



Exploration & Production

GENERAL SPECIFICATION

ROTATING MACHINERY

GS EP MEC 270



Supply of Mechanical Seal according to API Standard 682

05	01/2012	Mechanical Seal Data Sheet attached in Appendix 1
04	01/2011	Numbering Up-date
03	10/2008	Vendor, Manufacturer, Company, Supplier Format change
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1. Scope

This specification clarifies how to use the recommendations of [API Std 682 3rd edition](#) for selection of pump mechanical seals supplied to the Company.

The purpose of this specification is to clarify the requirements of [API Std 682 3rd edition](#), September 2004.

Technical proposal shall be supported by the data sheets included in Appendix 1.

This document modifies or complements some requirements of [API Std 682](#), when deemed necessary considering Company experience.

The paragraph numbering is identified in the same way as in [API Std 682](#) except for additional requirements, which may be presented with new paragraph numbers.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Standards

Reference	Title
API Std 682 3rd edition	Pumps - Shaft Sealing Systems for Centrifugal and Rotary Pumps

Professional Documents

Reference	Title
Not applicable	

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	



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General Specification

Date: 01/2012

GS EP MEC 270

Rev: 05

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP MEC 271	Centrifugal Pumps for the Petroleum, Chemical and Gas Industry Services according to API Standard 610

05



3. Comments and/or additions to **API Std 682 3rd Edition**

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5. Dimensions	
5.2 The purchaser shall specify whether data, drawings, hardware (including fasteners), and equipment supplied to this Standard shall use SI units or US Customary units.	Dimensions shall be in SI units.
6. Design requirements	
6.1 Common design requirements (all categories)	
6.1.1 General Information	
6.1.1.2 If specified, a stationary flexible element can be supplied for Type A or Type B seals. Note: The rotating flexible element was selected as the standard for pusher seals because it allows application of a smaller seal.	Stationary flexible element shall be supplied as soon as the mean diameter linear speed at the mating faces is greater or equal to 23 m/s. For polluted effluent as crude oil, springs have to be out of the product.
6.1.1.3 If specified, a rotating flexible element can be supplied for Type C seals.	For Type C seals, rotating flexible element is not allowed.
	6.1.1.12 (New paragraph) If applicable, the direction of rotation shall be marked on the gland plate and clearly visible once the seal is installed.
6.1.2 Seal chamber and gland plate	
6.1.2.5 If specified, a bolt-on seal chamber provided by the seal Manufacturer shall be supplied.	Bolt on seal chambers are not acceptable.
6.1.2.16 If specified, or if recommended by the seal Manufacturer, close clearance, floating throat bushings shall be furnished. Materials and clearances shall be suitable for the service and approved by the purchaser.	This paragraph is applicable, especially in case of API Std 682 - PLAN 32 .
6.1.2.24 If specified, heating jackets or inserts shall be provided on seal chambers. Heating requirements shall be agreed between the purchaser, Vendor and seal Manufacturer.	This paragraph is applicable.

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6.1.3 Cartridge seal sleeves	
6.1.3.13 If specified, or if recommended by the seal or pump Manufacturer and approved by the purchaser, devices other than set screws may be used for axially positioning and driving the sleeve. Examples include a split ring engaging a groove in the shaft (see Figure 19), or a shrink disc (see Figure 20).	Shrink disc attachment is acceptable only if pump Vendor can demonstrate that the tightening screws can be reached with a torque-measuring wrench once the seal has been installed on the pump.
6.1.4 Mating rings	
6.1.4.1 Anti-rotation devices shall be designed to minimize the distortion of the seal faces. Clamped faces shall not be used unless specifically approved by the purchaser (see figure 21).	(Addition purchaser decision) Clamped faces are not allowed.
6.1.5 Flexible elements	
6.1.5.1 If specified, a single spring Type A seal shall be furnished. Note 1: Multiple coil-spring seals tend to be more axially compact than single coil-spring seals. This gives wider applicability when dual seals are considered. Multiple springs also tend to provide a more even loading. Note 2: Single spring seals generally add 6 mm (0.25 in.) to 13 mm (0.5 in) to the axial space requirement of a sealing application. For single seal applications, the single spring has advantages and disadvantages. The single spring allows a lower spring rate to achieve the same face loading. This makes the single spring more tolerant of axial misalignment (errors in axial setting of the seal). This advantage is largely eliminated by use of cartridge seals. For corrosive services, the wire in single springs is significantly greater in cross-section providing a greater corrosion allowance.	Single coil-spring is not allowed. In addition, following good practice must be followed: In case of crude oil, arrangement must be multiple -springs out of the product (even if this does not comply with API Std anymore). Flushing inlet port must no be toward the faces to avoid any injection of sand. Prefer a tangential inlet to centrifuge the sand.
6.1.6 Materials	
6.1.6.2 Seal faces	
6.1.6.2.3 For Category 2 and Category 3 seals, one of the rings shall be reaction-bonded silicon carbide (RBSiC). If specified, self-sintered silicon carbide (SSSiC) shall be furnished. Several grades of these materials are available; therefore, the Manufacturer shall state the type of silicon carbide offered for each service. For Category 1 seals, one of the rings shall be self-sintered silicon carbide (SSSiC). If specified, reaction-bonded silicon carbide	This paragraph is applicable.

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(RBSiC) shall be furnished. Several grades of these materials are available; therefore, the Manufacturer shall state the type of silicon carbide offered for each service. Note: See B.3 for guidance related to manufacture and use of RBSiC versus SSSiC.	
6.1.6.5 Secondary sealing components	
6.1.6.5.1 Unless otherwise, O-rings shall be fluoroelastomer (FKM). Temperature limitations for elastomers are listed in annex B.3.	(Addition) For Crude oil, nitrile is absolutely forbidden. It is recommended to use TFE sealing elements as spring energized to avoid hang-up.
6.1.6.7 Gland plates	
• 6.1.6.7.2 Unless otherwise specified, dynamic and static secondary sealing elements shall be the same material required by 6.1.6.5.1 and 6.1.6.5.2. Gland plate to seal chamber gasket shall be an O-ring for services below 175°C (350°F). For temperatures over 175°C (350°F), or if specified, graphite-filled type 304 or 316 stainless steel spiral wound gaskets shall be used. Note: Spiral wound gaskets have bolt torque requirements for full compression. Refer to 6.1.2.7 for bolting requirements for spiral wound gaskets.	This paragraph is Applicable. For services with a minimum pumping temperature below -25°C, Vendor shall demonstrate the suitability of the chosen "O" ring material.
6.1.6.10 Welding	
• 6.1.6.10.5.1 In addition to 6.1.6.10.1, if specified 100% radiography, magnetic particle examination, ultrasonic examination, or liquid penetrant examination of welds shall be performed.	This paragraph is applicable.
• 6.1.6.10.5.4 If specified, proposed connection designs shall be submitted to the purchaser for approval before fabrication. The drawings shall show weld designs, size, materials, and pre- and post-weld heat treatments.	Approval by Company of auxiliary piping design shall be as specified in the latest revision of GS EP MEC 271.
6.1.6.11 Low temperature	
• 6.1.6.11.1 For operating temperatures below -30°C (-20°F) or, if specified, for other low-ambient temperatures, steels shall have properties as described in 6.1.6.11.2 through 6.1.6.11.6.	This paragraph is applicable.

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Note: Also see B.5. which covers temperature limits for elastomers.	
6.1.6.11.6 The purchaser shall specify the minimum design metal temperature to be used to establish impact test requirements. Note: Normally, this will be the lower of the minimum surrounding ambient temperature or minimum liquid pumping temperature. However, the purchaser may specify a minimum design metal temperature based on pumpage properties, such as autorefrigeration at reduced pressures.	This paragraph is applicable. The minimum design temperature shall be the lower of the minimum ambient temperature or the minimum liquid pumping temperature including any auto-refrigeration effect.
6.2.1 Category 1 seals	
6.2.1.2 Seal chamber and gland plate (category 1)	
6.2.1.2.1 If specified, or if required by 6.1.2.14, a distributed seal flush system such as a circumferential or multi-port arrangement shall be provided for Arrangement 1 and Arrangement 2 seals with rotating flexible elements. The seal flush arrangement shall be located to maximize the uniformity and degree of cooling of the seal faces. For multi-port systems, a minimum of 3 mm (1/8 in.) diameter ports shall be used. The seal flush passages shall be designed so that they can be cleaned (see Figure 22). Note: Distributed flush systems are not specified for stationary single seals or for stationary dual seals because this becomes complex and expensive. Furthermore, stationary single seal faces are in a position in the seal chamber where effective mixing takes place and the need for distribution of the flush is diminished.	A distributed seal flush shall be supplied if one of the following conditions exists: 1) The pumped fluid has a specific gravity less than 0.7. 2) The 20°C product temperature margin required in 6.1.2.14.1 cannot be met. 3) The seal diameter is greater than 100 mm. This requirement is valid for both stationary and rotating flexible elements.
6.2.2 Category 2 seals	
6.2.2.2 Seal chamber and gland plate (category 2)	
6.2.2.2.1 If specified, or if required by 6.1.2.14, a distributed seal flush system such as a circumferential or multi-port arrangement shall be provided for Arrangement 1 and Arrangement 2 seals with rotating flexible elements. The seal flush arrangement shall be located to maximize the uniformity and degree of cooling of the seal faces. For multi-port systems, a minimum of 3 mm (1/8 in.) diameter ports shall be used. The seal flush passages shall be designed so that they can be cleaned (see Figure 22).	A distributed seal flush shall be supplied if one of the following conditions exists: 1) The pumped fluid has a specific gravity less than 0.7. 2) The 20°C product temperature margin required in 6.1.2.14.1 cannot be met. 3) The seal diameter is greater than 100 mm. This requirement is valid for both stationary and rotating flexible elements.



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Note: Distributed flush systems are not specified for stationary single seals or for stationary dual seals because this becomes complex and expensive. Furthermore, stationary single seal faces are in a position in the seal chamber where effective mixing takes place and the need for distribution of the flush is diminished.	
7. Specific seal configurations	
7.1 Arrangement 1 seals	
7.1.2 Seal chamber and gland plate	
7.1.2.2 If specified, a close-clearance (floating) carbon throttle bushing shall be furnished for Category 1 or Category 2 seals.	A close-clearance carbon (floating) throttle bushing shall be supplied for all categories 1, 2 and 3. A floating carbon throttle bushing is the most efficient seal for quench applications and in the event of an arrangement 1 (single seal) failure.
7.2.1 General	
7.2.1.2 If specified, a non-contacting inner seal (2NC-CS) shall be provided. Note: Non-contacting inner seals designs utilize a lift-off face pattern, such as grooves or waves, which can provide reliable operation in liquid or gas service. Often it is difficult to provide adequate vapor suppression margin when sealing clean high vapor pressure or mixed vapor pressure fluids with contacting wet face designs. A non-contacting inner seal can give the option of sealing a liquid/gas mixture by allowing the product to flash into a gas across the seal faces, effectively using the non-contacting design inner seal as a gas seal. The leakage rate from a non-contacting design will normally be higher than a contacting wet design.	Non-contacting inner seals shall be subject to prior written approval by Company.
7.2.1.4 The buffer fluid shall be specified on the data sheet. Note: Many existing 2CW-CS installations do not use an external buffer gas. If a buffer gas is not used, the containment seal chamber will be filled with vaporized process fluid.	If applicable the buffer fluid shall be specified by the purchaser. The Vendor shall ensure the compatibility of the "O" ring material and the pumped fluid.
7.2.2 Seal sleeves	
7.2.2.1 Where possible, seal sleeves shall be design as one piece. Cartridge designs that incorporate an auxiliary sleeve at the inboard end of the seal sleeve to facilitate the assembly of the inner seal components are acceptable. The auxiliary sleeve shall be axially located on the seal sleeve by a shoulder and driven by dog point set screws (see Figure 25).	(Addition purchaser decision) Seal sleeves that are not designed as one-piece shall be submitted to Company for approval prior to order.



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7.2.3 Seal chamber and gland plate	
• 7.2.3.1 If specified as a result of the process conditions and if additional length for the seal arrangement is available, a fixed carbon throttle bushing shall be installed in the gland plate and positively retained against pressure blowout. A throttle bushing with a dual seal is rarely required, but may be used in cold services where a quench is used to avoid icing. Note: Limited axial space between the seal chamber face and the bearing housing often makes the use of a throttle bushing with an Arrangement 2 seal impractical.	This paragraph is applicable, if pump design allows it.
7.2.4 Contacting wet seals with a liquid fluid (2CW-CW)	
• 7.2.4.2.1 If specified, or if recommended by the seal Manufacturer, a tangential buffer fluid outlet shall be provided for Category 1 and Category 2 seal assemblies. A tangential buffer fluid outlet shall be provided for Category 3 seals. Note: Using a tangential buffer fluid outlet connection will increase buffer fluid flow, if an internal pumping ring is used. However, a tangential outlet is best applied if a radial-pumping ring is used and installed in the same plane as the outlet connection.	This paragraph is applicable for category 1, 2 et 3 seals. The Vendor shall demonstrate that the containment seal chamber remains self-venting through the buffer fluid outlet.
7.3 Arrangement 3 seals	
7.3.1 General	
• 7.3.1.1 The barrier fluid shall be a liquid or gas as specified. Note 1: Gas barrier seal designs may not be appropriate for services where dissolved or suspended solids in the pumped fluid tend to adhere to the seal faces or cause hang-up. This is especially true if the process fluid is on the ID of the inner gas lubricated seal. Liquid barrier seal designs arranged such that the process fluid is on the OD of the seal faces will help to minimize solids accumulation on the faces and minimize hang-up. Note 2: While stationary, capillary action of sticky or polymerizing fluids between gas barrier lubricated faces may cause torque failure upon start-up even if the gas barrier pressure is maintained while the pump is idle.	The barrier fluid shall be specified by the purchaser. The Vendor shall ensure the compatibility of the "O" ring material and the pumped fluid. Use of gas barrier fluid will be subject to prior written approval by Company.
7.3.2 Seal sleeves	
7.3.2.1 Where possible, seal sleeves shall be design as one piece. Cartridge designs that incorporate an auxiliary sleeve at the inboard end of the seal sleeve to facilitate the	(Addition) Seal sleeves that are not designed as one-piece shall be submitted to Company for approval prior to order.

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assembly of the inner seal components are acceptable. The auxiliary sleeve shall be axially located on the seal sleeve by a shoulder and driven by dog point set screws (see Figure 25). To ensure reliable seal performance, the fit of the auxiliary sleeve and the seal sleeve should meet the requirements of clause 6. Note: Having an auxiliary sleeve at the inboard end of dual seal cartridge will permit the inner seal to be from the inboard end. It reduces the time and complexity involved in cartridge assembly. It also makes it possible for inner and outer pusher seal to be the same size.	
7.3.3 Seal chamber and gland plates	
7.3.3.1 If specified as a result of the process conditions and if additional length for the seal arrangement is available, a fixed carbon throttle bushing shall be installed in the gland plate and positively retained against pressure blow-out. The specification of a throttle bushing for a dual seal is rarely required, but may be used in services where a quench is used to avoid icing. Note: Limited axial space between the seal chamber face and the bearing housing often makes the use of a throttle bushing with an Arrangement 3 seal impractical.	This paragraph is applicable.
• 7.3.3.2 If specified, a flush connection to the process side of the seal chamber shall be provided with Arrangement 3 configurations. Some Arrangement 3 configurations may require a flush on the process fluid side of the seal chamber to isolate the process fluid from the seal parts or to assist in heat removal from the inner seal. Toxic and/or difficult-to-seal applications may utilize a flush in the seal chamber in addition to an Arrangement 3 seal.	This paragraph is applicable, if only it is ensured that the flush connection to the process side doesn't dirt the springs.
7.3.4 Contacting wet seal configuration with a liquid barrier fluid (3CW-FB, 3CW-FF, 3CW-BB)	
7.3.4.2 Standard seal types and arrangement	
• 7.3.4.2.2 If specified, a face-to-face (3CW-FF) or a back-to-back (3CW-BB) configuration may be provided (Figure 5). Note: The installed population of Arrangement 3 seals arranged in series (3CW-FB) is relatively small compared to the other configurations (3CW-FF and 3CW-BB). Both back-to-back and face-to-face	This paragraph is applicable. 3CW-FF means that the flexible elements (springs or bellows) do not rotate and are therefore less sensitive to misalignment of the rotating element.

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configurations (3CW-BB and 3CW-FF) have the potential of more compact designs and can provide higher levels of performance. Therefore, a purchaser's option for alternative Arrangement 3 configurations (3CW-FF and 3CW-BB) is provided.	
7.3.4 Contacting wet seal configuration with a liquid barrier fluid (3CW-FB, 3CW-FF, 3CW-BB)	
7.3.4.3 Seal chambers and gland plates	
7.3.4.3 If specified, or if recommended by the seal Manufacturer, a tangential barrier fluid outlet shall be provided for Category 1 and Category 2 seal assemblies. A tangential barrier fluid outlet is required for Category 3 seals. Note: Using a tangential barrier fluid outlet connection will increase barrier fluid flow if an internal pumping ring is used. However, a tangential outlet is best applied if a radial-pumping ring is used and installed in the same plane as the outlet connection.	This paragraph is applicable. The Vendor shall demonstrate that the containment seal chamber remains self-venting through the buffer fluid outlet.
7.3.5 Standard seal types and arrangement non-contacting seal configurations with a gas barrier fluid (3NC-FB, 3NC-FF, 3NC-BB)	
7.3.5.2 If specified, a face-to-face (3NC-FF) or a face-to-back (3NC-FB) configuration may be provided (Figure 6). Note 1: The majority of installations for pressurized gas lubricated non-contacting seals are used by the chemical industry. Seal Manufacturers have standard designs that can be assembled in either a face-to-face or a back-to-back arrangement. Note 2: The installed population of series configuration pressurized gas lubricated non-contacting seals (3NC-FB) is small relative to the other configurations (3NC-FF and 3NC-BB).	3NC-FF seals will be offered. Alternates with technical justification will be considered. 3NC-FF means that the flexible elements (springs or bellows) do not rotate and are therefore less sensitive to misalignment of the rotating element.
8. Accessories	
8.1 Auxiliary piping systems	
8.1.4 If specified, the arrangement of the equipment, including piping and auxiliaries, shall be developed jointly by the purchaser and the Vendor. The arrangement shall provide adequate clearance areas and safe access for operation and maintenance.	Auxiliary piping arrangement development and approval requirements of auxiliary piping design shall be as specified in GS EP MEC 271 latest revision.
8.3 Quench systems (Group II)	
If specified, or if required by the seal Manufacturer, an external quench (see Figure G.19 and Figure G.20) shall be	This paragraph is applicable.

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provided to the seal gland plate in accordance with the following: - The design shall direct the quench to the seal face and secondary seals. - Seals equipped with a water quench shall be designed to allow quench water to exit via the drain connection. Note 1: Quenching is the introduction of a medium, usually water, nitrogen, or steam, on the atmospheric side of a mechanical seal assembly. Quenching is normally applied where the material being sealed is noxious, flammable, oxidizes, polymerizes, or will crystallize when dried. A quench may also be used for heating or cooling. The gland plate is equipped with a throttle bushing to prevent moisture or steam leakage from a quenched seal from entering the bearing housing and contaminating the lubricating oil, and to maximize containment of the quench fluid. - If a steam quench is specified and if space allows, the seal gland plate shall be equipped with an anti-coking baffle. Note 2: This baffle directs the steam to the area where coke would tend to collect and routes the steam to carry material away from the seal and seal faces. By cooling the leakage on the atmospheric side of the seal faces a steam quench prevents coke formation and subsequent seal hang-up in hot [above 150°C (300°F)] services. It also keeps viscous stocks thin when the pump is not running. If stocks thicken at the faces, seals may be damaged at start-up. Condensation collecting at the seal faces may vaporize and damage the seal faces.	
8.4 Cooling-water systems (Group III)	
8.4.2 If specified, galvanized pipe shall be used.	Stainless steel shall always be used in place of galvanized pipe.
8.4.3 If specified, sight flow indicators (open or closed as specified) shall be furnished in each outlet line.	Sight flow indicators shall be supplied on each outlet line.
8.4.4 If specified, each utility such as air and inert gas supply, cooling water supply and return lines, and others as specified shall be manifold to a common connection. The manifold shall be sized to handle the maximum flow through all components which may require simultaneous use of the specified utility.	Limit of supply shall not be more than one connection for each utility.

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8.5 Accessories and auxiliary system components	
8.5.2 Flow control orifice	
8.5.2.2 Unless otherwise specified, if tubing is supplied, a blind/orifice tubing connector or connectors shall be supplied. If piping is specified, a plate orifice or orifices shall be furnished and mounted in the auxiliary piping between a pair of flanges. Orifice unions shall not be used. The following shall apply: a) All orifices shall have a minimum bore of 3 mm (1/8 in) Note: Orifice bores smaller than 3mm (1/8 in) become blocked more easily and can cause a seal failure b) Unless otherwise specified, or required by 8.1.12, orifice plates shall be fabricated from austenitic stainless steel having a tang that extends beyond the outside diameter of the flange. The tang shall be stamped with the bore diameter, line size, and plate material.	Piping instead of tubing shall be supplied.
8.5.2.4 If specified, an orifice nipple (not an orifice union) shall be furnished at the pump discharge and/or suction nozzle to restrict leakage in the event of an auxiliary system pipe or component failure.	This paragraph is applicable.
8.5.3 Seal flush coolers	
8.5.3.1.4 If specified or required by local code, the seal flush coolers shall be designed, fabricated, and inspected in accordance with ISO 15649 using piping components. Note: For the purpose of this provision, ASME B31.3 is equivalent to ISO 15649.	This paragraph is applicable only if seal flush coolers are made of single fin pipe using piping components. If not, ASME section VIII Div 1 shall be applicable.
8.5.4.2 (general) Unless otherwise specified, the barrier/buffer fluid reservoir shall be arranged as follow (see Figures G.27 and G.28).[...]	G.28 arrangement shall apply for ease of inspection and maintenance.
8.5.4.2.h) Unless otherwise specified, the reservoir shall be equipped with a pressure switch and a pressure gauge sensing the vapour space above the high liquid level (HLL) in the reservoir. - The purchaser shall specify if the switch	Pressure transmitter instead of pressure switch shall be used.



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shall alarm on an increasing (high) pressure or a decreasing (low) pressure. Note: Arrangement 2 seals equipped with a buffer fluid reservoir normally utilize a high pressure alarm indicating that the primary seal has failed. Arrangement 3 seals equipped with a barrier fluid reservoir normally utilize a low pressure alarm indicating a drop or loss of barrier fluid pressure.	
• 8.5.4.2.i) Unless otherwise specified, the reservoir shall be equipped with a low level alarm (LLA) switch. If specified, a high level alarm (HLA) switch shall be provided.	LLA transmitter instead of LLA switch shall be used.
• 8.5.4.4.1 The standard reservoir shall be in accordance with Figure G.27. If specified, the reservoir shall be in accordance with Figure G.28.	G.28 arrangement shall be preferred for ease of inspection and maintenance.
8.5.4.4.3 Unless otherwise specified a) 12 l (3gal) reservoirs shall be fabricated from DN 150 (NPS6) schedule 40 pipe; and b) 20 l (5gal) reservoirs shall be fabricated from DN 200 (NPS8) schedule 40 pipe. If the reservoir is built entirely of piping components, ISO 15649 can be applied and provides adequate design for the reservoir just as it does for the pump suction and discharge piping. It is the USER's responsibility to ensure that local codes do not require that reservoirs be built in accordance with pressure vessel code such as EN 13445 or ASME VIII, Division 1. Note: For the purpose of this provision, ASME B31.3 is equivalent to ISO 15649	(Modification, purchaser decision) ASME VIII, Division 1 shall be applied for all reservoirs.
• 8.5.4.4.9 If specified, schedule 80, austenitic stainless steel pipe in accordance with Table 4 and below shall be provided: a) 12 mm (1/2 in.) minimum, for shaft diameter 60 mm (2.5 in.) and smaller; and b) 18 mm (3/4 in.) minimum, for shaft diameter greater than 60 mm (2.5 in.), if practical.	This paragraph is applicable.
8.5.4.4.10 Unless otherwise specified, all connections to the reservoir shall be threaded	(Modification purchaser decision) All process connections on reservoir shall be flanged.
8.5.5 Barrier/Buffer fluid selection criteria	
• 8.5.5.2 If specified, the seal and/or pump	Seal and pump Vendors shall always

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Manufacturer shall review the purchaser's selection of a barrier/buffer fluid	validate purchaser's selection of a buffer/bARRIER fluid; - In term of physical characteristics (TV, viscosity, lubricity, heat resistance, etc.) of the fluid. - In term also of compatibility with all parts (o-rings and gaskets for example) in contact with the barrier fluid.
8.6 Barrier/Buffer fluid and seal flush positive circulating devices	
8.6.1 General	
If dual wet seals or a single seal with a Plan 23 are specified, a positive circulating arrangement, such as an internal circulating device, an external circulating pump, or a flow-through system from an external source, is required to ensure positive circulation of the barrier/buffer fluid or seal flush to the seal. The purchaser shall specify which type of circulating device is to be provided.	Unless otherwise specified, seal Manufacturer standard shall apply.
8.6.2 Internal circulating device	
8.6.2.1 The internal circulating device shall provide the required flowrate using the specified barrier/buffer fluid, at all operating and start-up conditions based upon the accessory components supplied and the maximum installation criteria in Figure G.29 and Figure G.30. This needs to be looked at very carefully for pump speeds of 1800 r/min or less and those equipped with variable speed drivers.	This paragraph is applicable.
8.6.2.2 For Category 3 or if specified, the seal Manufacturer shall provide the head versus flow performance curve for the internal circulating device based on actual test results.	Seal Supplier shall provide internal circulating device performance curve for all the categories.
8.6.3 External circulating pump	
8.6.3.1 If specified, or if an internal circulating device cannot be provided to meet desired flow, an external forced circulation pump will be required. Circulation pump selection shall be mutually agreed upon by the purchaser and the seal Manufacturer. Where a failure of the external circulating pump could potentially result in a failure of the	Circulation pump selection shall be agreed by Company.

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mechanical seal in the main pump, an interlock between the circulating pump and the main pump should be considered.	
8.6.4 External seal flush systems	
8.6.4.1 If an external source of seal flush fluid is specified (Figure G.11 and Figure G.18) the purchaser shall specify the fluid characteristics. The seal Manufacturer shall specify the volume, pressure, and temperature required, where these are factors.	This paragraph is applicable.
8.6.4.2 If specified, the seal and/or pump Manufacturer shall review the purchaser's selection of external flush fluid. Note: Inappropriate selection of flush fluid or excessive flush rates may affect pump performance.	This paragraph is applicable.
8.6.5 Condensate collection reservoir	
8.6.5.3 If specified, a high level switch shall be provided.	LSH transmitter shall be always specified.
8.6.5.4 If specified, a test connection shall be installed for injection of nitrogen to test containment seal and/or purge collector.	Test connection shall always be supplied.
8.6.5.8 If leakage can solidify at ambient temperatures, the collector lines shall be heat traced and insulated. If specified, the purchaser shall identify type and specification for heat tracing.	This paragraph is applicable. In case of tracing or insulation, it shall be according Project specification.
8.6.6 Barrier/buffer gas supply systems	
8.6.6.5 If specified, a high flow switch shall be provided and installed between the flow meter and the check valve (see Figure G.23 and Figure G.24).	High flow transmitter shall always be supplied to detect sudden mechanical seal leakage.
9. Instrumentation	
9.1 General	
9.1.4 Instrumentation and controls shall be designed and manufactured for use in the area classification (class, group and division or zone).	Instrumentation shall conform to project specification.
9.4 Pressure gauges	
9.4.3 If specified, oil filled gauges shall be furnished.	Pressure gauges shall always be oil filled.



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9.5 Switches	
9.5.2 Pressure switches	
9.5.2.3 If specified, pressure transmitters shall be furnished.	Pressure transmitters shall always be furnished.
9.5.3 Level switches	
9.5.3.2 If specified, level transmitters shall be furnished.	Level transmitters shall always be furnished.
9.5.4 Flow switches	
9.5.4.2 If specified, flow transmitters shall be furnished.	Flow transmitters shall always be furnished.
9.6 Level indicators	
9.6.2 If specified, an externally mounted, removable, reflex indicator shall be furnished instead of the standard weld pad design.	Level indicators shall be furnished in accordance with Project specification.
9.7 Flow indicators	
9.7.2 If specified, flow transmitters shall be furnished	Flow indicators shall be furnished in accordance with Project specification.
9.8 Relief valves	
9.8.3 If specified, thermal relief valves shall be provided for components that may be blocked in by isolation valves.	Relief valves, if any, shall be provided in accordance with Project specification.
10. Inspection, testing, and preparation for shipment	
10.1 General	
10.1.4 The purchaser shall specify the extent of his participation in the inspection and testing. Unless otherwise specified, the Vendor shall give the purchaser a minimum of 5 working days notice for all observed and witnessed tests.	This paragraph is applicable.
10.1.7 If specified, the purchaser, the Vendor, or both, shall verify compliance with this Standard, and initial and date a completed checklist. An example of an Inspector's checklist is given in Annex E.	This paragraph is always applicable.
10.2 Inspection	
10.2.2 In addition to the requirements of 6.1.6.10, the purchaser may specify the following:	Reference to ASME standards and/or project specifications shall be taken.

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a) Parts that shall be subjected to surface and subsurface examination; and b) The type of examination required, such as magnetic particle, liquid penetrant, radiographic and ultrasonic examination.	
• 10.2.3.k) If specified, the hardness of parts, welds and heat-affected zones shall be verified as being within the allowable values by testing of the parts, welds or zones. The method, extent, documentation and witnessing of the testing shall be mutually agreed upon by the purchaser and the Manufacturer	This paragraph is applicable.
10.3.1 Seal Manufacturer qualification testing	
10.3.1.1 Purpose	
• 10.3.1.1.2 If specified, optional testing shall be performed as mutually agreed upon by the seal Manufacturer and the purchaser. The purchaser has the option to specify test conditions that may be different from the standard qualification test, as applicable.	Refer to Project specifications which shall specify optional tests, if any.
10.3.5 Test of job seal by pump Manufacturer	
• 10.3.5.1 If specified, the air-tested seal shall be supplied to the pump Manufacturer with modified seal faces for operation during the pump performance test. Following the pump performance test, the job seal faces shall be installed in the seal and air tested in accordance with 10.3.4.	This paragraph is applicable if the pump test is not carried out with the process fluid.
• 10.3.5.2 If specified, the seal being supplied shall not be operated in the pump during the pump performance test in order to prevent damage. During the pump performance test, the pump shall utilize a seal supplied by the pump Manufacturer. The seal being supplied and, the seal chamber (if applicable), shall be installed after the pump performance test and air tested in accordance with 10.3.4. It shall be specified if the seal is to be shipped uninstalled.	This paragraph is applicable if the pump test is not carried out with the process fluid.
11. Data transfer	
11.1 General	
11.1.4 If specified, the mechanical seal data	This paragraph is applicable.



API	GS
requirements form (Annex J) shall be completed by the purchaser and the Vendor. The purchaser may require this information in a form similar to or other than that indicated herein, provided it includes at least the information provided in Annex J.	
ANNEXE D	
D.7 Summary	
Example 2	
c) A liquid buffer fluid and contacting containment seal (7.2.1.3)	Refer to Project specifications which shall specify the exceptions and agreements given by the purchaser prior order.
d) Flexible graphite for secondary sealing elements (4.1.3)	Seal Manufacturer shall always prove with experience the use of non common secondary sealing elements which shall be submitted to purchaser approval prior order.
g) A tangential buffer fluid outlet (7.2.4.2) and	Refer to above concern paragraph.
h) 3/4 in. buffer fluid connections if the sleeve bore is over 63.5 mm (2.5 in.), where practical	This paragraph is applicable.



Appendix 1 Mechanical Seals Data Sheet for Centrifugal & Rotary Pumps



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Appendix 1

		REQUIRED FOR: _____ SITE: _____ UNIT: _____
Category 1 & 2 Seals		JOB/PROJECT NO. _____ ITEM NO. _____
MECHANICAL SEAL DATA SHEET		REQUISITION/SPEC. NUMBER _____ / _____
FOR CENTRIFUGAL & ROTARY PUMPS		INQUIRY NUMBER _____ BY _____
API Standard 682 / ISO 21049		PURCHASE ORDER NUMBER _____ DATE _____
		REVISION NO. 0 DATE _____
		PAGE 1 OF 2
		DS EP MEC 274
1 DATA SUPPLIED: ☐ CUSTOMARY UNITS ☒ SI UNITS		HARDWARE SUPPLIED ☐ CUSTOMARY UNITS ☒ SI UNITS
2 ☐ INDICATES DATA COMPLETED BY PURCHASER		☐ BY SEAL VENDOR ☒ BY SEAL VENDOR OR PURCHASER
3 ☒ ☐ DEFAULT SELECTION		
4 SEAL SPECIFICATION - (REF 4.1, FIGURES 1 TO 6)		
5 CATEGORY ☐ SEAL CATEGORY 1 (4.1.1) ☐ SEAL CATEGORY 2 (4.1.1)		☒ SEAL CODE (ANNEX D)
6 TYPE ☒ TYPE A (3.72) ☐ TYPE B (3.73)		☐ ALTERNATIVE STATIONARY (TYPE A & B)
7 (CODE-CW) ☒ TYPE C (3.74) ☐ ALTERNATIVE ROTATING (TYPE C)		☐ SINGLE SPRING (TYPE A)
8 ARR'GT	DEFAULT CONFIGURATION	ALTERNATIVE DESIGN
9 1 (3.2)	☒ 1CW-FX	☐ 1CW-FL ☐ DIST. FLUSH
10		☐ ALTERNATIVE BUSH
11 2 (3.3)	LIQUID ☒ 2CW-CW	☐ FX ☐ DIST. FLUSH
12		☐ TANGENTIAL LBO CONN'N
13 3 (3.4)	GAS ☒ 2CW-CS	☐ 2NC-CS ☐ FX
14	LIQUID ☒ 3CW-FB	☐ 3CW-BB ☐ FX
15		☐ 3CW-FF ☐ TANG. LBO
16	GAS ☒ 3NC-BB	☐ 3NC-FF ☐ 3NC-FB
17 SLEEVE-SHAFT DRIVE	☒ SET-SCREW ONT O SHAFT	☐ ALTERNATIVE (6.1.3.13) - SPECIFY _____
18 MATERIALS (REFERENCE 6.1.6 & ANNEX B)		
19 SECONDARY SEALS ☒ FKM ☐ FFKM ☒ CARBON VS SIC ☐ SIC VS SIC ☒ UNS N10276 (TYPE B) ☐ UNS N10276 OR N06455 ☒ UNS S31600 / S31635		
20 ☒ SPIRAL-W GASKET ☐ SS-SIC ☐ RB-SIC ☐ UNS N07718 (TYPE C) ☐ UNS N10276		
21 ☒ NBR ☐ VS ☐ UNS N08020 ☐ UNS S31600		
22 ☐ OTHER: _____ ☐ OTHER: _____ ☐ OTHER: _____		
23 ☐ OTHER: _____ ☐ OTHER: _____ ☐ OTHER: _____		
24 MECHANICAL SEAL DATA		
25 ☐ SEAL VENDOR _____		
26 ☐ DATA REQUIREMENTS FORM (ANNEX J)		
27 ☐ SIZE / TYPE _____		
28 ☐ SEAL DRAWING NUMBER _____		
29 ☐ VENDOR'S SEAL CODE _____		
30 ☐ MODIFIED FACES FOR PUMP PERFORMANCE TEST		
31 ☐ ALTERNATIVE SEAL FOR PUMP PERFORMANCE TEST		
32 ☐ DYNAMIC SEALING PRESSURE RATING (3.19) _____ KpA (bar) (ga)		
33 ☐ STATIC SEALING PRESSURE RATING (3.69) _____ KpA (bar) (ga)		
34 ☐ MAXIMUM ALLOWABLE TEMPERATURE (3.40) _____ °C		
35 ☐ MINIMUM DESIGN METAL TEMPERATURE (6.1.6.11.1) _____ °C		
36 SEAL CHAMBER DATA (REFERENCE 6.1.2.4)		
37 ASME B73.1 & 2 ☒ CYLINDRICAL ☐ TAPERED ☒ ISO 13709 ☐ ISO 3069-C ☐ OTHER, SPECIFY _____		
38 ☐ BOLT-ON CHAMBER (6.1.2.5) ☐ SEAL CHAMBER FLUSH PORT REQ'D ☐ SEAL CHAMBER VENT REQ'D		
39 ☐ FLOATING THROAT BUSH ☐ FIXED THROAT BUSH ☐ CHAMBER HEATING REQ'D		
40 PUMP DATA		
41 PUMP DESIGN ☐ MANUFACTURER _____ ☐ MODEL _____ ☐ FRAME/SIZE _____ ☐ CASE MATERIAL _____		
42 PUMP OPERATING PRESSURE ☐ SUCTION PRESS. (RATED) _____ KpA (bar) (ga) ☐ DISCHARGE PRESSURE _____ KpA (bar) (ga)		
43 SEAL CHAMBER ☐ NORMAL _____ KpA (bar) (ga) ☐ MIN/MAX (3.42) _____ / _____ KpA (bar) (ga) ☐ MSSP (3.44) _____ KpA (bar) (ga)		
44 SHAFT ☐ HORIZONTAL ☐ VERTICAL ☐ DIA. _____ mm ☐ SHAFT SPEED _____ r/min		
45 SHAFT DIRECTION (FROM DRIVER): ☐ CW ☐ CCW		
46 FLUID DATA - (FOR QUENCH, BUFFER AND BARRIER FLUID DATA, SEE PAGE 2)		
47 PUMPED STREAM		
48 ☐ TYPE OR NAME _____ CONC'N _____ %		
49 ☐ DISSOLVED CONTAMINANT ☐ H ₂ S _____ ml/m ³ ☐ WET		
50 ☐ CL ₂ _____ ml/m ³ ☐ OTHER _____ @ _____ ml/m ³		
51 ☐ SOLID CONTAMINANT _____		
52 ☐ CONCENTRATION (MASS FRACTION) _____		
53 ☐ PUMPING TEMPERATURE		
54 MIN _____ °C NORMAL _____ °C MAX _____ °C		
55 ☐ RELATIVE DENSITY (TO WATER @ 25°C) AT REF. TEMP.		
56 @ NORMAL TEMP. _____ @ MAX TEMP. _____		
57 ☐ ABSOLUTE VAPOR PRESSURE AT REFERENCE TEMP.		
58 NORMAL TEMP. _____ bar MAX TEMP. _____ bar		
59 ☐ ATMOSPHERIC BOILING POINT. _____ °C		
60 ☐ VISCOSITY @ NORMAL PUMPING TEMP. _____ Pa.s		
61 ☐ FLUSH FLUID If flush fluid is pumpage, then flush fluid data is not required		
62 ☐ TYPE OR NAME _____ CONC'N _____ %		
63 ☐ SEAL VENDOR REVIEW REQUIRED		
64 ☐ FLUID TEMPERATURE		
65 MIN _____ °C NORMAL _____ °C MAX _____ °C		
66 ☐ RELATIVE DENSITY (TO WATER @ 25°C) AT REF. TEMP.		
67 @ NORMAL TEMP. _____ @ MAX TEMP. _____		
68 ☐ ABSOLUTE VAPOR PRESSURE AT REFERENCE TEMP.		
69 NORMAL TEMP. _____ bar MAX TEMP. _____ bar		
70 ☐ ATMOSPHERIC BOILING POINT. _____ °C		
71 ☐ VISCOSITY @ NORMAL PUMPING TEMP. _____ Pa.s		
72 ☐ FLOW RATE REQ'D MAX/MIN _____ / _____ l/min		
73 ☐ PRESSURE REQ'D MAX/MIN _____ / _____ bar(ga)		

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Appendix 1

		REQUIRED FOR: _____ SITE: _____ UNIT: _____	
Category 1 & 2 Seals		JOB/PROJECT NO. _____ ITEM NO. _____	
MECHANICAL SEAL DATA SHEET FOR CENTRIFUGAL & ROTARY PUMPS API Standard 682 / ISO 21049 (FLUID DATA, UTILITIES, ACCESSORIES, & INSP./TEST.)		REQUISITION/SPEC. NUMBER _____ INQUIRY NUMBER _____ BY _____ PURCHASE ORDER NUMBER _____ DATE _____ REVISION NO. 0 DATE _____ PAGE 2 OF 2	
		DS EP MEC 274	
☐ INDICATES DATA COMPLETED BY PURCHASER ☐ BY SEAL VENDOR ☒ BY SEAL VENDOR OR PURCHASER			
☒ DEFAULT SELECTION			
FLUID DATA - (QUENCH, BUFFER AND BARRIER FLUID DATA, LIQUID AND GAS)			
4 QUENCH MEDIUM (PLAN 51, 62)		☒ SUPPLY TEMPERATURE MAX/MIN _____ / _____ °C	
5 ☒ TYPE OR NAME		☐ FLOW RATE REQ'D MAX/MIN _____ / _____ l/min	
6 BUFFER / BARRIER MEDIUM		☒ RELATIVE DENSITY (TO WATER @ 25°C) AT REF. TEMP.	
7 ☒ TYPE OR NAME		@ NORMAL TEMP. _____ @ MAX TEMP. _____	
8 ☐ PURCHASER SELEC'N ☐ SEAL VENDOR SELEC'N		☒ ABSOLUTE VAPOR PRESSURE AT REFERENCE TEMP.	
9 ☐ SEAL VENDOR REVIEW ☐ PURCHASER REVIEW		NORMAL TEMP. _____ kPa MAX TEMP. _____ kPa	
10 ☐ FLOW RATE REQ'D MAX/MIN _____ / _____ l/min		☒ ATMOSPHERIC BOILING POINT (LIQUID) _____ °C	
11 ☐ COOLING/HEATING REQUIRED (+ OR -) _____ Kw		☒ VISCOSITY @ NORMAL TEMP (LIQUID) _____ Pa.s	
12 ☒ SUPPLY PRESSURE MAX/MIN _____ / _____ kPa (bar) (ga)		☒ SPECIFIC HEAT CAPACITY @ CONSTANT PRESSURE	
13 ☒ FLUID OPERATING TEMPERATURE		FOR LIQUID @ NORMAL TEMPERATURE _____ J/Kg.K	
14 MIN _____ °C NORMAL _____ °C MAX _____ °C			
SITE AND UTILITIES			
16 ☐ CONTROL VOLTAGE _____ V PHASE _____ HERTZ _____		☐ COOLING H ₂ O SUPPLY TEMP. _____ °C ☐ Cl ₂ _____ ml/m ³	
17 ☐ ELECTRICAL AREA CL _____ GR _____ DIV _____		☐ COOLING H ₂ O PRESS. NORM./DES. _____ / _____ kPa (bar) (ga)	
18 ☐ DESIGN AMBIENT MIN./MAX. _____ / _____ °C		☐ ATEX (EC DIRECTIVE 94/9/EC) GR _____ CAT. _____ T CLASS _____	
ACCESSORIES (CLAUSES 8 AND 9)			
20 GENERAL			
21 ☐ JOINT USER/VENDOR LAYOUT OF EQUIPMENT (8.1.4)			
22 ☐ PIPE TAPER THREADS (8.1.9) ☐ ISO 7 ☐ ASME B1.20.1			
23 ☐ SPECIAL REQUIREMENT FOR HAZARDOUS SERVICE			
24			
25 ☐ SPECIAL CLEANING AND DECONTAMINATION REQ'TS			
26 ☐ UTILITY MANIFOLD CONNECTIONS REQUIRED (8.4.4)			
27 ☐ TYPE AND SPEC. OF HEAT TRACING (8.5.5.8)			
28			
29 ☐ THERMAL RELIEF VALVES REQUIRED (9.8.3)			
30 COOLING SYSTEM (PLAN 21, 22, 23, 41, 53B, 53C)			
31 ☐ HEAT EXCHANGER SUPPLIER			
32 ☒ WATER COOLED ☒ AIR COOLED ☐ ISO 15649			
33 ☒ EQUIPMENT REFERENCE / CODE _____			
34 ☐ COOLING WATER LINE SUPPLIER _____			
35 ☒ TUBING ☐ GALVANISED PIPING (8.4.2)			
36 ☒ COOLING WATER FLOW RATE _____ l/min			
37 ☐ SIGHT FLOW INDICATORS (8.4.3) ☐ OPEN ☐ CLOSED			
38 PLAN 11, 12, 13, 31 AND 41 SYSTEMS			
39 ☐ CONNECTING LINES SUPPLIER _____			
40 ☐ TUBING ☐ PIPING (8.5.2.2)			
41 ☐ RESTRICTION ORIFICE NIPPLE IN FLUSH LINE (8.5.2.4)			
42 ☐ CYCLONE SEPARATOR SUPPLIER _____			
43 ☐ PLAN 32 EQUIPMENT SUPPLIER _____			
44 ☐ PLAN 32 FLOW IND'R ☐ PLAN 32 TEMPERATURE IND'R			
45 PLAN 52 AND 53 SYSTEMS			
46 ☒ STANDARD (FIG G.27) ☒ ALTERNATIVE (FIG G.28)			
47 ☐ DIMENSIONAL VARIATIONS TO STANDARD (FIG G.27)			
48			
49 ☐ DIMENSIONAL VARIATIONS TO ALTERNATIVE (FIG G.28)			
50			
51 ☒ ALTERNATIVE FABRICATION STANDARD _____			
52 ☐ PRIMARY EQUIPMENT SUPPLIER _____			
53 ☒ SUPPLIER REFERENCE/CODE _____			
54 ☐ CONNECTING LINES SUPPLIER _____			
55 ☒ TUBING ☐ SCH 80 PIPING (8.5.4.4.9)			
56 INSPECTION AND TESTING			
57 ☐ PURCHASER PARTICIPATION IN INSPECTION & TEST			
58 SPECIFY: _____			
59 ☐ INSPECTOR'S CHECK LIST (10.1.7 & ANNEX H)			
60 ☐ PURCHASER APPROVAL REQUIRED FOR WELDED			
61 CONNECTION DESIGNS (6.1.6.10.5)			
62 ☐ HARDNESS TEST (10.2.3k) REQUIRED FOR: _____			
63			
		100% INSPECTION OF ALL WELDS (6.1.6.10.5) USING:	
		☐ MAGNETIC PARTICLE ☐ LIQUID PENETRANT	
		☐ RADIOGRAPHIC ☐ ULTRASONIC	
		☐ OPTIONAL QUALIFICATION TESTING REQ'D (10.3.1.1.2)	
		☒ MOD. FACES FOR PUMP TEST (10.3.5.1), SEE PG 1, LINE 30	
		☒ ALTERNATIVE SEAL PUMP TEST (10.3.5.2), SEE PG 1, LINE 25	

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		REQUIRED FOR: SITE: UNIT:	
Category 3 Seals		JOB/PROJECT NO. ITEM NO.	
MECHANICAL SEAL DATA SHEET		REQUISITION/SPEC. NUMBER	
FOR CENTRIFUGAL & ROTARY PUMPS		INQUIRY NUMBER BY	
API Standard 682 / ISO 21049		PURCHASE ORDER NUMBER DATE	
		REVISION NO. 0 DATE	
		PAGE 1 OF 2	
		DSEP MEC 274	
1 DATA SUPPLIED: ☐ CUSTOMARY UNITS ☒ SI UNITS		HARDWARE SUPPLIED ☐ CUSTOMARY UNITS ☒ SI UNITS	
2 ☐ INDICATES DATA COMPLETED BY PURCHASER ☐ BY SEAL VENDOR ☒ BY SEAL VENDOR OR PURCHASER			
3 ☒ DEFAULT SELECTION			
SEAL SPECIFICATION - (REF 4.1, FIGURES 1 TO 6)			
5 TYPE ☒ TYPE A (3.72) ☐ TYPE B (3.73) ☐ ALTERNATIVE STATIONARY (TYPE A & B)			
6 (CODE-CW) ☒ TYPE C (3.74) ☐ ALTERNATIVE ROTATING (TYPE C) ☐ SINGLE SPRING (TYPE A)			
7 ARR'GT		FLUSH PLANS (SEE ANNEX G)	
8 1 (3.2) ☒ 1CW-FL ☐ ALTERNATIVE BUSH		☒ 01 ☐ 11 ☐ 14 ☐ 23 ☐ 32 ☐ 51 ☐ 62	
9 ☐ 02 ☐ 13 ☐ 21 ☐ 31 ☐ 41 ☐ 61 ☐ 65			
10 2 (3.3) ☐ LIQUID ☒ 2CW-CW ☐ FX		☐ 01 ☐ 13 ☐ 23 ☐ 41 ☐ 62 ☐ 75	
11 ☐ GAS ☒ 2CW-CS ☐ 2NC-CS ☐ FX		☐ 02 ☐ 14 ☐ 31 ☐ 52 ☐ 71 ☐ 76	
12 ☐ 11 ☐ 21 ☐ 32 ☐ 61 ☐ 72			
13 3 (3.4) ☐ LIQUID ☒ 3CW-FB ☐ 3CW-BB ☐ 3CW-FF ☐ FX		☐ 01 ☐ 11 ☐ 14 ☐ 53A ☐ 53C ☐ 61 ☐ 74	
14 ☐ GAS ☒ 3NC-BB ☐ 3NC-FF ☐ 3NC-FB		☐ 02 ☐ 13 ☐ 32 ☐ 53B ☐ 54 ☐ 62	
15 SLEEVE-SHAFT DRIVE ☒ SET-SCREW ONTO SHAFT ☐ ALTERNATIVE (6.1.3.13) - SPECIFY			
MATERIALS (REFERENCE 6.1.6 & ANNEX B)			
17 SECONDARY SEALS		METAL BELLOWS	
18 ☒ FKM ☐ FFKM		☐ UNS N10276 (TYPE B)	
19 ☐ SPIRAL-W GASKET		☐ UNS N07718 (TYPE C)	
20 ☐ NBR		☐ UNS N08020	
21 ☐ OTHER:		OTHER:	
SEAL FACES		SPRINGS	
☐ CARBON VS SIC		☐ UNS N10276	
☐ SIC VS SIC		OR N06455	
☐ SS-SIC ☐ RB-SIC		☐ UNS S31600	
☐ VS		☐ UNS N08020	
		OR S31635	
		☐ OTHER:	
MECHANICAL SEAL DATA			
23 ☐ SEAL VENDOR			
24 ☐ DATA REQUIREMENTS FORM (ANNEX J)			
25 ☐ SIZE / TYPE			
26 ☐ SEAL DRAWING NUMBER			
27 ☒ SEAL CODE (ANNEX D) C3			
28 ☐ VENDOR'S SEAL CODE			
29 ☐ MODIFIED FACES FOR PUMP PERFORMANCE TEST			
30 ☐ ALTERNATIVE SEAL FOR PUMP PERFORMANCE TEST			
☐ DYNAMIC SEALING PRESSURE RATING (3.19) kPa (bar) (ga)			
☐ STATIC SEALING PRESSURE RATING (3.69) kPa (bar) (ga)			
☐ MAXIMUM ALLOWABLE TEMPERATURE (3.40) °C			
☐ MINIMUM DESIGN METAL TEMPERATURE (6.1.6.11.1) °C			
☐ GENERATED HEAT @ NORM. CONDITIONS kW			
☐ HEAT SOAK @ NORMAL CONDITIONS kW			
☐ TOTAL SEAL AXIAL THRUST ON SHAFT N			
SEAL CHAMBER DATA (REFERENCE 6.1.2.4)			
32 ☒ ISO 13709 (ISO 3069-H) ☐ OTHER, SPECIFY ☐ BOLT-ON CHAMBER (6.1.2.5)			
33 ☐ SEAL CHAMBER FLUSH PORT REQ'D ☐ SEAL CHAMBER VENT REQ'D ☐ CHAMBER HEATING REQ'D			
34 ☐ FLOATING THROAT BUSH ☐ FIXED THROAT BUSH			
PUMP DATA			
36 PUMP DESIGN ☐ MANUFACTURER ☐ MODEL ☐ FRAME/SIZE ☐ CASE MATERIAL			
37 PUMP OPERATING PRESSURE ☐ SUCTION PRESS. (RATED) kPa (bar) (ga) ☐ DISCHARGE PRESSURE kPa (bar) (ga)			
38 SEAL CHAMBER ☐ NORMAL kPa (bar) (ga) ☐ MIN/MAX (3.42) / kPa (bar) (ga) ☐ MSSP (3.44) kPa (bar) (ga)			
39 SHAFT ☐ HORIZONTAL ☐ VERTICAL ☐ DIA. mm ☐ SHAFT SPEED r/min			
40 SHAFT DIRECTION (FROM DRIVER): ☐ CW ☐ CCW			
FLUID DATA - (FOR QUENCH, BUFFER AND BARRIER FLUID DATA, SEE PAGE 2)			
41 PUMPED STREAM			
43 ☐ TYPE OR NAME CONC'N %			
44 ☐ DISSOLVED CONTAMINANT ☐ H ₂ S ml/m ³ ☐ WET			
45 ☐ CL ₂ ml/m ³ ☐ OTHER @ ml/m ³			
46 ☐ SOLID CONTAMINANT			
47 ☐ CONCENTRATION (MASS FRACTION)			
48 ☐ PUMPING TEMPERATURE			
49 MIN °C NORMAL °C MAX °C			
50 ☐ RELATIVE DENSITY (TO WATER @ 25°C) AT REF. TEMP.			
51 @ NORMAL TEMP. @ MAX TEMP.			
52 ☐ ABSOLUTE VAPOR PRESSURE AT REFERENCE TEMP.			
53 NORMAL TEMP. kPa MAX TEMP. kPa			
54 ☐ ATMOSPHERIC BOILING POINT. °C			
55 ☐ VISCOSITY @ NORMAL PUMPING TEMP. Pa.s			
56 FLUSH FLUID (PLAN 32) If flush fluid is pumpage, then flush fluid data is not required			
57 ☐ TYPE OR NAME CONC'N %			
58 ☐ SEAL VENDOR REVIEW REQUIRED			
59 ☐ FLUID TEMPERATURE			
60 MIN °C NORMAL °C MAX °C			
61 ☐ RELATIVE DENSITY (TO WATER @ 25°C) AT REF. TEMP.			
62 @ NORMAL TEMP. @ MAX TEMP.			
☐ HAZARDOUS ☐ FLAMMABLE ☐			
☐ FLUID SOLID @ AMBIENT			
☐ SOLIDIFIES @ °C POUR POINT °C			
☐ PUMPED STREAM SOLIDIFIES UNDER SHEAR			
☐ PUMPED STREAM CONTAINS AGENT THAT POLYMERIZE			
SPECIFY AGENTS @ TEMP °C			
☐ PUMPED STREAM CAN PLATE OUT OR DECOMPOSE:			
SPECIFY CONDITIONS			
☐ PUMPED STREAM IS REGULATED FOR FUGITIVE OR			
OTHER EMISSION. REGULATION LEVEL m ³ /m ³			
☐ SPECIAL PUMP CLEANING PROCEDURES			
SPECIFY:			
☐ ALTERNATIVE PROCESS FLUIDS & CONCENTRATION			
(INCL. COMMISSIONING)			
☐ ABSOLUTE VAPOR PRESSURE AT REFERENCE TEMP.			
NORMAL TEMP. kPa MAX TEMP. kPa			
☐ ATMOSPHERIC BOILING POINT. °C			
☐ VISCOSITY @ NORMAL PUMPING TEMP. Pa.s			
☐ FLOW RATE REQ'D MAX/MIN / l/min			
☐ PRESSURE REQ'D MAX/MIN / bar(ga)			

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		REQUIRED FOR: _____ SITE: _____ UNIT: _____	
Category 3 Seals		JOB/PROJECT NO. _____ ITEM NO. _____	
MECHANICAL SEAL DATA SHEET		REQUISITION/SPEC. NUMBER _____ / _____	
FOR CENTRIFUGAL & ROTARY PUMPS		INQUIRY NUMBER _____ BY _____	
API Standard 682 / ISO 21049		PURCHASE ORDER NUMBER _____ DATE _____	
(FLUID DATA, UTILITIES, ACCESSORIES, & INSP./TEST.)		REVISION NO. 0 DATE _____	
		PAGE 2 OF 2	
		DS EP MEC 274	
☐ INDICATES DATA COMPLETED BY PURCHASER ☐ BY SEAL VENDOR ☒ BY SEAL VENDOR OR PURCHASER			
☒ ☐ DEFAULT SELECTION			
FLUID DATA - (QUENCH, BUFFER AND BARRIER FLUID DATA, LIQUID AND GAS)			
1 ☐ QUENCH MEDIUM (PLAN 51, 62)		☒ SUPPLY TEMPERATURE MAX/MIN _____ / _____ °C	
2 ☒ TYPE OR NAME		☐ FLOW RATE REQ'D MAX/MIN _____ / _____ l/min	
3 BUFFER / BARRIER MEDIUM LIQUID/GAS		☒ RELATIVE DENSITY (TO WATER @ 25°C) AT REF. TEMP.	
4 ☒ TYPE OR NAME		@ NORMAL TEMP. _____ @ MAX TEMP. _____	
5 ☐ PURCHASER SELEC'N ☐ SEAL VENDOR SELEC'N		☒ ABSOLUTE VAPOR PRESSURE AT REFERENCE TEMP.	
6 ☐ SEAL VENDOR REVIEW ☐ PURCHASER REVIEW		NORMAL TEMP. _____ kPa MAX TEMP. _____ kPa	
7 ☐ FLOW RATE REQ'D MAX/MIN _____ / _____ l/min		☒ ATMOSPHERIC BOILING POINT (LIQUID) _____ °C	
8 ☐ COOLING/HEATING REQUIRED (+ OR -) _____ Kw		☒ VISCOSITY @ NORMAL TEMP (LIQUID) _____ Pa.s	
9 ☒ SUPPLY PRESSURE MAX/MIN _____ / _____ kPa (bar) (ga)		☒ SPECIFIC HEAT CAPACITY @ CONSTANT PRESSURE	
10 ☒ FLUID OPERATING TEMPERATURE		FOR LIQUID @ NORMAL TEMPERATURE _____ J/Kg.K	
11 MIN _____ °C NORMAL _____ °C MAX _____ °C			
SITE AND UTILITIES			
12 ☐ CONTROL VOLTAGE _____ V PHASE _____ HERTZ _____		☐ COOLING H ₂ O SUPPLY TEMP. _____ °C ☐ Cl ₂ _____ ml/m ²	
13 ☐ ELECTRICAL AREA CL _____ GR _____ DIV _____		☐ COOLING H ₂ O PRESS. NORM./DES. _____ / _____ kPa (bar) (ga)	
14 ☐ DESIGN AMBIENT MIN./MAX. _____ / _____ °C		☐ ATEX (EC DIRECTIVE 94/9/EC) GR _____ CAT. _____ T CLASS _____	
ACCESSORIES (CLAUSE 8 AND 9)			
GENERAL		PLAN 52 AND 53 SYSTEMS CONTINUED	
15 ☐ JOINT USER/VENDOR LAYOUT OF EQUIPMENT (8.1.4)		☐ ALTERNATIVE CODE/INSPECTION - SPECIFY _____	
16 ☐ PIPE TAPER THREADS (8.1.9) ☐ ISO 7 ☐ ASME B1.20.1		☐ EQUIPMENT SUPPORT SUPPLIER	
17 ☐ SPECIAL REQUIREMENT FOR HAZARDOUS SERVICE		☒ RESERVOIR CAPACITY (8.5.4.3) _____ l	
18 ☐ SPECIAL CLEANING AND DECONTAMINATION REQ'TS		☒ NLL TO GLAND PLATE HEIGHT (8.5.4.2) _____ m	
19 ☐ UTILITY MANIFOLD CONNECTIONS REQUIRED (8.4.4)		☐ RESERVOIR MAWP (3.41) _____ kPa (bar) (ga) @ _____ °C	
20 ☐ TYPE AND SPEC. OF HEAT TRACING (8.6.5.8)		☒ SET PRESSURE RANGE, MAX/MIN _____ / _____ kPa (bar) (ga)	
21 ☐ THERMAL RELIEF VALVES REQUIRED (9.8.3)		☒ SYSTEM HOLD-UP PERIOD (PLANS 53B & 53C) _____ DAYS	
22 COOLING SYSTEM (PLAN 21, 22, 23, 41, 53B & 53C)		☐ TEMPERATURE INDICATOR (PLAN 53B & 53C)	
23 ☐ HEAT EXCHANGER SUPPLIER		PRESSURE SWITCH (8.5.4.2.h) TO ACTIVATE ON:	
24 ☒ WATER COOLED ☒ AIR COOLED ☐ ISO 15649		☒ RISING PRESSURE (ARR 2) SET @ _____ kPa (bar) (ga)	
25 ☒ EQUIPMENT REFERENCE / CODE		☒ FALLING PRESSURE (ARR 3) SET @ _____ kPa (bar) (ga)	
26 ☐ COOLING WATER LINE SUPPLIER		☒ HIGH LEVEL ALARM REQUIRED (8.5.4.2.i)	
27 ☒ TUBING ☐ GALVANISED PIPING (8.4.2)		☐ CONNECTION LINES SUPPLIER	
28 ☒ COOLING WATER FLOW RATE _____ l/min		☒ TUBING ☐ SCH 80 PIPING (8.5.4.4.9)	
29 ☐ SIGHT FLOW INDICATORS (8.4.3) ☐ OPEN ☐ CLOSED		☐ FILLING SYSTEM SUPPLIER	
30 PLAN 11, 12, 13, 31 AND 41 SYSTEMS		☐ EXTERNAL CIRCULATING PUMP (8.6.3.1)	
31 ☐ CONNECTING LINES SUPPLIER		PLAN 72 AND 74 SYSTEM	
32 ☐ TUBING ☐ PIPING (8.5.2.2)		☐ EQUIPMENT SUPPLIER	
33 ☐ RESTRICTION ORIFICE NIPPLE IN FLUSH LINE (8.5.2.4)		☐ HIGH FLOW ALARM SWITCH (8.6.6.5)	
34 ☐ CYCLONE SEPARATOR SUPPLIER		PLAN 75 AND 76 SYSTEM	
35 ☐ PLAN 32 EQUIPMENT SUPPLIER		☐ EQUIPMENT SUPPLIER	
36 ☐ PLAN 32 FLOW IND'R ☐ PLAN 32 TEMPERATURE IND'R		☐ HIGH LEVEL ALARM SWITCH FOR PLAN 75 (8.6.5.3)	
37 PLAN 52 AND 53 SYSTEMS		☐ TEST CONNECTION (8.6.5.4)	
38 ☒ STANDARD (FIG G.27) ☒ ALTERNATIVE (FIG G.28)		INSTRUMENTATION	
39 ☐ DIMENSIONAL VARIATIONS TO STANDARD (FIG G.27)		☐ USER SPECIFICATION REFERENCE FOR	
40 ☐ DIMENSIONAL VARIATIONS TO ALTERNATIVE (FIG G.28)		INSTRUMENTATION/CONTROLS	
41 ☒ ALTERNATIVE FABRICATION STANDARD		PRESSURE GAUGES (9.4):	
42 ☐ PRIMARY EQUIPMENT SUPPLIER		☐ OIL FILLED PRESSURE GAUGES (9.4.3)	
43 ☒ SUPPLIER REFERENCE/CODE		PRESSURE SWITCHES (9.5.2): ☐ TRANSMITTER (9.5.2.3)	
44 ☐ ASME CODE STAMP REQUIRED		LEVEL SWITCHES (9.5.3): ☐ TRANSMITTER (9.5.3.2)	
		☐ HYDROSTATIC ☐ CAPACITANCE ☐ ULTRASONIC	
		LEVEL INDICATORS (9.6)	
		☒ WEL PAD ☐ EXTERNAL, REMOVABLE (9.6.2)	
		FLOW INSTRUMENTS (9.7): ☐ TRANSMITTER (9.7.3)	
INSPECTION AND TESTING			
45 ☐ PURCHASER PARTICIPATION IN INSPECTION & TEST		☐ 100% INSPECTION OF ALL WELDS (6.1.6.10.5) USING:	
46 SPECIFY: _____		☐ MAGNETIC PARTICLE ☐ LIQUID PENETRANT	
47 ☐ INSPECTOR'S CHECK LIST (10.1.7 & ANNEX H)		☐ RADIOGRAPHIC ☐ ULTRASONIC	
48 ☐ PURCHASER APPROVAL REQUIRED FOR WELDED		☐ OPTIONAL QUALIFICATION TESTING REQ'D (10.3.1.1.2)	
49 CONNECTION DESIGNS (6.1.6.10.5)		☒ MOD. FACES FOR PUMP TEST (10.3.5.1), SEE PG 1, LINE 29	
50 ☐ HARDNESS TEST (10.2.3.k) REQUIRED FOR:		☒ ALTERNATIVE SEAL PUMP TEST (10.3.5.2), SEE PG 1, LINE 30	
51 _____			
52 _____			
53 _____			
54 _____			
55 _____			
56 _____			
57 _____			
58 _____			
59 _____			
60 _____			
61 _____			
62 _____			

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