

ESCUELA TÉCNICA SUPERIOR DE INGENIEROS
INDUSTRIALES Y DE TELECOMUNICACIÓN

UNIVERSIDAD DE CANTABRIA



Trabajo Fin de Grado

***NUEVO COMPRESOR DE AIRE DE
REGENERACION DEL CATALIZADOR DE
LA UNIDAD DE FLUID CATALYTIC
CRACKING (FCC) PARA MEJORAR LA
EFICIENCIA ENERGETICA***

(NEW AIR COMPRESSOR OF CATALYST REGENERATION IN THE FLUID
CATALYTIC CRACKING UNIT (FCC) TO IMPROVE ENERGY EFFICIENCY)

Para acceder al Título de
**GRADUADO EN INGENIERÍA EN TECNOLOGÍAS
INDUSTRIALES**

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RESUMEN

OBJETO

Reducir costos de operación y reducir las emisiones de CO₂.

Tomando en consideración la baja eficiencia de los accionamientos de Turbina de vapor y la alta fiabilidad actual del sistema eléctrico de la Refinería de Petróleo de REPSOL objeto de este proyecto, se considera ventajoso la sustitución de grandes máquinas existentes accionadas por turbinas de vapor por máquinas nuevas, accionadas por motor eléctrico. Las ventajas principales son la reducción de los costos de operación y la reducción de emisiones de CO₂.

ALCANCE

Sustitución del Compresor de Aire de Regeneración del catalizador de la unidad de una UNIDAD DE FLUID CATALYTIC CRACKING accionado actualmente mediante por turbina de vapor por un nuevo Compresor accionado por motor eléctrico de 14 MW de potencia nominal.

DESCRIPCION DEL PROYECTO

Equipos principales

Soplante F3-C-1:

Nuevo compresor centrífugo axial dotado de variación de caudal mediante "Inlet Guide Vanes" (IGV), accionado por motor eléctrico de 14000 kW de potencia nominal por medio de un Multiplicador de Velocidad para ajustar las rpm. Las tres máquinas comprenden un Skid que se en un emplazamiento nuevo bajo la misma nave del compresor actual.

Equipos eléctricos

- Nueva celda adicional en el Cuadro de 30 kV de salida a nuevo Transformador dedicado a instalar en la Subestación Principal de 132 kV de alimentación a Refinería de 132kV.
- Nuevo transformador dedicado de 35MVA (30/11,5kV).

- Un nuevo cuadro de 11kV a instalar en la Subestación de Procesos Nº3. Para alimentación al motor del nuevo Compresor.

ALCANCE DE LOS TRABAJOS DE INGENIERIA

Los trabajos de ingeniería del Proyecto se desarrollan partiendo de los datos del compresor existente y de los datos que aporta el suministrador del Skid del nuevo Grupo de Compresión (Compresor, Multiplicador de Velocidad, Motor Eléctricos); MAN DIESEL & TURBO.

A continuación se indican los más significativos:

SELECCIÓN COMPRESOR. Tomando en consideración las hojas de datos y las curvas de operación

PLANO DE IMPLANTACIÓN del Nuevo Skid de compresión, nueva consola de aceite de lubricación, nuevo transformador y celdas eléctricas

CLASIFICACIÓN ÁREAS PELIGROSAS. Solo una parte de implantación de la consola de aceite de lubricación está calificada como zona CLASE 1/ ZONA 2/ IIA/ T3.

LISTA DE EQUIPOS. Indicando su características principales

LISTA DE LINEAS. Indicando las características y especificación de cada tubería

DISEÑO EN 3 DIMENSIONES (MAQUETA 3 D). Para optimizar la implantación de los Equipos mecánicos y el diseño de tuberías.

DISEÑO TUBERIAS. Planos de planta de tuberías e isométricas

DIAGRAMAS MECANICOS DE PROCESO E INSTRUMENTACION. Representan principalmente todos los Equipos, las tuberías de proceso y servicios auxiliares e instrumentación, indicando su especificación.

OBRA CIVIL. CIMENTACIONES. Se diseñan para el Skid del compresor cimentaciones pilotadas.

ESTRUCTURA METALICA. Principalmente plataformas de operación y soportación del filtro de aspiración de aire.

DISEÑO ELECTRICO. Principalmente los Diagramas Unifilares.

DISEÑO CONTROL. Principalmente los Diagramas lógicos y planos de conexionado.

SUMMARY

OBJECTIVES

Reduce operating costs and reduce CO2 emissions.

Considering the low efficiency of drives steam turbine and the current high reliability of the electrical system REPSOL Oil Refinery object of this project it is considered advantageous replacement of large existing machines powered by steam turbines for new machines, driven by electric motor. The main advantages are reducing operating costs and reducing CO2 emissions.

SCOPE

Replacing the Air Compressor catalyst regeneration unit of CATALITYC FLUID CRACKING UNIT currently driven by steam turbine for a new electric motor driven compressor 14 MW rated power.

PROJECT DESCRIPTION

Main equipment

Blower F3- C-1:

New centrifugal compressor equipped with axial flow variation by " Inlet Guide Vanes " (IGV) , driven by electric motor 14000 kW rated power by a speed multiplier to adjust the rpm . The three machines comprise a skid that in a new location on the same ship of the current compressor.

Electric equipment

- New additional cell in Table 30 kV output dedicated to new transformer installed in the Main Substation 132 kV power to 132kV in the refinery .
- New dedicated 35MVA transformer (30 / 11,5kV) .
- A new panel installed 11kV Substation Process No. 3 . To feed the engine of the new compressor.

SCOPE OF WORKS OF ENGINEERING

The engineering of the project are developed based on existing data compressor and data provided by the supplier of the new Group Skid Compression (Compressor , speed multiplier , Electric Motor) ; MAN DIESEL & TURBO.

The following are the most significant :

SELECTION COMPRESSOR. Considering the data sheets and performance curves.

IMPLEMENTATION PLAN. New Skid compression , new console lubricating oil, new transformer and electric cells.

CLASSIFICATION HAZARDOUS AREAS. Only part of implementation of the lubricating oil console is classified as zone CLASS 1/ ZONE 2/ IIA/ T3.

LIST OF EQUIPMENT. Indicating its main features.

LIST OF LINES. Indicating the features and specifications of each pipe.

DESIGN IN 3 DIMENSIONS. To optimize the implementation of mechanical equipment and piping design.

PIPING DESIGN . Floor plans of piping and isometric.

MECHANICAL DIAGRAMS PROCESSAND INSTRUMENTATION. Mainly they represent all equipment , process piping and instrumentation and ancillary services , indicating its specification.

CIVIL WORK. FOUNDATIONS . They are designed for the compressor piloted Skid foundations.

METALLIC STRUCTURE. Mainly operating platforms to support the filter of air intake.

ELECTRICAL DESIGN . Mainly Line Diagrams.

DESIGN CONTROL . Mainly logical diagrams and connection drawings.

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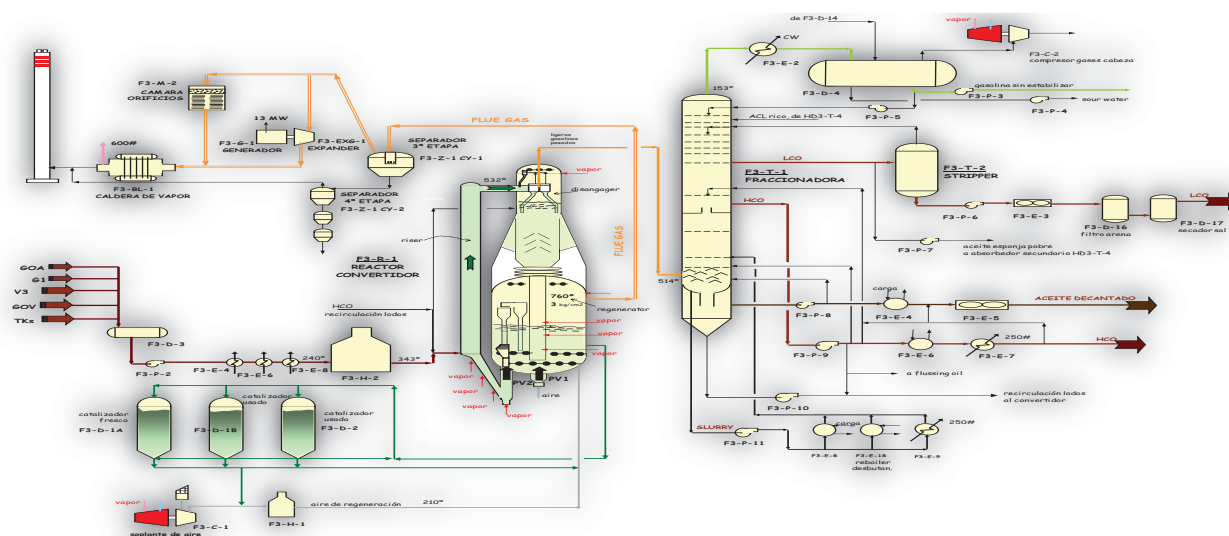
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1.1.2 Descripción de la Unidad de FCC

El esquema de proceso de la Unidad de FCC es el siguiente:



La Unidad opera normalmente con un flujo de carga de 46.000 BPSD, aunque por su diseño, puede llegarse con determinados tipos de carga, a los 48.000 BPSD, considerando su mínimo operativo en 28.000 BPSD. Las características de los productos dependerán de las condiciones de operación programadas en la Unidad, según convenga maximizar la producción de gasolinas o destilados medios (gasoil).

Carga a la Unidad

La carga a la Unidad FCC está compuesta principalmente por Gasóleos de Vacío procedentes de la Unidad de Destilación a Vacío. Otros posibles orígenes de la alimentación son Gas-oil procedente de la Unidad de Desulfuración de Gasoil de vacío, Gasoil procedente de las Unidades de destilación atmosférica y tanques de almacenamiento.

La carga a la Unidad es impulsada mediante un sistema de bombeo al horno. En una primera fase de precalentamiento intercambia calor de forma sucesiva con el aceite decantado y lodos con lo que se alcanza un incremento de temperatura aproximado entre 130-150 °C. Para una segunda fase de precalentamiento se dispone de un horno, F3-H-2 que eleva la temperatura de la carga hasta 240-340°C.

Convertidor

Comprende varias zonas:

Reactor: Es el lugar de encuentro de la carga y el catalizador. La primera entra en el reactor pulverizada a una temperatura entre 240-340 °C. El catalizador regenerado fluye del Regenerador a una temperatura entre 690-730 °C. En el reactor se desencadena una reacción de craqueo catalítico a una adecuada velocidad proporcionada por el estrechamiento calculado de la parte inferior del Reactor, también denominado Riser.

Separador: La mezcla hidrocarburo-catalizador-vapores cambia su sentido vertical ascendente, al horizontal, mediante un codo de diseño especial para minimizar los daños por erosión, entrando en los ciclones del Riser y de estos a los del Separador donde se produce la separación en dos etapas del catalizador que fluye por las patas de los ciclones al Agotador de los hidrocarburos y vapores, que fluyen hacia la fraccionadora F3-T-1. Por las patas de unos y otros ciclones se descarga el catalizador impregnado de carbón, fruto del craqueo catalítico.

Agotador: El catalizador recuperado, denominado “gastado” por su contaminación con carbón, es agotado mediante inyecciones de vapor separando de esta forma las partículas de hidrocarburos pesados retenidas en el catalizador.

Regenerador: Es la parte del Convertidor donde se efectúa la regeneración del catalizador quemando el carbón adsorbido en la reacción de craqueo catalítico para lo que el compresor, F3-C-1, proporciona el caudal de aire necesario. En la fase diluida entran en acción dos grupos de ciclones que, en doble etapa, separan de la corriente de gases de combustión, que denominamos flue-gas y el catalizador regenerado. La combustión casi completa, permite unos valores muy bajos en CO.

Compresor F3-C-1. La compresión del aire para regeneración del catalizador actualmente se realiza mediante un compresor centrífugo con 30 años de antigüedad accionado por una turbina de vapor que trabaja a condensación. Su sustitución por un nuevo compresor accionado por motor eléctrico es el objeto de este Proyecto. A fallo del compresor se provoca el disparo automático de vapor de emergencia, cuando dicho caudal baja a valores de 100.000 Nm³/h. El horno F3-H-1 se emplea para precalentar el aire durante determinadas fases de Parada y Puesta en Marcha. En situación normal está apagado, fluyendo el aire principal a través de él.

Sistema de Recuperación de Finos. La separación de finos arrastrados por el flue-gas se efectúa en varios separadores. La corriente de flue-gas se utiliza para accionar un turbogenerador.

Sección de fraccionamiento. Los vapores de hidrocarburos, vapor de agua e inertes que abandonan los ciclones secundarios del Separador del Convertidor, fluyen hacia la Torre Fraccionadora F3-T-1, donde se produce el fraccionamiento. Fruto de este fraccionamiento, nos encontramos con los productos, principalmente gasolinas, como se ha indicado anteriormente.

1.1.3 Necesidades de mejora y objetivo del proyecto

El Compresor de aire de regeneración de la Unidad de FCC opera actualmente accionado por una Turbina de Vapor. Tanto el Compresor como la citada Turbina de Vapor tienen una antigüedad en torno a 30 años por lo que su eficiencia y seguridad de operación son limitadas.

Dado que el sistema de regeneración del catalizador y por consiguiente el Compresor de Aire de regeneración juega un papel esencial en el funcionamiento de la Unidad de FCC, la sustitución del sistema de compresión actual por uno nuevo, más optimizado y eficiente, mejora considerablemente el rendimiento y seguridad de operación del sistema.

El objetivo principal de este Proyecto Final de Carrera es la realización de un diseño optimizado para la sustitución del Compresor de Aire de la Unidad de FCC de cara a obtener una mejora de la eficiencia energética del proceso. Esta sustitución incluye la Turbina de Vapor de accionamiento por un nuevo motor eléctrico y la consola de aceite de lubricación y el panel de control asociados al compresor por equipos nuevos.

El nuevo diseño de la instalación permitirá minimizar el consumo de vapor de la Refinería, las emisiones de CO₂ a la atmósfera y reducir las labores de mantenimiento de la unidad. Por tanto supone un beneficio para la operación de la Refinería.

1.2 INFORMACIÓN QUE COMPRENDE EL PROYECTO FINAL DE CARRERA (PFC)

La información que comprende el PFC se distribuye de acuerdo con lo siguiente:

DOCUMENTO N° 1. MEMORIA

En una primera parte se presenta el contexto y antecedentes del Proyecto, se describe el funcionamiento de la Unidad de FCC y se detalla la situación actual y las necesidades de mejora.

Seguidamente, se indican las alternativas del diseño básico estudiadas y se valora estas mediante criterios técnicos y económicos, habiendo seleccionado la opción que más se ajusta a las necesidades del Cliente.

Una vez planteada la necesidad se definen los beneficios (técnicos, económicos y sociales) que se espera conseguir con su ejecución.

A continuación se indican la Normativa y las Especificaciones de diseño aplicables para este Proyecto.

Finalmente se planifican todos los trabajos a realizar, estableciendo las diferentes relaciones entre las tareas a llevar a cabo.

DOCUMENTO N° 2. DISEÑO

En una primera parte se realiza un análisis de los datos de operación del nuevo compresor, para comprobar la eficiencia energética de la nueva instalación y confirmar la potencia del motor eléctrico.

A continuación se describe el diseño de la instalación resultante de la sustitución del Compresor, definiendo los nuevos Equipos y cada una de las modificaciones a realizar.

En los ANEXOS se incluyen respectivamente lo siguiente:

- ANEXO 1. Documentación generada por el Ingeniero
- ANEXO 2. Planos de diseño diseños editados por el Ingeniero
- ANEXO 3. Documentación más significativa generada por el suministrador del grupo compresor, MAN DIESEL & TURBO.

DOCUMENTO N° 3. PRESUPUESTO Y ESTUDIO DE RENTABILIDAD

Este documento contiene el Presupuesto del Proyecto y el análisis de rentabilidad del Proyecto.

DOCUMENTO N° 4. PLIEGO DE CONDICIONES

Este documento establece las bases para garantizar la correcta elaboración del Proyecto por el Ingeniero que presta los servicios de diseño.

1.3 ALTERNATIVAS PLANTEADAS Y SOLUCION ADOPTADA

Durante la fase conceptual previa a la ejecución del Proyecto, se contemplaron tres alternativas posibles para mejorar la eficiencia del sistema de compresión de aire de regeneración, analizando sus ventajas e inconvenientes para seleccionar la más idónea:

Alternativa 1: Cambio de la Turbina de Vapor de accionamiento del Compresor existente por una más moderna y eficiente manteniendo la misma implantación.

Ventajas:

- No es necesario el suministro de un compresor nuevo.
- Se mantiene la misma implantación del Grupo de Compresión.
- Utiliza la instalación actual de vapor adaptándola a la nueva turbina.

Inconvenientes:

- Ninguno de los posibles suministradores de Turbinas de Vapor de referencia mundial consultados se comprometen a presentar una oferta de suministro firme con las garantías necesarias del todo el Grupo de Compresión, ya que se mantiene en operación el compresor actual.
- La unidad de FCC debe estar parada para poder realizar la sustitución durante un periodo estimado mínimo de 75 días para realizar el desmontaje de la turbina actual y realizar el montaje de la nueva turbina de vapor con todo el equipamiento asociado de instrumentación y control. Si se aprovecha para la realizar la sustitución una Parada programada periódicamente por mantenimiento de la Unidad de FCC, con una duración

habitual de solo 45 días, la adopción de esta alternativa implica que la Unidad debe estar parada 30 adicionales.

- No se consigue uno de los objetivos del Proyecto como es la reducción de las emisiones de CO₂ a la atmósfera

Alternativa 2: Sustitución de la Turbina por un motor eléctrico nuevo en la misma ubicación

Ventajas:

- Eliminación consumo de 44 T/h de vapor (Presión: 42,3 kg/cm². Temperatura 371°C).
- Reducción costes de mantenimiento por eliminación del sistema de vapor.
- No es necesario el suministro de un Compresor nuevo.
- Se mantiene la misma implantación del Grupo de Compresión.

Inconvenientes:

- Además de la instalación del nuevo Motor Eléctrico, esta alternativa requiere la instalación de un nuevo Multiplicador de Velocidad para ajustar las revoluciones del compresor.
- Es necesario reformar la cimentación y la estructura del bastidor del tren de compresión para el montaje en él del nuevo Multiplicador de Velocidad y Motor Eléctrico con mucho mayor peso y dimensionamiento que la turbina actual. Lo anterior requiere una parada de la Unidad de aproximadamente 90 días para realizar el desmontaje de la turbina actual, el reforzamiento de la cimentación y del bastidor actuales y el montaje del nuevo Multiplicador de Velocidad y del nuevo Motor Eléctrico. Si se aprovecha una Parada programada periódicamente por mantenimiento de la Unidad de FCC con una duración de solo 45 días, supone la adopción de esta alternativa que la Unidad debe estar parada 45 adicionales. La instalación del sistema eléctrico asociado se realiza previamente a la Parada.
- Es necesario alimentar el nuevo motor eléctrico desde la Subestación Eléctrica de 132 kV muy alejada de la implantación del nuevo compresor.

- Los posibles Suministradores de motores de referencia mundial no se comprometen a presentar una oferta de suministro firme con las garantías necesarias ya que se mantiene en operación el Compresor actual.

Alternativa 3: Sustitución de todo el Grupo de Compresión actual por un nuevo Grupo Compresor accionado por Motor Eléctrico a través de un Equipo Multiplicador de Velocidad. Este nuevo Grupo de Compresión se ubica en un espacio libre dentro de la misma nave que alberga el Compresor existente.

Ventajas:

- Eliminación consumo de 44 T/h de vapor (Presión: 42,3 kg/cm². Temperatura 371°C).
- Reducción costes de mantenimiento por eliminación del sistema de vapor asociado a la Turbina de accionamiento.
- Debido a que se realiza la instalación en una nueva ubicación dentro de la nave del compresor actual, el montaje se pueden realizar antes de la Parada planificada periódicamente de la Unidad para mantenimiento. Durante la citada Parada sólo es necesario realizar el conexionado final de la tubería de impulsión de aire con una duración aproximada de 13 días, por lo que los trabajos se pueden realizar íntegramente en la citada Parada programada.
- Los posibles Suministradores de referencia (ELLIOT, GENERAL ELECTRIC Y MAN D&T) se comprometen a presentar una oferta de suministro firme con todas las garantías necesarias para el correcto funcionamiento y rendimientos del nuevo grupo de compresión.

Inconvenientes:

- Es necesario alimentar el nuevo motor eléctrico desde la Subestación Eléctrica de 132 kV muy alejada de la implantación del nuevo Compresor.
- Es necesario la instalación de un nuevo Equipo Multiplicador de Velocidad para ajustar la velocidad del Compresor a la del Motor Eléctrico. La variación de caudal se realiza mediante la dotación del compresor de un sistema mediante “Inlet Guide Vanes (IGV,s)”

Las alternativas 1 y 2 se descartan porque ninguno de las Empresas Suministradores de referencia consultadas ofrece garantías del correcto funcionamiento del Grupo de Compresión y además por el impacto económico que con lleva los días de la Parada necesaria de la Unidad del FCC adicionales a la parada planificada por mantenimiento con un costo del orden de 180.000 Euros/día.

Por lo tanto, la Alternativa seleccionada es la 3 tomando en consideración las ventajas ya citadas anteriormente.

Se adjunta tabla comparativa desde un punto de vista exclusivamente económico de las tres alternativas:

Criterio	Alternativa 1	Alternativa 2	Alternativa 3
Tiempo necesario en parada/ Tiempo parada planificada	75 días/ 45 días	90 días/ 45 días	13 días/ 45 días
Extracoste por días de parada adicionales	30 días x 180.000 €/dia =5.400.000 €	45 días x 180.000 €/dia = 8.100.000 €	Dentro del periodo de parada planificada
Coste nuevos Equipos	6.700.000 €	9.000.000 €	12.675.000 €
<u>Vapor</u> Consumo:44 T/h Precio: 28,16 €/Tn 8.580 horas de operación al año	10.630.963 €/año		
<u>Energía eléctrica</u> Consumo: 10.623 kWh Coste kWh: 0,0798 €. 8.580 de operación al año.		7.273.398 €/año	7.273.398 €/año
<u>Agua de refrigeración</u> Consumo:2.200 m3/h Precio: 0,0371 €/m3. 8.580 de operación al año	700.000 €		
Gastos anuales de mantenimiento	100.000 €	20.000 €	20.000 €
TOTAL INVERSIÓN + COSTE PARADA+COSTES OPERATIVOS	23.530.963 €	24.393.398 €	19.968.398 €

1.4 BENEFICIOS APORTADOS POR EL PROYECTO

A continuación se indican los beneficios técnicos- económicos y sociales del proyecto.

1.4.1 Beneficios técnico-económicos

Con la sustitución del Compresor existente accionado mediante turbina de vapor a condensación por un compresor nuevo accionado por motor eléctrico se consiguen los siguientes beneficios:

- Se consigue una reducción del consumo de 44 T/h de vapor recalentado de 42,3 kg/cm² de presión y 371°C de temperatura, cuyo

coste es muy superior al del correspondiente consumo de energía eléctrica de acuerdo con lo siguiente:

- Consumo medio de vapor: 44 Tn/h
- Consumo medio de energía eléctrica: 10.650 kWh
- Costo Tn/h vapor: 28,16 €
- Precio kWh: 0,0798 Euros
- Número de horas de operación: 8.580
- Coste consumo de vapor: 10.630.963 €
- Coste consumo energía eléctrica: 7.273.398 €

Reducción de coste por sustitución vapor por energía eléctrica: 3.357.565 €

- Se consigue una reducción de consumo de agua de refrigeración que se estima en 2.200 m³/h lo que supone una reducción de costo de 700.000 € (0.0371 €/m³).
- Con el nuevo sistema de control a implementar se mejora la seguridad de operación de la Unidad.
- Reducción de los gastos de mantenimiento del sistema de vapor. Los gastos de mantenimiento se estiman en 100.000 €/año, muy superior al gasto de mantenimiento del motor eléctrico que se estima en 20.000 Euros. Por tanto el ahorro por gastos de mantenimiento se estima en 80.000 €/año

Todo esto supone un ahorro mínimo anual de = 4.137.565 €.

1.4.2 Beneficios sociales

El beneficio social fundamental de este Proyecto es la reducción del impacto ambiental debido a la reducción de las emisiones de CO₂.

La producción de CO₂ se estima en 2,21 Tn por tFOE. Por tanto, el ahorro de 44 T/h de vapor de 42,3 kg/cm² y 371°C equivale a 26.580 tFOE/año. Por tanto la reducción de las emisiones de CO₂ es 58.770 Tn/ año.

La puesta en servicio de este Proyecto supone una importante mejora en el rendimiento del conjunto y un incremento por lo tanto de la eficiencia energética con la consiguiente reducción de emisiones a la atmósfera y del consumo de combustible con lo que ello supone la mejora medioambiental.

La realización del Proyecto no implica ningún incremento de las emisiones líquidas, gaseosas y de ruido al exterior del Complejo con respecto a los que actualmente se dan en la operación normal de la Planta, dado que el compresor actualmente en servicio se desmantelará, así como sus sistemas de lubricación y sello. Todos los drenajes de los equipos y tuberías objeto del Proyecto se conducirán a los sistemas de tratamiento de aceitosas de Refinería que cuentan con capacidad suficiente para el tratamiento de dichos efluentes. No se generarán nuevos residuos sólidos ni catalizadores.

1.5 NORMAS Y ESPECIFICACIONES DEL PROYECTO

Las normas aplicables más significativas para la ejecución del diseño del Proyecto son las siguientes:

1.5.1 European Directives

- 2006/42/CE Relativa a la aproximación de legislaciones de los Estados miembros sobre máquinas (MÁQUINAS) (MACHINERY) ? Real Decreto 1644/2008.
- 97/23/CE Relativa a la aproximación de las legislaciones de los Estados miembros sobre equipos a presión (EQUIPOS A PRESIÓN) (PRESSURE EQUIPMENT) □□Real Decreto 769/1999.
- 94/9/CE On equipment and protective systems intended for use in potentially explosive atmospheres (ATEX 100).
- 2000/14/CE Noisy emission for outdoor equipment.
- 2006/95/CE Low voltage directive.
- 2004/108/CE Electromagnetic compatibility.

1.5.2 Legislación española

- Real Decreto 1644/2008 de 10 de Octubre, por el que se dictan las disposiciones de aplicación de la directiva del consejo 2006/42/CE, relativa a la aproximación de las legislaciones de los estados miembros sobre maquinas. BOE núm. 246 de 11 de Octubre de 2008.
- Real Decreto 444/1994 por el que se establece los procedimientos de evaluación de la conformidad y los requisitos de protección relativos a compatibilidad electromagnética de los equipos, sistemas e instalaciones. Modificada por R.D. 1950/1995 y por Orden de 26/03/1996.
- Real Decreto 400/1996 por el que se dicta las disposiciones de aplicación de la Directiva del Parlamento Europeo y del Consejo 94/9/CE, relativa a los aparatos y sistemas de protección para uso en atmósferas potencialmente explosivas. BOE 85 de 08 de abril de 1996 (Directive 1994/9/CE).
- Real Decreto 1215/1997 por el que se establecen las disposiciones mínimas de seguridad y salud para la utilización por los trabajadores de los equipos de trabajo. BOE núm. 188 de 7 de agosto 5.
- Real Decreto 2060/2008 Reglamento de equipos a presión y sus ITC's. BOE núm. 31 del 5 de febrero de 2009.
- Real Decreto 212/2002 por el que se regulan las emisiones sonoras en el entorno debidas a determinadas máquinas de uso al aire libre
- Real Decreto 842/2002 por el que se aprueba el Reglamento electrotécnico para baja tensión. BOE núm. 224 del miércoles 18 de septiembre.

1.5.3 Normas API

- API-617, 7 th Ed. Axial and Centrifugal Compressors and Expander-compressors for Petroleum, Chemical and Gas Industry Services.
- API-614, 5th Ed. Lubrication, Shaft Sealing and Control Oil Systems for Petroleum, Chemical and Gas Industry Services.
- API-613, 5th Ed. Special purpose gear units for Petroleum, Chemical and Gas Industry Services.
- API-670, 4rd Ed. Machinery Protection Systems.

- API-671, 4rd Ed. Special purpose couplings for Refinery Service.

1.5.4 Otras Normas Oficiales

- IEC-60.034.1. Electric rotating machines
- IEC-61.508/2005 Functional safety of electrical/electronic/programmable electronic safety related systems.
- ASME PTC-10:1997 Performance Test Code on Compressors and Exhausters

1.5.5 Especificaciones de diseño de REPSOL

Se indican a continuación las de mayor implicación en el Proyecto:

ED-A-03.00. DISPOSICION GENERAL DE UNIDADES Y EQUIPOS

ED-A-07.00. PROCEDIMIENTO DE CLASIFICACION DE AREAS PELIGROSAS

ED-K-02.01. CENTRIFUGAL PROCESS COMPRESSOR (incluida en ANEXO 2).

ED-P-02.01. HIGH VOLTAGE ELECTRIC INDUCTION MOTORS (incluida en ANEXO 2). .

ED-K-03.01. SPECIAL PURPOSE GEAR UNITS

ED-K-04.00. LUBRICATION, SHAFT SEALING AND CONTROL-OIL SYSTEMS AND AUXILIARIES.

ED-A-01.02. EQUIPMENT NOISE CONTROL.

ED-P-05.00. POWER TRANSFORMER

ED-P-04.00. CUADROS ELECTRICOS DE ALTA TENSION

ED-P-02.00. LOW VOLTAGE ELECTRIC INDUCTION MOTORS

ED-J-09.00-I REV. 02. PANELES DE CONTROL

ED-J-06.00-I REV. 02A. VALVULAS DE CONTROL.

ED-Q-01.00. ESTRUCTURAS DE HORMIGON

ED-M-01.00. ESTRUCTURA METÁLICA

ED-L-01.00. DISEÑO DE TUBERÍAS EN UNIDADES DE PROCESO

ED-P-01.00. INSTALACIONES ELECTRICAS

ED-J-01.00. INGENIERÍA DE INSTRUMENTACIÓN

ED-I-02.00. GENERALIDADES DE UN SISTEMA DE ENCLAVAMENTOS.

ED-J-12.00-I REV. 02 INSTRUMENTACION PARA EQUIPOS MECANICO

ED-J-14.00. INSTALACION DE INSTRUMENTOS EN AREAS CLASIFICADAS

ED-J-13.02. CAJAS DE CONEXIONADO

1.5.6 Normas de gestión de proyectos de REPSOL

NRM-320 NORMA ALCANCE DE LA INGENIERIA DE DETALLE FASE FEL Y EPC

NRM-624 NORMA GESTION DE COMPRAS POR EL CONTRATISTA DE INGENIERIA

1.6 PLANIFICACIÓN

1.6.1 General

En este punto se describen las etapas y actividades que comprenden la ejecución del Proyecto. Se detallan las tareas a desarrollar, el plazo de ejecución previsto para cada una de ellas y su relación y el momento en que se deben ejecutar.

Previamente a la aprobación de la ejecución del Proyecto se realiza una etapa previa “FRONT END LOADING (FEL)” que comprende las actividades básicas de diseño y petición de ofertas de los equipos principales que permiten al Cliente realizar una estimación de la Inversión del Proyecto con una precisión de $\pm 10\%$ y su aprobación si el consiguiente estudio de rentabilidad es positivo. El plazo de ejecución de esta fase es de 7 meses

Una vez aprobada la ejecución del Proyecto, se edita la planificación de todas las tareas que comprenden las actividades de ingeniería, adjudicaciones de los Equipos y materiales, suministros de los citados equipos y materiales, actividades de construcción, comisionado y puesta en servicio (Etapas EPC). El plazo de ejecución es de 20 meses. La actividad que condiciona la duración del Proyecto es el suministro del nuevo Grupo Compresor que tiene un plazo de entrega de 14,5 meses.

Los servicios a realizar por la Empresa de Ingeniería especializada en Proyectos de Plantas Petroquímicas contratada por el Cliente comprende la realización de la

ingeniería de diseño de todas las especialidades y gestión de compras de equipos y materiales, incluyendo los trabajos de activación e inspección de su fabricación.

Todas las actividades de construcción se realizan con la Unidad de FCC en operación excepto la conexión del tramo nuevo del colector de impulsión con el existente y el comisionado y la puesta en servicio, con una duración estimada de 13 días.

En el ANEXO 1 se incluye un programa del desarrollo de todas las actividades del Proyecto.

1.6.2 Tareas del Proyecto de Ingeniería

Durante la etapa previa FRONT END LOADING (FEL) se edita la Requisición Técnica de Compra de los equipos principales. En ella se describen las características que deben cumplir el Compresor centrífugo axial de aire y el resto de equipos y sistemas asociados a este, así como los nuevos equipos eléctricos más significativos. Estos son:

- Motor eléctrico de accionamiento.
- Multiplicador de velocidad
- Sistema de aceite de lubricación y trabajo de los equipos.
- Panel local de control e instalación de instrumentación y control.
- Transformador dedicado
- Celdas de media tensión

Es necesario realizar un análisis de las hojas de datos y de las curvas de operación del compresor seleccionado MAN D&T, de cara a comprobar que cumple con todos los requerimientos exigidos por el cliente, así como un análisis de operatividad de la instalación

Una vez aprobada por el Cliente la ejecución del Proyecto y consecuentemente realizada la adjudicación del Grupo Compresor a MAN D&T, con la información suministrada por el Suministrador y la documentación de diseño y operación existente de la Unidad de FCC, la Empresa de Ingeniería contratada por el Cliente realiza el diseño del Proyecto. Incluye fundamentalmente las siguientes tareas:

- Diseño básico de proceso
- Diseño de obra civil y estructuras
- Diseño de tuberías
- Diseño del sistema eléctrico
- Diseño de Instrumentación y Control

También es parte de alcance de los servicios a prestar por la Empresa de Ingeniería la gestión de compras de todos los equipos y materiales (edición de requisiciones, tabulaciones de ofertas y propuestas de adjudicación) e inspección y activación de los suministros de todos los equipos y materiales del proyecto, que comprende el Proyecto, especialmente por su dedicación e importancia el del Grupo Compresor.

Las actividades de Ingeniería que comprende el diseño del PROYECTO se incluyen en el programa del Proyecto incluido en el ANEXO 1 indicando la duración de cada una de ellas.

1.6.3 Hitos para el control del proyecto

Los hitos más significativos de la planificación de proyecto que por tanto se deben seguir especialmente para evitar desviaciones respecto el programa son los siguientes:

El hito inicial que define el inicio del proyecto de ingeniería es la fecha de adjudicación del correspondiente Contrato de Servicios de Ingeniería a una Empresa especializada en proyectos en Plantas Petroquímicas.

El segundo hito es la adjudicación del pedido del Compresor a la Empresa suministradora seleccionada por REPSOL, en concreto MAN D&T.

El resto de hitos son aquellos que marcan las fechas de entrega de la documentación más significativa del suministrador del Compresor una vez adjudicado el Pedido, ya que esta documentación es necesaria para la edición de los distintos entregables (documentación y planos) del diseño del Proyecto. Los más significativos son los siguientes:

- Plano general del Grupo compresor
- Planos de cargas de grupo Compresor

- Hojas de datos, del compresor, motor de accionamiento, multiplicador de velocidad, consola de aceite de lubricación.
- Diagramas mecánicos de proceso
- Diagramas lógicos de control

1.7 RECURSOS HUMANOS Y MATERIALES

Para realizar el diseño de Proyecto es necesario el siguiente equipo de trabajo:

- *Director de Proyecto*
- *Ingeniero de Proyecto*
- *Ingeniero / Técnico especialista de procesos*
- *Ingeniero / Técnico especialista de obra civil/estructuras*
- *Ingeniero / Técnico especialista de mecánica-equipos*
- *Ingeniero / Técnico especialista de tuberías y suportación*
- *Ingeniero / Técnico especialista de instrumentación*
- *Ingeniero / Técnico especialista de electricidad*
- *Técnico de gestión de compras*
- *Ingeniero / Técnico especialista de calidad/medio ambiente*
- *Ingeniero / Técnico especialista de planificación*
- *Ingeniero / Técnico especialista de inspección /activación*
- *Delineantes proyectistas*
- *Delineantes*

En la gestión de compras participan todos los especialistas de las distintas disciplinas especialmente en lo que se refiere a la edición de las Requisiciones Técnicas de Petición de Ofertas y la elaboración de las tabulaciones técnico-económicas de las ofertas recibidas.

Sin embargo, el Proyecto Final de Carrera (PFC) sólo comprende las tareas más significativas. Por tanto, para llevar a cabo las actividades del PFC solo es necesario disponer de los siguientes recursos humanos y materiales;

Recursos humanos

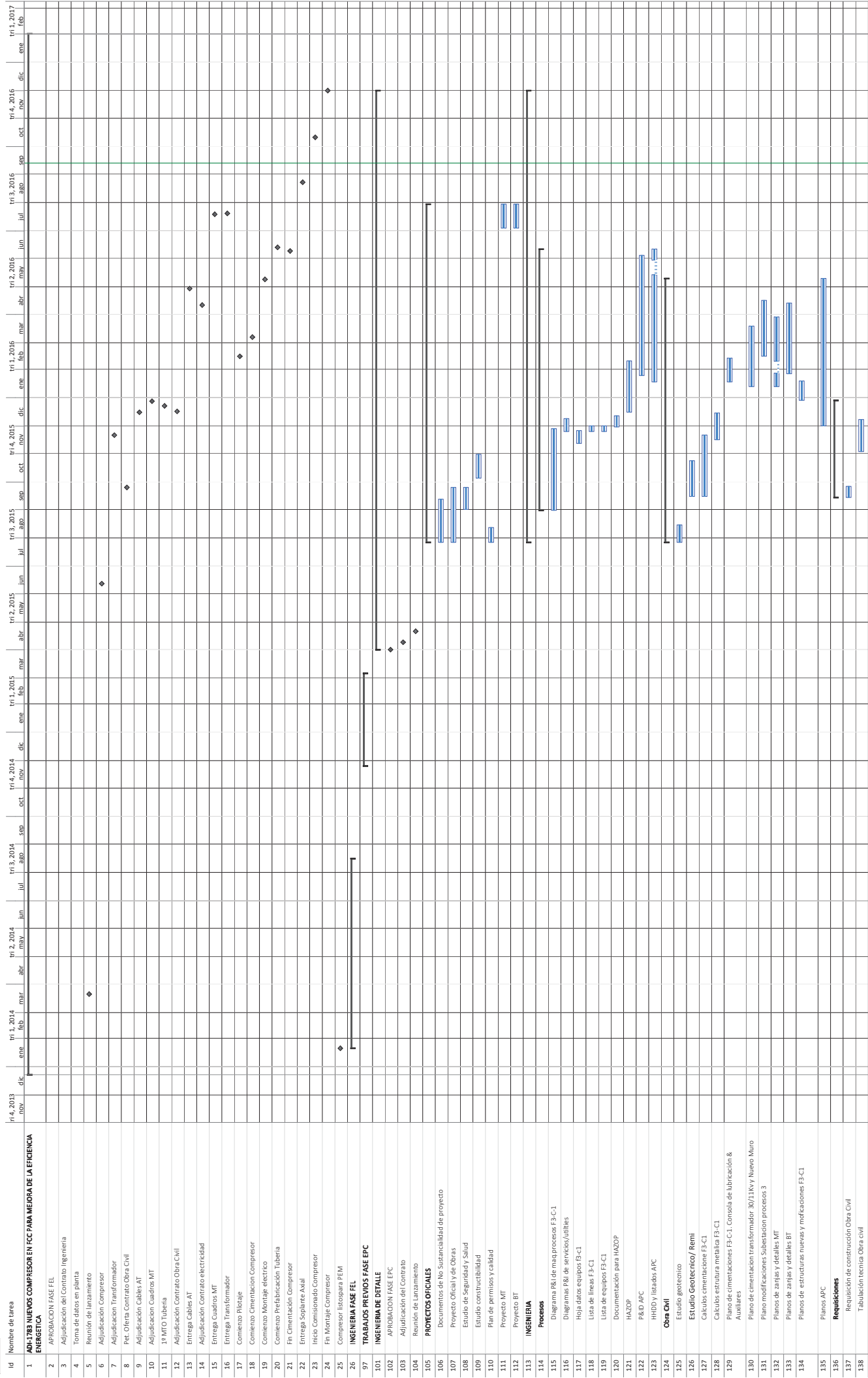
- Un Ingeniero Superior como Tutor y supervisor del proyecto
- Un Ingeniero de Grado en Ingeniería en Tecnologías Industriales con la función de ingeniero de proyecto

Recursos materiales

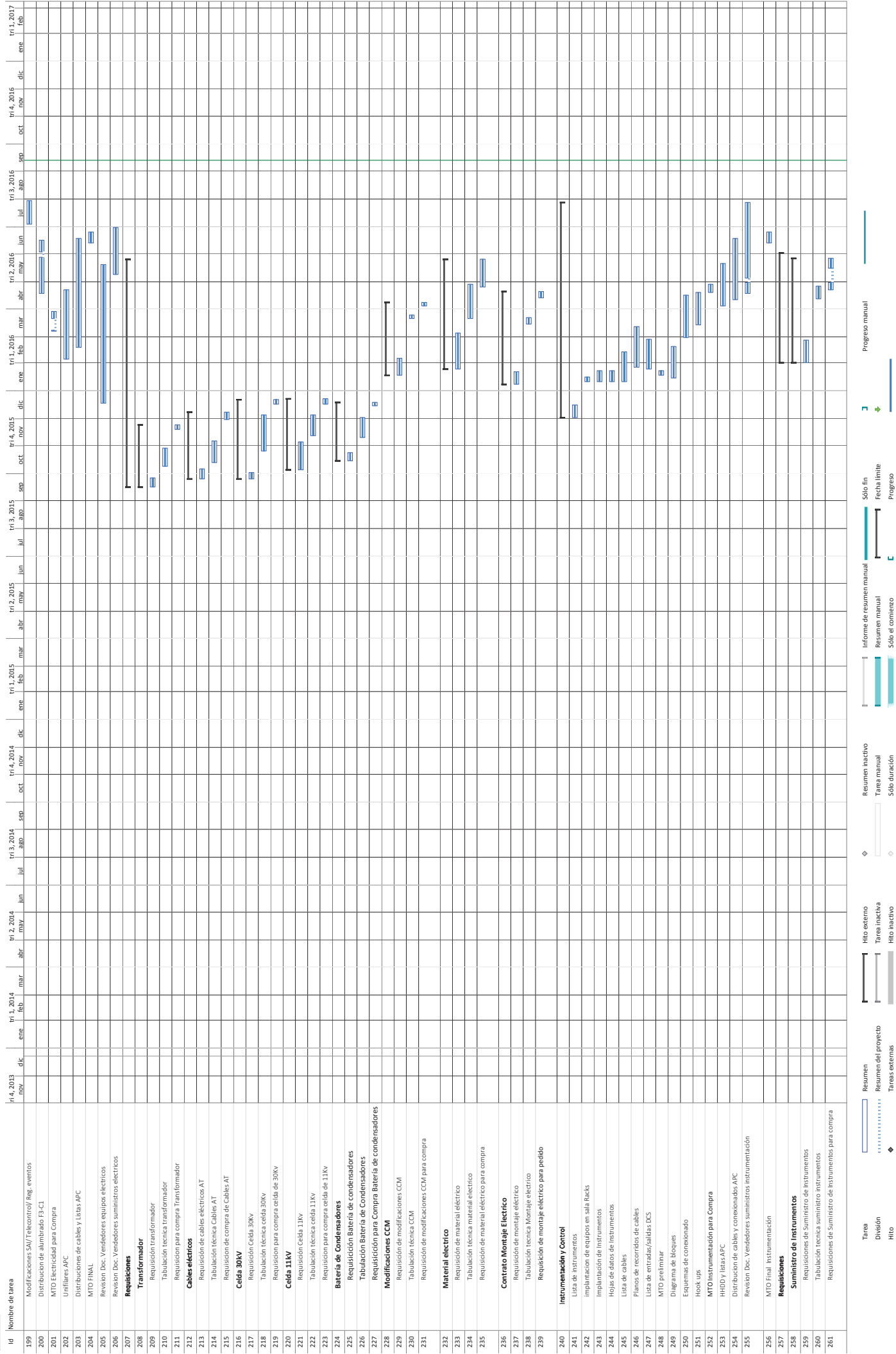
Los medios materiales que se van a emplear para la elaboración del PFC son los siguientes:

- Software: Microsoft Office, Cadworx / ORTOGEN, AutoCad, MicroStation, Descartes.
- Ordenadores
- Impresora/fotocopiadora
- Cámara de fotos

1.8 ANEXO. 1. PLANIFICACION DEL PROYECTO







Hito externo

Tarea inactiva

Hito inactivo

Resumen inactivo

Tarea manual

Solo duración

Informe de resumen manual

Resumen manual

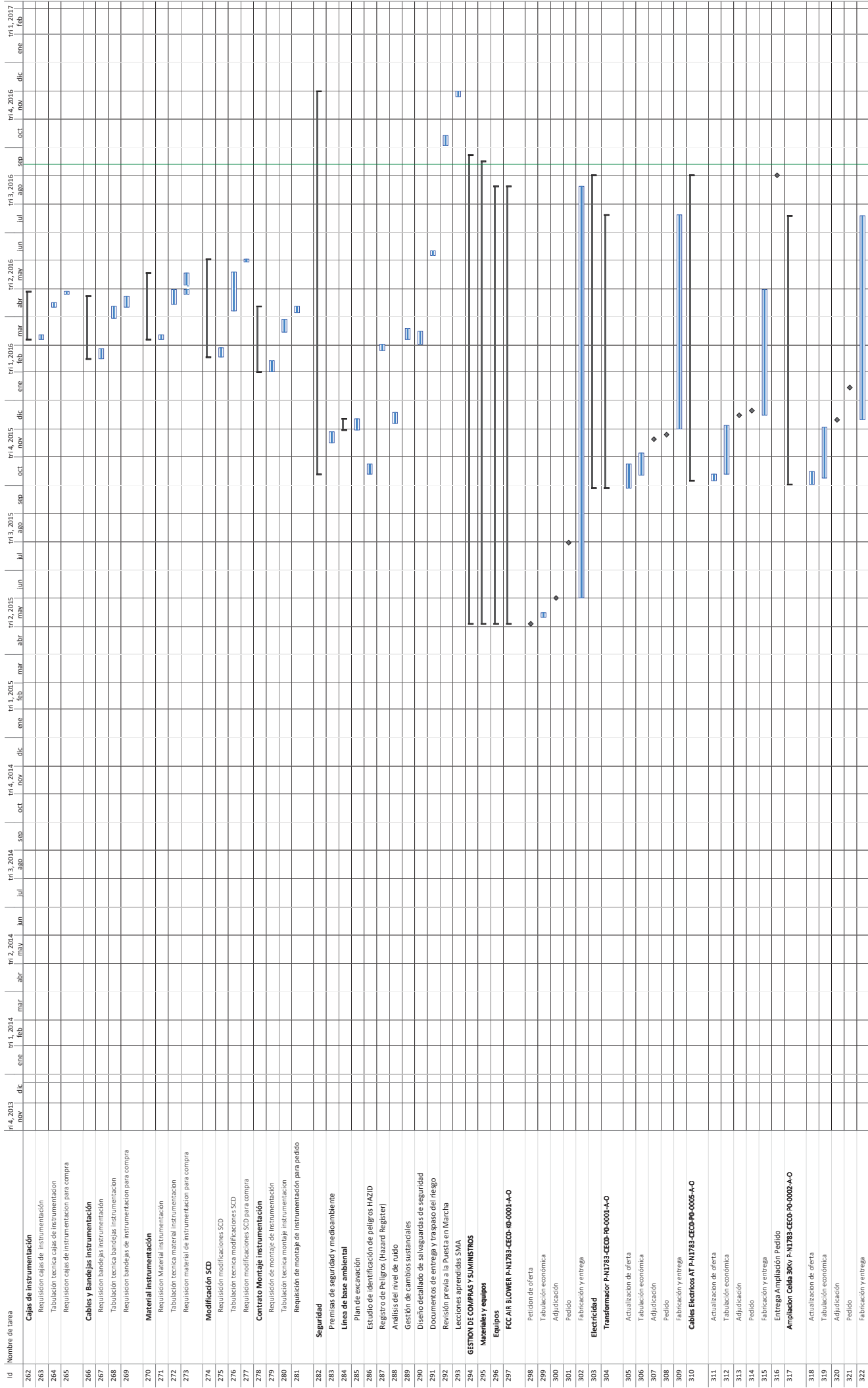
Solo el comienzo

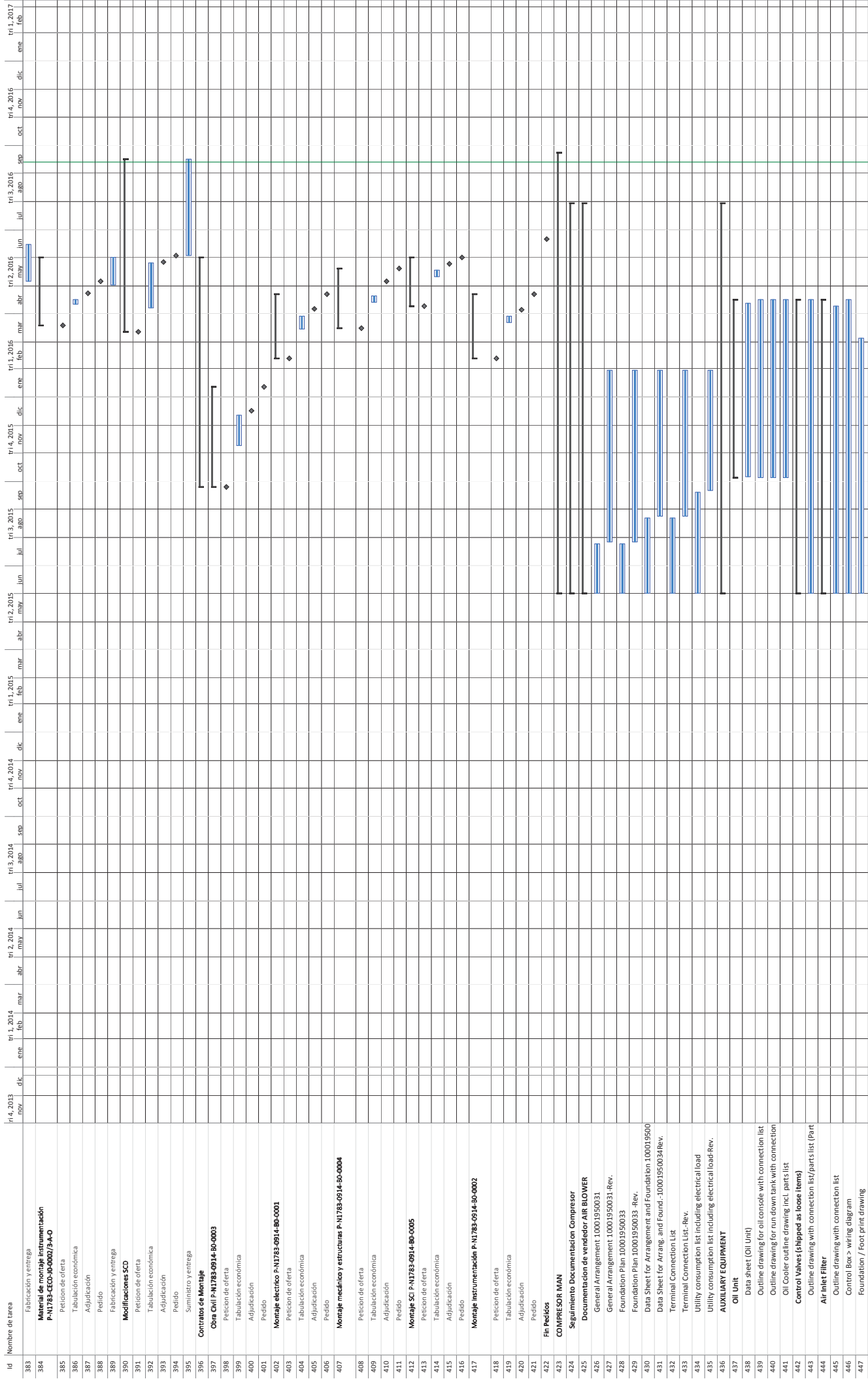
Sólo fin

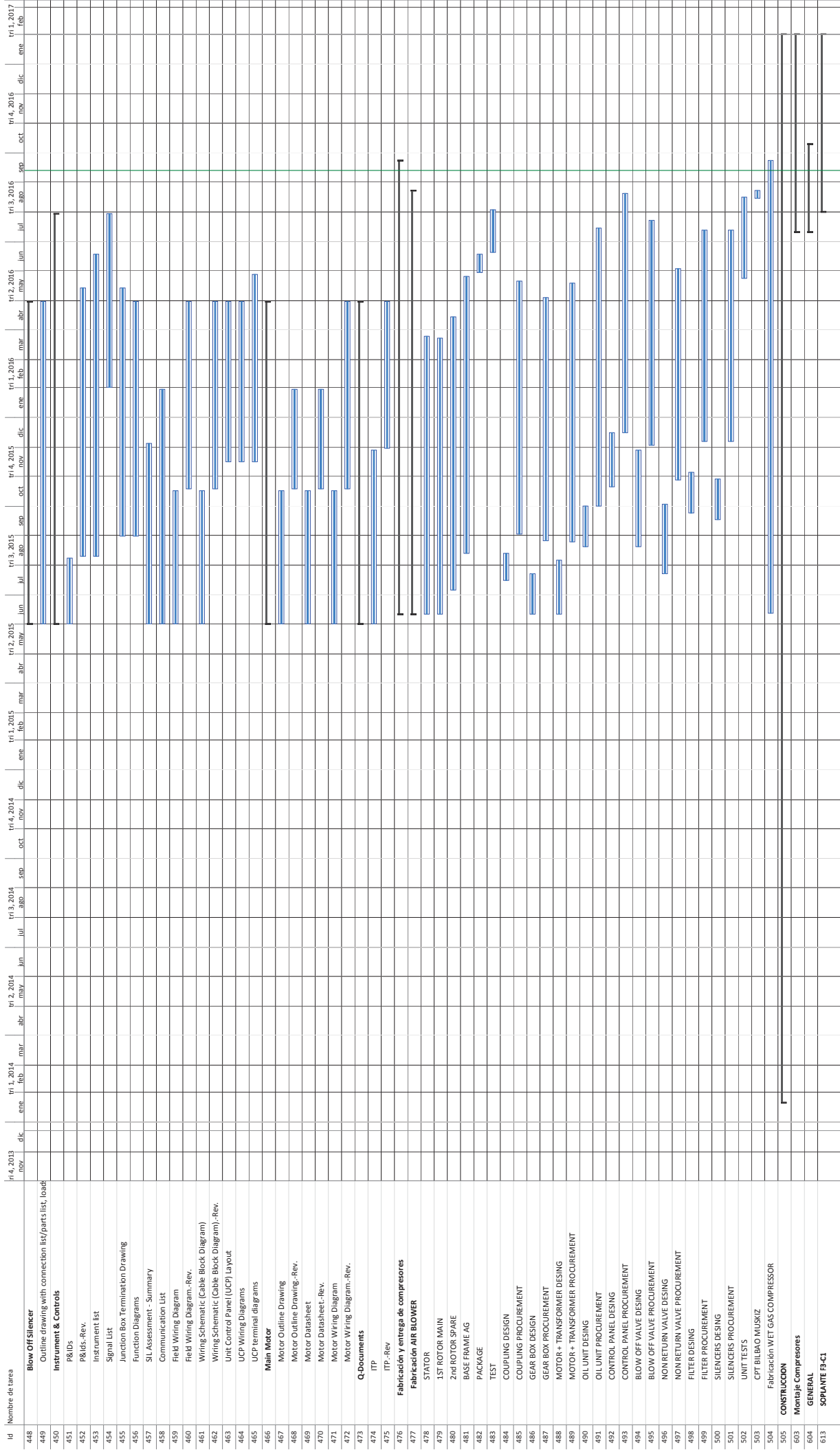
Fecha límite

Progreso

Progreso manual







Progreso manual

1.9 ANEXO. 2. ESPECIFICACIONES REPSOL

ED-K-02.01. CENTRIFUGAL PROCESS COMPRESSOR.

ED-P-02.01. HIGH VOLTAGE ELECTRIC INDUCTION MOTORS.



Design specification:

ED-K-02.01-I-02

Engineering Division

Technical Department

COMPRESSORS AND MACHINERY

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CENTRIFUGAL PROCESS COMPRESSORS

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02	SEPTEMBER 2014	CONFORMITY WITH CORPORATE STANDARD 00-00458NNO AND GUIDE 03-00008GU.	ANDRÉS RIVERA RUIZ	NOMBRE FERNANDEZ VALDES CESAR LUIS - NIF 45427653P 2014.09.30 19:00:27 +02'00'	PUCHE MOLINA, JUAN DE DIOS 2014.09.30 19:14:42 +02'00'
01	FEBRUARY 2005	FIRST ISSUE	C.L.F.V	A.O.R	J.C.P.P
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REVISIONS OF THE SPECIFICATION					

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1. GENERAL

1.1. Purpose

This specification covers the minimum requirements for axial compressors, single-shaft and integrally geared process centrifugal compressors and expander-compressors for use in the petroleum, chemical, and gas industries services that handle air or gas.

This document is part of the latest edition of the REPSOL technical specifications and refers to the latest edition of the Standards and Codes that are mentioned, as well as the provisions of the Basic Design Data (BDD) document, which covers the particular aspects for each project.

This document complements the seventh edition of API standard 617, reaffirmed in January 2009, which forms an integral part of this specification.

For ease of reference the paragraph numbering of API 617 standard Chapter 1 has been used throughout Sections of this specification (numbers shown between brackets). Paragraphs in API 617 standard not mentioned remain unaltered. Paragraphs are categorized as follows:

- **Addition:** it indicates that referenced paragraph has added or expanded requirements.
- **Modification:** it indicates that referenced paragraph has to be modified with indicated different requirements.
- **Replacement:** it indicates that referenced paragraph has been deleted and alternate requirements have been substituted.
- **New:** it indicates the addition of a completely new paragraph where an API paragraph does not exist.

1.2. Order of priority

This specification, together with the data sheets, is part of the equipment requisition. In the event of conflict between the documents included in the requisition, the following order of precedence shall govern:

- Applicable legislation.
- Data sheets.
- Equipment Requisition.
- This specification.
- Other specifications and standards referenced by this specification.
- API Standard 617

1.3. Responsibility

Exceptions, deviations, or clarifications to this specification shall be communicated to REPSOL in writing. Only those exceptions mentioned explicitly in the order can be accepted.

Compliance with this specification and/or other referenced specifications and standards and/or information given in the order does not relieve the vendor from its responsibility of providing suitable equipment for heavy and continuous duty according to the specified service requirements.

1.4. Manufacturer's reference list

For a centrifugal compressor to be considered technically acceptable, the supplier, at the time of the bid, shall have manufactured at least two compressors that are similar in power, speed, operating conditions, mechanical design, materials, and rotating element dynamics, and the machinery shall have been in continuous service for at least two years and be performing satisfactorily.

- Equipment manufactured under license, in addition to satisfying the above requirements shall also be furnished with the licensor's written guarantee.

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1.5. CE Marking

The equipment to be installed in the European Community shall be provided with CE Marking, and with a Declaration of Conformity according to the applicable European Directives.

1.6. Alternative design

(1.2 Addition) The Vendor may offer an alternative design providing sufficient detail to prove that it is technically superior.

1.7. Measuring Units

Unless other measurement units are specified in the BDD, the SI Units shall be used exclusively in the technical documents, calculations and data sheets, except for ANSI flanges and for NPT taper pipe threads.

2. DEFINITIONS OF TERMS

(1.5.18 Modification) **Maximum continuous speed.**- It corresponds to 105% of the maximum required speed for any of the specified operating conditions, regardless of the driver type.

3. BASIC DESIGN

3.1. General

(2.1.8 Modification) The unit shall be designed for outdoor installation, in the climatic zone and environmental conditions stated in the BDD and without any additional protection.

(2.1.9 Addition) The maximum allowable sound pressure level shall comply with the provisions of the corresponding chapter of REPSOL ED-A-01.02 specification and applicable addenda. The Vendor shall indicate the equipment's noise level in his proposal. If it exceeds the limits, the acoustic protection shall be removable, fire-proof, acoustic insulated and provided with quick-opening devices.

(2.1.14 Modification) All electrical components and instruments shall be selected for the area classification, gas group and temperature class specified by the Purchaser in the Material Requisition. For equipment to be installed in the European Community, compliance with ATEX 94/9/EC Directive is required.

(2.1.17 New) The 115% of the flow capacity at surge point at normal speed shall not exceed 85% of the normal flow capacity under any operating conditions without utilizing the bypass.

(2.1.18 New) The maximum Mach number at the impeller eye for any operating condition shall not exceed 0.9.

3.2. Materials

(2.2.1.2 Modification) Materials shall be identified in the proposal with their applicable ASTM, AISI, ASME, ISO, or SAE numbers, including the material grade.

(2.2.1.17 New) If the service is specified as wet H₂S (regardless of the concentration), the materials shall comply with the requirements of REPSOL ED-B-04.00 specification.

(2.2.1.18 New) Welding shall comply with the requirements of REPSOL ED-B-05.00 specification.

(2.2.1.19 New) Before proceeding with repair of any compressor component, the repair procedure shall be approved in writing by REPSOL

(2.2.2.5 New) Repairs of cast iron parts are not allowed.

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3.3. Casing

(2.3.1.11.6 New) If the gas temperature may be less than -28°C , the resilience of the materials in contact with the gas shall not exceed 4 kg/cm^2 (Mesnager probe) at the minimum operating temperature.

(2.3.1.11.7 New) The use of casings made of cast iron (either grey or nodular) is not allowed.

(2.3.1.11.8 New) Radially-split casings shall be used if the discharge pressure exceeds 30 barg.

(2.3.1.11.9 New) Axially-split casings with o-rings retained in grooves machined into the flange facing are not acceptable

(2.3.1.11.10 New) Axially-split compressors shall have the following axially-split components: Diaphragms, Inlet guides and Labyrinths

3.4. Casing connections.

(2.3.2.1.8 New) Casing drains shall be valved and flanged, with a minimum size of $\frac{3}{4}"$, and manifolded to the baseplate edge (1 NPS min.). The connections shall have reinforcing gusset plates.

3.5. Guide vanes, stators and stationary internals.

(2.4.1 New) Inter-stage cooled diaphragms are not acceptable.

3.6. Impellers.

(2.5.10.1 Modification) The impellers shall be finish machined and welded.

(2.5.10.8 New) When the process gas contains H_2S (2 ppm or more), a sample probe of impeller material shall be prepared and subjected to the same heat treatment and tests.

(2.5.10.9 New) The impellers shall be designed limiting the maximum stress in any direction at maximum continuous speed to 70% of the material yield strength.

3.7. Bearings and bearing housings.

(2.7.2 Addition) Radial bearings shall be tilting pad type.

(2.7.4.1 Addition) Bearing housings shall have labyrinth seals with external fluid sealing provisions.

(2.7.4.4 Addition) The following bearing metal temperature sensors shall be provided:

- Radial bearings: two RTD's in the shoe with greatest load of each bearing (if not feasible due to space limitations, REPSOL shall approve the alternate location).
- Thrust bearings: two RTD's shall be installed in two pads located 180 degrees apart on each side (i.e. active and inactive).

3.8. Shaft End Seals

(2.8.1.1 Addition) Dry gas seals shall be installed, either a tandem arrangement with intermediate labyrinth or a double pressurized seal, as specified on the data sheet. Auxiliary systems shall be in accordance with REPSOL ED-K-04.00 specification. An automatic leak detection system with alarm and compressor shutdown shall be installed.

Shaft end seals –regardless of its type- shall be leak-tight during compressor shutdown.

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(2.8.1.1 Addition) If an oil sealing system is specified, the Manufacturer shall guarantee the maximum oil loss under normal operating conditions. Lube oil and oil sealing systems shall be independent for compressors handling H₂S or other hazardous, corrosive, toxic or lethal gases. Gas losses through the seals shall be vented to flare or safe area.

(2.8.1.1. Addition) Single piece rotating and stationary seal rings shall be used.

(2.8.4.1 Addition) The Supplier shall indicate in his proposal seal gas requirements for the start-up and transient conditions. Seal gas positive pressure is always required. If seal gas is provided, an automatic differential pressure control system shall be installed (seal gas / seal liquid including the connections for differential pressure measurement).

(2.8.4.5 New) Gas seal piping shall be flanged including duplex filter, check valve, throttle valve, blind flanges and pressure gage for each seal. The filters shall be provided with a differential pressure gage.

(2.8.4.7 New) The Vendor shall clearly indicate in the proposal the estimated and guaranteed maximum amount of internal seal fluid leaks for each seal. This value shall be specified for normal operating and standby compressor conditions.

(2.8.4.8 New) If dry gas seals are supplied, the Vendor shall provide the barrier gas supply systems, which must include, as a minimum, the following: automatic differential pressure control with bypass, duplex filter, isolation valve, pressure gauge, low pressure alarm and delayed compressor shutdown. A permissive to start the lube oil pumps is also required, to ensure that the supply of the barrier gas is operating.

(2.8.4.9 New) The Vendor shall provide all the required controls, instrumentation and interconnecting piping for the seal gas system, including differential pressure gauge for the filter. The system shall be designed to work with the fluid at the specified conditions. The Vendor shall mount all the system on a local panel, which must be installed on the compressor baseplate, including all the interconnecting piping. All the components in contact with the seal gas shall be made of austenitic stainless steel.

3.9. Lubrication and sealing systems.

(2.10.3 Modification) Lubrication system shall comply with REPSOL ED-K-04.00 specification, Chapters 1 & 2.

(2.10.4 New) After mutual agreement between the manufacturers, the same type of REPSOL oil shall be used for driver and driven equipment.

(2.10.5 New) Bearing and seal housing shall be clearly separated to avoid lube oil contamination of the DGS.

3.10. Dynamics

(2.6.2.1 Addition) The critical speed value should not be twice the operating speed.

(2.6.2.3 Modification) Undamped rotor response analysis shall be provided.

(2.6.7.1 Modification) Compressor torsional analysis shall always be provided for REPSOL approval. All torsional excitation sources considered shall be indicated.

(2.6.7.6 Modification) The Vendor shall include in its tender a detailed description of the proposed transient torsional analysis, including the criteria adopted for safe operations with no damages.

3.11. Vibrations and balancing

(2.6.8.12 New) All removable parts shall be provided with a positioning mark.

3.12. Nameplates and rotation arrows

(2.11.3 New) The nameplate shall be written in the official language at site and the data in SI units. In addition to the information required by API 617, the nameplate shall include the Purchase Order number.

4. ACCESSORIES

4.1. Drivers

- (3.1.1 Modification) The type of driver shall be specified on the data sheet.
- 2 (3.1.4 Addition) If the specified driver is a steam turbine, it shall conform to ED-K-01.01 REPSOL specification. The Vendor shall provide all driver data designated as "Buyer specifications" on the REPSOL data sheets.
- (3.1.5 Addition) If the specified driver is an electric motor, it shall conform to REPSOL ED-P-02.01 (high voltage) specification. The Vendor shall provide all driver data designated as "Buyer specifications" on the REPSOL data sheets.
- (3.1.8 Addition) When the use of a gear is required, it shall comply with REPSOL ED-K-03.00 specification.
- (3.1.9 New) The compressor Manufacturer shall be responsible for the installation onto the baseplate and the driver alignment at his facilities.

4.2. Couplings and guards

- (3.2.1 Addition) Couplings shall be diaphragm-type, flexible, non-lubricated and with metallic elements. Couplings shall be hydraulically fitted. Natural axial frequencies (NARF) for diaphragm couplings shall be at least 20% less than the system's excitation frequency.
- (3.2.8 New) Couplings guards shall be in accordance with local safety requirements and shall be designed for a minimum vertical load of 1000N. The coupling guard shall be made of non sparking material.

4.3. Baseplates

- (3.3.2.1 Modification) The compressor and driver shall be mounted on a common baseplate.
- (3.3.2.12 New) Anchor bolts shall be supplied by the compressor manufacturer.
- (3.3.2.13 New) The baseplate shall be provided with vertical leveling screws and horizontal jackscrews (lateral and axial) to simplify the leveling and alignment of the compressor package.

4.4. Control and instrumentation

- (3.4.1.2 Addition) The equipment instrumentation shall comply with the requirements of REPSOL ED-J-12.00 specification, Instrumentation for mechanical equipment.

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CORPORATE STANDARD 00-00458NO	(3.4.2.2 Modification) A Surge Detection System (SDS) and an Anti-Surge Control System shall be supplied fully in accordance with API 670. As a minimum, the following shutdowns are required to safeguard the compressor: - excessive surge detected by the SDS (concept to be approved by REPSOL), - failure of the SDS, - low-low lube oil pressure, - high-high pressure on primary vent (for tandem DGS), - low-low seal gas pressure (for double DGS), - high-high radial vibration (if specified), - high-high axial displacement, The Vendor shall implement any other shutdown considered essential to safeguard the compressor.

2

- (3.4.2.2 Addition) The Vendor shall quote the following options for the anti-surge system. The anti-surge valve shall always be supplied by the Vendor.



- a) Anti-surge system engineering in order to implement the logic in the plant PLC. The Vendor shall provide the technical specification and data sheets of the transmitters and flow measurement primary element, which will be supplied by others.
- b) Anti-surge system provided by Compressor Controls Corporation (CCC) or alternate supplier approved by Repsol (refer to the Project Vendor List).

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CORPORATE STANDARD

00-00458NO

(3.4.5 Addition) Shutdown and alarm switches and circuit shall be completely independent. All start-up switches shall be normally closed (Fail-safe design).

A start-up permissive shall be provided for the lube-oil pumps, to ensure proper operation of the separation gas supply system.

A compressor permissive to start is required to ensure proper operation of the seal gas supply system and the lube oil system.

Alarms and shutdowns shall have a 2-out-of-3 voting logic, except for the radial vibrations (2-out-of-4 logic) and the axial displacement (2-out-of-2 logic).

4.5. Piping and appurtenances

(3.5.1.5 New) A removable suction filter with a differential pressure gauge shall be mounted at the inlet of each stage. The installation shall be suitable both for start-up and permanent installation.

(3.5.1.6 New) All throttle, control and bypass valves mounted on the skid shall be accessible from the baseplate edge.

(3.5.1.7 New) Flexible connections for auxiliary piping are not acceptable.

(3.5.1.8 New) When a noise protection enclosure is required, the piping passage through the enclosure itself shall be minimized.

(3.5.1.10 New) Lubrication and control oil piping shall be of stainless steel AISI 316 schedule 80 for diameters equal or smaller than 1 ½", and minimum schedule 40 for diameters equal or larger than 2".

(3.5.1.11 New) Piping shall be no smaller than ½" NPS. Flanged connections shall be used for piping 1" NPS and greater.

4.6. Special tools

(3.6.1 Addition) A complete set of special tools shall be provided, including the tools required to install and disassemble the coupling hubs provided by the Vendor.

5. INSPECTION, TESTING, AND PREPARATION FOR SHIPPING

5.1. General

(4.1.1 Modification) The Purchaser's representative shall have free access to the Vendor and subcontractor's workshops where the equipment is being manufactured, tested or inspected.

(4.1.3 Modification) The purchaser shall be notified at least ten days in advance about the dates for inspections and tests that are specified as witnessed. In the inspection point programs, all tests indicated in the data sheet or requisition as witnessed shall be considered hold points.

(4.1.8 New) The procedures for all tests designated as witnessed shall be submitted for approval at least 4 weeks prior to the scheduled test date; no tests shall be performed until the procedures have been approved.

5.2. Material inspection

(4.2.2.6 New) The Vendor shall make available to Purchaser's representative all the construction material certificates of the main components.

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5.3. Testing

(4.3.1.4 New) For variable speed machinery, surge points at 85% and 105% of design speed shall be verified in order to determine the surge curve.

(4.3.6.1.3 Modification) Tape recording shall be made of all real-time data, as mutually agreed upon by the Purchaser and the Vendor. The collected data shall be provided to the Purchaser.

(4.3.6.2.2 Modification) Shaft end seals shall be removed for inspection following a successful running test.

Rotor displacement shall be measured and recorded during final assembly and compared with the measure after the running tests (before bearings are opened for inspection).

5.4. Sound-level test

(4.3.8.3 Addition) The Vendor shall measure the noise generated by the compressor, gear and motor during the running tests.

5.5. Machine Gas Leakage Test

(4.3.8.9 New) Compressor casings handling a gas containing 30 mol per 100 or more of hydrogen shall be subjected to helium leakage tests.

(4.3.8.10 New) The compressor shall be subjected to a static pressure seal test at the maximum gas pressure specified on the data sheets. The test duration shall be of 1 hour to allow a thorough measurement of leaks.

5.6. Preparation for shipment

(4.4.7 New) In any case, preparation for shipment shall be in accordance with REPSOL ED-B-01.00 specification.

5.7. Painting

(4.4.8 New) The painting shall be in accordance with REPSOL ED-B-06.00 specification and PE-B-0600.01 Paint systems. The Manufacturer standard painting procedure may be acceptable for the compressor and driver, provided that it is suitable for offshore installation.

6. DRAWINGS AND INFORMATION

6.1. Proposals

(5.2.1 Addition) The proposal shall include a statement of compliance with the requirements of the inquiry requisition. Otherwise, a detailed list of exceptions shall be submitted (showing which document and paragraph refers to and the technical explanation for each deviation).

A reference list of similar equipment in similar services shall be furnished with the proposal.

6.2. Contract documents



Vendor documents shall comply with what was established in the specification ED-A-09.00, *Requirements for Vendor drawings and documentation* and also shall take into account the following

(5.2.1 Addition) The number of copies and issue dates of the drawings and documents required from the Vendor shall be indicated in the Material Requisition.

6.3. Recommended spare parts

(5.3.4.3 New) The spare parts shall be part of the vendor's scope of supply. The spare parts for the start-up shall be delivered with the machines.

The spare parts criteria shall be in accordance with Repsol Standard 01-00061NO (NRM-624) appendices *Minimum spare parts for the start-up phase and two years in service*.

6.4. Manuals



(5.3.5.5 New) Installation, operation and maintenance manuals shall be both in English and in the official language at the country of installation.

7. STANDARDS AND SPECIFICATIONS OF REFERENCE

Besides the documents mentioned in the API 617 standard, the following documents and the documents in them referenced shall be also part of this specification. The latest edition applies.

7.1. Repsol standards and technical specifications

Note:

Every REPSOL specification, subject to availability in English, is identified in the REPSOL index of technical specifications ED-A-00.01 with an addition of the letter "I" as indicated in the following example:

ED-Y-XX.XX Spanish language.

ED-Y-XX.XX-I English language.



7.1.1. Corporate standards

00-00458NO Prevention and mitigation of fire, explosions and toxic leaks

03-00008GU Safeguard design guide



7.1.2. Engineering Division standards

01-00061NO Purchase management for the engineering contractor (NRM-624)

7.1.3. Design specifications



ED-A-01.02 Equipment noise control

ED-A-09.00 Requirements for vendors drawings and documentation

ED-B-01.00 Packing, marking and shipping of equipment and materials

ED-B-04.00 Material requirements and limitations for special services

ED-B-05.00 General requirements for welding

ED-B-06.00 Painting

ED-J-12.00 Instrumentation for mechanical equipment

ED-K-01.01 Special purpose steam turbines

ED-K-03.00 Special purpose gear units

ED-K-04.00 Lubrication, shaft-sealing and control-oil systems and auxiliaries

ED-P-02.01 High voltage electric induction motors

7.1.4. Standard drawings

PE-B-0600.01 Paint systems



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SPECIFICATION REVIEWS					

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1. GENERAL

1.1. Purpose

This specification together with the project documentation (motor Data Sheets and project specifications) defines the standards to apply during design, manufacture and testing of three-phase totally enclosed fan cooled squirrel-cage induction motors, for voltages greater than 1000 V.

This document is part of the latest edition of the Repsol Technical Specifications. It makes reference to the latest edition of Standards and Codes mentioned and/or applicable as well as to definitions in the "Basic Design Data (BDD)" summarising specific aspects of each project.

This specification together with the data sheet and/or equipment engineering drawings is an integral part of the material requisition.

1.2. Scope

The following is an integral part of supply:

- Motors
- Cable terminal connection.
- Accessories and auxiliary elements
- Testing at manufacturers workshops
- Supervision of assembly and final operational tests (when required).
- Delivery documentation

In case of joint supply of motor with the mechanical equipment, it is required direct access of the electrical of both, Engineering and Repsol specialists, even though the purchase can be done through a different

1.3. Priority order between documents

In the event of discrepancies between the documents included with the requisition, the following priority sequence shall apply:

- Applicable legislation (if no more restrictive requirements are included in the data sheets, material requisition or in this specification).
- Data sheets and/or engineering drawings.
- Requisition of the material
- What is defined in this specification

1.4. Exceptions to the specification

Exceptions or variations to this specification that the manufacturer considers necessary shall be notified in writing together with the proposal in a single document which shall include all deviations and with reference to the contradictory chapter.

Only the variations specified in the order shall be accepted.

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1.5. Measurement units

The International Metric System (IS) of measurements or the Angloaxon units of measurements, to be established at the beginning of the project, shall be used in all the documents, test, etc. Other measurement units must be approved by Repsol.

1.6. Suppliers

The suppliers will have a long and demonstrated experience in the design, manufacture and starting-up of low voltage motors. The supplier will also have the adequate installations to do the complete electrical and mechanical tests to the equipment in normal conditions of operation or in what are required by IEC standards.

Even being accredited by Repsol, if the manufacture of the equipment is made in other country that is not the one of the supplier, this manufacture shall be communicate and in any case shall be authorized by Repsol.

2. SERVICE CONDITIONS

2.1. Environmental conditions

The motor shall be suitable for continuous operation to nominal power respecting the limits of temperature indicated in IEC standard located outdoors, without protection and in the following conditions:

- Altitude lower than 1000 m (3281 ft)
- Maximun temperature 40 °C (104°F)
- Minimum temperature -5 °C (23°F)
- Maximum relative humidity (daily average) 90%
- Minimum relative humidity (daily average) 50%
- Chemically aggressive atmosphere, salty, dusty and corrosive, common to industrial facilities.

More restrictive conditions will be detailed in the DBD document and/or in the particular documentation of the project (data sheets, particular requisition, etc.)

2.2. Power supply

Unless indicated otherwise in the project documents, the motors will be suitable for continuous running at rated output (at ambient temperature and at the voltage and frequency values defined in the project documents) with variations of voltage and frequency within the limits of "zone A" (defined in the standard IEC 60034-1), without exceeding the temperature rise defined for the insulation systems of thermal class B (80K).

Furthermore, the motors will be suitable for continuous running at rated output (at ambient temperature and at the voltage and frequency values defined in the project documents) with voltage and frequency variations exceeding the limits of "zone A", within zone B, but without exceeding the temperature rise permitted by the insulation system of thermal class B by more than 10K.

2.3. Starting conditions

Unless otherwise specified in the project documentation, motors shall comply with the following requirements:

- a) The motors shall be prepared on-line starting.

Based on the characteristics of the equipment being operated, the motor manufacturer shall specify any limitations and recommend the most appropriate motor for each specific case.

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In those cases in which the motors are driven by a speed-regulator and in which an on-line starting is not required, a motor that doesn't fulfill exactly the on-line starting condition could be acquired, previous Repsol authorization.

- b) During starting or the re-acceleration process the supply voltage may drop to 80% of the rated value defined in the project documents. In these conditions, the torque of the motor shall not be less than 130% of the load torque (without tolerances), at any speed between 0 and that corresponds to the maximum power torque. The resistant torque to be considered shall be the resistant torque of habitual starting's conditions of the driven machine.

The manufacturer of the driven equipment shall provide the torque-speed curve.

Care shall be given to special equipment (agitators, centrifuges, extruders, etc.) which require control of starting conditions and time.

When motors bigger than 1000 kW, the manufacturer shall check that the motors can start with 80% of the rated voltage and with the load torque of the driven machine, in the starting time of the motor and with the starting conditions

Lack of values of the driven machine, the motors' manufacturer shall assume the results, unless it is indicated in the offer as pending.

- c) Voltage during starting shall be 80% of rated value. In the conditions specified the motors shall support the following starting sequences:
- o Three consecutive cold start attempts (with return to the condition of zero speed before the next start attempt). It shall be possible to perform an additional start after running for 20 minutes or after 45 minutes -stopped once the motor has reached normal operating temperature.
 - o Two consecutive start attempts after continuous running at rated power.
 - o Three start attempts at equal intervals during one hour, during continuous running at rated power.
 - o Motors of power greater than 1,000 kW, shall be capable of at least six (6) startings in one day without suffering damage, with 1000 startings per year as minimum.

The manufacturer shall specify the waiting time after finishing the above starting cycle before performing a new start.

During the above-mentioned starting sequences, the temperature of the stator coil shall not exceed more than 10% the insulation class limit; the rotor's squirrel-cage temperature must not be higher than 250 °C (482°F) or other more restrictive conditions required in the standards for Ex execution motors.

These starts shall be considered at full load of the driven machine.

3. TECHNICAL CHARACTERISTICS

Unless otherwise specified in the project documentation, the technical characteristics shall comply with the following requirements:

3.1. Starting torque

At least, the conditions described in point 3.3 will always be fulfilled.

The starting torque for motors with power up to 500 kW will never be less than 80% of rated torque. The starting torque for motors with power over 500 kW will never be less than 60%.

3.2. Starting current



The locked rotor current values at rated voltage and frequency, shall be less than 660% of rated current for motors rated up to 1000 kW and less than 550% for motors of more than 1000 kW. (These are maximum values of current, in these values are already included the IEC tolerances).

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Greater values require Repsol approval.

3.3. Noise level

The noise level, indicated as average pressure of sound at one meter from the surface of the motor and measured in dB(A) in accordance with the ISO 3744 recommendation, shall not exceed the limits specified in the table of the IEC standard. The maximum level admitted is 82dB, (Without tolerances).

If to fulfill this noise level, an acoustic protection is needed, it will be indicated in the data sheet and it will require the Repsol authorization.

If it is allowed, this acoustic protection will be removable, made of acoustic and fireproof insulation material and equipped with devices which rapid opening.

During the routine test if the required noise level is not fulfill, the manufacturer will propose to Repsol the changes to be made to the motor to fulfill it. These changes will have to be approved by Repsol, who will be able to request the repetition of the test that had been carried out before the measurement of the unfulfilled noise level.

3.4. Vibrations

Motor vibration shall be measured at the points specified in the IEC 60034-14 standard. For this purpose flat areas of approximately 30x30mm (1.2"x1.2") shall be available on the casings next to the bearing supports to fix the accelerometer.

Vibration shall be measured by putting the motor on a rigid workbench and with a half-key (unless otherwise indicated in the motor Data Sheet).

The vibrations will be measured at no-load at rated voltage and frequency.

The vibration speed limits (at no-load and at full load) are defined in the standard IEC 60034-14, depending on the rated speed, demanding degree B to all motors. In exceptional cases it could be required vibration levels even lower, following the code API 541.

If vibrations in the driven machine are to be measured continuously, the motor shall include proximity measurement probes ("non contact" type). Unless otherwise specified, each bearing shall have two probes placed at 90°. The type of probes shall be the same as the ones used on the equipment being driven.

The vibrations shall be measured as speed (mm/s).

3.5. Direction of rotation

Motors that rotate in both directions are preferred. Motors that turn only in one direction are acceptable although in these cases it shall be possible to change the direction only by changing the external fan

The direction of rotation of the motor shall be defined viewed from the coupling side and shall be directly related to the phase sequence U, V, W.

The direction of rotation required in the Data Sheet, shall be marked on the motor casing with an embossed single arrow or stainless steel screwed plate on the side opposite the coupling.

The name plate shall specify the possible direction of rotation CW, CCW, or CW-CCW.

Sticky labels and painted signs are not acceptable.

3.6. Pulsating current

Pulsating current in motors that drive alternative compressors shall not be greater than 40% of full load current.

If it is necessary to add a flywheel, the manufacturer of the motor shall supply the manufacturer of the driven machine with the necessary data so that the latter can produce the relevant calculations to limit the irregularity factor to better than 1/100.

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3.7. Efficiency

Manufacturer shall always offer the motors of the higher efficiency it can build, always in accordance with the technical requirement of this specification.

For the economical evaluation during purchasing process it shall be considered not only the initial cost but also the cost of the energy consumption during a period of life of 5 years.

4. CONSTRUCTIONAL CHARACTERISTICS

4.1. External dimensions

The frame and main external dimensions shall correspond to the values specified in the IEC standard.

4.2. Construction type

The construction type and assembly requested in the Data Sheet shall be defined in accordance with the IEC standard.

4.3. Degree of Protection

Motors will be enclosed. The degree of protection of frame and the terminal box against external agents shall be IP55 and IP65, respectively.

The motor shall have one of the following cooling systems while maintaining the required degree of protection:

- a) Totally enclosed type, fan outer surface cooled with finned frame
- b) Totally enclosed type, with external and internal fans and with frame with tubes
- c) Totally enclosed type, with external and internal fans and with built on air-to-air heat exchanger
- d) Totally enclosed type, with external and internal fans and with built on air-to-water heat exchanger

4.4. Frame

- a) The motor frame shall withstand all possible forces during normal starting, short-circuits and counter-phase connections and in the event of re-acceleration due to supply voltage momentary interruptions.
- b) Unless otherwise specified in the project documentation, the frame shall be made of cast iron or corrosion-resistant steel appropriate for the most adverse environmental conditions.

4.5. Rotor

The Rotors shall be made laminated

The rotor squirrel-cages shall be made of copper.

The axial force, if any, shall be absorbed by the motor bearings.

Rotors and fans shall be separately and dynamically balanced with a half-key inserted (verify with the manufacturer of the equipment being driven).

The quality of balancing shall be at least grade G2.5.

The manufacturer must specify in its quotation the type of the cage (single or double cage, deep bars, etc.).

The rotor will be determine to allow the indicated starting conditions, even the re-start of the motor with a residual voltage of 40% and with a phase displacement of 180%.

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The rotor will be free of its own axial forces.

4.6. Fans

Fans shall in all cases be non-sparking and made of corrosion resistant material such as brass, bronze or aluminium (copper content < 0.2%).

The fan shall be bi-directional (where possible) and installed on the side opposite the coupling so that it sends air towards the coupling.

All the fans will be mounted on the motor's shaft. The cases where fans with auxiliary motors are needed require the Repsol's authorization.

The fan cover and grid shall be made of steel plate.

4.7. Shafts

The shaft shall be made of steel and machined (in compliance with existing standards) to receive half of the coupling.

The shaft shall be supplied complete with the corresponding key.

When the motor drives an alternative machine, the flywheel shall be calculated and supplied by the manufacturer of the driven equipment, to obtain a degree of irregularity 1/100 or greater. In these conditions, the new PD^2 for the complete group must be considered and whether its modification (due to the installation of these devices) changes the starting time and other conditions.

The centre holes located on the shaft ends (used during construction), shall be of adequate design to ensure their protection and avoid deterioration and conserve them in best working conditions in future eccentricity verifications.

The maximum allowed deflection, shall be established so that critical speed is reached at more than 120% of maximum operation.

- The end of the shaft shall be marked with the letter H or F, depending on whether it was balanced with half or full key.
- The shaft shall be permanently marked at the magnetic centre which must coincide with the geometrical centre, working with the fan installed and for the specified direction of rotation and revolutions.

4.8. Couplings

When required direct rigid couplings, (for example line pumps and vertical motors) then the ends of the shaft shall be made according to the instructions of the manufacturer of the driven equipment.

When required rigid coupling with flange then mechanized, drill holes and tolerances shall be made according to the instructions of the manufacturer.

Vertical motors used to drive pumps located in deep wells shall have couplings bolted to the motor shaft with an anti-turning device to avoid defects to the unit.

4.9. Windings and insulation

The windings shall be made of copper form-wound coils and insulated with epoxy resin and vacuum impregnated.

The installation shall guarantee that movement or distortions will not occur if there is a short-circuit between the coils and the supply leads.

The winding insulation shall be adequate for the rated voltage specified in the project documents.

The winding terminals shall be insulated with fireproof, non-hygroscopic material.

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Insulation shall be designed to support a motor re-start or re-acceleration with a phase displacement of 180° and a residual voltage of up to 40% of rated voltage (re-starting voltage value 140% of rated voltage).

Insulation system shall be class F, with temperature rise of class B.

The insulation temperatures allowed are those specified in IEC standard, measured with the resistance method in relation to altitude and temperature conditions at the plant.

4.10. Terminal boxes

Independent terminal boxes will be provided for:

- Main power terminals.
- Terminals for connecting the centre of the star (when necessary). (It can be the same)
- Terminals for differential protection connections.
- Space heaters
- Transformers secondary circuits for the differential protection.
- Temperature detectors.
- Level instruments, water leakage, etc.

4.10.1. Power terminal boxes

All terminal boxes shall be made of cast iron, or steel plate. The cover shall have neoprene joints and shall be screwed to the box.

The walls shall have a minimum thickness of 3mm (1/8")

The boxes shall have a threaded hole to which shall connect a metallic cable gland or lead-in bushing with the appropriate size to exterior diameter of the cable, if there are more than one cable three-phase or several mono-phase shall be installed a cable gland or lead-in bushing for every cable.

When a lead-in bushing is installed, the grounding of the armor of the cable shall be done by a cable clamp that shall be connected to the ground lead of the terminal box through a copper plait.

Inlet the box shall be installed the connection terminal and the trifurcation, if the supply is by three phase cable. The size shall be appropriate to allow the connection of the cables that are indicated in the data sheet, without forcing the turning radius of the cable.

The main terminal boxes shall have a fragile area so that if there is a short-circuit between terminals, the breakdown will occur in this area and always towards the motor frame, avoiding that strikes somebody who is close to the motor.

The terminal boxes will be rotatable by 90 ° steps to permit the cable arrival from the four orthogonal directions without having to work on the connection terminals and it shall be possible to remove them from the frame without removing the cable gland connection, the lead-in bushing nor the terminal connection.

The high voltage terminal connections, lead conductors and associated accessories shall withstand short-circuit conditions (minimum 0.3 secs.) defined in the project documentation for the electric system where the motor will be installed.

The separation between phase-phase and phase-earth shall comply with indications in IEC and shall be at least 90 (3.5") and 65 mm (2.5"), respectively.

The connection elements shall be made of tinned copper.

The windings shall be connected in star. The terminals for neutral shall be preferably accessible, in a separate terminal box. The box shall be placed on the side opposite the main box. When possible, both boxes shall be swappable and it shall be possible to use either of them for power feed or making the centre of the star.

If the naming sequence of windings is U, V, W – coinciding with the supply phase sequence – the direction of rotation (defined in 4.5) will be to the right (CW). If the direction of rotation is opposite (CCW), the naming sequence of terminals shall be maintained.

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The lead-in bushing through the motor frame to the terminal box shall be sealed to prevent the entry of moisture and foreign matter.

If the way of the cables from the stator to the terminal box pass through the pipe of the air cooling, on the route from the stator to the terminal box, shall be installed in rigid steel pipes or similar.

4.10.2. Terminal box if there is differential protection

These boxes shall have the same constructive characteristics that have been indicated in the previous section for terminal boxes.

The differential protection of the motor shall carry out applying the diagram called "self balancing differential", it consists on the installation of three toroidal current transformers through everyone pass the supply connection to the winding and the connection of the extreme that take the star of the same phase.

These toroidal current transformers shall be installed preferable in the terminal box.

Its secondary windings shall be connected to a auxiliary terminal box independently from the high voltage box.

Other solutions apart from differential protection shall be approved by Repsol.

The whole terminal box and toroidal transformer shall be appropriate for dangerous place indicated in the data sheet of the motor.

4.10.3. Auxiliary boxes

The boxes shall be of steel plate or steel alloy. The covers shall have neoprene joints and shall be screwed on the boxes.

The minimum thickness of the walls and of the cover shall be 3 mm (1/8").

They shall have screwed holes and double seal metallic cable glands appropriate to the cable indicated in the data sheet and appropriate to the Ex protection mode of the box.

The degree of protection shall be IP 659.

They shall be installed on the opposite side of the terminal box.

Independent boxes shall be installed for the following services:

- For the heat resistance of the windings, bearings, air, and water.
- For the secondary windings of the differential protection's current transformers.
- For level instruments, water leakage, etc.

Between the sensors and these boxes intermediate boxes are no allowed.

These services shall be able to group in one or more boxes if there is an appropriate separation between the several services and there is a Repsol approval, it must be justified in the offer by the manufacturer. The space heater's box shall be always independent.

4.11. Bearings and lubrication

- a) Motors of more than 500 kW at 3,000 rpm, 750 kW at 1,500 rpm or 900 kW at 1,000 rpm shall have sleeve bearings, and all the motors of less than 1000 rpm, independently of its power. These shall be preferably self-lubricating, with an oiling ring.

The maximum allowable temperature increment (above the ambient temperature specified in the project documentation) is 40 K measuring the temperature of the antifriction metal. This temperature shall be measured with the motor running at full load and stabilized.

The sleeve bearing material shall support a superior operating temperature of 130°C (266°F).

The axial displacement of sleeve bearings in horizontal motors shall be at least 6 mm (1/4"). The coupling to the driven machine shall be through limited axial play coupling, in accordance with the equipment manufacturer requirements.

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The ends of the maximum allowed axial displacement shall be marked, facilitating information about the maximum axial thrust transmitted by the motor in both extreme positions.

The sleeve bearings shall have adequate capacity to support the axial thrust inherent to the motor, limited at 450 N for every 750 kW.

- b) The other motors shall use ball bearings or roller bearings lubricated with grease or oil.

The bearing shall be rigid ball bearings with a play C3 or one line cylindrical bearings, the squirrel-cage shall be one piece of brass. The plays and fits shall be according to ISO 286. The bearings shall be chosen according to ISO 281 with a minimum working life L10h of 40.000 hours for 4 or 2 poles motors, and 80.000 hours for 6 or more poles motors (all the cases considering full load)

The bearings shall be SKF or FAG.

The manufacturer shall specify the applicable re-oiling periods between oil changes or re-oiling for vertical motors and the quantity of lubricant required for the correct operation of the motor. Bearings shall not be accepted if their oiling periods are shorter than:

- o Horizontal motors: 4000 hours,
- o Vertical motors: 2000 hours.

It must be possible to oil the motor in operation, without need to remove any cover or accessory.

- c) Bearing supports shall be equipped with a labyrinth seal and split deflectors.

Motors bigger than 1,100 kW shall have at least one insulated bearing. Insulated connectors shall be provided in the lubrication circuits to prevent bridge connections to ground. In motors of lesser power, bearings shall be insulated when the manufacturer considers it necessary, with prior approval from Repsol.

When the pure fog lubrication is not specified, oil-lubricated bearing supports shall incorporate a purge valve with a screw cap, as well as a constant level cup made of non-splinting glass with a TRICO or DENCO metallic squirrel-cage with a minimum capacity of 100 cm³ (6.1 in³). Likewise they shall have several inspection holes to verify the proper operation of the rings or oil projectors as well as oil level.

All motors shall have temperature indicators on both bearings.

- d) In addition to the local thermometer, a thermo resistance Pt 100, 3 or 4 threads on each bearing

In both cases, the temperature measured shall be the corresponding temperature of the anti friction metal

4.11.1. Lube oil system

When necessary to guarantee maximum allowed temperatures defined in the previous section the manufacturer of the motor shall supply the hole lube system according to indicated in the ED-K-04.00 (chapters 1 and 3-oil system for general services).

These lube oil system shall have two oiling motor pumps, one in operation and the other in stand-by, as well as cooler, double filter, valves, accessories and necessary elements for the proper operation.

The manufacturer shall specify the maximum amount of time the motor can operate with the lubrication switchboard stopped, at different room temperature values. The oil outlet flange shall have a limiter that ensures the minimum level of oil necessary. Likewise, it shall indicate the alarm and trip temperature at which the thermo resistances must be set.

If there is an oil lube sysem in the installation for the driven machine, the lube oil shall be given by the console of the driven machine; the manufacturer of the motor shall indicate the necessary flow and pressure for each bearing and shall give a diagram of the installation, saying piping diameters, accessories, etc.

4.12. Paintwork

The frame shall be painted following the manufacturer's standard procedure. However, the painting procedure must be appropriate for use in the specified environment conditions and specifically, paint shall be grease, oil, acid and salt proof.

The paint used shall have anti-static characteristics and a limit of 25% of aluminium by weight.

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The manufacturer shall include his painting procedure with the quotation. The colour of the finish layer shall be defined in the project documentation.

The end of the shaft shall be covered with an anti-oxidising product for protection during shipping and storage.

4.13. Nuts and bolts and grounding

All the nuts and bolts of up to M.8 diameter in contact with the external environment shall be made of 18/8 stainless steel. Bolts of greater diameter, if made of carbon steel, shall be protected with an electrolytic zinc or cadmium surface treatment.

The grounding terminals on motor frame shall be resistant to corrosion and able to connect a 70 mm² cross-section grounding cords, at least M10.

The grounding terminals or bolts shall be placed at both sides of the motor and will be marked with the grounding symbol.

A grounding terminal shall be placed inside the terminal box and marked with the grounding symbol.

4.14. Name plate

The name plates shall be made of stainless steel with embossed or stamped text, attached to the motors by bolts or screws made of the same material and easily accessible.

In addition to the data required by the IEC and CENELEC standards, the plates on each motor shall display the following information:

- a) Motor net weight (kg)
- b) Type, internal clearance, and size of bearings.
- c) Time between lubrications, quantity and type of lubricant.
- d) Motor item
- e) Direction of rotation CW-CCW.
- f) H or F balancing.
- g) Motors with a protection mode for explosive atmospheres, ATEX or IEC marks, according to it comes.
- h) Reference to the equivalent oil of Repsol for lubrication. (this data can be included in the same plate or in an additional one).

Other plates shall specify:

- Indication of the admissible axial displacement
- Indication of magnetic centre and the degree of tolerance allowed by the coupling in reference to a fixed point (to verify the correction positioning of the coupling).
- Voltage, power and characteristics of the space heaters.
- Starting limitations

4.15. Space heaters

All motors shall have space heaters to avoid condensation inside the motor. These shall be placed so that the heat given off does not deteriorate or shorten the life of the winding insulation, and does not have an adverse effect on the windings even during long stoppage period or no-load running. The maximum surface temperature of the resistance shall be 160 °C (320°F).

The supply voltage shall be specified in the Data Sheet.

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4.16. Accessories

Motors shall be supplied with lifting eyebolts.

Motors shall be supplied (if necessary) with anchor bolts prepared to withstand the forces caused by short-circuit and starting.

The motors with belt transmission shall be supplied with slipping slides (tightening rails) to adjust the tightening on the belt.

Motors shall have screws on the feet to level the unit. The motors shall be lined up using plates with screws welded to the bench.

Vertical motors shall have a canopy to protect from the rain mounted so that it does not affect the motor cooling.

Motors shall be equipped with two temperature detectors per phase, type Pt 100, 3 or 4 wires and all the connection terminals in the corresponding terminal box. The manufacturer of the motor shall specify the set point value recommended as an "early warning", in accordance with the winding class.

Each bearing shall be equipped with a local thermometer and with a heat resistance with the terminals connected to the corresponding terminal box .

It is necessary to indicate the type and position of main speed detector elements on variable speed motors, fed via frequency converters.

4.17. Cooling

Unless otherwise specified in the project documentation, motors shall be totally enclosed, preferably self-cooling air-air.

Fans made of sheet steel shall be acceptable as long as they incorporate non-sparking rings that guarantee perfect non-sparking behaviour of the unit.

The water-air closed-circuit cooling system shall meet the following rules:

- The cooling liquid may be located on top of the motor, coupled to the frame. However, Repsol must approve the definite location.
- The coolant shall comply with the pressure vessels standard, doing the corresponding certificate.
- Unless the documentation of the project states something different, the cooling liquid shall be calculated for the following operation conditions:
 - Temperature of water coming in 30°C (86°F)
 - Maximum thermal jump 7°C (44.6°F (7K))
 - Maximum load loss 0.85kg/cm² (12.09 psi)
 - Maximum cooling water velocity 1.5÷2.5m/s (5÷8.2 ft/s)
 - Contamination factor 0.0004h m² °C/Kcal (0.00195 h.ft² °F / BTU)
- The construction of motor and cooling system shall prevent water leaks from the cooling circuit falling directly on the motor windings; appropriate devices shall be installed. The layout of this system will prevent humidity (from leaks or otherwise) from penetrating the motor.
- The cooling system shall be easily removed for repair or cleaning. The heat exchanger shall be made with double tube. The possible leakage of the first tube shall be canalized to a receiver that allow the installation of a leakage detector.

The execution of the heat exchanger shall be proposed by the motor manufacturer and approved by Repsol.

The manufacturer's quotation shall specify the type of coolant and capacity of the motor with the cooling system out of service, and the standard to which shall it be defined and manufactured, as well as the expected flow of coolant and loss of head.

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Modular coolers of the following capacities shall be accepted:

- 2 sections of 100%.
- 3 sections of 50%.
- 4 sections of 33%.
- Entry of water to the cooler shall be from below.
- The cooling water data shall be specified in the project documentation.

The heat exchanger shall be provided with manually operated valves with position indicators to allow isolation and emptying the entire water cooling system while the motor continues in service without the heat exchanger.

The following list shows the instruments that shall be supplied with a water-air cooling system. The alarm contacts shall be normally closed.

- Water low flow switch and with switched alarm contacts.
- Local thermometers indicating the temperature of cooling water in and out and the air in the cooler.
- Water leak detector with alarm contact.

5. MOTORS TO BE INSTALLED IN HAZARDOUS AREAS

5.1. General

In addition to the requirements in this specification, the following paragraphs define the main standards that three-phase squirrel-cage induction motors shall comply with when installed in hazardous areas and specifically:

- IEC 60079-0 Electrical apparatus for explosive gas atmospheres,
- IEC 61241-14 Electrical apparatus for use in presence of combustible dust.

Motors and main accessories shall meet the requirements defined in project documentation and shall have an official certificate issued by the Official Certification Authority.

Motors with combined protection modes are accepted (pe, "d" y "e", "p" y "e", etc.)

When motors are required for installation in areas, with presence of electricity-conducting dust, the degree of protection required is IP 657. These motors will be marked as required in applicable legislation.

All the motors shall have as minimum, a maximum superficial temperature T3.

The certificate of the motor shall be for the motor, Terminal box and its accessories.

5.1.1. Starting conditions

In the defined starting conditions, the temperature of the motor surface temperature shall not be greater than the ignition temperature of gases present in the area.

5.2. Motors with protection mode "d"

The flameproof motors will be suitable for installation in explosive atmospheres with the sub grouping IIA, IIB, and IIC and for temperature class defined in the project documents.

In EU countries these motors will be category 2 marked, and shall have to fulfill the corresponding CENELEC standard.

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5.2.1. Standards

The design, construction and tests of the motors shall be adapted to the applicable requirements of the IEC and CENELEC standards (latest edition) and specifically:

- IEC/EN 60079-1 "d" Protection

5.2.2. Degree of Protection

Motors and other accessories shall be totally enclosed, self-ventilating and with IP55 degree of protection.

The execution shall be explosion proof and appropriate for group and temperature class of gases defined in the project.

Terminal and auxiliary boxes could be "e" protection mode.

5.3. Motors with protection mode "e"

Increased safety motors shall be ready for installation in explosive atmospheres depending on the temperature class defined in the project documentation.

In EU countries these motors will be category 2 marked, and shall have to fulfill the corresponding CENELEC standard.

5.3.1. Standards

The design, construction and tests of the motors shall be adapted to the applicable requirements of the IEC and CENELEC standards (latest edition) and specifically:

- IEC/EN 60079-7 "e" Protection

For motors with type of protection "e", the certification of test according to the paragraph 6.2.3.2 of the standard IEC 60079-7 (2006) "Additional tests for motors" shall be mandatory.

In case of manufacturer doesn't have this certificate, and only with the express approval of Repsol, the risks assessment test of table 4 of the same standard shall be done to avoid special measures to be employed to ensure that the enclosure does not contain an explosive gas atmosphere at the time of starting.

5.3.2. Degree of protection

Motors and other accessories shall be totally enclosed and self-ventilating with IP55 degree of protection. Execution type shall be of increase safety, adequate for the group and class of temperature of gases defined in the project.

5.3.3. Space heaters

Space heaters shall be designed to limit the temperature on the motors surface below the value specified by the class temperature.

Space heaters shall be certified EExd or EExe, adequate for the group and temperature class defined in the project fulfilling the 4.15 section.

5.3.4. Usage limitation or consideration

Before doing an evaluation for the 5.3.1 section the manufacturer shall have to guarantee the possibility of starting the motor, without special issues, like air drain or the installation of gas detectors. The utilization of these special issues requires the authorization of Repsol.

The motor shall have to be certificated for the operation conditions and usage required.

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5.4. Motors with protection mode “n”

Motors with this type of protection shall be ready for installation in explosive atmospheres depending on the apparatus grouping and temperature class defined in the project documentation.

In EU countries these motors will be category 3 marked

5.4.1. Standards

The design, construction and tests on frames shall comply with the applicable requirements of the IEC and CENELEC standards (latest edition) and specifically:

- IEC/EN 60079-15 “n” Protection

For motors with type of protection “n”, the certification of test according to the paragraph 22.13 of the standard IEC 60079-15 (2010) “Additional tests for large and high voltage motors”, shall be mandatory.

In case of manufacturer don't have this certificate, and only with the express approval of Repsol, the risks assessment tests of table 6 of the same standard shall be done to avoid special measures to be employed to ensure that the enclosure does not contain an explosive gas atmosphere at the time of starting.

5.4.2. Degree of protection

Motors shall be totally enclosed, self-ventilating and with IP55 degree of protection

The execution shall be non-sparking and appropriate for group and temperature class of gases defined in the project. (Protection mode nA).

5.4.3. Space heaters

Space heaters shall be designed to limit the temperature on the motor surface to below the value specified by the class temperature.

Space heaters shall be certified EExd or EExe, adequate for the group and temperature class defined in the project fulfilling the 4.5 section.

5.4.4. Limitations or usage considerations

When necessary motors for heavy starting duty (hoists, fans, mixers, etc) and frequent starting duty, the following additional requirements shall be considered:

- a) The starting torque of the driven machine under the worst environmental conditions specified by the manufacturer.
- b) Number of starting sequences specified in the project documentation.
- c) In the above-mentioned requirements, the stator's winding and rotor cage temperature shall not exceed the temperature class of the gases defined in the project.

After doing the test specified in the 5.4.1 section, the manufacturer shall have to guarantee the possibility of starting the motor without taking any special measure, like previous purging or the installation of gas detectors. The installation of this kind of special measures the authorization of Repsol is required.

The motor shall be certified for the operation conditions and usage required.

5.5. Motors with protection mode “px” y “pz”

Pressurized motors and their associated components (including the inlet and exhaust conduits for the protective gas) shall be ready for installation in explosive atmospheres depending on the apparatus grouping and temperature class defined in the project documentation.

In EU countries these motors will be category 2 or 3 marked and shall have to fulfill the corresponding CENELEC standard.

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5.5.1. Standards

The design, construction and tests on pressurized apparatus shall comply with the applicable requirements of the IEC and CENELEC standards (latest edition) and specifically:

- IEC/EN 60079-2 "px" y "pz" Protection

5.5.2. Space heaters

Space heaters shall be designed to limit the temperature on the motors surface below the value specified by the class temperature.

It shall have to fulfill what is specified in 4.15 section.

5.5.3. Supply scope

Motors shall be supplied with a complete purge and pressure system, including control panel, control and reducing pressure devices, volume flow gauge, pressure switch and any other necessary devices suitable for the inlet pressure defined in the project. The limit of supply shall be the inlet flange for piping connections.

Pressurized air shall be from a clean and dry place.

6. VARIABLE SPEED MOTORS

These motors will be special and the manufacturer will indicate in the corresponding project documentation that the motor is designed to be fed through a frequency converter, and will provide its type.

When using frequency converters that can generate harmonics of the 7th order or higher, the level of insulation shall be 2.3 times the rated voltage. During the dielectric test, the test voltage shall be that corresponding to this insulation level.

The insulation level shall be adequate for the harmonics generated by the speed variator and for its maximum voltage gradient.

Motors shall have at least one insulated bearing to avoid flow of current through the rotor.

The designed critical speed of bearings, shaft and fan shall be 1.25 times greater than the expected maximum operating speed.

These motors shall operate without additional ventilation within the speed margin required in the project documentation. The exceptional use of auxiliary fans when operating at low revolution shall be proposed by the manufacturer if considered necessary and requires approval from Repsol.

These motors shall have the conformity declaration or certificate, according to it comes, and the appropriate marks for de speed variator for the feeder and for the motor, for the installation in classified areas.

The noise and vibration levels in the entire speed range required shall comply as specified.

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7. INSPECTIONS AND TESTING

7.1. Inspection

During the construction of motors, the manufacturer shall allow access of inspection personnel to its workshops in order to verify the status of work in progress.

The inspection does not relieve the manufacturer of his guarantee and responsibility to supply satisfactory motors that comply with the requirements in this specification.

7.2. Test

Tests shall always be carried out at the manufacturer's workshop at its expense.

Repsol will always have the right to witness the acceptance tests. The same notification letter for tests sent by the manufacturer quality department shall be issued by the engineering company to Repsol.

Acceptance tests shall be always witnessed by at least a specialist of the project engineering company, or an inspector proposed by them. In this case the inspector shall be submitted to the Repsol approval.

Even if Repsol declines to be present during testing, the manufacturer shall issue certificates of the tests carried out, including all the information necessary and measurement results.

The tests shall be carried out in accordance with IEC and CENELEC standards.

For motors to be installed in hazardous areas, the manufacturer will issue the certificates of the tests carried out according to IEC and CENELEC standards.

7.2.1. Type of test

The routine and complete tests shall be carried out according with the following program:

The routine test shall be carried out to all the motors. The complete tests shall be carried out to one motor of each power and speed.

If the result of the type test of the chosen motor is not totally satisfactory, Repsol shall be able to request the carrying out the type tests to all motors with surcharge to the manufacturer.

The tests shall be carried out to the motors and its accessories.

7.3. Routine tests

- a) General check of motor conformity with construction specifications and drawings approved by Repsol.
- b) Measurements of resistance of windings and space heaters (at ambient temperature), using the U-I method if possible.
- c) No-load tests at rated voltage measuring current on each phase, power consumed and speed. Power factor calculation.
- d) Visual inspection of the motor's mechanical operation at no-load (bearings, vibration, noise, bearing insulation, etc.).
- e) Check of direction of rotation and sequence of phases at the terminals.
- f) Overvoltage test.
- g) Locked rotor test at rated current to calculate locked rotor torque and current, power factor and "Te" for increased safety motors.
- h) Stator winding dielectric and insulation test. Insulation resistance at 1 minute of the whole motor earthed.

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- i) Space heaters (rigidity and insulation).
- j) Electrical continuity review and verification of proper values at ambient conditions, measured using temperature resistance sensors.
- k) Vibration measurements with the motor working at no-load.
- l) Noise level measurement with the motor at no-load.
- m) If motors are equipped with instruments (for example pressure switches, temperature switches, pressure indicators, temperature indicators, etc.) these shall be calibrated separately by running the most significant tests.
- n) If the motors are equipped with forced oil lubrication bearings and the system is supplied by the motor manufacturer, the following tests shall be carried out:
 - o Hydraulic test of the circuit at a pressure corresponding to the applicable standard.
 - o Circuit operation test
 - o Check of the cleaning of the circuit
 - o Release test of the safety valves
- o) If the motors are pressurized type, the tests shall be carried out in compliance with the requirements of the IEC and CENELEC standards.

7.4. Complete test

In addition to the routine tests, the complete tests shall include:

- a) Complete tests, including the stator temperature rise test in continuous running using the direct method or using the bi-frequency method.
- b) Analysis of the electrical characteristics of the motor (current, slip, efficiency, power factor, torque-speed, etc) at 4/4, 3/4 and 1/2 of rated load.
- c) The over speed test (value defined in the project documentation) shall be carried out on motors that will be coupled to equipment that may cause an inverse over speed.
- d) If motors are equipped with insulated bearings, the insulation resistance shall be measured.
- e) If the motors are totally enclosed with an internal fan and heat exchanger (air-water type), the cooling system test shall be carried out. The safety valve test and the hydraulic test will also be carried out as required by standards.
- f) The test certificates shall be provided for all cooling system components such as pumps (including operation tests), motors (including type tests), piping (material certificates) and instrumentation (material certificates).
- g) The polarisation index measurement shall be carried out on motors with a rated voltage greater than 7.2 kV. This verification will consist of analyzing the insulation resistance during the first and tenth minute of the power, frequency and voltage test. The Mega-Ohm meter shall be at least 2500 V.

8. DOCUMENTATION

Any documents issued by Vendor shall fulfill with specification ED-A-09.00, *Requirements for Vendor drawings and documentation*.

The required documentation, drawings, operation and maintenance manuals shall be provided as required by the project documentation (language, quantity, etc.).

Unless the Data Sheet specifies otherwise, all documentation shall be delivered in Spanish.

Each motor shall be supplied with the following documentation:

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8.1. With the bid.

- Data Sheet duly filled in (guarantee data).
- Manufacturer's summarized specification (type and rotor material, windings, insulation, etc.)
- Weight and preliminary dimension drawings
- Detailed bearing housing and protection drawings (preliminary).
- Maximum heating time to reach the temperature class required with locked rotor.
- Program and kind of test that can be carried out at the manufacturer's workshop.
- List of recommended spare parts for two years operation, duly assessed.
- Motors with a protection mode for explosive atmospheres, shall have the conformity certificate or declaration, according to it comes.
- Category 2 and 3 marked motors, conformity declaration according to ATEX Directive.
- When dealing with Ex execution motors that do not have a prototype certificate, the manufacturer may supply the corresponding certificates after the purchase order (with the tests). The cost of the certificates (with the tests) shall be included in the supply of the motor.
- Declaration of Conformity of the motor-variable speed device unit, in the case of installations in a Hazardous Area, according with the motor protection mode.
- In case of Exn and Exe motors, the certificate of gas environment test according standard IEC 60079-15 or IEC 60079-7 shall be issued.
- Motors with sleeve anti-friction bearings; the vendor shall indicate the set point value temperatures for alarm and trip.
- Relation of factories authorized to make the repair in the country of the installation.
- In the case of motors greater than 500 kW and when the driven equipment is special, the following information shall be supplied:
 - Overload curve
 - Temperature to time curve during the required start-up cycles (rotor and stator) with 80% and 100% of Un, specifying maximum temperature allowed during re-acceleration at full load after a voltage drop.
 - Cooling to time curve with the motor stopped.
 - Time constant and residual voltage variation curve at motor terminals (until complete loss of voltage at terminals).
 - Maximum number of recommended starting attempts per day and minimum interval between them.
 - Maximum radial and axial displacement.

8.2. Alter the order

- a) The documentation to be supplied after receiving the purchase order shall be:
 - o Final dimensional drawings with special details of:
 - Design of the free shaft ends
 - Final design of all details relative to attachment the motor to the foundation, specifying weight, rotor PD2 and other dynamic or static characteristics during normal operation, short-circuit and counter-phase connection, with loads distribution over the foundation.
 - Final design and accessories layout.
 - Details of terminal boxes, and connection and cabling diagrams.
 - Final detailed drawings of bearing housing and protection.

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- o Material supply, manufacture and assembly programs
- o Assembly, usage and maintenance instructions
- o Program of tests to perform
- o Type and model of sleeve (or otherwise) bearings
- o Specification of lubricant and Repsol equivalent
- o List of certified materials
- o Declaration of conformity to type or Type examination certificate for motors that shall be installed in hazardous areas if not supplied with the quotation
- o Parts drawing to identify spare parts
- o Data of winding (section and wire pitch or copper plate, winding details, coil-span, etc). Stator and rotor, to can do the reparation according to 60079-19 with "R" mark.
- o Maximum residual balance certificate obtained in the dynamic balancing operation.
- o After testing, the test protocol and execution certificate from the Official Laboratory shall be issued (if necessary).
- o Cooling system specification. User guide.
- o Quality Control Certificate
- o Water/air exchanger certificate.
- o The manufacturer of the driven equipment shall have access to the necessary data (size and weight of the rotor) to calculate the complete shaft torsion "motor-machine" in order to approve the rotor design.

b) In addition to the above-mentioned documents, the following data and drawings shall also be supplied:

- o Utilities required and cooling water consumption, purging air and lubricant oil.
- o Oil bearing lubrication system scheme indicating the position of instruments and limit of supply.
- o Pressure and purging system scheme, identifying the positioning of control mechanisms and limit of supply, including the control panel drawing with the relevant schematic diagrams.

The data of the winding of the stator (section and of the cooper wire or plate, design details of the stator, etc.) and rotor windings, shall be accessible to Repsol, in case of necessity of reparation as per IEC 60079-19 , "R" marked.

9. STANDARDS AND REFERENCED SPECIFICATIONS

9.1. Repsol standards and technical specifications

Note:

Every REPSOL specification available in English language is identified with the letter "I" as indicated in the following example:

ED-Y-XX.XX	Spanish language.
ED-Y-XX.XX-I	English language.

9.1.1. Design specifications

ED-A-09.00	Requirements for Vendor drawings and documentation.
ED-B-01.00	Preparation of the equipment and materials for shipment.
ED-K-04.00	Lubrication, shaft-sealing and control-oil systems and auxiliaries.

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ED-P-01.00 Electrical installations.

9.2. Codes and international standards.

Motors and auxiliary equipment shall be designed and tested according to the IEC and CENELEC standards and/or any codes, standards and other reference documents defined in the project (Data Sheet) and specifically:

IEC 60034-xx	Rotating electrical machines.
IEC 60079-0	Explosive atmospheres - Part 0: Equipment - General requirements
IEC 60079-1	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
IEC 60079-2	Explosive atmospheres - Part 2: Equipment protection by pressurized enclosure "p"
IEC 60079-7	Explosive atmospheres - Part 7: Equipment protection by increased safety "e"
IEC-60079-15	Explosive atmospheres - Part 15: Equipment protection by type of protection "n"
IEC-60079-19	Explosive atmospheres - Part 19: Equipment repair, overhaul and reclamation
ISO 281	Rolling bearings -- Dynamic load ratings and rating life
ISO 286	ISO code system for tolerances on linear sizes
ISO 3744	Determination of sound power levels and sound energy levels of noise sources using sound pressure
API 541	Form-wound Squirrel-Cage Induction Motors—500 Horsepower and Larger

The latest edition of the IEC standards valid at the time of awarding the contract shall be applicable.

2 DOCUMENTO 2. DISEÑO

2.1 INTRODUCCIÓN

Este documento incluye el diseño técnico del Proyecto de sustitución del Compresor de Aire de regeneración del catalizador de la Unidad de FLUID CATALYTIC CRACKING (FCC).

Dentro del diseño técnico se realiza un análisis de los datos de operación del nuevo compresor para confirmar tanto la potencia que debe disponer el nuevo motor eléctrico como para comprobar la eficiencia energética de la nueva instalación.

También se describe la instalación resultante de la sustitución de los Equipos definiendo en detalle los nuevos elementos y cada una de las modificaciones a realizar.

Dada la extensión de la documentación de este Proyecto, en el PROYECTO FINAL DE CARRERA (PFC) solo se incluye la información más significativa, detallando especialmente la información correspondiente a la nueva Máquina.

En el ANEXO 1 se incluyen varios documentos que se consideran fundamentales en el Diseño del Proyecto, como son, como más significativos, la Requisición Técnica de Compra elaborada para la adquisición del nuevo Grupo Compresor y su equipamiento asociado. En el ANEXO 2 se incluye todos los planos más significativos de las diferentes especialidades que comprende el Proyecto. En el ANEXO 3 se incluye la documentación más importante editada por el suministrador del Grupo Compresor.

2.2 ANÁLISIS DE LOS DATOS DE OPERACIÓN DEL NUEVO COMPRESOR

Una vez definidos los datos básicos de diseño que principalmente tienen en cuenta las hojas de datos del compresor existente, se emiten las hojas de datos preliminares del nuevo Grupo Compresor (Motor Eléctrico- Multiplicadora de Velocidad- Compresor) y la Requisición Técnica de Petición de Ofertas.

Se ha seleccionado como Empresas ofertantes a Fabricantes de referencia en el mundo para este tipo de máquinas, en concreto los siguientes:

- ELLIOT GROUP
- GENERAL ELECTRIC
- MAN DIESEL & TURBO

Una vez realizado un análisis y tabulación exhaustiva de la ofertas se ha seleccionado como suministrador del nuevo Compresor a MAN DIESEL & TURBO. Dentro del alcance de este Suministrador se incluye también el suministro del motor eléctrico de accionamiento del Fabricante SIEMENS y la Multiplicadora de Velocidad del Fabricante FLENDER. Las tres máquinas se entregan por parte de MAN DIESEL & TURBO como un SKID compartiendo un bastidor único.

Adicionalmente se incluyen en el suministro de MAN DIESEL & TURBO la consola de aceite de lubricación, el Panel Local de control y la válvula de control antisurge.

Parte fundamental de la documentación del suministrador del Compresor son las hojas de datos definitivas y el mapa de operación o curvas de trabajo. Estos documentos definen el rango de trabajo, la potencia consumida y la eficiencia de la máquina.

Dado que el Proyecto se basa en la mejora de la eficiencia energética, el análisis exhaustivo de estos datos es esencial, ya que es necesario verificar que el nuevo equipo cumple con los requerimientos de éste Proyecto. En base a los datos anteriores se define la potencia del motor eléctrico de accionamiento.

En el Apartado 2.2.2 se analizan la hoja de datos y las curvas de trabajo o mapas de operación del compresor del Fabricante seleccionado para este suministro MAN

DIESEL & TURBO. Estos datos ya definitivos los proporciona el Suministrador de los equipos una vez realizado su diseño.

2.2.1 Casos de operación de la Unidad y del nuevo compresor

Se consideran los siguientes casos de operación de la Unidad de FCC dependiendo de la maximización de producción de gasolinas o destilados medios:

- NORMAL (Operación Unidad a 46.000 barriles/ día)
- RATED (Operación Unidad a 48.000 barriles/ día)
- 90 % (Operación Unidad a 40.000 barriles/ día)
- 60 % / 60 %N (Operación Unidad a 28.000 barriles/ día)

Todos los equipos del Grupo de Compresión, Motor Eléctrico–Multiplicador de Velocidad- Compresor) deben poder operar en los casos indicados de acuerdo con lo establecido en la hoja de datos del Compresor.

2.2.2 Análisis de las hojas de datos y mapa de trabajo del nuevo compresor

Para analizar la operación del nuevo compresor partimos de lo siguiente:

- Peso molecular del aire (Elevación: 6,5 m, Presión barométrica: 760 mm Hg)
 - Aire seco: 28,45 g/ mol
 - Aire húmedo: 28, 95 g/ mol
- Documentación recibida del suministrador del Compresor de Aire (MAN DIESEL & TURBO)
 - Hojas de Datos.
 - Mapa de Operación (curvas de trabajo).

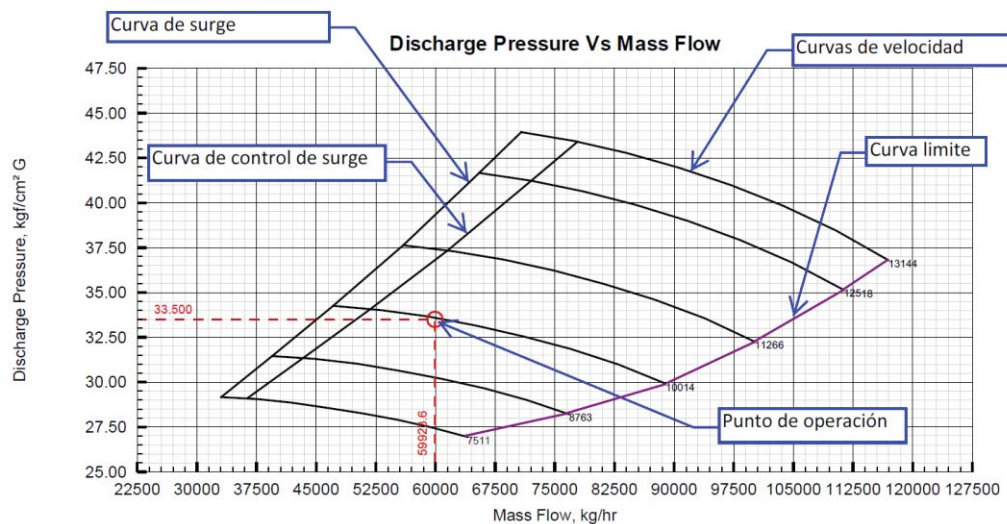
Hojas de datos

Las hojas de datos del compresor indican principalmente las condiciones de presión, caudal y eficiencia para cada caso de operación. A continuación se incluye un extracto de las hojas de datos del compresor.

facilitado por el Suministrador del equipo, ya que cada Fabricante tiene unos parámetros de diseño propios que forman parte de su know-how.

Para los mismos parámetros de proceso (composición, el caudal y la presión del fluido de proceso) los mapas de operación varían significativamente en función del Suministrador. A la hora de seleccionar un Compresor, deben analizarse estos mapas para decidir qué compresor es más eficiente y el que mejor se adapta a los casos de operación.

En la Figura 3 podemos ver un mapa de operación de un compresor centrífugo (solo como referencia).



Como se puede observar en la Figura adjunta, el mapa de operación está limitado por cuatro curvas:

- Curva de velocidad máxima del rotor o máxima apertura de los IGV,s , en la zona superior
- Curva de velocidad mínima del rotor o mínima apertura de los IGV,s, en la zona inferior
- Curva límite de caudal, también llamada “curva de choke” o “stonewall”, por la derecha
- Curva de surge (antibombeo) por la izquierda

El punto de operación debe encontrarse siempre en el recinto formado por estas cuatro curvas, aunque el límite real por caudal mínimo se establezca siempre en la

línea de control de surge para garantizar en todo momento la seguridad del compresor.

Se define como “surge” a la situación de inestabilidad de un compresor centrífugo debido a las repetidas reversiones del sentido de flujo que se producen en situación de caudales muy reducidos.

Para cada caso de operación, el caudal en cada punto de la línea de control de surge debe ser aproximadamente un 10% superior al caudal en el punto de la línea de surge.

Según la especificación de REPSOL de compresores centrífugos, el 115% del caudal en el punto de surge debe ser menor que el 85% del caudal de operación. Y si este requerimiento no se cumple se seleccionará el compresor que más se aproxime al mismo, como ha sido el caso del Compresor de aire de este Proyecto.

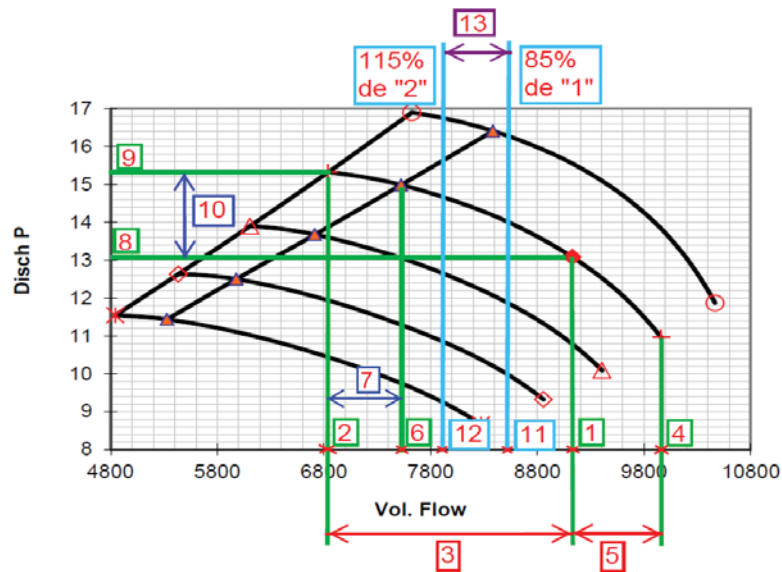
Si se disminuye el caudal a una velocidad o apertura de los IGV,s dada, el compresor puede entrar en zona de surge. Al llegar al punto indicado en la línea de control de surge, el sistema de control debe actuar disminuyendo en primer lugar la velocidad del compresor mediante el variador de velocidad o disminuyendo el caudal mediante el sistema de IGV,s como es el caso de este Proyecto. Si el caudal siguiera disminuyendo, el control abriría la válvula anti-surge, recirculando parte del caudal de descarga o enviándolo a atmósfera como es el caso de este Proyecto.

Hay varios tipos de curvas para cada compresor. Las principales son las siguientes:

- * Presión de descarga – Caudal
- * Potencia – Caudal
- * Altura politrópica – Caudal
- * Eficiencia politrópica – Caudal

De estas curvas, la de mayor importancia y la que requiere mayor estudio es la curva de Presión de descarga frente a caudal.

Los parámetros que se deben analizar se indican en la Figura 4:



Estos parámetros son:

- 1: Caudal en el punto de operación
- 2: Caudal en el punto de surge
- 3: Margen de caudal entre el punto de operación y el punto de surge
- 4: Caudal en el punto límite
- 5: Margen de caudal entre el punto de operación y el punto límite
- 6: Caudal en el punto de control de surge
- 7: Margen entre el punto de surge y el punto de control de surge
- 8: Presión en el punto de operación
- 9: Presión en el punto de surge
- 10: Diferencia de presión entre el punto de operación y el punto de surge
- 11: 85% del caudal de operación
- 12: 115% del caudal en el punto de surge
- 13: Diferencia entre los parametros 11 y 12.

Análisis de las curvas del nuevo Compresor para los distintos casos de operación

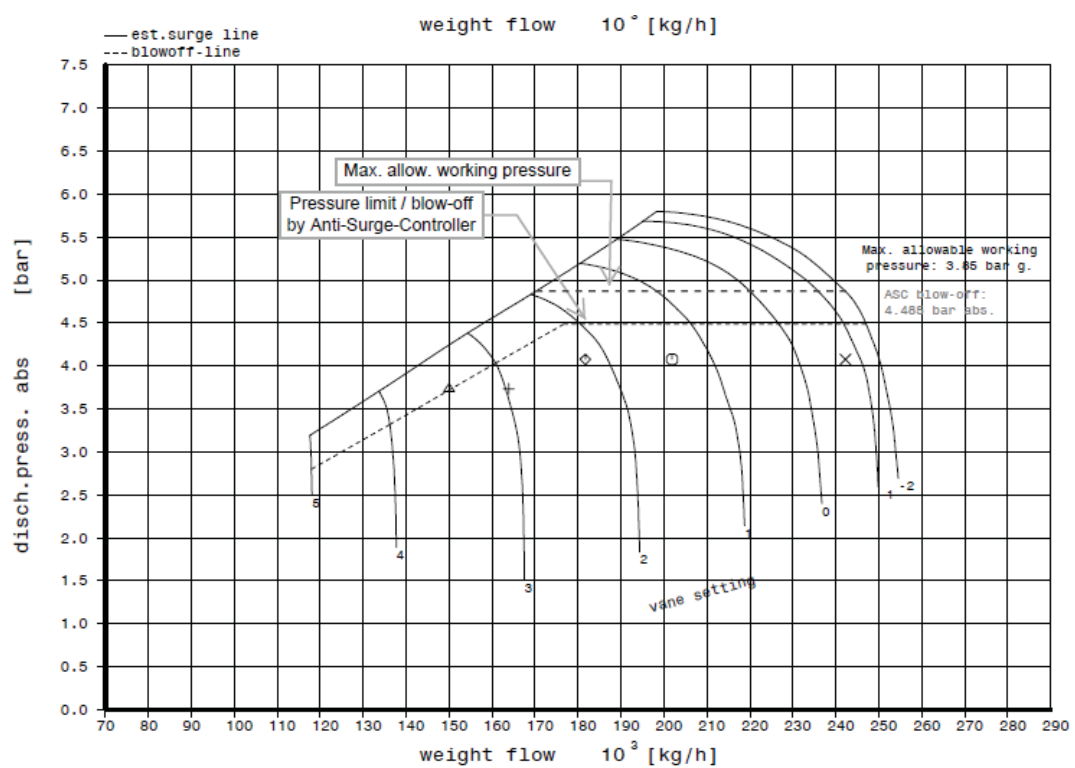
Todas las curvas de operación del compresor editadas por MAN DIESEL&TURBO se incluyen en el ANEXO N° 3 de este DOCUMENTO n° 2. A continuación se incluye la curva presión-caudal del compresor.

predicted performance map valid for:

suct. temperature : 33.30 [C]
suct.pressure abs. : 1.01 [bar]
relative humidity : 95.00 [%]
molecular weight : 28.43 [kg/kmol]
isentropic exponent : 1.3971 [-]
speed : 6506 [1/min]
medium : Air

operating point:

	m [kg/h]	pe [bar]	Nk [kW]
○ Normal	201911	4.08	9868
△ 60%N	150000	3.74	7255
+ 60%	163877	3.74	7718
× Rated	242241	4.08	11947
◇ 90%	181720	4.08	8973



Caso de operación NORMAL

Rango IGV: -2 a 5

Posición IGV: 1,35

1: Caudal en el punto de operación: 184.291 m³/h

2: Caudal en el punto de surge: 159.270 m³/h

3: Margen de caudal entre el punto de operación y el punto de surge: 115,7 %

- 4: Caudal en el punto límite: 192.588 m³/h
- 5: Margen de caudal entre el punto de operación y el punto límite: 104,5%
- 6: Caudal en el punto de control de surge: No indicado
- 7: Margen entre el punto de surge y el punto de control de surge: No indicado
- 8: Presión en el punto de operación: 4,078 bar a
- 9: Presión en el punto de surge: 5,1bar a
- 10: Relación presión punto de operación y el punto de surge: 125,1 %
- 11: 85% del caudal de operación: 156.647,4 m³/h
- 12: 115% del caudal en el punto de surge: 183.160,5 m³/h
- 13: Diferencia entre los parámetros 11 y 12: -26.513

Caso de operación 90 %

Rango IGV: -2 a 5

Posición IGV: 2,2

- 1: Caudal en el punto de operación: 165.862 m³/h
- 2: Caudal en el punto de surge: 150.805 m³/h
- 3: Margen de caudal entre el punto de operación y el punto de surge: 110 %
- 4: Caudal en el punto límite: 175.200 m³/h
- 5: Margen de caudal entre el punto de operación y el punto límite: 104 %
- 6: Caudal en el punto de control de surge: No indicado
- 7: Margen entre el punto de surge y el punto de control de surge: No indicado
- 8: Presión en el punto de operación: 4.078 bar a
- 9: Presión en el punto de surge: 4,75 bar a
- 10: Relación presión punto de operación y el punto de surge en %:116, 5
- 11: 85% del caudal de operación: 140.982,7 m³/h
- 12: 115% del caudal en el punto de surge: 173.425,8 m³/h
- 13: Diferencia entre los parametros: -32.443 m³/h

Caso de operación RATED

Rango IGV: -2 a 5

Posición IGV: -0,7

- 1: Caudal en el punto de operación: 221.102 m³/h
- 2: Caudal en el punto de surge: 175.460 m³/h
- 3: Margen de caudal entre el punto de operación y el punto de surge: 125,9 %
- 4: Caudal en el punto límite: 225.400 m³/h
- 5: Margen de caudal entre el punto de operación y el punto límite: 101,9 %
- 6: Caudal en el punto de control de surge: No indicado
- 7: Margen entre el punto de surge y el punto de control de surge: No indicado
- 8: Presión en el punto de operación: 4,078 bar a
- 9: Presión en el punto de surge: 5,7 bar a
- 10: Relación presión punto de operación y el punto de surge en %: 139,8
- 11: 85% del caudal de operación: 187.936,7 m³/h
- 12: 115% del caudal en el punto de surge: 201.986 m³/h
- 13: Diferencia entre los parametros: -14.049,3 m³/h

Caso de operación 60 %N/ 60 %

Rango IGV: -2 a 5

Posición IGV: 3,4/ 2,95

- 1: Caudal en el punto de operación: 136.910/ 149.576 m³/h
- 2: Caudal en el punto de surge: 132.034/ 140.191 m³/h
- 3: Margen de caudal entre el punto de operación y el punto de surge: 103,7/ 106,7 %
- 4: Caudal en el punto límite: 141.475/ 153.340 m³/h
- 5: Margen de caudal entre el punto de operación y el punto límite: 103,2/102,5 %

- 6: Caudal en el punto de control de surge: No indicado
- 7: Margen entre el punto de surge y el punto de control de surge: No indicado
- 8: Presión en el punto de operación: 3.735/ 3.735 bar a
- 9: Presión en el punto de surge: 4,1/ 4,4 bar a
- 10: Relación presión punto de operación y el punto de surge en %: 109,8/ 117,8
- 11: 85% del caudal de operación: 116.373,5/ 127.139,6 m3/h
- 12: 115% del caudal en el punto de surge: 151.839,5/ 161.219,7 m3/h
- 13: Diferencia entre los parametros: -35.465,6/ -34080,1 m3/h

Conclusiones del análisis del mapa de operación

- Margen entre el caudal y el caudal de surge: De acuerdo a lo recomendable, el punto de funcionamiento en todos los caso de operación se encuentran bastante alejado de la línea de surge, aunque no se cumple el requerimiento de la especificación de REPSOL de que el 115% del caudal de surge sea menor que el 85% caudal nominal para ninguno de los casos de operación. No obstante, la desviación es menor por lo que se considera aceptable.
- Diferencia de presión entre la presión de descarga y la presión de surge: Se considera aceptable para todos los casos de operación.
- Margen dentro del rango posición de IGVs: Su posición no está cerca de los límites en ninguno de los casos de operación.

2.2.3 Cálculo de la potencia necesaria del motor

Para el cálculo de la potencia necesaria del motor se selecciona el caso de operación más desfavorable, es decir con mayor consumo de energía eléctrica. En nuestro caso sería la potencia indicada en el caso RATED (la Unidad operando a 48.0000 Barriles/ día): 11.947 kW

Este dato, según el código API 617 puede llegar a un 104% en el test de funcionamiento.

A la potencia obtenida es necesario sumarle las pérdidas de la Multiplicadora de velocidad, aproximadamente 65 kW.

El código API 617 indica lo siguiente: “The motor rating shall be at least 110% of the greatest power required (including gear and coupling losses) for any of the specified operating conditions”. Por lo tanto, es necesario aplicar un coeficiente final de 1,1.

El resultado es: $(11.947) \text{ kW} \times 1,04 + 65 \text{ kW} \times 1,10 = 13.738 \text{ kW}$

Tomando en consideración el cálculo anterior, se selecciona un motor con una potencia nominal de 14.000 kW teniendo en cuenta los modelos de potencias de SIEMENS que es el Suministrador seleccionado por MAN DIESEL & TURBO y aceptado por ser un fabricante de referencia en el mundo.

2.3 DESCRIPCIÓN DEL EQUIPO PRINCIPAL (GRUPO COMPRESOR)

El nuevo Compresor comprende un modelo centrífugo axial accionado por un motor eléctrico de 14.000 KW de potencia nominal que transmite la potencia a través de un Multiplicador de Velocidad mecánico que amplía de forma fija las revoluciones. La variación de caudal se realiza mediante un sistema de “Inlet Guide Vanes (IGV,s)”

La lubricación del conjunto se realizará a través de una consola de lubricación de aceite.

Junto al compresor, pero en una zona segura (no clasificada como peligrosa), se instala el Panel de Control también incluido en el alcance del Fabricante del compresor MAN DIESEL & TURBO.

El alcance se indica con detalle en la Requisición Técnica Pedido incluida en el ANEXO 1 de este DOCUMENTO N° 2.

2.3.1 Compresor

Compresor centrífugo axial de aire (F3-C-1) diseñado según API-617 , 7 th Ed, la Especificación de REPSOL ED-K-02.01 y las hojas de datos editadas por MAN DIESEL & TURBO incluidas en el ANEXO 3 de este DOCUMENTO N° 2.

El tipo de compresor a suministrar por MAN DIESEL & TURBO es el AG60/ 11R que tiene una “casing” partido horizontalmente (horizontally Split). Dispone de 10 etapas axiales y una etapa radial final.

La disposición de la aspiración es radial por la parte superior tomando en consideración una disposición elevada del filtro de aire de aspiración a una altura de 10 m. con objeto de reducir su ensuciamiento. La disposición de la impulsión es radial por la parte inferior lo que facilita del nuevo tramo del colector de aire de impulsión hasta su conexión con el colector existente.

Las tapas de los cojinetes (bearing housing) son también de disposición partida horizontalmente lo que facilita la accesibilidad para los trabajos de inspección y mantenimiento.

El casing está fabricado de fundición nodular. Dispone de dos carcassas, una interna y otra externa. Los alabes del estator están fijados a la carcasa interna de forma termo-elástica para permitir la expansión térmica, son de acero inoxidable.

El rotor parte de una única pieza forjada de acero inoxidable que sufre una primera mecanización y un test de rotación. Posteriormente el rotor sufre una segunda mecanización para crear los anillos de soportación de los alabes, la etapa radial final y el “balance piston” que compensa las fuerza axial creada por la impulsión del aire. El material de los alabes es de acero inoxidable. Todo los alabes son pesados y distribuidos de acuerdo con su peso para evitar el desbalanceado al máximo.

La etapa radial es de chapas soldadas de acero de acero inoxidable. Después de un balanceado y test de velocidad es fijada al eje de rotor. Esta etapa desde el punto de vista termodinámico está poco cargada y permite la orientación del flujo de salida minimizando las pérdidas.

Una vez totalmente montado el rotor completamente es sometido a un test de balanceado, previamente a su montaje.

El rotor gira sobre cojinetes radiales hidrodinámicos del tipo tilting-pad. El cojinete de empuje es también del tipo tilting pad. Se instalarán en ellos RTD,s para medición de temperatura.

El sistema de sello es del tipo de laberintos.

El acoplamiento de baja velocidad entre Motor y Multiplicadora de Velocidad y el acoplamiento de alta velocidad entre Multiplicadora de Velocidad y Compresor cumplirá con API-671 4rd Ed. Ambos serán hidrodinámicos y del tipo diafragma.

2.3.2 Motor eléctrico

F3-C1-EMC-1, diseñado de acuerdo con las norma IEC 60.034 (Máquinas eléctricas rotativas), la especificación de REPSOL ED-P-02.0 y hojas de datos incluida en el ANEXO de este DOCUMENTO N° 2, Apartado 1.

Las características principales son las siguientes:

- Inducción, asíncrono
- Potencia: 14.000 kW
- Tensión: 11 kV
- Intensidad nominal: 842 A
- Frecuencia: 50 Hz
- Factor de potencia: 0,9
- Sistema de refrigeración: IC 81 W (aire-agua)
- Velocidad: 1.483 rpm
- Clase de aislamiento: F (155°C)
- Modo de protección ExnA, categoría 3 (atmósferas explosivas) de acuerdo con IEC-60.079-2
- Grado de protección IP-55
- Clase de temperatura: B
- Cojinetes: lubricación forzada

2.3.3 Multiplicadora de velocidad (GEAR BOX)

F3-C-1-GBC-1, de acuerdo con API-613 , 5th Ed, especificación de REPSOL ED-K-03-00 y las hojas de datos incluidas en el ANEXO 3 de este DOCUMENTO N° 2.

Las características más significativas son las siguientes:

- Simple etapa
- Potencias nominal. 14.000 kW
- Velocidad entrada/ salida: 1483 rpm/ 6.831,3 rpm
- Gear ratio: 4,39
- Número de dientes piñón: 31
- Número de dientes rueda:136
- Material carcasa: STEEL S355 J2
- Material Piñón 18 CrNiMO 7-6 Grado 2
- Material Gear 18 CrNiMO 7-6 Grado 2

La reductora está dotada de un Virador accionado eléctricamente que transmite a través de ella el giro de los rotores del compresor y motor eléctrico cuando están fuera de servicio con objeto de evitar su deformación en situación de paro.

2.3.4 Consola de aceite de lubricación

Una consola de aceite de lubricación para el compresor, reductora y motor, de acuerdo con API 614, 5th Ed y la Especificación de REPSOL, ED-K-04.00.

Caudal de impulsión de aceite a equipos: 486 litros por minuto

Temperatura del aceite envío a equipos: 28,3 °C

Temperatura del aceite de retorno: 43 °C

Comprende principalmente los siguientes elementos:

- Un depósito de almacenamiento del aceite, Item F3-C1-D3 A/B, de 1.500 l. de capacidad
- Dos bombas rotativas de tornillo de impulsión de aceite F3-C1-P1 A/B
- Dos intercambiadores, F3-C1-E1 A/B, de carcasa/ tubos aceite- agua, clase TEMA "C" -AEW. Códigos aplicables ASME VIII DIV 1. ED 2013/ TEMA C-AEW.
- Dos filtros de aceite, F3-C1-F1 A/B, con un nivel de filtración de 10 micras.

- Bomba Jacking-oil para aumento de la presión del aceite de lubricación de los cojinetes del motor que opera durante los procesos de puesta en servicio y parada del compresor y mientras está operando el virador con el compresor fuera de servicio.
- Un tanque de compensación de aceite (Lube Oil Rundown Tank), Item N° F3-C-1-D-2 de capacidad 1.500 litros a instalar en estructura elevada independiente para asegurar el suministro de aceite en caso de fallo de las bombas de aceite. Según ASME VIII, división 1 Edición 2013. Material A 240 GR 316L.

2.3.5 Panel local de control

Panel local de control. Item N° F3-C-1-LP-1, armario se fabricará en acero inoxidable, grado de protección IP-65. Será diseñado para área clasificada Clase 1, Zona 2 Grupo IIA, T3., aunque su ubicación va a ser en zona segura. También debe disponer de aire acondicionado para evitar altas temperaturas dentro del panel.

Principalmente comprende lo siguiente:

- Dos fuentes de alimentación segura a 115 Vac desde UPS (sistema de alimentación ininterrumpida) existente en la SEP-3.
- Un PLC (Programmable Logic Controller) de fabricación ALAN BRADLEY. Gestiona todas las señales que recibe de la instrumentación instalada, así como las señales emitidas por los módulos de control de CCC y BENTLY NEVADA para control de puesta servicio, parada y seguridad de Grupo Compresor
- Un Controlador del sistema del control antisurge de fabricación CCC serie 5.
- Un sistema de Bently Nevada (BN 3500) que controla la velocidad, Temperatura, Vibraciones, posición axial del rotor, etc .

2.3.6 Varios

- Un estructura soporte para el tren Compresor / Reductora / motor principal.

- Un filtro del aire aspirado, ítem N°: F3-C-1-F-2, incluyendo silenciador, ítem N°: F3-C-1-SL-1. De acuerdo con las hojas de datos incluidas en el ANEXO1.
- Un Sistema de Antisurge con válvula de control del blow off, de acuerdo con las hojas de datos incluidas en el ANEXO 1.
- Instrumentación asociada para la puesta en servicio, operación normal y parada de emergencia.

2.4 DISEÑO DE LA INSTALACIÓN

2.4.1 Introducción

La base de partida del diseño del Proyecto es la información de los datos del Compresor actualmente existente, documentación de diseño existente de la Unidad de FCC y la toma de datos en Refinería. Con esta información se elabora la Especificación Técnica para la compra del nuevo Grupo Compresor y documentación básica preliminar del proyecto, como son los planos de implantación, actualización del plano de clasificación de áreas, diagramas mecánicos de proceso, diseño preliminar en 3 y diagramas unifilares eléctricos.

Una vez seleccionado y adjudicado el nuevo Compresor a MAN DIESEL & TURBO, tomando en consideración la información que aporta de la máquina se realiza el diseño definitivo APC (aprobado para construcción) de todos los plano de diseño del proyecto; planos de implantación, plano de clasificación de áreas, diagramas mecánicos de proceso, obra civil, estructura metálica, tuberías, electricidad e instrumentación y control.

Fundamentalmente, el Proyecto de ingeniería de sustitución del Compresor comprende los siguientes trabajos:

- Revisión de la documentación generada por el MAN DIESEL & TURBO.
- Diseño de las cimentaciones profundas del nuevo Grupo Compresor F3-C-1 y cimentaciones convencionales para la consola de aceite de lubricación y panel local de control del compresor.
- Diseño plataformas metálicas para acceso y mantenimiento de los equipos.

- Diseño de nuevas líneas de tuberías entre Grupo compresor y consola de aceite de lubricación y de los nuevos tramos de impulsión de aire con el colector existente.
- Diseño de la Instalación eléctrica.
- Diseño del sistema de control.

2.4.2 Diseño General

Lista de equipos

En la Lista de Equipos mecánicos y en Lista de Equipos Eléctricos se incluyen todos los equipos del Proyecto. En estas Listas se indican los datos principales de diseño de cada equipo. Ambos documentos se incluyen en el ANEXO 1 de este DOCUMENTO nº 2.

Plano de implantación

Para determinar la implantación de los equipos se tiene en cuenta lo requerido por la Especificación de REPSOL ED-A-03.00. DISPOSICION GENERAL DE UNIDADES Y EQUIPOS.

En el plano de implantación F3-1-01-01 se define la posición en la Unidad de FCC del nuevo Grupo Compresor, la consola de lubricación y del panel local de control. Para la implantación del nuevo Grupo Compresor se aprovecha un espacio libre de la nave que ubica el compresor existente situada al oeste. La consola de aceite de lubricación se sitúa a nivel del suelo debajo del nuevo filtro de aspiración que se sitúa al sur de la citada nave.

En el plano de implantación de la Subestación eléctrica de 132 (SE-132) se representa la implantación de la nueva celda que se adiciona al cuadro existente de 30 kV, U-1-73-132, y en la Subestación Eléctrica de proceso nº 3 (SEP-3), U3-1-73-15, se representa la implantación del nuevo Transformador y las nuevas Celdas de 11 kV respectivamente. Los planos de implantación citados se adjuntan en el ANEXO 2 de este DOCUMENTO nº 2.

Plano de Clasificación de áreas

El plano de clasificación de áreas peligrosas determina el espacio en el que puede estar presente una atmósfera explosiva, que se puede formar como consecuencia de una fuga de productos en la Unidad, de acuerdo con la Especificación de REPSOL ED-A-07.00.

En el caso de líquidos y gases rodea normalmente la fuente de escape en todas las direcciones, extendiéndose más hacia arriba o hacia el suelo, dependiendo de que el vapor o gas sea más pesado o ligero que el aire.

Se denomina fuente de escape de un equipo o lugar desde donde se puede fugar a la atmósfera un vapor o líquido inflamable que pueda formar una atmósfera explosiva.

En el ANEXO 2 de este DOCUMENTO nº 2 se adjunta el plano de Clasificación de Áreas Peligrosas actualizado, tomando en cuenta la instalación del nuevo Compresor.

➤ F3-1-01-35 CLASIFICACIÓN AREAS PELIGROSAS

Como se puede comprobar en el plano, el compresor C1 no genera nuevas fuentes de escape por manejar aire y su implantación se encuentra situado fuera de la zona clasificada. Exclusivamente está en zona clasificada una pequeña parte de Filtro de Aire y de la Consola de Aceite de Lubricación. En concreto, esta parte afectada clasifica como CLASE 1/ ZONA 2/ IIA/ T3.

- CLASE 1. Emplazamientos en que puede haber gases, vapores o en cantidad suficiente nieblas para producir atmósferas explosivas o inflamables.
- ZONA 2. Emplazamiento que en condiciones normales no es probable que exista un atmósfera explosiva y si se produce es muy poco frecuente y por espacios de tiempo muy breves.
- II A. Subgrupo de gas.
- T3. Clase Térmica del Equipo. Temperatura admitida por el equipo.(T3 hasta 200 °C)

Todos los nuevos equipos eléctricos e instrumentos que estén ubicados en zona clasificada deberán estar dotados de algún tipo de protección especificada por la Reglamentación ATEX.

El panel de control del Compresor se sitúa en zona no clasificada, es decir zona segura.

Diagrama Mecánicos de Proceso e instrumentación

Los Diagrama Mecánicos de Proceso e instrumentación (P&ID,s) del Proyecto se editan tomando como base los diagramas originales de la Unidad y los proporcionados por el suministrador del nuevo Compresor. En ellos se representan principalmente todos los Equipos, las tuberías de proceso y servicios auxiliares e instrumentación, indicando su especificación.

En el ANEXO 2 de este DOCUMENTO nº 2 se incluyen los P&ID,s de proceso. No se incluyen los P&ID,s de servicios auxiliares

Lista de líneas

Una vez editados los P&ID del Proyecto se edita la LISTA DE LINEAS, que recoge las condiciones de presión y temperatura junto con el resto de parámetros fundamentales de las líneas del Proyecto:

- Denominación
- Origen y destino
- Presión y temperaturas de diseño
- Presión y temperatura de prueba
- Especificación de diseño

Se adjunta la LISTA DE LINEAS en el ANEXO 1 de este DOCUMENTO nº 2.

2.4.3 Obra civil y estructura metálica

Obra civil

El alcance de los trabajos de Obra Civil comprende las siguientes actividades:

- Cimentaciones del nuevo Grupo Compresor. Para su diseño se toma en consideración la especificación de diseño de REPSOL ED-Q-01.00 ESTRUCTURAS DE HORMIGON Y CIMENTACIONES y los datos del terreno derivado del estudio geotécnico realizado en etapas previas al Proyecto.
- Cimentaciones de la Consola de Aceite de Lubrificación.
- Cimentación de nuevo transformador.
- Cimentación del filtro de aspiración y de las plataformas de operación
- Pequeñas cimentaciones para el panel de control, soportación de los nuevos colectores y de las estructuras de las plataformas de operación.
- Zanjas de conducciones de cables eléctricos y de instrumentación. Los cables eléctricos de fuerza de 30 KV desde la Subestación SE-132 hasta la Subestación SEP-3 en la que se ubicará el nuevo compresor de 35 MVA se conducirán por canalizaciones butsen existentes que disponen de tubos de reserva suficientes. Para la conducción de cables de electricidad de 11 kV y de BT y los cables de instrumentación desde la SEP-3 hasta el nuevo Compresor F3-C-1 será necesarios la apertura y cierre de las zanjas de conducción de cables existentes.
- Adecuación de la red de drenajes de aceitosas que pasan, previamente a la ejecución de este Proyecto, por debajo las cimentaciones de los nuevos compresores y de la consola de aceite de lubricación.

Cimentación nuevo compresor

Los datos de carga y esfuerzos dinámicos son dados por MAN DIESEL & TURBO. A continuación se indican los pesos de los equipos que comprenden el Grupo Compresor.

- Compresor: 26.000 kg
- Multiplicador de velocidad: 10.000 kg
- Motor eléctrico: 32.000 kg

Dadas las características del terreno en la que está situada la unidad FCC, las cimentaciones del nuevo compresor deben diseñarse profundas mediante pilotes hasta roca (aproximadamente a 25 metros de profundidad). Las cimentaciones profundas se realizarán para cada compresor mediante 12 micropilotes de 220 mm de diámetro.

El encepado micropilotado se encuentra dividido en dos para salvar las interferencias que implican las cimentaciones de la nave existente, no obstante el diseño de cada encepado es monolítico. Sobre el encepado micropilotado se dispone un forjado de hormigón armado elevado sobre la solera 3,50 metros. Este forjado se soporta sobre 8 pilares que parten del mencionado encepado.

Ver plano F3-1-43-73 incluido en el ANEXO 2 de este DOCUMENTO nº 2

Estructura metálica

El diseño sigue lo requerido por la Especificación de REPSOL ED-M-01.00 “ESTRUCTURA METALICA” y ED-M-02.00 “CARGAS PARA EL DISEÑO DE ESTRUCTURAS”.

Incluye principalmente la instalación de las nuevas plataformas para mantenimiento de los nuevos equipos y la estructura de soportación del filtro de aire de entrada al compresor.

- Plataforma Compresor F3-C-1. Para el mantenimiento se construirán unas plataformas de estructura metálica con rejilla galvanizada. Ver plano adjunto F3-1-46-66 hoja 1.
- Soportación filtro de aspiración del Compresor. Nueva estructura para soportar el nuevo filtro de aspiración de Compresor F3-C-1. Ver plano adjunto F3-1-46-66 hoja 2.

El diseño se ha realizado utilizando el software TRICALC 9.0 de la compañía ARKTEC. Como cargas permanentes se han considerado los pesos propios de la estructura y el peso de operación del filtro que es de 12.500 Kg.

2.4.4 Sistema de tuberías

Las tuberías existentes de aire proceso y de servicios auxiliares (agua de refrigeración y aire de instrumentos) habrán de modificarse para conectarse con el nuevo compresor y equipamiento asociado. Por tanto, se realizará el diseño del trazado de tuberías nuevo hasta cada uno los puntos de conexión con los nuevos equipos. Para el diseño se sigue la especificación de REPSOL ED-L-01.00-03. DISEÑO DE TUBERIAS EN UNIDADES DE PROCESO.

Líneas de aire de proceso

- Aire de proceso. Conexión con colector existente que conduce el aire de proceso al regenerador.
- Línea nuevas del sistema de aceite de lubricación entre la Consola de Aceite de Lubricación con el Grupo Compresor.

Líneas de servicios

- Agua de refrigeración ida y retorno entre colector existente de la Unidad y la intercambiadores de la consola de aceite de refrigeración.
- Aire de instrumentos desde el colector general de Unidad existente a los nuevos instrumentos instalados en el Grupo Compresor y los nuevos tramos de colectores de tuberías.

El diseño de tuberías se realiza de acuerdo a los P&ID,s del proyecto, las buenas prácticas de ingeniería y las especificación de tuberías de REPSOL que aplican que se incluyen en el ANEXO 1, en concreto las siguientes:

- At. Aire de proceso
- L. Agua de refrigeración.
- La. Aire de instrumentos.
- Rh. Aceite de lubricación.

El diseño se realiza en tres dimensiones con un programa de diseño (PDS de la Empresa INTERGRAPH). A partir del diseño en 3D (maqueta 3 D) se edita los planos de planta de tuberías y los planos isométricos con el listado de materiales

para proceder a su compra, su prefabricación en taller y posteriormente a su montaje. Se incluye en el ANEXO 2 un diseño preliminar en 3 D.

Planos de Planta

En los planos de planta se indica el rutado esquemático de las nuevas líneas mostrando su ubicación para su montaje en la Planta. Representan todas las líneas de más de 0,5", indicando en cada cambio de dirección o elevación las coordenadas y la elevación a fondo de tubería cuando apoyen en soportes comunes y al eje cuando sean tramos independientes. Se indican todas las coordenadas de todos los ejes de equipos, estructuras y límites de plano

Planos isométricos

La definición exacta de las líneas de tubería para su prefabricación en taller se realiza por medio de planos isométricos, que indican su posición y coordenadas junto con la lista de materiales y elementos pertenecientes a cada línea. Adicionalmente se incluye la información de los correspondientes elementos de soportación.

Para el colector de impulsión de aire del compresor se ha realizado el correspondiente estudio de flexibilidad, tomado en consideración la temperatura de diseño y operación superior a 200 °C, mediante el programa CAESAR II. El objetivo de este estudio es minimizar las cargas sobre las toberas del compresor de formas que estén en los valores admisibles. Este estudio ha derivado en la necesidad de considerar la instalación de una junta de expansión.

Sistema de aire de instrumentación para accionamiento válvulas

Definen las nuevas líneas de aire de instrumentación desde el colector general de Unidad más cercano hasta las nuevas válvulas de control neumáticas.

Los planos isométricos de las líneas de proceso que se incluyen en el ANEXO 2 de este DOCUMENTO N° 2. En este mismo anexo se incluye un diseño preliminar de la maqueta 3 D

2.4.5 Sistema Eléctrico

El diseño de la instalación eléctrica sigue la especificación de REPSOL ED-P-01.00. (INSTALACIONES ELECTRICAS) incluida en el DOCUMENTO 1.

Previamente a la aprobación de la ejecución del Proyecto se realizaron Estudios del Sistema Eléctrico de la Refinería (flujo de cargas y cortocircuito). Estos estudios determinaron que la alimentación eléctrica al Grupo Compresor se debe realizar desde la Subestación de 132 kV (SE-132). Esta Subestación recibe la energía eléctrica de la Compañía Suministradora de Energía Eléctrica y transforma su tensión de 132 kV a 30 kV mediante 2 transformadores de 100 MVA. Desde el correspondiente cuadro de 30 kV se realiza la distribución de la energía eléctrica a las diferentes subestaciones eléctricas de proceso.

Con el objetivo de alimentar el nuevo compresor C1 es necesario la ampliación del citado cuadro eléctrico de 30 kV mediante una celda adicional. Esta nueva celda de 30 kV alimenta a un nuevo transformador de potencia dedicado (UFCC-TF30-1) de 35 MVA, situado en la Subestación de Proceso existente SEP-3, que transforma la tensión de 30 kV a 11 kV. Desde el correspondiente cuadro de 11 kV se alimenta el motor del nuevo compresor a una tensión de 11 kV.

Para este transformador se ha seleccionado la potencia de 35 MVA tomando en consideración la potencia del motor del nuevo compresor de 14 MW y la previsión futura de la realización de un proyecto de sustitución del compresor de gases de la misma Unidad de FCC, F3-C-2 de 4,2 MW.

Ver LISTA DE EQUIPOS ELECTRICOS en el ANEXO 1.

Modificaciones en SE-132 kV. Nueva celda de ampliación del cuadro de 30 kV existente

Comprende el siguiente alcance:

Ampliación del Cuadro de Distribución existente Y1-SW30-0132, tensión nominal de 30 kV, Intensidad nominal de 2500 A, potencia de cortocircuito de 40 kA a 1 seg. (fabricación MESA. Grupo SCHNEIDER), compuesto por celdas blindadas con aislamiento en SF6, con una nueva salida a transformador en barras B para alimentar al nuevo Transformador Dedicado UFCC-TF30-1 de 35 MVA, 30/11,5 kV,

que se instalará en la Subestación de Proceso existente SEP-3. Diseño de acuerdo con la especificación de REPSOL ED-P-04.00 (CUADROS ELECTRICOS DE AT).

La implantación de la nueva celda se refleja en el plano Y3-3-73-132. Alcance de acuerdo con lo reflejado en el Esquema Unifilar Y-2-73-132 hoja 2. Ambos documentos incluidos en el ANEXO 2 de este DOCUMENTO nº 2

- Seccionador barras-p. a t.
- Interruptor automático de 2500 A.
- Transformadores de intensidad
- Relé de protección multifunción (funciones: 50-51-50N-51N)..
- Transformador toroidal 100/1A para protección de neutro (funciones: 50N-51N).
- Relé de protección diferencial de línea (función: 87L)
- Relé de disparo y bloqueo (función: 86).
- Relé de disparo y bloqueo para protección diferencial de línea (función: 86L) de CEE.
- Analizador de redes multifunción, amperímetros, indicadores de tensión, lámparas, automáticos y relés auxiliares, selectores, bloques de pruebas, alumbrado, calefacción, regleteros de bornas, etc.

Transformador de 35 MVA, 30/11 kV (UFCC-TF30-4)

Instalación de un nuevo transformador dedicado sumergido en aceite (UFCC-TF30-4), a ubicar en la SEP-3 .Las características y requisitos técnicos del transformador serán de acuerdo a lo indicado en la Especificación de Repsol ED-P-05.00-02 (TRANSFORMADORRES DE POTENCIA) que se adjunta en el ANEXO del DOCUMENTO 1.

- Tensión nominal : 30 +- 2 x 2,5% / 11,5 kV
- Grupo de conexión : Dyn 11
- Potencia nominal : 35 MVA (ONAN)

- Tensión de cortocircuito : 7,5%
- Tres Transformadores de intensidad 750/5-5 A, 15VA 5P20, 15VA 5P20 (para protección de línea y protección diferencial del transformador), montados en los terminales del primario (30 kV), con los secundarios conectados a una caja de terminales auxiliar.
- Accesorios principales de este transformador serán:
 - Termómetro para medir la temperatura del aceite con contactos de alarma y disparo
 - Indicador de nivel de aceite
 - Relé Buchholz
 - Válvula de sobrepresión
 - Relé de imagen térmica
 - Transformador de intensidad bajo tapa para señal al relé de imagen térmica
 - Medida de temperatura en devanado por medio de sonda Pt-100.
 - Panel de protecciones IP 65, tensión de alimentación 230 V, F+N

Conexionado de una nueva resistencia de p. a t. (UFCC-TF30-1-GR) del neutro del transformador de 35 MVA (UFCC-TF30-1) a ubicar a lado del transformador en la de la SE P3. Las características y requisitos técnicos de la resistencia serán de acuerdo a lo indicado en la Especificación de Repsol ED-P-05.02-01.

- Tensión nominal: 11,5 kV
- Tensión de servicio: $11,5 / \sqrt{3}$ kV
- Nivel de aislamiento : 17,5 kV
- Intensidad asignada a 10 s : 1.250 A

- Resistencia óhmica: 5,3 Ohmios
- Transformador de intensidad: 1.250/5 A, 15VA 5P10

Cuadro de 11 kV UFCC-SW-11-1

Nuevo Cuadro UFCC-SW11-1, tensión nominal de 11,5 kV (aislamiento 17,5 kV), Intensidad nominal de 2500 A, potencia de cortocircuito de 31,5 kA, 1s, compuesto por celdas compartimentadas, en ejecución extraíble, conjunto resistente al arco interno (accesibilidad tipo A en caras delantera, lateral y trasera), con barra única, sin transferencia automática y características y requisitos de acuerdo a lo indicado en la Especificación de Repsol ED-P-04.00-01 00 (CUADROS ELECTRICOS DE AT). Ver esquema unifilar incluido en el ANEXO de este DOCUMENTO N° 2

Composición del nuevo cuadro:

- Una celda de acometida
- Una celda de salida a motor de 13.400 kW (F3-C-1: F.C.C. Air Blower)
- Una celda de salida a batería de condensadores

Componentes principales de cada una de las celdas:

Celda de acometida

Comprende lo siguiente:

- Interruptor automático extraíble 2500 A, corte en SF6, tensión de 17,5 kV, potencia de cortocircuito de 31,5 kA a 1 s, mando mecánico y eléctrico con bobina de apertura.
- Transformadores de intensidad.
- Transformadores de tensión.
- Relé de protección multifunción (funciones: 50-51-50N-51N).
- Relé de protección diferencial de línea (función: 87L).
- Relé de protección diferencial de transformador (función: 87T).

- Relé de mínima tensión de corriente alterna (función: 27).
- Relé de mínima tensión de corriente continua (función: 80).
- Relé de disparo y bloqueo para protección diferencial de línea (función: 86L).
- Un Relé de disparo y bloqueo para protección del transformador (función: 86T), tipo RAD-7004 de CEE.
- Analizador de redes multifunción, amperímetros, indicadores de tensión, conmutadores, lámparas, indicación alarmas trafo, automáticos y relés auxiliares, selectores, bloques de pruebas, alumbrado, calefacción, regleteros de bornas, etiquetas, sinóptico, enclavamientos, llaves, etc.

Celda de salida a motor 14.000 kW

Comprende lo siguiente:

- Interruptor automático extraíble 1250 A, corte en SF6, 17,5 kV, potencia de cortocircuito de 31,5 kA a 1 s, mando mecánico y eléctrico con bobina de apertura.
- Seccionador de p. a t, mando manual, con enclavamiento con llave
- Transformadores de intensidad,
- Relé de protección de motor multifunción (funciones: 5-37-46-48-49-50-51N-51LR-66).
- Transformador de intensidad toroidal 100/1 A para protección homopolar.
- Relés de protección de sobreintensidad 50N/51N (función: Protección diferencial self-balanced 87M).
- Relé de disparo y bloqueo (función: 86), tipo RAD-7004 de CEE.
- Analizador de redes multifunción, amperímetros, indicadores de tensión, conmutadores, lámparas, automáticos y relés auxiliares, selectores,

bloques de pruebas, alumbrado, calefacción, regleteros de bornas, etiquetas, sinóptico, enclavamientos, llaves,....

Celda de salida a batería de condensadores

Comprende lo siguiente:

- Interruptor automático extraíble 1250 A, corte en SF6, 17,5 kV, 31,5 kA, 1 s, mando mecánico y eléctrico con bobina de apertura.
- Seccionador de p. a t, mando manual, con enclavamiento con llave
- Transformadores de intensidad
- Relé de protección de motor multifunción (funciones: 5-37-46-48-49-50-51N-51LR-66).
- Transformador de intensidad 5/1 A, 15VA Cl. 0,5 para amperímetro en estación de maniobra.
- Transformador de intensidad toroidal 100/1 A para protección homopolar.
- Relés de protección de sobreintensidad 50N/51N (función: Protección diferencial self-balanced 87M).
- Relé de disparo y bloqueo (función: 86).
- Analizador de redes multifunción, amperímetros, indicadores de tensión, conmutadores, lámparas, automáticos y relés auxiliares, selectores, bloques de pruebas, alumbrado, calefacción, regleteros de bornas, etiquetas, sinóptico, enclavamientos, llaves,....

Baterías de condensadores de MT (UFCC-BC11-1).

Instalación de una batería de condensadores UFCC-BC11-1 de un único escalón, conexión en doble estrella, de 1700 kVAr a 11500 V, 3F, 50 Hz, 25 kA 1s, con seccionador de p. a t., fusibles de protección, resistencias de descarga rápida, inductancias de choque antiarmónicos, protección IP 23, transformador de intensidad 5/5 A, 15VA Cl, relé de protección de desequilibrio.

Ampliación Centros de Control de Motores U3-MC5-9 y U3-MC5-10

Se ampliarán los Centros de Control de Motores U3-MC5-9 y U3-MC5-10, existentes en la SEP-3, para incorporar los arrancadores correspondientes a todos los receptores de BT. En concreto los siguientes.

CCM U3-MC5-9

- Motor de la bomba de la consola de lubricación F3-C1-EMP-1B DE 22 kW
- Motor Bomba jockey motor accionamiento del compresor F3-C1-EMP-3 de 7,5 kW
- Calentador 2 en depósito consola de aceite lubricación F3-C1-E-2 de 9 kW

Ver diagrama unifilar NF3-2-73-02

U3-MC5-10.

- Motor de la bomba de la consola de lubricación F3-C1-EMP-1A de 22 kW
- Motor sistema de accionamiento de los IGV,s de 1,5 kW
- Calentador 1 en depósito consola de aceite lubricación F3-C1-E-1 de 9 kW.
- Motor accionamiento de virador conectado a las reductora de 5,5 kW

Ver Diagrama Unifilar NF3-2-73-01

Ampliación del SAI existente

Se amplía el SAI existente en la SE P3 para la alimentación segura de los paneles locales de control del compresor.

Ampliación Sistema de corriente continua 110 V c.c., existente en SE P3.

Se amplía el Cuadro de distribución de 110 V c.c., existente en la SE P3 con las siguientes salidas:

- Un Interruptor automático de 16 A, 2P para alimentación de los circuitos de carga de muelles de los interruptores automáticos de SF6 del Cuadro de 11 kV (UFCC-SW11-1).
- Un Interruptor automático de 10 A 2P para alimentación de los circuitos de control en el Cuadro de 11 kV (UFCC-SW11-1).

Otros Alcances a realizar en la SEP-3

Ampliación de la red de puesta a tierra para incluir a los nuevos equipos a instalar en la SEP-3: Transformador de 35 MVA, 30/11,5 kV (UFCC-TF30-1), Cuadro de 11 kV (UFCC-SW11-1), Resistencia de p. a t. (UFCC-TF30-1-GR) y Baterías de Condensadores (UFCC-BC11-1 y UFCC-BC11-2)

Conducciones de Cables

Teniendo en cuenta las potencias y la tensión de trabajo de los consumidores eléctricos y al Especificación de REPSOL ED-P-10-01, CABLES ELECTRICOS DE ALTA TENSION, se dimensionan los cables de alimentación a cada consumidor eléctrico. Ver lista de cables eléctricos en el ANEXO 1.

La sección de los cables se determina de acuerdo con el caso más desfavorable entre los siguientes:

- Intensidad máxima admisible en régimen permanente
- Intensidad de cortocircuito admisible en conductores para defecto trifásico
- Caída de tensión en funcionamiento normal y durante el arranque y reacceleración en el caso de motores

Cables entre Subestaciones SE-132 y SEP-3

Para la alimentación en 30 kV al primario del transformador cautivo de 35 MVA, 30/11,5 kV, desde la SE de 132 kV, se ha considerado una acometida con cables tipo RHVMAV 26/ 45 kV, mediante 3 ternas de 3 (9) cables unipolares de $1 \times 185 \text{ mm}^2$ Cu.

Los recorridos de estos cables se realizarán en su totalidad por canalizaciones tipo Butsen existentes que tienen tubos de reserva. Ver planos Y1-58-40 que se incluye en el ANEXO 2.

Cables entre transformador y celdas de 11 kV

La interconexión desde el secundario del Transformador UFCC-TF30-1 hasta el Cuadro 11 kV (UFCC-SW11-1), por el interior de la SE P3, se realiza mediante 8 ternas de cables (24) unipolares sin armadura RHV 12/20 kV de 1 x 300 mm² Cu. Ver plano U3-73-18 Incluidos en el ANEXO 2.

Cables asociados al nuevo motor de accionamiento del nuevo Compresor de aire

Para la alimentación en 11 kV al nuevo motor F3-C-1 (14.000 kW) se ha considerado un cable tipo RHVMAV 12/20 kV en 3 ternas de 3 cables (9) unipolares de 1 x 300 mm² Cu.

Para alcanzar los puntos de conexión de los nuevos motores desde las zanjas existentes se instalarán “conduits” para cada uno de los nuevos motores y nuevas centralitas de lubricación. Ver plano I3B-73-10 Incluido en el ANEXO 2

Los cables citados anteriormente y el resto de cables de menor entidad se incluyen en la LISTA DE CABLES incluída en el ANEXO 1 de este DOCUMENTO N° 2.

Planos y documentos no incluidos en este PFC

- Conexión a la red de tierras de la SEP-3
- Señales eléctricas de control para enclavamientos en SE-132 y SEP n° 3
- Ampliación sistema de alumbrado normal y de emergencia.

2.4.6 Sistema de Control e Instrumentación

Sistema de control

Se especifica en primer lugar la arquitectura de control del sistema. En ella quedan reflejadas las interconexiones de control entre equipos y sistemas y se define si las señales son de seguridad intrínseca o no, y si son comunicadas o cableadas. El correspondiente diagrama de bloques F3-1-75-104 se incluye en el ANEXO 2.

Comprende la transmisión de señales entre las siguientes equipamientos:

- Panel local de control F3-C-1-LP-1 con cajas de conexionado del Skid del Grupo Compresor.
- Panel local de control F3-C-1-LP-1 con cajas de conexionado de la Consola de Aceite de Lubricación.
- Panel local de control F3-C-1-LP-1 con la las celdas de 11 kV en SEP-3.
- Panel local de control F3-C-1-LP-1 con el Sistema de Control Distribuido existente en la sala de racks de SEP-3 .
- Panel local de control F3-C-1-LP-1 con caja de conexionado del Filtro de Aire situado en la aspiración del Compresor.
- Panel local de control F3-C-1-LP-1 con cajas de conexiones de control existente de la Unidad para señales de transmisión al TDC (Sistema de Control Distribuido existente).
- Skid del Grupo Compresor con caja de conexionado del tanque de compensación de aceite (Lube oil Run Down Tank)

El sistema de control se implementa en el Panel Control F3-C-1-LP-1 que se ubica cerca del compresor, pero en zona no clasificada como peligrosa. Comprende los siguientes sistemas:

- PLC Control Logix.
- Sistema de control de antisurge de fabricación CCC (serie 5).
- Sistema de control de seguridad de máquina de fabricación BENTLY NEVADA (3500)

PLC Control Logix. Gestiona todas las señales que recibe de los instrumentación instalada, así como las señales emitidas por los módulos de control de CCC y BENTLY NEVADA para control de puesta servicio, parada y seguridad de Grupo Compresor. Así mismo, comunica las señales más significativas con el Sistema de Control Distribuido de HONEYWELL (DCS) existente de la Sala de Control 3 de la Refinería para información de su estado en la sala de control. Las señales consideradas críticas y/o de seguridad serán enviadas como señales independientes al DCS mediante cableado dedicado. El resto serán transmitidas comunicadas mediante mediante protocolo ModBus

Sistema de control de antisurge CCC. Gestiona el caudal de compresor mediante la modulación de los Inlet Guide Vanes (IGV,s). El controlador FIC-0441 regula el flujo másico de aire que es calculado en función de los siguientes valores:

- Presión del PT-865
- Temperatura del TT-439
- Flujo del FT-440 A y FT-440B

Adicionalmente gestiona el control antisurge del Compresor mediante el controlador FIC-0444 que regula la apertura de la válvula de Blow off. El controlador antisurge determina el punto de operación del compresor y proporciona una señal analógica para control de la válvula de blow-off modulando su apertura en función de la proximidad del punto de operación a la línea límite de surge para seguridad del compresor. Un contador cuenta el número de surges que sufre la máquina a lo largo de su operación.

BLENTY NEVADA 3500. Gestiona los siguientes parámetros: Temperaturas cojinetes del Motor.

- Temperaturas de los devanados de Motor.
- Temperaturas de los cojinetes axiales y de empuje del Compresor
- Temperaturas de los cojinetes axiales y de empuje de la Multiplicadora de Velocidad. Lógica 2002
- Vibraciones rotores 1 y 2 de la Multiplicadora de Velocidad.
- Vibraciones del Casing de la Multiplicadora de Velocidad.
- Desplazamiento axial cojinetes rotor 1 de la Multiplicadora de Velocidad.
- Vibraciones rotor del Compresor.
- Desplazamiento axial cojinete de empuje Compresor:
- Velocidad rotor compresor

En los diagramas lógicos editados por MAN DIESEL % TURBO incluidos en el ANEXO 3 de este DOCUMENTO N° 2 se describe la gestión de control y seguridad gestionados por los sistemas indicados, teniendo en cuenta la lógica de tratamiento

de las señales repetidas prefijada con objeto de evitar tratamiento erróneo por fallo de un instrumento.

Instrumentación

Una vez editados, los P&ID,s y la citada arquitectura de control se editan la lista de instrumentos y sus hojas de datos tomando en cuenta los comprendidos en el Skid del Grupo Compresor editadas por MAN DIESEL & TURBO incluidas en el ANEXO 3 y las adicionales a instalar externamente al citado equipo (principalmente en los nuevos colectores de aspiración e impulsión de aire) editadas por la INGENIERIA incluidas en el ANEXO 2.

En el listado de instrumentos se indica, entre otros datos, los siguientes:

- TAG del instrumento.
- Tipo de instrumento.
- Servicio.
- Situación
- Tipo de conexión
- Tipo de señal
- Caja de conexiones

Con la información de los P&ID,s se editan la lista de señales tanto comunicadas, como cableadas, con el Sistema de Control Distribuido existente en la refinería (DCS) y la lista de cables de instrumentación. Estos documentos se incluyen en el ANEXO 1.

No se incluye en este PFC la siguiente documentación:

- Planos de implantación de instrumentos
- Esquemas de conexión a proceso de los instrumentos ubicados en el skid del Grupo Compresor y los ubicados fuera del Skid.
- Interconexión entre el Panel de Control y las cajas de conexión
- Diagramas de terminales de cables del Panel de Control

2.4.7 Sistema contra incendios

Se sigue lo establecido por la especificación de REPSOL, ED-S-02-01.

Las Unidad de FCC se encuentra protegida por la red perimetral de agua contra incendios y dispone de una distribución de hidrantes con una separación de 40 m.

La ubicación del nuevo compresor está en una zona protegida por monitores fijos situada a una distancia de 15 m de los equipos a proteger.

Tomando en consideración que el compresor maneja aire, por tanto gas no inflamable, solo es necesario proteger a consola de aceite de lubricación con un sistema fijo de agua pulverizada con un caudal de 20, 4 l/m/m². La actuación del sistema es automática mediante detección del incendio por ampollas fusibles taradas a 68°C que actúan sobre la válvula de diluvio.

2.5 ANEXO 1. DOCUMENTACION EDITADA POR LA INGENIERÍA

- 1º Requisición Técnica de compra Grupo Compresor
- 2º Lista de Equipos Mecánicos
- 3º Lista de Equipos Eléctricos
- 4º Lista de Líneas
- 5º Especificaciones de tuberías
- 6º Lista de cables eléctricos
- 7º Lista de instrumentos
- 8º Hojas de datos externos al skid grupo compresor
- 9º Lista de cables de instrumentación
- 10º Lista de señales cableadas a SCD
- 11º Lista de señales comunicadas

TECHNICAL REQUISITION

FOR PURCHASING

PROJECT Nr: P-0016-2164-1668	1. REQUISICION TECNICA DE PEDIDO DEL GRUPO COMPRESOR PRODUCT: FCC AIR BLOWER ITEM: F3-C-1 REFERENCE JOB CUSTOMER: ADI-1783
CUSTOMER: REPSOL	
PROJECT DESIGNATION: ADI-1783. NEW COMPRESSORS IN FCC FOR IMPROVEMENT OF ENERGY EFFICIENCY	

PRODUCT : FCC AIR BLOWER

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PRODUCT : FCC AIR BLOWER

I. GENERAL

The purpose of this requisition is to cover SUPPLIER scope of supply for the design, complete manufacture, shop testing, supervision for field erection, pre-commissioning, commissioning start-up and delivery to the Client of a complete Compression train, comprising: one (1) Axial compressor/Air Blower with inlet guide vanes, driven by one (1) High Voltage Induction Electric Motor, through one (1) Gear Unit and complete with an inlet air filter and all other herein specified accessories and auxiliary equipment.

New requirements or modifications included in this revision (rev. 1) have been marked in blue colour. Parts that do not apply any more have been directly deleted in this revision.

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II. SCOPE OF SUPPLY

A. SUPPLIER scope of Supply

SUPPLIER scope of supply shall include, but not be limited to the following equipment and/or services for this compressor train.

1. One (1) Horizontally Split, [Axial compressor](#) with inlet guide vanes. Item N°: F3-C-1, in agreement with the attached data sheet, Appendix "F3C1-5-00-50", the requirements included in this requisition and the applicable specifications listed in Chapter VII of this requisition.
2. One (1) High Voltage Main Motor Driver. Item N°: F3-C-1-EMC-1, in agreement with the attached data sheet, Appendix "F3C1-5-00-51", the requirements included in this requisition and the applicable specifications listed in Chapter VII of this requisition.
3. One (1) Gear Unit. Item N°: F3-C-1-GBC-1, in agreement with the attached data sheet, Appendix "F3C1-5-00-52", the requirements included in this requisition and the applicable specifications listed in Chapter VII of this requisition.
4. One (1) Inlet Air Filter. Item N°: F3-C-1-F-2, including (1) silencer. Item N°: F3-C-1-SL-1, in agreement with the attached data sheet, Appendix "F3C1-5-00-50", the requirements included in this requisition and the applicable specifications listed in Chapter VII of this requisition.
5. One (1) Special Purpose High Speed Coupling and Non Sparking Guard between Compressor and gear unit.
6. One (1) Special Purpose Low Speed Coupling and Non Sparking Guard between Main Motor and gear unit.
7. One (1) Common Baseplate for the complete train, composed by Compressor / gear / Main Motor Driver.
8. One (1) Console mounted Lube Oil System in accordance with [PURCHASER Specification ED-K-04.00](#), API 614 5th edition ([chapters 1 and 2](#)) and in agreement with the attached data sheet "F3C1-5-00-53", and the applicable specifications listed in Chapter VII of this requisition.
9. One (1) Lube Oil Rundown Tank, Item N° F3-C-1-D-2, loose supplied, for mounting by others on a Client's supplied structure.
10. One (1) Set of Compressor shaft Seals in agreement with section V.B, of this requisition.

PRODUCT : FCC AIR BLOWER

11. One (1) Compressor casing drain system in agreement with section V.C. of this requisition.
12. One (1) complete Compressor blow-off/Antisurge control valve, according to the attached data sheet "F3C1-5-00-50", the requirements included in this requisition and the applicable specifications listed in Chapter VII of this requisition.

Anti-surge system shall include pressure, temperature and flow transmitters, flow element and blow off valve. PURCHASER requires 2oo3 voting logic for surge detection.

The Blow off valve shall also be supplied by SUPPLIER. The Blow off valve shall be sized for the full compressor flow, not the expected surge flow. The selection of the Blow off valve shall be done by SUPPLIER and approved in writing by CCC.

The rest of primary elements for the anti-surge system, including the flow orifice, venturi or annubar, shall be supplied by PURCHASER. All these items shall be installed by the PURCHASER on the process piping. SUPPLIER will submit the specifications and requirements for transmitters and flow elements in process lines.

The following details of anti-surge element shall be provided:

- a. Data sheet of Control valve, including CV values. Compliance with PURCHASER specification ED-J-06.00-I required. For SUPPLIER comments & deviations to this specification see item VII. I.
 - b. Specifications/requirements for Transmitters.
 - c. Specifications/requirements for flow element.
 - d. % of rated flow that anti-surge system is designed for shall be minimum 100%.
13. One oil accumulator
 14. One check valve for compressor discharge line
 15. One blow off silencer
 16. One silencer for compressor discharge line
 17. The expansion joint/compensator required in compressor inlet nozzle connection.
 18. Transition piece between filter and compressor (if apply).

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19. One (1) Free standing alarm, instrument and control local panel, Item N° F3-C-1-LP-1, including the alarm annunciator, the PLC, the Anti-surge Controllers, the Bently Nevada series 3500 train Compressor speed, Temperature, Vibration, Axial Position and Temperature Monitoring System and the Main Motor and auxiliary motors Start-Stop pushbutton stations with the necessary manual-automatic and local-remote selector switch stations, in agreement with this requisition.

BN with required interface to System One.

Two HMIs, one for compressor and one for CCC.

Lamps, selectors and push buttons.

SUPPLIER will provide HMI screens for generation of DCS screens.

Local control panel will be near the compressor, not in control room. It will in safe area but it will be outside. It must be pressurize but not Exp certified for electronic protection.

The system will have not certification. Only an alarm will send to the control system if the pressurization is lost.

Internals of the LCP will be like BILBOREC analogy.

Construction of the panel (roof and keyboards) will be like CK6 analogy submitted.

20. Local gauge boards for each separate skid, as specified on the relevant attached data sheets and the requirements included in this requisition.
21. All necessary local instrumentation and safety devices, as required for start-up, normal operation and emergency shutdown, including the above indicated loose supplied blow off control valve. All in agreement with this requisition and the attached specifications listed in Chapter VII of this requisition.
22. Locally mounted junction boxes, located at the edge of the different skids for the different types of signals and cables, in agreement with this requisition.
23. One (1) Set of renewable Labyrinths for all internal close clearance points.
24. One (1) Set of compressor journal bearings
25. One (1) Set of compressor thrust bearings
26. One (1) Industrial PC with all necessary software tools to program and maintain the PLC. Shall be clarified which Trainview configuration software is provided with the Industrial PC for engineering and maintenance. A second PC shall be added to have an HMI for the compressor system that also displays the vibration data from the BN system.
27. The complete train will be preassembled. Train baseplate combination will be shipped as a unit. A complete "train test" before shipping is not required

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28. Export Packing for shipment for long term storage: For main equipment and spare parts. Packing for 6 months outdoor storage as per API will be supplied.
29. One (1) dynamically balanced and mechanically tested MRT spare Compressor Rotor. Performance test for spare rotor will not be required. Performance test will be required for job rotor only.
30. One (1) dynamically balanced and mechanically tested Gear Unit spare rotor - gearing Train.
31. One (1) steel container for the compressor spare rotor, suitable for Nitrogen pressurization. Container shall be suitable for vertical storage.
32. One (1) steel container for gear spare rotor, suitable for Nitrogen pressurization. Container shall be suitable for vertical storage.
33. One (1) dynamically balanced High Speed Shaft Spare complete main coupling.
34. One (1) dynamically balanced Low Speed Shaft Spare complete main coupling.
35. One (1) Set of spare compressor diaphragm
36. One (1) Set of spare compressor labyrinths
37. One (1) Set of spare Gear Unit bearings (radial and thrust)
38. One (1) Set of spare Compressor journal bearings
39. One (1) Set of spare Compressor thrust bearings
40. One (1) Set of spare static blades
41. One (1) Static blades control system Spare
42. One (1) Inner casing Spare
43. One (1) Electric actuator Spare
44. One (1) set of spare parts for erection, pre-commissioning, commissioning and start-up for the complete supply. About O-ring and gaskets for commissioning and start-up only a set is necessary, as seals are delivered mounted in compressor. Spare parts documentation shall be submitted including SPIR (Spare Parts List and Interchangeability Record), cross sectional & part list for the complete scope of supply, not only for the compressor. PURCHASER format will be used for the final documentation with SUPPLIERSPIR information.

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45. Spare parts recommendation for two (2) years continuous operation for all the supply, including: compressor, Oil System, Seals, Local Control Panel, Gear Unit and Main Motor.
46. The following spare parts will be supplied for erection, pre-commissioning, commissioning, start-up and two years of operation:

COMPRESSOR

- 1 set of gaskets, o-rings and back-up rings (including compressor)
- 1 piece of vibration probe
- 1 piece of axial displacement probe

Gear Box

- 1 set of o-rings

AIR INTAKE FILTER

- 1 set pre filter
- 1 set of fine filter

Lube Oil Unit (as per specification ED-K-04.00-I-02, Page 14/32)

- 1 Set of rotary pump bearings
- 1 Mechanical seal
- 1 Pump gaskets
- 1 Coupling
- 1 Set of bearings for electric motor
- 1 Set of gaskets for tank
- 1 Set of bolts and nuts for tank (10%)
- 1 Set of cooler tubes (5%)
- 1 Set of gaskets for cooler (100%)
- 1 Set of bolts and nuts for cooler (10%)
- 1 Temperature transmitter
- 1 Temperature elements
- 1 Temperature indicator
- 1 Pressure indicator
- 1 Pressure transmitter
- 1 Level transmitter

LOCAL CONTROL PANEL

- 1 Set of galvanic isolators (analog inputs)
- 1 Set of galvanic isolators (analog outputs)
- 1 Set of galvanic isolators (digital inputs)
- 1 Set of galvanic isolators (digital outputs)

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- 1 Set of galvanic isolators (RTD's)
- 1 Set of galvanic isolators (proximity probes)
- 1 HMI operator interface computer
- 2 push-buttons
- 2 pilot lights
- 2 bypass switches
- 6 control relays
- 6 power relays --> n.a. MCC is not in SUPPLIER scope of supply
- 2 circuit breakers
- 1 Set of miscellaneous items (fuses, bulbs, wire, etc.)

CCC

- 1 I/O Processor Transition module
- 1 I/O Processor Card
- 1 Transition module for XCALIBER 1002
- 1 Main Processor Unit
- 1 FTA, Duplex Analog
- 1 FTA, Duplex Discrete
- 2 FTA, Cable - 3 meters
- 4 Local Analog Input Conditioning Module
- 2 Local Analog Output Conditioning Module
- 2 Local Digital Input Conditioning Module
- 2 Local Digital Output Conditioning Module
- 1 Duplex Power Supply
- 1 Line Filter
- 1 Power supply module 350W 220/120 VAC Load sharing
- 5 AI Conditioning Module 4-20mA

CONTROL VALVES (oil system, anti-surge valve)

- 2 sets of gaskets
- 1 seat
- 1 trim
- 1 set of VALVE & ACTUATOR REPAIR KIT, Gasket packages, SOLENOID V/V & SWITCH BOX

47. One (1) Set of special tools, as required for installation and maintenance of the complete train, including all the tools required to minimize the repair time of the Gear Unit at site. Tools to remove compressor bundle must also be provided. Quotation shall include all the special tools required for a general overhaul, to remove the installed gear set and install the spare one for disassembling the Gear Unit and the compressor deck and/or by an unforeseen repair work at site. As this is a critical piece of equipment, all the tools or fixtures that service engineers commonly use to facilitate or speed the work shall be included in order to minimize the repair time.

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48. The necessary software (Three licenses required) for the HMIs, installed in the Main Local Control Panel. Three licenses for Allen Bradley and Three licenses for CCC Train View required.
49. Inspection and shop testing for the complete supply, as specified on the relevant sections of this requisition and the attached specifications and data sheets listed in Chapter VII of this requisition.
50. Painting of all supplied equipment as per SUPPLIER off shore standard. Finish colours (RAL) shall comply with PETRONOR Standards.
51. Torsional analysis of the complete train, performed by the Compressor manufacturer.
52. Independent lateral vibration analysis for Compressor, gear, and Main Motor, performed by their relevant Manufacturers. Compressor lateral analysis shall include both Level I and Level II stability analysis, as per API 617.
53. Documents, Certificates, Drawings, Data book material, Part lists and Spare parts quotations.
54. Overseas and/or overland transportation into the plant site, for D.A.P. delivery at PETRONOR refinery in Muskiz (Spain), indicating also the percentage of import duty if applies.
55. Client's personnel training at field. Five days of training will be taken into account, including all the scope (compressor, Gear Unit, Antisurge, etc.). For CCC, at least one complete day is required. CCC training will be carried out by CCC. The site training shall take place at the commissioning.
56. Pre-assembled, supported and mounted interconnecting wiring among the locally mounted instruments (SUPPLIER scope) and the relevant skid mounted junction boxes.
57. Field supervision services during erection, pre-commissioning, commissioning and start-up of the entire SUPPLIER scope of supply.

CCC supervision at site is required and included in SUPPLIER scope of supply.

Fares and the estimate duration in dates were indicated in SUPPLIER proposal.

SUPPLIER proposal was based on a duration of stay of SUPPLIER service engineers on site and shall be subject to revision in accordance with the daily rates included in SUPPLIER's bid in the event the actual duration of stay differs from the one mentioned in the Quotation; accordingly, the mentioned price for supervision cannot be regarded as fixed lump sum.

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From Monday to Sunday 10 working hours must be considered. Additional hours will be considered as per SUPPLIER overtime rate.

SUPPLIER and PURCHASER will verify the invoicing method for commissioning and training. The final price will depend on daily working reports and travel expenses according to SUPPLIER offer rates.

PURCHASER will indicate the final schedule for erection, pre-commissioning, commissioning and start-up, and SUPPLIER will confirm the schedule validity and will confirm that commissioning engineers will be available for these dates.

58. PURCHASER requires the delivery of the LCP and Lube-oil system in advance. These equipment will be delivered one month before the compressor.

B. Equipment to be provided by Purchaser

The following equipment and/or services will be provided by Purchaser under separate orders:

1. All concrete foundations and civil works, concrete foundation design, including any Topographic measurements and the supply of anchor bolts.
2. All buildings, structures, stairways, platforms surrounding the supplied equipment, except where stated in the appropriate section of this requisition.
3. L.V. and H.V. Induction Motors Control Centers.
4. Unit Control System (D.C.S.).
5. All interconnecting wiring between locally mounted junction boxes and the Local Control Panel / Electrical substation / Unit Control System (D.C.S.).
6. Power wiring between each motor or electric power consumer and the Electrical Substation.
7. All piping interconnecting the various skids, outside the limits of the scope of supply which be agreed.
8. Unloading of equipment when received at the plant site in PETRONOR refinery in Muskiz (Spain)
9. Any freight, import, state and local taxes, where applicable.
10. Storage of all equipment when received at the plant site.
11. Erection, pre-commissioning, commissioning and start-up at site, including all manpower, cranes, mobile platforms, tools and materials required to provide the complete mechanical, instrumentation and electrical erection and assembly of the specified equipment (But under SUPPLIER's technical supervision).

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12. First oil filling.
13. Any and all State and Local Building Environmental Permits, where applicable.
14. All required wiring, connectors, optic fiber conversers and any other necessary equipment for connecting the HMI to the Refinery Ethernet network.
15. Pre-assembled and supported Interconnecting process air, instrument air, lube oil and cooling water piping, including all valves, instruments and accessories that are not part of the skids (Compressor/Gear Unit/Main Motor and Lube Oil Console) and which are not included in the items I or II of this chapter.
16. All demolition activities.

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III. UNIT RESPONSIBILITY AND COORDINATION

SUPPLIER shall be responsible for: The design, engineering coordination, supply, delivery, testing, final checkout and satisfactory operation of the whole unit.

The engineering coordination shall also include handling and expediting of drawings and documentation.

SUPPLIER's bid will be deemed to be fully in accordance with this Material Requisition and all applicable Standards, Specifications and Codes unless a written list of exceptions is submitted with the bid.

Compliance with Standards, Codes and Specifications will not relieve **SUPPLIER** nor the manufacturer(s) from the responsibility of furnishing equipment, materials, and accessories of proper design and construction and fully suitable for all specified duties, operating conditions and performance guarantees.

SUPPLIER shall be responsible for the materials and equipment supplied by his sub-suppliers. **SUPPLIER** shall coordinate, expedite, and resolve any problems with his sub-suppliers. He shall also guarantee and be entirely responsible for the design and satisfactory performance and operation of the complete unit, i.e. compressor, transmission, driver, air filter, Local Control Panel, instrumentation and all auxiliary equipment.

SUPPLIER shall also be responsible for ensuring that all relevant information and documentation is passed-on to his sub-suppliers, since all the information pertaining to the equipment being supplied by the sub-suppliers may not necessarily be repeated in the relevant sections of this requisition.

All the sub-orders (signed by **SUPPLIER**) of the main equipment shall be sent to **ENGINEERING COMPANY/PURCHASER** for review in order to check that all the principal items are according to their requirements. Main equipment refers not only to compressor, but also to gear unit, main motor, couplings, air filter, oil system and Local Control Panel.

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IV. GUARANTEES

Besides the required guarantees indicated in the applicable specifications and those expressly stated in the documents and conditions of the request for supply, SUPPLIER shall guarantee that all the equipment included into his supply will comply with the requirements of this requisition. It shall be understood that SUPPLIER shall guarantee and agree the following:

- A. All main and auxiliary equipment and component parts, including those supplied from Subsuppliers, shall be guaranteed by SUPPLIER against defective materials, design, and/or workmanship in agreement with the terms stated on the commercial documents attached to the Request for Supply.
- B. Equipment shall be guaranteed within the tolerances stated on the applicable specifications for head, capacity, power and consumption of plant air, cooling water, nitrogen, instrument air and other utilities, at the specified operating conditions.
- C. Should any defects or malperformance occur during the guarantee period, SUPPLIER shall make all necessary alterations, repairs, and replacements, all free of charge. Field labour charges and liabilities, if any, shall be in agreement with the terms stated on the commercial documents attached to the Request for Supply.

Guarantees shall be defined in the commercial contract.

Performance guarantee values will be agreed between SUPPLIER and PURCHASER.

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V. SPECIFIC REQUIREMENTS FOR THE COMPRESSOR TRAIN

A. Specific Requirements for Compressor, Item F3-C-1

1. Horizontally Split, Air Blower with inlet guide vanes.
Inlet air nozzle could be either axial or upwards of the compressor. Outlet nozzle location shall be downwards.
2. SUPPLIER shall advise the maximum possible flow rate with the model, size and driver rated brake horsepower.
3. All equipment shall be adequate for the operating cases indicated in the compressor data sheets "F3C1-5-00-50".
4. Operating case "Normal" is the guarantee point at which maximum efficiency is required.
5. Occasional operation at 60% turndown is required for mid distillate operation with approximately 5 psig lower discharge pressure.
6. Compressor train must be capable of operation at the "maximum capability point" without reducing the API critical speed safety factors.
7. Compliance with quoted performance shall be verified during ASME PTC-10 Performance Test Type 1. Selection of test points shall be mutually agreed by SUPPLIER and PURCHASER. Test will be carried out with shop motor and project gear box.
8. API tolerance for test of 4% will be reduced to 2% of tolerance. This tolerance will also include instruments accuracy and uncertainties
9. Anti-surge system protection and performance controller based on CCC Series 5 shall be provided with the compressor package. SUPPLIER scope shall also include the review and approval of the compressor and Antisurge system P&ID's, and the Line sizes and instruments related to the Antisurge system selection.
10. In addition to the PDT for measuring compressor flow, the scope of supply of the Antisurge system shall also include the primary flow element, to be installed in the process piping by others.
11. SUPPLIER shall advise the discharge temperature.
12. SUPPLIER has stated that no anti-choke valve is necessary for this compressor.
13. SUPPLIER shall supply compressor performance curves with all specified operating cases. SUPPLIER shall indicate the predicted surge limit, the predicted surge control limit and predicted maximum capacity limit ("Choke" or "Stone wall").

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14. The 115% of the flow capacity at surge point at normal speed shall not exceed 85% of the normal flow capacity under any operating conditions without using the bypass. Compliance with this point shall also be graphically indicated on performance curves.
15. After performance test, SUPPLIER will submit the compressor as built data sheets and compressor as built performance curves according to test results.
16. Air to the compressor is drawn from a sea coast and a refinery/petrochemical plant atmosphere.
17. SUPPLIER shall advise if any other external shutdowns are required.
 - All these shutdowns shall be preceded by an alarm whose primary element shall also be supplied by purchaser but displayed on SUPPLIER Local Control Panel annunciator as well as in the plant DCS.
 - An external manual shutdown from control room will be provided (by others). This shutdown will act directly on the electric power center and also on SUPPLIER Local Control Panel.
18. Isolation valves connections shall comply with ANSI B16.5.
19. Should the noise level exceed the required dB(A) pressure level of 82,0 @ 1 meter, a suitable sound attenuation shall be provided. Refer to [PURCHASER specification ED-A-01.02-I](#) for the complete train noise requirements.

[Acoustic Insulation for compressor will be performed by the “mat type insulation”](#) to guarantee a noise level of 82 dB(A) 1 meter. Motor shall have a noise level below 82 dB(A) 1 meter.
20. Efficiency (losses) for compressor and Gear Unit are required separately.
21. Procedure for electrical-mechanical run out checks during manufacturing process for bare shaft and finished rotor shall be included. API requirements (API 617, chapter 1, para. 2.6.8.9 & 2.6.8.10) shall be met without exception.
22. For couplings (both LS & HS):
 - Shall be defined couplings make and model.
 - [The same supplier is required for both couplings \(LS and HS\). GOODRICH or AMERIDRIVES are the acceptable suppliers.](#)
 - API 671 compliance shall be confirmed. Balancing requirements shall be confirmed: component balance + assembly balance + residual unbalance check + repeatability check, as per API 671 method 3.
 - Both couplings shall be hydraulically fitted with tapered bore and diaphragm type required.

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- Brass coupling guards required. Oil tight, fully enclosed coupling guards in accordance with API 671 and flanged connections are required.
23. SUPPLIER will inform if special seals or dampers are used by design to achieve required rotor stability.
24. For Journal bearing-thrust bearing, the following information shall be included in the offer:
- Advise if there are self levelling pads
 - Number of tilting pads,
 - LOP or LBP design (journals)
 - Make and model
 - Location of RDTs
 - Number of RDTs per bearing
 - Type of RTDs, simplex or duplex
 - Advise if there is direct lubrication in bearing design
25. Casing bolts shall have rolled threads (not machined).
26. High speed balancing (HSB) is required for both compressor rotors (main rotor and spare rotor).
27. SUPPLIER piping specifications will be used inside compressor skid.
SUPPLIER will inform about the connection points so that PURCHASER could adapt its pipes to SUPPLIER pipes.
28. Turning device required for Air blower.

B. Specific Requirements for shaft Seals

1. Labyrinth shaft end Seals as per API 617 will be supplied.
2. The seal model shall be a selection of duplicate size and design which has a successful record of proven field experience.

Model and materials of construction of major components shall be included.
Model of seals shall be included.
Information about seals, including the technical details, typical drawing, materials of construction, etc, shall be submitted.
3. The seals shall receive the following witnessed tests at seal manufacturer's shop:
 - a. Cleanliness.
 - b. Air leak.
 - c. Functional test.

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4. The shaft Seals shall also be used during the main equipment performance and mechanical run testing.
5. The shaft Seal design and tests shall meet the requirements of API 617.

C. Specific requirements for compressor casing drain system

1. A complete drain collection system, as indicated below, shall be also included.
2. Casing drain line size shall not be less than that of the drain opening in the casing. Drain valves shall be located as close to the casing as possible and accessible.
3. Casing drain lines may be routed over the compressor baseplate if a continuous slope can be provided.
4. Unless otherwise specified, all the components of drain system shall be suitable for exposure to the maximum allowable working pressure of the compressor and shall have the same material and welding requirements as the compressor casing.

D. Specific Requirements for Main Motor, Item N° F3-C-1-EMC-1

1. The electric Main Motor Driver, Item N° F3-C-1-EMC-1, shall be in agreement with PURCHASER specification ED-P-02.01-I, as supplemented by the below listed additional requirements and the motor data sheet, Appendix "F3C1-5-00-51".
2. SIEMENS, ABB, or GE motor shall be supplied. PURCHASER requires from MOTOR SUPPLIER to assume that its Spanish offices will be involved in all phases of the supply: bid, design, manufacturing and reception tests. MOTOR SUPPLIER must send to the Spanish offices the bid to be checked against the REPSOL specification.

Motor SUPPLIER shall confirm that the motor balancing requirements shall conform to API 541. Vendor will balance the rotor in accordance with API 541. This does not mean to obtain the same end result, but also to follow the prescribed balancing process. If Motor supplier have an ISO procedure for balancing but the acceptance criteria will follow the API values, this is accepted by PURCHASER.

Motor supplier must confirm that motor will have a reduced vibration values, as per API 541.

SUPPLIER shall confirm that the supplied motor will have no deviations to PURCHASER Specifications.

3. Main Motor frame enclosure protection shall be IP-55 EExnA – Category 3.

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4. Main motor cooling should be in agreement with section 4.17 of PURCHASER specification ED-P-02.01-I, including all elements and accessories indicated in the motor data sheet.
5. Motor refrigeration system must have PURCHASER acceptance.
6. Motor shall be suitable for starting with 80% of rated voltage. In the condition specified the motor shall support the following starting sequences:
 - Three consecutive cold start attempts (with return to the condition of zero speed before the next start attempt).
 - Two consecutive start attempts after continuous running at rated power.
 - Three start attempts at equal intervals during one hour, during continuous running at rated power.
 - At least, six (6) startings in one day without suffering damage, with 1000 startings per year as minimum.
7. The motor shall have hydrodynamic split sleeve bearings, and arranged for pressure oil lubrication from the common lube oil system serving the Compressor and Gear Unit. Both motor bearings shall be electrically insulated. A shorting device shall be provided in the drive end bearing housing.
8. Duplex, three wire, Pt 100 ohm at 0 °C RTD's, to be monitorized on a Bently Nevada series 3500 monitor system, supplied by SUPPLIER , shall be included mounted on the motor as indicated in the motor data sheet.
9. All detector leads shall be metallic armored. Terminals for Winding Temperature Detectors and Bearing Temperature Detectors shall be brought to an independent dedicated terminal box with metric threaded cable inlet.
10. Both bearings shall be provided with two, X & Y, monitoring system, supplied by SUPPLIER, with their relevant extension cables, adapters, conduits, seals, proximitors and junction boxes.
11. Probes and Transducers shall be placed into suitable dust proof, intrinsically safety certified housings. Proximitors shall be grouped into single transducer housing, if possible.
12. For differential protection, Three (3) self balanced current transformers, installed on the motor, shall be included. One (1) additional current transformer, or double secondary on the above ones, for ammeter, shall be provided with the motor.
 - a. Current transformer secondary circuits shall be 0 to 5.0 Amp.
 - b. Current transformer secondary circuit terminals shall be brought to an independent dedicated terminal box.
13. The main motor shall have the following independent Junction boxes:

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- a. Main power supply and star center junction box, including the current transformers for differential protection and ammeter.
- b. Junction box for the secondary terminals of above indicated current transformers.
- c. Junction box for the temperature detectors for bearings and windings.
- d. Junction box for the space heater.
- e. Junction box for the Vibration Detection proximitors.

All these junction boxes shall have an IP-65 protection.

- 14. Main terminal box cabling type and quantity shall be advice during engineering phase.
- 15. In no case pre-purging will be admitted. Motor shall be “n”, but with presence of gas test as per IEC 60079-15 point 33.14.2. This way, motors without pre-purging can be used irrespective of the result of the Potential risk evaluation for ignition in the rotor and the stator.
- 16. Space heater must have an external sheath temperature not exceeding 160 °C. Sheath temperature is based on 40 °C ambient.
- 17. Space heater terminals shall be brought to an IP-65 protected, independent, dedicated terminal box. It shall be certified EExd.
- 18. Motor oil feed and drain piping shall be 304L stainless steel. Temperature and sight flow indicators shall be provided in each drain line.
- 19. The tested motor shall be shipped to SUPPLIER's shop for drilling of the baseplate and preliminary alignment with the compressor and Gear Unit. It is anticipated that the train baseplate combination will be shipped as a unit. Compressor train shall be delivered on its common baseplate, designed for a single point lift.
- 20. Suitable sound attenuation shall be provided, if required, to meet a dB(A) pressure level of 82,0 @ 1 meter. Refer to [PURCHASER specification ED-A-01.02-I](#) for the complete train noise requirements.
- 21. The motor [documentation](#) shall include the following information besides to that required by the PURCHASER Specification ED-P-02.01-I and the general notes for dynamic equipment:
 - a. Potential risk evaluation for ignition in the rotor and the stator.
 - b. Complete information on the required spares.

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- c. Torque vs. speed curves for 100% & 75% Un and starting times with the unloaded driven machine and/or loaded in agreement with the proposal confirmed Conditions for the compressor restarting.
- d. Torsional and pulsating current analyses.
- e. Preliminary studies on motor Start and stop.
- f. Confirmation of the total inertia factor for the specified re-accelerations.
- g. Slip Curve versus time for 50%, 75% & 100% load, or continuous regulation range.
- h. Confirmation of the compressor control response time.

The following information shall be submitted:

- Motor data sheet
- Motor curves
- Deviations to the material requisition issued for enquiry
- Deviations to PURCHASER High Voltage design specification
- Exn motors are required, and they shall be covered by a type tested per para. 33.14.2 of the IEC 60079-15 standard, to demonstrate that the motor can be used in the specified hazardous area without need to purge the motor prior to start-up.
- Motor scope of supply shall include provisions for air purge (for future use)
- Motor starting torque shall be at least 60% of the rated torque
- The motor shall be suit-able for continuous operation at the rated out-put (at the specified ambient temperature, voltage and frequency) with variations of voltage and frequency within the limits of "zone A" (defined in the IEC standard 60034-1), without exceeding the temperature rise defined for the insulation systems of thermal class B (80K).

If voltage and/or frequency variations exceed the limits of "zone A", but are within zone B, the motor shall not exceed the temperature rise permitted by the insulation system of thermal class B by more than 10K.

22. During starting or the re-acceleration process the supply voltage may drop to 80% of the rated value defined in the project documents. In these conditions, the torque of the motor shall not be less than 130% of the load torque (without tolerances), at any speed between 0 and that corresponds to the maximum power torque.

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E. Specific Requirements for Gear Unit, Item N° F3-C-1-GBC-1

1. The Gear Unit, Item N° F3-C-1-GBC-1, shall comply with standard API-613, as supplemented by the additional requirements and clarifications of this requisition, and attached data sheet, Appendix "F3C1-5-00-52".
2. The Gear Unit shall be provided with the following vibration detection and monitoring instrumentation:
 - a. X-Y radial vibration detection probes at all journal bearings (two (2) per bearing).
 - b. Two (2) axial position detection probes (dual voting) at each thrust bearing.
 - c. A keyphasor on the Low Speed Shaft.
 - d. Accelerometer on assembly casing.
 - e. Speed pick-up on the compressor coupling shaft extension.
3. Key-phasor, radial vibration and axial position detection probes shall be Bently Nevada Series 3300XL, suitable for a control panel mounted series 3500 monitoring system which shall also monitor the readings of the accelerometer.
4. Probes and Transducers shall be placed into suitable dust proof, intrinsically safety certified (IP-65 EExi) housing(s). Proximity sensors shall be grouped into single transducer housing, if possible.
5. Two (2) RTD's shall be provided for each radial bearing and each side of thrust bearing. All wired to a common junction box, equal to those specified for the compressor and the main motor driver.
6. Gear will be lubricated from the common oil system provided for the compressor and motor. All supplied piping shall be in 304L St. Stl.
7. A spare gearing set shall be supplied. The spare gearing set shall be fit into the gear housing and mechanically tested (At no load). The spare gearing set shall be shipped separately.
8. The Gear Unit, shall be shipped to SUPPLIER's shop for mounting, piping, and alignment on the common compressor-gear-motor baseplate.
9. Suitable sound attenuation shall be provided, to meet a dB(A) pressure level of 82,0 @ 1 meter. Refer to PETRONOR specification P-96 A2 for the complete train noise requirements.

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10. Oil tight coupling guards in accordance with API 671 and flanged connections are required unless Gear Unit supplier confirm that there is no oil leakage from the bearing housing.
11. The scope of the monitoring system shall include BENTLY NEVADA TDI Cards to communicate with the System 1.
12. Torsional analysis of the train shall be done by compressor SUPPLIER.
13. Only agreed deviations to material requisition and applicable specifications shall be accepted.
14. Gear Unit standard painting procedure (suitable for offshore services) is acceptable. Final coating RAL must be as per PETRONOR specification.
15. SUPPLIER shall confirm how the mechanical losses of the compressor are measured during the compressor performance test.
16. Gear Unit power losses shall be supplied (power losses and tolerances) for every operating case.
17. SUPPLIER shall confirm that the lube oil system meets all the requirements of this document.
18. Gear Unit supplier shall confirm which flow rate is required from the overhead tank. SUPPLIER shall confirm the same for the compressor and the motor, in order to size the overhead tank.
19. SUPPLIER will indicate if SIL certification is required for any instrument.

F. Specific Requirements for air filter, item N° F3-C-1-F-2 & Silencer, item N° F3-C-1-SL-1

1. An inertial separator type filter will be supplied, including:
 - Air inlet weather hood
 - Air inlet trash screen
 - Moisture eliminator, coalescer type with a pressure drop of 15mm WG.
 - Necessary instrumentation.
2. Static two stage filter will be offered.
3. Full set of spares for commissioning (100%) required for both stages.
4. For casing, stainless steel is required.

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5. A technical proposal accepted by PURCHASER from the supplier CAMFIL and submitted to SUPPLIER shall be considered as this proposal includes all the requirements from PURCHASER regarding mechanical items.
6. Compliance to PURCHASER I&C specifications required.
7. CAMFIL or Freudenberg are the acceptable suppliers.
8. Filter to be designed to handle air flow listed under operating data for compressor rated case.
9. Minimum pressure drop will be 25 mm WG. Maximum allowable pressure drop will be 35 mm WG.
10. Corrosiveness of air sea coast and refinery/petrochemical Plant atmosphere.
11. Filter housing material, frame material and ducting after filter material will be Carbon Steel.
12. Filter efficiency must be accepted by purchaser. Higher efficiency filtration elements required.
13. Filter will be mounted outdoors, supported on steel structure supplied by purchaser. The necessary supporting structure for filter to be disposed directly over purchaser platform shall be in SUPPLIER scope. This is required in order to avoid any welding or modification on the filter or on the filter supporting structure at site. Supporting structure is acceptable in carbon steel.
14. Inlet air filter shall be supplied with a blow-in door to prevent collapse of the inlet system should any portion of the inlet filter become blocked. The door shall be set to open at a vacuum of 105mm WG and shall have a limit switch to indicate the door has opened. All vendor supplied components in the inlet system shall be suitable for continuous operation at the blow-in door setting.
15. The filter shall be designed to permit coalescer elements to be safely replaced without interfering with the continuous operation of the compressor. Head losses with clean and collapsed filter must be clearly indicated.
16. Transition piece on filter house discharge with built in inlet silencer. Transition with line to be supplied complete with companion flange. If filter outlet and compressor inlet have the same dimension and shape, the transition piece in line can be avoided.
17. Filter will have facility for replacing filter elements while unit is in operation, i.e. access platforms, ladders, internal lighting, etc.

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18. Inlet filter and silencer/transition piece to be supported on structural steel supplied by purchaser. Vendor to supply any necessary mounting lugs or mounting brackets.
19. Silencer will be absorption type, splitters mounting form. Maximum allowable silencer pressure drop will be 5mmWG. Shell material will be carbon steel and sound absorbing material will be mineral wool. MAWP will be atmospheric pressure.
Companion flange for welding to PURCHASER inlet line will also be provided.
Transition piece must be self-supporting and made of carbon steel.
SUPPLIER will also include the lifting lugs required for erection.
20. Surface painting as per supplier off shore standard with final colour as per PETRONOR specification.

G. Specific Constructive Details for the Lubrication System

1. SUPPLIER shall include a forced feed type, lubricating oil system, common for the Compressor, the Gear Unit and the main Motor Driver, and in agreement with standard API-614, 5th Ed., PURCHASER specification ED-K-04.00-I and the attached data sheet, Appendix "F3C1-5-00-53".
2. The lube oil for the complete train shall be REPSOL ARIES TURBOGAS VG46.
3. When possible, all Oil transmitters, thermometers and pressure gauges shall be mounted on suitable gauge boards or brackets, located at the console or train baseplate edge.
4. The lube oil system components, accessory equipment and instrumentation shall be supplied from the acceptable subsuppliers listed in this requisition and in Data Sheet Appendix "F3C1-5-00-53" or approved equals.
5. All the oil system shall comply and be designed and instrumented in agreement with standard API-614, 5th ed.
6. The oil filter housing and ancillary equipment shall be made of AISI 316L stainless steel, with welding neck flanges. Carbon steel is not acceptable. The use of casted filter housings requires PURCHASER prior approval.
7. Fiberglass filtration elements with a minimum particle removal efficiency of 99,5% for 10 micron particles are required. However, the clean pressure drop across the total filter system (including transfer valves) shall not exceed 0,1 bar.
8. Compliance with API 614, 5th ed. "the minimum retention capacity shall be calculated based on 8 min of normal oil flow" (Chapter 2, para. 4.3.6.4) is required.
9. Oil reservoir shall be made of AISI 316L.

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10. Magnetic type level gauge required.
11. Guide radar level transmitter required.
12. Oil conditioning connections required.
13. Oil cooler-AEW construction is also acceptable.
14. Oil filter housing shall be made of AISI 316L.
15. Bypass valve (recirculation) shall be self regulated.
16. Backpressure PCV shall be a conventional control valve with a pneumatic actuator controlled by a PIC in the PLC. PT in the header shall be used to control de PCV.
17. TVC- Thermostatic valve shall be AMOT make, fully compliant with API 614, 5th ed.
18. Oil accumulator required.

Oil Piping and fittings shall be made of AISI 316L (ASTM materials). Construction shall be butt-welded, with WN flanges. Schedule as per API-614, 5th ed. [SUPPLIER piping specifications will be used inside the oil unit and inside compressor skid.](#)

[SUPPLIER will inform about the connection points so that PURCHASER could adapt its pipes to SUPPLIER pipes.](#)

[Valves as per SUPPLIER specification accepted by PURCHASER \(carbon steel casing and Stainless Steel internals\).](#)

19. Rundown tank shall be made of AISI 316. Level gauge and transmitter same as oil reservoir.

H. Specific Requirements for Instrumentation and Local Control Panel

1. General Design requirements.

- a. SUPPLIER shall submit an equipment full description with all instrumentation associated and design drawings, where show all interconnecting with the machine and others equipment as Bentley Nevada.
- b. All instrumentation supplied shall be according with PETRONOR specifications and shall be from qualified manufacturer/Model.
- c. All instrument design shall be based in "fail safe" philosophy.

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- d. All transmitters shall be Smart type with Hart protocol.
- e. Area classification is Class I, Zone 2, Gr IIA, T-3.
- f. All instrumentation shall have dust proof enclosure (IP 65 minimum), with intrinsic safety certified protection EExi.
- g. Each instrument shall be provided with its relevant certification of calibration and with the ATEX certificate of authorization for use in the specified area class.
- h. Instruments data sheets: will be agreed between SUPPLIER and ENGINEERING COMPANY the best way to submit the data, by a flat table or an excel data base.
- i. Installation materials and mounting for all SUPPLIER supplied process, pneumatic and electric connections from each instrument up to the relevant junction boxes shall be included.
- j. All interlocks for Emergency Shut Down (Safety Instrumented System Instrumentation S.I.S.) shall be designed according with the standard IEC-61508 "Functional Safety of Electrical / Electronic / programmable electronic safety-related system" and standard IEC-61511 "Functional safety – Safety instrumented system for the process industry sector"
The ESD shall also be hardwired to the Allen-Bradley PLC.
- k. Preliminary all instrumentation supplied by SUPPLIER for Emergency Shutdown Loop's shall be agree according with safety integrity level S.I.L. 2 requirements, according to standard IEC-61508 "Functional Safety of Electrical / Electronic / programmable electronic safety-related system- Part 1: General requirements. This safety integrity level will be subject to revision during study of the HAZOP and SIL.
- l. Self-acting valves are only allowed as PCV in the by-pass line of the lube oil system and the TCV in the lube oil system; other than that, SUPPLIER shall supply control valves with pneumatic controller (Foxboro, ABB, EMERSON or MASONEILAN).
Lube oil system Temperature Control Valve (TCV) shall be AMOT make. Fully compliant with API 614, 5th ed.
Self regulating valves are allowed to the Nitrogen. The lube oil back-pressure control valve shall be a conventional control valve with a pneumatic regulator.
- m. Speed, vibration and axial position Proximity sensors shall be grouped in boxes and the wires from proximity sensors shall be connected to terminal strips inside the boxes.
- n. RTD's from bearings, or from any other part of the machine, in which are normally embedded, shall be connected by SUPPLIER to dedicated junction boxes.

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- o. All RTD's including those in the main motor winding shall be duplex, Pt-100, 3 wire type, 100 Ω @ 0 °C.
- p. The supply and mounting of the interconnecting wiring is not in scope of SUPPLIER.
- q. Instruments wiring shall be with armored cable, using aerial cable trays. A common wire is not permitted. The individual cables shall have a minimum section of 1,5 mm². For BN cables, their standard supply will be acceptable.
- r. SUPPLIER shall provide single cables. Purchaser will provide cable outside the package. Non-Eexi cables shall be grey for voltages up to 24 V, and black for 110/230 V.
- s. Inductive switch shall be used for all instruments with digital output, in case of these are not possible, single-pole and double-throw (SPDT), hermetically sealed into dust proof enclosure (IP 65 minimum) and intrinsically safe switches shall be used.
- t. All limit switches for on-off and control valves shall be inductive type.
- u. The use of cable, combining two or more instruments, is not allowed. Every instrument shall be provided with pair, triple, or four wires as required. Special mention is given to provision of terminals for the screens or shields for each of following signals:
 - 1). Speed, vibration and displacement detectors.
 - 2). RTD's detectors.
 - 3). Alarm detectors.
 - 4). Shut-down detectors.
- v. All signals between existing interlock panel DCS, CCM and machine (Bently Nevada, PLC, etc) shall be hardwire.
- w. Block and bleed valves shall be provided for instrument operation.
- x. The control system is based in the ALLEN BRADLEY PLC and the anti-surge protection and performance controller is based on CCC Series 5. Duplex configuration required for all elements.
- y. In order to communicate with the DCS, digital signal shall be transmitted unpacked (bit-by-bit, as opposed to words or bytes). Detailed memory maps shall be supplied to implement the MODBUS communications with the DCS.

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- z. Calibration and loop checks on site shall be supervised by SUPPLIER service engineers, as part of the Field Services.
- aa. The machine trip function shall be implemented in the local PLC supplied by SUPPLIER; 2oo3 voting logic required, except for axial displacement where 2oo2 logic is acceptable.
- bb. All trip signals and trip bypasses shall be individually hardwired. Other signals may be communicated using Allen-Bradley DF1 (serial interface) protocol. SUPPLIER shall be given the opportunity to review PETRONOR operating procedures; if additional requirements are felt necessary, they will be included in the unit specific operating manual.
- cc. PURCHASER requires the same concept for trips and alarms as per BILBOREC, for example PURCHASER do not want HH temperature trips.
If there is any problem in the compressor train due to the lack of these trips, this will be PURCHASER responsibility.
- dd. The emergency pushbuttons must send the signal through a safety relay. Two different signals will be sent, one for Gear Unit and another one for CCC.
- ee. HMI workstations (2-off). One for PLC and one for CCC system.
- ff. Ae. CCC coordination is in SUPPLIER scope of supply.

2. Local Instruments

- a. Each instrument type shall be specified under its own corresponding specification; specifications are attached to this material requisition.
- b. All field local instrumentation, including pressure and temperature gauges / transmitters, speed and axial position detectors and vibration sensors shall be supplied and mounted by SUPPLIER.

All instruments on each skid shall be mounted on the local gauge boards. The only local instruments are level indicators, sight flow indicators and temperature gauges.
- c. All instrument and their installation methods shall be in accordance with PURCHASER specifications: ED-J-12.00-I, ED-J-13.00-I, ED-J-14.00-I and ED-J-17.00-I.
- d. Dial thermometers, RTD's, Thermocouples, etc connected to process lines, including Lube oil, shall be provided with protection wells, in AISI 316 stainless steel as a minimum material. The well shall be according to PURCHASER specification ED-J-17.00-I.

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Wells shall be threaded only in air and cooling water services. In process lines, they shall be flanged.

- e. Electrically connected local instruments shall have dust proof, intrinsically safe certified, IP-65 EExi enclosures.
- f. Control valves shall be specified as per PURCHASER specification ED-J.06.00-I
- g. Electro-pneumatic positioners of smart type with Hart protocol are required for throttling control valves.
- h. Thermal and Relief valves shall be calculated according to ASME VIII and PURCHASER specification ED-J-06.00-I ED-J-18.00-I.
- i. All temperature elements shall be provided with smart type temperature transmitters.
Temperature element and transmitters integral in the same enclosure type instrument are not allowed. Each temperature element shall be a separate instrument from temperature transmitter. Connection between each element and transmitters shall be made by thermocouple or thermoresistance cable.
- j. Wetted parts material shall be stainless steel, as a minimum, for:
 - 1). Control valves (For trim only).
 - 2). Transmitters.
 - 3). Dial thermometers.
 - 4). Pressure switches.
 - 5). Thermal and Relief valves.
- k. Body material for instruments shall be carbon steel as a minimum. Cast iron is forbidden.
- l. Share the same tap connection for different services, as alarm and shutdown, is not permitted.
- m. Electrical connection for instruments shall be ½" NPT-F.
- n. Flanged connections shall be per ANSI 16.34.
- o. Material of construction for connecting tubing between take-off connection and instrument shall be AISI 304 or 316 stainless steel and connected

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with AISI 304 stainless steel fittings Swagelock. SUPPLIER shall provide 3/4" Root valves on all process take-off connection.

When piping specifications do not allow the use of tubing for instrument mounting, process hook-ups shall be done with piping 1/2" NPS, welded fittings and valves, instead of manifolds.

Pneumatic air tubing shall be 1/4" OD, manufacturer in seamless annealed copper and with a black covering with 1,0 mm thickness.

Piping per API 614 shall be used up to the block or isolation valve; if tubing is allowed downstream of this valve by API 614, then only tubing, manifolds, valves and fittings made by SWAGELOK, HOKE or GYROLOCK are acceptable. Only one tubing SUPPLIER is allowed for the complete scope of supply.

- p. Solenoids valve shall be EExd type 117 Vac provided with manual reset.
- q. A proper stainless steel tag plate, fastened to the instrument with stainless steel fasteners, shall identify all instruments supplied. A second stainless steel plate showing all the technical data of the instrument as: serial number, model number, range and span, test certificates, etc. shall be permanently fixed to the instrument.

3. Junction Boxes

- a. All local instruments shall be wired by SUPPLIER to locally mounted junction boxes.
- b. SUPPLIER shall specified cable according to job specification PETRONOR P-60 A2 "Cableado eléctrico de instrumentos" (Only available in Spanish language). As this specification is not available in English language, SUPPLIER can find a summary in English on the attached document "summary of wiring installation".
- c. Cable glands shall be metallic type, suitable for the required electrical protection.
- d. Junction boxes protection grade shall be IP-65 as minimum and intrinsic safety (EExi) or increased safety (EExe), as required, and certified for the hazardous area according to ATEX.
- e. Junction boxes material shall be cast aluminum without copper, wall thickness shall be such as cable gland to enter in the wall five (5) screw fillet as a minimum. Stainless steel junction boxes are also acceptable. For compressor junction boxes the same type as for Gear Unit junction boxes can be accepted.

Junction boxes shall have a NPT connection with male plug, for drain in the bottom of the box.

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Junction boxes shall be according [PURCHASER specification ED-J-18.00-I](#).

- f. Junction boxes shall have, between box and top, a watertight neoprene joint, for other materials as silicone or polyurethane PURCHASER / PETRONOR approval is required.
- g. Junction box cable entries shall be always threaded NPT.F type according to ANSI/ASME B.1.20 standard.
- h. All junction boxes shall be provided with terminals for all the wires and for the screens or shields plus multicable spares. A 50% of extra terminals shall be provided on each junction box and on local panel terminal strips. Also, in the junction boxes a 50 % spare holes for cable inlet shall be provided with plugs. Cable entries shall be NPT type according to ANSI/ASME B.1.20.i.
All multicable outlets shall only be done at bottom of junction box, hole shall be for 2" conduit. Individual cable inlet shall only be done by lateral sides of junction box.
- i. Armoured cable shall be used for wiring from sensors to junction boxes. Wiring from junction boxes to local panel, to MCC, or to control room, shall be by Purchase and armored multicables will be used.
- j. All junction boxes shall be provided with terminals for all the wires and for the screens or shields plus multicables spares
- k. Segregation of signals from machine to Main Local Panel. Panel shall be made by supplying and connecting the primary detectors to the following type of junction boxes, supplied by SUPPLIER:
 - 1). Analog signal (4 – 20 mA) intrinsically safe use for indication, record and control.
 - 2). Analog signals (4 – 20 mA) intrinsically safe use for interlocks related to Plant protective system.
 - 3). Digital signals 24 Vcc intrinsically safe use for alarms, Start / Stop motors, status Open/Closed for valves.
 - 4). Digital signal 24 Vcc intrinsically safe use for interlocks related to plant protective system.
 - 5). Thermocouple signals.
 - 6). Thermoresistance signals.
 - 7). Vibration, axial position and phase angle detection

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- 8). In case that no intrinsically safe signals are necessary, these shall be segregated and grouped by type.
- 9). Power supply 117 Vac for solenoid valves in safety circuits.
- 10). Power supply 117 Vac for equipment with safety supply.
- 11). Power supply 230 Vac for equipment or systems that not requirement safety supply.
- I. Junction boxes shall NOT be installed on the compressor casing; they shall only be installed on local gauge boards.

4. Local Control Panel:

There is not a Local Panel at the compressor and a Remote Local Control Panel. There will be only a Local Control Panel, which will be installed close to the compressor in a safe area; this panel will be installed outdoors, unsheltered, so the scope of supply shall include a roof, side-walls and lighting (inside the panel outside the panel and under the roof in front of the panel).

- a. Although the main Local Control Panel, Item N° F3-C-1-LP-1, is intended to be located in a non-classified (Safe) area, SUPPLIER shall supply a purged panel, according to the specified area class for the compressor and auxiliary consoles (Class I, Zone 2, Group IIA, Temp. T-3), with instrument air at maximum pressure of 7,00 kg/cm²g and minimum of 6,30 kg/cm²g. For this option, SUPPLIER shall provide the certified necessary control system for panel purging.
- b. Loss of panel internal purge pressure shall not cause compressor shut down, only an alarm shall be produced.
- c. The minimum requirements for the unit Main Local Control Panel, Item N° F3-C-1-LP-1, are the following:
 - 1). The Main Local Control Panel item N° F3-C-1-LP-1 shall be made according to BILBOREC analogy. For external details (roof, keyboard position), coker (CK6) analogy will be followed.
 - 2). Main Local Control Panel, Item N° F3-C-1-LP-1, construction may be stainless steel 3 mm thick in lieu of painted carbon steel, IP-65 enclosure grade protection with front and back protected with a suitably lighted sun shade canopy.

Local Control Panel is installed outdoors, not in a control room. Hence, a RITTAL standard cabinet is not acceptable.

Main Local Control Panel shall be painted green light: RAL 6019.

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- 3). Selector switches, start/stop and emergency shutdown push buttons and status lights for manual and automatic operation of the equipment included in the units shall be included.
- 4). Erection of components in the panel via cable duct wiring.
- 5). Cable clamping rail.
- 6). PEN rail.
- 7). Support rail.
- 8). All wiring for external connections shall be carried by SUPPLIER to marked terminal strips mounted in the panel for purchase's interconnection.
- 9). Provision of intermediate terminal boards shall be provided for all signals and power entering or coming out in the panel. No direct connection between the sensor in the machine and the receiver instrument in the local panel or vice versa is allowed.
- 10). Main Local Control Panel, Item N° F3-C-1-LP-1, shall have one multi-window Panalarm, or similar, annunciator panel, weather protected, degree of protection IP-65 and embedded logic type. Reset button (RES) shall be mounted separate of TEST (Test of lamps.) and FIRST (First out) buttons.

Annunciator shall include and manage the logic.

- 11). Main Local Control Panel will be fed with two (2) power supplies, one (1) power supply safe of 115 Vac / 1 Phase / 50 Hz, from redundant UPS (this power supply have isolated neutral configuration) and another power supply of 230 Vac / 1 Phase / 50 Hz feed will be used for lighting and space heating. Each power supply shall have a bipolar thermal-magnetic breaker into HIMEL transparent box.

Annunciator panel shall be fed with safe power supply of 115 Vac from redundant UPS (this power supply have isolated neutral configuration). This panel shall provide an independent 24 VDC for indicating lamps and digital inputs.

- 12). The main Local Control Panel, Item N° F3-C-1-LP-1, shall have sound alarm pneumatic horn type with solenoid valve 115 Vac, EExd. Horn in Control Panel will annunciate alarms and trips.
- 13). Push buttons and selector switches in front of panel shall be 1,40 m high, as minimum.

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- 14). All local panel elements shall have proper stainless steel tag plate permanently fixed; description plate will be in Spanish language.
- 15). A cooling system will be included for LCP refrigeration, to avoid high temperatures inside the panel.
- d. Single cabinet for the three systems (AB PLC, BN3500, CCC).
- e. Same Operator Interface architecture for AB, PLC/BN3500 and CCC.
- f. AB PLC must merge all communicated signals from BN3500 and CCC, and added to its own signals, make them all accessible to DCS. Later, PETRONOR-PURCHASER will decide which should be displayed on the DCS screens.
- g. Communications and System Architecture must follow previous project design (BILBOREC)
- h. Digital Outputs shall be wired through relays.
- i. Purge system inlet shall be located on top or side-upper part of cabinet
- j. The Local Control Panel shall have sound alarm pneumatic horn type with solenoid valve 115 Vac, EExd. Horn in Control Panel will annunciate alarms and trips.
- k. Cause-Effect of Alarms and Trips should be defined to detail (Cause-Effect Matrix or similar documentation to be part of the engineering services deliveries). A table indicating common trips as indicated in P&IDs analogy will be required. Also for common alarms.
- l. Estimated duration of FAT to verify as close as possible to 100% (visual check of lay-out, insulation, redundancy, accuracy, simulation of IOs (hardwired and communicated) and logic in all three systems, failure and diagnostic facilities, etc.). 5 days with final documentation available is acceptable for PURCHASER.
PURCHASER requires that CCC will be present at FAT.
- m. CCC analogy submitted. CCC control will be based on flow. (Flow element, by others, in the discharge line).
- n. Current from main motor is used only in case that motor power will not cover all the compressor maps limits.
- o. Control shall be as indicated in the "control architecture" document from the proposal.
- p. Modbus RTU communication required instead TCP between DCS and PLC.

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- q. The scope of the monitoring system shall include BENTLY Nevada TDI cards to communicate with system 1.
- r. Isolation transformer in panel power feeds shall be included.
- s. Main Local Control Panel and plc panel shall include separate grounding lugs for the following:
 - 1). One (1) Electrical General.
 - 2). One (1) for Screens on frame.
- t. Alarm contacts and shutdown contacts will be open (de-energized) to sound alarm and be energized when compressor is in operation.
- u. Main Local Control Panel, Item N° F3-C-1-LP-1, shall include a locked emergency push button.
- v. Main Local Control Panel, Item N° F3-C-1-LP-1, pushbuttons, particularly the emergency shutdown and the door handle ones, shall be properly protected to avoid an accidental trip.
- w. Controls shall be adequate for machine protection, no-load start-up and full load and partial load capacity operation.
- x. A Panalarm made alarm annunciator shall be provided, located in the front of the local panel. Annunciator shall be embedded logic type and shall include first-out feature. SUPPLIER shall also provide acknowledge, reset and lamp test pushbuttons. Annunciator shall be according BILBOREC analogy.
- y. For alarms and shutdowns sequences see annexed document "Alarms and Shutdowns Sequences".
- z. The Main Local Control Panel, Item N° F3-C-1-LP-1, shall also include the Antisurge controllers and the necessary Bently Nevada series 3500 monitors (Refer to relevant section of this specification for details).
- aa. Panel shall include the necessary controllers for gear unit.
- bb. One ammeter for the main motor must also be included on the front of the Local Control Panel. This ammeter will be fed directly from its relevant current transformer secondary placed within the motor.
- cc. Manual shutdown of machine shall be available from both: The local panel and Control Room. Purchaser will provide an external manual shutdown from Control Room. This shutdown will act directly a power

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center. The shutdown order from Control Room will be conducted by hardware.

- dd. Trip bypasses will be supplied.
- ee. Maintenance bypass switches without key shall be mounted and actuated in main Local Control Panel front with status lamp; they shall be wired to input P.L.C. entries. the preference is without keys, but if SUPPLIER requires the use of keys, this is also acceptable. For 2oo3 voting type signals bypass switches shall be provided only one by pass switch for maintenances. Should any by-pass be activated SUPPLIER P.L.C. shall send one soft signal to the DCS (for each by-pass).
- ff. One common signal will sent to the Control Room in case any by pass is activated (hardwire). Individual "actuated by pass" for each initiator shall be to DCS throughout serial link.
- gg. No process fluid as water, etc., is allowed to driven into the Local Control Panel. Only instrument air for the internal purging purposes is permitted.
- hh. Local panel shall also include the necessary pushbutton stations for the start and stop of the main and auxiliary motors of the compressor train, the required selector switches for their manual and automatic operation and their relevant status lights.
- ii. BN information will be included in compressor HMI. The HMI software shall have the capability of showing trends of vibration, temperatures and process data.
- jj. Switches for interlock bypasses are required in the Local Control Panel (this applies to SUPPLIER compressor signals). As a proposal, SUPPLIER can install interlock bypasses associated to an alarm (monitored by PLC).
- kk. DCS will generate an alarm when a bypass is activated.

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5. Programmable Logic Controller (P.L.C.) General Requirements

- a. Main Local Control Panel, Item N° F3-C-1-LP-1, pushbuttons, particularly the emergency shutdown and the door handle ones, shall be properly protected to avoid an accidental trip.
- b. The P.L.C. shall be manufacturer by Rockwell (Allen Bradley), model "CONTROLLOGIX". Communications to DCS will be done by means of DF1. PLC must execute all the compressor sequences (start up and shut down), control all compressor auxiliary systems together with all the alarms and trips of the group.
- c. Redundant PLC is required. The P.L.C. shall have redundant C.P.U., single I/O cards, redundant communication ports and redundant power source. The power source will be fed from two different external source supplies from purchaser.
- d. LCP shall be watertight according to IP65 (minimum).
- e. Provision of intermediate terminal strips shall be supplied for all signals and power entering or coming out in the panel. No direct connection between the sensor in the machine and the receiver instrument in the cabinet panel or vice-versa is allowed.
- f. All terminals provided for screens will be grounded and connected in only one point in the panel.
- g. For all incoming and outgoing intrinsically safe circuits, galvanic isolators shall be provided. Zener barriers are not permitted.
- h. Terminals for digital/analogue inputs or outputs to panel (Either alarm or shutdown and for analog signal 4÷20 mA) shall be breakable in one of the active wires.
- i. All solenoid outputs from Main Local Control Panel shall be led to terminal strips, shall be protected by breakable terminal block with embedded fuse for positive pole and shall have breakable terminal block for negative pole.
- j. SUPPLIER shall supply 4÷20 mA, I to I signal repeaters in case where electronic indication or recording is required to be available at the DCS TDC 3000 HONEYWELL simultaneously than at the cabinet and with the same detector.
- k. All compressor trip signals shall be managed exclusively by this P.L.C., with the exception of the emergency shutdown.
- l. The P.L.C. shall be provided with the necessary devices to be able to communicate with the DCS TDC 3000 HONEYWELL, to follow up the main

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events in it and shall be able to distinguish and signalize in it the “first-out” option on alarms and shutdown, when a train of alarms is produced simultaneously in shutdown conditions.

- m. Communication between the equipment P.L.C. and the DCS TDC 3000 HONEYWELL shall be made by data link, through an RS-485 port and using a Modbus RTU protocol.
- n. The DCS TDC 3000 HONEYWELL, in this case, will only be able to read all alarms, which may be produced during the operation of the machine, but not to write on this P.L.C.
- o. The signal trips shall also be hardwired to DCS TDC 3000 HONEYWELL, signals only alarm could be connected via serial link
- p. In case of P.L.C. malfunction, one hardwired alarm shall be provided and shall not be transmitted via Modbus.
- q. The P.L.C. integrator (this means subcontracted company selected to make all activities involved in this P.L.C. design, software, hardware, construction and testing: FAT, SAT, etc.) selection shall be previously approved by purchaser. SUPPLIER can use his certified standard subsupplier for PLC programming and cabinet wiring.

6. Temperature, compressor speed, radial vibration, axial position and phase angle monitoring system.

- a. Signals coming from the temperature, compressor speed, radial vibration, axial position and phase angle transducers installed on the train shall be monitored on a Bently Nevada series 3500 monitoring system placed inside the main Local Control Panel, Item N° F3-C-1-LP-1, in agreement with [BILBOREC analogy submitted](#). Sensors shall be 3300 XL 8 mm series.
- b. Power supply unit(s) shall be suitable for 115 Vac 1Ph 50 Hz.
- c. Monitors shall be suitable for intrinsically safe EExi circuits with galvanic isolator interfaces.
- d. The system shall include a HMI, to receive and show all signals coming from the above indicated vibration, axial position, speed and temperature monitors, suitable for the area classification and mounted on the Local Control Panel front.
- e. Also, all required wiring, connectors, optic fiber conversers and any other necessary equipment for connecting the Bently Nevada Monitoring System to the Refinery Ethernet network, shall be optionally included into SUPPLIER scope of supply.

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- f. SUPPLIER standard design is acceptable for special holders proposed to allow adjustment and replacement of the eddy current probes during operation.

7. Anti-surge controller

- g. The compressor shall be protected against surge with SUPPLIER supplied controller.
- h. The Antisurge controller shall be CCC Series 5 Vanguard anti-surge controller -Duplex chassis-, with TrainTools workstation.
- i. The Antisurge controller shall be fully redundant, with redundant power sources and modules.
- j. Power supply unit(s) shall be suitable for 115 Vac, 1Ph, 50 Hz.
- k. The Anti-surge controller shall be installed in the main Local Control Panel, Item N° F3-C-1-LP-1.
- l. The Anti-surge controller shall include a Modbus RTU port for connection with the refinery DCS.
- m. The TrainTools server shall be installed in the P.L.C. Panel.
- n. Anti-surge and speed control (what it means that CCC will have two controllers (anti-surge controller and performance controller) shall be done by "CCC Series 5 – Duplex Chassis".

8. Engineering and Specific Documentation

- a. SUPPLIER shall provide for purchaser's approval complete flow diagrams, logic diagrams, written process control philosophy, control description, interlock description and complete documentation to enable compressor control through the customer's D.C.S. system for the following areas:
 - 1). Process air (Including capacity and Antisurge control) system.
 - 2). Lube oil system.
 - 3). Motor winding temperature and bearing temperature, speed, radial vibration and axial position detection for all train.
 - 5). Any other item not specifically mentioned on this paragraph, but belonging to the package.

Even though the Antisurge and performance control shall be implemented in the CCC system and not in DCS, the documentation to be supplied does not change.

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- b. Instrumentation numbering for instruments shown on these documents shall be in accordance with series of numbers given by Purchaser. Due to this, Purchaser will give the instrument numbering system, within the comments to the first issue of SUPPLIER P&ID's.
- c. Purchaser's Number must, always accompany SUPPLIER's identification numbering, if used.
- d. All components in a same loop will bear the same Purchaser's number, although different letters will identify the service.
- e. All flow diagrams, which may be supplied by different Subsuppliers, although pertaining to different areas of the package, should keep the same shape, and uniformity in the execution of them will be kept to a maximum extent. SUPPLIER shall coordinate with their Subsuppliers accordingly to meet this requirement.
- g. Additionally to the P&ID's mentioned in previous paragraph, SUPPLIER shall supply the following documents, which at least, represent, the basic information purchaser needs to develop his work. SUPPLIER shall provide any other document deemed to be necessary, or useful, according their experience:
 - 1). Instrument list where all instruments are listed, showing Purchaser's tag number, SUPPLIER and model, materials, process and electrical connections, ranges, set points, power supply, type of signal, etc.
 - 2). Installation hook-ups for approval.
 - 3). Junction box drawings, showing terminal number, Purchaser's tag of instrument connected to them on one side and connection size for the armoured multicore cable/cables to be connected and supplied by Purchase (only the multicores).
 - 4). Logic Diagrams
 - 5). Local Panel and P.L.C. Wiring Diagrams and field wiring diagram.
 - 6). Functional description: Including explanation of the shutdown system and actions to be taken by the P.L.C. and interlock description. (Software protocol for FAT)
 - 7). DCS communication: Document that shows the signals to be sent serial link to DCS (tags, services, address...).
 - 8). Test Protocol for Functional Test: Document to be used during the functional test, after loop check in site; it shall explain the basic

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interlocks or start up sequences that, in SUPPLIER's opinion, are enough to be sure that P.L.C. functionality is right and this will be tested before starting up the system.

- 9). Layouts: Showing the location of electrical instruments and junction boxes.
- 10). Local panel dimensional drawings.
- 11). Instrument datasheets.
- 12). Calculations: SUPPLIER shall give calculations for control valves, relief valves, orifice plates, restriction orifices, etc.
- 13). Process connection diagrams.
- 14). Pneumatic connection diagrams.
- 15). Instruction manuals.

All these documents, including those originated by his subsuppliers, will be revised as many times as needed, including the issue of an "As Built" revision, after site acceptance tests.

The lists shall be supplied also in Microsoft Excel file.

- h. All instruments that, although supplied by SUPPLIER, will be mounted or connected on Purchaser's piping (Loose Shipped Items) shall be very clearly shown on P&ID's and they will be shown in a separate list, as a minimum, with the following information:
 - 1). Tag number.
 - 2). Model and manufacturer.
 - 3). Process and electrical connections.
 - 4). Certified dimensional drawings.
 - 5). Immersion length for items to be introduced on pipe.
- i. Complete P.L.C. documentation (Lay out, wiring diagrams, etc.) shall be also provided and SUPPLIER must supply an "AS BUILT" revision of all these documents.

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I. Other Requirements

1. The plant conditions must be taking into account by SUPPLIER:

PLANT COOLING WATER		
	INLET	RETURN
Temperature ° F (°C)	83 (28,3)	120 (49)
Pressure psig (Kg/cm ² g)	72,5 (5,1)	30,5 (2,2)
Piping design pressure psig (Kg/cm ² g)	110 (7,7)	
Piping design temperature ° F (°C)	160 (71)	
Maximum outlet temperature ° F (°C)	120 (49)	
Heat exchangers design pressure psig (Kg/cm ² g)	100 (7,0)	
Heat exchangers design temperature ° F (°C)	= hot side	
Fouling factor hr.sqft. °F/BTU (hr. m ² . °C/Kcal)	0.003 (0.00061)	

PLANT INSTRUMENT AIR	
Battery limits conditions:	
Normal pressure psig (Kg/cm ² g)	100 (7,0)
Minimum pressure in equipment psig (Kg/cm ² g)	90 (6,3)
Temperature °F (°C)	100 (38)
Piping design pressure psig (Kg/cm ² g)	148 (10,4)
Piping design temperature °F (°C)	150 (66)
Dew point at dryer outlet pressure °F (°C)	-22 (-30)

2. Details of the compressor baseplate foundation bolts and proposed foundation arrangement shall be provided. Details of recommended epoxy grant layout are also required, as well as means provided in the baseplate for pouring the grant. Baseplate priming in contact with grouting shall be compatible with epoxy grout.

Following information must be supplied:

- Design details of compressor foundation bolts
- Grouting procedure. Design must be according an installation as per API 686. All the foundation must be filled with grouting.
- Base plate levelling.
- Arrangement of sole plates and sub-sole plates, if any.

Design provisions in API 686 shall be considered. The design and manufacturing tolerances shall allow meeting the API 686 requirements for baseplate levelling, grouting, shaft alignment, piping installation and flushing.

Alignment bolts and shims are required for the motor. Motor details about alignment bolts shall be indicated in the foundation plan.

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Alignment shims shall be in accordance with API RP 686, Chapter 7 and shall straddle hold down bolts and vertical jackscrews and shall be at least 5 mm larger on all sides than the equipment feet.

The gearbox shall be considered to be the fixed element. Shimming in gears is not permitted.

Requirements for the shims to be installed under the compressor and motor feet:

- The maximum allowable number of shims under any equipment support foot is five.
 - Shims shall be furnished by SUPPLIER. The compressor and the motor shall have a minimum of 3 mm of 300 series stainless steel shims under each support foot. The maximum shim stack height shall not exceed 12 mm. Only one 3 mm or thicker shim per mounting foot is allowed. The use of shims thinner than 0.05 mm is not permitted. Ground shims shall have a surface finish of 64 Ra, or better. Shims shall be finished flat to within 0.1 mm per dm of length. It is not acceptable to cut shims from rolled shim stock. Pre-cut shims from a commercial source acceptable to the user are required.
 - The stack-up of shims under the equipment support point used for alignment shall be measured. Individual shims shall be measured and totalled. The total stack thickness shall be recorded on the alignment data sheet. Measurement shall be recorded to the nearest 0.02 mm. The measurement will be in two or more locations to confirm the flatness requirement.
3. PURCHASER will use hydraulic jacks instead of levelling spindles (PURCHASER scope). Supplier shall indicate location and position for this system. Levelling spindle will be used by SUPPLIER for levelling and testing and will be delivered with the machine.
4. Requirements for Gear vibration monitoring:
- Add a note stating that one accelerometer be mounted horizontally on the output bearing housing and the other shall be mounted horizontally on the input bearing housing; both shall be mounted below the split line.
 - With regards to accelerometer readings and alarms, API 670 required a dual monitor. The accelerometers signal shall be divided into two separate paths in the monitor, and separate alarms required for both; so the representation in the P&ID shall include different tags for each band-pass filtered signal.
 - The first path is band-pass filtered and read out directly in peak acceleration units (g's or meters per second squared). This path observes the frequencies between 1000 Hz and 10 kHz. These frequencies are associated with gear mesh.
 - The second path is integrated to RMS velocity units (in millimeters per second). This signal is band-pass filtered to observe frequencies between 10 Hz and 1000 Hz. These frequencies are associated with the vibration of the rotating elements. It provides additional machine condition information to supplement a shaft vibration monitor.
 - A peak circuit detector shall be used in the monitor circuitry.

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5. Requirements for valves:
 - Ball valves shall not be used.
 - Needle valves are only acceptable for tubing.
 - Piping gate valves are required as root valves for all instruments (for instance, PI 56155 still shows a needle valve; please note a manifold is not valid as a root valve).
 - Gate valves in accordance with API 614 shall be used for isolation, equalizing lines, vents and drains (both on piping and for equipment).
 - Globe valves in accordance with API 614 shall be used for control valves bypass and relief valve bypass.
6. Level II stability analysis required if Log Dec is lower than 0.1 (as required by API 617)
7. This is required to make a real surge test at site (not just to check that the compressor is not in surge at the estimated surge line, but reducing the flow until the compressor goes into surge). SUPPLIER thermodynamics group generates a predicted surge line based on the test results –which is the basis for the CCC surge test at site-, but the final values programmed in the CCC will be the outcome from the site actual surge test.
8. Vents and air breathers necessity in the compressor skid shall be indicated. The oil system venting shall be preferably through the lube oil drain pipes. Blower & flame arrestor will be included in oil demister.
9. Levelling screws between foundation and baseplate will be supplied.
10. Interconnection details shall be submitted.
11. Plug and rings gauges are required for shaft ends and coupling bores. Tapered bores shall be checked by using the plug gauge from a hatched plug-and-ring gauge set provided by SUPPLIER. Witness inspection is required by purchaser.
20. Threaded piping connections are not acceptable in any service, regardless of the size. Threaded connections are acceptable only for differential pressure measurement. Connections to instruments must be done with tubing. Tubing is only acceptable for instruments, and only downstream of the root isolation valve, which shall be a flanged piping valve.
12. Full description of Special Tools shall be provided and shall include all tools & fixtures to replace at site the couplings, shaft seals, compressor rotor, bearings (all machines) and the Gear Unit gear set.
13. PMI is required for all alloyed materials.
14. M.O.C. of coupling diaphragms shall be confirmed, as well as type of coating applied (if not made of corrosion-resistant material).

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15. BN 3500 monitors will include motor winding temperatures. Gear Unit signals connected will be clearly indicated, vibration, temperature and overspeed protection signals are required. Specification of transmitters will be submitted. Emmerson transmitters will be used.
16. Annunciator is required in the Local Control Panel (LPC).
17. 2oo3 voting logic required for shutdown signals (except radial vibrations & axial displacement).
18. The Local control panel shall be mounted outdoors, in a safe area closed to the compressor (i.e. LOCAL CONTROL PANEL). The LCP shall be at the ground level, close to the compressor train. Therefore, a separate local Gauge board (with start/stop push buttons and lamps) will be not required, as everything will be installed in the LCP. Panel shall be positive pressured, although the lost of the same will not be the deenergization of the board but will generate an alarm. The pressurization system is only required for preservation of the internal components, not for hazardous area certification; hence, only an alarm is required in case of loss of pressurization.
19. Alarms announcer will be without intelligence; alarm management will be carried out by the PLC. As a proposal, interlock bypass associated to an alarm (monitored by PLC) can be installed.
20. Switches for interlock bypasses are required in the Local Control Panel. DCS will generate an alarm when a by-pass is activated.
21. Signals requiring SIL treatment could be managed through certified safety relays.
22. Detailed functional diagram for the control of anti-surge system according to ISA should be provided.
23. Spare parts interchangeability form for the complete scope of supply (not only for compressor) shall be provided. It shall be marked which elements are included as start-up spares and two years spares.
24. A separate contract for site supervision is not required. It will be part of compressor P.O. (at daily rates. Travel and accommodation cost by SUPPLIER). Shall be specified the number of people and duration for compressor, Gear Unit, CCC and Bently Nevada (separately).
25. Data sheets must be fulfilled by SUPPLIER with the maximum possible data at this stage. Data sheets and curves shall include Polytropic Head units in (N-m/kg). Curves are required with suction mass flow and not normal operating condition mass flow.

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26. Weights and dimensions as complete as possible for all the equipment will be supplied.
27. DCS only will send the control variable to CCC (signal 4-20mA), for CCC to control [IGVs position](#). Vibrations and Temperatures in Bently Nevada 3500.
28. [SUPPLIER shall supply an atmospheric rundown tank.](#)
29. Horizontal screw pumps are required for the lube oil console. They shall have end-suction and top discharge to improve the layout and provide optimum access for maintenance.
- [Oil return lines for Motor, Gear Unit and Compressor will be connected to a common manifold.](#)
30. A single battery limit is required for cooling water supply and return lines; SUPPLIER to include the CW piping manifolds in his scope of supply to serve the lube oil coolers.
31. Vents, drains and piping shall be furnished with valves to permit draining, cleaning, purging and refilling pressurizing of idle components, such as filter elements, while the equipment is in operation. All vent and drain connections shall be supplied with flanged valves.
32. The arrangement of the console shall provide adequate clearance areas and safe access for operation and maintenance. Maintenance considerations include access areas sufficient for filter element replacement, cooler bundle and heater element removal, control valve and instrument calibration and repair without removal or dismantling of adjacent equipment, piping or structure.
33. Requirements for oil:
- Socket weld connections shall not be used.
 - Welded connections shall be designed to eliminate pockets where debris can accumulate. Note that weld-o-let's on piping and vessels can create a pocket due to the size of the through hole.
34. On API data sheets following items shall be taken into account:
- ✓ Location and site data shall take into account that installation is outdoors.
 - ✓ Lateral analysis additional requirements, per API 617 shall be met. Data required by API 617 is also required to perform an independent rotordynamic audit.
 - ✓ Train torsional analysis per API 617 is required. The torsional analysis shall include the complete train, including the Gear Unit.
 - ✓ A list of undesirable speeds, per API 617 Ch. 1 – 2.6.1.4. shall be provided.

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- ✓ A stability analysis, per API 617 Ch. 1 – 2.6.5. shall be performed.
- ✓ Corrosion allowance shall be 3 mm.
- ✓ System relief set point will be submitted to SUPPLIER.
- ✓ ASTM material for compressor items listed in the data sheet shall be advised.
- ✓ Shaft ends shall be tapered (keyless).
- ✓ The balance piston shall not be integral with the shaft.
- ✓ In case that shaft sleeves were not needed due to design, it must be clarified and cross sectional drawing shall be submitted to contrast and validate this clarification.
- ✓ At-speed balancing is required.
- ✓ Residual balance check is required.
- ✓ J-strips are not the preferred option for interstage and balance piston labyrinths. An alternate design shall be proposed. Replaceable stationary parts of an abradable material are required at the labyrinth locations.
- ✓ The actual unit load and maximum allowable unit load for each bearing shall be advised.
- ✓ Thrust bearing shall be made by KINGSBURY.
- ✓ Flooded lubricated bearings shall be supplied (not directed lubricated).
- ✓ API 670 data sheets for the compressor monitoring system must be supplied. SUPPLIER will provide data sheets for all instruments during detailed engineering in ISA delivered format.
- ✓ Individual stage drains are required, valved, flanged and manifolded. If this is not the case, SUPPLIER must submit a written compromise indicating that if compressor start up with liquid inside (because of the casing draining cannot be completed) this will not occur any damage or break down and it will not affect to service life of any component.
- ✓ API 670 data sheets required for both low speed and high speed couplings.
- ✓ Fully enclosed coupling guards are required. There must not be any oil leakage in shafts. Oil tight coupling guards made of brass required on both couplings, according to API 671.

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- ✓ Plug and ring gauges are required. Contact requirements shall be checked by bluing the job coupling hubs and assembly those onto the shaft at the shop.
 - ✓ Levelling pads or targets required on baseplate for optical alignment.
 - ✓ All required tests shall be witnessed by PETRONOR.
 - ✓ The mechanical run test shall be made with contract probes (calibrated) and idling adaptors. Lube oil pressures and temperatures shall be varied during the MRT.
 - ✓ Vibration data requirements - Polar form, Tape record (per API 617).
 - ✓ Hydraulic coupling inspection required, per API 617.
 - ✓ Inspector's check list compliance required.
 - ✓ Draft manual shall be sent for review per API 617 Ch. 1 – 5.3.5.1.2. First the index of the IOM manual will be sent for review. Upon approval the manual shall be sent in PDF for review, and hardcopies only will be printed after approval of the PDF version.
 - ✓ Technical data manual is required, per API 617 Ch. 1 – 5.3.5.
 - ✓ Compressor shall be suitable for field run-in on air.
35. Cross sectional drawings with the associated part lists shall be submitted.
36. SUPPLIER shall advise about compressor overload flow limit, and shall confirm that the compressor in the test stand shall be run at the maximum allowable flow, until the choke condition is achieved.
- SUPPLIER must confirm that the compressor is suitable for continuous operation at the choke flow determined in the test stand.
- SUPPLIER shall submit the criteria that will be used to determine when the choke flow has been reached. In the teststand the limit of the predicted performance curve will be validated. This as well will be defined as the choke flow limit.
37. Pressure transmitters shall be furnished in the downstream end of the balance line and the balancing chamber, and curves of balance piston line differential pressure versus thrust load shall be supplied.
- SUPPLIER shall provide curves showing thrust over volume flow.
38. Unless specific deviations agreed, the requirements of API 614 5th edition apply for piping, instrumentation and control systems, and the requirements of API 670 4th edition to the protective and monitoring systems. HOKE or SWAGELOK compression fittings shall be used.

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39. Rotordynamic analysis requirements:
- Lateral analysis additional requirements as per API 617, 1-2,6,2,14 are applicable. All the required information for the rotordynamic analysis shall be provided by SUPPLIER; however, bearing manufacturing drawings shall not be supplied.
 - List of undesirable speeds is required. Critical speeds from lateral and torsional analysis will be provided with report during detailed engineering.
 - The rotordynamic analysis shall be submitted in English language;
 - Potential issues with the undamped analysis:
 - Mode shape plots shall be included (relative amplitude vs. axial position on the rotor).
 - SUPPLIER shall state the support stiffness values used in the damped unbalanced response analysis (both bearing support stiffness and bearing oil film stiffness).
40. NDE on welded impeller and NDE (PT) after [mechanical](#) test.
41. Type of split for diaphragm will be horizontal type.
42. During detailed engineering SUPPLIER shall advice the shaft diameter at the different locations (at impeller, at centre, at shaft seals, at journal bearings and at coupling).
43. SUPPLIER shall state the balance line flow with normal and 2xrunning clearances. This information shall be provided in the form a curve showing rate vs. thrust force.
44. [API 671](#) data sheets required for both low speed and high speed coupling.
45. Levelling pads or targets required on baseplate for optical alignment.
46. The mechanical run test shall be made with contract probes (calibrated) and idling adaptors. Lube oil pressures and temperatures shall be varied during the MRT.
47. Vibration data requirements-Polar form, tape recorded (per API 617)
48. SUPPLIER will provide the mechanical properties and chemical composition of all the materials proposed, and their supply form (cast, plate, forging, bar, sheet, etc.). Any material that is not weld repairable will be highlighted.
49. Lube oil coolers data sheets shall be provided. Fouling factor shall be at least $0.00061 \text{ h m}^2 \text{ }^\circ\text{C/kcal}$ and water velocity limits shall comply with API requirements.
50. [For blow off valve, the following vendors are accepted by PURCHASER:](#)

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- METSO (NELES)
- SAMSON (LEUSCH)
- EMERSON
- MASONEILAN (GE)
- CCI

The same suppliers apply for self regulated valves.

51. The only acceptable SUPPLIERS for ON/OFF valves are:

- Neles
- Samson
- Emerson
- Masoneilan

52. The only acceptable SUPPLIERS for CONTROL VALVES are:

- AMOT (only thermostatic TCVs)
- Samson
- Emerson
- Masoneilan

53. The only acceptable SUPPLIERS for SAFETY VALVES are:

- Anderson, Greenwood & Crosby
- Consolidated
- Lesser
- Nacional

54. The only acceptable SUPPLIERS for TUBING, COMPRESSION FITTING and SUPPLIERIFOLDS are:

- Swagelok
- Hoke
- Gyrolock

Only one SUPPLIER shall be used for the complete scope of supply.

55. EMERSON is acceptable for level transmitters, but only the guided-radar type is acceptable.

56. All the speed probes, keyphazors, proximity probes and vibration probes shall be supplied by BENTLY NEVADA.

57. Disc couplings for oil pumps shall be supplied by JOHN CRANE or BIBBY TURBOFLEX.

58. John Crane (ex-Sartorius) thrust bearings are accepted.

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59. The acceptable SUPPLIERS for OIL CONSOLES are:

- NORTEK (Spain)
- OILTECHNIK (France)
- BARIC SYSTEMS (England)

Only Oeltechnik is on SUPPLIER sub-vendor list; due to the lengthy qualification process REPSOL agreed to consider [and visit one not homologated vendor from SUPPLIER sub-vendor list](#). However, an order to any of these not homologated vendors would require prior qualification by REPSOL.

60. The acceptable SUPPLIERS for OIL PUMPS are:

- ALLWEILLER AG
- LEISTRITZ
- SEIM Srl

61. The bearing RTD's [can](#) be supplied by MINCO. Emerson is also acceptable.

62. The level indicators shall be of the magnetic type.

63. The only acceptable SUPPLIERS for differential pressure transmitters are:

- EMERSON
- YOKOGAWA

64. SUPPLIER shall submit a single document to summarize tools scope.

65. The scope of supply includes the anchor bolts, nuts, washers, base plates and sleeves shown on Anchor sleeve drawing.

66. PURCHASER [could](#) use ALPHATEC or CHOCKFAST epoxy grout; SUPPLIER will confirm if grouting is required only on the perimeter of the baseplate, underneath all the steel structural members or if the complete baseplate shall be filled with grout.

However, SUPPLIER will have to design all the required pour and vent points to be able to apply the epoxy grout with all the equipment installed on the baseplate. PURCHASER preference would be to have a baseplate design that only requires epoxy grout on the perimeter.

If possible, PURCHASER preference is a baseplate without the upper plate that allow an easy grouting work. In this case, the complete baseframe will be filled with concrete to the upper baseframe level. A strip must be supplied all around the baseframe to create a diptray.

67. Installation shall be made in accordance with API 686; design and manufacturing tolerances shall comply with the requirements of API 686, particularly for baseplate levelling and pedestals flatness requirements.

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68. All the equipment, including instrumentation and junction boxes shall have a specific codification as per PETRONOR standards.

69. CE marking and declaration of conformity:

- CE marking required for the complete scope of supply
- Declaration of incorporation of components for the complete scope of supply required
- Hazards identification according to Safety of Machinery directive

70. The main Local Control Panel will not include a BENTLY NEVADA (BN) display unit to show all the vibration and temperature values, alarms and trips. This is not required, as the data will be displayed in the compressor HMI

71. The temperature and vibration values are transmitted to the PLC by ethernet link (alarms and trips are individually hardwired). All vibration and temperature values, alarms and trips are displayed on the HMI on the main Local Control Panel.

72. The only trips required are for the following

High-High signals:

- Compressor rotor axial displacement
- Gear Unit vibration, and
- Gear Unit displacement

Low-Low signals:

- Low-low pressure of lube oil system.

For the rest of signals no trips are required; SUPPLIER shall implement two levels of alarm; it is an operator decision to stop the unit under alarm conditions.

73. 2 tags are required for each duplex RTD; both signals shall be hardwired to the local junction box, although only one of them shall be wired from the local junction box to the BN 3500 rack in the Local Control Panel.

74. To DCS only communicated grouped alarms will be send (grouped for type and for element; Motor bearing temperatures, Motor winding temperatures, Motor Vibrations...)

75. All the trips will be individually hardwired to DCS.

76. Rest of signals, only will be in LCP.

77. COMPRESSOR COMMON ALARMS AND TRIPS:

For annunciator and DCS common group alarms:

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- All H alarms (vibration and temperature) shall be grouped on the common alert alarm.
- All HH alarms (vibration and temperature) that do not cause automatic trip shall be grouped on the common danger alarm.
- All HH trips shall be grouped on the compressor common trip alarm on the annunciator (trips will be individually hardwired to DCS).

78. GEAR UNIT COMMON ALARMS AND TRIPS:

For annunciator and DCS common group alarms:

- All H alarms (vibration and temperature) shall be grouped on the common alert alarm.
- All HH alarms (vibration and temperature) that do not cause automatic trip shall be grouped on the common danger alarm.
- All HH trips shall be grouped on the compressor common trip alarm on the annunciator (trips will be individually hardwired to DCS).

79. MOTOR COMMON ALARMS AND TRIPS:

For annunciator and DCS common group alarms:

- All H alarms (vibration and temperature) shall be grouped on the common alert alarm.
- All HH alarms (vibration and temperature) that do not cause automatic trip shall be grouped on the common danger alarm.

80. Trip bypasses shall be included in the P&IDs

81. "Excessive surge" alarm required on the annunciator.

82. "Anti-surge and performance controller fault" alarm required on the annunciator.

83. All process variables involved in the anti-surge and performance controllers shall also be displayed in the DCS and the local CCC HMI

84. Remote set point HC on the DCS required for the performance controller.

85. The TI's at the oil return lines from each bearing housing shall be integrated into the bull's eye type sight glasses. Temperature indicators with termowells will be independent from sight glass.

86. LOCAL/REMOTE selector required for each pump and heater. Local Control Panel with start. The start/stop pushbuttons are also required, in addition to the specified selector (MAN/AUTO) in the LCP.

87. Selector required to define which pump is the main oil pump (as defined by the logic in the PLC). Both pumps can be defined as main oil pump due to same design. We do not need a selector for the operator to decide which one is the main; the logic shall use the pump running confirmation to determine which one is the main pump, and start-up the other in the event of low lube oil pressure.

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88. Three (3) oil sample connections (with valves and quick release connections) are required: in the tank close to the pump suction, upstream the oil filters and at the console (delivery flange).
89. A PIT signal at each pump shall be used at discharge for the PUMP RUNNING confirmation.
90. Sight glasses required on the cooling water return lines. They shall have a rotary element inside to show flow.
91. One PI required at each oil pump suction, downstream of the oil strainer.
92. A TI shall be included upstream the lube oil coolers.
93. By design oil pressure shall be higher than cooling water pressure.
94. A PI shall be included at the lube oil console delivery.
95. A permissive to start the compressor train is required based on the oil temperature at delivery.
96. A TIT in the lube oil reservoir shall be located close to the pump suction; this temperature signal shall be used to control the electric heaters.
97. The heaters shall incorporate a TAAH (over-heating cut out), with manual reset.
98. All oil return flow streams shall be hydraulically located as far away from the pump suction connections as possible.
99. All atmospheric oil return connections (including fill connections) shall be located above the maximum operating level and shall transport oil (via open-top stilling tubes or degassing trays) as shown in Figure B.24 of API 614. Stilling tubes shall have bottom baffles.
100. Pressurized oil shall not be returned to vented stilling tubes or degassing trays. Internal piping shall have bottom baffles.

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VI. MINIMUM INSPECTION REQUIREMENTS

Apart from this chapter requirements, after order and once received the Inspection and Test Plan, PURCHASER will agree with SUPPLIER the Observed, Witnessed/Hold points for the project test.

The following will be the minimum inspection requirements, besides of those included in the relevant data sheets:

A. Compressor, Item N° F3-C-1

1. For the general testing requirements, refer to the relevant section of the attached data sheet Appendix "F3C1-5-00-50".
2. Material Check:

For all internals the inspector shall approve the hardness reading certifications.
3. Casing Inspection:

All hydrotests shall be witnessed by customer representatives and any leaks shall be recorded and repaired by suitable methods, which shall be previously approved by the customer.
4. Impeller Inspection:
 - a. Depending on the impeller construction method, the customer will require a series of quality tests which shall be defined on SUPPLIER's approved inspection and testing plan.
 - b. Prior to the Overspeed test of each impeller the inspector shall perform a visual and dimensional inspection, liquid penetrant test or magnetic particle examination.
 - c. The Overspeed testing of all installed and spare impellers shall be witnessed by customer. After Overspeed testing, the impellers shall be again visually examined by customer and dimensional checked on main parts against drawing dimensions. Acceptance criteria shall be according to the approved SUPPLIER's quality plan.
 - d. Where repair is necessary in any impeller, the repaired area, by the approved NDT method, shall be re-examined by the customer's inspector and Overspeed tested again.

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5. Blades inspection:

- a. PMI
- b. Ultrasonic examination
- c. Surface crack test
- d. Weighing of each rotor blade and the circumferential distribution on each stage
- e. Tests on the coated blades

5. Rotor Fabrication Inspection:

For Main rotor Performance test, as per ASME PTC-10 [type 1](#) will be required.

- a. Ultrasonic testing of the shaft forging is required and will be witnessed by customer.
- b. Critical shaft dimensions shall be checked by customer's inspector prior to impeller assembly.

6. Diaphragm Inspection:

Diaphragm shall be visually checked by customer's inspector for casting failures before their assembly into the case.

7. Baseplate Fabrication Inspection:

The inspector shall check the general workmanship.

- 8. [SUPLIER](#) shall carry out a Level II stability analysis if Log Dec is lower than 0.1 (as required by API 617). No deviation to this paragraph of API 617 accepted.
- 9. [SUPPLIER](#) shall make a real surge test at site (not just to check that the compressor is not in surge at the estimated surge line, but reducing the flow until the compressor goes into surge). Their thermodynamics group generates a predicted surge line based on the test results –which is the basis for the CCC surge test at site-, but the final values programmed in the CCC will be the outcome from the site actual surge test.

B. Main Motor Driver, Item N° F3-C-1-EMC-1

For the general testing requirements, refer to the relevant section of the attached data sheet, Appendix "F3C1-5-00-51". [ITP will be identical to BILBOREC motor ITP.](#)

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C. Gear Unit, Item N° F3-C-1-GBC-1

1. General

For the general testing requirements, refer to the relevant section of the attached data sheet, Appendix "F3C1-5-00-52".

2. Gearing

Compressor mechanical and performance test will be carried out with the project gear unit.

The inspector shall approve SUPPLIER welding procedures and welder qualifications for fabricated gears. The procedure and/or drawings shall include the non destructive testing, as required to ensure the welding quality. All non destructive testing shall be witnessed.

Immediately before or immediately after the gear running tests, the inspector shall check the gear tooth contact, back lash and dimensions of gear rotor teeth.

D. Instrumentation and Local Control Panel

1. Factory Acceptance Tests (F.A.T.)

- a. Factory acceptance tests shall be performed after SUPPLIER has performed his internal testing. These tests will require that the contractual documents be complete, including, but not being limited to:
 - 1). Hardware testing procedures (Approved before the F.A.T. performing).
 - 2). System layout.
 - 3). Hardware drawings.
 - 4). Panel layout and in/out addresses.
 - 5). Cause-Effect diagrams.
 - 6). Interlock logic diagrams.
 - 7). Configuration and programming documents.
 - 8). SUPPLIER-to-machine interface documents.
- b. Before the F.A.T. start, the panel will be installed, electrically fed and connected, in a suitably sized area.

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- c. During the F.A.T. the following visual checks will be performed:
 - 1). Agreement with the system quantities and qualities.
 - 2). Equipment and component proper installation.
 - 3). Processor rack installation.
 - 4). In/out rack installation.
 - 5). Installation of In/out modules and isolators.
 - 6). Proper identification and tagging of all the equipment and components.
 - 7). Proper installation, in agreement with the specification for auxiliary components (pushbuttons, alarm annunciators, lamps, etc.).
- d. Once the visual inspection is successfully finished, the hardware testing will start, mainly consisting in:
 - 1). Electric feed test.
 - 2). Electric feed system redundancy test.
 - 3). System general tests by means of the system diagnostic routines.
 - 4). Main equipment (Consoles, power supply units, processors, In/out cards, communication busses, etc.) failure simulation and system diagnostics response verification.
 - 5). In/out simulation (From the panel inlet terminal marshalling), checking the response (at screen or at field element). These tests shall be performed for 100 % signals.
- e. Once the hardware inspection is satisfactorily finished, the software tests will start, mainly consisting in:
 - 1). Data base Check.
 - 2). Logic check.
 - 3). SUPPLIER to machine interface check (Graphics, groups, reports, etc.) if required.
- f. Software tests will be performed on 100 % points, graphics, etc. The activities to perform for this check will include, as a minimum:

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- 1). Check of the logic correct implementation by means of in/out simulation. A pushbutton/lamps box (to be supplied by SUPPLIER) and signal generators for transmitters shall be used.
- 2). SUPPLIER supplied configuration PC shall be used to follow the logic performance, check of shutdowns and alarm generation.
- 3). Check the correct data base implementation (Engineering units, measurement ranges, services, alarm and shut down points, etc.

2. Integrated Test

This test shall be coordinated between Compressor SUPPLIER and DCS SUPPLIER (Honeywell).

Scope of supply of this test is to demonstrate the right functionality of hardware, protocols and software for the communication between the local P.L.C. (supplied by compressor SUPPLIER) and the DCS (supplied by Honeywell). This test will be done using a test procedure agreed between SUPPLIER and Honeywell, and it will be realized during software test on Honeywell's FAT.

Participation on integration Test between Compressor SUPPLIER and DCS SUPPLIER will be done per diem rates plus travel and accommodation costs.

In addition, before start up, the "Pre start-up Safety Review (PSSR)" that corresponds to a special safety revision shall be done and shall be including the following activities:

- 1). Verify the correct installation and testing of the SIL according with the safety specifications.
- 2). Verify that all HAZOP actions have been implemented and resolved.

3. Site Acceptance Tests (S.A.T.)

The system will be totally tested after the installation of the panel at field and, before starting the commissioning activities. The activities to be performed will be the following:

- a. Before the system energizing and, before connecting the in /out modules to the field wires, continuity, insulation and non wished voltage (Improper connection at field instrument) will be checked.
- b. Also, before system energizing, the electric feed system and the grounding system shall be checked with SUPPLIER supervision.
- c. After the system energizing the network functionality with its final configuration and with all its modules shall be checked with SUPPLIER supervision.

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- d. After these activities, the loops functional tests, in which the instrument alignment and the software functional check, including the loop initial and final elements, will be performed

S.A.T. and all other site activities will be provided per diem rates.

E. Auxiliary Equipment

[IPT for auxiliary equipment will follow BILBOREC analogy.](#)

For the general testing requirements of other various auxiliary equipment pieces, refer to the relevant section of the attached Appendices:

- Appendix "F3C1-5-00-53" For the complete lube oil system.

F. Pre-inspection, inspection and expediting visits

After the order, the main equipment PIM (Pre-inspection meeting) will be carried out in SUPPLIER's installations and main subsupplier's installations.

After PIM, expediting visits will be carried out periodically in SUPPLIERS and main subsupplier's installations.

During these expediting visits:

- SUPPLIER will show to the purchaser inspector all the material received and the related certificates. Certificates shall comply with RFP and with PURCHASER specifications requirements, and shall match the rest of supplier documentation (data sheets, drawings, lists, etc.).
- SUPPLIER will submit a schedule updated to visit day, including also subsuppliers schedule.
- SUPPLIER will dispose all the project documentation updated to visit day.

The activation visit dates will be confirmed at least two weeks before the visit day. Visit dates will be agreed between SUPPLIER and purchaser, but in case SUPPLIER does not agree with any of dates proposed, the inspection will be carried out anyway and SUPPLIER will have to receive the purchaser visit on purchaser proposed dates.

During the construction of main equipment, the manufacturer shall allow access of inspection personnel to its workshops in order to verify the status of work in progress. The inspection does not relieve the manufacturer of his guarantee and responsibility to supply satisfactory equipment that must comply with the requirements in this specification.

For test inspections, supplier will send an official notification, at least ten working days in advance. The notification shall include all the information required to attend the test, as related point of ITP, exact date and hour for every test, location and supplier contact person for this test.

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Procedure for every test shall be submitted for approval as soon as possible after order, and minimum two months before the test. Procedures and all the information necessary for test or inspection (drawings, data sheets,...) must be approved by PURCHASER before the test date.

Test procedures will be dedicated for this project. Standard procedures that will not match completely with this project will not be approved by PURCHASER.

PURCHASER requires meetings in SUPPLIER or subsuppliers installations always that it will be considered necessary considering that schedule in documentation or production will suppose a delay in the project.

Resident inspector at SUPPLIER installations will be required by PURCHASER in case of major problems with the project and only during the assembly stage.

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VII. APPLICABLE LEGISLATION, OFFICIAL STANDARDS AND ATTACHED DOCUMENTS

A. Request for **purchasing** (P-N1783-CEC0-K0-0001-A-O) Data Sheets

Appendix "F3C1-5-00-50"	Rev. 1	Data Sheets for Air blower. Item N°: F3-C-1.
Appendix "F3C1-5-00-51"	Rev. 1	Data Sheets for Main Electric Motor. Item N°: F3-C-1-EMC-1.
Appendix "F3C1-5-00-52"	Rev. 1	Data Sheet for Gear Unit. Item N°: F3-C-1-GBC-1.
Appendix "F3C1-5-00-53"	Rev. 1	Data Sheets for Lube Oil System.

SUPPLIER will send these data sheets complimented taking into account these RFP requirements.

SUPPLIER will send to purchaser all the additional data sheets necessary to complete the equipment information fulfilled in PURCHASER format.

B. Spanish Legislation

1.	Real Decreto	1644/2008	de 10 de Octubre, por el que se dictan las disposiciones de aplicación de la directiva del consejo 2006/42/CE, relativa a la aproximación de las legislaciones de los estados miembros sobre maquinas. BOE núm. 246 de 11 de Octubre de 2008.
2.	Real Decreto	444/1994	por el que se establece los procedimientos de evaluación de la conformidad y los requisitos de protección relativos a compatibilidad electromagnética de los equipos, sistemas e instalaciones. Modificada por R.D. 1950/1995 y por Orden de 26/03/1996
3.	Real Decreto	400/1996	por el que se dicta las disposiciones de aplicación de la Directiva del Parlamento Europeo y del Consejo 94/9/CE, relativa a los aparatos y sistemas de protección para uso en atmósferas potencialmente explosivas. BOE 85 de 08 de abril de 1996 (Directive 1994/9/CE).

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4.	Real Decreto	1215/1997	por el que se establecen las disposiciones mínimas de seguridad y salud para la utilización por los trabajadores de los equipos de trabajo. BOE núm. 188 de 7 de agosto
5.	Real Decreto	2060/2008	Reglamento de equipos a presión y sus ITC's. BOE núm. 31 del 5 de febrero de 2009.
6.	Real Decreto	212/2002	por el que se regulan las emisiones sonoras en el entorno debidas a determinadas máquinas de uso al aire libre
7.	Real Decreto	842/2002	por el que se aprueba el Reglamento electrotécnico para baja tensión. BOE núm. 224 del miércoles 18 de septiembre.

C. European Directives

All equipment shall comply with the relevant EC Directives. Namely:

4.	2006/42/CE	Relativa a la aproximación de legislaciones de los Estados miembros sobre máquinas (MÁQUINAS) (MACHINERY). → Transpuesto por Real Decreto 1644/2008 ,
5.	97/23/CE	relativa a la aproximación de las legislaciones de los Estados miembros sobre equipos a presión (EQUIPOS A PRESIÓN) (PRESSURE EQUIPMENT) → Real Decreto 769/1999 .
6.	94/9/CE	On equipment and protective systems intended for use in potentially explosive atmospheres (ATEX 100).
7.	2000/14/CE	Noisy emission for outdoor equipment.
8.	2006/95/CE	Low voltage directive.
9.	2004/108/CE	Electromagnetic compatibility.

D. API Standards

API-613,	5 th Ed.	Special purpose gear units for Petroleum, Chemical and Gas Industry Services.
API-614,	5 th Ed.	Lubrication, Shaft Sealing and Control Oil Systems for Petroleum, Chemical and Gas Industry Services.

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API-617, 7th Ed. Axial and Centrifugal Compressors and Expander-compressors for Petroleum, Chemical and Gas Industry Services.

API-670, 4rd Ed. Machinery Protection Systems.

API-671, 4rd Ed. Special purpose couplings for Refinery Service.

E. Other Official Standards

IEC-61508:2005 Functional safety of electrical/electronic/programmable electronic safety-related systems.

ASME PTC-10:1997 Performance Test Code on Compressors and Exhausters

F. REPSOL Specifications

ED-A-01.02-I Rev. 03a Equipment noise control.

ED-B-01.00-I Rev. 02 Packing, marking and shipping of equipment and materials.

ED-B-02.00-I Rev. 02a Quality assurance and control for static and dynamic equipment.

ED-B-05.00-I Rev. 02 General welding requirements.

ED-I-02.00-I Rev. 02a Emergency shutdown systems (General).

ED-I-02.01-I Rev. 02a Emergency shutdown (ESD) systems using general purpose PLC.

ED-J-06.00-I Rev. 02a Control valves (General).

ED-J-09.00-I Rev. 02 Local field panels

ED-J-11.00-I Rev. 02 Interface with electric equipment

ED-J-12.00-I Rev. 02 Instrumentation for mechanical equipment

ED-J-13.00-I Rev. 02 Instruments electrical connection

ED-J-13.02-I Rev. 02 Junction boxes

ED-J-14.00-I Rev. 02 Installation of instruments in classified areas

ED-J-17.00-I Rev. 02 Instrument installation (general part)

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ED-J-18.00-I	Rev. 02a	Pressure relief valves and rupture disks.
ED-K-02.01-I	Rev. 02	Centrifugal process compressors.
ED-K-04.00-I	Rev. 02	Lubrication, shaft sealing and control-oil systems and auxiliaries.
ED-P-02.00-I	Rev. 04	Low voltage electric induction motors.
ED-P-02.01-I	Rev. 03b	High voltage electric induction motors.

SUPPLIER shall confirm his full acceptance of the above PURCHASER specifications. Any exception shall be clearly stated by SUPPLIER.

G. P&I Flow Diagrams

[Existing](#) compressor P&ID: [F3-2-50-02 Rev. P](#)

H. Other Documents

Alarms and Shutdowns Sequences

Summary of Wiring Installation

If any of these referenced specifications has not been submitted by ENGINEERING COMPANY/PURCHASER, supplier must request it.

I. Vendor Comments and Exceptions to Specifications

See attached documents:

- ✓ [CE answers 24-06-2015_Meeting 04-08-2015](#)
- ✓ [C&E_Bilbao_FCC_2014_MASTER_MAB_rev.02.pdf](#)

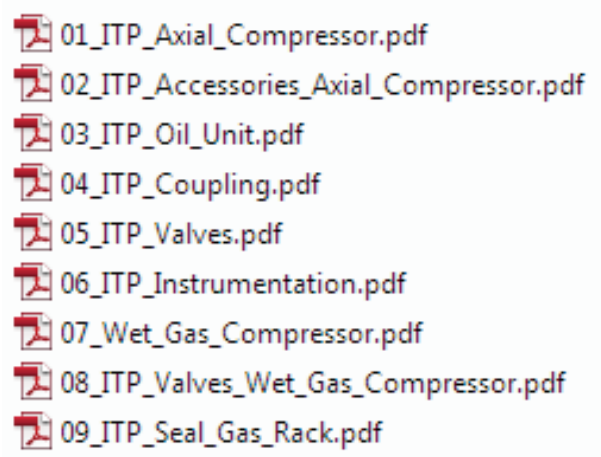
J. Agreements between SUPPLIER and PURCHASER.

Following documents show the different agreements reached between vendor and purchaser during pre-award meetings, kick off meetings and Pre-inspection meetings. In the event of any discrepancy or conflict between these documents and any item from this requisition, these documents shall prevail.

- [Pre-award MOM \(20th and 21st of May 2015 and 10th and 11st of June 2015\)](#) with attachments:
 - [“C&E answers”](#)
 - [“Clarification file_meeting F3-C-1 MAN D&T 10-11-junio 2015”](#)
 - [“Clarification file_meeting F3-C-2 MAN D&T 10-11-junio 2015”](#)

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- “C&E_Bilbao_FCC_2014_MASTER”
- “Documentation_Comments”
- “Q154 793_N7”
- Kick off MOM (24th and 25th of June 2015 “C&E answers 24-06-2015”) with attachment (“Bilboax_Inspection_Client_comments”)
- Kick off MOM (04th of August 2015):
 - “MOM 4-5 August 2015_Commented by Repsol Rotating Machinery”
 - “CE answers 24-06-2015_Meeting 04-08-2015”
 - “Bilboax_Inspection_Client_comments_REPSOL COMMENTS”
- Pre-inspection meeting MOM (09th and 10th of September 2015)
 - “MOM PIM FCC”
 - ITPs with comments:



K. Vendor data sheets and operating maps

Following documents annexed to this Request For Purchasing have been submitted by Vendor:

- ✓ Compressor_DataSheet_API617
- ✓ Compressor operating map
- ✓ Gear data sheet
- ✓ Motor data sheet

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VIII. SCHEDULE OF DOCUMENTS AND DATA REQUESTED

The documents and data request into this requisition will be sent by SUPPLIER to the engineering at different steps of supply and be included inside of this chapter.

SUPPLIER can not to define any exception to submit data and documents mandatory by laws, directives, specifications and standards Spanish or International regulations applicable to product and order.

If SUPPLIER and the manufacturer are different societies, documents submit by SUPPLIER to the engineering must have indicated the status being consider by SUPPLIER. Status may be exhibit by stamped or specific form (letter, fax, e-mail). PURCHASER does not review any document without previous status.

SUPPLIER perform one electronic file which will contain electronic edition (may be scanned) of all documents request to final dossier or data book. Other copy printed edition of all filled documents shall be submitted to the engineering for its review.

Delivery dates for documentation will be as per 4.7 of Technical Offer but taken into account the MOM agreements. Commercial agreements regarding delivery dates for documentation shall be respected.

A. After receiving the fax which contain notice of the order

DOCUMENT / DATA	REQUEST	NOTES
Inspection and test plan for all components. For mayor equipment (gear unit, motor, Lube oil system and LCP) dedicated ITPs referenced on main ITP will be submitted.	YES	According to supply
Manufacturing Programme	YES	According to supply
API Data Sheet for main components (oil unit, seal gas system, compressor and gear)	YES	According API standards. 20 weeks
General arrangement drawings for machine train, Oil unit (run down tank included), Silencers, Air intake filter and seal gas panel.	YES	Initial Issue Must contain weights and materials
P&ID for all components	YES	Through battery limits. 10 weeks
Predicted compressor performance curves	YES	Initial Issue
Foundation drawings	YES	Initial Issue Must contain dimensions and loads.
Welding Procedures	YES	WPS's and PQR's

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		30 days after placing order at sub-supplier
Report forms for tests and controls included into Inspection and test plan for all components	YES	Samples of forms will be submitted for information, but this is not part of the ITP
Electrical diagrams for main motor	YES	Initial Issue Consumption list 16 weeks.
Instrument list	YES	For all components

These documents will be submitted to the engineering for approval / comments.

B. During performance of supply

DOCUMENT / DATA	REQUEST	NOTES
Progress report of supply	YES	Monthly
Notifications for inspections and test	YES	According to applicable ITP At least ten working days in advance
Inspection procedures	YES	According to ITP. Procedures must be submitted at least two months before tests. Detailed procedures availability will be agreed during the PIM.
General outline drawings including dimensions weights and materials for main skid, air filter, oil unit, lube oil accumulator, oil run down tank, oil cooler, oil filter, silencers, check valve, anti-surge valves and seal panel.	YES	New issues submitted for approval
Foundation drawings including anchor bolts and levelling bolts details. Baseframe drawing also required to check grouting possibilities.	YES	Submitted for approval
P&ID for all components	YES	New issues submitted for approval
Line list including every line process conditions and class.	YES	Submitted for approval
Equipment list including every equipment data and class.	YES	Submitted for approval
Sectional drawings with part list	YES	Submitted for approval
Compressor performance curves	YES	As built edition
Other curves (speed/torque, operating maps....)	YES	Submitted for approval

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DOCUMENT / DATA	REQUEST	NOTES
API Data Sheet for main components (oil unit, seal gas system, compressor and gear)	YES	New issues submitted for approval and as built edition
Equipment data sheets (pumps, motors, heaters, filters, valves, instruments....) acc manufacturer standard	YES	Submitted for approval
Lateral and torsional vibration analysis reports	YES	Submitted for approval
Nozzle loads and movements	YES	Submitted for approval
Other calculations and special analysis	YES	Submitted for approval
Connection list	YES	Submitted for approval
Consumption list	YES	Submitted for approval
Thermal and mechanical calculations	YES	Submitted for approval
Electrical diagrams	YES	New issues submit for approval
Hook-up's	YES	Mechanical hook ups
Instruments Data sheet	YES	For all instruments to supply
Instrument list	YES	Submitted for approval
Alarm and trip list – included in signal list	YES	Submitted for approval. List must include it signal correspond to an alarm, a trip, or an interlock, and must reference to the P&ID in which is included.
Cabling list	YES	Submitted for approval. Information about the cabling that is going to be used is required. Not a specific document is required.
Wiring diagrams	YES	Submitted for approval
I/O list (wired and communicated signals)	YES	Submitted for approval
Local control panel layout and wiring diagram	YES	Submitted for approval
Junction boxes location	YES	Submitted for approval
Typical diagrams for electric consumers	YES	Submitted for approval

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DOCUMENT / DATA	REQUEST	NOTES
Safety system	YES	Cause-Effect Diagram Set point list shall be included in signal list. A table indicating common trips as indicated in P&IDs analogy will be required. Also for common alarms.
Functional description	YES	Submitted for approval
Reports of non Conformity	YES	When can to affect final quality
Installation, operation and maintenance Manuals	YES	For engineering review
Proporsal for changes and modifications about technical performances	YES	Submitted for approval
Proporsal for changes and modifications about materials	YES	Submitted for approval
Reports and certifies inspections and tests	YES	Not witnessed by Engineering representative: Non destructive testing Hardness tests. Part of Quality Data Book, scope acc. ITP Pressure tests Mechanical tests Others
Equipment and instrument calibration certificates	YES	Calibration certificates must be shown during inspections and also officially submitted if required by PURCHASER.
Other certificates (materials, electrical ...)	YES	Certificates must be shown during inspections and also officially submitted if required by PURCHASER.
Special Tools list	YES	
Spare parts	YES	For commissioning and Recommended for two years operation
Packing List	YES	Will contain detailed list of items, components, parts, elements and material for each package. Must be indicated dimensions and weight for each package

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DOCUMENT / DATA	REQUEST	NOTES
Special instructions	YES	In order to safe handling, lifting, preserve equipments, surfacing finish and other recommendations by SUPPLIER during store and preassembling parts

C. Final dossier or Data book

DOCUMENT / DATA	REQUEST	NOTES
Declaration of Conformity	YES	By manufacturer or SUPPLIER for all items request by ECC directives
Conformity Certificates	YES	For items, equipment and products request by ECC directives
Quality certificates	YES	For items, equipment and products not request by ECC directives. EN-10204 Class 3.1
Inspection and test plan for all components (ITP's)	YES	Last approved issue
General assembly drawings for Compressor, Gear Unit, Electrical motor, Lube system	YES	As-built issue With material list
P&IDs	YES	For full supply As-built issue
Nameplate copies	YES	According standard and ECC directives apply
Welding procedures	YES	Approved. SUPPLIER could not start any welding work without the approval of welding procedures by purchaser.
Welder performance qualifications	YES	All
Material certificates	YES	
Welding rods certificates	YES	
Non destructive testing reports / certificates	YES	
Heat treatment reports / certificates	YES	
Control and testing reports / certificates	YES	Originals

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Report forms	YES	Hardness tests , Dimensional control, Painting
Equipment and instrument calibration certificates	YES	
Records / certificates for special tests	YES	
Non Conformity reports	YES	All, issued by manufacturer, SUPPLIER, customer, notified body
Quality certificates for auxiliary equipment and instrument	YES	
Installation, operation and maintenance Manuals	YES	Approved issue
Spare parts list	YES	Last issue Capital spare parts, commissioning and start up spare parts and two years operation spare parts.

Apart from the documentation listed above, SUPPLIER will comply with all the applicable API chapters about “drawing and data requirements”.

The documents that are required in advance are those that have a connection with the rest of the plant. For example:

- Connection point list
- Utility consumption list
- Instrument list
- Dimensions and loads.
- Line data (pressure, temperature, flow,...)
- Anti-surge system requirements (in order to purchase the instruments, orifice plate...).

The document list generated by the supplier must include all the documents mentioned above, and also additional documentation required by purchaser during the project stage, considered necessary for inspection, installation, start up or maintenance. Reference for documentation will be BILBOREC documentation list.

SUPPLIER will submit every month the document list in excel file together with the monthly progress report.

Review cycle for documentation will be two weeks. However, if there is any mistake in the document it must be modified by Vendor even when review date will be delayed.

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All the project documentation shall be submitted by e-mail in pdf format. P&IDs and setting plans will be sent in dxf format. Process and I&C documentation, as lists and data sheets will be submitted in excel format as well.

FTP will be used instead of e-mail when necessary. Only the final documentation will be submitted as printed and electronic edition.

ENGINEERING COMPANY/PURCHASER will submit the available tags numbers for equipments, lines, instruments, junction boxes and piping accessories for SUPPLIER to include them in SUPPLIER project documentation (P&IDs, lists, etc.)

ENGINEERING COMPANY/PURCHASER will also submit the codification rules for lines for the same purpose.

Compressor Manuals shall be updated with the “as built” documentation, after the start-up in the event that any of the documents have changed. Operation Manuals will be edited in Spanish language.

ADI code (ADI-1783), purchasing code (P-N1783-CEC0-K0-0001-A-O) and compressor code (F3-C-1) will be included in formats for all the documents. All documents shall include this data. If not possible to include it in the document, it will be included in an additional cover sheet.

During project stage, monthly reports will be submitted the 20th of every month.

PROYECTO :	ADI-1783. NUEVOS COMPRESORES EN FCC PARA MEJORA DE LA EFICIENCIA ENERGETICA

TITULO DOCUMENTO :	2 LISTA DE EQUIPOS F3-C-1

1	25/02/2016	O.C.L.	M.A.R.	I.P.A	C.R.C	A.S.B			
0	23/11/2015	O.C.L.	M.A.R.	J.M.B.	C.R.C	P.C.L			
REV N°	FECHA	EDITA	VERIFI	REVIS	VALIDA	APROB			

N° DOCUMENTO :	F3-04-00-01
N° PROYECTO :	P-0016-2164-1668-14
FECHA :	25/02/2016
REVISION / EDICION :	1

PROYECTO :			LISTADO DE EQUIPOS F3-C-1 Y F3-C-2										PROYECTO Nº					DOCUMENTO :			
ADN-1783. NUEVOS COMPRESORES EN FCC PARA MEJORA DE LA EFICIENCIA ENERGÉTICA			P-0016-2164-1668-14										FECHA :					F3-04-00-01			
ADN-1783. NUEVOS COMPRESORES EN FCC PARA MEJORA DE LA EFICIENCIA ENERGÉTICA			P-0016-2164-1668-14										REVISION :					25/02/2016			
ADN-1783. NUEVOS COMPRESORES EN FCC PARA MEJORA DE LA EFICIENCIA ENERGÉTICA			P-0016-2164-1668-14										HOJA :					Rev. 1			
ADN-1783. NUEVOS COMPRESORES EN FCC PARA MEJORA DE LA EFICIENCIA ENERGÉTICA			P-0016-2164-1668-14										1 DE 1								
ITEM	TIPO DE EQUIPO, NUEVO/ SUBSTITUTO A DEMOLIR	DENOMINACION / SERVICIO	FLUIDOS OPERACIÓN		Nº P&ID	REGUBRICACION	PLANO GENERAL EQUIPO	OPERACIÓN		DEBIDO		VOLUM. M³	CATEG. PED	SUMINISTRADOR	CALORI FUGADO	IGNIFU GADO	PRECOS EN KG		NOTAS OBSERVACIONES		
			FLUIDOS	TIPO SPED				Temp.°C MAX-MIN	P (barg) MAX / MIN	Temp.°C MAX-MIN	P (bar) MAX / MIN						VACIO	OPERA CON		PRUEBA	
F3-C-1	NUEVO	SOP-LANTE	AIRE	1	F3-1-50-02	P-N17B3-C-CEO-K0-0001-A-O	10001950031_5001	203 / 155.2	3.078 / 2.735	--	--	--	--	MAN D&T	SI	N.A.	26.000	26.000	--	Adicionalmente la Bancada: 18.600Kg	
F3-C-1-GR-1	NUEVO	REDUCTORA	--	--	F3-1-50-02	P-N17B3-C-CEO-K0-0001-A-O	10001950031_5001	--	--	--	--	--	--	MAN D&T	N.A.	N.A.	10.000	10.000	--		
F3-C-1-LP-1	NUEVO	PANEL LOCAL DE INSTRUMENTACIÓN Y CONTROL	--	--	F3-1-50-53	P-N17B3-C-CEO-K0-0001-A-O	--	--	--	--	--	--	--	MAN D&T	N.A.	N.A.	--	--	--	Pendiente información suministrador	
F3-C-1-L-5-A	NUEVO	INTERRUPTOR "A" DE ACEITE DE LUBRICACIÓN	ACEITE LUBRICACION	2	F3-1-50-53	P-N17B3-C-CEO-K0-0001-A-O	10002664710	--	--	--	--	--	--	MAN D&T	N.A.	N.A.	--	--	--	Pendiente información suministrador	
F3-C-1-L-5-B	NUEVO	INTERRUPTOR "B" DE ACEITE DE LUBRICACIÓN	ACEITE LUBRICACION	2	F3-1-50-53	P-N17B3-C-CEO-K0-0001-A-O	10002664710	--	--	--	--	--	--	MAN D&T	N.A.	N.A.	--	--	--	Pendiente información suministrador	
F3-C-1-F-1-A	NUEVO	FILTRO "A" DE ACEITE	ACEITE LUBRICACION	2	F3-1-50-53	P-N17B3-C-CEO-K0-0001-A-O	10002664710	--	--	--	--	--	--	MAN D&T	N.A.	N.A.	--	--	--	Pendiente información suministrador	
F3-C-1-F-1-B	NUEVO	FILTRO "B" DE ACEITE	ACEITE LUBRICACION	2	F3-1-50-53	P-N17B3-C-CEO-K0-0001-A-O	10002664710	--	--	--	--	--	--	MAN D&T	N.A.	N.A.	--	--	--	Pendiente información suministrador	
F3-C-1-D-1	NUEVO	DEPOSITO DE ACEITE	ACEITE LUBRICACION	2	F3-1-50-53	P-N17B3-C-CEO-K0-0001-A-O	10002664710	60	ATM	1007/10	ATM	1.275	N/A	MAN D&T	N.A.	N.A.	420	1.705	--	Pendiente información suministrador	
F3-C-1-D-2	NUEVO	DEPOSITO LLEVADO DE ACEITE (RUN DOWN TANK)	ACEITE LUBRICACION	2	F3-1-50-53	P-N17B3-C-CEO-K0-0001-A-O	10002664711	45	ATM	--	--	--	--	MAN D&T	N.A.	N.A.	--	--	--	Pendiente información suministrador	
F3-C-1-D-4	NUEVO	DISPOSITO ACUMULADOR	ACEITE LUBRICACION	2	F3-1-50-53	P-N17B3-C-CEO-K0-0001-A-O	10002664710	60	--	--	--	--	--	MAN D&T	N.A.	N.A.	--	--	--	Pendiente información suministrador	
F3-C-1-P-1-A	NUEVO	BOMBA DE ACEITE "A"	ACEITE LUBRICACION	2	F3-1-50-53	P-N17B3-C-CEO-K0-0001-A-O	10002664710	--	--	--	--	--	--	MAN D&T	N.A.	N.A.	--	--	--	Pendiente información suministrador	
F3-C-1-P-1-B	NUEVO	BOMBA DE ACEITE "B"	ACEITE LUBRICACION	2	F3-1-50-53	P-N17B3-C-CEO-K0-0001-A-O	10002664710	--	--	--	--	--	--	MAN D&T	N.A.	N.A.	--	--	--	Pendiente información suministrador	
F3-C-1-P-3	NUEVO	JACKING OIL PUMP	ACEITE LUBRICACION	2	F3-1-50-53	SOLICITADO POR EL SUMINISTRADOR	10002664710	--	--	--	--	--	--	MAN D&T	N.A.	N.A.	--	--	--	Pendiente información suministrador	
FV-0444	NUEVO	VALVULA DE BLOW OFF	AIRE	1	F3-1-50-53	P-N17B3-C-CEO-K0-0002-A-O	10002076764	203 / 155.2	3.078 / 2.735	--	--	--	--	MAN D&T	N.A.	N.A.	6.850	6.850	--	ASILADA ACUSTICAMENTE	
NRV-122	NUEVO	VALVULA NO RETORNO DESCARGA	AIRE	1	F3-1-50-02	P-N17B3-C-CEO-K0-0001-A-O	--	203 / 155.2	3.078 / 2.735	--	--	--	--	MAN D&T	SI	N.A.	2.200	2.200	--	ASILADA ACUSTICAMENTE	
F3-C-1-E-2	NUEVO	FILTRO AIRE	AIRE	1	F3-1-50-02	P-N17B3-C-CEO-K0-0001-A-O	10002664510	33/0	-0.014	--	--	--	--	MAN D&T	N.A.	N.A.	12.500	12.500	--		
F3-C-1-SL-1	NUEVO	SIENDOSO CONDUCTO DE ASPIRACIÓN	AIRE	1	F3-1-50-02	P-N17B3-C-CEO-K0-0001-A-O	10002664510	33/0	-0.014	--	--	--	--	MAN D&T	N.A.	N.A.	--	--	--	Inicido en el Filtro de Aire	
F3-C-1-SL-2	NUEVO	SIENDOSO DE LA LINEA DE DESCARGA	AIRE	1	F3-1-50-02	P-N17B3-C-CEO-K0-0001-A-O	10001988643	207/203	3.078 / 2.735	220	5	--	--	MAN D&T	SI	N.A.	1.770	1.770	--	ASILADO ACUSTICAMENTE	
F3-C-1-SL-3	NUEVO	SIENDOSO DE LINEA DE BLOW OFF	AIRE	1	F3-1-50-02	P-N17B3-C-CEO-K0-0001-A-O	10001891536	205.1	1.04	250	4	--	--	MAN D&T	SI	N.A.	2.830	2.830	--	ASILADO ACUSTICAMENTE	

PROYECTO :

ADI-1783. NUEVOS COMPRESORES EN FCC PARA MEJORA DE LA EFICIENCIA ENERGETICA

TITULO DOCUMENTO :

3 LISTA DE EQUIPOS ELECTRICOS DEL PROYECTO

0	27/05/2016	M.A.P.	ICJ	M.A.R	C.R.C	A.S.B			
REV Nº	FECHA	EDITA	VERIFI	REVISA	VALIDA	APROB			

Nº DOCUMENTO :

LEE-N1783-05-0

Nº PROYECTO :

P-0016-2164-1668-14

FECHA :

27/05/2016

REVISION / EDICION :

0

[illegible]

PROYECTO :

ADI-1783. NUEVOS COMPRESORES EN FCC PARA MEJORA DE LA EFICIENCIA ENERGETICA

TITULO DOCUMENTO :

4 LISTA DE LINEAS F3-C-1

Nº DOCUMENTO : F3C1-04-00-02

Nº PROYECTO : P-0016-2164-1668-14

FECHA : 27/05/2016

REVISION / EDICION : 2

5. ESPECIFICACIONES DE TUBERIAS

CLASE: AT

SERVICIO	FLUIDOS DE PROCESO DE CORROSIÓN MEDIA					CORROSIÓN	3.0 mm.
SERIE ANSI	150 ≠ RF		MATERIAL DE TUBERÍAS		ACERO AL CARBONO CALMADO		
LIMITES DE	BRIDAS SIN AISLAR 19.6 Kg/cm² desde -29°C hasta 44°C; 5.41 Kg/cm² a 482°C						
SERVICIOS	BRIDAS AISLADAS 19.6 Kg/cm² desde -29°C hasta 38°C; 3.45 Kg/cm² a 482°C						
ÍTEMS	MEDIDAS EN PULGADAS		SERIE	EXTRE- MOS	GUARNI -CION	OTRAS DESCRIPCIONES	CODIGO NUMERO
	DE	HASTA					
VÁLVULAS DE COMPUERTA	½ 2	1½ 24	800≠ 150≠	SW FLGD	Nº 8 MONEL * Nº 1 MONEL *	BB, OS & Y, FCS, cuña sólida, s/API 602 BB, OS & Y, CCS, cuña sólida, s/API 600	V2819 V2820 V1001 V1014
VÁLVULAS DE ASIENTO	½ 2	1½ 6	800≠ 150≠	SW FLGD	Nº 8 Nº 1	BB, OS & Y, FCS, disco suelto, s/BS2995 BB, OS & Y, CCS, disco guiado, s/BS1873	V2921 V1179
VÁLVULAS DE RETENCIÓN	½ 2	1½ 24	800≠ 150≠	SW FLGD	Nº 1 Nº 1	BC, FCS, tipo bola/pistón (horizontal) s/BS 2995 BC, CCS, tipo clapeta simple, s/BS1868	V3006 V1287
ACCESO- RIOS	½ 1½ 2	1 --- 24	6000 3000 ---	SW SW BW	ASTM A105, espesor igual a tubería ASTM A105, espesor igual a tubería ASTM A234 Gr. WPB, espesor igual a tubería		
BRIDAS	½ 2	1½ 24	150≠ 150≠	SW RF WN RF	ASTM A105, espesor igual a tubería ASTM A105, espesor igual a tubería		
VÁLVULAS DE MARIPOSA	8	12	150 ≠	WAFER Y LUG	Cuerpo en Aº Inox 316, disco en 316 con asientos de Inox, operada con volante y engranaje		V1403
TUBERÍAS	½ 1 ½ 2 3 26 y	1 --- --- 24 mayo- res	S/ costura, ASTM A106 Gr. B SCH 160, extremos planos XS, extremos planos XS, extremos biselados STD, extremos biselados EFW, ASTM A 672 Cl. 12 Cr. G60 (con S3, S4, S10) espesor a calcular				
ESPARRA- GOS Y TUERCAS	Espárragos en acero aleado según ASTM A193 Gr. B7, cada uno con dos tuercas de cabeza exagonal según ASTM A194 Gr. 2H						
JUNTAS	Espirometálica con anillo centrador de refuerzo, grafito con fleje en 304 ó 316 A.I. Flexitallic style C.G. o similar.						

* Cuando se especifique en los diagramas de flujo.

CLASES DE TUBERÍAS

CLASE: L

SERVICIO	AGUA DE PLANTA, AGUA DE REFRIGERACIÓN, AIRE DE PLANTA					CORROSIÓN	1.25 mm.
SERIE ANSI	150 # RF		MATERIAL DE TUBERÍAS		ACERO AL CARBONO CALMADO		
LIMITES DE	BRIDAS SIN AISLAR Hasta 12", 12/8,6 Kg/cm ² a 75/200°C; 14"-24",10.3/6.9 Kg/cm ² a 75/190°C						
SERVICIOS	BRIDAS AISLADAS Hasta 12",12/8,6 Kg/cm ² a 65.6/179°C;14"-24",10.3/6.9 Kg/cm ² a 65.6/170°C						
ÍTEMS	MEDIDAS EN PULGADAS		SERIE	EXTRE- MOS	GUARNI -CION	OTRAS DESCRIPCIONES	CODIGO NUMERO
	DE	HASTA					
VÁLVULAS DE COMPUERTA	2	24	150#	FLGD	Bronce	BB, OS & Y, CCS, cuña sólida, s/API 600	V1008
VÁLVULAS DE BOLA (NOTA 1)	1/4	1/2	600#	THR.F	Bronce y PTFE	Bronce, paso reducido bola de bronce	V6186
	3/4	1½	800#	THR.F	PTFE+GR	CS, Bola/eje AISI 304, asiento PTFE+Grafito	V3031
VÁLVULAS DE ASIENTO (NOTA 1)	1/4	1/2	125#	THR.F	Bronce	Bronce, disco suelto, SB, IS-RS s/API 602	V6223
	3/4	1½	800#	THR.F	13% Cr +ST	CS, 13%CR, asiento cuerpo estellita	V2922
	2	6	150#	FLGD	Bronce	CS, BB, OS & Y, disco guiado, s/ API 600	V1187
VÁLVULAS DE RETENCIÓN (NOTA 1)	1/2	1 ½	125#	THR.F	Bronce	SC, Bronce, disco ascendente	V6293
	3 /4	1 ½	800#	THR.F	13%Cr	BC, FCS, tipo bola/pistón (horizontal) s/BS 2995	V3000
	2	24	150#	B'LFGD WAFER	AISI 316 BUNA N	CS, disco/eje 316, asiento Buna N, tipo simple o doble clapeta, s/ API 594 M.Inconel	V5935
ACCESO- RIOS	½	1½	3000	THR	ASTM A105, paso según tubería		
	2	24	---	BW	ASTM A234 Gr. WPB, espesor igual a la tubería		
BRIDAS	½	1½	150#	THR.RF	ASTM A105, paso según tubería		
	2	24	150#	WN RF	ASTM A105, paso según tubería		
VÁLVULA DE MARIPOSA	6	24	150#	B'FLGD	Cuerpo en CS; disco bronce alum.; Eje Ac. aleado asiento EPDM		V1404
	26	Mayor	150#	WAFER LUG	Cuerp. y disco CS, asiento EPDM vást. SS oper. manual		V1407
TUBERÍAS	½	1½	S/ costura, ASTM A106 Gr. B				
	2	---	XS, extremos roscados				
	3	24	STD, extremos biselados				
	26 y	mayores	ERW API 5L Gr. B ó API 5LS Gr. B, espesor a calcular				
ESPARRA- GOS Y TUERCAS	Espárragos en acero aleado según ASTM A193 Gr. B7, cada uno con dos tuercas de cabeza exagonal según ASTM A194 Gr. 2H.						
JUNTAS	Fibra sintética (C.S.F.) 1.5 mm. de espesor, dimensiones S/ ANSI B16.21 tabla 1. Fibras minerales y de aramida mezcladas en una matriz de caucho-nitrilo (NBR)						

NOTAS: 1. Usar válvulas de acero según la espec. "A" en zonas donde haya posibilidad seria de fuego.
2. Todas las roscas irán selladas con cinta de teflón.

CLASES DE TUBERÍAS

CLASE: LA

SERVICIO	AGUA POTABLE, AIRE INSTRUMENTOS					CORROSIÓN	1.25 mm.
SERIE ANSI	150 # RF		MATERIAL DE TUBERÍAS		ACERO AL CARBONO GALVANIZADO		
LIMITES DE	BRIDAS SIN AISLAR 18 Kg/cm ² a 40°C						
SERVICIOS	BRIDAS AISLADAS						
ÍTEMS	MEDIDAS EN PULGADAS		SERIE	EXTRE- MOS	GUARNI -CION	OTRAS DESCRIPCIONES	CODIGO NUMERO
	DE	HASTA					
VÁLVULAS DE COMPUERTA	3	8	150#	FLGD	Bronce	BB, OS & Y, CCS, cuña sólida	V1008
VÁLVULAS DE BOLA	1/4	1/2	600#	THR.F	Bronce y PTFE PTFE+GR	Bronce, paso reducido bola de Bronce	V6186
	3/4	2	800#	THR.F		CS, bola/eje AISI304, asiento PTFE+grafito	V3031
VÁLVULAS DE ASIENTO	1/4	1/2	125#	THR.F	Bronce	Bronce, disco suelto, SB, IS-RS	V6223
	3/4	2	800#	THR.F	13%Cr+ST	CS, 13% CR, asiento cuerpo estrellita	V2922
	3	6	150#	FLGD	Bronce	CS, BB, OS & Y, disco guiado	V1187
VÁLVULAS DE RETENCIÓN	1/2	1 ½	125#	THR.F	Bronce	SC, Bronce disco ascendente	V6293
	3/4	2	800#	THR.F	13%Cr	BC, FCS, tipo bola/pistón (horizontal) s/BS 2995	V3000
	3	8	150#	B'FLGD WAFER	AISI 316 BUNA N	CS, disco/eje 316 asiento Buna N. tipo simple o doble clapeta, M. Monel	V5935
ACCESO- RIOS	½	2	3000	THR	ASTM A105 galvanizados		
	3	8	---	BW	ASTM A234 Gr. WPB, espesor igual a tubería		
BRIDAS	½	2	150#	THR.RF	ASTM A105 galvanizados		
	3	8	150#	WN RF	ASTM A105		
UNIONES	½	2	3000		Acero al carbono A-105 galvanizado asiento integral		
TUBERÍAS	½	2	S/ costura, ASTM A120 galvanizadas XS, extremos roscados y con manguito				
	3	8	S/ costura ASTM A 106 Gr. B STD. W. extremos biselados				
ESPARRA- GOS Y TUERCAS	Espárragos en acero aleado según ASTM A193 Gr. B7, cada uno con dos tuercas de cabeza exagonal según ASTM A194 Gr. 2H.						
JUNTAS	Fibra sintética (C.S.F.) 1.5 mm. de espesor, dimensiones S/ ANSI B16.21 tabla 1. Fibras minerales y de aramida mezcladas en una matriz de caucho-nitrilo (NBR)						

NOTA: Todas las roscas irán selladas con cinta de teflón.

CLASES DE TUBERÍAS

CLASE: RH

SERVICIO	FLUIDOS CORROSIVOS					CORROSIÓN	0.75 mm.
SERIE ANSI	150 ≠ RF		MATERIAL DE TUBERÍAS		ACERO INOXIDABLE TUBERÍA TIPO 304L; 316 L (SW) 316 L (VÁLVULAS BRIDADAS)		
LIMITES DE	BRIDAS SIN AISLAR 16,17 Kg/cm ² desde -29°C hasta 44°C; 6,33 Kg/cm ² a 454°C						
SERVICIOS	BRIDAS AISLADAS 16,17 Kg/cm ² desde -29°C hasta 38°C; 4,57 Kg/cm ² a 454°C						
ITEMS	MEDIDAS EN PULGADAS		SERIE	EXTRE- MOS	GUARNI -CION	OTRAS DESCRIPCIONES	CODIGO NUMERO
	DE	HASTA					
VÁLVULAS DE COMPUERTA	½	1½	800≠	SW	Nº 10	BB,OS &Y,316 L cuña sólida, s/API 602	V4803
	2	24	150≠	FLGD	Nº 10	BB,OS&Y,316 cuña sólida, s/ API 600	V3606
VÁLVULAS DE ASIENTO	½	1½	800≠	SW	Nº 10	BB, OS&Y, 316 L disco suelto, s/ BS 2995	V5050
	2	6	150≠	FLGD	Nº 10	BB,OS&Y,304 disco guiado s/ BS 1873	V3735
VÁLVULAS DE RETENCIÓN	½	1½	800≠	SW	Nº 10	BC, 316 L, tipo pistón/bola (horizontal) s/BS 2995	V5224
	2	12	150≠	FLGD	Nº 10	BC, 304 tipo clapeta simple, s/BS 1868	V3876
ACCESO- RIOS	½	1½	3000	SW	ASTM A182 Gr. F304 L		
	2	24	---	BW	ASTM A403 Gr. WP 304 L, espesor igual a tubería		
BRIDAS	½	1½	150≠	SW RF	ASTM A182 Gr. F 304 L, paso según tubería		
	2	24	150≠	WN RF	ASTM A 182 Gr. F 304 L, paso según tubería		
UNIONES							
TUBERÍAS	½	1½	S/ costura ASTM A312 Gr. Tp 304 L				
		6	SCH 40S, extremos planos				
			SCH 10S, extremos biselados				
	2		S/ costura A312 Gr. Tp 304 L ó EFW A 358 Cl. 1, Gr. 304 L (el primero con S1 y el segundo con S1 y S4)				
	8	24	SCH 10S, extremos biselados				
ESPARRA- GOS Y TUERCAS	Espárragos en acero según ASTM A193 Gr. B7, cada uno con dos tuercas exagonales ASTM A194 Gr. 2H						
JUNTAS	Espirometálicas con anillo centrador de refuerzo, grafito con fleje en 304 ó 316 A.I. Flexitallic style C.G. o similar.						



ESTUDIOS E INGENIERIA APLICADA XXI, S.A.

PROYECTO :

MODIFICACION DE COMPRESORES EN FCC PARA MEJORA DE OPERATIVIDAD ENERGETICA

TITULO DOCUMENTO :

LISTA DE CABLES DE ELECTRICIDAD

CLIENTE :

REPSOL

REFERENCIA CLIENTE :

ADI-1783

3	30/05/2016	ICJ	MAR	FMS	CRC	ASB			
2	26/02/2016	ICJ	MAR	FMS	CRC	ASB			
1	01/02/2016	ICJ	MAR	FMS	CRC	ASB			
REV N°	FECHA	EDITA	VERIFI	REVISA	VALIDA	APROB			

N° DOCUMENTO : LCE-N1783-05-R3

N° PROYECTO : P-0016-2164-1668-14

FECHA : 30/05/2016

REVISION / EDICION : 3

LISTA DE CABLES DE ELECTRICIDAD																
DESIGNACIÓN	TEMPERO		KW	TENSIÓN	INTENSIDAD	AEREO	CABLE					LONGITUD	PRENDA EXC 40"		OBSERVACIONES	
	DESE	HASTA					CONDUIT	Nº COND	COMPOSICION	TIPO	ORIGEN		DESTINO			
US-7F30-0004-Y	CUADRO 10KV Y1 SW10-0132	TRANSFORMADOR US-7F30-0004	35 KVA	30000	674	1385	30	6	9	3x4x14.5 mm ²	RYMAYH-UMF 26/48V	1.415	-	M254L5	Alimentación auxiliar	
US-7F30-0004-Y2	CUADRO SERV. AUX. US-UP-32	TRANSFORMADOR US-7F30-0004		400/230		35	10		1	4x6 mm ²	RYMAYH-1.0/67HV	25	-	M254L5		
US-7F30-0004-Y3	CUADRO SERV. AUX. US-UP-32	REGULADOR TRANSFORMADOR US-7F30-0004	5	400/230		20	10		1	4x6 mm ²	RYMAYH-1.0/67HV	30	-	M254L5		
US-7F30-0004-X1	CUADRO 10KV Y1 SW10-0132	CUADRO 111V US-SW11-1		110V C.C.		1370	35	6	1	2x4.25 mm ²	RYMAYH-1.0/67HV	1405	-	-	Alimentación motor regulador Trfo	
US-7F30-0004-X2	CUADRO 10KV Y1 SW10-0132	CUADRO 111V US-SW11-1		6640	40	50		1	1	1x4.00 mm ²	RYMAYH-UMF 27/20W	50	-	-	Enchufeamiento eléctrico	
US-7F30-0004-GR-X1	RESISTENCIA PAT. US-7F30-0004-GR	RESISTENCIA PAT. US-7F30-0004-GR		-	-	50		1	1	1x8 mm ²	RY (ca) 6/20W	50	-	-	Encadenamiento de cables de instrumentación (IC-NI783-006)	
US-7F30-0004-GR-X2	RESISTENCIA PAT. US-7F30-0004-GR	RESISTENCIA PAT. US-7F30-0004-GR		230	-	30	10		1	3x4 mm ²	RYMAYH-1.0/67HV	40	-	M254L5	Auxiliar resistencia	
US-7F30-0002-GR-Y	CUADRO SERV. AUX. US-UP-32	RESISTENCIA PAT. US-7F30-0002-GR		230	-	35	10		1	3x4 mm ²	RYMAYH-1.0/67HV	45	-	M254L5	Auxiliar resistencia	
US-SW11-1-Y1-Y10	TRANSFORMADOR US-7F30-0004	CUADRO 111V US-PCS-SW11-1	35 KVA	11000	1.839	65	30	24	24	8x4x14.00 mm ²	RYMAYH-UMF 27/20W	95	-	M254L5		
FS-EMC-1-Y1-1	US-SW11-1 (CELULA SALIDA 1)	MOTOR FS-C-1	1400	11000	824	6	332	22	9	3x14x0.00 mm ²	RYMAYH-UMF 27/20W	360	-	M254L5	3ª Terna de cables	
FS-EMC-1-Y1-2	US-SW11-1 (CELULA SALIDA 1)	MOTOR FS-C-1	1400	11000	824	6	332	22	9	3x14x0.00 mm ²	RYMAYH-UMF 27/20W	360	-	M254L5	3ª Terna de cables	
FS-EMC-1-Y1-3	US-SW11-1 (CELULA SALIDA 1)	MOTOR FS-C-1	1400	11000	824	6	332	22	9	3x14x0.00 mm ²	RYMAYH-UMF 27/20W	360	-	M254L5	3ª Terna de cables	
FS-EMC-1-Y2	US-SW11-1 (CELULA SALIDA 1)	RESISTENCIA ANTONCENACION		230		338	22		1	3x4 mm ²	RYMAYH-1.0/67HV	300	-	M254L5		
FS-EMC-1-X1	US-SW11-1 (CELULA SALIDA 1)	PANEL LOCAL COMPRESOR FS-C-1-UP-1		110V C.C.		308	22		1	12x2.5 mm ²	RYMAYH-1.0/67HV	330	-	M254L5	Intercambio de cables	
FS-EMC-1-X2	US-SW11-1 (CELULA SALIDA 1)	SETA DE EMERGENCIA		110V C.C.		25	308	22		1	7x2.5 mm ²	RYMAYH-1.0/67HV	335	-	M254L5	
FS-EMC-1-X3	US-SW11-1 (CELULA SALIDA 1)	T° EN MOTOR FS-C-1		110V C.C.		30	308	22	1	3x4.20 mm ²	RYMAYH-1.0/67HV	360	-	M254L5	Cable de señalización. Protección Diferencial 87M	
FS-EMC-1-X4	US-SW11-1 (CELULA SALIDA 1)	TELECONTROL					50		1	12x2.5 mm ²	RYMAYH-1.0/67HV	50				
FS-EMC-1-X5	US-SW11-1 (CELULA SALIDA 1)	REGISTRADOR DE EVENTOS													Cable Instrumentación. Ver lista de Cables de Instrumentación (IC-NI783-006)	
FS-EMC-1-X6	US-SW11-1 (CELULA SALIDA 1)	PANEL LOCAL FS-C-1-UP-1													Cable Instrumentación. Ver lista de Cables de Instrumentación (IC-NI783-006)	
FS-EMC-1-X7	US-SW11-1 (CELULA SALIDA 1)	TDC													Cable Instrumentación. Ver lista de Cables de Instrumentación (IC-NI783-006)	
FS-EMC-1-X8	US-SW11-1 (CELULA SALIDA 1)	PANEL LOCAL COMPRESOR FS-C-1-UP-1		110V C.C.		308	22		1	12x2.5 mm ²	RYMAYH-1.0/67HV	330	-	M254L5	Ordenes y Señales	
FS-C-0001-BC11-0001-Y1	US-SW11-1 (CELULA SALIDA 1)	BATERIA DE CONDENSADORES FS-C-001-BC11-0001	1000 WVA	11000	89	35	40		3	3x14x0.00 mm ²	RYMAYH-UMF 27/20W	75	-	M254L5	AUXILIARES BATERIA CONDENSADORES	
FS-C-0001-BC11-0001-Y2	CUADRO SERV. AUX. US-UP-32	BATERIA DE CONDENSADORES FS-C-001-BC11-0001		230	-	40	10		1	4x6 mm ²	RYMAYH-1.0/67HV	50	-	M254L5	ENCUADRAMIENTO / PROTECCIONES	
FS-C-0001-BC11-0001-X1	US-SW11-1 (CELULA SALIDA 1)	BATERIA DE CONDENSADORES FS-C-001-BC11-0001		110V C.C.		20	40		1	12x2.5 mm ²	RYMAYH-1.0/67HV	60	-	M254L5		
FS-C-0001-BC11-0001-X2	US-SW11-1 (CELULA SALIDA 1)	BATERIA DE CONDENSADORES FS-C-001-BC11-0001		110V C.C.		30	40		1	2x4 mm ²	RYMAYH-1.0/67HV	60	-	M254L5	Relé de seguridad	
FS-C-0001-BC11-0001-X3	US-SW11-1 (CELULA SALIDA 1)	PANEL LOCAL COMPRESOR FS-C-1-UP-1		110V C.C.		308	22		1	12x2.5 mm ²	RYMAYH-1.0/67HV	330	-	M254L5	Orden de Corte	
FS-C-1-EMBC-Y	CCMAY001 V103 MCS-9	MOTOR TURNING GRAY	5.5	500		71	281	23	1	4x6 mm ²	RYMAYH-1.0/67HV	375	-	M254L5		
FS-C-1-EMBC-X1	CCMAY001 V103 MCS-9	ESTACION DE MANOBRA				71	281	23	1	7x2.5 mm ²	RYMAYH-1.0/67HV	375	-	M254L5		
FS-C-1-EMBC-X2	CCMAY001 V103 MCS-9	PANEL LOCAL COMPRESOR FS-C-1-UP-1				56	266	23	1	12x2.5 mm ²	RYMAYH-1.0/67HV	345	-	M254L5		
FS-C-1-EMBC-X3	CCMAY001 V103 MCS-9	PANEL LOCAL COMPRESOR FS-C-1-UP-1				56	266	23	1	12x2.5 mm ²	RYMAYH-1.0/67HV	345	-	M254L5		
FS-C-1-EMC-2-Y	CCMAY001 V103 MCS-9	MOTOR 45V	1.5	500		46	306	23	1	4x6 mm ²	RYMAYH-1.0/67HV	375	-	M254L5		
FS-C-1-EMC-2-X2	CCMAY001 V103 MCS-9	PANEL LOCAL COMPRESOR FS-C-1-UP-1				56	266	23	1	12x2.5 mm ²	RYMAYH-1.0/67HV	345	-	M254L5		
FS-C-1-EMP-JA-Y	CCMAY001 V103 MCS-9	BOMBA DE LUBRICACION FS-C-1	22	500		61	266	23	1	4x38 mm ²	RYMAYH-1.0/67HV	390	-	M232x5		
FS-C-1-EMP-JA-X1	CCMAY001 V103 MCS-9	ESTACION DE MANOBRA				81	266	23	1	7x2.5 mm ²	RYMAYH-1.0/67HV	370	-	M254L5		
FS-C-1-EMP-JA-X2	CCMAY001 V103 MCS-9	PANEL LOCAL COMPRESOR FS-C-1-UP-1				56	266	23	1	12x2.5 mm ²	RYMAYH-1.0/67HV	345	-	M254L5		
FS-C-1-EMP-JA-X3	CCMAY001 V103 MCS-9	PANEL LOCAL COMPRESOR FS-C-1-UP-1				56	266	23	1	12x2.5 mm ²	RYMAYH-1.0/67HV	345	-	M254L5		
FS-C-1-EMP-1B-Y	CCMAY001 V103 MCS-10	BOMBA DE LUBRICACION AUX. FS-C-1	22	500		54	266	20	1	4x38 mm ²	RYMAYH-1.0/67HV	340	-	M232x5		
FS-C-1-EMP-1B-X1	CCMAY001 V103 MCS-10	ESTACION DE MANOBRA				49	266	20	1	7x2.5 mm ²	RYMAYH-1.0/67HV	335	-	M254L5		
FS-C-1-EMP-1B-X2	CCMAY001 V103 MCS-10	PANEL LOCAL COMPRESOR FS-C-1-UP-1				49	266	20	1	12x2.5 mm ²	RYMAYH-1.0/67HV	335	-	M254L5		
FS-C-1-EMP-1B-X3	CCMAY001 V103 MCS-10	PANEL LOCAL COMPRESOR FS-C-1-UP-1				49	266	20	1	12x2.5 mm ²	RYMAYH-1.0/67HV	335	-	M254L5		
FS-C-1-E1-Y	CCMAY001 V103 MCS-10	CALENTADOR DE ACEITE LUBRICACION	9	500		51	266	23	1	4x10 mm ²	RYMAYH-1.0/67HV	340	-	M254L5		
FS-C-1-E1-X1	CCMAY001 V103 MCS-9	PANEL LOCAL DEL COMPRESOR FS-C-1				56	266	23	1	12x2.5 mm ²	RYMAYH-1.0/67HV	345	-	M254L5		
FS-C-1-E1-X2	CCMAY001 V103 MCS-9	PANEL LOCAL DEL COMPRESOR FS-C-1				56	266	23	1	12x2.5 mm ²	RYMAYH-1.0/67HV	345	-	M254L5		
FS-C-1-E2-Y	CCMAY001 V103 MCS-10	CALENTADOR DE ACEITE LUBRICACION	9	500		44	266	20	1	4x10 mm ²	RYMAYH-1.0/67HV	330	-	M254L5		
FS-C-1-E2-X1	CCMAY001 V103 MCS-10	PANEL LOCAL COMPRESOR FS-C-1-UP-1				49	266	20	1	12x2.5 mm ²	RYMAYH-1.0/67HV	335	-	M254L5		
FS-C-1-E2-X2	CCMAY001 V103 MCS-10	PANEL LOCAL COMPRESOR FS-C-1-UP-1				49	266	20	1	12x2.5 mm ²	RYMAYH-1.0/67HV	335	-	M254L5		
FS-C-1-EMP-3-Y	CCMAY001 V103 MCS-9	BOMBAJO	7.5	500		61	266	23	1	4x10 mm ²	RYMAYH-1.0/67HV	350	-	M254L5		
FS-C-1-EMP-3-X1	CCMAY001 V103 MCS-9	ESTACION DE MANOBRA				61	266	23	1	7x2.5 mm ²	RYMAYH-1.0/67HV	350	-	M254L5		
FS-C-1-EMP-3-X2	CCMAY001 V103 MCS-9	PANEL LOCAL COMPRESOR FS-C-1-UP-1				56	266	23	1	12x2.5 mm ²	RYMAYH-1.0/67HV	345	-	M254L5		
FS-C-1-EMP-3-X3	CCMAY001 V103 MCS-9	PANEL LOCAL DEL COMPRESOR FS-C-1-UP-1				56	266	23	1	12x2.5 mm ²	RYMAYH-1.0/67HV	345	-	M254L5		
FS-C-1-UP-1-Y	US-14-046-141N/17E	PANEL LOCAL DEL COMPRESOR FS-C-1	3.5	115			266	9	1	4x6 mm ²	RYMAYH-1.0/67HV	275	-	M254L5	Alimentación 1 LPH Panel Local del Compresor	
FS-C-1-UP-1-Y	US-14-046-141N/17E	PANEL LOCAL DEL COMPRESOR FS-C-1	3.5	115			266	9	1	4x6 mm ²	RYMAYH-1.0/67HV	275	-	M254L5	Alimentación 2 LPH Panel Local del Compresor	

7 LISTA DE INSTRUMENTOS DE CAMPO
HARDWARE-SOFTWARE SIGNAL AND INSTRUMENT LIST

DATOS GENERALES				PLANO DE SITUACIÓN		CONEXIONES		TIPO SIGNAL		CONEXIONES Y ALIMENTACIÓN		VARIOS	
SIGLA TAG	TIPO INSTRUMENTO	SERVICIO	DIAGRAMA MECANICO	UBICACIÓN	ELECTRICA	NEUMATICA	DE PROCESO	GRAL. SIST	PARTICULAR	CAJA / BORNERO	ALIMENT.	REQUISICIÓN	NOTA
	INSTRUMENT TYPE	SERVICE	P&ID	LOCATION	ELECTRICAL	PNEUMATIC	PROCESS	GRAL. SIST	PARTICULAR	JUNCT. BOX/TERM. STRIP	POWER	REQUISITION	NOTE
F3-FE-0440	FLOW ELEMENT- PITOT TUBE	MAB DISCHARGE	100019567/37 F3-2504/2	FIELD								P-N1783-CECO-JU-0008-A-O	Measuring Range 0, 288732 kg/h
F3-FE-0445	FLOW ELEMENT- PITOT TUBE	MAB DISCHARGE	100019567/37 F3-2-50/02	FIELD								P-N1783-CECO-JU-0008-A-O	Measuring Range 0, 288732 kg/h
F3-TT-0404A	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	MAB DISCHARGE	100019567/37 F3-2-50/02	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-064	+1,-1,1P	P-N1783-CECO-JU-0007-A-O	Measuring Range 0, 288732 kg/h
F3-TT-0404B	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	MAB DISCHARGE	100019567/37 F3-2-50/02	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-064	+2,-2,2P	P-N1783-CECO-JU-0007-A-O	Measuring Range 0, 288732 kg/h
F3-TT-0445	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	MAB DISCHARGE	100019567/37 F3-2-50/02	FIELD				AI_DCS				P-N1783-CECO-JU-0007-A-O	Measuring Range 0, 288732 kg/h
F3-FY-0444	POSITIONER	MAB ANTI SURGE CONTROL VALVE	100019567/37 F3-2-50/02	FIELD	F3-142-13		P-N1688-06-003	AO_PLC	4-20mA+HART	F3-J05-E-55	+3,-3,3P	MDT	Operating Range 0, 100 %
F3-JU-0402A	CURRENT TRANSMITTER	MOTOR CURRENT	100019567/37 F3-2504/2	SUB P3				AI_PLC	4-20mA+HART			HVSG	Measuring Range 0, 1000A
F3-JU-0402B	CURRENT TRANSMITTER	MOTOR CURRENT	100019567/37 F3-2504/2	SUB P3				AI_PLC	4-20mA+HART			HVSG	Measuring Range 0, 1000A
F3-PDT-0858A	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	MAB SUCTION ASC	100019567/37 F3-2-50/02	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-53	+3,-3,3P	MDT	Measuring Range -50, 250 mbar(g)
F3-PDT-0858B	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	MAB SUCTION ASC	100019567/37 F3-2504/2	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-53	+2,-2,2P	MDT	Measuring Range -50, 250 mbar(g)
F3-PDT-0859A	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	MAB SUCTION SD	100019567/37 F3-2504/2	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-53	+1,-1,1P	MDT	Measuring Range -50, 250 mbar(g)
F3-PDT-0859B	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	MAB SUCTION SD	100019567/37 F3-2504/2	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-53	+5,-5,5P	MDT	Measuring Range -50, 250 mbar(g)
F3-PDT-0860C	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	MAB SUCTION SD	100019567/37 F3-2504/2	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-53	+4,-4,4P	MDT	Measuring Range -50, 250 mbar(g)
F3-PDT-0861	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	MAB SUCTION FILTER	100019567/37 F3-2504/2	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-57	+1,-1,1P	MDT	Measuring Range 0, 10 mbar(g)
F3-PDT-0862	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	MAB SUCTION FILTER	100019567/37 F3-2-50/02	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-57	+2,-2,2P	MDT	Measuring Range 0, 10 mbar(g)
F3-PDT-0863	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	MAB SUCTION FILTER	100019567/37 F3-2504/2	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-57	+3,-3,3P	MDT	Measuring Range 0, 20 mbar(g)
F3-PT-0860	ELECTR. PRESS. TRANS. WITH INDICATOR	MAB SUCTION	100019567/37 F3-2504/2	FIELD			P-N1688-06-003	AI_PLC	4-20mA+HART	F3-J05-E-53	+6,-6,6P	P-N1783-CECO-JU-0007-A-O	Measuring Range -0,02, 0 kg/cm ² (g)
F3-PT-0864	ELECTR. PRESS. TRANS. WITH INDICATOR	MAB DISCHARGE	100019567/37 F3-2-50/02	FIELD			P-N1688-06-003	AI_PLC	4-20mA+HART	F3-J05-E-53	+11,-11,11P	P-N1783-CECO-JU-0007-A-O	Measuring Range 0, 4 kg/cm ² (g)
F3-TE-0104	SENSOR-TEMPERATURE	MAB DISCHARGE	100019567/37 F3-2504/2	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-064	+3,-3,3P	P-N1783-CECO-JU-0007-A-O	Measuring Range 0, 4 kg/cm ² (g)
F3-TE-0436A	THERMOCOUPLE TYPE "K"	MAB SUCTION SD	100019567/37 F3-2-50/02	FIELD				AI_PLC	TC "K"	F3-TT-0104	-	MDT	Measuring Range 0, 280 °C
F3-TE-0436B	THERMOCOUPLE TYPE "K"	MAB SUCTION SD	100019567/37 F3-2-50/02	FIELD				AI_PLC	TC "K"	F3-TT-0436A	-	MDT	Measuring Range -20, 400 °C
F3-TE-0436C	THERMOCOUPLE TYPE "K"	MAB SUCTION SD	100019567/37 F3-2504/2	FIELD				AI_PLC	TC "K"	F3-TT-0436B	-	MDT	Measuring Range -20, 400 °C
F3-TE-0437	THERMOCOUPLE TYPE "K"	MAB SUCTION ASC	100019567/37 F3-2-50/02	FIELD				AI_PLC	TC "K"	F3-TT-0436C	-	MDT	Measuring Range -20, 400 °C
F3-TE-0438	SENSOR-TEMPERATURE	MAB DISCHARGE	100019567/37 F3-2504/2	FIELD				AI_PLC	TC "K"	F3-TT-0437	-	MDT	Measuring Range 0, 400 °C
F3-TE-0439	SENSOR-TEMPERATURE	MAB DISCHARGE	100019567/37 F3-2504/2	FIELD				AI_PLC	TC "K"	F3-TT-0438	-	MDT	Measuring Range 0, 280 °C
F3-TT-0104	ELECTR. TEMPERATURE TRANSMITTER	MAB DISCHARGE	100019567/37 F3-2504/2	FIELD	F3-142-12			AI_PLC	4-20mA+HART	F3-J05-E-53	+12,-12,12P	P-N1783-CECO-JU-0008-A-O	Measuring Range 0, 280 °C
F3-TT-0404A	ELECTR. TEMPERATURE TRANSMITTER	MAB SUCTION SD	100019567/37 F3-2-50/02	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-53	+8,-8,8P	MDT	Measuring Range -20, 400 °C
F3-TT-0436B	ELECTR. TEMPERATURE TRANSMITTER	MAB SUCTION SD	100019567/37 F3-2504/2	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-53	+9,-9,9P	MDT	Measuring Range -20, 400 °C
F3-TT-0436C	ELECTR. TEMPERATURE TRANSMITTER	MAB SUCTION SD	100019567/37 F3-2504/2	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-53	+10,-10,10P	MDT	Measuring Range -20, 400 °C
F3-TT-0437	ELECTR. TEMPERATURE TRANSMITTER	MAB SUCTION ASC	100019567/37 F3-2504/2	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-53	+7,-7,7P	MDT	Measuring Range -20, 400 °C
F3-TT-0438	ELECTR. TEMPERATURE TRANSMITTER	MAB DISCHARGE	100019567/37 F3-2504/2	FIELD				AI_PLC	4-20mA+HART	F3-J05-E-53	+12,-12,12P	P-N1783-CECO-JU-0007-A-O	Measuring Range 0, 400 °C
F3-TT-0439	ELECTR. TEMPERATURE TRANSMITTER	MAB SUCTION	100019567/37 F3-2504/2	FIELD				AI_PLC	PT100	F3-J05-E-54	+4,-4,4P	P-N1783-CECO-JU-0008-A-O	Measuring Range 0, 280 °C
F3-TW-0104	THERMOWELL	MAB DISCHARGE	100019567/37 F3-2-50/02	FIELD								MDT	
F3-TW-0438	THERMOWELL	MAB DISCHARGE	100019567/37 F3-2504/2	FIELD								P-N1783-CECO-JU-0008-A-O	
F3-TW-0439	THERMOWELL	MAB DISCHARGE	100019567/37 F3-2504/2	FIELD								MDT	
F3-XA-0021A	AX. COMP. ADJUSTABLE STATOR BLADES	AX. COMP. ADJUSTABLE STATOR BLADES	100019567/37 F3-2-50/02	FIELD				DI_PLC	CLT	F3-J05-AL43	+3,-3,3P	MDT	
F3-XA-0021B	ALARM	AX. COMP. ADJUSTABLE STATOR BLADES	100019567/37 F3-2504/2	FIELD				DI_PLC	CLT	F3-J05-AL43	+4,-4,4P	MDT	
F3-XV-0122	SOLENOID VALVE	MAB DISCHARGE	100019567/37 F3-2504/2	FIELD	F3-142-12		P-N1688-06-003	DO_PLC	RELE (115V/ac)	F3-J05-SV-08	+01, -01	MDT	

LISTA DE INSTRUMENTOS DE CAMPO
HARDWARE-SOFTWARE SIGNAL AND INSTRUMENT LIST

DATOS GENERALES				PLANO DE SITUACIÓN			CONEXIONES		TIPO SEÑAL		CONEXIONADO Y ALIMENTACIÓN			VARIOS	
SIGLA TAG	TIPO INSTRUMENTO	SERVICIO	FASE	DIAGRAMA MECANICO	UBICACION LOCATION	ELECTRICA ELECTRICAL	NEUMATICA PNEUMATIC	DE PROCESO PROCESS	NEUMATICAS PNEUMATIC	GRAL. SBT	PARTICULAR PARTICULAR	CAJA / BORNIO	REQUISICION REQUISITION	NOTA NOTE	REV
INSTRUMENT TYPE	SERVICE	PHASE	P&ID	LOCATION	ELECTRICAL	PNEUMATIC	PROCESS	PNEUMATIC	GRAL. SIST.	PARTICULAR	JUNCT. BOX/TERM. STRIP	ALIMENT. POWER	REQUISITION	NOTE	REV
F3-XY-0444	SOLENOID VALVE	MAB ANTI SURGE CONTROL	F3-C-1	1000195877	FIELD	F3-142-13	F3-142-05		P-NI689-06-003	DO PLC	RELE (115V~e)	F3-J05-SV-08	MDT		1
F3-ZC-0021	POSITIONER	AX. COMP. ADJUSTABLE STATOR BLADES	F3-C-1	1000195877	FIELD					AO PLC	4-20mA+HART	F3-J05-E-066	MDT		1
F3-ZI-0021	DISTANCE, LENGTH, POSITION TRANSMITTER	AX. COMP. ADJUSTABLE STATOR BLADES	F3-C-1	1000195877	FIELD					AI PLC	4-20mA+HART	F3-J05-E-066	MDT		1
F3-ZSH-0021	LIMIT SWITCH	AX. COMP. ADJUSTABLE STATOR BLADES	F3-C-1	1000195877	FIELD					DJ PLC	CLT	F3-J05-AL-43	MDT		1
F3-ZSH-0122	PROXIMITY SWITCH	AX. COMP. DISCHARGE VALVE	F3-C-1	1000195877	FIELD	F3-142-12				DJ PLC	CLT	F3-J05-IN-06	MDT		1
F3-ZSH-0444	PROXIMITY SWITCH	MAB ANTI SURGE CONTROL	F3-C-1	1000195877	FIELD	F3-142-13	F3-142-05			DJ PLC	CLT	F3-J05-IN-06	MDT		1
F3-ZSL-0021	LIMIT SWITCH	AX. COMP. ADJUSTABLE STATOR BLADES	F3-C-1	1000195877	FIELD					DJ PLC	CLT	F3-J05-AL-43	MDT		1
F3-ZSL-0022A	LIMIT SWITCH	MAB SUCTION FILTER BLOW-IN DOOR	F3-C-1	1000195877	FIELD					DJ PLC	CLT	F3-J05-AL-47	MDT		1
F3-ZSL-0022B	LIMIT SWITCH	MAB SUCTION FILTER ACCESS DOOR	F3-C-1	1000195877	FIELD					DJ PLC	CLT	F3-J05-AL-47	MDT		1
F3-ZSL-0122	PROXIMITY SWITCH	AX. COMP. DISCHARGE VALVE	F3-C-1	1000195877	FIELD	F3-142-12				DJ PLC	CLT	F3-J05-IN-06	MDT		1
F3-ZSL-0444	DISTANCE, LENGTH, POSITION TRANSMITTER	MAB ANTI SURGE CONTROL	F3-C-1	1000195877	FIELD	F3-142-13	F3-142-05			DJ PLC	CLT	F3-J05-IN-06	MDT		1
F3-ZT-0122	POSITION MONITORING	AX. COMP. DISCHARGE VALVE	F3-C-1	1000195877	FIELD	F3-142-13				AI PLC	4-20mA+HART	F3-J05-E-065	MDT	Measuring Range: 0.100 °C	1
F3-KE-0016	SHAFT CONTROL PROBES	MAB SHAFT KEYPHASOR	F3-C-1	1000195878	FIELD					AI PLC	4 HILOS	F3-J05-EIN-05	MDT		1
F3-KE-0017	SHAFT CONTROL PROBES	GEAR SHAFT 1 KEYPHASOR	F3-C-1	1000195878	FIELD					AI PLC	4 HILOS	F3-J05-EIN-22	MDT		1
F3-KT-0016	PROXIMITOR	MAB SHAFT KEYPHASOR	F3-C-1	1000195878	FIELD					AI PLC	4 HILOS	F3-J05-EIN-05	MDT		1
F3-KT-0017	PROXIMITOR	GEAR SHAFT 1 KEYPHASOR	F3-C-1	1000195878	FIELD					AI PLC	4 HILOS	F3-J05-EIN-22	MDT		1
F3-SE-0060	SHAFT CONTROL PROBES	GEAR SPEED	F3-C-1	1000195878	FIELD					AI PLC	4 HILOS	F3-J05-EIN-03	MDT	Measuring Range: 0.8000 1/min	1
F3-ST-0060	PROXIMITOR	GEAR SPEED	F3-C-1	1000195878	FIELD					AI PLC	4 HILOS	F3-J05-EIN-03	MDT	Measuring Range: 0.8000 1/min	1
F3-TE-0410A8	BEARING RESISTANCE THERM	GEAR SHAFT 1 JOURN. BRG. DE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0410C0	BEARING RESISTANCE THERM	GEAR SHAFT 1 JOURN. BRG. DE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0411A8	BEARING RESISTANCE THERM	GEAR SHAFT 1 JOURN. BRG. NOE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0411C0	BEARING RESISTANCE THERM	GEAR SHAFT 1 JOURN. BRG. NOE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0412A8	BEARING RESISTANCE THERM	GEAR SHAFT 1 THRUST BRG. INBOARD	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0412C0	BEARING RESISTANCE THERM	GEAR SHAFT 1 THRUST BRG. INBOARD	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0419A8	BEARING RESISTANCE THERM	GEAR SHAFT 1 THRUST BRG. OUTBOARD	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0419C0	BEARING RESISTANCE THERM	GEAR SHAFT 1 THRUST BRG. OUTBOARD	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0414A8	BEARING RESISTANCE THERM	GEAR SHAFT 2 JOURN. BRG. DE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0414C0	BEARING RESISTANCE THERM	GEAR SHAFT 2 JOURN. BRG. DE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0415A8	BEARING RESISTANCE THERM	GEAR SHAFT 2 JOURN. BRG. NOE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0415C0	BEARING RESISTANCE THERM	GEAR SHAFT 2 JOURN. BRG. NOE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-04	MDT	Measuring Range: 0.150 °C	1
F3-TE-0417A8	BEARING RESISTANCE THERM	MAB JOURN. BRG. DE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-06	MDT	Measuring Range: 0.150 °C	1
F3-TE-0417C0	BEARING RESISTANCE THERM	MAB JOURN. BRG. DE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-06	MDT	Measuring Range: 0.150 °C	1
F3-TE-0419A8	BEARING RESISTANCE THERM	MAB JOURN. BRG. NOE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-06	MDT	Measuring Range: 0.150 °C	1
F3-TE-0419C0	BEARING RESISTANCE THERM	MAB JOURN. BRG. NOE	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-06	MDT	Measuring Range: 0.150 °C	1
F3-TE-0419A8	BEARING RESISTANCE THERM	MAB THRUST BRG. INBOARD 1	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-06	MDT	Measuring Range: 0.150 °C	1
F3-TE-0419C0	BEARING RESISTANCE THERM	MAB THRUST BRG. INBOARD 1	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-06	MDT	Measuring Range: 0.150 °C	1
F3-TE-0420A8	BEARING RESISTANCE THERM	MAB THRUST BRG. OUTBOARD	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-06	MDT	Measuring Range: 0.150 °C	1
F3-TE-0420C0	BEARING RESISTANCE THERM	MAB THRUST BRG. OUTBOARD	F3-C-1	1000195878	FIELD					AI PLC	PT100	F3-J05-EIN-06	MDT	Measuring Range: 0.150 °C	1
F3-VEVI-0013	ACCELERATION TRANSMITTER	GEAR CASING	F3-C-1	1000195878	FIELD					AI PLC	4 HILOS	F3-J05-EIN-03	MDT	Measuring Range: 0.25 mm/s	1

LISTA DE INSTRUMENTOS DE CAMPO
HARDWARE-SOFTWARE SIGNAL AND INSTRUMENT LIST

DATOS GENERALES				PLANO DE SITUACIÓN		CONEXIONES		TIPO SIGNAL	CONEXIONADO Y ALIMENTACIÓN		VARIABLES	
SIGLA TAG	TIPO INSTRUMENTO	SERVICIO	DIAGRAMA MECANICO	FASE	UBICACIÓN	ELECTRICA	NEUMATICA		CAJA / BORNIERO	ALIMENT.	REQUISICIÓN	NOTA
	INSTRUMENT TYPE	SERVICE	P&ID	PHASE	LOCATION	ELECTRICAL	PNEUMATIC	GRAL. SIST	JUNCT. BOX/TERM. STRIP	POWER	REQUISITION	NOTE
								PARTICULAR	TERMINALS			
F3VE-0017X	SHAFT CONTROL PROBES	MAB JOURN. BRG. DE	1000/19567/28 F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	F3-J05-EIN-05		MDT	Measuring Range 0.150 µm
F3VE-0017Y	SHAFT CONTROL PROBES	MAB JOURN. BRG. DE	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	F3-VT-0017Y		MDT	Measuring Range 0.150 µm
F3VE-0018X	SHAFT CONTROL PROBES	MAB JOURN. BRG. NDE	1000/19567/28	F3C-1	FIELD			AI_PLC	F3-J05-EIN-05		MDT	Measuring Range 0.150 µm
F3VE-0018Y	SHAFT CONTROL PROBES	MAB JOURN. BRG. NDE	1000/19567/28	F3C-1	FIELD			AI_PLC	F3-VT-0018Y		MDT	Measuring Range 0.150 µm
F3VE-0020X	SHAFT CONTROL PROBES	GEAR SHAFT 1 JOURN. BRG. DE	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	F3-J05-EIN-05		MDT	Measuring Range 0.150 µm
F3VE-0020Y	SHAFT CONTROL PROBES	GEAR SHAFT 1 JOURN. BRG. DE	1000/19567/28	F3C-1	FIELD			AI_PLC	F3-VT-0020Y		MDT	Measuring Range 0.150 µm
F3VE-0021X	SHAFT CONTROL PROBES	GEAR SHAFT 1 JOURN. BRG. NDE	1000/19567/28	F3C-1	FIELD			AI_PLC	F3-J05-EIN-22		MDT	Measuring Range 0.150 µm
F3VE-0021Y	SHAFT CONTROL PROBES	GEAR SHAFT 1 JOURN. BRG. NDE	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	F3-VT-0021Y		MDT	Measuring Range 0.150 µm
F3VE-0022X	SHAFT CONTROL PROBES	GEAR SHAFT 2 JOURN. BRG. DE	1000/19567/28	F3C-1	FIELD			AI_PLC	F3-J05-EIN-22		MDT	Measuring Range 0.150 µm
F3VE-0022Y	SHAFT CONTROL PROBES	GEAR SHAFT 2 JOURN. BRG. DE	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	F3-VT-0022X		MDT	Measuring Range 0.150 µm
F3VE-0023X	SHAFT CONTROL PROBES	GEAR SHAFT 2 JOURN. BRG. NDE	1000/19567/28	F3C-1	FIELD			AI_PLC	F3-J05-EIN-22		MDT	Measuring Range 0.150 µm
F3VE-0023Y	SHAFT CONTROL PROBES	GEAR SHAFT 2 JOURN. BRG. NDE	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	F3-VT-0023Y		MDT	Measuring Range 0.150 µm
F3VJT-0017X	PROXIMITOR	MAB JOURN. BRG. DE	1000/19567/28	F3C-1	FIELD			AI_PLC	F3-J05-EIN-05		MDT	Measuring Range 0.150 µm
F3VJT-0017Y	PROXIMITOR	MAB JOURN. BRG. DE	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	1A, 1R, 1N, 1P		MDT	Measuring Range 0.150 µm
F3VJT-0018X	PROXIMITOR	MAB JOURN. BRG. NDE	1000/19567/28	F3C-1	FIELD			AI_PLC	2A, 2R, 2N, 2P		MDT	Measuring Range 0.150 µm
F3VJT-0018Y	PROXIMITOR	MAB JOURN. BRG. NDE	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	4A, 4R, 4N, 4P		MDT	Measuring Range 0.150 µm
F3VJT-0020X	PROXIMITOR	GEAR SHAFT 1 JOURN. BRG. DE	1000/19567/28	F3C-1	FIELD			AI_PLC	5A, 5R, 5N, 5P		MDT	Measuring Range 0.150 µm
F3VJT-0020Y	PROXIMITOR	GEAR SHAFT 1 JOURN. BRG. DE	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	3A, 3R, 3N, 3P		MDT	Measuring Range 0.150 µm
F3VJT-0021X	PROXIMITOR	GEAR SHAFT 1 JOURN. BRG. NDE	1000/19567/28	F3C-1	FIELD			AI_PLC	F3-J05-EIN-22		MDT	Measuring Range 0.150 µm
F3VJT-0021Y	PROXIMITOR	GEAR SHAFT 1 JOURN. BRG. NDE	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	4A, 4R, 4N, 4P		MDT	Measuring Range 0.150 µm
F3VJT-0022X	PROXIMITOR	GEAR SHAFT 2 JOURN. BRG. DE	1000/19567/28	F3C-1	FIELD			AI_PLC	1A, 1R, 1N, 1P		MDT	Measuring Range 0.150 µm
F3VJT-0022Y	PROXIMITOR	GEAR SHAFT 2 JOURN. BRG. DE	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	2A, 2R, 2N, 2P		MDT	Measuring Range 0.150 µm
F3VJT-0023X	PROXIMITOR	GEAR SHAFT 2 JOURN. BRG. NDE	1000/19567/28	F3C-1	FIELD			AI_PLC	7A, 7R, 7N, 7P		MDT	Measuring Range 0.150 µm
F3VJT-0023Y	PROXIMITOR	GEAR SHAFT 2 JOURN. BRG. NDE	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	8A, 8R, 8N, 8P		MDT	Measuring Range 0.150 µm
F3ZE-0014A	SHAFT CONTROL PROBES	GEAR SHAFT 1 AXIAL DISPLACEMENT	1000/19567/28	F3C-1	FIELD			AI_PLC	5A, 5R, 5N, 5P		MDT	Measuring Range 0.150 µm
F3ZE-0014B	SHAFT CONTROL PROBES	GEAR SHAFT 1 AXIAL DISPLACEMENT	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	6A, 6R, 6N, 6P		MDT	Measuring Range 0.150 µm
F3ZE-0019A	SHAFT CONTROL PROBES	MAB THRUST BRG.	1000/19567/28	F3C-1	FIELD			AI_PLC	F3-J05-EIN-22		MDT	Measuring Range 0.150 µm
F3ZE-0019B	SHAFT CONTROL PROBES	MAB THRUST BRG.	F3-1-50-53 H01	F3C-1	FIELD			AI_PLC	F3-J05-EIN-03		MDT	Measuring Range -1. +1 mm
F3ZSH-0400A	PROXIMITY SWITCH	GEAR TURNING COVER	1000/19567/28	F3C-1	FIELD			DI_PLC	F3-ZT-0014A		MDT	Measuring Range -1. +1 mm
F3ZSH-0400B	PROXIMITY SWITCH	GEAR SHAFT 1 AXIAL DISPLACEMENT	F3-1-50-53 H01	F3C-1	FIELD			DI_PLC	F3-ZT-0014B		MDT	Measuring Range -1. +1 mm
F3ZSH-0400C	PROXIMITY SWITCH	GEAR SHAFT 1 AXIAL DISPLACEMENT	1000/19567/28	F3C-1	FIELD			DI_PLC	F3-J05-EIN-05		MDT	Measuring Range -1. +1 mm
F3ZSH-0400D	PROXIMITY SWITCH	GEAR SHAFT 1 AXIAL DISPLACEMENT	F3-1-50-53 H01	F3C-1	FIELD			DI_PLC	F3-J05-EIN-05		MDT	Measuring Range -1. +1 mm
F3ZSH-0400E	PROXIMITY SWITCH	GEAR SHAFT 1 AXIAL DISPLACEMENT	1000/19567/28	F3C-1	FIELD			DI_PLC	F3-J05-EIN-05		MDT	Measuring Range -1. +1 mm
F3ZSH-0400F	PROXIMITY SWITCH	GEAR SHAFT 1 AXIAL DISPLACEMENT	F3-1-50-53 H01	F3C-1	FIELD			DI_PLC	F3-J05-EIN-05		MDT	Measuring Range -1. +1 mm
F3-P-0086	PRESSURE GAUGE	MOTOR COOLER COOLING WATER SUPPLY	1000/19567/28	F3C-1	FIELD			AI_PLC			MDT	Measuring Range 0. -10 barg(g)
F3-TE-0400AB	BEARING RESISTANCE THERM.	MOTOR JOURN. BRG. NDE	1000/19567/28	F3C-1	FIELD			AI_PLC	F3-J05-EIN-02		MDT	Measuring Range 0.150 °C
			F3-1-50-53 H02	F3C-1	FIELD			AI_PLC	1A, 1R, 1N, 1P		MDT	Measuring Range -1. +1 mm
				F3C-1	FIELD			AI_PLC	2A, 2R, 2N, 2P		MDT	Measuring Range -1. +1 mm
				F3C-1	FIELD			AI_PLC	6A, 6R, 6N, 6P		MDT	Measuring Range -1. +1 mm
				F3C-1	FIELD			AI_PLC	7A, 7R, 7N, 7P		MDT	Measuring Range -1. +1 mm
				F3C-1	FIELD			DI_PLC	F3-J05-AL-42		MDT	Measuring Range -1. +1 mm
				F3C-1	FIELD			DI_PLC	2A, 2R, 2N, 2P		MDT	Measuring Range -1. +1 mm
				F3C-1	FIELD			DI_PLC	3A, 3R, 3N, 3P		MDT	Measuring Range -1. +1 mm
				F3C-1	FIELD			DI_PLC	4A, 4R, 4N, 4P		MDT	Measuring Range -1. +1 mm
				F3C-1	FIELD			DI_PLC	5A, 5R, 5N, 5P		MDT	Measuring Range -1. +1 mm
				F3C-1	FIELD			DI_PLC			MDT	Measuring Range 0. -10 barg(g)
				F3C-1	FIELD			AI_PLC			MDT	Measuring Range 0.150 °C

LISTA DE INSTRUMENTOS DE CAMPO
HARDWARE-SOFTWARE SIGNAL AND INSTRUMENT LIST

DATOS GENERALES			PLANO DE SITUACIÓN		CONEXIONES		TIPO SEÑAL		CONEXIONADO Y ALIMENTACIÓN		VARIABLES						
SIGLA TAG	TIPO INSTRUMENTO	SERVICIO	FASE	DIAGRAMA MECANICO	UBICACION	ELECTRICA	NEUMATICA	DE PROCESO	NEUMATICAS	GRAL. SIST	PARTICULAR	CAJA / BORNIERO	BOBINAS	ALIMENT.	REQUISICION	NOTA	REV
INSTRUMENT TYPE			PHASE	P&ID	LOCATION	LAYOUT	PNEUMATIC	PROCESS	PNEUMATIC	GRAL. SIST	PARTICULAR	JUNCT. BOX/TERM. STRIP	TERMINALS	POWER	REQUISITION	NOTE	
F3-TE-0400CD	BEARING RESISTANCE THERM.	MOTOR JOURN. BRG. NDE	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-EIN-02	2A, 2R, 2N, 2P		MDT	Measuring Range: 0.150 °C	1
F3-TE-0401AB	BEARING RESISTANCE THERM.	MOTOR JOURN. BRG. DE	F3-C-1	F3-1-50-S3 H02	FIELD					AI_PLC	PT100	F3-J05-EIN-02	1A, 1R, 1N, 1P		MDT	Measuring Range: 0.150 °C	1
F3-TE-0401CD	BEARING RESISTANCE THERM.	MOTOR JOURN. BRG. DE	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-EIN-02	4A, 4R, 4N, 4P		MDT	Measuring Range: 0.150 °C	1
F3-TE-0402A	BEARING RESISTANCE THERM.	MOTOR WINDINGS U	F3-C-1	F3-1-50-S3 H02	FIELD					AI_PLC	PT100	F3-J05-E-52	1A, 1R, 1N, 1P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0402B	BEARING RESISTANCE THERM.	MOTOR WINDINGS U	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-E-52	2A, 2R, 2N, 2P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0402C	BEARING RESISTANCE THERM.	MOTOR WINDINGS U	F3-C-1	F3-1-50-S3 H02	FIELD					AI_PLC	PT100	F3-J05-E-52	3A, 3R, 3N, 3P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0402D	BEARING RESISTANCE THERM.	MOTOR WINDINGS U	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-E-52	4A, 4R, 4N, 4P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0403A	BEARING RESISTANCE THERM.	MOTOR WINDINGS V	F3-C-1	F3-1-50-S3 H02	FIELD					AI_PLC	PT100	F3-J05-E-52	5A, 5R, 5N, 5P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0403B	BEARING RESISTANCE THERM.	MOTOR WINDINGS V	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-E-52	6A, 6R, 6N, 6P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0403C	BEARING RESISTANCE THERM.	MOTOR WINDINGS V	F3-C-1	F3-1-50-S3 H02	FIELD					AI_PLC	PT100	F3-J05-E-52	7A, 7R, 7N, 7P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0403D	BEARING RESISTANCE THERM.	MOTOR WINDINGS V	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-E-52	8A, 8R, 8N, 8P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0404A	BEARING RESISTANCE THERM.	MOTOR WINDINGS W	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-E-52	9A, 9R, 9N, 9P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0404B	BEARING RESISTANCE THERM.	MOTOR WINDINGS W	F3-C-1	F3-1-50-S3 H02	FIELD					AI_PLC	PT100	F3-J05-E-52	10A, 10R, 10N, 10P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0404C	BEARING RESISTANCE THERM.	MOTOR WINDINGS W	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-E-52	11A, 11R, 11N, 11P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0404D	BEARING RESISTANCE THERM.	MOTOR WINDINGS W	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-E-52	12A, 12R, 12N, 12P		MDT	Measuring Range: 0.200 °C	1
F3-TE-0406AB	RESISTANCE THERM. PT100	MOTOR COOLING AIR HOT	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-EIN-02	5A, 5R, 5N, 5P		MDT	Measuring Range: 0.150 °C	1
F3-TE-0407AB	RESISTANCE THERM. PT100	MOTOR COOLING AIR COLD	F3-C-1	F3-1-50-S3 H02	FIELD					AI_PLC	PT100	F3-J05-EIN-02	6A, 6R, 6N, 6P		MDT	Measuring Range: 0.100 °C	1
F3-TE-0407CD	RESISTANCE THERM. PT100	MOTOR COOLING AIR COLD	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-EIN-02	6A, 6R, 6N, 6P		MDT	Measuring Range: 0.100 °C	1
F3-TL-0408A	THERMOMETER	MOTOR COOLER COOLING	F3-C-1	F3-1-50-S3 H02	FIELD					AI_PLC	PT100	F3-J05-EIN-01			MDT	Measuring Range: 0.40 °C	1
F3-TL-0408B	THERMOMETER	MOTOR COOLER COOLING	F3-C-1	1000/19567/39	FIELD					AI_PLC	PT100	F3-J05-EIN-01			MDT	Measuring Range: 0.40 °C	1
F3-TL-0408C	THERMOMETER	MOTOR COOLER COOLING	F3-C-1	F3-1-50-S3 H02	FIELD					AI_PLC	PT100	F3-J05-EIN-01			MDT	Measuring Range: 0.60 °C	1
F3-TSV-0409A	TEMPERATURE RELIEF VALVE	MOTOR COOLER COOLING	F3-C-1	1000/19567/39	FIELD										MDT		1
F3-TSV-0409B	TEMPERATURE RELIEF VALVE	MOTOR COOLER COOLING	F3-C-1	1000/19567/39	FIELD										MDT		1
F3-TSV-0409C	TEMPERATURE RELIEF VALVE	MOTOR COOLER COOLING	F3-C-1	F3-1-50-S3 H02	FIELD										MDT		1
F3-TSV-0409D	TEMPERATURE RELIEF VALVE	MOTOR COOLER COOLING	F3-C-1	1000/19567/39	FIELD										MDT		1
F3-TW-0409A	THERMOWELL	MOTOR COOLER COOLING	F3-C-1	1000/19567/39	FIELD										MDT		1
F3-TW-0409B	THERMOWELL	MOTOR COOLER COOLING	F3-C-1	F3-1-50-S3 H02	FIELD										MDT		1
F3-VE-0010X	SHAFT CONTROL PROBES	MOTOR JOURN. BRG. NDE	F3-C-1	1000/19567/39	FIELD					AI_PLC	4 HILOS	F3-J05-EIN-01	F3-VT-0010X		MDT	Measuring Range: 0.150 µm	1
F3-VE-0010Y	SHAFT CONTROL PROBES	MOTOR JOURN. BRG. NDE	F3-C-1	1000/19567/39	FIELD					AI_PLC	4 HILOS	F3-J05-EIN-01	F3-VT-0010Y		MDT	Measuring Range: 0.150 µm	1
F3-VE-0011X	SHAFT CONTROL PROBES	MOTOR JOURN. BRG. DE	F3-C-1	F3-1-50-S3 H02	FIELD					AI_PLC	4 HILOS	F3-J05-EIN-01	F3-VT-0011X		MDT	Measuring Range: 0.150 µm	1
F3-VE-0011Y	SHAFT CONTROL PROBES	MOTOR JOURN. BRG. DE	F3-C-1	1000/19567/39	FIELD					AI_PLC	4 HILOS	F3-J05-EIN-01	F3-VT-0011Y		MDT	Measuring Range: 0.150 µm	1
F3-VT-0010X	PROXIMITOR	MOTOR JOURN. BRG. NDE	F3-C-1	1000/19567/39	FIELD					AI_PLC	4 HILOS	F3-J05-EIN-01	1A, 1R, 1N, 1P		MDT	Measuring Range: 0.150 µm	1
F3-VT-0010Y	PROXIMITOR	MOTOR JOURN. BRG. NDE	F3-C-1	1000/19567/39	FIELD					AI_PLC	4 HILOS	F3-J05-EIN-01	2A, 2R, 2N, 2P		MDT	Measuring Range: 0.150 µm	1
F3-VT-0011X	PROXIMITOR	MOTOR JOURN. BRG. DE	F3-C-1	1000/19567/39	FIELD					AI_PLC	4 HILOS	F3-J05-EIN-01	3A, 3R, 3N, 3P		MDT	Measuring Range: 0.150 µm	1
F3-VT-0011Y	PROXIMITOR	MOTOR JOURN. BRG. DE	F3-C-1	1000/19567/39	FIELD					AI_PLC	4 HILOS	F3-J05-EIN-01	4A, 4R, 4N, 4P		MDT	Measuring Range: 0.150 µm	1
F3-FO-0425	RESTRICTION ORIFICE	MOTOR LUBE OIL SUPPLY NDE	F3-C-1	1000/19567/40	FIELD										MDT		1
F3-FO-0426A	RESTRICTION ORIFICE	MOTOR JACKING OIL SUPPLY NDE	F3-C-1	1000/19567/40	FIELD										MDT		1
F3-FO-0426B	RESTRICTION ORIFICE	MOTOR LUBE OIL SUPPLY DE	F3-C-1	1000/19567/40	FIELD										MDT		1
F3-FO-0427	RESTRICTION ORIFICE	MOTOR JACKING OIL SUPPLY DE	F3-C-1	F3-1-50-S3 H03	FIELD										MDT		1
F3-FO-0428	RESTRICTION ORIFICE	MOTOR LUBE OIL SUPPLY DE	F3-C-1	1000/19567/40	FIELD										MDT		1
F3-FO-0429	RESTRICTION ORIFICE	MOTOR JACKING OIL SUPPLY DE	F3-C-1	1000/19567/40	FIELD										MDT		1
F3-FO-042A	RESTRICTION ORIFICE	GEAR CASING	F3-C-1	1000/19567/40	FIELD										MDT		1
F3-FO-042B	RESTRICTION ORIFICE	MAB LUBE OIL SUPPLY DE	F3-C-1	F3-1-50-S3 H03	FIELD										MDT		1

LISTA DE INSTRUMENTOS DE CAMPO HARDWARE-SOFTWARE SIGNAL AND INSTRUMENT LIST

[illegible]

LISTA DE INSTRUMENTOS DE CAMPO
HARDWARE-SOFTWARE SIGNAL AND INSTRUMENT LIST

DATOS GENERALES				PLANO DE SITUACIÓN		CONEXIONES		TIPO SEÑAL		CONEXIONADO Y ALIMENTACIÓN		VARIOS				
SIGLA TAG	TIPO INSTRUMENTO	SERVICIO	FASE	DIAGRAMA MECANICO	UBICACION	ELECTRICAL	PNEUMATIC	DE PROCESO	NEUMATICAS	GRAL. SST	PARTICULAR	CAJA/BORNERO	ALIMENT. POWER	REQUISICION	NOTA	REV
	INSTRUMENT TYPE	SERVICE	PHASE	P&ID	LOCATION	ELECTRICAL	PNEUMATIC	PROCESS	PNEUMATIC	GRAL. SST	PARTICULAR	JUNCT. BOX/TERM. STRIP	TERMINALS	REQUISITION	NOTE	REV
F3-FO-0437	RESTRICTION ORIFICE	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-FO-0438	RESTRICTION ORIFICE	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-FO-0439	RESTRICTION ORIFICE	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-LG-0462	LEVEL INDICATOR	OIL RESERVOIR 1	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-LG-0464	LEVEL INDICATOR	OVERHEAD RESERVOIR	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-LT-0461	RADAR LEVEL TRANSMITTER	OIL RESERVOIR	F3-C-1	10001956741 F3-1-50-53 H04	FIELD					AI PLC	4-20mA+HART	F3-05-EIN-08	+1,-1,1P	MDT	Measuring Range: 0.100 %	1
F3-LT-0463	RADAR LEVEL TRANSMITTER	OVERHEAD RESERVOIR	F3-C-1	10001956741 F3-1-50-53 H04	FIELD	F3-462-12				AI PLC	4-20mA+HART	F3-05-EIN-07	+4,-4,4P	MDT	Measuring Range: 0.100 %	1
F3-PCV-0850	CONTROL VALVE PRESSURE	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-PCV-0866	PRESSURE SELF-OPERATED VALVE	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-PDI-0851	DIFF. PRESSURE GAUGE	OIL FILTER	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT	Measuring Range: 0.2.5 bar(g)	1
F3-PDI-0850	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	OIL FILTER	F3-C-1	10001956741 F3-1-50-53 H04	FIELD					AI PLC	4-20mA+HART	F3-05-EIN-08	+5,-5,5P	MDT	Measuring Range: 0.1 bar(g)	1
F3-PI-0844	PRESSURE GAUGE	OIL PUMP SUCTION 3	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT	Measuring Range: -1.1 bar(g)	1
F3-PI-0845	PRESSURE GAUGE	OIL PUMP SUCTION 3	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT	Measuring Range: -1.1 bar(g)	1
F3-PI-0846	PRESSURE GAUGE	OIL PUMP DISCHARGE	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT	Measuring Range: 0.16 bar(g)	1
F3-PI-0848	PRESSURE GAUGE	OIL PUMP DISCHARGE	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT	Measuring Range: 0.16 bar(g)	1
F3-PI-0854	PRESSURE GAUGE	LUBE OIL HEADER	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT	Measuring Range: 0.10 bar(g)	1
F3-PI-0855	PRESSURE GAUGE	LUBE OIL ACCUMULATOR	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT	Measuring Range: 0.16 bar(g)	1
F3-PI-0856	PRESSURE GAUGE	OIL SIMULATION LINE	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT	Measuring Range: 0.16 bar(g)	1
F3-PSV-0450	PRESSURE RELIEF VALVE	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-PSV-0451	PRESSURE RELIEF VALVE	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-PSV-0452	PRESSURE RELIEF VALVE	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-PSV-0453	PRESSURE RELIEF VALVE	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-PSV-0552	PRESSURE RELIEF VALVE	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-PT-0843	ELECTR. PRESS. TRANS. WITH INDICATOR	OIL RESERVOIR	F3-C-1	10001956741 F3-1-50-53 H04	FIELD					AI PLC	4-20mA+HART	F3-05-EIN-08	+2,-2,2P	MDT	Measuring Range: 0.60 mbar	1
F3-PT-0947	ELECTR. PRESS. TRANS. WITH INDICATOR	OIL PUMP DISCHARGE	F3-C-1	10001956741 F3-1-50-53 H04	FIELD					AI PLC	4-20mA+HART	F3-05-EIN-08	+4,-4,4P	MDT	Measuring Range: 0.16 bar(g)	1
F3-PT-0949	ELECTR. PRESS. TRANS. WITH INDICATOR	OIL PUMP DISCHARGE	F3-C-1	10001956741 F3-1-50-53 H04	FIELD					AI PLC	4-20mA+HART	F3-05-EIN-08	+3,-3,3P	MDT	Measuring Range: 0.16 bar(g)	1
F3-PT-0857	ELECTR. PRESS. TRANS. WITH INDICATOR	OIL SIMULATION LINE	F3-C-1	10001956741 F3-1-50-53 H04	FIELD					AI PLC	4-20mA+HART	F3-05-EIN-08	+6,-6,6P	MDT	Measuring Range: 0.12 bar(g)	1
F3-PV-0842	POSITIONER	LUBE OIL PRESSURE CONTROL	F3-C-1	10001956741 F3-1-50-53 H04	FIELD				P-N0686-06-003	AO PLC	4-20mA+HART	F3-05-EIN-08	+12,-12,12P	MDT	Operating Range: 0.100 %	1
F3-SG-0407	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-SG-0408	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-SG-0409	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-SG-0410	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-SG-0411	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-SG-0412	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-SG-0413	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-SG-0414	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-SG-0415	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-SG-0416	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-SG-0417	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1
F3-SG-0418	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-53 H04	FIELD									MDT		1

LISTA DE INSTRUMENTOS DE CAMPO
HARDWARE-SOFTWARE SIGNAL AND INSTRUMENT LIST

DATOS GENERALES			PLANO DE SITUACIÓN		CONEXIONES		TIPO SEÑAL		CONEXIONADO Y ALIMENTACIÓN		VARIOS					
SIGLA TAG	TIPO INSTRUMENTO	SERVICIO	FASE	DIAGRAMA MECANICO	UBICACIÓN	ELECTRICA	NEUMATICA	DE PROCESO	NEUMATICAS	GRAL. SIST	PARTICULAR	CAJA / BORNERO	ALIMENT.	REQUISICIÓN	NOTA	REVISIÓN
	INSTRUMENT TYPE	SERVICE	PHASE	P&ID	LOCATION	ELECTRICAL	PNEUMATIC	PROCESS	PNEUMATICS	GRAL. SST	PARTICULAR	JUNCT. BOX/TERM. Strip	POWER	REQUISITION	NOTE	REV
F3-SG-0419	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT		1
F3-SG-0420	SIGHT GLASS	OIL UNIT	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT		1
F3-TE-0428	PT100 WITH HEAD TRANSMITTER	OIL RESERVOIR	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD					AI PLC	PT100	F3-TT-0428	-	MDT	Measuring Range: 0.100 °C	1
F3-TE-0432	PT100	OIL FILTER UPSTREAM	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD					AI PLC	PT100	F3-TT-0432	-	MDT	Measuring Range: 0.100 °C	1
F3-TE-0454	PT100	OIL RESERVOIR HEATER	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD					AI PLC	PT100	F3-TT-0454	-	MDT	Measuring Range: 0.100 °C	1
F3-TE-0455	PT100	OIL RESERVOIR HEATER	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD					AI PLC	PT100	F3-TT-0455	-	MDT	Measuring Range: 0.100 °C	1
F3-T-0427	THERMOMETER	OIL RESERVOIR	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT	Measuring Range: 0.100 °C	1
F3-T-0429	THERMOMETER	OIL PUMP DISCHARGE	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT	Measuring Range: 0.100 °C	1
F3-T-0430	THERMOMETER	OIL COOLER COOLING WATER RETURN 1	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT	Measuring Range: 0.100 °C	1
F3-T-0431	THERMOMETER	OIL COOLER COOLING WATER RETURN 1	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT	Measuring Range: 0.100 °C	1
F3-T-0433	THERMOMETER	OIL FILTER UPSTREAM 1	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT	Measuring Range: 0.100 °C	1
F3-TSHH-0454	CONTACT THERMOMETER	OIL RESERVOIR HEATER	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD					DI PLC	CLT	F3-J65-AL-48	+1,-1,1P	MDT		1
F3-TSHH-0455	CONTACT THERMOMETER	OIL RESERVOIR HEATER	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD					DI PLC	CLT	F3-J65-AL-48	+2,-2,2P	MDT		1
F3-TT-0428	ELECTR. TEMPERATURE TRANSMITTER	OIL RESERVOIR	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD					AI PLC	4-20mA+HART	F3-J65-EIN-08	+8,-8,8P	MDT	Measuring Range: 0.100 °C	1
F3-TT-0432	ELECTR. TEMPERATURE TRANSMITTER	OIL FILTER UPSTREAM	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD					AI PLC	4-20mA+HART	F3-J65-EIN-08	+8,-8,8P	MDT	Measuring Range: 0.100 °C	1
F3-TT-0454	ELECTR. TEMPERATURE TRANSMITTER	OIL RESERVOIR HEATER	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD					AI PLC	4-20mA+HART	F3-J65-EIN-08	+10,-10,10P	MDT	Measuring Range: 0.100 °C	1
F3-TT-0455	ELECTR. TEMPERATURE TRANSMITTER	OIL RESERVOIR HEATER	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD					AI PLC	4-20mA+HART	F3-J65-EIN-08	+14,-14,14P	MDT	Measuring Range: 0.100 °C	1
F3-TW-0427	THERMOWELL	OIL RESERVOIR	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT		1
F3-TW-0428	THERMOWELL	OIL RESERVOIR	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT		1
F3-TW-0429	THERMOWELL	OIL PUMP DISCHARGE	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT		1
F3-TW-0430	THERMOWELL	OIL COOLER COOLING WATER RETURN 1	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT		1
F3-TW-0431	THERMOWELL	OIL COOLER COOLING WATER RETURN 1	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT		1
F3-TW-0432	THERMOWELL	OIL FILTER UPSTREAM	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT		1
F3-TW-0433	THERMOWELL	OIL FILTER UPSTREAM 1	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD									MDT		1
F3-TY-0432	ELECTRO-HYDRAULIC CONVERTER	OIL FILTER UPSTREAM	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD				P-NI688-06-003	AO PLC	4-20mA+HART	F3-J65-EIN-08	+13,-13,13P	MDT	Operating Range: 0.100 %	1
F3-ZT-0842	POSITION MONITORING	LUBE OIL PRESSURE CONTROL	F3-C-1	10001956741 F3-1-50-S3 H04	FIELD					AI PLC	4-20mA+HART	F3-J65-EIN-08	+11,-11,11P	MDT	Measuring Range: 0.100 %	1
F3-HS-0448	PUSHBUTTON	SKID ESD BUTTON	F3-C-1	10001956742 F3-1-50-S3 H06	FIELD					DI PLC	CLT	F3-J65-IN-04	+1,-1,-2,-2,+3,-3	MDT		1
F3-HS-0449	PUSHBUTTON	SKID ESD BUTTON	F3-C-1	10001956742 F3-1-50-S3 H06	FIELD					DI PLC	CLT	F3-J65-IN-04	+1,-1,-2,-2,+3,-3	MDT		1

8 HOJA DE DATOS INSTRUMENTOS EXTERNOS AL SKID DEL COMPRESOR

		NUEVOS COMPRESORES EN FCC PARA MEJORA DE EFICIENCIA ENERGETICA				
		PROYECTO: ADI-1783 UNIDAD: F3 REF.: P-0016-2164-1668-14		HD-P-1668-J-004		
				HOJA 1		
				ELEMENTOS DE TEMPERATURA		REV.: 0
1	ITEM. / REVISIÓN.	1	0	2	0	
2	TAG N°.	F3-TE-438		F3-TE-439		
3	N° DE DIAGRAMA (P&ID).	F3-2-50-02		F3-2-50-02		
4	SERVICIO.	TEMPERAT. IMPULSIÓN F3-C-1		TEMPERAT. IMPULSIÓN F3-C-1		
5	LOCALIZACION	38"-A-F3-0201-At		36"-A-F3-0201-At		
6	FABRICANTE	(*)		(*)		
7	MODELO	(*)		(*)		
8	SUMINISTRADOR.	(*)		(*)		
CONDICIONES DE OPERACION						
9	FLUIDO.	AIRE		AIRE		
10	TEMPERATURA OPERACIÓN	209 °C		209 °C		
11	TEMPERATURA MAXIMA					
12	PRESION OPERACIÓN	3,08 kg/cm² (g)		3,08 kg/cm² (g)		
13	PRESION MAXIMA					
14	P. DISEÑO TEMP. DISEÑO	4,6 kg/cm² (g) 260 °C		4,6 kg/cm² (g) 260 °C		
ELEMENTO SENSIBLE						
15	TIPO	TERMOPAR TIPO K		TERMOPAR TIPO K		
16	SIMPLE	NO		NO		
17	DOBLE	SI		SI		
18	AISLADO DE MASA	SI		SI		
19	GALGA DE LOS HILOS	19 AWG		19 AWG		
20	MATERIAL FUNDA	INCONEL 600		INCONEL 600		
21	DIAMETRO FUNDA	6 mm		6 mm		
22	TIPO AISLAMIENTO	OXIDO MAGNESIO		OXIDO MAGNESIO		
23	LONGITUD AISLADA mm	(*)		(*)		
24						
25						
CABEZA DE CONEXIÓN						
26	MATERIAL	ALUMINIO		ALUMINIO		
27	PROTECCION	IP-65		IP-65		
28	CLASIFICACION ELECTRICA	Clase 1 Zona 2 IIA T3		Clase 1 Zona 2 IIA T3		
29	CONEXIÓN ELECTRICA	1/2" NPTH		1/2" NPTH		
30	TAPA	ROSCADA		ROSCADA		
31	CADENA	SI		SI		
TERMOPOZO						
32	TIPO	BARRA TALADRADA		BARRA TALADRADA		
33	CONEXIÓN A PROCESO	BRIDA 1 1/2" 150# RF		BRIDA 1 1/2" 150# RF		
34	MATERIAL	AISI 316		AISI 316		
35	LONGITUD "A"	447,7 mm		447,7 mm		
36	LONGITUD "B"	457,2 mm		457,2 mm		
37	LONGITUD "C"	508 mm		508 mm		
38	FIGURA ESTANDAR N°.	P65-B10 H15		P65-B10 H15		
ACCESORIOS						
39	UNION TRES PIEZAS	1/2" NPT AC. GALVANIZADO		1/2" NPT AC. GALVANIZADO		
40	NIPLES (DOS)	1/2" NPT AC. GALVANIZADO		1/2" NPT AC. GALVANIZADO		
41						
NOTAS:						
(*) A indicar por ofertante						
C						
B						
A						
1						
0	24/02/2016	Para aprobación y/o comentarios	A.M.U.	C.R.C.		
Rv.	FECHA	DESCRIPCION	REALIZADO	COMPROBADO		

		NUEVOS COMPRESORES EN FCC PARA MEJORA DE EFICIENCIA ENERGETICA		
		PROYECTO: ADI-1783		HD-P-1668-J-003
		UNIDAD: F3		HOJA 1
		REF.: P-0016-2164-1668-14		REV.: 0
		TRANSMISORES DE PRESION Y PRES. DIFER.		
1	ITEM / REVISIÓN	1 0	2 0	3 0
2	TAG N°.	F3-FT-44 A	F3-FT-44 B	F3-FT-445
3	N° DE DIAGRAMA (P&ID)	F3-2-50-02	F3-2-50-02	F3-2-50-02
4	SERVICIO	A A P F3- -1	A A P F3- -1	A A A A O
5	LOCALIZACION	36"-A-F3-0201-At	36"-A-F3-0201-At	-36"-A-1001-At
6	FABRICANTE			
7	MODELO			
8	SUMINISTRADOR			
CONDICIONES DE OPERACION				
9	FLUIDO	A	A	A
10	PRESION NORMAL	330	330	330
11	PRESION MAXIMA	675	675	675
12	TEMP.NORMAL	203 2	203 2	203 2
13	TEMP.MAXIMA			
14	PESO ESPECÍF. @ 15°C PESO MOLECULAR	2 5	2 5	2 5
15	PESO ESPECÍF. @ TEMPERAT. OPERACIÓN			
16	VISCOSIDAD (esp) @ TEMP. OPERACIÓN			
17	PRESIÓN DISEÑO	4 6	4 6	4 6
18	TEMPERATURA DISEÑO	260	260	266
19	PRESIÓN PRUEBA	7	7	7
20				
21				
GENERAL				
22	TIPO	O A	O A	O A
23	SERIE			
24	FUNCION	O O A A P F	O O A A P F	O O A A P F
25	SEÑAL DE SALIDA	4 20 A A	4 20 A A	4 20 A A
26	ALIMENTACION	24 2	25 2	26 2
27	MATERIAL CUERPO	A O	A O	A O
28	CONEXIÓN A PROCESO	12 P	12 P	12 P
29	CONEXIÓN ELECTRICA	12 P	12 P	12 P
30	MONTAJE	OPO 0 2	OPO 0 2	OPO 0 2
31	CLASIFICACION ELECTRICA	5	6	7
ELEMENTO DE MEDIDA				
32	TIPO			
33	MATERIAL	A O 316	A O 316	A O 316
34	SPAN MINIMO			
35	SPAN MAXIMO			
36	RANGO CALIBRACION	0 2 732	1 2 732	2 2 732
37	PROTECCION AMBIENTAL	P - 65	P - 65	P - 65
INDICADOR				
38	MONTAJE	A O	A O	A O
39	TAG N°.			
40	TIPO	A	A	A
41	ESCALA	0 2 732	0 2 732	0 2 732
42	UNIDAD			
43	FACTOR ESCALA	11	11	11
SEPARADOR				
44	BRIDA / MATERIAL			
45	MATERIAL CAPILAR / LONGITUD			
46	FLUIDO RELLENO SELLO			
47	REFERENCIA MODELO			
48	CONEXIÓN A PROCESO			
NOTAS:				
(*) A indicar por ofertante				
C				
B				
A				
1				
0	19/02/2016	Para aprobación y/o comentarios	A.M.U.	M.A.R.
Rv.	FECHA	DESCRIPCION	REALIZADO	COMPROBADO

		NUEVOS COMPRESORES EN FCC PARA MEJORA DE EFICIENCIA ENERGETICA			
		PROYECTO: ADI-1783 UNIDAD: F3 REF.: P-0016-2164-1668-14		HD-P-1668-J-003	
				HOJA 3	
		TRANSMISORES DE PRESION Y PRES. DIFER.		REV.: 0	
1	ITEM / REVISIÓN		0	0	
2	TAG N°.		F3- T-86	F3- T-864	
3	N° DE DIAGRAMA (P&ID)		F3-1-50-02	F3-1-50-02	
4	SERVICIO		A A P A F3- -1	A P F3- -1	
5	LOCALIZACION		1 00 00 -A-F3-0206-A	3 "-A-F3-0201-A	
6	FABRICANTE				
7	MODELO				
8	SUMINISTRADOR				
CONDICIONES DE OPERACION					
9	FLUIDO		A	A	
10	PRESION NORMAL		A	3 0	
11	PRESION MAXIMA				
12	TEMP.NORMAL		33 3	20	
13	TEMP.MAXIMA				
14	PESO ESPECÍF. @ 15°C PESO MOLECULAR		2 5	2 5	
15	PESO ESPECÍF. @ TEMPERAT. OPERACIÓN				
16	VISCOSIDAD (esp) @ TEMP. OPERACIÓN				
17	PRESIÓN DISEÑO		-0.014	4 6	
18	TEMPERATURA DISEÑO		33 3	260	
19	PRESIÓN PRUEBA		7	7	
20					
21					
GENERAL					
22	TIPO		O A	O A	
23	SERIE				
24	FUNCION		O O P	O O P	
25	SEÑAL DE SALIDA		4 20 A A	4 20 A A	
26	ALIMENTACION		24 2	24 2	
27	MATERIAL CUERPO		A O	A O	
28	CONEXIÓN A PROCESO		12 P	12 P	
29	CONEXIÓN ELECTRICA		12 P	12 P	
30	MONTAJE		OPO O 2	OPO O 2	
31	CLASIFICACION ELECTRICA		5	5	
ELEMENTO DE MEDIDA					
32	TIPO				
33	MATERIAL		A O 316	A O 316	
34	SPAN MINIMO				
35	SPAN MAXIMO				
36	RANGO CALIBRACION		-0.02 0	0 4	
37	PROTECCION AMBIENTAL		P - 65	P - 65	
INDICADOR					
38	MONTAJE		A O	A O	
39	TAG N°.				
40	TIPO		A	A	
41	ESCALA		-0.02 0	0 4	
42	UNIDAD				
43	FACTOR ESCALA		11	11	
SEPARADOR					
44	BRIDA / MATERIAL				
45	MATERIAL CAPILAR / LONGITUD				
46	FLUIDO RELLENO SELLO				
47	REFERENCIA MODELO				
48	CONEXIÓN A PROCESO				
NOTAS:					
(*) A indicar por ofertante					
C					
B					
A					
1					
0	19/02/2016	Para aprobación y/o comentarios	A.M.U.	M.A.R.	
Rv.	FECHA	DESCRIPCION	REALIZADO	COMPROBADO	

		NUEVOS COMPRESORES EN FCC PARA MEJORA DE EFICIENCIA ENERGETICA			
		PROYECTO: ADI-1783		HD-P-1668-J-003	
		UNIDAD: F3		HOJA 4	
		REF.: P-0016-2164-1668-14		REV.: 0	
		TRANSMISORES DE PRESION Y PRES. DIFER.			
1	ITEM / REVISIÓN	10	0		
2	TAG N°.	F3- T-865			
3	N° DE DIAGRAMA (P&ID)	F3-1-50-02			
4	SERVICIO	A P F3- -1			
5	LOCALIZACION	36"-A-F3-0201-A			
6	FABRICANTE				
7	MODELO				
8	SUMINISTRADOR				
CONDICIONES DE OPERACION					
9	FLUIDO	A			
10	PRESION NORMAL	3 0			
11	PRESION MAXIMA				
12	TEMP.NORMAL	20			
13	TEMP.MAXIMA				
14	PESO ESPECÍF. @ 15°C PESO MOLECULAR	2 5			
15	PESO ESPECÍF. @ TEMPERAT. OPERACIÓN				
16	VISCOSIDAD (esp) @ TEMP. OPERACIÓN				
17	PRESIÓN DISEÑO	4 6			
18	TEMPERATURA DISEÑO	260			
19	PRESIÓN PRUEBA	7			
20					
21					
GENERAL					
22	TIPO	O A			
23	SERIE				
24	FUNCION	O O P			
25	SEÑAL DE SALIDA	4 20 A A			
26	ALIMENTACION	24 2			
27	MATERIAL CUERPO	A O			
28	CONEXIÓN A PROCESO	12 P			
29	CONEXIÓN ELECTRICA	12 P			
30	MONTAJE	OPO O 2			
31	CLASIFICACION ELECTRICA	5			
ELEMENTO DE MEDIDA					
32	TIPO				
33	MATERIAL	A O 316			
34	SPAN MINIMO				
35	SPAN MAXIMO				
36	RANGO CALIBRACION	0 4			
37	PROTECCION AMBIENTAL	P - 65			
INDICADOR					
38	MONTAJE	A O			
39	TAG N°.				
40	TIPO	A			
41	ESCALA	0 4			
42	UNIDAD				
43	FACTOR ESCALA	11			
SEPARADOR					
44	BRIDA / MATERIAL				
45	MATERIAL CAPILAR / LONGITUD				
46	FLUIDO RELLENO SELLO				
47	REFERENCIA MODELO				
48	CONEXIÓN A PROCESO				
NOTAS:					
(*) A indicar por ofertante					
C					
B					
A					
1					
0	19/02/2016	Para aprobación y/o comentarios	A.M.U.	M.A.R.	
Rv.	FECHA	DESCRIPCION	REALIZADO	COMPROBADO	

		NUEVOS COMPRESORES EN FCC PARA MEJORA DE EFICIENCIA ENERGETICA			
		PROYECTO: ADI-1783		HD-P-1668-J-005	
		UNIDAD: F3		HOJA 1	
		REF.: P-0016-2164-1668-14		REV.: 0	
		TRANSMISORES DE TEMPERATURA			
1	ITEM. / REVISIÓN.	1	0	2	0
2	TAG N°.	F3-TT-438		F3-TT-439	
3	N° DE DIAGRAMA (P&ID).	F3-2-50-02		F3-2-50-02	
4	SERVICIO.	TEMPERAT. IMPULSIÓN F3-C-1		TEMPERAT. IMPULSIÓN F3-C-1	
5	LOCALIZACION	38"-A-F3-0201-At		36"-A-F3-0201-At	
6	FABRICANTE	(*)		(*)	
7	MODELO	(*)		(*)	
8	SUMINISTRADOR.	(*)		(*)	
CONDICIONES DE OPERACION					
9	FLUIDO.	AIRE		AIRE	
10	TEMPERATURA OPERACIÓN	209 °C		209 °C	
11	TEMPERATURA MAXIMA				
12	PRESION OPERACIÓN	3,08 kg/cm² (g)		3,08 kg/cm² (g)	
13	PRESION MAXIMA				
14	P. DISEÑO TEMP. DISEÑO	4,6 kg/cm² (g) 260 °C		4,6 kg/cm² (g) 260 °C	
GENERAL					
15	TIPO	O O A		O O A	
16	SERIE				
17	RANGO CALIBRACION	0 260		0 260	
18	SEÑAL ENTRADA	OPA PO		OPA PO	
19	SEÑAL SALIDA	4 20 A A		4 20 A A	
20	SPAN MINIMO				
21	SPAN MAXIMO				
22	ALIMENTACION ELECTRICA	24 2		24 2	
23	MATERIAL CUERPO	F O A O		F O A O	
24	CONEXIÓN A ELEMENTO SENSOR	12 P		12 P	
25	CONEXIÓN ELECTRICA	12 P		12 P	
26	MONTAJE	OPO O 2		OPO O 2	
27	PRECISION	0 02 PA		0 02 PA	
28	PROTECCION AMBIENTAL	P66		P66	
29	CLASIFICACION ELECTRICA	A O A 2 A 3		A O A 2 A 3	
ELEMENTO SENSOR					
30	CLASE	OPA		OPA	
31	TIPO	PO		PO	
32	CONEXIÓN	12 P		12 P	
33					
34					
35					
ACCESORIOS					
36	INDICADOR	A		A	
37	MONTAJE	A O		A O	
38	TIPO				
39	ESCALA	0 260		0 260	
40	UNIDAD				
41	FACTOR ESCALA	1 1		1 1	
42					
43					
NOTAS:					
(*) A indicar por ofertante					
D					
C					
B					
A					
0	24/02/2016	Para aprobación y/o comentarios		A.M.U.	C.R.C.
Rv.	FECHA	DESCRIPCION		REALIZADO	COMPROBADO

		NUEVOS COMPRESORES EN FCC PARA MEJORA DE EFICIENCIA ENERGETICA			
		PROYECTO: ADI-1783 UNIDAD: F3 REF.: P-0016-2164-1668-14		HD-P-1668-J-002	
				HOJA 1	
				REV.: 0	
TUBOS PITOT					
1	ITEM / REVISIÓN	1	0	2	0
2	TAG N°.	F3-FE-44		F3-FE-445	
3	N° DE DIAGRAMA (P&ID)	F3-1-50-02		F3-1-50-02	
4	SERVICIO	CAUDAL IMPULSION F3-C-1		CAUDAL A REGENERADOR	
5	IDENTIFICACIÓN TUBERIA	36"-A-F3-0201-At		R-36"-A-1001-At	
6	SCHEDULE	STD		STD	
7	DIAMETRO INTERIOR TUBERIA (mm)	895,36 mm		895,36 mm	
8	SUMINISTRADOR	(*)		(*)	
9					
10					
CONDICIONES DE OPERACION					
11	FLUIDO	AIRE		AIRE	
12	CAUDAL MÁXIMO	288732 kg/h (normal x 1.43)		288732 kg/h (normal x 1.43)	
13	CAUDAL NORMAL	201911 kg/h		201911 kg/h	
14	PRESIÓN	4,078 kg/cm² a		4,078 kg/cm² a	
15	TEMPERATURA	203,2 °C		203,2 °C	
16	PESO ESPECÍFICO @ 15°C PESO MOLECULAR	28,95 kg/kmol		28,95 kg/kmol	
17	PESO ESPECÍFICO @ TEMPERATURA OPERACIÓN				
18	VISCOSIDAD (esp) @ TEMPERATURA OPERACIÓN				
19	FACTOR COMPRESIBILIDAD (Z)	1.001		1.001	
20	FACTOR EXPANSIÓN				
21	CP / CV	1.388		1.388	
22	CALIDAD % RECALENTAMIENTO				
23	PRESIÓN BASE TEMPERATURA BASE				
24	PRESIÓN DISEÑO TEMPERATURA DISEÑO	4,6 kg/cm² g 260 °C		4,6 kg/cm² g 266 °C	
25	DENSIDAD				
ELEMENTO DE CAUDAL					
26	TIPO	ANNUBAR		ANNUBAR	
27	MATERIAL	AISI 316		AISI 316	
28	TRAMO MEDICION	VERTICAL SUBIENDO		VERTICAL SUBIENDO	
29	SENSOR TEMPERATURA	NO		NO	
30	CAUDAL MÍNIMO MEDIDOR	(*)		≤ 100000 Nm³/h (*) (NOTA 1)	
31	CAUDAL MÁXIMO MEDIDOR	(*)		(*)	
32	PRESIÓN DIFERENCIAL A CAUDAL MÁXIMO	(*)		(*)	
33	PERDIDA DE CARGA A CAUDAL MÁXIMO	(*)		(*)	
34	STANDARD PETRONOR N°				
35					
36					
CONEXIÓN A PROCESO					
37	TIPO DE CONEXIÓN	BRIDAS RF		RF	
38	TAMAÑO Y CLASE	(*) 150#		(*) 150#	
39	MATERIAL	ASTM A105		ASTM A105	
40	SOPORTE LADO OPUESTO	BRIDADO		BRIDADO	
41	ESPARRAGOS	ASTM A193 Gr.B7		ASTM A193 Gr.B7	
42	TUERCAS	HEXAGONAL ASTM A194 Gr.2H		HEXAGONAL ASTM A194 Gr.2H	
43	TIPO CABEZA	BLOQUE (2 x ½"NPTH)		BLOQUE (2 x ½"NPTH)	
44	VÁLVULAS	2 x BOLA INOX ½" NPT		2 x BOLA INOX ½" NPT	
45	MANIFOLD INTEGRADO	NO		NO	
46	STANDARD PETRONOR N°				
47					
NOTAS :					
(1) El sensor tiene que ser capaz de medir este caudal, con el que Petronor provoca un disparo de la unidad FCC.					
(*) A indicar por ofertante					
D					
C					
B					
A					
0	22/02/2016	Para aprobación y/o comentarios	A.M.U.	C.R.C.	
Rv.	FECHA	DESCRIPCION	REALIZADO	COMPROBADO	



ESTUDIOS E INGENIERIA APLICADA XXI, S.A.



PROYECTO :

NUEVOS COMPRESORES EN FCC PARA MEJORA DE EFICIENCIA ENERGETICA

TITULO DOCUMENTO :

LISTA DE CABLES DE INSTRUMENTACION

CLIENTE :

REPSOL

REFERENCIA CLIENTE :

ADI-1783

1	13/07/2016	AMU	MAR	FMS	CRC	ASB			
0	29/01/2016	AMU	MAR	FMS	CRC	ASB			
REV N°	FECHA	EDITA	VERIFI	REVIS	VALIDA	APROB			

N° DOCUMENTO : LCI-N1783-06

N° PROYECTO : P-0016-2164-1668-14

FECHA : 13/07/2016

REVISION / EDICION : 1

LISTA DE CABLES DE INSTRUMENTACIÓN

Nº DOCUMENTO :	LCI-M1783-06
FECHA:	13/07/2016
REVISION :	1
HQJA:	1 DE 3

REV.	DESIGNACIÓN	TENDIDO		KW	TENSIÓN	INTENSIDAD	CABLE					LONGITUD	PRENSA DE VIT		OBSERVACIONES
		DEBIDE	HABITA				ABRERO	ENTERRAMIENTOS	SOTANOS SUB	CONDUIT	Nº CONDO		COMPOSICION	TIPO S/ ESP. PARAS	
0	F3-MC55-EN-01	F3-H65-EN-01	F3-C-1-UP-1				45	0	0	5	18	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-02	F3-H65-EN-02	F3-C-1-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-03	F3-H65-EN-03	F3-C-1-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-04	F3-H65-EN-04	F3-C-1-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-05	F3-H65-EN-05	F3-C-1-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-06	F3-H65-EN-06	F3-C-1-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-07	F3-H65-EN-07	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
1	F3-MC55-EN-08	F3-H65-EN-08	F3-C-1-UP-1				45	0	0	5	48	50	1° WP	1° WP	Cambio de prensa de 1" a 1 1/2"
0	F3-MC55-EN-09	F3-H65-EN-09	F3-C-2-UP-1				45	0	0	5	18	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-10	F3-H65-EN-10	F3-C-2-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-11	F3-H65-EN-11	F3-C-2-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-12	F3-H65-EN-12	F3-C-2-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-13	F3-H65-EN-13	F3-C-2-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-14	F3-H65-EN-14	F3-C-2-UP-1				45	0	0	5	18	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-15	F3-H65-EN-15	F3-C-2-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-16	F3-H65-EN-16	F3-C-2-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-17	F3-H65-EN-17	F3-C-2-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
1	F3-MC55-EN-18	F3-H65-EN-18	F3-C-2-UP-1				45	0	0	5	48	50	1° WP	1° WP	Cambio de prensa de 1" a 1 1/2"
1	F3-MC55-EN-19	F3-H65-EN-19	F3-C-2-UP-1				45	0	0	5	48	50	1° WP	1° WP	Cambio de prensa de 1" a 1 1/2"
0	F3-MC55-EN-20	F3-H65-EN-20	F3-C-2-UP-1				45	0	0	5	24	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-21	F3-H65-EN-21	F3-C-2-UP-1				45	0	0	5	24	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-22	F3-H65-EN-22	F3-C-1-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-23	F3-H65-EN-23	F3-C-1-UP-1				45	0	0	5	36	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
1	F3-MC55-EN-24	F3-H65-EN-24	F3-C-1-UP-1				45	0	0	5	48	50	1° WP	1° WP	Cambio de prensa de 1" a 1 1/2"
0	F3-MC55-EN-25	F3-H65-EN-25	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-26	F3-H65-EN-26	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-27	F3-H65-EN-27	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-28	F3-H65-EN-28	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-29	F3-H65-EN-29	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-30	F3-H65-EN-30	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-31	F3-H65-EN-31	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-32	F3-H65-EN-32	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-33	F3-H65-EN-33	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-34	F3-H65-EN-34	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-35	F3-H65-EN-35	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-36	F3-H65-EN-36	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-37	F3-H65-EN-37	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-38	F3-H65-EN-38	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-39	F3-H65-EN-39	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-40	F3-H65-EN-40	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-41	F3-H65-EN-41	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-42	F3-H65-EN-42	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-43	F3-H65-EN-43	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-44	F3-H65-EN-44	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-45	F3-H65-EN-45	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-46	F3-H65-EN-46	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-47	F3-H65-EN-47	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-48	F3-H65-EN-48	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-49	F3-H65-EN-49	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-50	F3-H65-EN-50	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-51	F3-H65-EN-51	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-52	F3-H65-EN-52	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-53	F3-H65-EN-53	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-54	F3-H65-EN-54	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-55	F3-H65-EN-55	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-56	F3-H65-EN-56	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-57	F3-H65-EN-57	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-58	F3-H65-EN-58	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-59	F3-H65-EN-59	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-60	F3-H65-EN-60	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-61	F3-H65-EN-61	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-62	F3-H65-EN-62	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-63	F3-H65-EN-63	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-64	F3-H65-EN-64	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-65	F3-H65-EN-65	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-66	F3-H65-EN-66	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-67	F3-H65-EN-67	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-68	F3-H65-EN-68	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-69	F3-H65-EN-69	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-70	F3-H65-EN-70	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-71	F3-H65-EN-71	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-72	F3-H65-EN-72	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-73	F3-H65-EN-73	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-74	F3-H65-EN-74	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-75	F3-H65-EN-75	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-76	F3-H65-EN-76	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-77	F3-H65-EN-77	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-78	F3-H65-EN-78	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-79	F3-H65-EN-79	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-80	F3-H65-EN-80	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-81	F3-H65-EN-81	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-82	F3-H65-EN-82	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-83	F3-H65-EN-83	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-84	F3-H65-EN-84	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-85	F3-H65-EN-85	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP	[*] En especificaciones solo viene cable de 1.5 para no mineros municipal
0	F3-MC55-EN-86	F3-H65-EN-86	F3-C-1-UP-1				45	0	0	5	12	50	1° WP	1° WP</	

LISTA DE CABLES

DE INSTRUMENTACIÓN

REV.	DESIGNACIÓN	TENDIDO		KW	TENSIÓN	INTENSIDAD	CABLE					PRENSA ELEC. V		OBSERVACIONES			
		DESDE	HASTA				SECTORES SUB	COND.	COMPOSICIÓN	TIPO	SECTORES	ORIGEN	DESTINO				
0	F3-TT-440	F3-TT-440	F3-J65-E-54				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-JT-685	F3-JT-685	F3-J65-E-54				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-439	F3-TE-439	F3-TT-439				30	0	0	0	2	2x1.3mm ²	2A	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-439	F3-TT-439	F3-J65-E-54				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-POT-861	F3-POT-861	F3-J65-E-57				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-POT-862	F3-POT-862	F3-J65-E-57				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-POT-863	F3-POT-863	F3-J65-E-57				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-26-22A	F3-26-22A	F3-J65-AI-67				25	0	0	5	2	2x1.5mm ²	3C	30	Nº MPT	Nº MPT	
0	F3-25-22B	F3-25-22B	F3-J65-AI-67				25	0	0	5	2	2x1.5mm ²	3C	30	Nº MPT	Nº MPT	
0	F3-JT-148	F3-JT-148	F3-J65-E-06 (NOUJ)				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-JT-158	F3-JT-158	F3-J65-E-06 (NOUJ)				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-LSHH-13A	F3-LSHH-13A	F3-J65-IN-10				25	0	0	5	2	2x1.5mm ²	3A	30	Nº MPT	Nº MPT	Cambio LT por LSH (especificación 1A por 3A). Cambio a cable F3-J65-IN-10
1	F3-LSHH-13B	F3-LSHH-13B	F3-J65-IN-10				25	0	0	5	2	2x1.5mm ²	3A	30	Nº MPT	Nº MPT	Cambio LT por LSH (especificación 1A por 3A). Cambio a cable F3-J65-IN-10
1	F3-LSHH-13C	F3-LSHH-13C	F3-J65-IN-10				25	0	0	5	2	2x1.5mm ²	3A	30	Nº MPT	Nº MPT	Cambio LT por LSH (especificación 1A por 3A). Cambio a cable F3-J65-IN-10
1	F3-2L-1201	F3-2L-1201	F3-J65-IN-10				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	Cambio a cable F3-J65-IN-10
0	F3-JT-954	F3-JT-954	F3-J65-E-59				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-POT-955	F3-POT-955	F3-J65-E-59				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-945	F3-TE-945	F3-TT-945				30	0	0	0	2	2x1.3mm ²	2A	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-945	F3-TT-945	F3-J65-E-59				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-JT-956	F3-JT-956	F3-J65-E-59				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-945A	F3-TE-945A	F3-TT-945A				30	0	0	0	3	3x1.5mm ²	1B	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-945A	F3-TT-945A	F3-J65-EN-21				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-945B	F3-TE-945B	F3-TT-945B				30	0	0	0	3	3x1.5mm ²	1B	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-945B	F3-TT-945B	F3-J65-EN-21				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-945C	F3-TE-945C	F3-TT-945C				30	0	0	0	3	3x1.5mm ²	1B	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-945C	F3-TT-945C	F3-J65-EN-21				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-JT-957	F3-JT-957	F3-J65-E-59				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-946	F3-TE-946	F3-TT-946				30	0	0	0	2	2x1.3mm ²	2A	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-946	F3-TT-946	F3-J65-E-59				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-JT-573	F3-JT-573	F3-J65-E-59				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TSH-23	F3-TSH-23	F3-J65-IN-10				25	0	0	5	2	2x1.5mm ²	3A	30	Nº MPT	Nº MPT	Cambio a cable F3-J65-IN-10
0	F3-TE-26A	F3-TE-26A	F3-TT-26A				30	0	0	0	2	2x1.3mm ²	2A	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-25A	F3-TT-25A	F3-J65-EN-21				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-25B	F3-TE-25B	F3-TT-25B				30	0	0	0	2	2x1.3mm ²	2A	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-25B	F3-TT-25B	F3-J65-EN-21				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-25C	F3-TE-25C	F3-TT-25C				30	0	0	0	2	2x1.3mm ²	2A	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-26C	F3-TT-26C	F3-J65-EN-21				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-2LH-1202	F3-2LH-1202	F3-J65-IN-10				25	0	0	5	2	2x1.5mm ²	3A	30	Nº MPT	Nº MPT	Cambio a cable F3-J65-IN-10
0	F3-TT-573	F3-TT-573	F3-J65-E-61				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-2L-573	F3-2L-573	F3-J65-IN-07				25	0	0	5	2	2x1.5mm ²	3C	30	Nº MPT	Nº MPT	
0	F3-26H-573	F3-26H-573	F3-J65-IN-07				25	0	0	5	2	2x1.5mm ²	3C	30	Nº MPT	Nº MPT	
0	F3-JT-573	F3-JT-573	F3-J65-E-61				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-J65-573	F3-J65-573	F3-J65-E-61				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-JT-556	F3-JT-556	F3-J65-E-06 (NOUJ)				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-JT-556	F3-JT-556	F3-JT-556				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-JT-1000	F3-JT-1000	F3-JT-1000				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-LSHH-15A	F3-LSHH-15A	F3-J65-IN-10				25	0	0	5	2	2x1.5mm ²	3A	30	Nº MPT	Nº MPT	Cambio LT por LSH (especificación 1A por 3A). Cambio a cable F3-J65-IN-10
1	F3-LSHH-15B	F3-LSHH-15B	F3-J65-IN-10				25	0	0	5	2	2x1.5mm ²	3A	30	Nº MPT	Nº MPT	Cambio LT por LSH (especificación 1A por 3A). Cambio a cable F3-J65-IN-10
1	F3-LSHH-15C	F3-LSHH-15C	F3-J65-IN-10				25	0	0	5	2	2x1.5mm ²	3A	30	Nº MPT	Nº MPT	Cambio LT por LSH (especificación 1A por 3A). Cambio a cable F3-J65-IN-10
1	F3-2L-1203	F3-2L-1203	F3-J65-IN-10				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-POT-960	F3-POT-960	F3-J65-E-60				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-948	F3-TE-948	F3-TT-948				30	0	0	0	2	2x1.3mm ²	2A	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-948	F3-TT-948	F3-J65-E-60				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-JT-959	F3-JT-959	F3-J65-E-60				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-948A	F3-TE-948A	F3-TT-948A				30	0	0	0	3	3x1.5mm ²	1B	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-948A	F3-TT-948A	F3-J65-EN-21				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-948B	F3-TE-948B	F3-TT-948B				30	0	0	0	3	3x1.5mm ²	1B	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-948B	F3-TT-948B	F3-J65-EN-21				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-948C	F3-TE-948C	F3-TT-948C				30	0	0	0	3	3x1.5mm ²	1B	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-948C	F3-TT-948C	F3-J65-EN-21				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-JT-958	F3-JT-958	F3-J65-E-60				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-947	F3-TE-947	F3-TT-947				30	0	0	0	2	2x1.3mm ²	2A	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-947	F3-TT-947	F3-J65-E-60				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
0	F3-JT-574	F3-JT-574	F3-J65-E-60				30	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TSH-18	F3-TSH-18	F3-J65-IN-10				25	0	0	5	2	2x1.5mm ²	3A	30	Nº MPT	Nº MPT	Cambio a cable F3-J65-IN-10
1	F3-TE-26A	F3-TE-26A	F3-TT-26A				30	0	0	0	2	2x1.3mm ²	2A	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-26A	F3-TT-26A	F3-J65-EN-21				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-26B	F3-TE-26B	F3-TT-26B				30	0	0	0	2	2x1.3mm ²	2A	10	Nº MPT	Nº MPT	Nuevo cable.
0	F3-TT-26B	F3-TT-26B	F3-J65-EN-21				25	0	0	5	2	2x1.5mm ²	1A	30	Nº MPT	Nº MPT	
1	F3-TE-26C	F3-TE-26C	F3-TT-26C				30	0	0	0	2	2x1.3mm ²	2A	10	Nº MPT	Nº MPT	Nuevo cable.

LISTA DE CABLES DE INSTRUMENTACIÓN

[illegible]

10 LISTA DE SEÑALES CABLEADAS AL SCD

REV. Rev.	NOMBRE LAZO Loop_Name	TAG Tag_Name	TAG_DCS Tag_DCS	SERVICE Service	P&ID P&ID	LOCALIZACIÓN Location	ESTADO Status	TIPO I/E/S IO_Type	TIPO ESPECÍFICO I/E/S Specific_IO_Type	SISTEMA System	SEGURIDAD INTRÍNSECA Intrinsic Safety	REDUNDANCIA Redundance	ACCIÓN VALVULA Valve_Action	MULTICABLE Multicable	PAR Pair	ALIMENTACIÓN Power Supply	TENSION Power Supply	SALA DE RACKS Rack_Room	CABINA Cabinet	REGLETERO Terminal Block	BORNAS Terminals	BARRERA Barrier
0		F3-F0446	9F00446	CAUDAL A REGENERADOR	P3-2-50-02	CAMPO	NUOVO	AI	4-20 mA	SCD	SI	RED	NO APLICA	HOLD	HOLD	24Vdc	24Vdc	Sala Racks P3	HOLD	HOLD	HOLD	IMT-4041B
0		F3-I0402	9F00402	INTENSIDAD MOTOR F3-C-1	P3-2-50-02	CAMPO	NUOVO	AI	4-20 mA	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-3	1	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-3	±1	---
0		F3-XI-100A	9X0100A	DESVIACIÓN LÍNEA DE SURGE	P3-2-50-02	CAMPO	EXISTENTE	AI	4-20 mA	SCD	NSI	RED	NO APLICA	F3-C-1 LP-1-3	2	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-3	±2	---
0		F3-XY-100A	9XY100A	CONSIGNA REMOTA DE CAUDAL	P3-2-50-02	CAMPO	EXISTENTE	AO	4-20 mA	SCD	NSI	RED	NO APLICA	F3-C-1 LP-1-3	3	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-3	±3	---
0		F3-UC-0047	9H00047	LOW CLAMP F3-C-1	P3-2-50-02	CAMPO	NUOVO	AO	4-20 mA	SCD	NSI	RED	NO APLICA	F3-C-1 LP-1-3	4	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-3	±4	---
0		F3-XAH1-0452	9XAH0452	DISP. 3er EVENTO DE SURGE F3-C-1	P3-2-50-02	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-4	1	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-4	±1	---
0		F3-ZAH1-0014	9ZAH014	DISP. DESPL. AXIAL ACOPIR. F3-C-1	MAN 10001966738	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-4	2	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-4	±2	---
0		F3-ZAH1-0019	9ZAH019	DISP. DESPL. AXIAL COMPRESOR F3-C-1	MAN 10001966738	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-4	3	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-4	±3	---
0		F3-TAHH-0421	9TAHH041	DISP. TEMP. ACOPIRAMIENTO F3-C-1	MAN 10001966738	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-4	4	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-4	±4	---
0		F3-VAH1-0020	9VAHH020	DISP. TEMPERATURA COMPRESOR F3-C-1	MAN 10001966738	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-4	5	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-4	±5	---
0		F3-VAH1-0025	9VAHH025	DISP. VIBRACIÓN ACOPIRAMIENTO F3-C-1	MAN 10001966738	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-4	6	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-4	±6	---
0		F3-TAHH-0405	9TAHH05	DISP. TEMPERATURA MOTOR F3-C-1	MAN 10001966739	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-4	7	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-4	±7	---
0		F3-TAHH-0406	9TAHH06	DISP. TEMPERATURA DEV. MOTOR F3-C-1	MAN 10001966739	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-4	8	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-4	±8	---
0		F3-VAH1-0042	9VAHH042	DISP. VIBRACIÓN MOTOR F3-C-1	MAN 10001966739	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-4	9	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-4	±9	---
0		F3-PAL-0841	9PAL081	DISP. PRESIÓN LÍBIE F3-C-1	MAN 10001966739	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-4	10	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-4	±10	---
0		F3-TAH-0405	9TAH045	ALARMA TEMP. MOTOR F3-C-1	MAN 10001966740	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-4	11	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-4	±11	---
0		F3-TAH-0406	9TAH046	ALARMA TEMP. DEV. MOTOR F3-C-1	MAN 10001966742	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-5	1	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-5	±1	---
0		F3-VAH-0042	9VAH042	ALARMA VIBRACIÓN MOTOR F3-C-1	MAN 10001966742	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-5	2	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-5	±2	---
0		F3-XAH-0014	9XAH014	ALARMA ACOPIRAMIENTO F3-C-1	MAN 10001966742	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-5	3	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-5	±3	---
0		F3-XAH-0019	9XAH019	ALARMA COMPRESOR F3-C-1	MAN 10001966742	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-5	4	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-5	±4	---
0		F3-TAH-0421	9TAH041	ALARMA TEMP. COMPRESOR F3-C-1	MAN 10001966742	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-5	5	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-5	±5	---
0		F3-PAL-0841	9PAL081	ALARMA PRESIÓN LÍBIE F3-C-1	MAN 10001966742	CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-5	6	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-5	±6	---
0						CAMPO	NUOVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-1 LP-1-5	7	Diseño Tarjeta	24Vdc	Sala Racks P3	HOLD	F3-C-1 LP-1-5	±7	---

REV	NOMBRE LADO Lado_Name	TAG Tag_Name	ACCESORIOS Accessories	DISPOSITIVO I/S Input_Control_Device	BASTIDOR 01 Base_L1	TABERNA 01 Comp_L1	TABERNA 02 Comp_L2	CANAL 01 Channel_L1	CANAL 02 Channel_L2	NOTAS Remarks	RANGO MÍNIMO Min_Value	RANGO MÁXIMO Max_Value	UNIDAD INGENIERIA Engineering_Unit	CARACTERIZACIÓN Characterization	ESQUEMA DE CONTROL Control_Scheme	ACCION CONTROL Control_Action	PALETRA CLAVE Payload_Key	ÁREA Area	UNIDAD Unit	CONSEJO Comments
0		F3-T0445	NO APLICA	HOLD (FITA AI NUEVA)	HOLD	HOLD	HOLD	NO APLICA	NO APLICA		0	288732	kg/h	LINEAL	1	--	HOLD	CONVERSIÓN	HOLD	
0		F3-U0402	NO APLICA	HOLD (FITA AI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD		0	1000	A	LINEAL	1	--	HOLD	CONVERSIÓN	HOLD	
0		F3-M-100A	NO APLICA	HOLD (FITA AI EXIST.)	HOLD	HOLD	HOLD	NO APLICA	NO APLICA		0	100	%	LINEAL	3	--	HOLD	CONVERSIÓN	HOLD	
0		F3-XY-100A	NO APLICA	HOLD (FITA AO EXIST.)	HOLD	HOLD	HOLD	NO APLICA	NO APLICA		0	100	%	LINEAL	3	--	HOLD	CONVERSIÓN	HOLD	
0		F3-HC0417	NO APLICA	HOLD (FITA AO NUEVA)	HOLD	HOLD	HOLD	NO APLICA	NO APLICA		0	100	%	LINEAL	2	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0445	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	NO APLICA	NO APLICA	NO APLICA		--	--	--	--	--	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0014	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0019	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0416	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0421	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0020	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0025	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0405	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-044x	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0402	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-PALL-0841	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AH-0405	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AH-040x	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0042	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0014	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-1019	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0421	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-PAL-0841	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-FT-56	NO APLICA	HOLD (FITA AI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		0	111328	kg/h	LINEAL	1	--	HOLD	CONVERSIÓN	HOLD	
0		F3-FT-58	NO APLICA	HOLD (FITA AI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		0	109403	kg/h	LINEAL	1	--	HOLD	CONVERSIÓN	HOLD	
0		F3-PT-14B	NO APLICA	HOLD (FITA AI NUEVA)	HOLD	HOLD	HOLD	NO APLICA	NO APLICA		0	2 kg/m ³ (g)		LINEAL	3	--	HOLD	CONVERSIÓN	HOLD	
0		F3-PT-15B	NO APLICA	HOLD (FITA AI NUEVA)	HOLD	HOLD	HOLD	NO APLICA	NO APLICA		0	2 kg/m ³ (g)		LINEAL	3	--	HOLD	CONVERSIÓN	HOLD	
0		F3-L0903	NO APLICA	HOLD (FITA AI NUEVA)	HOLD	NO APLICA	NO APLICA	NO APLICA	NO APLICA		0	300	A	LINEAL	1	--	HOLD	CONVERSIÓN	HOLD	
0		F3-PT-15	NO APLICA	HOLD (FITA AO EXIST.)	HOLD	HOLD	HOLD	NO APLICA	NO APLICA		0	100	%	LINEAL	3	--	HOLD	CONVERSIÓN	HOLD	
0		F3-HC-6530	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	HOLD	HOLD	NO APLICA	NO APLICA		0	100	%	LINEAL	2	--	HOLD	CONVERSIÓN	HOLD	
0		F3-HC-6531	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	HOLD	HOLD	NO APLICA	NO APLICA		0	100	%	LINEAL	2	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-13B	NO APLICA	HOLD (FITA DI EXIST.)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-15B	NO APLICA	HOLD (FITA DI EXIST.)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-25A	NO APLICA	HOLD (FITA DI EXIST.)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-26A	NO APLICA	HOLD (FITA DI EXIST.)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0945	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0948	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-044x	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-040x	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0442	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0917	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0949	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0980	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0081	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0940	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0924	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	
0		F3-AHH-0952	NO APLICA	HOLD (FITA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	NO APLICA		--	--	--	--	5	--	HOLD	CONVERSIÓN	HOLD	



REV. Rev.	NOMBRE LAZO Loop_Name	TAG Tag_Name	GRÁFICO Graphic	VALOR DISPARO Set	ALARMA HH HH_Alarm	ALARMA H H_Alarm	ALARMA L L_Alarm	ALARMA LL LL_Alarm	ALARMA DIGITAL DigL_Alarm	ESTADO ON Dr_State	DESCRIPCION ON Op_Descript	COLOR ON On_Color	ESTADO OFF Off_Status	DESCRIPCION OFF Off_Descript	COLOR OFF Off_Color	PRIORIDAD H H_Priority	PRIORIDAD HH HH_Priority	PRIORIDAD L L_Priority	PRIORIDAD LL LL_Priority	PRIORIDAD DIGITAL DigL_Priority
0		F3-FT-0445	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-IJ-0202	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-XI-100A	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-XY-100A	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-HC-0072	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-XAHH-0452	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-ZAHH-0014	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-ZAHH-0519	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-0416	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-0421	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-VAHH-0200	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-VAHH-0225	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-0405	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-04xx	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-VAHH-0342	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-PALL-0841	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-0405	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-04xx	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-VAHH-0042	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-XAHH-0014	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-XAHH-0019	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-0421	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-PAL-0841	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-FT-56	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-FT-58	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-PT-148	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-PT-158	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-IJ-0903	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-PV-15	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-HC-0530	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-HC-0531	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-LAHH-138	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-LAHH-158	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-25A	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-26A	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-0945	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-0948	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-0902	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-04xx	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-0917	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-VAHH-0042	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-VAHH-0048	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-SAHH-0060	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-SAHH-0081	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-ZAHH-0040	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-TAHH-0924	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
0		F3-VAHH-0302	HOLD	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

REV Rev.	NOMBRE LAZO Loop Name	TAG Tag Name	TAG DCS Tag_DCS	SERVICE Service	RID RID	LOCALIZACIÓN Location	ESTADO Status	TIPO I/S ID_Type	TIPO ESPECÍFICO I/S Specific_ID_Type	SISTEMA System	SEGURIDAD INTRÍNSECA Intrinsic Safety	REDUNDANCIA Redundance	ACCIÓN VALVULA Valve_Action	MULTICABLE Multicable	PAR Pair	ALIMENTACIÓN Power Supply	TENSION Power Supply	SALA DE RACKS Rack_Room	CABINA Cabinet	REGLETTERO Terminal Block	BOINAS Terminals	BARRERA Barrier
0		FSZAHH-0041	9ZAHH041	DISP. DESPL. AXIAL COMPRESOR F3-C-2	MAN 10001983179	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-2-LP-1-4	17	Diseño Targela	24Vdc	Sala Racks P3	HOLD	F3-C-2-LP-1-4	#17	—
0		FSFALL-0919	9FALL919	DISP. PRESIÓN LUBE F3-C-2	MAN 10001983180	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-2-LP-1-4	18	Diseño Targela	24Vdc	Sala Racks P3	HOLD	F3-C-2-LP-1-4	#18	—
0		FSFAHH-0934	9FAHH934	DISP. TEMP. ACEITE ACOPL. F3-C-2	MAN 10001983181	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-2-LP-1-4	19	Diseño Targela	24Vdc	Sala Racks P3	HOLD	F3-C-2-LP-1-4	#19	—
0		FSFDALL-0952	9FALL952	DISP. PRESIÓN SELLO GAS F3-C-2	MAN 10001983183	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-2-LP-1-4	20	Diseño Targela	24Vdc	Sala Racks P3	HOLD	F3-C-2-LP-1-4	#20	—
0		FSFDALL-0953	9FALL953	DISP. PRESIÓN SELLO GAS F3-C-2	MAN 10001983183	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	F3-C-2-LP-1-4	21	Diseño Targela	24Vdc	Sala Racks P3	HOLD	F3-C-2-LP-1-4	#21	—
0		FSFAH-0902	9FAH092	ALARMA TEMP. MOTOR F3-C-2	MAN 10001983184	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	453-MC-K-402A	6	Diseño Targela	24Vdc	Sala Racks P3	HOLD	453-MC-K-402A	#6	—
0		FSFAH-090x	9FAH090x	ALARMA TEMP. DEV. MOTOR F3-C-2	MAN 10001983184	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	453-MC-K-402A	7	Diseño Targela	24Vdc	Sala Racks P3	HOLD	453-MC-K-402A	#7	—
0		FSVAH-0042	9VAH042	ALARMA VIBRACIÓN MOTOR F3-C-2	MAN 10001983184	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	453-MC-K-402A	9	Diseño Targela	24Vdc	Sala Racks P3	HOLD	453-MC-K-402A	#9	—
0		FSXAH-0014	9XAH014	ALARMA ACOPLAMIENTO F3-C-2	MAN 10001983184	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	453-MC-K-402A	1	Diseño Targela	24Vdc	Sala Racks P3	HOLD	453-MC-K-402A	#1	—
0		FSXAH-0019	9XAH019	ALARMA COMPRESOR F3-C-2	MAN 10001983184	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	453-MC-K-402A	2	Diseño Targela	24Vdc	Sala Racks P3	HOLD	453-MC-K-402A	#2	—
0		FS5AH-0080	95AH080	ALARMA VELOCIDAD ACOPL. F3-C-2	MAN 10001983184	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	453-MC-K-402A	4	Diseño Targela	24Vdc	Sala Racks P3	HOLD	453-MC-K-402A	#4	—
0		FS5AH-0081	95AH081	ALARMA VEL. SUPERPOS. ACOPL. F3-C-2	MAN 10001983184	CAMPO	NIUEVO	DI	CLP	SCD	NSI	NO RED	NO APLICA	453-MC-K-402A	8	Diseño Targela	24Vdc	Sala Racks P3	HOLD	453-MC-K-402A	#8	—

REV Rev.	NOMBRE LAZO Loop Name	TAG Tag Name	ACCESORIOS Accessories	DISPOSITIVO I/F Input/Output Device	BASTIDOR 01 Rack_01	BASTIDOR 02 Rack_02	TABLITA 01 Card_01	TABLITA 02 Card_02	CANAL 01 Channel_01	CANAL 02 Channel_02	NOTAS Remark	RANGO MINIMO Min_Int_Range	RANGO MAXIMO Max_Int_Range	UNIDAD INGENIERIA Engineering Unit	CARACTERIZACION Characterization	ESQUEMA DE CONTROL Control Scheme	ACCION CONTROL Control Action	PALABRA CLAVE Keyword	AREA Area	UNIDAD Unit	CONSOLE Console
0		FSZAH-0041	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD
0		FSFAL-0919	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD
0		FSFAH-0934	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD
0		FSFDAL-0952	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD
0		FSFDAL-0953	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD
0		FSFAH-0902	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD
0		FSFAH-090x	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD
0		FSVAH-0042	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD
0		FSXAH-0014	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD
0		FSXAH-0019	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD
0		FSXAH-0080	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD
0		FSXAH-0081	NO APLICA	HOLD (FTA DI NUEVA)	HOLD	NO APLICA	HOLD	NO APLICA	HOLD	NO APLICA		---	---	---	---	5	---	HOLD	CONVERSIÓN	---	HOLD

11 LISTA DE SEÑALES COMUNICADAS / COMMUNICATED SIGNAL LIST

DCS / F3-C-1-LP-1

C.Industrial / Industrial Complex	PETRONOR
Nº Anexo / Annex N ^o	CONVERSION
Unidad / Unit name	F3
Plano & Rev / Drawing & Rev	LSI-N1783-06-002

HD-J-0100.02 Hoja 2 de 2 ©Repsol, S.A. – Última actualización 2004 – 2013

DATOS GENERALES GENERAL DATA										NOTAS NOTES	
TAG	SERVICIO SERVICE	TIPO PUNTO POINT TYPE	NODO NODE	DIRECCION DIRECTION	RANGO EN U.I. E.U. RANGE	U.I ENGINEERING UNITS	KEYWORD	REV			
9XA00451	CONF MARCHA F3-C-1-P1A	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = PARADO / 1 = MARCHA	0		
9XA0451A	FALLO COMUN F3-C-1-P1A	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOFALLO / 1 = FALLO	0		
9XA0451C	DISPARO F3-C-1-P1A	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NO DISP / 1 = DISPARO	0		
9XA00452	CONF MARCHA F3-C-1-P1B	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = PARADO / 1 = MARCHA	0		
9XA0452A	FALLO COMUN F3-C-1-P1B	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOFALLO / 1 = FALLO	0		
9XA0452C	DISPARO F3-C-1-P1B	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NO DISP / 1 = DISPARO	0		
9XA00456	CONF MARCHA F3-C-1-P3	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = PARADO / 1 = MARCHA	0		
9XA0456A	FALLO COMUN F3-C-1-P3	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOFALLO / 1 = FALLO	0		
9XA0456C	DISPARO F3-C-1-P3	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NO DISP / 1 = DISPARO	0		
9XA00454	CONF MARCHA F3-C-1-E1	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = PARADO / 1 = MARCHA	0		
9XA0454A	FALLO COMUN F3-C-1-E1	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOFALLO / 1 = FALLO	0		
9XA0454C	DISPARO F3-C-1-E1	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NO DISP / 1 = DISPARO	0		
9XA00455	CONF MARCHA F3-C-1-E2	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = PARADO / 1 = MARCHA	0		
9XA0455A	FALLO COMUN F3-C-1-E2	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOFALLO / 1 = FALLO	0		
9XA0455C	DISPARO F3-C-1-E2	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NO DISP / 1 = DISPARO	0		
9XA00453	CONF MARCHA F3C1EMGBC1	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = PARADO / 1 = MARCHA	0		
9XA0453A	FALLO COMUN F3C1EMGBC1	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOFALLO / 1 = FALLO	0		
9XA0453C	DISPARO F3-C-1-EMGBC-1	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NO DISP / 1 = DISPARO	0		
9XA0466	FALLO CELDA MT	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOFALLO / 1 = FALLO	0		
9XA0466A	DISPARO CELDA MT	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NO DISP / 1 = DISPARO	0		
9XA0466B	CONF MARCHA CELDA MT	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = PARADO / 1 = MARCHA	0		
9ZA04044	VALV ANTISURGE ABIERTA	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOABIER / 1 = ABIERTA	0		
9ZAL0444	VALV ANTISURGE CERRADA	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOCERR / 1 = CERRADA	0		
9ZA040122	VALV ANTIRRET ABIERTA	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOABIER / 1 = ABIERTA	0		
9ZAL0122	VALV ANTIRRET CERRADA	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOCERR / 1 = CERRADA	0		
9ZA040021	F3-C-1-EMC-2 ABIERTA	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOABIER / 1 = ABIERTA	0		
9ZAL0021	F3-C-1-EMC-2 CERRADA	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOCERR / 1 = CERRADA	0		
9XA0021A	FALLO F3-C-1-EMC-2	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOFALLO / 1 = FALLO	0		
9XA0021B	MODO F3-C-1-EMC-2	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = LOCAL / 1 = REMOTO	0		
9XHH452	ALARMA 50 SURGES	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOALARM / 1 = ALARMA	0		

LISTA DE SEÑALES COMUNICADAS / COMMUNICATED SIGNAL LIST

DCS / F3-C-1-LP-1

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Nº Anexo / Annex N ^o	CONVERSION
Unidad / Unit name	F3
Plano & Rev / Drawing & Rev	LSI-N1783-06-002

HD-J-0100.02 Hoja 2 de 2 ©Repsol, S.A. – Última actualización 2004 – 2013

DATOS GENERALES GENERAL DATA										NOTAS NOTES		
TAG	SERVICIO SERVICE	TIPO PUNTO POINT TYPE	NODO NODE	DIRECCION DIRECTION	RANGO EN U.I. E.U. RANGE	U.I ENGINEERING UNITS	KEYWORD					
9XAxxxx	MOS VAHH-0017	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS VAHH-0018	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS ZAHH/LL-0019	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS VAHH-0020	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS VAHH-0021	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS ZAHH/LL-0014	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS VAHH-0022	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS VAHH-0023	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS TAAHH-0402	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS TAAHH-0403	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS TAAHH-0404	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS VAHH-0010	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS VAHH-0011	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS PALL-0841	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS DISP TEMP SUCC MAB	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS DISP PDIF SUCC MAB	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9XAxxxx	MOS CCC HARD MANUAL	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = MOS OFF / 1 = MOS ON	0			
9ZAH0015	CARCASA REDUCTORA CERR	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOCERR / 1 = CERRADA	0			
9LAH450A	ALTO NIV COJIN MOTOR	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOALARM / 1 = ALARMA	0			
9PAL0842	BAJ PRES COLECTOR LUBE	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOALARM / 1 = ALARMA	0			
9PALL852	BAJA PRES JACKING OIL	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOALARM / 1 = ALARMA	0			
9TAHH454	ALTA TEMP F3-C-1-E-1	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOALARM / 1 = ALARMA	0			
9TAHH455	ALTA TEMP F3-C-1-E-2	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOALARM / 1 = ALARMA	0			
9HSHH462	SETA EMERGENCIA PANEL	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOALARM / 1 = ALARMA	0			
9HSD0063	SETA EMERGENCIA CAMPO	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = NOALARM / 1 = ALARMA	0			
9XAxxxx	FIRST OUT VAHH-0017	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0			
9XAxxxx	FIRST OUT VAHH-0018	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0			

LISTA DE SEÑALES COMUNICADAS / COMMUNICATED SIGNAL LIST

DCS / F3-C-1-LP-1

C.Industrial / Industrial Complex	PETRONOR
Nº Anexo / Annex N ^o	CONVERSION
Unidad / Unit name	F3
Plano & Rev / Drawing & Rev	LSI-N1783-06-002

HD-J-0100.02 Hoja 2 de 2 ©Repsol, S.A. – Última actualización: 2004 – 2013

DATOS GENERALES GENERAL DATA											
TAG	SERVICIO SERVICE	TIPO PUNTO POINT TYPE	NODO NODE	DIRECCION DIRECTION	RANGO EN U.I. E.U. RANGE	U.I. ENGINEERING UNITS	KEYWORD	NOTAS NOTES	REV		
9XAxxxxx	FIRST OUT ZAHH/LL-0019	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FIRST OUT VAHH-0020	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FIRST OUT VAHH-0021	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FIRST OUT ZAHH/LL-0014	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FIRST OUT VAHH-0022	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FIRST OUT VAHH-0023	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FIRST OUT TAHH-0402	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FIRST OUT TAHH-0403	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FIRST OUT TAHH-0404	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FIRST OUT VAHH-0010	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FIRST OUT VAHH-0011	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FIRST OUT PALL-0841	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FRST OUT TEMP SUCC MAB	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9XAxxxxx	FRST OUT PDF SUCC MAB	FLAG	7	1:HOLD	ON - OFF	---	F3-C-1	0 = FO OFF / 1 = FO ON	0		
9ZI00444	POSIC VALV ANTISURGE	NUMERIC	7	3:HOLD	0 - 100	%	F3-C-1		0		
9ZI00122	POSIC VALV ANTIRRETORN	NUMERIC	7	3:HOLD	0 - 100	%	F3-C-1		0		
9PD10863	PRES DIF FILTRO ASPIR	NUMERIC	7	3:HOLD	0 - 20	mbar(g)	F3-C-1		0		
9PI00864	PRESION IMPULSION	NUMERIC	7	3:HOLD	0 - 4	bar(g)	F3-C-1		0		
9PI00865	PRESION IMPULSION	NUMERIC	7	3:HOLD	0 - 4	bar(g)	F3-C-1		0		
9FI0440A	CAUDAL IMPULSION	NUMERIC	7	3:HOLD	0 - 288732	kg/h	F3-C-1		0		
9FI0440B	CAUDAL IMPULSION	NUMERIC	7	3:HOLD	0 - 288732	kg/h	F3-C-1		0		
9TI00438	TEMPERATURA IMPULSION	NUMERIC	7	3:HOLD	0 - 400	°C	F3-C-1		0		
9TI00439	TEMPERATURA IMPULSION	NUMERIC	7	3:HOLD	0 - 280	°C	F3-C-1		0		
9ZC00021	SETPOINT F3-C-1-EMC-2	NUMERIC	7	3:HOLD	0 - 100	%	F3-C-1		0		
9ZI00021	POSICION F3-C-1-EMC-3	NUMERIC	7	3:HOLD	0 - 100	%	F3-C-1		0		
9VI00013	VIBRACION F3-C-1-GBC-1	NUMERIC	7	3:HOLD	0 - 25	mm/s	F3-C-1		0		
9KI00017	KEYPHASOR F3-C-1-GBC-1	NUMERIC	7	3:HOLD	0.25 - 2.3	mm	F3-C-1		0		

LISTA DE SEÑALES COMUNICADAS / COMMUNICATED SIGNAL LIST

DCS / F3-C-1-LP-1

C.Industrial / Industrial Complex	PETRONOR
Nº Anexo / Annex N ^o	CONVERSION
Unidad / Unit name	F3
Plano & Rev / Drawing & Rev	LSI-N1783-06-002

HD-J-0100.02 Hoja 2 de 2 ©Repsol, S.A. – Última actualización 2004 – 2013

DATOS GENERALES GENERAL DATA									
TAG	SERVICIO SERVICE	TIPO PUNTO POINT TYPE	NODO NODE	DIRECCION DIRECTION	RANGO EN U.I. E.U. RANGE	U.I. ENGINEERING UNITS	KEYWORD	NOTAS NOTES	REV
9SI00060	VELOCIDAD F3-C-1	NUMERIC	7	3:HOLD	0 - 8000	1/min	F3-C-1		0
9KI00016	KEYPHASOR F3-C-1	NUMERIC	7	3:HOLD	0.25 - 2.3	mm	F3-C-1		0
9TI406AB	TEMP COJIN F3C1-EMC-1	NUMERIC	7	3:HOLD	0 - 150	°C	F3-C-1		0
9PI00842	PRESION COLECTOR LUBE	NUMERIC	7	3:HOLD	0 - 6	bar(g)	F3-C-1		0
9PI00852	PRESION JACKING OIL	NUMERIC	7	3:HOLD	0 - 200	bar(g)	F3-C-1		0
9LI00453	NIVEL DEPOS F3-C-1-D-2	NUMERIC	7	3:HOLD	0 - 100	%	F3-C-1		0
9PY00842	CONTROL F3-PCV-0842	NUMERIC	7	3:HOLD	0 - 100	%	F3-C-1		0
9ZI00842	POSICION F3-PCV-0842	NUMERIC	7	3:HOLD	0 - 100	%	F3-C-1		0
9PI00857	PRESION RECIRC LUBE	NUMERIC	7	3:HOLD	0 - 12	bar(g)	F3-C-1		0
9TI00432	TEMPERATURA LUBE	NUMERIC	7	3:HOLD	0 - 100	°C	F3-C-1		0
9TY00432	CONTROL TEMP LUBE	NUMERIC	7	3:HOLD	0 - 100	%	F3-C-1		0
9PDI0850	PRESION FILTROS LUBE	NUMERIC	7	3:HOLD	0 - 1	bar(g)	F3-C-1		0
9PI00847	PRESION F3-C-1-EMP-1A	NUMERIC	7	3:HOLD	0 - 16	bar(g)	F3-C-1		0
9PI00849	PRESION F3-C-1-EMP-1B	NUMERIC	7	3:HOLD	0 - 16	bar(g)	F3-C-1		0
9LI00451	NIVEL DEPOS F3-C-1-D-3	NUMERIC	7	3:HOLD	0 - 100	%	F3-C-1		0
9PI00843	PRESION F3-C-1-D-3	NUMERIC	7	3:HOLD	0 - 60	mbar	F3-C-1		0
9TI00428	TEMPERATURA F3-C-1-D-3	NUMERIC	7	3:HOLD	0 - 100	°C	F3-C-1		0

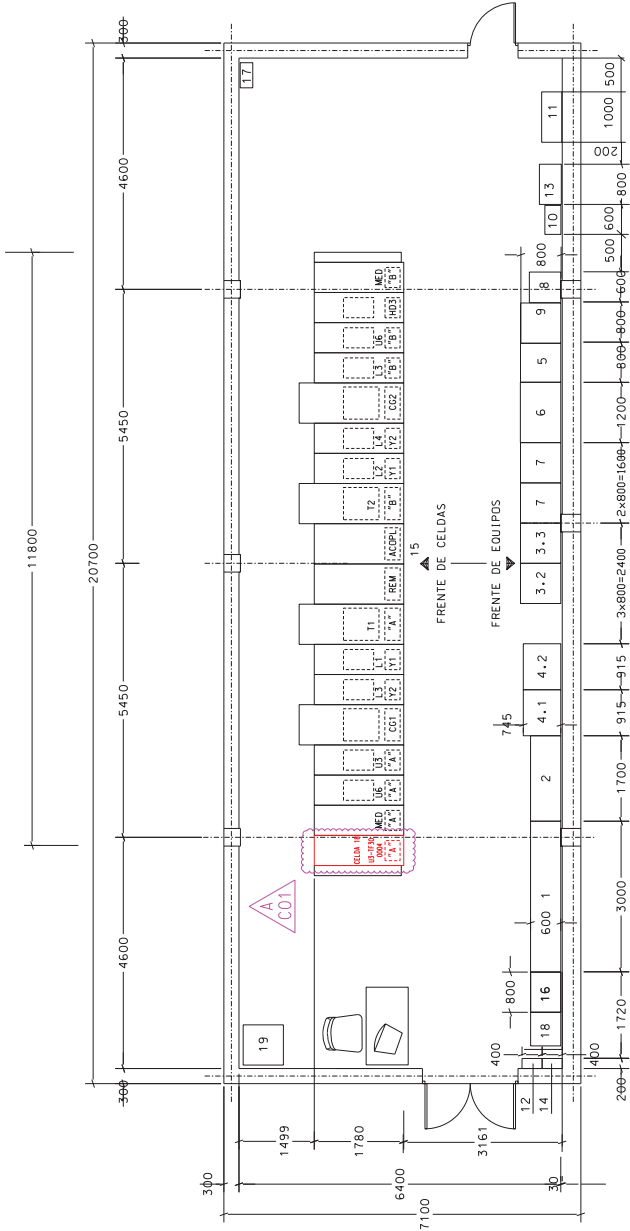
2.6 ANEXO 2. PLANOS EDITADOS POR LA INGENIERIA

DOCUMENTO	NUMERO	TÍTULO DEL PLANO
1° IMPLANTACIONES Y PLANO DE CLASIFICACIÓN DE AREAS		
F3-1-01-01	1	IMPLANTACION UNIDAD DE F.C.C.
U-1-73-132	2	DISPOSICION CELDA DE 30 KV EN SE-132.
U3-1-73-15	3	DISPOSICION TRAF0 Y CELDAS DE 11 KV EN SEP-3
F3-1-01-35	4	CLASIFICACION DE AREAS PELIGROSAS
2° DIAGRAMAS MECANICOS DE PROCESO (P&ID,s)		
F3-2-50-02	5	P&ID SOPLANTE
F3-1-50-53 h01	6	P&ID COMPRESOR F3-C-1 MONITORIZACIÓN COMPRESOR
F3-1-50-53 h02	7	P&ID COMPRESOR F3-C-1 MONITORIZACIÓN REDUCTORA
F3-1-50-53 h03	8	P&ID COMPRESOR F3-C-1 MONITORIZACIÓN MOTOR
F3-1-50-53 h05	9	P&ID COMPRESOR F3-C-1 ACEITE SKID COMPRESOR
F3-1-50-53 h04	10	P&ID COMPRESOR F3-C-1 ACEITE CONSOLA DE LUBRICACIÓN Y TANQUE ELEVADO
3° OBRA CIVIL		
F3-1-43-73	11	CIMENTACIONES PARA NUEVO COMPRESOR F3-C-1
4° ESTRUCTURA METALICA		
F3-1-46-66 hoja 1	12	PLATAFORMAS Y ESCALERAS NUEVO COMPRESOR F3-C-1
F3-1-46-66 hoja 2	13	ESTRUCTURA FILTRO F3-C-1
F3-1-46-66. hoja 3	14	PLATAFORMAS Y ESCALERAS NUEVO COMPRESOR F3-C-1
5° PLANTAS E ISOMETRICAS DE TUBERIAS		
F3-3-52-0201	1	IMPULSION DE AIRE A PROCESO
F3-3-52-0202	1	IMPULSION DE AIRE BLOW OFF
F3-3-52-0203	1	ISOMÉTRICA BLOW OFF
F3-3-52-R-A-1001	1	CONTINUACION IMPULSION AIRE A PROCESO
6° ELECTRICIDAD		
Y-2-73-132	2	ESQUEMA UNIFILAR SE-132. 30KV.
U3-1-73-10	2	DIAGRAMA GRAL UNIFILAR 30.000-6.300-500V SUBESTACION DE PROCESO Nº3
NF3-2-73-01	1	CENTRO CONTROL MOTORES U3-MC5-9 (S/E N 33/64 3)ESQ. UNIFILAR
NF3-2-73-02	1	CENTRO CONTROL MOTORES U3-MC5-10 (S/E Nº 3)ESQ. UNIFILAR
CONTROL E INSTRUMENTACION		
F3-1-75-104	1	DIAGRAMA DE BLOQUES



REFERENCIA DE PLANOS

PLANO No	PLANTA GENERAL DE MONTAJE	NOMBRE	HOJA No
Y-2-73-132			3



PLANTA

LISTA DE EQUIPOS

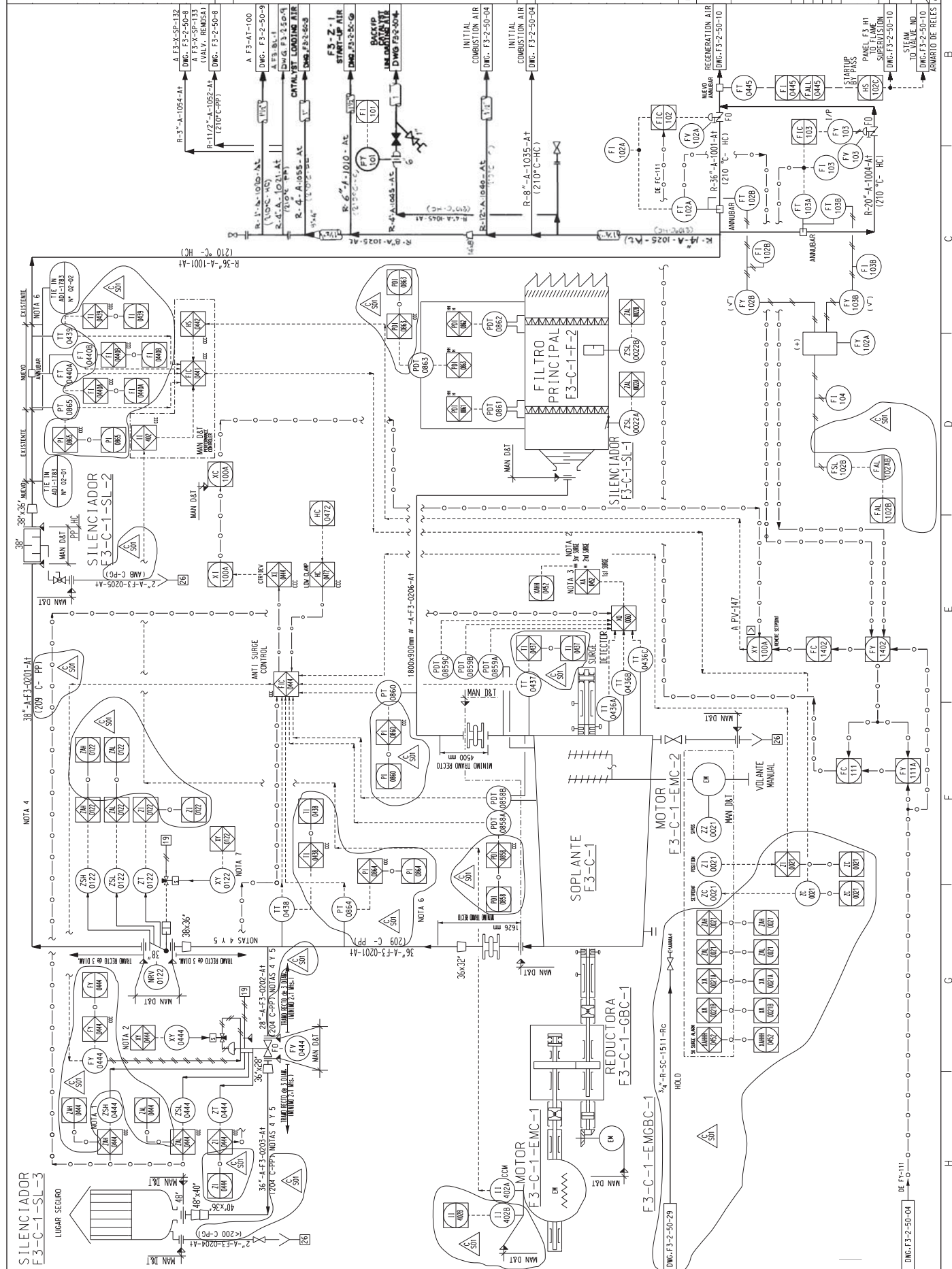
1	Y1-SW04-0132-A	CUADRO DE SERVICIOS AUXILIARES DE C.A.
2	Y1-P-RECT-0132-A	CUADRO DISTRIBUCION 110 V C.C. DE RECTIFICADORES
3.1	Y1-132PAN-0001	PANEL DE CTRL. Y PROTECC. LINEA 1 Y1-TF132-1-A
3.2	Y1-132PAN-0002	PANEL DE CTRL. Y PROTECC. ACOPL. LINEAS 1 Y 2
3.3	Y1-132PAN-0003	PANEL DE CTRL. Y PROTECC. LINEA 2 Y1-TF132-1-B
4.1	Y1-RECT-0132-A/B	RECTIFICADORES N 1 Y N 2 BATERIA 110 V C.C.
4.2	Y1-BAT-RECT-0132-A	BATERIAS N/CD DE RECTIFICADORES N 1 Y N 2 110 V C.C.
5	Y1-PAN-MED-0132	PANEL DE MEDIDA ENERGIA SUB 132 KV
6	Y1-RIS-0132	REGISTRADOR CRONOLOGICO DE EVENTOS SUB 132 KV
7	Y1-TLC-0132	CUADRO DE TELECONTROL SUB 132 KV
8	Y1-TLC-1BD	REMOJO DE TELECONTROL IBERDROLA SUB 132 KV
9	Y1-TLPD-1BD	ARMARIO TELEDISP. TELEPROTECC. Y COMUNC. IBERDROLA
10	Y1-TLT-0132	CUADRO TELETRANSMISION SUB. 132 KV
11	Y1-SCI-0132	ARMARIO DETECCION DE INCENDIOS EN EDIFICIO
12	Y1-INTRUS-0132	CENTRALITA INTRUSISMO EN SUB. 132 KV
13	Y1-AL-0132	ARMARID CONCENTRADOR SEÑALES SUB 132 kv
14	Y1-VENT-0132	ARMARIO DEL SISTEMA DE VENTILACION
15	Y1-SW30-0132	CUADRO DISTRIBUCION 30 KV SUB 132 KV
16	Y1-132-PAN-004	PANEL AUXILIAR DE PROTECCIONES L1 - L2
17		ARMARIO DE COMUNICACIONES POR FIBRA OPTICA
18	Y1-PAN-MED-0132B	PANEL MEDIDA ENERGIA SUB 132KV
19	RACK INFOR	RACK INFOR FIBRAS MONO/MULT.

Dibujado	A. P. E.	13-04-05
Comprobado	J. M. S.	13-04-05
Aprobado	F. V. G.	13-04-05
ESCALA	1:75	

SUBESTACION 132 KV
EDIFICIO PRINCIPAL
DISPOSICION DE EQUIPOS

PAID No	-
PL. PLANTA	-
SITUACION	-
No PLANO	Y-3-73-132 H-07

SILENCIADOR F3-C-1-SL-3



NOMENCLATURA

1. ALIMENT. AGUA REFRIGER. 19 AIRE DE INSTRUMENTOS
2. RETORNO AGUA REFRIGER. 20 DRENALDE DE AGUAS ACETOSAS
1. PERMISIVO DE ARRANQUE DEL COMPRESOR F3-C-1
2. SHUTDOWN DEL COMPRESOR F3-C-1
3. APERTURA FV-0444
4. TUBERIA CON AISLAMIENTO ACUSTICO
5. MAXIMO VOLUMEN COMPENDIDO ENTRE LA TOBERA DE DESCARGA DEL COMPRESOR, LA VALVULA DE BLOW-OFF Y LA VALVULA CHECK WPT-122 = 10.6 NL
6. ELIMINADOS: PT-101, PT-201, PT-147, PT-200, TSH-104 Y TSH-125.
7. LA SELECCION SE ENERGIZARA PARA ACELERAR EL CIERRE DE LA VALVULA DE NO RETORNO

EQUIPOS

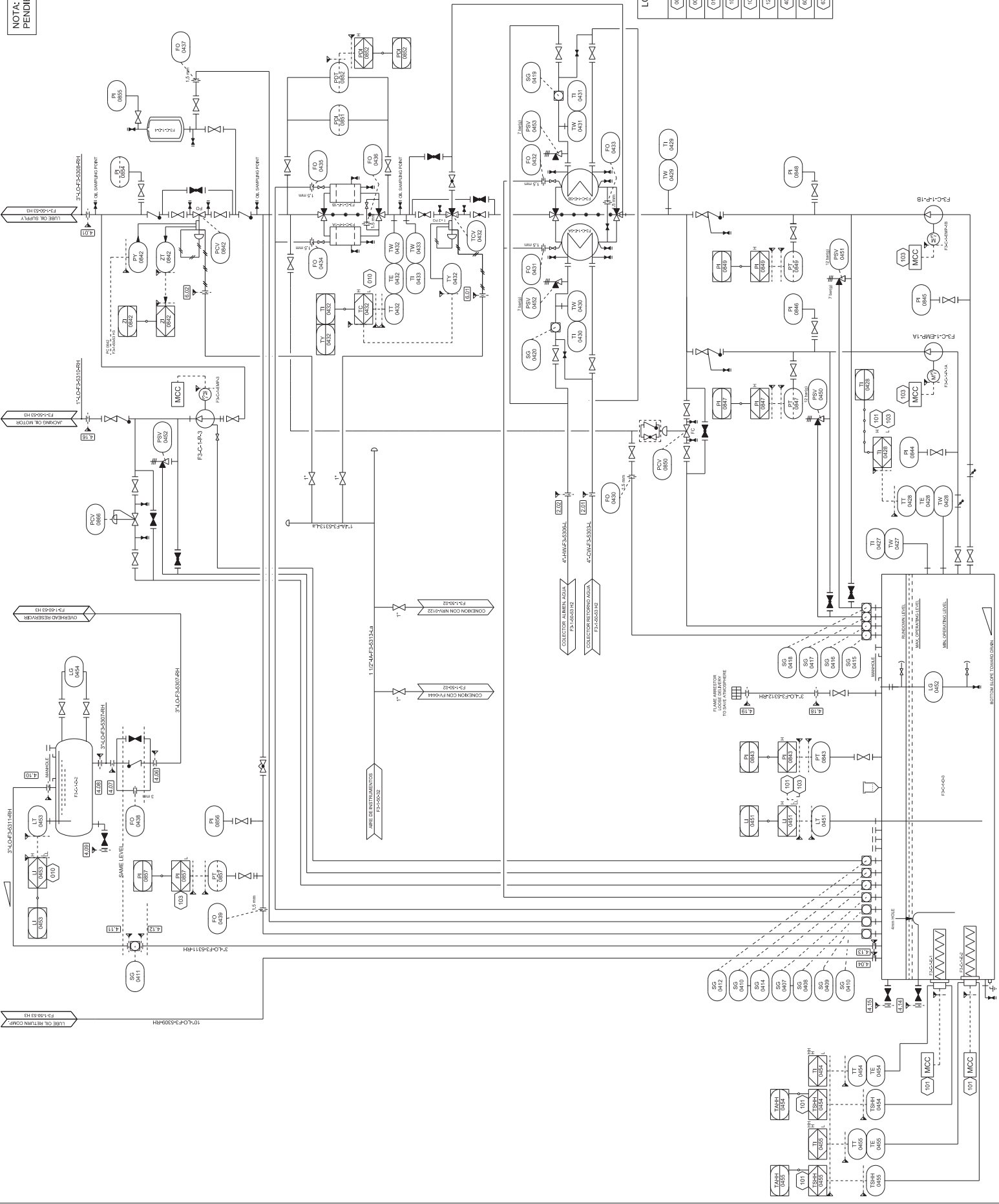
- F3-C-1
- F3-C1-SL-2/3
- F3-C-1-F-2

NO.	REVISION DESCRIPTION	DATE BY	CHK
1	ACTUALIZACION FEL ADI-1783	MAY 14	WAR

CONTRATO N° MRC-5260	SCALE: F3-2-50-02
ENGINEERED: DRAMBI	CHECKED: DRAMBI
ISSUED: DRAMBI	APPROVED: DRAMBI
DATED: DRAMBI	ISSUED: DRAMBI
CONST: DRAMBI	CONST: DRAMBI

40.000 BPSD FCCU	SOPLANTE
6241-01	62-D2A
JOB N°	AREA
CLASS	DRAWING N°

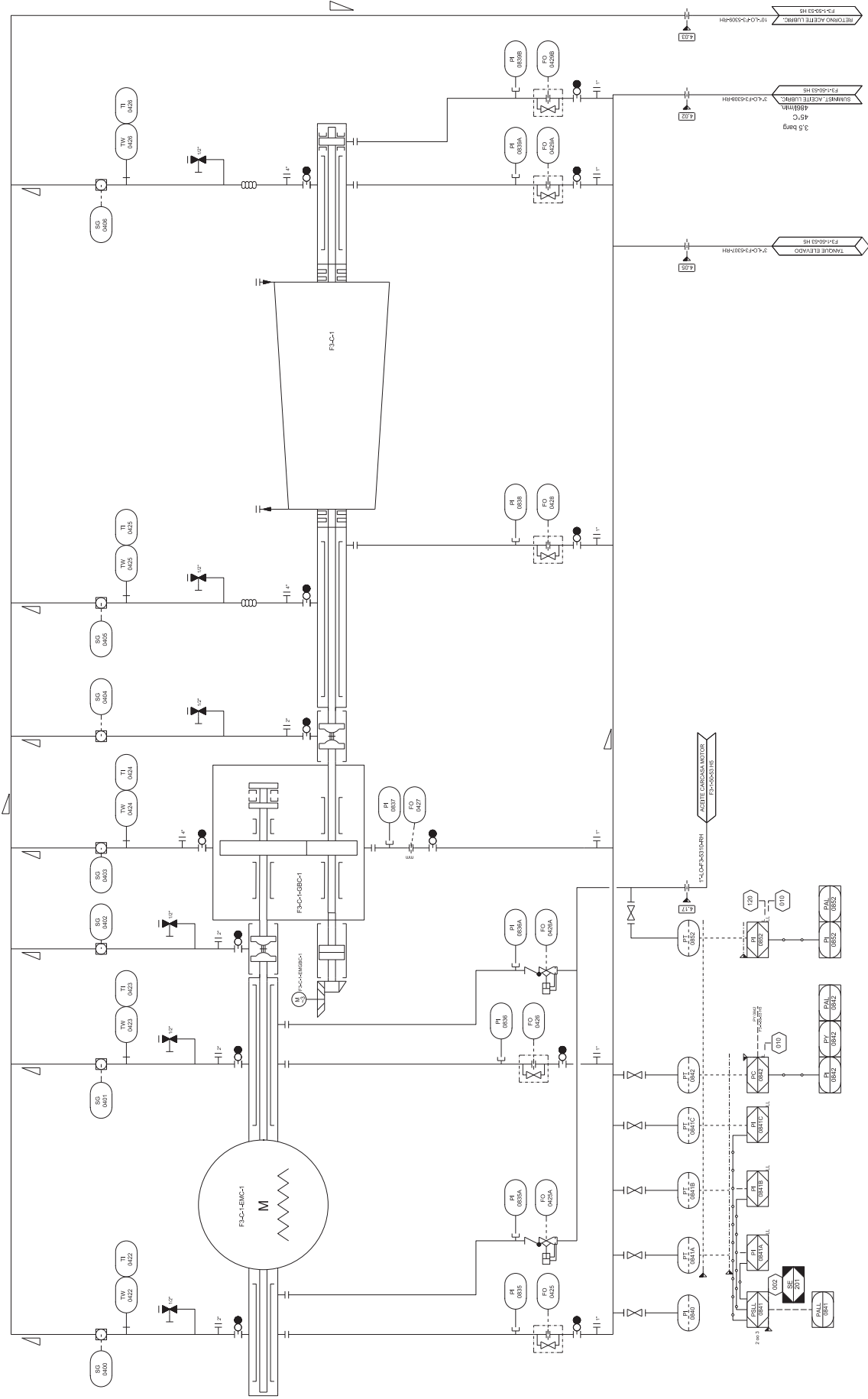
NOTA: DETALLES DE MONITORIZACION Y CONTROL,
PENDIENTES DE ACLARACION CON MAN D&T.



LOGIC IDENTIFICATION FIGURES		MAN STANDARD
001	SHUTDOWN UNDELAYED	
002	SHUTDOWN DELAYED AND/OR SEQUENTIAL	
003	INTERLOCK & PERMISSION TO START	
004	OIL TANK HEATER	
005	LUBE OIL PUMP	
006	TURNING GEAR	
007	ANTI-SURGE CONTROL VALVE	
008	MOTOR	
009	SPACE HEATER	

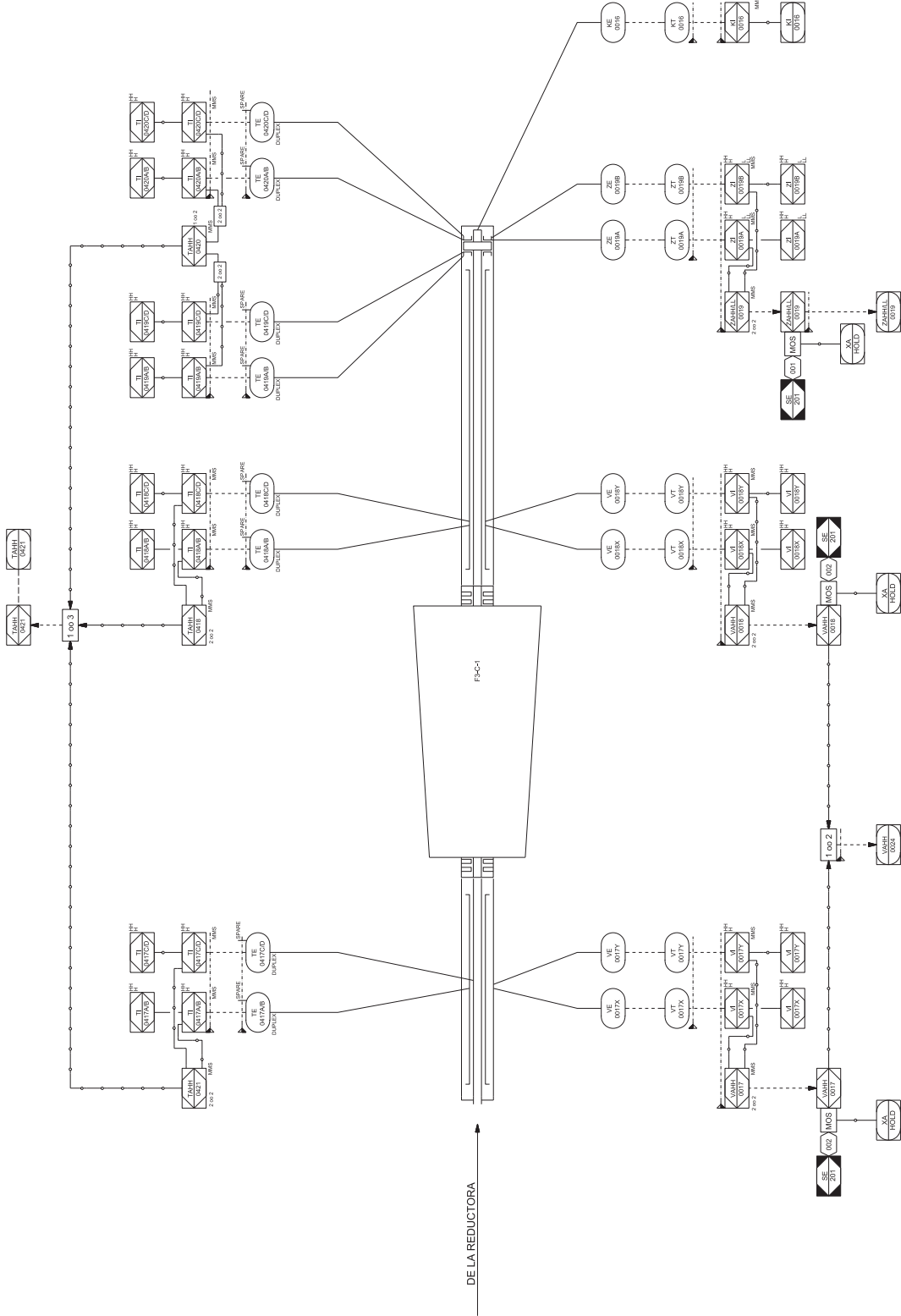
A	APROBADO PARA DISEÑO	
REV.	DESCRIPCION	

PROYECTO: NUEVOS COMPRESORES EN FCC PARA MEJORA DE LA EFICIENCIA ENERGETICA			
P&ID			
COMPRESOR F3-C-1			
ACEITE CONSOLA DE LUBRI. Y TANQUE ELEVADO			
ACERO	CLASIFIC.	PLANO #2	REVISION
F3	50	F3-1-50-53	A



SISTEMA DE ENCLAVAMIENTO	LOGIC IDENTIFICATION FIGURES		MAN STANDARD
	SIMBOLOGIA LOGICOS		
	001	SHUTDOWN UNDELAYED PARO SIN TEMPORIZACION	
	002	SHUTDOWN DELAYED AND/OR SEQUENTIAL PARO CON TEMPORIZACION Y/O SECUENCIAL	
	010	INTERLOCK & PERMISSION TO START PERMISIVO	
	001	OIL TANK HEATER CALENTADORES TANQUE DE ACEITE	
	103	LUBE OIL PUMP BOMBA DE ACEITE DE LUBRICACION	
	120	TURNING GEAR WINDSOR	
	400	ANTI-SURGE CONTROL VALVE VALVULA DE CONTROL ANTI-SURGE	
	600	MOTOR MOTOR	
	601	SPACE HEATER RESISTENCIA DE CALIDO	

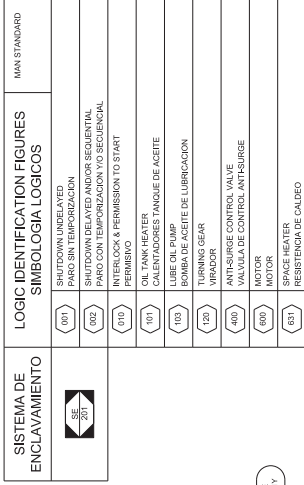
APPROVAL FOR CONSTRUCTION		REVISION	
APPROVAL FOR DESIGN		HOLD # OF R	
DESIGN			
PROJECT: NUEVOS COMPRESORES EN FCC PARA MEJORA DE LA EFICIENCIA ENERGETICA			
P&ID			
COMPRESOR F3-C-1			
ACEITE SKID COMPRESOR			
REV	DATE	BY	CHK
F3	50	F3-1-50-53	
P&ID INFORMANTIZADO (IND REVISAR MANUALMENTE)		A-0	F3050053104-104



SISTEMA DE ENCLAVAMIENTO	LOGIC IDENTIFICATION FIGURES		MAN STANDARD
	SIMBOLOGIA LOGICOS		
	(001)	SHUTDOWN UNDELAYED PARO SIN TEMPORIZACION	
	(002)	SHUTDOWN DELAYED AND/OR SEQUENTIAL PARO CON TEMPORIZACION Y/O SECUENCIAL	
	(010)	INTERLOCK & PERMISSION TO START PERMISIVO	
	(011)	OIL TANK HEATER CALENTADORES TANQUE DE ACEITE	
	(013)	LUBE OIL PUMP BOMBA DE ACEITE DE LUBRICACION	
	(120)	TURNING GEAR VIÑADOR	
	(400)	ANTI-SURGE CONTROL VALVE VALVULA DE CONTROL ANTISURGE	
	(000)	MOTOR COMPRESOR F3-C-1	
	(001)	MONITORING COMPRESSOR MONITORIZACION COMPRESOR	
	(012)	ANTI-SURGE CONTROL VALVE VALVULA DE CONTROL ANTISURGE	
	(017)	SPACE HEATER RESISTENCIA DE CALORE	

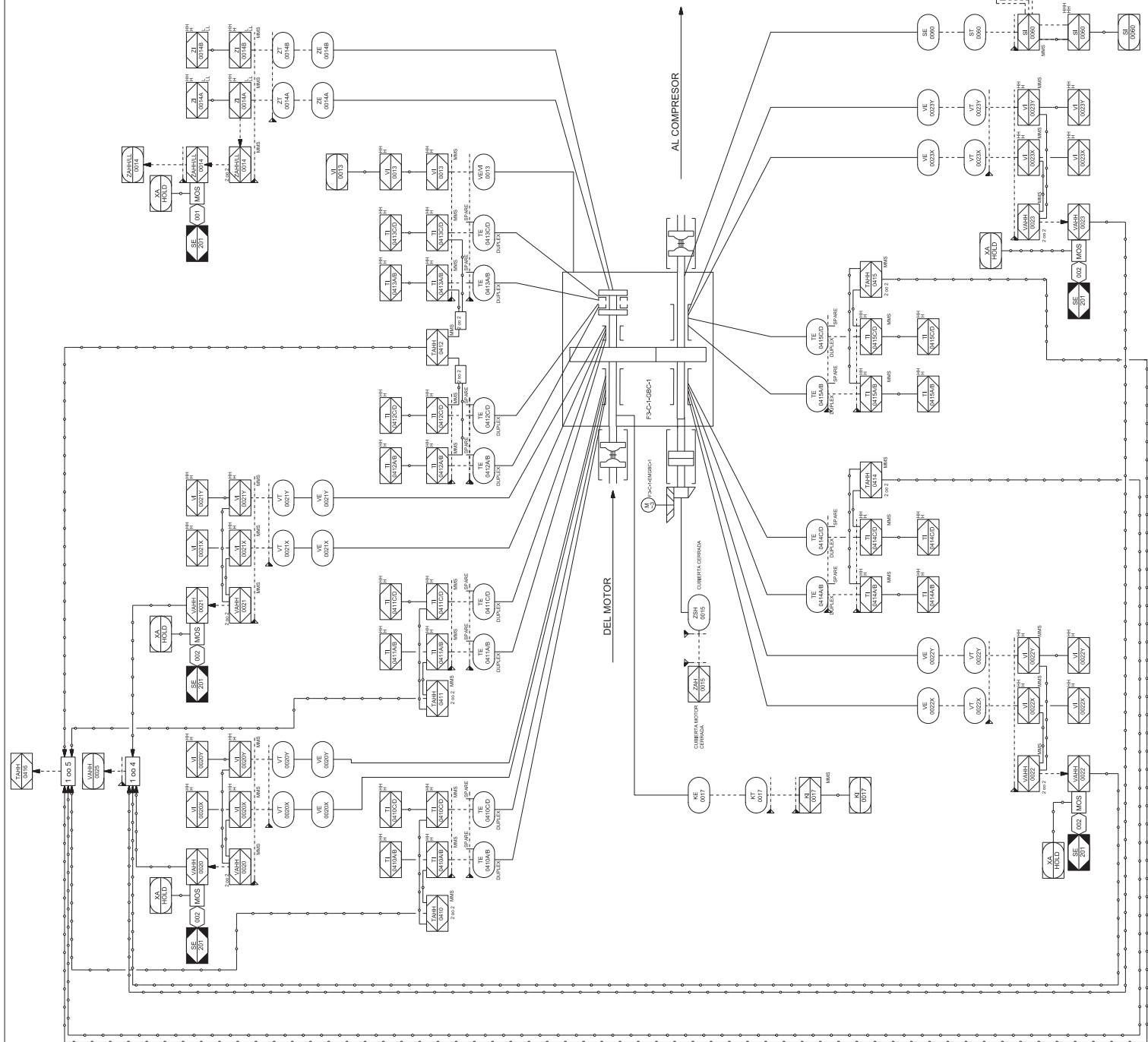
	</	

PROYECTO: NUEVOS COMPRESORES EN FCC PARA MEJORA DE LA EFICIENCIA ENERGETICA		
PID		
COMPRESOR F3-C-1		
MONITORIZACION COMPRESOR		
REVISOR	REVISADO	FECHA
F3	50	F3-L-50-53
PLANO INFORMATIZADO (NO REVISAR MANUALMENTE) 1 A-O F3050053P01-00A		

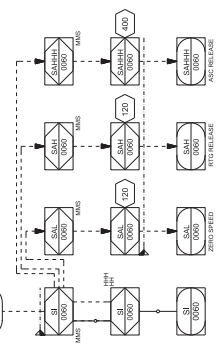


B	APROBADO PARA CONSTRUCCION	
A	APROBADO PARA DISEÑO	
NOTA:	DESCRIPCION	

ANEXO	CLASIFICA	PLANO Nº	REVISOR
F3	50	F3-1-50-53	B



SISTEMA DE ENCLAVAMIENTO	LOGIC IDENTIFICATION FIGURES	MAN STANDARD
	(001) SHUTDOWN UNDELAYED	PANOS SIN TEMPORIZACION
	(002) SHUTDOWN DELAYED AND/OR SEQUENTIAL	PANOS CON TEMPORIZACION Y/O SECUENCIAL
	(010) INTERLOCK & PERMISSION TO START	INTERLOCK & PERMISION TO START
	(101) OIL TANK HEATER	CALENTADORES TANQUE DE ACEITE
	(102) LUBE OIL PUMP	BOMBA DE ACEITE DE LUBRICACION
	(103) TURNING GEAR	VRADOR
	(400) ANTI-SURGE CONTROL VALVE	VALVULA DE CONTROL ANTI-SURGE
	(600) START STOP MOTOR	PARO Y ARRANQUE MOTOR
	(001) SPACE HEATER	RESISTENCIA DE CALDEO



[illegible]

El Hornopando será continuo sin que se produzcan juntas frías: las ondes y junto
- K31110

La temperatura de la resina en el momento del vertido será inferior a 290°C,
superior a 5°C, no se horneará ni se prevea temperaturas superiores a los 350°C o
inferiores a los 0°C en los 7 días posteriores al vaciado.
El tiempo de curado de la resina en el momento de la colocación será tal que el
cemento en el cono de Abrams sea de 40 a 50 mm.
Cada tongado se horneará de modo continuo en todo la longitud de la pieza.
El tiempo de hornear será de 15 minutos.
Al vibrar cada tongado, el vibrador penetrará en la tongada inferior de modo que
entre ambas tongadas no se produzca la junta fría. El tiempo transcurrido entre
tongadas será inferior a dos horas.

[illegible]

CARACTERÍSTICAS DE LOS MATERIALES, SEGUN INSTRUCCION DE COMISION EJECUTIVA E-20									
CONTROL DE ELABORACION	IDENTIFICACION	MATERIAL	MAYOR	MAYOR	CONCRETO		ACEROS	MORTAROS	COMBUSTIBLES
					TIPUS	MITAS			
ACERO	ARMON	ESTRUCTURAL	HR-304207111040	20	5.5	20	250 g/9.00	40	50
		EN BARRAS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		EN BARRAS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		EN BARRAS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		EN BARRAS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
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ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
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ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
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ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
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ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
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ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
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ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
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ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
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ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
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ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
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ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
		ELECTRODOS	HR-304207111040	20	5.5	-	250 g/9.00	40	-
ACERO	ARMON	ELECTRODOS	HR-304207111040	20	5.5	-</			

MORTERO SIN RETRACCION (GROUTING) PARA RELLENO DE ANCLAJES.

- 2.- RESISTENCIA MINIMA A COMPRESION:
 - 24 HORAS = 24.0 MPO
 - 58 DIAS = 100.0 MPO
- 3.- NO TIENDRA RETRACCION, CON EXPANSION DENTRO DE LOS REQUERIMIENTOS DE ASTM C 827-95.
- 4.- RESISTENTE AL ACIDO.
- 5.- SERA ENTREGADO EN OBRA POR PERSONAL DEBIDAMENTE CUALIFICADO.

- APOLTEC 800 (APOLTEC ENGINEERING),
 - CHOCKFAST RED (SINTEMAR/ITW POLYMER TECHNOLOGIES)
 LA UTILIZACION DE CUALQUIER OTRO PRODUCTO DEBERA SER
 PREVIAMENTE APROBADA POR LA DIRECCION DE OBRA.

CARACTERISTICAS DE LOS MICROPILOTOS.

- 1.- ARMADURA TUBULAR ACERO N80 DIAM. 139'7x12mm
- 2.- LECHADA DE CEMENTO fca=30 MPa
- 3.- RELACION AGUA-CEMENTO MAX: 0.55

NOTAS

1.- COTAS EN MIL METROS, TENDRAN LAS DIMENSIONES EN METROS Y LOS ANGULOS EN GRADOS SEXAGESIMOS, SEGUN LAS SIGUIENTES TABLAS DE COMPARACION EN OBRAS ANTIGUAS DEL INICIO DE LOS TRABAJOS.

ANTIGÜEDAD DE LA OBRA	ANTIGÜEDAD DE LA OBRA	ANTIGÜEDAD DE LA OBRA
1.- HASTA EL SIGLO XVIII	1.- HASTA EL SIGLO XVIII	1.- HASTA EL SIGLO XVIII
2.- SIGLO XIX	2.- SIGLO XIX	2.- SIGLO XIX
3.- SIGLO XX	3.- SIGLO XX	3.- SIGLO XX

4.- EL HORIZONTE DEBIA CONSIDERARSE EN BLANCA. LAS MEDIDAS SERAN: 1.- EN LONGITUD SIN EMPUJADO, EN CONTACTO CON EL TERRENO; 2.- EN LONGITUD EMPUJADO, EN CONTACTO CON EL SUELO MURDO Y 3.- EN LONGITUD EMPUJADO, EN CONTACTO CON EL SUELO MURDO Y 4.- EN LONGITUD EMPUJADO, EN CONTACTO CON EL SUELO MURDO.

5.- PARA GARANTIZAR LOS RECUERDOS Y LA POSICION DE LAS PAREDES, LAS COTAS DEBEN SER EN METROS Y DECIMALES, SIN DECIMALES, SEGUN LAS SIGUIENTES TABLAS DE COMPARACION.

ANTIGÜEDAD DE LA OBRA	ANTIGÜEDAD DE LA OBRA	ANTIGÜEDAD DE LA OBRA
1.- HASTA EL SIGLO XVIII	1.- HASTA EL SIGLO XVIII	1.- HASTA EL SIGLO XVIII
2.- SIGLO XIX	2.- SIGLO XIX	2.- SIGLO XIX
3.- SIGLO XX	3.- SIGLO XX	3.- SIGLO XX

6.- LAS COTAS DEBEN SER EN METROS Y DECIMALES, SIN DECIMALES, SEGUN LAS SIGUIENTES TABLAS DE COMPARACION.

ANTIGÜEDAD DE LA OBRA	ANTIGÜEDAD DE LA OBRA	ANTIGÜEDAD DE LA OBRA
1.- HASTA EL SIGLO XVIII	1.- HASTA EL SIGLO XVIII	1.- HASTA EL SIGLO XVIII
2.- SIGLO XIX	2.- SIGLO XIX	2.- SIGLO XIX
3.- SIGLO XX	3.- SIGLO XX	3.- SIGLO XX

7.- LAS COTAS DEBEN SER EN METROS Y DECIMALES, SIN DECIMALES, SEGUN LAS SIGUIENTES TABLAS DE COMPARACION.

ANTIGÜEDAD DE LA OBRA	ANTIGÜEDAD DE LA OBRA	ANTIGÜEDAD DE LA OBRA
1.- HASTA EL SIGLO XVIII	1.- HASTA EL SIGLO XVIII	1.- HASTA EL SIGLO XVIII
2.- SIGLO XIX	2.- SIGLO XIX	2.- SIGLO XIX
3.- SIGLO XX	3.- SIGLO XX	3.- SIGLO XX

8.- TODAS LAS SOLERIAS PREVIAMENTE DEMARCADAS PARA LA ELECCION DE UN PUNTO EN LA OBRA, DEBEN SER EN METROS Y DECIMALES, SIN DECIMALES, SEGUN LAS SIGUIENTES TABLAS DE COMPARACION.

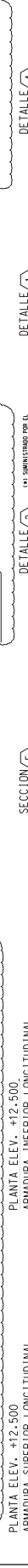
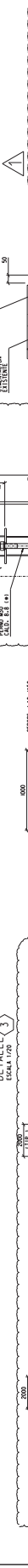
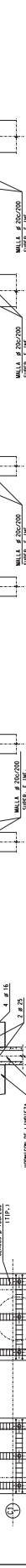
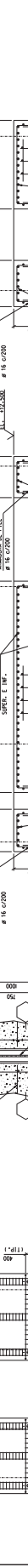
ANTIGÜEDAD DE LA OBRA	ANTIGÜEDAD DE LA OBRA	ANTIGÜEDAD DE LA OBRA
1.- HASTA EL SIGLO XVIII	1.- HASTA EL SIGLO XVIII	1.- HASTA EL SIGLO XVIII
2.- SIGLO XIX	2.- SIGLO XIX	2.- SIGLO XIX
3.- SIGLO XX	3.- SIGLO XX	3.- SIGLO XX

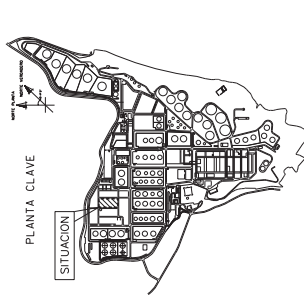
MEDICIONES	
DEMOLICION SOLERA	118 m ²
EXCAVACION	330 m ³
ENCOFRADO NO VISTO	78'40 m ²
ENCOFRADO VISTO	159'80 m ²
HORMIGON DE LIMPIEZA	7'62 m ³
HORMIGON ESTRUCTURAL	218 m ³
ACERO ARMADURAS	12.000 Kg
GROUTING	2.580 Lts
MORTERO MICROFLOJES	18'47 m ³
OTROS MATERIALES	412 m ³

REV.	FECHA	DESCRIPCION	REALIZ	COMPR	APROB	VP	BP
0	02-12-15	PARA CONSTRUCCION	H.A. 2	J.G. G.	C. R. C.		
1	11-12-15	RONDE SE INDICA 	H.A. 2	J.G. G.	C. R. C.		

PROYECTO	REALIZADO	H.A.Z.	02-12-15
ADJ 1 1783	COMPRAS	J.A.S.	02-12-15
ESCALA	IMPRESION	C.A.C.	02-12-15
11501:10110			

UNIDAD	CLASIFICACION	NOMBRE DE PLANO	REVISION
F3	--	F3-1-43-73	1





REFERENCIA DE PLANOS		NO. PLAN
PLANO	NUMERO	NOMBRE
F3-1-01-00		PLANO DE IMPLANTACION UNIDAD DE F.C.C.
F3-1-01-01-00		ESTRUCTURA PARA COMPRESORES F3-01-1 PLAN 461/HOLA -11
F3-1-01-01-01		UNIDAD DE F.C.C.
F3-1-01-01-02		ESTRUCTURA PARA COMPRESORES F3-01-2 ALZADO/HOLA -11
F3-1-01-01-03		ESTRUCTURA PARA COMPRESORES F3-01-3
F3-1-01-01-04		PLANTA 1 DETALLES/HOLA -2 UNIDAD DE F.C.C.
F3-1-01-01-05		ALZADO 1 DETALLES/HOLA -2 UNIDAD DE F.C.C.

[illegible]

LISTA DE MATERIALES

REV.	EFFECTIVE DATE	DESCRIPTION	DATE	BY	CHKD.	APP'D.
0	01-12-15	FINAL CONSTRUCTION				

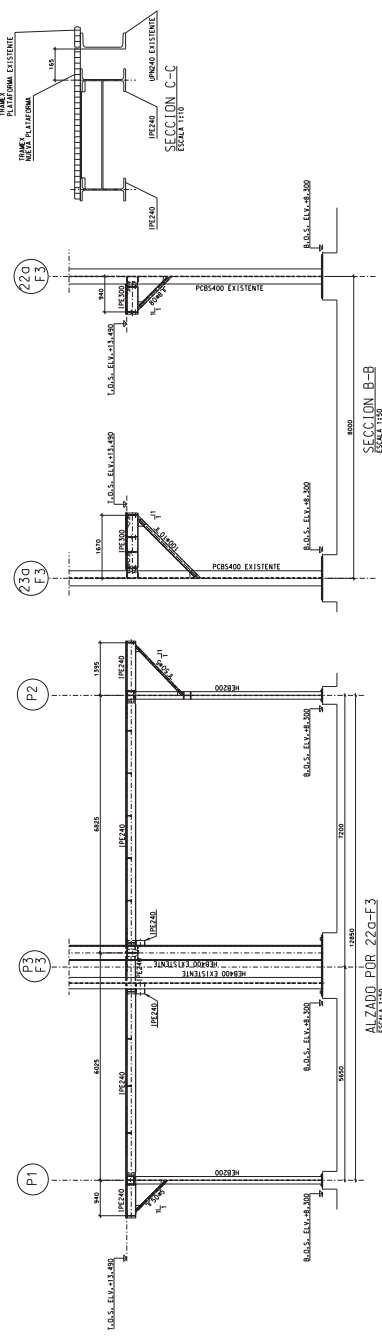
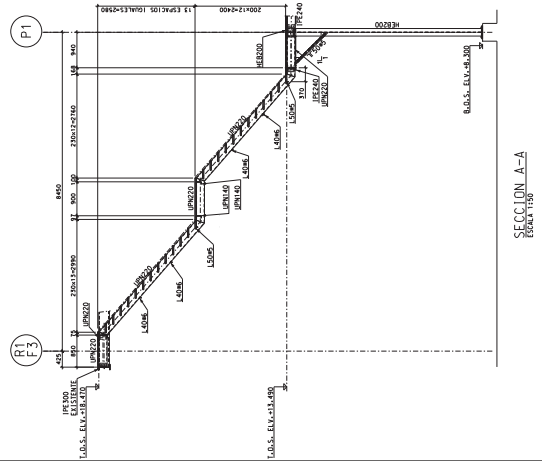
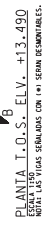
PROTECTOR	REALIZADO	J.C.S.S.	00-12-15
AD-1-1783	COMPROBADO	C.M.C.C.	00-12-15
ENCUADRA	ANALIZADO	C.M.C.C.	00-12-15
	1/50	1/50	

NUEVOS COMPRESORES EN FCC PARA MEJORA DE EFICIENCIA ENERGETICA

PLATAFORMAS Y ESCALERAS

NUEVO COMPRESOR E3-C-1, HOJA 1

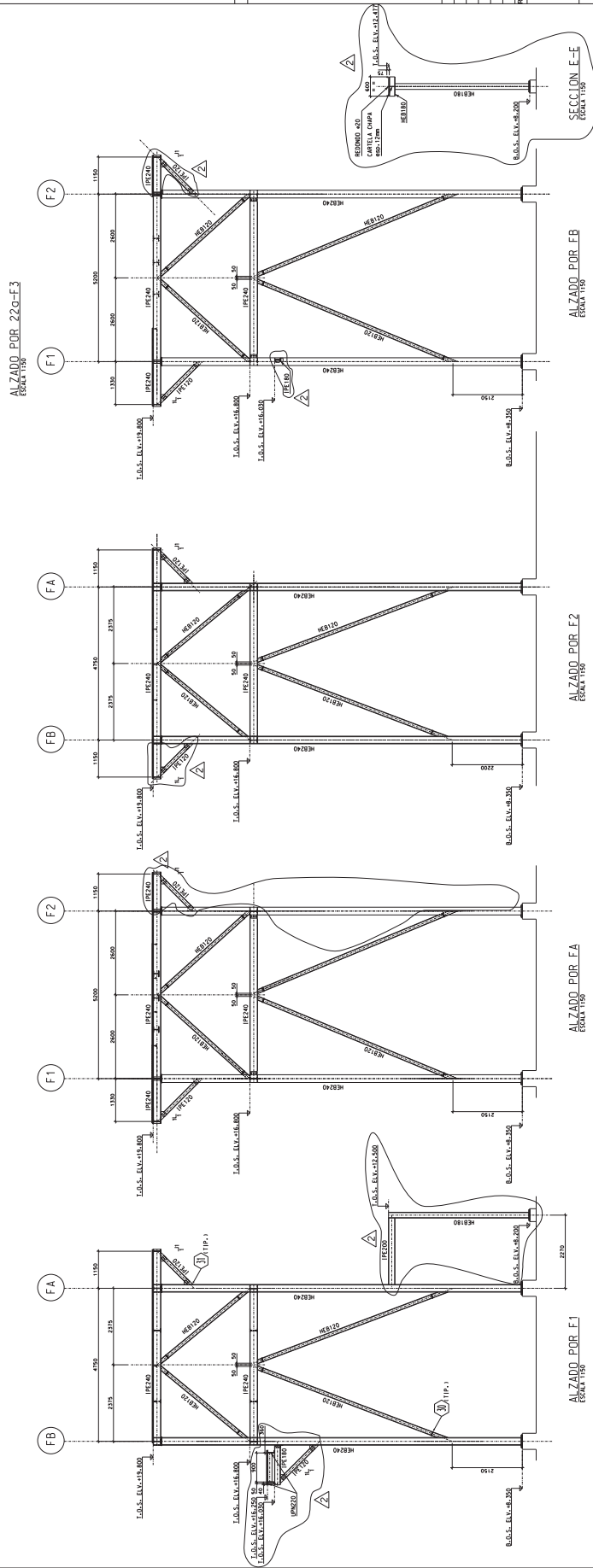
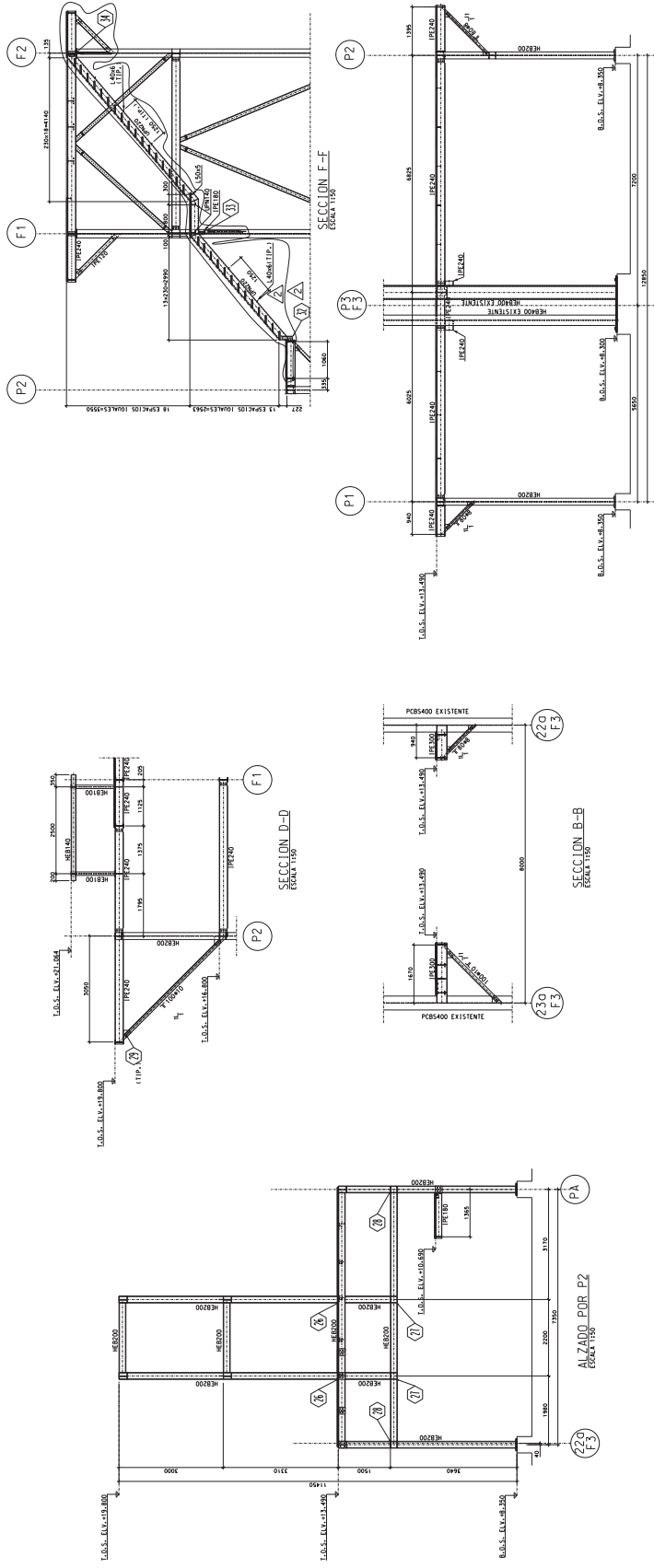
PLANO	INFORMATIZADO (NO REVISAR MANUALMENTE)	+3046066601.029



SECCION A-A
ESCALA 1:50

SECTION 8-B

ALZADO POR 220-F3



PIANO NUMERO	NOME	FOLIO NO
13-1-10-01	PLANO DE IMPLANTACION UNIDAD DE F.C.C.	1 0 1
13-1-10-33/39	COMBRESOS 13-1-1 PLANTAS (FOLIA 1-3) UNIDAD DE F.C.C.	1 0 1
13-1-10-34/35	ESTRUTURA PARA COMBRESOS 13-1-1 ALZADOS (FOLIA 1-3) UNIDAD DE F.C.C.	1 0 1
13-1-10-36/37	COMBRESOS 13-1-1 PLANTAS Y DETALLES (FOLIA 2-2) UNIDAD DE F.C.C.	1 0 1
13-1-10-38/39	ESTRUTURA PARA COMBRESOS 13-1-1 (FOLIA 2-2) UNIDAD DE F.C.C.	1 0 1

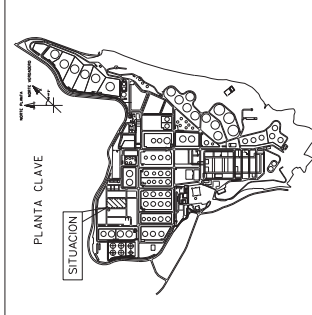
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LISTA DE MATERIALES

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PROJECT #	REAL / ADG	J. C. S.	29-01-16
AD-1783	COMPASS	E. M. O.	29-01-16
ESCALA	APROBADO	C. R. C.	29-01-16
1/50			

	17.30	19.10 20.00
NUEVOS COMPRESORES EN FCC PARA MEJORA DE EFICIENCIA ENERGETICA		
PLATAFORMAS Y ESCALERAS		
NUEVO COMPRESOR F3-C-1		



PLANO NÚMERO	NOMBRE	REFERENCIA DE PLANOS
F3-1-01	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-1
F3-1-02	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-2
F3-1-03	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-3
F3-1-04	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-4
F3-1-05	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-5
F3-1-06	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-6
F3-1-07	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-7
F3-1-08	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-8
F3-1-09	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-9
F3-1-10	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-10

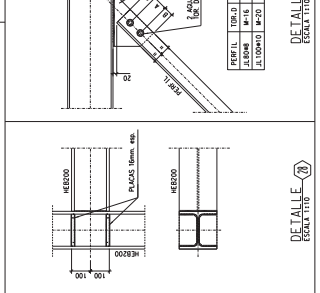
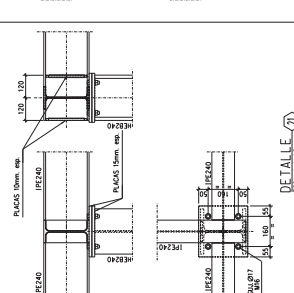
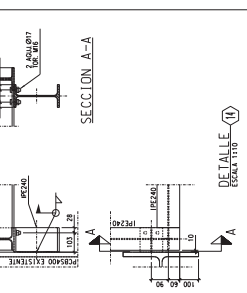
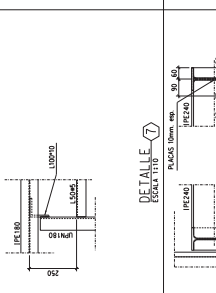
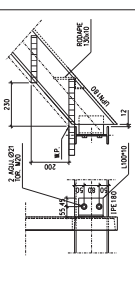
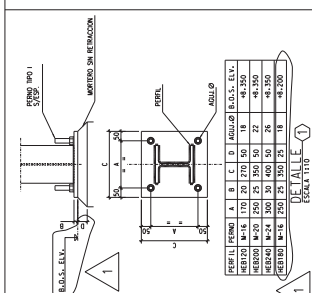
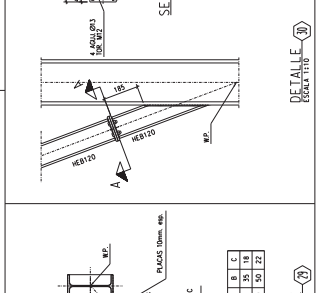
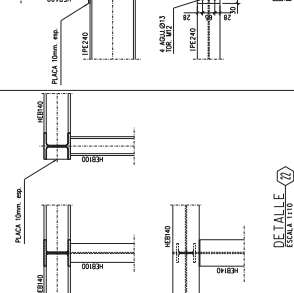
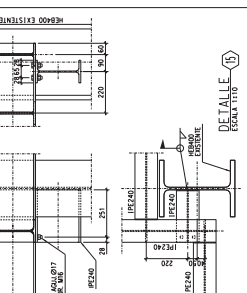
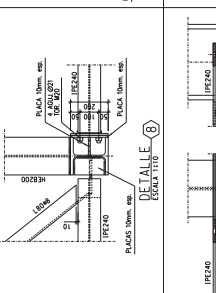
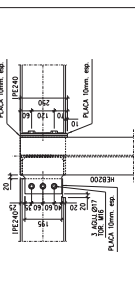
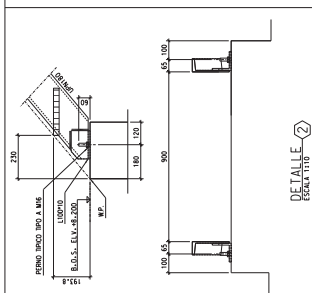
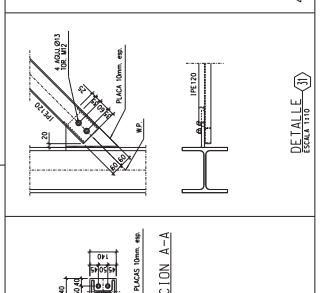
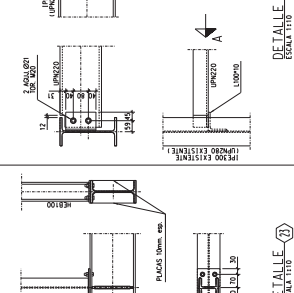
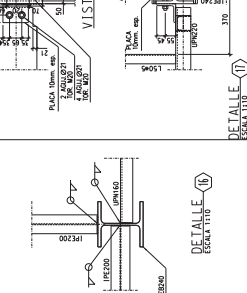
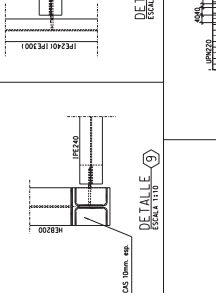
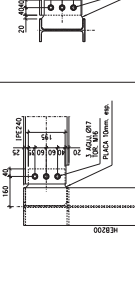
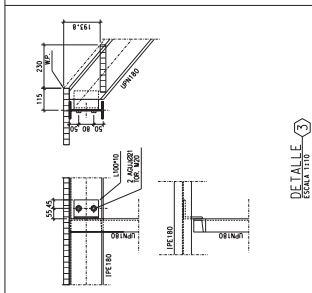
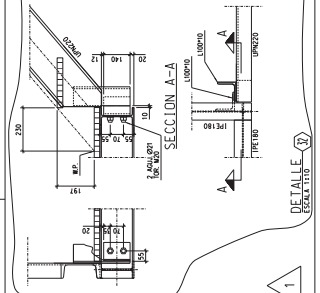
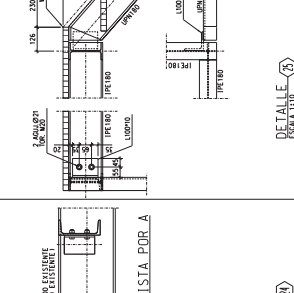
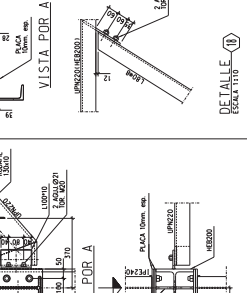
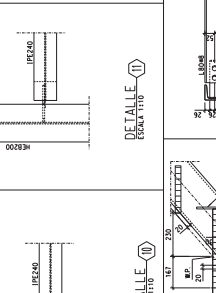
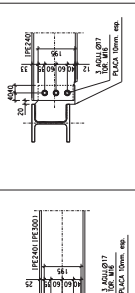
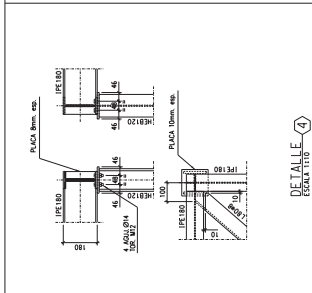
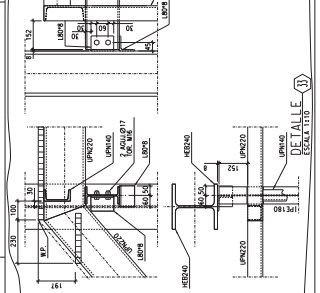
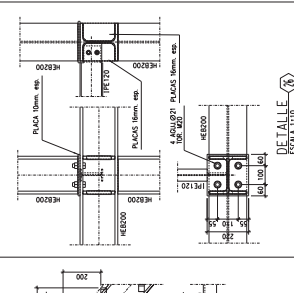
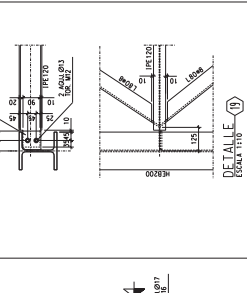
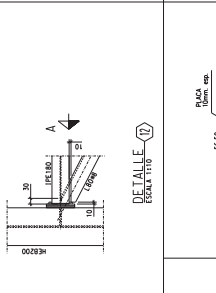
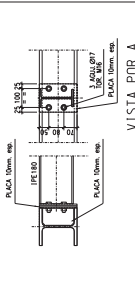
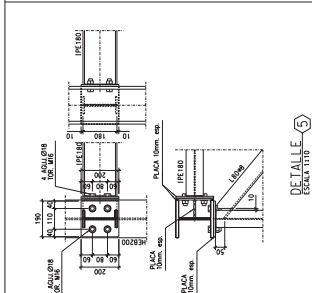
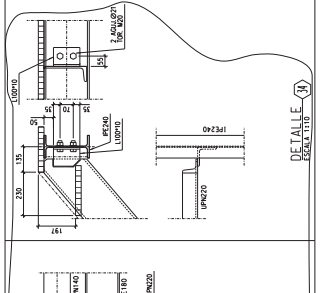
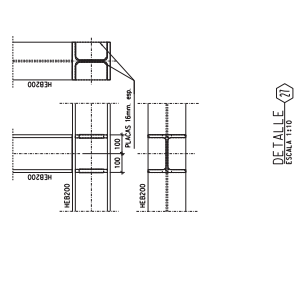
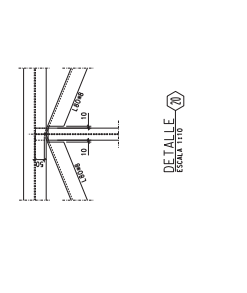
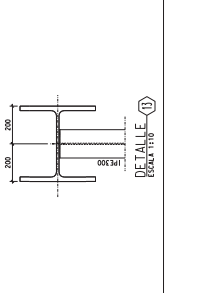
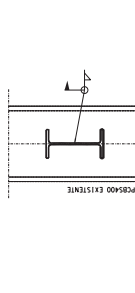
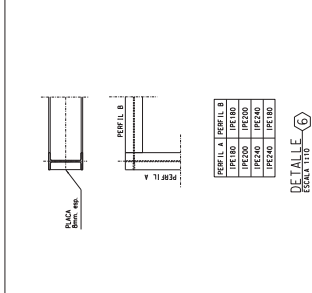
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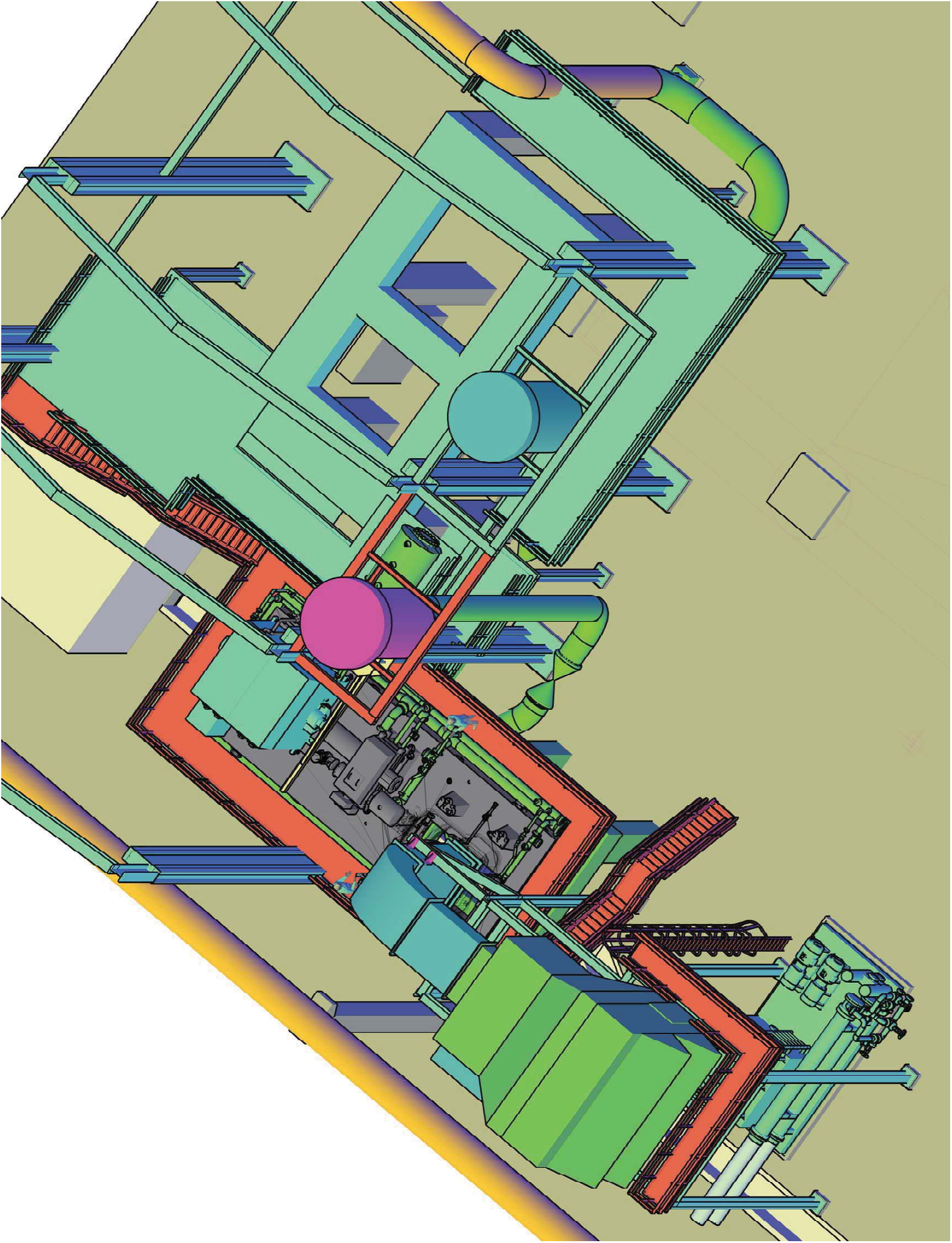
- 1.- TODAS LAS COTAS ESTÁN DADAS EN MILÍMETROS.
- 2.- LAS COTAS SE DÁN EN LA DIRECCIÓN DE LA LÍNEA DE LA COTA.
- 3.- LAS COTAS SE DÁN EN LA DIRECCIÓN DE LA LÍNEA DE LA COTA.
- 4.- LAS COTAS SE DÁN EN LA DIRECCIÓN DE LA LÍNEA DE LA COTA.
- 5.- EFECTUACIÓN DE DISEÑO RELACIONADA CON LOS PLANOS DE ESTRUCTURA METALICA.
- 6.- EFECTUACIÓN DE DISEÑO RELACIONADA CON LOS PLANOS DE ESTRUCTURA METALICA.
- 7.- EFECTUACIÓN DE DISEÑO RELACIONADA CON LOS PLANOS DE ESTRUCTURA METALICA.
- 8.- EFECTUACIÓN DE DISEÑO RELACIONADA CON LOS PLANOS DE ESTRUCTURA METALICA.
- 9.- EFECTUACIÓN DE DISEÑO RELACIONADA CON LOS PLANOS DE ESTRUCTURA METALICA.
- 10.- EFECTUACIÓN DE DISEÑO RELACIONADA CON LOS PLANOS DE ESTRUCTURA METALICA.

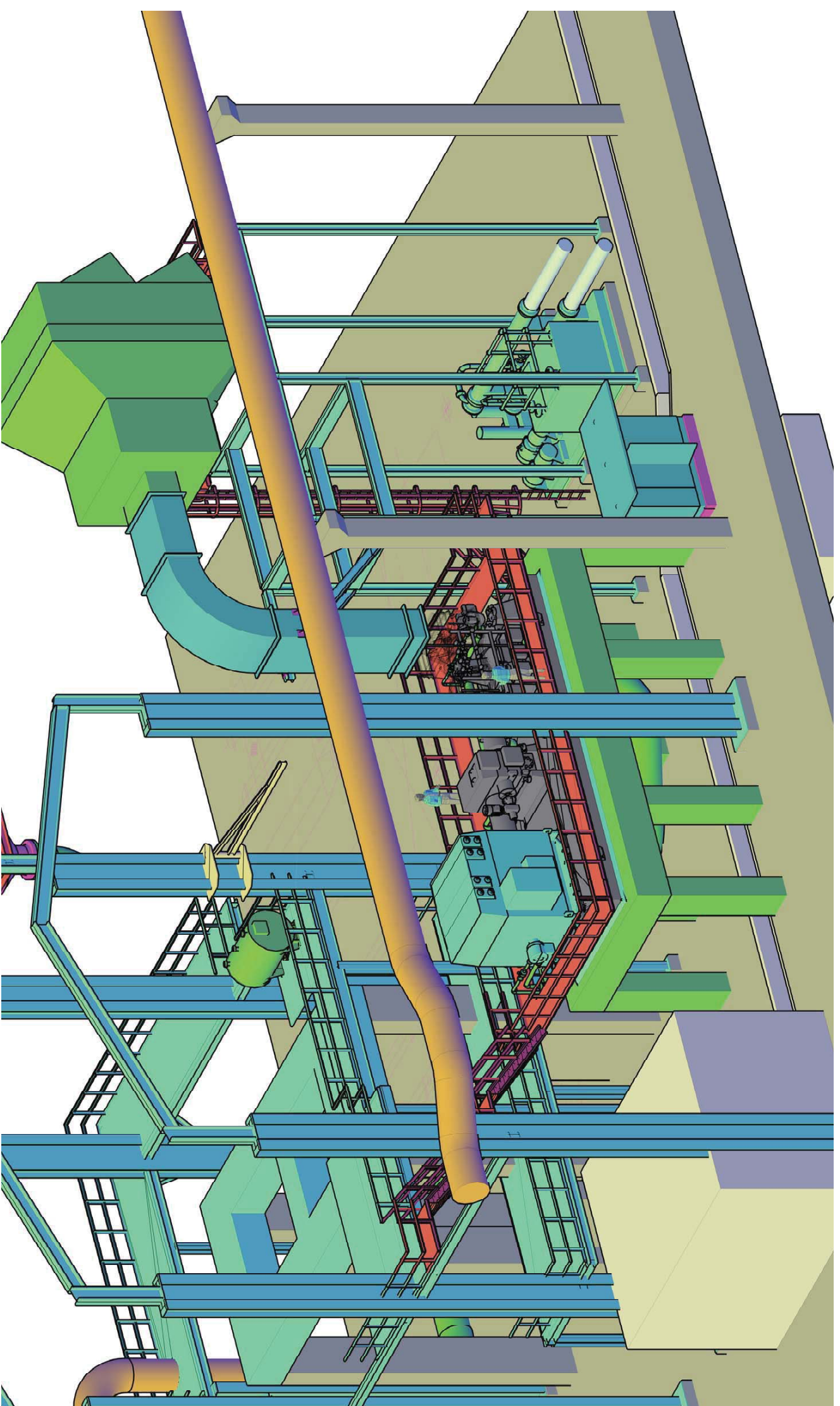
PLANO NÚMERO	NOMBRE	REFERENCIA DE PLANOS
F3-1-11	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-11
F3-1-12	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-12
F3-1-13	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-13
F3-1-14	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-14
F3-1-15	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-15
F3-1-16	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-16
F3-1-17	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-17
F3-1-18	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-18
F3-1-19	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-19
F3-1-20	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-20

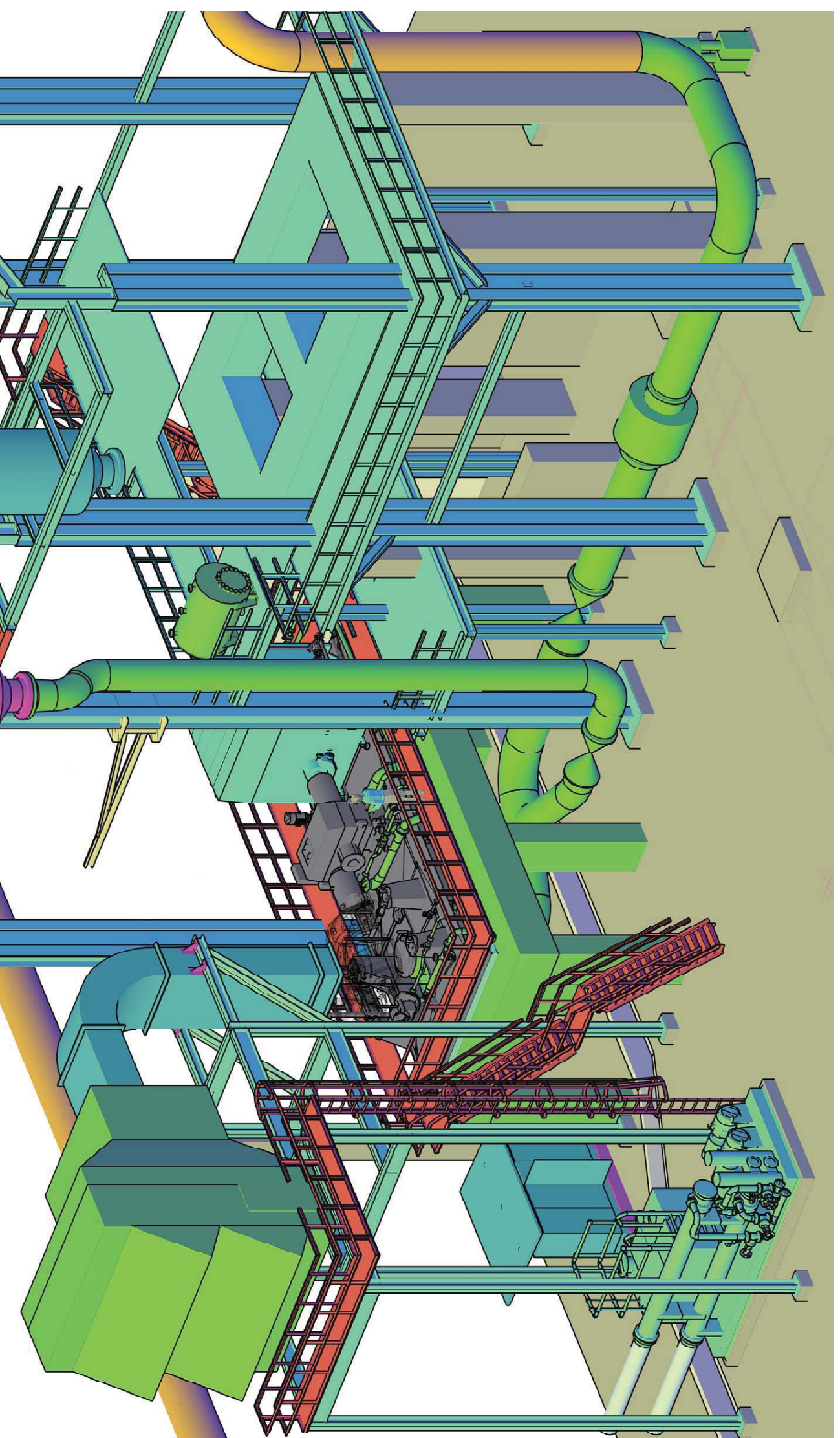
PLANO NÚMERO	NOMBRE	REFERENCIA DE PLANOS
F3-1-21	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-21
F3-1-22	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-22
F3-1-23	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-23
F3-1-24	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-24
F3-1-25	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-25
F3-1-26	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-26
F3-1-27	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-27
F3-1-28	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-28
F3-1-29	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-29
F3-1-30	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-30

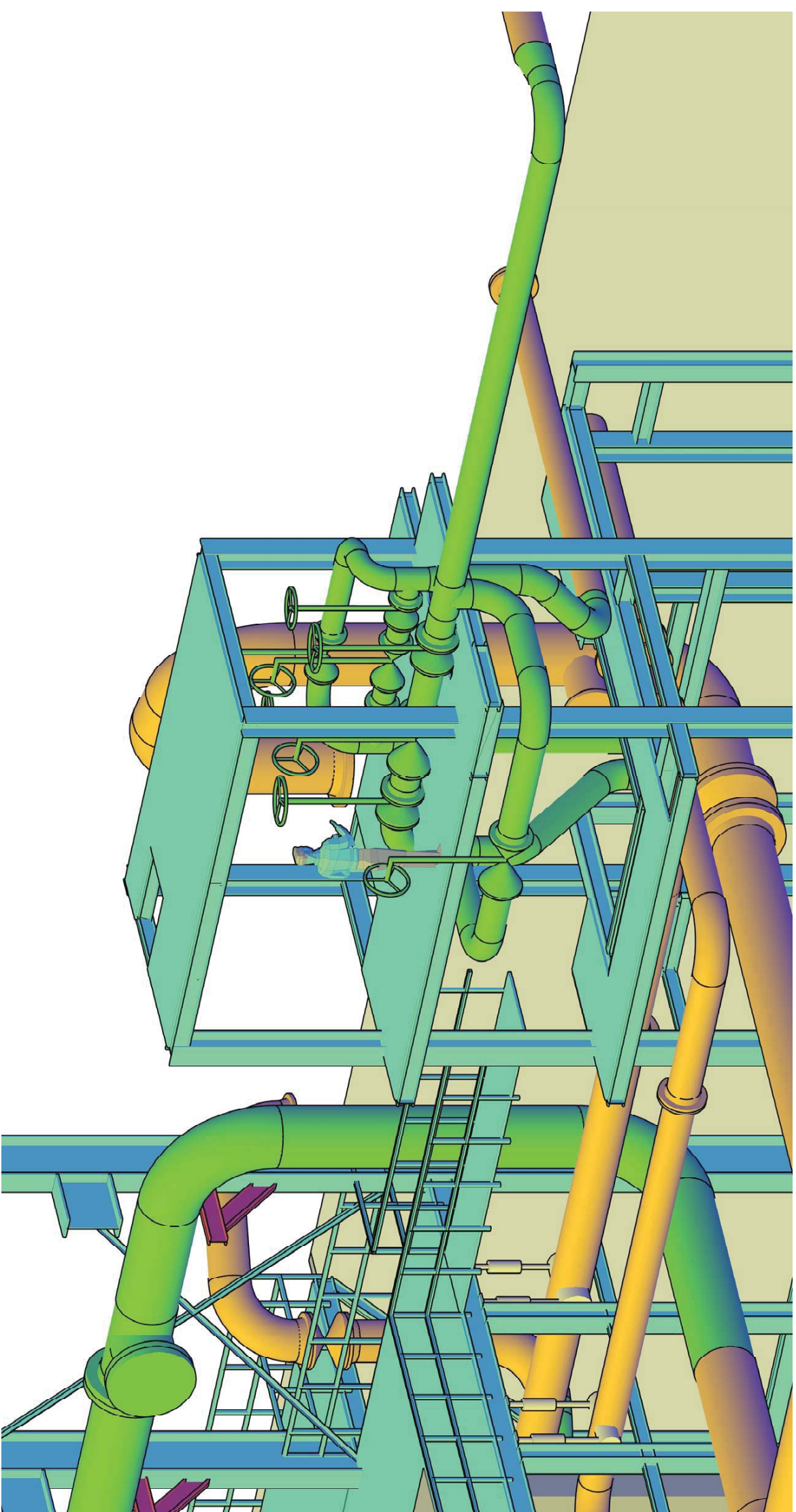
PLANO NÚMERO	NOMBRE	REFERENCIA DE PLANOS
F3-1-31	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-31
F3-1-32	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-32
F3-1-33	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-33
F3-1-34	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-34
F3-1-35	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-35
F3-1-36	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-36
F3-1-37	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-37
F3-1-38	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-38
F3-1-39	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-39
F3-1-40	PLANO DE IMPLANTACIÓN ANTERIOR DE F.C.C.	1-0-40









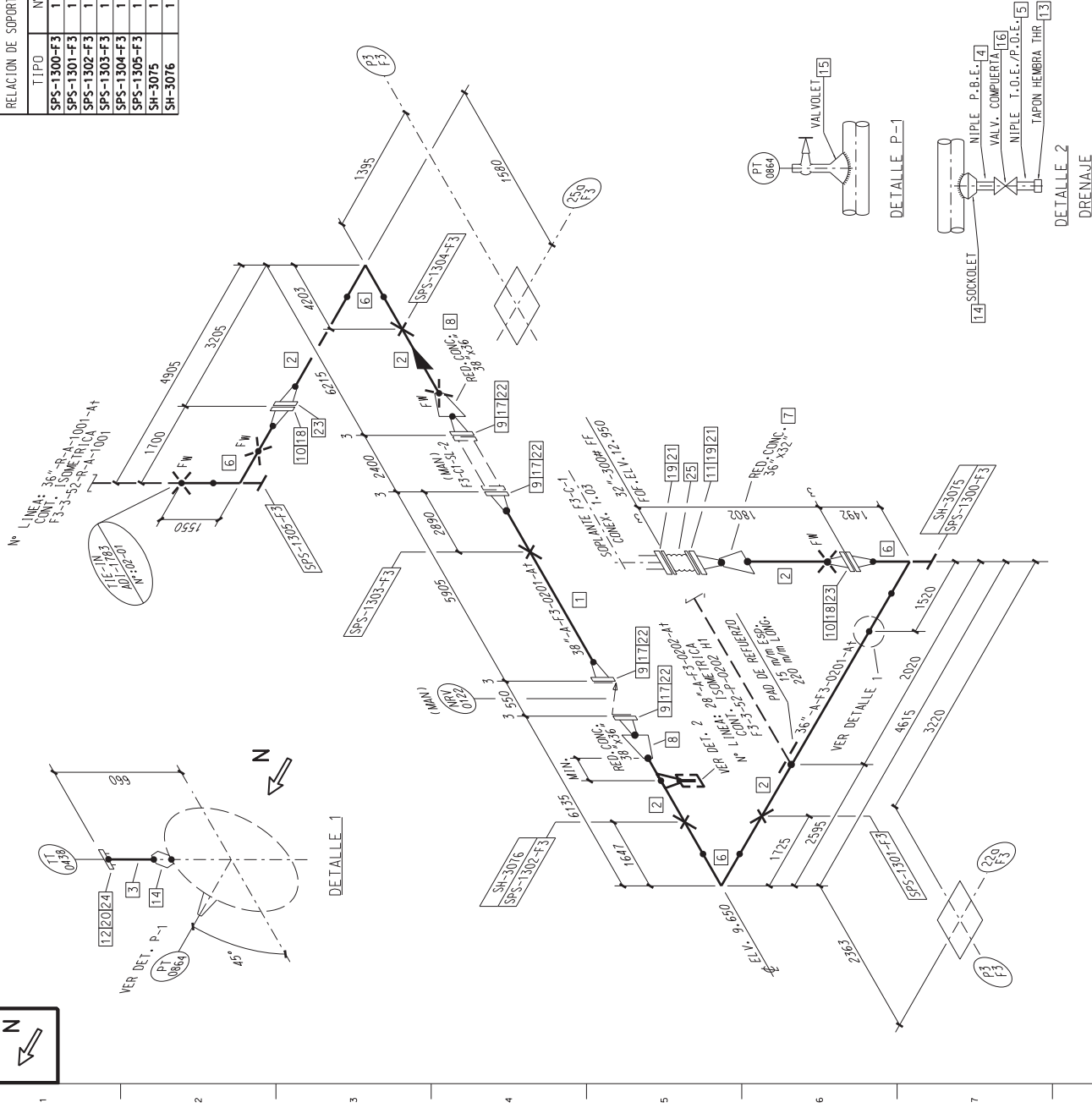


LISTADO DE MATERIALES - FABRICACION

UNICODE	MARCA	TAMANO	DESCRIPCION	CANT.
P/PA090B138STD	1	38	TUBO. EF#M. ASTM A 672 Cl. 12 Gr-G60. SCH. STD. Ext. Bisel.	6 m
P/PA090B136STD	2	36	TUBO. EF#M. ASTM A 672 Cl. 12 Gr-G60. SCH. STD. Ext. Bisel.	15 m
P/PA010A111/280	3	1 1/2	TUBO. S/COSTURAS. ASTM A 106 Gr-B. SCH. XS. Ext. Pitoros	1 m
-	4	1 1/2	NIPPLE P.B.E.. ASTM A 106 Gr-B. SCH. XS. L=150mm	1
-	5	1 1/2	NIPPLE T.D.E./P.O.E.. ASTM A 106 Gr-B. SCH. XS. L=150mm	1
90LA20WF336STD	6	36	CODO 90. BW. ASTM A234 Gr. WPB. SCH. STD	4
CREA20WF332153015	7	36x32	REDUCCION CONCEN.. BW. ASTM A234 Gr. WPB. SCH. STD	1
CREA20WF333155215	8	38x36	REDUCCION CONCEN.. BW. ASTM A234 Gr. WPB. SCH. STD	2
WNF A300R1638STD	9	38	BRIDA WN. 150# RF. ASTM A105. SCH. STD ASME B16.47 SERIE B	4
WNF A300R1636STD	10	36	BRIDA WN. 150# RF. ASTM A105. SCH. STD ASME B16.47 SERIE B	4
WNF A300F3632STD	11	32	BRIDA WN. 300# RF. ASTM A105. SCH. STD ASME B16.47 SERIE B	1
WNF A300F1511/280	12	1 1/2	BRIDA WN. 150# RF. ASTM A105. SCH. XS ASME B16.5	1
-	14	36 x 1 1/2	SOCKLEET. 3000#. ASTM A105.	2
V53_4L-V501	15	36 x 3/4	VALVULE EXTREMO ROSCADO. THR. V-7302. 800#.	1
-	16	1 1/2	VALVULA DE CUPOUERTA. 800 #. SW. V-2819	1

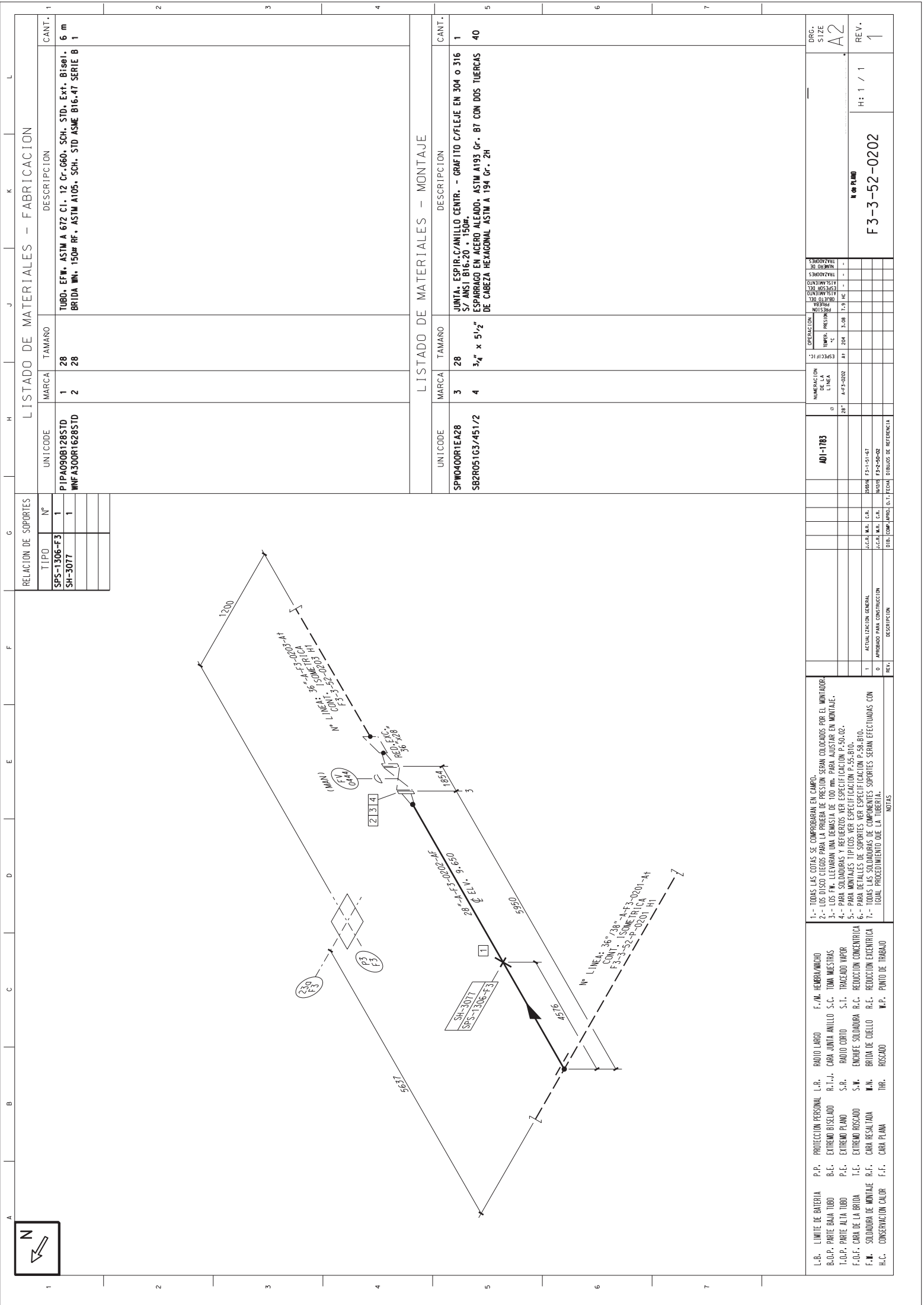
LISTADO DE MATERIALES - MONTAJE

UNI CODE	MARCA	TAMARO	DESCRIPCION	CANT.
-	13	1 1/2	TAPON HEMBRA. THR. 3000#, ASTM A105	1
SPW0400R1EA38	17	38	JUNTA. ESPIR.C/ANILLO CENTR. - GRAFITO C/FLEJE EN 304 O 316	5
SPW0400R1EA36	18	36	S/ ANSI. B16-20 .150#.	5
SPW0400R3EA32	19	32	JUNTA. ESPIR.C/ANILLO CENTR. - GRAFITO C/FLEJE EN 304 O 316	2
SPW0400R1EA11/2	20	1 1/2	S/ ANSI. B16-20 .150#.	2
SBR051G11/212	21	1 1/2" x 12"	JUNTA. ESPIR.C/ANILLO CENTR. - GRAFITO C/FLEJE EN 304 O 316	1
SB2R051G171/2	22	1" x 7 1/2"	ESPARRAGO EN ACERO ALEADO. ASTM A193 Gr. B7 CON DOS TUERCAS DE CABEZA HEXAGONAL ASTM A 194 Gr. 2H	64
SB2R051G5/831/2	23	7/8" x 6 3/4"	ESPARRAGO EN ACERO ALEADO. ASTM A193 Gr. B7 CON DOS TUERCAS DE CABEZA HEXAGONAL ASTM A 194 Gr. 2H	160
SB2R051G1/23	24	1 1/2" x 3"	ESPARRAGO EN ACERO ALEADO. ASTM A193 Gr. B7 CON DOS TUERCAS DE CABEZA HEXAGONAL ASTM A 194 Gr. 2H	88
-	25	32	ESPARRAGO EN ACERO ALEADO. ASTM A193 Gr. B7 CON DOS TUERCAS DE CABEZA HEXAGONAL ASTM A 194 Gr. 2H	4
BILFA300R1638	38	38	JUNTA DE EXPANSION. 300# FF.	1
			BRIDA CIEGA. 150# RF. ASTM A105. ASME B16.47 SERIE B (PARA PRUEBA HIDRAULICA)	1

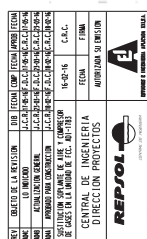


L.B.	LIMITE DE BATERIA	P.P.	PROTECCION PERSONAL	L.R.	RADIO LARGO	F./M. HEMBRA/MUCHO	1.- TODAS LAS COPIAS DE COMPROBACION EN CAMPO. 2.- LOS DOS CIGUOS PARA LA PROBEA DE PRESION SEAN COLOCADOS POR EL MONITADOR. 3.- LOS FLORES LLEVARAN UNA DEMASIA DE 100 mm. PARA AJUSTAR EN MONTAÑAS. 4.- PARA SOLIDARIDAD Y REFUERZO VER ESPECIFICACION P.50-02. 5.- PARA MONTAJES TÍPICOS VER ESPECIFICACION P.55-80. 6.- PARA DETALLES DE SOPORTES VER ESPECIFICACION P.58-80. 7.- TODAS LAS SOLIDARIDADES DE COMPONENTES SUPORTES SERAN EFECTUADAS CON UN PROCEDIMIENTO QUE LA COMANDO EN UNO DE LOS NOTAS.										REV. 1		H: 1 / 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO		A2		REV. 1		F3-3-52-0201		L.6 DE PLANO	

NOTES



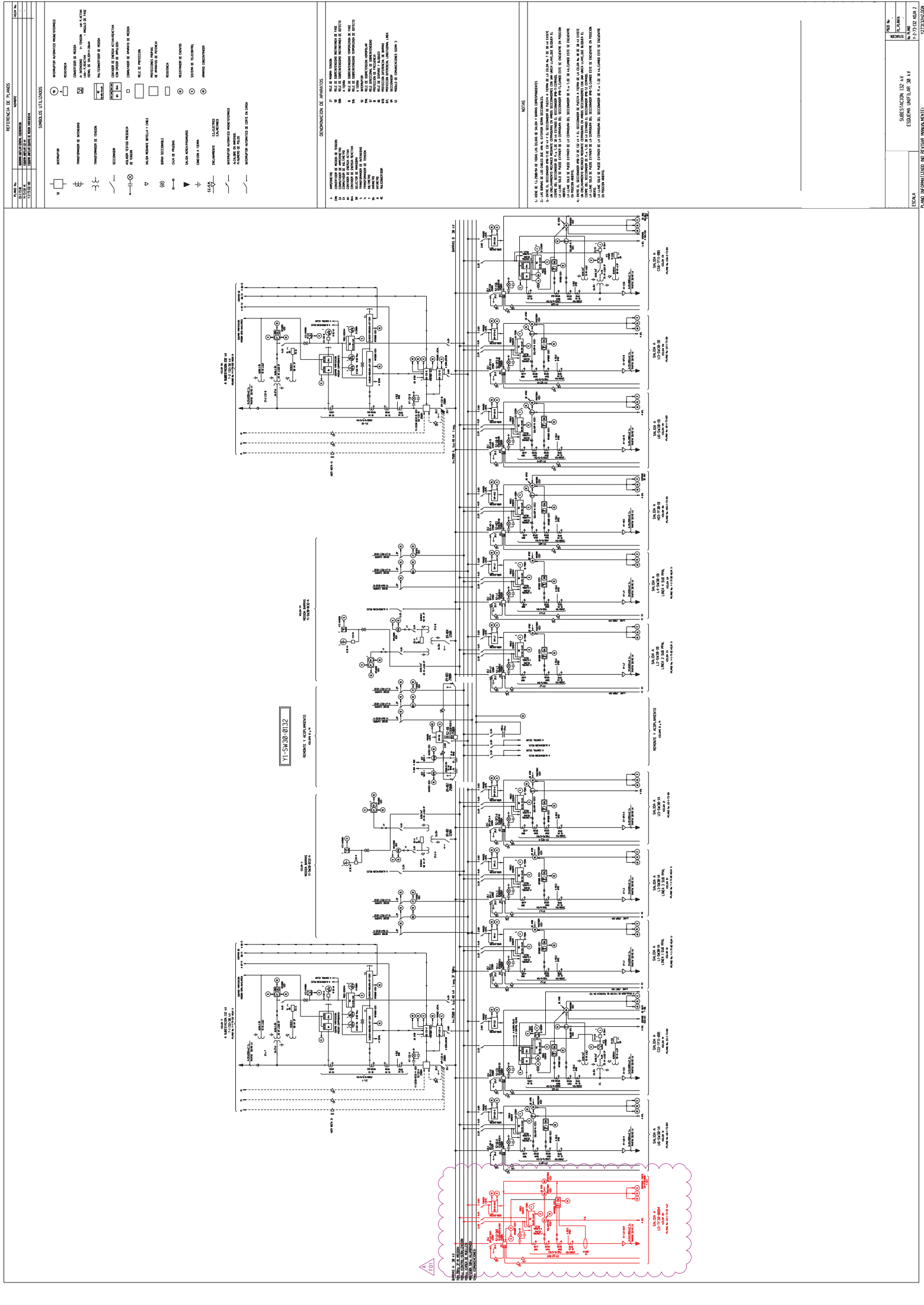
RELACION DE SOPORTES		LISTADO DE MATERIALES – FABRICACION		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE MATERIALES – MONTAJE		LISTADO DE 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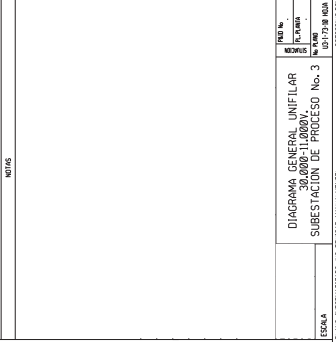


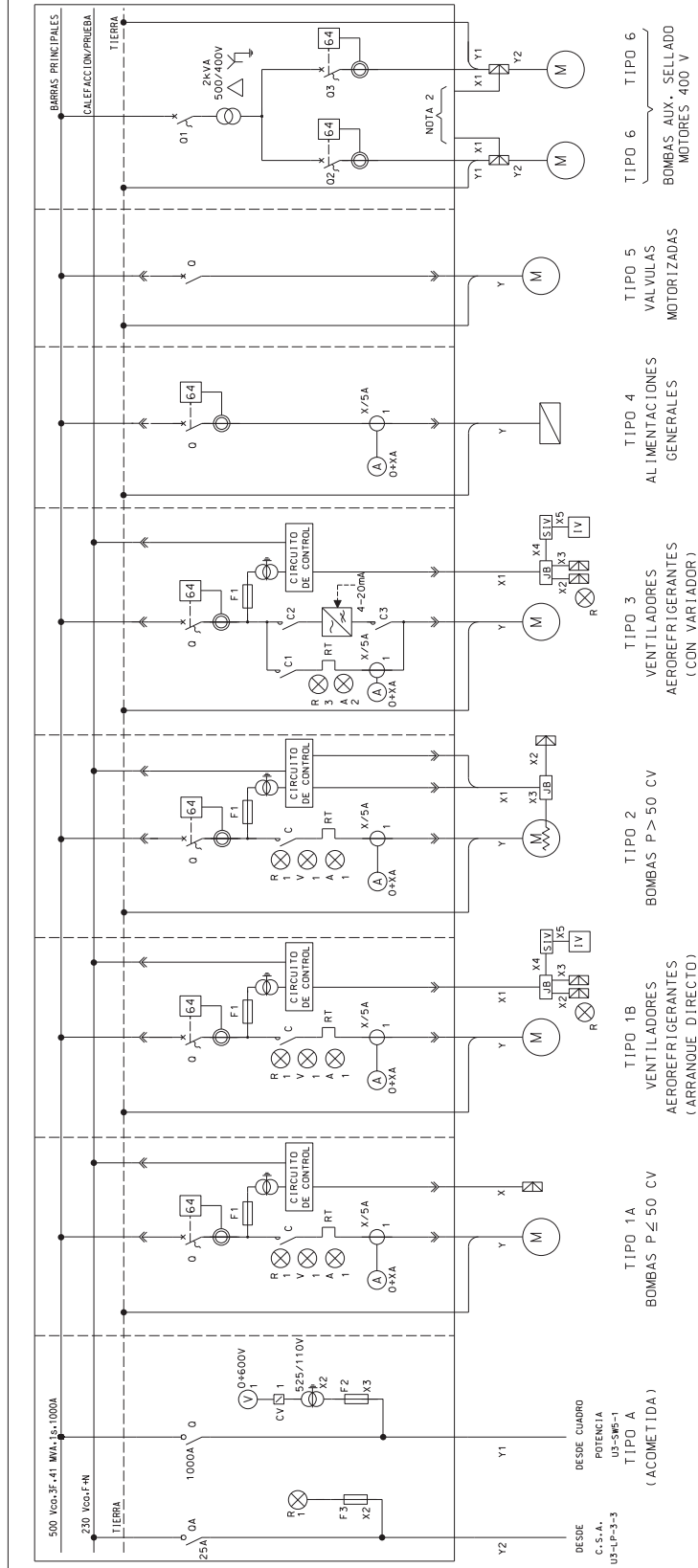
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9) LAS VERSIONES DE "UNO"
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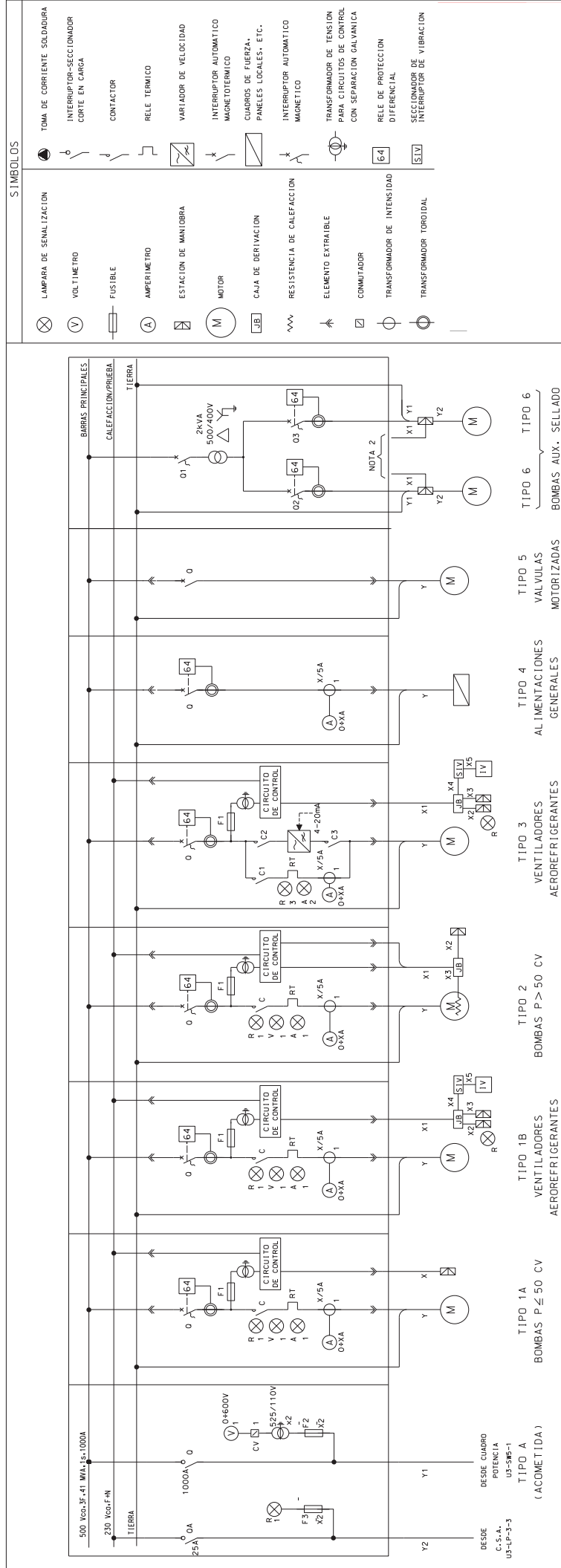




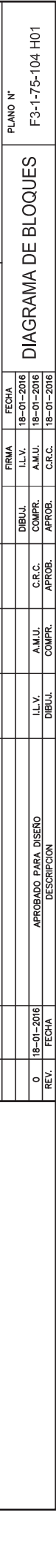




IDENTIFICACION					APARELLO			MEDIDA			CABLES					ESQUEMA CONEXION	PLANO DE SITUACION	NOTAS		
UNID.	N°EQUIPO	SERVICIO	POT./INT KW/A	TIPO CONEX.	GRUPO REACEL	INTERRUPTOR SECCIONADOR	RELE TERMICO	CONTACTOR	T. I.	AMP.	Y/Y1	Y2	X/X1	X2	X3	X4, X5	PLANO CONSONI	ESQUEMA	PLANO DE SITUACION	NOTAS
U3	U3-M5-9	ACOMETIDA CCM B. PRINCIPALES				1000A					9X1X300	3X4					65-080		U3-1-73-15/2	
U3	NF3-NF3-EMP-2	BOMBA DE DRENCH NF3-P-2A	22KW	1A	B1	160A(152A)	14-45A	50A	50/5A	0-50A	3-5X35		5X2.5				H010 17		NF3-1-71-01	
NF3	NF3-NF3-EMP-2A	BOMBA DE DRENCH NF3-P-2A	7.5KW	1A	B1	160A(125A)	3.7-12A	40A	20/5A	0-20A	4X16		5X2.5				H010 15		NF3-1-71-01	
NF3	NF3-NF3-EMP-4A	BOMBA DE PRODUCTO HCN NF3-P-4A	22KW	1A	B2	160A(152A)	14-45A	50A	50/5A	0-50A	3-5X35		5X2.5				H010 24		NF3-1-71-01	
NF3	NF3-NF3-EMP-2A	V-AEROPREFR. EFLENTE NOS NF3-E-2A	15KW	3	A	160A(132A)	12-32A	50A	30/5A	0-30A	3-5X25		12X2.5	7X2.5	5X2.5	5X2.5	H010S 34-35		NF3-1-71-03	
NF3	NF3-NF3-EMP-2B	V-AEROPREFR. EFLENTE NOS NF3-E-2B	15KW	1B	A	160A(132A)	12-32A	50A	30/5A	0-30A	3-5X25		12X2.5	7X2.5	5X2.5	5X2.5	H010 23		NF3-1-71-03	
NF3	NF3-NF3-EMP-2C	V-AEROPREFR. EFLENTE NOS NF3-E-2C	15KW	3	A	160A(132A)	12-32A	50A	30/5A	0-30A	3-5X25		12X2.5	7X2.5	5X2.5	5X2.5	H010S 36-37		NF3-1-71-03	
NF3	NF3-NF3-EMP-2D	V-AEROPREFR. EFLENTE NOS NF3-E-2D	15KW	1B	A	160A(132A)	12-32A	50A	30/5A	0-30A	3-5X25		12X2.5	7X2.5	5X2.5	5X2.5	H010 31		NF3-1-71-03	
NF3	NF3-NF3-EMP-5	V-AEROPREFR. CABEZA ESTAB. NF3-E-5	15KW	3	B1	160A(132A)	12-32A	50A	30/5A	0-30A	3-5X25		12X2.5	7X2.5	5X2.5	5X2.5	H010S 38-39		NF3-1-71-03	
NF3	NF3-NF3-C1A-EMP-2	BOMBA LUBRICACION COMP. NF3-C-1A	4KW	1A	-	160A(18.5A)	3.7-12A	40A	10/5A	0-10A	4X10		12X2.5				H010 14		NF3-1-71-02	
NF3	NF3-NF3-C1-EMP-3	BOMBA PRIN. DE REFRIG. DE NF3-C-1A/B	5.5KW	1A	-	160A(11A)	3.7-12A	40A	10/5A	0-10A	4X10		12X2.5				H010 29		NF3-1-71-02	
-	-	RESERVA EQUIPADA	10KW	4	-	160A(25A)			30/5A	0-30A							H010 13			
NF3	NF3-NF3-C1-E5	CALENTADORES REFRIG COMPRESOR NF3-C-1A/B	11KW	1A	-	160A(20A)	12-32A	40A	20/5A	0-20A	4X16		3X2.5				H010 16		NF3-1-71-02	
-	-	RESERVA EQUIPADA	10KW	4	-	160A(25A)			30/5A	0-30A							H010 20			
F3	F3-EMP-104A	BOMBA DE NAFTA LIGERA PRODUCTO	22KW	1A	-	160A(152A)	14-45A	50A	50/5A	0-50A	3-5X70		5X2.5				H010 32		M3-1-73-03-01	
F3	F3-EMP-31A	BOMBA DE CEA PRODUCTO	45KW	2	-	160A(180A)	26-85A	95A	75/5A	0-75A	3-5X95		7X2.5	5X2.5	3X2.5		H010 25		M3-1-73-03-01	
F3	NF3-MOV-002	VALVULA MOTORIZADA MOV-002	32A	5	-	160A(32A)			40/5A	0-40A	3-5X35		5X2.5				H010 30		M3-1-73-03-01	
NF3	NF3-MOV-003	VALVULA MOTORIZADA MOV-003	32A	5	-	160A(32A)					4X6						H010 11		NF3-1-71-01	
NF3	NF3-MOV-009	VALVULA MOTORIZADA MOV-009	32A	5	-	160A(32A)					4X6						H010 12		NF3-1-71-03	
-	-	RESERVA EQUIPADA	7.5KW	1A	-	160A(12.5A)	3.7-12A	40A	20/5A	0-20A							H010 26		NF3-1-71-03	
-	-	RESERVA EQUIPADA	15KW	1A	-	160A(32A)	12-32A	50A	30/5A	0-30A							H010 21			
-	-	RESERVA EQUIPADA	30KW	1A	-	160A(152A)	12-32A	63A	50/5A	0-50A							H010 22			
-	-	RESERVA EQUIPADA	45KW	2	-	160A(180A)	26-85A	95A	75/5A	0-75A							H010 18			
-	-	RESERVA EQUIPADA	40A	4	-	160A(40A)			40/5A	0-40A							H010 33			
-	-	RESERVA EQUIPADA	32A	5	-	160A(32A)											H010 28			
-	-	RESERVA EQUIPADA	32A	5	-	160A(32A)											H010 27			
NF3	NF3-P2A-EMP-1	BOMBA SELLO DE NF3-P-2A	0.37KW	6	-	160A(110A)			4X6		4X6	4X6	3X2.5				H010 19		NF3-1-71-01	
F3	F3-P2A-EMP-1	BOMBA SELLO DE F3-P-2A	0.37KW	6	-	160A(110A)			4X6		4X6	4X6	3X2.5				H010 19		M3-1-73-03-01	
F3	F3-C-1-EMC-BE-1	MOTOR TURNING GEAR	1-5KW	1A	-				4X6		4X6		7X2.5	12X2.5	12X2.5	12X2.5	-	-	-	
F3	F3-C-1-EMC-2	MOTOR LGV	1-5KW	1A	-				4X6		4X6		7X2.5	12X2.5	12X2.5	12X2.5	-	-	-	
F3	F3-C-1-EMP-1A	BOMBA LUBRICACION F3-C-1	22KW	1A	-				4X35				7X2.5	12X2.5	12X2.5	12X2.5	-	-	-	
F3	F3-C-1-E-1	CALENTADOR ACEITE LUBRICACION F3-C-1	9KW	1A	-				4X10				12X2.5	12X2.5	-	-	-	-	-	



IDENTIFICACION										APARELLAJE				MEDIDA		CABLES				ESQUEMA CONEXION	PLANO DE SITUACION	NOTAS
UNID.	Nº EQUIPO	SERVICIO	POT./INT. KW/A	TIPO CONEX.	GRUPO REACEL. SECCIONADOR	RELE TERMINICO	APARELLAJE	T. 1.	AMP.	Y/Y1	Y2	X/X1	X2	X3	X4, X5	PLANO CONSONANTE	ESQUEMA CONEXION	PLANO DE SITUACION	NOTAS			
U3	U3-MC5-10	ACOMETIDA COM B. PRINCIPALES	22KW	1A	B1	160A(52A)	1000A	50/5A	0-50A	9X1X300	3X4	5X2.5				H010 3	U3-1-73-15/2					
NF3	NF3-EMP-2B	BOMBA DE QUENCH NF3-P-2B	7.5KW	1A	B1	160A(12.5A)	14-46A	40A	20/5A	0-20A	4X16	5X2.5				H010 17	NF3-1-71-01					
NF3	NF3-EMP-3B	BOMBA REFUELO ESTABILIZADOR NF3-P-3B	22KW	1A	B1	160A(52A)	3.7-12A	40A	20/5A	0-20A	4X16	5X2.5				H010 21	NF3-1-71-01					
NF3	NF3-EMP-4B	BOMBA DE PRODUCTO CON NF3-P-4B	22KW	1A	B2	160A(52A)	14-46A	50A	50/5A	0-50A	3.5X35	5X2.5				H010 24	NF3-1-71-01					
NF3	NF3-EMP-2E	V. AEROREFR. EFLENTE HOS NF3-E-2E	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010B 34-35	NF3-1-71-03					
NF3	NF3-EMP-2F	V. AEROREFR. EFLENTE HOS NF3-E-2F	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 16	NF3-1-71-03					
NF3	NF3-EMP-2G	V. AEROREFR. EFLENTE HOS NF3-E-2G	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010B 36-37	NF3-1-71-03					
NF3	NF3-EMP-2H	V. AEROREFR. EFLENTE HOS NF3-E-2H	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 22	NF3-1-71-03					
NF3	NF3-EMP-2I	V. AEROREFR. EFLENTE HOS NF3-E-2I	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010B 30	NF3-1-71-03					
NF3	NF3-EMP-2J	V. AEROREFR. EFLENTE HOS NF3-E-2J	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 28	NF3-1-71-02					
NF3	NF3-EMP-2K	V. AEROREFR. EFLENTE HOS NF3-E-2K	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 15	NF3-1-71-02					
NF3	NF3-EMP-2L	V. AEROREFR. EFLENTE HOS NF3-E-2L	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 14	NF3-1-71-02					
NF3	NF3-EMP-2M	V. AEROREFR. EFLENTE HOS NF3-E-2M	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 13	NF3-1-71-02					
NF3	NF3-EMP-2N	V. AEROREFR. EFLENTE HOS NF3-E-2N	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 32	NF3-1-73-03-01					
NF3	NF3-EMP-2O	V. AEROREFR. EFLENTE HOS NF3-E-2O	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 25	NF3-1-73-03-01					
NF3	NF3-EMP-2P	V. AEROREFR. EFLENTE HOS NF3-E-2P	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 31	NF3-1-73-03-01					
NF3	NF3-EMP-2Q	V. AEROREFR. EFLENTE HOS NF3-E-2Q	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 29	NF3-1-73-03-01					
NF3	NF3-EMP-2R	V. AEROREFR. EFLENTE HOS NF3-E-2R	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 23	NF3-1-73-03-01					
NF3	NF3-EMP-2S	V. AEROREFR. EFLENTE HOS NF3-E-2S	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 18	NF3-1-73-03-01					
NF3	NF3-EMP-2T	V. AEROREFR. EFLENTE HOS NF3-E-2T	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 30	NF3-1-73-03-01					
NF3	NF3-EMP-2U	V. AEROREFR. EFLENTE HOS NF3-E-2U	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 20	NF3-1-73-03-01					
NF3	NF3-EMP-2V	V. AEROREFR. EFLENTE HOS NF3-E-2V	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 26	NF3-1-73-03-01					
NF3	NF3-EMP-2W	V. AEROREFR. EFLENTE HOS NF3-E-2W	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-2X	V. AEROREFR. EFLENTE HOS NF3-E-2X	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 27	NF3-1-73-03-01					
NF3	NF3-EMP-2Y	V. AEROREFR. EFLENTE HOS NF3-E-2Y	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 25	NF3-1-73-03-01					
NF3	NF3-EMP-2Z	V. AEROREFR. EFLENTE HOS NF3-E-2Z	15KW	3	A	160A(32A)	12-32A	50A	30/5A	0-30A	3.5X25	5X2.5	7X2.5	5X2.5	5X2.5	H010 26	NF3-1-73-03-01					
NF3	NF3-EMP-3A	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3B	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3C	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3D	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3E	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3F	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3G	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3H	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3I	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3J	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3K	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3L	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3M	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3N	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3O	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3P	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3Q	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3R	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3S	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3T	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3U	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3V	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3W	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3X	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3Y	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-3Z	BOMBA DE C3 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-4A	BOMBA DE C4 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-4B	BOMBA DE C4 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-4C	BOMBA DE C4 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-4D	BOMBA DE C4 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-4E	BOMBA DE C4 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-4F	BOMBA DE C4 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-4G	BOMBA DE C4 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-4H	BOMBA DE C4 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-4I	BOMBA DE C4 PRODUCTO	45KW	2	A	160A(80A)	26-85A	95A	75/5A	0-75A	4X16	5X2.5	7X2.5	5X2.5	5X2.5	H010 19	NF3-1-73-03-01					
NF3	NF3-EMP-4J	BOMBA DE C4 PRODUCTO	45																			



2.7 ANEXO 3. DOCUMENTACION EDITADA POR MAN DIESEL & TURBO

- 1º Hoja de datos del Compresor
- 2º Curvas de operación del Compresor
- 3º Hoja de datos Motor Eléctrico
- 4º Hoja de datos de la Multiplicadora de Velocidad
- 5º Curva de operación del motor eléctrico
- 6º Hoja de datos de la Consola de Lubricación
- 7º Disposición General compresor
- 8º Plano seccional del compresor
- 9º Plano de conjunto del motor
10. Plano de conjunto Multiplicadora de Velocidad
11. Disposición general Consola de Lubricación
12. Diagramas lógicos
13. Esquemas de interconexión entre Panel de Control y cajas de conexión
14. Hojas de datos de instrumentos



AXIAL COMPRESSOR
F3-C-1 DATA SHEET

KENNWORT / CODE WORD
BILBOAX
AUFTRAG-NR / ORDER-NO
H.0200062.02

1. HOJAS DE DATOS DEL COMPRESOR

AXIAL COMPRESSOR

F3-C-1 DATA SHEET

AWARDING CODE: P-N1783-CEC0-K0-0001-A-O

	00	01	02	03	04	05	REVIDIERTE ZEILE REVISED LINE
DATUM DATE	17.07.2015	22.10.2015	13.04.2016	23.06.2016			
NAME NAME	Dreyer	Dreyer	Dreyer	Dreyer			BLATT SHEET
GEPRÜFT CHECKED	Dreyer	Dreyer	Dreyer	Dreyer			0 VON / OF 7
ABTEILUNG DEPARTMENT	TELEFON PHONE NO.	TELEFAX FAX NO.	FORMAT SIZE	DOKUMENTEN-NR. / DOCUMENT NO:			REVISION REVISION
ETEAD	49 208 692 9413	49 208 692 9311	A4	10001967744			03

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This dwg. is the property of MAN Diesel & Turbo SE and is solely for the use of the party to which it is handed over.

Project : Bilbao, Muskiz Refinery Project

MAN Diesel & Turbo

Drawing title : **AXIAL COMPRESSOR** AWARDING CODE. : P-N1783-CECO-K0-0001-A-O
F3-C-1 DATA SHEET



Sl. No	Purchaser's comment	Vendor's reply	Status (open/ close/ ↓)
	Page3/7, line 3: "Please explain max. continuous speed and trip speed values. Take into consideration that for this compressor there is no Variable speed gear."	API 617 Ch. 1, para. 1.5.18 maximum continuous speed: "For compressors driven by fixed speed electric motors, this speed is based on the synchronous speed of the motor". API 617 Ch. 1 para 1.5.50 trip speed: ".....the trip speed of alternating current electric motors, except variable frequency drives, is the speed (rpm) corresponding to the synchronous speed of the motor at maximum supply frequency". A maximum supply frequency of 50 Hz + 5% = 52.5 Hz according to the material requisition for the motor (page 2, line 5 of the requisition) has been considered for both, maximum cont. speed and trip speed.	

C.R.C.	1						
	2	APPLICABLE TO: ☐ PROPOSAL ☒ PURCHASE ☐ AS BUILT					
	3	CLIENT:	PETRONOR / REPSOL			ITEM	F3-C-1
	4	SITE	MUSKIZ (SPAIN)			No. REQUIRED	ONE (1)
	5	SERVICE	AXIAL COMPRESSOR (AIR BLOWER)			SIZE AND TYPE	AG060-11RB
F.M.S.	6	MANUFACTURER	MAN DIESEL & TURBO SE	MODEL	AXIAL COMPRESSOR	SERIAL No.	6865
	7	NOTES: INFOR. TO BE COMPLETED BY: ☒ PURCHASER ☒ MANUFACTURER ☐ MANUF. OR PURCHASER					
Check:	8	OPERATING CONDITIONS [Note1]					
	9	(All data on per unit basis)					
M.A.R.	10		NORMAL	60%N	60%	RATED	90%
	11	☒ Capacity (kmol/h) (wet)	7102	5181	5661	8368	6277
	12	☒ Weight flow (kg/h) (wet)	201911	150000	163877	242241	181720
	13	☒ Molecular weight (wet/dry) (kg/kmol)	28.43/28.95	28.43/28.95	28.43/28.95	28.43/28.95	28.43/28.95
	14	☒ Relative humidity (%)	95	95	95	95	95
Prep:	15						
	16	INLET CONDITIONS					
	17	☒ Pressure (bara) [Note1]	1,006	1,006	1,006	1,006	1,006
	18	☒ Temperature (°C)	33,3	33,3	33,3	33,3	33,3
	19	☐ Relative humidity %	95	95	95	95	95
DATE: MAY 2013	20	☐ Molecular weight	28,43	28,43	28,43	28,43	28,43
	21	☒ Cp/Cv (K ₁) or (K _{average})	1,388	1,388	1,388	1,388	1,388
	22	☒ Compressibility (Z ₁) or (Z _{average})	1,000	1,000	1,000	1,000	1,000
	23	☒ Volume flow, (m ³ /h)	179744	133532	145886	215647	161770
	24						
REV: 0	25	DISCHARGE CONDITIONS					
	26	☒ Pressure (bara)	4,078	3,735	3,735	4,078	4,078
	27	☒ Temperature (°C)	201,5	199,4	195,2	203,2	203,1
	28	☒ Cp/Cv (K ₁) or (K _{average})	1,388	1,388	1,388	1,388	1,388
	29	☒ Compressibility (Z ₁) or (Z _{average})	1,001	1,001	1,001	1,001	1,001
F3C1-5-00-50	30	☒ Polytropic compression power, kW	9804	7191	7654	11883	8909
	31	☒ Compression train absorbed power, kW	9869	7255	7718	11947	8973
	32						
	33	☒ Power required (inc. mech. Losses w.o. gear) kW	9869	7255	7718	11947	8973
	34	☒ Speed (rpm)	6506	6506	6506	6506	6506
DS FILE CODE	35	☒ Turndown %	82,1	89,8	82,2	68,4	91,1
	36	☒ Estimated surge flow, m ³ /h (at speed ind. up)	157040	129312	137704	172439	148032
	37	☒ Polytropic head (N-m/Kg)	157300	147900	147000	157400	157800
	38	☐ Polytropic efficiency (%)	90,0	85,7	87,4	89,1	89,4
	39	☒ Certified point	-	-	-	-	-
DATA SHEET	40	☐ Performance curve number	10001966274-3	10001966274-3	10001966274-3	10001966274-3	10001966274-3
	41						
	42						
	43	PROCESS CONTROL					
	44	Method	☐ Suction throttling ☒ Variable inlet guide vanes ☐ Speed variation ☐ Discharge blowoff ☐ Cooled bypass				
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	45		from (bar abs) guide vanes from (%) blowoff from				
	46		to (bar abs) to (%) to to				
	47						
	48	Signal	☒ Source PLANT DCS				
	49	Type	☒ Electronic ☐ Pneumatic ☐ Other				
	50	Range	4-20 mA (bar g)				
	51						
	52	Anti-surge system including:	☒ Controller ☒ Logic ☒ Valve ☐ Valve specification ☐ Primary elements				
	53						
	54						
ENGINEER DIVISION	55	REMARKS:					
	56	Note1: Air Filter Clean					
	57						
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ANNEX DESCRIPTION / DRAWING TITLE			CLIENT / PLANT				
AXIAL COMPRESSOR			 PETRONOR / MUSKIZ				
F3-C-1 DATA SHEET			ANNEX	SPEC.	DRAWING No.	SHEET	REV.
			K			1a of 7	3
AXIAL COMPRESSOR DATA SHEET			No. F3C1-5-00-50 Sheet 1 of 7				

C.R.C.	1						
	2	APPLICABLE TO: ☐ PROPOSAL ☒ PURCHASE ☐ AS BUILT					
	3	CLIENT: PETRONOR / REPSOL				ITEM	
	4	SITE MUSKIZ (SPAIN)				No. REQUIRED ONE (1)	
	5	SERVICE AXIAL COMPRESSOR (AIR BLOWER)				SIZE AND TYPE AG060-11RB	
F.M.S.	6	MANUFACTURER MAN DIESEL & TURBO SE	MODEL AXIAL COMPRESSOR	SERIAL No. 6865			
	7	NOTES: INFOR. TO BE COMPLETED BY: ☒ PURCHASER ☐ MANUFACTURER ☐ MANUF. OR PURCHASER					
Check:	8	OPERATING CONDITIONS [Note1]					
	9	(All data on per unit basis)					
	10		NORMAL	60%N	60%	RATED	90%
	11	☒ Capacity (kmol/h) (wet)	7135	5300	5791	8560	6421
	12	☒ Weight flow (kg/h) (wet)	201911	150000	163877	242241	181720
M.A.R.	13	☒ Molecular weight (wet/dry) (kg/kmol)	28.30/28.95	28.30/28.95	28.30/28.95	28.30/28.95	28.30/28.95
	14	☒ Relative humidity (%)	95	95	95	95	95
	15						
DATE: MAY 2013	16	INLET CONDITIONS					
	17	☒ Pressure (bara) [Note 1]	0.986	0.986	0.986	0.986	0.986
	18	☒ Temperature (°C)	33,3	33,3	33,3	33,3	33,3
	19	☐ Relative humidity %	95	95	95	95	95
	20	☐ Molecular weight	28,30	28,30	28,30	28,30	28,30
	21	☒ Cp/Cv (K ₁) or (K _{average})	1,396	1,396	1,396	1,396	1,396
	22	☒ Compressibility (Z ₁) or (Z _{average})	1,000	1,000	1,000	1,000	1,000
	23	☒ Volume flow, (m ³ /h)	184291	136910	149576	221102	165862
REV.: 0	24						
	25	DISCHARGE CONDITIONS					
	26	☒ Pressure (bara)	4,078	3,735	3,735	4,078	4,078
	27	☒ Temperature (°C)	202,9	200,3	196,4	209	204,5
	28	☒ Cp/Cv (K ₁) or (K _{average})	1,386	1,386	1,387	1,386	1,386
	29	☒ Compressibility (Z ₁) or (Z _{average})	1,001	1,001	1,001	1,001	1,001
	30	☒ Polytropic compression power, kW	9956	7283	7766	12383	9048
	31	☒ Compression train absorbed power , kW	10020	7347	7830	12447	9112
F3C1-5-00-50	32						
	33	☒ Power required (inc. mech. Losses w.o. gear) kW	10020	7347	7830	12447	9112
	34	☒ Speed (rpm)	6506	6506	6506	6506	6506
	35	☒ Turndown %	81,4	89,3	81,7	67,9	90,5
	36	☒ Estimated surge flow, m ³ /h (at speed ind. up)	159270	132034	140191	175640	150805
	37	☒ Polytropic head (N-m/Kg)	160500	150900	150000	161700	161000
	38	☐ Polytropic efficiency (%)	90,4	86,3	87,9	87,9	89,8
	39	☒ Certified point	Y	-	-	-	-
DS FILE CODE	40	☐ Performance curve number	10001966274-6	10001966274-6	10001966274-6	10001966274-6	10001966274-6
	41						
	42						
	43	PROCESS CONTROL					
	44	Method ☐ Suction throttling ☒ Variable inlet					
	45	from (bar abs)	guide vanes				
	46	to (bar abs)	from (%)				
	47		to (%)				
DATA SHEET	48	Signal ☒ Source PLANT DCS					
	49	Type ☒ Electronic ☐ Pneumatic ☐ Other					
	50	Range 4-20 mA (bar g)					
	51						
	52	Anti-surge system including: ☒ Controller ☒ Logic ☒ Valve ☐ Valve specification ☐ Primary elements					
	53						
	54						
	55	REMARKS:					
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	56	Note1: Air Filter congested					
	57						
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	64						
	ENGINEER DIVISION	ANNEX DESCRIPTION / DRAWING TITLE		CLIENT / PLANT			
AXIAL COMPRESSOR		PETRONOR / MUSKIZ					
F3-C-1 DATA SHEET		ANNEX	SPEC.	DRAWING No.	SHEET	REV.	
		K			1b of 7	3	
AXIAL COMPRESSOR DATA SHEET							No. F3C1-5-00-50 Sheet 1 of 7

1		OPERATING CONDITIONS (Continued)									
C.R.C.	2	Gas analysis:	NORMAL	60%N	60%	RATED	90%		Remarks:		
	3	☐ Mol % ☐									
	4	MW									
	5	Air (wet / dry)	28.43 / 28.95	95.2/100	95.2/100	95.2/100	95.2/100	95.2/100			
F.M.S.	6	Oxygen									
	7	Nitrogen									
	8	Water vapor	18,02	4,8	4,8	4,8	4,8	4,8			
	9	Carbon monoxide									
M.A.R.	10	Carbon dioxide									
	11	Hydrogen sulfide									
	12	Hydrogen									
	13	Methane									
DATE: MAY 2013	14	Ethylene									
	15	Ethane									
	16	Propylene									
	17	Propane									
REV.: 0	18	I-Butane									
	19	n-Butano									
	20	I-Pentane									
	21	n-Pentane									
F3C1-5-00-50	22	Hexane plus									
	23	Corrosive agents									
	24								[Note1]		
	25	Total		100	100	100	100	100			
DS FILE CODE	26	Molecular weight (average)		28,43	28,43	28,43	28,43	28,43			
	27	LOCATION					NOISE SPECIFICATIONS				
	28	☐ Indoor ☒ Outdoor ☐ Grade ☐ Heated ☒ Under roof ☐ Mezzanine ☐ Unheated ☒ Partial sides ☐					☒ Applicable to machine See specification See Chapter VII of requisition ☒ Applicable to neighborhood See specification See Chapter VII of requisition Acousting housing ☐ YES ☐ NO				
	29	☒ Electric classification Class I Group IIA Division 2 Temp. T-3 ☐ Winterization required ☐ Tropicalization required					APPLICABLE SPECIFICATIONS: API 617, 7th edition, Chapter 1 y 2 ☒ Vendor having unit responsibility Compressor manufacturer ☒ Repsol YPF ED-K-02.01 - Centrifugal compressor ☒ Other See Chapter VII of requisition				
DATA SHEET	30	SITE DATA					Painting				
	31	☒ Elevation 6,5 m Barom. Press. 760 (mm Hg) ☐ Range of ambient temps: Dry bulb Wet bulb Normal °C 33 Maximum °C 0 Minimum °C					☐ Manufacturer standard ☒ Other See Chapter VII of requisition				
	32	☐ Copper and copper alloys prohibited Coating: ☐ Rotating components ☐ Stationary components					SHIPMENT: ☐ Overland ☒ Marine ☐ Other ☒ Outdoor storage for 6 months Spare rotor assembly package to: ☐ Horizontal storage ☒ Vertical storage ☒ Valid for nitrogen inertization				
	33	UNUSUAL CONDITIONS ☐ Dust ☐ Fumes									
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	34	☒ Other Salt landen sea coastal refinery atmosphere ☐ Other									
	35										
	36										
	37										
ENGINEER DIVISION	38	REMARKS:									
	39	Note1: Air Filter Clean									
	40										
	41										
ANNEX DESCRIPTION / DRAWING TITLE		CLIENT / PLANT									
AXIAL COMPRESSOR		PETRONOR / MUSKIZ									
F3-C-1 DATA SHEET											
AXIAL COMPRESSOR DATA SHEET		No. F3C1-5-00-50 Sheet 2 of 7									

C.R.C.		OPERATING CONDITIONS (Continued)								Remarks:
1	2	Gas analysis:	NORMAL	60%N	60%	RATED	90%			
3	4	☐ Mol % ☐								
5	6	MW								
7	8	Air (wet / dry)	28.30/28.95	95.1 / 100	95.1 / 100	95.1 / 100	95.1 / 100	95.1 / 100		
9	10	Oxygen								
11	12	Nitrogen								
13	14	Water vapor	18,02	4,9	4,9	4,9	4,9	4,9		
15	16	Carbon monoxide								
17	18	Carbon dioxide								
19	20	Hydrogen sulfide								
21	22	Hydrogen								
23	24	Methane								
25	26	Ethylene								
27	28	Ethane								
29	30	Propylene								
31	32	Propane								
33	34	I-Butane								
35	36	n-Butane								
37	38	I-Pentane								
39	40	n-Pentane								
41	42	Hexane plus								
43	44	Corrosive agents								
45	46									
47	48	Total		100	100	100	100			
49	50	Molecular weight (average)								
51	52	LOCATION								
53	54	☐ Indoor ☒ Outdoor ☐ Grade ☐ Heated ☒ Under roof ☐ Mezzanine ☐ Unheated ☒ Partial sides ☐								
55	56	☒ Electric classification Class I Group IIA Division 2 Temp. T-3 ☐ Winterization required ☐ Tropicalization required								
57	58	SITE DATA								
59	60	☒ Elevation 6,5 m Barom. Press. 760 (mm Hg) ☐ Range of ambient temps:								
61	62	Dry bulb Wet bulb Normal °C 33 Maximum °C 0 Minimum °C								
63	64	UNUSUAL CONDITIONS ☐ Dust ☐ Fumes ☒ Other Salt landen sea coastal refinery atmosphere								
65	66	☐ Copper and copper alloys prohibited Coating:								
67	68	☐ Rotating components ☐ Stationary components								
69	70	REMARKS:								
71	72	Note1: Air Filter congested								
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C.R.C.	1	CONSTRUCTION FEATURES	
	2	SPEEDS:	
Approv.:	3	Max. cont. 6910 Rpm	Trip 6910 Rpm
	4	Max. tip speeds 303.2 m/s @ 100% speed	
F.M.S.	5	322 m/s @ Max cont. speed	
	6		
Check:	7	LATERAL CRITICAL SPEEDS (DAMPED)	
	8	First critical 2844 Rpm	BOUNCING Mode
M.A.R.	9	Second critical >12750 Rpm	COUPLING Mode
	10	Third critical	Mode
Prep.:	11	Fourth critical	Mode
	12	☐ Lateral analysis additional requirements	
DATE: MAY 2013	13	☐ Train lateral analysis required	
	14	☐ Train torsional analysis required	
REV.: 0	15		
	16	TORSIONAL CRITICAL SPEEDS:	
F3C1-5-00-50	17	First critical 1121 Rpm	
	18	Second critical 2670 Rpm	
DS FILE CODE	19	Third critical 14693 Rpm	
	20	Fourth critical	Rpm
DATA SHEET	21	☐ List of train undesirable speeds ☐ Stability analysis	
	22	Vibrations	
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	23	Allowable test level 25.4 micron (peak to peak)	
	24		
ENGINEER DIVISION	25	☒ Rotation, viewed from driven end ☒ CW ☐ CCW	
	26		
	27	☒ MATERIALS INSPECTION REQUIREMENTS	
	28		
	29	☐ Radiography required for	
	30	☐ Ultrasonic required for	
	31	☐ Magnetic particle required for	
	32	☐ Liquid penetrant required for	
	33	☐ Low temperature	
	34	Min. desing metal temperature 0 °C at bar g	
	35	☐ Other train components	
	36		
	37	CASING:	
	38	Model AG060	
	39	Casing split NOTE 1	
	40	Material EN-GJS-400-18-RT	
	41	Thickness(mm.) 40 Corr. allow. (mm) 3	
	42	Max. allowable pressure 3.85 (Note 2) (barg)	
	43	Test pressure Hydrostatic 9.3 (barg)	
	44	Helium N/A (barg)	
	45	Max. allowable temperature 260 °C	
	46	Min. operating temperature 0 °C	
	47	Max. operating temperature 240 °C	
	48	Max. casing capacity (m³/h)	
	49		
	50	☒ Relief valve set pressure (Barg)	
	51	☐ Q.C. of inaccessible welds	
	52		
	53	DIAPHRAGMS:	
	54	Material EN-GJS-400-18-RT	
	55	Axially split Yes ☐ No ☒	
	56		
	57	REMARKS:	
	58	NOTE 1: COMPRESSOR WILL BE HORIZONTALLY SPLIT	
	59		
	60	NOTE 2: MAWP according to minutes of meeting held on 09th/10th December 2015 at EIA XXI offices, item 15	
	61		
	62		
	63		
	64		
ANNEX DESCRIPTION / DRAWING TITLE		CLIENT / PLANT	
AXIAL COMPRESSOR		PETRONOR / MUSKIZ	
F3-C-1 DATA SHEET			
ANNEX	SPEC.	DRAWING No.	SHEET
K			3 of 7
REV.		3	
AXIAL COMPRESSOR DATA SHEET		No. F3C1-5-00-50 Sheet 3 of 7	

C.R.C. Approv.: F.M.S. Check: M.A.R. Prep.: DATE: MAY 2013 REV.: 0 F3C1-5-00-50 DS FILE CODE DATA SHEET TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES ENGINEER DIVISION	1	CONSTRUCTION FEATURES (CONTINUED)									
	2	SHAFT SEALS:					☐ Buffer gas control system schematic by vendor ☐ Pressurizing gas for subatmospheric seals				
	3	☒ Seal type LABYRINTH SHAFT END SEALS					☐ Eductor ☐ Injection				
	4	☐ Max sealing settling out pressure barg N/A					☒ Seal manufacturer MAN Diesel & Turbo				
	5	☐ Min. sealing pressure barg N/A					☐ Leakage to process (l/day/seal)				
	6	☐ Supplemental device required for contact seals					Buffer gas required for ☐ Air run-in ☐ Other				
	7										
	8										
	9	Type									
	10						☐ Flow (per seal) Norm: Kg/min. @ Bar ΔP Max: Kg/min. @ Bar ΔP				
	11	☐ Type buffer gas									
	12	☐ Pressure barg									
	13	☐ Flowrate Nm ³ /h									
	14	☐ Filtration									
	15										
16	☐ Buffer gas system required					☒ Bearing housing construction					
17	☐ Method of control					Type (separate, integral) SEP. Split HORIZ.					
18						Material EN-GJS-400-18RT					
19	AXIAL COMPRESSOR										
20	STAGE		1	2	3	4	5	6	7	8	9
21	ROTOR										
22	Blade material		X3CrNiMo13-4		X20CrMo13						
23	Blade root type		DOVETAIL								
24	Cord width (mm.)		104	80	80	80	80	80	80	80	80
25	Outer diameter (mm.)		802	789	775	760	747	744	741	722	705
26	Blade height (mm)		225	198	175	167.5	161	159.5	158	148.5	140
27	Blade quantity		17	19	19	19	20	20	20	20	20
28	STATOR										
29	Blade material		X3CrNiMo13-4					X20CrMo13	X12Cr13		
30	Type (movable, fixed, adjustable)		MOV.	MOV.	MOV.	MOV.	MOV.	FIXED	FIXED	FIXED	FIXED
31	Cord width (mm.)		88	63	63	63	63	52	52	52	52
32	Blade quantity		18	36	36	36	36	46	46	46	46
33											
34	STAGE		10	11	12	13	14	15	16	17	18
35	ROTOR										
36	Blade material		X20CrMo13								
37	Blade root type		DOVETAIL								
38	Cord width (in)		80	80							
39	Outer diameter (mm)		690	675							
40	Blade height (mm)		132.5	125							
41	Blade quantity		46	46							
42	STATOR										
43	Blade material		X12Cr13								
44	Type (movable, fixed, adjustable)		FIXED	FIXED							
45	Cord width (in)		52	52							
46	Blade quantity		46	46							
47	REMARKS:										
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
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64											
ANNEX DESCRIPTION / DRAWING TITLE			CLIENT / PLANT								
AXIAL COMPRESSOR			PETRONOR / MUSKIZ								
F3-C-1 DATA SHEET			ANNEX	SPEC. K	DRAWING No.			SHEET 4 of 7		REV. 3	
AXIAL COMPRESSOR DATA SHEET						No. F3C1-5-00-50 Sheet 4 of 7					

1		CONSTRUCTION FEATURES (CONTINUED)						
2		BEARINGS AND BEARING HOUSING						
3		RADIAL		DE	NDE	THRUST	Active	Inactive
4		Type		TILTING PAD	TILTING PAD	Type	SELF EQUAL.	SELF EQUAL.
5		Manufacturer		JOHN CRANE	JOHN CRANE	Manufacturer	KINGSBURY	KINGSBURY
6		Length(mm)		100	80	Unit loading (max) Mpa	1.45	-
7		Shaft diam.(mm)		160	125	Unit loading (allow.)Mpa	3.5	3.5
8		Unit load (Act/Allow.) (MPa)		1.02 / 2.5	1.12 / 2.5	Area (mm ²)	16180	1680
9		Base material		STEEL	STEEL	No. pads	14	14
10		Babbitt thickness (mm)		1.5	1.5	Pivot: center/offset, %	CENTER	CENTER
11		No. Pads		4	4	Pad base material	STEEL	
12		Load between/on pad		BTWN.	BTWN	☐ Copper backed Lubrication: ☒ Flooded ☐ Directed Thrust collar: ☒ Integral ☐ Replaceable		
13		Pivot: Central/Offset%		CTR.	CTR.	Material 34CrNiMo6		
14		Pad material		STEEL		Design criteria		
15		☐ Copper base material						
16		☐ With hardened steel bearing						
17		Bearing span		3155 mm		VIBRATION DETECTORS: ☒ See attached API-670 data sheet		
18		BEARING TEMPERATUR DETECTORS						
19		☒ See attached API-670 data sheet						
20		☐ Thermocouples type						
21								
22		☒ Resistance temp.detectors						
23		☒ Resistance material		Platinum		☐ 100 @ 0 °C Ohms		
24		☒ Alarm temperature						
25		☒ Shutdown temperature						
26		☒ Provision for local disconnect						
27								
28		☒ Location of radial bearing						
29		No. ☒ 2 ☐ Ea. pad ☐ Every oth pad ☐ Per bearing						
30		Other						
31		☒ Location of thrust bearing						
32		No. ☒ 2 ☐ Ea. pad ☐ Every oth pad ☐ Per bearing						
33		Other						
34		No (inact) ☐ Ea. pad ☐ Every oth pad ☐ Per bearing						
35		Other						
36		☐ Local disconnection						
37		☒ Monitor supplied by		COMPRESSOR SUPPLIER				
38		☒ Location		LOCAL PANEL		Enclosure IP-65		
39		☒ Manuf.		BENTLY NEVADA		Model 3500		
40		☒ Scale range				☒ Alarm: ☒ Set @ °C		
41		☒ Shtdwn				☒ set @ °C ☒ Time delay 3 s		
42		☒ Key phasor required						
43		☒ Compressor ☒ Gear ☒ H.S. shaft ☒ L.S. shaft						
44		CASING CONNECTIONS						
45		Connection		ASME B16.5	Facing Diameter Bore	Orientation	Flanged or studded	Mating flange and gasket by vendor
46								Gas velocity, m/s
47								
48								
49		Inlet		MFR. STD	FF [Note 1]	UPWARDS	FLANGED	
50		Discharge		ANSI B16.47B CL.300	FF, 32"	DOWNWARDS	FLANGED	
51								
52								
53								
54		☒ Boroscopic inspection ports rq'd						
55		REMARKS:						
56								
57		Note 1: Rectangular inlet flange 900 mm x 1800 mm						
58								
59		Note: Values for radial vibration trip, axial displacement trip and delay will be agreed together with the CLIENT						
60								
61								
62								
63								
64								
ANNEX DESCRIPTION / DRAWING TITLE		AXIAL COMPRESSOR					CLIENT / PLANT	
F3C-1 DATA SHEET							PETRONOR / MUSKIZ	
ANNEX		SPEC.		DRAWING No.		SHEET		REV.
		K				5 of 7		3
AXIAL COMPRESSOR DATA SHEET								
No. F3C1-5-00-50 Sheet 5 of 7								

C.R.C.	1	OTHER CONNECTIONS			
	2				
	3	SERVICE			
	4	Lub.-oil inlet	No.	Dia.	Type
	5	Lub.-oil outlet	1 + 2	1" + 1 1/2"	STUDDED
	6	Seal-oil inlet	1 + 1	4" + 6"	STUDDED
	7	Seal-oil outlet			N/A
	8	Seal gas inlet			N/A
	9	Seal gas outlet			N/A
	10	Casing drains	4	1"	STUDDED
	11	Stage drains			N/A
	F.M.S.	12			
13		☐ Individual stage drains required ☐ Valved and blinded ☒ Valved, blinded and manifold (NOTE 1)			
14					
15					
M.A.R.	16				
	17	LUBRICATION AND SEALING SYSTEM			
	18	☐ See attached API 614 data sheet ☒ See attached Repsol F3C1-5-00-53 data sheet			
	19	☒ Separate ☐ Combined ☐ Integral oil reservoir ☒ Oil type			
DATE: MAY 2013	20				
	21				
	22	ACCESORIES			
	23	COUPLING AND GUARDS			
REV.: 0	24	Note: See end shaft details in sheet 5 of 9			
	25				
	26	☒ See attached API 671 data sheet ☒ Keyless hydraulic ☐ Keyed ☐ Flanged ☐ Other			
	27				
F3C1-5-00-50	28	Coupling furnished by MAN Diesel & Turbo			
	29	Manufacturer	Ameridrives	Type	Series RM
	30			Model	Size #14-12
	31	Coupling guard furnished by Vendor			
DS FILE CODE	32	Type	☒ Fully enclosed ☐ Semi-open ☐ Other		
	33	COUPLING DETAILS		☒ Mounting gauges for conic shafts per API 671 Lubrication requirements: ☒ Non-lub. ☐ Cont. oil lube ☐ Other	
	34	Max. out.diam.	374.7	mm	Quantity per hub N/A l/min
	35	Hub weight	56.9	Kg	
DATA SHEET	36	Spacer lenght	579.2	mm	
	37	Spacer weight	113.8	Kg	
	38	BASEPLATES			
	39	Baseplates furnished by		☐ Soleplates furnished by ☐ Thickness mm ☐ Subsole plates required	
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	40	Compressor ☒ Driver ☒ Gear			
	41	Other			
	42	Nonskid decking ☒ Sloped deck			
	43	Leveling pads or targets			
ENGINEER DIVISION	44	Column mounting		Stainless steel shim thickness - mm ☒ Driver ☒ Gear 0.0 ☒ Compressor 4.5	
	45	Sub-sole plates required			
	46	Stainless steel shim thickness mm		☐ Counter bore anchor bolt holes	
	47	Machined mounting pads required			
	48				
	49	REMARKS: NOTE 1: All casing drain connections will be valved and piped to a single customer connection located			
	50	at base edge Refer to point V.C. of requisition.			
	51	NOTE 2: Refer to Section V.C of requisition			
	52				
	53				
	54				
	55				
	56				
	57				
	58				
	59				
	60				
	61				
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	63				
	64				
ANNEX DESCRIPTION / DRAWING TITLE		CLIENT / PLANT			
AXIAL COMPRESSOR		PETRONOR / MUSKIZ			
F3-C-1 DATA SHEET					
		ANNEX	SPEC.	DRAWING No.	SHEET
			K		6 of 7
					REV. 3
AXIAL COMPRESSOR DATA SHEET		No. F3C1-5-00-50 Sheet 6 of 7			

1	AUXILIARY SERVICE								
2									
3	● Utility conditions				Manuals				
4	Steam: Drivers				● Draft manual for review				
5	Inlet-Min. barg @ °C				○ Final dossier review				
6	Normal barg @ °C								
7	Maximum barg @ °C				Miscellaneous:				
8	Exhaust.-Min barg @ °C				■ Recommended straight run of pipe diameters				
9	Normal barg @ °C				before suction				
10	Maximum barg @ °C				● Compressor to be suitable for field run-in on air				
11					● Provision for liquid injection				
12	Electricity				● Injection manifold with single connection				
13					○ Vendor's review and comments on purchaser's				
14	Voltage, V				control systems				
15	Hertz				● Shop fitup of vendor process piping				
16	Phase				● Welding hardness testing				
17					○				
18	● Reduced voltage start Per Spec ED-P-02.01-I				● Desing audit				
19					● Balance piston ΔP (bar)(kPa)				
20	● No. of starts Per Spec ED-P-02.01-I				● Provide tail end schedules				
21					Vendor's representative shall				
22	Instrument air				● Observe flange parting				
23	Max. press. 7 (barg) Min. press. 6 (barg)				● Check alignment at temperature				
24					● Be present at initial alignment				
25									
26									
27									
28	Inspection and test				Weight (Kg):				
29	Cleaning				■ Compressor 26500 kg Gear 10300 kg				
30	Hydrostatic				■ Driver 32000 kg Baseplate 18600 kg				
31	Impeller overspeed				■ Rotors: Compressor 2912 kg Gear 4752 kg				
32	Mechanical run NOTE 1				Driver 7400 kg				
33	● Contract coupling ○ Adapt.low run				■ Compressor upper case 7500 kg				
34	● Contract sensors ○ Test stand sensors								
35	Vary oil pressure and temperature				■ Max. for maintenance 7500 kg				
36					■ Identify component Compressor upper case				
37					Total shipping weight				
38	Polar form vib. data				Space requirements (mm):				
39	Tape record vib. data				■ Complete unit dimensions				
40	Seal inspection NOTE 2				Lenght 11.4 m x Width 4.8 m x Height 4.7 m				
41	Gas leak test at disch. press.								
42	Post test disassembly								
43	○ Before gas leakage test								
44	○ After gas leakage test								
45	Performance test (gas)								
46	Performance test (air) (ASME PTC-10, API 617)								
47	Complete unit test								
48	Tandem test								
49	Gear test								
50	Helium leak test								
51	Sound level test								
52	Aux. equipment test NOTE 3								
53	Full-load/speed/press. Test								
54	Hydraulic coupling insp.								
55	Spare parts test								
56	Inspector's checklist compliance								
57	Gas seal test vendor shop								
58									
59	REMARKS: NOTE 1: For both rotors: Main and spare.								
60	NOTE 2: At OEM workshop and with the main equipment.								
61	NOTE 3: At OEM workshop								
62									
63									
64									
ANNEX DESCRIPTION / DRAWING TITLE					CLIENT / PLANT				
AXIAL COMPRESSOR					PETRONOR / MUSKIZ				
F3-C-1 DATA SHEET									
ANNEX					SPEC.				
K					DRAWING No.				
					SHEET				
					7 of 7				
					REV.				
					3				
AXIAL COMPRESSOR DATA SHEET					No. F3C1-5-00-50 Sheet 7 of 7				

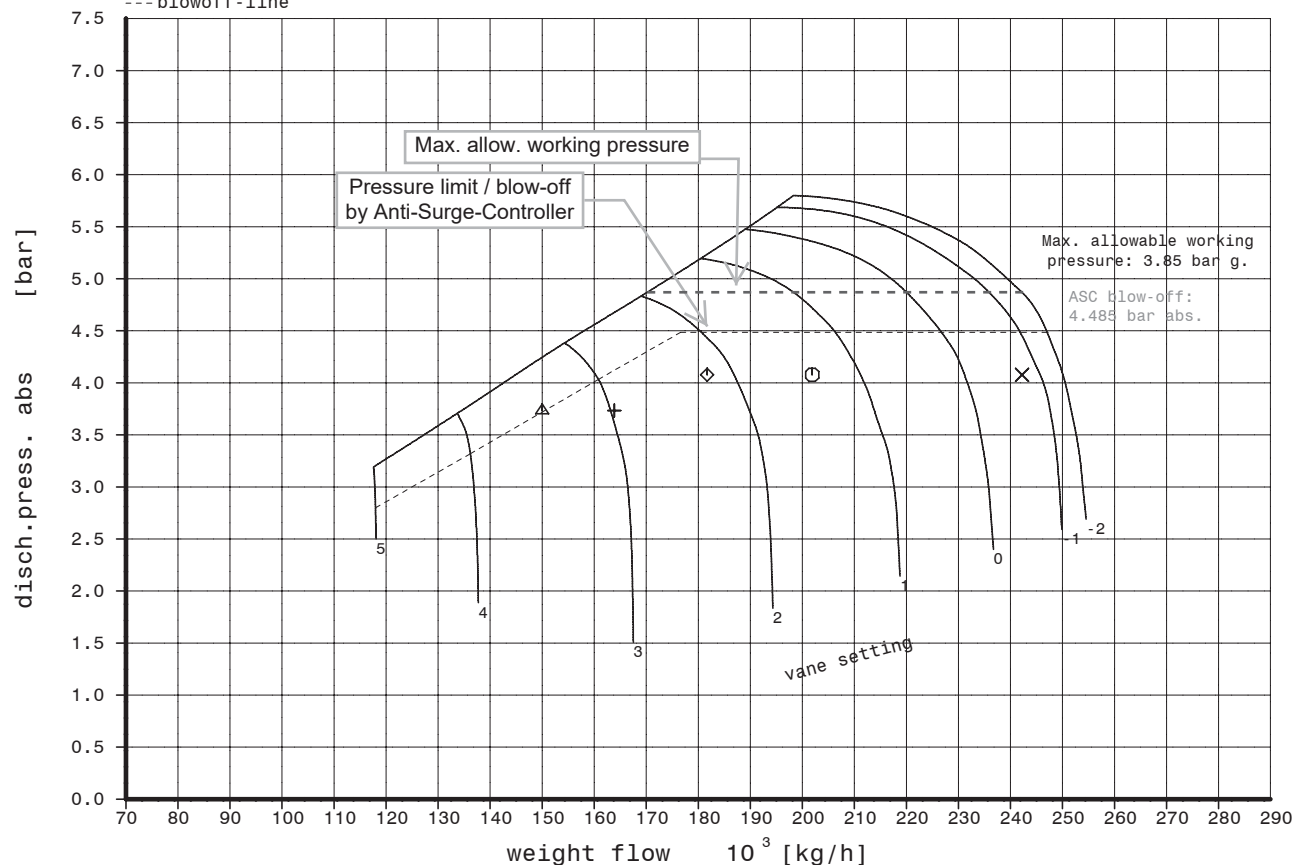
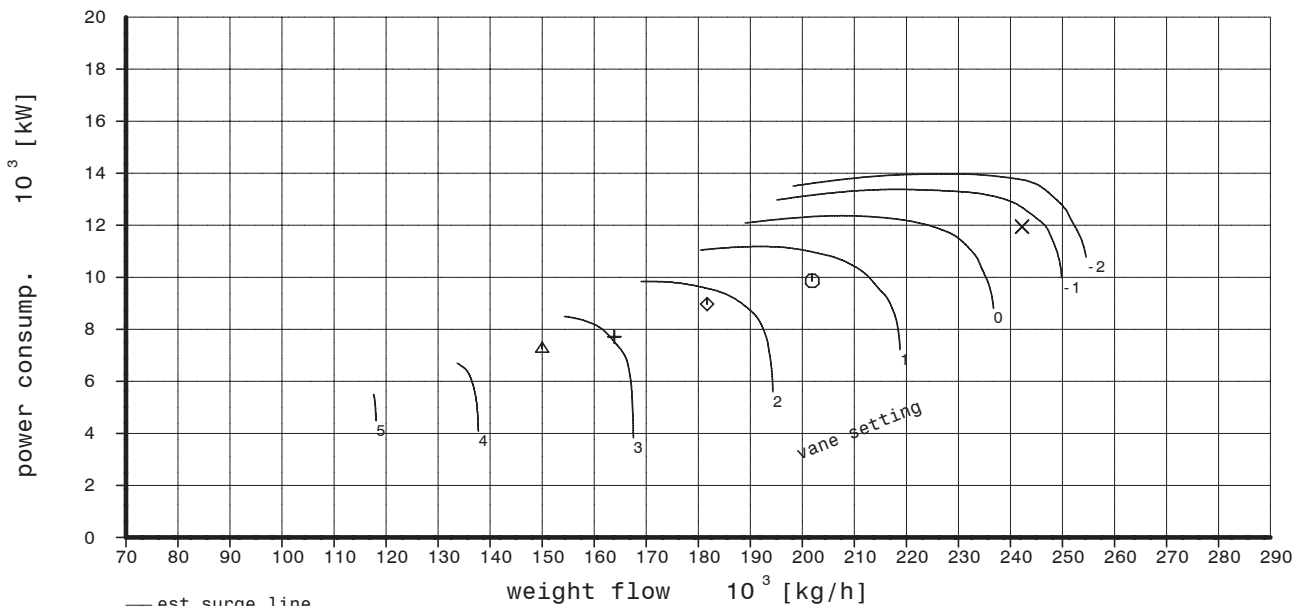
2. CURVAS DE OPERACION DEL COMPRESOR

predicted performance map valid for:

suct. temperature : 33.30 [C]
 suct.pressure abs. : 1.01 [bar]
 relative humidity : 95.00 [%]
 molecular weight : 28.43 [kg/kmol]
 isentr.exponent : 1.3971 [-]
 speed : 6506 [1/min]
 medium : Air

operating point:

	m [kg/h]	pe [bar]	Nk [kW]
⊙ Normal	201911	4.08	9868
△ 60%N	150000	3.74	7255
+ 60%	163877	3.74	7718
× Rated	242241	4.08	11947
◇ 90%	181720	4.08	8973



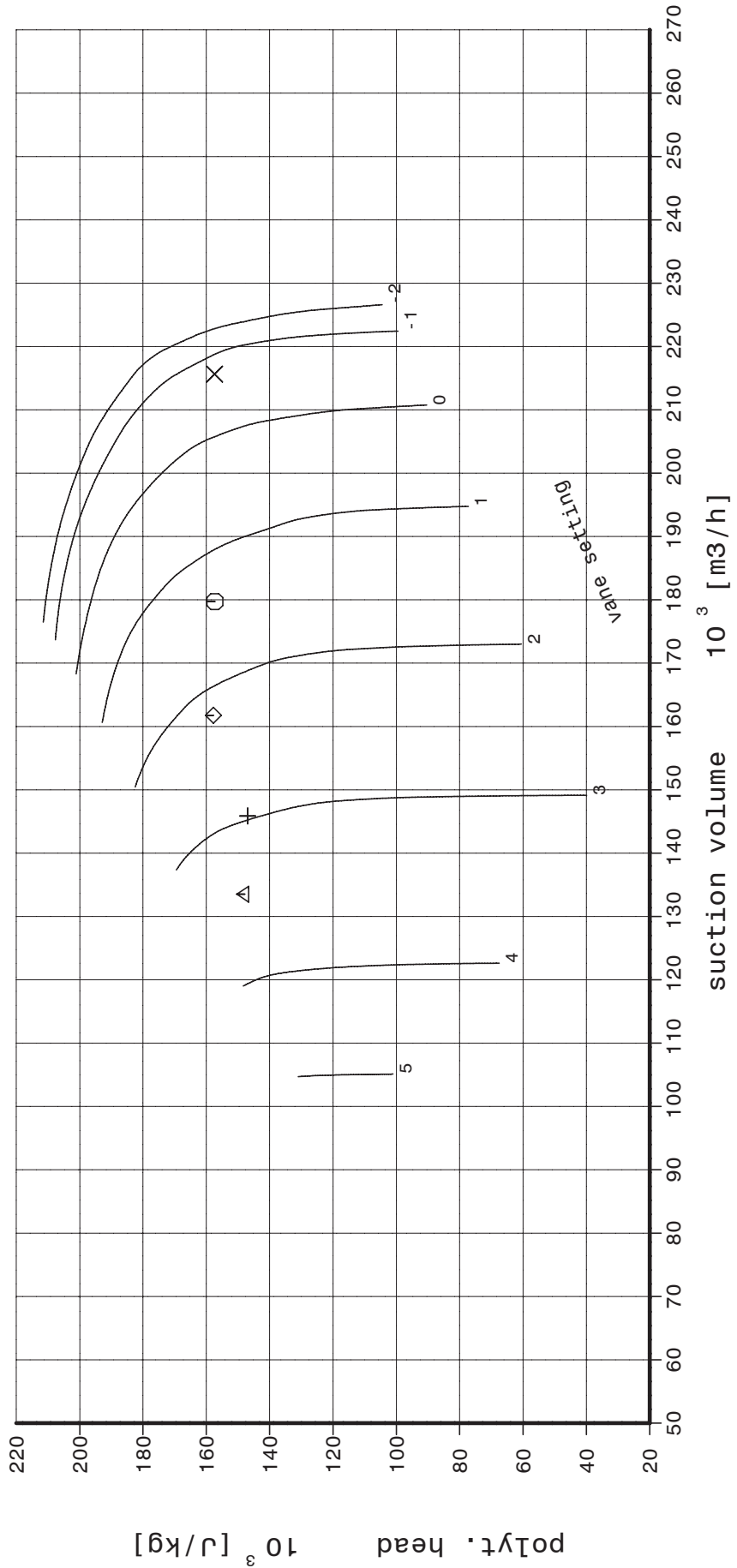
predicted performance map valid for:

suct. temperature : 33.30 [C]
suct.pressure abs. : 1.01 [bar]
relative humidity : 95.00 [%]
molecular weight : 28.43 [kg/kmol]
isentropic exponent : 1.3971 [-]
speed : 6506 [1/min]
medium : Air

operating point:

① Normal
△ 60%N
+ 60%
× Rated
◇ 90%

Va [m³/h] hp [J/kg]
179744 157331
133532 147901
145886 146984
215647 157410
161770 157787



Bearb.: He	Auf.Ang.Nr.: H.0200062	Kunde: REPSOL	Kennwort: BILBOAX
Abt. : ETEA	Maschinennr: 6865		Datum : 9.May 2016
	Performance Map F3-C-1: suct. filter clean		10001966274
	Main Air Blower AG060-11,L5Rad		Rev.2
	P-N1783-CECO-K0-0001-A-0		page 04 of 08

predicted performance map valid for:

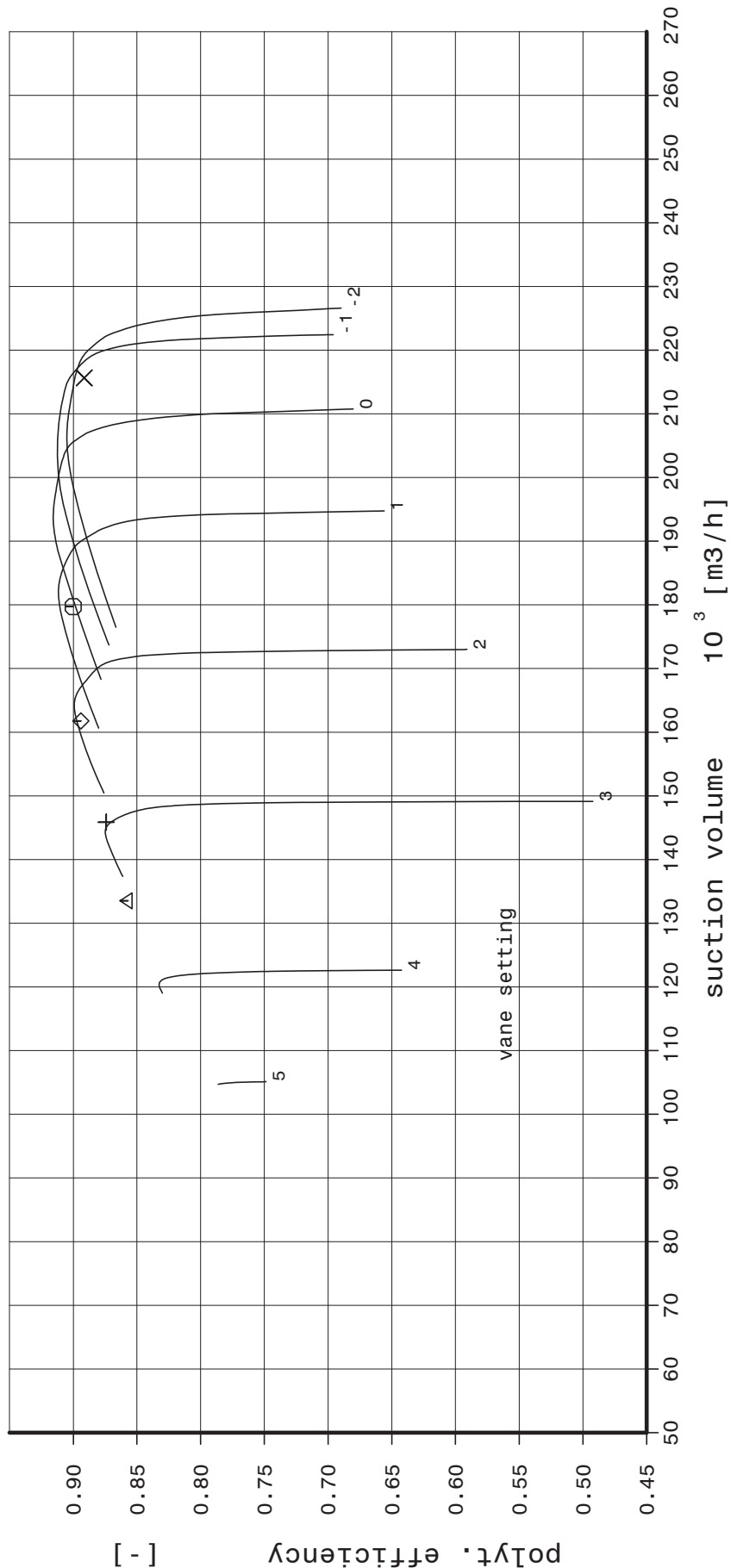
suct. temperature : 33.30 [C]
suct.pressure abs. : 1.01 [bar]
relative humidity : 95.00 [%]
molecular weight : 28.43 [kg/kmol]
isentropic exponent : 1.3971 [-]
speed : 6506 [1/min]
medium : Air

operating point:

① Normal
△ 60%N
+ 60%
× Rated
◇ 90%

Va [m3/h]
179744
133532
145886
215647
161770

etap [-]
0.900
0.857
0.874
0.891
0.894



Bearb.: He	Auf.Ang.Nr.: H.0200062	Kunde: REPSOL	Kennwort: BILBOAX
Abt. : ETEA	Maschinennr: 6865		Datum : 9.May 2016
	Performance Map F3-C-1: suct. filter clean		10001966274
	Main Air Blower AG060-11,L5Rad		Rev.2
	P-N1783-CECO-K0-0001-A-0		page 05 of 08

**DATENBLATT / DATA SHEET**

KENNWORT / CODE WORD

BILBOAX

AUFTRAG-NR. / ORDER-NO

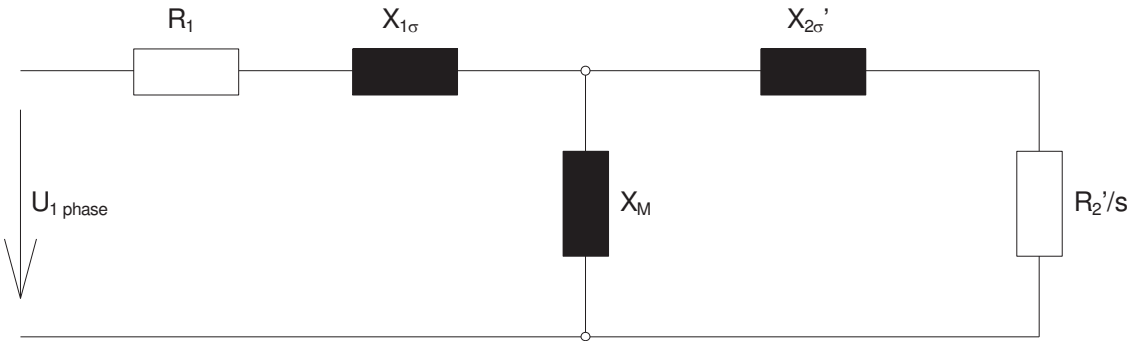
H.0200062.02**Motor****Data Sheets****DECKBLATT / COVER SHEET****3. HOJAS DE DATOS MOTOR ELECTRICO****Main Air Compressor****ITEM: F3-C-1****REFERENCE JOB CUSTOMER: ADI-1783****P-N1783-CEC0-K0-0001-A-O**

REVISION REVISION	00	01	02	03	04	05	REVIDIERTE ZEILE REVISED LINE
DATUM DATE	16.10.2015	09.03.2016					
NAME NAME	Hahne	Siemens					BLATT SHEET
GEPRÜFT CHECKED	Melot de Beauregard	Melot de Beauregard					1 VON / OF 3
ABTEILUNG DEPARTMENT	TELEFON PHONE NO.	TELEFAX FAX NO.			DOKUMENTEN-NR. / DOCUMENT NO:	Doc.Par	REVISION REVISION
ETEIR	0208-692 2816	0208-692 2848			1 000 1956792	001	01

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This dwg. is the property of MAN Diesel & Turbo SE and is solely for the use of the party to which it is handed over.

Three-Phase Induction Motor with Laminated Squirrel Cage Rotor						Order No. Order date 03.09.15 Manuf. No. D1531425701			
AB	Type	1TZ1739-8CF02-Z		Cooling System	IC81W		Mounting	IM1003	
	Unit	1		Cooling Circuit	sec. prim.		Enclosure	IP55	
	Drive for	Compressor		Cooling Medium	water air		Ex-Prot.	II 3 G Ex nA e IIC T3 Gc	
	Type Dr.Mach.			Coolant Flow	m³/h 11.2 m³/s		Ex-Standard	94/9/EG (ATEX)	
AC	Required power	12612 kW		Inlet Temp.	28 °C 38 °C		Insul. System	Micalastic	
	Standard	IEC 60034, VDE		Ventilation System	bilat.		Thermal Class	F	
	Rotation	ccw		Type of Fan	2AX988-10		Service Altitude	≤ 1000 m	
							Over-Speed	1800 min⁻¹	
						Inertia Motor/Load		1.014 / 2.460 tm²	
Operating Data				Rated Point					
Output kW				14000					
Voltage V				11000		Y			
Range % ±				5.0 / 5.0					
Frequency Hz				50					
Range % ±				5.0 / 5.0					
Current A				842					
Speed min⁻¹				1483					
Power Factor				0.9					
Cooling Temperature sec./prim. °C				28 / 38					
Stator Winding Temperature °C				≤ 125 (ETD)					
Duty Type				S1					
Remarks									
Starting Data direct-on-line								Counter	
Voltage U/UN p.u.				1.00		0.8		Speed p.u.	
External Reactance XV/ZN p.u.								T p.u.	
Locked Rotor Torque MA/MN p.u.				0.73		0.46		1.0 0.315	
Pull-up Torque MS/MN p.u.				-		-		0.8 0.221	
Breakdown Torque MK/MN p.u.				2.2				0.6 0.133	
Locked Rotor Current IA/IN p.u.				5.0		3.96		0.4 0.069	
Locked Rotor Power Factor				0.14		0.14		0.2 0.027	
Starting Time s				8		13		0.0 0.000	
LR-Thermal Limit Time cold/hot s				6 / 4.5		10 / 8			
Allowed Rep. Rate cold/hot ca.				3 / 2		3 / 2			
Efficiency						Losses at Rated Load			
Load		P.F.		Efficiency					
1.00		0.90		97.0 % +		x Bearing Friction kW			
0.75		0.90		97.2 % +		x Windage kW			
0.50		0.86		97.0 % +		x Core kW			
						x I²R _{DC} Stator 95 °C kW			
						x I²R _{DC} Rotor 95 °C kW			
						x Additional acc. to IEC 60034 kW			
						Converter Supply kW			
						Separated Fan Power kW			
x Marked Losses are included in the Efficiency									
Resistances, Reactances						Time Constants			
Ref. Impedance ZN = 7.542 Ω		Ref. Temperature 95 °C				Ref. Temperature 95 °C			
F=0		F=FN		s=0		s=1			
				R2' 10.60 ‰		29.00 ‰			
R1 4.00 ‰		4.90 ‰		X1S 0.138 p.u.		0.142 p.u.			
				X2S' 0.1054 p.u.		0.079 p.u.			
				XM 4.419 p.u.		6.225 p.u.			
Magnetic Forces				Short Circuit		Magnetic Current at SN			
Excentric		CM(N=0) 13.60 kN/mm		Sudden sc torque 3-ph(R.fld.) 12.5 p.u.		U/UN			
		CM(N=NN) kN/mm		2-ph 5.8 p.u.		0.80			
Axial		FML1 1.48 kN		Ref. Values		1.00			
		FMLmax 4.28 kN		Rated current 842 A		1.10			
				Rated torque 90.09 kNm		IMUE [A] 117			
						184			
						240			
Remarks:									
A further start-up is permitted after a waiting-time of 20 min with motor running or 45 min with motor at standstill.									
* Specified values without tolerance; + Specified values with tolerance acc. to IEC60034; calculated values without mark									
PD LD AP MG MF-DW		Dep. EN1		Works No. 1314257 Code BILBAO		Electrical data		Sheet 2 of 7	
Siemens AG		Name Jungelnes		DI1385 K.54 DP approval		A5E36644866A-AC		1326878	
		Phone/Fax							
		Date 04.03.16							

$P_N = 14000 \text{ kW}$; $U_N = 11000 \text{ V}$; $F_N = 50 \text{ Hz}$; $I_N = 842 \text{ A}$; $n_N = 1483 \text{ min}^{-1}$



Rated impedance $Z_N = 7.542 \text{ } \Omega$ per phase

Stator resistance at $F=F_N$	R_1	0.0049	p.u.	0.037	Ω per phase
Stator resistance at $F=0$	R_1	0.0040	p.u.	0.030	Ω per phase
Rotor resistance at $s=1$	R_2'	0.0290	p.u.	0.219	Ω per phase
Rotor resistance at $s=0$	R_2'	0.0106	p.u.	0.080	Ω per phase
Stator reactance at $s=1$	$X_{1\sigma}$	0.1420	p.u.	1.071	Ω per phase
Stator reactance at $s\approx 0$	$X_{1\sigma}$	0.1380	p.u.	1.041	Ω per phase
Rotor reactance at $s=1$	$X_{2\sigma}'$	0.0790	p.u.	0.596	Ω per phase
Rotor reactance at $s\approx 0$	$X_{2\sigma}'$	0.1054	p.u.	0.795	Ω per phase
Magnetizing reactance at $s=1$	X_M	6.2250	p.u.	46.949	Ω per phase
Magnetizing reactance at $s\approx 0$	X_M	4.4190	p.u.	33.328	Ω per phase

Rotor values referred to stator
Resistance values at $95 \text{ } ^\circ\text{C}$

Equivalent Circuit Diagram



DECKBLATT / COVER SHEET

KENNWORT / CODE WORD

BILBOAX

AUFTRAG-NR. / ORDER-NO

H.0200062.02**GEARBOX
DATA SHEET****4. HOJA DE DATOS MULTIPLICADORA DE VELOCIDAD****Main Air Compressor****ITEM: F3-C-1****REFERENCE JOB CUSTOMER: ADI-1783****P-N1783-CEC0-K0-0001-A-O**

REVISION REVISION	00	01	02	03	04	05	REVIDIERTE ZEILE REVISED LINE
DATUM DATE	13.10.15	29.02.16	25.04.16	30.06.16			↑
NAME NAME	Pohlmann	Pohlmann	Pohlmann	Pohlmann			BLATT SHEET
GEPRÜFT CHECKED	Pohlmann	Pohlmann	Pohlmann	Pohlmann			0 VON / OF 4
ABTEILUNG DEPARTMENT	TELEFON PHONE NO.	TELEFAX FAX NO.	FORMAT SIZE	DOKUMENTEN-NR. / DOCUMENT NO:			REVISION REVISION
ETEAD	0208-692-2739	0208-692-9311	A4	10001960566			03

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DATA FILE:

SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
DATA SHEET SI UNITS

Job No. 39471 Item No. A
P.O. No. _____ Date _____
Requisition No. B.0212174
Inquiry No. _____
Revision 3 Date 24/05/2016 By FG

Applicable To : ☐ Proposal ☐ Purchase ☒ As Built For <u>MAN Diesel & Turbo</u> Site <u>Bilboax</u> Unit <u>H.0200062.02</u> Service <u>EM/CC</u> No. required <u>1</u>	Manufacturer <u>FLENDER-GRAFFENSTADEN</u> Model No. <u>TX71/4C</u> Serial No. _____ Driver type <u>electric motor</u> Driven equipment <u>axial compressor</u>
NOTE : Numbers within () refer to applicable API standard 613 paragraphs	
☐ Information To be completed by purchaser ☐ Information to be completed by manufacturer	
☐ UNITS OF MEASUREMENT ☐ US Customary units ☒ SI units ☐ RATING REQUIREMENTS Driven equip. (2.1.4) : Norm. <u>9944</u> Max <u>12447</u> kW Driver : Rated <u>14000</u> Max _____ kW Normal transmitted power (2.2.2) _____ kW Gear unit rated power (2.2.1) <u>14000</u> kW Torque @ max cont speed _____ Nm Max torque (2.2.1) _____ Nm @ _____ rpm ☐ Reducer ☒ Increaser Rated speed (2.1.5) : Input <u>1483</u> rpm ☒ Specified ☐ Nominal Output <u>6506</u> rpm ☐ Specified ☒ Nominal Allow var In gear ratio (2.1.5) (+) (-) _____ % Max continuous speed (1.5) <u>1557,15 / 6831,3</u> rpm Trip speed (1.5) (2.1.7) <u>1650,579 / 7241,178</u> rpm Gear service factor (2.2.3.1) <u>1,6</u> <u>API 613/2003 5 TH</u> (min) Hardness (2.2.3.2) Pinion _____ Gear _____ Shaft assembly designation (2.1.19) <u>R/L</u> HS shaft rot fac'g cpl'g (2.1.20.2) ☐ CW ☒ CCW LS shaft rot fac'g cpl'g (2.1.20.2) ☐ CW ☒ CCW External loads (2.1.16) _____ Other operating conditions (2.2.2) (2.6.1.3) _____	☒ BASIC GEAR DATA ☒ Single stage ☐ Single helical ☐ Double stage ☒ Double helical ☐ Epicyclic ☐ horizontal offset Mechanical rating (1.5.16) <u>22400</u> kW @ <u>1483 / 6506,1</u> rpm Gear service factor (2.2.3.1) <u>1,62</u> (actual) Full load gear unit power loss <u>165</u> kW Gear Unit Mechanical efficiency <u>98,84</u> % Rating speed Pinion <u>6 506,1</u> Gear <u>1 483,0</u> rpm Hardness used for Rating, (HB or Rc) Pinion <u>58 HRC</u> Gear <u>58 HRC</u> Tooth pitting index, "K" (2.2.4.1) (2.2.4.2) Allowable <u>1,90</u> Actual <u>1,86</u> MPa Material index number (Fig 3, Table 4) <u>3,03</u> MPa Bending stress number, "S_t" (2.2.5.1) (2.2.5.2) Pinion : Allowable <u>265,4</u> Actual <u>256,5</u> MPa Gear : Allowable <u>265,4</u> Actual <u>245,8</u> MPa Pitch line velocity <u>89,8</u> m/s Anticipated SPL (2.1.6) <u>82</u> dB(A) @ <u>1</u> m WR² referred to LS shaft <u>697,65</u> kgm² Breakaway torque <u>1690</u> Nm @ LS Shaft Pinon teeth hardness range <u>58 - 63 HRC</u> Pinion teeth hardening method <u>CARBURIZED</u> ☐ HS shaft separate hardness range _____ Gear teeth (rim) hardness range <u>58 - 63 HRC</u> Gear teeth hardening method <u>CARBURIZED</u> Gear hub : ☒ Forged cylinder ☐ Forged & Copped ☐ Fabricated Gear to Shaft fit method (2.5.3.2) ☐ Integral ☐ Keyed interference ☒ Keyless interference Rim attachment (2.5.3.2) <u>FORGED GEAR WHEEL</u> LS shaft hardness range <u>HB 230 - 274</u> Journal static weight loads (2.6.6.3) Pinion <u>329</u> / <u>103</u> kg Gear <u>2940</u> / <u>1852</u> kg Total gear unit assembled weight <u>9861</u> kg NOTES : _____
☐ INSTALLATION DATA (2.1.14) ☐ Indoor ☐ Heated ☐ Under roof ☒ Outdoor ☐ Unheated ☐ Partial sides ☐ Grade ☐ Mezzanine ☒ OFFSHORE ☐ Winterization required ☐ Tropicalization required Electrical area (2.1.10) Class <u>T3</u> Grp <u>IIA</u> Div <u>2</u> Electrical area (2.1.10) Zone <u>2</u> Grp <u>IIA</u> Temp <u>200</u> °C Max allow SPL (2.1.6) <u>82</u> dB(A) @ <u>1,0</u> m Elevation _____ m Barometer _____ kPa abs Range of ambient temperatures : Dry bulb _____ °C Wet bulb _____ °C Normal _____ °C _____ °C Maximum <u>40</u> °C _____ °C Minimum <u>0</u> °C _____ °C Unusual conditions ☐ Dust ☐ Fumes ☒ Salt laden sea coastal refinery atmosphere	

SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
DATA SHEET SI UNITS

Job No. 39471 Item No. A
P.O. No. _____ Date _____
Requisition No. B.0212174
Inquiry No. _____
Revision 3 Date 24/05/2016 By _____ FG

GEAR DATA

	Pinion	Gear	
Number of teeth	<u>31</u>	<u>136</u>	
Gear ratio	<u>4,39</u>		
Tangential load, "Wt" (2.2.4.2)	<u>155 911</u>		N
AGMA Geometry factor "J"	<u>0,53</u>	<u>0,55</u>	
Pitch diameter	<u>263,59</u>	<u>1156,41</u>	mm
Outside diameter	<u>280,60</u>	<u>1169,10</u>	mm
Root diameter	<u>243,92</u>	<u>1132,45</u>	mm
Center groove diameter	<u>204,00</u>	<u>1120,00</u>	mm
Normal pressure angle	<u>20,00</u>		deg
Normal diametral pitch	<u>3,39</u>		in ⁻¹
Helix angle	<u>27,50</u>		deg
Center distance	<u>710,00</u>		mm
Backlash min	<u>0,48</u>		mm
Net face width, "Fw"	<u>390,00</u>		mm
Pinion L/D	<u>1,84</u>		
Face overlap ratio	<u>7,64</u>		
Transverse contact ratio	<u>1,41</u>		
AGMA 6011 service factor	<u>2,82</u>		
Rating based on ANSI/AGMA 6011 with SF=1.0			
Durability Power	<u>46588</u>		kW
Strength Power	<u>39538</u>		kW
Tooth Surface Finish, Ra	<u>0,4</u>	<u>0,4</u>	µm
Tooth Generation Process	<u>Hobbing</u>	<u>Hobbing</u>	
Tooth Finishing Process	<u>Grinding</u>	<u>Grinding</u>	

Lead modification (2.2.4.6)	☒ Not Req'd	☐ Req'd
Calculated Total Lead Mismatch		µm

SCUFFING DATA (2.2.6)

Scuffing Data per ANSI/AGMA 925-A03			
Scuffing Risk (2.2.6) <=5% (Low)	Calculation Method	<u>AGMA925</u>	
Composite surface roughness, σ_x	<u>0,57</u>		µm
Specific film thickness, EHL λ_{min}	<u>6,18</u>		µm
Tooth temperature, θ_m	<u>64</u>		°C
Maximum contact temperature, θ_{Bmax}	<u>83</u>		°C

MATERIALS

Gear casing	<u>Steel-S355J2</u>	Oil seals	<u>aluminium</u>
Pinion(s)	<u>18CrNiMo7-6 - Grade 2</u>		
Gear rim(s)	<u>18CrNiMo7-6 - Grade 2</u>		
HS Shaft	<u>integral</u>	LS Shaft	<u>42CrMo4</u>
Radial bearings	<u>Babbitt</u>	Backing	<u>Steel</u>
Thrust bearing(s)	<u>Babbitt</u>	Backing	<u>Steel</u>
Internal Piping in 304L			

SHAFT END DETAIL

☐ Gear shaft end for coupling integral flange (2.5.4.2)	
☐ Pinion shaft end for coupling integral flange (2.5.4.2)	
☒ Other : <u>LSS & HSS TAPERED</u>	

COUPLINGS AND GUARDS

	Pinion	Gear
Coupling furnished by (3.2.1)	<u>MDT</u>	<u>MDT</u>
Mount coupling halves (3.2.2)	<u>MDT</u>	<u>MDT</u>
Cplg. guard adapter by (3.2.3)	<u>MDT</u>	<u>MDT</u>
Cplg. guard furnished by (3.2.3)		
Coupling vendor (3.2.3)	<u>Ameridrives</u>	<u>Ameridrives</u>
Vendor's model number (3.2.3)	<u>DB-414681</u>	<u>DB-414690</u>
Coupling weight on shaft, kg	<u>99,9</u>	<u>362,9</u>
CG inboard / outboard of shaft end		
Hub drill template provided	☐	☐

SHAFT END DETAIL (2.5.4.2)

Shaft end detail specified by:	☐ Purchaser	☐ Gear vendor
(Integral unless otherwise specified)		
Shaft end detail if 'otherwise' specified:	Pinion	Gear
Tapered / Keyless	☒ ☐	☒ ☐
Tapered / 1-Key	☐ ☐	☐ ☐
Tapered / 2-Keys	☐ ☐	☐ ☐
Cylindrical / 1-Key	☐ ☐	☐ ☐
Cylindrical / 2-Keys	☐ ☐	☐ ☐
Other	☐ ☐	☐ ☐
Shaft diameter	<u>140,0</u>	<u>240,0</u>
(If integral flange use diameter immediately adjacent to flange)		

RADIAL BEARINGS

	Pinion	Gear
Type	<u>OFFSET / OFFSET</u>	<u>CYL. / CYL.</u>
Diameter	<u>170 / 170</u>	<u>300 / 280</u>
Length	<u>170 / 170</u>	<u>150 / 140</u>
Journal velocity	<u>57,9 / 57,9</u>	<u>23,3 / 21,7</u>
Loading	<u>2,84 / 2,91</u>	<u>2,51 / 2,63</u>
Clearance (min-max)	<u>0,21-0,26</u>	<u>0,29-0,374</u>
Span	<u>750</u>	<u>750</u>
Power loss each bearing	<u>33,5 / 33,5</u>	<u>8,5 / 7,5</u>
Oil flow each bearing	<u>63,0 / 63,0</u>	<u>18,0 / 13,0</u>

THRUST BEARINGS

Location	<u>OPP.CPLG.SIDE</u>
Manufacturer	<u>Kingsbury</u>
Type	<u>BPKJJ</u>
Size	<u>BPKJJ 10.5"</u>
Area	<u>35550</u>
Loading	<u>1,18</u>
Rating	<u>1,50</u>
Int. thrust load	<u></u>
Ext. thrust load	<u>-41 831</u>
Power loss each	<u>4,0</u>
Oil flow each bearing	<u>28,0</u>

NOTES : Self balance thrust bearing
Equal thrust capacity on both directions

SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
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Job No. **39471** Item No. **A**
P.O. No. _____ Date _____
Requisition No. **B.0212174**
Inquiry No. _____
Revision **3** Date **24/05/2016** By **FG**

O LUBRICATION REQUIREMENTS				O ADDITIONAL REQUIREMENTS			
☐ Oil system furnished by (2.8.3) _____ ☐ Other _____ ☐ Gear vendor _____ ☐ Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6) ☒ ISO Grade 46,0 Load stage (2.2.6) 7,0				O VIBRATION DETECTORS RADIAL (3.4.2.1) (2.7.4.5) (2.7.4.6) ☒ Manufacturer BENTLY NEVADA 3300 XL ☒ Total No. 8 ☒ X-Y probes pinion bearings ☒ Coupling end ☒ Blind end ☒ X-Y probes gear bearings ☒ Coupling end ☒ Blind end ☐ Other _____ AXIAL (3.4.2.1) (2.7.4.5) (2.7.4.6) ☒ Manufacturer BENTLY NEVADA 3300 XL ☒ Total No. 2 ☒ Dual probes at each thrust bearing ☐ Single probe any shaft without thrust bearing ☐ Other _____ ONE EVENT PER REVOLUTION PROBE (2.7.4.5) (2.7.4.6) ☒ Manufacturer BENTLY NEVADA 3300 XL Total No. 1 ☒ One on input shaft ☐ One on output shaft ☐ Other _____ ACCELEROMETER (3.4.2.1) (2.7.4.5) (2.7.4.6) ☒ Manufacturer BENTLY NEVADA 33040I ☒ No. required 1 ☐ Pinion coupling end ☒ Gear coupling end ☐ Other on upper casing			
MESH Mesh and windage power loss 78,0 kW Oil flow, mesh 100,0 l/min							
LUBRICATION REQUIREMENTS Min. startup oil temperature 20,0 °C Normal oil inlet temperature 45,0 °C Maximum oil inlet temperature 55,0 °C Unit oil flow (total) 285,0 l/min Unit oil pressure 1,5 bar ☐ Oil visc. _____ cp @ 40°C _____ cp @ 100°C (2.8.6) ☒ ISO Grade 46 Load stage (2.2.6) 7,0							
PIPING CONNECTIONS				O TEMPERATURE DETECTORS			
Service	No.	Size	Type	☐ Dial type thermometers (3.4.2.7) _____ ☒ Type brg. temp. sensors (3.4.2.7) (2.7.1.3) PT100 ☒ RTD ☐ Thermocouple / ☐ Simplex ☒ Duplex Calibration No ☒ HS/LS bearings no. sensors each 2 / 2 ☒ Thrust number of sensing elements each face 2			
Lube oil inlet	1	3 in.	ANSI 150 LBS				
Lube oil outlet	1	8 in.	ANSI 150 LBS				
Casing drain *	1	2 in.	ANSI 150 LBS				
Vent	1	NPS 1 1/2	For Air Breather				
Casing purge							
* Casing drain is 'dead bottom' housing drain, not lube oil outlet							
O MOUNTING PLATES ☐ Gear furnished with (3.3.1.1) ☐ Baseplate ☐ Soleplate ☐ Subplate(s) (3.3.2.10) ☐ Mounting plates(s) furnished by (3.3.1.1) _____ ☐ Baseplate leveling (3.3.2.3) _____ ☐ Baseplate with leveling pads (3.3.2.3) ☐ Baseplate suitable for column mounting (3.3.2.4) ☐ Vendor review of purchaser's foundation dwgs. (2.1.13) ☐ Grout type (3.3.1.2.4) _____				O OTHER VIBRATION AND TEMPERATURE (3.4.2.5) (3.4.2.6) Other Gear vendor Oscillator demodulator supplied by ☐ ☒ Vibration monitor supplied by ☒ ☐ ☐ Vibration shutdown delay time _____ seconds Temperature monitor supplied by ☒ ☐ Oscillator demodulator J-box by ☐ ☒ Temp. sensor termination J-box by ☐ ☐ J-box type STAHL Mount Yes			
O CONTRACT DATA ☒ Test data prior to shipment _____ ☒ Progress report (5.3.3) _____ ☒ Vendor signoff of inspector checklist (4.1.1.3) ☒ Information retained for 20 years (4.2.1.1) (4.2.2.6.1) ☒ Technical manual (5.3.5.4) ☒ PAINTING (4.4.3.1) ☒ OFFSHORE C5-M- RAL5019 ☒ Painting housing interior not allowed (2.3.1.14)				O MISCELLANEOUS ☒ Undamped critical analysis report (2.6.2.1) ☐ w/ dampd rotr respsn analys rpt (2.6.2.4.3) (2.6.2.6) Torsional analysis by (2.6.5.2) ☐ Gear vendor ☒ Other ☒ Spare set of gear rotors (4.3.2.4) ☐ Gear case furnished with inlet purge connection (2.4.3) ☐ Orientation of oil inlet & drain conns. (2.4.6) _____ ☒ Filter breather location (2.3.1.12) On upper casing ☐ Torsional device provisions (2.5.4.5) _____ ☐ Rotor vertical storage provisions (2.5.4.8) _____ ☐ Rotor vertical storage fixture(s) (3.6.2) _____ ☐ Vendor service rep. on site (2.1.13) _____			
O SHIPMENT ☒ Steel rotor storage container (4.4.5) ☐ Shaft covers (4.4.4) Contract unit Spares Export boxing ☐ ☐ Domestic boxing ☐ ☐ Outdoor storage over 6 mos. ☐ 3 years indoor ☐ (4.4.3.9)							

SPECIAL PURPOSE GEAR UNITS
API 613 FIFTH EDITION
DATA SHEET SI UNITS

Job No. 39471 Item No. A
P.O. No. _____ Date _____
Requisition No. B,0212174
Inquiry No. _____
Revision 3 Date 24/05/2016 By FG

O INSPECTIONS AND TESTS (4.1)					NOTES :
☒	Advance notice of witness testing required (4.1.3)				
	Number calendar days <u>14</u>				
		Req'd	Witness	Observe	Test Log
6	Shop Inspection (4.1.1)	☒	☐	☐	
7	Cleanliness Inspection (4.2.3.1)	☒	☐	☒	
8	Hardness Verification (4.2.3.3)	☒	☐	☒	☒
9	Dismantle-reassembly (4.3.2.3.1)	☒	☒	☐	☐
10	Contact Check (2.5.2.2)	☒	☒	☐	☐
11	Contact Check Tape Lift (2.5.2.2)	☒	☒	☐	☒
12	Gear accuracy check (2.5.2.1)	☒	☒	☐	☒
13	Double helical axial stability (2.5.2.3)	☒	☒	☐	☐
14	Special testing integral forged gears (2.5.3.3)				
15	(testing per mutual agreement)	☐	☐	☐	☐
16	Residual unbalance check (2.6.6.2)	☒	☒	☐	☒
17	Mechanical Run Test (Main) (4.3.2)	☒	☒	☐	☒
18	Mechanical Run Test (Spare) (4.3.2.4)	☒	☒	☐	☒
19	Add'l. Mechanical Tests (4.3.2.2.16)	☐	☐	☐	☐
20	Part or Full Load And Full Speed				
21	Test (4.3.3.1)	☒	☒	☐	☒
22	Full torque, reduced speed (4.3.3.2)	☐	☐	☐	☐
23	Full Torque Static Test (4.3.3.3)	☐	☐	☐	☐
24	Back-To-Back Locked Torque				
25	Test (4.3.3.4)	☐	☐	☐	☐
26	Sound Level Test (4.3.3.5)	☒	☐	☐	☒
27	Additional gear tooth test (4.2.2.8)	☐	☐	☐	☐
28	Use shop Lube System	☒	☐	☐	
29	Use job lube system	☐	☐	☐	
30	Use shop Vibration Probes, Etc.	☐	☐	☐	
31	Use job Vibration Probes, Etc.	☒	☒	☐	
32	Final Assembly, Maintenance &				
33	Running Clearance (4.2.1.1.e)	☒	☒	☐	☒
34	Oil System Cleanliness (4.2.3.2)	☒	☒	☐	
35	Oil System-Casing Joint				
36	Tightness (4.3.2.1.4)	☒	☒	☐	
37	Warning And Protection				
38	Devices (4.3.2.1.5)	☒	☒	☐	
39	Seismic Vibration Data (4.3.2.2.3)	☒	☒	☐	☒
40	Vibration, Phase Plots (4.3.2.2.12)	☒	☒	☐	☒
41	Oil inlet Range test (4.3.2.2.13)	☒	☒	☐	☒
42	Tape recorded Vibration Data	☒	☐	☐	☒
43	(4.3.2.2.14) (4.3.2.2.15)	☒	Purchaser copy		
44	NON-DESTRUCTIVE TESTING (4.2.1.2) (4.2.2.1)				
45		Surface	Sub surface		Log
46	☒ Casing	☒	☒		☒
47	☒ Rot. Elemts.	☒	☒		☒
48	☒ Bearings	☒	☒		☒
49	☐ Other :	☐	☐		☐
50	(Specify) _____				

**DATENBLATT / DATA SHEET**

KENNWORT / CODE WORD

BILBOAX

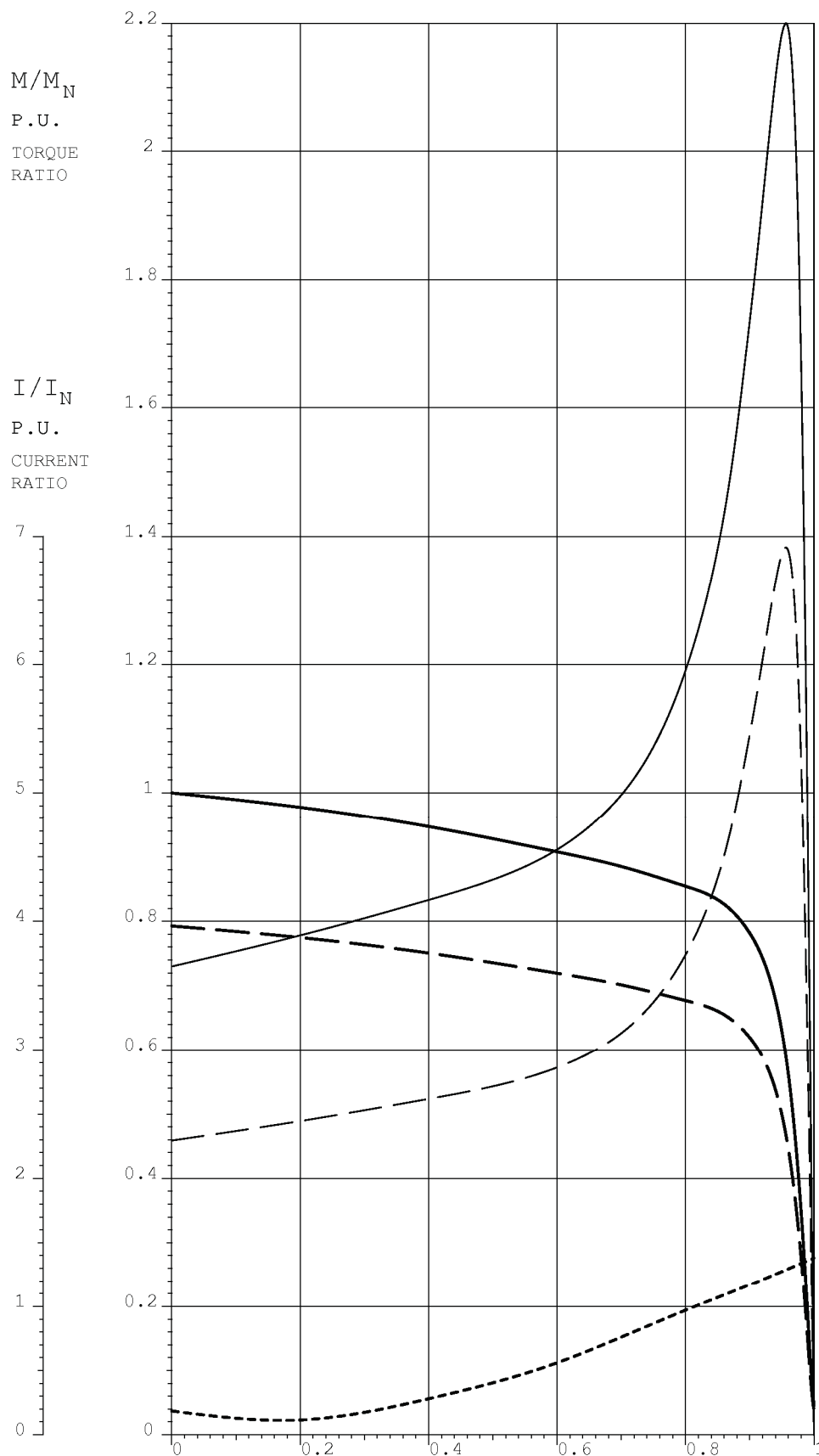
AUFTRAG-NR / ORDER-NO

H.0200062.02**Motor****Performance Curves****DECKBLATT / COVER SHEET****Main Air Compressor****ITEM: F3-C-1****REFERENCE JOB CUSTOMER: ADI-1783****P-N1783-CEC0-K0-0001-A-O**

REVISION REVISION	00	01	02	03	04	05	REVIDIERTE ZEILE REVISED LINE
DATUM DATE	16.10.2015						↑
NAME NAME	Hahne						BLATT SHEET
GEPRÜFT CHECKED	Melot de Beauregard						1 VON / OF 4
ABTEILUNG DEPARTMENT	TELEFON PHONE NO.	TELEFAX FAX NO.	FORMAT SIZE	DOC. TYPE	DOKUMENTEN-NR. / DOCUMENT NO:		Doc.Par
ETEIR	0208-692 2816	0208-692 2848	A4	TED	1 000 195 6793		001
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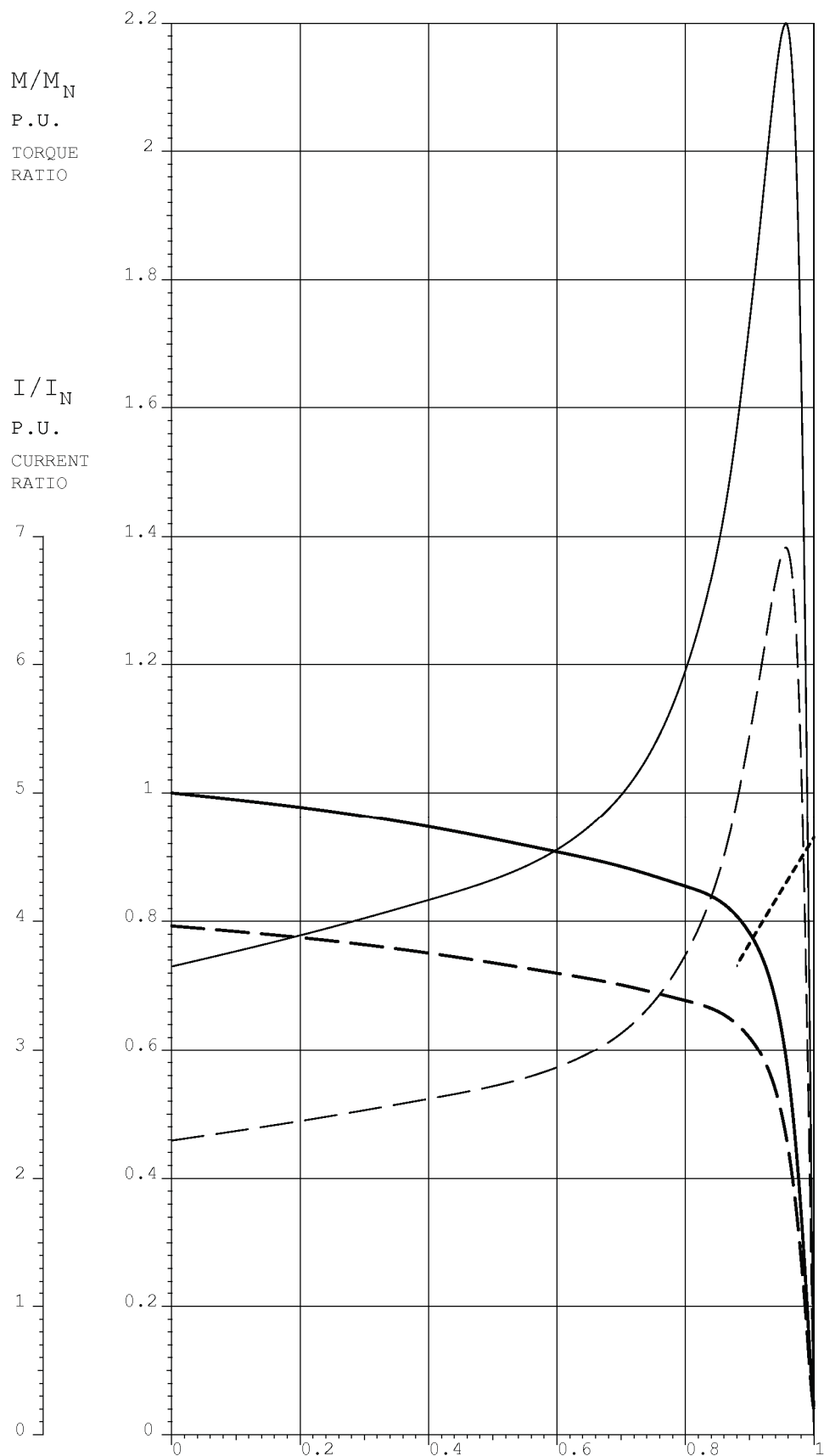
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ANLAUF-DATEN / STARTING-DATA

14000 KW 11000 V 842 A 1483 min⁻¹ 50 Hz

PD LD AP MG MF-DW	Dep. EN1	Works No. 1314257	Code BILBAO	Electrical data	Sheet 4 of 7
Siemens AG	Name Jungelnes	DI1385 K.54 DP approval		A5E36644866A-AA	1326878
	Phone/Fax				
	Date 11.09.15				

ANLAUF-DATEN / STARTING-DATA

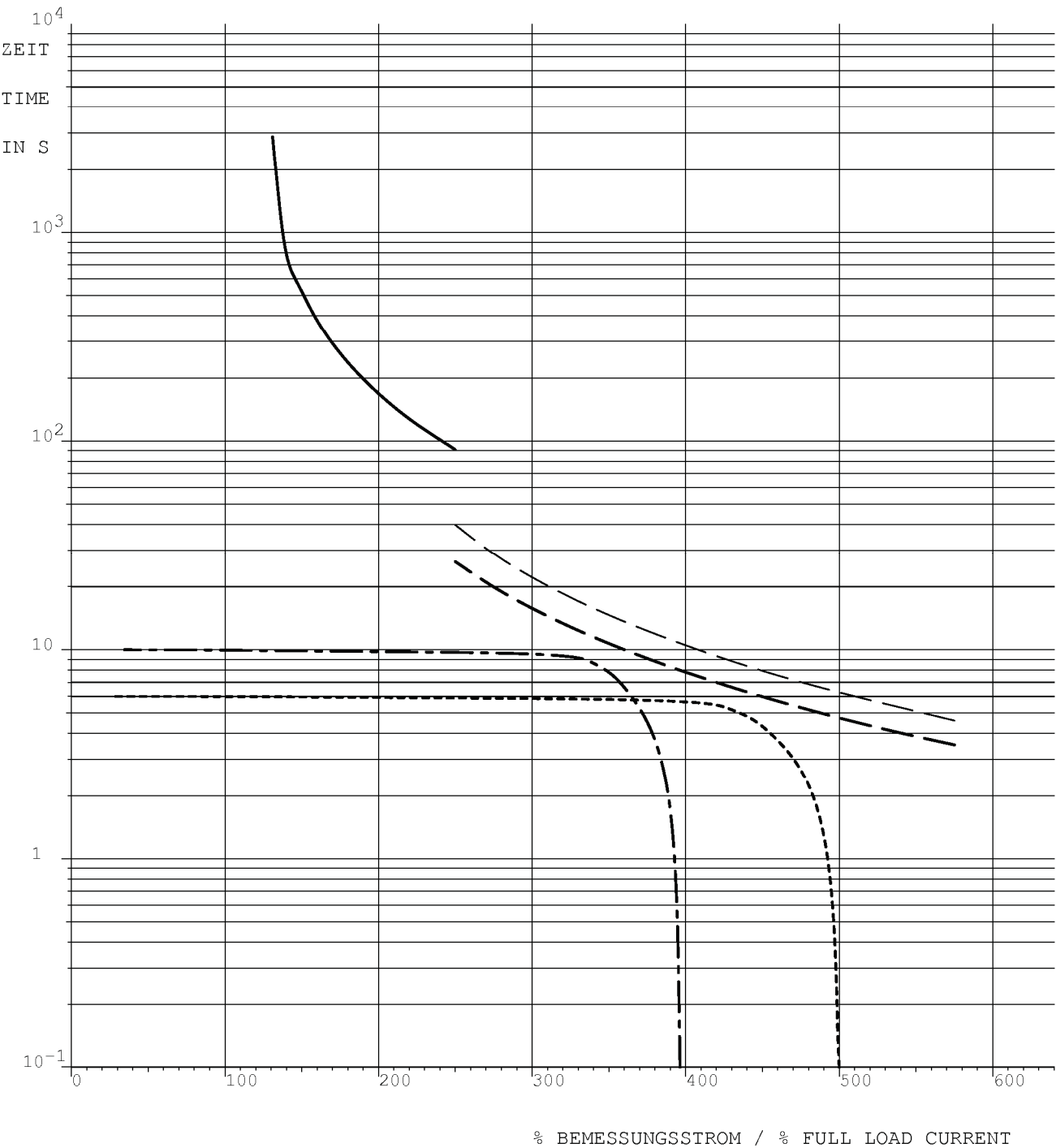
14000 KW 11000 V 842 A 1483 min⁻¹ 50 HzConfidential
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PD LD AP MG MF-DW	Dep. EN1	Works No. 1314257 Code BILBAO	Electrical data	Sheet 5 of 7
Siemens AG	Name Jungelnes			
	Phone/Fax	DI1385 K.54 DP approval	A5E36644866A-AA	1326878
	Date 11.09.15			

THERMAL LIMIT CURVES-ANSI/IEEE STD 620

14000 KW 11000 V 842 A 1483 min⁻¹ 50 Hz

- UEBERSTROM AUS BEMESSUNGSBETRIEB / OVERCURRENT FROM RATED CONDITION "RUNNING"
- FESTGEBREMSTER LFR. AUS BEMESSUNGSBETRIEB / LOCKED ROTOR FROM RATED CONDITION
- FESTGEBREMSTER LFR. AUS KALTEM ZUSTAND / LOCKED ROTOR FROM COLD CONDITION
- ANLAUF BEI 100% UN / STARTING CURRENT 100% VOLTAGE
- ANLAUF BEI 80% UN / STARTING CURRENT 80% VOLTAGE



Confidential
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C.R.	Approv.:	F.M.S.	Check:	M.A.R.	Prep.:	DATE: MAY 2013	REV.: 0	F3C1-5-00-53	DS FILE CODE:	DATA SHEET	TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	ENGINEER DIVISION

6. HOJA DE DATOS CONSOLA DE LUBRIFICACION

MATERIAL REQUISITION

Nº P-N1783-CEC0-K0-0001-A-O

LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR (AIR BLOWER)

ADI-1783

					PREPARED BY			DRAWING FILE	
					APPROVED BY			CONTRACTOR	
0	REQUEST FOR PROPOSAL	17.05.2013	M.A.R.	C.R.	CLIENT AUTHORIZED BY			PROJECT	
REV.	DESCRIPTION	DATE	PREP.	APPROV.					
ANNEX DESCRIPTION / DRAWING TITLE					CLIENT / PLANT				
LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1					 PETRONOR / MUSKIZ				
DATA SHEET					ANNEX	SPEC..	DRAWING No.	PAGE	REV.
					K		10002064709	1 of 20	0
LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET							No. F3C1-5-00-53		

C.R.	1	Applicable to: ☒ Proposal ☒ Purchase ☒ As built
	2	
Approv.:	3	Final user: PETRONOR Site: MUSKIZ (VIZCAYA-SPAIN)
	4	Oil/gas system for: COMPRESOR F3-C-1, ELECTRICAL DRIVER & SPECIAL PURPOSE GEAR UNIT
F.M.S.	5	Supplier: Man Diesel & Turbo SE Manufacturer: COES
	6	Purchase order No.: 528-4633527 Date Serial No.: L160039
Check.:	7	<i>Note: It's referred to the purchase order number issued by supplier to console manufacturer</i>
	8	Notes: 1. Information to be completed by:
M.A.R.	9	☒ Purchase ☒ Vendor ☒ either, but by vendor if not by purchaser
	10	2. A dot * indicates that the standard API 614 especifices a requirement.
Prep.:	11	3. Designations in () are applicable portions of the standard API 614; numbers without a prefix are paragraph numbers,
	12	those prefixed "T" are text figure numbers; and those prefixed "A" are Appendix "A" figure numbers.
DATE: MAY 2013	13	
	14	Applicable documents:
REV.: 0	15	
	16	☒ Local instruments and panel items (chapter 1) ☒ Pumps
F3C1-5-00-53	17	☒ Instruments suppliers (chapter 1) ☒ Pumps drivers (Motor)
	18	☒ Special purpose oil system (chapter 2) ☒ Pumps drivers (Turbine)
DS FILE CODE:	19	☒ General purpose oil systems (chapter 3) ☒ Referenced standards Table A-1 (4-1)
	20	☒ Self-acting gas seals support systems (chapter 4) ☒ ED-K-04.00-I-01
DATA SHEET	21	☒ P-60 A1 and P-64 C1 ☒ ED-G-04.00-I-01
	22	☒ ☒ ED-G-05.00-I-01
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	23	Installation data: (also see page 2)
	24	
ENGINEER DIVISION	25	☐ *General site data included in specification
	26	☐ *Utility data included in specification
ANNEX DESCRIPTION / DRAWING TITLE	27	* If blank, provide on page 2 of this specification
	28	☐ Space available for oil system:
CLIENT / PLANT	29	Length m Width m Height m
	30	☐ Plot plan showing console location in relation to main equipment:
DRAWING No.	31	☒ Max. allow. noise level 82,0 dB (or see spec. P-96 A2 Ap. F)
	32	(Sketch the equipment plot plan with relation to the console location here)
PAGE	33	☐ Winterize ☐ Tropicalize
	34	☒ Area classification: Class. 1 Gr. IIC Cat. 3G Temp. T3
REV.	35	Equipment oil required:
	36	
REMARKS:	37	Lube oil:
	38	
REMARKS:	39	Supply pressure, 4,5 barg
	40	☒ Driven equipment
REMARKS:	41	☐ Driven equipment
	42	☐ Driven equipment
REMARKS:	43	☒ Prime mover
	44	☒ Gears
REMARKS:	45	☐ Couplings
	46	☒ Reserve
REMARKS:	47	☒ Total:
	48	
REMARKS:	49	☐ Control oil (normal)
	50	
REMARKS:	51	☐ Control oil (transient)
	52	
REMARKS:	53	
	54	
REMARKS:	55	
	56	
REMARKS:	57	
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REMARKS:	59	
	60	
REMARKS:	61	
	62	
REMARKS:	63	
	64	

ANNEX DESCRIPTION / DRAWING TITLE

**LUBE OIL & SHAFT SEALING SYSTEM
FOR AXIAL COMPRESSOR F3-C-1**

DATA SHEET

CLIENT / PLANT

PETRONOR / MUSKIZ

ANNEX

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LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET No. F3C1-5-00-53

C.R.	1	* Site data		Utility data																			
	2																						
Approv.:	3	☒ Ambient conditions		☒ Electrical		☒ Cooling water: water source		COOLING TOWER WATER															
	4	☒ Min/max temperature (°C) 33,5		Volts 500		Inlet temperature (°C) 28,3		Max return(C°) 43															
F.M.S.	5	☒ Relative humidity 95% MAX		Hertz 50		Normal pressure 5		Max Design press 7															
	6					(barg)		(barg)															
Check:	7	☐ Corrosive atmosphere		Phase 3		Min return 4,3		Max ΔP 0,7															
	8					(barg)		(bar2)															
M.A.R.	9																						
	10	☐ Steam		Drivers		Heating																	
Prep:	11	Inlet min.		Pressure	N.A.	Temperature	N.A.	Pressure	N.A.														
	12	Normal		Pressure	N.A.	Temperature	N.A.	Pressure	N.A.														
DATE: MAY 2013	13	Maximum		Pressure	N.A.	Temperature	N.A.	Pressure	N.A.														
	14	Exhaust min.		Pressure	N.A.	Temperature	N.A.	Pressure	N.A.														
REV.: 0	15	Normal		Pressure	N.A.	Temperature	N.A.	Pressure	N.A.														
	16	Maximum		Pressure	N.A.	Temperature	N.A.	Pressure	N.A.														
F3C1-5-00-53	17																						
	18	Location:																					
DS FILE CODE:	19																						
	20	☐ Indoor		☐ Heated		☒ Under roof																	
DATA SHEET	21	☒ Outdoor		☒ Unheated																			
	22																						
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	23	Painting:		☒ Weights, kg		☒ Dimensions, mm																	
	24																						
ENGINEER DIVISION	25	☒ Component supplier OFF SHORE standard		Console Panel 13800 Console Panel 8000 <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:33%;">Leght</th> <th style="width:33%;">Width</th> <th style="width:33%;">Height</th> </tr> <tr> <td>3300</td> <td>3500</td> <td>3300</td> </tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </table>		Leght	Width	Height	3300	3500	3300												
	Leght	Width	Height																				
3300	3500	3300																					
26	☐ Unified per system supplier standard																						
27	☐ EC-B57 Repsol YPF Specification																						
28	☐ ED-B-06.00. FOR ALL EQUIPMENT																						
	29	☒ Finish colour: PETRONOR spec. P-O 101																					
	30																						
	31																						
	32	Preparation for shipment		Miscellaneous documentation																			
	33	(NOTE 1)		☒ Spare parts quotation with proposal ☐ Spare parts quotation after contract Spare parts for: ☒ Start up ☒ 2 years (NOTE 2)																			
	34	☒ Install new filter elements and tag																					
	35	☒ Include sets of extra filter elements																					
	36	☒ Box extra sets with the system																					
	37																						
	38	Other spares		☒ Complete inspector's checklist ☒ Progress reports ☒ Components selection review ☐																			
	39																						
	40																						
	41																						
	42																						
	43																						
	44																						
	45	System and components		Spare parts																			
	46		Vendor std.	ED-B-01.00	Vendor std.	ED-B-01.00																	
	47	☐ Domestic	☐	☐	☐	☐																	
	48	☒ Export	☐	☒	☐	☒																	
	49	☒ Extended storage	☐	☐	☐	☐																	
	50	6 months																					
	51	REMARKS:																					
	52	NOTE 1: Preparation fot shipment acc. To Repsol Spec. ED-B-01.00-I-01																					
	53	NOTE 2: Spares shall be duly filled in by compressor supplier.																					
	54																						
	55																						
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	62																						
	63																						
	64																						

ANNEX DESCRIPTION / DRAWING TITLE

**LUBE OIL & SHAFT SEALING SYSTEM
FOR AXIAL COMPRESSOR F3-C-1**

DATA SHEET

CLIENT / PLANT

PETRONOR / MUSKIZ

ANNEX

SPEC..

DRAWING No.

PAGE

REV.

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LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET No. F3C1-5-00-53

C.R.	1	Applicable to: ☒ Proposal ☐ Purchase ☐ As built		
	2			
Approv.:	3	Final user:	PETRONOR	Site: MUSKIZ (VIZCAYA-SPAIN)
	4	Oil/gas system for:	COMPRESOR F3-C-1, ELECTRICAL DRIVER & SPECIAL PURPOSE GEAR UNIT	
F.M.S.	5	Supplier:	Man Diesel & Turbo SE	Manufacturer: COES
	6	Purchase order No.:	528-4633527	Date: Serial No.: L160039
Check.:	7	<i>Note: It's referred to the purchase order number issued by supplier to console manufacturer</i>		
	8			
M.A.R.	9	Pressure gauges	WIKA	233.30.100
	10	Temperature gauges	WIKA	F73.100/4
Prep.:	11	Level gauges	BONETTI	MAG / MNP Class A1 - FIG.3321
	12	Differential pressure gauges	WIKA	733.14.100
DATE: MAY 2013	13	Pressure switches	NA	NA
	14	Differential pressure switches	NA	NA
REV.: 0	15	Temperature switches	NA	NA
	16	Level switches	NA	NA
F3C1-5-00-53	17	Control valves	MASONEILAN	526/10900 - 87-21124 - 88-80385
	18	Pressure relief valve	LESER	5262.0472H2
DS FILE CODE	19	Thermal relief valve	LESER	4594.2172-H2
	20	Sight flow indicators	OPM	2 GLASS
DATA SHEET	21	Pressure transmitter	EMERSON	3051CG
	22	Level transmitter	ENDRESS HAUSER	FMP51-BBACCDACA4AFJ+AE
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	23	Temperature transmitter	EMERSON	3144P D1 A 2 I1 M5 C4 Q4
	24	Vibration equipment	NA	NA
ENGINEER DIVISION	25	Tachometer	NA	NA
	26	Solenoid valves	NA	NA
	27	Annunciator	NA	NA
	28	Thermocouples	NA	NA
	29	RTDs	EMERSON	0065 D 3 2 F
	30	Thermowells	WIKA	TW 10-P
	31	Limit Switch	NA	NA
	32	Programable Logic Controller (PLC)	NA	NA
	33	Temperature Monitoring	NA	NA
	34			
	35			
	36			
	37			
	38	Alarm / Trip wiring per arrangement 1 ☐ 2 ☐ 3 ☒ (Section 3, Chapters 2,3,4)		
	39			
	40			
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	45			
	46			
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	56			
	57	REMARKS:		
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	63			
	64			

ENGINEER DIVISION	ANNEX DESCRIPTION / DRAWING TITLE		CLIENT / PLANT		
	LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1		PETRONOR / MUSKIZ		
	DATA SHEET				
	ANNEX	SPEC..	DRAWING No.	PAGE	REV.
		K	10002064709	4 of 20	0
LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET			No. F3C1-5-00-53		

C.R.	1	Applicable to: ☒ Proposal ☐ Purchase ☐ As built			
	2				
Approv.:	3	Final user: PETRONOR		Site: MUSKIZ (VIZCAYA-SPAIN)	
	4	Oil/gas system for: COMPRESOR F3-C-1, ELECTRICAL DRIVER & SPECIAL PURPOSE GEAR UNIT			
F.M.S.	5	Supplier: Man Diesel & Turbo SE		Manufacturer: COES	
	6	Purchase order No.: 528-4633527		Date	Serial No.: L160039
Check:	7	Note: It's referred to the purchase order number issued by supplier to console manufacturer			
	8	Notes: 1. Information to be completed by: ☒ Purchaser ☒ Vendor ☐ either, but by vendor if not by purchaser			
M.A.R.	9	2. A dot * indicates that the standard API 614 especifices a requirement.			
	10	3. Designations in () are applicable portions of the standard API 614; numbers without a prefix are paragraph numbers, those prefixed "T" are text figure numbers; and those prefixed "A" are Appendix "A" figure numbers.			
Prep.:	11				
	12				
DATE: MAY 2013	13				
	14				
REV.: 0	15	Service	Console gauge board	Local control panel	PLC Panel
	16	☒ Panel identification		F3-C-1-LP-1	
F3C1-5-00-53	17	☒ Supplied by		Compressor Vendor	
	18	☒ Type: Free standing		Yes	
DS FILE CODE:	19	Mounted on		Near Machine	
	20	☒ Open o fully enclosed		Fully Enclosed	
DATA SHEET	21	☒ Weather tight		Yes (IP-55)	
	22	☒ Purged or pressurized		Yes	
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	23	☒ Purge or pressure gas		Instrument Air	
	24	☒ Shutoff valves for shutdown sensing devices		Yes	
ENGINEER DIVISION	25	☒ Annunciator system		Yes	
	26	☒ Rear access doors		Yes	
	27	☒ Walk-in facility		Yes	
	28	☒ Sun and weather roof extension		Yes	
	29	☒ Light panel front/interior		Yes	
	30	☒ Limits: max. height above floor			
	31	☒ Lowest item above floor			
	32	☒ Spare terminals required			
	33	☒ Minimum wire size			
	34	☒ Material:front panel		Cb. Stl. Plate	
	35	☒ Other panels and doors		Cb. Stl. Plate	
	36	☒ Chassis		Cb. Stl. Plate	
	37	☒ Vibration isolator			
	38	☒ Electrical area classification		SAFETY AREA	
	39	☒ Panel power supply			
	40	☒ Extra cutouts required			
	41				
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	55				
	56	REMARKS:			
	57	NOTE 1: For L.C.P. see requisition chapter V.H.			
	58				
	59				
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	62				
	63				
	64				
ANNEX DESCRIPTION / DRAWING TITLE			CLIENT / PLANT		
LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1			 PETRONOR / MUSKIZ		
DATA SHEET			ANNEX	SPEC..	DRAWING No.
			K		10002064709
				PAGE	REV.
				5 of 20	0
LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET			No. F3C1-5-00-53		

C.R.	1	Applicable to: ☒ Proposal ☒ Purchase ☐ As built								
	2									
Approv.	3	Final user: PETRONOR	Site: MUSKIZ (VIZCAYA-SPAIN)							
	4	Oil/gas system for: COMPRESOR F3-C-1, ELECTRICAL DRIVER & SPECIAL PURPOSE GEAR UNIT								
F.M.S.	5	Supplier: Man Diesel & Turbo SE	Manufacturer: COES							
	6	Purchase order No.: 528-4633527	Date	Serial No.: L160039						
Check:	7	<i>Note: It's referred to the purchase order number issued by supplier to console manufacturer</i>								
	8	Panel mounted item details:								
M.A.R.	9	Use the following code letters to show instrumentation details								
	10	F - Flush mount on front	H - Purchaser remote mount (control room)	CP - Cutout to purchaser item						
Prep.	11	S - Surface mount on front	P - Purchaser supply and mount	M - Mount by vendor of purchaser supplied item						
	12	R - Rear of panel mount	V - Vendor supply and mount							
DATE: MAY 2013	13	L - Locally mount on Gage board	B - Local equipment panel	C - Remote equipment panel (DCS)						
	14		D - Rack Room Panel							
REV.: 0	15	EQUIPMENT INSTRUMENTATION								
	16									
DS FILE CODE: F3C1-5-00-53	17	Panel identification	L	B	C	Panel identification	L	B	C	
	18	Pressure gauges				Push button stations				
DATA SHEET	19	☐ Main turbine inlet				☒ Main equipment start	V	V,B		
	20	☐ Main turbine first stage				☒ Main equipment stop	V	V,B	P	
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	21	☐ Main turbine extraction				☐ Compressor block in				
	22	☐ Main turbine exhaust				☐ Compressor unblock				
ENGINEER DIVISION	23	☐ Steam chest				Miscellaneous				
	24	☐ First stage after extraction				☒ Equipment tachometer	V	V,B	P	
ANNEX	25	☐ Nozzle bowl				☒ Equipment speed control	V	V		
	26	☐ Steam seal				☒ Equipment ammeter (Main Motor)	V	V,B	P	
SPEC.. K	27	☒ Compressor casing drain collect. Drum	V			☒ Compressor inlet controller	P		P	
	28	☒ Compressor suction	M	V	P	☒ Annunciation system	V	V,B	P	
DRAWING No. 10002064709	29	☒ Compressor discharge	M	V	P	☒ Equipment flow meter	P	V,B	P	
	30	☐ Each compressor section				☒ Guide vane positoner	V	V,B	P	
PAGE 6 of 20	31	☒ Balance chamber	V	V		☐ Suction throttle valve				
	32	Differential pressure gauges				☒ Anti-surge equipment	M	V	P	
REV. 0	33	☒ Compressor air filter	V	V	P	☒ Capacity control equipment	P		P	
	34	☐ Buffer gas				☐				
CLIENT / PLANT PETRONOR / MUSKIZ	35	☐ Seal gas (See API-614 fig 4A-1)				☐				
	36	☐				☐				
REMARKS:	37	Temperature gauges				☐				
	38	☐ Main turbine inlet steam				☐				
ANNEX K	39	☐ Main turbine exhaust				☐				
	40	☐ Seal gas (See API-614 fig 4A-1)				☐				
DRAWING No. 10002064709	41	☒ Compressor suction (each section)	M	V	P	Monitors (On all train bearings)				
	42	☒ Compressor discharge (each section)	M	V	P	☒ Vibration	V	V,B	P	
PAGE 6 of 20	43	☐				☒ Axial position	V	V,B	P	
	44	Level indicators/controllers				☒ Thrust bearing metal temp	V	V,B	P	
REV. 0	45	☐ Suction separator				☒ Journal bearing metal temp	V	V,B	P	
	46	☐ Interstage separator				☒ Monitor Display	V	V,B		
CLIENT / PLANT PETRONOR / MUSKIZ	47	☐ Discharge separator				☒ Gear case vibration	V	V,B	P	
	48	☒ Rundown Tank	V	V	P	☒ Phase angle	V	V,B	P	
ANNEX K	49	☐				☐				
	50	☐				☐				
DRAWING No. 10002064709	51	☐				☐				
	52	☐				☐				
PAGE 6 of 20	53	☐				☐				
	54	☐				☐				
REV. 0	55	☐				☐				
	56	☐				☐				
CLIENT / PLANT PETRONOR / MUSKIZ	57	REMARKS:								
	58	NOTE 1: Lube-oil system instrumentation shall comply with API STD 614, 5th ED.								
ANNEX K	59	NOTE 2: Refer to requisition for the required number of primary transducers and relevant required monitoring points on each of the train components.								
	60									
DRAWING No. 10002064709	61	NOTE 3: See requisition for additional information.								
	62									
PAGE 6 of 20	63									
	64									
REV. 0	ANNEX DESCRIPTION / DRAWING TITLE					CLIENT / PLANT				
	LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1					PETRONOR / MUSKIZ				
CLIENT / PLANT PETRONOR / MUSKIZ	DATA SHEET					ANNEX	SPEC.. K	DRAWING No. 10002064709	PAGE 6 of 20	REV. 0
	LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET					No. F3C1-5-00-53				

C.R.	1	Applicable to: ☒ Proposal ☒ Purchase ☒ As built	
	2		
Approv.:	3	Final user: PETRONOR	Site: MUSKIZ (VIZCAYA-SPAIN)
	4	Oil/gas system for: COMPRESOR F3-C-1, ELECTRICAL DRIVER & SPECIAL PURPOSE GEAR UNIT	
F.M.S.	5	Supplier: Man Diesel & Turbo SE	Manufacturer: COES
	6	Purchase order No.: 528-4633527	Date: Serial No.: L160039
Check:	7	Note: It's referred to the purchase order number issued by supplier to console manufacturer	
	8	Panel mounted item details:	
M.A.R.	9	Use the following code letters to show instrumentation details	
	10	F - Flush mount on front	H - Purchaser remote mount (control room) CP - Cutout to purchaser item
Prep.:	11	S - Surface mount on front	P - Purchaser supply and mount M - Mount by vendor of purchaser supplied item
	12	R - Rear of panel mount	V - Vendor supply and mount C - Remote equipment panel (DCS)
	13	L - Locally mount on Gage board	B - Local equipment panel
	14		D - Rack Room Panel
	15		
	16	EQUIPMENT INSTRUMENTATION	
DATE: MAY 2013	17	Panel identification	L B C
	18	Pressure gauges	
REV.: 0	19	☒ MAIN LUBE OIL PUMP DISCHARGE	V ---
	20	☒ STAND-BY LUBE OIL PUMP DISCH. ^{GE}	V ---
	21	☐ EMERG. ^{CY} LUBE OIL PUMP DISCH. ^{GE}	---
	22	☐ SEAL OIL PUMP DISCHARGE	---
	23	☐ STAND-BY SEAL OIL PUMP DISCH. ^{GE}	---
	24	☐ EMERGENCY SEAL OIL PUMP DISCH. ^{GE}	---
	25	☐ BOOSTER PUMP DISCHARGE	---
	26	☐ STAND-BY BOOSTER PUMP DISCH. ^{GE}	---
	27	☐ EMERG. ^{CY} BOOSTER PUMP DISCH. ^{GE}	---
	28	☒ LUBE OIL HEADER (EACH LEVEL)	V V P
	29	☐ SEAL OIL HEADER (EACH LEVEL)	---
	30	☐ GOVERNOR OIL HEADER	---
	31	☐ CONTROL OIL HEADER	---
	32	☐ PUMP TURBINE STEAM SUPPLY	---
	33	☒ ACCUMULATOR PRE CHARGE GAS	V ---
	34	☒ COMPRESSOR SEAL REFERENCE GAS	---
	35	☐ COUPLING OIL	---
	36	☒ LOCAL PANEL PURGE GAS SUPPLY	V P
	37	☐ EACH OIL PUMP SUCTION	---
	38	☒ Gear Oil Circuit	V ---
	39	DIFFERENTIAL PRESSURE GAUGES:	---
	40	☒ LUBE OIL FILTERS	V V P
	41	☒ SEAL GAS FILTERS	V V P
	42	☐ BOOSTER OIL FILTERS	---
	43	☐ GOVERNOR OIL FILTERS	---
	44	☒ VORECON CONTROL OIL CYRCUIT FILTERS	V V P
	45	☐ COUPLING OIL FILTERS	---
	46	☒ OIL PURIFIER	V ---
	47	☒ COMPRESSOR SEALS (EACH LEVEL)	V ---
	48	☒ SEAL GAS (See API-614 fig 4A-1)	V V P
	49	SIGHT FLOW INDICATORS:	---
	50	☒ COUPLING DRAINS (EA. COUPLING)	V ---
	51	☒ THRUST BEARING DRAINS (EA. BRG.)	V ---
	52	☐ OUTER SEAL DRAINS (EA. SEAL)	---
	53	☒ GEAR CASE DRAINS	V ---
	54	☒ JOURNAL BEARING DRAINS (EA. BRG.)	V ---
	55	☒ EMERGENCY LUBE OIL RUNDOWN	V ---
	56	☐ TANK OUTLET	---
	57	☐ COUPLING INLET	---
	58	☐	---
	59	TEMPERATURE GAUGES:	---
	60	☒ COOLER INLETS/OUTLETS	V ---
	61	☒ OIL OUTLET EACH BEARING	---
	62	☒ OTHER LOCATIONS (NOTE 1)	V V P
	63	☐	---
	64	REMARKS:	
	65	NOTE 1: Lube-oil system instrumentation shall comply with API STD 614 5th ED., as ammended by PETRONOR specification P-60 A1	
	66	NOTE 2: Permissive for Oil pump start and heater connection.	
	67	NOTE 3: See requisition for aditional information.	
	68		
ENGINEER DIVISION	ANNEX DESCRIPTION / DRAWING TITLE		CLIENT / PLANT
	LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1		 PETRONOR / MUSKIZ
DATA SHEET		ANNEX	SPEC..
		K	
		DRAWING No.	PAGE
			7 of 20
		REV.	0
LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET		No. F3C1-5-00-53	

C.R.	1	Applicable to: ☒ Proposal ☒ Purchase ☒ As built																																											
	2																																												
	3	Final user: PETRONOR Site: MUSKIZ (VIZCAYA-SPAIN)																																											
Approv.:	4	Oil/gas system for: COMPRESOR F3-C-1, ELECTRICAL DRIVER & SPECIAL PURPOSE GEAR UNIT																																											
	5	Supplier: Man Diesel & Turbo SE		Manufacturer: COES																																									
F.M.S.	6	Purchase order No.: 528-4633527 Date _____		Serial No.: L160039																																									
	7	<i>Note: It's referred to the purchase order number issued by supplier to console manufacturer</i>																																											
Check.:	8	Notes: 1. Information to be completed by:																																											
	9	☒ Purchase ☒ Vendor ☒ either, but by vendor if not by purchaser																																											
	10	2. A dot * indicates that the standard API 614 especifics a requirement.																																											
	11	3. Designations in () are applicable portions of the standard API 614; numbers without a prefix are paragraph numbers, those prefixed "T" are text figure numbers; and those prefixed "A" are Appendix "A" figure numbers.																																											
M.A.R.	12																																												
	13																																												
Prep.:	14	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:50%;">Overall system typical schematics</th> <th style="width:15%;">Figure No.</th> <th style="width:15%;">Options Nos.</th> <th style="width:20%;">Comment</th> </tr> </thead> <tbody> <tr> <td>☐ Combined lube, seal and control system</td> <td>N.A.</td> <td>N.A.</td> <td>N.A.</td> </tr> <tr> <td>☐ Separate seal-oil system</td> <td>N.A.</td> <td>N.A.</td> <td>N.A.</td> </tr> <tr> <td>☐ Seal module at equipment</td> <td>N.A.</td> <td>N.A.</td> <td>N.A.</td> </tr> <tr> <td>☒ Lube oil system</td> <td>2-B.10</td> <td>No Options</td> <td>None</td> </tr> <tr> <td>☒ Basic oil supply module</td> <td>2-B.12</td> <td>No Options</td> <td>None</td> </tr> <tr> <td>☒ Lube module at equipment</td> <td>2-B.13</td> <td>No Options</td> <td>None</td> </tr> <tr> <td>☒ Drawing requirements</td> <td></td> <td>☒ Component review</td> <td></td> </tr> </tbody> </table>				Overall system typical schematics	Figure No.	Options Nos.	Comment	☐ Combined lube, seal and control system	N.A.	N.A.	N.A.	☐ Separate seal-oil system	N.A.	N.A.	N.A.	☐ Seal module at equipment	N.A.	N.A.	N.A.	☒ Lube oil system	2-B.10	No Options	None	☒ Basic oil supply module	2-B.12	No Options	None	☒ Lube module at equipment	2-B.13	No Options	None	☒ Drawing requirements		☒ Component review									
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DATE: MAY 2013	16																																												
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REV.: 0	22																																												
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F3C1-5-00-53	24																																												
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ANNEX DESCRIPTION / DRAWING TITLE

**LUBE OIL & SHAFT SEALING SYSTEM
FOR AXIAL COMPRESSOR F3-C-1**

DATA SHEET

CLIENT / PLANT

PETRONOR / MUSKIZ

ANNEX	SPEC..	DRAWING No.	PAGE	REV.
	K	10002064709	8 of 20	0

LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET No. F3C1-5-00-53

C.R. F.M.S. M.A.R. Prep.	1	Oil conditioners:	Desgassing drum:	
	2	☐ Purchaser's item No.	☐ Purchaser's item No.	☐ Service used to
	3	☐ Service used in	☐ Type per Figure 2A-4 or other espec.	☐ Flow control
	4	☐ Type	☐ Operating temp. °C	☐ Thermostat control
	5	☐ Portable or mounted on	☐ Normal/max. flow, m3/h	☐ Material
	6	☐ Rated flow of oil (m ³ /hr)	☐ Normal retention minutes	☐ Interior coating
	7	☐ Manufacturer	☐ Nom/max capacity	☐ Oversized vent
	8	☐ Model	☐ Purge gas type	☐ Vent relief device
	9	☐ Driver for	☐ Nm ³ /h required	☐ Omit breather
	10	☐ Power and enclosure	☐ Type heating device	☐ Code design
	11	☐ Volt./Phases/Hz	☐ Corrosion allowance mm	☐ Code stamp
	12	☐ / /	☐ Desing/test pressure, kg/cm2g	
	13	☐ Water removal rate		
	14	☒ Material of construction		
	15	Reservoir		
16				
17				
18	☒ Purchaser's item No.	☒ Separate lube	☐ Seal combined lube/	☐ Separate seal
19	☒ Figures No.	F3-C-1-D-3		
20	☒ Include options No.	2-B.24		
21	☒ Heater steam/electric	B.24_B,C,D,E & F.		
22	☒ Heater in sealed tube	ELECTRIC		
23	☒ Material	Yes	☐	☐
24	☒ Normal flow 486 LPM	316 St. Stl.		
25	☒ Free surface 5 m ²			
26	☒ Working capacity (minutes / liter)	6 / 2916		
27	☒ Retention time (min)	9		
28	☒ Rundown capacity (at stopped engine), l	1500		
29	☒ Normal operating range	500		
30	☒ Charge capacity, l	7400		
31	☒ Insulation clips	☒	☐	☐
32	☒ Ladder with handrail	☒	☐	☐
33	☒ Handrails on top	☒	☐	☐
34	☒ Non-skid decking	☒	☐	☐
35	☒ Flanged vent	☒	☐	☐
36	☐ Oversized flanged vent	☐	☐	☐
37	☐ Pressure relief device type		☐	☐
38	☒ Siphon breaker	☒	☐	☐
39	☐ Top mounted components permitted:	No	☐	☐
40	☐ Top mounted components are:	N.A.		
41	☐ Submerged components and materials			
42	☒ Dimensions of tank L x W x H (mm)	2500 x 2000 x 1810		
43	Pumps and drivers:	Lube	Lube and seal	Separate seal
44	☒ Service application	Yes	N.A.	N.A.
45	☒ Figure Nos.	B.22	N.A.	N.A.
46	☒ Include option Nos.	A, B & C	N.A.	N.A.
47	☒ Emergency pump system	Yes	☐	☐
48	Pump service	Main/ Standby	Main/ Standby	Main/ Standby
49		Emergency	Emergency	Emergency
50	☒ Pump item No.	F3-C-1-EMP-1A/B		
51	☒ Pump type	Rotary screw		
52	☒ Pump data sheet			
53	☒ Horizontal or vertical (H/V)	H		
54	☒ Driver item No.	F3-C-1-EMP-1A/B		
55	☐ Turbine driver for	N.A.		
56	☐ Turbine data sheet	N.A.		
57	☒ Electric motor for	Both Pumps		
58	☒ Electric motor data sheet			
59	☒ Coupling type	Flexible Disc		
60	☐ Booster pumps required	No		
61	☐ Booster suction protection	No		
62	☐ Solenoid trip valve	No		
63	☒ Rotary pump relief valve by			
64	☐ purchaser/vendor	VENDOR		
65	ANNEX DESCRIPTION / DRAWING TITLE		CLIENT / PLANT	
66	LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1		PETRONOR / MUSKIZ	
67	DATA SHEET			
68	LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET		No. F3C1-5-00-53	

C.R.	1	FILTERS									
	2	Service	☒ Lube oil ☐ Seal oil ☒ Control oil	☒ Separate control oil	☐ Separate seal oil	☐ Booster pump discharge oil	☐ Separate coupling oil				
F.M.S.	5	Purchaser item Nos.	F3-C-1-F-1 A/B								
	6	Twin	Yes ☒								
	7	Second filter for control oil	No ☐								
	8	Include option Nos.									
	9	Filtration level	10 µm (Note 1)								
M.A.R.	10	Manufacturer	COES								
	11	Model	OF600 4 150RF								
Pep.	12	Design/test pressure (barg)	12 / 18								
	13	Code construction/stamp (P.E.D.)	■ / ■								
	14	Material: case and top	St. Stl.								
	15	Cartridges:	2600 R010 ON/PO /-KB								
DATE: MAY 2013	16	Furnish ☐ extra sets of cartridges		☐ Per service		☐ Per filter (extra over other spares)					
	17	COOLERS									
REV.: 0	18	Service	☒ Lube ☐ Lube+seal ☐ Separate oil								
	19	Purchaser item Nos.	F3-C-1-E-5 A/B								
	20	Twin Units	Yes ☒								
	21	Include option Nos.	2A-17b; 2A-17c; 2A-17e								
	22	Water side for steam heating	No ☐								
F3C1-5-00-53	23	Details on data sheet									
	24	Water side corrosion allowance	3,0 mm								
	25	Manufacturer	COES								
	26	Model	CAW 1612-23-4								
	27	TEMA class	"C" - AEW								
	28	Fouling factor water/oil-side	0,00061 °C*m ² /h/kCal								
	29	Duty: KW	312								
	30	Tube: Leng./O.Dia./BWG	3658 / 15,875 / 1,245 mm								
	31	Design/test shell side, (barg)	12 / 18								
	32	Design/test tube side, (kg/cm ² g)	7,0 / 10,5								
DS FILE CODE:	33	Code construction/stamp (P.E.D.)	● / ●								
	34	Tube water vel. and cap. (mps/m ³ /h)	1,5 / 53								
	35	Material: shell	Cb. Stl.								
	36	Channels and covers	Cb. Stl.								
	37	Tube sheets and tubes	Naval Brass / Inhibited Admiralty								
	38	Removable tube bundle	Yes ☒								
	39	U-bend tubes permitted	No ☐								
	40	Oil temperatur control valve	Yes ☒								
	41	CONTINUOUS FLOW TRANSFER VALVES									
	DATA SHEET	42	Service					☒ Lube oil ☐ Seal oil ☒ Control oil	☒ Separate control oil	☐ Separate seal oil	☐ Booster pump discharge oil
43		Common for coolers and filters	No ☐								
44		Tight shutoff required	No ☐								
45		Type	3 Way valve BALL								
46		Manufacturer	ADLER								
47		Model	FA4								
48		With lifting jack	☐								
49		Rating, kg/cm ² g									
50		Material: Body	Cb. Stl.								
51		Plug or ball	St. Stl.								
52	Trim	St. Stl.									
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	53	REMARKS: 1) Beta 10 >= 10 and Beta 15 >= 200									
	54										
	55										
	56										
	57										
	58										
	59										
	60										
	61										
	62										
ENGINEER DIVISION	63										
	64										
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				PAGE	REV.						
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LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET				No. F3C1-5-00-53							

C.R. Approv.: F.M.S. Check: M.A.R. Prep.: DATE: MAY 2013 REV.: 0	1	ACCUMULATORS				
	2	Service	☒ Lube	☐ Control	☐ Seal	☐ Seal booster
	3	● Purchaser's item No.	F3-C-1-D-4			
	4	▼ Required, yes or no, and quantity	Yes, 1			
	5	▽ Service combined with				
	6	▽ Direct contact type	☐	☐	☐	☐
	7	▼ Bladder type	Yes ☒	☐	☐	☐
	8	○ Include option Nos.				
	9	● Rundown (min)	1 sec			
	10	○ Oil temperature control	☐	☐	☐	☐
	11	○ Constant pressure regulator	☐	☐	☐	☐
	12	▼ Manufacturer	HYDAC			
	13	▼ Model	SB40-50A1/342U-12B			
	14	▼ Nominal/ usable capacity (liters)	50			
	15	● Material: shell	316 St. Stl.			
	16	● Material: bladder	NBR			
	17	● Design/test pressure (kg/cm2g)	12/18			
	18	● Code construction/stamp (P.E.D.)	ASME VIII DIV1 / ●	☐	☐	☐
	19	● Include: charge pressure gauge plus	Yes ☒	☐	☐	☐
	20	● Manual charge valve or	Yes ☒	☐	☐	☐
	21	● Gas supply regulator	Yes ☒	☐	☐	☐
F3C1-5-00-53 DS FILE CODE: DATA SHEET TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES ENGINEER DIVISION	22	OVERHEAD TANKS				
	23	Service	☒ Lube	☐ Control	☐ Seal	☐ Seal booster
	24	▼ Required, yes or no	Yes			
	25	▽ Service combined with				
	26	● Direct contact tank	☒	☐	☐	☐
	27	○ Bladder type	☐	☐	☐	☐
	28	● Include option Nos.	2-B.15 A&B			
	29	□ Capacity (minutes)				
	30	□ Capacity (liters)				
	31	● Blowdown connection				
	32	Rundown tanks (Figs. 2-B.15)	Required	---	---	---
	33	Overhead tank-	---	---	---	---
	34	● Corrosion allowance	0 mm			
	35	▼ Material	316 St. Stl.			
	36	▼ Total capacity (liters)	1500			
	37	▼ Design/test pressure (kg/cm2g)	Atmospheric			
	38	○ Code construction/stamp	N.A. / ○	☐	☐	☐
	39	Accumulator unit (Figure 2A-13)	Rundown lube	Low pressure seal	Medium pressure seal	High pressure seal
	40	● Purchaser's item No.	F3-C-1-D-2			
	41	● Corrosion allowance	N.A.			
	42	▼ Manufacture and quantity	COES, 1			
43	▽ Model					
44	▼ Material: shell	316 St. Stl.				
45	▽ Material: bladder	N.A.				
46	■ Nominal/ usable capacity (liters)	1500				
47	▼ Design/test pressure (kg/cm2g)	Atmospheric				
48	TRAPS FOR INNER SEAL OIL: (OIL SEALS)					
49	○ Service					
50	○ Purchaser's item No.					
51	○ Seal-gas vent piping arrangement					
52	○ Float controlled	☐	☐	☐	☐	
53	○ Transmitter controlled	☐	☐	☐	☐	
54	○ Pots only, for manual drain	☐	☐	☐	☐	
55	○ with: valving	☐	☐	☐	☐	
56	○ Flush level glass	☐	☐	☐	☐	
57	○ High level switch	☐	☐	☐	☐	
58	○ Include option Nos.					
59	○ Retention: Time (h) / Capacity (l)					
60	REMARKS:					
61						
62						
63						
64						
ANNEX DESCRIPTION / DRAWING TITLE		CLIENT / PLANT				
LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1		PETRONOR / MUSKIZ				
DATA SHEET		ANNEX	SPEC..	DRAWING No.	PAGE	
		K		10002064709	11 of 20	
LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET		No. F3C1-5-00-53				

C.R.	1	FLOAT TRAP				
	2	Service	Rundown lube	Low pressure seal	Medium pressure seal	High pressure seal
	3					
Approv:	4	▽ Manufacturer/model				
	5	▽ Pressure rating (kg/cm2g)				
F.M.S.	6	▽ Material: body				
	7	▽ Float/trim				
	8	○ Drain line piped to:				
Check:	9	DRAIN POT				
	10	○ Corrosion allowance				
	11	▽ Material				
M.A.R.	12	▽ Design/ test pressure (kg/cm2g)				
	13	○ Code construction/stamp	IO	IO	IO	IO
Prep:	14	MIST ELIMINATOR				
	15	○ Corrosion allowance				
	16	▽ Material: shell				
DATE: MAY 2013	17	▽ Demisting mesh				
	18	▽ Design/ test pressure (kg/cm2g)				
	19	○ Code construction/stamp	IO	IO	IO	IO
REV: 0	20	Shop inspection	Shop test			
	21	● Compliance with inspector's checklist		Required	Witness	
	22	● Required for system assemblies	● Cleanliness	■	■	
	23	● Cleanliness prior to closure	● Four hour run	■	■	
	24	● Required for major components	● Check controls	■	■	
	25	● Material certifications to be furnished	● Changeover filters/coolers	■	■	
	26	○ Special examinations	● One and two pump operation	■	■	
	27	● Code construction/stamp (P.E.D.)	● Sound level	■	■	
	28	● Certified copies of all test logs and data	● Hydro test assembled system	□	□	
	29		● Use for complete unit system test	■	■	
F3C1-5-00-53	30	○	● Certified copies of all test logs and data	■	■	
	31	○	● Emergency Pump operation	■	■	
	32	○				
	33	○				
	34	REMARKS:				
DS FILE CODE:	35					
	36					
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DATA SHEET	45					
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TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	55					
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ENGINEER DIVISION	ANNEX DESCRIPTION / DRAWING TITLE			CLIENT / PLANT		
	LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1			PETRONOR / MUSKIZ		
	DATA SHEET					
ANNEX			SPEC..	DRAWING No.	PAGE	REV.
			K	10002064709	12 of 20	0
LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET					No. F3C1-5-00-53	

C.R.	1	Applicable to:	☒ Proposal	☐ Purchase	☐ As built
	2				
Approv.	3	Final user:	PETRONOR		Site: MUSKIZ (VIZCAYA-SPAIN)
	4	Oil/gas system for:	COMPRESOR F3-C-1, ELECTRICAL DRIVER & SPECIAL PURPOSE GEAR UNIT		
F.M.S.	5	Supplier:	Man Diesel & Turbo SE		Manufacturer: COES
	6	Purchase order No.:	528-4633527	Date	Serial No.: L160039
Check:	7	Note: It's referred to the purchase order number issued by supplier to console manufacturer			
	8	Notes:	1. Information to be completed by:		
M.A.R.	9		☒ Purchase	☒ Vendor	☐ either, but by vendor if not by purchaser
	10		2. A dot * indicates that the standard API 614 specifies a requirement.		
Prep.	11		3. Designations in () are applicable portions of the standard API 614; numbers without a prefix are paragraph numbers, those prefixed "T" are text figure numbers; and those prefixed "A" are Appendix "A" figure numbers.		
	12				
DATE: MAY 2013	13				
	14		☐ Drawing requirements	☐ Component review	
REV.: 0	15	System responsibility: (2.1.2)			
	16		☐ Vendor responsible for system design	☐ Vendor responsible for installation	☐ Vendor responsible for scope of supply
F3C1-5-00-53	17	Supply arrangement:			
	18		☐ Separate modules for	☐ Multiple package for	
DS FILE CODE:	19	Basic system details: (see referenced Figures 4A-1 through 4A-4)			
	20	Dry gas seal type:			
DATA SHEET	21		☐ Double (4A-1)	☐ Tandem with internal laby (4A-2)	☐ Tandem (4A-3)
	22		☐ Single (4A-4)		
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	23	Dry gas seal specifics:			
	24		☐ Seal manufacturer	☐ Seal model no.	
ENGINEER DIVISION	25		☐ Seal gas hazardous (yes/no)	☐ Seal gas composition below or refer to	
	26		☐ Seal gas composition:	Gas	Mole pct.
	27				
	28				
	29	Basic system details:			
	30	MW =			
	31	Gas supply:	☐ Pressure	☐ Temperature	☐ Flow
	32		☐ Description of gas		
	33	☐ Seal gas supply (2.1.11)			
	34	☐ Buffer gas			
	35	☐ Intermediate gas			
	36	Options			
	37	Basics		Outlet modules	
	38	☐ Seal gas filter module (4A-5a, 4A-5b)	☐	☐ Flow monitoring—diff. pressure (4A-8a)	
	39	☐ Separation gas filter module (4A-5c)	☐	☐ Flow monitoring—backpressure (4A-8b)	
	40	☐ Differential pressure control (4A-6a)	☐	☐ Flow measuring (4A-8c)	
	41	☐ Flow control (4A-6b, 4A-6c, 4A-6d)	☐	Separation gas modules	
	42	For option 4A2 (tandem with internal laby)	☐	☐ Option (4A-9a, 4A-9b, 4A-9c)	
	43	☐ Differential pressure control (4A-7a)	☐		
	44	☐ Flow control (4A-7b, 4A-7c)	☐		
	45	☐ Material	☐ Special requirements		
	46	☐ Double blocks and bleeds (2.1.8)	☐ Instrument test valves required		
	47	REMARKS:			
	48	NOTE 1: Labyrinth shaft end seals will be used.			
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ANNEX DESCRIPTION / DRAWING TITLE

**LUBE OIL & SHAFT SEALING SYSTEM
FOR AXIAL COMPRESSOR F3-C-1**

DATA SHEET

CLIENT / PLANT

PETRONOR / MUSKIZ

ANNEX K

SPEC..

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LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET

No. F3C1-5-00-53

C.R.	1	COMPONENTS			
	2	Piping and tubing:			
	3	☐ Tight shutoff		☐ Carbon steel slip-on flanges	
	4	☐ Tubing fittings -Manuf.: _____		☐ Through studs required	
	5	☐ Heat tracing suppl.by _____			
F.M.S.	6	CONTINUOUS FLOW TRANSFER VALVES			
	7	Service application		Gas ☐ No ☐	
	8	☐ Common for coolers and filters		Strainer reg'd (2.4.3)	
	9	☐ Tight shutoff required		☐ With lifting jack	
	10	☐ Type _____		Rating, kg/cm2g _____	
M.A.R.	11	☐ Manufacturer _____		☐ Materials: body _____	
	12	☐ Model _____		☐ Plug or ball _____	
	13	FILTERS:			
	14	Service _____		☐ Design/test pressure (kg/cm2g) _____ / _____	
	15	☐ Purchaser item no. _____		☐ Code construction/stamp (2.1.9) _____ / _____	
DATE: MAY 2013	16	☐ Twin ☐		☐ Material: case and top _____	
	17	☐ Include option nos. _____		☐ Cartridges: _____	
	18	☐ Filtration level _____		☐ Filter body diameter (mm) _____	
	19	☐ Manufacturer _____			
	20	☐ Model _____			
REV: 0	21	Furnish _____ extra sets of cartridges.		☐ Per service ☐ Per filter (extra over other spares).	
	22	COOLERS: (Note 1)			
	23	Service _____		☐ Design/test pressure shell side _____	
	24	☐ Purchaser item nos. _____		☐ Design/test pressure tube side _____	
	25	☐ Twin units ☐		☐ Code construction/stamp _____ ☐ / ☐	
F3C1-5-00-53	26	☐ Include option nos. _____		☐ Tube water velocity (m/s) and capacity (l) _____	
	27	☐ Water side for steam heating		☐ Material: shell _____	
	28	☐ Details on data sheet		☐ Channels and covers _____	
	29	☐ Water side corrosion allowance _____		☐ Tube sheets and tubes _____	
	30	☐ Manufacturer _____		☐ Removable tube bundle ☐	
DS FILE CODE:	31	☐ Model _____		☐ U-bend tubes permitted ☐	
	32	☐ TEMA class _____		☐ Gas temperature control valve ☐	
	33	☐ Fouling factor water/oil side _____ °C*m2*h/kCal			
	34	☐ Duty: kw/h _____			
	35	☐ Tube: L/OD/BWG _____			
DATA SHEET	36	INSPECTION AND TEST			
	37	Shop inspection		Shop test	
	38	☐ Compliance with inspector's checklist			
	39	☐ Required for system assemblies		☐ Cleanliness	
	40	☐ Cleanliness prior to closure		☐ Four hours run	
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	41	☐ Required for major components		☐ Check controls	
	42	☐ Material certifications to be furnished		☐ Changeover filters/coolers	
	43	☐ Special examinations		☐ Main and stand-by pump operation	
	44	☐ Code construction/stamp (P.E.D.)		☐ Sound level	
	45	☐ Certified copies of all test logs and data		☐ Hydro test assembled system	
ENGINEER DIVISION	46	☐ Use for complete unit system test		☐ Certified copies of all test logs and data	
	47	☐ Pipe loads check(4.3.1.4)		☐	
	48	☐ Pipe radiography (2.1.2.2)		☐	
	49	☐		☐	
	50	☐		☐	
51	☐		☐		
52	REMARKS:				
53	NOTE 1: Labyrinth shaft end seals will be used.				
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ANNEX DESCRIPTION / DRAWING TITLE		CLIENT / PLANT			
LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1		PETRONOR / MUSKIZ			
DATA SHEET		ANNEX SPEC.. DRAWING No. PAGE REV.			
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LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET		No. F3C1-5-00-53			

C.R.	1	Applicable to: ☒ Proposal ☐ Purchase ☐ As built																	
	2																		
	3	Final user: PETRONOR Site: MUSKIZ (VIZCAYA-SPAIN)																	
Approv.:	4	Oil/gas system for: COMPRESOR F3-C-1, ELECTRICAL DRIVER & SPECIAL PURPOSE GEAR UNIT																	
	5	Supplier: Man Diesel & Turbo SE Manufacturer: COES																	
F.M.S.	6	Purchase order No.: 528-4633527 Date Serial No.: L160039																	
	7																		
Check:	8	Notes: 1. Information to be completed by:																	
	9	☒ Purchase ☒ Vendor ☐ either, but by vendor if not by purchaser																	
	10	2. A dot * indicates that the standard API 614 especifices a requirement.																	
	11	3. Designations in () are applicable portions of the standard API 614; numbers without a prefix are paragraph numbers, those prefixed "T" are text figure numbers; and those prefixed "A" are Appendix "A" figure numbers.																	
M.A.R.	12																		
	13																		
Prep:	14	Note: For definon of General Purpose basic system, see 1.1.1																	
	15	<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th style="width:45%;">Overall system typical schematics:</th> <th style="width:15%;">Figure No.</th> <th style="width:20%;">Options Nos.</th> <th style="width:20%;">Comment</th> </tr> </thead> <tbody> <tr> <td>☐ Basic oil supply module</td> <td></td> <td></td> <td></td> </tr> <tr> <td>☐ Lube module at equipment</td> <td></td> <td></td> <td></td> </tr> <tr> <td>☐ Documentation requirements</td> <td></td> <td>☐ Components review</td> <td></td> </tr> </tbody> </table>			Overall system typical schematics:	Figure No.	Options Nos.	Comment	☐ Basic oil supply module				☐ Lube module at equipment				☐ Documentation requirements		☐ Components review
Overall system typical schematics:	Figure No.	Options Nos.	Comment																
☐ Basic oil supply module																			
☐ Lube module at equipment																			
☐ Documentation requirements		☐ Components review																	
DATE: MAY 2013	16																		
	17																		
	18																		
	19																		
REV: 0	20	Oil Requirements: See Chapter 1 data sheet (1.2.5, 1.2.7, 1.2.8, 1.2.10, 1.2.11, and 1.2.13)																	
	21	Baseplate/layout:																	
	22	☐ Grout hole/vent holes (1.3.5) ☐ Combined with equipment base (1.4.11.2)																	
	23	☐ Epoxy grout/primer pre-coat (1.3.5) ☐ Point support (1.3.6)																	
F3C1-5-00-53	24	☐ Min. clearance for components (1.2.12) m																	
	25	Basic system details:																	
	26	☐ Equipment coast-down time minutes ☐ Shop test conditions																	
	27	☐ Minimum start-up oil temperature °C ☐ Field start-up/run-in conditions																	
DS FILE CODE:	28	☐ Sound level dB max. (1.2.6) ☐ Welding and special fabrication requirements																	
	29	Components: ☐ All steel external components (1.2.14)																	
	30	Piping and Tubing:																	
	31	☒ Tubing fittings - Manufacturer: ☐ Special requirements, see 																	
DATA SHEET	32	☐ Carbon steel slip-on flanges not allowed (Table 1D) ☐ Utilities manifolded to common connections																	
	33	☐ Through studs required ☐ Air																	
	34	Heat tracing supplied by ☐ Purchaser ☐ Vendor ☐ Cooling water																	
	35	☐ Valve heads vented to reservoir ☐ Instrument test valves required																	
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	36	☐ Radiographic examination (2.1.2.2)																	
	37	Continuous flow transfer valves																	
	38	☐ Separate for coolers and filters ☐ ☒ With lifting jack ☐																	
	39	☐ Tight shutoff required ☐ Rating, barg 																	
ENGINEER DIVISION	40	☐ Type ☒ Materials: body 																	
	41	☒ Manufacturer ☒ Plug or ball 																	
	42	☒ Model ☒ Trim 																	
	43	OIL CONDITIONERS																	
	44	☐ Purchaser's item no. ☐ Driver for 																	
	45	☐ Type ☒ Power and enclosure 																	
	46	☐ Portable or mounted on ☒ Volt. / Phase / Hz																	
	47	☒ Nominal oil flow (m ³ /hr) / / 																	
	48	☒ Manufacturer ☐ Water removal rate 																	
	49	☒ Model ☒ Material of construction 																	
	50	REMARKS:																	
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		ANNEX DESCRIPTION / DRAWING TITLE		CLIENT / PLANT															
LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1		PETRONOR / MUSKIZ																	
DATA SHEET		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:10%;">ANNEX</td> <td style="width:10%;">SPEC..</td> <td style="width:40%;">DRAWING No.</td> <td style="width:20%;">PAGE</td> <td style="width:20%;">REV.</td> </tr> <tr> <td></td> <td style="text-align: center;">K</td> <td style="text-align: center;">10002064709</td> <td style="text-align: center;">15 of 20</td> <td style="text-align: center;">0</td> </tr> </table>		ANNEX	SPEC..	DRAWING No.	PAGE	REV.		K	10002064709	15 of 20	0						
ANNEX	SPEC..	DRAWING No.	PAGE	REV.															
	K	10002064709	15 of 20	0															
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C.R.	1	RESERVOIR (1.4)		PUMPS AND DRIVERS (1.5)	
	2	☐ Figures no.		☐ Purchaser item nos.	
Approv.:	3	☐ Include options no.		☐ Full details on data sheet	
	4	☐ Electric heater (1.4.7.1)		Pump type and material (1.5.1)	
F.M.S.	5	☐ Special heater sizing (1.4.7.1.2)		☐ Supplier standard	
	6	☐ Oil level glass (1.4.5.1.4)		☐ ANSI/ASME B73.1 horizontal	
Check:	7	☐ Low level alarm (1.4.6.2)		☐ ANSI/ASME B73.2 vertical	
	8	☐ Min. 50 mm fill opening (1.4.5.1.6)		☐ Rotary positive displacement	
M.A.R.	9	☐ Sloped bottom (1.4.4.3)		☐ In-line	
	10	☐ Free surface m ²		☐ Submerged	
Prep:	11	☐ Working capacity (minutes / liters)		☐ Steel casing (1.2.14)	
	12	☐ Retention time (minutes)		☐ API 610	
DATE: MAY 2013	13	☐ Rundown capacity (liters)		Pump quantity and driver(s)	
	14	☐ Normal operating range		☐ Single-shaft driven	
REV.: 0	15	☐ Total capacity (liters)		☐ Single-motor driven	
	16	☐ Insulation clips (1.4.8)		☒ Prelube pump motor-driven if main pump is shaft-driven (1.5.4.1)	
F3C1-5-00-53	17	☐ Ladder with handrail (1.4.10.1)		☐ Prelube pump motor driven permitted as auxiliary pump (1.5.4)	
	18	☐ Handrails on top (1.4.10.2)		☐ Dual motor drive	
DS FILE CODE:	19	☐ Non-skid decking (1.4.10.3)		☐ Dual steam turbine main/motor aux. (1.5.4)	
	20	☐ Flanged vent		Pump installation	
DATA SHEET	21	☐ Flanged drain (1.4.4.4)		☐ Removable strainer (1.5.14)	
	22	☐ Extra connection (1.4.9)		☐ Mounting pads (1.5.19.1)	
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	23	☐ Siphon breaker			
	24	☐ Top mounted components permitted			
ENGINEER DIVISION	25	☐ Top mounted components are:			
	26	☐ Submerged components and materials			
		27	☐ Dimensions of tank L x W x H (m)		
		28			
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ANNEX DESCRIPTION / DRAWING TITLE LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1 DATA SHEET	CLIENT / PLANT PETRONOR / MUSKIZ <table style="width:100%; font-size: small;"> <tr> <td>ANNEX</td> <td>SPEC..</td> <td>DRAWING No.</td> <td>PAGE</td> <td>REV.</td> </tr> <tr> <td></td> <td>K</td> <td>10002064709</td> <td>16 of 20</td> <td>0</td> </tr> </table>	ANNEX	SPEC..	DRAWING No.	PAGE	REV.		K	10002064709	16 of 20	0
ANNEX	SPEC..	DRAWING No.	PAGE	REV.							
	K	10002064709	16 of 20	0							

LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET

No. F3C1-5-00-53

C.R. Approv.: F.M.S. Check: M.A.R. Prep:	1	Shop inspection	Shop test		
	2	☐ Compliance with inspector's checklist		Required	Witness
	3	☐ Required for system assemblies	☐ Cleanliness	☐	☐
	4	☐ Cleanliness prior to closure	☐ Four hours running	☐	☐
	5	☐ Required for major components	☐ Check controls	☐	☐
	6	☐ Material certifications to be furnished	☐ Changeover filters/coolers	☐	☐
	7	☐ Special examinations	☐ Main and stand-by pump operation	☐	☐
	8	☐ Code construction/stamp	☐ Sound level	☐	☐
	9	☐ Certified copies of all test logs and data	☐ Hydro test assembled system	☐	☐
	10		☐ Use for complete unit shop test	☐	☐
	11	☐ Check pipe strain (4.3.1.4)	☐ Certified copies of all test logs and data	☐	☐
	12	☐ Pipe radiography (2.1.2.2)			
	13	☐	☐ Sound level recorded during test	☐	☐
	14	☐	☐	☐	☐
	15	☐	☐	☐	☐
	16	☐	☐	☐	☐
DATE: MAY 2013 REV.: 0 F3C1-5-00-53 DS FILE CODE: DATA SHEET	17	REMARKS:			
	18				
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	TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	34			
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ENGINEER DIVISION		51			
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ANNEX DESCRIPTION / DRAWING TITLE			CLIENT / PLANT		
LUBE OIL & SHAFT SEALING SYSTEM FOR AXIAL COMPRESSOR F3-C-1			PETRONOR / MUSKIZ		
DATA SHEET					
ANNEX	SPEC..	DRAWING No.	PAGE	REV.	
	K	10002064709	17 of 20	0	
LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET			No. F3C1-5-00-53		

C.R.	1	Applicable to:	☒ Proposal	☐ Purchase	☐ As built	
	2					
Approv.	3	Final user:	PETRONOR		Site: MUSKIZ (VIZCAYA-SPAIN)	
	4	Oil/gas system for:	COMPRESOR F3-C-1, ELECTRICAL DRIVER & SPECIAL PURPOSE GEAR UNIT			
F.M.S.	5	Supplier:			Manufacturer:	
	6	Purchase order No.:		Date	Serial No.:	
Check:	7					
	8	Notes:	1. Information to be completed by: ☒ Purchase ☒ Vendor ☐ either, but by vendor if not by purchaser			
M.A.R.	9		2. A dot * indicates that the standard API 614 specifies a requirement.			
	10		3. Designations in () are applicable portions of the standard API 614; numbers without a prefix are paragraph numbers, those prefixed "T" are text figure numbers; and those prefixed "A" are Appendix "A" figure numbers.			
Prep.	11					
	12					
DATE: MAY 2013	13					
	14		☐ Drawing requirements ☐ Component review			
REV.: 0	15	System responsibility: (2.1.2)				
	16					
F3C1-5-00-53	17	☐ Vendor responsible for system design	☐ Vendor responsible for installation		☐ Vendor responsible for scope of supply	
	18					
DS FILE CODE:	19	Supply arrangement:				
	20					
DATA SHEET	21	☐ Separate modules for				
	22	☐ Multiple package for				
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	23					
	24	Basic system details: (see referenced Figures 4A-1 through 4A-4)				
ENGINEER DIVISION	25	Dry gas seal type:				
	26					
	27	☐ Double (4A-1)	☐ Tandem with internal laby (4A-2)	☐ Tandem (4A-3)	☐ Single (4A-4)	
	28					
	29	Dry gas seal specifics:				
	30					
	31	☐ Seal manufacturer	☐ Seal model no.			
	32	☐ Seal gas hazardous (yes/no)	☐ Seal gas composition below or refer to			
	33	☐ Seal gas composition:	Gas	Mole pct.		
	34					
	35					
	36					
	37					
	38	Basic system details:				
	39					
	40	MW =				
	41	Gas supply:	☐ Pressure	☐ Temperature	☐ Flow	☐ Description of gas
	42	☐ Seal gas supply (2.1.11)				
	43	☐ Buffer gas				
	44	☐ Intermediate gas				
	45	Options				
	46	Basics				
	47	☐ Seal gas filter module (4A-5a, 4A-5b)				
	48	☐ Separation gas filter module (4A-5c)				
	49	☐ Differential pressure control (4A-6a)				
	50	☐ Flow control (4A-6b, 4A-6c, 4A-6d)				
	51	For option 4A2 (tandem with internal laby)				
	52	☐ Differential pressure control (4A-7a)				
	53	☐ Flow control (4A-7b, 4A-7c)				
	54	☐ Material				
	55	☐ Double blocks and bleeds (2.1.8)				
	56	REMARKS:				
	57	NOTE 1: Labyrinth shaft end seals will be used.				
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ANNEX DESCRIPTION / DRAWING TITLE

**LUBE OIL & SHAFT SEALING SYSTEM
FOR AXIAL COMPRESSOR F3-C-1**

DATA SHEET



CLIENT / PLANT

PETRONOR / MUSKIZ

ANNEX	SPEC..	DRAWING No.	PAGE	REV.
	K	10002064709	18 of 20	0

LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET No. F3C1-5-00-53

C.R.	1	COMPONENTS			
	2	Piping and tubing:			
F.M.S.	3	☐ Tight shutoff		☐ Carbon steel slip-on flanges ☐ Through studs required	
	4	☐ Tubing fittings -Manuf.: 			
M.A.R.	5	☐ Heat tracing suppl.by		☐ Purchaser ☐ Vendor	
	6	CONTINUOUS FLOW TRANSFER VALVES			
Check:	7	Service application		Gas	
	8	☐ Common for coolers and filters		☐	
Prep:	9	☐ Tight shutoff required		☐	
	10	☐ Type			
DATE: MAY 2013	11	☐ Manufacturer			
	12	☐ Model			
REV: 0	13	FILTERS:			
	14	Service			
F3C1-5-00-53	15	☐ Purchaser item no.		☐ Design/test pressure (barg) / 	
	16	☐ Twin		☐ Code construction/stamp (2.1.9) / 	
DS FILE CODE:	17	☐ Include option nos.		☐ Material: case and top 	
	18	☐ Filtration level		☐ Cartridges: 	
DATA SHEET	19	☐ Manufacturer		☐ Filter body diameter (mm) 	
	20	☐ Model			
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	21	Furnish extra sets of cartridges.		☐ Per service ☐ Per filter (extra over other spares).	
	22	COOLERS:			
ENGINEER DIVISION	23	Service		☐ Design/test pressure shell side 	
	24	☐ Purchaser item nos.		☐ Design/test pressure tube side 	
ANNEX	25	☐ Twin units		☐ Code construction/stamp / 	
	26	☐ Include option nos.		☐ Tube water velocity (m/s) and capacity (l) 	
SPEC..	27	☐ Water side for steam heating		☐ Material: shell 	
	28	☐ Details on data sheet		☐ Channels and covers 	
DRAWING No.	29	☐ Water side corrosion allowance		☐ Tube sheets and tubes 	
	30	☐ Manufacturer		☐ Removable tube bundle 	
PAGE	31	☐ Model		☐ U-bend tubes permitted 	
	32	☐ TEMA class		☐ Oil temperature control valve 	
REV.	33	☐ Fouling factor water/oil side			
	34	☐ Duty: kw/h			
K	35	☐ Tube: L/OD/BWG			
	36	INSPECTION AND TEST			
10002064709	37	Shop inspection		Shop test	
	38	☐ Compliance with inspector's checklist			
19 of 20	39	☐ Required for system assemblies		☐ Cleanliness	
	40	☐ Cleanliness prior to closure		☐ Four hours run	
0	41	☐ Required for major components		☐ Check controls	
	42	☐ Material certifications to be furnished		☐ Changeover filters/coolers	
ANNEX	43	☐ Special examinations		☐ Main and stand-by pump operation	
	44	☐ Code construction/stamp		☐ Sound level	
SPEC..	45	☐ Certified copies of all test logs and data		☐ Hydro test assembled system	
	46	☐ Pipe loads check(4.3.1.4)		☐ Use for complete unit system test	
DRAWING No.	47	☐ Pipe radiography (2.1.2.2)		☐ Certified copies of all test logs and data	
	48	☐		☐	
PAGE	49	☐		☐	
	50	☐		☐	
REV.	51	☐		☐	
	52	REMARKS:			
K	53				
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10002064709	55				
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19 of 20	57				
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ANNEX	61				
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SPEC..	63				
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ANNEX DESCRIPTION / DRAWING TITLE

LUBE OIL & SHAFT SEALING SYSTEM
FOR AXIAL COMPRESSOR F3-C-1

DATA SHEET

LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET



CLIENT / PLANT

PETRONOR / MUSKIZ

ANNEX

SPEC..

DRAWING No.

PAGE

REV.

K

10002064709

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0

No. F3C1-5-00-53

C.R.	1	Applicable to:		☐ Proposal	☐ Purchase	☐ As built	Item		
	2						Manuf.		
	3								
Approv.:	4	☐ Gas seal supplier			☐ Equipment manufacturer				
	5								
Check.:	6	Purchase Order No.		Date		Inquiry no.		Requisition No.	
	7								
M.A.R.	8	Gas seal design:							
	9								
Pep.:	10								
	11	Rotational speed		max. rpm		☐ Vent pressure		normal/max	
DATE: MAY 2013	12							/	
	13							barg	
REV.: 0	14	☐ Application		☐ New	☐ Retrofit	Vendor drawing no.			
	15	☒ Rotation viewed from driver end		☐ CW	☐ CCW	☐ Equipment suction pressure (min/max)			
F3C1-5-00-53	16	☐ Maximum sealing pressure:			barg (2.1.6)	☐ Equipment discharge temperature			
	17	☐ Settle out pressure			barg	☐ Process relief valve setting			
DS FILE CODE:	18					Seal maximum design pressure:			
	19					barg			
DATA SHEET	20								
	21	Leakage rates:		Normal operation			Static		
TECHNICAL DEPARTMENT - COMPRESSORS AND MACHINES	22								
	23								
ENGINEER DIVISION	24	Primary vent							
	25	Secondary vent							
	26	Secondary vent for intermediate laby.							
	27								
	28	REMARKS:							
	29	NOTE 1: Labyrinth shaft end seals will be used.							
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		DATA SHEET							
		ANNEX		SPEC..		DRAWING No.		PAGE	REV.
				K		10002064709		20 of 20	0
		LUBRICATION, SHAFT-SEALING AND CONTROL-OIL SYSTEM AND AUXILIARIES DATA SHEET					No. F3C1-5-00-53		

7 DISPOSICION GENERAL GRUPO COMPRESOR



1. PROCESS GAS				
TOP No	E (mm)	N (mm)	U (mm)	Rating
TP1.01	+0	-3850	-8000	N 1500 x 300
TP1.02	+0	+0	+1500	S 1500 x 300
TP1.03	-877	+1855	-1300	D 300 lbs

2. COOLING WATER				
TOP No	E (mm)	N (mm)	U (mm)	Rating
TP2.01	+5015	-8545	-5875	U 3.0" x 150 lbs
TP2.02	+9015	-8545	-5875	U 3.0" x 150 lbs
TP2.03	+2552	+10064	-405	N1.2 4.0" x 150 lbs
TP2.04	+2349	+8973	-601	N1.2 4.0" x 150 lbs

3. DRAIN & CONDENSATE				
TOP No	E (mm)	N (mm)	U (mm)	Rating
TP3.01	+2715	-925	-5211	D 1.0" x 150 lbs
TP3.02	+0	-11161	+5306	D 1.5" x 150 lbs
TP3.03	+2365	-11835	+5406	E 1.0" x 150 lbs

4. LUBE OIL SYSTEM				
TOP No	E (mm)	N (mm)	U (mm)	Rating
TP4.01	+1840	-4845	-500	U 3.0" x 150 lbs
TP4.02	+2808	-1133	-1465	S2 D 3.0" x 150 lbs
TP4.03	+2645	-1291	-1378	S2 D 3.0" x 150 lbs
TP4.04	-2035	-6725	-4008	U 3.0" x 150 lbs
TP4.05	+2313	-410	-1330	S2 S44 95 3.0" x 150 lbs
TP4.06	+4483	-110	-1310	U 3.0" x 150 lbs
TP4.07	+4483	-110	-630	U 3.0" x 150 lbs
TP4.08	+4483	-2710	-8255	D 3.0" x 150 lbs
TP4.09	+4483	-2710	-5871	D 3.0" x 150 lbs
TP4.10	+4483	-2710	-5871	D 3.0" x 150 lbs
TP4.11	+4483	-2710	-5871	D 3.0" x 150 lbs
TP4.12	+4483	-2710	-5871	D 3.0" x 150 lbs
TP4.13	+4483	-2710	-5871	D 3.0" x 150 lbs
TP4.14	+4483	-2710	-5871	D 3.0" x 150 lbs
TP4.15	+4483	-2710	-5871	D 3.0" x 150 lbs
TP4.16	+4483	-2710	-5871	D 3.0" x 150 lbs
TP4.17	+4483	-2710	-5871	D 3.0" x 150 lbs
TP4.18	+4483	-2710	-5871	D 3.0" x 150 lbs

5. INSTRUMENT AIR				
TOP No	E (mm)	N (mm)	U (mm)	Rating
TP5.01	HOLD	HOLD	HOLD	HOLD
TP5.02	HOLD	HOLD	HOLD	HOLD
TP5.03	HOLD	HOLD	HOLD	HOLD
TP5.04	HOLD	HOLD	HOLD	HOLD
TP5.05	HOLD	HOLD	HOLD	HOLD

All Takeover Point from

Oil Unit
Run-down Tank
Filling Group
Sightglass RD
have a tail deviation

The North direction on this drawing corresponds to the North direction on the drawing F3-1-01-01.

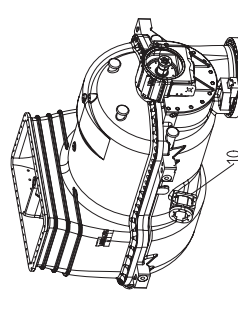
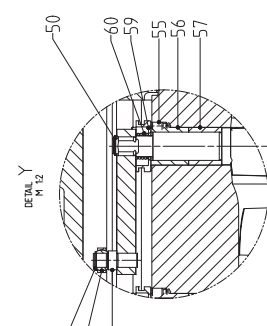
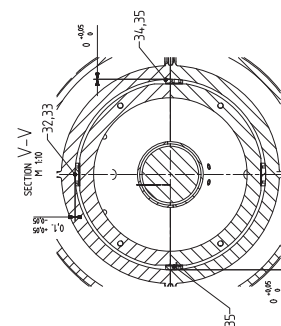
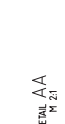
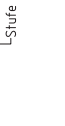
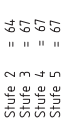
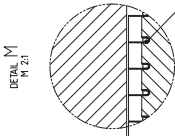
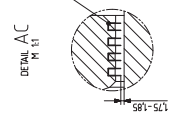
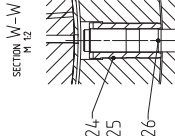
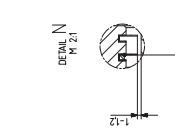
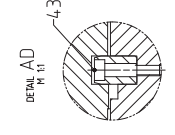
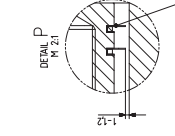
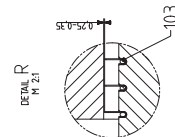
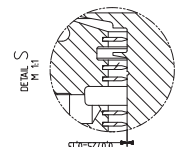
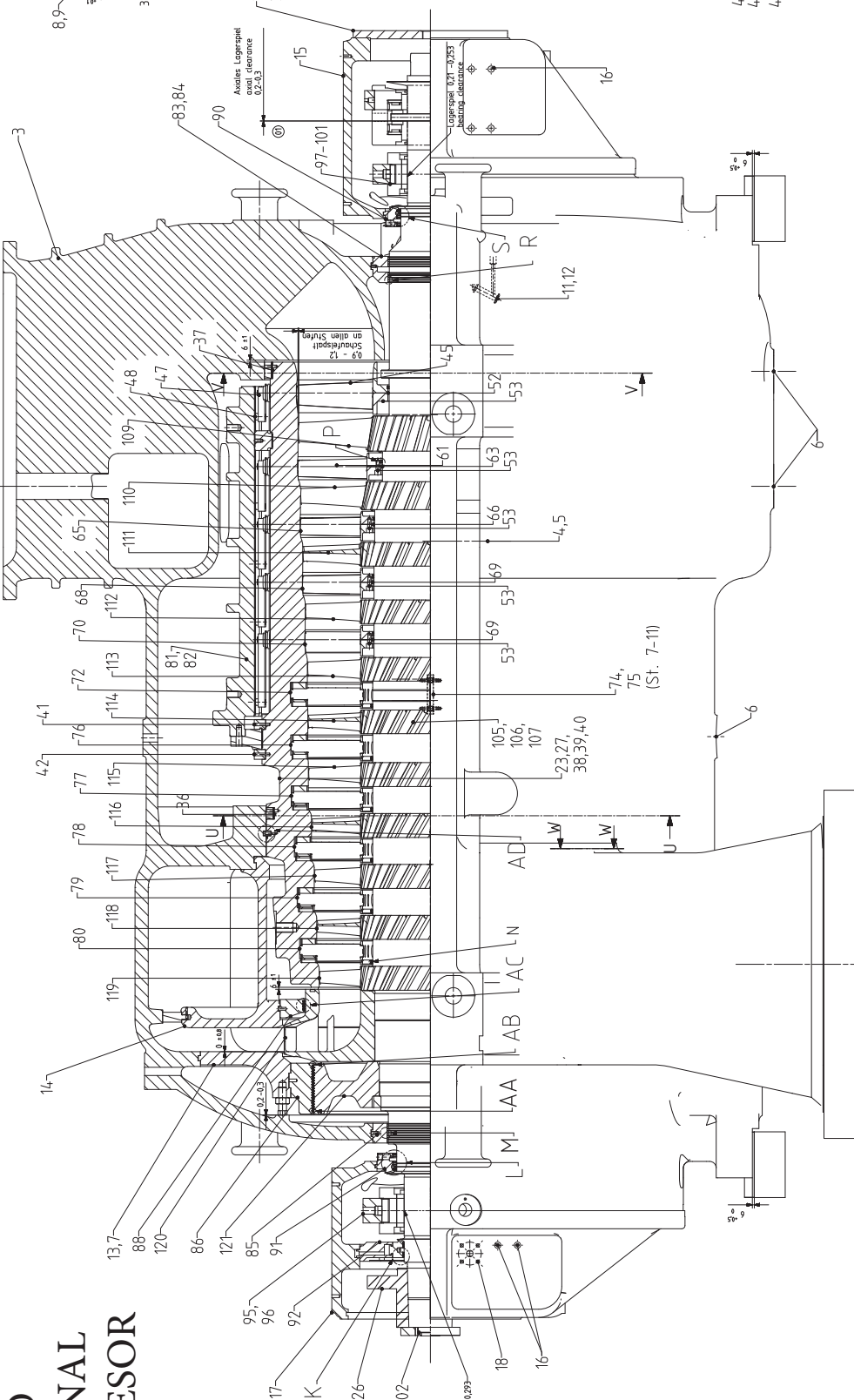
NOISE DATA SHEET AX: 10002070379
Coupling Alignment: 10001980331
Transport DRW Base Frame Shd contains COG: 10002091509
Technical data: 10001950034

ITEM: F3-C-1
REFERENCE JOB CUSTOMER: ADI-1783
PURCHASE ORDER: P-NI783-CECOK-K0001-A-0

GENERAL ARRANGEMENT									
BILBO MAB									
Scale		1:100		1:200		1:500		1:1000	
Author		ADJ		ADJ		ADJ		ADJ	
Checker		ADJ		ADJ		ADJ		ADJ	
Approver		ADJ		ADJ		ADJ		ADJ	
Project No		10001950034							
Revision		1.0							
Drawn By		ADJ							
Checked By		ADJ							
Approved By		ADJ							
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Revision		1.0							
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[illegible]

85-58 (S+1-5)

[illegible]

Hersteller	MAN Diesel & Turbo SE
Boat type	2016
Year built	2016
Machine number	6805
Manufacturer's serial number	6805
Class	AG60/11BZ15
Type and size	AG60/11BZ15

Bei allen Dichtungen beziehen sich die eingeprägten
 Spiele auf den Spalt, bei den Lagern auf die
 Durchmesserdifferenz.

For all clearances the indicated values refer
 to the gap, except in the case of bearings,
 where the values refer to differences in diameter.

Messens und Überwachung :
 total displacement monitoring :
 Alarm : Abschaltung
 trip point
 positive displacement : 0,3 mm 0,3 mm
 negative displacement : 0,4 + 5 mm 0,4 + 5 mm
 S = Lager-
 stepel
 clearance
 Einstellung :
 adjustant :
 Der Laufer ist in positiver Richtung an das Drucklager
 angebracht und dann sind die oben genannten Werte einzustellen.
 Die der rotor adjustant thus bearing in positive direction.

Dichtung auf Teilung UT

001 (FP70) Leitschlauchträger
002 (PTE) Leitschlauch-Spindel und Gehäuse

5'0"-8'0"

CUSTOMER DATA	
Owner:	MAN OBERHAUSEN
Project Name:	BILBOAX
Purchase Order N°:	P-N1783-CEC0-K0-00001-A-O

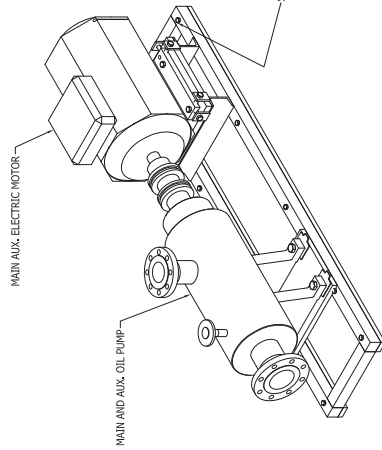
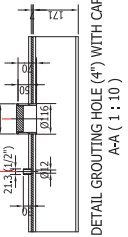
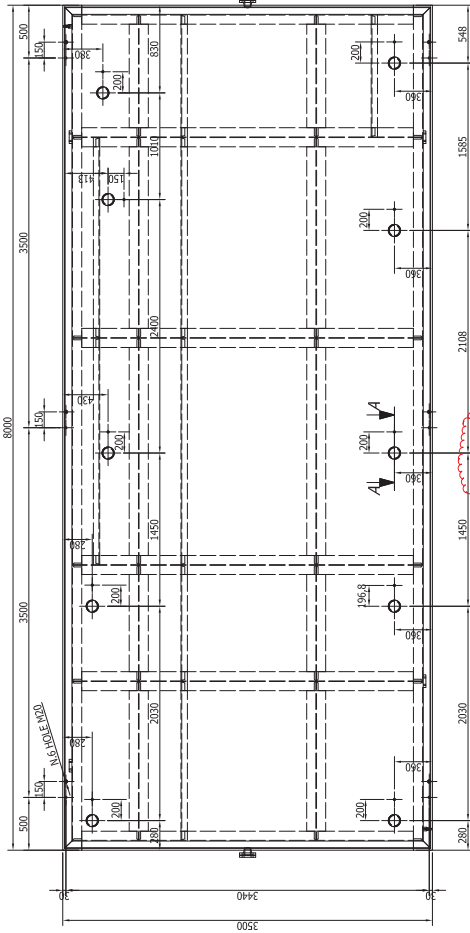
FG DATA	
Sales order:	46047238 - 110
Serail Number:	13527
Gearbox type:	TX71/4C

A	23/06/2016	CREATION	ADDIS	SCHIBY	
Revision	Date	Modification	Written	Checked	Approved
GEARBOX BILLS OF MATERIALS					

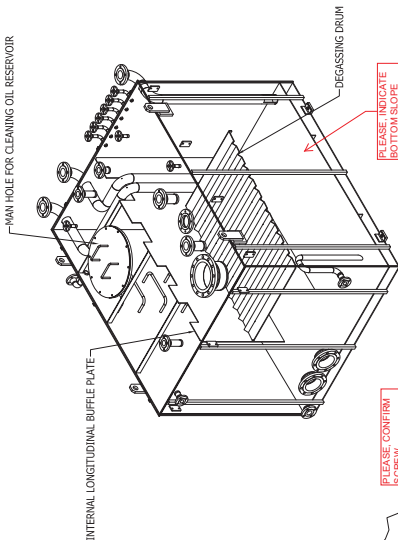
TAG	Nb	COMPOSANT	COMPONENT	DRAWING	REFERENCE	MATERIAL	REV
A100	1	MONTAGE PV	LS ASSEMBLY	A5E36652714A/AC			
A102	1	ARBRE DE ROUE	WHEEL SHAFT	A5E36652728A/AB		42CrMo4	
A104	1	ROUE	WHEEL	A5E36652738A/AA		18CrNiMo7-6	
A115	1	ECROU MAN DW 220 - 260	DW 220 - 260 MAN NUT	A5E37203348A/AA		42CrMo4	
A116	6	VIS CHR	SCREW CHR		M12-040_DIN7984_088_A	CLASS 8.8	
A117	2	GOUPILLE	PIN		ø12X50 DIN 7		
A200	1	MONTAGE GV	HS ASSEMBLY	A5E36652701A/AB			
A201	1	ARBRE-PIGNON	PINION	A5E36652893A/AC		18CrNiMo7-6	
A215	1	ECROU MAN DW 140	DW 140 MAN NUT	A5E37203368A/AA		42CrMo4	
A216	6	VIS CHR	SCREW CHR		M10-035_DIN7984_088_A	CLASS 8.8	
A217	2	GOUPILLE	PIN		ø10X40 DIN 7		
B110	1	PALIER PV11	LS11 BEARING	A5E36652228A/AA			
B111	1	GOUPILLE	PIN		ø6X14 DIN 1472		
B120	1	PALIER PV12	LS12 BEARING	A5E36652228A/AA			
B121	1	GOUPILLE	PIN		ø6X14 DIN 1472		
B150	1	BUTEE PV15	LS TRUST BEARING	A5E36652228A/AA			
B151	1	GOUPILLE	PIN		ø6X14 DIN 1472		
B210	1	PALIER REGALBLE GV21	HS21 BEARING	A5E36652228A/AA			
B211	1	GOUPILLE	PIN		ø6X14 DIN 1472		
B220	1	PALIER GV22	HS22 BEARING	A5E36652228A/AA			
B221	1	GOUPILLE	PIN		ø6X14 DIN 1472		
D050	1	CHASSIS BOIS	WOOD CHASSIS				
D100	1	CARTER	CASING	A5E37156498A/AF		E24-4	
D101	16	VIS H	SCREW H		M20-070_ISO4017_088_A	CLASS 8.8	
D102	16	RONDELLE DE 20	WASHER FROM 20		DIN125_A	CARBON STEEL	
D109	4	VIS H	SCREW H		M24-040_ISO4017_088_A	CLASS 8.8	
D110	8	TIGE FILETEE	STUDBOLT		M36-0380_109_A	CLASS 10.9	
D111	8	RONDELLE PALIER 36	WASHER 36	03I829/36		CARBON STEEL	
D112	8	ECROU STOVER	LOCK NUT		M36_DIN980_10_A	CLASS 10.9	
D120	4	GOUPILLE CONIQUE	TAPER PIN		ø16X100 DIN 7977		
D121	4	RONDELLE DE 16	WASHER FROM 16		DIN125_A	CARBON STEEL	
D122	4	ECROU H	NUT H		M16 DIN934_08_A	CLASS 8.8	
D130	2	VIS CHC	SCREW CHC		M16-130_DIN912_088_A	CLASS 8.8	
D131	6	VIS CHC	SCREW CHC		M16-050_DIN912_088_A	CLASS 8.8	
D132	2	VIS CHC	SCREW CHC		M16-110_DIN912_088_A	CLASS 8.8	
D133	6	VIS CHC	SCREW CHC		M16-050_DIN912_088_A	CLASS 8.8	
D401	8	VIS H	SCREW H		M08-016_ISO4017_088_A	CLASS 8.8	
D402	8	RONDELLE DE 8	WASHER FROM 8		DIN463_A	CARBON STEEL	
D501	8	VIS H	SCREW H		M12-030_ISO4017_088_A	CLASS 8.8	
D502	8	RONDELLE DE 12	WASHER FROM 12		DIN125_A	CARBON STEEL	
D511	6	VIS H	SCREW H		M10-030_ISO4017_088_A	CLASS 8.8	
D512	6	RONDELLE DE 10	WASHER FROM 10		DIN125_A	CARBON STEEL	
D550	1	BRIDE PLEINE	BLIND FLANGE		150LBS_3"	SS 316L	
D551	1	JOINT	GASKET		PN20 DN80-3"		
D552	4	VIS H	SCREW H		M16-040_ISO4017_088_A	CLASS 8.8	
D553	4	RONDELLE DE 16	WASHER FROM 16		DIN125_A	CARBON STEEL	
D560	1	BRIDE SLIPON	SLIPON FLANGE		150LBS_8"	SS 316L	
D561	1	JOINT	GASKET		PN20 DN200-8"		
D562	8	VIS H	SCREW H		M20-050_ISO4017_088_A	CLASS 8.8	
D563	8	RONDELLE DE 20	WASHER FROM 20		DIN125_A	CARBON STEEL	
D580	1	BRIDE PLEINE	BLIND FLANGE		150LBS_1"1/2"	SS 316L	
D600	1	RENIFLARD	AIR BREATHER		1"1/4 EPE REF : BF32R	SS	
D602	1	JOINT	GASKET		PN20 DN40-1 1/2"		
D603	4	VIS H	SCREW H		M12-030_ISO4017_088_A	CLASS 8.8	
D604	4	RONDELLE DE 12	WASHER FROM 12		DIN125_A	CARBON STEEL	
D650	1	BRIDE PLEINE	BLIND FLANGE		150LBS_2"	SS 316L	
D651	1	JOINT	GASKET		PN20 DN50-2"		
D652	4	VIS H	SCREW H		M16-030_ISO4017_070	SS 316L	
D653	4	RONDELLE DE 16	WASHER FROM 16		DIN125_A	SS 316L	
D700	4	GUIDE MAN	MAN GUIDE	A5E37408274A/AA		E24-2	
D701	8	PLAQUETTE MAN	MAN PLATE	A5E37408295A/AA		E24-2	
D702	8	CALE MAN	MAN SHIM	A5E37408282A/AA		CARBON STEEL	
D703	4	VIS H	SCREW H		M16-050_ISO4017_088_A	CLASS 8.8	
D704	4	RONDELLE DE 16	WASHER FROM 16		DIN127_A	CARBON STEEL	
D705	16	VIS CHC	SCREW CHC		M06-030_DIN912_088_A	CLASS 8.8	
D710	2	PLAQUE DE FIRME	FIRM PLATE	03AH331/A			
D711	12	CLOU CANNELE	GROOVED SCREW		ø2X6 DIN1476 (INOX)		
D750	2	INDICATEUR DIRECT.A	INDICATOR				
D751	4	CLOU CANNELE	GROOVED SCREW		ø2X6 DIN1476 (INOX)		
D760	1	PLAQUETTE ATEX	ATEX PLATE	03AJ366/C		ATEX II3G CIAT3	
D761	4	CLOU CANNELE	GROOVED SCREW		ø2X6 DIN1476 (INOX)		
D780	2	MISE A LA TERRE	EARTHING	03AR292/A	M10		
D800	4	PROTECTION NIVEAU	LEVEL COVER	03AG311/B			
D801	4	VIS H	SCREW H		M08-020_ISO4017_088_A	CLASS 8.8	
D810	1	BOUCHON	PLUG		3/4" NPT 6 PANS CREUX INOX A4	SS 316L	
D850	4	TIGE FILETEE	STUDBOLT		M16-0150_109_A	CLASS 10.9	
D851	4	RONDELLE PALIER 16	WASHER16	03I829/16		CARBON STEEL	
D852	4	ECROU STOVER	LOCK NUT		M16_DIN980_10_A	CLASS 10.9	
D853	2	GOUPILLE CONIQUE	TAPER PIN		ø12X50 DIN 7978		
D855	1	DISQUE DE POSITION	THRUST BEARING COLLAR	03AL394/A			
D856	1	GOUPILLE	PIN		ø6X16 DIN 1472		
D860	1	CAGE A BUTEE	THRUST BEARING CAGE	03AM460/A			
D861	8	VIS H	SCREW H		M05-020_ISO4017_088_A	CLASS 8.8	
D862	8	RONDELLE DE 5	WASHER FROM 5		DIN463_A	CARBON STEEL	
D870	1	CAGE A BUTEE	THRUST BEARING CAGE	03AM460/A			
D871	8	VIS H	SCREW H		M05-020_ISO4017_088_A	CLASS 8.8	
D872	8	RONDELLE DE 5	WASHER FROM 5		DIN463_A	CARBON STEEL	
F121	1	VIS H	SCREW H		M16-035_ISO4017_088_A	CLASS 8.8	
F122	1	RONDELLE DE 16	WASHER FROM 16		DIN125_A	CARBON STEEL	
H100	1	JOINT	GASKET		PN16 DN40-1 1/2"		
H101	4	VIS H	SCREW H		M16-030_ISO4017_07	SS 316L	
H102	4	RONDELLE DE 16	WASHER FROM 16		DIN463_A	SS 316L	
H103	2	VIS H	SCREW H		M08-020_ISO4017_088_A	CLASS 8.8	
H105	4	BUSE	SPRAY NOZZLE		HB 1/2" U SS 80°/80 (INOX)	SS	
K110	1	GARNITURE PV	LS LABYRINTH SEAL	A5E37397285A/AA		AU4G	
K111	1	VIS CHC	SCREW CHC		M05-020_DIN912_109_A	CLASS 10.9	
K115	1	DEFLECTEUR PV	LS DEFLECTOR	A5E37398549A/AA			
K116	8	VIS H	SCREW H		M05-016_ISO4017_070	SS 316L	
K117	8	RONDELLE DE 5	WASHER FROM 5		DIN125_A	SS 316L	
K210	1	GARNITURE GV	HS LABYRINTH SEAL	03AM302/A		AU4G	

TAG	Nb	COMPOSANT	COMPONENT	DRAWING	REFERENCE	MATERIAL	REV
K211	1	VIS CHC	SCREW CHC		M05-020_DIN912_088_A	CLASS 8.8	
K215	1	DEFLECTEUR GV	HS DEFLECTOR	A5E37398613A/AA			
K216	8	VIS H	SCREW H		M05-016_ISO4017_070	SS 316L	
K217	8	RONDELLE DE 005	WASHER FROM 005		DIN12	SS 316L	
L111	2	SONDE	RTD		PT100_EMERSON_2X3FILS		
L112	1	SUPPORT DE CAPTEUR	PROBE HOLDER	03AK964/A	LG:180	SS	
L113	1	SUPPORT DE CAPTEUR	PROBE HOLDER	03AK964/A	LG:180	SS	
L121	2	SONDE	RTD		PT100_EMERSON_2X3FILS		
L122	1	SUPPORT DE CAPTEUR	PROBE HOLDER	03AK964/A	LG:180	SS	
L123	1	SUPPORT DE CAPTEUR	PROBE HOLDER	03AK964/A	LG:180	SS	
L151	2	SONDE	RTD		PT100_EMERSON_2X3FILS		
L161	2	SONDE	RTD		PT100_EMERSON_2X3FILS		
L170	2	SUPPORT DE CAPTEUR	PROBE HOLDER	03AK964/A	LG:140	SS	
L175	12	TETE DE RACCORD.	CONNEXION HEAD	08T267/C	FLENDER GRAFFENSTADEN	SS	
L176	12	RONDELLE DE 16	WASHER FROM 16		DIN433	SS 316L	
L177	12	ECROU H	NUT H		M16x1.5_DIN439_70_I4A	SS 316L	
L179	12	PROXIMITOR	PROXIMITOR		BN 3300		
L180	1	SUPPORT DE CAPTEUR	PROBE HOLDER	03AK964/A	LG:180	SS	
L195	1	ACCELEROMETRE	ACCELEROMETER		BN 330400		
L196	1	CABLE D'EXTENSION	EXTENSION CABLE				
L197	1	TETE ACCELEROMETRE	ACCELEROMETER HOUSING	08T272/C	FLENDER GRAFFENSTADEN	SS	
L213	2	SONDE	RTD		PT100_EMERSON_2X3FILS		
L214	1	SUPPORT DE CAPTEUR	PROBE HOLDER	03AK964/A	LG:260	SS	
L217	1	SUPPORT DE CAPTEUR	PROBE HOLDER	03AK964/A	LG:260	SS	
L223	2	SONDE	RTD		PT100_EMERSON_2X3FILS		
L224	1	SUPPORT DE CAPTEUR	PROBE HOLDER	03AK964/A	LG:280	SS	
L227	1	SUPPORT DE CAPTEUR	PROBE HOLDER	03AK964/A	LG:200	SS	
L280	1	BOUCHON	PLUG		3/4" NPT 6 PANS CREUX	SS 316L	
L290	1	SUPPORT DE CAPTEUR	PROBE HOLDER	03AK964/A	LG:220	SS	
L300	1	BOUCHON	PLUG		3/4" NPT 6 PANS CREUX	SS 316L	
L400	1	COFFRET TEMPERATURE	TEMP. JUNCTION BOX		BN 3300		
L403	1	RAIL	RAIL		TS 35X7.5 LG 2 M		
L404	1	BUTEE D'ARRET	STOP TERMINAL		EW 35		
L405	1	BORNE	TERMINAL		WEIDMULLER WDU2.5 BLEUE		
L406	1	FLASQUE D'EXTENSION	START TERMINAL		WAP 2,5 BLEU		
L407	1	REPERE BORNES 1-50	TERMINAL TAG 1-50				
L407	1	REPERE BORNES 51-100	TERMINAL TAG 51-100				
L407	1	REPERE BORNES 101-150	TERMINAL TAG 101-150				
L408	1	GOULOTTE	CABLE DUCT				
L408	1	GOULOTTE	CABLE DUCT				
L409	1	RIVETS GOULOTTE	RIVETS FOR CABLE DUCT				
L411	1	ADAPTATEUR	ADAPTER		M-M63/F-2"NPT_ATEX_INOX	SS	
L412	1	ECROU	NUT		ISO_M63x1.5_ATEX_INOX	SS	
L413	1	JOINT	GASKET		NYLON_M63		
L420	1	SUPPORT COFFRET	JUNCTION BOX HOLDER	A5E37556641A/AA			
L421	4	VIS CHC	SCREW CHC		M10-180_DIN912_088_A	CLASS 8.8	
L440	1	SUPPORT COFFRET	JUNCTION BOX HOLDER	A5E37556661A/AA			
L441	4	VIS H	SCREW H		M16-110_ISO4017_088_A	CLASS 8.8	
L450	1	COFFRET VIBRATION	VIB. JUNCTION BOX		STAHL_8150/5		
L451	1	COFFRET VIBRATION	VIB. JUNCTION BOX		STAHL_8150/5		
L461	2	ADAPTATEUR	ADAPTER		M-M63/F-2"NPT_ATEX_INOX	SS	
L462	2	ECROU	NUT		ISO_M63x1.5_ATEX_INOX	SS	
L463	2	JOINT	GASKET		NYLON_M63		
L480	13	PROXIMITOR	PROXIMITOR		BN 3300		
L481	13	CABLE D'EXTENSION	EXTENSION CABLE		BN 3300		
L483	1	RAIL DE TERRE	EARTHING RAIL				
L484	1	FIXATION RAIL DE TERRE	EARTHING RAIL MOUNTING				
L485	1	GAINÉ THERMORETRACTABLE	HEAT-SHRINKABLE SHEATH		BLEUE DIA:25.4mm		
L486	1	CONNEXION POUR BORNE	TERMINAL CONNEXION				
L960	6	PRESSE ETOUPE	CABLE GLAND		ATEX_ADL1F 1/2 NPT LN		
L982	6	RONDELLE	WASHER		DIN 6798J Int 21,3mm		
L984	6	BOUCHON	PLUG		1/2"NPT INOX ATEX	SS	
L985	6	RACCORD GAINÉ	SHEATH CONNECTION		1/2 NPT D LN		
L986	6	RACCORD GAINÉ	SHEATH CONNECTION		1/2 NPT 45° LN		
L987	6	RACCORD GAINÉ	SHEATH CONNECTION		1/2 NPT 90° LN		
L988	6	ECROU	NUT		1/2"NPT L.N. ATEX		
L989	6	JOINT	GASKET		COFFRET NYLON 1/2NPT		
L990	6	GAINÉ	FLEXIBLE CONDUIT		ANACCONDA 1/2 HTDL 330.016.2		
N100	1	VIREUR	TURNING GEAR		FLENDER (KAF148K4)		
N101	8	VIS H	SCREW H		M16-040_ISO4017_088_A	CLASS 8.8	
N102	8	RONDELLE DE 16	WASHER FROM 16		DIN125_A	CARBON STEEL	
N130	1	MOTEUR	MOTOR				
N131	4	VIS H	SCREW H		M12-030_ISO4017_088_A	CLASS 8.8	
N132	1	RONDELLE DE 12	WASHER FROM 12		DIN125_A	CARBON STEEL	
N135	1	VIS CBL	SCREW CBL		M05-010_DIN85_088_A	CLASS 8.8	
N140	1	PLAQUE DE CONTACT	CONTACT PLATE		1"1/2x100_lg170x40		
N141	2	VIS H	SCREW H		M06-016_ISO4017_088_A	CLASS 8.8	
N142	2	RONDELLE DE 6	WASHER FROM 6		DIN125_A	CARBON STEEL	
N144	1	CONTACT TELEMECANIQUE	LIMIT SWITCH				
N145	2	VIS H	SCREW H		M05-008_ISO4017_088_A	CLASS 8.8	
N146	2	RONDELLE DE 5	WASHER FROM 5		DIN125_A	CARBON STEEL	
N150	1	VOLANT	HAND STEERING WHEEL		D315-28/8		
N160	1	CLUTCH	CLUTCH		36T RH_SM17007 (161-173)_STD		
N161	16	VIS	SCREW	03AC472/A	HAA M8		
N162	16	ECROU STOVER	LOCK NUT		M08_DIN980_10_A	CLASS 10.9	
N163	1	AXE MOTOX	TURNING GEAR ROTOR	03AJ949/C	KAF 148/36T_STD		
N164	1	CLAVETTE	KEY	03AH969/A			
N170	1	JOINT	GASKET		DEUB.1102-070-103RH		
N171	1	BRIDE	FLANGE	03AH854/A	KAF 148 STD		
N172	4	VIS CHC	SCREW CHC		M08-020_DIN912_088_A	CLASS 8.8	
N180	1	CAPOT DE PROTECTION	PROTECTION DECK	03AH852/A	KAF 148 STD		
N181	8	VIS H	SCREW H		M20-060_ISO4017_088_A	CLASS 8.8	
N182	8	RONDELLE DE 20	WASHER FROM 20		DIN125_A	CARBON STEEL	
N185	1	FLEXIBLE	OIL FLEXIBLE				
N186	1	RAC UNION MALE	MALE UNION FITTING		UMAG13-1/4BGSN		
N187	1	PONTET	BRIDGE		DIA:19 INOX	SS	
N188	1	VIS CHC	SCREW CHC		M06-012_DIN912_088_A	CLASS 8.8	
S101	1	JOINT	GASKET		PN20 DN80-3"		
S102	4	VIS H	SCREW H		M16-040_ISO4017_070	SS 316L	
S103	4	RONDELLE DE 16	WASHER FROM 16		DIN125_A	SS 316L	

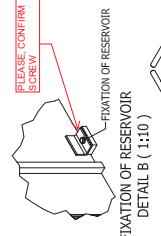
TAG	Nb	COMPOSANT	COMPONENT	DRAWING	REFERENCE	MATERIAL	REV
S110	1	JOINT	GASKET		PN20 DN80-3"		
S111	4	VIS H	SCREW H		M16-040_ISO4017_070	SS 316L	
S112	4	RONDELLE DE 16	WASHER FROM 16		DIN125_A	SS 316L	
S150	2	VIS H	SCREW H		M12-040_ISO4017_070	SS 316L	
S151	2	RONDELLE DE 12	WASHER FROM 12		DIN125_A	SS 316L	
S200	1	DIAPHRAGME	DIAPHRAGM	02R518/A	3" 2 MANO		
S210	1	BRIDE SLIPON	SLIPON FLANGE		150LBS_3"	SS 316L	
S211	1	JOINT	GASKET		PN20 DN80-3"		
S212	4	VIS H	SCREW H		M16-040_ISO4017_088_A	CLASS 8.8	
S213	4	RONDELLE DE 16	WASHER FROM 16		DIN125_A	CARBON STEEL	
T100	1	FAUX MOYEU PV	LS DUMMY	A5E37690351A/AA			
T200	1	FAUX MOYEU GV	HS DUMMY	A5E37545587A/AB			
T201	1	DISQUE FAUX MOYEU GV	HS DUMMY DISC	A5E37545591A/AA			
T202	6	VIS CHC	SCREW CHC		M08-020_DIN912_088_A	CLASS 8.8	



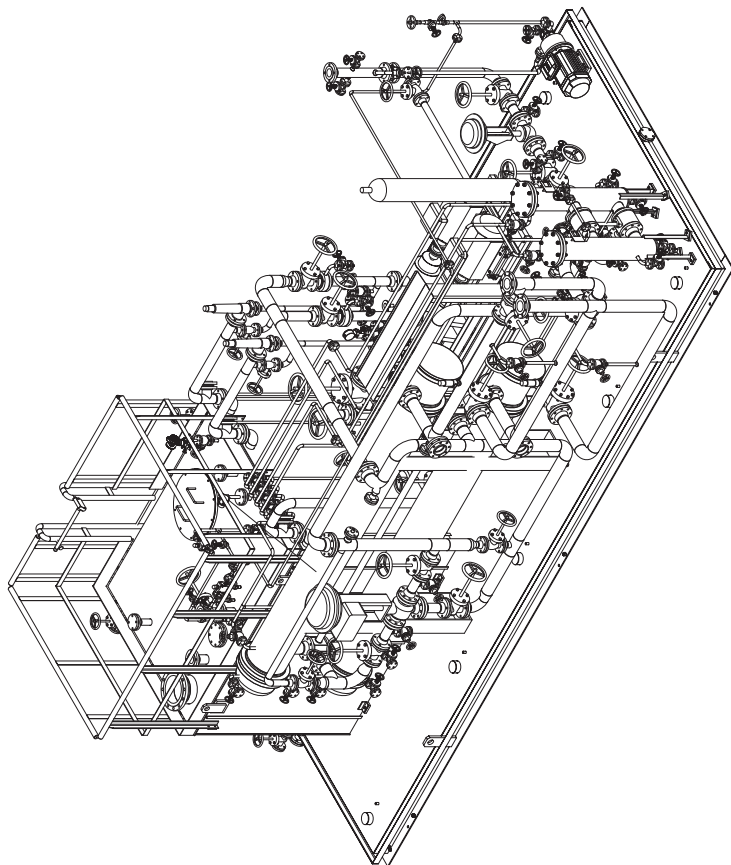
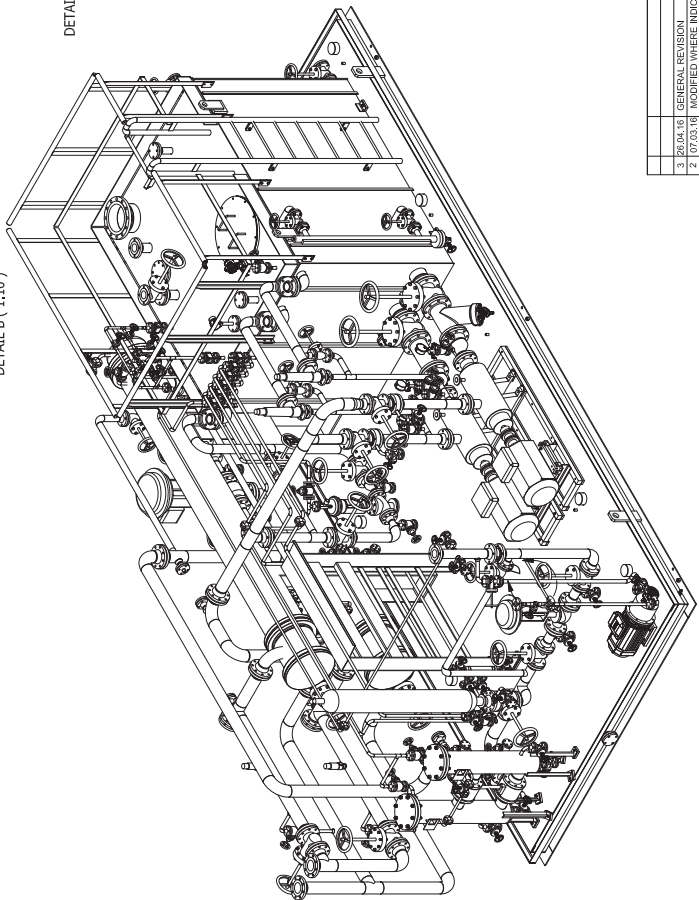
DETAIL FIXING MAIN AN AUX. OIL PUMP (1 : 10)



DETAIL INTERNAL OIL RESERVOIR (1 : 25)



DETAIL FILTER ON FILLING CONNECTION (1 : 10)



3	22.04.18	GENERAL REVISION	M. CHAPPA
2	17.05.18	INDICATED WHERE INDICATED	M. PIERINI M. CHAPPA
1	15.12.17	FOR APPROVAL	M. PIERINI M. CHAPPA
0	15.12.17	FOR APPROVAL	M. PIERINI M. CHAPPA
REV.	DATE	DESCRIPTION	APPROVED
JOB N°	596/15	SCALE	1:25
SERIAL N°		SIZE	A1
OUTLINE DRAWING FOR OIL CONSOLE WITH CONNECTION LIST			
CGA22557			
SHEET	2	OF	2
Original	Revised	Design	Change
Date	Date	Date	Date
Checked	Checked	Checked	Checked
Date	Date	Date	Date
Change No.	Change No.	Change No.	Change No.
Original Scale	Original Scale	Original Scale	Original Scale
Scale A1	Scale A1	Scale A1	Scale A1
Similar Drawing	Similar Drawing	Similar Drawing	Similar Drawing
Scale	Scale	Scale	Scale
Doc. Type	Doc. Type	Doc. Type	Doc. Type
Document No.	Document No.	Document No.	Document No.
DRW	10002064710	001	03
2	2	2	2



COMMENTS

LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

12. DIAGRAMAS LOGICOS

SIZE A3 L

Revision	0	1	2	3	4	5
Nature	1st issue					
Date	10.05.2016					
Drawn	von Kiedrowski					
Checked	von Kiedrowski					
Dept. ETEIO	MAN Project					
H.0200062.02 BILBAO / BILBOAX						
		Title		Doc.-No.		
LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS				10001956754		

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LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

11.05.2016

SHEET 6

MODULE	MOS - TRIP MAINTENANCE OVERRIDE SWITCH MODULE
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99	99
100	100

MOS FUNCTION
IF - MOS KEYSWITCH IS SELECTED ON - AND - MOS IS SELECTED VIA HMI PB ON - AND - NO OTHER MOS MODULE IS ACTIVE (ALL MOS LED OFF) THEN - MOS MODULE IS SET (=ON) - TRIP SIGNAL IS BLOCKED - MOS STATE INDICATION (=LCP FRONT LED ON) - TRIP ALARM WITHOUT MOTOR SHUT-OFF IS ALWAYS ACTIVE - START OF 8 HOURS MOS RESET COUNT DOWN
IF - MOS STATE INDICATION = 1 (LCP FRONT LED ON) - AND - MOS LCP FRONT KEY SWITCH IS OFF LONGER THAN 3 SECONDS - OR - MOS HMI PB OFF IS TOUCHED LONGER THAN 3 SECONDS THEN - MOS MODULE IS RESET (=OFF) - TRIP SIGNAL IS NOT BLOCKED - MOS STATE INDICATION = 0 (LCP FRONT LED OFF)
IF - MOS STATE INDICATION = 1 (LCP FRONT LED ON) - AND - MOS LCP FRONT KEY SWITCH IS OFF SHORTER THAN 3 SECONDS - OR - MOS HMI PB ON IS TOUCHED THEN - MOS STATE REMAINS ON WITHOUT INTERRUPT - TRIP IS ALWAYS BLOCKED - NEW RE-START OF 8 HOURS MOS RESET COUNT DOWN
IF - COMMON TRIP IS ACTIVE THEN - ALL MOS MODULES ARE LOCKED OFF AND RESETED

1

Proj.

BILBAO / BILBOAX

Main Air Blower FCC

2

No.

H.0200062.02

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Doc.

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Rev. 0

10.05.2016

4

Sheet

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von Kiedrowski -ETEIO-

SIZE A3 L

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LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

11.05.2016

SHEET 7

TRIP 1

HMI

LED

1=TRIP

TRIP 2

HMI

LED

TRIP 3

HMI

LED

MOS KEY SWITCH 4

HMI

LED

RELEASE 5

HMI

LED

1=REL

RESET 6

HMI

OFF

1=TRIP

COMMON TRIP

TRIP 2003 / 3003 SELECTOR

1

2

3

AND OR

& ≥1

1+2

AND

&

2+3

AND

&

1+3

AND

&

1+2+3

1=MOS ON

LED 8

STATE

1=TRIP

TIMER 1 TIME VALUE

9

TRIP 2003 / 3003 SELECTOR

TYPICAL

FAULT OR TRIP 1

FAULT OR TRIP 2

FAULT OR TRIP 3

MOS SWITCH

RELEASE

RESET

AUTO-OFF

TIMER

AUTO OFF

AFTER 8 h

2003

3003

AND

OR

&

≥1

AND

&

TRIP 2003

TRIP 1

TRIP 2

TRIP 3

MOS

REL

RESET

TRIP 2003

TRIP=1

MOS

TRIP

2003 / 3003

SELECTOR

MOS FUNCTION

IF

MOS LCP FRONT KEY SWITCH IS ON AND RELEASE = 1

THEN

- TRIP SELECTION IN 3003

- MOS STATE INDICATION = 1 (LCP FRONT LED ON)

IF

MOS LCP FRONT KEY SWITCH IS OFF LONGER THAN 3 SECONDS

THEN AFTER 3 SECONDS

- TRIP SELECTION IN 2003

- MOS STATE INDICATION = 0 (LCP FRONT LED OFF)

IF

MOS LCP FRONT KEY SWITCH IS OFF SHORTER THAN 3 SECONDS

THEN

- TRIP SELECTION IN 3003

- MOS STATE INDICATION = 1 (LCP FRONT LED ON)

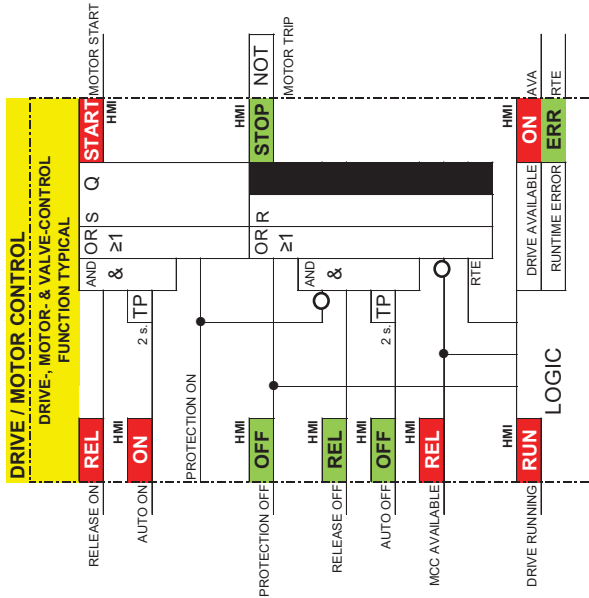
- NEW RE-START OF 8 HOURS MOS RESET COUNT DOWN

MAN Diesel & Turbo AG, 42699 Solingen, Germany

8 / 60

LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

MODULE DRIVE CONTROL



DRIVE CONTROL MODULE

THE DRIVE MAY BE STARTED IF:

- RELEASE ON = HIGH
- AND
- PROTECTION OFF = LOW

THE DRIVE WILL BE STOPPED IF:

- AUTO ON = HIGH (RISING EDGE)

THE DRIVE WILL BE FORCED ON IF:

- PROTECTION ON = HIGH
- AND
- PROTECTION OFF = LOW

THE DRIVE WILL BE FORCED OFF IF:

- PROTECTION OFF = HIGH
- OR
- RUNTIME ERROR = LOW

THE DRIVE WILL BE OFF-INTERLOCKED IF:

- MCC NOT AVAILABLE

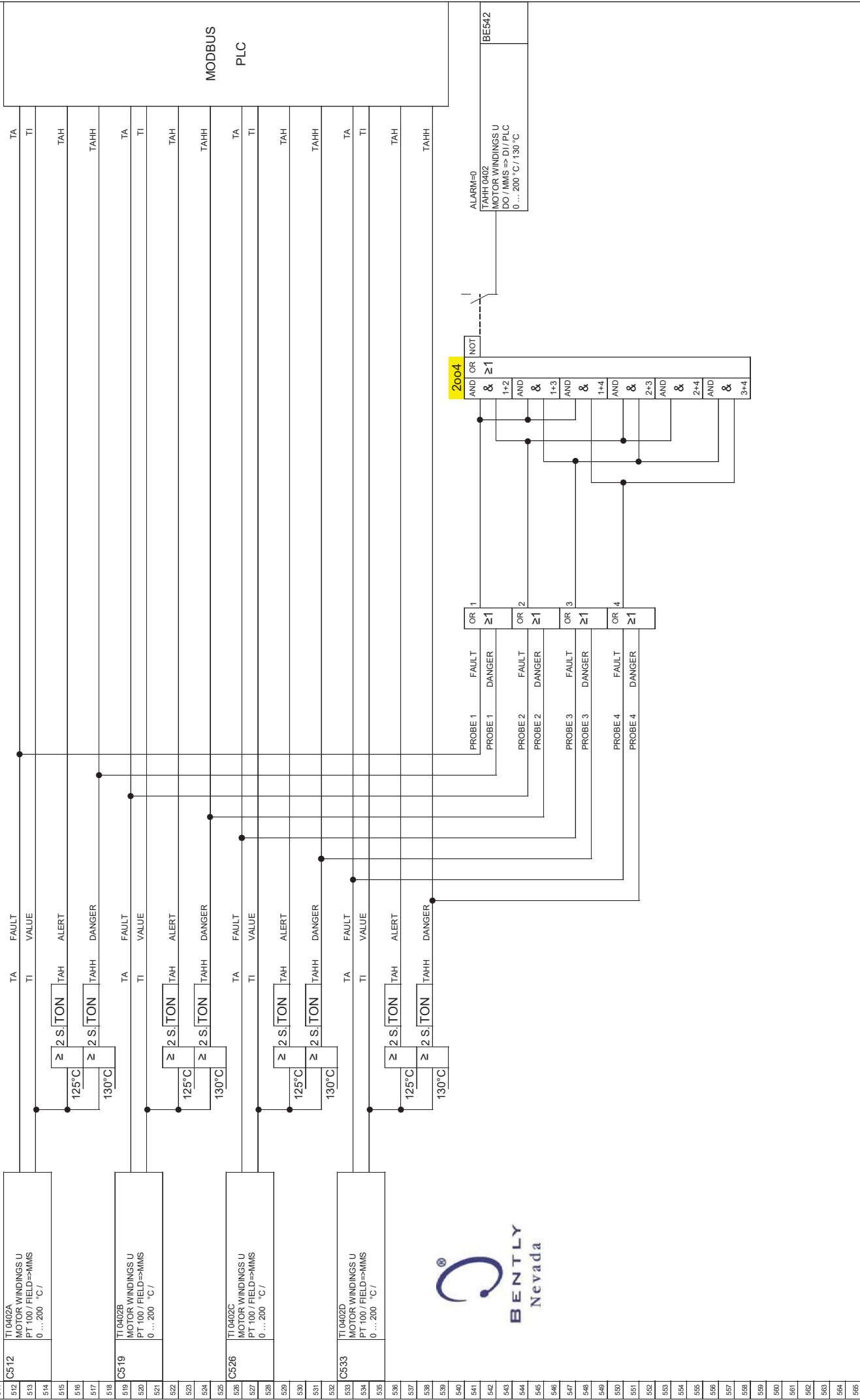
THE DRIVE MAY BE STOPPED IF:

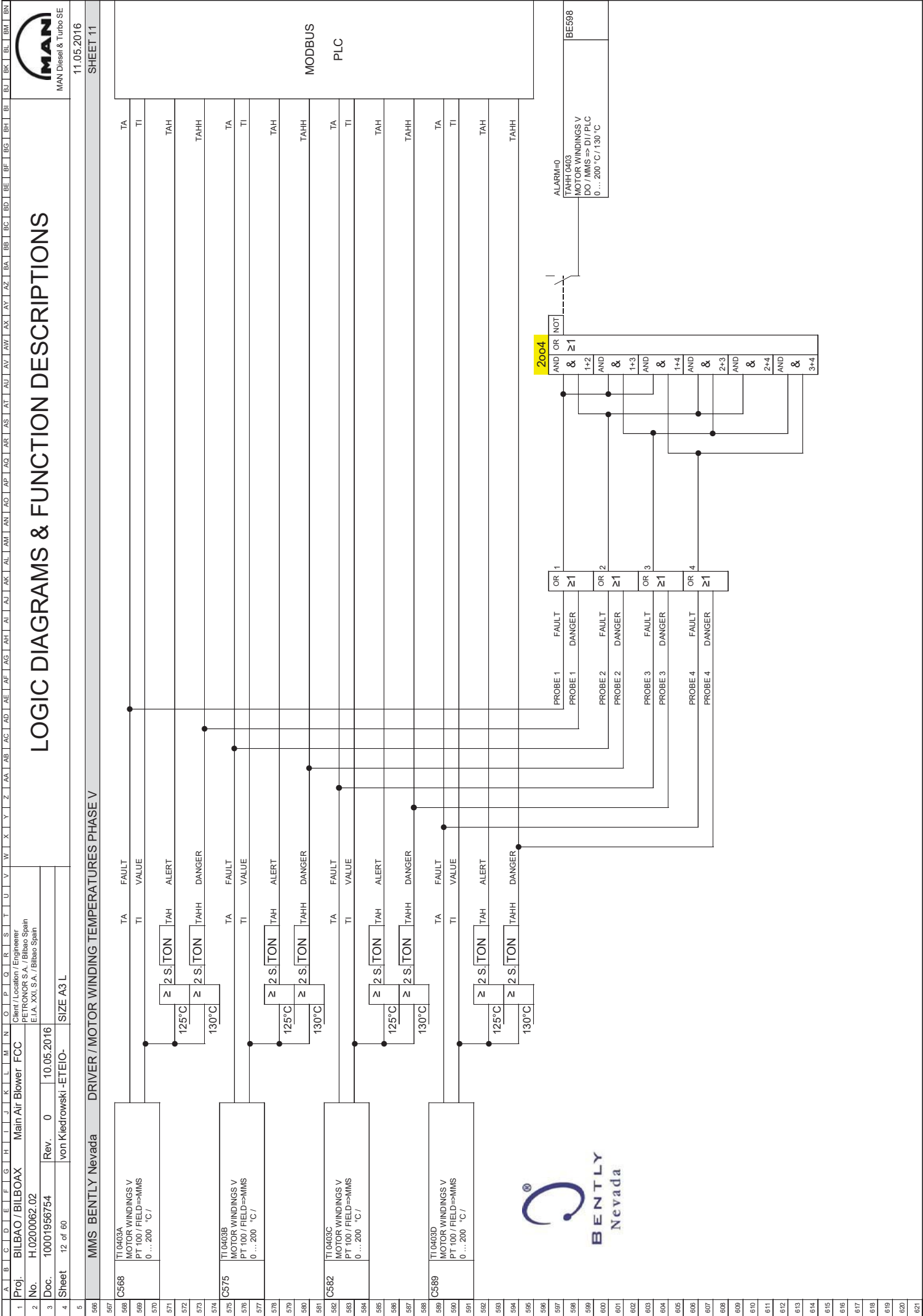
- PROTECTION ON = LOW
- AND
- RELEASE OFF = HIGH

THE DRIVE WILL BE STOPPED IF:

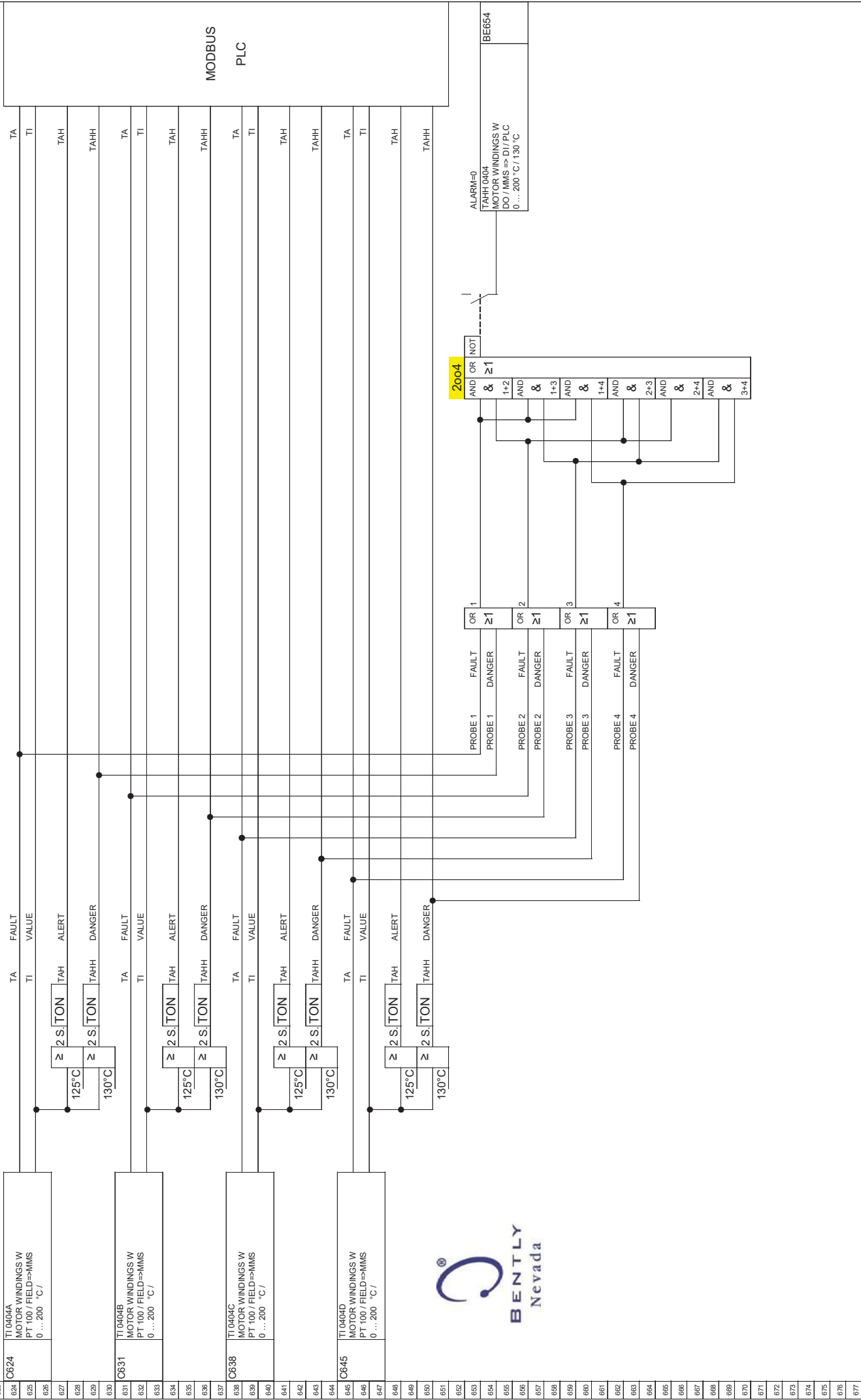
- AUTO OFF = HIGH (RISING EDGE)

LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS





LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

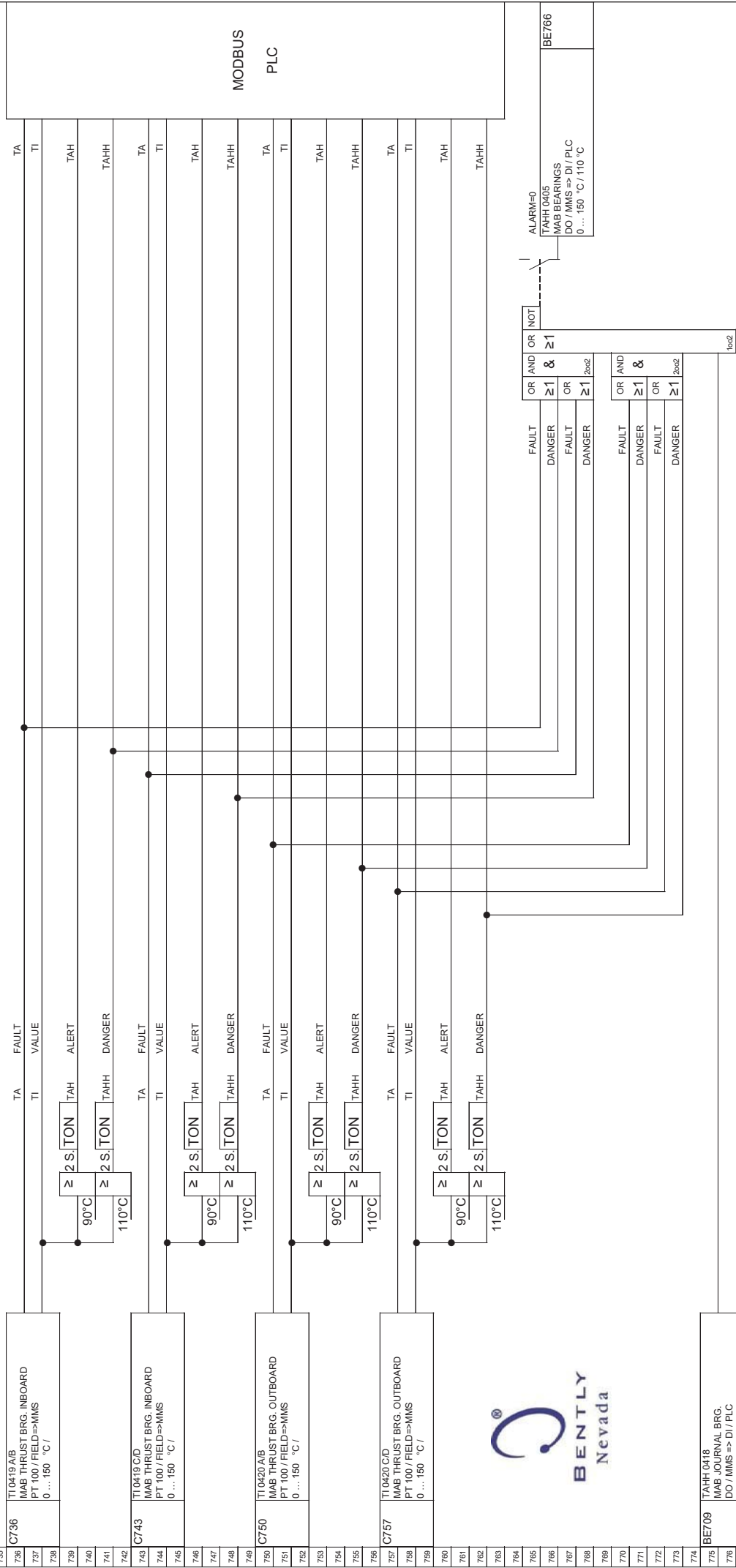


LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS



4	Sheet	15 of 60	von Kiedrowski - ETEIO-	SIZE A3 L
MAN Diesel & Turbo SE				

MMS BENTLEY Nevada MAIN AIR BLOWER VIB THIRST BEARING TEMPERATURES SHEET 14



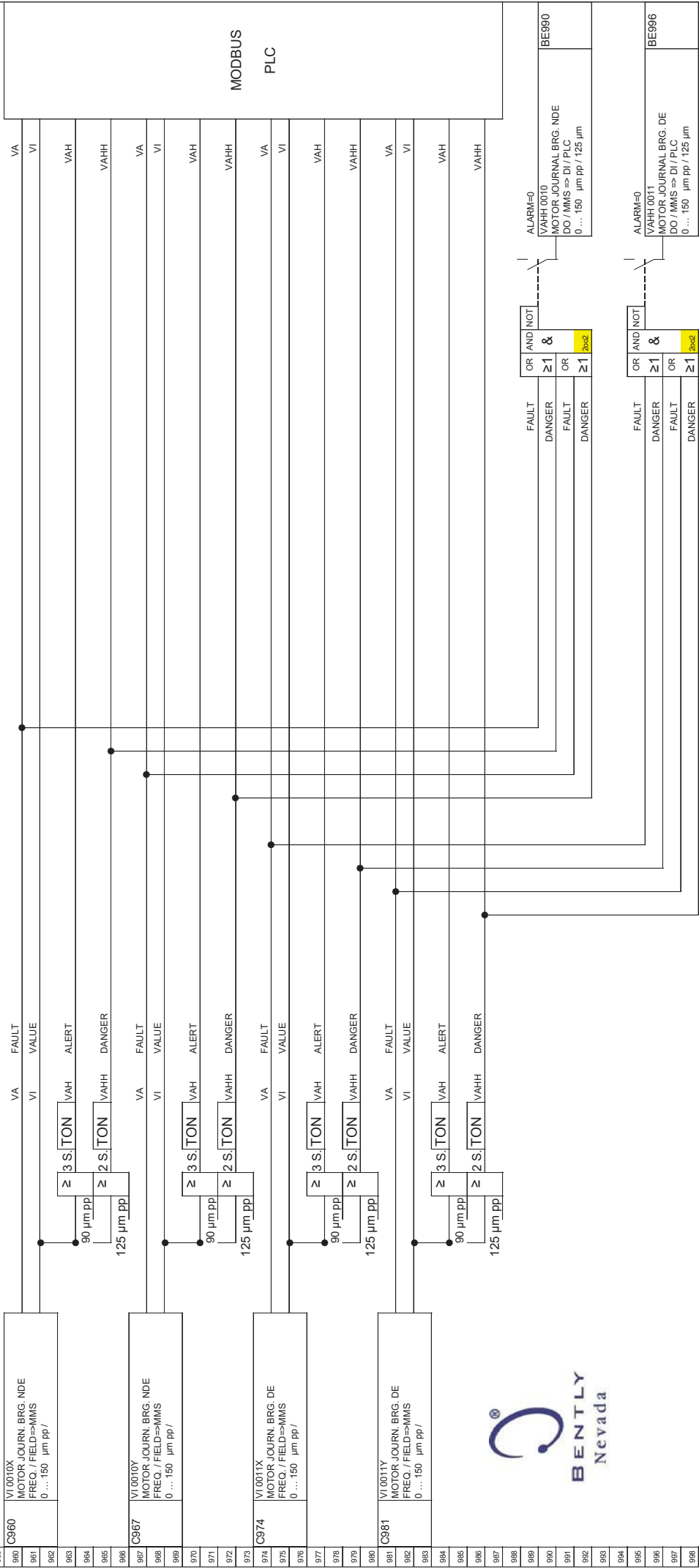
=> SHEET 13

LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS



4	Sheet	19 of 60	von K'edrowski - ETEIO-	SIZE A3 L
MAN Diesel & Turbo SE				

958 MMS BENTLY Nevada DRIVER / MOTOR SHAFT VIBRATION SHEET 18



**DUE TO
REFINERY PROCESS
IT IS INADMISSIBLE
TO TRIP WITH A SINGLE
HH ALARM OR FAILURE**



LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

11.05.2016

SHEET 21

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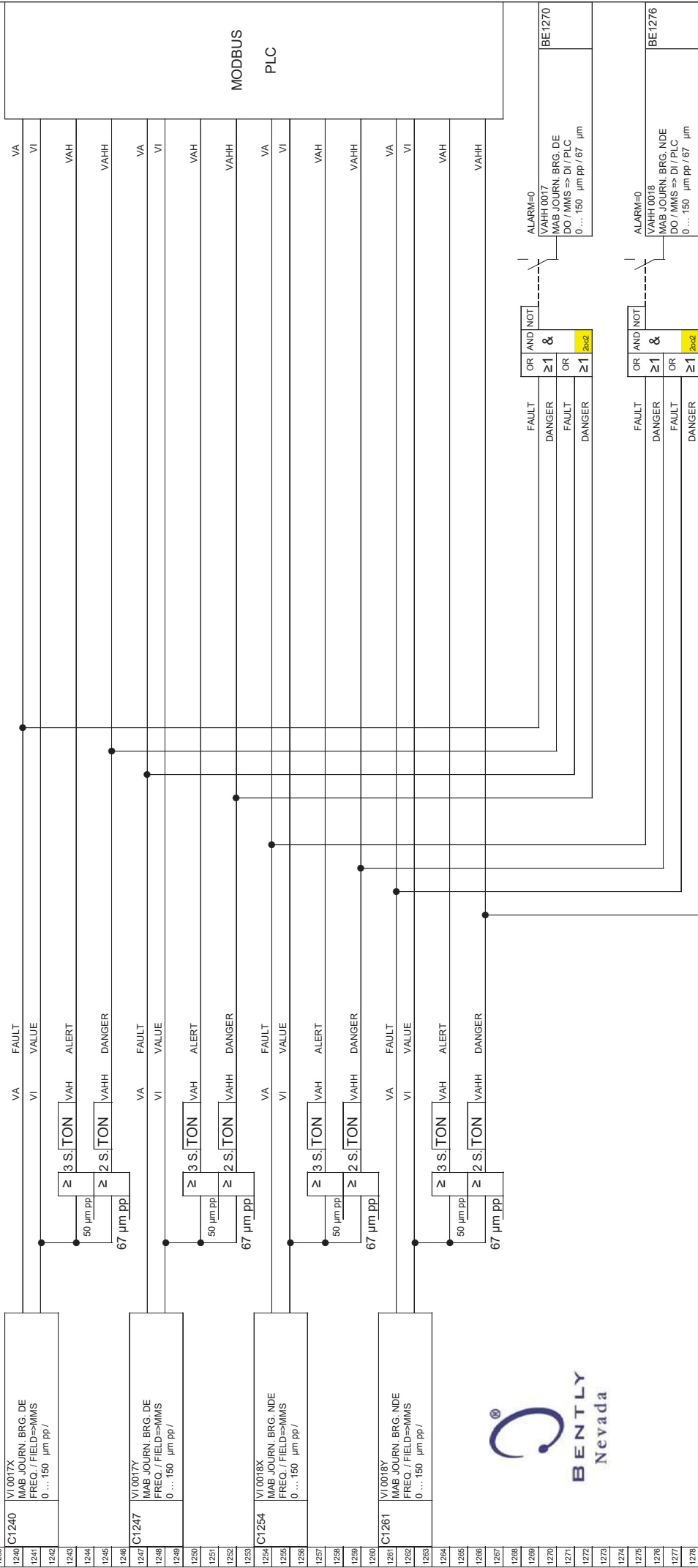
LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS



5					11.05.2016
1238	MMS BENTLY Nevada	MAIN AIR BLOWER MAB SHAFT VIBRATION			SHEET 23

MMS BENTLY Nevada MAIN AIR BLOWER MAB SHAFT VIBRATION

1238 MMS BENTLY Nevada MAIN AIR BLOWER MAB SHAFT VIBRATION SHEET 23



**DUE TO
REFINERY PROCESS
IT IS INADMISSIBLE
TO TRIP WITH A SINGLE
HH ALARM OR FAILURE**

LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

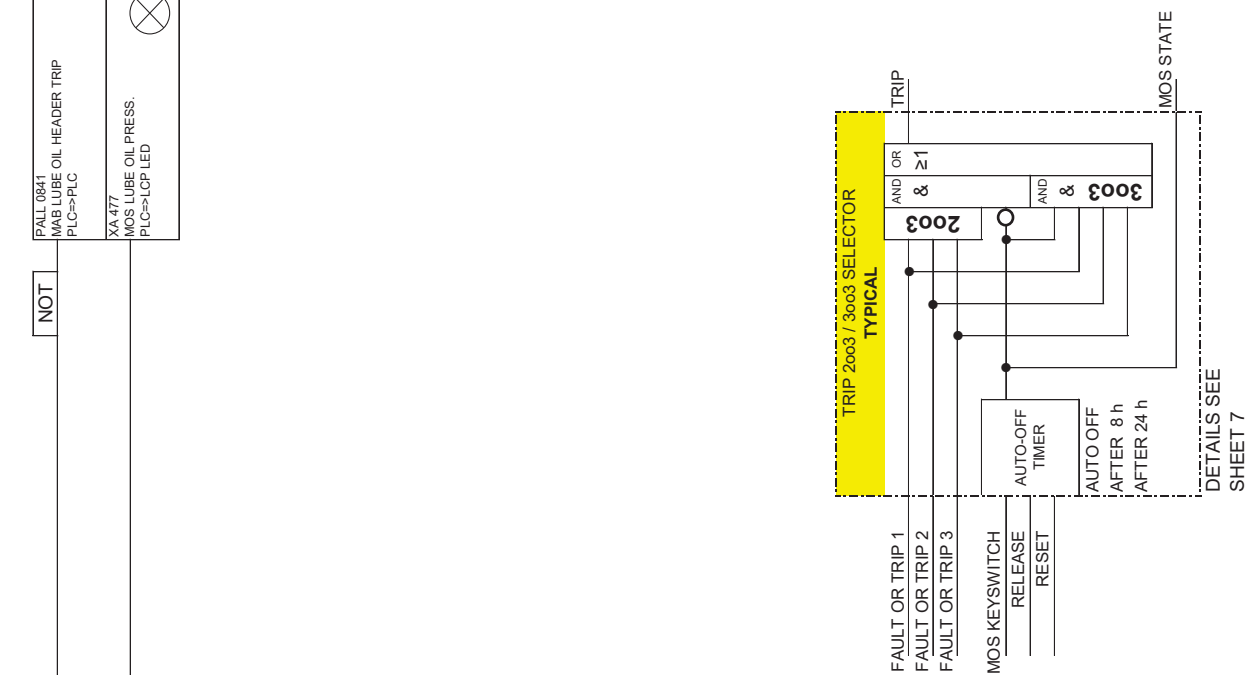


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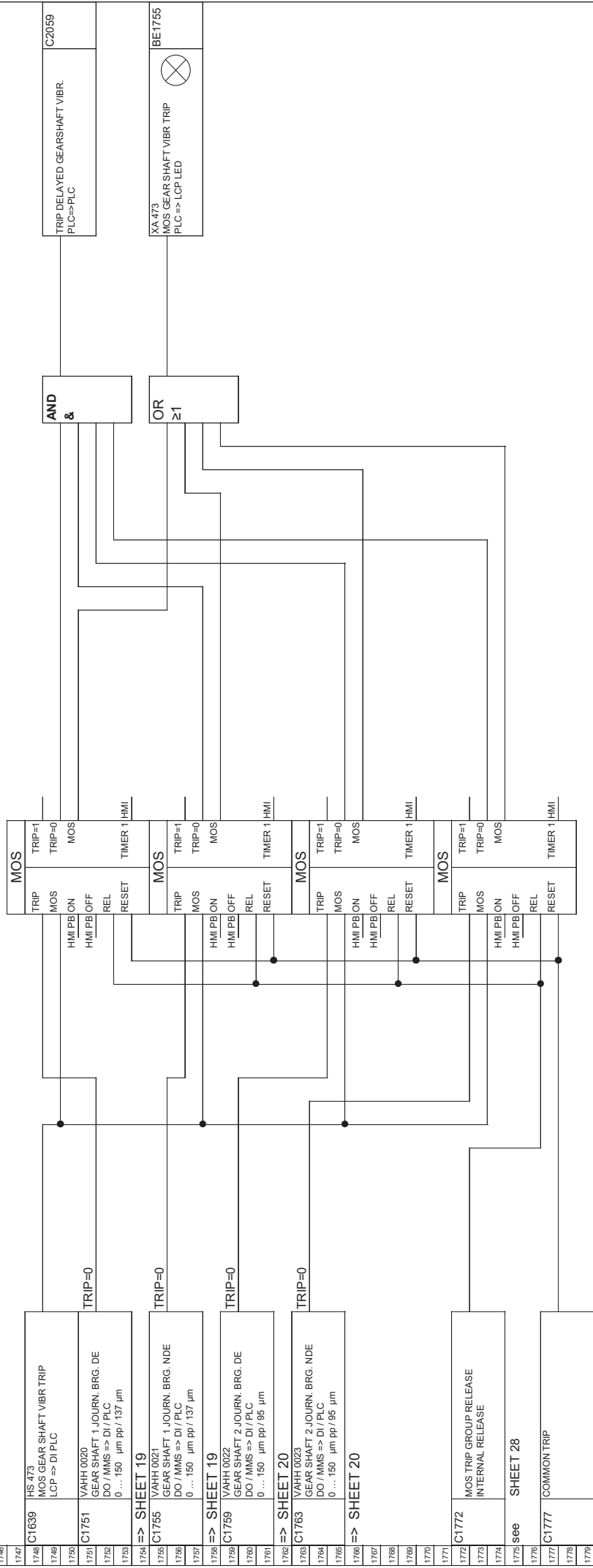
SHEET 27

SHEET 27



DETAILS SEE
SHEET 7

LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS





LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

11.05.2016

SHEET 35

START PERMISSIVE

PLC

 $\wedge$

SHEET 34

REL

AND &

C1913	ZSL122 PROCESS CHECKVALVE CLOSED FIELD=>PLC DI	1913
		1914
		1915
		1916
C1917	LSH 0450 A MOTOR CW LEAKAGE DETECTOR FIELD=>PLC DI	1917
		1918
		1919
		1920
C1921	LSH 0450 A MOTOR CW LEAKAGE DETECTOR FIELD=>PLC DI	1921
		1922
		1923
		1924
C1925	LSH 0450 B MOTOR CW LEAKAGE DETECTOR FIELD=>PLC DI	1925
		1926
		1927
		1928
C1929	LSH 0450 C MOTOR CW LEAKAGE DETECTOR FIELD=>PLC DI	1929
		1930
		1931
		1932
C1933	LSH 0450 D MOTOR CW LEAKAGE DETECTOR FIELD=>PLC DI	1933
		1934
		1935
		1936
C1937	LSH 0450 E MOTOR CW LEAKAGE DETECTOR FIELD=>PLC DI	1937
		1938
		1939
		1940
C1941	ZSL 0228 INLET FILTER ACCESS DOOR CLOSED FIELD=>PLC DI	1941
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SHEET 38

LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

MAIN MOTOR START, TRIP & BLOW OFF VALVE CONTROL

THE MAIN MOTOR MAY BE STARTED IF:

- MAIN MOTOR START-UP PERMISSIVES IS COMPLIED

THE MAIN MOTOR WILL BE STARTED IF:

- MOTOR START PB IS OPERATED

THE MAIN MOTOR WILL BE TRIPPED UNDELAYED BY:

- EMERGENCY OFF PUSHBUTTON (SKID)
- EMERGENCY OFF PUSHBUTTON (FIELD)
- EMERGENCY OFF PUSHBUTTON IS OPERATED (LCP)
- HV SG TRIP

THE MAIN MOTOR WILL BE TRIPPED 2 SEC. DELAYED BY:

- LUBE OIL PRESSURE INADMISSIBLE
- MOTOR WINDING TEMPERATURE INADMISSIBLE
- MOTOR SHAFT VIBRATION INADMISSIBLE
- GEAR BOX SHAFT VIBRATION INADMISSIBLE
- MAB SHAFT VIBRATION INADMISSIBLE

THE MAIN MOTOR WILL BE OFF-INTERLOCKED IF:

- HV SG NOT AVAILABLE

THE MAIN MOTOR MAY BE STOPPED IF:

- ALWAYS

THE MAIN MOTOR WILL BE STOPPED IF:

- STOP SEQUENCE IS COMPLIED

THE BLOW OFF VALVE WILL BE ENERGIZED BY:

- MAIN MOTOR START

THE BLOW OFF VALVE WILL BE UNDELAYED DEENERGIZED WITH QUICK OPEN BY:

-MAIN MOTOR TRIP	OR
-EMERGENCY OFF PUSHBUTTON (SKID)	OR
-EMERGENCY OFF PUSHBUTTON (FIELD)	OR
-EMERGENCY OFF PUSHBUTTON IS OPERATED (LCP)	OR
-HV SG TRIP	OR
-SURGE DETECTOR / 3rd SURGE	OR
-AXIAL DISPLACEMENT GEAR BOX INADMISSIBLE	OR
-AXIAL DISPLACEMENT MAB INADMISSIBLE	OR
-START-UP INTERRUPT (WRONG IGV POSITION)	OR
-LUBE OIL PRESSURE INADMISSIBLE	OR
-MOTOR WINDING TEMPERATURE INADMISSIBLE	OR
-MOTOR SHAFT VIBRATION INADMISSIBLE	OR
-GEAR BOX SHAFT VIBRATION INADMISSIBLE	OR
-MAB SHAFT VIBRATION INADMISSIBLE	OR
-SURGE DETECTOR SURGE	OR
-EMERGENCY PUSH BUTTON TO HV SG	OR

MAB PROCESS DISCHARGE CHECK/VALVE / NON RETURN VALVE

THE NRV GETS CLOSING ASSIST IF ENERGIZED (IMPULSE 20 SEC.)

THE VALVE WILL BE MANDATORY ENERGIZED IF

- MAB BLOW OFF VALVE IS DEENERGIZED OPEN

THE VALVE WILL BE MANDATORY DEENERGIZED

- MAB BLOW OFF VALVE IS ENERGIZED & READY FOR CONTROL



Sheet 42 of 60	von Kiedrowski - ETEIO-	SIZE A3
MAN Diesel & Turbo SE		

2246	PLC	LUBE OIL HEATER 1	SHEET 41

LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

LUBE OIL HEATER 1 CONTROL

THE HEATER AUTOMATIC MAY BE STARTED IF:

- OIL RESERVOIR TEMPERATURE IS LOWER THAN 50°C

THE HEATER AUTOMATIC WILL BE STARTED IF:

- HEATER START PB IS OPERATED & MANUAL MODE BY KEYSWITCH IS SELECTED
 - OIL RESERVOIR TEMPERATURE IS LOWER THAN 40°C & AUTOMATIC MODE BY KEYSWITCH IS SELECTED
- OR

THE HEATER AUTOMATIC WILL BE STOPPED IF:

- HEATER STOP PB IS OPERATED & MANUAL MODE BY KEYSWITCH IS SELECTED
- OIL RESERVOIR TEMPERATURE IS HIGHER THAN 50°C & AUTOMATIC MODE BY KEYSWITCH IS SELECTED
- AUTOMATIC MODE SELECTION WILL BE CHANGED TO MANUAL MODE

THE HEATER AUTOMATIC WILL BE FORCED OFF AND INTERLOCKED IF:

- LUBE OIL RESERVOIR LEVEL IS LOWER THAN 40%
- HEATER TEMPERATURE IS HIGHER THAN 80°C OR TRANSMITTER FAILURE
- HEATER TEMPERATURE SAFETY SWITCH OPENED
- OIL RESERVOIR TEMPERATURE TRANSMITTER FAILURE
- HEATER FAILURE

THE HEATER MAY BE STARTED IF:

- HEATER TEMPERATURE IS LOWER THAN 60°C

THE HEATER WILL BE STARTED IF:

- HEATER TEMPERATURE IS LOWER THAN 60°C
- HEATER AUTOMATIC IS ON

THE HEATER WILL BE STOPPED IF:

- HEATER AUTOMATIC IS OFF

THE HEATER WILL BE FORCED OFF AND INTERLOCKED IF:

- THE HEATER AUTOMATIC IS FORCED OFF AND INTERLOCKED
- HEATER TEMPERATURE IS HIGHER THAN 70°C OR TRANSMITTER FAILURE

THE HEATER AUTOMATIC WILL BE OFF-INTERLOCKED IF:

- OR
- MCC NOT AVAILABLE
 - RUNTIME ERROR

LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

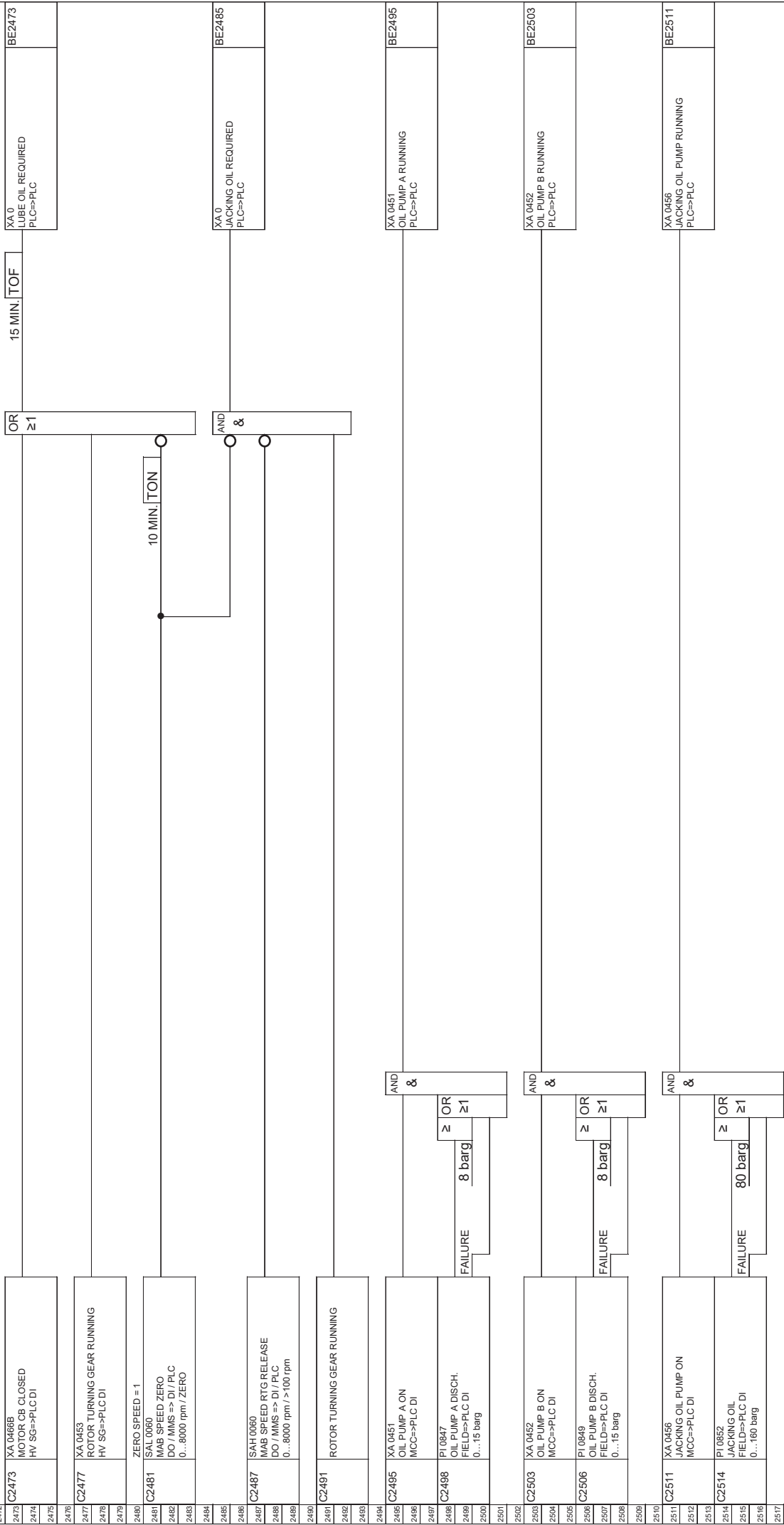


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11.05.2016

SHEET 45

LUBE OIL REQUIRED & PUMP STATE



1

Proj.

BILBAO / BILBOAX

Main Air Blower FCC

2

No.

H.0200062.02

3

Doc.

10001956754

Rev. 0

10.05.2016

4

Sheet

57 of 60

von Kiedrowski -ETEIO-

SIZE A3 L

MAN

MAN Diesel & Turbo SE

11.05.2016

SHEET 56

LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

PLC

SURGE DETECTOR

3098

SI 0060

MAB SPEED

AO / MMS => AI / PLC

0...8000 rpm

3099

TI 0436A

MAB SUCTION (SD)

FIELD=>PLC AI (FAST)

3100

TI 0436B

MAB SUCTION (SD)

FIELD=>PLC AI (FAST)

3101

TI 0436C

MAB SUCTION (SD)

FIELD=>PLC AI (FAST)

3109

PDI 0859A

MAB SUCTION (SD)

FIELD=>PLC AI (FAST)

3112

PDI 0859A

MAB SUCTION (SD)

FIELD=>PLC AI (FAST)

3115

PDI 0859A

MAB SUCTION (SD)

FIELD=>PLC AI (FAST)

IF NO FAILURE

MEDIAN 3oo3

IF 1 FAILURE

MEDIAN 2oo3

IF 2 FAILURES

1oo3

IF 3 FAILURES

OUT=LOW

IF NO FAILURE

MEDIAN 3oo3

IF 1 FAILURE

MEDIAN 2oo3

IF 2 FAILURES

1oo3

IF 3 FAILURES

OUT=HIGH

TEMPERATURE REFERENCE

1 K/MIN.

RAMP

Xin

RUN

Xo

COMP

x1

x2

x1≥x2

SUB

-

50 °C

≥

50 mbar

≥

TO BE MODIFIED WITH TESTRUN VALUE

RESET

HMI

SURGE DETECTOR

TYPICAL

RELEASE

SURGE BY TEMP

SURGE BY FLOW

20 SEC. TON

AND &

OR ≥1

120 SEC. TP

1 SEC. TON

120 SEC. TP

AND &

TP

2nd SURGE

3rd SURGE

BE3128

SURGE DETECTOR REL BOV

PLC=>PLC

BE3132

SURGE COUNTER

LOP>LOP

BE3135

SURGE DETECTOR TRIP

PLC=>PLC

NOT

OR ≥1

0.5 SEC. TP

SHEET

MAN Diesel & Turbo AG, 42699 Solingen, Germany

57 / 60

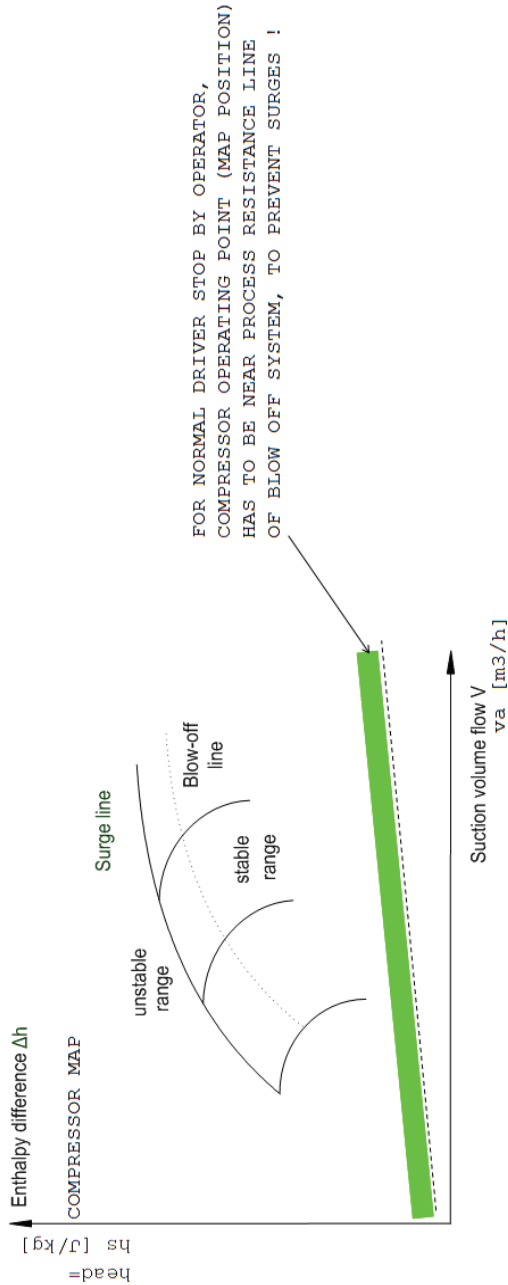
		LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS																										MAN Diesel & Turbo SE 11.05.2016	
		ANTI SURGE CONTROLLER RELEASE																										SHEET 57	
		PLC / CCC																											
		C3145																										BE3145	
		SI 0060 MAB SPEED AO / MMS => AI / PLC 0...8000 rpm																										ASC/PERF. CTRL ENABLE PLC DO =>CCC	
		2																										95% Nmin.	
		FAILURE																											
		C3153																										BE3150	
		COMMON TRIP																										CCC ASC EXCESSIVE SURGE TRIP CCC=>PLC	
		C3157																										NOT	
		HS 0444																										=> SHEET 28	
		RELEASE																											
		CCC ANTI SURGE CONTROLLER																											
		DETAILS SEE CCC I/O LIST & P&ID 10001956737																										DETAILS SEE CCC I/O LIST & P&ID 10001956737	

LOGIC DIAGRAMS & FUNCTION DESCRIPTIONS

COMPRESSOR NORMAL STOP

[illegible]

STEP 1	IF	NO TRIP AND COMPRESSOR IN OPERATION
	THEN	STEP 2
STEP 2	IF	MANUAL START COMPRESSOR STOP SEQUENCE
	THEN	ASC OFF OPEN BLOW OFF VALVE
		STEP 3 AFTER 2 SEC.
STEP 3	IF	BLOW OFF VALVE IS OPEN AND COMPRESSOR INLET GUIDE VANES ARE CLOSED
	THEN	STEP 4 AFTER 2 SEC.
STEP 4	IF	COMPRESSOR DISCH. PRESS. IS LESS THEN x barg
	THEN	STOP DRIVER AFTER 5 SEC.



HARDWIRED SIGNALS BETWEEN PLC/CCC/BN
AND DCS/ESD NOT INCLUDED IN THIS DOCUMENT
AS PER BILBOREC ANALOGY

13. PLANOS DE CONEXIONADO PANEL DE CONTROL
CON CAJAS DE CONEXIONES

JUNCTION BOXES:

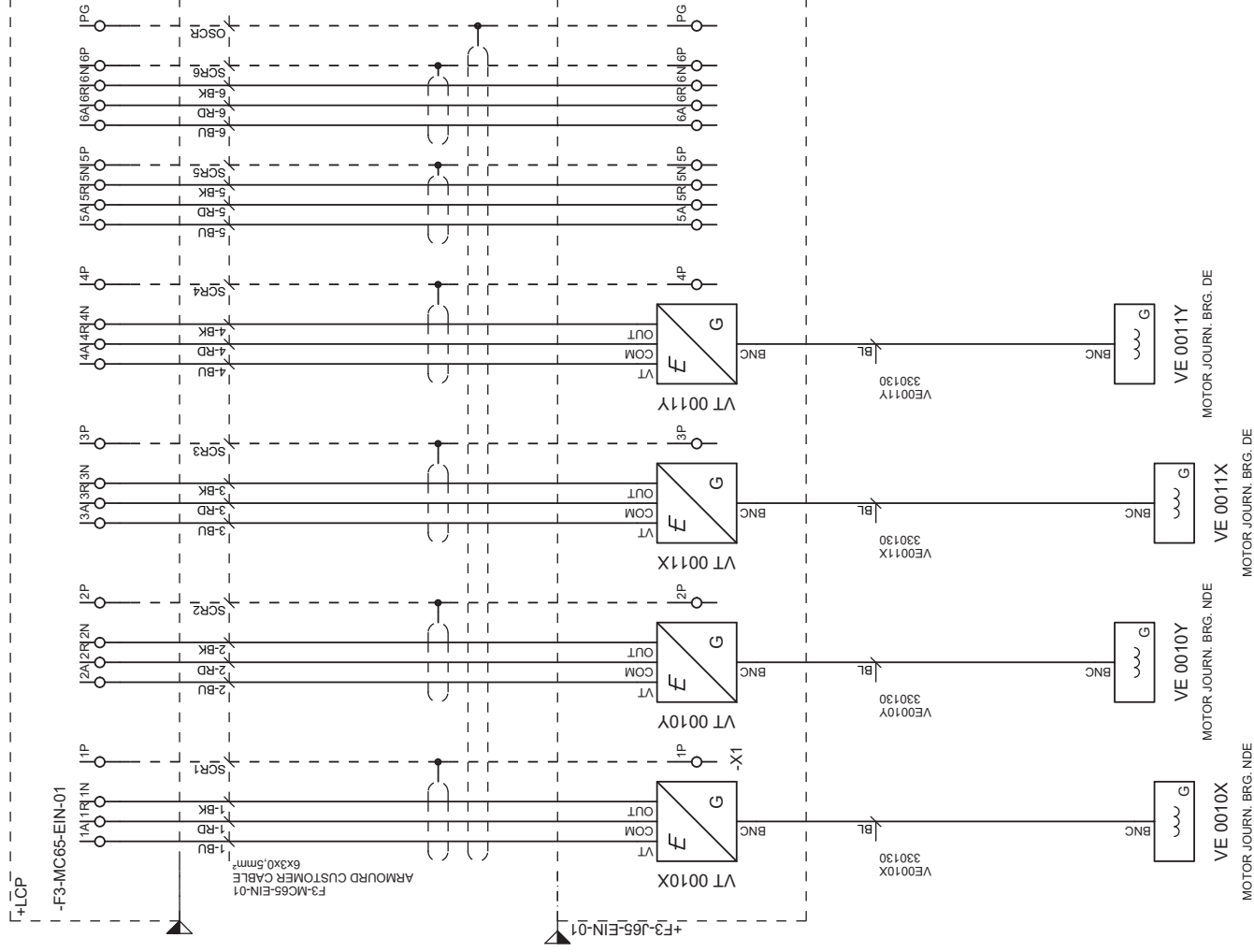
DESIGN: EEx(i) ; EEx(d) / IP65
MATERIAL: STAINLESS STEEL
SINGLE CABLE ENTRY FROM SIDE ADJACENT BOXES MUST BE SEPARATED MIN 500MM
MULTI CORE CABLE ENTRY FROM BOTTOM
SPARE CONNECTION AND MULTICORE CABLE CONNECTIONS PLUGGED
TERMINALS KLIPPON TYPE SAK 2.5 (MIN.) OR EQUIVALENT BLUE FOR EExi and GREY FOR EExd CIRCUITS
CABLE GLANDS:

DESIGN: EEx(e/d) / IP65
MATERIAL: BRASS NICKEL PLATED, IP65, PVC SHROUD
CABLE ENTRIES: 1/2 INCHES NPT(F)

P-N1783-CEC0-K0-0001-A-O

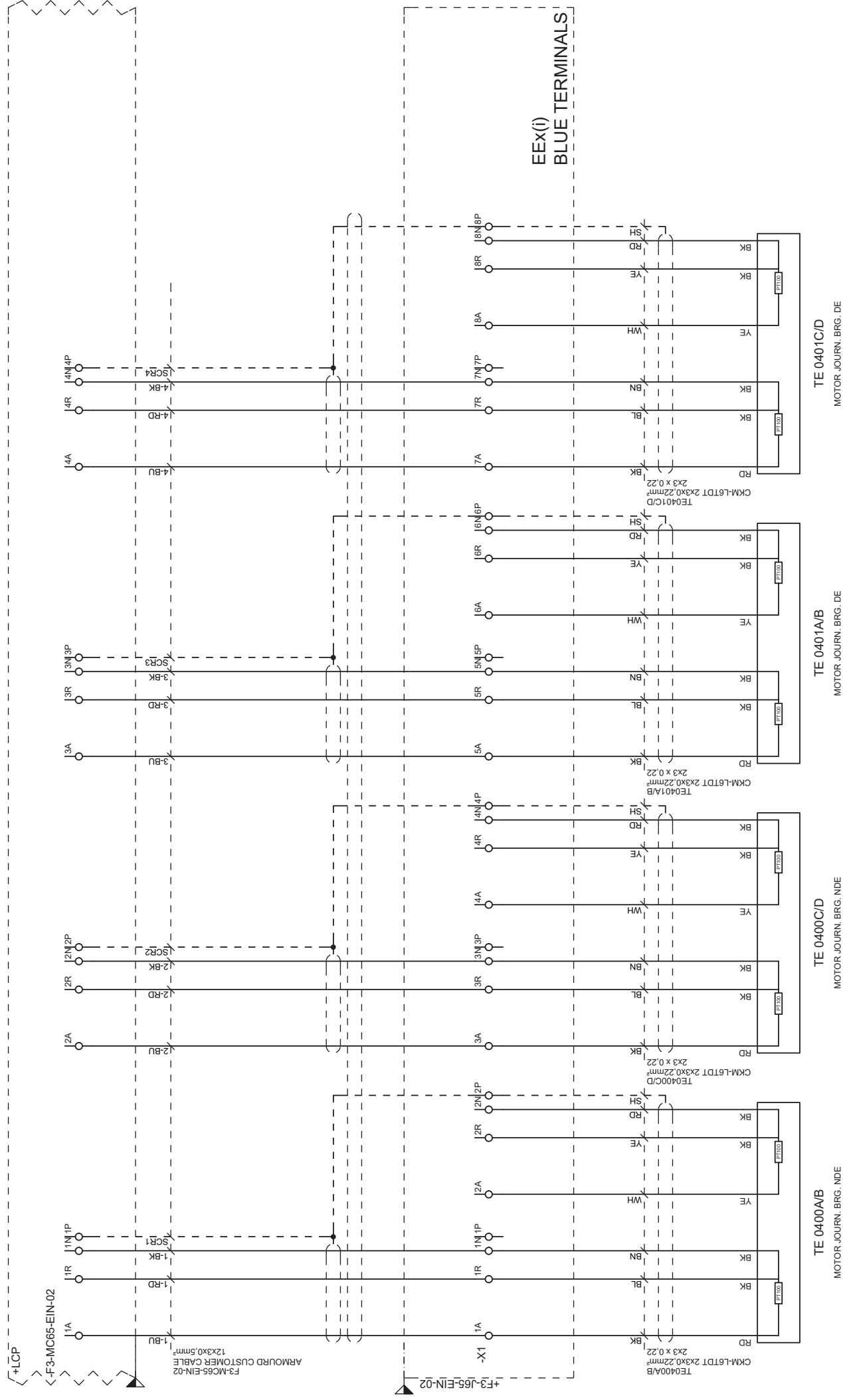
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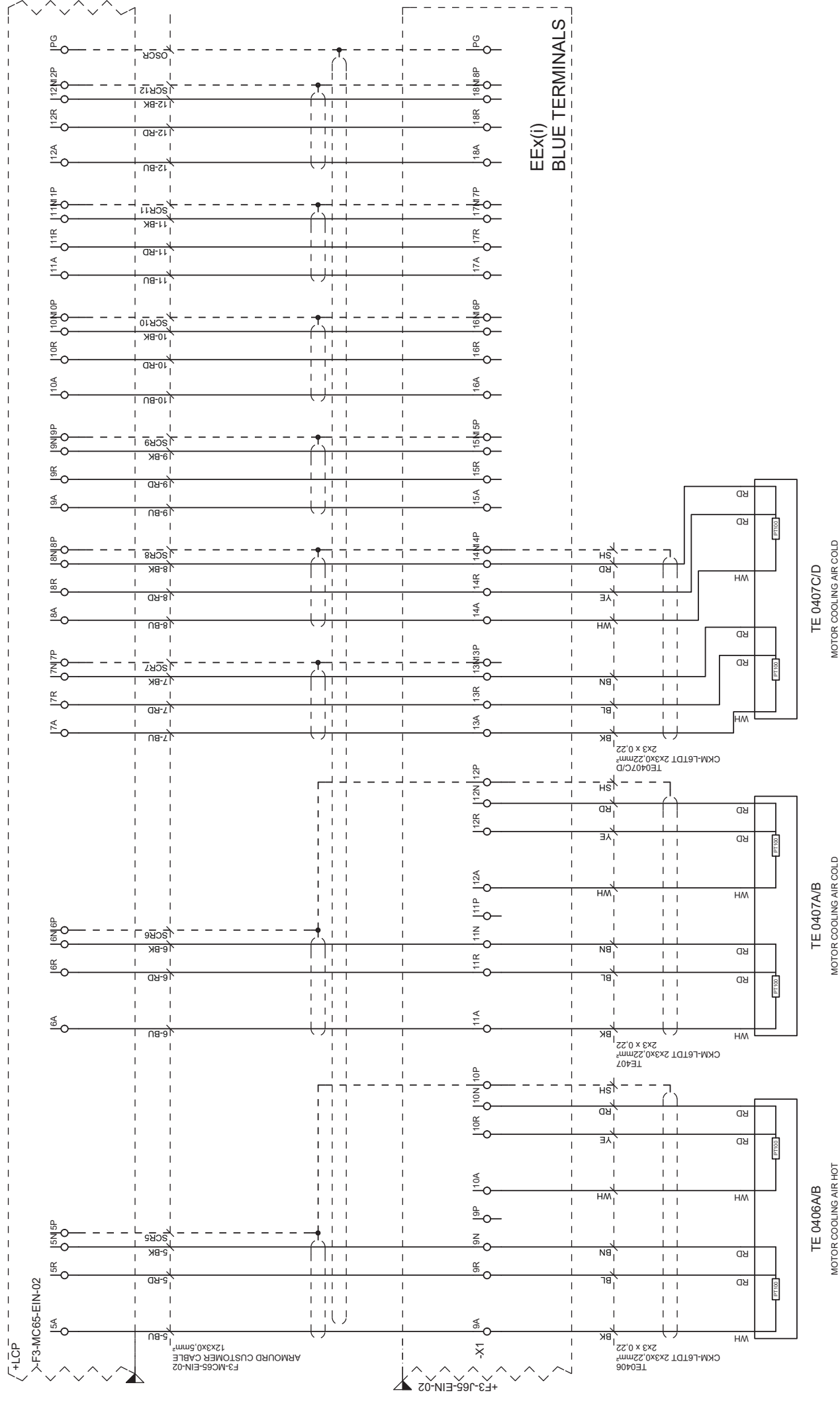
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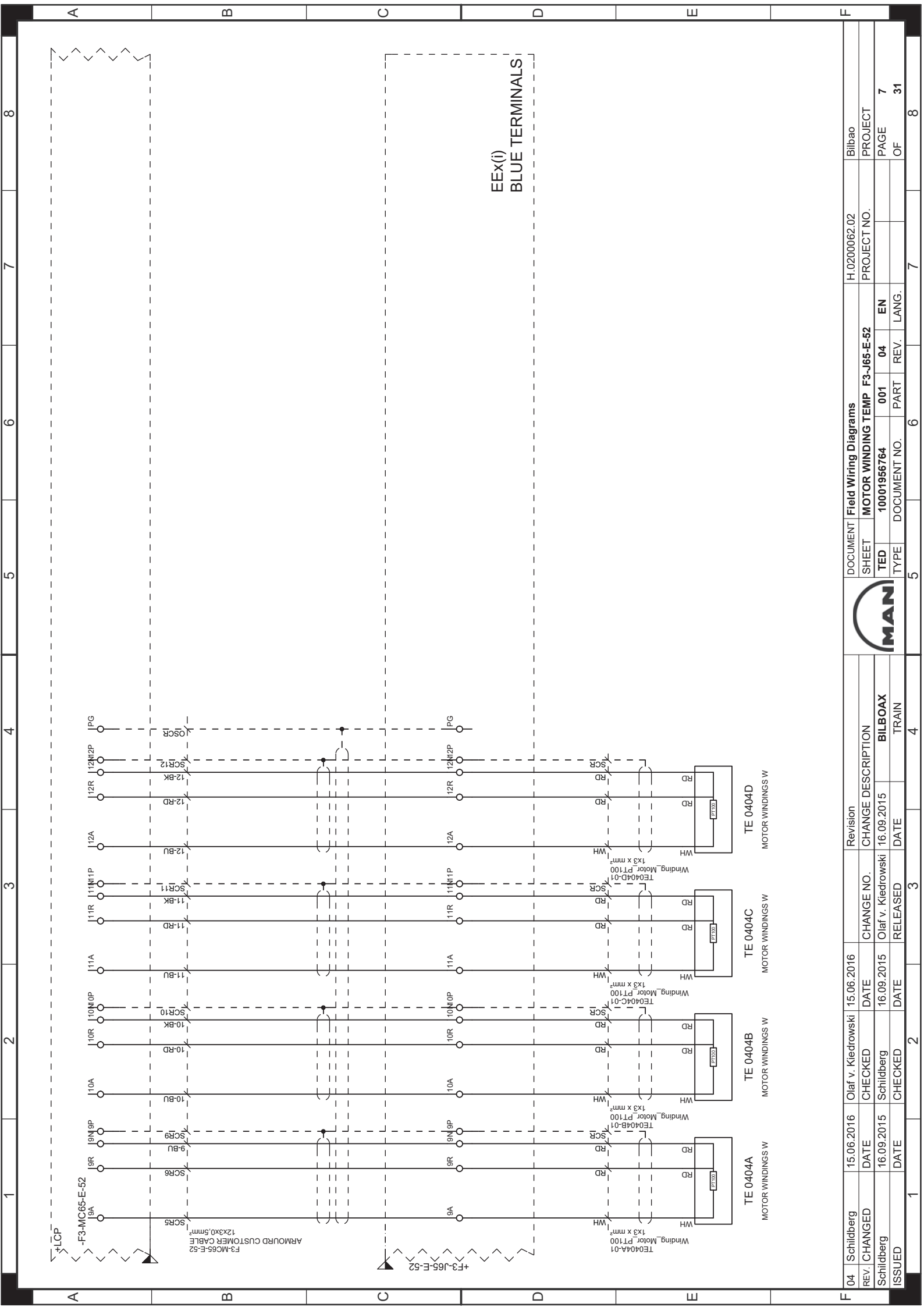
EEEx(i)
BLUE TERMINALS

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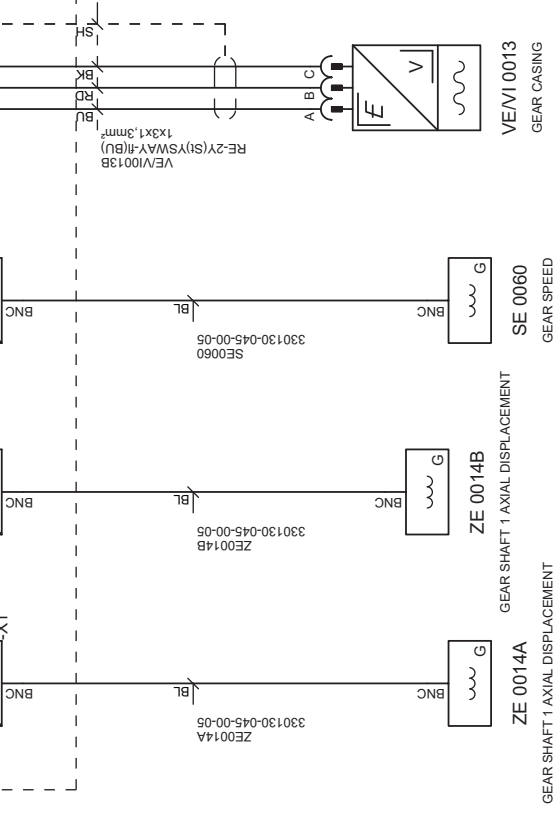
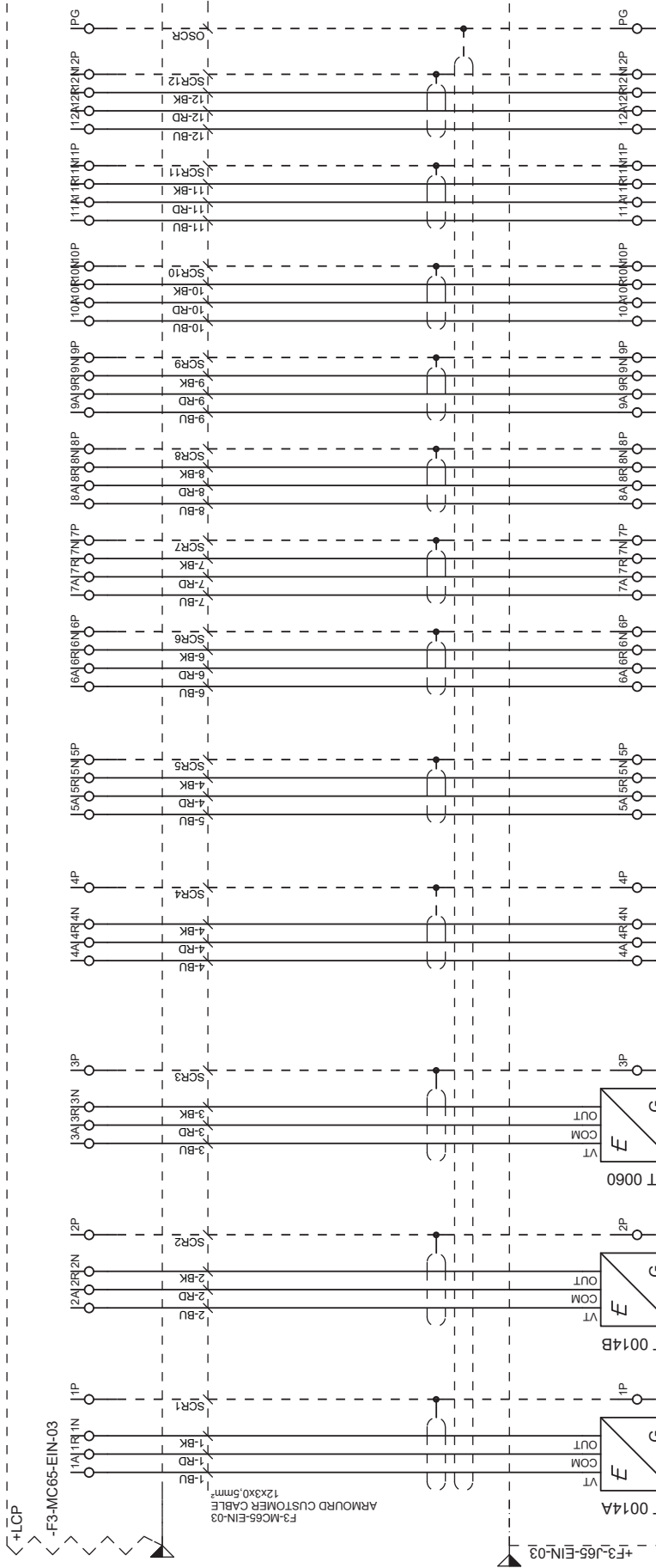
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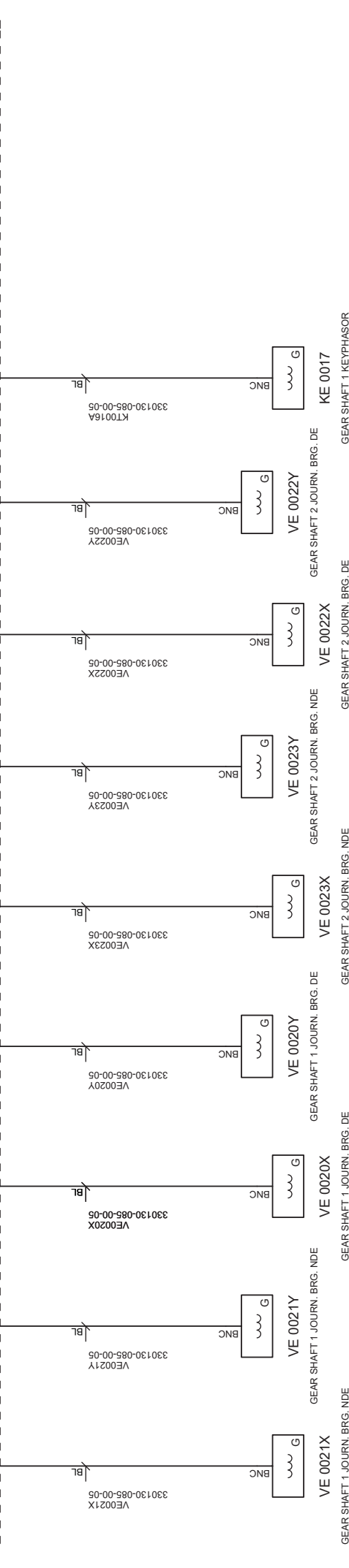
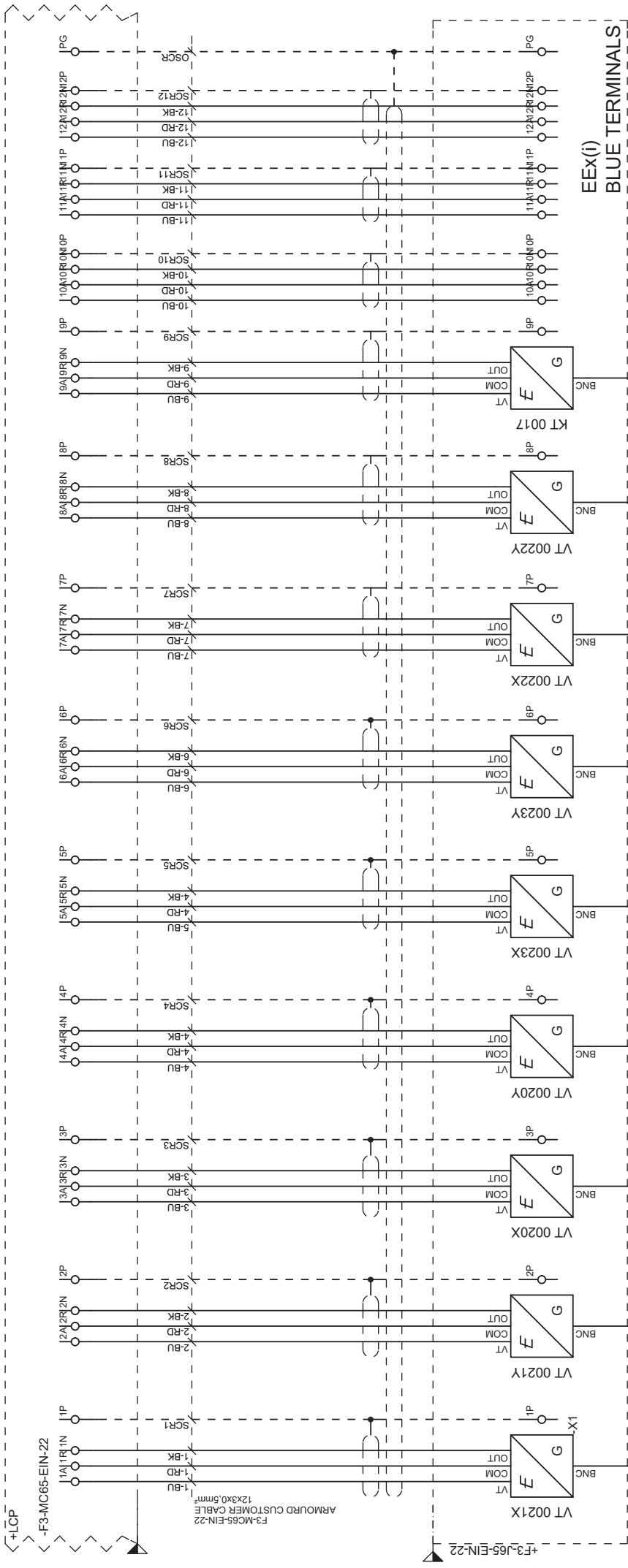


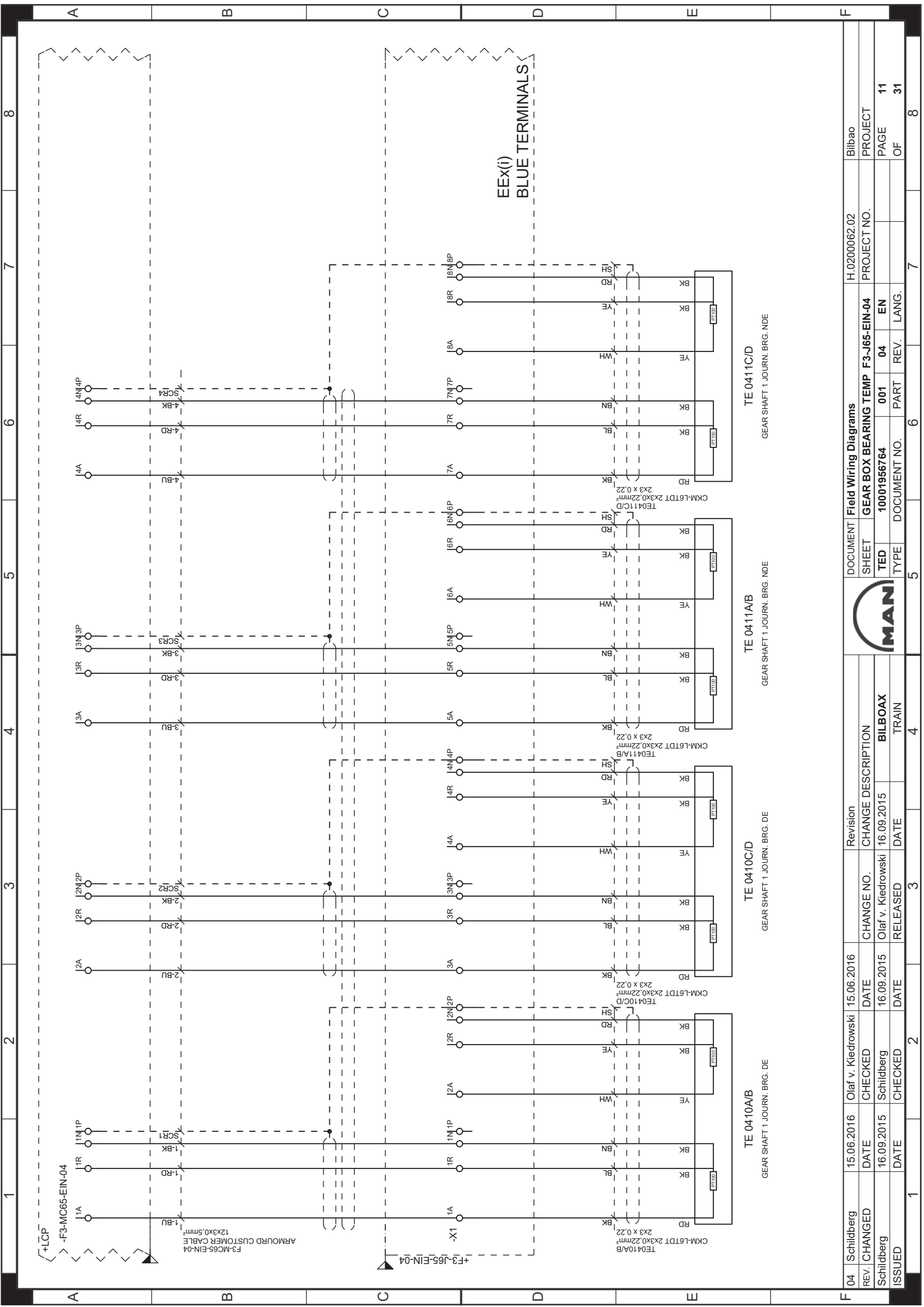
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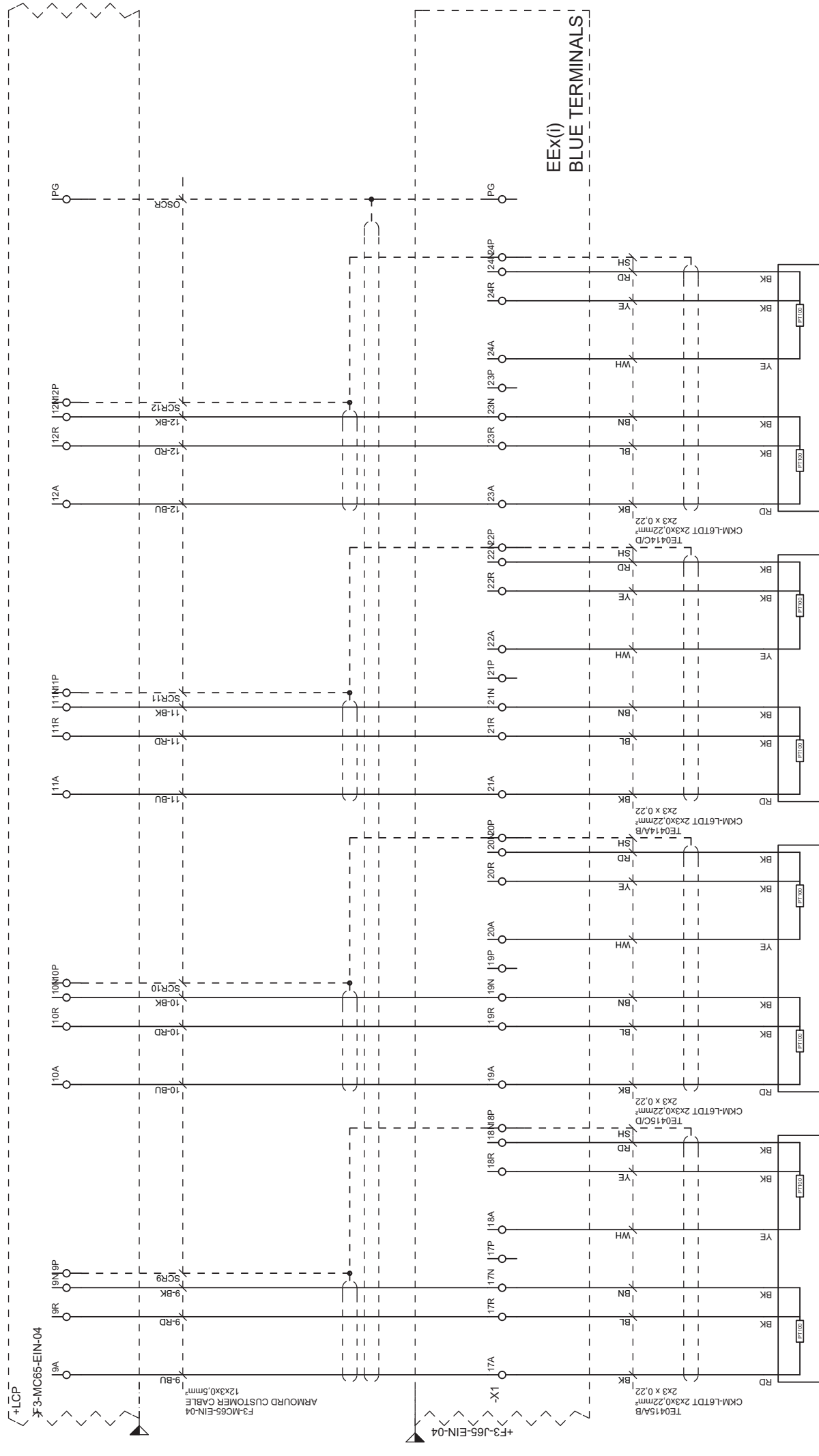
											
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TE 0415A/B

GEAR SHAFT 2 JOURN. BRG. NDE

TE 0415C/D

GEAR SHAFT 2 JOURN. BRG. NDE

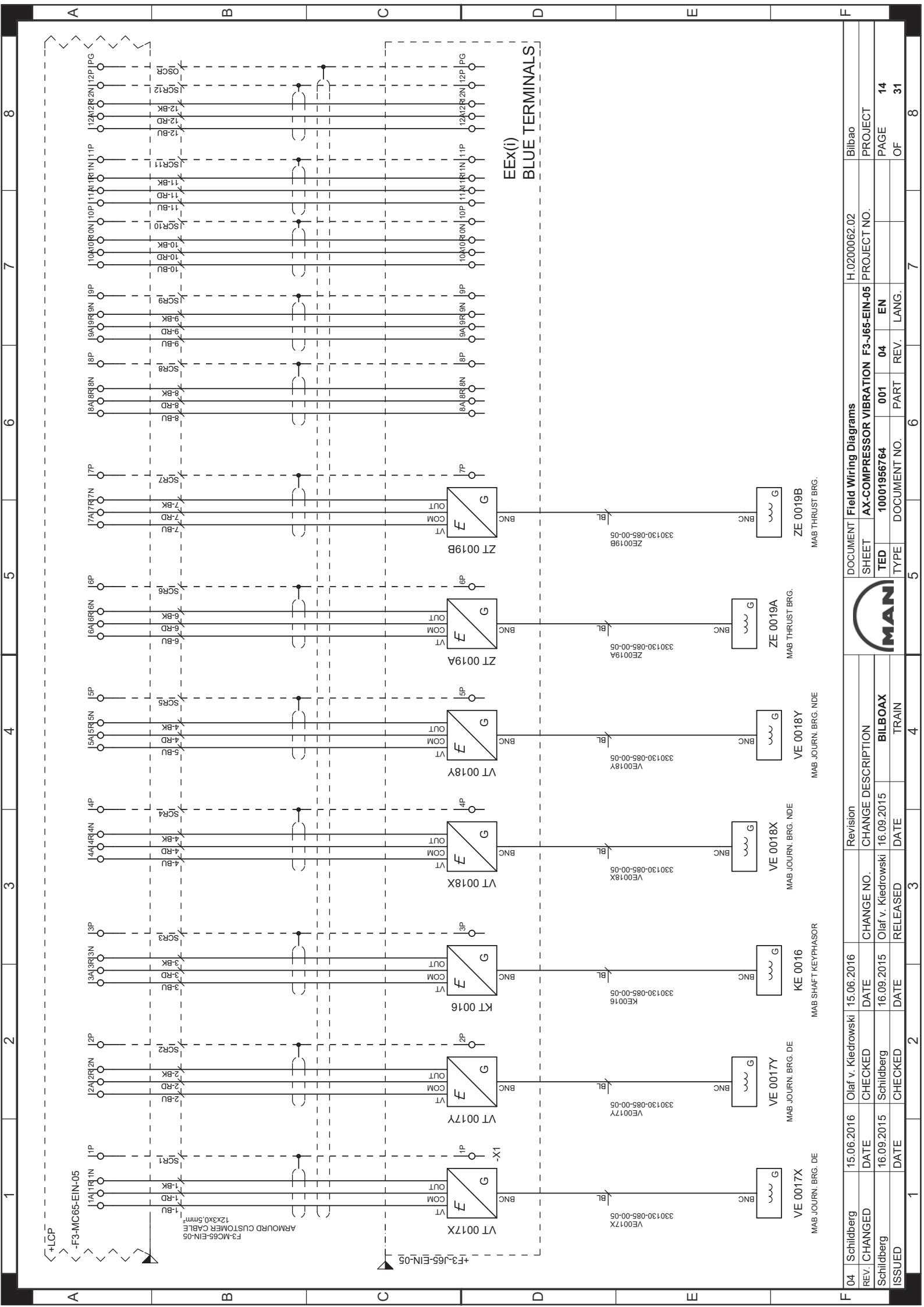
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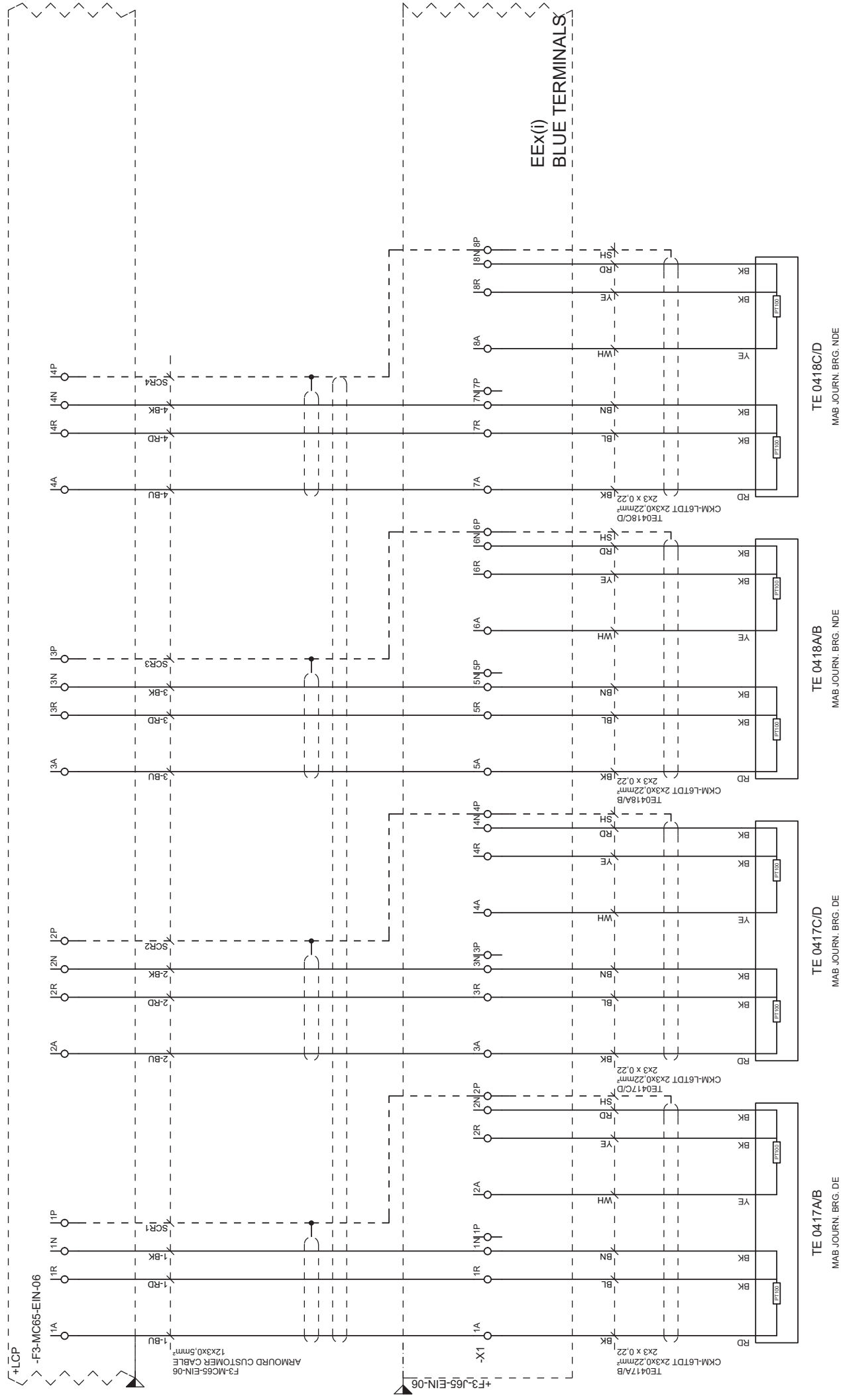
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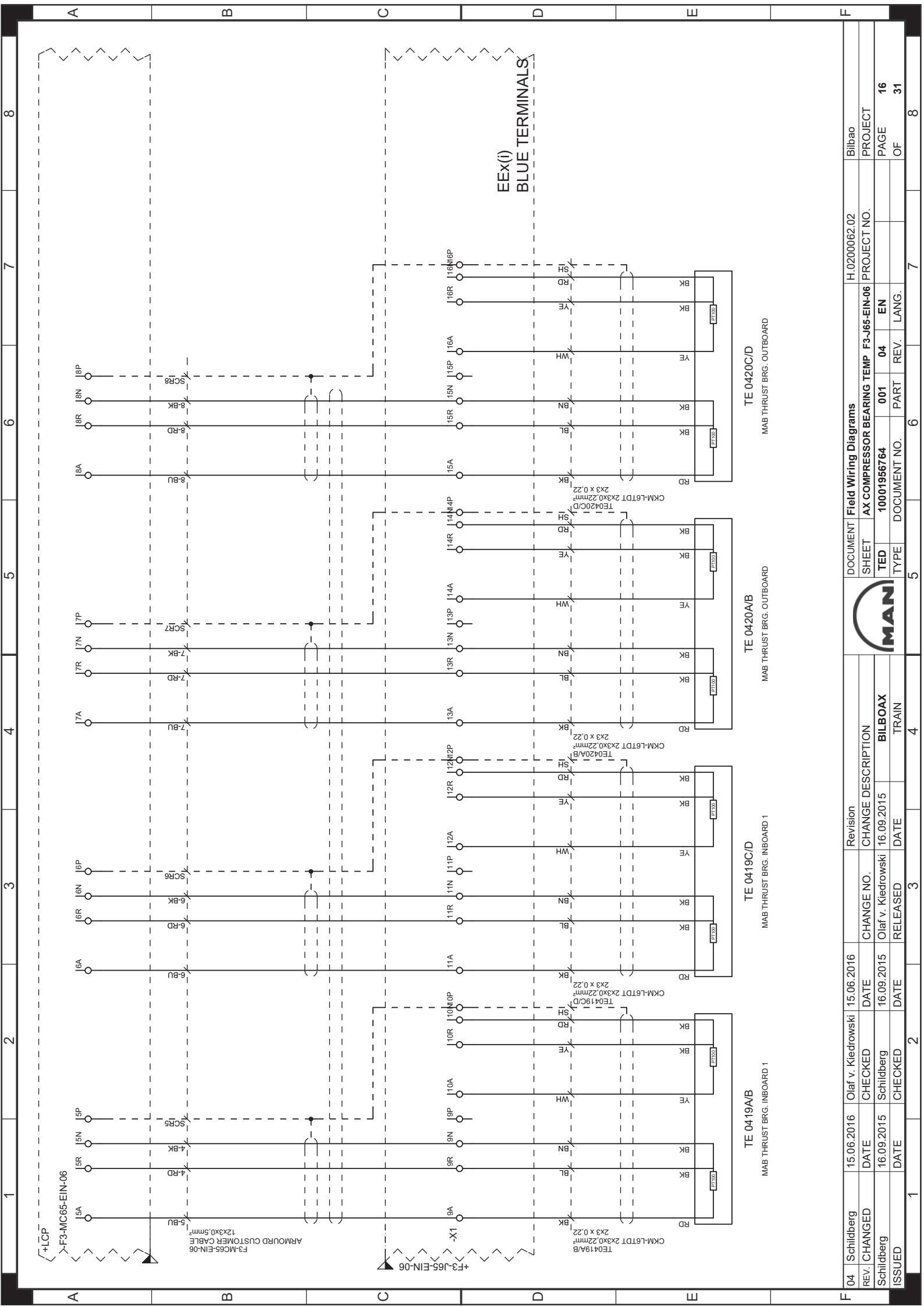
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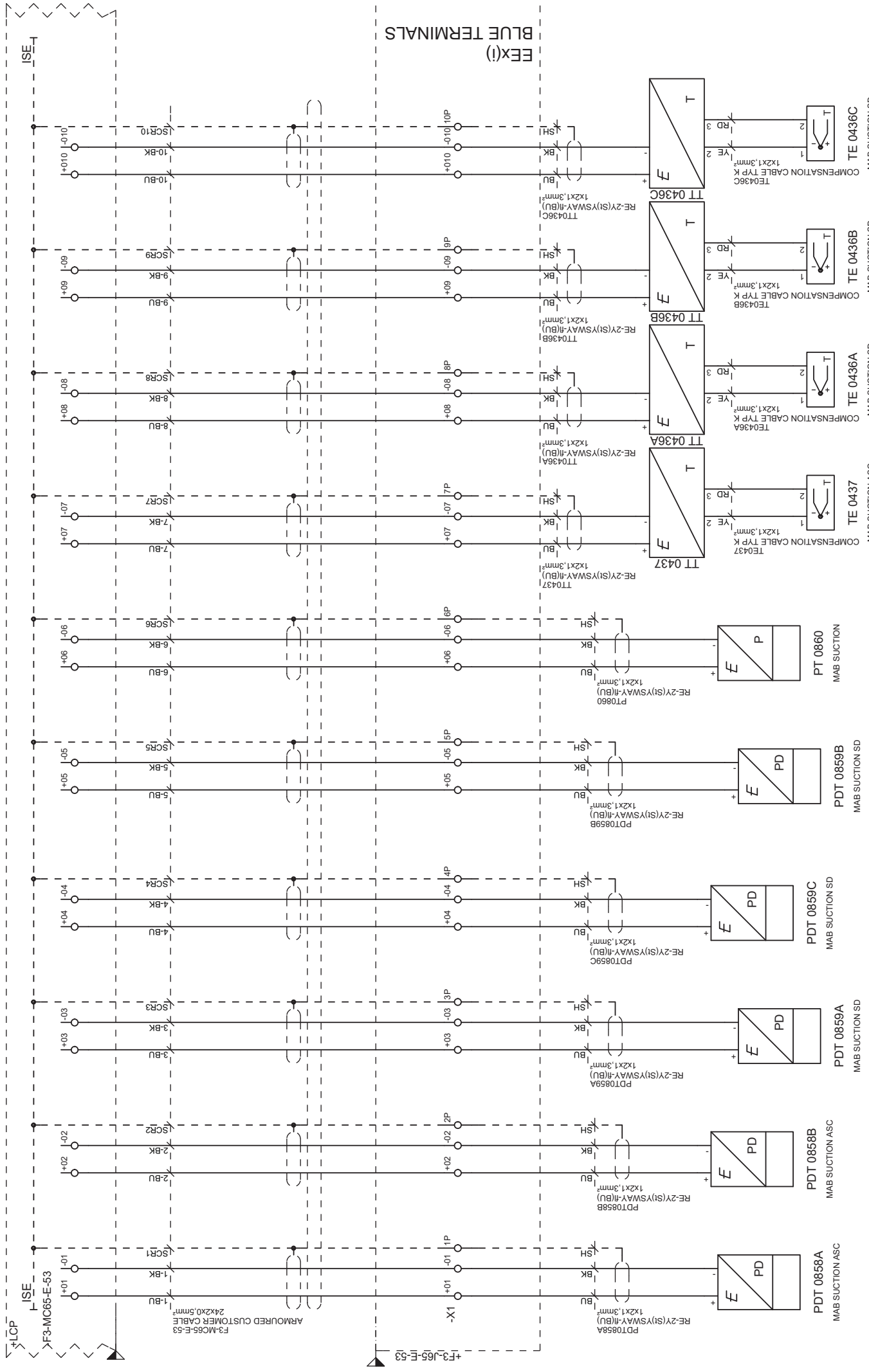
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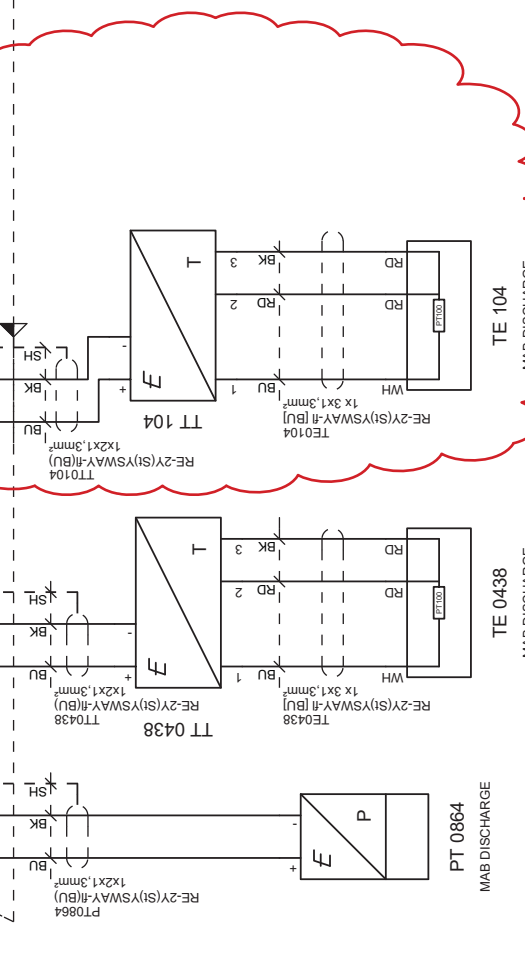
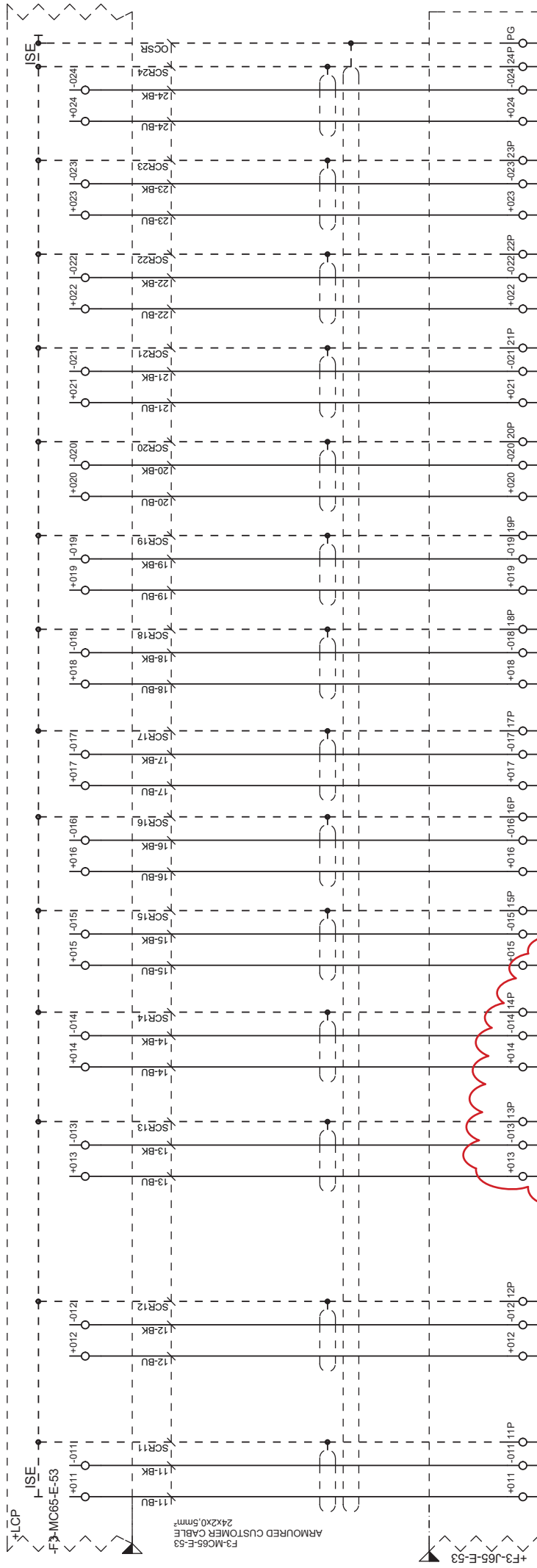
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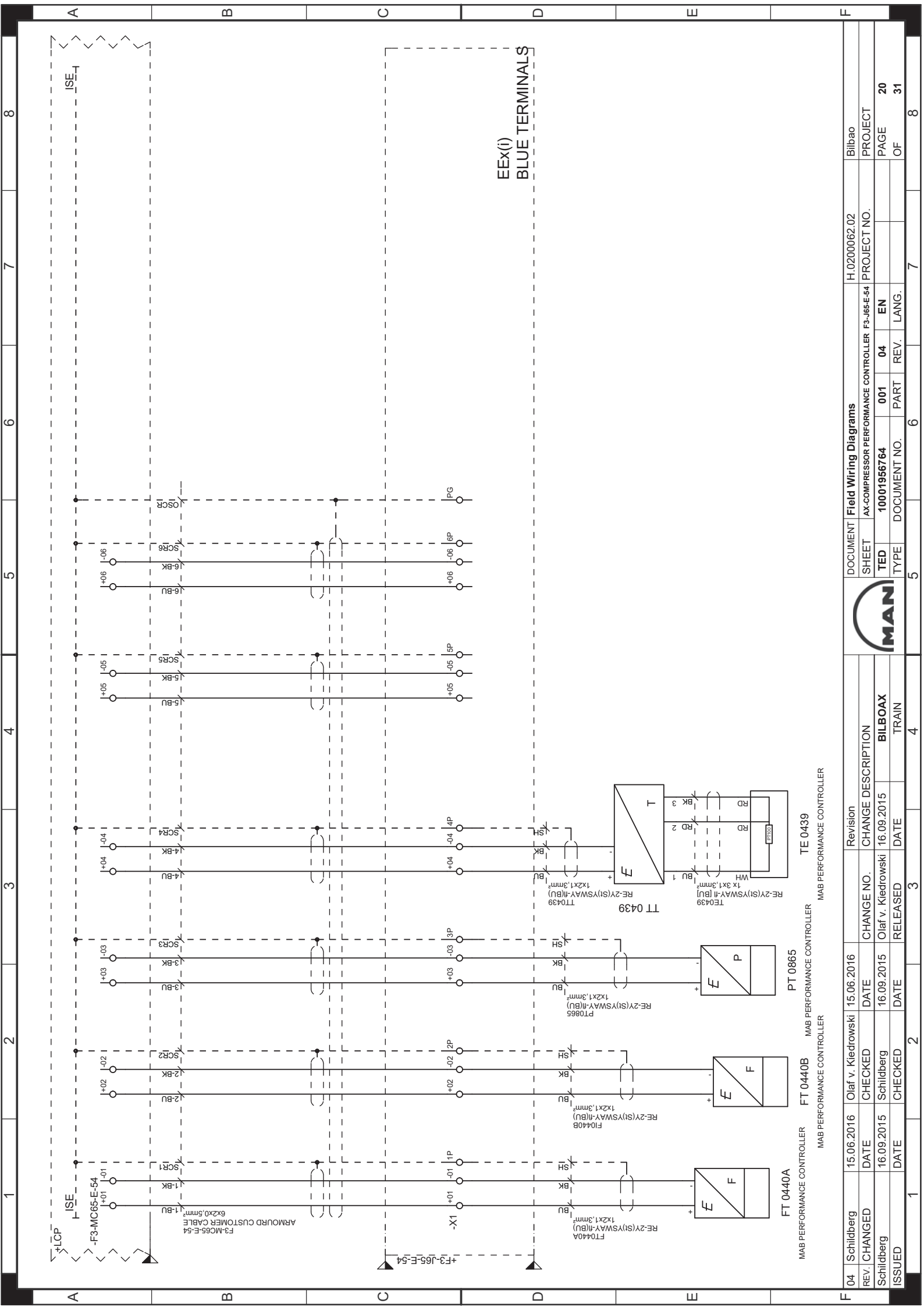
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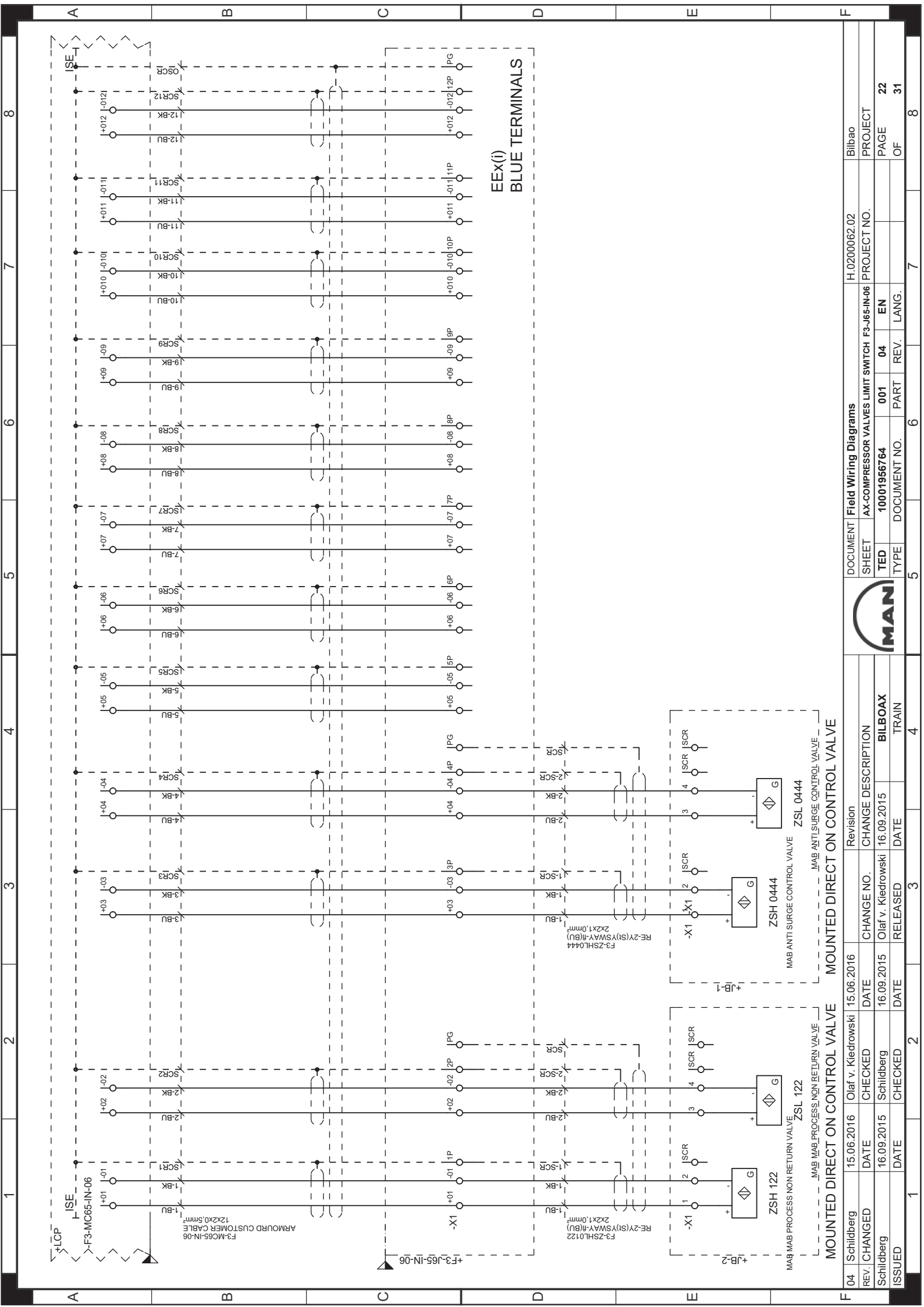


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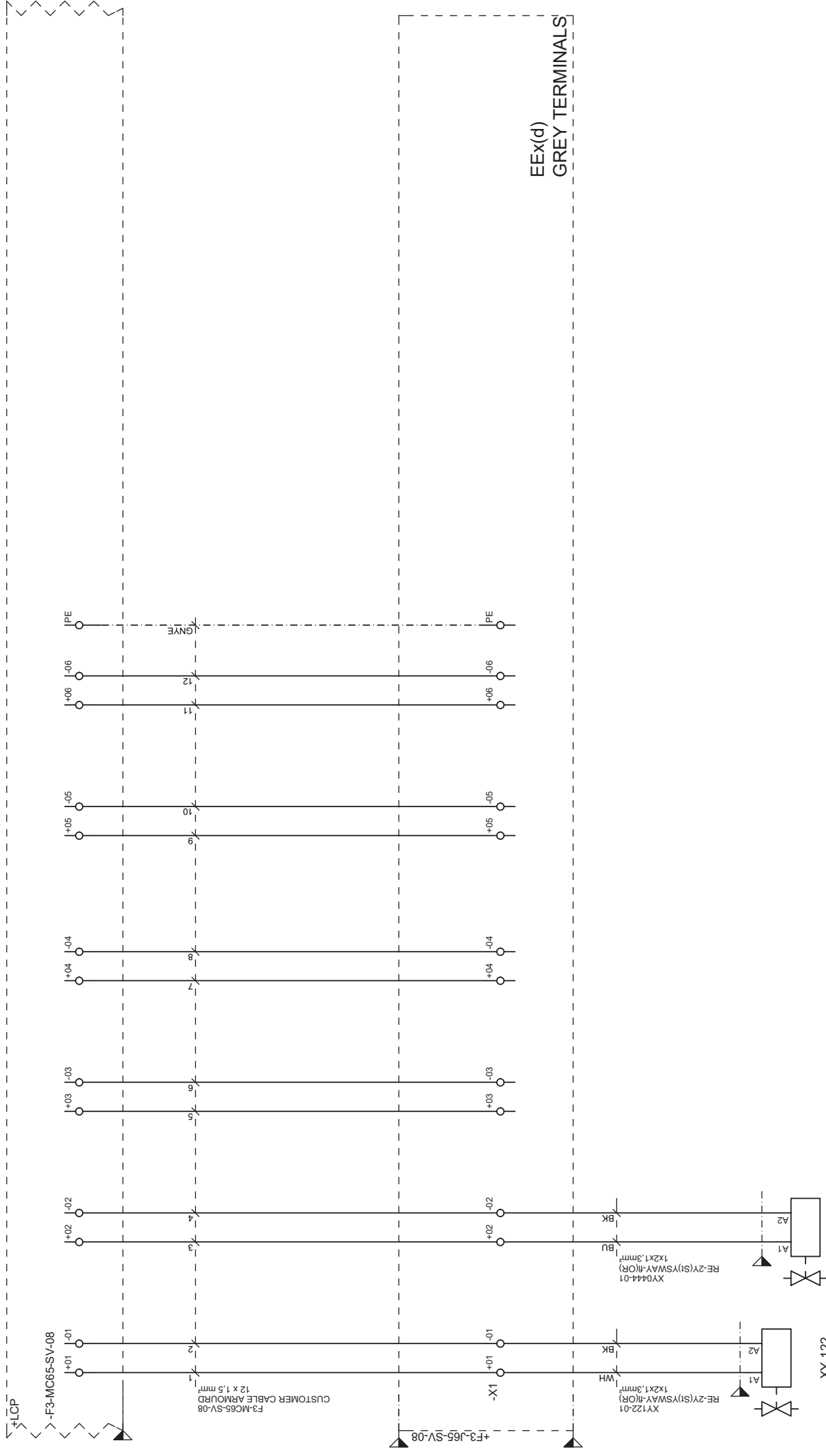


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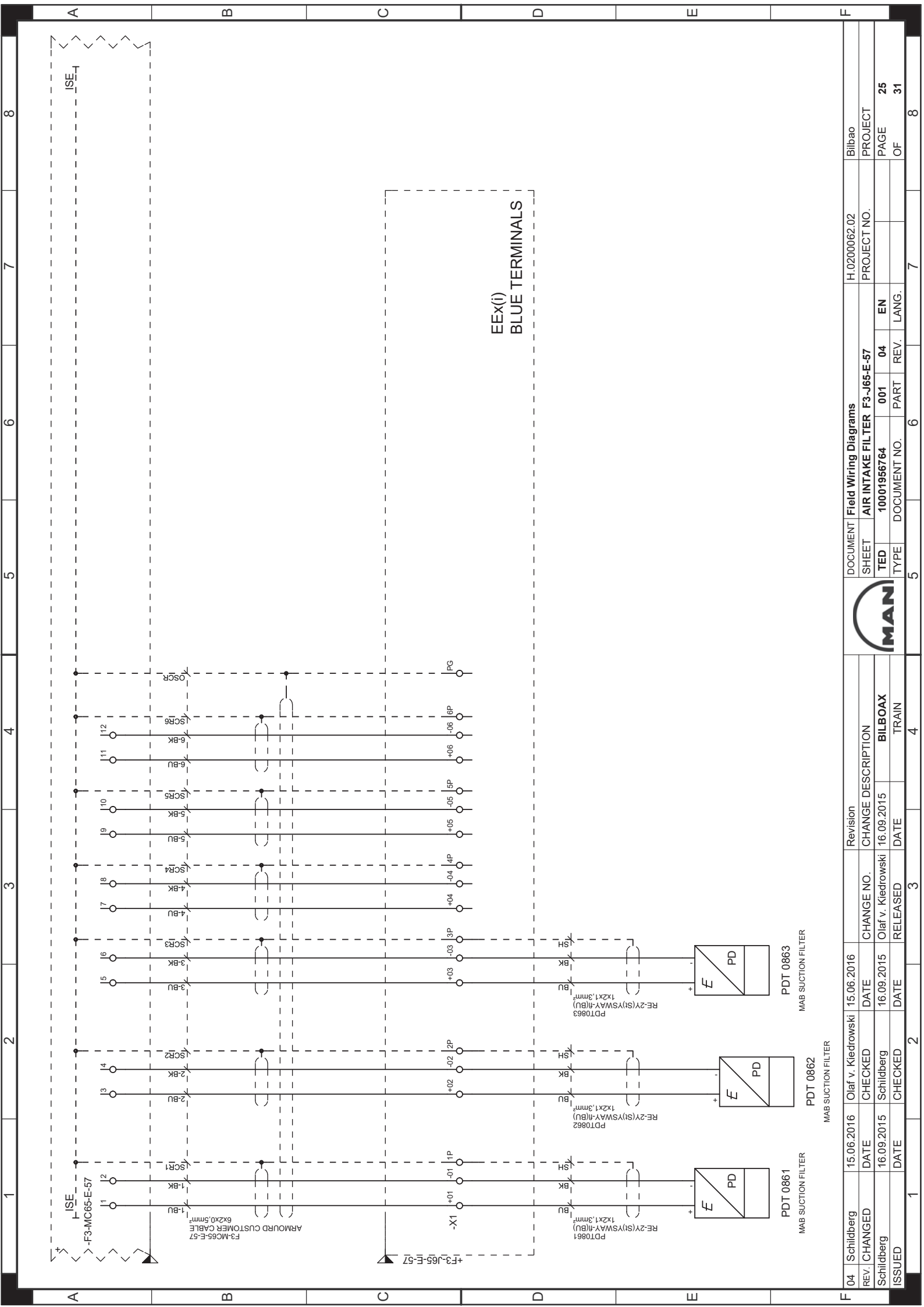
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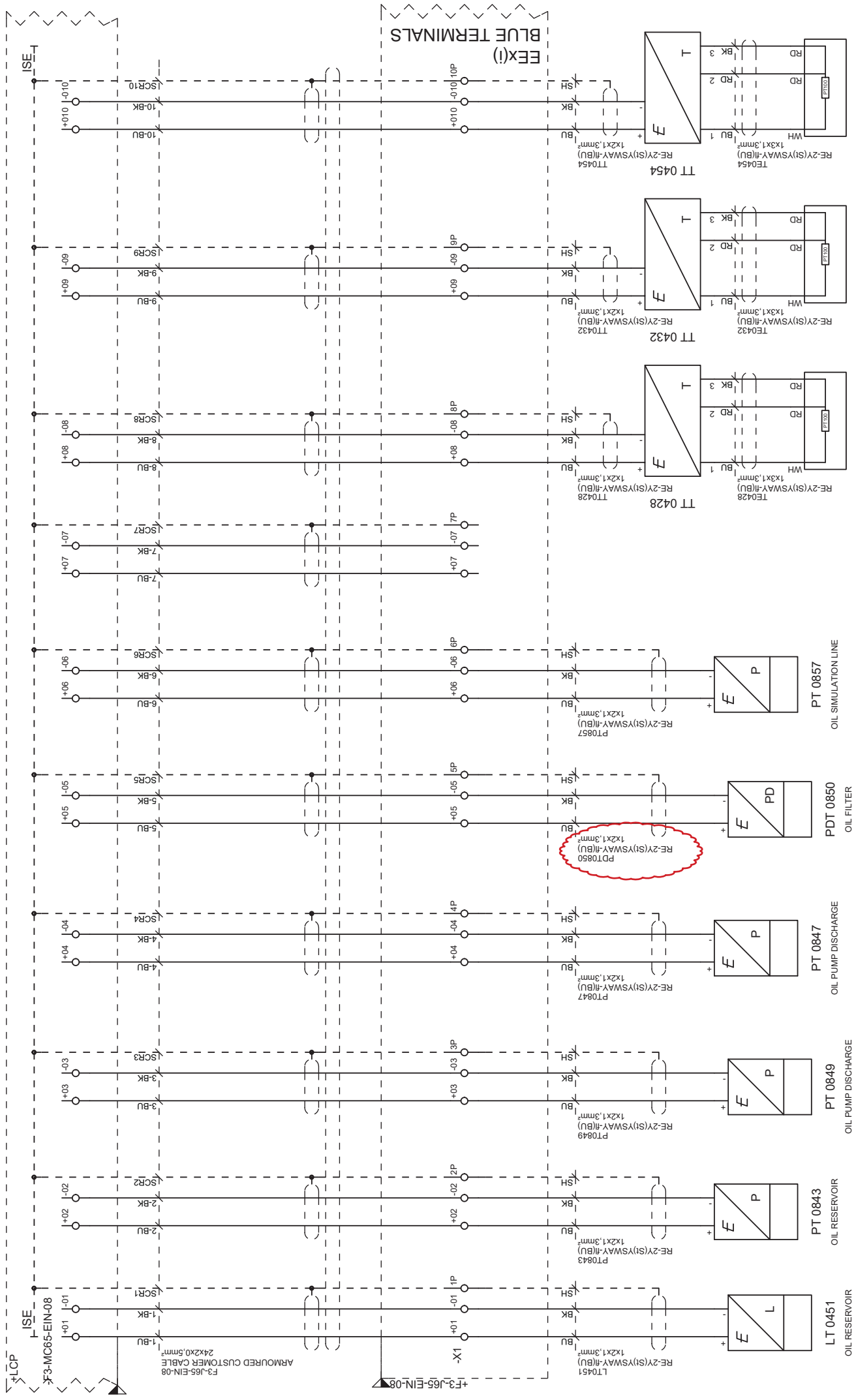
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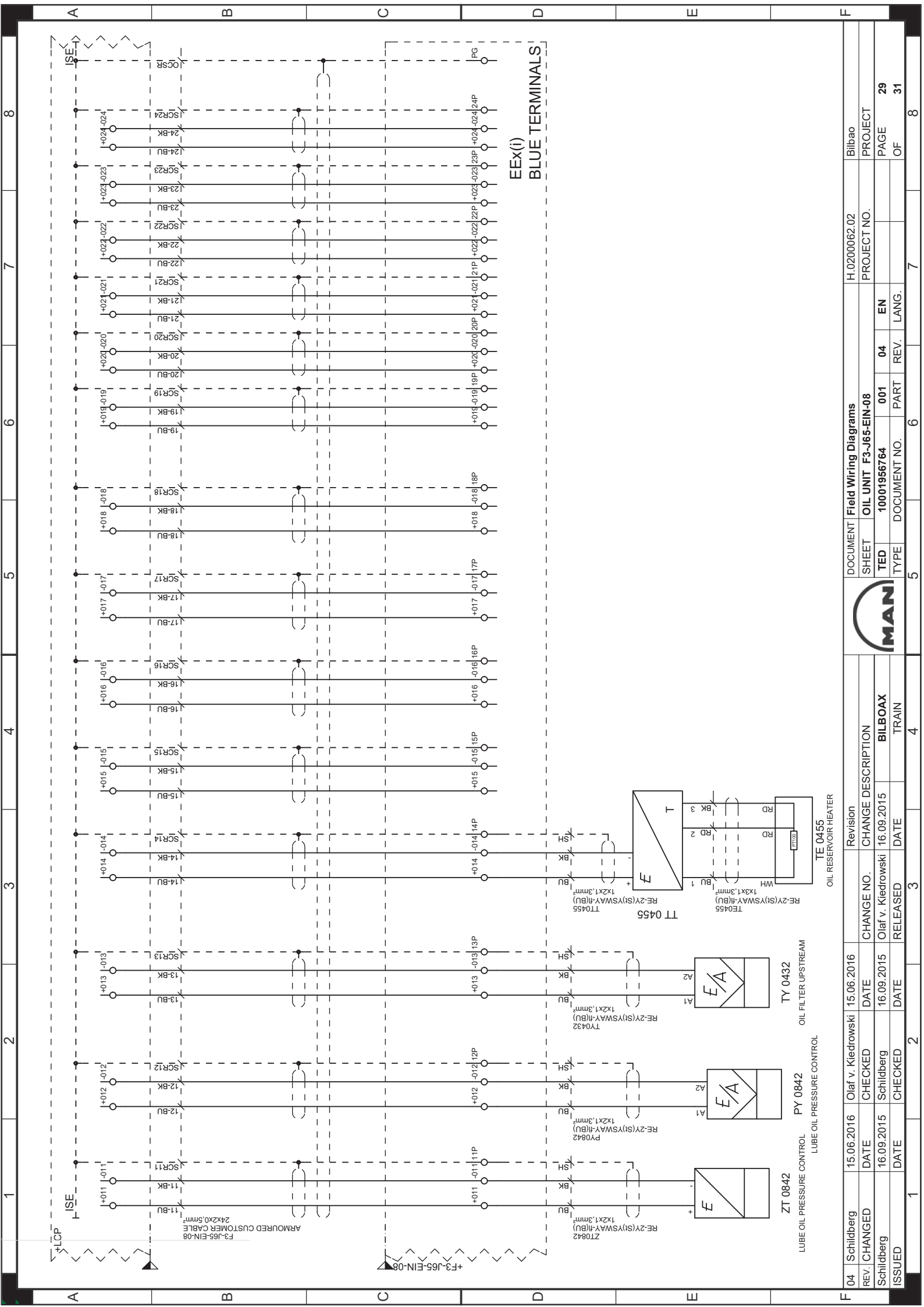
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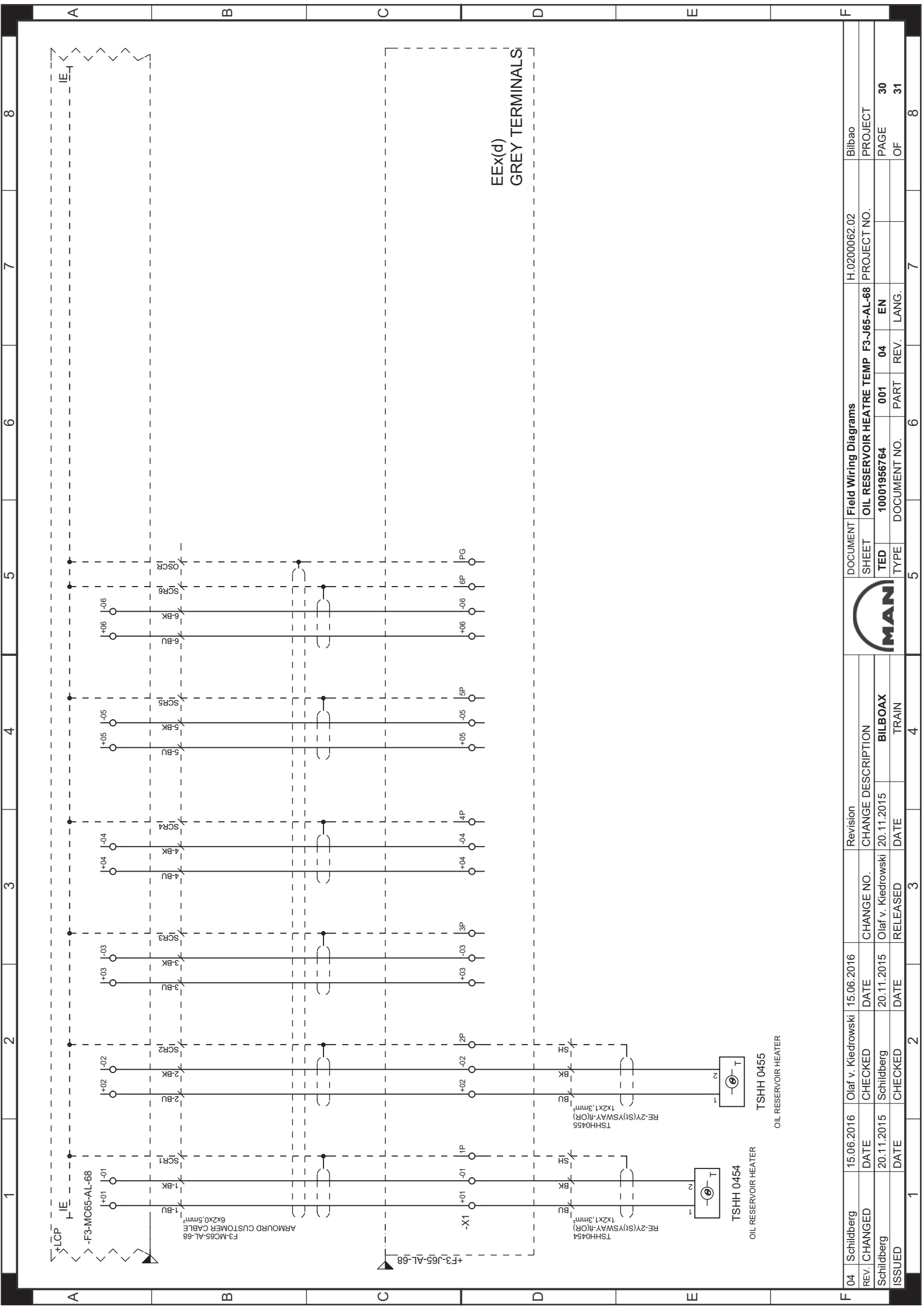
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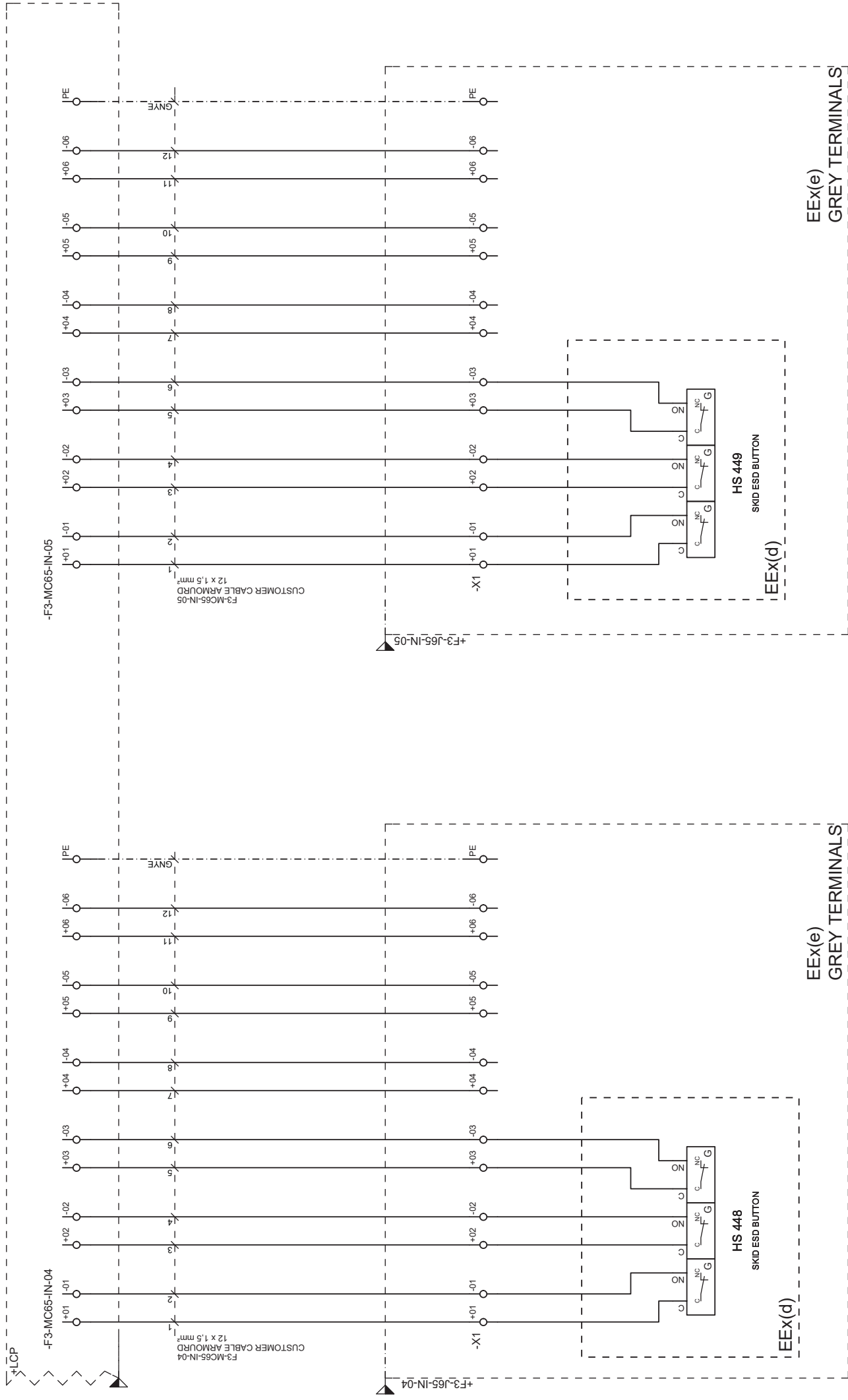
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1	10001956751	001	02	05.07.2016	COVER SHEET	1	Schildberg, Carsten	17.09.2015	24	10001956751	001	02	05.07.2016	THERMOWELL	44	Schildberg, Carsten	18.09.2015
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3	10001956751	001	02	05.07.2016	RESISTANCE THERMOMETER	5	Schildberg, Carsten	18.09.2015	26	10001956751	001	02	05.07.2016	ELECTR. TEMPERATURE TRANSMITTER	47	Schildberg, Carsten	22.06.2016
4	10001956751	001	02	05.07.2016	RESISTANCE THERMOMETER	7	Schildberg, Carsten	18.09.2015	27	10001956751	001	02	05.07.2016	ELECTR. PRESS. TRANS. WITH INDICATOR	49	Schildberg, Carsten	22.06.2016
5	10001956751	001	02	05.07.2016	RESISTANCE THERMOMETER	9	Schildberg, Carsten	18.09.2015	28	10001956751	001	02	05.07.2016	LEVEL INDICATOR	51	Schildberg, Carsten	22.06.2016
6	10001956751	001	02	05.07.2016	GUIDED WAVE RADAR LEVEL TRANSMITTER	11	Schildberg, Carsten	18.09.2015	29	10001956751	001	02	05.07.2016	ELECTR. TEMPERATURE TRANSMITTER	53	Schildberg, Carsten	05.07.2016
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8	10001956751	001	02	05.07.2016	ELECTR. PRESS. TRANS. WITH INDICATOR	15	Schildberg, Carsten	18.09.2015	31	10001956751	001	02	05.07.2016	THERMOCOUPLE WITH HEAD TRANSMITTER	57	Schildberg, Carsten	17.09.2015
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14	10001956751	001	02	05.07.2016	PRESSURE GAUGE	27	Schildberg, Carsten	18.09.2015	37	10001956751	001	02	05.07.2016	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	69	Schildberg, Carsten	17.09.2015
15	10001956751	001	02	05.07.2016	PRESSURE GAUGE	29	Schildberg, Carsten	18.09.2015	38	10001956751	001	02	05.07.2016	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR	71	Schildberg, Carsten	17.09.2015
16	10001956751	001	02	05.07.2016	PRESSURE GAUGE	31	Schildberg, Carsten	18.09.2015	39	10001956751	001	02	05.07.2016	LIMIT SWITCH	73	Schildberg, Carsten	22.06.2016
17	10001956751	001	02	05.07.2016	PRESSURE GAUGE	33	Schildberg, Carsten	18.09.2015	40	10001956751	001	02	05.07.2016	RESISTANCE THERMOMETER	75	Schildberg, Carsten	22.06.2016
18	10001956751	001	02	05.07.2016	DIFF. PRESSURE GAUGE	35	Schildberg, Carsten	18.09.2015	41	10001956751	001	02	05.07.2016	POSITION MONITORING	77	Schildberg, Carsten	22.06.2016
19	10001956751	001	02	05.07.2016	LEVEL INDICATOR	37	Schildberg, Carsten	18.09.2015	42	10001956751	001	02	05.07.2016	ELECTR. TEMPERATURE TRANSMITTER	78	Schildberg, Carsten	22.06.2016
20	10001956751	001	02	05.07.2016	THERMOWELL	39	Schildberg, Carsten	18.09.2015	43	10001956751	001	02	05.07.2016	ELECTR. TEMPERATURE TRANSMITTER	80	Schildberg, Carsten	22.06.2016
21	10001956751	001	02	05.07.2016	THERMOWELL	40	Schildberg, Carsten	18.09.2015	44	10001956751	001	02	05.07.2016	THERMOMETER	82	Schildberg, Carsten	22.06.2016
22	10001956751	001	02	05.07.2016	THERMOWELL	41	Schildberg, Carsten	18.09.2015	45	10001956751	001	02	05.07.2016	THERMOMETER	84	Schildberg, Carsten	22.06.2016
23	10001956751	001	02	05.07.2016	THERMOWELL	42	Schildberg, Carsten	18.09.2015	46	10001956751	001	02	05.07.2016	PRESSURE GAUGE	86	Schildberg, Carsten	22.06.2016
																	
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48	10001956751	001	02 05.07.2016	THERMOWELL	89	Schildberg, Carsten 22.06.2016	71	10001956751	001	02 05.07.2016	LIMIT SWITCH	130	Schildberg, Carsten 05.07.2016
49	10001956751	001	02 05.07.2016	THERMOWELL	90	Schildberg, Carsten 22.06.2016							
50	10001956751	001	02 05.07.2016	SHAFT CONTROL PROBES	91	Schildberg, Carsten 17.09.2015							
51	10001956751	001	02 05.07.2016	BEAR. RESIST. THERM.	93	Schildberg, Carsten 17.09.2015							
52	10001956751	001	02 05.07.2016	BEAR. RESIST. THERM.	95	Schildberg, Carsten 17.09.2015							
53	10001956751	001	02 05.07.2016	PROXIMITOR	97	Schildberg, Carsten 17.09.2015							
54	10001956751	001	02 05.07.2016	THERMOMETER	99	Schildberg, Carsten 17.09.2015							
55	10001956751	001	02 05.07.2016	THERMOWELL	101	Schildberg, Carsten 17.09.2015							
56	10001956751	001	02 05.07.2016	THERMOMETER	103	Schildberg, Carsten 02.12.2015							
57	10001956751	001	02 05.07.2016	RESIST. THERM. PT100	105	Schildberg, Carsten 22.06.2016							
58	10001956751	001	02 05.07.2016	PRESSURE GAUGE	107	Schildberg, Carsten 22.06.2016							
59	10001956751	001	02 05.07.2016	PRESSURE GAUGE	109	Schildberg, Carsten 22.06.2016							
60	10001956751	001	02 05.07.2016	PRESSURE GAUGE	111	Schildberg, Carsten 22.06.2016							
61	10001956751	001	02 05.07.2016	THERMOWELL	113	Schildberg, Carsten 22.06.2016							
62	10001956751	001	02 05.07.2016	SHAFT CONTROL PROBES	115	Schildberg, Carsten 17.09.2015							
63	10001956751	001	02 05.07.2016	BEAR. RESIST. THERM.	117	Schildberg, Carsten 17.09.2015							
64	10001956751	001	02 05.07.2016	PROXIMITOR	119	Schildberg, Carsten 17.09.2015							
65	10001956751	001	02 05.07.2016	PROXIMITOR	120	Schildberg, Carsten 17.09.2015							
66	10001956751	001	02 05.07.2016	SHAFT CONTROL PROBES	121	Schildberg, Carsten 02.12.2015							
67	10001956751	001	02 05.07.2016	PROXIMITOR	123	Schildberg, Carsten 02.12.2015							
68	10001956751	001	02 05.07.2016	THERMOMETER	125	Schildberg, Carsten 22.06.2016							
69	10001956751	001	02 05.07.2016	PRESSURE GAUGE	127	Schildberg, Carsten 22.06.2016							
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	PROJECT NO.	H.0200062.02	RESISTANCE THERMOMETER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			0065				
3	ITEM NUMBER	0065									
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-60 ... +600 °C			ELECTRICAL CONNECTION			TERMINAL BLOCK			
8	ACCURACY	KLASSE A 0...450 °C			CABLE ENTRY POINT			FEMALE THREAD 1/2-14 NPT			
9	LOOP ARRANGEMENT	3-WIRE									
10	MEASURING ELEMENT	PT 100 DIN			EXTENSION CONNECTION			1/2" NPT FEMALE			
11	MEASURING ELEMENT MATERIAL	1.4541			EXTENSION DIAMETER			12 x 1,5 mm			
12	STANDARD	DIN/EN 60751 (IEC751)									
13	NUMBER OF ELEMENTS	2									
14	HIGH VIBRATION PROOF	YES			PROCESS CONNECTION			SEE SEP. DATA SHEET			
15											
16											
17	CASING MATERIAL	STAINLESS STEEL			ALLOWABLE AMBIENT TEMP.			-40 ... +85 °C			
18					ALLOWABLE MEDIUM TEMP.			0 ... +350 °C			
19	EXTENSION MATERIAL	STAINLESS STEEL			EXTENSION CONNECTION PROCESS			1/2" NPT MALE			
20	EARTHING SCREW	NO									
21	CAPTION LABEL	SS TAG LABEL									
22											
23											
24											
25	SAFETY - CERTIFICATE /										
26	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES			
27	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO			
28	SIL - CONFIRMATION	NO			PRESSURE TEST			NO			
29											
30											
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1	ELECTRONICAL UTILIZATION CATEGORY /										
2	EXPLOSION PROTECTION	II 2G EEx ia IIC T6									
3											
4											
5	SIL - FUNCTIONAL SAFETY /										
6											
7											
8											
9	UTILITIES /										
10	THERMOWELL	YES			THERMOWELL MATERIAL	SEE SEP. DATA SHEET					
11	THERMOWELL TYPE	SEE SEP. DATA SHEET									
12											
13											
14	TAG-NO.	DESIGNATION			ADJU. RANGE						
15	TE 0432	OIL FILTER UPSTREAM			0 100 °C						
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
	SHEET	RESISTANCE THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			0065				
3	ITEM NUMBER	0065									
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-60 ... +600 °C			ELECTRICAL CONNECTION			TERMINAL BLOCK			
8	ACCURACY	KLASSE A 0...450 °C			CABLE ENTRY POINT			FEMALE THREAD 1/2-14 NPT			
9	LOOP ARRANGEMENT	3-WIRE									
10	MEASURING ELEMENT	PT 100 DIN			EXTENSION CONNECTION			1/2" NPT FEMALE			
11	MEASURING ELEMENT MATERIAL	1.4541			EXTENSION DIAMETER			12 x 1,5 mm			
12	STANDARD	DIN/EN 60751 (IEC751)									
13	NUMBER OF ELEMENTS	2									
14	HIGH VIBRATION PROOF	YES			PROCESS CONNECTION			SEE SEP. DATA SHEET			
15											
16											
17	CASING MATERIAL	STAINLESS STEEL			ALLOWABLE AMBIENT TEMP.			-40 ... +85 °C			
18					ALLOWABLE MEDIUM TEMP.			0 ... +350 °C			
19	EXTENSION MATERIAL	STAINLESS STEEL			EXTENSION CONNECTION PROCESS			1/2" NPT MALE			
20	EARTHING SCREW	NO									
21	CAPTION LABEL	SS TAG LABEL									
22											
23											
24											
25	SAFETY - CERTIFICATE /										
26	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES			
27	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO			
28	SIL - CONFIRMATION	NO			PRESSURE TEST			NO			
29											
30											
	SHEET	RESISTANCE THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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1	ELECTRONICAL UTILIZATION CATEGORY /										
2	EXPLOSION PROTECTION	II 2G EEx ia IIC T6									
3											
4											
5	SIL - FUNCTIONAL SAFETY /										
6											
7											
8											
9	UTILITIES /										
10	THERMOWELL	YES			THERMOWELL MATERIAL	SEE SEP. DATA SHEET					
11	THERMOWELL TYPE	SEE SEP. DATA SHEET									
12											
13											
14	TAG-NO.	DESIGNATION			ADJU. RANGE						
15	TE 0428	OIL RESERVOIR			0 100 °C						
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
	SHEET	RESISTANCE THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT NO.	H.0200062.02	RESISTANCE THERMOMETER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	Jumo	02	TYPE			9022...	02			
3	ITEM NUMBER	9022503241510011650011400000								02	
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-200 ... +600 °C	02								
8	ACCURACY	KLASSE B	02								
9	LOOP ARRANGEMENT	3-WIRE									
10	MEASURING ELEMENT	PT 100 DIN									
11	MEASURING ELEMENT MATERIAL	1.4541		EXTENSION DIAMETER			6 mm	02			
12	STANDARD	DIN/EN 60751 (IEC751)									
13	NUMBER OF ELEMENTS	1	02								
14	HIGH VIBRATION PROOF	NO	02	PROCESS CONNECTION			NOT DETERMINED	02			
15				INSERT LENGTH			500 mm	02			
16											
17	CASING MATERIAL	1.4571	02				...				
18							...				
19	EXTENSION MATERIAL	1.4571	02								
20	EARTHING SCREW	NO									
21	CAPTION LABEL	SS TAG LABEL									
22											
23											
24											
25	SAFETY - CERTIFICATE /										
26	DECLARATION OF CONFORMITY	NO	02	MATERIAL CERTIFICATE			NO	02			
27	CALIBRATION DATA SHEET	NO	02	NACE - CONFIRMATION			NO				
28	SIL - CONFIRMATION	NO		PRESSURE TEST			NO				
29											
30											
	SHEET	RESISTANCE THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT NO.	H.0200062.02		RESISTANCE THERMOMETER							
1	ELECTRONICAL UTILIZATION CATEGORY /										
2											
3											
4											
5	SIL - FUNCTIONAL SAFETY /										
6											
7											
8											
9	UTILITIES /										
10											
11											
12											
13											
14	TAG-NO.	DESIGNATION			ADJU. RANGE						
15	TE 0454	OIL RESERVOIR HEATER			0 100 °C						
16	TE 0455	OIL RESERVOIR HEATER			0 100 °C						
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
	SHEET		RESISTANCE THERMOMETER			TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT NO.	H.0200062.02		GUIDED WAVE RADAR LEVEL TRANSMITTER								
1	MANUFACTURER DATA /											
2	MANUFACTURER	ROSEMOUNT			TYPE			5301 HA				
3	ITEM NUMBER	5301HA										
4												
5												
6	TECHNICAL DATA /											
7	MEASURING RANGE	0 ... 100 %			CAPTION LABEL			SS TAG LABEL				
8	ACCURACY	+/- 5mm										
9	AUXILIARY POWER	14 ... 30 V DC										
10	ELECTRICAL CONNECTION	SCREW TERMINALS										
11	CABLE ENTRY POINT	FEMALE THREAD 1/2-14 NPT			MEASURING PRINCIPLE			RADAR				
12	LOOP ARRANGEMENT	2-WIRE			STANDARD			ANSI				
13	OUTPUT SIGNAL	4-20mA HART-PROTOCOL			MEASURING ELEMENT			COAX. RADAR PROBE				
14	ASSEMBLING	TOP OF TANK			MEASURING ELEMENT MATERIAL			1.4404 / SST 316L				
15	LOCAL INDICATION	LCD-INDICATOR			ALLOWABLE AMBIENT TEMP.			-20 ... 70 °C				
16	CASING PROTECTION CATEGORY	IP66			ALLOWABLE MEDIUM TEMP.			-40 ... 150 °C				
17	CASING MATERIAL	PU COVERED ALUMINUM										
18												
19												
20												
21	SAFETY - CERTIFICATE /											
22	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES				
23	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO				
24	SIL - CONFIRMATION	NO			PRESSURE TEST			NO				
25												
26	ELECTRONICAL UTILIZATION CATEGORY /											
27	EXPLOSION PROTECTION	II 1 G EEx ia IIC T4										
28												
29												
30												
	SHEET	GUIDED WAVE RADAR LEVEL TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783				
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1	SIL - FUNCTIONAL SAFETY /												
2													
3													
4													
5	UTILITIES /												
6													
7													
8													
9													
10													
11													
12													
13	TAG-NO.	DESIGNATION				ADJU. RANGE							
14	LT 0451	OIL RESERVOIR				0 100 %							
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		GUIDED WAVE RADAR LEVEL TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783				
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1	MANUFACTURER DATA /											
2	MANUFACTURER	ROSEMOUNT			TYPE			5301 HA				
3	ITEM NUMBER	5301HA										
4												
5												
6	TECHNICAL DATA /											
7	MEASURING RANGE	0 ... 100 %			CAPTION LABEL			SS TAG LABEL				
8	ACCURACY	+/- 5mm										
9	AUXILIARY POWER	14 ... 30 V DC										
10	ELECTRICAL CONNECTION	SCREW TERMINALS										
11	CABLE ENTRY POINT	FEMALE THREAD 1/2-14 NPT			MEASURING PRINCIPLE			RADAR				
12	LOOP ARRANGEMENT	2-WIRE			STANDARD			ANSI				
13	OUTPUT SIGNAL	4-20mA HART-PROTOCOL			MEASURING ELEMENT			COAX. RADAR PROBE				
14	ASSEMBLING	TOP OF TANK			MEASURING ELEMENT MATERIAL			1.4404 / SST 316L				
15	LOCAL INDICATION	LCD-INDICATOR			ALLOWABLE AMBIENT TEMP.			-20 ... 70 °C				
16	CASING PROTECTION CATEGORY	IP66			ALLOWABLE MEDIUM TEMP.			-40 ... 150 °C				
17	CASING MATERIAL	PU COVERED ALUMINUM										
18												
19												
20												
21	SAFETY - CERTIFICATE /											
22	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES				
23	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO				
24	SIL - CONFIRMATION	NO			PRESSURE TEST			NO				
25												
26	ELECTRONICAL UTILIZATION CATEGORY /											
27	EXPLOSION PROTECTION	II 1 G EEx ia IIC T4										
28												
29												
30												
	SHEET	GUIDED WAVE RADAR LEVEL TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783				
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1	SIL - FUNCTIONAL SAFETY /												
2													
3													
4													
5	UTILITIES /												
6													
7													
8													
9													
10													
11													
12													
13	TAG-NO.	DESIGNATION					ADJU. RANGE						
14	LT 0453	OVERHEAD RESERVOIR					0 100 %						
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		GUIDED WAVE RADAR LEVEL TRANSMITTER					TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT NO.	H.0200062.02		ELECTR. PRESS. TRANS. WITH INDICATOR							
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT			TYPE			3051 CG			
3	ITEM NUMBER	3051CG4A02A1AM5I1V5S5C4Q4Q8HR5									
4	SAP NUMBER	10747266									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-62 ... 62 mbar			CASING MATERIAL			PU COVERED ALUMINUM			
8	COMMENT MEASUR. RANGE	PROGRAMMABLE			LIQUID FILLING			SILICON OIL			
9	ACCURACY	± 0,04 %			EARTHING SCREW			YES			
10	TRANSMITTER FAILURE MODE	RISING, NAMUR NE43			CAPTION LABEL			SS TAG LABEL			
11	CABLE ENTRY POINT	FEMALE THREAD 1/2-14 NPT			PROCESS CONNECTION			1/2" NPT FEMALE 1.4401 AISI 316			
12					O RING MATERIAL			PTFE, GLASSFILLED			
13	AUXILIARY POWER	10,5...30 V DC			MEASURING ELEMENT			DIAPHRAGM			
14	LOOP ARRANGEMENT	2-WIRE			MEASURING ELEMENT MATERIAL			1.4404 AISI 316L			
15	OUTPUT SIGNAL	4-20mA HART-PROTOCOL			ALLOWABLE AMBIENT TEMP.			-40 ... 80 °C			
16	ASSEMBLING	UNIVERSAL MOUNTING BRACKET			ALLOWABLE MEDIUM TEMP.			-40 ... 149 °C			
17	LOCAL INDICATION	LCD INDICATOR			ALLOWABLE OP. PRESSURE			250 bar(g)			
18	CASING PROTECTION CATEGORY	IP 66									
19											
20											
21	SAFETY - CERTIFICATE /										
22	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES			
23	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO			
24	SIL - CONFIRMATION	NO			PRESSURE TEST			NO			
25											
26	ELECTRONICAL UTILIZATION CATEGORY /										
27	EXPLOSION PROTECTION	II 1 GD Ex ia IIC T4									
28											
29											
30											
	SHEET	ELECTR. PRESS. TRANS. WITH INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao		DATASHEET								
	PROJECT NO.	H.0200062.02		ELECTR. PRESS. TRANS. WITH INDICATOR								
1	SIL - FUNCTIONAL SAFETY /											
2												
3												
4												
5	UTILITIES /											
6	MANIFOLD	INTEGR. 2F.-MANIFOLD BLOCK			MANUFACTURER MANIFOLD			ROSEMOUNT				
7	CATALOGUE-NO. MANIFOLD	0305RC22B11B4L4										
8												
9												
10												
11	TAG-NO.	DESIGNATION				ADJU. RANGE						
12	PT 0843	OIL RESERVOIR				0 60 mbar						
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
	SHEET	ELECTR. PRESS. TRANS. WITH INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.	10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 16 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	ELECTR. PRESS. TRANS. WITH INDICATOR								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			3051 CG				
3	ITEM NUMBER	3051CG4A02A1AM5I1V5S5C4Q4Q8HR5									
4	SAP NUMBER	10747266									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0.98 ... 20.7 bar		CASING MATERIAL			PU COVERED ALUMINUM				
8	COMMENT MEASUR. RANGE	PROGRAMMABLE		LIQUID FILLING			SILICON OIL				
9	ACCURACY	± 0,04 %		EARTHING SCREW			YES				
10	TRANSMITTER FAILURE MODE	RISING, NAMUR NE43		CAPTION LABEL			SS TAG LABEL				
11	CABLE ENTRY POINT	FEMALE THREAD 1/2-14 NPT		PROCESS CONNECTION			½" NPT FEMALE 1.4401 AISI 316				
12				O RING MATERIAL			PTFE, GLASSFILLED				
13	AUXILIARY POWER	10,5...30 V DC		MEASURING ELEMENT			DIAPHRAGM				
14	LOOP ARRANGEMENT	2-WIRE		MEASURING ELEMENT MATERIAL			1.4404 AISI 316L				
15	OUTPUT SIGNAL	4-20mA HART-PROTOCOL		ALLOWABLE AMBIENT TEMP.			-40 ... 80 °C				
16	ASSEMBLING	UNIVERSAL MOUNTING BRACKET		ALLOWABLE MEDIUM TEMP.			-40 ... 149 °C				
17	LOCAL INDICATION	LCD INDICATOR		ALLOWABLE OP. PRESSURE			250 bar(g)				
18	CASING PROTECTION CATEGORY	IP 66									
19											
20											
21	SAFETY - CERTIFICATE /										
22	DECLARATION OF CONFORMITY	YES		MATERIAL CERTIFICATE			YES				
23	CALIBRATION DATA SHEET	YES		NACE - CONFIRMATION			NO				
24	SIL - CONFIRMATION	NO		PRESSURE TEST			NO				
25											
26	ELECTRONICAL UTILIZATION CATEGORY /										
27	EXPLOSION PROTECTION	II 1 GD Ex ia IIC T4									
28											
29											
30											
	SHEET	ELECTR. PRESS. TRANS. WITH INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE OF17131

	PROJECT	Bilbao	DATASHEET											
	PROJECT NO.	H.0200062.02	ELECTR. PRESS. TRANS. WITH INDICATOR											
1	SIL - FUNCTIONAL SAFETY /													
2														
3														
4														
5	UTILITIES /													
6	MANIFOLD	INTEGR. 2F.-MANIFOLD BLOCK			MANUFACTURER MANIFOLD			ROSEMOUNT						
7	CATALOGUE-NO. MANIFOLD	0305RC22B11B4L4												
8														
9														
10														
11	TAG-NO.	DESIGNATION				ADJU. RANGE								
12	PT 0849	OIL PUMP DISCHARGE				0 16 bar(g)								
13	PT 0847	OIL PUMP DISCHARGE				0 15 bar(g)								
14	PT 0857	OIL SIMULATION LINE				0 12 bar(g)								
15														
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
	SHEET		ELECTR. PRESS. TRANS. WITH INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783					
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE OF	18 131

	PROJECT	Bilbao		DATASHEET							
	PROJECT NO.	H.0200062.02		ELECTR. DIFF. PRESSURE TRANS. W. INDICATION							
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT			TYPE			3051 CD			
3	ITEM NUMBER	3051CD-2									
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-623 ... 623 mbar			ASSEMBLING			UNIVERSAL MOUNTING BRACKET			
8					LOCAL INDICATION			LCD INDICATOR			
9	ACCURACY	± 0,065 %			CASING PROTECTION CATEGORY			IP 66			
10	TRANSMITTER FAILURE MODE	RISING			CASING MATERIAL			PU COVERED ALUMINUM			
11	CABLE ENTRY POINT	FEMALE THREAD M20 X 1.5			LIQUID FILLING			SILICON OIL			
12	ELECTRICAL CONNECTION	SCREW TERMINALS			EARTHING SCREW			YES			
13	AUXILIARY POWER	10,5...42,4 V DC			CAPTION LABEL			SS TAG LABEL			
14	LOOP ARRANGEMENT	2-WIRE			PROCESS CONNECTION			½" NPT FEMALE, 1.4401			
15	OUTPUT SIGNAL	4-20mA, HART-PROTOCOL			O RING MATERIAL			PTFE, GLASSFILLED			
16					ALLOWABLE AMBIENT TEMP.			-20 ... 80 °C			
17	MEASURING ELEMENT	DIAPHRAGM			ALLOWABLE MEDIUM TEMP.			-40 ... 149 °C			
18	MEASURING ELEMENT MATERIAL	1.4404 AISI 316L			ALLOWABLE OP. PRESSURE			250 bar			
19											
20											
21	SAFETY - CERTIFICATE /										
22	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES			
23	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO			
24	SIL - CONFIRMATION	NO			PRESSURE TEST			NO			
25											
26	ELECTRONICAL UTILIZATION CATEGORY /										
27	EXPLOSION PROTECTION	II 1/2 GD EEx d IIC T5									
28											
29											
30											
	SHEET	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao		DATASHEET									
	PROJECT NO.	H.0200062.02		ELECTR. DIFF. PRESSURE TRANS. W. INDICATION									
1	SIL - FUNCTIONAL SAFETY /												
2													
3													
4													
5	UTILITIES /												
6	MANIFOLD	INTEGR. 5W.-MANIFOLD			MANUFACTURER MANIFOLD			ANDERSON GREENWOOD					
7	CATALOGUE-NO. MANIFOLD	0305-A-C-5-2-B-1-1-B4-L4			PROCESS CONNECTION			½" NPT FEMALE, 1.4401					
8													
9													
10													
11	TAG-NO.	DESIGNATION				ADJU. RANGE							
12	PDT 0850	OIL FILTER				0 1.2 bar(g)							
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		ELECTR. DIFF. PRESS. TRANS. W. INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 20 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOMETER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			S 5550				
3											
4											
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0 ... 100 °C									
8					PROCESS CONNECTION			1/2" NPT			
9	ACCURACY	CLASS 1,0 (DIN 13190)			MEASURING ELEMENT			BIMETAL COIL			
10	SCALE UNIT	°C			MEASURING ELEMENT MATERIAL			BIMETAL			
11	DIAL	ALU, WHITE/ SCALE BLACK									
12	CASE STYLE	ADJUSTABLE EVERY ANGLE									
13	LIQUID FILLING	GLYCERINE									
14	CONNECTION POSITION	CENTER BACK									
15	CASING DIAMETER	100 mm									
16	GLASS COVER	SAFETY GLASS									
17	CASING MATERIAL	SS 316/316L									
18	CASING PROTECTION CATEGORY	IP66 (EN 60 529/ IEC 529)			ALLOWABLE AMBIENT TEMP.			-20 ... +60			
19	CAPTION LABEL	SS TAG LABEL			ALLOWABLE MEDIUM TEMP.			... 110 °C			
20											
21											
22											
23	SAFETY - CERTIFICATE /										
24	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES			
25	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO			
26	SIL - CONFIRMATION	NO			PRESSURE TEST			NO			
27											
28											
29											
30											
	SHEET	THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOMETER								
1	ELECTRONICAL UTILIZATION CATEGORY /										
2	EXPLOSION PROTECTION	II 2 GD EX c TX									
3											
4											
5	UTILITIES /										
6	THERMOWELL	SEE SEP. DATA SHEET									
7											
8											
9	TAG-NO.	DESIGNATION									
10	TI 0427	OIL RESERVOIR									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
	SHEET	THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOMETER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			S 5550				
3											
4											
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0 ... 100 °C									
8					PROCESS CONNECTION			1/2" NPT			
9	ACCURACY	CLASS 1,0 (DIN 13190)			MEASURING ELEMENT			BIMETAL COIL			
10	SCALE UNIT	°C			MEASURING ELEMENT MATERIAL			BIMETAL			
11	DIAL	ALU, WHITE/ SCALE BLACK									
12	CASE STYLE	ADJUSTABLE EVERY ANGLE									
13	LIQUID FILLING	GLYCERINE									
14	CONNECTION POSITION	CENTER BACK									
15	CASING DIAMETER	100 mm									
16	GLASS COVER	SAFETY GLASS									
17	CASING MATERIAL	SS 316/316L									
18	CASING PROTECTION CATEGORY	IP66 (EN 60 529/ IEC 529)			ALLOWABLE AMBIENT TEMP.			-20 ... +60			
19	CAPTION LABEL	SS TAG LABEL			ALLOWABLE MEDIUM TEMP.			... 110 °C			
20											
21											
22											
23	SAFETY - CERTIFICATE /										
24	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES			
25	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO			
26	SIL - CONFIRMATION	NO			PRESSURE TEST			NO			
27											
28											
29											
30											
	SHEET	THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE 23 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOMETER								
1	ELECTRONICAL UTILIZATION CATEGORY /										
2	EXPLOSION PROTECTION	II 2 GD EX c TX									
3											
4											
5	UTILITIES /										
6	THERMOWELL	SEE SEP. DATA SHEET									
7											
8											
9	TAG-NO.	DESIGNATION									
10	TI 0429	OIL PUMP DISCHARGE									
11	TI 0433	OIL FILTER UPSTREAM 1									
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
	SHEET	THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOMETER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			S 5550				
3											
4											
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0 ... 100 °C									
8					PROCESS CONNECTION			1/2" NPT			
9	ACCURACY	CLASS 1,0 (DIN 13190)			MEASURING ELEMENT			BIMETAL COIL			
10	SCALE UNIT	°C			MEASURING ELEMENT MATERIAL			BIMETAL			
11	DIAL	ALU, WHITE/ SCALE BLACK									
12	CASE STYLE	ADJUSTABLE EVERY ANGLE									
13	LIQUID FILLING	GLYCERINE									
14	CONNECTION POSITION	CENTER BACK									
15	CASING DIAMETER	100 mm									
16	GLASS COVER	SAFETY GLASS									
17	CASING MATERIAL	SS 316/316L									
18	CASING PROTECTION CATEGORY	IP66 (EN 60 529/ IEC 529)			ALLOWABLE AMBIENT TEMP.			-20 ... +60			
19	CAPTION LABEL	SS TAG LABEL			ALLOWABLE MEDIUM TEMP.			... 110 °C			
20											
21											
22											
23	SAFETY - CERTIFICATE /										
24	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES			
25	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO			
26	SIL - CONFIRMATION	NO			PRESSURE TEST			NO			
27											
28											
29											
30											
	SHEET	THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOMETER								
1	ELECTRONICAL UTILIZATION CATEGORY /										
2	EXPLOSION PROTECTION	II 2 GD EX c TX									
3											
4											
5	UTILITIES /										
6	THERMOWELL	SEE SEP. DATA SHEET									
7											
8											
9	TAG-NO.	DESIGNATION									
10	TI 0430	OIL COOLER COOLING WATER RETURN 1									
11	TI 0431	OIL COOLER COOLING WATER RETURN 1									
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
	SHEET	THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PRESSURE GAUGE								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE		233.30					
3	ITEM NUMBER	233.30.100									
4											
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	-1 ... 1 bar(g)		ASSEMBLING		PIPE MOUNTED					
8				PROCESS CONNECTION		½" NPT, 1.4404 AISI 316 L					
9	ACCURACY	CLASS 1.0		MEASURING ELEMENT		BOURDON TUBE					
10				MEASURING ELEMENT MATERIAL		1.4404 AISI 316L					
11	DIAL	WHITE/ BLACK LETTERING									
12	BLOW OUT DISC	BLOW-OUT BACK		LIQUID FILLING		GLYCERINE					
13	MEASURING PRINCIPLE	BOURDON TUBE									
14	SAFETY PRESSURE GAUGE	WITH SOLID BAFFLE WALL		ALLOWABLE AMBIENT TEMP.		-20 ... 60 °C					
15				ALLOWABLE MEDIUM TEMP.		... +100 °C					
16	CONNECTION POSITION	RADIAL BOTTOM ENTRY		ALLOWABLE MAX. OP. PRESSURE		1,3 x FULL SCALE VALUE -					
17	GLASS COVER	SAFETY GLASS		CASING DIAMETER		100 mm					
18	CAPTION LABEL	SS TAG LABEL		CASING MATERIAL		1.4404 AISI 316L					
19				CASING PROTECTION CATEGORY		IP 65 (EN 60 529/ IEC 529)					
20											
21											
22	SAFETY - CERTIFICATE /										
23	DECLARATION OF CONFORMITY	YES		MATERIAL CERTIFICATE		YES					
24	CALIBRATION DATA SHEET	YES		NACE - CONFIRMATION		NO					
25	SIL - CONFIRMATION	NO		PRESSURE TEST		NO					
26											
27	ELECTRONICAL UTILIZATION CATEGORY /										
28											
29											
30											
	SHEET	PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		PRESSURE GAUGE								
	1	TAG-NO.		DESIGNATION									
2	PI 0844		OIL PUMP SUCTION 3										
3	PI 0845		OIL PUMP SUCTION 3										
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 28 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PRESSURE GAUGE								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			233.30				
3	ITEM NUMBER	233.30.100									
4											
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0 ... 16 bar(g)			ASSEMBLING		PIPE MOUNTED				
8					PROCESS CONNECTION		½" NPT, 1.4404 AISI 316 L				
9	ACCURACY	CLASS 1.0			MEASURING ELEMENT		BOURDON TUBE				
10					MEASURING ELEMENT MATERIAL		1.4404 AISI 316L				
11	DIAL	WHITE/ BLACK LETTERING									
12	BLOW OUT DISC	BLOW-OUT BACK			LIQUID FILLING		GLYCERINE				
13	MEASURING PRINCIPLE	BOURDON TUBE									
14	SAFETY PRESSURE GAUGE	WITH SOLID BAFFLE WALL			ALLOWABLE AMBIENT TEMP.		-20 ... 60 °C				
15					ALLOWABLE MEDIUM TEMP.		... +100 °C				
16	CONNECTION POSITION	RADIAL BOTTOM ENTRY			ALLOWABLE MAX. OP. PRESSURE		1,3 x FULL SCALE VALUE -				
17	GLASS COVER	SAFETY GLASS			CASING DIAMETER		100 mm				
18	CAPTION LABEL	SS TAG LABEL			CASING MATERIAL		1.4404 AISI 316L				
19					CASING PROTECTION CATEGORY		IP 65 (EN 60 529/ IEC 529)				
20											
21											
22	SAFETY - CERTIFICATE /										
23	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE		YES				
24	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION		NO				
25	SIL - CONFIRMATION	NO			PRESSURE TEST		NO				
26											
27	ELECTRONICAL UTILIZATION CATEGORY /										
28											
29											
30											
	SHEET	PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE OF29131

	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		PRESSURE GAUGE								
	1	TAG-NO.		DESIGNATION									
2	PI 0846		OIL PUMP DISCHARGE										
3	PI 0848		OIL PUMP DISCHARGE										
4	PI 0856		OIL SIMULATION LINE										
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 30 OF 131

	PROJECT	Bilbao			DATASHEET					
	PROJECT NO.	H.0200062.02			PRESSURE GAUGE					
1	MANUFACTURER DATA /									
2	MANUFACTURER	WIKA			TYPE			233.30		
3	ITEM NUMBER	233.30.100								
4										
5										
6	TECHNICAL DATA /									
7	1. MEASURING RANGE	0 ... 6 bar(g)			ASSEMBLING			PIPE MOUNTED		
8					PROCESS CONNECTION			½" NPT, 1.4404 AISI 316 L		
9	ACCURACY	CLASS 1.0			MEASURING ELEMENT			BOURDON TUBE		
10					MEASURING ELEMENT MATERIAL			1.4404 AISI 316L		
11	DIAL	WHITE/ BLACK LETTERING								
12	BLOW OUT DISC	BLOW-OUT BACK			LIQUID FILLING			GLYCERINE		
13	MEASURING PRINCIPLE	BOURDON TUBE								
14	SAFETY PRESSURE GAUGE	WITH SOLID BAFFLE WALL			ALLOWABLE AMBIENT TEMP.			-20 ... 60 °C		
15					ALLOWABLE MEDIUM TEMP.			... +100 °C		
16	CONNECTION POSITION	RADIAL BOTTOM ENTRY			ALLOWABLE MAX. OP. PRESSURE			1,3 x FULL SCALE VALUE -		
17	GLASS COVER	SAFETY GLASS			CASING DIAMETER			100 mm		
18	CAPTION LABEL	SS TAG LABEL			CASING MATERIAL			1.4404 AISI 316L		
19					CASING PROTECTION CATEGORY			IP 65 (EN 60 529/ IEC 529)		
20										
21										
22	SAFETY - CERTIFICATE /									
23	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES		
24	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO		
25	SIL - CONFIRMATION	NO			PRESSURE TEST			NO		
26										
27	ELECTRONICAL UTILIZATION CATEGORY /									
28										
29										
30										
	SHEET	PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783		
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		PRESSURE GAUGE								
1	TAG-NO.		DESIGNATION										
2	PI 0854		LUBE OIL HEADER										
3													
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30													
	SHEET		PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 32 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PRESSURE GAUGE								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			233.30				
3	ITEM NUMBER	233.30.100									
4											
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0	...	xx	bar(g)	ASSEMBLING	PIPE MOUNTED				
8						PROCESS CONNECTION	½" NPT, 1.4404 AISI 316 L				
9	ACCURACY	CLASS 1.0				MEASURING ELEMENT	BOURDON TUBE				
10						MEASURING ELEMENT MATERIAL	1.4404 AISI 316L				
11	DIAL	WHITE/ BLACK LETTERING									
12	BLOW OUT DISC	BLOW-OUT BACK				LIQUID FILLING	GLYCERINE				
13	MEASURING PRINCIPLE	BOURDON TUBE									
14	SAFETY PRESSURE GAUGE	WITH SOLID BAFFLE WALL				ALLOWABLE AMBIENT TEMP.	-20 ... 60 °C				
15						ALLOWABLE MEDIUM TEMP.	... +100 °C				
16	CONNECTION POSITION	RADIAL BOTTOM ENTRY				ALLOWABLE MAX. OP. PRESSURE	1,3 x FULL SCALE VALUE -				
17	GLASS COVER	SAFETY GLASS				CASING DIAMETER	100 mm				
18	CAPTION LABEL	SS TAG LABEL				CASING MATERIAL	1.4404 AISI 316L				
19						CASING PROTECTION CATEGORY	IP 65 (EN 60 529/ IEC 529)				
20											
21											
22	SAFETY - CERTIFICATE /										
23	DECLARATION OF CONFORMITY	YES				MATERIAL CERTIFICATE	YES				
24	CALIBRATION DATA SHEET	YES				NACE - CONFIRMATION	NO				
25	SIL - CONFIRMATION	NO				PRESSURE TEST	NO				
26											
27	ELECTRONICAL UTILIZATION CATEGORY /										
28											
29											
30											
	SHEET	PRESSURE GAUGE				TRAIN	BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE 33 OF 131

	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		PRESSURE GAUGE								
1	TAG-NO.		DESIGNATION										
2	PI 0855		LUBE OIL ACCUMULATOR										
3													
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	SHEET		PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 34 OF 131

	PROJECT	Bilbao		DATASHEET								
	PROJECT NO.	H.0200062.02		DIFF. PRESSURE GAUGE								
1	MANUFACTURER DATA /											
2	MANUFACTURER	WIKA			TYPE			733.31				
3	ITEM NUMBER	733.31.100										
4												
5												
6	TECHNICAL DATA /											
7	1. MEASURING RANGE	0 ... 100 mbar			ASSEMBLING			GAUGE BOARD MOUNTED				
8					PROCESS CONNECTION			2 x 1/2" NPT FEMALE [1.4571]				
9	ACCURACY	CLASS 1,6 (DIN 16005)			MEASURING ELEMENT			DIAPHRAGM				
10					MEASURING ELEMENT MATERIAL			1.4571				
11	DIAL	WHITE/ BLACK LETTERING										
12	BLOW OUT DISC	BLOW-OUT BACK			LIQUID FILLING			GLYCERINE				
13	MEASURING PRINCIPLE	DIAPHRAGM										
14	SAFETY PRESSURE GAUGE	WITH SOLID BAFFLE WALL			ALLOWABLE AMBIENT TEMP.			-20 ... +60 °C				
15					ALLOWABLE MEDIUM TEMP.			... +100 °C				
16	CONNECTION POSITION	BOTTOM ENTRY			ALLOWABLE MAX. OP. PRESSURE			10 bar				
17	GLASS COVER	SAFETY GLASS			CASING DIAMETER			100 mm				
18	CAPTION LABEL	SS TAG LABEL			CASING MATERIAL			CrNi-STAHl				
19					CASING PROTECTION CATEGORY			IP 66 (EN 60 529/ IEC 529)				
20												
21												
22	SAFETY - CERTIFICATE /											
23	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES				
24	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO				
25	SIL - CONFIRMATION	NO			PRESSURE TEST			NO				
26												
27	ELECTRONICAL UTILIZATION CATEGORY /											
28												
29												
30												
	SHEET	DIFF. PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		DIFF. PRESSURE GAUGE								
1	TAG-NO.		DESIGNATION										
2	PDI 0851		OIL FILTER										
3													
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	SHEET		DIFF. PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao		DATASHEET										
	PROJECT NO.	H.0200062.02		LEVEL INDICATOR										
1	MANUFACTURER DATA /													
2	MANUFACTURER		KROHNE			TYPE		BM 26						
3														
4														
5														
6	TECHNICAL DATA /													
7	INDICATION TYPE		MAGNETIC ROLLER											
8						MEASURING ELEMENT		FLOAT						
9						MEASURING ELEMENT MATERIAL		1.4404 (SS 316L)						
10														
11	CASING MATERIAL		SS 316/316L											
12	CASING PROTECTION CATEGORY		IP68											
13	CAPTION LABEL		SS TAG LABEL											
14						ALLOWABLE MEDIUM TEMP.		-40 ... +150 °C						
15						ALLOWABLE MAX. OP. PRESSURE		16 bar						
16	REMARK													
17														
18														
19	SAFETY - CERTIFICATE /													
20	DECLARATION OF CONFORMITY		NO			MATERIAL CERTIFICATE		NO						
21	CALIBRATION DATA SHEET		NO			NACE - CONFIRMATION		NO						
22	SIL - CONFIRMATION		NO			PRESSURE TEST		NO						
23														
24	ELECTRONICAL UTILIZATION CATEGORY /													
25	EXPLOSION PROTECTION		II 1 G Ex ia IIC T6...T4											
26														
27														
28	UTILITIES /													
29														
30														
	SHEET		LEVEL INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783					
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		LEVEL INDICATOR								
	1	TAG-NO.		DESIGNATION				ADJU. RANGE					
2	LG 0452		OIL RESERVOIR 1										
3													
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	SHEET		LEVEL INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao		DATASHEET						
	PROJECT NO.	H.0200062.02		THERMOWELL						
1	MANUFACTURER DATA /									
2	MANUFACTURER	ROSEMOUNT		TYPE		0096				
3	ITEM NUMBER	0096D0200T46T060DM99Q8								
4	SAP NUMBER	10791295								
5										
6	TECHNICAL DATA /									
7	THERMOWELL	BARSTOCK		PROCESS CONNECTION		FLANGE, x", xxx lbs, RF				
8	THERMOWELL MATERIAL	1.4404, 316L		THERMOW. TO SENSOR CONN.		FEMALE THREAD NPT 1/2"				
9	CAPTION LABEL	SS TAG LABEL		INSERT LENGTH		U =	mm			
10				OVERALL LENGTH		S =	mm			
11										
12										
13										
14	REMARK	MARKED WITH: MANUFACTURER, MATERIAL, MAX. PRESSURE								
15										
16	SAFETY - CERTIFICATE /									
17	DECLARATION OF CONFORMITY	NO		MATERIAL CERTIFICATE		YES				
18	CALIBRATION DATA SHEET	NO		NACE - CONFIRMATION		NO				
19	SIL - CONFIRMATION	NO		PRESSURE TEST		NO				
20	VIBRATION CALCULATION	YES								
21										
22	ELECTRONICAL UTILIZATION CATEGORY /									
23										
24										
25										
26	UTILITIES /									
27										
28										
29	TAG-NO.	DESIGNATION								
30	TW 0428	OIL RESERVOIR								
	SHEET	THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783		
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	PROJECT	Bilbao		DATASHEET					
	PROJECT NO.	H.0200062.02		THERMOWELL					
1	MANUFACTURER DATA /								
2	MANUFACTURER	ROSEMOUNT		TYPE		0096			
3	ITEM NUMBER	0096D0200T46T060DM99Q8							
4	SAP NUMBER	10791295							
5									
6	TECHNICAL DATA /								
7	THERMOWELL	BARSTOCK		PROCESS CONNECTION		FLANGE, x", xxx lbs, RF			
8	THERMOWELL MATERIAL	1.4404, 316L		THERMOW. TO SENSOR CONN.		FEMALE THREAD NPT 1/2"			
9	CAPTION LABEL	SS TAG LABEL		INSERT LENGTH		U =		mm	
10				OVERALL LENGTH		S =		mm	
11									
12									
13									
14	REMARK	MARKED WITH: MANUFACTURER, MATERIAL, MAX. PRESSURE							
15									
16	SAFETY - CERTIFICATE /								
17	DECLARATION OF CONFORMITY	NO		MATERIAL CERTIFICATE		YES			
18	CALIBRATION DATA SHEET	NO		NACE - CONFIRMATION		NO			
19	SIL - CONFIRMATION	NO		PRESSURE TEST		NO			
20	VIBRATION CALCULATION	YES							
21									
22	ELECTRONICAL UTILIZATION CATEGORY /								
23									
24									
25									
26	UTILITIES /								
27									
28									
29	TAG-NO.	DESIGNATION							
30	TW 0432	OIL FILTER UPSTREAM							
	SHEET	THERMOWELL			TRAIN		BILBOAX F3-C-1 ADI-1783		
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOWELL								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			TW10				
3											
4											
5											
6	TECHNICAL DATA /										
7				PROCESS CONNECTION			FLANGE, 1 1/2", 300 lbs, RF				
8	THERMOWELL MATERIAL	1.4404, 316/316L		THERMOW. TO SENSOR CONN.			G 1/2 FEMALE				
9	CAPTION LABEL	SS TAG LABEL		INSERT LENGTH			U =		mm		
10				OVERALL LENGTH			S =		mm		
11											
12											
13											
14	REMARK	LABELED WITH: MANUFACTURER, MATERIAL, ALLOWED PRESSURE									
15											
16	SAFETY - CERTIFICATE /										
17	DECLARATION OF CONFORMITY	YES		MATERIAL CERTIFICATE			YES				
18	CALIBRATION DATA SHEET	NO		NACE - CONFIRMATION			NO				
19	SIL - CONFIRMATION	NO		PRESSURE TEST			NO				
20	VIBRATION CALCULATION	NO									
21											
22	ELECTRONICAL UTILIZATION CATEGORY /										
23											
24											
25											
26	UTILITIES /										
27											
28											
29	TAG-NO.	DESIGNATION									
30	TW 0427	OIL RESERVOIR									
	SHEET	THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao			DATASHEET					
	PROJECT NO.	H.0200062.02			THERMOWELL					
1	MANUFACTURER DATA /									
2	MANUFACTURER	WIKA			TYPE			TW10		
3										
4										
5										
6	TECHNICAL DATA /									
7					PROCESS CONNECTION			FLANGE, 1 1/2", 300 lbs, RF		
8	THERMOWELL MATERIAL	1.4404, 316/316L			THERMOW. TO SENSOR CONN.			G 1/2 FEMALE		
9	CAPTION LABEL	SS TAG LABEL			INSERT LENGTH			U =	mm	
10					OVERALL LENGTH			S =	mm	
11										
12										
13										
14	REMARK	LABELED WITH: MANUFACTURER, MATERIAL, ALLOWED PRESSURE								
15										
16	SAFETY - CERTIFICATE /									
17	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES		
18	CALIBRATION DATA SHEET	NO			NACE - CONFIRMATION			NO		
19	SIL - CONFIRMATION	NO			PRESSURE TEST			NO		
20	VIBRATION CALCULATION	NO								
21										
22	ELECTRONICAL UTILIZATION CATEGORY /									
23										
24										
25										
26	UTILITIES /									
27										
28										
29	TAG-NO.	DESIGNATION								
30	TW 0429	OIL PUMP DISCHARGE								
	SHEET	THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783		
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		THERMOWELL								
1	TAG-NO.		DESIGNATION										
2	TW 0433		OIL FILTER UPSTREAM 1										
3													
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	SHEET		THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao		DATASHEET					
	PROJECT NO.	H.0200062.02		THERMOWELL					
1	MANUFACTURER DATA /								
2	MANUFACTURER	WIKA		TYPE		TW10			
3									
4									
5									
6	TECHNICAL DATA /								
7				PROCESS CONNECTION		FLANGE, 1 1/2", 300 lbs, RF			
8	THERMOWELL MATERIAL	1.4404, 316/316L		THERMOW. TO SENSOR CONN.		G 1/2 FEMALE			
9	CAPTION LABEL	SS TAG LABEL		INSERT LENGTH		U =		mm	
10				OVERALL LENGTH		S =		mm	
11									
12									
13									
14	REMARK	LABELED WITH: MANUFACTURER, MATERIAL, ALLOWED PRESSURE							
15									
16	SAFETY - CERTIFICATE /								
17	DECLARATION OF CONFORMITY	YES		MATERIAL CERTIFICATE		YES			
18	CALIBRATION DATA SHEET	NO		NACE - CONFIRMATION		NO			
19	SIL - CONFIRMATION	NO		PRESSURE TEST		NO			
20	VIBRATION CALCULATION	NO							
21									
22	ELECTRONICAL UTILIZATION CATEGORY /								
23									
24									
25									
26	UTILITIES /								
27									
28									
29	TAG-NO.	DESIGNATION							
30	TW 0430	OIL COOLER COOLING WATER RETURN 1							
	SHEET	THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783	
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	PROJECT		Bilbao		DATASHEET									
	PROJECT NO.		H.0200062.02		THERMOWELL									
1	TAG-NO.		DESIGNATION											
2	TW 0431		OIL COOLER COOLING WATER RETURN 1											
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	SHEET		THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783					
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	POSITION MONITORING								
1	MANUFACTURER DATA /										
2	MANUFACTURER	MASONEILAN		TYPE			BTL-5-E				
3	ITEM NUMBER	SVI 2 AP									
4											
5											
6	TECHNICAL DATA /										
7											
8											
9	ALLOWABLE AMBIENT TEMP.	-40 ... 85 °C									
10											
11	OUTPUT SIGNAL	4-20mA									
12											
13											
14	SAFETY - CERTIFICATE /										
15											
16											
17											
18											
19	ELECTRONICAL UTILIZATION CATEGORY /										
20	EXPLOSION PROTECTION	II 2 G Ex dm IIB+H2 T6									
21											
22											
23	SIL - FUNCTIONAL SAFETY /										
24											
25											
26											
27	TAG-NO.	DESIGNATION			ADJU. RANGE						
28	ZT 0842	LUBE OIL PRESSURE CONTROL			0 100 %						
29											
30											
	SHEET	POSITION MONITORING				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	ELECTR. TEMPERATURE TRANSMITTER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			644S				
3	ITEM NUMBER	644S									
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-200 ... 850 °C			CABLE ENTRY POINT			FEMALE THREAD 1/2-14 NPT			
8	COMMENT MEASUR. RANGE	PROGRAMMABLE			ATTENUATION			0 s			
9	ACCURACY	± 0.1% OF SPAN									
10	TRANSMITTER FAILURE MODE	DOWNSCALE, NAMUR NE43			LOCAL INDICATION			LCD-INDICATOR			
11	AUXILIARY POWER	12...42,4 V DC			CASING MATERIAL			PU COVERED ALUMINUM			
12	ELECTRICAL CONNECTION	SCREW TERMINALS			CASING PROTECTION CATEGORY			IP 66			
13	LOOP ARRANGEMENT	2-WIRE			EARTHING SCREW			YES			
14	INPUT SIGNAL	2 X PT 100 DIN			CAPTION LABEL			SS TAG LABEL			
15	OUTPUT SIGNAL	4-20mA HART-PROTOCOL			ALLOWABLE AMBIENT TEMP.			-40 ... +85 °C			
16	REMARK	Housing Rosemount Connection Head									
17											
18											
19	SAFETY - CERTIFICATE /										
20	DECLARATION OF CONFORMITY	NO			MATERIAL CERTIFICATE			NO			
21	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO			
22	SIL - CONFIRMATION	YES			PRESSURE TEST			NO			
23											
24	ELECTRONICAL UTILIZATION CATEGORY /										
25	EXPLOSION PROTECTION	II 1 G EEx ia IIC T5/T6									
26	AGENCY	EECS/BASEEFA			CERTIFICATE NO.			BAS 01 ATEX 1431 X			
27											
28											
29											
30											
	SHEET	ELECTR. TEMPERATURE TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET										
	PROJECT NO.	H.0200062.02	ELECTR. TEMPERATURE TRANSMITTER										
1	SIL - FUNCTIONAL SAFETY /												
2	AGENCY		EXIDA										
3	CERTIFICATE NO.		ROS 060933 C001										
4													
5	TAG-NO.	DESIGNATION				ADJU. RANGE							
6	TT 0428	OIL RESERVOIR				0 100 °C							
7	TT 0432	OIL FILTER UPSTREAM				0 100 °C							
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		ELECTR. TEMPERATURE TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	ELECTRICAL PRESSURE TRANS. W. INDICATION								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			3051 TG 4				
3	ITEM NUMBER	3051TG4A2B21AM5S5B4I1V5C4Q4Q8HR5									
4	SAP NUMBER	10747279									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-1.0 ... 276 bar			CASING MATERIAL			PU COVERED ALUMINUM			
8	COMMENT MEASUR. RANGE	PROGRAMMABLE			LIQUID FILLING			SILICONE OIL			
9	ACCURACY	+/-0,04 %			EARTHING SCREW			YES			
10	TRANSMITTER FAILURE MODE	RISING, NAMUR NE43			CAPTION LABEL			SS TAG LABEL			
11	CABLE ENTRY POINT	FEMALE THREAD 1/2-14 NPT			PROCESS CONNECTION			1/2"-14NPT I[1.4401]			
12					O RING MATERIAL			PTFE, GLASSFILLED			
13	AUXILIARY POWER	10.5 ... 55 V DC			MEASURING ELEMENT			DIAPHRAGM			
14	LOOP ARRANGEMENT	2-WIRE			MEASURING ELEMENT MATERIAL			1.4404 AISI 316L			
15	OUTPUT SIGNAL	4-20MA, HART-SIGNAL			ALLOWABLE AMBIENT TEMP.			-20 ... 80 °C			
16	ASSEMBLING	UNIVERSAL MOUNTING BRACKET			ALLOWABLE MEDIUM TEMP.			-40 ... 149 °C			
17	LOCAL INDICATION	LCD-INDICATOR			ALLOWABLE OP. PRESSURE			413,7 bar(g)			
18	CASING PROTECTION CATEGORY	IP66									
19											
20											
21	SAFETY - CERTIFICATE /										
22	DECLARATION OF CONFORMITY	NO			MATERIAL CERTIFICATE			YES			
23	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO			
24	SIL - CONFIRMATION	NO			PRESSURE TEST			NO			
25											
26	ELECTRONICAL UTILIZATION CATEGORY /										
27	EXPLOSION PROTECTION	II 1 G EEX IA IIC T4									
28	AGENCY	EECS			CERTIFICATE NO.			BAS97ATEX1089X			
29											
30											
	SHEET	ELECTR. PRESS. TRANS. WITH INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET									
	PROJECT NO.	H.0200062.02	ELECTRICAL PRESSURE TRANS. W. INDICATION									
1	SIL - FUNCTIONAL SAFETY /											
2												
3												
4												
5	UTILITIES /											
6	MANIFOLD	INTEGR. 2F.-MANIFOLD BLOCK			MANUFACTURER MANIFOLD			ROSEMOUNT				
7	CATALOGUE-NO. MANIFOLD	0306RT22BA11										
8												
9												
10												
11	TAG-NO.	DESIGNATION				ADJU. RANGE						
12	PT 0852	POWER OIL PUMP				0 200 bar(g)						
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
	SHEET		ELECTR. PRESS. TRANS. WITH INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG. EN	PAGE 50 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	LEVEL INDICATOR								
1	MANUFACTURER DATA /										
2	MANUFACTURER	KROHNE		TYPE			BM 26				
3											
4											
5											
6	TECHNICAL DATA /										
7	INDICATION TYPE	MAGNETIC ROLLER									
8				MEASURING ELEMENT			FLOAT				
9				MEASURING ELEMENT MATERIAL			1.4404 (SS 316L)				
10											
11	CASING MATERIAL	SS 316/316L									
12	CASING PROTECTION CATEGORY	IP68									
13	CAPTION LABEL	SS TAG LABEL									
14				ALLOWABLE MEDIUM TEMP.			-40 ... +150 °C				
15				ALLOWABLE MAX. OP. PRESSURE			16 bar				
16	REMARK										
17											
18											
19	SAFETY - CERTIFICATE /										
20	DECLARATION OF CONFORMITY	NO		MATERIAL CERTIFICATE			NO				
21	CALIBRATION DATA SHEET	NO		NACE - CONFIRMATION			NO				
22	SIL - CONFIRMATION	NO		PRESSURE TEST			NO				
23											
24	ELECTRONICAL UTILIZATION CATEGORY /										
25	EXPLOSION PROTECTION	II 1 G Ex ia IIC T6...T4									
26											
27											
28	UTILITIES /										
29											
30											
	SHEET	LEVEL INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE 51 OF 131

	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		LEVEL INDICATOR								
	1	TAG-NO.		DESIGNATION				ADJU. RANGE					
2	LG 0454		OVERHEAD RESERVOIR										
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
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25													
26													
27													
28													
29													
30													
	SHEET		LEVEL INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 52 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	ELECTR. TEMPERATURE TRANSMITTER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			3144				
3	ITEM NUMBER	3144PD1A2I1M5C4Q4									
4	SAP NUMBER	Coes									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-200 ... 850 °C			CABLE ENTRY POINT			FEMALE THREAD 1/2-14 NPT			
8	COMMENT MEASUR. RANGE	PROGRAMMABLE			ATTENUATION			0 s			
9	ACCURACY	± 0.1% OF SPAN									
10	TRANSMITTER FAILURE MODE	DOWNSCALE, NAMUR NE43			LOCAL INDICATION			LCD-INDICATOR			
11	AUXILIARY POWER	12...42,4 V DC			CASING MATERIAL			PU COVERED ALUMINUM			
12	ELECTRICAL CONNECTION	SCREW TERMINALS			CASING PROTECTION CATEGORY			IP 66			
13	LOOP ARRANGEMENT	2-WIRE			EARTHING SCREW			YES			
14	INPUT SIGNAL	2 X PT 100 DIN			CAPTION LABEL			SS TAG LABEL			
15	OUTPUT SIGNAL	4-20mA HART-PROTOCOL			ALLOWABLE AMBIENT TEMP.			-40 ... +85 °C			
16	REMARK	Housing Rosemount Connection Head									
17											
18											
19	SAFETY - CERTIFICATE /										
20	DECLARATION OF CONFORMITY	NO			MATERIAL CERTIFICATE			NO			
21	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO			
22	SIL - CONFIRMATION	YES			PRESSURE TEST			NO			
23											
24	ELECTRONICAL UTILIZATION CATEGORY /										
25	EXPLOSION PROTECTION	II 1 G EEx ia IIC T5/T6									
26	AGENCY	EECS/BASEEFA									
27											
28											
29											
30											
	SHEET	ELECTR. TEMPERATURE TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET										
	PROJECT NO.	H.0200062.02	ELECTR. TEMPERATURE TRANSMITTER										
1	SIL - FUNCTIONAL SAFETY /												
2	AGENCY		EXIDA										
3													
4													
5	TAG-NO.	DESIGNATION				ADJU. RANGE							
6	TT 0454	OIL RESERVOIR HEATER				0 100 °C							
7	TT 0455	OIL RESERVOIR HEATER				0 100 °C							
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		ELECTR. TEMPERATURE TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	SHAFT CONTROL PROBES								
1	MANUFACTURER DATA /										
2	MANUFACTURER	BENTLY NEVADA		TYPE			330105				
3	ITEM NUMBER	330105-02-12-05-02-05									
4	SAP NUMBER	97001122									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0.25 ... 2.3 mm									
8				CABLE TYPE			COAXIAL CABLE				
9				OIL RESISTANT			YES				
10	MEASURING ELEMENT	8mm/0,31"	02	CABLE LENGTH			0.5 m				
11	MEASURING ELEMENT MATERIAL	1.4301 AISI 304		FINISH WIRE ENDS			CONNECTOR	02			
12	MEASURING PRINCIPLE	EDDY CURRENT		PROBE LENGTH			1.2 in	02			
13	PROBE TIP MATERIAL	PPS (POLYPHENYLENE SULFIDE)	02	THREAD LENGTH			0.2 in	02			
14	CASING PROTECTION CATEGORY	IP66		PROCESS CONNECTION			3/8"-24UNF				
15				PROBE TIP			8 mm				
16	CAPTION LABEL	WITHOUT		ALLOWABLE MEDIUM TEMP.			-51 ... +177 °C				
17				ALLOWABLE AMBIENT TEMP.			-34 ... +177 °C				
18				ALLOWABLE OP. PRESSURE			690 kPa				
19											
20											
21	SAFETY - CERTIFICATE /										
22	DECLARATION OF CONFORMITY	YES									
23	CALIBRATION DATA SHEET	YES									
24											
25											
26	ELECTRONICAL UTILIZATION CATEGORY /										
27	EXPLOSION PROTECTION	II 1 G Ex ia IIC T1...T5 Ga									
28	AGENCY	EECS			CERTIFICATE NO.			BAS99ATEX1099 BAS99ATEX3098X			
29											
30											
	SHEET	SHAFT CONTROL PROBES				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao		DATASHEET									
	PROJECT NO.	H.0200062.02		SHAFT CONTROL PROBES									
1	SIL - FUNCTIONAL SAFETY /												
2													
3													
4													
5	UTILITIES /												
6	DESIGNATION	330130-085-00-05			ARMOR			WITHOUT					
7	IMPEDANCE	75 Ohm			CONNECTOR			YES					
8	CABLE LENGTH	8.5 m			SAP - NO. EXT.CABLE			97001124					
9													
10	TAG-NO.	DESIGNATION				ADJU. RANGE							
11	VE 0018X	MAB JOURN. BRG. NDE				0 150 µm							
12	VE 0018Y	MAB JOURN. BRG. NDE				0 150 µm							
13	VE 0017X	MAB JOURN. BRG. DE				0 150 µm							
14	VE 0017Y	MAB JOURN. BRG. DE				0 150 µm							
15	KE 0016	MAB SHAFT KEYPHASOR											
16	ZE 0019A	MAB THRUST BRG.				-1 +1 mm							
17	ZE 0019B	MAB THRUST BRG.				-1 +1 mm							
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		SHAFT CONTROL PROBES				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 56 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOCOUPLE WITH HEAD TRANSMITTER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			T-GYI(RZ-VER-T) (SURGE)				
3	ITEM NUMBER	HSG33210181									
4	SAP NUMBER	10421094									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0 ... +500 °C									
8	ACCURACY	CLASS 2 0...500 °C			CABLE ENTRY POINT			FEMALE THREAD 1/2-14 NPT			
9	LOOP ARRANGEMENT	2-WIRE			PROBE LENGTH			ML = 425 mm			
10	MEASURING ELEMENT	NiCr-Ni (K)			EXTENSION CONNECTION			M24 x 1,5 MALE			
11	MEASURING ELEMENT MATERIAL	1.4571			EXTENSION DIAMETER			12 x 2,5 mm			
12	STANDARD	DIN / EN 60584-1									
13	NUMBER OF ELEMENTS	1			STANDARD LENGTH			NL = 375 mm			
14					PROCESS CONNECTION			3/4" NPT			
15					INSERT LENGTH			EINSTELLBAR mm			
16	HEAD CONNECTION	EMERSON 1"D"			PROBE TIP			TAPERED TIP 12mm/0,5mm			
17	CASING MATERIAL	ALUMINUM						...			
18	CASING PROTECTION CATEGORY	IP 68						...			
19											
20	EARTHING SCREW	NO									
21	CAPTION LABEL	SS TAG LABEL									
22											
23											
24											
25	SAFETY - CERTIFICATE /										
26	DECLARATION OF CONFORMITY	EN 10 204 2.2				MATERIAL CERTIFICATE			EN 10 204 3.1		
27											
28											
29											
30											
	SHEET	THERMOCOUPLE WITH HEAD TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao		DATASHEET									
	PROJECT NO.	H.0200062.02		THERMOCOUPLE WITH HEAD TRANSMITTER									
1	ELECTRONICAL UTILIZATION CATEGORY /												
2													
3													
4													
5	SIL - FUNCTIONAL SAFETY /												
6													
7													
8													
9	UTILITIES /												
10	THERMOWELL	NO											
11					HEAD TRANSMITTER	SEE SEP. DATA SHEET							
12													
13													
14	TAG-NO.	DESIGNATION			ADJU. RANGE								
15	TE 0436A	MAB SUCTION SD			-20 400 °C								
16	TE 0436B	MAB SUCTION SD			-20 400 °C								
17	TE 0436C	MAB SUCTION SD			-20 400 °C								
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		THERMOCOUPLE WITH HEAD TRANSMITTER			TRAIN		BILBOAX F3-C-1 ADI-1783					
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 58
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOCOUPLE WITH HEAD TRANSMITTER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			T-GYI(T-RZ-VER-T) (ANTI SURGE)				
3	ITEM NUMBER	HSG33210182									
4	SAP NUMBER	10421119									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0 ... +500 °C									
8	ACCURACY	CLASS 2 0...500 °C			CABLE ENTRY POINT			FEMALE THREAD 1/2-14 NPT			
9	LOOP ARRANGEMENT	2-WIRE			PROBE LENGTH			ML = 423 mm			
10	MEASURING ELEMENT	NiCr-Ni (K)			EXTENSION CONNECTION			M24 x 1,5 MALE			
11	MEASURING ELEMENT MATERIAL	1.4571			EXTENSION DIAMETER			12 x 2,5 mm			
12	STANDARD	DIN / EN 60584-1									
13	NUMBER OF ELEMENTS	1			STANDARD LENGTH			NL = 375 mm			
14					PROCESS CONNECTION			3/4" NPT			
15					INSERT LENGTH			EINSTELLBAR mm			
16	HEAD CONNECTION	EMERSON \\"D\\"			PROBE TIP			SPITZE VERJÜNGT 12mm/3,6mm			
17	CASING MATERIAL	ALUMINUM						...			
18	CASING PROTECTION CATEGORY	IP 68						...			
19											
20	EARTHING SCREW	NO									
21	CAPTION LABEL	SS TAG LABEL									
22											
23											
24											
25	SAFETY - CERTIFICATE /										
26	DECLARATION OF CONFORMITY	EN 10 204 2.2				MATERIAL CERTIFICATE			EN 10 204 3.1		
27											
28											
29											
30											
	SHEET	THERMOCOUPLE WITH HEAD TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOCOUPLE WITH HEAD TRANSMITTER								
1	ELECTRONICAL UTILIZATION CATEGORY /										
2											
3											
4											
5	SIL - FUNCTIONAL SAFETY /										
6											
7											
8											
9	UTILITIES /										
10	THERMOWELL	NO									
11					HEAD TRANSMITTER		SEE SEP. DATA SHEET				
12											
13											
14	TAG-NO.	DESIGNATION	ADJU. RANGE								
15	TE 0437	MAB SUCTION ASC	-20 60 °C								
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
	SHEET	THERMOCOUPLE WITH HEAD TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	BEAR. RESIST. THERM.								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			W-EYK(P-EXI)				
3	ITEM NUMBER	HSG31537077									
4	SAP NUMBER	10381033									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0 ... +150 °C									
8	ACCURACY	CLASS A 0...150 °C									
9	LOOP ARRANGEMENT	3-WIRE									
10	MEASURING ELEMENT	PT 100 DIN			OIL RESISTANT			YES			
11	MEASURING ELEMENT MATERIAL	1.4571 AISI 316Ti									
12	STANDARD	DIN/EN 60751 (IEC751)									
13	NUMBER OF ELEMENTS	2			PROBE LENGTH			L1= 1000mm mm			
14	HIGH VIBRATION PROOF	YES			ALLOWABLE AMBIENT TEMP.			-51 ... +60 °C			
15					ALLOWABLE MEDIUM TEMP.			-50 ... +450 °C			
16											
17											
18											
19	SAFETY - CERTIFICATE /										
20											
21											
22											
23											
24	ELECTRONICAL UTILIZATION CATEGORY /										
25	EXPLOSION PROTECTION	Ex II 2G EEx ia IIC T6									
26	AGENCY	IBExU			CERTIFICATE NO.			IBExU03ATEX1066X			
27											
28											
29											
30											
	SHEET	BEAR. RESIST. THERM.			TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET									
	PROJECT NO.	H.0200062.02	BEAR. RESIST. THERM.									
1	SIL - FUNCTIONAL SAFETY /											
2												
3												
4												
5	TAG-NO.	DESIGNATION				ADJU. RANGE						
6	TE 0418A/B	MAB JOURN. BRG. NDE				0 150 °C						
7	TE 0418C/D	MAB JOURN. BRG. NDE				0 150 °C						
8	TE 0417A/B	MAB JOURN. BRG. DE				0 150 °C						
9	TE 0417C/D	MAB JOURN. BRG. DE				0 150 °C						
10	TE 0419A/B	MAB THRUST BRG. INBOARD 1				0 150 °C						
11	TE 0419C/D	MAB THRUST BRG. INBOARD 1				0 150 °C						
12	TE 0420A/B	MAB THRUST BRG. OUTBOARD				0 150 °C						
13	TE 0420C/D	MAB THRUST BRG. OUTBOARD				0 150 °C						
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
	SHEET		BEAR. RESIST. THERM.				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.		10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE 62
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	PROJECT	Bilbao		DATASHEET						
	PROJECT NO.	H.0200062.02		PROXIMITOR						
1	MANUFACTURER DATA /									
2	MANUFACTURER	BENTLY NEVADA			TYPE		330180			
3	ITEM NUMBER	330180-91-05								
4	SAP NUMBER	97001125								
5										
6	TECHNICAL DATA /									
7	MEASURING RANGE	0.25 ... 2.3 mm			AUXILIARY POWER		-23...-26 V DC			
8					ELECTRICAL CONNECTION		TENSION SPRING TERMINALS			
9	ALLOWABLE AMBIENT TEMP.	-35 ... +85 °C			CAPTION LABEL		WITHOUT			
10	FOR SENSOR TYPE	330101/**2/**3/**4/**5/**6			ASSEMBLING		DIN RAIL MOUNTED			
11	OUTPUT SIGNAL	-1 ... -18 V DC								
12										
13										
14	SAFETY - CERTIFICATE /									
15	DECLARATION OF CONFORMITY	YES								
16										
17										
18										
19	ELECTRONICAL UTILIZATION CATEGORY /									
20	EXPLOSION PROTECTION	II 1 G Ex ia IIC T4/T5 Ga								
21	AGENCY	EECS			CERTIFICATE NO.		BAS99ATEX1101			
22										
23	SIL - FUNCTIONAL SAFETY /									
24										
25										
26										
27	TAG-NO.	DESIGNATION			ADJU. RANGE					
28	VT 0018X	MAB JOURN. BRG. NDE			0 150 µm					
29	VT 0018Y	MAB JOURN. BRG. NDE			0 150 µm					
30	VT 0017X	MAB JOURN. BRG. DE			0 150 µm					
	SHEET	PROXIMITOR				TRAIN		BILBOAX F3-C-1 ADI-1783		
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		PROXIMITOR								
1	TAG-NO.		DESIGNATION				ADJU. RANGE						
2	VT 0017Y		MAB JOURN. BRG. DE				0 150 µm						
3	KT 0016		MAB SHAFT KEYPHASOR										
4	ZT 0019A		MAB THRUST BRG.				-1 +1 mm						
5	ZT 0019B		MAB THRUST BRG.				-1 +1 mm						
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		PROXIMITOR				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 64 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	ELECTR. PRESS. TRANS. WITH INDICATOR								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			3051 CG				
3	ITEM NUMBER	3051CG2A02A1AM5I1V5S5C4Q4Q8HR5									
4	SAP NUMBER	10747264									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-621 ... 623 mbar			CASING MATERIAL			PU COVERED ALUMINUM			
8	COMMENT MEASUR. RANGE	PROGRAMMABLE			LIQUID FILLING			SILICON OIL			
9	ACCURACY	± 0,04 %			EARTHING SCREW			YES			
10	TRANSMITTER FAILURE MODE	RISING, NAMUR NE43			CAPTION LABEL			SS TAG LABEL			
11	CABLE ENTRY POINT	FEMALE THREAD 1/2-14 NPT			PROCESS CONNECTION			½" NPT FEMALE 1.4401 AISI 316			
12					O RING MATERIAL			PTFE, GLASSFILLED			
13	AUXILIARY POWER	10,5...30 V DC			MEASURING ELEMENT			DIAPHRAGM			
14	LOOP ARRANGEMENT	2-WIRE			MEASURING ELEMENT MATERIAL			1.4404 AISI 316L			
15	OUTPUT SIGNAL	4-20mA HART-PROTOCOL			ALLOWABLE AMBIENT TEMP.			-40 ... 80 °C			
16	ASSEMBLING	UNIVERSAL MOUNTING BRACKET			ALLOWABLE MEDIUM TEMP.			-40 ... 149 °C			
17	LOCAL INDICATION	LCD INDICATOR			ALLOWABLE OP. PRESSURE			250 bar(g)			
18	CASING PROTECTION CATEGORY	IP 66									
19											
20											
21	SAFETY - CERTIFICATE /										
22	DECLARATION OF CONFORMITY	NO			MATERIAL CERTIFICATE			YES			
23	CALIBRATION DATA SHEET	YES									
24											
25											
26	ELECTRONICAL UTILIZATION CATEGORY /										
27	EXPLOSION PROTECTION	II 1 GD Ex ia IIC T4 Ga									
28	AGENCY	BASEEFA			CERTIFICATE NO.			BAS 97 ATEX 1089X			
29											
30											
	SHEET	ELECTR. PRESS. TRANS. WITH INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET									
	PROJECT NO.	H.0200062.02	ELECTR. PRESS. TRANS. WITH INDICATOR									
1	SIL - FUNCTIONAL SAFETY /											
2												
3												
4												
5	UTILITIES /											
6	MANIFOLD	INTEGR. 2F.-MANIFOLD BLOCK			MANUFACTURER MANIFOLD			ROSEMOUNT				
7	CATALOGUE-NO. MANIFOLD	0305RC22B11B4L4										
8												
9												
10												
11	TAG-NO.	DESIGNATION				ADJU. RANGE						
12	PT 0860	MAB SUCTION				-0.02 0 kg/cm²(g)						
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
	SHEET		ELECTR. PRESS. TRANS. WITH INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG. EN	PAGE 66 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	ELECTR. PRESS. TRANS. WITH INDICATOR								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			3051 CG				
3	ITEM NUMBER	3051CG4A02A1AM5I1V5S5C4Q4Q8HR5									
4	SAP NUMBER	10747266									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0.98 ... 20.7 bar		CASING MATERIAL			PU COVERED ALUMINUM				
8	COMMENT MEASUR. RANGE	PROGRAMMABLE		LIQUID FILLING			SILICON OIL				
9	ACCURACY	± 0,04 %		EARTHING SCREW			YES				
10	TRANSMITTER FAILURE MODE	RISING, NAMUR NE43		CAPTION LABEL			SS TAG LABEL				
11	CABLE ENTRY POINT	FEMALE THREAD 1/2-14 NPT		PROCESS CONNECTION			½" NPT FEMALE 1.4401 AISI 316				
12				O RING MATERIAL			PTFE, GLASSFILLED				
13	AUXILIARY POWER	10,5...30 V DC		MEASURING ELEMENT			DIAPHRAGM				
14	LOOP ARRANGEMENT	2-WIRE		MEASURING ELEMENT MATERIAL			1.4404 AISI 316L				
15	OUTPUT SIGNAL	4-20mA HART-PROTOCOL		ALLOWABLE AMBIENT TEMP.			-40 ... 80 °C				
16	ASSEMBLING	UNIVERSAL MOUNTING BRACKET		ALLOWABLE MEDIUM TEMP.			-40 ... 149 °C				
17	LOCAL INDICATION	LCD INDICATOR		ALLOWABLE OP. PRESSURE			250 bar(g)				
18	CASING PROTECTION CATEGORY	IP 66									
19											
20											
21	SAFETY - CERTIFICATE /										
22	DECLARATION OF CONFORMITY	NO		MATERIAL CERTIFICATE			YES				
23	CALIBRATION DATA SHEET	YES									
24											
25											
26	ELECTRONICAL UTILIZATION CATEGORY /										
27	EXPLOSION PROTECTION	II 1 GD Ex ia IIC T4 Ga									
28	AGENCY	BASEEFA		CERTIFICATE NO.			BAS 97 ATEX 1089X				
29											
30											
	SHEET	ELECTR. PRESS. TRANS. WITH INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET										
	PROJECT NO.	H.0200062.02	ELECTR. PRESS. TRANS. WITH INDICATOR										
1	SIL - FUNCTIONAL SAFETY /												
2													
3													
4													
5	UTILITIES /												
6	MANIFOLD	INTEGR. 2F.-MANIFOLD BLOCK			MANUFACTURER MANIFOLD			ROSEMOUNT					
7	CATALOGUE-NO. MANIFOLD	0305RC22B11B4L4											
8													
9													
10													
11	TAG-NO.	DESIGNATION				ADJU. RANGE							
12	PT 0864	MAB DISCHARGE				0 6 bar(g)							
13	PT 0842	MAB LUBE OIL HEADER				0 6 bar(g)							
14	PT 0841A	MAB LUBE OIL HEADER				0 6 bar(g)							
15	PT 0841B	MAB LUBE OIL HEADER				0 6 bar(g)							
16	PT 0841C	MAB LUBE OIL HEADER				0 6 bar(g)							
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		ELECTR. PRESS. TRANS. WITH INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 68 OF 131

	PROJECT	Bilbao		DATASHEET								
	PROJECT NO.	H.0200062.02		ELECTR. DIFF. PRESSURE TRANS. W. INDICATION								
1	MANUFACTURER DATA /											
2	MANUFACTURER	ROSEMOUNT			TYPE			3051 CD				
3	ITEM NUMBER	3051CD1										
4												
5												
6	TECHNICAL DATA /											
7	MEASURING RANGE	-62.2 ... 62.2 mbar			ASSEMBLING			UNIVERSAL MOUNTING BRACKET				
8					LOCAL INDICATION			LCD-INDICATOR				
9	ACCURACY	± 0,04 %			CASING PROTECTION CATEGORY			IP 66				
10	TRANSMITTER FAILURE MODE	RISING, NAMUR NE43			CASING MATERIAL			PU COVERED ALUMINUM				
11	CABLE ENTRY POINT	FEMALE THREAD 1/2-14 NPT			LIQUID FILLING			SILICON OIL				
12					EARTHING SCREW			YES				
13	AUXILIARY POWER	10,5...30 V DC			CAPTION LABEL			SS TAG LABEL				
14	LOOP ARRANGEMENT	2-WIRE			PROCESS CONNECTION			½" NPT FEMALE [1.4401]				
15	OUTPUT SIGNAL	4-20mA, HART-Protokoll			O RING MATERIAL			PTFE, GLASSFILLED				
16					ALLOWABLE AMBIENT TEMP.			-20 ... 80 °C				
17	MEASURING ELEMENT	MEMBRANE			ALLOWABLE MEDIUM TEMP.			-40 ... 149 °C				
18	MEASURING ELEMENT MATERIAL	1.4404			ALLOWABLE OP. PRESSURE			250 bar				
19												
20												
21	SAFETY - CERTIFICATE /											
22					MATERIAL CERTIFICATE			YES				
23	CALIBRATION DATA SHEET	YES										
24												
25												
26	ELECTRONICAL UTILIZATION CATEGORY /											
27	EXPLOSION PROTECTION	II 1G EEx ia IIC T4										
28	AGENCY	EECS			CERTIFICATE NO.			BAS 97 ATEX 1089X				
29												
30												
	SHEET	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao		DATASHEET									
	PROJECT NO.	H.0200062.02		ELECTR. DIFF. PRESSURE TRANS. W. INDICATION									
1	SIL - FUNCTIONAL SAFETY /												
2													
3													
4													
5	UTILITIES /												
6	MANIFOLD	INTEGR. 5F.-MANIFOLD BLOCK			MANUFACTURER MANIFOLD			ROSEMOUNT					
7	CATALOGUE-NO. MANIFOLD	0305RC52B11B4L4											
8													
9													
10													
11	TAG-NO.	DESIGNATION				ADJU. RANGE							
12	PDT 0861	MAB SUCTION FILTER				0 10 mbar(g)							
13	PDT 0862	MAB SUCTION FILTER				0 10 mbar(g)							
14	PDT 0863	MAB SUCTION FILTER				0 15 mbar(g)							
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783					
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE OF	70 131	

	PROJECT	Bilbao		DATASHEET							
	PROJECT NO.	H.0200062.02		ELECTR. DIFF. PRESSURE TRANS. W. INDICATION							
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT			TYPE			3051 CD			
3	ITEM NUMBER	3051CD2A02A1AM5I1V5S5C4Q4Q8HR5									
4	SAP NUMBER	10747271									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-623 ... 623 mbar			ASSEMBLING			UNIVERSAL MOUNTING BRACKET			
8					LOCAL INDICATION			LCD-INDICATOR			
9	ACCURACY	± 0,04 %			CASING PROTECTION CATEGORY			IP 66			
10	TRANSMITTER FAILURE MODE	RISING, NAMUR NE43			CASING MATERIAL			PU COVERED ALUMINUM			
11	CABLE ENTRY POINT	FEMALE THREAD 1/2-14 NPT			LIQUID FILLING			SILICON OIL			
12					EARTHING SCREW			YES			
13	AUXILIARY POWER	10,5...30 V DC			CAPTION LABEL			SS TAG LABEL			
14	LOOP ARRANGEMENT	2-WIRE			PROCESS CONNECTION			½" NPT FEMALE [1.4401]			
15	OUTPUT SIGNAL	4-20mA, HART-Protokoll			O RING MATERIAL			PTFE, GLASSFILLED			
16					ALLOWABLE AMBIENT TEMP.			-20 ... 80 °C			
17	MEASURING ELEMENT	MEMBRANE			ALLOWABLE MEDIUM TEMP.			-40 ... 149 °C			
18	MEASURING ELEMENT MATERIAL	1.4404			ALLOWABLE OP. PRESSURE			250 bar			
19											
20											
21	SAFETY - CERTIFICATE /										
22					MATERIAL CERTIFICATE			YES			
23	CALIBRATION DATA SHEET	YES									
24											
25											
26	ELECTRONICAL UTILIZATION CATEGORY /										
27	EXPLOSION PROTECTION	II 1G EEx ia IIC T4									
28	AGENCY	EECS			CERTIFICATE NO.			BAS 97 ATEX 1089X			
29											
30											
	SHEET	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao		DATASHEET									
	PROJECT NO.	H.0200062.02		ELECTR. DIFF. PRESSURE TRANS. W. INDICATION									
1	SIL - FUNCTIONAL SAFETY /												
2													
3													
4													
5	UTILITIES /												
6	MANIFOLD	INTEGR. 5F.-MANIFOLD BLOCK			MANUFACTURER MANIFOLD			ROSEMOUNT					
7	CATALOGUE-NO. MANIFOLD	0305RC52B11B4L4											
8													
9													
10													
11	TAG-NO.	DESIGNATION				ADJU. RANGE							
12	PDT 0858A	MAB SUCTION ASC				-50 250 mbar(g)							
13	PDT 0858B	MAB SUCTION ASC				-50 250 mbar(g)							
14	PDT 0859B	MAB SUCTION SD				-50 250 mbar(g)							
15	PDT 0859C	MAB SUCTION SD				-50 250 mbar(g)							
16	PDT 0859A	MAB SUCTION SD				-50 250 mbar(g)							
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET	ELECTR. DIFF. PRESS. TRANS. W. INDICATOR				TRAIN		BILBOAX F3-C-1 ADI-1783					
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE OF	72 131	

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	LIMIT SWITCH								
1	MANUFACTURER DATA /										
2	MANUFACTURER	TURCK		TYPE			BIM-G12-Y1X				
3	ITEM NUMBER	40100									
4											
5											
6	TECHNICAL DATA /										
7				ELECTRICAL CONNECTION			CABLE				
8											
9				CONTACT TYPE			NAMUR (EN 60947)				
10				CONTACT PROCESS			NO				
11	MEASURING ELEMENT MATERIAL	1.4541		AUXILIARY POWER			8,2 V DC				
12	MEASURING PRINCIPLE	INDUCTIVE									
13	PROBE TIP MATERIAL	PA12-GF30									
14											
15	CASING MATERIAL	GD-ZN		CABLE LENGTH			2 m				
16	CASING PROTECTION CATEGORY	IP 67									
17											
18											
19											
20	ALLOWABLE AMBIENT TEMP.	-25 ... +70 °C									
21											
22											
23											
24	SAFETY - CERTIFICATE /										
25											
26											
27	SIL - CONFIRMATION	YES									
28											
29											
30											
	SHEET	LIMIT SWITCH				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET										
	PROJECT NO.	H.0200062.02	LIMIT SWITCH										
1	ELECTRONICAL UTILIZATION CATEGORY /												
2	EXPLOSION PROTECTION	II 2 G EEx ia IIC T6											
3	AGENCY	KEMA			CERTIFICATE NO.			KEMA 02 ATEX 1090X					
4													
5	SIL - FUNCTIONAL SAFETY /												
6													
7													
8													
9	UTILITIES /												
10													
11													
12													
13													
14	TAG-NO.	DESIGNATION			ADJU. RANGE								
15	ZSL 0022B	MAB SUCTION FILTER ACCESS DOOR											
16	ZSL 0022A	MAB SUCTION FILTER BLOW-IN DOOR											
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		LIMIT SWITCH				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 74 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	RESISTANCE THERMOMETER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			0065				
3	ITEM NUMBER	0065									
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-60 ... +600 °C			ELECTRICAL CONNECTION			TERMINAL BLOCK			
8	ACCURACY	KLASSE A 0...450 °C			CABLE ENTRY POINT			FEMALE THREAD 1/2-14 NPT			
9	LOOP ARRANGEMENT	3-WIRE									
10	MEASURING ELEMENT	PT 100 DIN			EXTENSION CONNECTION			1/2" NPT FEMALE			
11	MEASURING ELEMENT MATERIAL	1.4541			EXTENSION DIAMETER			12 x 1,5 mm			
12	STANDARD	DIN/EN 60751 (IEC751)			EXTENSION LENGTH			405 mm			
13	NUMBER OF ELEMENTS	2									
14	HIGH VIBRATION PROOF	YES			PROCESS CONNECTION			SEE SEP. DATA SHEET			
15											
16											
17	CASING MATERIAL	STAINLESS STEEL			ALLOWABLE AMBIENT TEMP.			-40 ... +85 °C			
18					ALLOWABLE MEDIUM TEMP.			0 ... +350 °C			
19	EXTENSION MATERIAL	STAINLESS STEEL			EXTENSION CONNECTION PROCESS			1/2" NPT MALE			
20	EARTHING SCREW	NO									
21	CAPTION LABEL	SS TAG LABEL									
22											
23											
24											
25	SAFETY - CERTIFICATE /										
26	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE			YES			
27	CALIBRATION DATA SHEET	YES			NACE - CONFIRMATION			NO			
28	SIL - CONFIRMATION	NO			PRESSURE TEST			NO			
29											
30											
	SHEET	RESISTANCE THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET									
	PROJECT NO.	H.0200062.02	RESISTANCE THERMOMETER									
1	ELECTRONICAL UTILIZATION CATEGORY /											
2	EXPLOSION PROTECTION	II 2G EEx ia IIC T6										
3												
4												
5	SIL - FUNCTIONAL SAFETY /											
6												
7												
8												
9	UTILITIES /											
10	THERMOWELL	YES			THERMOWELL MATERIAL	SEE SEP. DATA SHEET						
11	THERMOWELL TYPE	SEE SEP. DATA SHEET										
12												
13												
14	TAG-NO.	DESIGNATION			ADJU. RANGE							
15	TE 0438	MAB DISCHARGE			0 400 °C							
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
	SHEET		RESISTANCE THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG. EN	PAGE 76 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	POSITION MONITORING								
1	MANUFACTURER DATA /										
2	MANUFACTURER	SAMSON			TYPE		3730-3				
3											
4											
5											
6	TECHNICAL DATA /										
7											
8											
9	ALLOWABLE AMBIENT TEMP.	0 ... 40 °C									
10											
11	OUTPUT SIGNAL	4-20mA									
12											
13											
14	SAFETY - CERTIFICATE /										
15											
16											
17											
18											
19	ELECTRONICAL UTILIZATION CATEGORY /										
20	EXPLOSION PROTECTION	Ex ia									
21											
22											
23	SIL - FUNCTIONAL SAFETY /										
24											
25											
26											
27	TAG-NO.	DESIGNATION				ADJU. RANGE					
28	ZT 0444	MAB ANTI SURGE CONTROL VALVE				0 100 %					
29											
30											
	SHEET	POSITION MONITORING				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	ELECTR. TEMPERATURE TRANSMITTER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			3144P				
3	ITEM NUMBER	3144P-D1-A-2-I1-G1-F5-C8-C4-Q4-U1-QT-XA									
4	SAP NUMBER	10699433									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-200 ... 850 °C		CABLE ENTRY POINT			FEMALE THREAD 1/2-14 NPT				
8	COMMENT MEASUR. RANGE	PROGRAMMABLE		ATTENUATION			0	s			
9	ACCURACY	± 0.1% OF SPAN									
10	TRANSMITTER FAILURE MODE	DOWNSCALE, NAMUR NE43		LOCAL INDICATION			NO				
11	AUXILIARY POWER	12...42,4 V DC		CASING MATERIAL			PU COVERED ALUMINUM				
12	ELECTRICAL CONNECTION	SCREW TERMINALS		CASING PROTECTION CATEGORY			IP 66				
13	LOOP ARRANGEMENT	2-WIRE		EARTHING SCREW			YES				
14	INPUT SIGNAL	2 X NICR-NI (K)		CAPTION LABEL			SS TAG LABEL				
15	OUTPUT SIGNAL	4-20mA HART-PROTOCOL		ALLOWABLE AMBIENT TEMP.			-40 ... +85 °C				
16											
17											
18	SAFETY - CERTIFICATE /										
19	DECLARATION OF CONFORMITY	NO		MATERIAL CERTIFICATE			NO				
20	CALIBRATION DATA SHEET	YES		NACE - CONFIRMATION			NO				
21	SIL - CONFIRMATION	YES		PRESSURE TEST			NO				
22											
23	ELECTRONICAL UTILIZATION CATEGORY /										
24	EXPLOSION PROTECTION	II 1 G EEx ia IIC T5/T6									
25	AGENCY	EECS/BASEEFA		CERTIFICATE NO.			BAS 01 ATEX 1431 X				
26											
27	SIL - FUNCTIONAL SAFETY /										
28	AGENCY	EXIDA									
29	CERTIFICATE NO.	ROS 060933 C001									
30											
	SHEET	ELECTR. TEMPERATURE TRANSMITTER			TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		ELECTR. TEMPERATURE TRANSMITTER								
1	TAG-NO.		DESIGNATION				ADJU. RANGE						
2	TT 0437		MAB SUCTION ASC				-20 400 °C						
3	TT 0436A		MAB SUCTION SD				-20 400 °C						
4	TT 0436B		MAB SUCTION SD				-20 400 °C						
5	TT 0436C		MAB SUCTION SD				-20 400 °C						
6													
7													
8													
9													
10													
11													
12													
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30													
	SHEET		ELECTR. TEMPERATURE TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 79 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	ELECTR. TEMPERATURE TRANSMITTER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			3144P				
3	ITEM NUMBER	3144P-D1-A-2-I1-G1-F5-C8-C4-Q4-U1-QT-XA									
4	SAP NUMBER	10699433									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-200 ... 850 °C		CABLE ENTRY POINT			FEMALE THREAD 1/2-14 NPT				
8	COMMENT MEASUR. RANGE	PROGRAMMABLE		ATTENUATION			0	s			
9	ACCURACY	± 0.1% OF SPAN									
10	TRANSMITTER FAILURE MODE	DOWNSCALE, NAMUR NE43		LOCAL INDICATION			NO				
11	AUXILIARY POWER	12...42,4 V DC		CASING MATERIAL			PU COVERED ALUMINUM				
12	ELECTRICAL CONNECTION	SCREW TERMINALS		CASING PROTECTION CATEGORY			IP 66				
13	LOOP ARRANGEMENT	2-WIRE		EARTHING SCREW			YES				
14	INPUT SIGNAL	2 X PT 100 DIN		CAPTION LABEL			SS TAG LABEL				
15	OUTPUT SIGNAL	4-20mA HART-PROTOCOL		ALLOWABLE AMBIENT TEMP.			-40 ... +85 °C				
16											
17											
18	SAFETY - CERTIFICATE /										
19	DECLARATION OF CONFORMITY	NO		MATERIAL CERTIFICATE			NO				
20	CALIBRATION DATA SHEET	YES		NACE - CONFIRMATION			NO				
21	SIL - CONFIRMATION	YES		PRESSURE TEST			NO				
22											
23	ELECTRONICAL UTILIZATION CATEGORY /										
24	EXPLOSION PROTECTION	II 1 G EEx ia IIC T5/T6									
25	AGENCY	EECS/BASEEFA		CERTIFICATE NO.			BAS 01 ATEX 1431 X				
26											
27	SIL - FUNCTIONAL SAFETY /										
28	AGENCY	EXIDA									
29	CERTIFICATE NO.	ROS 060933 C001									
30											
	SHEET	ELECTR. TEMPERATURE TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		ELECTR. TEMPERATURE TRANSMITTER								
1	TAG-NO.		DESIGNATION				ADJU. RANGE						
2	TT 0438		MAB DISCHARGE				0 400 °C						
3	TT 104		MAB DISCHARGE				0 400 °C						
4	TT 0439		MAB PERFORMANCE CONTROLLER				0 260 °C						
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
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28													
29													
30													
	SHEET		ELECTR. TEMPERATURE TRANSMITTER				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOMETER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			S 5550				
3											
4	SAP NUMBER	11047252									
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0 ... 120 °C	ASSEMBLING				DIRECT MOUNTED				
8											
9	ACCURACY	CLASS 1,0 (DIN 13190)	MEASURING ELEMENT				BIMETAL COIL				
10	SCALE UNIT	°C	MEASURING ELEMENT MATERIAL				BIMETAL				
11	DIAL	ALU, WHITE/ SCALE BLACK	PROBE DIAMETER				6 mm				
12	CASE STYLE	ADJUSTABLE EVERY ANGLE	INSTRUMENT CONNECTION				½" NPT				
13	LIQUID FILLING	YES	THERMOWELL CONNECTION				1 1/2" NPT				
14											
15	CASING DIAMETER	100 mm	OVERALL LENGTH				L1 = 307 mm				
16	GLASS COVER	SAFETY GLASS									
17	CASING MATERIAL	CrNi-STEEL									
18	CASING PROTECTION CATEGORY	IP 66 (EN 60529/ IEC 529)	ALLOWABLE AMBIENT TEMP.				-20 ... 60				
19	CAPTION LABEL	SS TAG LABEL									
20											
21											
22											
23	SAFETY - CERTIFICATE /										
24	DECLARATION OF CONFORMITY	YES	MATERIAL CERTIFICATE				YES				
25	CALIBRATION DATA SHEET	YES	NACE - CONFIRMATION				NO				
26	SIL - CONFIRMATION	NO	PRESSURE TEST				NO				
27											
28											
29											
30											
	SHEET	THERMOMETER				TRAIN	BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET										
	PROJECT NO.	H.0200062.02	THERMOMETER										
1	ELECTRONICAL UTILIZATION CATEGORY /												
2													
3													
4													
5	UTILITIES /												
6	THERMOWELL	TW 10p											
7	THERMOWELL TYPE	TAPERED											
8													
9	TAG-NO.	DESIGNATION											
10	TI 0425	MAB LUBE OIL RETURN DE											
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 83 OF 131

	PROJECT	Bilbao	DATASHEET									
	PROJECT NO.	H.0200062.02	THERMOMETER									
1	MANUFACTURER DATA /											
2	MANUFACTURER	WIKA		TYPE			S 5550					
3												
4	SAP NUMBER	11047260										
5												
6	TECHNICAL DATA /											
7	1. MEASURING RANGE	0 ... 120 °C		ASSEMBLING			DIRECT MOUNTED					
8												
9	ACCURACY	CLASS 1,0 (DIN 13190)		MEASURING ELEMENT			BIMETAL COIL					
10	SCALE UNIT	°C		MEASURING ELEMENT MATERIAL			BIMETAL					
11	DIAL	ALU, WHITE/ SCALE BLACK		PROBE DIAMETER			6 mm					
12	CASE STYLE	ADJUSTABLE EVERY ANGLE		INSTRUMENT CONNECTION			½" NPT					
13	LIQUID FILLING	YES		THERMOWELL CONNECTION			1 1/2" NPT					
14				CONNECTION TYPE			COMPRESSION FITTING					
15	CASING DIAMETER	100 mm		OVERALL LENGTH			L1 = 347 mm					
16	GLASS COVER	SAFETY GLASS										
17	CASING MATERIAL	CrNi-STEEL										
18	CASING PROTECTION CATEGORY	IP 66 (EN 60529/ IEC 529)		ALLOWABLE AMBIENT TEMP.			-20 ... 60					
19	CAPTION LABEL	SS TAG LABEL										
20				ALLOWABLE MAX. OP. PRESSURE			250 bar					
21												
22												
23	SAFETY - CERTIFICATE /											
24	DECLARATION OF CONFORMITY	YES		MATERIAL CERTIFICATE			YES					
25	CALIBRATION DATA SHEET	YES		NACE - CONFIRMATION			NO					
26	SIL - CONFIRMATION	NO		PRESSURE TEST			NO					
27												
28												
29												
30												
	SHEET	THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOMETER								
1	ELECTRONICAL UTILIZATION CATEGORY /										
2											
3											
4											
5	UTILITIES /										
6	THERMOWELL	TW 10p									
7	THERMOWELL TYPE	TAPERED									
8											
9	TAG-NO.	DESIGNATION									
10	TI 0426	MAB LUBE OIL RETURN NDE									
11											
12											
13											
14											
15											
16											
17											
18											
19											
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21											
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26											
27											
28											
29											
30											
	SHEET	THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PRESSURE GAUGE								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			233.30				
3	ITEM NUMBER	233.30.100									
4	SAP NUMBER	11049306									
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0	...	6	bar(g)	ASSEMBLING	PIPE MOUNTED				
8						PROCESS CONNECTION	½" NPT, 1.4404 AISI 316 L				
9	ACCURACY	CLASS 1.0				MEASURING ELEMENT	BOURDON TUBE				
10						MEASURING ELEMENT MATERIAL	1.4404 AISI 316L				
11	DIAL	WHITE/ BLACK LETTERING									
12	BLOW OUT DISC	BLOW-OUT BACK				LIQUID FILLING	GLYCERINE				
13	MEASURING PRINCIPLE	BOURDON TUBE									
14	SAFETY PRESSURE GAUGE	WITH SOLID BAFFLE WALL				ALLOWABLE AMBIENT TEMP.	-20 ... 60 °C				
15						ALLOWABLE MEDIUM TEMP.	... +100 °C				
16	CONNECTION POSITION	RADIAL BOTTOM ENTRY				ALLOWABLE MAX. OP. PRESSURE	1,3 x FULL SCALE VALUE -				
17	GLASS COVER	SAFETY GLASS				CASING DIAMETER	100 mm				
18	CAPTION LABEL	SS TAG LABEL				CASING MATERIAL	1.4404 AISI 316L				
19						CASING PROTECTION CATEGORY	IP 65 (EN 60 529/ IEC 529)				
20											
21											
22	SAFETY - CERTIFICATE /										
23						MATERIAL CERTIFICATE	YES				
24	CALIBRATION DATA SHEET	YES									
25						PRESSURE TEST	YES				
26											
27	ELECTRONICAL UTILIZATION CATEGORY /										
28											
29											
30											
	SHEET	PRESSURE GAUGE				TRAIN	BILBOAX F3-C-1 ADI-1783				
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		PRESSURE GAUGE								
1	TAG-NO.		DESIGNATION										
2	PI 0839B		MAB THRUST BRG. 1										
3	PI 0839A		MAB LUBE OIL SUPPLY NDE										
4	PI 0838		MAB LUBE OIL SUPPLY DE										
5	PI 0840		MAB LUBE OIL HEADER										
6													
7													
8													
9													
10													
11													
12													
13													
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15													
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28													
29													
30													
	SHEET		PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOWELL								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT		TYPE			EB				
3	ITEM NUMBER	EB102F8B177010K1F001-R21									
4											
5											
6	TECHNICAL DATA /										
7	THERMOWELL	BARSTOCK		PROCESS CONNECTION			FLANGE, 2", 150 lbs, RF				
8	THERMOWELL MATERIAL	316L		THERMOW. TO SENSOR CONN.			FEMALE THREAD NPT 1/2"				
9	CAPTION LABEL	SS TAG LABEL		INSERT LENGTH			U =270		mm		
10				OVERALL LENGTH			S =330		mm		
11											
12											
13											
14	REMARK	MARKED WITH: MANUFACTURER, MATERIAL, MAX. PRESSURE									
15											
16	SAFETY - CERTIFICATE /										
17	DECLARATION OF CONFORMITY	NO		MATERIAL CERTIFICATE			YES				
18	CALIBRATION DATA SHEET	NO		NACE - CONFIRMATION			NO				
19	SIL - CONFIRMATION	NO		PRESSURE TEST			NO				
20	VIBRATION CALCULATION	YES									
21											
22	ELECTRONICAL UTILIZATION CATEGORY /										
23											
24											
25											
26	UTILITIES /										
27											
28											
29	TAG-NO.	DESIGNATION									
30	TW 0438	MAB DISCHARGE									
	SHEET	THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET							
	PROJECT NO.	H.0200062.02	THERMOWELL							
1	MANUFACTURER DATA /									
2	MANUFACTURER	WIKA		TYPE			TW10-P			
3										
4	SAP NUMBER	11047272								
5										
6	TECHNICAL DATA /									
7	THERMOWELL	BARSTOCK		PROCESS CONNECTION			FLANGE / 1 1/2", 150 lbs, RF			
8	THERMOWELL MATERIAL	1.4541		THERMOW. TO SENSOR CONN.			FEMALE THREAD NPT 1/2"			
9	CAPTION LABEL	SS TAG LABEL		INSERT LENGTH			U =260	mm		
10				OVERALL LENGTH			S =310	mm		
11				BORE DIAMETER			6.6	mm		
12				THERMOWELL DIAMETER			19	mm		
13				TIP DIAMETER			6.4	mm		
14	REMARK	LABELLING WITH: MANUFACTURER, MATERIAL, ALLOWED PRESSURE								
15										
16	SAFETY - CERTIFICATE /									
17				MATERIAL CERTIFICATE			EN 10204 3.1			
18										
19				PRESSURE TEST			DRUCKTEST			
20										
21										
22	ELECTRONICAL UTILIZATION CATEGORY /									
23										
24										
25										
26	UTILITIES /									
27										
28										
29	TAG-NO.	DESIGNATION								
30	TW 0425	MAB LUBE OIL RETURN DE								
	SHEET	THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783		
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOWELL								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			TW10-P				
3											
4	SAP NUMBER	11047274									
5											
6	TECHNICAL DATA /										
7	THERMOWELL	BARSTOCK		PROCESS CONNECTION			FLANGE / 1 1/2", 150 lbs, RF				
8	THERMOWELL MATERIAL	1.4541		THERMOW. TO SENSOR CONN.			FEMALE THREAD NPT 1/2"				
9	CAPTION LABEL	SS TAG LABEL		INSERT LENGTH			U =300	mm			
10				OVERALL LENGTH			S =350	mm			
11				BORE DIAMETER			6.6	mm			
12				THERMOWELL DIAMETER			19	mm			
13				TIP DIAMETER			6.4	mm			
14	REMARK	LABELLING WITH: MANUFACTURER, MATERIAL, ALLOWED PRESSURE									
15											
16	SAFETY - CERTIFICATE /										
17				MATERIAL CERTIFICATE			EN 10204 3.1				
18											
19				PRESSURE TEST			DRUCKTEST				
20											
21											
22	ELECTRONICAL UTILIZATION CATEGORY /										
23											
24											
25											
26	UTILITIES /										
27											
28											
29	TAG-NO.	DESIGNATION									
30	TW 0426	MAB LUBE OIL RETURN NDE									
	SHEET	THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE OF 90 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	SHAFT CONTROL PROBES								
1	MANUFACTURER DATA /										
2	MANUFACTURER	BENTLY NEVADA		TYPE			330105				
3	ITEM NUMBER	330105-02-12-05-02-05									
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0.25 ... 2.3 mm									
8					CABLE TYPE			COAXIAL CABLE			
9					OIL RESISTANT			YES			
10	MEASURING ELEMENT	8mm/0,31"		02	CABLE LENGTH			0.5 m			
11	MEASURING ELEMENT MATERIAL	1.4301 AISI 304			FINISH WIRE ENDS			PLUG			
12	MEASURING PRINCIPLE	EDDY CURRENT			PROBE LENGTH			0.5 m			
13	PROBE TIP MATERIAL	PPS (POLYPHENYLENE SULFIDE)			THREAD LENGTH			3/8"-24UNF mm			
14	CASING PROTECTION CATEGORY	IP66			PROCESS CONNECTION			THREAD			
15					PROBE TIP			8 mm			
16	CAPTION LABEL	WITHOUT			ALLOWABLE MEDIUM TEMP.			-51 ... +177 °C			
17					ALLOWABLE AMBIENT TEMP.			-34 ... +177 °C			
18					ALLOWABLE OP. PRESSURE			690 kPa			
19	REMARK	SCOPE OF MOTOR MANUFACTURER, FOR MORE DETAILS REFER TO MOTOR MANUFACTURER MANUALS									
20											
21	SAFETY - CERTIFICATE /										
22	DECLARATION OF CONFORMITY	YES									
23	CALIBRATION DATA SHEET	YES									
24											
25											
26	ELECTRONICAL UTILIZATION CATEGORY /										
27	EXPLOSION PROTECTION	II 1 G Ex ia IIC T5									
28	AGENCY	EECS			CERTIFICATE NO.			BAS99ATEX1099 BAS99ATEX3098X			
29											
30											
	SHEET	SHAFT CONTROL PROBES				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao		DATASHEET									
	PROJECT NO.	H.0200062.02		SHAFT CONTROL PROBES									
1	SIL - FUNCTIONAL SAFETY /												
2	AGENCY		N/A				PFD-VALUE		N/A				
3	CERTIFICATE NO.		N/A				MTBF-VALUE		N/A				
4													
5	UTILITIES /												
6	DESIGNATION		330130-045-00-05				ARMOR		WITHOUT				
7	IMPEDANCE		75 Ohm				CONNECTOR		YES				
8	CABLE LENGTH		4.5 m										
9													
10	TAG-NO.	DESIGNATION				ADJU. RANGE							
11	VE 0010X	MOTOR JOURN. BRG. NDE				0 150 µm							
12	VE 0010Y	MOTOR JOURN. BRG. NDE				0 150 µm							
13	VE 0011X	MOTOR JOURN. BRG. DE				0 150 µm							
14	VE 0011Y	MOTOR JOURN. BRG. DE				0 150 µm							
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		SHAFT CONTROL PROBES				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	BEAR. RESIST. THERM.								
1	MANUFACTURER DATA /										
2	MANUFACTURER	EPHY MESS	02	TYPE			PR-SPA-EX-LTH	02			
3	ITEM NUMBER	995110216000001								02	
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-50 ... 180 °C	02	CABLE TYPE			RDBN(2xRD/WH/2xBK/YE)	02			
8	ACCURACY	CLASS A 0...150 °C									
9	LOOP ARRANGEMENT	3-WIRE									
10	MEASURING ELEMENT	PT 100 DIN		OIL RESISTANT			YES				
11	MEASURING ELEMENT MATERIAL	1.4571 AISI 316Ti		CABLE LENGTH			5000 m	02			
12	STANDARD	class B, ±0.3°C at 0°C acc. to DIN EN 60751	02								
13	NUMBER OF ELEMENTS	2		PROBE LENGTH			240 mm	02			
14	HIGH VIBRATION PROOF			ALLOWABLE AMBIENT TEMP.			-51 ... +60 °C				
15				ALLOWABLE MEDIUM TEMP.			-50 ... +450 °C				
16	ASSEMBLING	brass, nickel-plated	02								
17											
18											
19	SAFETY - CERTIFICATE /										
20	DECLARATION OF CONFORMITY	BY MANUFACTURER (Q32)	02	MATERIAL CERTIFICATE			NO	02			
21	CALIBRATION DATA SHEET	BY MANUFACTURER	02	NACE - CONFIRMATION			NO	02			
22	SIL - CONFIRMATION	NO	02	PRESSURE TEST			NO	02			
23											
24	ELECTRONICAL UTILIZATION CATEGORY /										
25	EXPLOSION PROTECTION	II 2G Ex ia IIC T3 Gb	02								
26	AGENCY	ATEX	02	CERTIFICATE NO.			PTB 02 ATEX 2020X	02			
27											
28											
29											
30											
	SHEET	BEAR. RESIST. THERM.			TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET										
	PROJECT NO.	H.0200062.02	BEAR. RESIST. THERM.										
1	SIL - FUNCTIONAL SAFETY /												
2													
3													
4													
5	TAG-NO.	DESIGNATION				ADJU. RANGE							
6	TE 0400A/B	MOTOR JOURN. BRG. NDE				0 150 °C							
7	TE 0400C/D	MOTOR JOURN. BRG. NDE				0 150 °C							
8	TE 0401A/B	MOTOR JOURN. BRG. DE				0 150 °C							
9	TE 0401C/D	MOTOR JOURN. BRG. DE				0 150 °C							
10													
11													
12													
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29													
30													
	SHEET		BEAR. RESIST. THERM.				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 94
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	screened slot resistance thermometer								
1	MANUFACTURER DATA /										
2	MANUFACTURER	EPHY MESS	02	TYPE			PR-SPA-EX-NWT	02			
3											
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	-60 ... 180 °C	02								
8	ACCURACY	class A, ±0.15°C at 0°C, acc. to DIN EN 60751	02								
9	LOOP ARRANGEMENT	3-WIRE									
10	MEASURING ELEMENT	PT 100 DIN									
11	MEASURING ELEMENT MATERIAL	1.4541		CABLE LENGTH			5000 m	02			
12											
13	NUMBER OF ELEMENTS	1		PROBE LENGTH			180 mm	02			
14	HIGH VIBRATION PROOF			ALLOWABLE AMBIENT TEMP.			-51 ... +60 °C				
15				ALLOWABLE MEDIUM TEMP.			-50 ... +450 °C				
16											
17											
18											
19	SAFETY - CERTIFICATE /										
20	DECLARATION OF CONFORMITY	BY MANUFACTURER (Q32)	02	MATERIAL CERTIFICATE			NO	02			
21	CALIBRATION DATA SHEET	BY MANUFACTURER	02	NACE - CONFIRMATION			NO	02			
22	SIL - CONFIRMATION	NO	02	PRESSURE TEST			NO	02			
23											
24	ELECTRONICAL UTILIZATION CATEGORY /										
25	EXPLOSION PROTECTION	Ex ia IIC Gb	02								
26	AGENCY	ATEX	02	CERTIFICATE NO.			IBExU 14 ATEX 1281 U	02			
27											
28											
29											
30											
	SHEET	BEAR. RESIST. THERM.			TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET										
	PROJECT NO.	H.0200062.02	screened slot resistance thermometer										
1	SIL - FUNCTIONAL SAFETY /												
2													
3													
4													
5	TAG-NO.	DESIGNATION				ADJU. RANGE							
6	TE 0402A	MOTOR WINDINGS U				0 200 °C							
7	TE 0402B	MOTOR WINDINGS U				0 200 °C							
8	TE 0402C	MOTOR WINDINGS U				0 200 °C							
9	TE 0402D	MOTOR WINDINGS U				0 200 °C							
10	TE 0403A	MOTOR WINDINGS V				0 200 °C							
11	TE 0403B	MOTOR WINDINGS V				0 200 °C							
12	TE 0403C	MOTOR WINDINGS V				0 200 °C							
13	TE 0403D	MOTOR WINDINGS V				0 200 °C							
14	TE 0404A	MOTOR WINDINGS W				0 200 °C							
15	TE 0404B	MOTOR WINDINGS W				0 200 °C							
16	TE 0404C	MOTOR WINDINGS W				0 200 °C							
17	TE 0404D	MOTOR WINDINGS W				0 200 °C							
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		BEAR. RESIST. THERM.				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 96
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PROXIMITOR								
1	MANUFACTURER DATA /										
2	MANUFACTURER	BENTLY NEVADA			TYPE		330180				
3	ITEM NUMBER	330180-51-05									02
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0.25 ... 2.3 mm			AUXILIARY POWER		-23...-26 V DC				
8					ELECTRICAL CONNECTION		TENSION SPRING TERMINALS				
9	ALLOWABLE AMBIENT TEMP.	-35 ... +85 °C			CAPTION LABEL		WITHOUT				
10	FOR SENSOR TYPE	330101/**2/**3/**4/**5/**6			ASSEMBLING		DIN RAIL MOUNTED				
11	OUTPUT SIGNAL	-1 ... -18 V DC									
12											
13											
14	SAFETY - CERTIFICATE /										
15	DECLARATION OF CONFORMITY	YES			MATERIAL CERTIFICATE		YES				
16											
17											
18											
19	ELECTRONICAL UTILIZATION CATEGORY /										
20	EXPLOSION PROTECTION	II 1 G Ex ia IIC T4/T5 Ga									
21	AGENCY	EECS			CERTIFICATE NO.		BAS99ATEX1101				
22											
23	SIL - FUNCTIONAL SAFETY /										
24											
25											
26											
27	TAG-NO.	DESIGNATION			ADJU. RANGE						
28	VT 0010X	MOTOR JOURN. BRG. NDE			0 150 µm						
29	VT 0010Y	MOTOR JOURN. BRG. NDE			0 150 µm						
30	VT 0011X	MOTOR JOURN. BRG. DE			0 150 µm						
	SHEET	PROXIMITOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		PROXIMITOR								
1	TAG-NO.		DESIGNATION			ADJU. RANGE							
2	VT 0011Y		MOTOR JOURN. BRG. DE			0 150 µm							
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
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30													
	SHEET		PROXIMITOR				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOMETER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			S 5550				
3											
4	SAP NUMBER	11047246									02
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0 ... 120 °C		ASSEMBLING			DIRECT MOUNTED				
8											
9	ACCURACY	CLASS 1,0 (DIN 13190)		MEASURING ELEMENT			BIMETAL COIL				
10	SCALE UNIT	°C		MEASURING ELEMENT MATERIAL			BIMETAL				
11	DIAL	ALU, WHITE/ SCALE BLACK		PROBE DIAMETER			6 mm				
12	CASE STYLE	ADJUSTABLE EVERY ANGLE		INSTRUMENT CONNECTION			½" NPT				
13	LIQUID FILLING	YES		THERMOWELL CONNECTION			1 1/2" NPT				
14				CONNECTION TYPE			COMPRESSION FITTING				
15	CASING DIAMETER	100 mm		OVERALL LENGTH			L1 = 247 mm	02			
16	GLASS COVER	SAFETY GLASS									
17	CASING MATERIAL	CrNi-STEEL									
18	CASING PROTECTION CATEGORY	IP 66 (EN 60529/ IEC 529)		ALLOWABLE AMBIENT TEMP.			-20 ... 60				
19	CAPTION LABEL	SS TAG LABEL									
20				ALLOWABLE MAX. OP. PRESSURE			250 bar				
21											
22											
23	SAFETY - CERTIFICATE /										
24	DECLARATION OF CONFORMITY	YES		MATERIAL CERTIFICATE			YES				
25	CALIBRATION DATA SHEET	YES		NACE - CONFIRMATION			NO				
26	SIL - CONFIRMATION	NO		PRESSURE TEST			NO				
27											
28											
29											
30											
	SHEET	THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET											
	PROJECT NO.	H.0200062.02	THERMOMETER											
1	ELECTRONICAL UTILIZATION CATEGORY /													
2														
3														
4														
5	UTILITIES /													
6	THERMOWELL	TW 10p	02											
7	THERMOWELL TYPE	TAPERED												
8														
9	TAG-NO.	DESIGNATION												
10	TI 0422	MOTOR BEARING HOUSING LUBE OIL SUPPLY NDE												
11	TI 0423	MOTOR BEARING HOUSING LUBE OIL SUPPLY DE												
12														
13														
14														
15														
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29														
30														
	SHEET		THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783					
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	PROJECT	Bilbao		DATASHEET						
	PROJECT NO.	H.0200062.02		THERMOWELL						
1	MANUFACTURER DATA /									
2	MANUFACTURER	WIKA		TYPE		TW10-P				
3										
4	SAP NUMBER	10508229								
5										
6	TECHNICAL DATA /									
7	THERMOWELL	BARSTOCK		PROCESS CONNECTION		FLANGE / 1 1/2", 150 lbs, RF				
8	THERMOWELL MATERIAL	1.4541		THERMOW. TO SENSOR CONN.		FEMALE THREAD NPT 1/2"				
9	CAPTION LABEL	SS TAG LABEL		INSERT LENGTH		U =200	mm	02		
10				OVERALL LENGTH		S =250	mm	02		
11				BORE DIAMETER		6.6	mm	02		
12				THERMOWELL DIAMETER		19	mm	02		
13				TIP DIAMETER		6.4	mm	02		
14	REMARK	LABELLING WITH: MANUFACTURER, MATERIAL, ALLOWED PRESSURE								
15										
16	SAFETY - CERTIFICATE /									
17				MATERIAL CERTIFICATE		EN 10204 3.1				
18										
19				PRESSURE TEST		DRUCKTEST				
20										
21										
22	ELECTRONICAL UTILIZATION CATEGORY /									
23										
24										
25										
26	UTILITIES /									
27										
28										
29	TAG-NO.	DESIGNATION								
30	TW 0422	MOTOR BEARING HOUSING LUBE OIL SUPPLY NDE								
	SHEET	THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783		
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	PROJECT		Bilbao		DATASHEET									
	PROJECT NO.		H.0200062.02		THERMOWELL									
1	TAG-NO.		DESIGNATION											
2	TW 0423		MOTOR BEARING HOUSING LUBE OIL SUPPLY DE											
3														
4														
5														
6														
7														
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9														
10														
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29														
30														
	SHEET		THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783					
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOMETER								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			S 5550				
3											
4	SAP NUMBER	11049305									02
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0 ... 60 °C	02	ASSEMBLING			PIPE MOUNTED				
8											
9	ACCURACY	CLASS 1,0 (DIN 13190)		MEASURING ELEMENT			BIMETAL COIL				
10	SCALE UNIT	°C		MEASURING ELEMENT MATERIAL			BIMETAL				
11	DIAL	ALU, WHITE/ SCALE BLACK		PROBE DIAMETER			6 mm				
12	CASE STYLE	ADJUSTABLE EVERY ANGLE		INSTRUMENT CONNECTION			1/2" NPT				
13	LIQUID FILLING	GLYCERINE									
14				CONNECTION TYPE			COMPRESSION FITTING				
15	CASING DIAMETER	100 mm		OVERALL LENGTH			267 mm	02			
16	GLASS COVER	FLAT INSTRUMENT GLASS									
17	CASING MATERIAL	CrNi-STEEL									
18	CASING PROTECTION CATEGORY	IP65									
19	CAPTION LABEL	SS TAG LABEL		ALLOWABLE MEDIUM TEMP.			... 66 °C				
20											
21	REMARK	stem length 235 mm									
22											
23	SAFETY - CERTIFICATE /										
24	DECLARATION OF CONFORMITY	NO		MATERIAL CERTIFICATE			YES				
25	CALIBRATION DATA SHEET	NO		NACE - CONFIRMATION			NO				
26	SIL - CONFIRMATION	NO		PRESSURE TEST			NO				
27											
28											
29											
30											
	SHEET	THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET									
	PROJECT NO.	H.0200062.02	THERMOMETER									
1	ELECTRONICAL UTILIZATION CATEGORY /											
2												
3												
4												
5	UTILITIES /											
6	THERMOWELL	SEE SEP. DATA SHEET										
7												
8												
9	TAG-NO.	DESIGNATION										
10	TI 0408A	MOTOR COOLER COOLING WATER SUPPLY										
11	TI 0408B	MOTOR COOLER COOLING WATER RETURN										
12												
13												
14												
15												
16												
17												
18												
19												
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21												
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24												
25												
26												
27												
28												
29												
30												
	SHEET		THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET							
	PROJECT NO.	H.0200062.02	RESIST. THERM. PT100							
1	MANUFACTURER DATA /									
2	MANUFACTURER	EPHY MESS			TYPE		PR-SPA-EX-LTH			
3	ITEM NUMBER	995110216000001								
4										
5										
6	TECHNICAL DATA /									
7	MEASURING RANGE	-50 ... 180 °C			CABLE TYPE		RDBN(2xRD/WH/2xBK/YE)			
8	ACCURACY	CLASS A 0...150 °C								
9	LOOP ARRANGEMENT	3-WIRE								
10	MEASURING ELEMENT	PT 100 DIN			OIL RESISTANT		YES			
11	MEASURING ELEMENT MATERIAL	1.4571 AISI 316Ti			CABLE LENGTH		5000 m			
12	STANDARD	class B, ±0.3°C at 0°C acc. to DIN EN 60751								
13	NUMBER OF ELEMENTS	2			PROBE LENGTH		240 mm			
14	HIGH VIBRATION PROOF				ALLOWABLE AMBIENT TEMP.		-51 ... +60 °C			
15					ALLOWABLE MEDIUM TEMP.		-50 ... +450 °C			
16	ASSEMBLING	brass, nickel-plated								
17										
18										
19	SAFETY - CERTIFICATE /									
20	DECLARATION OF CONFORMITY	BY MANUFACTURER (Q32)			MATERIAL CERTIFICATE		NO			
21	CALIBRATION DATA SHEET	BY MANUFACTURER			NACE - CONFIRMATION		NO			
22	SIL - CONFIRMATION	NO			PRESSURE TEST		NO			
23										
24	ELECTRONICAL UTILIZATION CATEGORY /									
25	EXPLOSION PROTECTION	II 2G Ex ia IIC T3 Gb								
26	AGENCY	ATEX			CERTIFICATE NO.		PTB 02 ATEX 2020X			
27										
28										
29										
30										
	SHEET	RESIST. THERM. PT100				TRAIN		BILBOAX F3-C-1 ADI-1783		
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN
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	PROJECT	Bilbao	DATASHEET											
	PROJECT NO.	H.0200062.02	RESIST. THERM. PT100											
	1	SIL - FUNCTIONAL SAFETY /												
2														
3														
4														
5	TAG-NO.	DESIGNATION				ADJU. RANGE								
6	TE 0407A/B	MOTOR COOLING AIR COLD				0 100 °C								
7	TE 0407C/D	MOTOR COOLING AIR COLD				0 100 °C								
8	TE 0406A/B	MOTOR COOLING AIR HOT				0 150 °C								
9														
10														
11														
12														
13														
14														
15														
16														
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29														
30														
	SHEET		RESIST. THERM. PT100				TRAIN		BILBOAX F3-C-1 ADI-1783					
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PRESSURE GAUGE								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			233.30				
3	ITEM NUMBER	233.30.100									
4	SAP NUMBER	11049306									
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0	...	6	bar(g)	ASSEMBLING	PIPE MOUNTED				
8						PROCESS CONNECTION	½" NPT, 1.4404 AISI 316 L				
9	ACCURACY	CLASS 1.0				MEASURING ELEMENT	BOURDON TUBE				
10						MEASURING ELEMENT MATERIAL	1.4404 AISI 316L				
11	DIAL	WHITE/ BLACK LETTERING									
12	BLOW OUT DISC	BLOW-OUT BACK				LIQUID FILLING	GLYCERINE				
13	MEASURING PRINCIPLE	BOURDON TUBE									
14	SAFETY PRESSURE GAUGE	WITH SOLID BAFFLE WALL				ALLOWABLE AMBIENT TEMP.	-20	...	60	°C	
15						ALLOWABLE MEDIUM TEMP.		...	+100	°C	
16	CONNECTION POSITION	RADIAL BOTTOM ENTRY				ALLOWABLE MAX. OP. PRESSURE	1,3 x FULL SCALE VALUE			-	
17	GLASS COVER	SAFETY GLASS				CASING DIAMETER	100			mm	
18	CAPTION LABEL	SS TAG LABEL				CASING MATERIAL	1.4404 AISI 316L				
19						CASING PROTECTION CATEGORY	IP 65 (EN 60 529/ IEC 529)				
20											
21											
22	SAFETY - CERTIFICATE /										
23						MATERIAL CERTIFICATE	YES				
24	CALIBRATION DATA SHEET	YES									
25						PRESSURE TEST	YES				
26											
27	ELECTRONICAL UTILIZATION CATEGORY /										
28											
29											
30											
	SHEET	PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE OF107131

	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		PRESSURE GAUGE								
	1	TAG-NO.		DESIGNATION									
2	PI 0835		MOTOR LUBE OIL SUPPLY NDE										
3	PI 0836		MOTOR LUBE OIL SUPPLY DE										
4													
5													
6													
7													
8													
9													
10													
11													
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30													
	SHEET		PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PRESSURE GAUGE								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			233.30				
3	ITEM NUMBER	233.30.100									
4	SAP NUMBER	11049308									
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0	...	10	bar(g)	ASSEMBLING	PIPE MOUNTED				
8						PROCESS CONNECTION	½" NPT, 1.4404 AISI 316 L				
9	ACCURACY	CLASS 1.0				MEASURING ELEMENT	BOURDON TUBE				
10						MEASURING ELEMENT MATERIAL	1.4404 AISI 316L				
11	DIAL	WHITE/ BLACK LETTERING									
12	BLOW OUT DISC	BLOW-OUT BACK				LIQUID FILLING	GLYCERINE				
13	MEASURING PRINCIPLE	BOURDON TUBE									
14	SAFETY PRESSURE GAUGE	WITH SOLID BAFFLE WALL				ALLOWABLE AMBIENT TEMP.	-20 ... 60 °C				
15						ALLOWABLE MEDIUM TEMP.	... +100 °C				
16	CONNECTION POSITION	RADIAL BOTTOM ENTRY				ALLOWABLE MAX. OP. PRESSURE	1,3 x FULL SCALE VALUE -				
17	GLASS COVER	SAFETY GLASS				CASING DIAMETER	100 mm				
18	CAPTION LABEL	SS TAG LABEL				CASING MATERIAL	1.4404 AISI 316L				
19						CASING PROTECTION CATEGORY	IP 65 (EN 60 529/ IEC 529)				
20											
21											
22	SAFETY - CERTIFICATE /										
23						MATERIAL CERTIFICATE	YES				
24	CALIBRATION DATA SHEET	YES									
25						PRESSURE TEST	YES				
26											
27	ELECTRONICAL UTILIZATION CATEGORY /										
28											
29											
30											
	SHEET	PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		PRESSURE GAUGE								
1	TAG-NO.		DESIGNATION										
2	PI 0866		MOTOR COOLER COOLING WATER SUPPLY										
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
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30													
	SHEET		PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 110 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PRESSURE GAUGE								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			233.30				
3	ITEM NUMBER	233.30.100									
4	SAP NUMBER	11049309									
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0 ... 100 bar(g)			ASSEMBLING			PIPE MOUNTED			
8					PROCESS CONNECTION			½" NPT, 1.4404 AISI 316 L			
9	ACCURACY	CLASS 1.0			MEASURING ELEMENT			BOURDON TUBE			
10					MEASURING ELEMENT MATERIAL			1.4404 AISI 316L			
11	DIAL	WHITE/ BLACK LETTERING									
12	BLOW OUT DISC	BLOW-OUT BACK			LIQUID FILLING			GLYCERINE			
13	MEASURING PRINCIPLE	BOURDON TUBE									
14	SAFETY PRESSURE GAUGE	WITH SOLID BAFFLE WALL			ALLOWABLE AMBIENT TEMP.			-20 ... 60 °C			
15					ALLOWABLE MEDIUM TEMP.			... +100 °C			
16	CONNECTION POSITION	RADIAL BOTTOM ENTRY			ALLOWABLE MAX. OP. PRESSURE			1,3 x FULL SCALE VALUE -			
17	GLASS COVER	SAFETY GLASS			CASING DIAMETER			100 mm			
18	CAPTION LABEL	SS TAG LABEL			CASING MATERIAL			1.4404 AISI 316L			
19					CASING PROTECTION CATEGORY			IP 65 (EN 60 529/ IEC 529)			
20											
21											
22	SAFETY - CERTIFICATE /										
23					MATERIAL CERTIFICATE			YES			
24	CALIBRATION DATA SHEET	YES									
25					PRESSURE TEST			YES			
26											
27	ELECTRONICAL UTILIZATION CATEGORY /										
28											
29											
30											
	SHEET	PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE 111 OF 131

	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		PRESSURE GAUGE								
	1	TAG-NO.		DESIGNATION									
2	PI 0835A		MOTOR JACKING OIL SUPPLY NDE										
3	PI 0836A		MOTOR JACKING OIL SUPPLY DE										
4													
5													
6													
7													
8													
9													
10													
11													
12													
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14													
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29													
30													
	SHEET		PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 112 OF 131

	PROJECT	Bilbao	DATASHEET							
	PROJECT NO.	H.0200062.02	THERMOWELL							
1	MANUFACTURER DATA /									
2	MANUFACTURER	WIKA		TYPE			TW10-P			
3										
4	SAP NUMBER	11049303								
5										
6	TECHNICAL DATA /									
7	THERMOWELL	BARSTOCK		PROCESS CONNECTION			FLANGE / 1 1/2", 150 lbs, RF			
8	THERMOWELL MATERIAL	1.4401		THERMOW. TO SENSOR CONN.			FEMALE THREAD NPT 1/2"			
9	CAPTION LABEL	SS TAG LABEL		INSERT LENGTH			U = 220	mm		
10				OVERALL LENGTH			S = 270	mm		
11				BORE DIAMETER			6.6	mm		
12				THERMOWELL DIAMETER			25	mm		
13				TIP DIAMETER			19	mm		
14	REMARK	LABELLING WITH: MANUFACTURER, MATERIAL, ALLOWED PRESSURE								
15										
16	SAFETY - CERTIFICATE /									
17	DECLARATION OF CONFORMITY	NO		MATERIAL CERTIFICATE			YES			
18	CALIBRATION DATA SHEET	NO		NACE - CONFIRMATION			NO			
19	SIL - CONFIRMATION	NO		PRESSURE TEST			YES			
20	VIBRATION CALCULATION	NO								
21										
22	ELECTRONICAL UTILIZATION CATEGORY /									
23										
24										
25										
26	UTILITIES /									
27										
28										
29	TAG-NO.	DESIGNATION								
30	TW 0408A	MOTOR COOLER COOLING WATER SUPPLY								
	SHEET	THERMOWELL			TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		THERMOWELL								
1	TAG-NO.		DESIGNATION										
2	TW 0408B		MOTOR COOLER COOLING WATER RETURN										
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
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29													
30													
	SHEET		THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 114 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	SHAFT CONTROL PROBES								
1	MANUFACTURER DATA /										
2	MANUFACTURER	BENTLY NEVADA		TYPE			330105				
3	ITEM NUMBER	330105-									
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0.25 ... 2.3 mm									
8					CABLE TYPE			COAXIAL CABLE			
9					OIL RESISTANT			YES			
10	MEASURING ELEMENT	8mm/0,31"		02							
11	MEASURING ELEMENT MATERIAL	1.4301 AISI 304			FINISH WIRE ENDS			PLUG			
12	MEASURING PRINCIPLE	EDDY CURRENT									
13	PROBE TIP MATERIAL	PPS (POLYPHENYLENE SULFIDE)									
14	CASING PROTECTION CATEGORY	IP66			PROCESS CONNECTION			3/8"-24 UNF-2A			
15					PROBE TIP			8 MM			
16	CAPTION LABEL	WITHOUT			ALLOWABLE MEDIUM TEMP.			-51 ... +177 °C			
17					ALLOWABLE AMBIENT TEMP.			-34 ... +177 °C			
18					ALLOWABLE OP. PRESSURE			690 kPa			
19	REMARK	SCOPE OF GEAR MANUFACTURER, FOR MORE DETAILS REFER TO GEAR MANUFACTURER MANUALS									
20											
21	SAFETY - CERTIFICATE /										
22	DECLARATION OF CONFORMITY	YES									
23	CALIBRATION DATA SHEET	YES									
24											
25											
26	ELECTRONICAL UTILIZATION CATEGORY /										
27	EXPLOSION PROTECTION	II 1 G EEx ia IIC T1,,T5									
28	AGENCY	EECS				CERTIFICATE NO.			BAS99ATEX1099 BAS99ATEX3098X		
29											
30											
	SHEET	SHAFT CONTROL PROBES				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	SHAFT CONTROL PROBES								
1	SIL - FUNCTIONAL SAFETY /										
2											
3											
4											
5	UTILITIES /										
6	DESIGNATION	330130-040-00-05		ARMOR	WITHOUT						
7	IMPEDANCE	75	Ohm	CONNECTOR	YES						
8	CABLE LENGTH	4.0	m								
9											
10	TAG-NO.	DESIGNATION	ADJU. RANGE								
11	ZE 0014A	GEAR SHAFT 1 AXIAL DISPLACEMENT	-1 +1 mm								
12	ZE 0014B	GEAR SHAFT 1 AXIAL DISPLACEMENT	-1 +1 mm								
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
	SHEET	SHAFT CONTROL PROBES				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE 116 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	BEAR. RESIST. THERM.								
1	MANUFACTURER DATA /										
2	MANUFACTURER	ROSEMOUNT									
3											
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0 ... +150 °C									
8	ACCURACY	CLASS A 0...150 °C									
9	LOOP ARRANGEMENT	3-WIRE									
10	MEASURING ELEMENT	PT 100 DIN			OIL RESISTANT		YES				
11	MEASURING ELEMENT MATERIAL	1.4541									
12	STANDARD	DIN/EN 60751 (IEC751)									
13	NUMBER OF ELEMENTS	2									
14	HIGH VIBRATION PROOF	YES			ALLOWABLE AMBIENT TEMP.		-51 ... +60 °C				
15					ALLOWABLE MEDIUM TEMP.		-50 ... +450 °C				
16											
17											
18											
19	SAFETY - CERTIFICATE /										
20											
21											
22											
23											
24	ELECTRONICAL UTILIZATION CATEGORY /										
25	EXPLOSION PROTECTION	Ex II 2G EEx ia IIC T6									
26	AGENCY	IBExU			CERTIFICATE NO.		IBExU03ATEX1066X				
27											
28											
29											
30											
	SHEET	BEAR. RESIST. THERM.				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET									
	PROJECT NO.	H.0200062.02	BEAR. RESIST. THERM.									
1	SIL - FUNCTIONAL SAFETY /											
2												
3												
4												
5	TAG-NO.	DESIGNATION			ADJU. RANGE							
6	TE 0411A/B	GEAR SHAFT 1 JOURN. BRG. NDE			0 150 °C							
7	TE 0411C/D	GEAR SHAFT 1 JOURN. BRG. NDE			0 150 °C							
8	TE 0410A/B	GEAR SHAFT 1 JOURN. BRG. DE			0 150 °C							
9	TE 0410C/D	GEAR SHAFT 1 JOURN. BRG. DE			0 150 °C							
10	TE 0412A/B	GEAR SHAFT 1 THRUST BRG. INBOARD			0 150 °C							
11	TE 0412C/D	GEAR SHAFT 1 THRUST BRG. INBOARD			0 150 °C							
12	TE 0413A/B	GEAR SHAFT 1 THRUST BRG. OUTBOARD			0 150 °C							
13	TE 0413C/D	GEAR SHAFT 1 THRUST BRG. OUTBOARD			0 150 °C							
14	TE 0415A/B	GEAR SHAFT 2 JOURN. BRG. NDE			0 150 °C							
15	TE 0415C/D	GEAR SHAFT 2 JOURN. BRG. NDE			0 150 °C							
16	TE 0414A/B	GEAR SHAFT 2 JOURN. BRG. DE			0 150 °C							
17	TE 0414C/D	GEAR SHAFT 2 JOURN. BRG. DE			0 150 °C							
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
	SHEET		BEAR. RESIST. THERM.			TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE 118
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PROXIMITOR								
1	MANUFACTURER DATA /										
2	MANUFACTURER	BENTLY NEVADA		TYPE			330180				
3	ITEM NUMBER	330180-51-05									
4											
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0.25 ... 2.3 mm	AUXILIARY POWER			-23...-26 V DC					
8	COMMENT MEASUR. RANGE	LINEAR	ELECTRICAL CONNECTION			TENSION SPRING TERMINALS					
9	ALLOWABLE AMBIENT TEMP.	-35 ... +85 °C									
10	FOR SENSOR TYPE	330101/**2/**3/**4/**5/**6	ASSEMBLING			DIN RAIL MOUNTED					
11	OUTPUT SIGNAL	-1 ... -18 V DC									
12	REMARK	FOR MORE DETAILS REFER TO GEAR MANUFACTURER MANUAL									
13											
14	SAFETY - CERTIFICATE /										
15	DECLARATION OF CONFORMITY	YES									
16	CALIBRATION DATA SHEET	YES									
17											
18											
19	ELECTRONICAL UTILIZATION CATEGORY /										
20	EXPLOSION PROTECTION	II 1 G EEx ia IIC T5									
21	AGENCY	EECS	CERTIFICATE NO.			BAS99ATEX1101					
22											
23	SIL - FUNCTIONAL SAFETY /										
24											
25											
26											
27	TAG-NO.	DESIGNATION	ADJU. RANGE								
28	ZT 0014A	GEAR SHAFT 1 AXIAL DISPLACEMENT	-1 +1 mm								
29	ZT 0014B	GEAR SHAFT 1 AXIAL DISPLACEMENT	-1 +1 mm								
30											
	SHEET	PROXIMITOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PROXIMITOR								
1	MANUFACTURER DATA /										
2	MANUFACTURER	BENTLY NEVADA		TYPE			330400				
3	ITEM NUMBER	330400									
4											
5											
6	TECHNICAL DATA /										
7											
8											
9				CAPTION LABEL			SS TAG LABEL				
10				ASSEMBLING			DIN RAIL MOUNTED				
11											
12											
13											
14	SAFETY - CERTIFICATE /										
15											
16											
17											
18											
19	ELECTRONICAL UTILIZATION CATEGORY /										
20											
21											
22											
23	SIL - FUNCTIONAL SAFETY /										
24											
25											
26											
27	TAG-NO.	DESIGNATION			ADJU. RANGE						
28	VE/VI 0013	GEAR CASING			0 25 mm/s						
29											
30											
	SHEET	PROXIMITOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	SHAFT CONTROL PROBES								
1	MANUFACTURER DATA /										
2	MANUFACTURER	BENTLY NEVADA			TYPE		330105				
3	ITEM NUMBER	330105-02-12-05-02-05									
4	SAP NUMBER	97001122									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0.25 ... 2.3 mm									
8					CABLE TYPE		COAXIAL CABLE				
9					OIL RESISTANT		YES				
10	MEASURING ELEMENT	8mm/0,31"			CABLE LENGTH		0.5 m				
11	MEASURING ELEMENT MATERIAL	1.4301 AISI 304			FINISH WIRE ENDS		CONNECTOR				
12	MEASURING PRINCIPLE	EDDY CURRENT			PROBE LENGTH		1.2 in				
13	PROBE TIP MATERIAL	PPS (POLYPHENYLENE SULFIDE)			THREAD LENGTH		0.2 in				
14	CASING PROTECTION CATEGORY	IP66			PROCESS CONNECTION		3/8"-24UNF				
15					PROBE TIP		8 mm				
16	CAPTION LABEL	WITHOUT			ALLOWABLE MEDIUM TEMP.		-51 ... +177 °C				
17					ALLOWABLE AMBIENT TEMP.		-34 ... +177 °C				
18					ALLOWABLE OP. PRESSURE		690 kPa				
19											
20											
21	SAFETY - CERTIFICATE /										
22	DECLARATION OF CONFORMITY	YES									
23	CALIBRATION DATA SHEET	YES									
24											
25											
26	ELECTRONICAL UTILIZATION CATEGORY /										
27	EXPLOSION PROTECTION	II 1 G Ex ia IIC T1...T5 Ga									
28	AGENCY	EECS			CERTIFICATE NO.		BAS99ATEX1099 BAS99ATEX3098X				
29											
30											
	SHEET	SHAFT CONTROL PROBES				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET									
	PROJECT NO.	H.0200062.02	SHAFT CONTROL PROBES									
1	SIL - FUNCTIONAL SAFETY /											
2												
3												
4												
5	UTILITIES /											
6	DESIGNATION	330130-085-00-05		ARMOR	WITHOUT							
7	IMPEDANCE	75	Ohm	CONNECTOR	YES							
8	CABLE LENGTH	8.5	m	SAP - NO. EXT.CABLE	97001124							
9												
10	TAG-NO.	DESIGNATION	ADJU. RANGE									
11	SE 0060	GEAR SPEED	0 8000 1/min									
12	VE 0021X	GEAR SHAFT 1 JOURN. BRG. NDE	0 150 µm									
13	VE 0021Y	GEAR SHAFT 1 JOURN. BRG. NDE	0 150 µm									
14	VE 0020X	GEAR SHAFT 1 JOURN. BRG. DE	0 150 µm									
15	VE 0020Y	GEAR SHAFT 1 JOURN. BRG. DE	0 150 µm									
16	KE 0017	GEAR SHAFT 1 KEYPHASOR										
17	VE 0023X	GEAR SHAFT 2 JOURN. BRG. NDE	0 150 µm									
18	VE 0023Y	GEAR SHAFT 2 JOURN. BRG. NDE	0 150 µm									
19	VE 0022X	GEAR SHAFT 2 JOURN. BRG. DE	0 150 µm									
20	VE 0022Y	GEAR SHAFT 2 JOURN. BRG. DE	0 150 µm									
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
	SHEET		SHAFT CONTROL PROBES				TRAIN		BILBOAX F3-C-1 ADI-1783			
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PROXIMITOR								
1	MANUFACTURER DATA /										
2	MANUFACTURER	BENTLY NEVADA			TYPE		330180				
3	ITEM NUMBER	330180-91-05									
4	SAP NUMBER	97001125									
5											
6	TECHNICAL DATA /										
7	MEASURING RANGE	0.25 ... 2.3 mm			AUXILIARY POWER		-23...-26 V DC				
8					ELECTRICAL CONNECTION		TENSION SPRING TERMINALS				
9	ALLOWABLE AMBIENT TEMP.	-35 ... +85 °C			CAPTION LABEL		WITHOUT				
10	FOR SENSOR TYPE	330101/**2/**3/**4/**5/**6			ASSEMBLING		DIN RAIL MOUNTED				
11	OUTPUT SIGNAL	-1 ... -18 V DC									
12											
13											
14	SAFETY - CERTIFICATE /										
15	DECLARATION OF CONFORMITY	YES									
16											
17											
18											
19	ELECTRONICAL UTILIZATION CATEGORY /										
20	EXPLOSION PROTECTION	II 1 G Ex ia IIC T4/T5 Ga									
21	AGENCY	EECS			CERTIFICATE NO.		BAS99ATEX1101				
22											
23	SIL - FUNCTIONAL SAFETY /										
24											
25											
26											
27	TAG-NO.	DESIGNATION			ADJU. RANGE						
28	ST 0060	GEAR SPEED			0 8000 1/min						
29	VT 0021X	GEAR SHAFT 1 JOURN. BRG. NDE			0 150 µm						
30	VT 0021Y	GEAR SHAFT 1 JOURN. BRG. NDE			0 150 µm						
	SHEET	PROXIMITOR				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE OF123131

	PROJECT		Bilbao		DATASHEET							
	PROJECT NO.		H.0200062.02		PROXIMITOR							
	1	TAG-NO.	DESIGNATION				ADJU. RANGE					
	2	VT 0020X	GEAR SHAFT 1 JOURN. BRG. DE				0 150 µm					
	3	VT 0020Y	GEAR SHAFT 1 JOURN. BRG. DE				0 150 µm					
	4	KT 0017	GEAR SHAFT 1 KEYPHASOR									
	5	VT 0023X	GEAR SHAFT 2 JOURN. BRG. NDE				0 150 µm					
	6	VT 0023Y	GEAR SHAFT 2 JOURN. BRG. NDE				0 150 µm					
	7	VT 0022X	GEAR SHAFT 2 JOURN. BRG. DE				0 150 µm					
8	VT 0022Y	GEAR SHAFT 2 JOURN. BRG. DE				0 150 µm						
9												
10												
11												
12												
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
SHEET		PROXIMITOR				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET									
	PROJECT NO.	H.0200062.02	THERMOMETER									
1	MANUFACTURER DATA /											
2	MANUFACTURER	WIKA		TYPE			S 5550					
3												
4	SAP NUMBER	11047248										
5												
6	TECHNICAL DATA /											
7	1. MEASURING RANGE	0 ... 120 °C		ASSEMBLING			DIRECT MOUNTED					
8												
9	ACCURACY	CLASS 1,0 (DIN 13190)		MEASURING ELEMENT			BIMETAL COIL					
10	SCALE UNIT	°C		MEASURING ELEMENT MATERIAL			BIMETAL					
11	DIAL	ALU, WHITE/ SCALE BLACK		PROBE DIAMETER			6 mm					
12	CASE STYLE	ADJUSTABLE EVERY ANGLE		INSTRUMENT CONNECTION			½" NPT					
13	LIQUID FILLING	YES		THERMOWELL CONNECTION			1 1/2" NPT					
14				CONNECTION TYPE			COMPRESSION FITTING					
15	CASING DIAMETER	100 mm		OVERALL LENGTH			L1 = 407 mm					
16	GLASS COVER	SAFETY GLASS										
17	CASING MATERIAL	CrNi-STEEL										
18	CASING PROTECTION CATEGORY	IP 66 (EN 60529/ IEC 529)		ALLOWABLE AMBIENT TEMP.			-20 ... 60					
19	CAPTION LABEL	SS TAG LABEL										
20				ALLOWABLE MAX. OP. PRESSURE			250 bar					
21												
22												
23	SAFETY - CERTIFICATE /											
24	DECLARATION OF CONFORMITY	YES		MATERIAL CERTIFICATE			YES					
25	CALIBRATION DATA SHEET	YES		NACE - CONFIRMATION			NO					
26	SIL - CONFIRMATION	NO		PRESSURE TEST			NO					
27												
28												
29												
30												
	SHEET	THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783				
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	PROJECT	Bilbao	DATASHEET										
	PROJECT NO.	H.0200062.02	THERMOMETER										
1	ELECTRONICAL UTILIZATION CATEGORY /												
2													
3													
4													
5	UTILITIES /												
6	THERMOWELL	TW 10p											
7	THERMOWELL TYPE	TAPERED											
8													
9	TAG-NO.	DESIGNATION											
10	TI 0424	GEAR CASING											
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
	SHEET		THERMOMETER				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 126
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	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	PRESSURE GAUGE								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			233.30				
3	ITEM NUMBER	233.30.100									
4	SAP NUMBER	11049306									
5											
6	TECHNICAL DATA /										
7	1. MEASURING RANGE	0 ... 6 bar(g)			ASSEMBLING			PIPE MOUNTED			
8					PROCESS CONNECTION			½" NPT, 1.4404 AISI 316 L			
9	ACCURACY	CLASS 1.0			MEASURING ELEMENT			BOURDON TUBE			
10					MEASURING ELEMENT MATERIAL			1.4404 AISI 316L			
11	DIAL	WHITE/ BLACK LETTERING									
12	BLOW OUT DISC	BLOW-OUT BACK			LIQUID FILLING			GLYCERINE			
13	MEASURING PRINCIPLE	BOURDON TUBE									
14	SAFETY PRESSURE GAUGE	WITH SOLID BAFFLE WALL			ALLOWABLE AMBIENT TEMP.			-20 ... 60 °C			
15					ALLOWABLE MEDIUM TEMP.			... +100 °C			
16	CONNECTION POSITION	RADIAL BOTTOM ENTRY			ALLOWABLE MAX. OP. PRESSURE			1,3 x FULL SCALE VALUE -			
17	GLASS COVER	SAFETY GLASS			CASING DIAMETER			100 mm			
18	CAPTION LABEL	SS TAG LABEL			CASING MATERIAL			1.4404 AISI 316L			
19					CASING PROTECTION CATEGORY			IP 65 (EN 60 529/ IEC 529)			
20											
21											
22	SAFETY - CERTIFICATE /										
23					MATERIAL CERTIFICATE			YES			
24	CALIBRATION DATA SHEET	YES									
25					PRESSURE TEST			YES			
26											
27	ELECTRONICAL UTILIZATION CATEGORY /										
28											
29											
30											
	SHEET	PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE 127 OF 131

	PROJECT		Bilbao		DATASHEET								
	PROJECT NO.		H.0200062.02		PRESSURE GAUGE								
1	TAG-NO.		DESIGNATION										
2	PI 0837		GEAR CASING										
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
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28													
29													
30													
	SHEET		PRESSURE GAUGE				TRAIN		BILBOAX F3-C-1 ADI-1783				
	DOCUMENT NO.		10001956751		TYPE		PART	001	REV.	02	LANG.	EN	PAGE 128 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	THERMOWELL								
1	MANUFACTURER DATA /										
2	MANUFACTURER	WIKA		TYPE			TW10-P				
3											
4	SAP NUMBER	11047270									
5											
6	TECHNICAL DATA /										
7	THERMOWELL	BARSTOCK		PROCESS CONNECTION			FLANGE / 1 1/2", 150 lbs, RF				
8	THERMOWELL MATERIAL	1.4541		THERMOW. TO SENSOR CONN.			FEMALE THREAD NPT 1/2"				
9	CAPTION LABEL	SS TAG LABEL		INSERT LENGTH			U =360	mm			
10				OVERALL LENGTH			S =410	mm			
11				BORE DIAMETER			6.6	mm			
12				THERMOWELL DIAMETER			19	mm			
13				TIP DIAMETER			6.4	mm			
14	REMARK	LABELLING WITH: MANUFACTURER, MATERIAL, ALLOWED PRESSURE									
15											
16	SAFETY - CERTIFICATE /										
17				MATERIAL CERTIFICATE			EN 10204 3.1				
18											
19				PRESSURE TEST			DRUCKTEST				
20											
21											
22	ELECTRONICAL UTILIZATION CATEGORY /										
23											
24											
25											
26	UTILITIES /										
27											
28											
29	TAG-NO.	DESIGNATION									
30	TW 0424	GEAR CASING									
	SHEET	THERMOWELL				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE OF 129 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	LIMIT SWITCH								
1	MANUFACTURER DATA /										
2	MANUFACTURER	TELEMECANIQUE		TYPE			XCKWM2110H29				
3											
4											
5											
6	TECHNICAL DATA /										
7											
8				CABLE ENTRY POINT			PG13,5				
9				CONTACT TYPE			DIN 19234, NAMUR				
10											
11	MEASURING ELEMENT MATERIAL	1.4541									
12	MEASURING PRINCIPLE	INDUCTIVE									
13											
14	ASSEMBLING	SQUARE BAR									
15	CASING MATERIAL	POLYAMID									
16	CASING PROTECTION CATEGORY	IP65									
17											
18	CAPTION LABEL	SS TAG LABEL									
19											
20	ALLOWABLE AMBIENT TEMP.	-25 ... +60 °C									
21											
22											
23											
24	SAFETY - CERTIFICATE /										
25											
26											
27											
28											
29											
30											
	SHEET	LIMIT SWITCH				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE 130 OF 131

	PROJECT	Bilbao	DATASHEET								
	PROJECT NO.	H.0200062.02	LIMIT SWITCH								
1	ELECTRONICAL UTILIZATION CATEGORY /										
2	EXPLOSION PROTECTION	EEx d IIC, T6									
3											
4											
5	SIL - FUNCTIONAL SAFETY /										
6											
7											
8											
9	UTILITIES /										
10											
11											
12											
13											
14	TAG-NO.	DESIGNATION	ADJU. RANGE								
15	ZSH 0015	GEAR TURNING COVER									
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
	SHEET	LIMIT SWITCH				TRAIN		BILBOAX F3-C-1 ADI-1783			
	DOCUMENT NO.	10001956751	TYPE		PART	001	REV.	02	LANG.	EN	PAGE 131 OF 131

3. DOCUMENTO 3. PRESUPUESTO Y ANALISIS DE RENTABILIDAD

3.1 PRESUPUESTO DEL PROYECTO

3.1.1 Datos del Proyecto

Denominación del Proyecto: NUEVO COMPRESOR DE AIRE DE REGENERACION DE LA UNIDAD DE FLUID CATALYTIC CRAKING (FCC) PARA MEJORA DE LA EFICIENCIA ENERGETICA.

Objetivo: Mejora de la eficiencia energética y reducción de las emisiones de CO2

Cliente: REPSOL

Localización del proyecto: Refinería de Petróleo situada en el norte de ESPAÑA.

Precisión de Presupuesto: +/- 10%

Fecha de edición del Presupuesto: Enero de 2016

3.1.2 Documentación técnica de soporte para la edición del Presupuesto

La documentación técnica que se toma como base para editar el Presupuesto del Proyecto es la siguiente editada durante la fase previa del proyecto FRONT END LOADING:

- Plano de Implantación preliminar
- Lista de Equipos preliminar
- Diagrama mecánicos de proceso preliminares
- Maqueta electrónica 3D preliminar
- Planos preliminares de cimentaciones
- Recorridos conducciones cables eléctricos y de control
- Recuentos de materiales para tuberías, instrumentación, electricidad
- Programación preliminar de la ejecución del proyecto

3.1.3 Conceptos a considerar en la edición del Presupuesto

En la edición del presupuesto se aplican los siguientes conceptos:

- Márgenes de diseño: corresponden al grado de terminación en la definición del alcance conocido del Proyecto. Cubren el coste de lo que no está definido pero que será necesario para construir y operar las nuevas Instalaciones. Como conceptos típicos que encontramos en los márgenes de diseño están las revisiones de Ingeniería después de la adjudicación de los equipos, grado de terminación de la ingeniería de detalle, revisión de las mediciones, etc.
- Re-works: es un tipo de margen, también llamado margen de construcción, que proporciona una cobertura de costes para todos aquellos trabajos que deberán re-hacerse durante la fase de construcción. Representan el volumen normal de modificaciones que ocurren durante la fase de construcción, ya sea por cambios de ingeniería o de obra, debidos a imperfecciones en la definición de los trabajos, calendario muy ajustado, etc.
- Contingencias técnicas: Proporciona la precisión de la estimación. Las contingencias típicas son errores u olvidos en las cantidades, incremento impredecible de precios, cambios de diseño, causas no previstas en proveedores y/o subcontratistas, etc.
- Contingencia global: Esta partida cubre costes impredecibles que pueden llegar a ocurrir durante la ejecución del proyecto y que no son posibles cuantificar en esta fase previa del Proyecto. Cubre la provisión de evaluación de riesgos, quiebra de socios, proveedores o contratistas, incrementos inusuales de precios, factores externos globales impredecibles tales como huelgas, causas de fuerza mayor, etc.

3.1.4 Condiciones del Presupuesto

Las condiciones económicas de la estimación del presupuesto están basadas en las condiciones de mercado existentes durante el año 2016, se aplica la escalación necesaria para actualizar los precios conforme al Programa del Proyecto incluido en el DOCUMENTO 1 (MEMORIA).

La moneda utilizada para la estimación es el EURO.

3.1.5 Alcance que comprende el Presupuesto

La estimación del Presupuesto se edita utilizando la mejor información técnica disponible en el momento de su emisión indicada en el Apartado 1.2.

Servicios de ingeniería

El coste correspondiente a la oferta de estos servicios de la Empresa de Ingeniería seleccionada por el CLIENTE durante la etapa previa a la aprobación del Proyecto FRONT END LOADING.

Equipos

La estimación del precio del Grupo Compresor y equipamiento asociado (consola de aceite de lubricación y panel de control) estará soportado por la información de la tabulación económica de ofertas firmes de Empresas Fabricantes reconocidas mundialmente; ELLIOT, GENERAL ELECTRIC Y MAN D&T.

Para la estimación de los otros equipos de menor entidad como son el transformador y las celdas eléctricas de 30 y 11 kV. Se realizan peticiones de oferta tipo “budget”.

Los equipos restantes se estiman mediante datos internos existentes de otros Proyectos recientes ejecutados por el Grupo REPSOL.

Se considera entrega DDP (“Delivered Duty Paid”) que incluye el transporte y seguros hasta su recepción en la Planta.

Repuestos

Se incluyen en el Presupuesto, en apartado independiente, los siguientes repuestos que deberá incluir en su oferta los Suministradores, principalmente los correspondientes al Grupo Compresor desglosado por los siguientes conceptos

- Repuestos capitales.
- Repuestos de puesta en servicio
- Repuestos de dos años de operación

Materiales

Tuberías

El material asociado a tuberías incluirá: tubería, válvulas, accesorios, bridas, juntas, tornillos, tuercas, soportes, soportes especiales y otro material diverso, tales como mangueras, juntas de expansión, etc.

Las cantidades de tubería se basarán en un recuento de materiales en base a los trabajos a realizar y documentación de diseño preliminar, Maqueta 3D, P&IDs y plano de implantación.

El coste del material de tuberías será estimado tomando en consideración la información de precios otros Proyectos recientes realizados en Grupo REPSOL.

Electricidad

El material de electricidad incluirá cableado de potencia y control, bandejas, conduits, cajas de distribución, accesorios, material de iluminación, material de puesta a tierra, etc.

Las cantidades para electricidad estarán basadas en la lista de consumidores y el plano de implantación. Se realiza un recuento de materiales teniendo en cuenta un 10 % de mayoración.

El coste para los instrumentos se estima teniendo en cuenta precios considerados en proyectos anteriores realizados en el Grupo REPSOL.

Instrumentación

El material de instrumentación incluirá todos los instrumentos de campo (válvulas de control, válvulas ON/OFF, válvulas de seguridad, discos de ruptura, transmisores, medición de caudal, medición de temperaturas y material secundario (tubing, cajas de distribución, etc).

Las cantidades para instrumentación estarán basadas en P&IDs, el listado de instrumentos y el plano de implantación. Se realiza un recuento y se aplica un 10 % de mayoración.

El coste para los instrumentos se estima teniendo en cuenta precios considerados en proyectos anteriores realizados en el grupo REPSOL.

Transporte

Se aplicará un porcentaje global del 2 % sobre el coste total del material para tener en cuenta el transporte hasta la Planta.

Construcción

Obra civil y estructura metálica

Las cantidades se basarán en el recuento de cantidades tomando como base el Plot Plan General y los planos preliminares existentes de cimentaciones y estructuras.

El coste incluirá material e instalación y se estimará en base a precios de proyectos anteriores realizados en el Grupo REPSOL incluyendo todos los costes indirectos.

Montaje mecánico

El coste para el montaje mecánico estará basado en una estimación a partir de los equipos y cantidades de tubería a instalar teniendo en cuenta ratios de Proyectos anteriores. Incluye el coste de la pintura y aislamiento.

Instalación eléctrica y de instrumentación

El coste para la instalación eléctrica y de instrumentación estará basado en una estimación a partir de los recuentos de materiales y ratios de Proyectos anteriores. Los precios incluyen todos los costes indirectos.

Equipo de supervisión de la construcción

Se realizará una estimación en base al equipo de supervisores necesario, plazos de tiempo y precios por hora ofertados por la Empresa de Ingeniería de supervisión de montaje.

Instalaciones temporales para la construcción

El coste para las instalaciones temporales de los diversos contratistas de montaje estará incluido en los costes de construcción. Se realizará una estimación.

Comisionado y puesta en marcha

El coste de la asistencia al montaje y la puesta en marcha del Suministrador del Compresor será estimada en base a las tarifas presentadas por el Suministrador y plazos necesarios de ocupación. Se consideran necesarios los siguientes especialistas:

- Supervisor mecánico
- Supervisor de control
- Supervisor de comisionado y puesta en servicio

Exclusiones

A continuación se presenta un listado preliminar de exclusiones de conceptos que no se incluyen el Presupuesto del Proyecto.

- Costes de operación.
- Costes de personal del CLIENTE durante la ejecución del Proyecto.
- Costes de consumibles, fluidos, y consumo de energía.
- Costes de catalizadores, productos químicos y lubricantes.
- Costes de entrenamiento de operadores.
- Cualquier trabajo de demolición.
- Cualquier descontaminación necesaria del subsuelo.

3.1.6 Cuadro resumen del Presupuesto

A continuación se incluyen los importes de todos los conceptos que comprende el Proyecto:

DESCRIPCION	IMPORTE
	EUROS
Ingeniería de detalle y gestión de compras	491.600
TOTAL SERVICIOS DE INGENIERIA	491.600
Grupo Compresor	5.700.000

Subtotal Equipos	5.700.000
Repuestos	950.000
Subtotal Repuestos	950.000
Material de tuberías	100.000
Sistemas de control	50.000
Material de instrumentación	50.000
Equipo y material eléctrico	1.400.000
Suministro de estructura metálica	100.000
Suministro de sistema contra incendios y HVAC	50.000
Subtotal Materiales	1.750.000
TOTAL SUMINISTROS	8.400.000
Obra civil	620.000
Montaje estructura metálica	50.000
Montaje mecánico de equipos	700.000
Montaje de instrumentación	100.000
Montaje eléctrico	400.000
Aislamiento. Incluido en montaje mecánico	
Pintura. Incluido en montaje mecánico	
Medios auxiliares de construcción	50.000
TOTAL CONSTRUCCION	1.920.000
Supervisión de construcción	538.400
Instalaciones temporales	25.000
TOTAL SUPERVISION DE CONSTRUCCION	563.400
TOTAL PLANTA	11.375.000

Licencias, permisos y tasas del proyecto	300.000
Contingencias	700.000
TOTAL VARIOS	1.000.000
GRAN TOTAL PLANTA	12.375.000
Seguros	50.000
Asistencia a puesta en marcha	250.000
TOTAL INVERSIÓN	12.675.000

3.2 PRESUPUESTO DE INGENIERIA

En la tabla se detalla el Presupuesto de la realización de los servicios de ingeniería y gestión de compras. Se considera el precio hora por cada una de las figuras profesionales que trabajan en la ejecución del Proyecto y el número de horas estimado de ocupación de cada una ellas:

DISCIPLINA	HORAS	DIRECTOR PROYECTO	INGENIERO PROYECTO	INGENIERO/ TECNICO ESPECIALISTA	COORDINADOR COMPRAS	DELINEANTE PROYECTISTA	DELINEANTE
Precio/hora (€)		75	65	60	45	40	30
GESTION PROYECTOS	1250	500	750				
PROCESOS	480			240		160	80
OBRA CIVIL/ESTRUCTURAS	650			500			150
MECANICA-EQUIPOS	1500			1400			100
TUBERIAS SOPORTACION	860			500		160	200
INSTRUMENTACION	800			600			200
ELECTRICIDAD	1100			500		300	300

GESTION DE COMPRAS	500	100	100		300		
CALIDAD/MEDIO AMBIENTE	250				250		
PLANIFICACION	200		200				
INSPECCION /ACTIVACIÓN	1150		150	1000			
TOTAL HORAS	8740	600	1200	4.990	300	620	1.030
Coste por disciplina (€) =		45.000	78.000				
Horas x Precio/hora		€	€	299.400 €	13.500 €	24.800 €	30.900 €
COSTE TOTAL (€)							491.600
							€

3.3 ANALISIS DE RENTABILIDAD

Considerando los flujos netos de caja estimados en el apartado de “beneficios económicos” que se presenta en el Apartado 4.1 del DOCUMENTO N°1, se calculan a continuación tres parámetros que permiten determinar la rentabilidad del Proyecto:

- Periodo de Recuperación (PAYBACK), indica la liquidez del Proyecto.
- Valor Actual Neto (VAN), indica la rentabilidad del Proyecto.
- Tipo Interno de Rendimiento (TIR), indica el riesgo del proyecto.

Consideramos lo siguiente:

Inversión: 12.675.000 €.

Vida útil de los nuevos Equipos de 20 años.

Amortización anual: 633.750 Euros.

Se considera que no existen gastos financieros.

Ahorro anual (según se ha indicado en el DOCUMENTO 1, Apartado 4). El flujo de caja anual de la explotación del Proyecto es de 4.137.565 €. Se toma la posición conservadora de considerar este ahorro constante a lo largo de la vida útil de los equipos.

Teniendo en cuenta las amortizaciones el beneficio anual del Proyecto es de 3.506.000 €.

Tomando en consideración un 28 % de impuestos sobre beneficios, es decir 981.680 €, el Beneficio después de Impuestos es de 2.524.320 euros.

El flujo de caja antes de impuestos es de 4.137.565 €

El flujo de caja después de impuestos es de 3.155.885 €

3.3.1 Periodo de Recuperación (PAY-BACK)

El Período de Recuperación o PAY-BACK analiza la liquidez. Es el tiempo que necesita el Proyecto para recuperar la Inversión inicial, es decir el tiempo que necesita el Proyecto para que el saldo del flujo de caja acumulado generado por el Proyecto sea 0.

Durante los años 2.015 y 2.016 se ejecuta el Proyecto. El Proyecto pasa a explotación el 1 de Enero de 2017. Por tanto, se considera un tiempo de 22 años, 2 de ejecución y 20 de explotación del Proyecto. En el año 2015 y el año 2016 que dura la ejecución del Proyecto, los desembolsos son de 5.000.000 y 7.675.000 respectivamente.

Una vez entrado la nueva instalación en servicio el 1 de Enero de 2017, durante los 20 años de explotación del Proyecto el flujo de caja anual antes de impuestos estimado es de 4.137.565 € respectivamente.

Teniendo en cuenta los flujos de caja estimados anuales, se calculan los flujos de caja acumulativos, que se pueden ver en la tabla adjunta. El año 2017 se considera como año 0.

AÑO	FLUJO DE CAJA	FLUJO DE CAJA	SITUACION

		ACUMULADO	PROYECTO
2015	-5.000.000	-5.000.000	EJECUCION
2016	-7.675.000	-12.675.000	EJECUCION
2017	4.137.565	-8.537.435	EXPLOTACION
2018	4.137.565	-4.399.870	EXPLOTACION
2019	4.137.565	-262.305	EXPLOTACION
2020	4.137.565	3.875.260	EXPLOTACION
2021	4.137.565	8.012.825	EXPLOTACION
2022	4.137.565	12.150.390	EXPLOTACION
2023	4.137.565	16.287.955	EXPLOTACION
2024	4.137.565	20.425.520	EXPLOTACION
2025	4.137.565	24.563.085	EXPLOTACION
2026	4.137.565	28.700.650	EXPLOTACION
2027	4.137.565	32.838.215	EXPLOTACION
2028	4.137.565	36.975.780	EXPLOTACION
2029	4.137.565	41.113.345	EXPLOTACION
2030	4.137.565	45.250.910	EXPLOTACION
2031	4.137.565	49.388.475	EXPLOTACION
2032	4.137.565	53.526.040	EXPLOTACION
2033	4.137.565	57.663.605	EXPLOTACION
2034	4.137.565	61.801.170	EXPLOTACION
2035	4.137.565	65.938.735	EXPLOTACION
2036	4.137.565	61.801.170	EXPLOTACION

Para una Inversión de la ejecución del Proyecto de 12,675.000 €, como se indica en el Presupuesto, conseguimos un Periodo de Recuperación o PAY-BACK de poco

más de 2 años. Este dato es totalmente positivo para el CLIENTE, ya que la vida del nuevo equipo y de la instalación está estimada en un mínimo de 20 años.

3.3.2 Valor Actual Neto (VAN)

El VAN de un Proyecto de Inversión es igual al valor actualizado de todos los flujos de caja esperados. Es decir es igual a la diferencia entre el valor actual de los cobros que genera y los pagos que origina.

$$VAN = -I + \frac{Q_1}{(1 + Kt)^1} + \frac{Q_2}{(1 + Kt)^2} + \frac{Q_3}{(1 + Kt)^3} + \dots + \frac{Q_n}{(1 + Kt)^n}$$

- I: Coste del Proyecto
- Qt: Flujo neto de caja o diferencia entre cobros y pagos al final del periodo t
- n: duración del proyecto
- Kt: Coste de capital de la empresa en el periodo t. Es el coste de oportunidad de los recursos financieros o rentabilidad de la mejor inversión alternativa que se podría obtener invirtiendo hasta el final del periodo n. Suponemos una tasa del 5%.

Suponiendo que el número de años estimados de vida de proyecto es n=20 años.

Tomando los valores del flujo neto de caja obtenemos un VAN de 39.839.849 €.

AÑO	FLUJO DE CAJA	FLUJO DE CAJA ACUMULADO	SITUACION PROYECTO	VAN
2015	-5.000.000	-5.000.000	EJECUCION	4.761.904,76
2016	-7.675.000	-12.675.000	EJECUCION	6.961.451,25
2017	4.137.565	-8.537.435	EXPLOTACION	3.940.538,10
2018	4.137.565	-4.399.870	EXPLOTACION	3.752.893,42
2019	4.137.565	-262.305	EXPLOTACION	3.574.184,21
2020	4.137.565	3.875.260	EXPLOTACION	

				3.403.984,97
2021	4.137.565	8.012.825	EXPLOTACION	3.241.890,44
2022	4.137.565	12.150.390	EXPLOTACION	3.087.514,71
2023	4.137.565	16.287.955	EXPLOTACION	2.940.490,20
2024	4.137.565	20.425.520	EXPLOTACION	2.800.466,85
2025	4.137.565	24.563.085	EXPLOTACION	2.667.111,29
2026	4.137.565	28.700.650	EXPLOTACION	2.540.105,99
2027	4.137.565	32.838.215	EXPLOTACION	2.419.148,56
2028	4.137.565	36.975.780	EXPLOTACION	2.303.951,01
2029	4.137.565	41.113.345	EXPLOTACION	2.194.239,06
2030	4.137.565	45.250.910	EXPLOTACION	2.089.751,48
2031	4.137.565	49.388.475	EXPLOTACION	1.990.239,51
2032	4.137.565	53.526.040	EXPLOTACION	1.895.466,20
2033	4.137.565	57.663.605	EXPLOTACION	1.805.205,90
2034	4.137.565	61.801.170	EXPLOTACION	1.719.243,72
2035	4.137.565	65.938.735	EXPLOTACION	1.637.374,97
2036	4.137.565	61.801.170	EXPLOTACION	1.559.404,73
				39.839.849,33

Por lo tanto, el Proyecto genera riqueza, por encima de la que pudiera obtenerse con inversiones alternativas. En definitiva, el Proyecto debe acometerse.

3.3.3 Tipo Interno de Rendimiento (TIR)

El tipo Interno de Rendimiento o TIR es el tipo de descuento que anula el VAN de la misma. El TIR mide la rentabilidad anual del Proyecto de Inversión.

$$VAN = 0 = -I + \frac{Q_1}{(1+r)^1} + \frac{Q_2}{(1+r)^2} + \frac{Q_3}{(1+r)^3} + \dots + \frac{Q_n}{(1+r)^n}$$

Donde;

- I: Coste del Proyecto
- Qt: Flujo neto de caja o diferencia entre cobros y pagos al final del periodo t
- n: Duración del proyecto
- r: TIR

Mediante una hoja de cálculo (Excel) se calcula el Tipo Interno de Rendimiento (TIR) por aproximaciones sucesivas, obteniéndose un valor de aproximadamente un 35 %, siendo este un valor excelente que hace totalmente aconsejable la ejecución del Proyecto

4 DOCUMENTO 4. PLIEGO DE CONDICIONES

4.1 INTRODUCCIÓN

Este documento incluye el Pliego de Condiciones del Proyecto de SUSTITUCIÓN DEL COMPRESOR DE AIRE DE REGENERACIÓN DEL CATALIZADOR DE LA UNIDAD DE FLUID CATALYTIC CRACKING (FCC) de una Refinería de Repsol situada en el norte de ESPAÑA.

El Pliego se organiza en una serie de apartados en los cuales se engloban las distintas condiciones que permiten llevar a cabo el Proyecto de forma adecuada, teniendo en cuenta tanto los factores técnicos, como los económicos y administrativos.

A lo largo de este documento se denominará PROVEEDOR de Servicios de Ingeniería al equipo de trabajo que lleva a cabo el Proyecto de Ingeniería. Se denomina Cliente a la Empresa que realiza el Proyecto, en este caso REPSOL.

El Pliego de Condiciones contiene toda la información necesaria para regular las relaciones entre el PROVEEDOR y el CLIENTE. Incluye las condiciones técnicas y exigencias de calidad y aceptación. Las condiciones de aceptación se basan en las especificaciones, normas, directivas y estándares de acuerdo a los cuales se debe elaborar el Proyecto para que sea validado por el CLIENTE.

También se incluyen las condiciones que deberá satisfacer el PROVEEDOR, así como las exigencias de seguimiento y control, las condiciones de garantía, y las condiciones legales y contractuales. En este último apartado del Pliego, se determina la forma de validar el Proyecto, valorarlo y pagarlo.

Por tanto, este Documento pretende establecer las bases para garantizar la correcta elaboración del Proyecto de acuerdo con los requisitos del CLIENTE, y es por tanto, desde el punto de vista legal y contractual, el Documento más importante del Proyecto a la hora de la contratación y realización de los servicios.

4.2 CONDICIONES TECNICAS

4.2.1 Desarrollo

El proyecto debe ajustarse a todo lo expuesto en el DOCUMENTO N°1: MEMORIA y en el DOCUMENTO N° 2: DISEÑO, donde se especifican las funcionalidades que el Proyecto debe aportar y los requerimientos que debe satisfacer.

El DOCUMENTO N° 2 contiene tres ANEXOS; el primer ANEXO incluye los Documentos más significativos editados por el PROVEEDOR de los Servicios de Ingeniería. En el ANEXO 2 se incluyen los planos que definen la instalación editados por el PROVEEDOR de los Servicios de Ingeniería. El ANEXO 3 contiene información fundamental generada por MAN D&T, suministrador del Grupo Compresor, que es necesaria para el desarrollo del diseño del PROYECTO por el PROVEEDOR de los Servicios de Ingeniería.

Todos los planos y documentos editados por el PROVEEDOR de los Servicios de Ingeniería serán revisados formalmente por el CLIENTE, siendo el plazo máximo de revisión de dos semanas desde la emisión de cada uno de ellos.

4.2.2 Datos de partida

Una de las actividades significativas fundamentales de ingeniería es la toma de datos de partida, principalmente la hoja de datos y curvas de operación del Compresor existente. Estos datos de partida estarán determinados en los requisitos del CLIENTE y comprenderán en general todos los parámetros y características establecidas por el CLIENTE.

Los datos de partida recogerán a su vez los requisitos legales aplicables a la ejecución de las Actividades de desarrollo del Proyecto de Ingeniería.

Como el Proyecto se integra en otras instalaciones existentes, se solicitarán al CLIENTE los planos relacionados con los sistemas a los que se va a conectar.

4.2.3 Equipos

El Proyecto debe incluir los siguientes trabajos concernientes a la adquisición de los nuevos Equipos, como más significativos los siguientes:

- Lista de Equipos
- Requisición Técnica de Compra de todos los Equipos y materiales. Como más significativo se indica el del Skid del Grupo Compresor.
- Activación y control del Pedido, incluyendo la revisión de la documentación emitida por los suministradores.

La lista de Equipos del Proyecto y el del Skid del Grupo Compresor se incluyen en el DOCUMENTO Nº 2 (DISEÑO) , ANEXO 1.

4.3 CONDICIONES DE CALIDAD

Para cumplir con las especificaciones demandadas por el CLIENTE y los plazos de realización del Proyecto es necesario realizar reuniones periódicas de seguimiento con asistencia del CLIENTE y del PROVEEDOR.

Las fechas de las reuniones se fijaran de mutuo acuerdo con al menos una semana de antelación.

Las Especificaciones de Diseño del CLIENTE no garantizan por sí mismas que los requisitos del CLIENTE se vayan a satisfacer completamente si el sistema organizativo del PROVEEDOR muestra deficiencias. Por tanto, es necesario la certificación de las normas y directrices de sistemas de calidad, como por ejemplo contar al menos con la certificación ISO 9001 con una antigüedad de menos de un año y convenientemente renovada en la fecha vigente.

También será necesario contar con un Plan de Calidad que se centre en detallar las normas de calidad para el Proyecto y los criterios de calidad que se utilizan para medir y determinar si los resultados son los esperados.

Dicho proceso, estará basado en la política de calidad del PROVEEDOR y tendrá por objeto desarrollar un plan que determine:

- Los estándares, normas de calidad y regulaciones que afectan al Proyecto
- Los estándares que deberán desarrollarse específicamente para el Proyecto
- La manera de asegurar la conformidad con dichos estándares
- Los procesos y planes de mejora continua
- Las métricas que se utilizarán para medir los resultados del Proyecto

- Los procesos que se utilizaran para aplicar dichas métricas
- El grado de calidad del producto y cualidades que deben ser poseídas por los documentos entregables del Proyecto

4.4 CONDICIONES DE ACEPTACIÓN

Las condiciones de aceptación del Proyecto son las que marcan las Especificaciones de Diseño del CLIENTE, indicadas las más significativas en el ANEXO del DOCUMENTO N°1 (MEMORIA).

El proyecto debe cumplir también con las Normas del Cliente que definen en detalle los requisitos de elaboración de la documentación.

También es necesario que el Proyecto cumpla con las Directivas, estándares y normas oficiales aplicables que se indican en el citado DOCUMENTO 1.

Cabe destacar que las Normas y las Especificaciones de Diseño de CLIENTE son de obligado cumplimiento y desarrollan todos los aspectos técnicos, organizativos y jurídicos; tanto a nivel municipal como a nivel autonómico, nacional y comunitario.

Las Especificaciones de Diseño del CLIENTE, aplicables al Proyecto, se utilizarán en su última revisión, siempre que sus exigencias no sean superadas por las recomendaciones, especificaciones de los licenciarios u otras especificaciones aplicables.

El CLIENTE deberá aprobar cualquier excepción sobre las Especificaciones de Diseño y decidirá en su momento si se justifica la preparación de una revisión de cualquiera de las citadas Especificaciones por las necesidades del Proyecto.

El PROVEEDOR deberá proponer al CLIENTE las revisiones que estime oportunas a cualquier punto de una Especificación o a la totalidad de la misma.

4.5 CONDICIONES DE SEGUIMIENTO Y CONTROL

4.5.1 Organización

Antes del inicio de las actividades a prestar por el PROVEEDOR de los Servicios de Ingeniería, deberá quedar plasmado por escrito en un Procedimiento de Coordinación cualquier aspecto notable de organización del Proyecto que regule las

relaciones o compromisos entre el CLIENTE y el PROVEEDOR de los Servicios de Ingeniería.

Las relaciones con el PROVEEDOR de Servicios de Ingeniería se canalizarán a través del Jefe de Proyecto designado por el CLIENTE. La supervisión del trabajo y la duración de las actividades de revisión y aprobación de la documentación se han de tener en cuenta en la programación del Proyecto.

4.5.2 Procedimiento de aprobación y revisión

El Equipo de Proyecto del CLIENTE será el responsable de la aprobación y revisión de la documentación generada por el PROVEEDOR de los Servicios de Ingeniería.

Una vez completado el diseño realizado por el PROVEEDOR de los Servicios de Ingeniería y revisado por el Equipo de Proyecto del CLIENTE, es enviado oficialmente al CLIENTE junto con la información adicional requerida.

La fecha de finalización del proyecto será la que se indica en la planificación del Proyecto incluida en el DOCUMENTO N°1 (MEMORIA).

Conocidos los plazos de las actividades y el decalaje de los aprovisionamientos, el Director de Proyecto del PROVEEDOR de los Servicios de Ingeniería convocará una reunión de lanzamiento interna para que los distintos Departamentos conozcan el contenido global del Proyecto y la casuística de los problemas previstos. A esta reunión de lanzamiento podrán asistir otros departamentos que a juicio del citado Director de Proyecto estén implicados.

4.5.3 Seguimiento del Proyecto

Durante la ejecución del Proyecto, el PROVEEDOR de Servicios de Ingeniería realizará las siguientes actividades:

- Ejecución de los planos de ingeniería
- Ejecución de los cálculos
- Ejecución de las requisiciones de compra y los pedidos
- Visitas de activación de los Pedidos principales.
- Autorizaciones de envío de Equipos y materiales

- Revisión de la documentación presentada por los suministradores para su aprobación.
- Seguimiento del estado de la documentación.
- Edición de los informes mensuales de progreso del Proyecto.
- Identificar, controlar y corregir las desviaciones en tiempo y en plazo, sobre el programa, ocupación del personal y estado económico del proyecto.

4.5.4 Relaciones con el CLIENTE

El PROVEEDOR de Servicios de Ingeniería es el responsable de la realización del Proyecto y de su presentación ante el CLIENTE.

Asistirá a la reunión de lanzamiento, a las reuniones periódicas establecidas en el procedimiento de coordinación y a las reuniones no periódicas convocadas por el CLIENTE.

Podrá proponer convocatorias de reuniones con el CLIENTE por propia iniciativa. Informará al CLIENTE del estado del seguimiento del Proyecto con la periodicidad y la forma convenida y de las “no conformidades” abiertas que se determinen como aceptables con autorización del CLIENTE.

Informará al CLIENTE de las incidencias que puedan originar distorsiones o decalajes en el programa del Proyecto y canalizará las reclamaciones a éste.

Transmitirá de toda la documentación generada por él mismo o por los suministradores que requieran la aprobación del CLIENTE, realizando un seguimiento completo de la misma.

Realizará la identificación y el seguimiento de las modificaciones introducidas o propuestas por el CLIENTE relacionadas con el Proyecto.

4.5.5 Áreas de responsabilidad

Son las definidas en los acuerdos contractuales entre el CLIENTE y el PROVEEDOR de Servicios de Ingeniería para el Proyecto correspondiente.

EL PROVEEDOR realizará los servicios ingeniería y gestión de compras (en lo que sea aplicable) necesarios para el Proyecto.

El CLIENTE pondrá a disposición del PROVEEDOR de Servicios de Ingeniería toda la documentación técnica relativa a las instalaciones existentes que disponga en sus archivos y sea requerida para la ejecución del Proyecto. El PROVEEDOR deberá obtener directamente en Planta toda la información adicional que se requiera y será el responsable de verificar que esta información está al día.

4.5.6. Modificaciones

Cuando el CLIENTE realice comentarios sobre el contenido de cualquiera de los documentos del Proyecto, que supongan la introducción de modificaciones, se comprobará su procedencia, determinando si los mismos corresponden a errores o desviaciones de las actividades realizadas por el PROVEEDOR de servicios de ingeniería o si corresponden a modificaciones introducidas por el CLIENTE. En cualquier caso, atenderá los comentarios introducidos por el CLIENTE.

Se modificarán los aspectos expresados en los comentarios, teniendo en cuenta el posible encadenamiento con otros aspectos. Cuando las modificaciones correspondan al análisis de datos de operación, se tendrá en cuenta que los nuevos datos de salida pueden afectar a planos, hojas de datos, listados y requisiciones de compra. Los nuevos documentos emitidos tendrán un número de revisión incrementado en una unidad o en una letra, según la modalidad aplicable, para diferenciarlos de los anteriores.

4.5.7. Control de modificaciones y cambios

Todas las modificaciones y cambios introducidos por el CLIENTE, que no estén motivadas por errores de ejecución del PROVEEDOR de Servicios de Ingeniería, deben documentarse a efectos de control y valoración económica.

Si los cambios o modificaciones están acompañados de un documento del CLIENTE este documento tendrá los efectos de solicitud generando un suplemento de pedido.

Cuando no exista documento del CLIENTE, el Director del Proyecto del PROVEEDOR de Servicios de Ingeniería emitirá el documento de “Orden de cambio” y se lo remitirá al CLIENTE para su aprobación. El PROVEEDOR de Servicios de Ingeniería realizará el seguimiento de las Órdenes de Cambio emitidas y remitidas al CLIENTE.

4.5.8 Incidencias

Se registrarán las incidencias correspondientes a los siguientes conceptos:

- Actividades suplementarias realizadas por el PROVEEDOR de servicios de ingeniería sin poder emitir Orden de Cambio por errores o inconcrecciones sobre datos remitidos por el CLIENTE.
- Retrasos o demoras en la ejecución de actividades por falta de datos a proporcionar por el CLIENTE. El PROVEEDOR de Servicios de Ingeniería recopilará y gestionará las incidencias registradas, transmitiéndoselas al CLIENTE para su aprobación.

4.6 CONDICIONES DE GARANTÍA

El Director del Proyecto del PROVEEDOR de servicios de ingeniería debe garantizar al CLIENTE que los servicios requeridos por el mismo van a ser realizados correctamente, con sujeción a las especificaciones establecidas, a los requisitos de calidad especificados en el Contrato y a la correspondiente legislación vigente así como a las normas del CLIENTE y que los realizará ateniéndose a los plazos convenidos. Asimismo, certifica que el trabajo será debidamente ejecutado en todos sus aspectos y que estará libre de defectos.

Si el PROVEEDOR de servicios de ingeniería no cumpliera con diligencia en el plazo establecido las obligaciones derivadas de esta garantía, el CLIENTE podrá a su exclusivo criterio, subsanar dichos defectos. Serán por cuenta del PROVEEDOR de servicios de ingeniería todas las modificaciones que sean necesarias por causa de la realización defectuosa de los servicios contratados. El plazo de garantía se interrumpirá por el tiempo que se emplee en las respectivas modificaciones, que a su vez serán garantizadas, a partir de su terminación, por igual tiempo al de la garantía.

El CLIENTE descontará de las facturas pendientes de abono al PROVEEDOR de servicios de ingeniería las penalizaciones que se establezcan en el Contrato por retrasos o incumplimiento de las normas o especificaciones establecidas.

4.7 CONDICIONES LEGALES Y CONTRACTUALES

4.7.1 Validez y prelación de la documentación contractual

Las condiciones legales y contractuales constituyen las bases de compra y contratación de servicios de ingeniería que integrarán la documentación que se establezca en el correspondiente Contrato en todos sus términos y condiciones.

En caso de discordancia sobre los documentos que integren un mismo Contrato, el orden de relación o prioridad será el siguiente:

- Las eventuales modificaciones al Contrato, expresamente convenidas por escrito y posteriores a su fecha de emisión.
- El Contrato y su documentación anexa
- Las eventuales modificaciones a las Especificaciones Técnicas de diseño del CLIENTE
- Las Especificaciones Técnicas de diseño del CLIENTE
- Las modificaciones al Pliego de Condiciones
- Las aclaraciones formuladas por escrito por el PROVEEDOR de Servicios de Ingeniería con posterioridad a la presentación a su Oferta.
- La Oferta del PROVEEDOR

No se aceptarán condiciones generales de venta del PROVEEDOR que entren en contradicción con las establecidas en el presente documento, por lo que el PROVEEDOR dará absoluta prioridad a este Pliego. Cualquier excepción a lo indicado en las presentes condiciones y que sea aceptada por el CLIENTE deberá ser expresamente citada en el Contrato.

Quedarán nulas y sin valor las condiciones que el PROVEEDOR de Servicios de Ingeniería inserte en sus notas de entrega, facturas u otros documentos cruzados entre las partes que contradigan las condiciones expresas establecidas de común acuerdo.

El Contrato se mantendrá en vigor mientras durante la realización de los trabajos objeto del mismo, de acuerdo con lo establecido en la documentación contractual. Si se hubiera predeterminado una fecha de vencimiento, con independencia de dichos

trabajos, el Contrato se entenderá tácitamente prorrogado por periodos mensuales sucesivos, salvo denuncia por escrito de cualquiera de las partes con una antelación mínima de treinta días a dicha fecha de vencimiento o de cualquiera de las prórrogas.

4.7.2 Obligaciones y responsabilidades del PROVEEDOR DE SERVICIOS DE INGENIERÍA

El PROVEEDOR de Servicios de Ingeniería es el responsable de realizar los servicios en la extensión que se recoge en el Contrato y a cumplir todas las obligaciones de carácter técnico, administrativo, fiscal, laboral y legal derivadas de la relación contractual.

El PROVEEDOR de Servicios de Ingeniería deberá entregar toda la documentación técnica y legal que sea requerida por el CLIENTE en los documentos aplicables al Contrato, tanto en plazo como en cantidad, así como cualquier otra información de cualquier índole que pudieran citar las normas o reglamentaciones aplicables al servicio.

El PROVEEDOR de Servicios de Ingeniería, ante el requerimiento del CLIENTE, deberá justificar documentalmente el cumplimiento de las obligaciones a que se refieren los apartados anteriores. La falta de presentación o la presentación insuficiente de tal documentación justificativa lo colocará en grave incumplimiento contractual.

El PROVEEDOR de Servicios de Ingeniería nombrará a los responsables de la ejecución de los servicios que se establezcan en el mismo y comunicará tal designación al CLIENTE.

El PROVEEDOR de Servicios de Ingeniería mantendrá indemne al CLIENTE frente a cualquier responsabilidad por muerte, enfermedad o lesiones de su personal o de terceros, así como los daños ocasionados por sus vehículos como consecuencia de los servicios objeto del Contrato (como la toma de datos en campo) y contra cualquier reclamación, demanda o acción que resulte como consecuencia de lo anterior por acción u omisión negligente del PROVEEDOR en el desempeño de sus obligaciones de acuerdo con el Contrato, incluyendo honorarios legales y costas y sin que los montos de los seguros que se suscriban constituyan un límite a su responsabilidad.

EL PROVEEDOR de Servicios de Ingeniería deberá cumplir cuantas disposiciones relativas al Medio Ambiente y Seguridad e Higiene se hallaren vigentes y resulten de aplicación al Contrato y en cualquier caso las establecidas en la normativa y práctica interna del CLIENTE.

4.7.3 Obligaciones y responsabilidades del CLIENTE

El CLIENTE nombrará un Coordinador que facilitará al PROVEEDOR de Servicios de Ingeniería toda aquella información y documentación necesaria de su responsabilidad establecida en el Contrato.

4.7.4 Seguros

El PROVEEDOR deberá contar con los seguros detallados en el Contrato con Compañías autorizadas a entera satisfacción del CLIENTE. Los montos de dichos seguros nunca serán inferiores a los obligatorios según las leyes y normas vigentes.

Las pólizas contendrán una cláusula en la cual el asegurador renunciará al derecho de subrogación a favor del CLIENTE.

4.7.5 Condiciones económicas e impuestos

Los precios recogidos en el Contrato y sus anexos se entenderán fijos y no revisables hasta la total y correcta cumplimentación del Contrato. Incluirán toda clase de impuestos, cargas, gravámenes, tasas y arbitrios a excepción del Impuesto sobre el Valor Añadido o impuesto de similar naturaleza, que figurará por separado como partida independiente.

No se pagarán los servicios no incluidos en el Contrato si su ejecución no ha sido previamente ofertada por el PROVEEDOR por escrito y aceptada también por escrito por el CLIENTE.

El pago de anticipos se efectuará, según sea cada caso, contra presentación de la correspondiente garantía por parte del PROVEEDOR, siempre y cuando tal pago de anticipos esté contemplado así en el Contrato.

El pago del precio considerado en el Contrato no implica renuncia alguna a los derechos del CLIENTE estipulados en el mismo.

El PROVEEDOR de Servicios de Ingeniería será responsable de cualquier diferencia de gastos originados por incumplimiento de las condiciones establecidas o aplicables al Contrato.

Todos los impuestos que graven las operaciones comerciales a que estas condiciones se refieran serán soportados por las partes de acuerdo a lo legalmente establecido. El contribuyente del impuesto es responsable, en cada caso, de la correcta tributación reflejada en los correspondientes documentos contables.

4.7.6 Forma de pago

Todos los pagos se realizan a los 60 días naturales de fecha de factura, en los días de pago establecidos por el CLIENTE. Las facturas se pagarán sólo si el CLIENTE posee documentos que demuestren la recepción conforme de los servicios realizados.

Se establece como medio de pago la transferencia bancaria.

4.7.7 Facturación

Para los trabajos descritos se realizará facturación mensual, según los avances reflejados en los Informes de Progreso del Proyecto presentados por el PROVEEDOR de Servicios de Ingeniería.

Los gastos reembolsables (viajes, etc.), caso de producirse, serán incluidos en la facturación del mes en que se produzcan

4.7.8 Aceptación del contrato

La firma del Contrato por parte del PROVEEDOR de servicios de ingeniería dará por supuesta la total aceptación del mismo.

4.7.9 Plazo de entrega

El plazo de entrega que se establece en el Contrato será firme. En caso de retraso el CLIENTE podrá optar entre aceptar el servicio aplicando las penalidades que se hayan establecido o bien rechazarlo sin que proceda reclamación alguna por parte del PROVEEDOR.

El CLIENTE podrá cambiar periódicamente y en forma razonable los programas de entrega y ordenar la suspensión temporal de las entregas programadas sin que ello implique una modificación del precio ni de los términos y condiciones del Contrato.

4.7.10 Sanciones por incumplimiento

Las sanciones o penalizaciones por incumplimiento del PROVEEDOR se establecerán en el Contrato.

4.7.11. Resolución del Contrato

El Contrato se extinguirá por resolución o por vencimiento del mismo. Además de las establecidas legalmente, el CLIENTE se reserva la facultad de resolver el Contrato por las causas que se indican a continuación:

- El incumplimiento por parte del PROVEEDOR de Servicios de Ingeniería de cualquiera de las cláusulas del Contrato.
- El incumplimiento por parte del PROVEEDOR de Servicios de Ingeniería de la legislación vigente.
- El quedar pendiente de entrega más del 20% de los servicios cuando haya vencido el plazo establecido en el Contrato.
- Existencia de inexactitudes graves en la información ofrecida

Cuando concurra alguna de las causas anteriores, el Contrato quedará resuelto y sin efecto desde la fecha en que el CLIENTE comunique su decisión en tal sentido al PROVEEDOR de Servicios de Ingeniería.

En los casos en que se proceda la resolución del Contrato, el CLIENTE podrá adoptar todas o algunas de las siguientes medidas:

- Suspender los pagos pendientes
- Realizar las garantías que el PROVEEDOR tuviere constituidas.

4.7.12 Rescisión del contrato por voluntad del CLIENTE

El CLIENTE se reserva el derecho de dejar sin efecto el Contrato de forma unilateral. Para ello deberá comunicarlo fehacientemente al PROVEEDOR de Servicios de Ingeniería.

El CLIENTE deberá indemnizar al PROVEEDOR de Servicios de Ingeniería por los daños y perjuicios que le ocasione, con una suma cuyo importe será fijado de mutuo acuerdo entre ambas partes.

4.7.13. Fuerza mayor

Ninguna de las partes será considerada responsable por el incumplimiento de cualquiera de sus obligaciones derivadas del Contrato en tanto en cuanto la ejecución de las mismas se retrase o se hiciese imposible como consecuencia de Fuerza mayor.

A estos efectos, se considerarán causas de Fuerza Mayor aquellos fenómenos naturales, accidentes inevitables, incendio, revuelta o motín popular, actos de guerra, por imposición, norma, orden o acto de cualquier Gobierno o Agencia Gubernamental, así como de cualquier otra autoridad competente, o cualquier otra causa de similar naturaleza, o que previsible, fuera inevitable, irresistible o independiente de la voluntad de las partes y que escape a su control.

La suspensión de las obligaciones contractuales durará en tanto en cuanto permanezca la causa que haya originado la Fuerza Mayor. La parte que sufra ésta deberá ponerlo inmediatamente en conocimiento de la otra y efectuar los esfuerzos que sean razonables para resolver la causa de la suspensión en el plazo más corto posible.

Si por motivos de fuerza mayor fuese imposible el incumplimiento del contrato, la parte afectada debe comunicarlo a la otra mediante un aviso en un plazo máximo de 48 horas desde que se produzca el evento origen de la Fuerza Mayor.

4.7.14. Arbitrajes y tribunales

Las partes deberán ajustarse a lo establecido en el Contrato y en caso de diferencias, estas serán resueltas si es posible por acuerdo entre las partes. En caso de no ser posible llegar a un acuerdo, se acudirá a un tribunal de arbitraje.

En caso de que cualquier discrepancia o controversia entre ellos no pudiese ser llevada a buen fin, resolviéndose con éxito en la forma anteriormente indicada, ambas partes se comprometen a someter tales discrepancias a arbitraje, formalizado de acuerdo a las normas reguladoras del mismo contenidas en la vigente Ley de Arbitraje de Derecho Privado.

El arbitraje se realizará en Madrid y en la escritura de compromiso figurará el plazo de treinta días como término en que los árbitros deberán pronunciar el Laude correspondiente.

El procedimiento de arbitraje estará de acuerdo con la legislación española vigente y será resuelto en derecho por tres árbitros, uno elegido por cada parte y otro ya designado. Si las partes no llegaran a un acuerdo para designar al primer árbitro, éste será designado por extracción entre los tres árbitros de una lista que haya sido proporcionada por el Colegio de Abogados de Madrid.

Los árbitros procederán a liquidar los gastos de procedimiento arbitral, incluyendo sus honorarios y a establecer a cuál de las partes tendrán que cargarse los gastos de enjuiciamiento.

Las partes declaran desde ahora aceptar las decisiones del Colegio Arbitral. En caso de que las partes acepten el Laude del arbitraje, harán lo que este diga. Por el contrario, si una de las partes decide no respetar el Laude, la otra podrá acudir a los tribunales competentes para exigir el incumplimiento de ese Laude mediante sentencia. Si fuera necesaria la participación de los tribunales, los competentes serán los Juzgados de Madrid.