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Ersatz für
DIN EN ISO 10438-1:2008-07**Erdöl-, petrochemische und Erdgasindustrie –
Schmieröl-, Sperröl- und Regelölversorgungsanlagen und
Hilfsanlagen –****Teil 1: Allgemeine Anforderungen (ISO 10438-1:2007);
Englische Fassung EN ISO 10438-1:2007, mit CD-ROM**

Petroleum, petrochemical and natural gas industries –
Lubrication, shaft-sealing and control-oil systems and auxiliaries –
Part 1: General requirements (ISO 10438-1:2007);
English version EN ISO 10438-1:2007, with CD-ROM

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 (ISO 10438-1:2007);
Version anglaise EN ISO 10438-1:2007, avec CD-ROM

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Normenausschuss Erdöl- und Erdgasgewinnung (NÖG) im DIN
Normenausschuss Maschinenbau (NAM) im DIN

Nationales Vorwort

Dieses Dokument (EN ISO 10438-1:2007) wurde vom ISO/TC 67 „Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries“, Subkomitee SC 6 „Processing equipment and systems“, in Zusammenarbeit mit dem Technischen Komitee CEN/TC 12 „Materialien, Ausrüstungen und Offshore-Bauwerke für die Erdöl-, petrochemische und Erdgasindustrie“ (Sekretariat AFNOR, Frankreich) erarbeitet.

Für Deutschland hat hieran der Arbeitsausschuss NA 109-00-01 AA „Materialien, Ausrüstungen und Offshore-Bauwerke für die Erdöl-, petrochemische und Erdgasindustrie - Spiegelausschuss zu CEN/TC 12 und ISO/TC 67“ im Normenausschuss Erdöl- und Erdgasgewinnung (NÖG) des DIN Deutsches Institut für Normung e. V. mitgearbeitet.

Diese Europäische Norm enthält unter Berücksichtigung des DIN-Präsidialbeschlusses 1/2004 nur die englische Originalfassung der ISO Norm.

Diese Norm enthält neben den gesetzlichen Einheiten auch die Einheiten „°F“, „ft“, „gal (galone)“, „in (inch)“, „NPS“, „ppm“ und „psi“, die im Deutschen Normenwerk nicht zugelassen sind. Es wird ausdrücklich darauf hingewiesen, dass die Anwendung dieser Einheiten im nationalen amtlichen und geschäftlichen Verkehr aufgrund des Gesetzes über Einheiten im Messwesen nicht zulässig ist.

Umrechnung:

Nicht-SI-Einheit	SI-Einheit	Umrechnung	
°F	°C	°C	= (5/9) (°F-32)
ft	m	1 ft	= 0,3048 m
gal (galone)	l	1 gal	= 3,785 l
in (inch)	mm	1 in	= 25,4 mm
NPS	DN	1 NPS	= DN 25
ppm	mg/kg	1 ppm	= 1 mg/kg
psi (psig)	kPa	1 psi	= 6,894 757 kPa

Für die in diesem Dokument zitierten Internationalen Normen wird im Folgenden auf die entsprechenden Deutschen Normen hingewiesen:

ISO 7-1	siehe	DIN EN 10226-1
ISO 10434	siehe	DIN EN ISO 10434
ISO 13706	siehe	DIN EN ISO 13706
ISO 15761	siehe	DIN EN ISO 15761
ISO 16812	siehe	DIN EN ISO 16812

ISO 10438 *Petroleum, petrochemical and natural gas industries — Lubrication, shaft-sealing and control-oil systems and auxiliaries* besteht aus den folgenden Teilen:

- *Part 1: General requirements*
- *Part 2: Special-purpose oil systems*
- *Part 3: General-purpose oil systems*
- *Part 4: Self-acting gas seal support systems*

Änderungen

Gegenüber DIN EN ISO 10438-1:2005-07 wurden folgende Änderungen vorgenommen:

- a) zu Abschnitt 4.2 wurde eine Begriffsbestimmung zu „Design“ (de: „Auslegung“) neu eingefügt;
- b) Anhang B (informativ) berücksichtigt graphische Symbole;
- c) Anhang E (informativ) mit einer Übersicht über internationale Werkstoffspezifikationen wurde neu aufgenommen;
- d) Anhang F (informativ) mit Erläuterungen zur Befüllung von Behältern wurde neu aufgenommen;
- e) der Norm-Inhalt dieses Teils 1 wurde redaktionell neu gegliedert.

Gegenüber DIN EN ISO 10438-1:2008-07 wurde folgende Korrektur vorgenommen:

- f) das Datasheet aus dem informativen Anhang A „Datasheets“ wird auf einer extra CD-Rom zur Verfügung gestellt.

Frühere Ausgaben

DIN EN ISO 10438-1: 2005-07, 2008-07

Nationaler Anhang NA (informativ)

Literaturhinweise

DIN EN 10226-1, *Rohrgewinde für im Gewinde dichtende Verbindungen — Teil 1: Kegelige Außengewinde und zylindrische Innengewinde — Maße, Toleranzen und Bezeichnung*

DIN EN ISO 10434, *Schieber aus Stahl mit geflanschem Oberteil für die Erdöl-, petrochemische und verwandte Industrien*

DIN EN ISO 13706, *Erdöl-, petrochemische und Erdgasindustrie — Luftgekühlte Wärmeaustauscher*

DIN EN ISO 15761, *Schieber, Kugel und Rückschlagventile aus Stahl mit Nennweiten DN 100 und kleiner für die Erdöl- und Erdgasindustrie*

DIN EN ISO 16812, *Erdöl-, petrochemische und Erdgasindustrie — Rohrbündelwärmetauscher*

English Version

Petroleum, petrochemical and natural gas industries —
Lubrication, shaft-sealing and control-oil systems and auxiliaries —
Part 1: General requirements
(ISO 10438-1:2007)

Industries du pétrole, de la pétrochimie et du gaz naturel —
Systèmes de lubrification, systèmes d'étanchéité,
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Schmieröl-, Sperröl- und Regelölversorgungsanlagen und
Hilfsanlagen —
Teil 1: Allgemeine Anforderungen
(ISO 10438-1:2007)

This European Standard was approved by CEN on 14 December 2007.

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Foreword

This document (EN ISO 10438-1:2007) has been prepared by Technical Committee ISO/TC 67 "Materials, equipment and offshore structures for petroleum and natural gas industries" in collaboration with Technical Committee CEN/TC 12 "Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries", the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2008, and conflicting national standards shall be withdrawn at the latest by June 2008.

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

This document supersedes EN ISO 10438-1:2003.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of ISO 10438-1:2007 has been approved by CEN as a EN ISO 10438-1:2007 without any modification.

Introduction

This part of ISO 10438 was developed jointly with API 614, 5th edition, together with the other three parts of ISO 10438.

NOTE API 614 is equivalent to ISO 10438 (all parts).

Users of this part of ISO 10438 should be aware that further or differing requirements can 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 can 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 subclause indicates that either a decision is required or further information is to be provided by the purchaser. This information should be indicated on the datasheet(s); otherwise it should be stated in the quotation request or in the order.

In this International Standard, United States customary (USC) units are included in brackets for information.

1 Scope

This part of ISO 10438 specifies general requirements for lubrication systems, oil-type shaft-sealing systems, dry-gas face-type shaft-sealing systems and control-oil systems for general- or special-purpose applications. General-purpose applications are limited to lubrication systems. These systems can serve equipment such as compressors, gears, pumps and drivers.

This part of ISO 10438 is intended to be used in conjunction with ISO 10438-2, ISO 10438-3 or ISO 10438-4, as appropriate.

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 designation*

ISO 10434, *Bolted bonnet steel gate valves for the petroleum, petrochemical and allied industries*

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

ISO 15649, *Petroleum and natural gas industries — Piping*

ISO 15761, *Steel gate, globe and check valves for sizes DN 100 and smaller, for the petroleum and natural gas industries*

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

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

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

ANSI/API RP 551, *Process Measurement Instrumentation*

API RP 520 (all parts), *Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries*

API STD 526, *Flanged Steel Pressure Relief Valves*

API STD 611, *General-Purpose Steam Turbines for Petroleum, Chemical and Gas Industry Services*

API RP 686-96, *Machinery Installation and Installation Design*

ASME B1.1, *Unified Inch Screw Threads (UN and UNR Thread Form)*

ASME B16.5, *Pipe Flanges and Flanged Fittings: NPS 1/2 through 24*

ANSI/ASME B16.11, *Forged Fittings, Socket-Welding and Threaded*

ANSI/ASME Y14.2M, *Line Conventions and Lettering*

ASTM A193/A193M-07, *Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications*

ASTM A194/A194M-07, *Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both*

ASTM E94, *Standard Guide for Radiographic Examination*

ASTM E709, *Standard Guide for Magnetic Particle Examination*

ANSI/AWS D1.1/D1.1M, *Structural Welding Code — Steel*

ISA 18.1, *Annunciator Sequences and Specifications*

NEMA 250, *Enclosures for Electrical Equipment (1 000 Volts Maximum)*

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

3 Terms, abbreviated terms and definitions

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 depressurize 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

components

machinery and hardware items, such as reservoirs, pumps, coolers, filters, valves, and instruments, that are 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 1 With a console, the purchaser is required only to make external connections.

NOTE 2 Rundown tanks and seal-oil tanks that are separately mounted, as well as other items such as instrumentation mounted on the equipment, are not part of the console.

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

device position

3.1.10.1

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.

3.1.10.2

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.

3.1.11

double seal

seal arrangement that utilizes two seal faces in an opposed configuration, whereby sealing gas is injected between the seal faces

NOTE See tandem seal (3.1.49).

3.1.12

dry gas seal system

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

3.1.13

equipment

main machinery served by the oil or gas system

3.1.14

fail safe

system or component that causes the equipment to revert to a permanently safe condition (shutdown and/or depressurized) in the event of a component failure or failure of the energy supply to the system

3.1.15

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

3.1.16

gauge board

unenclosed bracket or plate used to support and display gauges, switches and other instruments

NOTE A gauge board is not a panel. A panel is an enclosure. Refer to 3.1.31 for the definition of a panel.

3.1.17

general-purpose

usually spared or in non-critical service

3.1.18

local

mounted on or near the equipment or console

3.1.19

mission time

duration of the mission

NOTE Mission time begins when the equipment or system is 100 % operational, i.e. equipment or system capability has returned to engineered capability, and the equipment or system is ready for service. The mission time ends when the equipment or system can no longer meet the defined mission objectives. To meet the business plan, it is necessary that the actual mission time be equal to or greater than the planned mission time.

3.1.20

main oil pump

oil pump that is normally in operation

3.1.21

maximum allowable temperature

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

3.1.22

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

3.1.23

maximum discharge pressure

〈centrifugal pump〉 maximum specified suction pressure plus the maximum differential pressure the pump with the finished impeller is able to develop when operating at rated speed with fluid of the specified normal relative density (specific gravity)

3.1.24

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.

3.1.25

multiple-package

total oil supply system whose components are separated into individually packaged units

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

3.1.26

normal flow

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

3.1.27

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.

3.1.28
observed

when the purchaser is notified of the timing of the inspection or test and the inspection or test is performed as scheduled, whether or not the purchaser or his representative is present

3.1.29
owner

final recipient of the equipment, who may delegate another agent as the purchaser of the equipment

3.1.30
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.

3.1.31
panel

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

NOTE Instruments in a panel may be open or enclosed by the panel. (See 3.1.16.)

3.1.32
pressure-limiting valve
PLV

automatic pressure-limiting device, which opens in proportion to the increase in pressure over the opening set pressure and automatically closes when the upstream pressure is reduced below the set pressure, and which is actuated by the static pressure upstream of the valve

NOTE 1 These devices are not necessarily tight shutoff when closed, i.e. they may have a small leakage flow when closed. These devices are designed for liquid service only and are normally used for limiting the discharge pressure of positive-displacement-type oil pumps and the downstream pressure of fail-open oil-pressure regulating valves when necessary.

NOTE 2 PLVs require a flowing test system in order to test. Normally, these valves are, therefore, tested in the system on which they are installed.

3.1.33
pressure safety valve
relief valve
PSV

automatic pressure-relieving device, which opens in proportion to the increase in pressure over the opening set pressure, has a rapid full opening or pop action characteristic and is actuated by the static pressure upstream of the valve

NOTE The device automatically closes when the upstream pressure is reduced below the set pressure. These devices are considered to be tight shutoff when closed and are normally used in gas, vapour or liquid service.

3.1.34
purchaser

agency that issues the order and specification to the vendor

NOTE The purchaser can be the owner of the plant in which the equipment is installed or the owner's appointed agent.

3.1.35
remote

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

3.1.36

seal buffer gas

clean gas supplied to the high-pressure side of a seal

NOTE 1 This term was originally used on oil seals and has been replaced with the term “seal gas supply” for clean gas that also serves as the sealing gas for a dry gas seal.

NOTE 2 See ISO 10438-4:2007, Figures D.1 to D.4.

3.1.37

seal gas

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

NOTE See ISO 10438-4:2007, Figures D.1 to D.4.

3.1.38

seal gas leakage

gas that flows from the high-pressure side of the seal to the low-pressure side of the seal

3.1.39

secondary seal-gas supply

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.

3.1.40

self-contained regulator

regulating valve assembly that utilizes or internally senses the controlling pressure or temperature

3.1.41

separation gas

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

3.1.42

settling-out pressure

maximum pressure the system can reach under static conditions

3.1.43

shaft-driven pump

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

3.1.44

shutdown point

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

3.1.45

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

3.1.46

standby pump

oil pump that is capable, either automatically or manually, of being immediately brought up to operating speed, and that is capable of operating continuously

3.1.47

standby service

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

3.1.48

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

NOTE 2 See ISO 10438-2:2007, Figure B.24.

3.1.49

tandem seal

seal arrangement which utilizes two seal faces oriented in the same direction, whereby the outboard seal face acts as a backup seal to the inboard or primary seal face

NOTE 1 A special arrangement of this seal incorporates an intermediate labyrinth seal to allow an inert sealing gas to be injected between the seal faces. In this arrangement, the backup or outboard seal face seals against the inert sealing gas and is not exposed to the process gas.

NOTE 2 See double seal (3.1.11).

3.1.50

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.

3.1.51

vendor

supplier

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

NOTE The vendor may be the manufacturer of the equipment or the manufacturer's agent and normally is responsible for service support.

3.1.52

vent gas

seal gas leakage that is taken away by the vent system

3.1.53

vent system

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

3.1.54

witnessed

inspection or test where the purchaser is notified of the timing of the inspection or test and a hold is placed on the inspection or test until the purchaser or his representative is in attendance

3.2 Abbreviated terms

AS air supply

BWG	Birmingham wire gauge
DN	nominal diameter
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 (when labelling a valve)
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
NDT	non-destructive testing
NO	normally open
NPS	nominal pipe size

NPT	national pipe thread (tapered)
P&ID	process (piping) and instrument drawing
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
PN	nominal pressure
PSH	pressure switch high
PSHH	pressure switch high high
PSL	pressure switch low
PSLL	pressure switch low low
PSV	pressure safety (relief) valve
PT	pressure transmitter
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
UNC	unified national coarse thread
VDDR	vendor drawing and data requirements

4 General

4.1 Dimensions and units

- Drawings and maintenance dimensions shall be in SI units or United States customary (USC) units. Use of an SI datasheet indicates that SI units shall be used. Use of an USC datasheet indicates that USC units shall be used.

NOTE Dedicated datasheets for SI units and for USC units are provided in Annex A in each of the four parts of ISO 10438.

4.2 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.

4.3 System selection

- **4.3.1** 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 schematics 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. Symbols shown on these schematics and diagrams are identified in Annex B of this part of ISO 10438. The purchaser and the vendor shall agree upon a mutually acceptable system before the order is released.
- **4.3.2** 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. Annexes C and D of this part of ISO 10438 are intended to assist in this definition.

4.4 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.

4.5 Basic design

4.5.1 Equipment shall be designed for installation in accordance with API 686.

- **4.5.2** The equipment, including all auxiliaries, shall be suitable for operation under the environmental conditions specified. These conditions shall include whether the installation is indoors (heated or unheated) or outdoors (with or without a roof), maximum and minimum temperatures, unusual humidity, and dusty or corrosive conditions.

4.5.3 The equipment, including all auxiliaries, shall be suitable for operation, using the utility stream conditions specified.

4.5.4 Spare and replacement parts shall meet all the criteria of the furnished system.

4.5.5 The vendor shall assume unit responsibility for all equipment and all auxiliary systems included in the scope of the order.

4.5.6 Where drilled check valves are provided, they shall be labelled with stainless steel tags stamped indicating that they are drilled and the size of the drilled hole.

NOTE Drilled check valves are sometimes utilized with shaft-driven pumps or atmospheric rundown tanks.

4.5.7 The purchaser and the vendor shall mutually determine the measures that shall be taken to comply with any governmental codes, regulations, ordinances or rules that are applicable to the equipment.

It is recommended that this be done as early as possible and preferably in the inquiry stage.

4.6 Welding

4.6.1 Welding of piping and pressure-containing parts, as well as any dissimilar-metal welds and weld repairs, shall be performed and inspected by operators and procedures qualified in accordance with the pressure design code or the piping system design code as appropriate.

- **4.6.2** In addition to the requirements of 4.6.1 and the applicable piping code, the purchaser may specify that additional radiography, magnetic particle inspection or liquid-penetrant inspection of specific welds on equipment and/or piping is required.

NOTE 1 ISO 15649 already includes a level of NDT inspection for piping.

NOTE 2 ISO 10438-3 systems do not require radiography of piping (see ISO 10438-3:2007, 5.1.2).

4.6.3 All welding other than that covered by the pressure design code or the piping systems design code such as welding on baseplates, non-pressure ducting, lagging and control panels shall be in accordance with a structural welding standard such as AWS D1.1, unless otherwise specified.

4.7 Statutory requirements

The purchaser and the vendor shall mutually determine the measures to be taken to comply with any governmental codes, regulations, ordinances or rules that are applicable to the equipment, its packaging and any preservatives used.

4.8 Documentation requirements

The hierarchy of documents shall be specified.

NOTE Typical documents include company and industry specifications, meeting notes and modifications to these documents.

5 Piping

5.1 General

5.1.1 Piping design and joint fabrication examination and inspection shall comply with ISO 15649.

NOTE 1 ISO 15649 includes ASME B31.3 as a normative reference, and for the purposes of this part of ISO 10438, the provisions are identical. See also CEN/TR 14549.

NOTE 2 The alphanumeric designation of size used for reference purposes for components of a pipework system, when using the DN system, comprises the letters DN followed by a dimensionless whole number that is indirectly related to the nominal physical size in millimetres. The number following the letters DN does not represent a measurable value and it is not appropriate that they be used for calculation purposes except where specified in the relevant standard.

NOTE 3 The alphanumeric designation relating to pressure used for reference purposes for components of a pipework system, when using the PN system, comprises the letters PN followed by a convenient round, dimensionless number. For further information, see ISO 7268.

NOTE 4 It is intended that all equipment of the same nominal size (DN) designated by the same PN number have the same mating dimensions appropriate to the type of end connections.

The permissible working pressure depends upon the materials, design and working temperature and shall be selected from the pressure/temperature rating tables in corresponding standards.

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

- a) Group I, Auxiliary process fluids (see Table 1):
 - 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 associated with group I systems,
 - 8) starting gas,
 - 9) separation gas,
 - 10) solvents injection;
- b) Group II, Steam and air (see Table 2):
 - 1) sealing steam,
 - 2) steam injection,
 - 3) water injection,
 - 4) starting air,
 - 5) instrument and control air,
 - 6) drains and vents associated with group II systems;
- c) Group III, Cooling water (see Table 3):
 - 1) cooling water,
 - 2) liquid wash (water based),
 - 3) drains and vents associated with group III systems;
- d) Group IV, Lubricating, control and seal oil (see Table 4):
 - 1) lubricating oil,
 - 2) control oil,