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Valves for high pressure gas cylinders

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS B 8246 : 1996** is replaced with **JIS B 8246 : 2004**.

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In the event of any doubts arising as to the contents,
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Valves for high pressure gas cylinders

Introduction This Japanese Industrial Standard has been prepared providing, in addition to the text specifying the valve types and their quality and shape and dimensions covered in the former Standard, supplementation of annex 1 based on the second edition of **ISO 407** *Small medical gas cylinders—Pin-index yoke-type valve connections* published in 1991 with some modifying of the technical contents.

In this annex 1, portions underlined with dots are the matters in which the contents of the original International Standard have been modified. Annex 3 (informative) lists the modifications with the explanation.

1 Scope This Standard specifies valves for high pressure gas cylinders (hereafter referred to as “valves”, among which yoke fastening type valves for medical gases, as “yoke valves”) mainly used for those of internal volume up to 150 L. Excepting this does not apply to the valves for dissolved acetylene and for liquefied petroleum cylinders.

Remarks : The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO 407 : 1991 *Small medical gas cylinders—Pin-index yoke-type valve connections* (MOD)

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

JIS B 0208 *Unified fine screw threads*

JIS B 0212 *Limits of sizes and tolerances for unified fine screw threads*

JIS B 0401-2 *ISO system of limits and fits—Part 2 : Tables of standard tolerance grades and limit deviations for holes and shafts*

Remarks : **ISO 286-2** : 1988 *ISO system of limits and fits—Part 2 : Tables of standard tolerance grades and limit deviations for holes and shafts* is identical with the said standard.

JIS B 0405 *General tolerances—Part 1 : Tolerances for linear and angular dimensions without individual tolerance indications*

Remarks : **ISO 2768-1** : 1989 *General tolerances—Part 1 : Tolerances for linear and angular dimensions without individual tolerance indications* is identical with the said standard.

JIS B 8244 *Valves for dissolved acetylene cylinder*

JIS B 8245 *Valves for liquefied petroleum gas cylinder*

- JIS G 3201 *Carbon steel forgings for general use*
JIS G 3205 *Carbon and alloy steel forgings for pressure vessels for low-temperature service*
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 H 3250 *Copper and copper alloy rods and bars*
JIS H 4140 *Aluminium and aluminium alloy forgings*

3 Classification Valves shall be classified by the types of valve connection and safe device as shown in table 1.

Table 1 Classification of valves

Classification		Symbol	Remarks
Type of valve connection	External thread	A ₁	Mainly for industrial purposes. Shape and dimensions are given in 5.2 table 7.
		A ₂	Mainly for medical purposes. Shape and dimensions are given in 5.2 table 8.
	Internal thread	B	Mainly for industrial purposes. Shape and dimensions are given in 5.2 table 7.
	Yoke type	C	To be used for valve connection for small medical gas cylinders. Shape and dimensions are given in annex 1.
Type of safety device	Diaphragm	R	—
	Fusible alloy	F	—
	Diaphragm and fusible alloy	RF	—
	None	O	—

4 Performances

4.1 Open/close operation of valve The open/close of valves shall be portable in ease and function smoothly.

4.2 Pressure proof Valve bodies, when subjected to a pressure by water, air or inert gases not less than the test pressure according to the kind of gas filled as given in table 2, shall be free from leakage and other abnormalities.

Table 2 Test pressure for pressure proof test

Division of gases	Kind of filling gas	Test pressure MPa	Division of gases	Kind of filling gas	Test pressure MPa
Compressed gas	—	Pressure equal to 5/3 of the filling pressure at 35 °C	Liquefied gas	Hydrogen sulfide	5.2
				Ammonia	2.9
				Chlorine	2.2
Liquefied gas	Ethylene	22.1		Methyl ether	1.8
	Carbon dioxide	19.6		Chloromethyl (Methyl chloride)	1.6
	Nitrous oxide	19.6		Sulfurous acid gas	1.2
	Ethane	19.6		Vinyl chloride	1.2
	Sulfur hexafluoride	19.6		Monomethylamine	1.0
	Carbon dioxide + ethylene oxide	19.6		Ethylene oxide	1.0
	Carbon dioxide + nitrous oxide	19.6		Trimethylamine	0.6
	Tetrafluoroethylene	13.7		Hydrogen cyanide	0.6
	Xenon	12.7		Phosgene	0.6
	Hydrogen chloride	12.7		Other gases	Pressure equal to 5/3 of the pressure at 48 °C, or 24.5
	Hydrogen bromide	6.7			

4.3 Gas tightness Valves, when subjected to the gastightness test as given in table 3 by using air or inert gas, shall be free from leakage of the respective checking points.

Table 3 Gastightness test conditions

Checking point	Test method	Test pressure MPa	Test duration s
Valve body, filling port and safety device	Closing the valve, to examine with pressurizing from cylinder connection.	At least 60 % of the test pressure given in table 2	30 min.
Valve body and gland nutted part	Closing filling port or cylinder connection tightly, apply pressure from the opposite outlet to examine with opening the valve.		

4.4 Actuation of safety device The safety device shall function at the pressure or temperature as given in table 4. Those using suasive alloy, however, shall function under the temperature relevant to the actuation pressure.

The temperature at measuring the actuation pressure of a safety device shall be $60\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ for that using copper diaphragm or $40\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ for that using other kind of diaphragm.

Table 4 Conditions for actuation pressure or actuation temperature

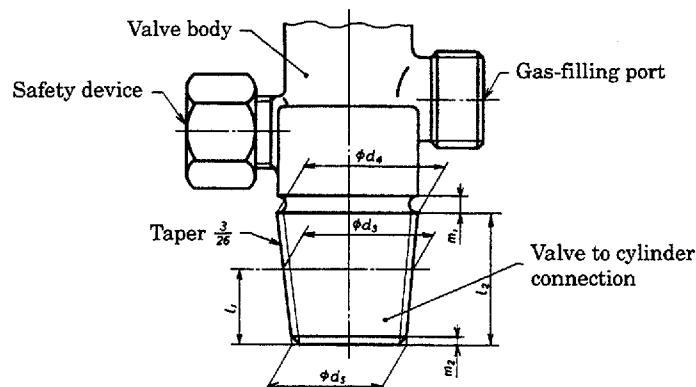
Construction of safety device	Actuation pressure or temperature		Tolerance on actuation pressure or temperature
Using diaphragm for safety valve	80 % of the test pressure of table 2		Actuation pressure ${}^0_{-15}\%$
Using fusible alloy for safety valve	Compressed gas	105 °C	Actuation temperature $\pm 5\text{ }^{\circ}\text{C}$
	Liquefied gas	Temperature relevant to 80 % of the table 2 test pressure	Actuation temperature max. with lower limit temperature relevant to 60 % of the table 2 test pressure
Using diaphragm and fusible alloy for safety valve	Compressed gas	80 % of the test pressure of table 2	Actuation pressure ${}^0_{-15}\%$
		105 °C	Actuation temperature $\pm 5\text{ }^{\circ}\text{C}$
	Liquefied gas	80 % of the table 2 test pressure	Actuation pressure ${}^0_{-25}\%$
		Temperature relevant to 80 % of the table 2 test pressure	Actuation temperature max. with lower limit temperature relevant to 60 % of the table 2 test pressure

4.5 Vibration proof For a valve under a state loaded with a pressure as given in table 3, when they are vibrated for every 30 min in three directions of vertical, lateral and in normal to them with 2 mm total amplitude at a rate of 2 000 cycles per min, there shall be no leakage or other abnormalities.

5 Dimension and constructions

5.1 Cylinder connection

5.1.1 Taper thread The dimensions of taper threads shall be as given in table 5.

Table 5 Dimensions of cylinder connection

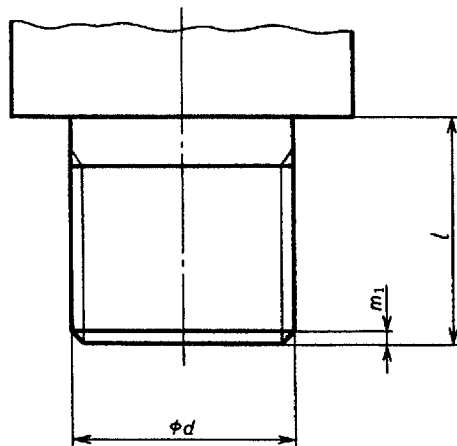
Unit: mm

Symbol for cylinder connection	Screw threads							m_1 (approx.)	m_2 (approx.)	Cylinder to be fitted	
	Gauge diam. d_3	d_4	d_5	l_1 (approx.)	l_2	Threads per the length (25.4 mm)	Taper			Capacity	Test pressure
V_1	20.000	21.2	18.661	11.60	22	14	$\frac{3}{26}$	3	2	≤ 5 L	—
V_2	28.000	29.5	26.038	17.00	30	14	$\frac{3}{26}$	3	2	> 5 L	> 9.8 MPa
V_3	28.000	29.5	26.500	13.00	26	14	$\frac{3}{26}$	3	2	> 5 L	≤ 9.8 MPa

- Remarks
- 1 The threads on the cylinder connection of valves shall be as specified in annex 2.
 - 2 The thread profile shall be a 55° triangle with a round crest ($H_1 = 0.639\,264P$, $r' = 0.138\,470P$) perpendicular to the taper surface, and the pitch shall be measured parallel to the axis.
 - 3 The thread shall be right-handed.
 - 4 With the thread engaged with a screw gauge by hand tightening the end of threaded portion shall be within two threads from the end of the screw gauge used (within the depth of notch in the screw gauge).
 - 5 The screws specified in **JIS B 8244** and **JIS B 8245** may be used.

5.1.2 Parallel thread The dimensions of parallel threads shall be as given in table 6.

Table 6 Dimensions of cylinder connection of valves



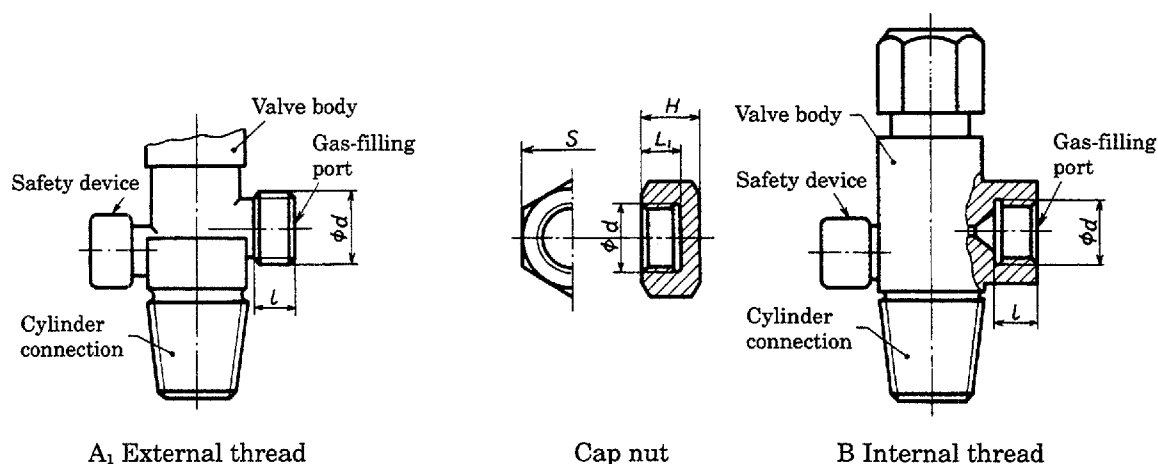
Unit: mm

Designation of thread	d	Threads per the length (25.4 mm)	l	m_1 (approx.)	Remarks
$\frac{1}{2}$ -20 UNF	12.700	20	18	1	See JIS B 0208
$\frac{5}{8}$ -18 UNF	15.875	18	18	1.5	
$\frac{3}{4}$ -16 UNF	19.050	16	23	1.5	
$\frac{7}{8}$ -14 UNF	22.225	14	23	2	
$1 \frac{1}{8}$ -12 UNF	28.575	12	24	2	
$\frac{3}{4}$ -14 NPSM	26.264	14	23	2	—

- Remarks
- 1 The basic thread profile shall be based on the unified thread.
 - 2 The thread shall be right-handed.
 - 3 The basic size, permissible deviations and tolerances of thread shall be as specified in annex 2.
 - 4 The dimension l in the table may be determined by agreement between the supplier and purchaser taking the matching with cylinder into account.

5.2 Gas-filling port and cut nut, and yoke-type valves The symbols, dimensions of the gas-filling port and cap nut and filling gas used by the type of valves shall be as given in tables 7 and 8.

Yoke-type valves shall comply with annex 1.

Table 7 Dimensions of filling port and cap nut

Unit: mm

Type symbol of valve	Gas to be filled	Gas-filling port				Cap nut		
		Screw threads				S	H	L ₁
		Drive direction	d	Threads per the length (25.4 mm)	l			
A ₁	Combustible compressed gas	LH	W22	14	13	30	14	10
	Combustible liquefied gas	LH	W20	14	13	30	14	10
		LH	W22	14	13	30	14	10
		LH	W26	14	12	32	12	9
B	Noncombustible compressed gas	RH	W22	14	13	30	14	10
	Noncombustible liquefied gas	RH	W20	14	13	30	14	10
		RH	W22	14	13	30	14	10
		RH	W26	14	12	32	12	9
	Combustible gas	LH	W23	14	16	—	—	—
	Noncombustible gas	RH	W23	14	16	—	—	—

Remarks 1 For the dimension S, 30 mm may be replaced by 29 mm for a while.

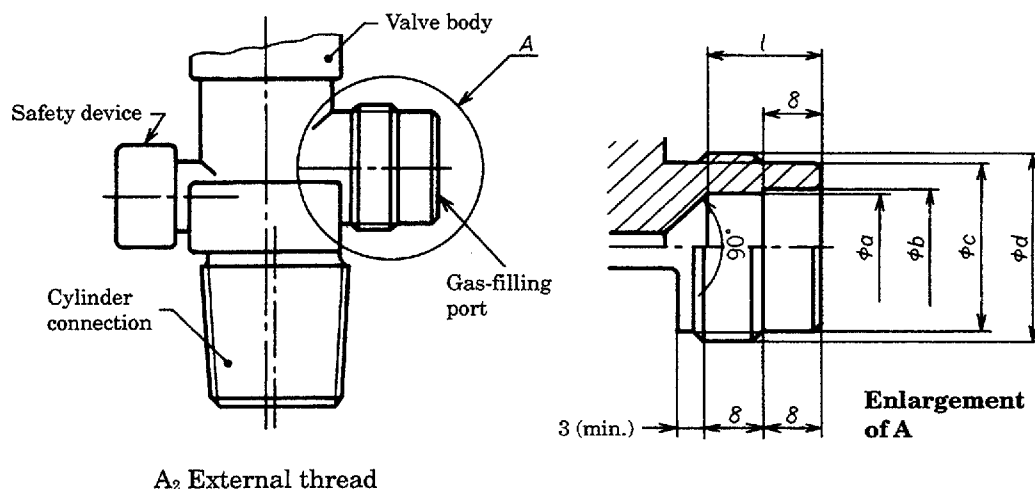
2 The cap nut may be omitted if no need.

3 The thread of filling port shall comply with annex 2.

4 The dimensional tolerances on S shall be $29^{0}_{-0.35}$ mm, $30^{0}_{-0.35}$ mm, and $32^{0}_{-0.40}$ mm.5 The dimensional tolerances on L₁ shall be 9 mm ± 0.2 mm and 10 mm ± 0.2 mm.

6 For the tolerance on the part with no indication of tolerance, the medium class of JIS B 0405 shall apply.

Table 8 Dimensions of filling port



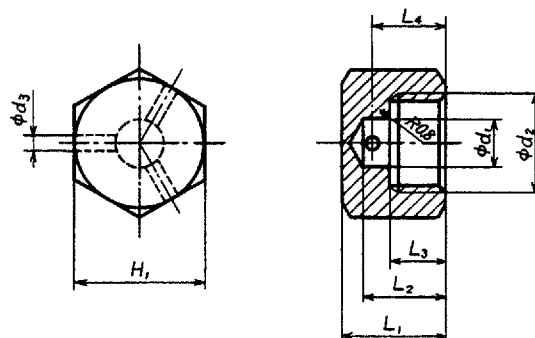
Unit: mm

Type symbol of valve	Gas to be filled	Gas-filling port						
		Screw threads						
		Drive direction	d	Pitch	a	b	c	l
A ₂	Nitrogen	RH	W24	2	13.3	14.7	21	16.6
	Oxygen	RH	W24	2	14	14	21	16.3
	Oxygen/nitrous oxide mixture	RH	W27	2	13.2	18.8	24	16.7
	Air	RH	W27	2	13.9	18.1	24	16.3
	Nitrous oxide	RH	W27	2	15.3	16.7	24	15.6
	Carbon dioxide	RH	W27	2	16	16	24	15.3

- Remarks 1 The oxygen/nitrous oxide mixture shall be 30 % or 50 % in mixing ratio of nitrous oxide.
- 2 The filling gas and the dimensions of gas-filling port are based on **ISO 5145**.
- 3 The dimensional tolerances on a and b shall be H10 of **JIS B 0401-2**.
- 4 The dimensional tolerance on c shall be h11 of **JIS B 0401-2**.
- 5 For the dimensions of cap nut, while these are not specified, relationship with the cylinder cap shall be taken into account.

5.3 Safety device The safety device shall meet the requirement of 4.4, excepting the case where the cylinder is equipped with a safety device.

5.4 Nut for safety valve (excluding yoke valves) Table 9 gives the dimensions of the nut for safety valve for the case where a diaphragm is used in the safety device.

Table 9 Dimensions of nut for safety valve

Unit: mm

Symbol of cylinder connection	d_1	d_2	Threads per the length (25.4 mm)	d_3	L_1	L_2	L_3	L_4	H_1
V ₁	6	W14	18	2	14	11.5	8	10.5	19 ⁰ _{-0.35}
V ₂	8	W16	18	2.5	16	13.5	9	12	21 ⁰ _{-0.35}

- Remarks 1 The thread in the nut shall be as specified in annex 2.
- 2 The part without indication of permissible deviation shall conform to the medium class specified in **JIS B 0405**.

6 Appearance On the appearance, valves shall be well finished as well as free from cracks, detrimental flaws to use, rust, peeling and other defects.

7 Materials The materials used for the valve body and the nut for safety device, which shall be suitable to the property of the gas filled, shall be as given in table 10 or at least equivalent thereto in quality.

Table 10 Materials for valve body and nut for safety device

Name of part	Materials			
Valve body and nut for safety device	JIS G 3201	SF390A, SF440A	JIS G 4303	SUS304, 316, 420J1, 420J2, 420F
	JIS G 3205	SFL2		SUS420F2
	JIS G 3214	SUSF304, SUSF304L, SUSF316, SUSF316L	JIS H 3250	C3604, C3712, C3771, C4641, C4622, C6782
	JIS G 4051	S25C	JIS H 4140	2014, 6061

8 Inspection Valves shall be inspected for the performance, dimensions, construction, appearance and materials to be resulted in conforming to the requirements in clauses 4 to 7. Excepting that the inspections for 4.2 and 4.5 shall be carried out at the time of new design and manufacturer or reconstruction and modification, or as required.

9 Designation Valves shall be designated by the number or title of this Standard, type of valve, symbol of cylinder connection and kind of gas to be filled.

Example 1 **JIS B 8246** A₁RV₂ oxygen

Example 2 Valve for high pressure gas cylinder A₂RV₂ oxygen

Example 3 **JIS B 8246** CRV₁ oxygen

Example 4 Yoke-type valve CFV₁ oxygen/nitrous oxide mixture

10 Marking Valves shall be marked with the following information on an appropriate place.

- a) Manufacturer's name or abbreviation
- b) Year and month of manufacture or their abbreviation (example: 04-01)
- c) Mass in kg (example: W0.7)
- d) Test pressure in MPa (example: TP24.5)⁽¹⁾

Note ⁽¹⁾ TP24.5M indicates that the pressure of the pressure proof test is 24.5 MPa.

- e) Name or chemical symbol of the gas to be filled (for yoke-type valves)