

Fire Test for Soft-seated Quarter-turn Valves

ANSI/API Standard 607
Fifth Edition, June 2005

**ISO 10497-5:2004 (Identical), Testing of valves—
Fire type-testing requirements**



API

American Petroleum Institute

Copyright American Petroleum Institute
Reproduced by IHS under license with API
No reproduction or networking permitted without license from IHS

Special Notes

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be utilized. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

All rights reserved. No part of this work may be reproduced, stored in a retrieval system, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher. Contact the Publisher, API Publishing Services, 1220 L Street, N.W., Washington, D.C. 20005.

Copyright © 2005 American Petroleum Institute

API Foreword

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API standard. Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually and updated quarterly by API, 1220 L Street, N.W., Washington, D.C. 20005.

Suggested revisions are invited and should be submitted to the Standards and Publications Department, API, 1220 L Street, NW, Washington, DC 20005, standards@api.org.

Contents

	Page
API Foreword	ii
Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Test conditions	2
4.1 Direction and conditions for valves to be tested	2
4.2 Pressure relief provision	2
5 Fire test method	3
5.1 General warning	3
5.2 Principle	3
5.3 Apparatus	3
5.3.1 General	3
5.3.2 Specific apparatus	4
5.4 Test fluid	4
5.5 Test fuel	4
5.6 Procedure	4
6 Performance	10
6.1 General	10
6.2 Through-seat leakage during burn period	10
6.3 External leakage during burn and cool-down periods	10
6.4 Low pressure test through-seat leakage after cool-down	10
6.5 Operability	11
6.6 External leakage following operational test	11
6.7 Test report.....	11
7 Qualification of other valves by representative size, pressure rating and materials of construction	12
7.1 General	12
7.2 Materials of construction	13
7.3 Qualification of valves by nominal size	13
7.4 Qualification of valves by pressure rating	14
7.5 Special marking	15
Bibliography	16

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 10497 was prepared by Technical Committee ISO/TC 153, *Valves*, Subcommittee SC 1, *Design, manufacture, marking and testing*.

This second edition cancels and replaces the first edition (ISO 10497:1992), which has been technically revised.

Introduction

This International Standard covers the requirements and method for evaluating the performance of valves when they are exposed to defined fire conditions. The performance requirements establish limits of acceptability of a valve, regardless of size or pressure rating. The burn period has been established to represent the maximum time required to extinguish most fires. Fires of longer duration are considered to be of major magnitude with consequences greater than those anticipated in the test.

The test pressure during the burn is set at 0,2 MPa (2 bar) for soft-seated valves rated PN 16, PN 25 and PN 40, Class 150 and Class 300, to better simulate the conditions that would be expected in a process plant when a fire is detected and pumps are shut down. In this case, the source of pressure in the system is the hydrostatic head resulting from liquid levels in towers and vessels. This situation is approximated by this lower test pressure.

In production facilities, valves are typically of a higher rating and the pressure source is not easily reduced when a fire is detected. Therefore, for all other valves, the test pressure during the burn is set at a higher value to better simulate the expected service conditions in these facilities.

Use of this International Standard assumes that the execution of its provisions is entrusted to appropriately qualified and experienced personnel, because it calls for procedures that may be injurious to health if adequate precautions are not taken. This International Standard refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage of the procedure.

Testing of valves — Fire type-testing requirements

1 Scope

This International Standard specifies fire type-testing requirements and a fire type-test method for confirming the pressure-containing capability of a valve under pressure during and after the fire test. It does not cover the testing requirements for valve actuators other than manually operated gear boxes or similar mechanisms when these form part of the normal valve assembly. Other types of valve actuators (e.g. electrical, pneumatic or hydraulic) may need special protection to operate in the environment considered in this valve test, and the fire testing of such actuators is outside the scope of this International Standard.

NOTE For the purposes of this International Standard, the terms “fire type-test” and “fire test” are synonymous.

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*

IEC 60584-2, *Thermocouples — Part 2: Tolerances*

3 Terms and definitions

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

3.1

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 the physical size, in millimetres, of the bore or outside diameter of the end connections

[ISO 6708:1995, definition 2.1]

3.2

nominal pressure

PN

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

NOTE 1 It is intended that all equipment of the same nominal size (DN) designated by the same PN number have compatible mating dimensions.

NOTE 2 The maximum allowable working pressure depends on materials, design and working temperatures, and is to be selected from the tables of pressure/temperature ratings given in the appropriate standards.

NOTE 3 Adapted from ISO 7268:1983, Clause 2.

3.3**NPS**

alphanumeric designation of size for components of a pipework system, which is used for reference purposes, and which comprises the letters NPS followed by a dimensionless number indirectly related to the physical size of the bore or outside diameter of the end connections

NOTE The number following the letters NPS does not represent a measurable value and is not intended to be used for calculation purposes except where specified in the relevant standard.

3.4**Class**

alphanumeric designation used for reference purposes related to a combination of mechanical and dimensional characteristics of a component of a pipework system, which comprises the word "Class" followed by a dimensionless whole number

NOTE The number following the word Class does not represent a measurable value and is not intended to be used for calculation purposes except where specified in the relevant standard.

3.5**symmetric seated valve**

valve with an internal construction which has a plane of symmetry perpendicular to the axis of the body ends

NOTE This is a valve where both seat sealing elements are identical.

3.6**asymmetric seated valve**

valve with an internal construction which has no plane of symmetry perpendicular to the axis of the body ends

NOTE This is a valve with a single seat offset from the shaft centreline.

4 Test conditions**4.1 Direction and conditions for valves to be tested**

4.1.1 Symmetric seated valves intended by the manufacturer for bi-directional installation shall be tested in one direction only.

4.1.2 Asymmetric seated valves intended by the manufacturer for bi-directional installation shall be tested by carrying out the burn test procedure twice, once in each direction of the potential installation.

The same valve may be refurbished and re-tested, or another, identical, valve may be tested in the other direction.

4.1.3 Valves intended solely for unidirectional installation shall be clearly and permanently marked as such and shall be tested in the stated direction of installation.

4.1.4 If the valve being tested is fitted with a gearbox or other such manual device, then only that particular assembly shall qualify. If a valve can be supplied with or without a gearbox, testing with a gearbox fitted shall qualify valves without a gearbox but not the converse.

4.1.5 Valves (and gearboxes) shall not be protected with insulation material of any form during testing, except where such protection is part of the design of the component(s).

4.2 Pressure relief provision

If the valve under test incorporates a pressure relief device as part of its standard design and if this device activates during the fire test, then the test shall be continued and any leakage to atmosphere from the device shall be measured and counted as external leakage. If the design is such that the device vents to the

downstream side of the valve, then any leakage shall be counted as through-seat leakage (see 5.6.11 and 5.6.13).

However, the test shall be stopped if the system pressure relief device described in 5.3.2.8 activates.

5 Fire test method

5.1 General warning

Fire testing of valves is potentially hazardous and it is essential that the safety of personnel be given prime consideration. Given the nature of the fire test and the possibility of weaknesses in the design of the test valve and test equipment, hazardous rupture of the pressure boundary could occur. Adequate shields in the area of the test enclosure and other appropriate means for the protection of personnel are necessary.

5.2 Principle

A closed valve completely filled with water under pressure is completely enveloped in flames with an environmental temperature in the region of the valve of 750 °C to 1 000 °C for a period of 30 min. The objective is to completely envelop the valve in flames to assure that the seat and sealing areas are exposed to the high burn temperature. The intensity of the heat input shall be monitored using thermocouples and calorimeter cubes as specified in 5.6.7 and 5.6.8. During this period the internal and external leakage is recorded. After cool-down from the fire test, the valve is hydrostatically tested to assess the pressure-containing capability of the valve shell, seats and seals.

5.3 Apparatus

5.3.1 General

The test equipment shall not subject the valve to externally applied stress affecting the results of the test.

Schematic diagrams of recommended systems for fire type-testing of valves are given in Figure 1.

Potential pipework-to-valve end connection joint leakage is not evaluated as part of the test and is not included in the allowable external leakage (see 6.3 and 6.6). For the purposes of this test, it may be necessary to modify these joints to eliminate leakage.

The test equipment shall be designed so that if the nominal diameter of the pipework situated immediately upstream of the test valve is larger than DN 25 or one-half the DN of the test valve, the pipework shall be enveloped in flames for a minimum distance of 150 mm from the test valve. The diameter of the upstream pipework shall be sufficient to deliver a flow rate in excess of the maximum allowable leak rate for the size of valve being tested.

The pipework downstream of the test valve shall be at least DN 15 and shall be inclined so that the downstream side is fully drained.

The flame source shall be at least 150 mm minimum away from the valve or any calorimeters, and should have sufficient capacity to completely envelop the valve in flames.

The enclosure containing the valve shall provide a horizontal clearance of a minimum of 150 mm between any part of the test valve and the enclosure, and the height of the enclosure above the top of the test valve shall be a minimum of 150 mm.

5.3.2 Specific apparatus

5.3.2.1 Vapour trap to minimise the cooling effect of the upstream liquid. See Figure 1, (8).

5.3.2.2 Industrial pressure measurement devices having a full-scale reading of between 1,5 and 4 times the pressure being measured. The accuracy of each test device used at any point on the scale shall be within 3 % of its maximum scale value for readings taken both up and down the scale with either increasing or decreasing pressure. See Figure 1, (7), (14).

5.3.2.3 Calorimeter cubes made of carbon steel in accordance with the design and dimensions shown in Figure 2, with a thermocouple of the accuracy specified in 5.3.2.4, located in the centre of each cube. Calorimeter cubes shall be scale-free before exposure to the fire environment.

5.3.2.4 Flame environment and valve body thermocouples of an accuracy at least equal to tolerance class 2 for type B or tolerance class 3 for other types as specified in IEC 60584-2. See Figure 1, (13).

5.3.2.5 Containers of a size suitable for collecting the water leaked from the valve under test. See Figure 1, (18).

5.3.2.6 Calibrated sight gauge or device for measuring the water used during the test. See Figure 1, (4).

5.3.2.7 Calibrated device for measuring the leakage water collected during the test.

5.3.2.8 Pressure relief provision, incorporated in the system, consisting of a **pressure relief valve** to relieve the test valve centre cavity pressure to the atmosphere, to protect against potential rupture of the valve if it is designed such that liquid can be trapped in the cavity. See Figure 1, (14).

The pressure relief valve setting shall be

- either that determined by the valve manufacturer from data obtained by hydrostatic pressure testing of valves of the same size and type as the fire-tested valve, or
- when pressure test data is not available, a setting not greater than 1,5 times the maximum permissible working pressure at 20 °C.

5.4 Test fluid

The test fluid used shall be water.

5.5 Test fuel

The test fuel shall be gaseous.

5.6 Procedure

NOTE The numbered items in parentheses refer to the apparatus of Figure 1.

5.6.1 Mount the test valve in the test apparatus so that the stem and bore of the valve are in the horizontal position. Mount a valve that operates in only one direction (unidirectional) in their normal operating position.

Locate the flame environment, body thermocouples and calorimeter cubes in the positions shown in Figures 3 and 4, as appropriate.

For soft-seated valves up to DN 100 or NPS 4 and pressure ratings up to PN 40, Class 300, use two flame environment thermocouples, two body thermocouples and calorimeter cubes as shown in Figure 3.

For all other valves, use two flame environment thermocouples and two calorimeter cubes as shown in Figure 4. For valves DN 200 or NPS 8 and larger, use a third calorimeter cubes as shown in Figure 4.

5.6.2 With the test valve in the partially open position, open the water supply valve (5), the shut-off valve (6), the vent valves (16) and the shut-off valve (15) to flood the system and purge the air. When the system is completely filled with water, close the shut-off valve (15), the vent valves (16) and the water supply valve (5). Pressurize the system with water to a test pressure of 1,4 times the maximum permissible working pressure at 20 °C — the actual test pressure may be rounded up to the next highest bar¹⁾. Check for leaks in the test apparatus and eliminate as necessary. Release the pressure, close the test valve and open the shut-off valve (15).

5.6.3 If the valve under test is of the upstream sealing type, determine the volume of water that is trapped between the upstream seat seal and the downstream seat seal when the valve is closed. Record this volume.

It is assumed that, during the fire type-test, this volume of water will flow through the valve and pass the downstream seat seal to be collected in the container (18). Since this volume has not actually leaked through the upstream seat seal, it is deducted from the total volume collected in the downstream container when determining the through-seat leakage (see 5.6.11).

5.6.4 Pressurize the system to one or the other of the following pressures, as appropriate:

- a) for soft-seated valves rated PN 10, PN 16, PN 25 and PN 40, Class 150 and Class 300, the low test pressure at 0,2 MPa (2 bar);
- b) for all other valves, the high test pressure at 75 % of the maximum permissible seat working pressure at 20 °C.

Maintain this test pressure during the burn and cool-down periods, momentary pressure losses of up to 50 % of the test pressure being permitted provided that the pressure recovers within 2 min and the cumulative duration is less than 2 min.

5.6.5 Record the reading on the calibrated sight gauge or device (4). Empty the container (18).

5.6.6 Adjust the test system, excluding the test valve, during the test period to maintain the temperatures and pressures required.

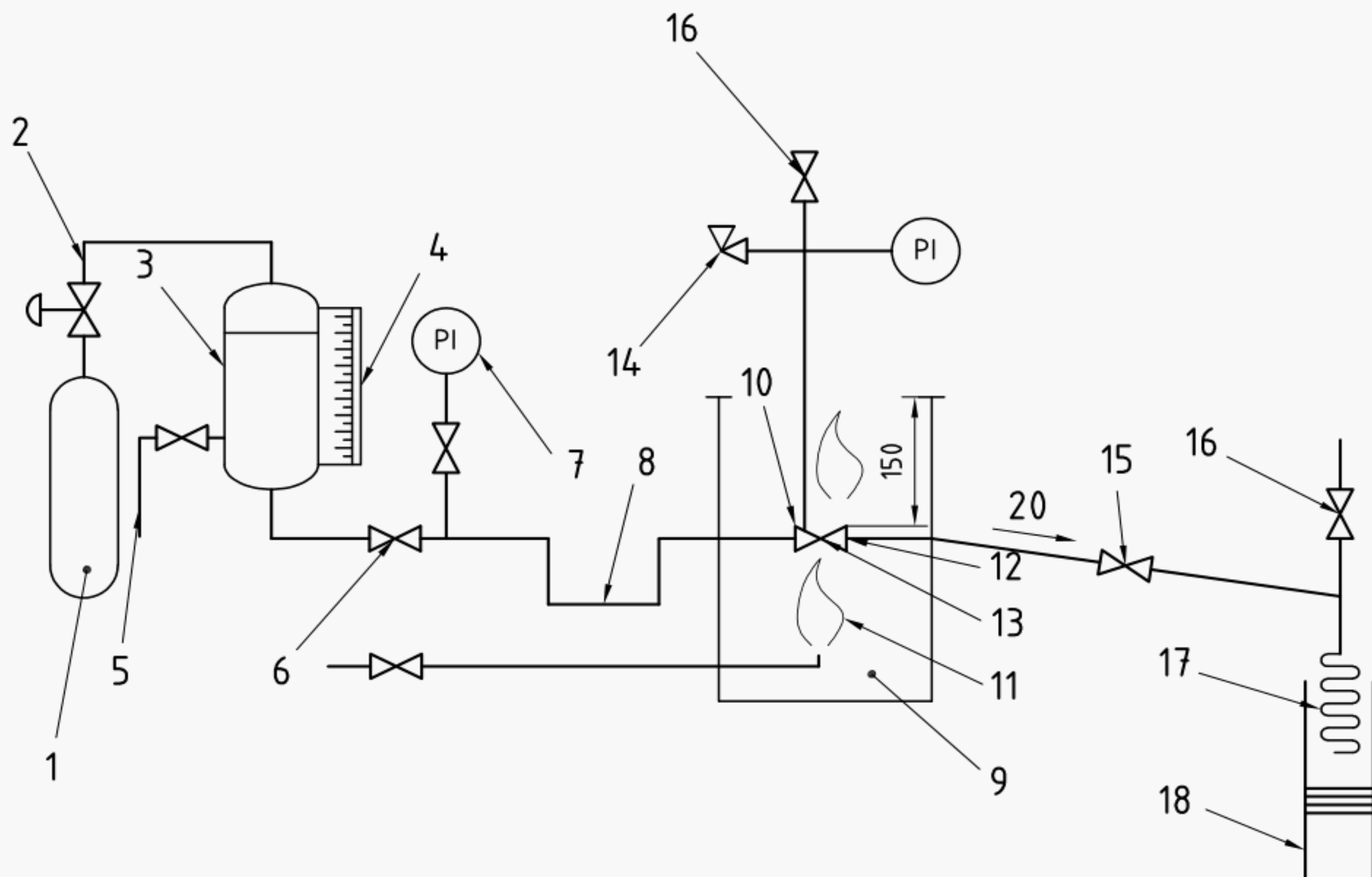
5.6.7 Open the fuel supply, establish a fire and monitor the flame environment temperature throughout the burn period of 30 ⁺⁵₀ min. Check that the average temperature of the two flame environment thermocouples (13) reaches 750 °C within 2 min from the start of the burn period, i.e. from ignition of the burners. Maintain the average temperature between 750 °C and 1 000 °C, with no reading less than 700 °C for the remainder of the burn period of 30 min.

1) 1 bar = 0,1 MPa = 10⁵ Pa; 1 MPa = 1 N/mm²

The diagram illustrates a microgravity simulation facility for fluid experiments. It features a main tank (3) with a liquid level indicator (2) and a pump (19). The system includes various valves (5, 6, 7, 14, 15, 16, 20) and pressure indicators (PI). A central chamber (10) is surrounded by a fluid medium (8) and a heating/cooling system (9, 11, 12, 13, 17, 18). A vertical column (15) is connected to the main tank via a valve (16). A detailed view of the central chamber (10) shows its internal structure (9, 10, 21) and a central tube (10).

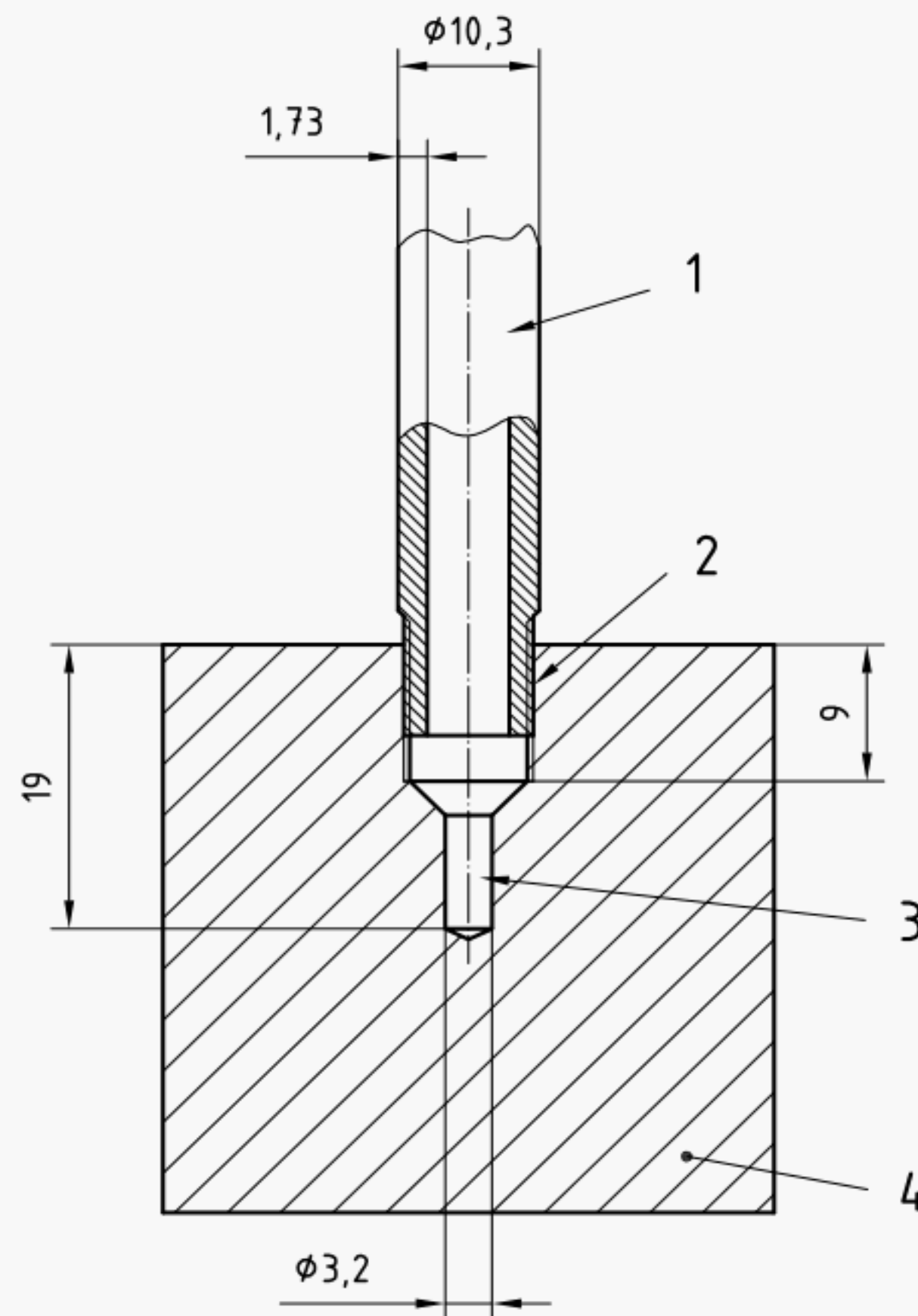
Figure 1 — Recommended systems

Dimensions in millimetres

**b) Compressed gas as pressure source****Key**

- 1 pressure source
- 2 pressure regulator and relief
- 3 vessel for water
- 4 calibrated sight gauge
- 5 water supply
- 6 shut-off valve
- 7 pressure gauge
- 8 piping arranged to provide vapour trap (see 5.3.2)
- 9 enclosure for test
- 10 test valve mounted horizontally with stem in horizontal position (see 5.6.1)
- 11 fuel gas supply and burners
- 12 calorimeter cubes (see 5.3.2)
- 13 flame environment and body thermocouples (see 5.3.2)
- 14 pressure gauge and relief valve (see 5.3.2)
- 15 shut-off valve
- 16 vent valve
- 17 condenser
- 18 container (see 5.3.2)
- 19 check valve
- 20 slope
- 21 clearance: 150 mm

Figure 1 — Recommended systems (continued)

**Key**

- 1 pipe
- 2 pipe thread Rc 1/8 complying with ISO 7-1
- 3 thermocouple well
- 4 38 mm cube

Figure 2 — Calorimeter cube design and dimensions

5.6.8 The average temperature of the calorimeter cubes shall be 650 °C within 15 min of starting the burn period. For the remainder of the burn period, maintain the minimum average temperature of 650 °C, with no temperature falling to less than 560 °C. For valves subjected to the low pressure test (see 5.6.1), the body thermocouple shall maintain 590 °C (1 100 °F) for at least 5 min and the bonnet thermocouple shall maintain 650 °C (1 200 °F) for at least 15 min of the burn period. The burn period may be extended by up to 5 min in order to achieve this requirement.

5.6.9 Record instrument readings (7), (12), (13), (14) every 30 s during the burn period. Thermocouples should be numbered and individual records of temperature should be recorded.

5.6.10 At the end of the burn period (30^{+5}_0 min) shut off the fuel supply.

5.6.11 Immediately determine the amount of water collected in the container (18) and establish the total through-seat leakage during the burn period. If the test valve is an upstream sealing type (see 5.6.3), deduct the volume of water trapped between the upstream seat seal and the downstream seat seal. Continue collecting water in the container (18) for use in establishing the external leakage rate of the test valve during the burn and cool-down periods.

5.6.12 Within 5 min of extinguishing the fire, force-cool the test valve with water so that its external surface temperature remains below 100 °C; the time for cooling shall not exceed 10 min. Record the time taken to force-cool the external surface of the valve below 100 °C.

WARNING — The internal parts of the valve could remain at significantly higher temperatures than the external surface of the valve.

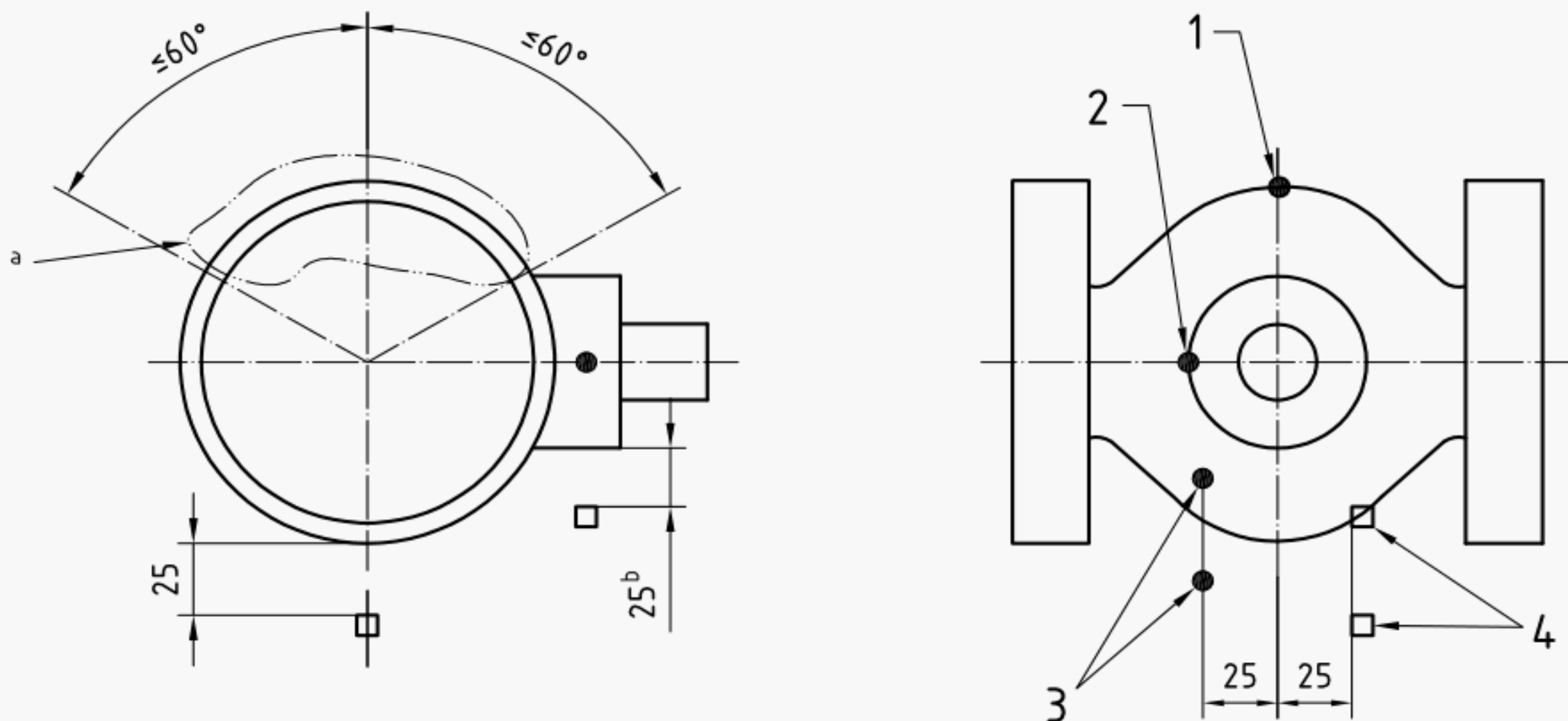
5.6.13 Check and adjust the test pressure in accordance with 5.6.4. Record the readings on the sight gauge (4) and determine the quantity of water in the container (18). Record any leakage through the external pressure relief device if fitted as part of the standard design. The figures are used to calculate the total external leakage throughout the burn and cool-down periods.

5.6.14 For valves PN 100 or Class 600 and lower, decrease or stabilize the pressure to the low test pressure at 0,2 MPa (2 bar), and measure the through-seat leakage over a 5 min period.

5.6.15 Increase or stabilize the test pressure to the high test pressure, close the shut-off valve (15). And operate the test valve against the test pressure to the fully open position.

5.6.16 Stabilize the pressure to the high test pressure and measure the external leakage over a 5 min period.

Dimensions in millimetres



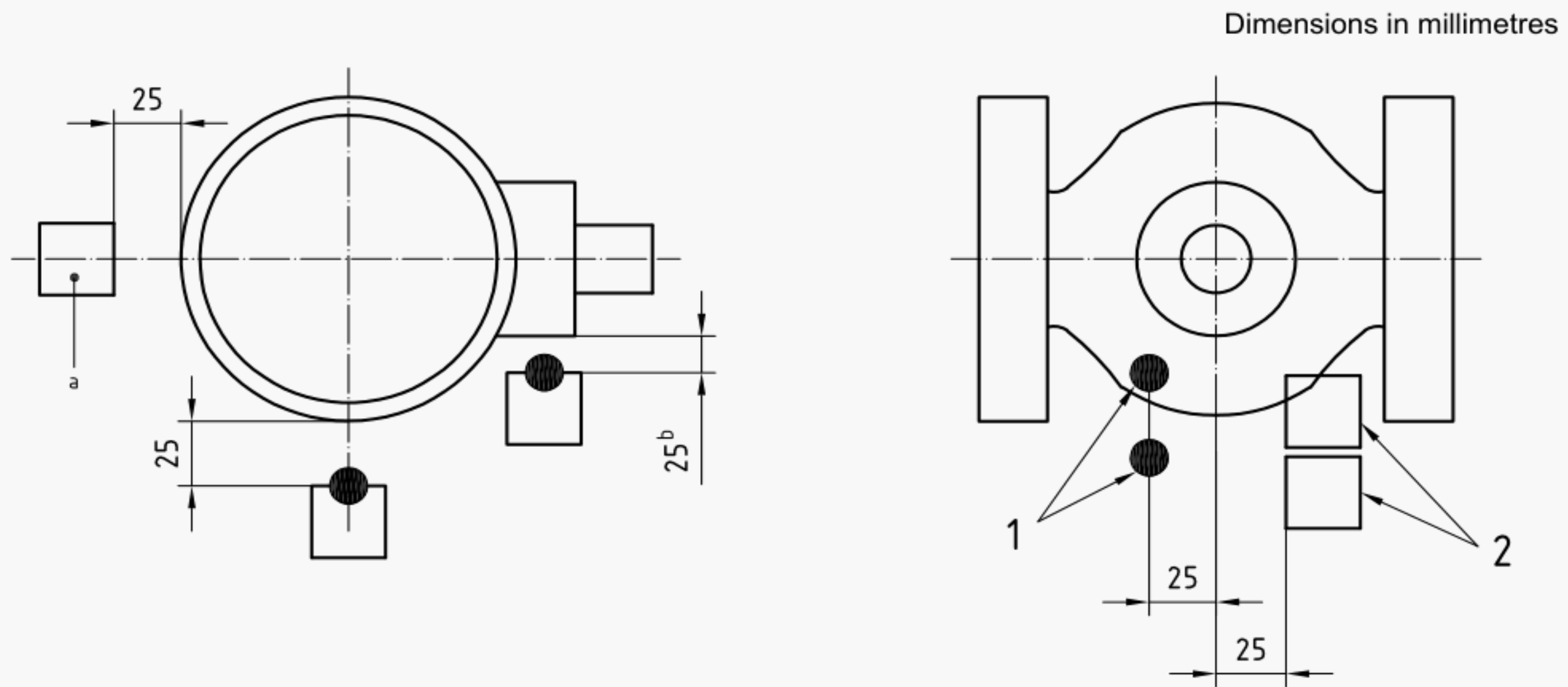
Key

- 1 body thermocouple
- 2 bonnet thermocouple
- 3 flame thermocouples
- 4 flame calorimeter cubes

^a The body thermocouple is installed in this area. When installed, the body and bonnet thermocouples are recessed into the valve body/bonnet a distance of 1/2 the thickness of the wall or 13 mm, whichever is the lesser.

^b From the stem seal.

Figure 3 — Location of temperature measurement sensors — Soft-seated valves up to DN 100 — NPS 4 — PN 10, PN 16, PN 25 and PN 40 — Class 150 and Class 300

**Key**

- 1 flame thermocouples
- 2 38 mm calorimeter cubes
- a Additional calorimeter cube added for DN 200 (8 in) and above.
- b From the stem seal.

Figure 4 — Location of temperature measurement sensors for all other valves (soft-seated valves larger than DN 100, NPS 4, PN 10, PN 16, PN 25 and PN 40, Class 150 and Class 300, and all valve sizes > PN 40, Class 300)

6 Performance

6.1 General

Valves tested in accordance with Clause 5 shall be in accordance with 6.2 to 6.7.

6.2 Through-seat leakage during burn period

For the low pressure test, the average through-seat leakage at low test pressure during the burn period (see 5.6.11) shall not exceed the value given in Table 1.

For the high pressure test, the average through-seat leakage at high test pressure during the burn period (see 5.6.11) shall not exceed the value given in Table 1.

6.3 External leakage during burn and cool-down periods

For the low pressure test, the average external leakage, not including through-seat leakage, during the burn and cool-down periods (see 5.6.13) shall not exceed the value given in Table 1.

For the high pressure test the average external leakage, not including through-seat leakage, during the burn and cool-down periods (see 5.6.13) shall not exceed the value given in Table 1.

6.4 Low pressure test through-seat leakage after cool-down

The maximum through-seat leakage shall not exceed the value given in Table 1.

6.5 Operability

After the fire test, the valve shall be unseated from the closed position against the high test pressure and moved to the fully open position (see 5.6.15), using the operator fitted to the test valve. No additional wrenches or extensions may be used.

6.6 External leakage following operational test

The average external leakage of the valve in the open position at the high test pressure (see 5.6.16) shall not exceed the value given in Table 1.

NOTE External leakage does not include potential leakage from the pipework-to-valve end connection (see 5.3.1).

Table 1 — Maximum leak rates

Maximum leak rates ml/min							
Valve size		Through-seat leakage			External leakage		
DN	NPS	During burn (see 5.6.11 and 6.2)		After cool-down (see 5.6.14 and 6.4)	During burn and cool-down (see 5.6.13 and 6.3)		After operational test (see 5.6.16 and 6.6)
		Low test pressure	High test pressure	Low test pressure	Low test pressure	High test pressure	High test pressure
8	1/4	32	128	13	8	32	8
10	3/8	40	160	16	10	40	10
15	1/2	60	240	24	15	60	15
20	3/4	80	320	32	20	80	20
25	1	100	400	40	25	100	25
32	1 1/4	128	512	51	32	128	32
40	1 1/2	160	640	64	40	160	40
50	2	200	800	80	50	200	50
65	2 1/2	260	1 040	104	65	260	65
80	3	320	1 280	128	80	320	80
100	4	400	1 600	160	100	400	100
125	5	500	2 000	200	125	500	125
150	6	600	2 400	240	150	600	150
200	8	800	3 200	320	200	800	200
> 200	> 8	800	3 200	320	200	800	200

6.7 Test report

The test report shall include the following information:

- date of fire type-test;
- place at which the fire type-test was conducted;
- specification used for the fire type-test (including date of publication and applicable amendments);

- d) valve manufacturer's name and address;
- e) statement that the fire-tested valve has passed all the required hydrostatic, air type and production pressure tests required by the standard to which the valve was manufactured (manufacturer's statement may be accepted);
- f) full description of the valve tested, including nominal size, pressure rating designation, type (e.g. gate), weight, whether reduced or full bore, material of body/bonnet, trim material and manufacturer's reference number;
- g) markings on the valve and their locations, including manufacturer's nameplate date (if fitted);
- h) manufacturer's sectional drawing of the valve and a detailed parts list, including materials, of all valve components tested, identified in the text by identification number (drawing number) and revision and date of issue of documents;
- i) statement as to whether or not a gear box is fitted to the test valve and, if fitted, the type, manufacturer's name, model number and mechanical advantage;
- j) test pressure during burn and cool-down;
- k) time of test start, i.e. of ignition of burners;
- l) temperature recorded at start and at 30 s intervals throughout duration of test, with individual records for each thermocouple;
- m) through-seat leakage during burn period (see 6.2);
- n) external leakage during burn and cool-down periods (see 6.3);
- o) time required for valve to cool to 100 °C;
- p) through-seat leakage (low pressure test) for valves PN 100 and Class 600 and lower;
- q) statement as to whether or not the test valve unseated and moved to the fully open position (see 6.5);
- r) external leakage in the open position (see 6.6);
- s) whether the valve is asymmetric and intended for bi-directional installation — test results in both directions;
- t) observations made during the course of the test that may have bearing on the results provided;
- u) declaration as to whether or not the test valve complied with the requirements of this International Standard;
- v) indication on the cover sheet or table of contents of the report of the total number of pages contained in the document (including drawings), with each page being numbered, e.g. 1/12, 2/12;
- w) name and affiliation of individuals witnessing the fire test;
- x) body cavity set relief pressure and setting.

7 Qualification of other valves by representative size, pressure rating and materials of construction

7.1 General

Instead of testing each nominal size and nominal pressure rating of a given valve design, all valves of the same basic design as the test valve may be deemed to have been fire-tested, subject to the following limitations.

- a) A test valve may be used to qualify valves larger than the test valve but not exceeding twice the nominal size of the test valve (see 7.3). A size DN 200 or NPS 8 test valve qualifies all larger sizes. If the minimum size of a given range of valves is greater than DN 200 or NPS 8, then the minimum size of the range shall be tested to qualify all sizes.
- b) A DN 50 (2") valve may be used to qualify all smaller sizes of valve of the same types. If the maximum size of a given range of valves is smaller than DN 50 or NPS 2, then the maximum size of the range shall be tested to qualify all sizes.
- c) A test valve may be used to qualify valves with higher PN or Class ratings but not exceeding twice the PN or Class rating of the test valve, except as shown in Tables 3 and 4.
- d) A reduced bore (or Venturi pattern) test valve may be used to qualify a smaller nominal size full bore (or regular pattern) valve when the components associated with the obturator, seat seals and stem are identical in design and size. In such a case, the permissible average leakage rates are those applicable to the full bore (or regular pattern) valve.
- e) The type of valve body ends are not considered by this International Standard. However, the mass of the valve is determined in part by the body end type. For qualification to the present International Standard, and providing that all other qualification criteria have been met, valves with ends different to those of the test valve may also qualify provided that
 - their mass is greater than that of the test valve, or
 - their mass is not less than 75 % of that of the test valve.

7.2 Materials of construction

7.2.1 For the purposes of product compliance certification or type testing systems, the materials of construction of the pressure retaining envelope of the valve shall be deemed to qualify other materials of construction within the generic classifications below.

- Ferritic
- Austenitic
- Duplex

7.2.2 If a range of valves is covered by testing of ferritic test valves then the type-testing coverage may be extended to cover austenitic or duplex materials by carrying out a further test on a mid-range size of valve of the same design in that material.

7.2.3 Other materials of construction of the pressure-retaining envelope of the valve require full testing of representative size and pressure ratings as specified in 7.3 and 7.4.

7.2.4 Alloy steel bolting (e.g. B7, L7) used as part of the valve's pressure-retaining envelope may be used to qualify austenitic steel bolting but not vice-versa.

7.2.5 Any change in non-metallic materials with respect to the seat-to-closure member seal, seat-to-body seal, stem seal and body joint and seal require a re-qualification. Filled PTFE, however, may qualify non-filled PTFE and vice-versa.

7.3 Qualification of valves by nominal size

The valves of other nominal sizes which may be deemed to have been fire type-tested relative to the actual valve tested are given in Tables 2 and 3.

Table 2 — Other valves qualified by DN

Size of valve to be tested DN	Other valve sizes qualified DN
50	50 and below; 65; 80; 100
65	65; 80; 100; 125
80	80; 100; 125; 150
100	100; 125; 150; 200
125	125; 150; 200; 250
150	150; 200; 250; 300
200	200 and larger

Table 3 — Other valves qualified by NPS

Size of valve to be tested NPS	Other valve sizes qualified NPS
2	2 and below; 2 1/2; 3; 4
2 1/2	2 1/2; 3; 4; 5
3	3; 4; 5; 6
4	4; 5; 6; 8
5	5; 6; 8; 10
6	6; 8; 10; 12
8	8 and larger

7.4 Qualification of valves by pressure rating

The valves of other PN and Class which may be deemed to have been fire type-tested relative to the actual valve tested are given in Tables 4 and 5.

Table 4 — Other valves qualified by PN

Valve tested PN	Other valves qualified	
	PN	Class rating
10	10; 16	150
16	16; 25	150
25	25; 40	150; 300
40	40; 63; 100	300; 400; 600
63	63; 100	300; 400; 600
100	100; 150	600; 800; 900
150	150; 260	900; 1 500
260	260; 420	1 500; 2 500
420	420	2 500

Table 5 — Other valves qualified by Class

Valve tested Class rating	Other valves qualified	
	Class rating	PN
150	150; 300	10; 16; 25; 40
300	300; 400; 600	40; 63; 100
400	400; 600; 800	63; 100
600	600; 800; 900	100; 150
800	800; 900; 1 500	100; 150; 260
900	900; 1 500	150; 260
1 500	1 500; 2 500	260; 420
2 500	2 500	420

7.5 Special marking

In addition to the marking required by relevant standards and regulations, valves qualified to this International Standard shall be marked “ISO-FT” (which stands for ISO fire-tested).

Bibliography

- [1] EN 1333, *Pipework components — Definition and selection of PN*
- [2] ISO 6708, *Pipework components — Definition and selection of DN (nominal size)*
- [3] ISO 7268, *Pipe components — Definition of nominal pressure*
- [4] EN 736-3, *Valves — Terminology — Part 3: Definition of terms*



American Petroleum Institute

2005 Publications Order Form

Effective January 1, 2005.

API Members receive a 30% discount where applicable.

The member discount does not apply to purchases made for the purpose of resale or for incorporation into commercial products, training courses, workshops, or other commercial enterprises.

Available through Global Engineering Documents:

Phone Orders: 1-800-854-7179 (Toll-free in the U.S. and Canada)
303-397-7956 (Local and International)

Fax Orders: 303-397-2740

Online Orders: www.global.ihs.com

Date: _____

☐ **API Member** (Check if Yes)

Invoice To (☐ Check here if same as "Ship To")

Name: _____

Title: _____

Company: _____

Department: _____

Address: _____

City: _____ State/Province: _____

Zip/Postal Code: _____ Country: _____

Telephone: _____

Fax: _____

E-Mail: _____

Ship To (UPS will not deliver to a P.O. Box)

Name: _____

Title: _____

Company: _____

Department: _____

Address: _____

City: _____ State/Province: _____

Zip/Postal Code: _____ Country: _____

Telephone: _____

Fax: _____

E-Mail: _____

Quantity	Product Number	Title	SO★	Unit Price	Total
	C59406	Std 594, Check Valves: Flanged, Lug, Wafer and Butt-welding		\$74.00	
	C59808	Std 598, Valve Inspection and Testing		\$63.00	
	C59905	Std 599, Metal Plug Valves-Flanged, Threaded and Welding End		\$58.00	
	CX60011	API 600, Bolted Bonnet Steel Gate Valves for Petroleum and Natural Gas Industries		\$84.00	
	C60207	Std 602, Compact Steel Gate Valves-Flanged, Threaded, Welding, and Extended Body Ends		\$58.00	
	C60306	Std 603, Corrosion-Resistant, Bolted Bonnet Gate Valves-Flanged and Butt-Welding Ends		\$49.00	
	C60803	Std 608, Metal Ball Valves-Flanged, Threaded and Butt-Welding Ends		\$74.00	
	C60906	Std 609, Butterfly Valves: Double Flanged, Lug- and Water-Type		\$63.00	

☐ **Payment Enclosed** ☐ **P.O. No.** (Enclose Copy) _____

☐ **Charge My Global Account No.** _____

☐ **VISA** ☐ **MasterCard** ☐ **American Express** ☐ **Diners Club** ☐ **Discover**

Credit Card No.: _____

Print Name (As It Appears on Card): _____

Expiration Date: _____

Signature: _____

Subtotal

Applicable Sales Tax (see below)

Rush Shipping Fee (see below)

Shipping and Handling (see below)

Total (in U.S. Dollars)

★ To be placed on Standing Order for future editions of this publication, place a check mark in the SO column and sign here:

Pricing and availability subject to change without notice.

Mail Orders – Payment by check or money order in U.S. dollars is required except for established accounts. State and local taxes, \$10 processing fee*, and 5% shipping must be added. Send mail orders to: **API Publications, Global Engineering Documents, 15 Inverness Way East, M/S C303B, Englewood, CO 80112-5776, USA.**

Purchase Orders – Purchase orders are accepted from established accounts. Invoice will include actual freight cost, a \$10 processing fee*, plus state and local taxes.

Telephone Orders – If ordering by telephone, a \$10 processing fee* and actual freight costs will be added to the order.

Sales Tax – All U.S. purchases must include applicable state and local sales tax. Customers claiming tax-exempt status must provide Global with a copy of their exemption certificate. **Shipping** (U.S. Orders) – Orders shipped within the U.S. are sent via traceable means. Most orders are shipped the same day. Subscription updates are sent by First-Class Mail. Other options, including next-day service, air service, and fax transmission are available at additional cost. Call 1-800-854-7179 for more information.

Shipping (International Orders) – Standard international shipping is by air express courier service. Subscription updates are sent by World Mail. Normal delivery is 3-4 days from shipping date.

Rush Shipping Fee – Next Day Delivery orders charge is \$20 in addition to the carrier charges. Next Day Delivery orders must be placed by 2:00 p.m. MST to ensure overnight delivery.

Returns – All returns must be pre-approved by calling Global's Customer Service Department at 1-800-624-3974 for information and assistance. There may be a 15% restocking fee. Special order items, electronic documents, and age-dated materials are non-returnable.

***Minimum Order** – There is a \$50 minimum for all orders containing hardcopy documents. The \$50 minimum applies to the order subtotal including the \$10 processing fee, excluding any applicable taxes and freight charges. If the total cost of the documents on the order plus the \$10 processing fee is less than \$50, the processing fee will be increased to bring the order amount up to the \$50 minimum. This processing fee will be applied before any applicable deposit account, quantity or member discounts have been applied. There is no minimum for orders containing only electronically delivered documents.

There's more where this came from.

The American Petroleum Institute provides additional resources and programs to the oil and natural gas industry which are based on API® Standards. For more information, contact:

- | | |
|---|--|
| • API Monogram® Licensing Program | Phone: 202-962-4791
Fax: 202-682-8070 |
| • American Petroleum Institute Quality Registrar (APIQR®) | Phone: 202-962-4791
Fax: 202-682-8070 |
| • API Spec Q1® Registration | Phone: 202-962-4791
Fax: 202-682-8070 |
| • API Perforator Design Registration | Phone: 202-962-4791
Fax: 202-682-8070 |
| • API ISO/TS 29001 Registration | Phone: 202-962-4791
Fax: 202-682-8070 |
| • API Training Provider Certification Program | Phone: 202-682-8490
Fax: 202-682-8070 |
| • Individual Certification Programs | Phone: 202-682-8064
Fax: 202-682-8348 |
| • Engine Oil Licensing and Certification System (EOLCS) | Phone: 202-682-8516
Fax: 202-962-4739 |
| • API PetroTEAM™ (Training, Education and Meetings) | Phone: 202-682-8195
Fax: 202-682-8222 |

Check out the API Publications, Programs, and Services Catalog online at www.api.org.



Helping You Get
The Job Done Right.®

Additional copies are available through Global Engineering Documents at (800) 854-7179 or (303) 397-7956

Information about API Publications, Programs and Services is available on the World Wide Web at <http://www.api.org>



**American
Petroleum
Institute**

1220 L Street, Northwest
Washington, D.C. 20005-4070
202-682-8000

Product No: CX60705