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**Malleable iron and ductile iron
valves**

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Foreword

This Japanese Industrial Standard has been revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Valve Manufacturers' Association (JVMA) with a draft being attached, based on the provision of Article 12, paragraph (1) of the Industrial Standardization Act applied mutatis mutandis pursuant to the provision of Article 16 of the said Act. This edition replaces the previous edition (**JIS B 2051**:2015), which has been technically revised.

However, **JIS B 2051**:2015 may be applied in the **JIS** mark certification based on the relevant provisions of Article 30, paragraph (1), etc. of the Industrial Standardization Act until 22 September 2020.

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Malleable iron and ductile iron valves

1 Scope

This Standard specifies requirements for screwed end valves and flanged end valves made of malleable cast iron and ductile cast iron used for general machinery (hereafter referred to as valves).

Annex C shows for reference the operation restriction torque for operating the valve by handwheel.

NOTE 1 The malleable cast iron in the title of this Standard is the generic term for blackheart malleable cast iron, and the ductile cast iron is the generic term for the spherical graphite cast iron and the ductile cast iron products specified in Annex A of this Standard.

NOTE 2 All the pressure values shown in this Standard are gauge pressure values.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 0100 *Glossary of terms for valves*

JIS B 0203 *Taper pipe threads*

JIS B 0253 *Gauges for taper pipe threads*

JIS B 1054-1 *Mechanical properties of corrosion-resistant stainless steel fasteners—Part 1: Bolts, screws and studs*

JIS B 1054-2 *Mechanical properties of corrosion-resistant stainless steel fasteners—Part 2: Nuts*

JIS B 1180 *Hexagon head bolts and hexagon head screws*

JIS B 1181 *Hexagon nuts and hexagon thin nuts*

JIS B 2001 *Nominal size and bore of valves*

JIS B 2002 *Face-to-face and end-to-end dimensions of valves*

JIS B 2003 *General rules for inspection of valves*

JIS B 2004 *General rules for marking on valves*

JIS B 2239 *Cast iron pipe flanges*

JIS G 0320 *Standard test method for heat analysis of steel products*

JIS G 3101 *Rolled steels for general structure*

JIS G 3202 *Carbon steel forgings for pressure vessels*

JIS G 3214 *Stainless steel forgings for pressure vessels*

JIS G 4051 *Carbon steels for machine structural use*

- JIS G 4303 *Stainless steel bars*
- JIS G 5121 *Corrosion-resistant cast steels for general applications*
- JIS G 5501 *Grey iron castings*
- JIS G 5502 *Spheroidal graphite iron castings*
- JIS G 5705 *Malleable iron castings*
- JIS H 3100 *Copper and copper alloy sheets, plates and strips*
- JIS H 3250 *Copper and copper alloy rods and bars*
- JIS H 5120 *Copper and copper alloy castings*
- JIS K 0116 *General rules for atomic emission spectrometry*
- JIS K 6896 *Polytetrafluoroethylene powder for molding and extrusion materials*
- JIS K 7137-1 *Plastics—Polytetrafluoroethylene (PTFE) semi-finished products—
Part 1: Requirements and designation*
- JIS Z 2241 *Metallic materials—Tensile testing—Method of test at room temperature*
- JIS Z 2242 *Method for Charpy pendulum impact test of metallic materials*
- JIS Z 2243-1 *Brinell hardness test—Part 1: Test method*
- JIS Z 2243-2 *Brinell hardness test—Part 2: Table of hardness values*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS B 0100** apply.

4 Classification

Valves shall be classified according to the combination of nominal pressure, type of valve and nominal size, as given in Table 1.

Table 1 Classification

Material	Nominal pressure	Type of valve		Nominal size														Face-to-face dimension	Wall thickness	
				A	15	20	25	32	40	50	65	80	100	125	150	200	250			300
				B	1½	¾	1	1¼	1½	2	—	—	—	—	—	—	—	—	—	Table number-column number ^{a)}
MD	10K	Screwed end	Inside screw globe valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	5-1	7-1	
			Inside screw gate valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	5-4		
			Lift check valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	5-1		
			Swing check valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	5-1		
		Flanged end	Inside screw globe valve	⊙	⊙	⊙	⊙	⊙	⊙	—	—	—	—	—	—	—	—	6-1		
			Inside screw gate valve	⊙	⊙	⊙	⊙	⊙	⊙	—	—	—	—	—	—	—	—	6-5		
			Lift check valve	⊙	⊙	⊙	⊙	⊙	⊙	—	—	—	—	—	—	—	—	6-1		
MD and MDS	10K	Screwed end	Inside screw globe valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	5-2	7-2	
			Inside screw gate valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	5-5		
			Lift check valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	5-2		
		Flanged end	Inside screw globe valve	⊙	⊙	⊙	⊙	⊙	⊙	—	—	—	—	—	—	—	—	6-2		7-4
			Inside screw gate valve	⊙	⊙	⊙	⊙	⊙	⊙	—	—	—	—	—	—	—	—	6-5		
			Lift check valve	⊙	⊙	⊙	⊙	⊙	⊙	—	—	—	—	—	—	—	—	6-2		
			Outside screw globe valve	—	—	—	—	—	⊙	⊙	⊙	⊙	⊙	⊙	⊙	—	—	6-2		
			Outside screw gate valve	—	—	—	—	—	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	6-6		
			Swing check valve	—	—	—	—	—	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	⊙	6-2		

Table 1 (concluded)

Material	Nominal pressure	Type of valve		Nominal size																Face-to-face dimension	Wall thickness
				A	15	20	25	32	40	50	65	80	100	125	150	200	250	300			
				B	1½	¾	1	1¼	1½	2	—	—	—	—	—	—	—	—	—		
MD and MDS	16K	Screwed end	Inside screw globe valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	—	5-2	7-2	
			Inside screw gate valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	—	5-5		
			Lift check valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	—	5-2		
		Flanged end	Inside screw globe valve	◎	◎	◎	◎	◎	◎	—	—	—	—	—	—	—	—	—	6-2		
			Inside screw gate valve	◎	◎	◎	◎	◎	◎	—	—	—	—	—	—	—	—	—	6-6		
			Lift check valve	◎	◎	◎	◎	◎	◎	—	—	—	—	—	—	—	—	—	6-2		
			Outside screw globe valve	—	—	—	—	—	◎	◎	◎	◎	◎	◎	◎	◎	—	—	6-2		
			Outside screw gate valve	—	—	—	—	—	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	6-6		
			Swing check valve	—	—	—	—	—	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	6-2		
MDS	20K	Screwed end	Inside screw globe valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	—	5-3	7-3	
			Inside screw gate valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	—	5-6		
			Lift check valve	○	○	○	○	○	○	—	—	—	—	—	—	—	—	—	5-3		
		Flanged end	Inside screw globe valve	◎	◎	◎	◎	◎	◎	—	—	—	—	—	—	—	—	—	6-3		
			Inside screw gate valve	◎	◎	◎	◎	◎	◎	—	—	—	—	—	—	—	—	—	6-7		
			Lift check valve	◎	◎	◎	◎	◎	◎	—	—	—	—	—	—	—	—	—	6-3		
			Outside screw globe valve	—	—	—	—	—	◎	◎	◎	◎	◎	◎	◎	◎	—	—	6-4		
			Outside screw gate valve	—	—	—	—	—	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	6-8		
			Swing check valve	—	—	—	—	—	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	6-4		

The markings of ○ and ◎ in the nominal size column indicate the applicable nominal size for each valve type; ○ means the value in column B of Table 1 (hereafter referred to as Designation B) applies and ◎ means the value in column A of Table 1 (hereafter referred to as Designation A) applies.

NOTE For symbols in the material column, see 7.2 a).

Note ^{a)} Of the pairs of numerals in “Table number-column number” column, the former indicates the number of the table in this Standard and the latter indicates the number of the column in that table that contains the relevant dimension.

Example The pair “5-1” means that the dimension concerned is contained in column 1 of Table 5.

5 Relationship between fluid temperature and maximum allowable pressure

The relationship between the fluid temperature and the maximum allowable pressure (hereafter referred to as pressure-temperature rating) shall be as follows.

Valves could be subject to prohibition or restriction of use as stipulated by the High Pressure Gas Safety Act, or other related laws and regulations, regardless of **a)** or **b)**. The user of this Standard shall use the valves in accordance with criteria of the related laws and regulations.

- a) The pressure-temperature rating shall be in accordance with Table 2, Table 3 and Figure 1. However, if necessary, it can be altered within the range of Table 2, Table 3 and Figure 1.
- b) The pressure-temperature rating of the value with soft seat of 16K and 20K may be set within the range of Table 2 and Figure 1.

Table 2 Pressure-temperature rating of metal seat

Unit: MPa

Nominal pressure	Maximum allowable pressure			
	Fluid temperature °C			
	-10 to 120	220	300	350
10K	1.4	1.2	1.0	—
16K	2.2	2.0	1.8	1.6
20K	2.8	2.5	2.3	2.0
The maximum allowable pressure at an intermediate temperature between the temperatures shown in Table 2 shall be calculated by the proportional interpolation method.				

Table 3 Pressure-temperature rating of soft seat

Unit: MPa

Nominal pressure	Material of soft seat	Maximum allowable pressure		
		Fluid temperature °C		
		-10 to 120	183	220
10K	Reinforced polytetrafluoroethylene resin	1.4	1.2	1.0
	Polytetrafluoroethylene resin	1.4	1.0	—
The maximum allowable pressure at an intermediate temperature between the temperatures shown in Table 3 shall be calculated by the proportionate interpolation method.				

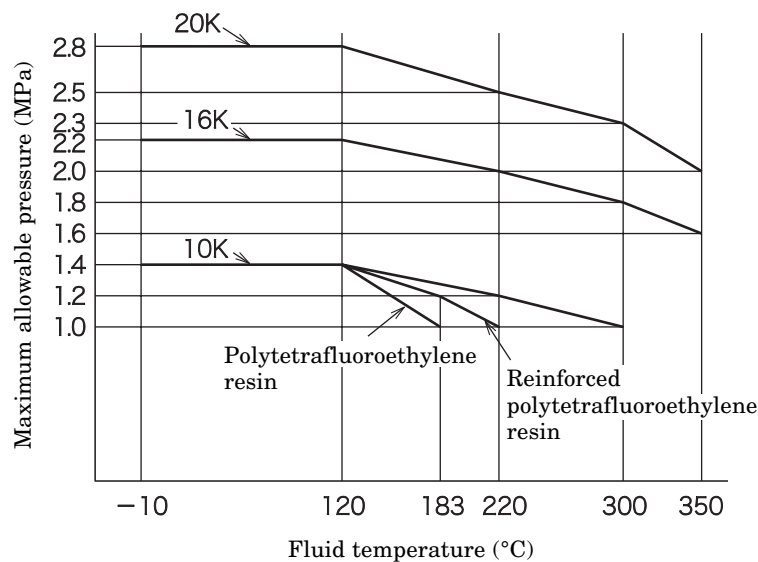


Figure 1 Pressure-temperature rating

6 Quality

6.1 Performance

The performance of valves shall be as follows.

- Pressure resistance performance** When pressure shell of valve is tested according to **a)** of Clause 9, each part composing the pressure shell shall be free from leakage, seeping out or other abnormalities.
- Valve seat leakage performance** When the valve seat leakage performance is tested according to **b)** of Clause 9, requirements in Table 4 shall be satisfied.
- Actuation performance** When tested according to **c)** of Clause 9, each moving part shall be smoothly actuated so as to be suited for the opening/closing operation of valve. The lift check valve and swing check valve shall return to the closing position by its own weight.

Table 4 Allowable leakage rate of valve seat

Type of valve		Rate
Globe valve	Metal seat	A
		B ^{a)}
	Soft seat	A
Gate valve	Metal seat	A
		D ^{a)}
Check valve	Metal seat	D
	Soft seat	A
		B ^{a)}

The rate given in this table is based on leakage division and allowable leakage rate specified in **JIS B 2003**.

The nominal sizes to be used for calculation shall be Designation A.

Note ^{a)} This shall apply where it is not detrimental to use.

6.2 Construction, shape and dimensions

6.2.1 Common matters

The construction and shape of valve shall be checked visually, dimensions shall be tested according to **d)** of Clause **9**, and the results shall satisfy the following.

- a) The bore of valve shall be in accordance with **JIS B 2001**.
- b) The valve seat bore shall be equal to the valve bore. However, the valve seat bore for flanged end type gate valves of nominal size 50 or under may be that of one size smaller.
- c) The screw thread at both ends of valve body of screwed end valve and screw thread for drain shall be in accordance with **JIS B 0203**.
- d) The flanges at both ends of valve body of flanged end valve shall be in accordance with **JIS B 2239**.
- e) The face-to-face dimensions of valve shall be as given in Table 5 and Table 6. The correspondence between the face-to-face dimension and the type of valve shall be as given in Table 1. The face-to-face dimensions of flanged end valves may be in accordance with **JIS B 2002**, if necessary.
- f) The wall thickness of valve body and the diameter of valve stem shall be in accordance with Table 7. The correspondence between the wall thickness and the valve type shall be as given in Table 1.
- g) The screw thread for drain shall be provided, if necessary.

When the wall thickness of valve body is insufficient relative to the specified length of effective threaded portion, the drain seat shall be provided. The dimensions of the screw thread for drain and the drain seat shall be as given in Table 8.

- h) For the reference to identify the size of valve, the height of fully opened valve of nominal pressure 20K which is maximum among valves, and diameter of handwheel are given in Table 6 and Table 7.
- i) Examples of constructions and shapes are given in Figure 2 to Figure 7. The correspondence between the part number and the name of part in Figure 2 to Figure 7 is given in Table 11.
- j) As to the opening/closing of valve, the counterclockwise turn of handwheel shall be defined as “opening”, and the clockwise turn as “closing”.
- k) The connection between the valve body and the bonnet shall be the screwed bonnet type, union bonnet type or bolted bonnet type.
- l) The valve disc may be equipped with the disc seat ring. The valve seat shall be attached by either screw-in or press-in.
- m) The body seat ring may be either of the screw-in type or the spread fixing type.
- n) The bonnet bolt shall satisfy the following Equation (1).

$$P \cdot \frac{A_g}{A_b} \leq 0.45\sigma_a \dots\dots\dots (1)$$

where, P : nominal pressure (MPa)
 A_g : area surrounded by the effective outside diameter of gasket (mm²)
 A_b : total effective cross-sectional area of bolt (mm²)
 σ_a : allowable stress of bolt material (N/mm²)
 In the case of S35C of **JIS G 4051**, the allowable stress shall be 76 N/mm².

- o) The soft seat shall be attached to the valve disc or valve seat.
- p) The gasket contact surfaces of flanges at both ends of valve body shall be of either flat face or raised face. However, it should be raised face for valves of nominal pressure 20K.
- q) The trapezoidal screw thread shall be used for the screw thread of valve stem. However, other screw thread may be used by agreement between the interested parties.
- r) The length of engagement between the screw thread of valve stem and the internal thread for the valve fully opened shall be as follows. The positions for the diameter of valve stem and the nominal size of screw thread of valve stem are shown in Figure 8.
 - 1) For the inside screw type, the length shall be at least the nominal size of screw thread of valve stem.
 - 2) For the outside screw type of nominal pressure 10K, the length shall be at least 1.2 times the diameter of valve stem.
 - 3) For the outside screw type of nominal pressures 16K and 20K, the length shall be at least 1.5 times the diameter of valve stem.
- s) The depth of stuffing box shall be at least 5 times the clearance between the valve stem and the stuffing box, except for inside screw type valves.
- t) If necessary, an operation machine of geared manual, electric, pneumatic, hydraulic or other type may be attached.
- u) The tolerances and permissible values of dimension, inclination, etc. shown below shall be according to **JIS B 2003**.
 - 1) Tolerances of face-to-face dimension
 - 2) Permissible values of inclination of flanges at both ends
 - 3) Permissible values of coaxiality between axes of screw threads at both ends
 - 4) For bolted bonnet type, permissible values of difference in circumferences at flange coupling part between valve body and bonnet