

DEP SPECIFICATION

**LUBRICATION, SHAFT-SEALING AND OIL-CONTROL
SYSTEMS AND AUXILIARIES
(AMENDMENTS/SUPPLEMENTS TO ISO 10438:2007)**

DEP 31.29.60.32-Gen.

February 2017

DESIGN AND ENGINEERING PRACTICE

DEM1



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PART I INTRODUCTION

I.1 SCOPE

This DEP specifies requirements and gives recommendations for lubricating oil, seal oil and control oil supply systems and shaft sealing systems using self-acting gas seals and auxiliaries. These systems may serve compressors, fans, centrifugal pumps, steam turbines, gas turbines, expanders, gears and electric motors. This DEP does not apply to shaft sealing for centrifugal pumps.

This DEP is based on ISO 10438:2007. Part III of this DEP amends, supplements and deletes various clauses/paragraphs of ISO 10438:2007. All clauses of ISO 10438:2007 that are not modified in this DEP remain applicable as written.

API Standard 614, 5th edition, May 2008, is the same as ISO 10438:2007.

This DEP is intended to be used in conjunction with the data/requisition sheet relevant to the equipment it serves. This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual (DEM) 1 – Application of Technical Standards.

This DEP is a revision of the DEP of the same number dated February 2015; see (1.5) regarding the changes.

I.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process shall be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

I.3 DEFINITIONS

I.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

In ISO 10438, the term **Purchaser** is used. In this DEP, the term Purchaser shall be understood to mean the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

In ISO 10438, the term **Vendor** is used. In this DEP, the term Vendor shall be understood to mean the Manufacturer/Supplier.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

I.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section or clause number is shown in brackets (). Other documents referenced by this DEP are listed in (Part IV).

I.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated February 2015. The changes followed a requirements quality review and were not a full technical update. The following are the main, non-editorial changes.

PART II GENERAL

Part III of this DEP is written as amendments and supplements to Parts 1, 2, 3, and 4 of ISO 10438:2007. Wherever reference is made to ISO 10438, it shall be understood to mean ISO 10438:2007 as amended/supplemented by this DEP.

For ease of reference, the clause numbering of ISO 10438 has been used throughout Part III of this DEP.

Clauses of ISO 10438 which are not mentioned in this DEP shall remain valid as written.

This DEP shall be used in conjunction with the data/requisition sheet relevant to the equipment it serves.

The Principal shall advise whether general-purpose requirements or special-purpose requirements are to be applied to a particular piece of equipment- and indicate the same on equipment datasheets.

ISO 10438:2007 bullet decision points which are required by this DEP have been specified. Other bullet decision items are either application specific or they are not required.

With rare exception, all new centrifugal compressors/expanders are now equipped with dry gas seals. Reference to seal oil systems have now been removed from this DEP. If a new compressor/expander is required to have oil seals, or an existing seal oil system is being upgraded, refer to the DEP version dated February 2011, Amended September 2011 (DEPs v38).

PART III AMENDMENTS/SUPPLEMENTS TO ISO 10438

Part 1 General Requirements

3 Terms, abbreviated terms and definitions

3.1 Terms and definitions

Add the following new definitions:

3.1.55 toxic substances

1. Substances that produce serious harm to health as a result of a single or short-term exposure. As defined in the data/requisition sheets, the following shall be considered very toxic:
 - a. levels of H₂S exceeding 1,000 ppm mole (vol) in process streams;
 - b. other toxic substances as specified by the Principal;
 - c. “very toxic- acute”, “very toxic – chronic”, and “very toxic – environment” substances as defined in DEP 01.00.01.30-Gen.

3.1.56 essential (non–spared)

a service in which failure of equipment renders a plant inoperable or reduces performance to a level unacceptable to the Principal. See Table 3.1

3.1.57 essential (spared)

a service in which failure of equipment renders a plant inoperable or reduces performance to a level unacceptable to the Principal. See Table 3.1

3.1.58 non-essential

all services that are not essential or vital. See Table 3.1



3.1.59 vital

a service in which failure of equipment renders a plant inoperable or reduces performance.
See Table 3.1

Table 3.1 Definition of Vital, Essential and Non-Essential Services

	SAFETY EQUIPMENT	OTHER EQUIPMENT		
	SERVICE CATEGORY			
	VITAL	ESSENTIAL		NON-ESSENTIAL
		Non-spared equipment	Spared equipment	
Definition	A service in which failure of equipment causes an unsafe condition of the plant or installation resulting in jeopardy to life and/or major damage (fire, explosion, etc.).	A service in which failure of equipment renders a plant or process unit inoperable or reduces performance to a level unacceptable to the Principal.	A service in which failure of equipment renders a plant or process unit inoperable or reduces performance to a level unacceptable to the Principal.	All other services.
Examples	Firewater pumps with diesel and motor drives; Emergency Shutdown (ESD) systems; Emergency Instrument Air (EIA) compressor.	Hydrocracker (HCU) feed pump; HCU recycle compressor; Cat Cracker (FCCU) main air compressor; Forced Draft (FD) and Induced Draft (ID) fans.	Boiler Feedwater (BFW) pumps; Fractionator's bottom pumps; Fresh gas compressors (HCU).	Drinking water pumps; Sewage pumps.

4 General

4.3 System selection

4.3.1

Replace the last sentence of this clause with the following:

1. The Principal, and the Supplier shall mutually agree upon an acceptable system before the order is placed.

Add the following to this clause:

2. Lube and control oil systems shall be selected in accordance with DEP 31.29.60.33-Gen., Section 2.1.

5 Piping

5.1 General

5.1.2

Add the following to this clause:

1. Socket welded connections shall not be used in Group I and IV services.
 - a. Threaded joints may be used only for instrument connections and in tubing systems.

Replace gasket requirements in Tables 1, 2, 3, 4 with the following:

2. All flange gaskets shall be spiral wound, austenitic stainless steel windings, graphite-filled with both an external centering ring and internal centering ring.

5.1.4

Add the following to this clause:

1. Flanged connections shall terminate within the baseplate so any liquid drips are captured within the baseplate.

5.1.5

b) *Add the following to this clause:*

1. Piping shall be supported above the console deck to facilitate wash down.
2. Piping shall be routed so that it does not create tripping hazards.

d) *Add the following to this clause:*

1. Piping Vent connections shall have valves.

e) *Add the following to this clause:*

1. Piping drain connections shall have valves.

Add the following new clauses:

- f. Piping shall not have pockets, traps which might collect debris and prevent thorough flushing and drainage,
- g. Headers shall terminate with blind flanges to accommodate flushing and cleaning.
- h. Block valves shall not be installed in piping where interruption of flow will result in machine damage.

5.1.7

Replace this clause with the following:

1. Pipe bushings and unions shall not be used in piping systems.
2. The use of couplings in tubing systems should be kept to a minimum.

5.1.8

Add the following to this clause:

1. PTFE tape shall not be used as a thread sealant.

5.1.12

Add the following to this clause:

1. All compression fittings shall be of the two-ferrule design.
2. Couplings in tubing systems shall not be located close to high-temperature equipment components such as turbine casings or steam piping.

High temperature in this case is defined as the temperature at which there is a risk of ignition of the fluid which may come in contact with the hot surface in case of leakage from the coupling.

5.1.18

Add the following to this clause:

1. Stainless steel weld neck flanges, raised face, shall be used for all flanged connections in pressurized oil and gas lines.
2. Stainless steel slip-on flanges may be applied in atmospheric oil drain lines.

5.1.20

Replace this clause with the following:

1. Threaded or threaded seal welded pipe connections shall not be used for any of the following services:
 - a. steam;
 - b. oil;
 - c. gas application except air and inert gases.
2. Threaded (but not seal-welded) connections may be used for the following subject to the approval of the Principal:
 - a. downstream of instrument block valves;
 - b. for dismantling purpose

5.1.21

Add the following to this clause:

1. All valves larger than DN 50 (2 NPS) shall be flanged.
2. All control valves shall be flanged with following exception:
 - a. Control valves up to DN 25 (1 NPS) in air or inert gas service may be threaded.
3. Valves DN 100 (4 NPS) and smaller shall comply with ISO 15761.
API 602 is equivalent to ISO 15761.
4. Valves larger than DN 100 (4 NPS) shall comply with ISO 10434.
API 600 is equivalent to ISO 10434.
5. Globe valves shall comply with applicable portions of ISO 15761 or ISO 10434.
6. Soft seated and wafer type check valves shall not be used.

5.1.27

Add the following to this clause:

1. All pressure transmitter block valves shall have a test valve.

5.1.30

Delete the "If specified" from this clause:

5.1.33

Delete the "If Specified" from this clause:

Add the following new clause:

5.1.35

1. Cadmium or zinc plated studs, bolts, and nuts shall not be used.

5.2 Oil piping

5.2.1

Replace the last two sentences of this clause with the following:

1. Drain lines shall be connected individually to the return header at a 45° angle in the direction of flow at a point above the header centreline.
2. The minimum size for all drain lines shall be DN 50 (NPS 2) without a reduction in size from the machine drain connection to the return header, unless otherwise approved by the Principal.
3. Branch connections (pressure and oil return) shall be flanged at the header and at the machine.
 - a. Branch pipe shall not be directly welded to run pipe.
 - b. Tees shall be used.
4. The hydraulic design of drain lines for gears with high pitch line velocities should be reviewed by the vendor for the following:
 - a. to prevent the backing up of drained oil into other components of the machine train;
 - b. to ensure gear sump does not hold a level.

Add the following new clauses:

5.2.5

1. Main oil supply header shall have DN 20 (NPS 3/4) flanged and blinded connections in the top of the pipe just downstream of the lube oil filter and downstream of each pressure regulating valve.

5.2.6

1. A sampling connection with a needle valve shall be installed in the line downstream of the filter.
 - a. A block valve shall be installed to isolate this sampling connection.

5.3 Instrument piping and tubing

5.3.2

Add the following to this clause:

1. Instrument pressure connections to main headers shall be made with branch welding fittings (weldolets).

5.4 Process piping

Delete clause 5.4.

5.5 Intercoolers and aftercoolers

Delete clause 5.5.

6 Instrumentation, control and electrical systems

6.1 General

6.1.2

Replace this clause with the following:

1. The Supplier shall supply all on-skid instrumentation, instrument piping, and cabling including instrumentation of overhead and run-down tanks
The instrumentation include pressure and temperature indicators, pressure and level transmitters, level switches, thermocouples and/or RTDs for indication, control, alarm and/or shutdown functions as described in ISO 10438 as amended by this DEP.
2. Instruments and instrument signal lines shall be installed and lined up to a common junction box on the edge of the base plate.
3. Instrument makes and types shall be chosen from a list of acceptable instruments provided by the Principal.
4. Only the various instrument connections and level indicators, as specified in this DEP shall be required.

6.1.4

Delete clause 6.1.4

6.2 Alarm, shutdown and control systems

6.2.1 General

6.2.1.2

Replace the first sentence with the following:

1. Shutdown-sensing devices shall be provided with valving, bridging links or other approved instrumentation protocols to allow replacement with the equipment in operation.

6.3 Instrumentation

6.3.1 Instrument installation and gauge boards

6.3.1.1

Add the following to this clause:

1. For a dry gas seal system an instrument panel board shall be supplied.
The panel board can be integrated into the dry gas seal rack/module as long as sufficient space is maintained for equipment access and that instruments are mounted at a level which allows for easy reading of the indicators.

6.3.1.5

Add the following to this clause:

1. Smart transmitters with Integral Indicator shall be used (i.e., no gauges to be used).
2. Instruments with integral indicator shall be located where they are easily readable.

6.3.2 Switches

Delete clause 6.3.2

6.3.3 Transmitters

6.3.3.1

Delete the "If Specified" from this clause:

6.3.3.3

Replace this clause with the following:

1. Smart transmitters with Integral Indicator shall be used (i.e., no gauges to be used).

6.3.3.10

Add the following to this clause:

1. Transmitters shall be factory-calibrated.

6.3.4 Temperature indicators

6.3.4.2

Replace this clause with the following:

1. Temperature-sensing elements shall not be located in oil flow sight-glasses.

6.3.7 Level instruments

Add the following to this clause:

1. Displacer operated type level switches shall not be used.
2. Sensing elements shall be made of stainless steel.

6.3.9 Oil sight flow indicators

6.3.9.1

Replace this clause with the following:

1. Flow indicators shall be furnished in the atmospheric oil-drain return line from each bearing, gear, seal, and from each relief valve.
 - a. Flow indicators shall comply with ISO 10438, Part 2, 4.4.17.
2. Flow indicators shall not be installed in pressurized lines.