

Specification for

Valve fittings —

For compressed gas cylinders —

**Part 1: Valves with taper stems
(excluding valves used for breathing
and medical purposes)**

Co-operating organizations

The Chemical Engineering Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

- Association of British Chemical Manufacturers*
- Association of Consulting Engineers (Incorporated)
- Board of Trade
- British Chemical Plant Manufacturers' Association
- Coke Oven Managers' Association
- Engineering Equipment Users' Association
- Gas Council
- Glass Manufacturers' Federation
- Institute of Petroleum
- Institution of Chemical Engineers
- Institution of Gas Engineers
- Institution of Mechanical Engineers
- Institution of Structural Engineers
- Ministry of Transport*
- Society of Chemical Industry (Chemical Engineering Group)
- United Kingdom Atomic Energy Authority

The organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this standard:

- Air Ministry
- Associated Offices Technical Committee
- British Acetylene Association
- British Iron and Steel Federation
- Council of British Manufacturers of Petroleum Equipment
- D.S.I.R. — National Engineering Laboratory
- Federation of British Industries
- Home Office
- Institute of Refrigeration
- Liquefied Petroleum Gas Industry Technical Committee
- Lloyd's Register of Shipping
- Ministry of Labour (Factory Inspectorate)
- War Office
- Individual manufacturers and users of valves and gases

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Foreword

This standard makes reference to the following British Standards:

BS 18, *Tensile testing of metals*.

BS 84, *Parallel screw threads of Whitworth form*.

BS 131, *Methods for notched bar tests. Part 1: The Izod impact test on metals*.

BS 919, *Screw gauge limits and tolerances*.

BS 970, *Wrought steels. En series*.

BS 1095, *Metric screw threads, système international*.

BS 2033, *Aluminium nickel iron bronze rods and forgings for general engineering purposes*.

BS 2779, *Fastening threads of BSP. sizes*.

This standard has been prepared under the authority of the Chemical Engineering Industry Standards Committee and supersedes the 1945 edition. It was first published in 1931 in response to a request from the Gas Cylinder Research Committee, D.S.I.R., and was revised in 1945. It has been again revised to form the present edition.

The scope of the standard has been extended by the inclusion of valves for gases which were not provided for in the previous edition and also by the inclusion of dimensional particulars of the individual valve stems, outlets and connectors. Special purpose valves have not been included.

Requirements for the valve fittings for compressed gas cylinders used for medical purposes are contained in BS 1319, *“Medical gas cylinders and anaesthetic apparatus”*. Valve fittings for gas cylinders used for breathing purposes, other than medical, are contained in BS 341-2¹⁾, *“Valves with taper stems for use with breathing apparatus (excluding medical gas cylinders to BS 1319)”*. A specification for valves with parallel thread stems is under consideration and will form the subject of Part 3 of this standard.

Limited oversize threads for valve stems and cylinder necks may be used provided the minimum length of engagement of thread as specified in Table 1 is maintained.

The following British Standards apply to gas cylinders:

BS 399, *“High carbon” steel cylinders for “permanent” gases*.

BS 400, *“Low carbon” steel cylinders for the storage and transport of “permanent” gases*.

BS 401, *Steel cylinders for the storage and transport of “liquefiable” gases*.

BS 1045, *Manganese steel gas cylinders for atmospheric gases*.

BS 1287, *High carbon steel gas cylinders for carbon dioxide, nitrous oxide and ethylene*.

BS 1288, *Manganese steel gas cylinders for carbon dioxide, nitrous oxide and ethylene*.

NOTE Where metric equivalents are stated the figures in British units are to be regarded as the standard. The metric conversions are approximate. More accurate conversions should be based on the tables in BS 350, *“Conversion factors and tables”*. Attention is also drawn to BS 2856, *“Precise conversion of inch and metric sizes on engineering drawings”*.

¹⁾ In course of preparation.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 38 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard covers:

- a) The material and dimensions of valve fittings for compressed gas cylinders for all gases in general use other than for breathing and medical purposes.
- b) A safety release for carbon dioxide cylinders.
- c) The dimensions of valving capsules.

In the Appendix, recommendations for inspection gauges for the taper threads on the valve stems and in the necks of gas cylinders are included.

2 Material

a) *General*. All components used in valve construction shall be made from materials compatible with the gas to be contained in the cylinder. The material of the valve bodies shall comply with the mechanical properties in Clause 2 c).

b) *Valve bodies*. Compatible materials are indicated in Table 3 and Table 4. The chemical composition shall be the subject of agreement between the purchaser and the manufacturer.

Among the suitable materials are the following:

- i) Steel conforming to BS 970,²⁾ En 4, except that the minimum Izod value shall be 40 ft lbf;
- ii) Bronze or brass for pressures not exceeding 4 000 lbf/in²;
- iii) Aluminium bronze conforming to BS 2033.³⁾

The valve body shall not be a casting.

c) *Tests*.

i) *Test samples for mechanical tests*. The test samples for the tensile test specified in Sub-clause c) ii) shall, where practicable be taken from a valve blank: where this is not practicable, the test piece shall be treated in the same manner as the valve so as to be representative of the material in the condition in which it is to be used.

ii) *Tensile test*. A tensile test carried out on a proportional round test piece in accordance with BS 18⁴⁾, shall show the following properties:

Minimum tensile strength	28 tonf/sq in (62 720 lbf/in ²)
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Minimum elongation	20 per cent
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iii) *Impact test*. An impact test carried out in accordance with BS 131-1⁵⁾ shall show the following properties:

Minimum Izod value	a) 40 ft lbf for steel ^a , brass or bronze
	b) 20 ft lbf for aluminium bronze.

^a It may be necessary to oil quench and temper the steel to obtain this Izod value.

²⁾ BS 970, "Wrought steels. En series".

³⁾ BS 2033, "Aluminium nickel iron bronze rods and forgings for general engineering purposes".

⁴⁾ BS 18, "Tensile testing of metals".

⁵⁾ BS 131, "Notched bar tests", Part 1, "The Izod impact test on metals".

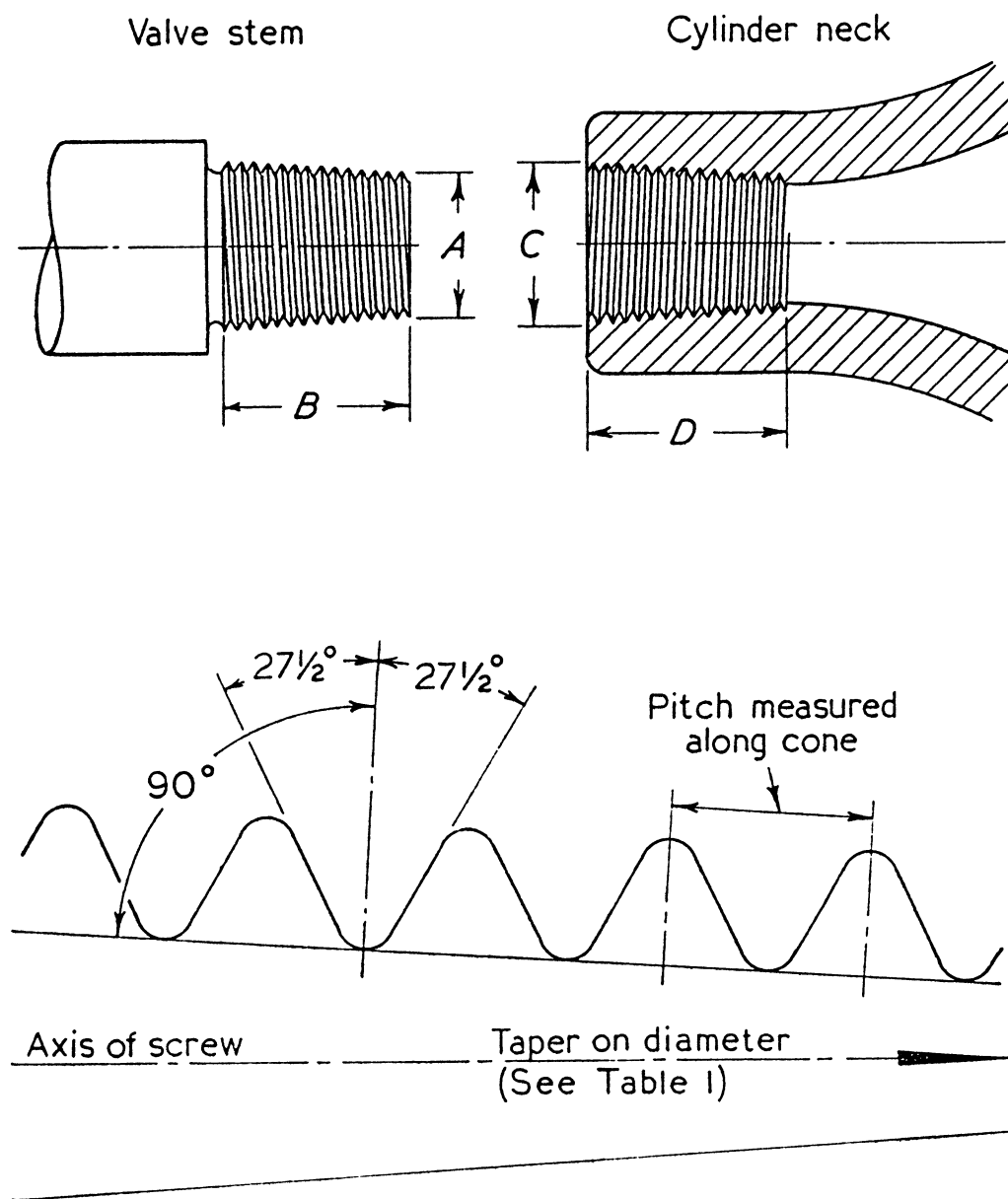


Figure 1 — Whitworth form thread, right hand, normal to surface of cone

3 Screw threads on valve stems and in cylinder necks

Three standard sizes of taper screw thread connections between valve stems and cylinders are specified. They are designated by the sizes 0.715 in, 1 in, and 1.25 in, which represent the maximum major diameter at the small end of the valve stem.

The principal dimensions of these screw threads shall be as given in Table 1 and Figure 1.

Where the taper screw thread for a particular application departs from the requirements specified in Table 1 and Table 2, the details of these threads for the valve stem are shown on the illustration of the valve outlet for the appropriate gas.

Threads on valve stems for use with gases which are not included in this standard, but which will subsequently become available in commercial quantities, shall be in accordance with the appropriate requirements given in Table 1 and Table 2.

Table 1 — Principal dimensions of standard taper screw threads on valve stems and in cylinder necks

NOTE Other special sizes of cylinder valve inlet stems are in current use and are indicated on the appropriate outlet drawing.

1	2	3	4	5	6	7	8
Nominal size of valve	Taper on diameter	Number of threads per inch measured along cone	“Stem” maximum major diameter <i>A</i>	Length of thread <i>B</i>	“Cylinder” minimum major diameter <i>C</i>	Minimum length of engagement ^a	Minimum length of thread in cylinder neck <i>D</i>
in			in	in	in	in	in
0.715	1 in 8	14	0.715	$\frac{7}{8} \begin{smallmatrix} +1/8 \\ -0 \end{smallmatrix}$	0.793	$\frac{5}{8}$	$\frac{7}{8}$
1	1 in 8	14	1.000	$1 \begin{smallmatrix} +1/8 \\ -0 \end{smallmatrix}$	1.094	$\frac{3}{4}$	1
1.25	1 in 8	11	1.250	$1\frac{1}{4} \begin{smallmatrix} +1/8 \\ -0 \end{smallmatrix}$	1.375	1	$1\frac{1}{4}$

^a When the valve stem is screwed down tight.

The screw threads on standard valve stems and in cylinder necks shall lie between the diametral limits stated in Table 2. Recommended limit gauges for controlling the screw threads between these limits are given in the Appendix.

Table 2 — Limits for standard taper screw threads on valve stems and in cylinder necks

1	2	3	4	5	6
Nominal size of valve	Thread element	Diameter of thread on stem at small end (See Figure 1) <i>A</i>		Diameter of thread at mouth of cylinder (See Figure 1) <i>C</i>	
		max.	min.	max.	min.
in		in	in	in	in
0.715	Major diameter	0.715 0	0.707 0	0.803 7	0.793 0
	Effective diameter	0.669 2	0.663 9	0.752 5	0.747 2
	Minor diameter	0.623 4	0.612 7	0.709 4	0.701 4
1	Major diameter	1.000 0	0.992 0	1.104 7	1.094 0
	Effective diameter	0.954 2	0.948 9	1.053 5	1.048 2
	Minor diameter	0.908 4	0.897 7	1.010 4	1.002 4
1.250	Major diameter	1.250 0	1.239 5	1.389 0	1.375 0
	Effective diameter	1.191 7	1.184 7	1.323 7	1.316 7
	Minor diameter	1.133 4	1.119 4	1.268 9	1.258 4

4 Valve outlets and connectors

The dimensions and tolerances of the valve outlets shall be in accordance with the details given in Table 3 and Table 4, and outlet numbers 1 to 18 as appropriate.

Other dimensions for connectors, washers, and nuts are given for guidance purposes.

Any hexagon with left hand thread on the valve outlet, and any hexagon nut with left hand thread shall for easy identification have notches at the corners.

Valves for cylinders containing gases or gas mixtures not provided for shall have valve outlets with left hand threads in the case of combustible gases or gas mixtures, and right hand threads in the case of non-combustible gases or gas mixtures.

NOTE It is requested that when it is intended to use a valve outlet or connector for a gas not provided for in Table 3, suggestions for these should be submitted to the B.S.I. for consideration with a view to their inclusion in the standard.

5 Spindles

The spindle end shall be square and of the size shown in Column 10 of Table 3 and Table 4, unless a hand-wheel is attached to the spindle.

6 Testing

Representative sample valve bodies from the production batch shall be submitted to a proof test at a pressure consistent with their maximum permissible working pressure.

7 Marking

Valves shall be permanently marked with their maximum permissible working pressures.

8 Safety release for carbon dioxide cylinders

The valve fittings for gas cylinders for carbon dioxide of 8 lb and over water capacity shall be provided with a safety release so arranged as to release the gas at a pressure between 2 500 and 2 850 lbf/sq in.

Table 3 — Details of valves

1	2	3	4	5	6	7	8	9	10
Gas		Material of valve	Screw thread of outlet (parallel threads)					Outlet No.	Width across flats of square on spindle
Name	Symbol		External or internal	Hand	Form	Nominal size	Threads per inch		
Acetylene	C ₂ H ₂	Non-ferrous or steel	I	L.H.	BSP.	$\frac{5}{8}$ in	14	2	$\frac{9}{32}$ in
Acetylene (Marine lighting)	C ₂ H ₂	Non-ferrous or steel	I	R.H.	BSP.	$\frac{3}{4}$	14	1	$\frac{5}{16}$
Air	—	Non-ferrous or steel	I	R.H.	BSP.	$\frac{5}{8}$	14	3	$\frac{9}{32}$
Ammonia	NH ₃	Steel	E	R.H.	BSP.	$\frac{1}{2}$	14	10	$\frac{3}{8}$
Argon	Ar	Non-ferrous or steel	I	R.H.	BSP.	$\frac{5}{8}$	14	3	$\frac{9}{32}$
Butadiene	CH ₂ CHCHCH ₂	Non-ferrous or steel	I	L.H.	BSP.	$\frac{5}{8}$	14	4	$\frac{9}{32}$
Butane	C ₄ H ₁₀	Non-ferrous or steel	E	L.H.	S.I.	21.8 mm	14	9	—
Carbon dioxide	CO ₂	Non-ferrous or steel	E	R.H.	B.S.W.	0.860	14	8	—
Carbon monoxide	CO	Non-ferrous or steel	I	L.H.	BSP.	$\frac{5}{8}$	14	4	$\frac{9}{32}$
Chlorine	Cl ₂	Steel	E	R.H.	BSP.	$\frac{5}{8}$	14	6	$\frac{3}{8}$
Chlorine trifluoride	ClF ₃	Steel	E	R.H.	BSP.	$\frac{5}{8}$	14	6	$\frac{3}{8}$
Chlorodifluoromethane	CHClF ₂	Non-ferrous or steel	E	R.H.	BSP.	$\frac{5}{8}$	14	6	$\frac{3}{8}$
Chlorotri-fluoromethane	CF ₃ Cl	Non-ferrous or steel	E	R.H.	BSP.	$\frac{5}{8}$	14	6	$\frac{3}{8}$
Coal gas	—	Non-ferrous or steel	I	L.H.	BSP.	$\frac{5}{8}$	14	4	$\frac{9}{32}$

Table 3 — Details of valves

1	2	3	4	5	6	7	8	9	10
Gas		Material of valve	Screw thread of outlet (parallel threads)					Outlet No.	Width across flats of square on spindle
Name	Symbol		External or internal	Hand	Form	Nominal size	Threads per inch		
						in			in
Dichloro-difluoro-methane	CCl_2F_2	Non-ferrous or steel	E	R.H.	BSP.	$\frac{5}{8}$	14	6	$\frac{3}{8}$
Dichloro-fluoromethane	CHFC l_2	Non-ferrous or steel	E	R.H.	BSP.	$\frac{5}{8}$	14	6	$\frac{3}{8}$
Ethyl chloride	$\text{C}_2\text{H}_5\text{Cl}$	Non-ferrous or steel	E	L.H.	BSP.	$\frac{5}{8}$	14	7	$\frac{3}{8}$
Ethylamine	$\text{C}_2\text{H}_5\text{NH}_2$	Steel	E	L.H.	BSP.	$\frac{1}{2}$	14	11	$\frac{3}{8}$
Ethylene	C_2H_4	Non-ferrous or steel	I	L.H.	BSP.	$\frac{5}{8}$	14	4	$\frac{9}{32}$
Ethylene oxide	$\text{C}_2\text{H}_4\text{O}$	Non-ferrous or steel	E	L.H.	BSP.	$\frac{5}{8}$	14	7	$\frac{3}{8}$
Helium	He	Non-ferrous or steel	I	R.H.	BSP.	$\frac{5}{8}$	14	3	$\frac{9}{32}$
Hydrogen	H_2	Non-ferrous or steel	I	L.H.	BSP.	$\frac{5}{8}$	14	4	$\frac{9}{32}$
Hydrogen chloride	HCl	Steel	E	R.H.	BSP.	$\frac{5}{8}$	14	6	$\frac{3}{8}$
Hydrogen fluoride	HF	Non-ferrous or steel	E	R.H.	BSP.	$\frac{5}{8}$	14	6	$\frac{3}{8}$
Methane	CH_4	Non-ferrous or steel	I	L.H.	BSP.	$\frac{5}{8}$	14	4	$\frac{9}{32}$
Methyl chloride	CH_3Cl	Non-ferrous or steel	E	L.H.	BSP.	$\frac{5}{8}$	14	7	$\frac{3}{8}$
Methylamine	CH_3NH_2	Steel	E	L.H.	BSP.	$\frac{1}{2}$	14	11	$\frac{3}{8}$
Neon	Ne	Non-ferrous or steel	I	R.H.	BSP.	$\frac{5}{8}$	14	3	$\frac{9}{32}$
Nitrogen	N_2	Non-ferrous or steel	I	R.H.	BSP.	$\frac{5}{8}$	14	3	$\frac{9}{32}$
Nitrous oxide	N_2O	Non-ferrous or steel	E	R.H.	BSW.	$\frac{11}{16}$	20	13	$\frac{15}{64}$
Oxygen	O_2	Non-ferrous	I	R.H.	BSP.	$\frac{5}{8}$	14	3	$\frac{9}{32}$
Phosgene	COCl_2	Steel	E	R.H.	BSP.	$\frac{5}{8}$	14	6	$\frac{3}{8}$
Propane	C_3H_8	Non-ferrous or steel	I	L.H.	BSP.	$\frac{5}{8}$	14	4 or 5	$\frac{9}{32}$ —
Sulphur dioxide	SO_2	Non-ferrous or steel	E	R.H.	BSP.	$\frac{1}{2}$	14	12	$\frac{3}{8}$
Sulphur hexafluoride	SF_6	Non-ferrous or steel	E	R.H.	BSP.	$\frac{5}{8}$	14	6	$\frac{3}{8}$
Trichloro-fluoromethane	CFCl_3	Non-ferrous or steel	E	R.H.	BSP.	$\frac{5}{8}$	14	6	$\frac{3}{8}$
Vinyl chloride	$\text{C}_2\text{H}_3\text{Cl}$	Non-ferrous or steel	E	L.H.	BSP.	$\frac{5}{8}$	14	7	$\frac{3}{8}$

Table 4 — Details of alternative valves for use with cylinders of 25 lb water capacity and under

1	2	3	4	5	6	7	8	9	10
Gas		Material of valve	Screw thread of outlet (parallel threads)					Outlet No.	Width across flats of square on spindle
Name	Symbol		External or internal	Hand	Form	Nominal size	Threads per inch		
Acetylene	C ₂ H ₂	Non-ferrous or steel	E	R.H.	B.S.W.	in 0.906	18	18	—
Butadiene	CH ₂ CHCHCH ₂	Non-ferrous or steel	E	L.H.	BSP.	³ / ₈	19	15	⁹ / ₃₂
Chlorine	Cl	Steel	E	R.H.	BSP.	³ / ₈	19	14	⁹ / ₃₂
Dichloro-difluoromethane	CCl ₂ F ₂	Non-ferrous or steel	E	R.H.	BSP.	³ / ₈	19	14	⁹ / ₃₂
Ethyl chloride	C ₂ H ₅ Cl	Non-ferrous or steel	E	L.H.	BSP.	¹ / ₄	19	17	⁹ / ₃₂
Ethylene oxide	C ₂ H ₄ O	Non-ferrous or steel	E	L.H.	BSP.	³ / ₈	19	15	⁹ / ₃₂
Hydrogen chloride	HCl	Steel	E	R.H.	BSP.	³ / ₈	19	14	⁹ / ₃₂
Hydrogen sulphide	H ₂ S	Steel	E	L.H.	BSP.	³ / ₈	19	15	⁹ / ₃₂
Methyl bromide	CH ₃ Br	Non-ferrous or steel	E	R.H.	BSP.	¹ / ₄	19	16	⁹ / ₃₂
Methyl chloride	CH ₃ Cl	Non-ferrous or steel	E	L.H.	BSP.	¹ / ₄	19	17	⁹ / ₃₂
Phosgene	COCl ₂	Steel	E	R.H.	BSP.	³ / ₈	19	14	⁹ / ₃₂
Sulphur dioxide	SO ₂	Non-ferrous or steel	E	R.H.	BSP.	¹ / ₄	19	16	⁹ / ₃₂

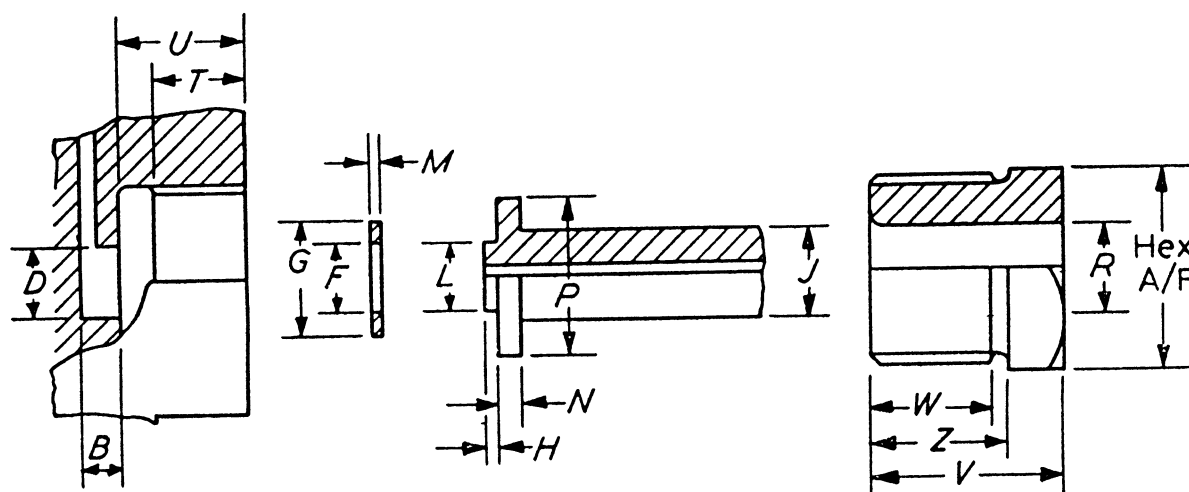
9 Valving capsules

a) *General.* A valving capsule, of suitable soft metal, for fitting between the taper threaded portion of the cylinder valve and the internally threaded portion of the cylinder neck, may be used to ensure a gas-tight joint when the valve is screwed home. A torque-limiting device should be used. Since the material must be suitable for use with the gas to be contained in the cylinder, the chemical composition shall be the subject of agreement between the purchaser and the manufacturer.

b) *Dimensions.* The capsule shall consist of a tapered sleeve and shall conform to the dimensions given in Table 5.

Table 5 — Valving capsules

Nominal size of valve	Inside diameter at large end	Inside diameter at small end	Length	Approximate thickness
in	in	in	in	in
0.715	0.824	0.715	⁷ / ₈	0.005
1	1.109	1.000	⁷ / ₈	0.005
1.25	1.375	1.250	1	0.005

³/₄ in BSP.F right hand internal outlet connection for acetylene (marine lighting installations)

VALVE OUTLET			CONNECTOR			HEXAGON NUT		
Thread	$\frac{3}{4}$ BSP.F–R.H.		Nose diameter	L	0.375	Thread	$\frac{3}{4}$ BSP.F–R.H.	
Minor diameter	0.9709 – 0.9496		Nose length	H	$\frac{1}{16}$	Major diameter	1.041 – 1.0323	
Effective diameter	1.0013 – 0.9953		Shoulder diameter	P	$\frac{3}{4}$	Effective diameter	0.9953 – 0.9893	
Major diameter (min.)	1.041		Shoulder length	N	$\frac{1}{8}$	Minor diameter (max.)	0.9496	
Bore depth	U	$\frac{11}{16}$	Shank diameter	J	0.500	Hexagon across flats	1.100 – 1.090	
Full thread	T	$\frac{1}{2}$				Hole diameter	R	0.512
Recess diameter	D	0.406	WASHER			Shank	Z	$\frac{3}{4}$
Recess length	B	$\frac{7}{32}$	Diameter	G	$\frac{5}{8}$	Full thread	W	$\frac{5}{8}$
			Hole diameter	F	$\frac{25}{64}$	Length	V	$1\frac{1}{16}$ min.
			Thickness	M	$\frac{1}{16}$			

General machining tolerances unless otherwise stated:

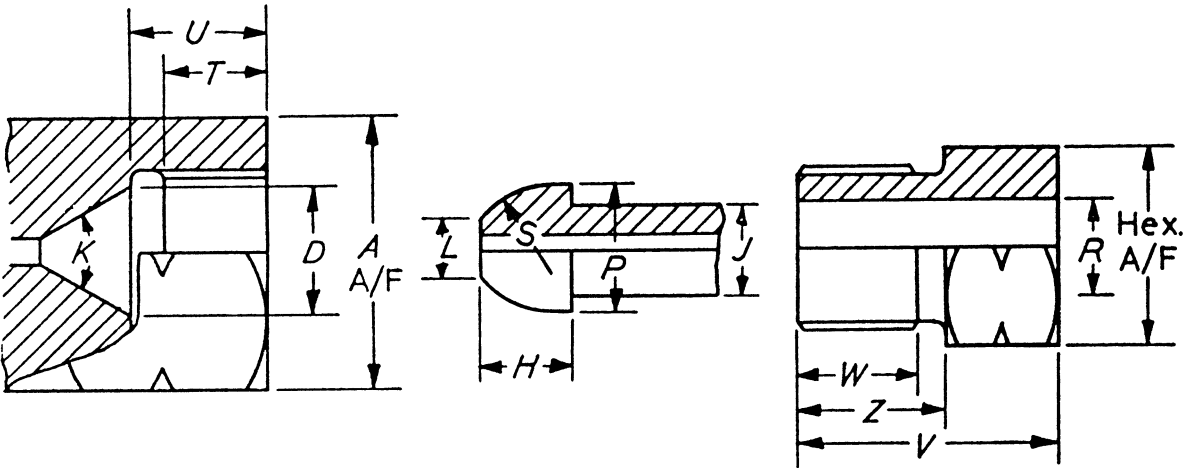
Fractional dimensions $\pm 1/64$. Decimal dimensions ± 0.005 .

All dimensions are in inches.

^a BS 2779, “Fastening threads of BSP. sizes”.

OUTLET No. 2

⁵/₈ in BSP.F left hand internal outlet connection for acetylene



VALVE OUTLET			CONNECTOR			HEXAGON NUT		
Thread	⁵ / ₈ BSP.F–L.H.		Nose diameter	<i>P</i>	0.718	Thread	⁵ / ₈ BSP.F–L.H.	
Minor diameter	0.8319 – 0.8106		Nose radius	<i>S</i>	0.500	Major diameter	0.902 – 0.8937	
Effective diameter	0.8619 – 0.8563		Nose length	<i>H</i>	0.500	Effective diameter	0.8563 – 0.8507	
Major diameter (min.)	0.902		End diameter	<i>L</i>	0.343	Minor diameter (max.)	0.8106	
Bore depth	<i>U</i>	³ / ₄	Shank diameter	<i>J</i>	0.500	Hexagon across flats	1.100 – 1.090	
Full thread	<i>T</i>	³⁵ / ₆₄				Hole diameter	<i>R</i>	0.531
Seat diameter	<i>D</i>	0.707				Shank	<i>Z</i>	¹³ / ₁₆
Angle	<i>K</i>	60°				Full thread	<i>W</i>	⁵ / ₈
Boss hexagon A/F	<i>A</i>	1.46 min.				Length	<i>V</i>	1 ¹ / ₈ min.

BSP.F threads to BS 2779^a with Medium class tolerances.

General machining tolerances unless otherwise stated:

Fractional dimensions ± ¹/₆₄. Decimal dimensions ± 0.005.

Angular tolerance ± 15'.

All dimensions are in inches.

^a BS 2779, "Fastening threads of BSP. sizes".