INTERNATIONAL STANDARD

ISO 5208

Third edition
2008-08-01

Industrial valves — Pressure testing of metallic valves

Robinetterie industrielle — Essais sous pression des appareils de robinetterie métalliques

Reference number
ISO 5208:2008(E)

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Published in Switzerland

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Foreword

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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 5208 was prepared by Technical Committee ISO/TC 153, *Valves*, Subcommittee SC 1, *Design, manufacture, marking and testing*.

This third edition cancels and replaces the second edition (ISO 5208:1993) which has been technically revised.

Introduction

The purpose of this International Standard is the establishment of basic requirements and practices for pressure testing valves of various configurations that are used in general purpose, power generation, petroleum, and petrochemical or allied industry applications. The intent is to provide a consistent set of procedural requirements and acceptance criteria that can be considered in conjunction with valve specific standards appropriate for specific applications. Account has been taken of the valve testing requirement needs of EN 12266 and API 598 with requirements referenced for PN designated valves for the former and Class designated valves for the latter.

Industrial valves — Pressure testing of metallic valves

1 Scope

This International Standard specifies examinations and tests that a valve manufacturer needs to act upon in order to establish the integrity of the pressure boundary of an industrial metallic valve and to verify the degree of valve closure tightness and the structural adequacy of its closure mechanism. This International Standard is to be applied in conjunction with the specific requirements of a valve product standard to the extent cited by the product standard as a normative reference. Where requirements of a product standard differ from those given in this International Standard, the requirements of the product standard apply.

This International Standard does not cover safety aspects of pressure testing.

2 Terms and definitions

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

2.1
shell test
test at a pressure in excess of the **cold working pressure** (2.9) rating of a valve for the purpose of validating the soundness and strength of the valve pressure containing and retaining structures

NOTE These structures include valve-actuating mechanisms that have a direct connection to the valve internals subject to fluid test pressure within the valve proper.

2.2
closure test
pressure test for the purpose of validating leakage through a valve's closure mechanism

2.3
test pressure
internal pressure (gauge), expressed in bar [1)] to which the valve under test is subjected

NOTE Unless otherwise noted, gauge pressure is used throughout this International Standard.

2.4
test fluid
pressurized liquid or gas used to test a valve

2.5
test fluid temperature
temperature of the test fluid, $\geqslant$ 5 °C and $\leqslant$ 40 °C

2.6
resilient seats
broad category of seating surface materials that make up a pliable seat sealing combination, including elastomeric, polymeric, solid and semi-solid grease seals, either used in combination or used in conjunction with a mating metallic or ceramic component

1) 1 bar = 10^5 Pa.

2.7
DN, NPS, A
alphanumeric designation of size that is common for components used in a piping system, used for reference purposes, comprising the letters DN or NPS followed by, or the letter A preceded by, a dimensionless number indirectly related to the physical size of the bore or outside diameter of the end connections

NOTE The number following DN or NPS or preceding A does not represent a measurable value and is not used for calculation purposes except where specified in a product standard.

2.8
PN or Class
alphanumeric designation for pressure-temperature rating that is common for components used in a piping system, used for reference purposes, comprising the letters “PN or Class” followed by a dimensionless number indirectly related to the pressure retaining capability as a function of temperature of the component

NOTE The number following “PN or Class” does not represent a measurable value and is not used for calculation purposes except where specified in a product standard. There is no definitive correlation that links PN designations to Class designations.

2.9
cold working pressure
CWP
maximum fluid pressure assigned to a valve for operation at a fluid temperature of −20 °C to 38 °C

NOTE Valve pressure-temperature ratings are specified in product standards by reference to PN or Class designations.

2.10
design differential pressure
limiting pressure difference across the upstream and downstream sides of the closure element seals when the valve is in the closed position

NOTE While the standard is for this to be equal to the CWP there may be circumstances that dictate a lesser pressure difference.

2.11
double block-and-bleed valve
valve with two separate closure seating surfaces that, when in the closed position, block flow from both ends where the cavity between the two seating surfaces is fitted with a bleed connection to which either temporary or permanent piping or piping components may be installed

3 Conditions relevant to pressure testing

3.1 Purchaser examination options

3.1.1 A purchaser may specify, in a valve procurement purchase order, examination and pressure testing requirements along with the opportunity to be witness to specific in-process examinations and tests as regards valves that are the subject of the purchase order. In this event, a representative of the purchaser shall be allowed access to those areas of the manufacturer's site that are involved with related examination and pressure testing of the purchase order valves.

3.1.2 When a purchaser specifies examinations or testing to be witnessed as described in 3.1.1, the valve manufacturer shall give notice to the purchaser at least five working days prior to the purchase order specified activity.

3.2 Witnessing

If pressure testing in the presence of a representative of the purchaser is specified for valves that are in stock, painted or coated valves from stock may be retested without removal of painting or coating.

3.3 Closure pressure testing options

A purchaser may specify, in a valve procurement purchase order, optional closure testing. See Table 1.

4 Requirements for pressure testing

4.1 Forewarning

A user of this International Standard needs to properly take into account the hazard involved with working with pressurized gases and liquids.

4.2 Location

Pressure tests shall take place either at the site of the valve manufacture or at a test facility under the supervision of the valve manufacturer.

4.3 Test equipment

4.3.1 The test equipment shall be of such a design, that it does not subject the valve to externally applied loads that may affect the results of the test. When end-clamping devices are used, the valve manufacturer shall be able to demonstrate that, during the valve closure test, they do not serve to reduce the resultant leakage. Valves designed for installation between flanges, e.g. wafer style check or butterfly valves, shall not have test equipment clamping forces applied that are so great as to bear upon the pressure test results.

4.3.2 When equipment such as volume loss detection devices are used, the manufacturer shall be capable of demonstrating equivalence of the system with the requirements of this International Standard.

4.4 Pressure measuring equipment

The equipment used for measuring test fluid pressure shall measure the fluid pressure with an accuracy of $\pm$ 5 % of the required test pressure.

4.5 Shell surfaces

Before the shell test, valves shall not be externally painted or otherwise coated with materials capable of sealing against leakage from external surfaces of the shell. However, valves with internal liners, internal linings or internal coatings that form a design feature of the valve may be tested with the liner, lining or coating in place. In the event a purchaser specifies a retest of the shell test of valves that have been painted, retesting may be without removal of external paint or coatings.

4.6 Test fluid

The test fluid to be used, as specified in the relevant tests detailed in this International Standard, shall be:

— water, that may contain a corrosion inhibitor, kerosene or other appropriate liquid having a viscosity not greater than that of water, or

— air or other suitable gas.

The temperature of the test fluid shall be between 5 °C and 40 °C. Pressure testing valves with shell components of austenitic stainless steel, using water as the test fluid, requires that the chloride content of the water shall not exceed 100×10^{-6} (100 ppm).

NOTE A purchaser may specify, in a valve procurement purchase order, that a wetting agent be added to water used as a test fluid.

4.7 Test pressure

Except for low-pressure closure testing, test pressures are related to the valve CWP which in turn is related to the shell material of the valve under test.

NOTE Piping systems in which valves are installed are subjected to pre-operational pressure testing. Therefore, valve standards, by and large, include requirements for CWP-related marking to be on an attached valve identification label or valve body.

4.8 Pressure tests

4.8.1 Compliance with this International Standard for pressure testing requires:

— satisfactory execution of the required tests listed in Table 1, taking into account the exceptions and clarifications of 4.8.3;

— satisfactory execution of the tests that may be required by the referencing valve product standard, which are listed as optional in Table 1;

— pressure testing is conducted following written procedures prepared by the valve manufacture, which are in accordance with this International Standard.

4.8.2 In the event that a purchaser specifies optional tests as shown in Table 1, the optional tests shall be performed in addition to Table 1 required tests.

4.8.3 The following clarifications and exceptions to Table 1 are applicable:

— for plug valves that rely on a sealing compound to effect a closure seal, a high-pressure closure test is required and the low-pressure test is an option;

— for valves having bellows stem sealing, a backseat test is not required;

— for valves specified as double block and bleed, a high-pressure closure test is required and the low-pressure test is an option.

4.8.4 For the purpose of identifying required tests, test duration times and calculating closure leakage rates, it is necessary to establish the equivalent DN number for those valves that have size designations other than DN. The equivalent DN numbers of valves having flanged ends, threaded ends, weld ends, capillary or compression ends shall be as given in Table A.1.

4.8.5 A shell test option using gas as a test fluid may be specified in a valve procurement purchase order. In this event precautions are vital to safe conduct of this test, see 4.1.

4.9 Closure test compliance

Valve types listed in Table 1, for which a high-pressure closure test is an option, are nevertheless required to be able to pass the test (as a test of the valve closure structure). Results of tests confirming the ability of the valve design to pass the high-pressure closure test shall be supplied when specified in a valve purchase order.

Table 1 — Prescribed pressure tests

Test	DN	PN or Class	Gate valve	Globe valve	Plug valve [a]	Check valve	Floating ball or diaphragm valve	Butterfly or trunnion mounted ball valve
Shell test Liquid test	All	All	Required	Required	Required	Required	Required	Required
Shell test Gas test	All	All	Optional	Optional	Optional	Optional	Optional	Optional
Backseat test [b, c] Liquid test	All	All	Optional	Optional	Not required	Not required	Not required	Not required
Closure test Gas Low-pressure	DN $\leqslant$ 100	Class $\leqslant$ 1 500 and PN $\leqslant$ 250	Required	Optional	Required	Optional	Required	Required
		Class $>$ 1 500 and PN $>$ 250	Optional	Optional	Optional	Optional	Required	Optional
	DN $>$ 100	Class $\leqslant$ 600 and PN $\leqslant$ 100	Required	Optional	Optional	Optional	Required	Required
		Class $>$ 600 and PN $>$ 100	Optional	Optional	Optional	Optional	Required	Optional
Closure test Liquid High-pressure	DN $\leqslant$ 100	Class $\leqslant$ 1 500 and PN $\leqslant$ 250	Optional	Required	Optional	Required	Optional	Optional
		Class $>$ 1 500 and PN $>$ 250	Required	Required	Required	Required	Optional	Required
	DN $>$ 100	Class $\leqslant$ 600 and PN $\leqslant$ 100	Optional	Required	Optional	Required	Optional	Optional
		Class $>$ 600 and PN $>$ 100	Required	Required	Required	Required	Optional	Required

NOTE 1 Successful completion of an optional test does not relieve the manufacturer from also successfully completing the required test.

NOTE 2 In the case of resilient seated valves, a high-pressure closure test may degrade subsequent closure sealing performance in low-pressure applications.

[a] Plug valves that rely on a sealing compound to effect a closure seal may be closure tested with the compound installed.

[b] Successful completion of a backseat test should not be interpreted as a recommendation by the valve manufacturer that, while an installed valve is pressurized, the stem seal may be altered, repaired or replaced when backseated.

[c] In the case of bellows stem sealed valves, a backseat test is not required.

4.10 Shell test

4.10.1 Shell test fluid

The shell test fluid shall be:

a) for the required shell test listed in Table 1, water or a liquid complying with 4.6;

b) for the option shell test listed in Table 1, gas complying with 4.6, see also 4.8.5.

4.10.2 Shell test procedure

— The stem seals shall be in place and if the seal is adjustable it shall be adjusted to accommodate the test pressure.

— The obturator shall be in a partially open position.

— The valve end connections shall be blanked off and in conformance with 4.3.

— All cavities of the valve shall be filled with the test fluid.

— The shell test fluid pressure specified in 4.10.3 shall be progressively applied.

— The shell test pressure shall be maintained for a test duration not less than the time specified in Table 2.

— The entire external surface of the shell shall be visually examined.

— If the test fluid is a liquid, the external surface of the shell shall be visually examined for leakage.

— If the test fluid is a gas, the external surfaces of the shell shall be coated with a leak detection fluid or submerged in water not more than 50 mm below the upper surface and an examination shall be made for the continuous formation of bubbles.

4.10.3 Shell test pressure

The shell test pressure shall be as follows:

a) if the test fluid is a liquid, for the required shell test (Table 1), the shell test pressure shall be a minimum of $\times$ 1,5 the CWP;

b) if the test fluid is a gas, for the optional shell test (Table 1), the shell test pressure shall be a minimum of $\times$ 1,1 the CWP.

If an optional gas shell test is to be performed, the less hazardous required liquid shell test should be performed first in order to verify the pressure retention capability of the valve structure. See 2.1.

4.10.4 Shell test duration

The shell test pressure shall be maintained for a period of time not less than the time specified in Table 2.

4.10.5 Shell test acceptance criteria

The shell test acceptance criteria shall be as follows:

— if the test fluid is a liquid, visually detectable leakage from any external surface of the shell is cause for rejection;

— if the test fluid is a gas, the continuous formation of bubbles from any submerged external surface or any external surface coated with a leak detection fluid is cause for rejection.

When the test fluid is a liquid, stem seal leakage is permitted provided that there is no visually detectable leakage at the stem seal when the test pressure is × 1,1 the CWP. This may be demonstrated initially as the test pressure is being raised to the full shell test requirement.

Table 2 — Minimum duration for pressure tests

Valve size	Minimum test duration [a] s			
	Shell	Optional backseat	Closure	
	All valves	When relevant [b]	Isolation valves	Check valves
DN ⩽ 50	15	15	15	60
65 ⩽ DN ⩽ 150	60	60	60	60
200 ⩽ DN ⩽ 300	120	60	120	120
DN ⩾ 350	300	60	120	120

[a] The test duration is the period of time for inspection after the test valve is fully prepared and under test pressure.

[b] See 4.8.2.

4.11 Optional backseat test

4.11.1 General

A backseat test, for valves having this feature, shall be performed in accordance with the requirements of this subclause when this option is specified in a valve procurement purchase order.

4.11.2 Backseat test fluid

The backseat test fluid shall be water or a liquid complying with 4.6.

4.11.3 Recommended backseat test procedure

— The stem seal adjustment shall be set, so that the force-tending affect on a seal has been negated.

— The backseat shall be fully engaged.

— The valve end connections shall be blanked off and in accordance with 4.3.

— All cavities of the valve shall be filled with the test fluid.

— The test fluid pressure specified in 4.11.4 shall be progressively applied.

— The test pressure shall be maintained for a test duration not less than the time specified in Table 2.

— The shell-seal-stem interface shall be visually examined.

— The backseat test, having been made either before or after the shell test, shall have the proper stem seal adjustment restored.

4.11.4 Backseat test pressure

The backseat test pressure shall be a minimum of × 1,1 the CWP.

4.11.5 Backseat test duration

The backseat test pressure shall be maintained for a period of time not less than the time specified in Table 2.

4.11.6 Backseat test acceptance criteria

Visually detectable leakage from any external interface of the shell-seal-stem is cause for rejection.

4.12 Closure test

4.12.1 General requirements

4.12.1.1 Except for plug valves that rely on a sealing compound to effect a closure seal, closure sealing surfaces shall be clean, free from oil, grease or compounds that may serve to reduce leakage. However, if necessary, to prevent galling of surfaces in contact, these surfaces may be coated with a film of oil whose viscosity is not more than that of kerosene.

4.12.1.2 Leakage detected as originating from behind seat rings, through disc porosity, around liners or resilient closure materials shall be cause for rejection.

4.12.1.3 Valves with body or bonnet cavities, e.g. gate, ball or plug valves, shall be tested using a test method whereby the cavities are filled with the test fluid. This is to ensure that closure leakage measurement is not compromised because of the unoccupied volume.

4.12.2 Closure test fluid

The closure test fluid for both required and optional tests of Table 1 shall be water or other liquid complying with 4.6, or gas. When testing with liquid, the valve chamber under test shall be essentially free of air.

4.12.3 Leak detection

4.12.3.1 The closure test method, except for double block and bleed valve designs (see Table 3), shall have the test pressure applied to one side of the valve obturator and closure leakage assessed on the opposite side, the side that is open to the atmosphere.

4.12.3.2 As an alternative to 4.12.3.1, fluid displacement measurement devices may be used, provided that:

a) the measurement accuracy is consistent with the closure test leakage acceptance criteria;

b) the valve manufacturer can demonstrate and validate that the procedure yields results that are equivalent to the tests under 4.12.3.1.

4.12.3.3 As an alternative to 4.12.3.1, fluid volumetric measurement devices (generically referred to as bubblers) may be used, provided that:

a) the measurement accuracy is consistent with the closure test leakage acceptance criteria;

b) the valve manufacturer can demonstrate and validate that the procedure yields results that are equivalent to the tests under 4.12.3.1;

c) the manufacturer's test procedure requires that the volumetric device be calibrated using the same test fluid and at the same temperature as used for the closure test;

d) the manufacturer's test procedure requires that the test duration do not commence until flow through the test tubing is established and stabilized;

e) for valve sizes DN $>$ 50, this closure test leakage measurement method is specified by the purchaser in their valve procurement purchase order.

4.12.4 Closure test pressure

4.12.4.1 The closure test pressure, subject to the exceptions of 4.12.4.2 and 4.12.4.3, shall be as follows:

a) if the test fluid is a gas, the closure test pressure shall be 6 bar ± 1 bar;

b) if the test fluid is a liquid, the closure test pressure shall be a minimum of × 1,1 the CWP.

4.12.4.2 For valves, including combination non-return types fitted with manual or power actuated torque multiplying devices, the required high-pressure closure test shall be performed at 110 % of the obturator design differential pressure used to size the device. The identification plate that the manufacturer affixes to the valve shall include this design pressure differential limitation.

4.12.4.3 Valves that are designed for operating conditions in which the pressure differential across the obturator is limited to values less than the CWP rating, because obturator actuating devices (direct, mechanical, fluid or electrical) would likely be damaged by or be incapable of function at high differential pressures, may be tested at a lower closure pressure than prescribed in 4.12.4.1 b). This exception may be exercised only by agreement between the manufacturer and valve purchaser. The closure test pressure shall then be at × 1,1 the design differential pressure value. The identification plate that the manufacturer affixes to the valve shall include the design pressure differential limitation.

4.12.5 Closure test duration

The closure test pressure shall be maintained for a period of time not less than the time specified in Table 2.

4.12.6 Closure test progression

A closure testing progression outline for testing various valve types and service applications is shown in Table 3.

4.12.7 Closure test acceptance criteria

At the time of manufacture, the maximum allowable closure test leakage shall be in accordance with the following.

a) The leakage measured during the test duration, Table 2, shall not exceed the Table 4 leakage rate specified in the applicable valve standard or, in the absence of a reference standard, the leakage rate specified in the valve purchase document. See Table 4, Note 2.

b) The required closure leakage rate of Table 4, when referenced, should include both the designation of this International Standard and that of the Table 4 closure rate, e.g. “ISO 5208:2008, Leakage rate A”.

c) For valves having a valve size designation other than DN, Annex A shall be used for nominal valve size conversion to DN in order to utilize Table 4.

4.13 Certification of compliance

The manufacturer, when specified in the purchaser's valve procurement document, shall provide a certificate of compliance indicating that valves specified have met the requirements of this International Standard.

Table 3 — Closure testing progression

Type of valve	Test progression
Gate valve Ball valve Plug valve	Fill the valve cavity including, if appropriate, the bonnet cavity with the test fluid. Move the obturator to the closed position. Open one valve port for leakage observation. Apply the test pressure specified in 4.12 and maintain the test pressure for the test duration specified in Table 2. Determine the leakage rate. Repeat the procedure for the other valve port. See NOTE 1.
Globe valve Diaphragm valve	Move the obturator to the closed position. Fill the upstream valve cavity with the test fluid. Apply the test pressure specified in 4.12 in the direction to unseat the obturator, and maintain the test pressure for the test duration specified in Table 2. Determine the leakage rate.
Butterfly valve	Fill the valve cavity with the test fluid. Move the obturator to the closed position. Open one valve port for leakage observation. Apply the test pressure specified in 4.12 in the direction producing the most adverse disc sealing condition, and maintain the test pressure for the test duration specified in Table 2. Determine the leakage rate. Repeat the procedure for the other valve port. See NOTE 2.
Check valve	Fill the downstream valve cavity (the obturator being in the closed position) including, if appropriate, the cover cavity with the test fluid. Apply the test pressure specified in 4.12 in the direction tending to close the obturator, and maintain the test pressure for the test duration specified in Table 2. Determine the leakage rate.
Double block and bleed design	Move the obturator to the closed position. Fill one valve port with the test fluid. Apply the test pressure specified in 4.12 and maintain the test pressure for the test duration specified in Table 2. Determine the leakage rate through a tapped opening between the seats. Repeat the procedure for the other valve port. See NOTE 3.
Unidirectional closure	Move the obturator to the closed position. Fill the cavity opposite to that shown by the unidirectional flow indictor marked on the valve for normal flow direction with the test fluid. Apply the test pressure specified in 4.12 in the direction tending to close the obturator, and maintain the test pressure for the test duration specified in Table 2. Determine the leakage rate. See NOTE 4.

NOTE 1 Valves with independent double closure sealing, e.g. a valve having a multi-piece obturator or a split obturator, may be tested by applying the test pressure between the seats and checking each side of the closed valve. See also 2.11.

NOTE 2 Butterfly valves having symmetrical seating, equal closure capability in either flow direction, need to be tested only once using either flow direction.

NOTE 3 At the conclusion of the closure test, pipe plugs are installed in all tapped openings between the seats except for the case where a purchaser specifies the installation of other piping or other piping components. Pipe plugs should be of a material having a nominal composition of the shell material. Plugs of cast iron, either flake or spheroidal, cannot be used.

NOTE 4 This test is only used for those valves that have distinct unidirectional flow marking.

Table 4 — Maximum allowable closure test leakage rate

Test fluid	Unit leakage rates	Rate A	Rate AA	Rate B	Rate C	Rate CC	Rate D	Rate E	Rate EE	Rate F	Rate G
Liquid	mm^3/s	No visually detectable leakage for the duration of the test	0,006 × DN	0,01 × DN	0,03 × DN	0,08 × DN	0,1 × DN	0,3 × DN	0,39 × DN	1 × DN	2 × DN
	drops/s		0,000 1 × DN	0,000 16 × DN	0,000 5 × DN	0,001 3 × DN	0,001 6 × DN	0,004 8 × DN	0,006 2 × DN	0,016 × DN	0,032 × DN
Gas	mm^3/s	No visually detectable leakage for the duration of the test	0,18 × DN	0,3 × DN	3 × DN	22,3 × DN	30 × DN	300 × DN	470 × DN	3 000 × DN	6 000 × DN
	bubbles/s		0,003 × DN	0,004 6 × DN	0,045 8 × DN	0,340 7 × DN	0,458 4 × DN	4,583 7 × DN	7,129 3 × DN	45,837 × DN	91,673 × DN

NOTE 1 The leakage rates only apply when discharging test fluid to the atmosphere.

NOTE 2 The closure leakage rate that applies is either that identified in a valve product standard or a leakage rate identified in a purchaser's valve procurement purchase order that is more stringent than that specified in the product standard.

NOTE 3 The meaning of "No visually detectable leakage" is that there is no visible weeping or leakage in the form of drops or bubbles.

NOTE 4 There is a loosely defined correspondence between the leakage rate acceptance values of API 598 and the leakage values Rate A as applied to DN $\leqslant$ 50, Rate AA-Gas and Rate CC-Liquid for other than metal seated check valves and for check valves Rate EE-Gas and Rate G-Liquid. Rates A, B, C, D E, F and G correspond to values in EN 12266-1.

Annex A
(normative)

Equivalent DN numbers

For the purpose of determining seat leakage rates and test duration times, it is necessary to establish the equivalent DN number for those valves that are designated other than by the size descriptor DN. The equivalent DN numbers of valves having flanged ends, threaded ends, welding ends, capillary ends or compression ends shall be as given in Table A.1.

Table A.1 — Equivalent DN numbers for different types of body ends

DN	NPS	A	Capillary or compression ends for copper tube mm	Compression ends for plastic tube mm
8	1/4	8	8	—
10	3/8	10	10; 12	10; 12
15	1/2	15	14; 14,7; 15; 16; 18	14,7; 15; 16; 18
20	3/4	20	21; 22	20; 21; 22
25	1	25	25; 27,4; 28	25; 27,4; 28
32	1 1/4	32	34; 35; 38	32; 34
40	1 1/2	40	40; 40,5; 42	40; 40,5
50	2	50	53,6; 54	50; 53,6
65	2 1/2	65	64; 66,7; 70	63
80	3	80	76,1; 80; 88,9	75; 90
100	4	100	108	110
125	5	125		
150	6	150		
200	8	200		
250	10	250		
300	12	300		
350	14	350		
400	16	400		
450	18	450		
500	20	500		
600	24	600		
650	26	650		
700	28	700		
750	30	750		
800	32	800		
900	36	900		
1 000	40	1 000		

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ICS 23.060.01

Price based on 13 pages