

NORSOK STANDARD

MECHANICAL EQUIPMENT

R-001
Rev. 3, November 1997

Please note that whilst every effort has been made to ensure the accuracy of the NORSOK standards neither OLF nor TBL or any of their members will assume liability for any use thereof.

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FOREWORD

NORSOK (The competitive standing of the Norwegian offshore sector) is the industry initiative to add value, reduce cost and lead time and remove unnecessary activities in offshore field developments and operations.

The NORSOK standards are developed by the Norwegian petroleum industry as a part of the NORSOK initiative and are jointly issued by OLF (The Norwegian Oil Industry Association) and TBL (Federation of Norwegian Engineering Industries). NORSOK standards are administered by NTS (Norwegian Technology Standards Institution).

The purpose of this industry standard is to replace the individual oil company specifications for use in existing and future petroleum industry developments, subject to the individual company's review and application.

The NORSOK standards make extensive references to international standards. Where relevant, the contents of this standard will be used to provide input to the international standardisation process. Subject to implementation into international standards, this NORSOK standard will be withdrawn.

INTRODUCTION

This standard replaces R-CR-001, rev. 2, April 1996 and includes some revisions marked with a vertical line in the margin.

1 SCOPE

This standard describes technical requirements for the design, manufacturing, assembling, product inspection, installation and testing of mechanical equipment, except lifting equipment.

The requirements of this standard and the relevant data sheets of Annex A are covering the mechanical requirements of the following equipment categories:

Pumps, compressors, gas turbines, reciprocating combustion engines, transmissions, expanders, steam turbines, lubrication and seal oil systems, baseplates, centrifuges, cyclones, pressure retaining equipment (incl. heat exchangers etc.) and atmospheric tanks.

2 NORMATIVE REFERENCES

The following standards include provisions which, through reference in this text, constitute provisions of this NORSOK standard. Latest issue of the references shall be used unless otherwise agreed. Other recognized standards may be used provided it can be shown that they meet or exceed the requirements of the standards referenced below.

2.1 General References

ANSI B1.020	Pipe Threads.
ANSI B16.5	Steel Pipe Flanges and Flanged Fittings.
ANSI/ASME B31.3	Process Piping.
API 670	Non-contacting Vibration and Axial Position Monitoring System.
API 678	Accelerometer Based Vibration Monitoring System.
INSTA 121	Acoustics - Determination of Sound Power Level of Noise Sources Using Sound Intensity Measurement, Scanning Method for Use in Situ.
ISO 262	General Purpose Metric Screw Threads.
ISO 1940	Mechanical Vibration - Balance Quality Requirements of Rigid Rotors.
ISO 9614 - 2	Acoustics - Determination of Sound Power Level of Noise Sources Using Sound Intensity, Part 2: Measurement by Scanning.
MSS SP 44	Steel Pipeline Flanges

2.2 Pumps

API 610	Centrifugal Pumps for General Refinery Service. (Replace with ISO 13709 when issued)
API 674	Positive Displacement Pumps Reciprocating. (Replace with ISO 13710 when issued)
API 675	Positive Displacement Pumps Controlled Volume.
API 676	Positive Displacement Pumps Rotary.
NFPA 20	Centrifugal Fire Pumps.

2.3 Compressors

API 617	Centrifugal Compressors for General Refinery Service. (Replace with ISO 10439 when issued)
API 618	Reciprocating Compressors for Petroleum, Chemical and Gas Industry Services (Replace with ISO 13707 when issued).
ASME PTC 10	Power Test Code - Compressors and Exhausters.
NEMA SM23	Steam Turbines for mechanical drive service.

2.4 Gas Turbines

API 616	Gas Turbines for Refinery Services.
ASME PTC 22	Performance Test Code - Gas Turbine Power Plants.
ISO 1363	Package Gas Turbines (in development).

2.5 Reciprocating Combustion Engines

DNV	Rules for Classification of Steel Ships.
ISO 2954	Mechanical Vibration of Rotating and Reciprocating Machines.
ISO 3046	Reciprocating Internal Combustion Engines - Performance.
ISO 3945	Mechanical Vibration of Large Rotating Machines.

2.6 Transmissions

API 613	Special Purpose Gear Units for Refinery Service (Replace with ISO 13711 when issued).
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2.7 Expanders

API 617	Centrifugal Compressors for General Refinery Service (Replace with ISO 10439 when issued).
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2.8 Steam Turbines

IEC	Publication No.45.
ISO 10437	Special Purpose Steam Turbines for Refinery Services.

2.9 Lubrication and Seal Oil Systems

API 614	Lubrication, Shaft Sealing and Control - Oil Systems for Special Purpose Applications. (Replace with ISO 10438 when issued)
ISO 4406	Hydraulic fluid power Fluids, Method for coding of contamination by solid particles.
NAS 1638	National Aerospace Standard. Cleanliness required of parts used in hydraulic systems.

2.10 Baseplates

NS 3472	Structural Steel - Design Rules.
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2.11 Pressure Retaining Equipment

ASME VIII	Boiler and Pressure Vessel Code.
BS 5500	Unfired Fusion Welded Pressure Vessel Code.
DBE regulations	Forskrifter om kjelanlegg med veiledninger (Regulations for boiler plants and guidelines).
DIN 1942	Abnahmeversuche an Dampferzeugern.
ISO 5730	Stationary shell boilers of welded construction.
TBK 1-2	Norwegian Pressure Vessel Code.
TEMA	Standards of Tubular Exchanger Manufacturers Association.
TRD 611	Speisewasser und Kesselwasser von Dampferzeugern der Gruppe IV.

2.12 Atmospheric Tanks

API 650	Welded Steel Tanks for Oil Storage.
BS 2654	Specification for manufacture of vertical steel welded non-refrigerated storage tanks with butt-welded shells for the petroleum industry.
DIN 1055	Lasten in silozellen
NS 1544	Vertical cylindrical steel tanks for storage of flammable A, B and C liquids at initial pressure approximately atmospheric pressure.
NS 3472	Structural Steel - Design Rules.

As per Pressure Retaining Equipment.

3 DEFINITIONS AND ABBREVIATIONS

3.1 Definitions

Can	Can-requirements are conditional and indicates a possibility open to the user of the standard.
May	May indicates a course of action that is permissible within the limits of the standard (a permission).
Shall	Shall is an absolute requirement which shall be followed strictly in order to conform with the standard.
Should	Should is a recommendation. Alternative solutions having the same functionality and quality are acceptable.

3.2 Abbreviations

ACM/H	Actual Cubic Meter per Hour
CCR	Central Control Room
DBE	Direktorat for brann og eksplosjonsvern (Norwegian directorate for fire and explosion prevention).
DN	Nominal Diameter
FAT	Factory Acceptance Test
INSTA	Inter Nordic Standardisation Association
LCR	Local Control Room
MCR	Maximum Continuous Rating

NAS	National Aerospace Standard
NPSH	Net Positive Suction Head
NPSHA	Net Positive Suction Head Available
NPSHR	Net Positive Suction Head Required
NS	Norwegian Standard
PL	Peak Load
PN	Nominal Pressure
PO	Purchase Order
PSV	Pressure Safety Valve
RMS	Root Mean Square Value
TBK	Norwegian Pressure Vessel Committee
TOD	True Over Design
TRD	Technische Regeln zur Dampfkessel
VGB	Technische Vereinigung der Grosskraftwerksbetreiber (German Boiler Association)
WHRU	Waste Heat Recovery Unit

4 GUIDELINES FOR SELECTION OF EQUIPMENT IN SYSTEMS

Equipment selection should be done in accordance with Table 1. The boxed numbers are referring to clauses in this standard.

Equipment application in cases where the table is empty shall be done in accordance with data sheets and clause 5.1. Deviations from the table shall require project acceptance.

The main design code or standard shall be stated on the relevant data sheets. An API-standard shall only be included if it is deemed necessary due to the critical nature of the equipment or if necessary for the definition of the design, ref. Table 1.

Vertical in-line pumps or similar shall be the preferred selection for all sizes of dry mounted motor driven pumps due to lower total cost. Less cost is associated with piping design, piping stress calculations, piping alignment and equipment alignment.

Submerged pumps shall be selected in preference to line shaft and sump pumps.

There shall be no principal preference to aero-derivative over industrial gas turbines, suitability shall determine.

Table 1 - Equipment Selection Matrix

	Pumps	Compressors	Gas Turbines	Combustion Engines	Transmissions	Expanders	Steam Turbines	Lube & Seal Oil Systems	Pressure Vessels	Heat Exchangers	Exhaust Boilers and Heat Recovery Units
Oil Processing	5.2.2	5.3	5.4		5.6			5.9.2	5.11.1	5.11.3	
Gas Processing	5.2.1	5.3	5.4		5.6	5.7	5.8	5.9.2	5.11.1	5.11.4	
Well Stream	5.2.2				5.6	5.7		5.9.1		5.11.2	
Oil Export	5.2.2		5.4	5.5.2			5.8	5.9.1			
Gas Export		5.3	5.4		5.6		5.8	5.9.2	5.11.1	5.11.4	
Cooling Seawater	5.2.1										
Cooling Medium	5.2.1								5.11.1	5.11.3	
Heating Medium	5.2.2								5.11.1		5.11.5
Steam/Condensate	5.2.1							5.9.1	5.11.1	5.11.2	5.11.6
Chemical Injection	5.2.1										
Flare/Vent	5.2.1								5.11.1		
Produced Water	5.2.1										
Fuel Gas		5.3								5.11.4	
Seawater Supply	5.2.2										
Ballasting	5.2.1										
Fresh Water	5.2.1										
Hot water	5.2.1										
Drain	5.2.1										
Diesel	5.2.1										
Pressurised Air					5.6				5.11.1		
Inert Gas					5.6				5.11.1		
Hydraulic Power									5.11.1		
Glycol	5.2.1										
Fire Water	5.2.1		5.4	5.5.2	5.6						
Main Power			5.4	5.5.1	5.6		5.8	5.9.2			
Essential Power	5.2.1		5.4	5.5.2	5.6		5.8	5.9.1			
Emergency Power	5.2.1		5.4	5.5.2				5.9.1			

5 TECHNICAL REQUIREMENTS

5.1 General

5.1.1 Engineering basis

The application of voluntary paragraphs shall be settled.

Machinery taken into use on fixed offshore installations shall meet the requirements laid down in the “Norwegian Machinery Regulations”, alternative “Directive 89/392/EEC, Machinery, as amended” including the requirement to CE marking and declaration of conformity.

All equipment shall be designed for ease of installation and maintenance. Special tools and equipment shall be supplied.

5.1.2 Dynamic design

Balance quality for all rotating equipment shall be stated in accordance with ISO 1940.

For equipment with vibration detection instrumentation, the measurements shall be verified on the equipment.

5.1.3 Lay-out, piping and alignment

Shaft alignment tolerances shall be determined and specified, based on the conditions for installation.

All equipment mounted on baseplates and requiring alignment to fine tolerances shall be designed for application of temporary alignment measuring system, preferably laser optical.

Hatches, doors and manways shall be provided as required for repair, inspection, maintenance or installation. Provisions shall be made to secure them in open position.

Equipment with walk-in enclosures shall have windows for visual control of conditions inside.

General piping design shall be in accordance with ANSI/ASME B31.3.

All packages including a baseplate shall have all flange connections at the edge of the base. Piping terminations for each service shall have single inlet and outlet flange connections.

Steel pipe flanges and flanges fittings design shall be in accordance with ANSI B16.5 or MSS SP 44 for flange sizes over DN 600. Non standard flanges and mechanical joints of proven design can also be used for special purposes.

Pipe threads shall be in accordance with ANSI B1.020.

Liquid containing systems shall be completely drainable in all parts without dismantling, or use of manual methods.

Provisions shall be made to avoid air pockets during pressure testing.

Drains shall be provided on all casings.

Drain lines shall be brought out to the edge of the base plate and individually valved.

Vent connections shall be provided with valves.

Valves shall be grouped and accessible within reach from the operating floor level.

Drain points shall have a second barrier against leakage or accidental emptying.

Systems and equipment shall be designed without pockets to avoid foreign matter accumulation.

Traps, strainers or filters shall be used to capture foreign matter detrimental to the equipment.

5.1.4 Mechanical design

Systems or equipment which are dependent on liquid supply at emergency or other run-down situations shall be provided with emergency supply for the necessary period.

Flow and rotation direction shall be permanently marked.

Equipment located on floating production units shall be designed for wave-induced fatigue.

Renewable sleeves under seals shall be removable on site without the application of heat.

Material for external bolting of 10 mm and smaller shall be corrosion resistant steel. Larger bolting shall as a minimum be hot dip galvanised low alloy steel. Submerged bolting shall be compatible with the base metal. Bolts shall be in accordance with ISO 262.

All equipment shall have a material handling procedure. When manhandling cannot be expected, handling and lifting devices shall be provided or clearly defined.

Couplings shall not contain wear parts and shall use forged steel. Dampening couplings can be differently designed.

All rotating couplings shall be shielded by structurally strong coupling guards. Non-sparking guard is required in classified zones 0, 1 and 2.

Limitation of the noise emission from the equipment shall be specified. Special considerations shall be given to noise limitations during design of equipment.

5.1.5 Nozzle loads

Equations below, gives forces and moments induced from package external pipework, which shall be minimum allowance in the calculations.

$$M = 4x(DN-25)^{1.4} + 2x10^{-5}xPNx(DN)^{2.7} [Nm]$$

$$F = 7.5x(DN)^{1.2} + 0.1xPNx(DN)^{1.2} [N]$$

PN in bar and DN in millimetres.

Forces and moments are acting at the nozzle to shell junction and at skid edge for piping nozzles. The equations does not apply to equipment nozzles within package units interconnected to each other with Supplier's piping.

The moment 'M' (Nm) and the force 'F' (N) shall be applied simultaneously in:

- two perpendicular directions at the right angle to the axis of pipe or in the plane tangent to the pressure retaining part at the nozzle-to-shell interface;
- direction perpendicular to the above plane.

Whenever relevant, the stress analysis shall be done both for the radial force pulling outwards together with the internal design pressure and for the same force pushing inwards with zero pressure resp. vacuum.

5.1.6 Design loads

The equipment shall be designed taking account of all relevant loads listed in codes and data sheets, and include the effect of field hydrostatic tests, wind, explosion blast pressure, acceleration, connected piping, transportation and installation.

5.1.7 Testing

Hydrocarbon gas containing equipment shall be tested with gas for leakages.

All equipment shall be subjected to FAT under realistic conditions according to accepted procedure.

All registrations necessary to demonstrate adherence to requirements or needed as reference for maintenance/surveillance shall be electronically stored and be available as print-out or curves.

All noise tests shall be performed in accordance with listed standard INSTA 121 and ISO 9614-2.

Changes or repairs as a result of failed tests require retesting if the performance or function may be affected.

A complete performance test dossier shall be produced immediately after acceptance.

5.1.8 Cleaning and preservation

The equipment shall be delivered fully cleaned and flushed for immediate service.

The equipment shall be properly preserved for transport and storage.

5.2 Centrifugal pumps

5.2.1 Standard requirements

5.2.1.1 Basic design

All shaft seals on pumps shall be mechanical.

The NPSHR shall be at least 1.0m less than the NPSH available, for boiler feed pumps at least 3m less. Correction factors for hydrocarbons are not allowed.

Onset of cavitation shall be defined as three (3.0) percent head drop (first-stage head on multistage pumps) from the horizontal line drawn through the non-cavitating points derived from the head/NPSH plot obtained by holding speed and flow constant, while reducing the suction pressure.

The region of uncertainty is defined as +5.0% of the NPSHR at the point of incipience and shall be added to the measured NPSHR to define the contract NPSHR value.

The whole pump casing shall have a pressure rating allowing it to be tested at the hydrostatic test pressure of the discharge side by mounting blinds to the suction and discharge nozzles.

The best efficiency point for the pump shall be to the right of the rated point on the head capacity curve.

Fire water pumps shall be designed in accordance with NFPA 20.

5.2.1.2 Critical speeds

If the first lateral or torsional critical speed of the shaft system for Multi-stage Pumps above 500kW when coupled to the driver, lies below the minimum operating speed of the pump, vibration calculations are required.

5.2.1.3 Drivers

Drivers shall allow full testing with water.

The nominal motor power rating (kW) shall be selected in accordance with the requirements in API 610.

5.2.1.4 Alignment

Minimum twice the forces and moments in API 610, Table 2 at maximum deck deflection shall apply, but the design's additional capability shall be stated.

5.2.2 Centrifugal Pumps to API 610

5.2.2.1 Piping

Rating	PN	API-Pumps
150	20	2 x API 610
300	50	4 x API 610
600	100	6 x API 610
900	150	8 x API 610
1500	250	10 x API 610

Vertical pump main nozzles shall withstand a multiple as defined in the above table of the standard forces and moments as defined in API 610, table 2 under continuous operation.

Hydrocarbon duty pumps shall have direct casing vent and drain connections.

5.2.2.2 Vibration and balance

Vibration limits shall apply to horizontal and vertical pumps. These limits shall cover rotor vibration during shop tests at rated speed from minimum flow to 110% rated capacity.

5.3 Centrifugal compressors

The following consist of amendments, additions or other changes to API standard 617 for Centrifugal compressors.

5.3.1 General

The following additional requirements apply:

For the purpose of performance calculation it shall be assumed that for any given process case specified in the data sheets, a condition of flow recycling exists if the discharge volume flow from the operating point to the surge line at constant speed becomes less than 5% of the design capacity. At the specified operating point in the data sheets the calculated pressure rise to surge shall not exceed 15%, but not be lower than 7.5%. The turn down range shall be 35% minimum at rated speed.

5.3.2 External forces and moments

The following additional requirements apply:

Each nozzle shall withstand 4 x NEMA SM23 forces and moments within the alignment tolerances.

5.3.3 Rotating elements

The following amendments apply:

The thrust collar shall be hydraulically fitted and replaceable. A locally mounted pressure gauge (with valve bleeder) shall be supplied to indicate balancing drum pressure.

The following additional requirements apply:

For compressor with a rated discharge pressure of 100 barg or above, a pressure gauge with valve bleeder mounted directly on the casing with a flanged or studded boss connection to indicate balancing drum pressure shall be included.

5.3.4 Bearings and bearing housings

The following additional requirements apply:

Each radial bearing shall be fitted with two temperature sensors, one spare decoupled. Details of installation shall be as per API Standards 670 and 678.

The following amendments apply:

Thrust bearings shall be sized for continuous operation and thrust calculations shall take into account the thrust imposed by the loss of balance piston labyrinths. For compressors with discharge pressures greater than 200 barg (20 MPag), thrust bearings shall be selected at no more than one third of the manufacturer's rating. All thrust bearings shall be provided with four bearing metal temperature sensing elements, two located on the pads on the active side and two on the pads on the inactive side.

5.3.5 Shaft seals

The following additional requirements apply:

The standard sealing method is to use dry gas shaft seals. The gas seals shall be designed as a replaceable cartridge.

The following additional requirements apply:

The maximum amount of seal oil leakage to the gas side of the seal shall be specified and verified in the FAT.

5.3.6 Dynamics

The following additional requirements apply:

The critical speed transition behaviour shall be recorded on run-up and on deceleration at the beginning and at the end (after the overspeed) of the mechanical test run. The rate of change of speed when passing through the critical speed shall be uniform and about 500 RPM/minute.

The following amendments apply:

Torsional vibration analysis shall be performed for the complete coupled train also for turbine driven units.

The following amendments apply:

The maximum permissible residual specific unbalance value of the rotor during the shop tests of the assembled machine shall be determined by the balance quality grade G1 as specified in ISO 1940/1.

The following amendments apply:

After completion of the final balancing, all major elements of the assembled rotor shall be match marked.

5.3.7 Drivers

The following amendments apply:

Driver torque capabilities shall exceed compressor torque requirements by a minimum of 10%. For el-motors, torque requirements must be met at 80% voltage.

5.3.8 Controls and instrumentation

Unless otherwise specified, the sub-sections for instrumentation, alarms and shutdown, and electrical systems to be deleted. Requirements are covered by dedicated specifications.

5.3.9 Optional tests

The following amendments apply:

The compressor shall be performance tested in accordance with ASME Power Test Code PTC 10, latest addition, "Compressors and Exhausters", according to the class specified on the data sheets. A minimum of five points including surge and overload shall be plotted at 100% test speed. For variable speed units, four additional points shall be plotted. These shall be at 85% of the test speed and surge points at 75%, 95% and 105% of the test speed. For the purpose of defining the polytrophic efficiency on a flange to flange basis, the power losses due to internal gas recirculations shall be taken into account. For compressors above 200 bars full load test at full density shall be offered.

The following additional requirements apply:

A mechanical string test shall be offered.

5.4 Gas turbines

The following items consist of amendments, additions or other changes to API Standard 616.

5.4.1 Basic design

The following additional requirements apply:

The guaranteed rated power shall be as defined and subject to zero negative tolerance when operated at rated firing temperature (subject to a maximum tolerance of +2.5%) and rated speed (subject to a measuring tolerance of $\pm 0.2\%$). The guaranteed heat rate shall be the heat rate at rated power or at rated temperature +2.5%, whichever gives the greater value. The gas turbine shall be guaranteed not to exceed a specified power/efficiency degradation at 8000 and 24000 operating hours before major overhaul, and at 24000 operating hours after a major overhaul program. The Supplier shall specify these guaranteed power and efficiency degradation figures in the quotation. Supplier shall also specify the effect of fuel type on the guaranteed figures.

5.4.2 Combustors and fuel nozzles

The following additional requirements apply:

Turbines with only conventional combustors available shall be prepared for change out to dry low NO_x types at a later stage.

5.4.3 Controls and instrumentation

The following amendments apply:

The starting sequence control system shall be fully automatic. Both manual and automatic starting systems shall be supplied. The control system shall visually display the progress of the starting sequence, including the running state of motor driven auxiliaries.

The following additional requirements apply:

Operation and shut-down protection shall be maintained during a break in A.C. power on changeover from emergency to main supply and vice versa. Gas turbine control shall not be affected by changeovers between hydraulic pumps or by gas turbine operating transients.

5.4.4 Inlet and Exhaust systems

The following additional requirements apply:

The air inlet system shall include an anti-icing system upstream of the moisture separator and air filtration. The inlet air anti-icing system shall be manually actuated.

The following additional requirements apply:

The inlet filter shall be designed for minimum pressure loss and optimum energy conservation.

5.4.5 Weatherproofing (enclosure)

The following additional requirements apply:

The gas turbine should be installed in an enclosure having inspection windows with blinds, main and emergency lights and thermostatically controlled anti-condensation heaters. Equipment needing inspection and/or maintenance during normal operation shall be installed outside the enclosure.

The following additional requirements apply:

The enclosure shall be of corrosion resistant and approved fire resistant material. Noise insulation shall be of fibreglass or equivalent non-flammable sound absorption material. Insulation shall be designed to avoid collection of flammable fluids. The access doors shall be lockable from the outside only and overridden by a quick release bar on the inside. Doors shall be equipped with micro-switches to give closed or open indication signals.

5.4.6 Fire protection

The following additional requirements apply:

A suitable fire prevention and protection system compatible with the existing surrounding system shall be provided. This shall include heat, flame and gas detection and fire extinguishing facilities. The following protection and shut-down functions shall be provided:

- Detection of a low level gas concentration in the ventilation air inlet to the gas turbine enclosure shall cause an alarm.
- Confirmed detection of high gas concentration in the ventilation air inlet shall cause an alarm and shall shut down the affected gas turbine unit. Also the ventilation air inlet to the enclosure shall be closed.
- Detection of a low gas concentration in the ventilation air outlet shall cause an alarm and shall on dual fuel machines initiate changeover to diesel fuel.
- Confirmed detection of a high gas concentration in the ventilation air outlet or combustion air inlet, or in the enclosure shall cause an alarm, shut down the affected unit, close the ventilation inlet and activate the fire extinguisher.
- Detection of heat or flame in the gas turbine enclosure or ventilation air ducts shall cause an alarm, shut down the affected gas turbine unit, close the ventilation air inlet and outlet and activate the fire extinguisher.
- Detection of heat or flame in the combustion air inlet shall shut down the gas turbine.

The following additional requirements apply:

Enclosures for all turbine drivers located in safe area shall have a ventilation system under negative pressure. There shall be two full capacity motor driven fans with dampers to prevent back-flow. A failure of the fan maintaining flow through the turbine enclosure ventilation system shall cause the other fan to start automatically. Automatic or manually initiated changeover shall take place without causing turbine trip. The turbine enclosure ventilation system shall be equipped with three independent devices checking the adequacy of ventilation flow through the system. Turbine shut-down shall occur as a result of two out of three redundancy.

5.4.7 Fuel system

The following additional requirements apply:

Manual changeover from gas to liquid fuel shall also be possible by manual initiation in the Local control room, with automatic sequencing and control. Change over from liquid to gas fuel shall be only by manual initiation in the Local control room, with automatic sequencing and control.

The following additional requirements apply:

Dual fuel gas turbines shall be arranged to switch the fuel control system automatically from gas to liquid fuel when sensing fuel gas pressure falling below set limit and with no more than 1% speed reduction by change-over. Manual changeover from gas to liquid fuel shall also be possible with automatic sequencing and control. The fuel gas double block and intermediate bleed-off (vent) valve shall be located upstream of the gas fuel flow control valve. All valving shall be as close to the gas turbine as practically possible. Piping shall be installed to automatically drain off liquid fuel from inside the gas turbine after a false start. A flanged connection of DN 25 minimum shall be installed at the skid boundary. A drain box shall be provided to keep the connection open at all times. A purge cycle shall be included where the fuel line between the fuel gas scrubber and the turbine is purged by fuel gas vented to a flare system prior to cold start of the turbine and prior to changeover from liquid fuel to gas fuel.

5.4.8 Inspection and tests

Mechanical running test

The following additional requirements apply:

The recording of an unfiltered signal shall be made with a digital tape recorder and shall cover the frequency range from zero up to twice maximum vane passing frequency or 10kHz as applicable. In addition, vibration signature tape recording and spectrum analysis during start-up and coast-down, shall be done.

The following amendments apply:

Performance test shall be performed according to ASME Power Test Code PTC 22. Inspection of hub/shaft fit for hydraulically mounted couplings shall be performed. Governor response and emergency overspeed trip system tests shall be performed. Two overspeed trips from each speed pick-up on the power turbine shall be performed.

5.4.9 Preparation for shipment

The following additional requirements apply:

Borescope examination of blades, nozzles and combustion areas shall be done after testing.

5.5 Combustion engines

5.5.1 Standard requirements

5.5.1.1 Type approval

The engine shall have a relevant type approval.

5.5.1.2 Engine rating

Ratings shall be given according to ISO standard No. 3046 or an equivalent standard.

5.5.1.3 Vibration

The measurement and evaluation of vibration severity shall be in accordance with ISO 10816.

5.5.1.4 Crankshaft dynamics

The crankshaft shall specifically comply with DNV "Rules for classification of steel ships".

5.5.1.5 Torsional stresses and deflections

The torsional natural frequencies of the engine and driven system including ancillary drives shall not be closer than 10% to any specified running speed including variation. Constant speed applications shall be considered to have a speed range within plus or minus 10% of stated running speed.

5.5.1.6 Engine starting

The engine shall be capable of starting when coupled to the driven machine. Starting devices shall have enclosed rotating parts.

5.5.1.7 Engine cooling system

Jacket water and sea water cooling system shall be completely separate. Direct sea water cooling of engine components is not permitted.

The jacket cooling water circulation pump shall be engine driven. The system shall be thermostatically controlled with a full bypass temperature control valve.

5.5.1.8 Engine lubricant system

A thermostatically controlled bypass shall be installed.

The oil filters shall be of the full flow cartridge type with continuous flow transfer valves and differential pressure gauge.

5.5.1.9 Exhaust system

The surface temperature shall not exceed 200°C. Water shielding is preferred for the exhaust manifold and turbocharger. If insulation is used, the metal jacket shall be completely water tight.

The engine shall be supplied with exhaust silencer(s) with spark arrestor.

5.5.1.10 Safety devices

Minimum requirements for safety devices:

- Crankcase safety valves according to DNV.
- Automatic inlet air shut-off valve.
- Guards to protect personnel from bodily contact with hot surfaces and moving parts.
- Overspeed trip driven directly by the engine.

5.5.1.11 Instrumentation

The minimum instrumentation to be supplied is listed below.

Function	Indication	Alarm	Trip
Start and stop push buttons			
Hours run counter	x		
Engine overspeed	x	x	x 1)
Coolant temperature	x	x	x
Coolant pressure	x		
Coolant level	x	x	x
Charge air pressure	x		
Exh. Temp. engines < 600 kW (each bank)	x		
Exh. Temp., engines > 600 kW(each cylinder)	x		
Lubricating oil temperature	x	x	
Lubricating oil pressure	x	x	x 1)
Fuel leakage	x	x	
Governor battery voltage	x	x	

Note 1 Engines for emergency power generators and fire pumps shall only have these two trip initiators.

5.5.1.12 Auxiliary piping

Flexible joints shall be provided for all piping connections to and from the skid mounted equipment.

5.5.1.13 Hydrostatic tests

Hydrostatic tests shall be done for engine parts and engine accessories according to DNV rules.

5.5.1.14 Mechanical running test

A mechanical running test shall be conducted to control the mechanical function of the engine and accessories, governor system, control and safety device, etc. The system tests shall include but not be restricted to the following:

- Speed governor and any speed-regulating devices shall be tested according to ISO 3046 - 4 and the specified governor class.
- The adjustable governor response speed range and the sensitivity and linearity of relationship between the speed and control signals shall be documented as tested.

5.5.1.15 Performance test

The engine including all auxiliaries and control panels shall be subject to a full load performance test in accordance with ISO 3046 or an equal standard.

5.5.1.16 Noise test

The exhaust noise level shall be measured separately.

5.5.2 Diesel engines

5.5.2.1 Engine starting

Engines for emergency power generators or fire pumps:

- Shall be capable of carrying its full rated load within 20 seconds after cranking is initiated.
- The starting system shall be based on NFPA 20. If air starting is used, the capacity of the air supply vessels shall be sufficient for 12 cranking cycles.

5.5.2.2 Engine fuel system

Filters shall be of the duplex type with automatic changeover. A differential pressure gauge shall be installed across the filter.

The fuel piping between the fuel pump and the injectors shall be double-walled, and equipped with instruments for detection of leaks.

5.5.2.3 Auxiliary piping

High pressure fuel oil piping to the fuel injectors is to be double walled and secured to prevent fuel oil or fuel oil mist from reaching a source of ignition on the engine or its surroundings. These pipes shall be equipped with leakage detection. When pressure pulsations can be expected in the return piping, shielding of this piping shall be provided.

5.5.2.4 Material certificates

Material certificates for engine parts for emergency power generator and fire pump engines shall be available according to relevant classification.

5.6 Transmissions

The following items consist of amendments, additions or other changes to API Standard 613 for Gear units.

5.6.1 General

The following additional requirements apply:

Machined surfaces shall be provided near the input and output shaft bearing housings for mounting of optical alignment instruments.

5.6.2 Basic design

The following additional requirements apply:

Gears located next to the driver shall be rated for the potential maximum power of the driver, plus the potential maximum power of any helper-driver transmitting power through the gear unit during operation.

A gear located between items of driven equipment shall be rated for 110% of the maximum torque required by the driven equipment, including the applicable service factor.

5.6.3 Casings

The following additional requirements apply:

Casings shall be fitted with temporary jacking screws to facilitate vertical alignment.

5.6.4 Casing connections

The following additional requirements apply:

Inert gas purge connection, suitably plugged, shall be provided.

5.6.5 Gear design

The following amendments shall apply:

The design of the gears shall be such that it is not necessary to plate teeth to prevent scuffing during initial operation.

The following amendments shall apply:

Hunting tooth combinations are only required for non surface hardened gears.

The following additional requirements apply:

The free end of the high speed shaft shall have a suitable arrangement which can be used to turn the shafts manually after removing the bearing end cover.

5.6.6 Bearings

The thrust collar which revolves with the shaft shall be replaceable.

The following additional requirements apply:

Shaft oil seals shall be easily accessible for removal and re-installation without removing couplings.

5.6.7 Controls and instrumentation

The following additional requirements apply:

Measurement of combined oil temperatures from more than one bearing (i.e., from radial and thrust bearings) shall be avoided wherever possible.

The following additional requirements apply:

Wiring with particular attention to vibration and temperature measurements shall be arranged to facilitate removal of the casing top.

5.7 Expanders

In the lack of an appropriate recognised standard for gas and well stream expanders the API standard 617 shall be used.

The following items consist of amendments, additions or other changes to API standard 617.

5.7.1 Scope

The scope of API 617 shall apply also for expanders

5.7.2 Definition of terms

The following additional definitions apply:

Expander normal operating point is the point at which the usual process operation is expected. Design point is the point of operating duty which provides optimum isentropic efficiency from the expander. The design point shall be so selected to:

1. Achieve best possible efficiency at normal operating duty with design feed analysis at expander inlet.
2. Ensure acceptable efficiency at maximum flow rates.

5.7.3 Basic design interstage diaphragms and Inlet guide vanes

The following amendments shall apply:

Expander inlet guide vanes shall be adjustable and suitable for operation at all the specified operating, start-up, shut-down, trip-out and transient conditions.

The compressor - specific requirements shall be replaced by:

The expander guide vanes shall be designed to minimise mechanical wear, vapour/liquid erosion and losses over the operating life of the machine. The guide vanes control system shall be capable of both remote and local adjustment. The adjustable guide vane positions shall be locally indicated by a pointer over a scale marked in 5 percent of area divisions from fully closed to maximum. Inlet guide vanes with adjustment mechanism should optionally be proposed for the compressor if a significant improvement in expander efficiency could be achieved by speed adjustment of the machine at the specified off-normal duties.

5.7.4 Bearings and braring houses

The following additional requirements apply:

When using magnetic bearing system, radial bearing rating shall not exceed 25% of manufacturer's rating.

5.7.5 Thrust bearings

The following additional requirements apply:

For turbo-expander with inlet pressures greater than 200 barg, thrust bearings shall be selected at no more than one third of the manufacturer's rating. The thrust bearings shall be provided with two bearing metal temperature sensing elements for each bearing side. High-temperature alarm with adjustable set point shall be included.

5.7.6 Shaft seals

The following additional requirements apply:

The seal gas system shall be design to avoid excessive pressure build-up in the unit's casing.

5.7.7 Accessories

API 617 requirements with regard to the type of driver shall not be applicable.

API 617 requirements with regard to gears shall not be applicable.

5.7.8 Controls and instrumentation

API 617 requirements with regard to instruments shall not be applicable.

API 617 requirements with regard to the alarms and shut-downs shall only be used when applicable to turbo expanders.

The following additional requirements apply:

1. Lube oil pump running confirmation:
To indicate that the stand-by pump circuit is functional and ready for starting.
To indicate that the stand-by pump is running.
2. "Ready to start" confirmation:
Confirmation shall be provided on the panel/monitor to indicate when various required levels have been reached in the seal/lubrication system, etc. to allow safe starting of the machine without mechanical damage.

API 617 requirements with regard to the electrical systems shall not be applicable.

5.7.9 Impeller overspeed test

API requirements with regard to the overspeed testing shall be applicable on all wheels, both expander, compressor and any spare equipment.

5.7.10 Mechanical running test

The following amendments apply:

Employing an external compressed air facility, operate the turbo-expander unit in the following sequence as described for the mechanical running test.

5.7.11 Performance tests

The following additional requirements apply:

Performance tests for evaluating both expander and compressor performance shall be carried out at the manufacturer's works prior to delivery. These tests shall simulate the individual operating cases as defined on the data sheets and in particular the "normal operating point" (guaranteed performance).

5.7.12 Vendors data

The following additional requirements apply:

Performance curves for each operating case listed on the data sheet shall be included in the proposals. The performance curves for the expander shall take the form of polytropic efficiency plotted against the ratio of expander impeller tangential tip speed (U) divided by the ideal spouting velocity for the expansion (Co). The U/Co ratios for all operating cases specified on the data sheets and their individual operating speeds shall be shown.

5.8 Steam turbines

The following items consist of amendments, additions or other changes to ISO 10437.

5.8.1 General

The following additional requirements apply:

The rated load shall be at least 110% of the maximum operating load at any of the specified operating conditions. The speed at rated load is the normal speed.

5.8.2 Pressure casings

The following amendments shall apply:

All pressure parts of the turbine shall be suitable for continuous operation at the maximum specified steam conditions. The behaviour of the turbine casing, where subjected to swings in temperature or pressure, shall be in accordance with the requirements of IEC - publication No 45, latest edition.

The following additional requirements apply:
For continuous drainage, steam traps shall be provided.

5.8.3 Dynamics

The following additional requirements apply:
Drum type rotors (stiff shafts) can be dynamically balanced, after final assembly of the rotors by "high speed" balancing close to the critical speed N_{cn} .

The following additional requirements apply:
The rotor and turbine design shall include provisions to facilitate field balancing.

5.8.4 Bearings and bearing housing

The following additional requirements apply:
Active magnetic bearings can be accepted. One key-phazor probe shall be furnished per shaft.

5.8.5 Accessories

The following additional requirements apply:
Limit switches shall be furnished on each trip valve to indicate "open" or "closed" position of it.

5.8.6 Insulation and jacketing

The following additional requirements apply:
The insulation shall be reusable.

5.9 Lube and seal oil systems

5.9.1 Standard requirements

The lube and seal oil system shall be cleaned and flushed in accordance with the requirements in NAS 1638 and ISO 4406.

The lube oil system shall be arranged with sample testing facilities for the oil at the following locations:

- In storage tank.
- Downstream of filters.
- In return line from the equipment.

The sampling facilities shall be arranged so that the samples can be taken during operation of the unit.

Baseplates shall be suitable for column mounting, multipoint three point bolt down support.

An electric heating device shall be provided for heating of the oil prior to start-up. Electric immersion heaters shall be corrosion resistant.

Connections for oil conditioner with pipe loop shall be provided.

Drain lines shall be provided with valves and blind flanges at the lowest point on the oil pump inlet and outlet.

Oil vent pipes shall be routed back to the reservoir. A flanged vent valve shall be provided at the highest point on the cooling medium side of the coolers with vent pipe routed to an open drain line.

Vent and drain nozzles shall be provided with valves and blind flanges.

5.9.2 Lubrication and seal oil system to API 614

The following items consist of amendments, additions or other changes to API standard 614. References given under each subheading below are to API 614.

5.9.2.1 Basic design

The following additional requirements shall apply:

Where a gas compressor shares a common lube-oil system with a (or part of a) gas turbine, oil returns from driven equipment and driver shall be separated from each other in separate sections of the lube-oil reservoir. Each section shall have its own vent connection.

5.9.2.2 Oil reservoirs

The following additional requirements shall apply:

Provisions shall be made to prevent oil from flowing into the gas turbine via the lube oil reservoir in case of compressor and gas turbine driver having common lube oil system.

Transfer Valves

The following amendments shall apply:

Individual transfer valves independently serving each cooler and filter set, are required.

5.9.2.4 Degassing drum

The following amendments shall apply:

Seal-oil degassing facilities shall be provided when the compressor duty will contaminate the oil.

5.10 Baseplates

5.10.1 Design requirements

The baseplate shall be designed in accordance with NS 3472.

The lifting lugs shall be designed for a load calculated assuming that only two diagonally opposite lifting lugs are carrying the full load. The design and manufacture of the lifting lugs shall be certified.

The base plate and equipment supports shall also be designed to sustain loads resulting from the supported equipment during ocean-going transportation.

The provision of all appurtenances required to tie-down the baseplate with all supported equipment during transportation shall be specified. When an ocean going vessel is used, the baseplate shall be provided with suitable attachments for securing directly to the vessel deck.

5.10.2 Lay-out and functional requirements

The baseplate shall be fitted with a steel plate top sheet continuously welded to the framework where fluid leakages may occur and shall be selfdraining.

When multipoint mounting is specified, the base plate shall be provided with foundation pads at least 20 mm thick for anchoring to the foundation framework.

Unless otherwise specified, the bottom of the baseplate between structural members shall be open. Closed pedestal supports or closed volumes are not permitted. All surfaces shall be accessible for proper sandblasting and painting including the underside.

All joints shall be designed as continuously welded.

The height of mounting pads and/or support pedestals shall be such that a minimum vertical clearance of 50 mm is available underneath all mounted equipment and piping including under the drain line flanges at the edges of the baseplate.

The driver mounting pads shall be machined to corresponding center height allowing the driver to be mounted with a shim pack of minimum 3mm and maximum 6mm. Final machining shall take place after heat treatment.

5.10.3 Installation requirements

All base plates shall be designed to be skidded in two orthogonal directions in the horizontal plane. Lugs/reinforcement shall be located at suitable points around the baseplate to enable easy application of an appropriate motive force.

Where necessary, provisions shall be made for the levelling of base plate mounted equipment and this shall be accomplished by the suitable location of jacking points. After jacking, appropriate shim plates shall be located at the support points.

When applicable, consideration shall be given to access with sufficient space for the bolting of the base plate to the deck foundations. Fixation shall be designed for the most critical of the loading conditions.

All shims shall provide full foot support. Shims shall be made of stainless steel, pre-cut and deburred.

5.11 Pressure retaining equipment

5.11.1 Standard requirements

5.11.1.1 General

Pressure retaining equipment shall be designed in accordance with one of the following codes:

TBK 1-2, BS 5500, ASME VIII

5.11.1.2 Design pressure

Equipment operating at less than atmospheric pressure shall be designed for full vacuum.

Differential pressure shall not be used as design basis for multicompartment equipment.

5.11.1.3 Design temperature

Upper and lower design temperatures shall cover all normal-, testing- and emergency conditions.

For compressor installations, the actual operating conditions shall be taken into consideration.

5.11.1.4 Nozzles and openings

Nozzles welded to pressure retaining equipment shall as a minimum be 50 mm nominal diameter.

Minimum standoff is 150 mm measured from nozzle face to equipment or insulation surface.

Reinforcement of openings in equipment designed for more than 200 bar or with wall thickness above 40 mm shall be by integrally reinforced nozzle necks or locally increased wall thickness. Hence, doubling plates are not allowed.

Full penetration welds shall be applied between vessel and pipe connected nozzles with nominal diameter larger than three times the shell thickness.

5.11.1.5 Miscellaneous requirements

Manholes shall have a nominal diameter of 600 mm.

Hand holes shall have a minimum nominal diameter of 200 mm.

The vessel shall be provided with all necessary attachment brackets for insulation and for installation of access platforms and ladders. Openings used for access shall have rungs or ladders and handgrips inside the vessel.

All attachment welds shall be continuous.

Internal piping shall be flanged inside the vessel.

All connections shall be flanged and readily accessible. There shall be no connections inside vessel skirts or equipment foundations.

Skirts shall have top and bottom vent openings and access opening allowing easy inspection of vessel.

Lifting lugs shall be designed with a safety factor 2.

Corrosion allowance shall be added to all medium exposed surfaces. Removable internals can have corrosion allowance added to one side only.

5.11.1.6 Fabrication

Welder and welding operators shall be certified according to a recognised certification scheme.

All welding shall be performed according to qualified welding procedures

All NDT operators shall be certified according to a recognised certification scheme

5.11.2 Shell and tube type heat exchangers

5.11.2.1 General

TEMA Class R shall apply for all hydrocarbon service. Class C may be selected for utility service.

Vibration analysis shall be carried out.

5.11.2.2 Thermal design

The design shall account for fouling. TOD shall be specified on datasheet.

$TOD = (k_{\text{clean}}/k_{\text{service}} - 1) \times 100$, and k = overall heat transfer coefficient (OHTC).

5.11.2.3 Mechanical design

The internals shall be equipped with necessary provisions for separate and easy dismantling and removal, through the manhole.

Square tube arrangement is required on removable bundles where shell side fluid fouling resistance is $0.00035 \text{ m}^2\text{C/W}$ or more.

Internal welds of shells for heat exchangers with removable bundles shall be finished flush with the inner contour for ease of tube bundle insertion and withdrawal.

5.11.3 Plate type heat exchangers

5.11.3.1 General requirements

All relevant pressure retaining parts shall be designed, fabricated and tested in accordance with the pressure vessel code.

5.11.3.2 Thermal design

The design shall account for expected fouling. TOD shall be at least 20%.

5.11.3.3 Mechanical design

The cover plate shall be movable without the assistance of mechanical equipment. The frame and bolting shall be designed to allow for future installation of 20% additional plates.

Plate gaskets shall be arranged so that a gasket leak cannot result in mixing of the fluids for example by use of double gaskets with a vent opening between.

The plates shall be marked to facilitate correct reassembly.

5.11.4 Matrix type heat exchangers (bonded plates)

5.11.4.1 Thermal design

Additional heat transfer area is required due to fouling.

TOD shall be:

For cooling water services :	20%
For fouling services such as natural gas and crude oil cooling etc. :	25%

5.11.4.2 Pressure testing

A hydrostatic test shall be performed on each side independently as well as together. The heat exchanger shall be checked for leakage at the end of each test sequence.

A helium leak test shall be carried out on each side after hydrostatic testing.

The helium leak test pressure shall be either at 25% of the design pressure or 800 kPag, whichever is lower.

The helium leak test procedure shall be sensitive to helium leaks exceeding 2×10^{-4} cc/s.

No detectable leakage shall be permitted.

5.11.5 Waste heat recovery units

5.11.5.1 General

The Waste heat recovery unit shall be skid mounted and supplied as a package unit including necessary expansion bellows for connection to fixed duct and pipe.

Headers and coils shall be designed as pressure vessels.

5.11.5.2 Thermal design

Maximum and minimum heat output at the specified maximum and minimum gas flow conditions shall be given.

The temperature margin against thermal decomposition of any component of the heating medium mixture in the critical part of the coil shall be documented.

The temperature of the metal at the coldest section of the tubes shall be at least 10°C higher than the condensing temperature of the corrosive compounds contained within the exhaust gases.

The tube and fin-tip metal design temperature shall be 25°C higher than the highest expected normal operating temperature. This must take into account the maximum occurring local metal temperature affected by internal fouling and heating medium and gas flow imbalances.

5.11.5.3 Coil

The coil shall be equipped with a manual blowdown and vent facility.

5.11.5.4 Headers

The WHRU shall have external header boxes or header pipes which shall be supported independently of the tubes. Each header shall be equipped to enable inspection of the tubes during major shutdowns.

Provision shall be made to facilitate the removal and reinstallation of tubes. A description of tube removal and replacement procedures shall be furnished.

5.11.5.5 Duct design

Provision shall be made for duct drainage in connection with water washing and in the event of firewater entering the ducts with a hopper arrangement. All sections shall be joined using flanged and bolted connections.

If the design of the Waste heat recovery unit is such that this design pressure may be exceeded due to maloperation, a pressure release device shall be included in the design to prevent overpressurizing the exhaust ductwork.

5.11.6 Exhaust steam boilers

5.11.6.1 Boiler surveillance category

The requirements to the boiler operation mode is specified in Norwegian DBE boiler regulations, section 8. The boiler shall be designed, equipped and operated to the surveillance category "Indirect surveillance".

5.11.6.2 General boiler design

The boiler shall be designed for at least two years of continuous service and shall be capable of sustained operation at MCR between mandatory inspections. Required design life shall be stated on data sheet.

5.11.6.3 Feed water, boiler water and steam quality

Feed water and boiler water quality shall meet the requirements given in the ISO 5730.

The steam quality shall be to the German boiler association - VGB - recommendations as a minimum.

5.11.6.4 Noise Level

The noise levels shall apply at all operating conditions up to MCR.

5.11.6.5 Boiler design criteria

Boiler circulation shall be based upon the following parameters:

- Furnace tubes inlet water velocity shall be 1.0m/s minimum.
- Boiler bank tubes inlet water velocity shall be 0.5m/s minimum.

The boiler gas side shall be designed for 5000 Pa overpressure, minimum.

The boiler shall be suitable for chemical cleaning prior to commissioning or after long lay up. Inspection nozzles shall be provided at various locations to facilitate connection to chemical cleaning system as well as to provide means for inspection after chemical cleaning.

5.11.6.6 Furnace design

The heat release in the furnace shall not exceed 800 KW/m³ at any condition.

The number and position of the peep holes shall enable control of all important parts of the furnace.

5.11.6.7 Steam drum

The steam drum water volume at the low-level alarm point shall accommodate the water shrinkage resulting from a decrease in load of 25% of MCR occurring in one minute and with system pressure increased to the safety valve setting pressure without actuating the low-level trip.

Minimum drum hold-up capacity shall be two minutes at MCR and shall be based on volume between low level alarm and lowest visible level.

Vortex breakers shall be fitted to downcomers, nominal bore 150 mm and above.

The steam drum shall be furnished with steam drying equipment.

The moisture carry-over shall not be more than 0.02% during normal operations and 0.2% during upset conditions.

Thermal sleeve nozzle arrangement with waterfilled sleeve shall not be accepted.

Drum longitudinal weld seam(s) shall be located in the steam area.

5.11.6.8 Gas and air ducting

Safety release hatch(es) shall be arranged in the ducting system to prevent overpressure by damper failure.

Each part of duct shall be provided with access doors, 600 mm square, to allow access to any section of the duct.

Ducts shall be furnished with arrangement allowing washing/firewater drain. Drain size shall be 100 mm minimum.

5.11.6.9 Dampers

The dampers shall be designed to fail open on loss of power, air supply or linkage failure.

5.11.6.10 Requirements for piping

By-pass lines with shut-off valves shall be provided at control valves, flow meter etc.

All pressure safety valves shall have flanged connections.

Flanged pipe connections shall be limited to a minimum for high pressure steam and water systems. Control valves shall be flanged.

Boiler start-up steam vent shall be arranged:

- Branch-off valve, manual operated gate.
- Remote controlled, motor operated valve with by-pass arrangement.
- Discharge silencer.

Individual steam/water sample coolers including the required sample/cooling water piping shall be arranged.

5.11.6.11 Hydrostatic test

The complete steam boiler including economiser and superheater with interconnecting piping shall be hydrotested.

Pre-start-up tests

Following completion of erection, a cold test of boiler, equipment, control and safeguard systems including pressure safety valves shall be performed.

5.11.6.12 Performance and acceptance tests

After at least 48 hours of satisfactory operation at MCR, performance and acceptance tests shall be run and include at least:

- 8 h operation at normal boiler load.
- 8 h operation at minimum continuous boiler load.

A boiler efficiency test shall be performed during MCR operation.

Boiler efficiency test shall be carried out according to DIN 1942, indirect method.

5.11.6.13 Boiler tests

Boiler and control system response to load variations shall be recorded and compared to guarantee data.

Remote control shall be tested.

5.11.6.14 Boiler plant emission tests

Test measurements shall be performed of the boiler plant emissions.

5.11.6.15 Service and maintenance requirements

The Supplier shall recommend suitable equipment and related boiler facilities for cleaning the gas side of the steam boiler, economiser and fuel gas ducting.

5.12 Atmospheric tanks

5.12.1 General

Atmospheric tanks shall be designed in accordance with standard listed in clause 2.

All relevant requirements listed under 5.11.1 Standard Requirements shall apply.

5.12.2 Loads

The following additional loads shall be accounted for in the design:

- 1000 N/m² vertically on top surface plus.
- 250 Pa external or 750 Pa internal pressure.

5.12.3 Deflection

Deflections calculated for the worst combination of operating condition loads, using load coefficient 1.0, shall be less than:

- 1/300 of span of stiffeners.
- 1/150 of shortest width of flat plates.

Stiffening should be by external stiffeners. Stiffeners shall be continuously welded on both sides. Internal stays shall not be used.

The tank bottom shall have a slope of at least 1/50 towards the drain connection.

5.12.4 Openings

All openings shall be reinforced by addition of cross sectional area equivalent to the area removed.

ANNEX A MECHANICAL EQUIPMENT DATA SHEETS (NORMATIVE)

RDS-001	Rev. 1, Dec. 1994	Centrifugal pump
RDS-002	Rev. 1, Dec. 1994	Rotary pump
RDS-003	Rev. 1, Dec. 1994	Reciprocating pump
RDS-004	Rev. 1, Dec. 1994	Controlled volume pump
RDS-005	Rev. 1, Dec. 1994	Centrifugal compressor
RDS-006	Rev. 2, April 1996	Positive displacement rotary compressor
RDS-007	Rev. 1, Dec. 1994	Combustion gas turbine
RDS-008	Rev. 1, Dec. 1994	Diesel engine
RDS-009	Rev. 1, Dec. 1994	Gear (standard type)
RDS-010	Rev. 1, Dec. 1994	Special purpose gear
RDS-011	Rev. 1, Dec. 1994	Coupling
RDS-012	Rev. 2, April 1996	Oil system
RDS-013	Rev. 1, April 1996	Hydraulic power pack
RDS-014	Rev. 1, Dec. 1994	Centrifugal separator
RDS-015	Rev. 1, Dec. 1994	Cyclone (standard type)
RDS-016	Rev. 1, Dec. 1994	Cyclone (treatment of produced water)
RDS-017	Rev. 1, Dec. 1994	Pressure vessel
RDS-018	Rev. 1, Dec. 1994	Shell and tube heat exchanger (standard type)
RDS-019	Rev. 1, Dec. 1994	Shell and tube heat exchanger
RDS-020	Rev. 1, Dec. 1994	Plate heat exchanger (standard type)
RDS-021	Rev. 1, Dec. 1994	Air cooled heat exchanger
RDS-022	Rev. 1, Dec. 1994	Waste heat recovery unit
RDS-023	Rev. 1, Dec. 1994	Atmospheric tank
RDS-024	Rev. 1, April 1996	Vacuum pump package
RDS-025	Rev. 1, April 1996	Hydraulic motor
RDS-026	Rev. 1, April 1996	Centrifuge (standard type)
RDS-027	Rev. 1, April 1996	Filter
RDS-028	Rev. 1, April 1996	Fresh water maker
RDS-029	Rev. 1, April 1996	Reverse osmosis membrane
RDS-030	Rev. 1, April 1996	Reciprocating compressor

Note

The data sheets can be subject to changes both in the selection and content as part of this Annex without affecting the revision status of the standard.

NORSOK R-001	CENTRIFUGAL PUMP DATA SHEET	RDS-001 Rev. 1, Dec. 1994 Page 1 of 5
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Package No.	Doc. No.	Rev.
Tag No. _____	Location/Module _____	
Unit _____	No. req'd _____	
Service _____	Inquiry No. _____	
Size & Type _____	Quote No. _____	
Supplier _____	P.O. No. _____	
Manufacturer _____	Job No. _____	
Model _____	Serial No. _____	

1	Motor provided by	_____
2	Motor mounted by	_____
3	No. of turbines required	_____
4	Turbine item no.	_____
5 No. of stages	Turbine provided by	_____
6 No. of motors required	Turbine mounted by	_____
7 Motor item no.	Remarks:	_____
8 Notes: O indicates information to be completed by Purchaser.	☐ indicates information to be completed by Manufacturer.	
9		
10 OPERATING CONDITIONS (to be completed by purchaser)		
11 Liquid _____	NPSH available (m):	
12 Pumping temperature (°C) PT _____	Rated	Maximum Minimum
13 Normal Maximum Minimum	Capacity @ PT (m3/h):	
14 Specific gravity @ PT _____	Rated	Maximum Minimum
15 Vapor pressure @ PT (bar) _____	Discharge pressure (bar g):	
16 Viscosity @ PT _____	Rated	Maximum Minimum
17 _____ cP	Differential pressure (bar)	
18 Site temperature (°C) : _____	Rated	Maximum Minimum
19 Normal Maximum Minimum	Differential head (m):	
20 Electrical area hazard:	Rated	Maximum Minimum
21 Zone Temp. class	Hyd. power (kW) Rated	Max. Min.
22 Unusual conditions	Location	O Indoor O With Roof O Heated
23	O Outdoor	O Without Roof O Unheated
24 Corrosion/erosion caused by	Remark:	_____
25		
26 PERFORMANCE (to be completed by manufacturer)		
27 Proposal curve No. _____	Minimum continuous flow (m3/h)	
28 Speed (rpm) _____	Thermal	Stable
29 NPSH required (m MLC). _____	Driver rating (kW)	
30 3 % Head drop at rated flow _____	Shaft thrust (kN) Max.	
31 Rated power (kW) _____		
32 Maximum kW with rated impeller _____	Rotation (viewed from coupling end): O CW O CCW	
33 Maximum head with rated impeller (m) _____	Suction specific speed	
34 Max. continuous flow m3/h _____	Efficiency (%) at rated flow	
35 NOTES:		
36		
37		
38		
39		
40		
41		

O Cooling-water piping plan			
O Tubing	O Carbon steel	O Copper	
O Piping	O Stainless steel		
Total cooling water required (m ³ /h)			
O Sight flow indications required			
O Packing cooling injection required			
☐	m ³ /h	☐	barg
Case connection			
Remarks:			

NORSOK R-001	ROTARY PUMP DATA SHEET	RDS-002 Rev. 1, Dec. 1994 Page 1 of 3
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Package no.	Doc. no.	Rev.
Tag no. _____	Location/module _____	
Unit _____	No. req'd _____	
Service _____	Inquiry no. _____	
Size & type _____	Quote no. _____	
Supplier _____	P.O. no. _____	
Manufacturer _____	Job no. _____	
Model _____	Serial no. _____	

1		
2	For: _____	No. of motors required _____
3	Site _____	Serial no. _____
4	Remarks _____	
5		
6	Notes: O indicates information to be completed by Purchaser.	☐ indicates information to be completed by Manufacturer.
7	API standard 676 governs unless otherwise noted	

8 OPERATING CONDITIONS (to be completed by purchaser)		
9 Liquid _____	Rated Capacity @ PT (m³/h) _____	
10 Pumping temperature (°C) PT _____	@ Maximum viscosity @ Minimum viscosity	
11 Normal Maximum Minimum	Discharge pressure (bar g):	
12 Specific gravity @ PT _____	Maximum Minimum Rated	
13 Vapor pressure @ PT (bar) _____	Suction pressure (bar g)	
14 Viscosity @ PT _____	Maximum Minimum Rated	
15 Maximum Minimum		
16 Electrical area hazard: _____	Maximum Minimum Rated	
17 Zone Temp.Class _____	NPSH available (m)	
18 Site temperature (°C) : _____	Hydraulic power kW	
19 Normal Maximum Minimum	Location : O Indoor O Heated	
20 Corrosion/erosion caused by _____	O Outdoor O Unheated	
21 _____	Remarks : _____	
22		

PERFORMANCE (to be completed by manufacturer)		
23 At rated conditions: _____	At rated conditions: _____	
24 NPSH required (m) _____	Volumetric efficiency (%) _____	
25 Rated speed (rpm) _____	Mechanical efficiency (%) _____	
26 Displacement (m³/h) _____	Brake kW @ maximum viscosity _____	
27 Remarks: _____	Brake kW @ relief valve setting _____	
28 _____	Maximum allowable speed (rpm) _____	
29 _____	Minimum allowable speed (rpm) _____	
30		

CONSTRUCTION (to be completed by purchaser and manufacturer)		
Pump Type:	Nozzel	Size Rating Facing Location
31 ☐ Spur gear ☐ Twin-screw ☐ Vane	Suction	
32 ☐ Helical gear ☐ Three-screw ☐ Progre. cavity	Discharge	
33 ☐ Other _____	Gland flush	
34 Casing: _____	Drains	
35 Maximum allowable press. _____ barg: @ _____ °C	Vents	
36 Hydrostatic test press. _____ barg: _____	Jackets connection	
37 Steam jacket press. _____ barg: @ _____ °C	Packing:	
38 Rotor mount: ☐ Between bearings ☐ Overhung	☐ Manuf. and type _____ ☐ No. of rings _____	

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39 CONSTRUCTION (Continued)			
40 Timing gears?	☐ Yes	☐ No	O Mechanical seals
41 Bearing type:	☐ Radial	☐ Thrust	☐ Manufacturer and model
42 Lubrication type:			☐ Manufacturer code
43 ☐ Pumped fluid	☐ Ring Oil	☐ Oil mist	O API 610 Seal flush plan
44 ☐ External	☐ Oil fluid	☐ Grease	☐ API 610 Code
45 ☐ Lubricant type			Piping for seal flush furnished by:
46 Remarks:			O Pump vendor
47			O Others
48			Piping for cooling/heating furnished by:
49			O Pump vendor
			O Others
MATERIALS (to be completed by manufacturer)			
50 Casing			Gland(s)
51 Stator			Bearing housing
52 End plates			Timing gears
53 Rotor(s)			Baseplate
54 Vanes			Remarks:
55 Shaft			
56 Sleeve(s)			
57			
58			
SHOP TESTS (to be completed by purchaser)			
59 Test	Nonwitnessed	Witnessed	Remarks:
60 Hydrostatic	O	O	
61 Mechanical run	O	O	
62 Performance	O	O	
63 NPSH	O	O	
64 O Shop inspection			
65 O Dismantel and inspect after test			
66 O Other			
67			
DRIVER (to be completed by purchaser and manufacturer)			
68 O Motor	O Turbine	O Other	Remarks:
69 O Driver data sheet			
70 ☐ kW @		rpm	
71			
DRIVE MECHANISM (to be completed by purchaser and manufacturer)			
72 O Direct-coupled	O V-belt drive	O Variable speed	remarks
73 ☐ Coupling manufacturer			
74			
75			
BASEPLATE (to be completed by purchaser)			
76 O By pump manufacturer		O Decking	
77 Remarks:		O Open beam support	
78		O Fully grouted	O Ungouted
79			
ADDITIONAL INFORMATION			
80			
81 Total weight			

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43

CONSTRUCTION (to be completed by manufacturer)

44

Liquid end:

45

☐ Simplex

☐ Multiplex

☐ Plunger

Nozzles

Size

Raiting

Facing

Location

46

☐ Duplex

☐ No. of cylinders

☐ Piston

Liquid suction

Liquid discharge

47

☐ Single acting

☐ Horizontal

☐ Removable liners

Gas inlet

Gas exhaust

48

☐ Double acting☐ Vertical☐ No Liners

Glan flush

Drains

49

Valves per corner:

Number

Area (cm3)

Velocity (m/s)

50

Suction

51

Discharge

52

Valve type:

☐ Disc☐ Wing☐ Double ported☐ Ball

53

Remarks:

54

55

MATERIALS (to be completed by the manufacturer)

56

Part

ASTM no.

Liquid end

Gas end

57

API.674 Class 0

58

Cylinder

59

Liner

60

Piston and plunger

61

Piston rings

62

Piston rod

63

Valve / valve seats

64

Gland

65

Throat bushing

66

Packing

67

Lantern ring

68

Bolting

69

70

71

Remarks

72

SHOP TESTS (to be completed by purchaser)

73

Test

Nonwitnessed

Witnessed

74

Hydraulic

O

O

Remarks:

75

Mecanical run

O

O

76

Performance

O

O

77

NPSH

O

O

78

☐ Shop inspection

79

☐ Dismantel and inspect after test

80

81

82

83

LIQUID END LUBRICATION (to be completed by purchaser and manufacturer)

84

☐ Packing lube

☐ Lubricator make

85

☐ Flush source

Size

No. of feeds

86

NOTES:

87

88

89

90

NORSOK R-001		CONTROLLED VOLUME PUMP DATA SHEET		RDS-004 Rev. 1, Dec. 1994 Page 2 of 2	
Package no.		Doc. no.		Rev.	
40 ☐ NSPH required (m)				☐ Pump head:	
41 ☐ kW, rated		At relief setting		Maximum pressure barg.	
42				Hydro test pressure barg.	
43 SHOP TESTS					
44		Nonwitnessed		Witnessed	
45 Hydrostatic		O		O	
46 Steady state accuracy		O		O	
47 Repeability		O		O	
48 Linearity		O		O	
49		O		O	
50 DRIVERS					
51 ☐ Motor				O Other	
52 ☐ Manufacturer				O Gas driven	
53 ☐ Type				O Steam driven	
54 ☐ Frame no.				O Other	
55 ☐ Constant speed					
56 ☐ Variable speed					
57 ☐ kW rpm				Remarks	
58 ☐ Volts Phase					
59 ☐ Hertz Service factor					
60 ☐ Enclosure					
61 WEIGHTS					
62 ☐ Pump, base and driver (Kg)				Remarks	
63					
64 LUBRICATION FLUID					
65					
66 ☐ Crankcase				☐ Intermediate	
67 ☐ Hydraulic fluid				Remarks	
68 CONTROLS					
69 Type				Stroke control.	
70 ☐ Manual		O Remote		Pneumatic (kPa gage)	
71 ☐ Automatic		O Local		Minimum Maximum	
72 Signal				Electronic (mA)	
73 ☐ Pneumatic		O Electronic		Minimum Maximum	
74 ACCESSORIES					
75				O Vendor furnished relief valve	
76				O Internal O External	
77				Relief valve setting (barg)	
78				O Vendor furnished back-pressure valve	
79 ADDITIONAL INFORMATION					
80					
81					
82					
83					
84					
85					
86					
87					
88					

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OPERATING CONDITIONS, CONTD.									
47	Process control:								
48	Method	O Bypass from					To		
49		O Antisurge bypass:			O Manual	O Automatic			
50		O Suction throttling from					To		
51		O Speed variation from					To		
52		O Other							
53	Signal	O Source							
54		O Type							
55		O Range: for pneumatic control rpm @ bar g rpm @ bar g							
56		O Other:							
57									
58	Service	O Conditions		O Intermittent		O Stand by			
59									
60									
61									
62									
63									
64									
65	Gas analysis			Other conditions					
66	O Mol % O							Remarks	
67		MW							
68	Air	28.966							
69	Oxygen	32.000							
70	Nitrogen	28.016							
71	Water Vapor	18.016							
72	Carbon Monoxide	28.010							
73	Carbon Dioxide	44.010							
74	Hydrogen Sulfide	34.076							
75	Hydrogen	2.016							
76	Methane	16.042							
77	Ethylene	28.052							
78	Ethane	30.068							
79	Propylene	42.078							
80	Propane	44.094							
81	i-Butane	58.120							
82	n-Butane	58.120							
83	i-Pentane	72.146							
84	n-Pentane	72.146							
85	Hexane plus								
86									
87									
88	Total								
89	Avg. mol. WT.								
90	NOTES:								
91									
92									
93									
94									
95									
96									
97									
98									
99									
100									

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CONSTRUCTION FEATURE CONTD.		
155 ☐ Diaphragms	☐ Bearing housing construction	
156 Material	Type (sep. Int.) _____ Split _____	
157 Max. allowable diaph. ΔP bar	Matrial _____	
158 ☐ Impellers		
159 No. _____ Diameters		
160 No. _____ Vanes ea impeller	☐ Radial bearings	
161 Type (open, enclosed. etc) _____	Type _____ Span (mm) _____	
162 Type fabrication _____	Area (cm ²) _____ Loading (kPa) Act. _____ Allow. _____	
163 Material _____	Centre pivot _____	
164 Max. yield strength (kPa) _____	Offset pivot _____	
165 Brinell hardness _____ Max. _____ Min. _____	% _____	
166 Smallest tip international width _____ mm	Pad material _____	
167 Max. mach no. @ impeller eye _____	Type babbitt _____	
168 Max. impeller head @ rated speed _____ KJ/kg	Babbitt thicknes _____	
169 _____		
170 ☐ Shaft	☐ Thrust bearing	
171 Material _____	Location _____ Type _____	
172 Dia. @ impellers (mm) _____	MFR. _____ Area (cm ²) _____	
173 Dia. @ coupling (mm) _____	Loading (kPa) _____ Actual _____ Allowable _____	
174 Shaft end ☐ Tapered ☐ Cylindrical	Gas loading (N) _____ Cplg slip load (N) _____	
175 Max. yield strenght (kPa) _____	Cplg coeff. frict _____	
176 ☐ Balance piston	Cplg gear pitch dia (mm) _____	
177 Material _____ Area _____ cm ²	Bal. piston compensating load _____ N	
178 Fixation method _____	Center pivot _____	
179 _____	Offset pivot _____	
180 ☐ Shaft sleeves	% _____	
181 At interstg. close clear Pts. _____ Matl. _____	Pad material _____	
182 O At shaft seals _____ Matl. _____	Type babbitt _____	
183 _____	Babbitt thickness _____	
184 _____		
185 _____		
186 O Labyrinths	☐ Main connections	
187 Interstage _____		
188 Type _____ Material _____		
189 Balance piston _____		
190 Type _____ Material _____		
191 _____		
192 Shaft seals _____		
193 ☐ Type _____		
194 O Seal system type _____		
195 O Setting out pressure _____		
196 ☐ Inner oil leakage guar. (LTR/DAY/SEAL) _____		
197 O Type buffer gas _____		
198 ☐ Buffer gas flow (per seal) _____		
199 Normal _____ kg/min @ _____ bar D P		
200 Max. _____ kg/min @ _____ bar D P		
201 O Buffer gas required for _____		
202 ☐ Start-up _____		
203 ☐ Air run-in _____		
204 ☐ Other _____		
205 ☐ Buffer gas control _____		
206 System supplied by _____		
207 _____		
208 _____		

Inlet					
Discharge					

☐ Allowable piping forces and moments	
Inlet	Discharge
Force N	Momt Nm
Force N	Momt Nm
Force N	Momt Nm
Force N	Momt Nm
Force N	Momt Nm
Force N	Momt Nm

Axial					
Vertical					
Horiz 90°					

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CONSTRUCTION FEATURE CONTD.									
209									
210									
211		Force	Momt	Force	Momt	Force	Momt		
212		N	Nm	N	Nm	N	Nm		
213	Axial								
214	Vertical								
215	Horiz 90°								
216									
217									
218	☐ Other connections	No	Size	Type					
219	Service								
220	Lube-oil inlet								
221	Lube-oil outlet								
222	Seal-oil inlet								
223	Seal-oil outlet								
224	Casing drains								
225	Stage drains								
226	Vents								
227	Cooling water								
228	Pressure								
229	Temperature								
230	Purge for								
231	Brg. housing								
232	Between brg. & seal								
233	Between seal & gas								
234	Solvent injection								
235									
236	Vibration detector								
237	O Type	☐ Model							
238	O MFR								
239	O No. at each shaft bearing	Total no.							
240	O Oscillator-detectors supplied by								
241	O MFR	☐ Model							
242	O Monitor supplied by								
243	O Location	Enclosure							
244	O MFR	☐ Model							
245	☐ Scale range	O Alarm	☐ Set @				µm		
246	O Shutdown:	☐ Set @				µm			
247	O Time delay						sec		
248									
249	Axial position detector								
250	O Type	☐ Model							
251	O MFR	☐ No. required							
252	O Oscillator-demodulator supplied by								
253	O MFR	☐ Model							
254	O Monitor supplied by								
255	O Location	Enclosure							
256	O MFR	☐ Model							
257	O Scale range	O Alarm	☐ Set @				µm		
258	O Shutdown:	☐ Set @				µm			
259	O Time delay						sec		
260									
261									
262									

Couplings				Driver-compor driver-gear	Gear-comp
O Make/type					
☐ Model					
O Lubrication					
O Mount cplg. halves					
O Spacer req'd					
O Limited end float red					
O Idling adaptor req'd					
☐ Cplg. rating (kW/100 rpm)					
☐ Keyed (1) or (2): or hydr. fit					

Baseplate & soleplates			
Soleplates for O Compressor O Gear O Driver			
baseplate			
O Common (under comp. gear & driver)			
O Under comp. only		O Other	
O Decked with non-skid deck plate		O Open const.	
O Drip rim		O With open drain	
O Horitz. adjusting screws for equipment			
O Suitable for multipoint support			
O Suitable for perimeter support			
O Stainless shims: thickness			
☐ Grouting: type			

Shop inspection and tests			
	Req'd	Witness	Observed
Shop inspection	O	O	O
Hydrostatic	O	O	O
Helium leak	O	O	O
Mechanical run	O	O	O
Mech. run spare rotor	O	O	O
Fit in spare rotor	O	O	O
Performance test O (Gas) O (Air)	O	O	O
Comp. with driver	O	O	O
Comp. less driver	O	O	O
Use shop lube & seal sys	O	O	O
Use job lube & seal sys	O	O	O
Use shop vibration			
Probes. etc.	O	O	O
Use job vib. & axial disp.			
Probes. oscilator-detectors			
& Monitor	O	O	O
Pressure comp. to full			
Oper. press	O	O	O
Disassemble-reassemble			
Comp. after test	O	O	O
Check brgs & seal after test	O	O	O
Noise level test	O	O	O
Residual electrical/mech. runout	O	O	O

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CONSTRUCTION FEATURE CONTD.				
263				
264	☐ Weights (kg)			
265	Compr.	Gear	Drive	Base
266	Rotors: Compr.		Driver	Gear
267	Compr. upper case			
268	L.O. console		S.O console	
269	Max. for maintenance (identify)			
270	Total shipping weight			
271				
272	☐ Space requirements (m)			
273	Complete Unit: L		W	H
274	L.O. console L		W	H
275	S.O. console L		W	H
276				
277	UTILITIES			
278	Utility Conditions:			
279	Steam	Drivers	Heating	
280	Inlet min.	bar g	°C	barg °C
281	Norm.	bar g	°C	barg °C
282	Max	bar g	°C	barg °C
283	Exh.min.	bar g	°C	barg °C
284	Norm.	bar g	°C	barg °C
285	Max.	bar g	°C	barg °C
286		bar g	°C	barg °C
287	Electricity:			
288		Driver	Heating	Control Shutdown
289	Voltage			
290	Hertz			
291	Phase			
292	Cooling water:			
293	Temp. inlet	°C	Max. return	°C
294	Press norm	°C	Barg design	bar g
295	Min. return	Barg Max allow		P bar
296	Water source			
297	Instrument air:			
298	Max press	Barg min. press		barg
299				
300	NOTES:			
301				
302				
303				
304				
305				
306				
307				
308				
309				
310				
311				
312				
313				
314				
315				

[illegible]

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90 Construction features

91 ☐ Speeds
 92 Max.allow _____ rpm Trip _____ rpm
 93 Lateral Criticals 1st. _____ rpm 2nd _____ rpm
 94 Torsional Criticals 1st. _____ rpm 2nd _____ rpm
 95 Max Tip speeds _____ m/s at rated speed
 96 _____ m/s at max cont. speed
 97

98 ☐ Rotation, viewed from driven end _____
99 ☐ Casing
 100 Model _____
 101 Casing split _____
 102 Material _____
 103 Thickness (mm) _____ Corr. allow. (mm) _____
 104 Max work Press _____ bar G
 105 Max allow work Press _____ bar G
 106 Test Press bar G Helium _____ Hydro _____
 107 Max. allow temp. _____ °C Min. oper temp. _____ °C
 108 Max. Casing Capacity (lm³/h) _____
 109 Radiograph quality ☐ Yes ☐ No

110 ☐ Rotors
 111 Diameter (mm) _____
 112 No. Lobes: Male _____ Female _____
 113 Type _____
 114 Type Fabrication _____
 115 Material _____
 116 Max. yield strenght N/mm² _____
 117 Brinell hardness. Max _____ Min _____
 118 Rotor lenght to diameter ratio (L/D) _____
 119 Max. mach No. at impeller eye _____
 120 Rotor clearance (mm) _____
 121 Max. deflection (mm) _____

122 ☐ Shaft
 123 Material _____
 124 Dia. at rotors (mm) _____ Dia. at cplg (mm) _____
 125 Shaft end ☐ Tapered ☐ Cylindrical
 126

127
128 Shaft sleeves
 129 ☐ At shaft seals _____ ☐ Matl. _____
 130 _____
 131 _____
132 ☐ Timing gears
 133 Size (mm) _____ Type _____
 134 Material _____
135 Shaft seals
 136 ☐ Type _____
 137 ☐ Seal system type _____
 138 ☐ Inner oil leakage guar. (ltr./day/seal) _____
 139 ☐ Type buffer gas _____
 140 ☐ Buffer gas flow (per seal) _____
 141 Normal _____ kg/min. at _____ barg
 142 Max. _____ kg/min. at _____ barg

☐ Bearing housing construction
 Type (separate integral) _____ Split _____
 Material _____

☐ Radial bearings
 Type _____ Span (mm) _____
 Area (cm²) _____ Loading (N/mm²) Act. _____ Allow. _____

☐ Thrust bearing
 Location _____ Type _____
 Mfr. _____ Area (cm²) _____
 Loading (N/mm²) Actual _____ Allowable _____
 Gas loaded (N) _____ cplg. slip load (N) _____
 cplg. coeff. frict. _____ splg. gear pitch dia. (mm) _____
 Bal. piston compensating load _____ N

☐ Main connections

	Size	ANSI Rating	Facing	Position
Inlet				
Discharge				

☐ Allowable piping forces and moments

	Inlet		Discharge			
	Force N	Momt NM	Force N	Momt NM	Force N	Momt NM
Axial						
Vertical						
Horiz. 90°C						

	Force N	Momt NM	Force N	Momt NM	Force N	Momt NM
Axial						
Vertical						
Horiz. 90°C						

☐ Other connections

Service	No.	Size	Type
Lube oil inlet			
Lube oil outlet			
Seal oil inlet			
Seal oil outlet			
Casing drains			
Vents			
Cooling water			
Pressure			
Temperature			
Purge for.:			
Brg. housing			
Betw. Brg. & Seal			
Betw. Seal & Gas			

Remarks _____

305	
306	

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159 FUEL SYSTEM (Also see page 6)					CONSTRUCTION FEATURES				
160 Information by purchaser/manufacture					Information by manufacturer				
161	Types	O Gas	O Liquid	O Dual	Model	Type			
162	O Manual transfer	O Shutdown to transfer			☐ Shafts	☐ Single	☐ Two	☐	
163	O Auto	O Transfer @ Rated load			Rotation (facing output coupling) ☐ CW ☐ CCW				
164	O Transfer @	% load			Critical speeds				
165	Max.time allow.to trans. gas to liquid				Lateral System				
166	Max.time allow. to trans.liquid to gas				Comp Turb Torsional				
167	For gas fuels:				1st RPM				
168	O Fuel analyses	Mol%			2nd RPM				
169	Composition:	M.W	Normal	Starting	Alt.	3rd RPM			
170	Air	29							
171	Oxygen	32							
172	Nitrogen	28							
173	Water vapor	18							
174	Carbone monoxide	28							
175	Carbone dioxide	44							
176	Hydrogen Sulfide	34							
177	Hydrogen	2							
178	Methane	16							
179	Ethylene	28							
180	Ethane	30							
181	Propylene	42							
182	Propane	44							
183	i-Butane	58							
184	n-Butane	58							
185	i-Pentane	72							
186	n-Pentane	72							
187	Hexane plus								
188	Corrosive agents								
189	Contaminants								
190	Total:								
191	Avg.Mol Wt								
192	cp/cv @ _____°C _____(barg)								
193	HHV KJ/m³								
194	LHV KJ/m³								
195	Fuel press, max/min								
196	(barg)								
197	Fuel press, max/min.,°C								
198	☐ Fuel press required								
199	Max/min., (barg)								
200	O Fuel gas heater required for start-up:	☐ Yes	☐ No						
201	For liquid fuels (3.7.3.3)								
202	O Fuel grade								
203	O ASTM Grade No.1-GT	O ASTM	Grade No.2-GT						
204	O ASTM Grade No.3-GT	O ASTM	Grade No.4-GT						
205	O Other, indicate composition								
206	O Uninterrupted run length (2.1.1)				YRS				
207	Liquide fuel treatment required	O Yes	O No						
208	Treatment system supplied by	O Vendor	O Other						
209	☐ Liquid fuel press. req'd,max/min. (barg)								
210	Max. (barg)	Min. (barg)							
211	☐ Entrained	Water Limit	ppm						
212	☐ Solid contaminants limit	mg/kg of fuel							
213	☐ Solid contaminants size limit	microns							

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215 INSTRUMENT & CONTROLS				
216 INFORMATION BY PURCHASER/ MANUFACTURER				
217 Bearing temperature devices		Pressure gauges		
218 O Thermistors		No. required	Type	
219 O Type pos. temp. coeff. neg. temp. coeff.		O Oil filled		
220 O Temp switch & indicator:		Mounting locations		
221 By Purch. Mfr.		Instrumentation-alarm & trip		
222 O Thermocouples		Gas generator		
223 O Selector switch & indicator:		Parameter	Alarm	Shutdown
224 By Purch. Mfr.		Vibration high	O	O
225 O Resistance temp.detector:		Gas generator overspeed	O	O
226 O Resistance mat'l Ohms		Exhaust gas temp. high		
227 O Selector switch & indicator:		Starting	O	O
228 O By Purch. Mfr.		Running	O	O
229 O Location - journal brg.:		Loss of exhaust gas		
230 No. Ea.pad Every other pad		Temperatur signal	O	O
231 Per Brg. Other		Lubrication oil inlet		
232 O Location - thrust brg.:		Temperature high	O	O
233 No.(act) Ea.pad Every other pad		Lubr.oil outl./scavenge		
234 Per Brg. Other		Temperature(s) high	O	O
235 No.(intact) Ea.pad Every other pad		Lubrication oil inlet		
236 Per. Other		Pressure low	O	O
237 ☐ Max.bearing temps.:		Lubr.oil outl./scavenge		
238 °C for alarm °C for shutdown		Pressure high	O	O
239 Temperature instruments		Lubrication oil filter		
240 Indicators Mfr.		Diff.pressure low	O	
241 Recorder(s) Mfr.		Hydraulic/control oil		
242 No. Extra Points for purchaser's use		Pressure low	O	O
243 Location		Hydraulic/control oil		
244 Provide O Thermocouples O Thermometers		Temperature high	O	O
245 And O Recorder for:		Oil level(s) in tank(s) Low	O	
246 Turbine exhaust Indicating Recording		Oil level(s) in tank(s) High	O	
247 (4 Points min.) O O		Sequencer or starter		
248 (2 Points min.) O O		Failure to initiate start		O
249 Inter turbine		Failure to light-off		O
250 (2 shaft only) O O		Failure to accelerate from light up		O
251 Turbine staging inlet O O		Start overspeed (or		
252 Gas turbine air comp.,		failure of starter clutch		O
253 Inlet O O		to disengage)		
254 Disch O O		Flame failure		
255 Oil Cooler Inlet O O		(Underspeed)		O
256 Outlet O O				
257 Oil outlet ea. bearing				
258 (No) O O				
259 Fuel Manifold O O				
260 Oil Reservoir O O				
261 Other O O				
262 O O		Air Inlet Filtration	Alarm	Shutdown
263 O O		Diff. Pressure High	O	
264 O O		Filter House Access		
265 O O		Door Open	O	
266 O O		Plenum Chamber		
267		Access Door Unlocked	O	O
268		Air Inlet Anti - icing		
269		Failure	O	

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327		
328 INSTRUMENTS & CONTROLS (Cont'd)		
329 Governor		
330 O Mfr's. std	O Other	Remote shutdown signal
331 O Constant speed	O Variable speed	O Electric
332 Reset by: O Pneumatic signal	O Manual	O Pneumatic
333 O Electronic signal	O Hydraulic signal	O Hydraulic
334 Sped range rpm. _____ max. _____ min.		O None
335 Control signal (barg) _____ max. _____ min.		Hand speed changer rpm. _____ max. _____ min.
336 On signal failure, gov. goes to O Max.rpm		Limit Switch of gen.drive
337 O Min. rpm O Remains stationary O Cause an alarm		O Yes
338 O Cause a shutdown		O No
339		Regulation, nema class
340 ACCESSORIES SUPPLIED BY TURBINE MANUFACTURER		O Provision req'd. for testing separate
341 Starting equipment	Min.size _____ kW	shutoff valve during operation
342 O Clutch	O Electric motor	Controlled process variable
343 O Steam turbine	O Hydraulic motor and	Method of control
344 O Diesel engine	power unit	
345 O Helper driver	O Expansion turbine	
346	O Shaft turning device	
347 ☐ Electric motor		
348 Type _____		
349 Mfr. _____ Model _____		
350 kW _____ Utility req'd _____		
351		
352 ☐ Hydraulic motor	Mfr. _____	
353 Type/model _____ kW _____	Utility requirements	
354		
355 ☐ Hydraulic power unit	Mfr. _____	
356 Pump Capacity _____ m³/s		
357 Diesel engine make _____		
358		
359 Oil reservoir capacity _____ m³		
360 Retention time _____ sec.		
361 Relief valve Presure setting _____ bar		
362 ☐ Turbine (ref.API data sheet)		
363 Mfr. _____ Model _____		
364 kW _____ max. steam flow _____ kg/s		
365 Total /start _____ kg		
366		
367 ☐ Expansion turbine		
368 Mfr. _____ Model _____		
369 kW _____ Max.Gas Flow _____ kg/s		
370 Total/start _____ kg		
371 O Gas for expansion turbine		
372	Min Max Normal	
373 Inlet pressure (bar)		
374 Exhaust press. (bar)		
375 Gas temp. °C		
376 Molecular weight		
377 NOTES:		
378		
379		
380		
381		

Speed control	O Governor	O Pressure regulator
Instrumentation		
O Overspeed protection trip		
O Clutch engage indicator		
Incomplete start sequences		O Alarm
		O Shutdown
		Yes No
Inlet control valve furnished		
Stainless steel piping manif.		
Carbon steel flangers		
Y-strainer w/breakout flanges		
Low speed capability		
(For compressor cleaning)		
Overspeed protection shield		
Relief valve pressure set point		bar
Casing material		
Seal type		
Complatable w/hazard zone class		
O Diesel engine		
Mfr.		model
kW		rpm
O Shaft turning device		
Type		rating
kW		
Engange	☐ Auto	☐ Manual
Disengage	☐ Auto	☐ Manual
Engage indicator		☐ Panel mounted
Mfr. also supplies		
O Gears, see separate gear data sheet		
O Driven equip., see sepearte data sheet		
O Helper driver, see separate data sheet		

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383		
384 ACCESSORIES SUPPLIED BY GAS TURBINE MANUFACTURER		
385 O Fire protection equipment		Coupling
386 O Type of fire protection equipment:		O Mount 1/2 Coupling Type
387 O Fire eye Number _____		☐ MFR.
388 O Infrared Number _____		☐ Spacer req'd
389 O Halon		O Coupling furnished by
390 O CO ₂		☐ Keyed & shrunk Hydraulic fit
391 O Foam		☐ Cplg. coeff. frict.
392 O Manifold header by		Cplg gear pitch dia. mm
393 O Vendor O Purchaser		Turbine shaft Taper cyl
394 O Spare rotor		Driven equip.shaft Taper cyl
395 O Baseplate		Coupling guard Mfr. std. Other
396 O Extended to receive _____		☐ Lubrication req'd Yes No
397 O Decking type _____		Notes
398 O Column mounting		
399 O Soleplates		
400 O Grouting		
401 O Concrete O Epoxy O other		
402		
403 Inlet system (purchaser)		Inlet system (manufacturer)
404 O Air filter		(All inlet and exhaust data for site rated conditions)
405 Type _____		Filter Max Δ P Dirty mbar
406 Location O Ground level O Elevated		Mfr. Model Δ P mbar
407 O Air cooler		Ducting
408 O Ducting, sketch attached		Gauge/material
409 O Expansion joint for turbine flange		Expansion Joint
410 O Silencer		Mfr. Type
411 O Manometer		Silencer
412 O Implosion door		Mfr. Δ P mbar
413 O Anti-icing system, type _____		Manometer
414 Compressor cleaning system		Mfr. Model Range mbar
415 Type _____		System site rate pressure drop mbar
416 Flange size mm Type		Minimum air velocity at intake mbar
417 Flange orientation		
418 O Up O Down O Side		Exhaust system (manufacturer)
419 Allowable system site rated pressure		Expansion joint
420 Drop mbar		Mfr. Type
421		Ducting
422 Exhaust system (purchaser)		Gauge/material
423 O Expansion joint		Silencer
424 O Ducting & stack , sketch attached		Mfr. Type Δ P mbar
425 O Silencer		Heat recovery device
426 O Heat recovery device		Mfr. Type Δ P mbar
427 O By purchaser		Steam gen. press (kPa)(mbar) Temp °C
428 O By vendor		Rate _____ kg/s
429 Est. Δ _____ mbar		Manometer
430 O Manometer		Mfr. Model Range mbar
431 O Atmos. relief device		Atmospheric relief device
432 Flange size mm Type		Type Mfr. Location
433 Flange orientation		System rated pressure drop mbar
434 O Up O Down O Side		
435 Special insulation required _____		
436 Allowable system site rated		
437 Pressure drop mbar		

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439				
440	ACCESSORIES			
441	Lube oil system	Lube oil system		
442	Information by purchaser	Information by manufacturer		
443	☐ Common or	Oil requirements	m³/h	(m barg)
444	☐ Separate from driven equipment	Turbine		
445	☐	Driven equipment		
446	☐ Mounting arrangement	Gear		
447	☐ Console ☐ Colony ☐ Base Plate	Couplings		
448	☐ API 614 Lube system required			
449	☐ API 614 Seal system required	Total		
450	Syntethic oil for gas turbine	Reservoir capacity		
451		Charge	m³	
452		Working	m³	min
453		Retention	m³	min
454		Comments		
455	Refer to seperate data sheets for lube and/or seal system requirements			
456	NOTES:			
457				
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INSTRUMENT AND OPERATOR CONTROL DEVICES

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46	ENGINE DATA (CONTINUED)				
47	Starting system				
48	☐ Air				
49	Make				
50	Model				
51	Air press	barg			
52	No/size air tanks				
53	No of starts				
54	☐ Electric				
55	Make				
56	Model				
57	Voltage				
58	Battery capacity	Amp/h			
59	Mains battery charger	Ah			
60	Generator charger	Ah			
61	☐ Hydraulic				
62	Make				
63	Model				
64	☐ Glow plug start	☐ Other			
65	Fuel system				
66	Fuel type				
67	Tank				
68	Capacity	m³			
69	Fuel pump				
70	Pump driver	☐ Prehcamber ☐ Dir. Inject. ☐ Fuel Pressure Regulator ☐ Automatic drain ☐ Manual drain			
71	Water separator	☐ Yes ☐ No			
72	Type				
73	Manufacturer				
74	Model				
75	Oil filter	☐ Yes ☐ No			
76	Type				
77	Filter to	Microns			
78	Manufacturer				
79	Model				
80	Governor	☐ Constant speed ☐ Variable speed			
81	Make				
82	Model				
83	Reset by	☐ Manual ☐ Pneum.signal ☐ Electric signal ☐ Other			
84	Speed range	rpm	Max	Min	
85	Regulation	%			
86	Signal range				
87	Tachometer	☐ Mechanical ☐ Electrical ☐ Other			
88	Make				
89	Model				
90	Pyrometer required	☐ Yes ☐ No No points			
91	Make				
92	Model				
93	Engine gauge board furnished with	☐ Pyrometer ☐ Tachometer ☐ Oil Pressure Gauge ☐ Oil Temp. Gauge ☐ J.W.temp gauge ☐ Fuel Press. Gauge ☐ Air Press. Gauge ☐ Hours Run Meter			
94					
95	NOTES:				
96					
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98					
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101 ENGINE DATA (CONTINUED)				
102	Weights			
103	Net	Max. kg		
104	Erection	Max. kg		
105	Maintenance	kg		
106	Flywheel	kg		
107	Approx floor space	mm	Length	Width Height
108	Additional maintenance clearance	mm		
109	Min. ctr. distances between units	mm		
110	Connection	No	Size	Rating
111	Exhaust			
112	Air inlet			
113	Starting air			
114	Jacket water inlet			
115	Jacket water outlet			
116	Oil inlet			
117	Oil outlet			
118	Jacket water			
119	Capacity	m ³		
120	Flow	m ³		dP(bar) _____
121	Inlet temperature	°C		dT(°C) _____
122	Oil cooler cooling water			
123	Flow	m ³ /h		dP(bar) _____
124	Inlet temperature	°C		dT(°C) _____
125	Air cooler			
126	Type			
127	Electric fan			
128	Engine driven fan			
129				
130 AUXILIARY EQUIPMENT				
131	Lube oil pump	☐ Integral	☐ Separate type	
132	Drive			
133	Capacity	m ³ /h		
134	Pressure	barg		
135	Speed			
136	Impeller or gear material			
137	Case material			
138	Manufacturer			
139	Model			
140	Pre-lub. pump	☐ Yes	☐ No	
141	Type			
142	Drive			
143	Capacity	m ³ /h		
144	Minimum pressure	barg		
145	Jacket water pump	☐ Yes	☐ No	
146	Drive			
147	Capacity	m ³ /h		
148	Head	m	Seal	
149	Speed	rpm		
150	Impeller material			
151	Case material			
152	Manufacturer			
153				

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154 AUXILLARY EQUIPMENT (CONTINUED)									
155			Volts		Watts		Phase		
156	☐ Jacket water heater								
157	☐ Lube oil heater								
158	Exhaust Silencer	☐ Yes	☐ No		☐ Spark Arrestor		☐ Std/Hospital		
159	Manufacturer								
160	Model								
161	Mounting	☐ Horizontal	☐ Vertical	☐ Saddles	☐ Trunions	☐ Other			
162	Air Filter	☐ Yes	☐ No	☐ Dry	☐ Oil Bath				
163	Manufacturer								
164	Model								
165	Connection	☐ Side	☐ Top	☐ Bottom					
166	Max. allowable dP	mbar							
167	Lub.oil filter	☐ Yes	☐ No						
168	Type								
169	Filter to	Microns							
170	Manufacturer								
171	Model								
172	Lub. oil level controllers	Lubricator	☐ Yes	☐ No	Crankcase	☐ Yes	☐ No		
173	Manufacturer								
174	Model								
175	Lub.oil dipstick	☐ Yes	☐ No	Magnetic Filter		☐ Yes	☐ No		
176	Slow flow oil meter	☐ Yes	☐ No						
177	Manufacturer								
178	Model								
179	Flywheel bearing	☐ Manual	☐ Air Jack	Flywheel Guard		☐ Yes	☐ No		
180	Type								
181	Lub.oil cooler	No							
182	Manufacturer								
183	Type								
184	Duty	kJ/h							
185	Surface	m²							
186	Code								
187	Shell O.D.	mm							
188	Thickness	mm							
189	Design pressure	barg							
190	Tubes O.D.	mm							
191	Length								
192	BWG.	No							
193	Material shell								
194	Material tubes								
195	Material channel								
196	Material baffles								
197									
198 WINTERIZATION									
199	Item								
200	1								
201	2								
202	3								
203	4								
204	5								
205	6								
206	7								
207	8								
208	9								

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209 ALARM AND SAFETY SHUT DOWN												
210	Condition		Alarm Set		S D Set		Condition		Alarm Set		S D Set	
211	Overspeed	☐	_____		☐	_____	High J.W. Temp	☐	_____		☐	_____
212	Low L.O. Press.	☐	_____		☐	_____	High fan Vibr.	☐	_____		☐	_____
213	High L.O. Temp.	☐	_____		☐	_____		☐	_____		☐	_____
214												
215 INSPECTION AND TESTS												
216		Required				Witnessed						
217		Yes	No			Yes	No					
218	Shop inspection	☐	☐			☐	☐					
219	Mechanical run	☐	☐			☐	☐					
220	Performance	☐	☐			☐	☐					
221	Bearings	☐	☐			☐	☐					
222	Auxillary equipment	☐	☐			☐	☐					
223	With driven equipment	☐	☐			☐	☐					
224	Other	☐	☐			☐	☐					
225												
226 UTILITIES												
227	Steam	kg/h	_____		barg	_____		°C	_____			
228	Water	m³/h	_____		barg	_____		°C	_____			
229	Electric	Volts	_____		Amps	_____	Hz	_____	Ph	_____		
230	Starting air	Scm³/Start	_____		Minimum barg	_____						
231	Instrument air	m³/h	_____		Minimum barg	_____						
232	Service air	m³/h	_____		Minimum barg	_____						
233	Fuel	barg	_____		L/hr	_____		Min. °C	_____			
234												
235 ATMOSPHERIC EMISSIONS												
236	Content O ₂ in combustion	%	_____									
237	Guaranteed NO _x	g/kWh	_____									
238	Guaranteed NO _x	ppm	_____									
239	Unburnt Hydrocarbons VOC	ppm	_____									
240	Guaranteed CO ₂	g/kWh	_____									
241	Guaranteed CO	ppm	_____									
242	NOTES:											
243												
244												
245												
246												
247												
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Package no.	Doc. no.	Rev.
Tag no.	Location/module	
Unit	No. req'd	
Service	Inquiry no.	
Size & type	Quote no.	
Supplier	P.O. no.	
Manufacturer	Job no.	
Model	Serial no.	

1				
2	Note: Information to be completed:	☐ By purchaser	☐ By manufacturer	
3	API Standard 613 Governs unless otherwise noted.			
4				
5	O RATING REQUIREMENTS			
6	Driven equipment	kW	Normal	Max
7	Driver	kW	Rated	Max
8	Gear	kW	Rated	
9	Torque @ max continuous speed	Nm		
10	Max torque	Nm		@ rpm
11	Rat. inp. speed	rpm		Specf. O Nom. O
12	Rat. outp. speed	rpm		Specf. O Nom. O
13	Allowable variation in gear ratio (+)(-)	%		
14	Max. continuous speed	rpm		
15	Trip speed	rpm		
16	Gear application factor	(nin.)		
17	Shaft assembly designation			
18	H.S. shaft rotation facing cpl'g		Cw O Ccw O	
19	L.S. shaft rotation facing cpl'g		Cw O Ccw O	
20	Shaft ends		Cylind. O Tapered O Flanged O Keyed O	
21	External loads			
22	Other operating conditions			
23				
24	O INSTALLATION DATA			
25	O Indoor	O Heated	O Under roof	O Outdoor
26	O Partial Sides	O Grade	O Mezzanin	O Unheated
27	O Winterization req'd		O Tropicalization req'd	
28	Hazardous area zone		Gas gr.	Temp. class
29	Required sound pressure level	dBa	@	m
30	Elevation	m	Barometer	bara
31	Range of ambient temperatures:		Dry bulb	Wet Bulb
32	Normal	°C		
33	Maximum	°C		
34	Minimum	°C		
35	Unusual conditions:		O Dust	O Fumes
36	Specifications, codes & standards			
37	API standards			
38				
39	☐ BASIC GEAR DATA			
40	Mechanical rating	kW	@	rpm
41	Full load power loss	kW		
42	Mechanical efficiency	%		
43	Pitch line velocity	m/s		
44	Tooth pitting index, "K":		Actual	Allowable
45	Tangential load, "Wt"	N		
46	Anticipated sound p. level	dBa	@	m
47	Journal static weight loads	kg	Pinion	Gear
48	Residual unbalance	kg	Pinion	Gear

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106 Construction features (cont'd.)			
107	☐ Piping connection		
108	Service	No.	Size
109	Lube oil inlet		
110	Lube oil outlet		
111	Casing drains		
112	Vents		
113	Casing purge		
114			
115			
116	Vibration detectors		
117	Radial position detectors		
118	O Type		☐ Model
119	O Manufacturer		
120	O No. at each shaft bearing		Total No.
121	O Oscillator - demodulators supplied by		
122	O Manufacturer		☐ Model
123	O Monitor supplied by		
124	O Location		Enclosure
125	O Manufacturer		☐ Model
126	O Scale range		O Alarm ☐ Set @ μm
127	O Shutdown ☐ Set @ μm		O Time Delay sec
128	Axial position detector:		
129	O Type		☐ Model
130	O Manufacturer		O No. required
131	O Location		
132	O Oscillator-demodulators supplied by		
133	O Manufacturer		☐ Model
134	O Monitor supplied by		
135	O Location		Enclosure
136	O Manufacturer		☐ Model
137	☐ Scale Range		O Alarm ☐ Set @ μm
138	O Shutdown ☐ Set @ μm		☐ Time Delay sec
139	Additional transducers		
140	O Velocity		☐ Acceleration
141	O Manufacturer		☐ Model
142	O No. required		
143	O Couplings and guards		
144		High speed	Low speed
145	Coupling furnished by		
146	Coupling type		
147	Coupling lubrication		
148	Mount coupling halves		
149	Spacer required		
150	Limited end float required		
151	Idling adaptor required		
152	Coupling guard furnished by		
153	Coupling guard drain hose required		
154	☐ Weights and dimensions		
155	Net weight:	kg	Gear
156	Max maintenance weight (Identify)	kg	Auxiliaries
157	Total shipping weight(s)	kg	
158	Total shipping dimensions	mm	
159	NOTES:		
160			
161			

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162	Construction features (cont'd)			
163	☐	Lubrication requirement		
164	☐	Oil system furnished by _____		
165	☐	Oil system in accordance with _____		
166	☐	Oil ISO VG _____		
167	☐	Minimum startup oil temperature _____		
168	☐	Oil flow required	l/min	_____
169	☐	Oil pressure required (nominal)	barg	_____
170	☐	Additional requirements _____		
171	Mounting plates:			
172	☐	Gear suitable for _____	Baseplate	Soleplate mounting
173	☐	Soleplate / baseplate furnished by _____		
174	☐	Equipment on baseplate _____		
175	☐	Baseplate suitable for column mounting _____		
176	Grout type:	☐ Epoxy	O	_____
177	Painting:			
178	☐	Manufacturer's standard	O	_____
179	Shipment:			
180	☐	Domestic	☐	Export
	☐	Export boxing required	☐	Outdoor storage over 3 years
181	Miscellaneous:			
182	☐	Rotor response analysis (Yes/No) _____		
183	☐	Spare set of gear rotors required _____		
184	☐	Gear casing furnished w/inlet purge connection _____		
185	☐	Orientation of oil inlet & drain connection _____		
186	☐	Vendor's review of purchaser's baseplate and/or foundation. Drw.req'd. _____		
187	☐	Filter breather location _____		
188	☐	Thermometers thermocouples, RTD's required. _____		
189	☐	Provision for secondary axial position detector required. _____		
190				
191	☐	Inspection & tests		
192		Req'd	Witness	Test Log
193	Shop inspection	☐	☐	☐
194	Cleanliness inspection	☐	☐	☐
195	Hardness verification insp.	☐	☐	☐
196	Dismantle-reassembly insp.	☐	☐	☐
197	Contact check	☐	☐	☐
198	Journal runout check	☐	☐	☐
199	Axial stability check	☐	☐	☐
200	Calibration check of rotor balance machine	☐	☐	☐
201	Mechanical run test	☐	☐	☐
202	Mechanical run test (spare rotors)	☐	☐	☐
203	Full load & full speed test	☐	☐	☐
204	Full torque, slow roll test	☐	☐	☐
205	Full torque static test	☐	☐	☐
206	Back-to back locked torque test	☐	☐	☐
207	Sound level test	☐	☐	☐
208	Use shop lube systems	☐	☐	☐
209	Use job lube system	☐	☐	☐
210	Use shop vibration probes, etc	☐	☐	☐
211	Use job vibration probes, etc	☐	☐	☐
212	Other	☐	☐	☐
213	_____	☐	☐	☐
214	_____	☐	☐	☐
215	_____	☐	☐	☐
216	_____	☐	☐	☐
217	_____	☐	☐	☐

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218	NOTES:
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Package no.	Doc. no.	Rev.
Tag no.		Location/module
Unit		No. req'd
Service		Inquiry no.
Size & type		Quote no.
Supplier		P.O. no.
Manufacturer		Job no.
Model		Serial no.

1				
2	Note: Information to be completed :		☐ By purchaser ☐ By manufacturer	
3	API Standards 671 Governs unless otherwise noted			
4				
5	☐ Driver type	Manufacturer	Model	
6	Serial no.	Tag no.		
7	Driven unit	Manufacturer	Model	
8	Serial No.	Tag no.		
9				
10	☐ Coupling assembly drawing no.			
11				
12				
13	OPERATING CONDITIONS			
14				
15	☐ Power transmitted (kW) normal		Maximum continous	
16	☐ Speed (rpm) maximum allowable	normal	Max. Cont.	Trip
17	☐ Torque (Nm) maximum continous		Maximum transient	
18	☐ Frequency of transient (events/time)			
19	☐ Minimum required application factor		☐ Actual	
20	☐ Ambient temperature (°C) maximum		Minimum	
21	Environment	☐ Dust ☐ Hydrogen sulfide	☐	
22	Lubrication	☐ Continuos	☐ Filtration	
23		☐ Grease- packed	☐ ISO viscos grade	
24		☐ Oil-filled	☐ Pressure (barg)	Normal Maximum
25		☐ Nonlubricated	☐ Temperature °C	Normal Maximum
26			☐ Flow (m³/h)	Normal Maximum
27	NOTES:			
28				
29				
30				
31				
32				
33				
34				
35				
36				
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39				
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41				
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Package no.	Doc. no.	Rev.
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47

47

48

49

50

Bolting torque (Nm)

☐ Lubricated

☐ Dry

Bolt extension

mm

51

☐ Shaft separation at operating temp. (mm B.S.E)

Thermal growth (mm)

52

from

°C ambient

53

☐ Motor rotor float (mm)

☐ Limited end float (mm):

☐ Electrically insulated

54

☐ Marine type required

☐ Flex-hub required

55

☐ Design rating (kW/100 rpm)

☐ Maximum continous torque (Nm)

56

☐ Required misalignment capacity:

57

Stedy state : Angular (deg.)

Parallel offset (mm/mm)

Axial (mm)

58

Transient: Angular (deg.)

Parallel offset (mm/mm)

Axial (mm)

59

☐ Maximum allowable misalignment:

60

Steady state. Angular (deg.)

Parallel offset (mm/mm)

Axial (mm)

61

Transient: Angular (deg.)

Parallel offset (mm/mm)

Axial (mm)

62

Dynamic balance:

☐ O

Component balance only

63

☐ O Component balance and assembly check balance

☐ O

Component and assembly balance

64

☐ O Check sensitivity of balance machine

65

☐ Maximum allowable residual unbalance (g mm) driver end

driven unit end

66

☐ Maximum actual residual unbalance (g mm) driver end

driven unit end

67

☐ Diaphragm coupling initial deflection (mm) :

☐ Prestretch

☐ Compression

68

☐ Diaphragm coupling axial responant frequency (Hz) :

Calculated

Actual

69

☐ Torsional stiffnes (Nm/°)

70

☐ Axial stiffnes (N/mm)

71

☐ W_r² (kgm²)

72

☐ Angular (misalignment) stiffness (Nm/°)

73

☐ O

74

75

76

77

78

MATERIALS

79		
80	Drive end materials	Driven end materials
81		
82	Hub/flange	
83		
84	Spacer	
85		
86	Sleeve	
87		
88	Diaphragms	
89		
90	Diaphragms guard	
91		
92	Bolts	
93		
94	Nuts	

95

☐ Diaphragm protective coating

☐ Vendor standard

☐ O

97

☐ O Material and weld hardness test required

98

Internal teeth hardness (Rockwell C)

☐ Drive end actual

☐ O Driven end actual

99

External teeth hardness (Rockwell C)

☐ Drive end actual

☐ O Driven end actual

100

101

102

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Package no.	Doc. no.	Rev.
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103		
104	COUPLING HUB MACHINE	
105		
106	Drive end	Driven end
107		
108	O Type (integral, cylindrical, taper)	
109		
110	O Taper (1 deg. I.A., 1 in 24, 3 in 48)	
111		
112	O Keyed or hydraulically fitted	
113		
114	☐ Keyway dimensions and number	
115		
116	☐ Nominal bore diameter	
117		
118	☐ Interference fit (mm) max./min.	
119		
120	O Puller holes	
121		
122	O Balancing holes	
123		
124		
125		
126		
127	COUPLING GUARD	
128		
129	O Coordinator	O Oil mist cooling O Gas cooling
130		
131	O Flanged cylindrical O Base mount	O Contract guard to be used during shop test
132		
133	O Air tight	
134		
135	O Oil tight	
136		
137	O Spark resistant	
138		
139	O Transparent window for each oil spray point	
140		
141	O Vent connection O 1 Inch NPT with filter-breather	
142		
143	O 1 Inch flanged, rating & facing	
144		
145	O Purge gas O Dry air purge	
146		
147	☐ Connection size & type _____	
148		
149	☐ Sm³ required _____	
150		
151	NOTES: _____	
152	_____	
153	_____	
154	_____	
155	_____	
156	_____	
157	_____	

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159		
160	ACCESSORIES	
161	☐ Prime equipment supplier to furnish one set of plug	☐ Puller by coupling
162	and ring gauges	manufacturer
163	☐ Drill template for integral flange hubs by	☐
164	☐ Coupling manufacturer ☐ Purchaser	
165	☐ Two-piece stop rings by coupling manufacturer	
166	☐ One pump set furnished for all hydraulic couplings at	
167	each site by coupling manufacturer (to include hand	
168	pump, pressure gauge, fittings and house)	
169		
170		
171		
172	Applicable specifications	Preparation for shipment
173	☐ API-671, Special Purpose Couplings	☐ Outdoor storage for more
174		than years
175		☐ Expected storage time
176		
177		Shipping: ☐ Dom Storage: ☐ Indoor
178		☐ Export ☐ Outdoor
179		
180		☐ See coupling purchase order for
181		preservation, boxing and
182		shipping instructions
183	NOTES:	
184		
185		
186		
187		
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191		
192		
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Package No.	Doc. No.	Rev.														
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;">Tag No. _____</td> <td style="width: 50%; border: none;">Location/Module _____</td> </tr> <tr> <td style="border: none;">Unit _____</td> <td style="border: none;">No. req'd _____</td> </tr> <tr> <td style="border: none;">Service _____</td> <td style="border: none;">Inquiry No. _____</td> </tr> <tr> <td style="border: none;">Size & Type _____</td> <td style="border: none;">Quote No. _____</td> </tr> <tr> <td style="border: none;">Supplier _____</td> <td style="border: none;">P.O. No. _____</td> </tr> <tr> <td style="border: none;">Manufacturer _____</td> <td style="border: none;">Job No. _____</td> </tr> <tr> <td style="border: none;">Model _____</td> <td style="border: none;">Serial No. _____</td> </tr> </table>			Tag No. _____	Location/Module _____	Unit _____	No. req'd _____	Service _____	Inquiry No. _____	Size & Type _____	Quote No. _____	Supplier _____	P.O. No. _____	Manufacturer _____	Job No. _____	Model _____	Serial No. _____
Tag No. _____	Location/Module _____															
Unit _____	No. req'd _____															
Service _____	Inquiry No. _____															
Size & Type _____	Quote No. _____															
Supplier _____	P.O. No. _____															
Manufacturer _____	Job No. _____															
Model _____	Serial No. _____															

1		
2	Notes	1. The party to complete the information is indicated as follows:
3		☐ Purchaser ☐ Vendor x Either, but Vendor if not by Purchaser
4		2. API614 governs unless otherwise noted.
5		
6		
7		
8		

Applicable Documents	Installation Data
9 ☐ Documents listed on page no. _____ 10 ☐ Lube and Seal Oil Systems _____ 11 ☐ Centrifugal Pumps _____ 12 ☐ General Purpose Turbines _____ 13 ☐ Induction Motors _____ 14 ☐ _____ 15 ☐ _____ 16 ☐ Sound Levels _____ 17 ☐ Other Codes _____	General Site Data O Page No. _____ Utilities Data O Page No. _____ Location Main Equipment O Page No. _____ Oil Supply System O Grade _____ Inner Seal Drainers O _____ Degassing Drum O _____ Oil System Panel O _____ O Winterize O Tropicalize O _____

Overall System Schematics	Fig. No.	Option Nos.	Comments
19 ☐ Separate Lube Oil System			
20 ☐ Separate Seal Oil System			
21 ☐ Combined Lube & Seal System			
22 ☐ Lube Oil at Main Equipment			
23 ☐ Seal Oil at Main Equipment			
24 ☐ Relief Valves to Protect Low Pressure Systems:	x No,	x Yes,	For

Equipment Oil Req'd.	Normal	After Trip	Basic system Details
25 ☐ Lube Oil	m ³ /h	barg	O Compressor Block-In Time _____ Minutes
26 ☐ Driven Equip.			☐ Equipment Coast-Down Time _____ Minutes
27 ☐ Prime Mover			☐ Equip. Cool-Off Time Driver _____ Minutes
28 ☐ Gears			☐ _____ Other _____ Minutes
29 ☐ Couplings			☐ Minimum Start-Up Oil Requirement _____ cP
30 ☐ _____			
31 ☐ Total			
32 ☐ Control Oil Normal			Supply Arrgt.
33 ☐ Transient			O Separate Lube Oil Seal Oil Combined
34 ☐ _____			O Multi-Package O O O
35 ☐ Seal Oil At _____			O Package No. 1 O O O
36 ☐ At _____			O Package No. 2 _____ _____ _____
37 ☐ At _____			O Package No. 3 _____ _____ _____
38 ☐ At _____			_____
39 ☐ At _____			Bases Console PKG*1 PKG*2 PKG*3
40 ☐ Total			O Fabr. Steel O O O O
41 x Oil Type Viscosity _____			O Flat Steel O O O O
42 _____			O Non-Skid Deck O O O O
			O _____ _____ _____ _____ _____

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Reservoir

43	☐ Service Application	☐ Separate Lube	☐ Lube Seal Comb.	☐ Separate Seal
44	☐ Purchasers Item No.	_____	_____	_____
45	☐ Figure Nos.	_____	_____	_____
46	☐ Including Option Nos.	_____	_____	_____
47	☐ Other Requirements	_____	_____	_____
48	_____	_____	_____	_____
49	☐ Material	_____	_____	_____
50	☐ Interior Coating	_____	_____	_____
51	☐ Normal Flow m ³ /h	_____	_____	_____
52	☒ Free Surface m ² /m ³ /h	_____	_____	_____
53	☒ Working Capacity, Minutes & m ³	_____	_____	_____
54	☒ Retention Capacity, Minutes & m ³	_____	_____	_____
55	☐ Rundown Capacity m ³	_____	_____	_____
56	☐ Normal Operation Range m ³	_____	_____	_____
57	☐ Charge Capacity m ³	_____	_____	_____
58	☐ Insulation Supports	☐ O	☐ O	☐ O
59	☐ Separating Baffle	☒ x	☒ x	☒ x
60	☐ Ladder with Handrails	☒ x	☒ x	☒ x
61	☐ Flanged Vent	_____	_____	_____
62	☐ Oversize Flanged Vent	_____	_____	_____
63	☐ Press. Relief Device Type & Mat.	_____	_____	_____
64	_____	_____	_____	_____
65	☐ Grounding Pad or Clip	☐ O	☐ O	☐ O
66	☐ Top Mounted Permitted	_____	_____	_____
67	_____	_____	_____	_____
68	☐ Actual	_____	_____	_____
69	_____	_____	_____	_____
70	Approx. dims. (tank only) LxWxH	_____	_____	_____

Pumps and Drivers

71	☐ Service Application	☐ O Lube	☐ O Lube & Seal	☐ O Separate Seal Oil	☐ O Booster Seal Oil
72	☐ Flow Schematic	_____	_____	_____	_____
73	☐ Including Option Nos.	_____	_____	_____	_____
74	☐ Emergency Pump System	_____	_____	_____	_____
75	☐ Emergency Pump Duty	_____	_____	_____	_____
76	_____	_____	_____	_____	_____
77	Pump Service	Main/Stdby.	Emergency	Main/Stdby.	Emergency
78	☐ Pump Item No.	_____	_____	_____	_____
79	☐ Pump Type	_____	_____	_____	_____
80	☐ Pump Data Page No.	_____	_____	_____	_____
81	☐ Temporary Strainer	☐ O	☐ O	☐ O	☐ O
82	☐ Driver Item No.	_____	_____	_____	_____
83	☐ Turbine Driver for	_____	_____	_____	_____
84	☐ Turbine Data Page No.	_____	_____	_____	_____
85	☐ Elect. Motor Driver for	_____	_____	_____	_____
86	☐ Elect. Motor Data Page No.	_____	_____	_____	_____
87	☐ Other Driver _____ for	_____	_____	_____	_____
88	☐ Other Driver Data Page No.	_____	_____	_____	_____
89	☐ Turb. Auto-Start Req'd	☐ O	☐ O	☐ O	☐ O
90	☐ Auto-Start by Vendor	☐ O	☐ O	☐ O	☐ O
91	☐ Booster Suction Protection	_____	_____	_____	_____
92	_____	_____	_____	_____	_____
93	_____	_____	_____	_____	_____
94	_____	_____	_____	_____	_____

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Coolers						
95	Service Application	O Lube Oil	O Lube & Seal Comb.	O Separate Seal Oil		
96	☐ Purchasers Item No.	_____	_____	_____		
97	☐ Twin Units	_____	_____	_____		
98	☐ Including Option Nos.	_____	_____	_____		
99	☐ Bypass Temp. Control	_____	_____	_____		
100	☐ Including Option Nos.	_____	_____	_____		
101	☐ WaterSide for Steam Heating	_____	_____	_____		
102	☐ Full Details on Page no. ###	_____	_____	_____		
103	☒ Water Side Corrosion Allowance	_____	_____	_____		
104	☒ Manufacturer	_____	_____	_____		
105	☒ Model	_____	_____	_____		
106	☐ Tema Class R	_____	_____	_____		
107	☒ Fouling Factor Water/Oil side	_____	_____	_____		
108	☐ Duty Joule/hour	_____	_____	_____		
109	☒ Tube L.xO.D.xBWG	_____	_____	_____		
110	☒ Design/Test barg Shell Side	_____	_____	_____		
111	☒ Design/Test barg Tube Side	_____	_____	_____		
112	☐ Code Construction/Stamp	_____	_____	_____		
113	☒ Tube Water Velocity m/sec.	O / O	O / O	O / O		
114	☒ Material Shell	_____	_____	_____		
115	Channels & Covers	_____	_____	_____		
116	Tube Sheets	_____	_____	_____		
117	Tubes	_____	_____	_____		
118	☐ Cooling Water - m ³ /h	_____	_____	_____		
### Do not complete the details below the "Page No." when a separate data page is used.						
Filters						
119	☒ Service Application	O Lube, Seal	☒ Separate	O Separate	O Booster Pump	O Separate
120		x & Control Oil	Control Oil	Seal Oil	Discharge Oil	Coupling Oil
121	☐ Purchaser's Item Nos.	_____	_____	_____	_____	_____
122	☐ Twin	_____	_____	_____	_____	_____
123	Single	_____	_____	_____	_____	_____
124	Including Option Nos.	_____	_____	_____	_____	_____
125	Microns (Nominal)	_____	_____	_____	_____	_____
126	☒ Manufacturer	_____	_____	_____	_____	_____
127	☒ Model	_____	_____	_____	_____	_____
128	☒ Design/Test barg	_____	_____	_____	_____	_____
129	☒ Code Const./Stamp	O / O	O / O	O / O	O / O	O / O
130	☒ bar Clean/Fail	_____	_____	_____	_____	_____
131	☒ Material: Case & Top	_____	_____	_____	_____	_____
132	Cartridges	_____	_____	_____	_____	_____
133	Furnish Sets of Extra Cartridges	O Per Service	O Per Filter (Extra Over Other Ordered Spares)			
Continous Flow Transfer Valves						
134	☒ Service Application	O Lube, Seal	☒ Separate	O Separate	O Booster Pump	O Coupling Oil
135	☒	x & Control Oil	Control Oil	Seal Oil	Discharge Oil	
136	☒ Manufacturer	_____	_____	_____	_____	_____
137	☒ Model	_____	_____	_____	_____	_____
138	☒ With Lifting Jack	_____	_____	_____	_____	_____
139	☐ Rating: (barg)	_____	_____	_____	_____	_____
140	☒ Materials: Body	_____	_____	_____	_____	_____
141	☒ Plug or Ball	_____	_____	_____	_____	_____
142	☒ Trim	_____	_____	_____	_____	_____
143	_____	_____	_____	_____	_____	_____
144	_____	_____	_____	_____	_____	_____
145	_____	_____	_____	_____	_____	_____

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	Accumulators	Lube Oil	Control Oil	Seal Oil	Seal Oil Booster
146	Service Application				
147	☐ Purchaser's Item No.				
148	☒ Required Yes or No & Quantity				
149	☒ Service Combined with				
150	☐ Direct Contact Type				
151	☐ Bladder Type				
152	☐ Including Option Nos.				
153	☐ Valve Failure Action				
154	☐ Rundown, Minutes				
155					
156					
157	☒ Manufacturer				
158	☒ Model				
159	☐ Nominal/Usable Capacity, m ³				
160	☒ Material Shell				
161	☒ Bladder				
162	☒ Design/Test, barg				
163	☐ Code: Construction/Stamp	O / O	O / O	O / O	O / O
164	☐ Include: Charge Pressure Gauge	O	O	O	O
165	☐ Manual Charge Valve	O	O	O	O
166	☐ Gas Supply Regulator	O	O	O	O
	Overhead Tanks				
167	Service Application	Rundown Lube	Low Press Seal	Med Press Seal	High Press Seal
168	☒ Required: Yes or No				
169	☒ Service Combined with				
170	☐ Direct Contact Tank				
171	☐ Tank Plus Bladder Type				
172	☐ Including Option Nos.				
173	☐ Rundown Minutes				
174	☐ Purge Gas Type of Gas				
175	Sm ³ /h Req'd				
176	Incl. Control				
177					
178	Overhead Tank Item No.				
179	☐ Corrosion Allowance				
180	☒ Material				
181	☒ Total Capacity, m ³				
182	☒ Design/Test, barg				
183	Code: Construction/Stamp	O / O	O / O	O / O	O / O
184	Accumulator Unit Item No.				
185	☐ Corrosion Allowance				
186	☒ Manufacturer & Quality				
187	☒ Model				
188	☒ Material Shell				
189	☒ Bladder				
190	☐ Nominal/Usable Capacity, m ³				
191	☒ Design/Test, barg				
192	☐ Code Construction/Stamp	O / O	O / O	O / O	O / O
193					
194					
195					
196					
197					

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Drainers For Inner Seal Oil				
198	Service Application	Low Pressure Seal Oil	Med. Pressure Seal oil	High Pressure Seal Oil
199	☐ Purchasers Item no.	_____	_____	_____
200	☐ Float Controlled	_____	_____	_____
201	☐ Transmitter Controlled	_____	_____	_____
202	☐ Pots Only, for Manual Drain	☐	☐	☐
203	☐ with valving	☐	☐	☐
204	☐ Flush Level Glass	☐	☐	☐
205	☐ High Level Switch	☐	☐	☐
206	☐ Including Option Nos.	_____	_____	_____
207	☒ Retention: hours & m ³	_____	_____	_____
208	_____	_____	_____	_____
Float Trap				
209	☒ Manufacturer/Model	_____	_____	_____
210	☒ Pressure Rating	_____	_____	_____
211	☒ Material Body	_____	_____	_____
212	☒ Float/Trim	_____	_____	_____
213	_____	_____	_____	_____
Drain Pot				
214	☐ Corrosion Allowance	_____	_____	_____
215	☒ Material	_____	_____	_____
216	☒ Design/Test, barg	_____	_____	_____
217	☐ Code: Constr./Stamp	O / O	O / O	O / O
218	_____	_____	_____	_____
Mist Eliminator				
219	☐ Corrosion Allowance	_____	_____	_____
220	☒ Material: Shell	_____	_____	_____
221	☒ Demisting Mesh	_____	_____	_____
222	☒ Design/Test, barg	_____	_____	_____
223	☐ Code: Constr./Stamp	O / O	O / O	O / O
Degassing Drum				
224	☐ Purchaser's Item No.	_____	_____	_____
225	☐ Service Used In	_____	_____	_____
226	☐ Thermostat Control	_____	_____	_____
227	☐ Operating Temp., °C	_____	_____	_____
228	☐ Normal/Max	_____	_____	_____
229	☐ Normal Holdup, Minutes	_____	_____	_____
230	☐ m ³ /h Normal/Max. Capacity, m ³	_____	_____	_____
231	☐ Purge Gas Type	_____	_____	_____
232	☐ Sm ³ /h Required	_____	_____	_____
233	☐ Flow Control	_____	_____	_____
234	_____	_____	_____	_____
235	☐ Corrosion Allowance	_____	_____	_____
236	☒ Material	_____	_____	_____
237	☒ Interior Coating	_____	_____	_____
238	☒ Oversized Vent	_____	_____	_____
239	☐ Vent Relief Device	_____	_____	_____
240	Notes	_____	_____	_____
241	_____	_____	_____	_____
242	_____	_____	_____	_____
243	_____	_____	_____	_____
244	_____	_____	_____	_____
245	_____	_____	_____	_____

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Piping and Tubing 246 ☐ Double Block and Bleed For _____ 247 ☐ Material _____ 248 Steel Fittings for Tubing 249 Mfr. _____ Model _____ 250 Instr./Contr. Air After Air Filters 251 ☐ OS.S _____ ☐ Copper 252 ☐ Heat Tracing Required 253 ☐ Furnished By Purchaser 254 ☐ Vendor Drawings Specify Requirements 255 ☐ _____ 256 _____ 257 Painting 258 ☐ Component Supplier's Standard 259 ☐ Unified, System Suppliers Standard 260 ☐ Special 261 _____ 262 _____ 263 _____ 264 Miscellaneous Documentation 265 ☐ Spare Parts Quotation With Proposal 266 ☐ Spare Parts Quotation After Contract 267 Above Based On Normal Supply For _____ Months 268 ☐ _____ 269 ☐ _____ 270 ☐ _____ 271 ☐ _____ 272 _____ 273 Oil Purifier 274 ☐ Purchaser's Item No. _____ 275 ☐ Serviced Used In _____ 276 ☐ Type _____ 277 ☐ Portable, or Mounted On _____ 278 x Rated m³/h _____ 279 x Manufacturer _____ 280 x Model _____ 281 ☐ Driver for _____ 282 x kW & Enclosure _____ 283 ☐ v./Ph./Hz _____ 284 _____ 285 Notes _____ 286 _____ 287 _____ 288 _____ 289 _____ 290 _____ 291 _____ 292 _____ 293 _____ 294 _____ 295 _____ 296 _____ 297 _____ 298 _____ 299 _____	Shop Inspection ☐ Required for System Assemblies ☐ Required for Components ☐ Material Certification to be Furnished ☐ As Specified By Purchasing Documents As Specified By _____ Shop Tests Of Systems <table border="0"> <thead> <tr> <th></th> <th>Required</th> <th>Witnessed</th> </tr> </thead> <tbody> <tr><td>☐ Cleanliness</td><td>☐</td><td>☐</td></tr> <tr><td>☐ Four-Hour Run</td><td>☐</td><td>☐</td></tr> <tr><td>☐ Check Controls</td><td>☐</td><td>☐</td></tr> <tr><td>☐ Changeovers</td><td>☐</td><td>☐</td></tr> <tr><td>☐ One-And Two-Pump Operation</td><td>☐</td><td>☐</td></tr> <tr><td>☐ Sound Levels</td><td>☐</td><td>☐</td></tr> <tr><td>☐ Use for Driver Equipment Tests</td><td>☐</td><td>☐</td></tr> <tr><td>☐ Use for Driven Equipment Tests</td><td>☐</td><td>☐</td></tr> <tr><td>☐ Hydrostatic</td><td>☐</td><td>☐</td></tr> </tbody> </table> <u>O Supply Certified Copies Of All Test Logs And Data</u> Preparation For Shipment General ☐ Install New Filter Elements and Tag ☐ Include Extra Filter Elements Sets Per Page _____ Box Above Exstra Sets With The ☐ System ☐ Other Spares ☐ "OSHA" Warning Tag On Each Assembly ☐ _____ System & Components <table border="0"> <thead> <tr> <th></th> <th>Vendor's Std.</th> <th>Purchaser's Std.</th> </tr> </thead> <tbody> <tr><td>Domestic</td><td>☐</td><td>☐</td></tr> <tr><td>Export</td><td>☐</td><td>☐</td></tr> <tr><td>Extended Storage</td><td>_____ Months</td><td>_____ Months</td></tr> </tbody> </table> Spare Parts <table border="0"> <tbody> <tr><td>Domestic</td><td>☐</td><td>☐</td></tr> <tr><td>Export</td><td>☐</td><td>☐</td></tr> <tr><td>Extended Storage</td><td>_____ Months</td><td>_____ Months</td></tr> </tbody> </table>		Required	Witnessed	☐ Cleanliness	☐	☐	☐ Four-Hour Run	☐	☐	☐ Check Controls	☐	☐	☐ Changeovers	☐	☐	☐ One-And Two-Pump Operation	☐	☐	☐ Sound Levels	☐	☐	☐ Use for Driver Equipment Tests	☐	☐	☐ Use for Driven Equipment Tests	☐	☐	☐ Hydrostatic	☐	☐		Vendor's Std.	Purchaser's Std.	Domestic	☐	☐	Export	☐	☐	Extended Storage	_____ Months	_____ Months	Domestic	☐	☐	Export	☐	☐	Extended Storage	_____ Months	_____ Months
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Instruments And Controls			
300	Switch Actions	Contacts to	O Open O Close To Alarm
301		Contacts to	O Open O Close To Trip
302		Contacts to	O Open O Close To Start Standby Pump
303		Contacts to	O Open O Close To Start Emergency Pump
304	O Switch enclosures:	O Explosion proof	O Weather proof O Other
305	Calibrations: _____		
306	Air Signals: _____		
307	Connections:	O Terminals at Edge of	O Base O Panel
308		O By Purchaser Direct to Instruments	
309	Substitute Pneumatic-Operated (for Direct-Acting) Control Valves O		All Valves O _____
310	Positioners Required on Pneumatic-Operated Valves O		All O _____
311	Valve Failure position	O Failure Open for _____	
312		O Fail Closed for _____	
313		O Fail Locked for _____	
314	Include Thermal Relief Valves On _____		
315	Additional Oil System Instruments (Not Included in Figures and Options) _____		
316	All Items Locally Mounted, Except	See page _____	For Panel-Mounted Items _____
317	Manufacturers and Models: _____		
318	_____		
	Panels	Console Gage Board	Equipment Panel Equipment Panel
319	O Panel Number or Identification	_____	_____
320	O Service	_____	_____
321	O Supplied by	_____	_____
322	O Location	Local	Local Remote
323	O Type: Free Standing	O	O
324	O Mounted on	_____	_____
325	O Open or Fully Enclosed	_____	_____
326	O Weather-Tight	O	O
327	O Purged or Pressurized	_____	_____
328	O Purge or Pressure Gas	_____	_____
329	O Rear Acces Doors	O	O
330	O Walk-in Facility	_____	_____
331	O Sun and Weather Roof Extension	O	O
332	O Lightning Panel Front/Rear	_____	_____
333	O Interior Heater (and Control)	_____	_____
334	O Limits: Max. Height Above Floor	_____	_____
335	O Lowest Item Above Floor	_____	_____
336	O Spare Terminals Required	_____	_____
337	x Minimum Wire Size	_____	_____
338	x Material: Front Panel	_____	_____
339	x Other Panels & Doors	_____	_____
340	O Chassis	_____	_____
341	O Electric Area Classification	_____	_____
342	Panel-Mounted Items: See Page _____	_____	_____
343	_____	_____	_____
344	_____	_____	_____
345	_____	_____	_____
346	_____	_____	_____
347	_____	_____	_____

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Makes And Models - Instrument And Controls					
448 Use the following code Letters to indicate intent					
449 N-No Substitution					
450 X-Preferred, But Vendor May Propose A Similar Item For Purchaser's Consideration					
451 E-Elective (Optional) By Vendor, Subject To Purchaser's Approval					
452	Manufacturer	Model/Size		Manufacturer	Model/Size
Air-Operated Items			Control Valves (Direct Acting)		
453	Gauge (Indicator), Local		Pressure, Low		
454	Gauge, Panel-Mounted		Pressure, High		
455	Switch, Local		Differential Pr., Low Pressure		
456	Switch, Panel-Mounted		Differential Pr., High Pressure		
457	Oil Valve, Low Pressure				
458	Oil Valve, High Pressure				
459	Turbine Auto-Start Steam		Special Valves		
460			Temp., Filled System		
461			Turbine Start, Hydraulic		
Transmitters (Air)			Solenoid Valves		
462	Pressure, Low		Air 3-Way		
463	Pressure, High		Air 3-Way, Manual Reset		
464	Differential Pressure		Turb. Steam, With Reset		
465	Temperature				
466	Level, Reservoir				
467	Level, Low Pressure				
468	Level, High Pressure		Relief Valves		
469			Oil, Low Pressure		
470			Oil, High Pressure		
471	Pressure Gauges (Direct Reading)		Steam, Turbine Exhaust		
472	Pressure, Low		Thermal, Oil		
473	Pressure, High		Thermal, Water		
474	Differential, Low Pressure				
475	Differential, High Pressure		Level Glasses		
476			Pad Type, Low Pressure		
477			Pad Type, High Pressure		
478	Temperature Gauges (Direct Reading)		Column Type, Low Press.		
479	Reservoir		Column Type, High Press.		
480	Pressure Supply System				
481	Equipment Radial Brgs.				
482	Equipment Thrust Brgs.		Thermowells		
483			Threaded (Bored)		
484			Flanged (Bored)		
485	Switches (Direct Acting)		Reservoir heater		
486	Pressure, Low		Electric Element		
487	Pressure, High		Thermostat		
488	Differential Pr., Low Press.				
489	Differential Pr., High Press.		Annunciators And Alarms		
490	Level, Reservoir				
491	Level, Low Pressure				
492	Level, High Pressure				
493	Temperature				
494					
495					
496	Flow Glasses				
497	Non-Restrictive				
498	Restrictive		Purge Flow Control See Page No(s).		
499					

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Panel-Mounted Item Details			
500 Use the following Code Letters to Show Details:			
501 F-Flush Mount on Front	H-Purchaser Remote Mount (in Control House) Vendors NEMA-1 Enclosed Item		
502 S- Surface Mount on Front	P-Purchaser Supply and Mount	C-Cut-out for Purchaser's Item	
503 R-Rear of Panel Mount	V-Vendor Supply and Mount	M-Mount by Vendor of Purchaser's Item	
504 Panel Identification	L	B	C
Pressure Indicators:			
505 O Lube Pump Discharges			
506 O Seal Pump Discharges			
507 O Emergency Pump. Disch.			
508 O Lube Oil Headers			
509 O Control Oil at Users			
510 O Coupling Oil			
511 O Compressor Seal Gas			
512 O Purge Gas Supply			
513 O Accumulator Gas			
514 O Steam to Pump Turbine			
515 O Main Turbine Inlet			
516 O Main Turbine First Stage			
517 O Main Turbine Extraction			
518 O Main Turbine Exhaust			
519 O Compressor Suction			
520 O Compressor Discharge			
521 O Each Compressor Section			
522 O Balance Chamber			
523			
Differential Pressure Indicators			
524 O Lube Oil Filters			
525 O Seal Oil Filters			
526 O Booster Oil Filters			
527 O Control Oil Filters			
528 O Coupling Oil Filters			
529 O Compressor Seals			
530 O Seal Gas			
531 O Oil Purifier			
532 O Compressor Air Filter			
533			
534			
Purge Gas Flow Indicators			
535 O Reservoirs			
536 O Degassing Drum			
537 O Overhead Tanks			
538			
539 Miscellaneous			
540 O Equipment Tachometer			
541 O Equipment Speed Control			
542 O Equipment Ammeter			
543 O Compr. Inlet Controller			
544 O Annunciator System			
545			
546			
547 Note: All Alarms shall be Annunciated			
548 L= Locally Mounted on Piping B= Local Equipment Panel C= Remote Equipment Panel			
549			
550			

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Package No.	Doc. No.	Rev.																												
<table> <tr> <td>Tag No.</td> <td>_____</td> <td>Location/Module</td> <td>_____</td> </tr> <tr> <td>Unit</td> <td>_____</td> <td>No. req'd</td> <td>_____</td> </tr> <tr> <td>Service</td> <td>_____</td> <td>Inquiry No.</td> <td>_____</td> </tr> <tr> <td>Size & Type</td> <td>_____</td> <td>Quote No.</td> <td>_____</td> </tr> <tr> <td>Supplier</td> <td>_____</td> <td>P.O. No.</td> <td>_____</td> </tr> <tr> <td>Manufacturer</td> <td>_____</td> <td>Job No.</td> <td>_____</td> </tr> <tr> <td>Model</td> <td>_____</td> <td>Serial No.</td> <td>_____</td> </tr> </table>			Tag No.	_____	Location/Module	_____	Unit	_____	No. req'd	_____	Service	_____	Inquiry No.	_____	Size & Type	_____	Quote No.	_____	Supplier	_____	P.O. No.	_____	Manufacturer	_____	Job No.	_____	Model	_____	Serial No.	_____
Tag No.	_____	Location/Module	_____																											
Unit	_____	No. req'd	_____																											
Service	_____	Inquiry No.	_____																											
Size & Type	_____	Quote No.	_____																											
Supplier	_____	P.O. No.	_____																											
Manufacturer	_____	Job No.	_____																											
Model	_____	Serial No.	_____																											

1 Design Data					
2	Area classification	:	_____		
3	Environmental condition	:	_____		
4	Flow medium	:	_____		
5	Operating capacity	m ³ /h :	Max/min capacity	m ³ /h :	_____
6	Design/operating temp.	°C :	Design/oper. press.	Barg :	_____
7	Flow medium density	kg/m ³ :	Viscosity	cP :	_____
8	Amount of solid wt	% :	Solid density	kg/m ³ :	_____
9	Separation requirements	:	_____		
10	_____				
11	_____				
12 Construction					
13	Code/standard	:	_____		
14	Certifying authority/institution	:	_____		
15	G-force of bowl	:	Rotating mass	kg :	_____
16	Bowl speed	rpm :	Conveyor speed	rpm :	_____
17	Bowl, direction of rot.	:	Conveyor, direction of rot.	:	_____
18	Flushing system	:	_____		
19	Vibration pads	:	Noise insulation	:	_____
20	_____				
21	Drive type/numbers	:	Drive manufacturer	:	_____
22	Power required	:	El. power	V/Ph/Hz :	_____
23	Transmission type	:	Transm. manufacturer	:	_____
24	_____				
25	_____				
26	_____				
27	_____				
28	_____				
29	Nozzle	No	DN	PN	Type Service
30	_____	_____	_____	_____	_____
31	_____	_____	_____	_____	_____
32	_____	_____	_____	_____	_____
33	_____	_____	_____	_____	_____
34	_____	_____	_____	_____	_____
35	_____	_____	_____	_____	_____
36	_____				
37	Utility requirements	:	_____		
38	Hydraulic	:	_____		
39	Air	:	_____		
40	Water	:	_____		
41	Purge gas	:	_____		
42	_____				
43	_____				
44	_____				
45	_____				
46	_____				
47	_____				

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48	Materials		
49		Description	Cert. DIN 50049
50	Skid		MDS No.
51	Bowl		
52	Conveyor		
53	Shaft		
54	Disk stack		
55			
56			
57			
58			
59	Surface Protection		
60			
61			
62			
63			
64			
65	Sizes and Weight		
66	Overall dimensions	:	
67	Lifting weight	kg :	Operating weight kg :
68			
69			
70			
71	Lubrication/Hydr. Fluid		
72	Lubrication	Type: _____	Supplier: _____
73			
74	Hydr. fluid	Type: _____	Supplier: _____
75			
76	Inspection and Testing		
77	Performance test	:	
78	Vibration test	:	
79	Noise test	:	
80		:	
81			
82			
83			
84	References		
85			
86			
87			
88			
89			
90			
91	Notes: _____		
92			
93			
94			
95			
96			
97			
98			
99			
100			
101			
102			

NORSOK R-001	CENTRIFUGAL SEPARATOR DATA SHEET	RDS-014 Rev. 1, Dec. 1994 Page 1 of 1
Package no.	Doc. no.	Rev.

Tag no.	Location/module
Unit	No. req'd
Service	Inquiry no.
Size & type	Quote no.
Supplier	P.O. no.
Manufacturer	Job no.
Model	Serial no.

1	DESIGN DATA		
2			
3 Fluid			
4 Flowrate	kg/h :		
5 Inlet pressure	barg :		
6 Discharge pressure	barg :		
7 Design pressure	barg :		
8 Inlet temperature	°C :		
9 Operating temperature	°C :		
10 Design temperature	°C :		
11 Contaminants, inlet	micron :		
12 Seawater content, inlet	kg/h :		
13 Contaminants, outlet	micron :		
14 Seawater content, outlet	ppm :		
15 Specific gravity at 15 °C	kg/m³ :		
16 Viscosity	cP :		
17			
18			
19			
20	SEPARATOR DATA		
21			
22 Power required	kW :		
23 Driver speed	rpm :		
24 Motor driver	:		
25 Electr. power	V/Ph/Hz :		
26 Transmission	:		
27 Equipment skid	:		
28			
29			
30			
31	MATERIALS	Cert type	MDS no
32			
33 Frame			
34 Frame hood			
35 Bowl body			
36 Bowl hood			
37 Sliding bowl bottom			
38 Gravity disk			
39 Disc stack			
40 Shaft			
41 Paring disk water pump			
42 Paring disk oil pump			
43			

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Package no.	Doc. no.	Rev.
Tag no.	Location/module	
Unit	No. req'd	
Service	Inquiry no.	
Size & type	Quote no.	
Supplier	P.O. no.	
Manufacturer	Job no.	
Model	Serial no.	

1 DESIGN DATA			
2 Environmental conditions	:		
3 Flow medium	:		
4 Operating capacity	m ³ /h :	Max./min. capac.	m ³ /h :
5 Design temp	°C :	Oper. inlet temp	°C :
6 Design pressure	barg :	Oper. inlet pressure	barg :
7 Oper. disch. pressure	barg :		
8 Flow medium density	kg/m ³ :	Viscosity	cP :
9 Amount of solid wt	% :	Solid density	kg/m ³ :
10 Separation requirements	:		
11			
12			
13 CONSTRUCTION			
14 Code/standard	:		
15 Certifying authority/institution	:		
16 No of cones each unit	:		
17 Dimension each cyclone	mm :		
18 Dimension each unit	mm :		
19 Manifold dim./flange stand.	:		
20			
21 Weight	kg :		
22			
23			
24			
25 MATERIALS			
26	Description	Cert. DIN 50049	MDS No.
27 Cones			
28 Manifold			
29 Support			
30			
31			
32 SURFACE PROTECTION			
33			
34			
35			
36 INSPECTION AND TESTING			
37			
38			
39			
40 NOTES:			
41			
42			
43			
44			

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Package no.	Doc. no.	Rev.
Tag no.	Location/module	
Unit	No. req'd	
Service	Inquiry no.	
Size & type	Quote no.	
Supplier	P.O. no.	
Manufacturer	Job no.	
Model	Serial no.	

DESIGN DATA			
1 Code	:		
2 Code for design and supports	:		
3 Specifications	:		
4 Joint efficiency category	:		
5 Operating pressure	barg :		
6 Design pressure	barg :		
7 Pressure loss in equipment	barg :		
8 Operating temperature	°C :		
9 Design temperature	°C :		
10 Specific gravity oil	:		
11 Specific gravity water	:		
12 Viscosity water at _____ °C	cP :		
13 Dissolved gas in water	:	at	barg and deg C
14 Solids or sand content	mg/l :		
15 Water from formation	% :		
16 Water from process	% :		
17 Water from slops	% :		
18 Water from other sources	% :		
19 Oil content of water max.	mg/l oil :		
20 Oil content of water normal	mg/l oil :		
21 Dissolved oil max	mg/l :		
22 Determination of content	:		
23 Flow capacity, max.	m³/h :		
24 Flow capacity, min.	m³/h :		
25 Water quality on discharge req'd. max.	mg/l :		
26 Water quality on discharge req'd.	mg/l :		
27 Chamber inside diameter	mm :		
28 Chamber length, incl. flange, excl. blind flange	mm :		
29 Horizontal or vertical unit	:		
30 Type of heads	:		
31 Corrosion allowance	mm :		
32 Chamber shell thickness incl. ca.	mm :		
33 Lifting lugs	:		
34 Insulation thickness	mm :		
35 No. of cyclones in each chamber	:		
36 No. of chambers	:		
37 Total dimension, L x B x H	mm :		
38			
39			
40			
41			
42 NOTES:			
43			
44			
45			

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Package no.	Doc. no.	Rev.
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INTERNALS			
46 Involute inlet	:		
47 Liner head	:		
48 Tapered cone assembly	No. req'd per chamber	:	
49 Parallel liner section	No. req'd per chamber	:	
50 Spacer rubber	:		
51 Spacer spider	:		
52 "O"ring kit	:		
53 Fastener kit	:		
54 Cone	:		
55 Backing flange	:		
56 Reject gallery assembly	:		
57 Roller kit	:		
58	:		
59	:		
WEIGHTS			
60 Total weight empty (incl. internals)	kg	:	
61 Total weight operating	kg	:	
62 Total weight hydrotest	kg	:	
63 Total weight shipping	kg	:	
64 Weight of insulation	kg	:	
65 Weight of fireproofing	kg	:	
66 Weight of internals	kg	:	
67	kg	:	
68	kg	:	
FABRICATION INSPECTION & TESTING			
69 Heat treatment of heads after forming	:		
70 Post weld heat treatment	:		
71 Radiographic inspection of butt welds	%	:	
72 Ultrasonic inspection of butt welds	%	:	
73 Ultrasonic inspection of nozzle/shell conn.	%	:	
74 MPI of nozzle/shell conn.	%	:	
75 Hydrotest pressure	barg	:	
76 Production test	:		
77	:		
MATERIALS			
	Description	Cert. DIN. 50049	MDS No.
78			
79 Shell			
80 Nozzle neck plates			
81 Nozzle neck pipes			
82 Forged nozzles			
83 Forged flanges			
84 Blind flanges			
85 Legs			
86 Base plates			
87 Brackets support			
88 Insulation support			
89 Name plate			
90 Bolts for ext. flanges			
91 Nuts for ext. flanges			
92 Bolts for int. flanges & attachments			
93 Nuts for int. flanges & attachments			
94 Lifting lugs			
95 Gaskets			

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Package no.	Doc. no.	Rev.
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MATERIALS (CONTINUATION)			
	Description	Cert. DIN. 50049	MDS No.
96	Involute inlet		
97	Liner head		
98	Tapered cone assembly		
99	Parallel liner section		
100	Spacer rubber		
101	Spacer spider		
102	"O" ring kit		
103	Fastener kit		
104	Cone		
105	Backing flange		
106	Reject gallery assembly		
107	Roller kit		
108			
109			
110			
111			
112	External paint	:	
113	Internal paint	:	
114	Preservation coating (during storage)	:	
115	Export Boxing Req'd	:	
116			
117			
118			
119			
120			
121			
122	NOTES:		
123			
124			
125			
126			
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Package no.	Doc. no.	Rev.
Tag no.	Location/Module	
Unit	No. req'd	
Service	Inquiry no.	
Size & type	Quote no.	
Supplier	P.O. no.	
Manufacturer	Job no.	
Model	Serial no.	

DESIGN DATA		
1 Contents		
2 Max. spec. Gravity 15.6/15.6	°C	
3 Operating volume	m³	
4 Operating pressure	barg	
5 Design pressure	barg	
6 Operating temperature	°C	
7 Design temperature	°C	
8		
9 ENGINEERING DATA		
10 Inside diameter	mm	
11 Length tan/tan	mm	
12 Elevation	mm	
13 Corrosion allowance	mm	
14 Insulation	mm	
15		
16 Process cases		
17 Hydrocarbon liquid		
18 Flow	kg/h	
19 Specific gravity 15.6/15.6	°C	
20 Density at T & P	kg/m³	
21 Viscosity	cP	
22 Surface tension	dyn/cm	
23		
24 Gas / Vapour		
25 Flow	kg/h	
26 Molecular weight		
27 Density at T & P	kg/m³	
28 Viscosity	cP	
29 Water		
30 Flow	kg/h	
31 Specific gravity 15.6/15.6	°C	
32 Density at T & P	kg/m³	
33 Viscosity	cP	
34		
35 NOTES:		
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Package no.	Doc. no.	Rev.
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76	NOZZLE LIST					
77	MARK	No.	DN	PN	Type	SERVICE
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107	NOTES:					
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NORSOK R-001	PRESSURE VESSEL DATA SHEET	RDS-017 Rev. 1, Dec. 1994 Page 5 of 6
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Package no.	Doc. no.	Rev.
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185 CONSTRUCTION DATA			
186 Code			
187 Code for design of supports			
188 Specifications			
189			
190 Joint efficiency/category			
191 Wind Loading			
192 Explosion blast pressure			
193 Earthquake loading			
194 Transportation loading on land			
195 Transportation loading at sea			
196 Horizontal or vertical vessel			
197 Types of heads			
198 One piece or welded heads			
199 Skirt heights			
200 Lifting lugs			
201 Platform supports			
202 Ladder attachments			
203 Insulation supports			
204			
205			
206			
207 Shell thickness incl. c.a.	mm	Head thickness incl. c.a.	mm
208 Skirt thickness	mm	Saddle plate thickness	mm
209			
210 INTERNALS			
211 Trays		No required	
212 Type		No of passes	
213 Mist extractor type		Mesh density	kg/m ³
214 Mesh thickness	mm	Mesh wire diameter	mm
215 Splash cone dia/angle	mm/deg		
216			
217 FABRICATION INSPECTION & TESTING			
218 Heat treatm. of heads after forming			
219 Post weld heat treatment			
220 Radiographic inspec. of butt welds	%	Ultrasonic inspec. of butt welds	%
221 Ultrasonic inspec. of noz./shell conn.	%	MPI of nozzle/shell conn.	%
222 Hydrostatic press. at top of vessel	barg	Production test	
223		DPI of nozzles/shell conn.	%
224	NOTES:		
225			
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NORSOK R-001	PRESSURE VESSEL DATA SHEET	RDS-017 Rev. 1, Dec. 1994 Page 6 of 6
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Package no.	Doc. no.	Rev.
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240 MATERIALS			
241	Material standard	Cert.type	MDS no.
242 Shell			
243 Heads			
244 Nozzle neck plates			
245 Nozzle neck pipes			
246 Forged nozzles			
247 Forged flanges			
248 Blind flanges			
249 Reinforcement pads			
250 Saddle doubling plate			
251 Saddles (except doubling plates)			
252 Skirt			
253 Legs			
254 Base rings and chairs			
255 Base plate			
256 Brackets/support			
257 Ladder and platforms			
258 Insulation supports			
259 Name plate			
260 Bolts for ext. flanges			
261 Nuts for ext. flanges			
262 Bolts for int. flanges & attach.			
263 Nuts for int. flanges & attach			
264 Splash cones			
265 Baffles & weirs			
266 Mist extractor mesh			
267 Mist extractor ring			
268 Trays			
269 Tray supports			
270 Lifting lugs			
271 Gaskets			
272 External paint			
273 Internal paint/lining			
274 Preservation coating (storage)			
275			
276 NOTES:			
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NORSOK R-001	SHELL AND TUBE HEAT EXCHANGER (STANDARD TYPE) DATA SHEET	RDS-018 Rev. 1, Dec. 1994 Page 1 of 2
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Package no.	Doc. no.	Rev.
Tag no.	Location/Module	
Unit	No. req'd	
Service	Inquiry no.	
Size & type	Quote no.	
Supplier	P.O. no.	
Manufacturer	Job no.	
Model	Serial no.	

DESIGN DATA				
1 Heat exchanged per unit	kW			
2	Tube side		Shell side	
3 Fluid				
4 Total flow	kg/h			
5 Design temperature	°C			
6 Design pressure	barg			
7 Pressure drop	bar			
8 Fouling resist	m²C/W			
9				
10	Inlet	Outlet	Inlet	Outlet
11 Liquid flow	kg/h			
12 Vapour flow	kg/h			
13 Operating temperature	°C			
14 Operating pressure	barg			
15				
16	CONSTRUCTION DATA			
17	SHELL			
18 Shell per unit		Surface per shell	m²	
19 No. in series		No. in parallel		
20	TUBES			
21 No of tubes		Outside diameter	mm	
22 Wall thk (min.)	mm			
23				
24	Shell side		Tube side	
25 Test pressure	barg			
26 Corrosion allowance	mm			
27 Gasket type				
28 Volume	m³			
29 Surface preparation				
30 Painting				
31 Insulation				
32 Preservation coating (storage)				
33				
34 Specification				
35 Code requirements				
36 Explosion blast pressure	barg			
37 Total weight empty	kg			
38				
39				
40	FABRICATION INSPECTION & TESTING			
41 Heat treatment of heads after forming				
42 Post weld heat treatment				
43 Radiographic inspec. of butt welds	%	Ultrasonic inspec. of butt welds	%	
44 Ultrasonic Inspec. of noz./shell conn.	%	MPI of nozzle/shell conn.	%	

NORSOK R-001		SHELL AND TUBE HEAT EXCHANGER (STANDARD TYPE) DATA SHEET			RDS-018 Rev. 1, Dec. 1994 Page 2 of 2	
Package no.		Doc. no.			Rev.	
46 MATERIAL SHELL AND CHANNEL						
47 Components		Shell	MDS	Channel/Bonnet		MDS
48 Shell						
49 Nozzle						
50 Nozzle flange						
51 Lifting lug						
52						
53 MATERIAL TUBE BUNDLE						
54 Tubes						
55 Tube sheet						
56 Baffle						
57						
58 MATERIAL BOLTS, NUTS, GASKETS						
59		Bolts	MDS	Nuts	MDS	Gaskets
60 Channel/channel cover						
61 Channel/shell						
62 Shell/shell cover						
63						
64 NOTES:						
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Package no.	Doc. no.	Rev.
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	Mark	No.	DN	PN	TYPE	SERVICE
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153	NOTES:					
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NORSOK R-001	PLATE HEAT EXCHANGER (STANDARD TYPE) DATA SHEET	RDS-020 Rev. 1, Dec. 1994 Page 2 of 2
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Package no.	Doc. no.	Rev.
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42 MATERIALS	Description	Cert. DIN 50049	MDS no.
43 Fixed head/follower			
44 Plates			
45 Nozzles			
46 Flanges			
47 Nameplate			
48 Brackets/supports			
49 Studs			
50 Tie bars			
51 Nuts			
52 Painting			
53 Gaskets			
54			
55			
56			
57 INSPECTION & TESTING			
58 Heat treatment			
59 Post weld heat treatment			
60 Radiographic insp. of butt welds			
61 Ultrasonic insp.			
62 NDT examination			
63 Hydrotest			
64 Leak test air/halogen/helium			
65 Quality control procedure			
66			
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Package no.	Doc. no.	Rev.
Tag no.	Location/Module	
Unit	No. req'd	
Service	Inquiry no.	
Size & type	Quote no.	
Supplier	P.O. no.	
Manufacturer	Job no.	
Model	Serial no.	

1 Surface per unit-finned tube	m ²	
2 Bare tube	m ²	
3 Heat exchanged	kW	
4 MTD. eff	°C	
5 Transfer rate-finned tube	W/m ² °C	Service Clean
6 Plot area	m ²	
7 Proposal drawing No.		
8 Weight-bundle	kg	
9 Weight-Shipping	kg	
10 Performance data - tube side		
11 Fluid name		
12 Total fluid entering	kg/s	
13	In	Out
14 Temperature	°C	
15 Liquid	kg/s	
16 Vapor	kg/s, mol.wt.	
17 Noncond	kg/s, mol.wt.	
18 Steam	kg/s	
19 Water	kg/s	
20 Viscosity	(Liq)(Vap) cP	
21 Density, liquid	kg/m ³	
22 Specific heat capacity	kJ/kg °C	
23 Cond. (liq.)(vap.)	W/m °C	
24 (Pour)(freeze) point	°C	
25 Bubble point	°C	
26 Latent heat	°C	
27 Inlet pressure	bar G	
28 Press.drop,allow/calc	bar	
29 Fouling resist., inside	m ² °C/W	
30 Performance		
31 Air quantity, total	kg/h	
32 Air quantity, fan	Actual m ³ /h	
33 Actual static pressure	barg	
34 Face velocity	Std m/s mass velocity	
35 Altitude above sea level	m	
36 Temperature in (design dry bulb)	°C	
37 Temperature out	°C	
38 (Net free area)	kg/s.m ²	
39 Min. design amb.	°C	
40 NOTES:		
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43		
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NORSOK R-001	AIR COOLED HEAT EXCHANGER DATA SHEET	RDS-021 Rev. 1, Dec. 1994 Page 2 of 3
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Package no.	Doc. no.	Rev.
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45 Design - materials - construction		
46 Design pressure	barg	
47 Test pressure	barg	
48 Design temp.	°C	
49 Tube bundle		
50 Size		
51 No./bay		
52 Arrangement		
53 Bundles	In par	In series
54 Bays	In par	In series
55 Bundle frame		
56 Miscellaneous		
57 Struct. mount (Grade)(Piperack)	c/c	
58 Surface preparation		
59 Louvers	Auto	Manual
60 Vibration switches		
61 Header		
62 Type		
63 Material		
64 No. passes	Slope	mm/m
65 Plug matr.		
66 Gasket matr.		
67 Corr. allowance	mm	
68 No., size inlet nozzle	mm	
69 No., size outlet nozzle	mm	
70 Special nozzle	mm	
71 Rating & facing		
72 TI		
73 PI		
74 Chem. cleaning		
75 Tube		
76 Material		
77 Seamless ☐ Welded ☐		
78 OD x thick	mm	
79 Min. thick	mm	
80 No. / bundle		
81 Length	m	
82 Pitch	mm	
83 Fin, type		
84 Material		
85 OD	mm	
86 Stack thick	mm	
87 No. / mm		
88 Fin des.temp	°C	
89 Code-Asme VIII, Div.1		
90 Stamp (Yes)(No)		
91 Specs.		
92 NOTES:		
93		
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NORSOK R-001	AIR COOLED HEAT EXCHANGER DATA SHEET	RDS-021 Rev. 1, Dec. 1994 Page 3 of 3
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Package no.	Doc. no.	Rev.
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100 Mechanical equipment

101 Fan

102 Manufacturer & model	
103 No./ bay	
104 RPM	
105 Diameter	mm
106 No. blades	
107 Pitch	
108 ADJ/auto	
109 Blade material	
110 Hub material	
111 Rating	kW
112 Min. ambient	deg.C

113 Driver

114 Type	
115 Manufacturer	
116 No./bay	
117 Driver	kW
118 RPM	
119 Enclosure	
120 Volt, phase, cycle	

121 Speed reducer

122 Type	
123 Manufacturer & model	
124 No./bay	
125 AGMA Rating	kW
126 Ratio	
127 Support (structure)(pedestal)	
128	

129 Control action on air failure-fan pitch (min)(max)(lock-up)	
130 Louvers (open)(close)(lock-up)	
131 Degree cntrol of outlet process temperature (max. cooling)	
132 Resirculation (none)(internal)(external over side)(external over end)	
133 Steam coil (Yes)(No)	

134 **NOTES:** _____

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NORSOK R-001	WASTE HEAT RECOVERY UNIT DATA SHEET	RDS-022 Rev. 1, Dec. 1994 Page 1 of 5
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Package no.	Doc. no.	Rev.
Tag no.	Location/Module	
Unit	No. req'd	
Service	Inquiry no.	
Size & type	Quote no.	
Supplier	P.O. no.	
Manufacturer	Job no.	
Model	Serial no.	

1 ENVIRONMENTAL DATA					
2 Ambient max.extreme	°C				
3 Ambient monthly average (max)	°C				
4 Ambient monthly average (min)	°C				
5 Annual average time below 0 °C	h				
6 Wind velocity (100 year return period)					
7 3 sec gust (at unity elevation)	m/s				
8 Relative humidity max/min	%				
9					
10					
11 PROCESS DATA					
12 Heat exchanged per unit	kW				
13		Hot Side	Cold Side		
14 Fluid					
15 Total flow	kg/h				
16 Design temperature	°C				
17 Design pressure	barg				
18 Allowable pressure drop	bar				
19 Calc. pressure drop	bar				
20 Dew point	°C				
21 Bubble point	°C				
22 Fouling resist	m²C/W				
23					
24		Inlet	Outlet	Inlet	Outlet
25 Liquid flow	kg/h				
26 Vapour flow	kg/h				
27 Operating temperature	°C				
28 Operating pressure	barg				
29					
30 LIQUID PROPERTIES					
31 Density at T & P	kg/m³				
32 Specific heat	kJ/kg K				
33 Viscosity	cp				
34 Thermal cond.	W/m K				
35					
36					
37 VAPOUR PROPERTIES					
38 Density at T & P	kg/m³				
39 Specific heat	kJ/kg K				
40 Viscosity	cp				
41 Thermal cond.	W/m K				
42 Molecular weight					
43					
44					
45					

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Package no.	Doc. no.	Rev.
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46	PROCESS DATA FOR ONE UNIT		Min load	Norm load	Design L WHRU	Max load
47						
48	Gas turbine shaft load	MW				
49	WHRU heat recovery	MW				
50	EXHAUST GAS DATA					
51	Exhaust gas flow	Kg/h				
52	EXHAUST GAS TEMPERATURE					
53	Inlet base continuous	°C				
54	Inlet peak at max. ambient	°C				
55	Outlet nominal	°C				
56	Outlet peak	°C				
57	EXHAUST GAS PRESSURE					
58	Leaving turbine nominal	mbars				
59	Allowable total press. drop (ducting and WHRU)	mbars				
60						
61	Calculated total press drop ducting	mbars				
62	Calculated total press drop WHRU	mbars				
63	Calculated stack loss	mbars				
64	Calculated by-pass system loss (when WHRU not operating)	mbars				
65						
66	EXHAUST GAS VELOCITY					
67	Main duct upstream WHRU	m/s				
68	Main duct downstream WHRU	m/s				
69	By-pass duct (when WHRU not operating)	m/s				
70						
71	Stack	m/s				
72						
73	NOTES:					
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Package no.	Doc. no.	Rev.
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101 MECHANICAL DESIGN CONDITION/DATA		
102 TUBE BANK DESIGN		
103 Hydrostatic test pressure	barg	
104 Allowable pressure drop	bar	
105 Number of passes		
106 Number of tubes per row		
107 Number of rows		
108 Straight tube length	m	
109 Effective straight tube length	m	
110 Bare tube number		
111 Bare tube total exposed surface	m ²	
112 Extended surface tubes number		
113 Extended surface tubes total exp surface	m ²	
114 Pitch parallel to flow	mm	
115 Pitch across flow	mm	
116 In line or staggered		
117 Tube centre to duct wall	mm	
118 Weld inspection requirement (X-ray or other)		
119 Stress relieve		
120		
121		
122		
123 TUBES		
124 Vertical or horizontal		
125 Tube corrosion allowance	mm	
126 Outside diameter	mm	
127 Wall thickness (min./average)	mm	
128	Hot side	Cold side
129 Max. tube wall temperature (calculated)	°C	
130 Max. tube wall temperature (design)	°C	
131 Inside film coefficient	W/m ² °C	
132 Overall film coefficient	W/m ² °C	
133 Fouling factor	m ² C/W	
134 Inlet velocity	m/s	
135 Design basis for tube wall thickness		
136		
137		
138 DESCRIPTION OF EXTENDED SURFACE		
139 Type		
140 Fin dimension	mm	
141 Fin spacing	mm	
142 Extension ratio		
143 Max. fin temperature	°C	
144		
145		
146 NOTES:		
147		
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Package no.	Doc. no.	Rev.
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156 Exhaust duct					
157 Expansion joints no. off					
158 Expansion joints location					
159 Expansion joints manufacturer					
160 Expansion joints type					
161 Support type					
162 Support location					
163 Access/inspection no.off					
164 Access/inspection location					
165 Access/inspection size					
166 Notes					
167					
168 STACK					
169 Stack height above grade					
170 Stack weather protection hood type					
171 MISCELLANEOUS CONNECTIONS					
172 Gas pressure					
173 Temperature					
174 Gas sample and flow measurements					
175 Drain. bottom of WHRU					
176 Drain. ducting					
177 Drain. header boxes					
178 Others					
179 Explosion doors					
180 Painting and galvanizing requirements					
181 Notes					
182					
183 HEADER BOXES					
184 Location					
185 Insulation thickness					
186 Header doors bolted or hinged					
187 EXHAUST DUCT AND WHRU CASING					
188	WHRU casing	Main duct upstream of WHRU	Main duct downstream of WHRU	By-pass duct	
189					
190 Max. temp. on casing surface	°C				
191 Length	m				
192 Dimensions light opening	m				
193 Dimensions casing	m				
194 Dimensions outside	m				
195 HEADER					
196 Flange size and rating					
197 MANIFOLDS					
198 Outside diameter	mm				
199 NOTES:					
200					
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Package no.	Doc. no.	Rev.
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212 MATERIALS				
213	Material standard	Thick mm	Cert type	MDS no
214				
215 Tubes				
216 Fins				
217 Exhaust duct				
218 Expansion joint				
219 Exhaust support				
220 Stack				
221 Header box plate				
222 Header box insulation				
223 Header box anchoring				
224 WHRU support beam				
225 WHRU support hangers				
226 WHRU casing suport				
227 Return bends				
228 Header				
229 Manifolds				
230 Tube supports				
231 WHRU CASING				
232 Internal lagging plate				
233 Internal insulation				
234 Casing plate				
235 Casing flange				
236 Casing bolts				
237 Casing gaskets				
238 External insulation				
239 External lagging plate				
240 MAIN DUCT UPSTREAM OF WHRU				
241 Internal lagging plate				
242 Internal insulation				
243 Casing plate				
244 Casing flange				
245 Casing bolts				
246 Casing gaskets				
247 External insulation				
248 External lagging plate				
249 MAIN DUCT DOWNSTREAM OF WHRU				
250 Internal lagging plate				
251 Internal insulation				
252 Casing plate				
253 Casing flange				
254 Casing bolts				
255 Casing gaskets				
256 External insulation				
257 External lagging plate				
258 BY-PASS DUCT				
259 Internal lagging plate				
260 Internal insulation				
261 Casing plate				
262 Casing flange				
263 Casing bolts				
264 Casing gaskets				
265 External insulation				
266 External lagging plate				

NORSOK R-001	ATMOSPHERIC TANK DATA SHEET	RDS-023 Rev. 1, Dec. 1994 Page 1 of 5
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Package no.	Doc. no.	Rev.
Tag no.	Location/Module	
Unit	No. req'd	
Service	Inquiry no.	
Size & type	Quote no.	
Supplier	P.O. no.	
Manufacturer	Job no.	
Model	Serial no.	

1 Design data	
2 Code	
3 Specifications	
4 Load coefficient for fluid pressure	
5	
6 Contents	
7 Density at T & P	kg/m ³
8	
9	
10 Operating pressure at top of tank	barg
11 Design pressure at top of tank	barg
12 Operating temperature	°C
13 Design temperature	°C
14 Wind load	N/m ²
15 Explosion blast pressure	
16 Earthquake loading	
17 Transportation loading on land	
18 Transportation loading at sea	
19 Operating volume	m ³
20 Total volume	m ³
21 Length	mm
22 Width	mm
23 Height	mm
24 Inside diameter	mm
25 Length tan/tan or height tan/tan	mm
26 Elevation	mm
27 Horizontal or vertical tank	
28	
29	
30	
31 Type of heads	
32 One piece or welded heads	
33	
34	
35 Corrosion allowance	mm
36 Thickness of top plate incl.c.a.	mm
37 Thickness of side plates incl.c.a.	mm
38 Thickness of bottom plate incl.c.a.	mm
39 Dist.betw. stiffeners in top plate	mm
40 Dist.betw. stiffeners in side plates	mm
41 Dist.betw. stiffeners in bottom plate	mm
42 Section of stiffeners in top plate	
43 Section of stiffeners in side plates	
44 Section of stiffeners in bottom plate	
45 Shell thickness Incl.c.a.	mm

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Package no.	Doc. no.	Rev.
46 Head thickness incl.c.a.	mm	
47 Skirt thickness incl.c.a.	mm	
48 Skirt height	mm	
49 Saddle plate thickness	mm	
50		
51		
52		
53		
54 Platform supports		
55 Ladder attachments		
56 Insulation thickness	mm	
57 Lifting lugs		
58		
59		
60		
61		
62		
63		
64		
65		
66		
67		
68 Weights		
69 Total weight, empty	kg	
70 Total weight, operating	kg	
71 Total weight, hydrotest	kg	
72 Total weight, shipping	kg	
73 Weight of insulation	kg	
74 Weight of fireproofing	kg	
75		
76		
77		
78		
79 Fabrication, inspection & testing		
80 Radiographic inspection of butt welds	%	
81 Ultrasonic inspection of butt welds	%	
82 Ultrasonic inspection of nozzle/plate conn.	%	
83 MPI or of nozzle/plate conn.	%	
84 Magnetic particle examination of plate welds	%	
85 Magnetic particle examination of corner joints	%	
86 Magnetic particle examination of plate/stiffener conn.	%	
87 Magnetic particle examination of lifting lugs conn.	%	
88 Dye penetrant examination of nozzle/plate conn.	%	
89 Dye penetrant examination of corner joints	%	
90 Dye penetrant examination of plate/stiffener conn.	%	
91 Dye penetrant examination of lifting lugs conn.	%	
92		
93 Hydro test pressure at top of tank	barg	
94		
95		
96		
97 NOTES:		
98		

Package no.	Doc. no.	Rev.
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99	Materials	Description	Cert. DIN 50049	MDS no.
100	Plates			
101	Stiffeners			
102	Shell and heads			
103	Saddles/skirts/legs			
104	Lifting lugs			
105	Nozzle neck plates			
106	Nozzle neck pipes			
107	Forged nozzles			
108	Forged flanges			
109	Blind flanges			
110	Reinforcement pads			
111	Brackets			
112	Ladders and platforms			
113	Insulation supports			
114	Name plate			
115	Bolts for ext. flanges			
116	Nuts for ext. flanges			
117	Gaskets			
118				
119				
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124				
125				
126	External paint			
127	Internal paint			
128	Preservation coating (during storage)			
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133	NOTES:			
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Package no.	Doc. no.	Rev.
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	Nozzle	X	Y	Z	Nozzle	X	Y	Z
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155								
156								
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NORSOK R-001		ATMOSPHERIC TANK DATA SHEET			RDS-023 Rev. 1, Dec. 1994 Page 5 of 5	
Package no.		Doc. no.			Rev.	
	Mark	No.	DN	PN	TYPE	SERVICE
170						
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181						
182						
183						
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200	NOTES:					
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NORSOK R-001		VACUUM PUMP PACKAGE DATA SHEET		RDS-024 Rev. 1, April 1996 Page 1 of 3	
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Package No.	Doc. No.	Rev.
Tag No.	Location/Module	
Unit	No. req'd	
Service	Inquiry No.	
Size & Type	Quote No.	
Supplier	P.O. No.	
Manufacturer	Job No.	
Model	Serial No.	

1 Machinery 1. stage type	Motor provided by	
2 Machinery 2. stage type	Motor mounted by	
3 Machinery 3. stage type	Ejectors provided by	
4 No. of pumps required	Ejectors mounted by	
5 No. of motors required	Separator provided by	
6 No. of ejectors required	Separator mounted by	
7 No. of separators required	Baseplate provided by	
8 Operating Conditions		
9 Seawater flow	m ³ /h	Seawater content of oxygen O ₂ ppm
10 Seawater temperature (PT)	°C	Seawater content of Nitrogen N ₂ ppm
11 Density at PT	Kg/m ³	Required residual Oxygen content ppm
12 Viscosity at PT	cP	1. Stage Temp. °C Press mbar
13 Electrical area hazard		2. Stage Temp. °C Press mbar
14 Corrosion / erosion caused by		3. Stage Temp. °C Press mbar
15 Ejector Operating Conditions		
16	1. stage ejector	2. Stage
17 Capacity curve no.		
18		
19 Motive medium flow		Kg/h
20 Motive medium press		mbar a
21 Motive medium temp.		°C
22 Content Oxygen O ₂		Kg/h
23 Content Nitrogen N ₂		Kg/h
24 Content vapour H ₂ O		Kg/h
25 Suction		
26 Suction flow		Kg/h
27 Suction press.		mbar a
28 Suction temp.		°C
29 Content Oxygen O ₂		Kg/h
30 Content Nitrogen N ₂		Kg/h
31 Content vapour H ₂ O		Kg/h
32 Discharge		
33 Discharge flow		Kg/h
34 Discharge press.		mbar a
35 Discharge temp.		°C
36 Content Oxygen O ₂		Kg/h
37 Content Nitrogen N ₂		Kg/h
38 Content vapour H ₂ O		Kg/h
39 Notes		
40		
41		
42		
43		
44		
45		
46		

NORSOK R-001		VACUUM PUMP PACKAGE DATA SHEET			RDS-024 Rev. 1, April 1996 Page 2 of 3	
Package No.		Doc. No.			Rev.	

Ejector Construction						
46	1. stage ejector			2. Stage Ejector		
47						
48	Flanges (size, rating, facing):			Size	Rating	Facing
49	Inlet operation					
50	Suction					
51	Discharge					
52						
53	Design pressure			barg		
54	Test pressure			barg		
55	Materials					
56	Part	Type	Cert. DIN 50049	MDS No.	Remarks	
57	Body 1. st.					
58	Ejector					
59	Nozzle 1. st.					
60	Ejector					
61	Body 2. st.					
62	Ejector					
63	Nozzle 2. st.					
64	Ejector					
65						
66						
67	Applicable Documents Ejector					Remarks
68	Drawings					
69	Specifications					
70						
71						
72						
73	Vacuum Pump Operating Conditions					
74	Vacuum pump conditions:			Performance:		
75	Actual flow		Kg/h	Capacity curve no.		
76	Suction pressure		mbara	Speed		(RPM)
77	Discharge pressure		mbara	Mode of operation		
78	Temp. suct./disch.		°C	Power at duty		kW
79	Content Oxygen O ₂		Kg/h	No. of stages		
80	Content Nitrogen N ₂		Kg/h	Remarks		
81	Content Vapour H ₂ O		Kg/h			
82	Seal water flow		Kg/h			
83	Seal water press.		barg			
84	Seal water temp.		°C			
85	Vacuum Pump Construction					
86	Nozzles	Size	Rating	Facing	Loc.	Aux piping by mfr.
87	Suction					Design press. barg
88	Discharge					Test press. barg
89	Sealwater inlet					Pipework material
90	Sealwater outlet					Shop test Required Witnessed
91	Casing design press./temp.		barg	°C	Running test	
92	Rotation facing coupling CW/CCW				Performance test	
93	Bearings (type no.)				Dismantling	
94	Lubrication				Hydrostatic barg	
95	Packing				Weights	
96	Baseplate				Pump	Kg
97	Foundation bolts by				Motor	Kg
98	Coupling				Base	Kg
99	Seal				Total weight	Kg
100						

[illegible]

NORSOK R-001	HYDRAULIC MOTOR DATA SHEET	RDS-025 Rev. 1, April 1996 Page 1 of 1
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Package No.		Doc. No.		Rev.	
Tag No.		Location/Module			
Unit		No. req'd			
Service		Inquiry No.			
Size & Type		Quote No.			
Supplier		P.O. No.			
Manufacturer		Job No.			
Model		Serial No.			

1					
2 Design Data (Motor)				Units	
3					
4	Displacement (high/low)			litres	
5	Max. continuous torque			Nm	
6	Max. speed			R.P.M.	
7	Max. continuous inlet pressure			bar	
8	Intermittant pressure			bar	
9	Average start torque at inter pressure			Nm	
10	Max. continuous power			kW	
11	Max. intermittant power (high displacement)			kW	
12	Max. intermittant power (low displacement)			kW	
13	Max. circuit temperature			°C	
14	Fluid viscosity			cSt	
15	Efficiency torque (stalled/running)			%	
16 Design Data (Brake)					
17	Braketype				
18	Actuator type				
19	Static brake torque rating			kNm	
20	Dynamic brake torque rating			kNm	
21					
22	Power rating (dynamic)			kW	
23	Max. intermittant power			kW	
24	Continuous or average power			kW	
25	Dimensions		Units	Units	
26	Drive shaft dia.		mm	Overall length	mm
27	Mounting details			Overall width	mm
28	Inlet port dia.		mm	Overall height	mm
29	Outlet port dia.		mm	G.A. drwg. no.	
30	Dry weight		kg	Torque graph. no.	
31 Materials					
32	Casing			Main shaft seals	
33	Crank shaft			Bearings (type)	
34	Gears				
35	Pistons				
36	Conn. rod				
37	Piston seals				
38					
39					
40 Notes					
41					
42					
43					

NORSOK R-001	HYDRAULIC POWER PACK DATA SHEET	RDS-026 Rev. 1, April 1996 Page 1 of 3
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Package No.	Doc. No.	Rev.
Tag No.	Location/Module	
Unit	No. req'd	
Service	Inquiry No.	
Size & Type	Quote No.	
Supplier	P.O. No.	
Manufacturer	Job No.	
Model	Serial No.	

1	Design Data	
2	Area classification	:
3	Environmental condition	:
4		:
5	Design effect	kW :
6	Flow capacity	m ³ /h :
7	Pressure cCapacity, cCont.	Barg :
8	Pressure capacity, internal	Barg :
9	Hydr. test pressure	Barg :
10	Design temperature	°C :
11	Max/min operation temp.	°C :
12	Hydr. fluid viscosity max/min	cP :
13	Req. hydr. fluid cleanness	:
14	Hydraulic pump (manuf./type)	:
15	Accumulator	:
16	Cooling system	:
17	Vibration pads	:
18		:
19	Oil reservoir	m ³ :
20		:
21	Filtration	:
22		:
23	Auxillary pumps; Effekt	kW :
24	Flow	m ³ /h :
25	Pressure	Barg :
26	Manuf./type	:
27		:
28		:
29	Hydraulic manifold/block	:
30		:
31		:
32		:
33		
34		
35		
36		
37		
38	Utility Requirements	
39	Electric	:
40	Air	:
41	Cooling medium	:
42		:
43		:
44		:
45		
46		

NORSOK R-001	HYDRAULIC POWER PACK DATA SHEET	RDS-026 Rev. 1, April 1996 Page 2 of 3
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Package No.	Doc. No.	Rev.
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48	Construction			
49	Code	:		
50	Certifying authority	:		
51	Motor-pump locat. (horiz./vert.)	:		
52			<u>Manufacturer</u>	<u>Type/Model</u>
53	Skid frame	:		
54	Hydraulic tank	:		
55	Hydraulic pumps	:		
56	Electric motors	:		
57	Couplings	:		
58	Hoses, H.P./L.P.	:		
59	Piping	:		
60	Tubing	:		
61	Flanges	:		
62	Fittings	:		
63	Filters	:		
64	Junction boxes	:		
65	Heat exchanger	:		
66	Vibration pads	:		
67		:		
68		:		
69		:		
70				
71				
72				
73				
74				
75	Material			
76		Description	Cert. DIN 50049	MDS No.
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				
92	Surface Protection			
93				
94				
95				
96				
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NORSOK R-001	HYDRAULIC POWER PACK DATA SHEET	RDS-026 Rev. 1, April 1996 Page 3 of 3
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Package No.	Doc. No.	Rev.
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103	Lubrication/Hydr. Fluid	
104	Hydraulic fluid	Type: _____ Supplier: _____
105	Grease lubricant	Type: _____ Supplier: _____
106		
107	Detailed lube chart required. Other info, see vendor maint. manual: _____	
108		
109		
110		
111	Inspection and Testing	
112	Functional/perform. test	: _____
113	Hydrostatic test	: _____
114	Noise test	: _____
115	Flushing requirements	: _____
116		: _____
117		: _____
118	Inspection requirement	: _____
119		
120		
121		
122	References	
123		
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130		
131	Notes: _____	
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NORSOK R-001	FILTER DATA SHEET	RDS-027 Rev. 1, April 1996 Page 1 of 4
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Package No.	Doc. No.	Rev.
Tag No.	Location/Module	
Unit	No. req'd	
Service	Inquiry No.	
Size & Type	Quote No.	
Supplier	P.O. No.	
Manufacturer	Job No.	
Model	Serial No.	

1 Process		
2	Filtered medium	
3	Suspended solids	
4	Particle size range	Micron
5	Degree of filtration	Micron
6	Density	kg/m ³
7	Viscosity	cP
8	Flowrate normal	m ³ /h
9	Flowrate design	m ³ /h
10	Min. filter flow	m ³ /h
11	Max. filter flow	m ³ /h
12	Filter type	Media bed/Cartridge
13	Media bed	
14	Grain size range	Micron
15	No. of beds	
16	Bed volume	m ³
17	Bed deepness	mm
18	Backwash liquid	
19	Anticipated life	year
20	Cartridge	
21	Type of mesh	
22	Filtering area	m ²
23	Nominal pore size	Micron
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35 Design Data		
36	Code	
37	Code for design of support	
38	Specifications	
39		
40	Joint efficiency/Category	
41	Operating pressure	barg
42	Design pressure	barg
43	Test pressure	barg
44	Differential pressure clean	bar
45	Max. differential pressure dirty	bar

NORSOK R-001	FILTER DATA SHEET	RDS-027 Rev. 1, April 1996 Page 2 of 4
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Package No.	Doc. No.	Rev.
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46	Operating temperature	°C	
47	Design temperature	°C	
48	Operating volume	m ³	
49	Total volume	m ³	
50	Inside diameter	mm	
51	Length tan/tan or Height tan/tan	mm	
52	Horizontal or vertical vessel		
53	Type of heads		
54	One piece or welded heads		
55	Corrosion allowance	mm	
56	Shell thickness incl. c.a.	mm	
57	Head thickness incl. c.a.	mm	
58	Skirt thickness	mm	
59	Skirt height	mm	
60	Saddle plate thickness	mm	
61	Lifting lugs		
62	Platform supports		
63	Ladder attachments		
64	Free height req'd for maintenance	mm	
65	Free space req'd for any direction	mm	
66			
67			
68			
69			
70			
71	Weights		
72	Total weight, empty	kg	
73	Total weight, operating	kg	
74	Total weight, hydrotest	kg	
75	Total weight, shipping	kg	
76	Weights of internals	kg	
77	Weight of media bed	kg	
78	Weight of cartridge	kg	
79			
80			
81			
82			
83			
84		Cert.	
85	Materials	Description	DIN 50049 MDS No.
86	Shell		
87	Heads		
88	Nozzle neck plates		
89	Nozzle neck pipes		
90	Forged nozzles		
91	Forged flanges		
92	Reinforcement pads		
93	Saddle doubling plate		
94	Saddles		
95	Skirt		
96	Legs		
97	Brackets/supports		
98	Ladders/platforms		
99	Name plate		
100	Bolt for ext. flanges		
101	Nuts for ext. flanges		
102	Bolts int. attachm.		
103	Nuts int. attachm.		

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Package No.	Doc. No.	Rev.
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104				Cert.			
105	Materials Cont.			Description		DIN 50049	MDS No.
106	Baffles and weires						
107	Trays						
108	Tray supports						
109	Lifting lugs						
110	Gaskets						
111	Ext. pipework						
112	Foundation bolts						
113	Int. pipework						
114	Int. strainer						
115	Int. header						
116	Baseplate						
117							
118							
119							
120							
121	Protective coating						
122	Surface preparation inside						
123	Paint inside						
124	Surface preparation outside						
125	Paint outside						
126	Preservation coating for storage						
127							
128							
129							
130							
131	Nozzles						
132	Mark	No. off	Service	DN	PN	Type	
133							
134							
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142							
143							
144							
145	Instrumentation						
146	Mark	No. off	Service	DN	PN	Type	
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Package No.	Doc. No.	Rev.
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162	
163	Fabrication, Inspection and Testing
164	Heat treatment of heads after forming
165	Post weld heat treatment
166	Radiographic inspection of butt welds %
167	Ultrasonic inspection of butt welds %
168	Ultrasonic inspection of nozzle/shell conn. %
169	MPI or DPI of nozzle/shell conn. %
170	Dye penetrant %
171	Hydrotest
172	Production test
173	
174	
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177	Notes
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NORSOK R-001	FRESHWATER MAKER DATA SHEET	RDS-028 Rev. 1, April 1996 Page 1 of 2
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Package No.	Doc. No.	Rev.
Tag no.	Location/module	
Unit	No. req'd	
Service	Inquiry no.	
Size & type	Quote no.	
Supplier	P.O. no.	
Manufacturer	Job no.	
Model	Serial no.	

1	Process			Type			
2	Performance			Weights			
3	Capacity per unit		m ³ /24h	Total weight, empty			kg
4	Salinity		ppm	Total weight, operating			kg
5	Distillate temp. with cooler		°C	Total weight, hydrotest			kg
6	Distillate temp. without cooler		°C	Weight heater tubenest			kg
7				Weight condenser tubenest			kg
8							
9	Operating conditions						
10	Heating system (heater)			Cooling system (condenser)			
11	Heating medium			Cooling medium			
12	Inlet temperature		°C	Inlet temperature			°C
13	Outlet temperature		°C	Outlet temperature			°C
14	Flow		m ³ /h	Flow			m ³ /h
15	Heat exchanged		kW	Heat exchanged			kW
16	Operating pressure		barg	Operating pressure			barg
17	Design pressure		barg	Design pressure			barg
18	Test pressure		barg	Test pressure			barg
19	Pressure drop heater		bar	Pressure drop condenser			bar
20							
21							
22	Design and engineering data						
23	Evaporating chamber (shell)			Nozzle data			
24	Operating pressure		barg	No. off	Service	Size	Rating
25	Boiling point		°C		Inlet condenser		Face
26	Design temperature		°C		Outlet condenser		
27	Design pressure		barg		Inlet heater		
28	Test pressure		barg		Outlet heater		
29	Corrosion allowance		mm		Feed water inlet		
30	Feed system				Distillate outlet		
31	Feed water flow		m ³ /h		Outlet to brine ejector		
32	Feed water pressure before orifice		barg		Outlet air ejector		
33	Feed water system design pressure		barg		Connection relief valve		
34	Feed water system test pressure		barg				
35							
36	Ejector system						
37	Air ejector			Brine ejector			
38	Motive seawater pressure/temp.		barg/°C	Motive seawater pressure/temp.			barg/°C
39	Air suction capacity		kg/h	Brine suction capacity			kg/h
40	Discharge pressure		barg	Discharge pressure			barg
41	Motive water flow		m ³ /h	Motive water flow			m ³ /h
42	Design pressure		barg	Design pressure			barg
43	Test pressure		barg	Test pressure			barg
44							

NORSOK R-001	FRESHWATER MAKER DATA SHEET	RDS-028 Rev. 1, April 1996 Page 2 of 2
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Package No.	Doc. No.	Rev.
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45 Materials						
46	Part	Description	Cert. DIN 50049	MDS No.		
47	Evaporator					
48	Shell					
49	Demister					
50	Pipework					
51	Condenser					
52	Tubeplates					
53	Tubes					
54	Waterbox					
55	Heater					
56	Tubeplates					
57	Tubes					
58	Waterbox					
59	Air ejector					
60	Body					
61	Orifice					
62	Brine ejector					
63	Body					
64	Orifice					
65						
66 Instruments						
67	No. off	Service	Remarks	No. off	Service	Remarks
68						
69						
70						
71 Inspection and test						
72 Construction according to						
73 Inspection authority						
74	Test	Nonwitnessed	Witnessed	Observed	Test standard	Acceptance criteria
75	Performance					
76	Hydrostatic					
77	Shop inspection					
78	Dismantling					
79						
80 Protective coating						
81	Surface prep. (inside)					
82	Paint (inside)					
83	Surface prep. (outside)					
84	Paint (outside)					
85						
86 Applicable documents						
87	Drawings					
88	Specifications					
89						
90 Notes						
91						
92						
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NORSOK R-001	REVERSE OSMOSIS MEMBRANE DATA SHEET	RDS-029 Rev. 1, April 1996 Page 1 of 2
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Package No.	Doc. No.	Rev.
Tag no.	Location/module	
Unit	No. req'd	
Service	Inquiry no.	
Size & type	Quote no.	
Supplier	P.O. no.	
Manufacturer	Job no.	
Model	Serial no.	

1	Service		
2	Design feed flowrate	m ³ /h	
3	Operation feed flowrate	m ³ /h	
4	Max. feed flowrate	m ³ /h	
5	Design product flowrate	m ³ /h	
6	Operation product flowrate	m ³ /h	
7	Max. product flowrate	m ³ /h	
8	Max. chlorine content for feed water		
9			
10	Allowable pH range		
11	Operating pressure	barg	
12	Design pressure	barg	
13	Operating temperature	°C	
14	Design temperature	°C	
15			
16	Weights		
17	Empty weight	kg	
18	Hydrotest weight	kg	
19	Shipping weight	kg	
20	Operating weight	kg	
21			
22	Materials	Description	Cert type
23	Wetted parts		
24	Pressure vessel		
25	Membranes		
26			
27	Connections		
28	Feed		
29	Product		
30	Brine		
31	Other		
32			
33	Notes		
34			
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43	Design	
44	Membrane type	
45	Membranes per unit	
46	Membrane expected life	
47	Membrane cleaning interval	
48	Vessel length	mm
49	Vessel diameter	mm
50	Face to face	mm
51		
52	Inspection and testing	
53	Hydrotest	
54		
55		
56	Visual inspection	
57	Ultrasonic inspection	
58	Radiographic inspection	
59	DPI nozzle/shell conn.	
60	Other	
61		
62	Notes	
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45	☐ Capacity Control	
46		
47 To Permit Operation	_____	Capacity Control shall be by ☐ Variable speed to _____ % Rated ☐ Purchaser By-Pass ☐ Mfr. Standard Automatic Control ☐ Start/Stop ☐ (2)(3)(5)Step ☐ Piloted by Rec. Pressure ☐ Piloted by Purch. Instr. w/ _____ Bar G Air Signal ☐ Clearance Pockets, _____ Cyl. ☐ Fixed ☐ Variabel ☐ Manual ☐ Manual Pneu ☐ Auto ☐ Suct. Valve Unloaders _____ Cyl. ☐ Type ☐ Plug ☐ Finger ☐ _____ ☐ Manual ☐ Manual Pneu ☐ Auto ☐ On Air/Power Failure Compressor Shall ☐ Unload ☐ Load
48 At an inlet of m ³ /h	_____	
49 Pockets/Valves Operation	_____	
50 Inlet Pressure Bar A	_____	
51 Discharge Pres. Bar A	_____	
52 Actual Disch. Temp °C	_____	
53 kW/Stage	_____	
54 Total kW	_____	
55 _____	_____	
56 _____	_____	
57 _____	_____	
58 _____	_____	
59 _____	_____	
60 _____	_____	
61 _____	_____	
62 _____	_____	
63 _____	_____	
64	O Site Data	☐ Utility Consumption
65 Altitude _____ m. Barometer _____ Bar A		Locked Full Load
66 Design Temp. °C _____ Summer max _____ Winter min. _____	Electric	kW Rotor Amps. Amps.
67 Design Wet bulb. Temp °C _____	Main Driver	_____
68 O Winterization Req'd O Tropicalization Req'd	Main Lube Oil Pump	_____
69 Unusual Conditions O Dust O Fumes	Aux. Lube Oil Pump	_____
70 O Other _____	Pkg. Coolant Water Pump	_____
71 Equipment Shall Suitable for	Mech. Lubricator	_____
72 O Indoors O Heated O Unheated		Watts Volts Hz
73 O Outdoors O Under Roof O Without Roof	Frame Oil Heater	_____
74 Hazardous Area Zone Gas Gr. _____ Temp Cl _____	Lubricator Heater	_____
75 Cooling water for Comp. Cylinders _____	Space Heater	_____
76 Type Water _____		
77 Press. Bar G _____ Supply _____ Return min. _____	Steam	kg/h Bar G °C to Bar G
78 Temp. °C _____ Supply _____ Return max _____	Main Driver	_____
79 Cooling water for (Oil Cooler)(Intercoolers)(Rod Pkg):	Lubricator Heater	_____
80 Type Water _____	Frame Heater	_____
81 Press. BarG _____ Supply _____ Return min. _____		
82 Temp. °C _____ Supply _____ Return max _____		
83 Electric Power for Heaters	Cooling Water	Cyl. Rod. L.O. Inter
84 _____ Volts _____ Phase _____ Hz		Jkts. Pkg. Cooler Coolers Other
85 Steam for Heater	Quantity l/h	_____
86 Normal _____ Bar G _____ °C	Inlet Temp °C	_____
87 Max. _____ Bar G _____ °C	Outlet Temp °C	_____
88 Instrument Air Supply	Inlet Press. Bar G	_____
89 Press. Bar G _____ Max. _____ Norm. _____ Min. _____	Outlet Press. Bar G	_____
90 _____	Max. Press Bar G	_____
91 _____	Total C.W. l/h	_____
92 _____		
93 Remarks		
94 _____		
95 _____		
96 _____		
97 _____		
98 _____		
99 _____		
100 _____		

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Package No.	Doc. No.	Rev.
101 Inspection and Shop Tests		Alarms and Shutdowns
102		
103	Req'd	Witnessed
104 Shop Inspection	O	O
105 Mfr. Std. Shop Tests	O	O
106 Valve Leak Test	O	O
107 Cyl. Hydro Test	O	O
108 Hydro Cyl. Water Jkts _____ Bar G	O	O
109 Cyl. Helium Leak Test MWP.	O	O
110 Bar over to Check Rod Runout	O	O
111 Mech. Run Test w/Shop driver	O	O
112 Mech. Run Test w/Job driver	O	O
113 Aux. Equip. Oper. Test	O	O
114 Dismantle-Reassemb. Insp.	O	O
115	O	O
116	O	O
117 Painting		
118 O Manufacturers Standard		
119 O Other		
120 Shipment		
121 O Domestic O Export O Export Boxing Req'd		
122 O Outdoor Storage Over _____ Months		
123 _____		
124 _____		
Comp. Mfr. Shall Furnish Elec. Separate Contacts for Pre-Alarm Shutdown Low Lube Oil Pressure O O Low Mech. Lubr. Oil Level O O High Comp. Jacket W. Temp _____ °C O O High Level in Each Moist. Sep. O O High Gas Disch. Temp. _____ °C O O Low Gas Suct. Press. _____ Bar G O O High Vibration O O High Main Bearing Temp. O O Remote Shutdown O Elec. O Pneumatic O Hydr. Pre-Alarm Contact shall O Open O Cls. to Alarm Shutdown Contacts shall O Open O Close to Shutdown O Control Current _____ Volts _____ Phase _____ Hz Switch Enclosure O EEx O IP _____		

125 Gas Analysis	Rated Operating Conditions						Remarks
126 O Mol %							
127	M.W.						
128 Air	28.966						
129 Oxygen	32.000						
130 Nitrogen	28.016						
131 Water Vapor	18.016						
132 Carbon Monoxide	28.010						
133 Carbon Dioxide	44.010						
134 Hydrogen Sulfide	34.076						
135 Hydrogen	2.016						
136 Methane	16.042						
137 Ethylene	28.052						
138 Ethane	30.068						
139 Propylene	42.078						
140 Propane	44.094						
141 I-Butane	58.120						
142 n-Butane	58.120						
143 i-Pentane	72.146						
144 n-Pentane	72.146						
145 Hexane Plus							
146							
147							
148							
149							
150							
151							
152 Total							
153 Avg.Mol.Wt.							
154 Notes _____							
155 _____							

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Package No.	Doc. No.	Rev.
157 ☐ Cylinder Data		Compressor Packing
158		O Full Floating Vented Packing w/Stainless Steel Springs
159 Stage		O Forced Feed Lubrication
160 No. of Cyl. per Stage		O Non-Lubricated O Teflon O Carbon
161 Type Cyl Cooling Req'd		☐ Water Cooled
162 Type Cyl. (Step)(Tandem)		O Provisions for Future (Water)(Oil) Cooling
163 Single/Double Acting		O Vented to
164 Cyl. Liner Yes/No		Distance Piece
165 Cyl. Liner Wet/Dry		O Standard
166 Outside Dia. Liner, mm		O Extra Long Single Compartment
167 Bore, mm		O Two Compartment
168 Stroke, mm		O Solid Cover O
169 Piston Displacement, l/min		O Vented to O Design Press. Bar G
170 Clearance %		Lubrication
171 Volumetric Efficiency, %		Frame
172 API Valve Gas Velocity, m/min		O Splash System
173 No.Inlet/Disch. Valves/Cyl.		O Pressure System (Included the Following)
174 Type of Valves		O Main Oil Pump Driven by Comp. Shaft ☐ Driven by (Elec. Motor) ☐
175 Inlet/Disch. Vlve Lift mm.		O Aux. Oil Pump Driven by Elec. Motor
176 Max. Allow. Piston Spe.m/s		O Hand Operated Pump for Starting
177 Normal Piston Speed m/s		O System Oil Capacity litres
178 Rod Diameter mm		O Oil ISO V.G.
179 Max.Allow.Rod Loading T		O Elec. Htr. w/Thermostat O Steam Oil
180 Max.Allow.Rod Loading C		Type Bearing ☐ Sleeve ☐ Rolling ☐
181 Actual Rod. Load, T(Gas Load)		Brg. Matl. ☐ Alum. ☐ Babbitt ☐
182 Actual Rod. Load, C(Gas Load)		O Outboard Bearing Included O Type
183 Actual Rod. Load, T(Gas&Inter.)		Cylinders
184 Actual Rod. Load, C(Gas&Inter.)		Lubricator to be Driven by:
185 Degrees Rod Reversal		O Compressor shaft O Electric Motor O Both
186 Max.Allow. Cyl. Press Bar G		Lubricator Capacity O 24h. O
187 Max.Allow.Cyl.Temp. °C		☐ Type Oil ISO V.G.
188 Recom. Relief Valve Bar G		☐ Lubricator Make Model
189 Hydrostatic Test, Bar G		O Steam Coll ☐ No. of Comp.
190 Suction size/Rating		O Electric Heater w/Thermostat
191 Facing		Barring Device O Manual O Pneum.
192 Disch.size/Rating		☐ Coupling - Low Speed
193 Facing		Mfr. Model
194		Type
195 ☐ Compressor Materials		☐ Coupling - High speed
196 Cylinders		Mfr. Model
197 Cylinder Liners		Type
198 Pistons		☐ Coupling - (Main)(Aux) Oil Pump
199 piston Rings		Mfr. Model
200 Rider Rings		Type
201 Piston Rods		Type Guards O Code O Standard O Non-Spark
202 Piston Rod Hard (Rockwell "C")		O Static Cond. V-Belts O Tot.Encl. V-Belt Grd.
203 Valve Seats		Air Intake Filter by O Comp. Mfr. O Purch.
204 Valve Stops		O Mfr. Model
205 Valve Plates		O Type O Flang.Outlet Conn.
206 Valve Springs		
207 Rod Packing		
208 Cross Heads		
209 Connecting Rods		
210 Crankshaft		
211 Frame		
212		