INTERNATIONAL STANDARD

ISO 15848-1

Second edition
2015-06-01

Industrial valves — Measurement, test and qualification procedures for fugitive emissions —

Part 1: Classification system and qualification procedures for type testing of valves

iTeh STANDARD PREVIEW
(standards.iteh.ai)

Robinetterie industrielle — Mesurage, essais et modes opératoires de qualification pour émissions fugitives —

Partie 1: Système de classification et modes opératoires de qualification pour les essais de type des appareils de robinetterie

ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/050e8004-1910-48a9-8a24-f31efd184072/iso-15848-1-2015

Reference number
ISO 15848-1:2015(E)

© ISO 2015

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191c-48a3-ba21-f31efd184072/iso-15848-1-2015

COPYRIGHT PROTECTED DOCUMENT

© ISO 2015

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

© ISO 2015 – All rights reserved

Contents

Page

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191e-48a3-ba21-f31efd184072/iso-15848-1-2015

© ISO 2015 – All rights reserved

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

The committee responsible for this document is ISO/TC 153, *Valves*, Subcommittee SC 1, *Design, manufacture, marking and testing*.

ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/[illegible]/iso-15848-1-2015

This second edition cancels and replaces the first edition (ISO 15848-1:2006) which has been technically revised. The main changes are the following:

— leak rate at the stem seal (Table 1) is expressed in mbar·l·s^{-1} per mm stem diameter;

— flushing method is replaced by accumulation or suck through method to measure leak rate from stem seal with Helium (Annex A);

— leakage is expressed in ppmv; leakage with methane is measured by sniffing;

— for tightness Class AH, leak rate ≤ 1,78·10^{-7} mbar·l·s^{-1}·mm^{-1} (10^{-5} mg·s^{-1}·m^{-1});

— the appropriate leak rate is given for Classes BH and CH;

— addition of Table 3 which gives tightness classes for stem (or shaft) seals with methane;

— there is no correlation intended between the tightness classes when the test fluid is helium (Classes AH, BH, CH) and when the test fluid is methane (Classes AM, BM, CM);

— modification of the number of mechanical cycles for isolating valves;

— addition of Table 4;

— addition of Figures 3, 4, and 5;

— addition of type leak (A.1.3.4, B.1.4.2, B.1.6.1);

— modification of Figure B.2;

— modification of B.1.6.1 on calibration procedures;

— deletion of Figure B.3;

 © ISO 2015 – All rights reserved

— addition of Table C.1 and modification of Table C.2.

ISO 15848 consists of the following parts, under the general title *Industrial valves — Measurement, test and qualification procedures for fugitive emissions*:

— *Part 1: Classification system and qualification procedures for type testing of valves*

— *Part 2: Production acceptance test of valves*

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191c-48a3-ba21-f31efd184072/iso-15848-1-2015

© ISO 2015 – All rights reserved

Introduction

The objective of this part of ISO 15848 is to enable classification of performance of different designs and constructions of valves to reduce fugitive emissions.

This part of ISO 15848 defines type test for evaluation and qualification of valves where fugitive emissions standards are specified.

The procedures of this part of ISO 15848 can only be used with the application of necessary precautions for testing with flammable or inert gas at temperature and under pressure.

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191c-48a3-ba21-f31efd184072/iso-15848-1-2015

© ISO 2015 – All rights reserved

Industrial valves — Measurement, test and qualification procedures for fugitive emissions —

Part 1: Classification system and qualification procedures for type testing of valves

1 Scope

This part of ISO 15848 specifies testing procedures for evaluation of external leakage of valve stem seals (or shaft) and body joints of isolating valves and control valves intended for application in volatile air pollutants and hazardous fluids. End connection joints, vacuum application, effects of corrosion, and radiation are excluded from this part of ISO 15848.

This part of ISO 15848 concerns classification system and qualification procedures for type testing of valves.

2 Normative references

iTeh STANDARD PREVIEW
(standards.iteh.ai)

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

ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191c-48a3-ba21-f31efd184072/iso-15848-1-2015

ISO 5208, *Industrial valves — Pressure testing of metallic valves*

EN 13185:2001, *Non-destructive testing — Leak testing — Tracer gas method*

3 Terms and definitions

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

3.1
body seals
any seal in pressure containing part except stem (or shaft) seals

3.2
Class
convenient round number used to designate pressure-temperature ratings

Note 1 to entry: It is designated by the word “Class” followed by the appropriate reference number from the following series: Class 125, Class 150, Class 250, Class 300, Class 600, Class 900, Class 1 500, Class 2 500.

3.3
concentration
ratio of test fluid volume to the gas mixture volume measured at the leak source(s) of the test valve

Note 1 to entry: The concentration is expressed in ppmv[1)].

1) Parts per million volume is a unit deprecated by ISO. 1 ppmv = 1 ml/m^3 = 1 cm^3/m^3.

© ISO 2015 – All rights reserved

3.4
control valve
power operated device which changes the fluid flow rate in a process control system and which consists of a valve connected to an actuator that is capable of changing the position of a closure member in the valve in response to a signal from the controlling system

3.5
fugitive emission
chemical or mixture of chemicals, in any physical form, which represents an unanticipated or spurious leak from equipment on an industrial site

3.6
leakage
loss of the test fluid through the stem (or shaft) seal or body seal(s) of a test valve under the specified test conditions and which is expressed as a concentration or a leak rate

3.7
leak rate
mass flow rate of the test fluid, expressed in $mg \cdot s^{-1}$ per millimetre of stem diameter through stem seal system or volumic flow rate of the test fluid, expressed in $mbar \cdot l \cdot s^{-1}$ per millimetre of stem diameter through stem seal system

3.8
local leakage
measurement of the test fluid leakage using a probe at the leak source point

iTeh STANDARD PREVIEW

3.9
mechanical cycle of control valves
(standards.iteh.ai)
for linear/rotary control valves, test cycles performed at 50 % of stroke/angle with an amplitude of ±10 % of full stroke/angle

ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191c-48a3-ba21-f31efd184072/iso-15848-1-2015

3.10
mechanical cycle of isolating valves
motion of a valve obturator moving from fully closed position to fully opened position, and returning to fully closed position

3.11
nominal size
DN
alphanumeric designation of size for components of a pipework system, which is used for reference purposes, comprising the letters DN followed by a dimensionless whole number which is indirectly related to physical size, in millimetres, of the bore or outside diameter of the end connections

Note 1 to entry: The nominal diameter is designated by the letters DN followed by a number from the following series: 10, 15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200, 250, 300, 350, 400, etc.

Note 2 to entry: The number following the letters DN does not represent a measurable value and should not be used for calculation purposes except where specified in the relevant standard.

Note 3 to entry: Adapted from ISO 6708:1995, definition 2.1.

3.12
nominal pressure
PN
numerical designation relating to pressure, which is a convenient rounded number for reference purposes, comprising the letters PN followed by the appropriate reference number

Note 1 to entry: All equipment of the same nominal size (DN) designated by the same PN number have compatible mating dimensions.

Note 2 to entry: The maximum allowable working pressure depends upon materials, design, and working temperatures and is selected from the pressure/temperature rating tables in the appropriate standards.

© ISO 2015 – All rights reserved

Note 3 to entry: The nominal pressure is designated by the letters PN followed by the appropriate reference number from the following series: 2,5, 6, 10, 16, 20, 25, 40, 50, etc.

Note 4 to entry: Adapted from ISO 7268:1983, definition 2.1.

3.13
isolating valve
valve intended for use principally in the closed or open position which can be power actuated or manually operated

3.14
performance class
level of the performance of a test valve

Note 1 to entry: The performance classes are defined in Clause 6.

3.15
room temperature
temperature in the range of −29 °C to +40 °C

3.16
stem
shaft
valve component extending into the valve shell to transmit the linear/rotary motion from the actuating device to the valve obturator

iTeh STANDARD PREVIEW
(standards.iteh.ai)

3.17
stem seal
shaft seal
component(s) installed around the valve stem (or shaft) to avoid leakage of internal fluids to atmosphere

ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191c-48a3-ba21-f31efd184072/iso-15848-1-2015

3.18
test pressure
pressure used for testing the valve which, unless otherwise specified, is the rated pressure specified at the test temperature and the shell material of a test valve in the relevant standards

3.19
test temperature
fluid temperature selected for the test as measured inside the test valve

Note 1 to entry: The test temperature is given in Table 5.

3.20
thermal cycle
change of the temperature from the room temperature to the specified test temperature and return to the room temperature

3.21
total leakage
collection of leakage of the test fluid at the leak source using an encapsulation method

3.22
type test
a test conducted to establish the performance class of a valve

4 Symbols and abbreviations

M_{alr} predicted maximum leakage

SSA stem (or shaft) seal adjustment

© ISO 2015 – All rights reserved

OD_{stem} stem outside diameter

RT room temperature

NOTE The abbreviation SSA corresponds to the abbreviation of "Stem Seal Adjustment".

5 Type test

5.1 Test conditions

5.1.1 Preparation of a valve to be tested

Only a fully assembled valve shall be used for the test.

A valve shall be selected from standard production at random. The valve shall have been tested and accepted in accordance with ISO 5208 or any other applicable standard and no subsequent protective coating shall have been applied.

Additional seal arrangements to allow the stem sealing system leakage measurement is permitted and shall not affect the sealing performance of the valve.

The test valve interior shall be dried and lubricants (if any) shall be removed. The valve and test equipment shall be clean and free of water, oil, and dust and the packing may be changed prior to the test. If the valve packing is changed prior to the test, it should be done under the supervision of the valve manufacturer.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

If a test valve is equipped with a manually adjustable stem (or shaft) seal(s), it shall be initially adjusted according to the manufacturer's instructions and recorded in the test report as provided in Clause 7.

ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/350e8864-191c-48a3-ba21-f31efd184072/iso-15848-1-2015

The valve manufacturer shall select the appropriate actuating device.

5.1.2 Test fluid

The test fluid shall be helium gas of 97 % minimum purity or methane of 97 % minimum purity. The same test fluid shall be used throughout the test.

5.1.3 Test temperature

Valve mechanical cycling is carried out at the room temperature or in the steps of the room temperature and the selected test temperature other than the room temperature (see 5.2.4.1).

The test temperature shall be recorded for each leakage measurement.

5.1.4 Measurement of test valve temperature

The temperature of the test valve shall be measured at three locations, as shown in Figure 1, and recorded in a test report.

a) Measurement at location 1 shall be used to determine the test temperature.

b) Measurement at location 2 is also made for information. Any use of insulation shall be detailed in the test report.

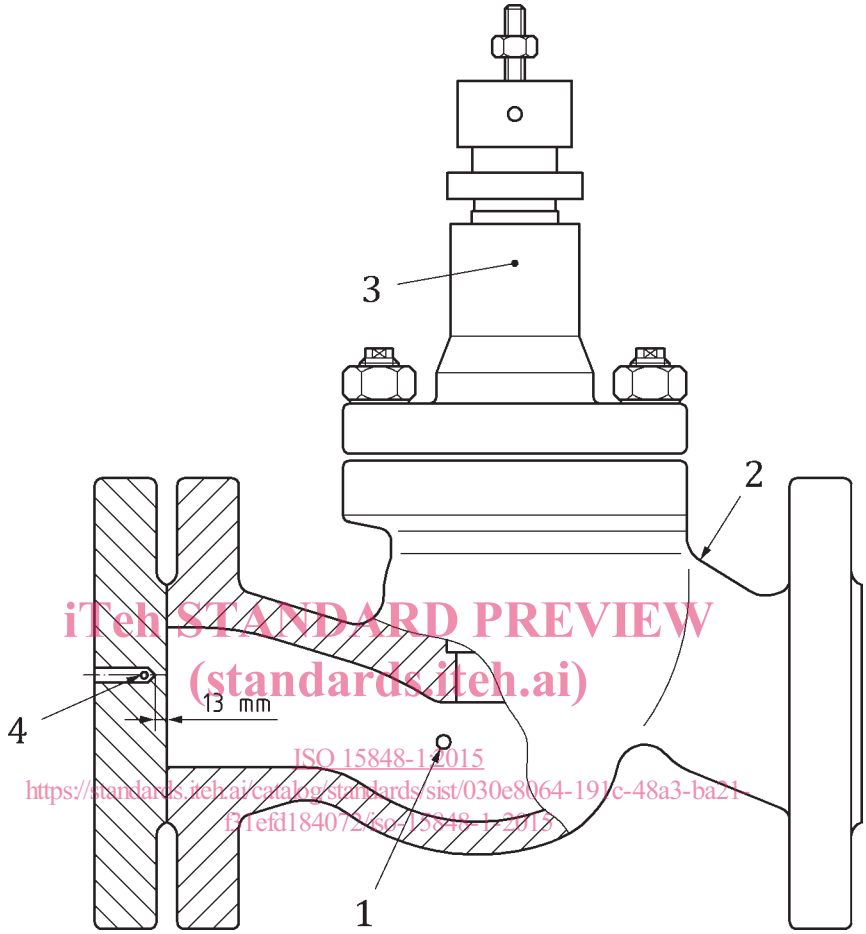
c) Measurement at location 3 is used to determine the external valve temperature adjacent to the stem (or shaft) seal(s) for information.

d) Measurement at location 4 is an option if measurement location 1 is not possible (except in the case where heating elements penetrate the blind flanges).

 © ISO 2015 – All rights reserved

All temperatures at location 1, 2, and 3 (and 4) shall be stabilized before leakage is measured (see Figures 2 and 3). Temperature at location 3 shall be stabilized for minimum 10 min prior to leakage measurement.

Check if the temperature variation is within ±5 %.



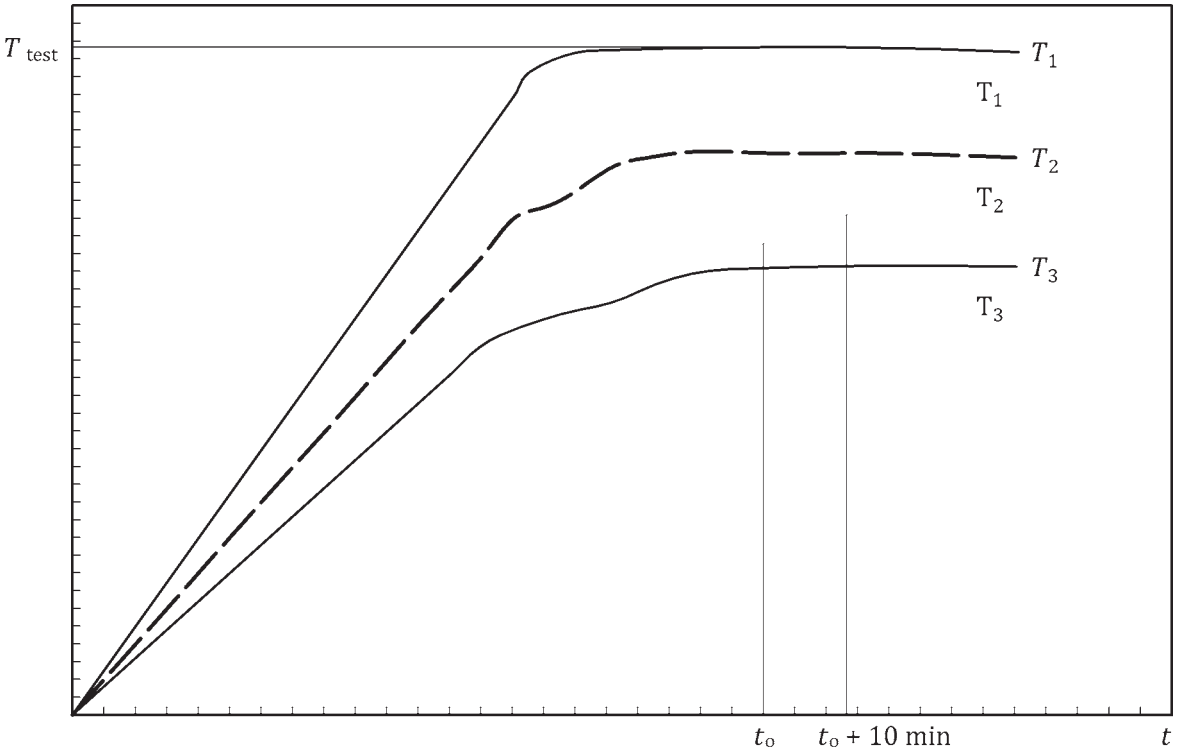
iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191c-48a3-ba21-f31efd184072/iso-15848-1-2015

Key

1 location 1: flow path (temperature T_1)
2 location 2: valve body (temperature T_2)
3 location 3: stuffing box (temperature T_3)
4 location 4: optional for flow path (temperature T_1)

Figure 1 — Measurements of temperature

© ISO 2015 – All rights reserved



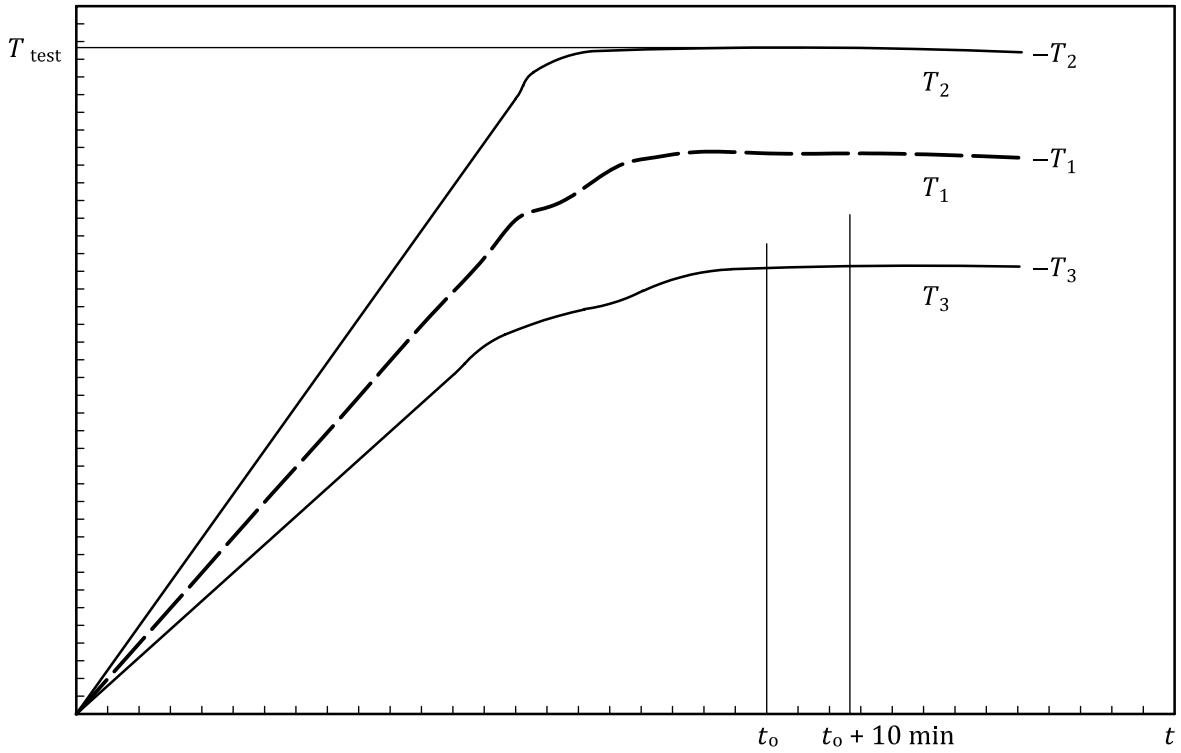
Key

T_{test}	test temperature, °C
T_1	stabilization temperature at location 1 (flow path)
T_2	stabilization temperature at location 2 (valve body)
T_3	stabilization temperature at location 3 (stuffing box)
t	time
t_0	stabilization of temperature at location 3 (stuffing box)
t_0+ 10 min	start of mechanical cycles

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191c-48a3-ba21-f31efd184072/iso-15848-1-2015

Figure 2 — Stabilization of temperatures (when the valve is internally heated or cooled)

© ISO 2015 – All rights reserved



Key

T_{test}	test temperature, °C
T_1	stabilization temperature at location 1 (flow path)
T_2	stabilization temperature at location 2 (valve body)
T_3	stabilization temperature at location 3 (stuffing box)
t	time
t_0	stabilization of temperature at location 3 (stuffing box)
t_0+ 10 min	start of mechanical cycles

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191c-48a3-ba21-f31efd184072/iso-15848-1-2015

Figure 3 — Stabilization of temperatures (when the valve is externally heated or cooled)

5.1.5 Leakage measurement

5.1.5.1 Stem (or shaft) leakage measurement

Leakage shall be measured from a test valve at rest in the partly open position.

The leakage measurement shall be performed

— by the global method (vacuum or bagging) according to the procedures described in Annex A, or

— by the local leakage measurement (sniffing) according to the procedures described in B.2.

5.1.5.2 Body seal leakage measurement

The local leakage shall be measured by sniffing method according to the procedure described in Annex B.

Evaluation of the end connections should be done to ensure that they do not affect the results of the evaluation of the body seals.

© ISO 2015 – All rights reserved

5.1.5.3 Leakage-measurement records

All results of leakage measurements shall be recorded in a test report as specified in Clause 7.

5.2 Test procedures

5.2.1 Safety rules

Testing with high pressure gas is potentially hazardous and thus all applicable local safety rules and adequate safety measures shall be followed. If methane (CH_4) is used, the combination of the test pressure and temperature shall be reviewed for possible combustion concerns.

5.2.2 Test equipment

The test equipment shall be appropriately selected to

a) apply and maintain the test pressure within a range of ±5 % of the nominal value,

b) apply valve mechanical cycles,

c) heat or cool the test valve to the selected test temperature and maintain it within a range of ±5 % but not exceeding 15 °C; no mechanical cycling is permitted during temperature change,

d) measure and record time, pressure, temperature, leakage, and duration of a valve mechanical cycle,

e) measure and record actuation forces or torques to operate a test valve, and

f) measure and record the stem sealing system loading, if applicable.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

5.2.3 Stem (or shaft) seal adjustment (SSA)

ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191c-48a3-ba21-f1efd184072/iso-15848-1-2015

5.2.3.1 Number of stem seal adjustment

Mechanical adjustments of stem (or shaft) sealing system during the type test shall be permitted only once, as shown below, for each of qualification stage done according to Figures 4, 5, and 6, if stem (or shaft) leakage has been measured in excess of the target tightness class selected from Tables 1 to 4.

The maximum retightening force (or torque) to apply shall be determined prior to the type test.

EXAMPLE

— A maximum of one adjustment is accepted for CC1 or CO1.

— A maximum of two adjustments is accepted for CC2 or CO2.

— A maximum of three adjustments is accepted for CC3 or CO3.

5.2.3.2 Test failure after stem seal adjustment

If a stem (or shaft) sealing arrangement fails to achieve the target tightness class, or it is not possible to continue mechanical cycling, the test shall be considered terminated, and the test valve shall be evaluated for qualification of lower tightness and endurance classes, if applicable.

5.2.3.3 Reporting the number of SSA

The total number of stem (or shaft) seal adjustment shall be recorded in the test report and indicated in the designation of the valve classification as “SSA-1”, “SSA-2”, and “SSA-3”.

 © ISO 2015 – All rights reserved

5.2.4 Test description

5.2.4.1 General

The test description is the following:

a) The test valve shall be mounted on a test rig, according to the instructions given by the manufacturer.

b) The valve mounting shall be principally made with a stem (or shaft) positioned vertical. A valve intended for use in other positions shall be mounted with the stem (or shaft) positioned horizontally.

c) All sealing systems shall have been properly adjusted beforehand, according to the manufacturer's instructions. For valves using packings as a stem seal, the tightening torque of the gland boltings shall be measured and recorded at the beginning of the test and after any stem seal adjustment.

d) The target number and combination of mechanical and thermal cycles shall be selected from the endurance classes specified in Figures 4, 5, and 6.

e) Leakage from the stem (or shaft) seal and from the body seals shall be separately measured. If the valve does not allow such a separate measurement, the total leakage of both stem (or shaft) and body seals shall be measured at the same time according to Annex A and Annex B respectively.

f) Actual methods of mechanical cycles other than those specified in 5.2.4.2 and 5.2.4.3 shall be in accordance with the manufacturer's instructions, and opening, closing, and dwelling time shall be recorded in the test report. Basically, they shall represent the intended operating conditions of a test valve.

iTeh STANDARD PREVIEW

g) Valve opening and closing force (or torque) shall be measured and recorded at the start and at the end of the test, following subsequent stem seal adjustments if applicable.

(standards.iteh.ai)

5.2.4.2 Mechanical cycles of isolating valves

ISO 15848-1:2015
https://standards.iteh.ai/catalog/standards/sist/030e8064-191c-48a3-ba21-f31ef1184072/iso-15848-1-2015

Unless otherwise specified by the valve manufacturer, the valve seating force (or torque) required for tightness under a differential pressure of 0,6 MPa (6 bar), air or inert gas shall be used as the minimum force (or torque) for mechanical cycle of a test valve.

Fully back seating a test valve is not required.

5.2.4.3 Mechanical cycles of control valves

The stem motion of linear action valves shall be between 1 mm/s and 5 mm/s. The shaft motion of rotary control valves shall be between 1°/s and 5°/s.

The actuator to operate a test valve shall withstand only the pressure and friction force (or torque) acting on the valve stem, and these values shall be recorded.

NOTE Measurement of friction force (or torque) is principally intended to check the packing friction usually expressed as the dead band.

5.2.4.4 Preliminary tests at the room temperature (test 1)

The tests are carried out as shown below.

a) Pressurize a test valve with the test fluid to the test pressure as specified in a relevant standard.

b) After the test pressure has been stabilized, measure leakages both from the stem (or shaft) seal and from the body seals, in accordance with Annexes A and B, respectively.

c) Record the test result in a test report.

© ISO 2015 – All rights reserved