INTERNATIONAL STANDARD

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Petroleum, petrochemical and natural gas industries — Lubrication, shaft-sealing and control-oil systems and auxiliaries —

Part 1: General requirements

Industries du pétrole, de la pétrochimie et du gaz naturel — Systèmes de lubrification, systèmes d'étanchéité, systèmes d'huile de régulation et leurs auxiliaires —

Partie 1: Exigences générales

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10438-1 was prepared by Technical Committee ISO/TC 67, *Materials, equipment and offshore structures, for the petroleum, petrochemical and natural gas industries*, Subcommittee SC 6, *Processing equipment and systems*.

ISO 10438 consists of the following parts, under the general title *Petroleum, petrochemical and natural gas industries — Lubrication, shaft-sealing and control-oil systems and auxiliaries*:

— *Part 1: General requirements*

— *Part 2: Special-purpose oil systems*

— *Part 3: General-purpose oil systems*

— *Part 4: Self-acting gas seal support systems*

Introduction

ISO 10438 is based on API Std 614, 4th edn., April 1999, divided into four parts as follows:

— *Part 1: General requirements* (this part) is based on Chapter 1 of API Std 614;

— *Part 2: Special-purpose oil systems* is based on Chapter 2 of API Std 614;

— *Part 3: General-purpose oil systems* is based on Chapter 3 of API Std 614;

— *Part 4: Self-acting gas seal support systems* is based on Chapter 4 of API Std 614.

Users of this part of ISO 10438 should be aware that further or differing requirements may be needed for individual applications. This part of ISO 10438 is not intended to inhibit a vendor from offering, or the purchaser from accepting, alternative equipment or engineering solutions for the individual application. This may be particularly appropriate where there is innovative or developing technology. Where an alternative is offered, the vendor should identify any variations from this part of ISO 10438 and provide details.

This part of ISO 10438 requires the purchaser to specify certain details and features.

A bullet (•) at the beginning of a clause or sub-clause indicates that either a decision is required or further information is to be provided by the purchaser. This information or decision should be indicated on suitable data sheets; otherwise it should be stated in the quotation request (inquiry) or in the order.

Petroleum, petrochemical and natural gas industries — Lubrication, shaft-sealing and control-oil systems and auxiliaries —

Part 1: General requirements

1 Scope

This part of ISO 10438 specifies general requirements for lubrication, shaft-sealing systems and control-oil systems and auxiliaries for use in the petroleum, petrochemical and natural gas industries as well as in other industries by agreement. It is intended to be used in conjunction with ISO 10438-2, ISO 10438-3 and ISO 10438-4, as appropriate. ISO 10438 in its entirety specifies requirements for lubrication systems, oil-type shaft-sealing systems, self-acting gas seal systems, control-oil systems and other auxiliaries for general- and special-purpose applications. These systems can serve equipment such as compressions, gears, pumps and drivers.

None of the parts of ISO 10438 is applicable to internal combustion engines.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designations*

ISO 7005 (all parts), *Metallic flanges*

ISO 10437, *Petroleum, petrochemical and natural gas industries — Steam turbines — Special-purpose applications*

ISO 13706, *Petroleum and natural gas industries — Air-cooled heat exchangers*

ISO 16812, *Petroleum and natural gas industries — Shell-and-tube heat exchangers*

IEC 60072 (all parts), *Dimensions and output series for rotating electrical machines*

IEC 60079 (all parts), *Electrical apparatus for explosive gas atmospheres*

API RP 520, Parts I and II, *Sizing, selection and installation of pressure-relieving devices in refineries*

API Std 526, *Flanged steel pressure relief valves*

API RP 551, *Process measurement instrumentation*

API Std 611, *General-purpose steam turbines for petroleum, chemical, and gas industry services*

ASME B1.1, *Unified inch screw threads (UN and UNR thread form)*

ASME B16.11, *Forged fittings, socket-welding and threaded*

ASME Y14.2M, *Line conventions and lettering*

ASTM A 193, *Standard specification for alloy-steel and stainless steel bolting materials for high-temperature service*

ASTM A 194, *Standard specification for carbon and alloy steel nuts for bolts for high-pressure or high-temperature service, or both*

ASTM E 94, *Standard guide for radiographic examination*

ASTM E 125, *Standard reference photographs for magnetic particle indications on ferrous castings*

ASTM E 709, *Standard guide for magnetic particle examination*

NFPA 70:2002, *National electrical code*

TEMA, *Standards of the Tubular Exchanger Manufacturers Association,* 8th edn.

3 Terms, definitions and abbreviated terms

For the purposes of this document, the following terms, definitions and abbreviated terms apply.

3.1 Terms and definitions

3.1.1
alarm point
preset value of a parameter at which an alarm warns of a condition requiring corrective action

3.1.2
block-in time
period required after the driver is tripped to isolate a piece of equipment, such as a compressor, from its system and to de-pressurize it

3.1.3
booster pump
oil pump that takes suction from the discharge of another pump to provide oil at a higher pressure

3.1.4
coast-down time
period required after the driver is tripped for the equipment to come to rest

3.1.5
component
machinery and hardware item, such as reservoir, pump, cooler, filter, valve and instrument, that is part of the system

3.1.6
console
total system whose components and controls are packaged as a single unit on a continuous or joined baseplate

NOTE With a console, the purchaser needs only to make external connections.

3.1.7
continuous-flow transfer valve
valve that can simultaneously divert both inlet and outlet flows from one component to its installed spare equipment without altering the continuity of full flow through the transfer valve to the equipment

3.1.8
control oil
oil required to operate such components as relays, servomotors and power pistons on the main equipment

3.1.9
cool-off time
period during which oil has to be circulated through the equipment to prevent heat damage after the driver is tripped

3.1.10
emergency oil pump
separate oil pump that provides adequate pressure and capacity to permit safe shutdown of the equipment when the main and standby pumps are inoperable

3.1.11
equipment
main machinery served by the oil or gas system

3.1.12
gas seal module
arrangement of piping, filters and instrumentation used to control and monitor the pressure or flow of seal, buffer, or separation gas to the equipment shaft-end seals

3.1.13
gauge board
un-enclosed bracket or plate used to support and display gauges, switches and other instruments

3.1.14
general purpose
application that is usually spared or is in non-critical service

3.1.15
local
mounted on or near the equipment or console

3.1.16
main oil pump
oil pump that is normally in operation

3.1.17
maximum allowable temperature
maximum continuous temperature for which the manufacturer has designed the equipment (or any part to which the term refers) when handling the specified fluid at the specified pressure

3.1.18
maximum allowable working pressure
maximum continuous pressure for which the manufacturer has designed the console or components when handling the specified fluid at the maximum allowable temperature

3.1.19
maximum sealing pressure
highest pressure expected at the seals during any specified static or operating conditions and during start-up and shutdown

NOTE Considerations should include both relief valve settings and relief-valve accumulation pressure.

3.1.20
multiple-package arrangement
total oil supply system whose components are separated into individually packaged units

NOTE With this arrangement, the purchaser need only install the interconnections between the packages and the external connections.

3.1.21
normal flow
total amount of oil required by equipment components such as bearings, seals, couplings, and steady-state controls excluding transient flow for controls or oil by-passed directly back to the reservoir

3.1.22
normal operating point
point at which normal operation is expected and optimum efficiency is desired

NOTE This point is usually the point at which the vendor certifies that the performance is within the tolerances stated in the relevant standard.

3.1.23
normal seal gas flow
total amount of seal gas required by the equipment seals excluding transient gas flows or by-pass flows

3.1.24 device position

3.1.24.1
normally open

de-energized position of a device (e.g. automatically controlled electric switch or valve) remaining in an open position during operation unless energized

NOTE During operation of the equipment, the positions of these devices are not necessarily the same as their on-the-shelf positions.

3.1.24.2
normally closed
de-energized position of a device (e.g. automatically controlled electric switch or valve) remaining in a closed position during operation unless energized

NOTE During operation of the equipment, the positions of these devices are not necessarily the same as their on-the-shelf positions.

3.1.25
package
total system, or part of a system, whose components are mounted on a single baseplate

NOTE A package is complete in all respects, including controls and instrumentation.

3.1.26
panel
enclosure used to mount, display and protect gauges, switches and other instruments

3.1.27
piping system design code
recognized piping system design standard specified or agreed by the purchaser

EXAMPLE ASME B31.3

3.1.28
pressure design code
recognized pressure vessel design standard specified or agreed by the purchaser

EXAMPLE ASME BPVC-VIII

3.1.29
primary seal gas
dry, filtered gas supplied to the high pressure side of a self-acting gas seal

NOTE Primary seal gas is either supplied from the compressor discharge or from an external source. When supplied from an external source, it is referred to as seal buffer gas (see 3.1.32).

3.1.30
remote
located away from the equipment or the console, typically in a control house

3.1.31
seal barrier gas
clean gas supplied to the area between the seals of a dual seal arrangement at a pressure higher than the process pressure

3.1.32
seal buffer gas
clean gas supplied to the high pressure side of a seal

3.1.33
seal gas leakage
gas which flows from the high pressure side of the seal to the low pressure side of the seal

3.1.34
secondary-seal seal gas
clean purge gas supplied to the area between the seals of a tandem self-acting gas seal having an intermediate labyrinth

NOTE This gas is at a pressure lower than the process pressure.

3.1.35
self-acting gas seal system
self-acting gas seal module and all other components necessary for operation of the self-acting gas seal

3.1.36
self-acting gas seal module
arrangement of components on a skid or a rack used to support the self-acting gas seal

3.1.37
separation gas
supply of inert gas or air fed into the region between the seal and the shaft bearing

3.1.38
settling-out pressure
maximum pressure the system can reach under static conditions

3.1.39
shaft-driven pump
oil pump driven by the shaft of one of the main machines served by the oil system

3.1.40
shutdown point
preset value of a parameter at which automatic or manual shutdown of the system is required

3.1.41
special-purpose application
application for which the equipment is designed for uninterrupted, continuous operation in critical service and for which there is usually no spare equipment

3.1.42
standby pump
oil pump that is normally either stopped or running at idling speed, that is capable of either automatically or manually being immediately brought up to operating speed, and that is capable of operating continuously

3.1.43
standby service
normally idle or idling piece of equipment that is capable of immediate automatic or manual start-up and continuous operation

3.1.44
stilling tube
pipe extending into the reservoir from the connection to below pump suction loss level to prevent splashing and provide free release of foam and gas

NOTE A stilling tube is typically used for non-pressurized returns, and has an open top or vent holes to equalize to reservoir pressure.

3.1.45
unit responsibility
responsibility for coordinating the technical aspects of the equipment and all auxiliary systems included in the scope of the order

NOTE Responsibility for such factors as the power requirements, speed, rotation, general arrangement, couplings, dynamics, noise, lubrication, sealing system, material test reports, instrumentation, piping and testing of components is included.

3.1.46
vendor
agency that manufactures, sells and provides service support for the equipment

3.1.47
vent gas
seal gas leakage which is taken away by the vent system

3.1.48
vent system
arrangement of piping and valves used to take gas to a safe location

3.2 Abbreviated terms

AS air supply

DP differential pressure indicator

FAL flow alarm low

FC fail closed

FCV flow control valve

FE flow element

FG flow glass

FI flow indicator

FIC flow indicator controller

FL fail locked

FO	fail open (when labelling a valve)
FRO	flow restriction orifice
FT	flow transmitter
FY	I/P (current to pneumatic) interposing relay
LC	level controller
LG	level gauge
LIC	level indicator controller
LSH	level switch high
LSHH	level switch high high
LSL	level switch low
LSLL	level switch low low
LT	level transmitter
LV	level valve
LY	level relay
NC	normally closed
NO	normally open
NPS	nominal pipe size
PCV	pressure control valve
PDCV	pressure differential control valve
PDI	pressure differential indicator
PDS	pressure differential switch
PDSH	pressure differential switch high
PDSL	pressure differential switch low
PDSLL	pressure differential switch low low
PDT	pressure differential transmitter
PI	pressure indicator
PLV	pressure-limiting valve
PRV	pressure relief valve
PSH	pressure switch high
PSHH	pressure switch high high

PSL pressure switch low

PSLL pressure switch low low

PT pressure transmitter

S solenoid actuator

TC temperature controller

TCV temperature control valve

TI temperature indicator

TIC temperature indicator controller

TS temperature switch

TSH temperature switch high

TSL temperature switch low

VDDR vendor drawing and data requirements

4 Dimensions and units

- Drawings and maintenance dimensions shall be in SI units or United States Customary (USC) units. Use of an ISO datasheet indicates that SI units shall be used. Use of a USC datasheet indicates that USC units shall be used. Typical datasheets in both systems of units are given in Annex A.

5 System selection

5.1 Annexes in ISO 10438-2, ISO 10438-3 and ISO 10438-4 provide schemas and diagrams of typical complete lubrication, oil-type shaft-sealing, dry gas face-type shaft sealing, and control-oil systems. These schemas and diagrams illustrate the general philosophy and requirements of this part of ISO 10438 and are included to assist the purchaser in the selection of an appropriate system. The purchaser and the vendor shall agree upon a mutually acceptable system before the order is released.

- **5.2** The purchaser shall define the scope of supply, the level of quality or the brand of components, the system type, the general arrangement (including plan and elevation views of the console orientation), the space available for the console, the service (special purpose or general purpose) and other requirements. Annex B may be used to define scope of supply responsibility.

6 Basic design

6.1 Pressure design code

- The pressure design code shall be specified or agreed by the purchaser. Pressure components shall comply with the pressure design code and the supplementary requirements in this part of ISO 10438.

6.2 Design

The term “design” shall apply solely to parameters or features of the equipment supplied by the manufacturer. The term “design” should not be used in the purchaser's enquiry or specifications because it can create confusion in understanding the order.

EXAMPLES design power, design pressure, design temperature, design speed

7 Piping

7.1 General

7.1.1 The purchaser shall specify or agree the piping system design code to be used (e.g. ASME B31.3). Piping shall comply with the piping system design code so specified or agreed. Further information can be found in ISO 15649.

7.1.2 Auxiliary systems are defined as piping systems that are in the following services:

a) Group I, **Auxiliary process fluids**: (see Table 1, Column 3)

1) sealing fluid;
2) gland and flushing fluid;
3) recirculation fluid;
4) balance gas;
5) buffer gas;
6) fuel gas or oil;
7) drains and vents;
8) starting gas;
9) separation gas;

b) Group II, **Steam and air**: (see Table 1, Column 4)

1) sealing steam;
2) steam injection;
3) water injection;
4) starting air;
5) instrument and control air;
6) drains and vents;

c) Group III, **Cooling water**: (see Table 1, Column 5)

1) cooling water;
2) liquid wash;
3) drains and vents;

a) Group IV, **Lubricating, control and seal oil**: (see Table 1, Column 2)

1) lubricating oil;
2) control oil;