BRITISH STANDARD

BS 341 : Part 1 : 1991

Transportable gas container valves

Part 1. Specification for industrial valves for working pressures up to and including 300 bar

BSI STANDARDS

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Pressure Vessel Standards Policy Committee (PVE/-) to Technical Committee PVE/3, upon which the following bodies were represented:

Aluminium Extruders Association
Aluminium Federation
Associated Offices Technical Committee
British Compressed Gases Association
British Fire Consortium
British Fire Protection Systems Association Ltd.
British Railways Board
British Soft Drinks Association Ltd.
Chief and Assistant Chief Fire Officers' Association
Department of Trade and Industry (Mechanical Engineering and Manufacturing Technology Division (Mmt))
Department of Trade and Industry (National Engineering Laboratory)
Department of Trade and Industry (National Physical Laboratory)
Department of Transport (Marine Directorate)
Engineering Equipment and Materials Users' Association
Fire Extinguishing Trades Association
Health and Safety Executive
Home Office
Industrial Safety (Protective Equipment) Manufacturers' Association
Institute of Refrigeration
Institute of Chemical Engineers
Liquefied Petroleum Gas Industry Technical Association (UK)
Ministry of Defence

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Contents

Foreword

This Part of BS 341 has been prepared under the direction of the Pressure Vessel Standards Policy Committee at the request of the Health and Safety Executive and supersedes BS 341 : Part 1 : 1962 and BS 341 : Part 2 : 1963, which are withdrawn. It details the design, manufacture and testing of valves fitted to containers used for the conveyance of permanent, liquefiable and dissolved gases **except those for liquefied petroleum gas (LPG) applications**. ⚠1

It has been revised to include the recommendations contained in the Report of the Home Office Gas Cylinders and Container Committee [1] (published in 1969).

⚠1

This Part of BS 341 is restricted to monobloc valve bodies and fittings.

The opportunity has been taken to bring together into this Part of BS 341 the current requirements for container valves previously given in BS 341 : Part 1 : 1962 and BS 341 : Part 2 : 1963, covering the following:

1) material requirements, design, manufacture, inspection and testing of new valves;
2) dimensioning of valve stems and outlet connections;
3) periodic inspection, testing and maintenance of valves in service.

NOTE. Additional requirements may be necessary to cover the design, manufacture and construction of valves fitted to containers for military use.

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

Section 1. General

1.1 Scope

This Part of BS 341 specifies requirements for the design, materials, manufacture and testing of new and refurbished valves together with the testing, periodic inspection and maintenance of valves in service, for use with refillable aluminium and steel containers manufactured for the suitable conveyance and storage of permanent, liquefiable and dissolved gases for industrial applications, but excluding valves with outlets conforming to BS 1319.

This Part of BS 341 applies to valves limited to a charging pressure (see **1.3.19**) of 300 bar[1)] (developed pressures for particular gases may exceed this pressure).

This Part of BS 341 also gives requirements for the design, manufacture, testing and installation of pressure relief devices, to protect containers up to 130 L capacity from excessive pressure, particularly when exposed to heat.

WARNING. It is essential that pressure relief devices should not be used with toxic gases.

Recommendations for the plating of copper alloy valves are given in annex A and recommendations for the valving of containers are given in annex B. A list of the alternative outlets for the less commonly used gases imported into the United Kingdom is given in annex C.

This Part of BS 341 does not include requirements for the selection of valve outlets and materials for gas mixtures, valves for medical applications complying with BS 1319 and ultra-high-purity gases.

1 **This Part of BS 341 does not cover valves for liquefied petroleum gas (LPG).**

1.2 References

1.2.1 Normative references

This Part of BS 341 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 341 only when incorporated in it by updating or revision.

1.2.2 Informative references

This Part of BS 341 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

1.3 Definitions

For the purposes of this Part of BS 341, the following definitions apply.

1.3.1 valve body

The major valve component which includes an inlet and an outlet and, where applicable, a boss for a pressure relief device.

1.3.2 spindle

The element of the valve which, when operated, directly or indirectly actuates the sealing member (seal) to an open or closed position.

1.3.3 seating face

The fixed contact face in the valve body for completing the seal against gas flow.

1.3.4 valve stem

The inlet connection fitted to the container.

1.3.5 valve outlet

The service connection.

1.3.6 container neck

The part of the container that has the threaded connection for the valve stem.

1.3.7 dip (or syphon) tube

A tube fitted to the valve to allow withdrawal of liquefied gas without inversion of the container.

1.3.8 goose neck eductor

A tube fitted to the valve stem to allow withdrawal of vapour or liquefied gas when the container is correctly positioned on its side.

1.3.9 oversized valve

A valve having a larger than normal stem thread to suit an oversized container neck thread.

1.3.10 vapour/liquid valve

A valve designed so that either vapour or liquid may be discharged without inverting the container.

NOTE. The valve may have separate vapour and liquid outlets or a common outlet.

1.3.11 thread sealant

A material applied to a taper thread to effect a gas tight joint. It fills the cavity remaining in the helix of mating threads.

1.3.12 pressure relief device

A device designed to reduce the possibility of failure of a charged container from excessive pressure particularly when the container is exposed to heat.

1.3.13 pressure relief valve

A pressure relief device that is in direct contact with the gas, and is designed to open and close within predetermined pressure limits.

[1)] 1 bar = 10^5 N/m^2 = 100 kPa.

1.3.14 bursting disc
A pressure relief device consisting of a disc that is in direct contact with the gas and is designed to rupture between predetermined pressure limits.

1.3.15 fusible plug
A device containing a material of low melting point which is in direct contact with the gas. It is intended to yield or melt within predetermined limits of temperature and permit the discharge of the contained gas.

1.3.16 start-to-discharge pressure
The pressure at which the leakage rate from a pressure relief device first exceeds 10^{-3} torr·L/s[2)].

1.3.17 flow rating pressure
The pressure at the inlet of a pressure relief device which is used for establishing its rated flow capacity.

1.3.18 rated flow capacity
The capacity of a pressure relief device measured in cubic metres per minute of free air at the designed flow rating pressure.

1.3.19 charging pressure
The settled pressure at a uniform temperature of 15 °C at full gas content.

1.3.20 specified bursting pressure
The nominal pressure at which a bursting disc is designed to rupture.

1.3.21 maximum bursting pressure
The specified bursting pressure plus the upper permitted design tolerance.

1.3.22 leak
An unintended flow of gas or liquid in excess of 10^{-3} torr· L/s.

1.3.23 ageing
A change in a metal by which its structure recovers from an unstable condition produced by quenching or cold working.

1.3.24 stress relieving
A process to reduce internal residual stresses in a metal by heating it to a suitable temperature for a stipulated period of time.

1.3.25 normalizing
A process in which a carbon or alloy steel is heated to a temperature above its upper transformation temperature (known as the solution temperature) and subsequently cooled in still air.

1.3.26 quenching
A process in which a material is heated to a temperature above its upper transformation temperature (known as the solution temperature) and then quenched in a suitable medium.

1.3.27 prototype test
A test or series of tests directed towards approval of a design, conducted to determine whether an item is capable of meeting the requirements of the product specification.

1.3.28 proving tests
Tests carried out on representative samples of the first production run of valves to determine the rated flow capacity and other operating characteristics.

1.3.29 direct acting valve
A valve in which the sealing member is downstream of the seating face and the gas pressure tends to open the valve.

1.3.30 indirect acting valve
A valve in which the sealing member is upstream of the seating face and the gas pressure tends to close the valve.

1.3.31 inspection gauge
Gauge used for the routine gauging of cylinder neck and valve stem thread. They are not for checking other gauges.

1.3.32 check gauge
A gauge for checking dimensional conformity of inspection gauges. They are not for gauging of cylinder neck and valve stem threds.

1.3.33 single piece gauge
An inspection gauge designed to contact the full length of taper thread. These gauges are plug or ring, smooth or threaded types.

1.3.34 two piece gauges
Two inspection gauges to be used in combination, where one is designed to contact the large end of the taper cone and the other the small end. These sets of gauges are plug or ring, smooth or threaded types.

1.4 Classification and types of valves

1.4.1 Classification
Valves are classified as either direct acting valves (see **1.3.29**) or indirect acting valves (see **1.3.30**).

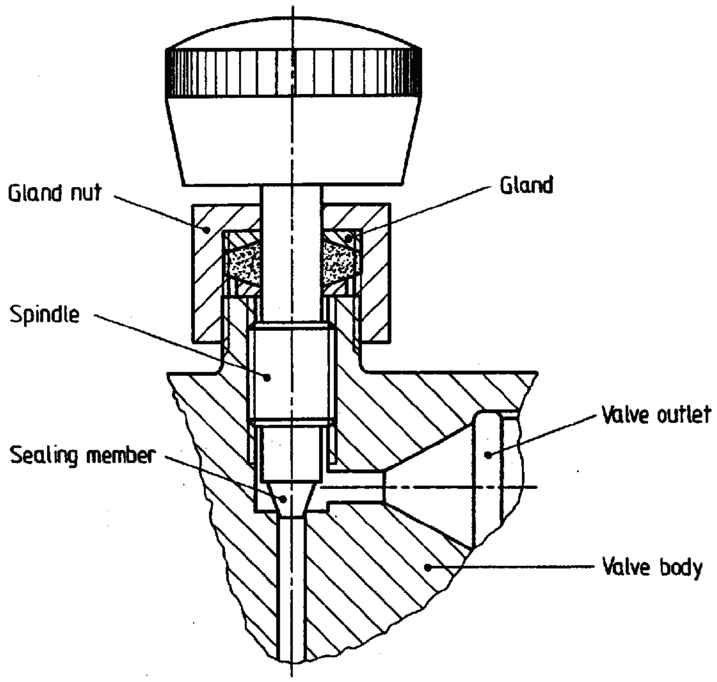
NOTE. Direct acting valves are more commonly used than indirect acting valves. The usual modes of operation of direct acting valves are as follows:

a) integral screw threaded spindle and sealing surface rotating on the seating face (see figure 1a));

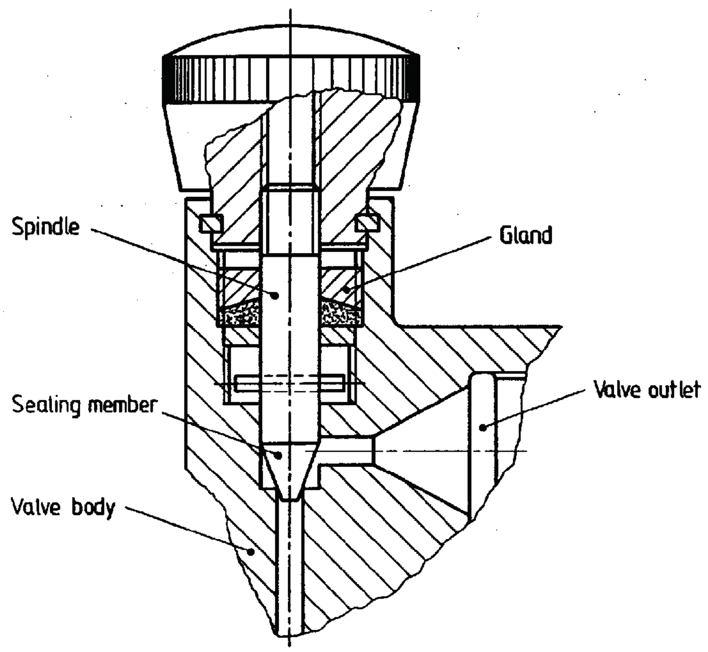
b) screwed spindle independent from a non-rotating sealing surface (see figure 1b)).

Indirect acting valves are usually of the non-rotating sealing type (see figure 2).

1 [2)] 10^{-3} torr·L/s^2 ≈ 5 mbar·L/h = 133.3 × 10^{-6} N·m/s. An approximate indication of this leakage rate would be the formation of four 3.5 mm diameter or ten 2.5 mm diameter bubbles per minute.

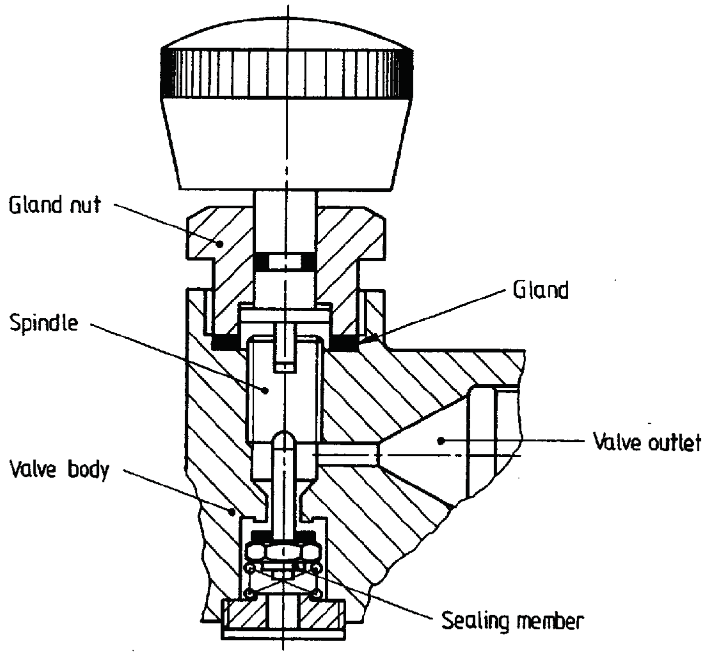


a) Direct acting valve with rotating sealing member



b) Direct acting valve with non-rotating sealing member

Figure 1. Illustration of typical direct acting valves



NOTE. The example is an indirect acting valve with non-rotating sealing member.

Figure 2. Illustration of a typical indirect acting valve

1.4.2 Valve types

NOTE. Examples of methods of spindle sealing are as follows:

a) adjustable gland packing (see figure 1a));

b) automatic gland seal packing (see figure 1b));

c) 'O'-ring or moulded seal packing (see figure 2);

d) diaphragm seal (see figure 3).

Valves shall be either:

1) handwheel operated (see figures 1, 2 and 3); or

2) key operated (see figure 4).

1.5 Classification of gases

For the purposes of this standard, gases are classified as permanent gases, liquefiable gases or dissolved acetylene.

a) *Permanent gases*: gases that have a critical temperature below −10 °C.

b) *Liquefiable gases*: gases that are liquefiable by pressure at −10 °C but which completely vaporize at 17.5 °C at a pressure of not more than 1013 mbar.

High pressure liquefiable gases are those having a critical temperature between −10 °C and 70 °C inclusive.

Low pressure liquefiable gases are those having a critical temperature above 70 °C.

Toxic substances that are liquids at a pressure of 1013 mbar and a temperature of 0 °C but which boil at or below 30 °C at that pressure shall be treated as low pressure liquefiable gases.

c) *Dissolved acetylene*: acetylene dissolved under pressure in a solvent contained in a porous substance at ambient temperature and that is released from the solvent without the application of heat.

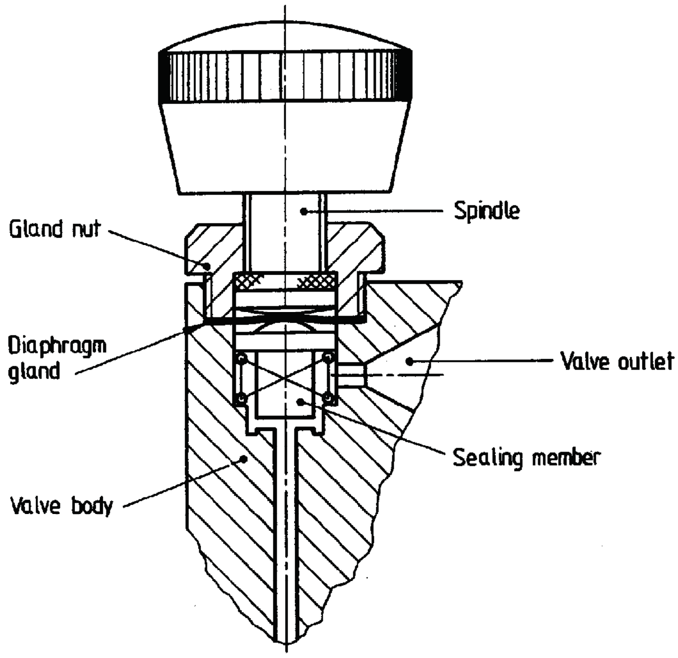
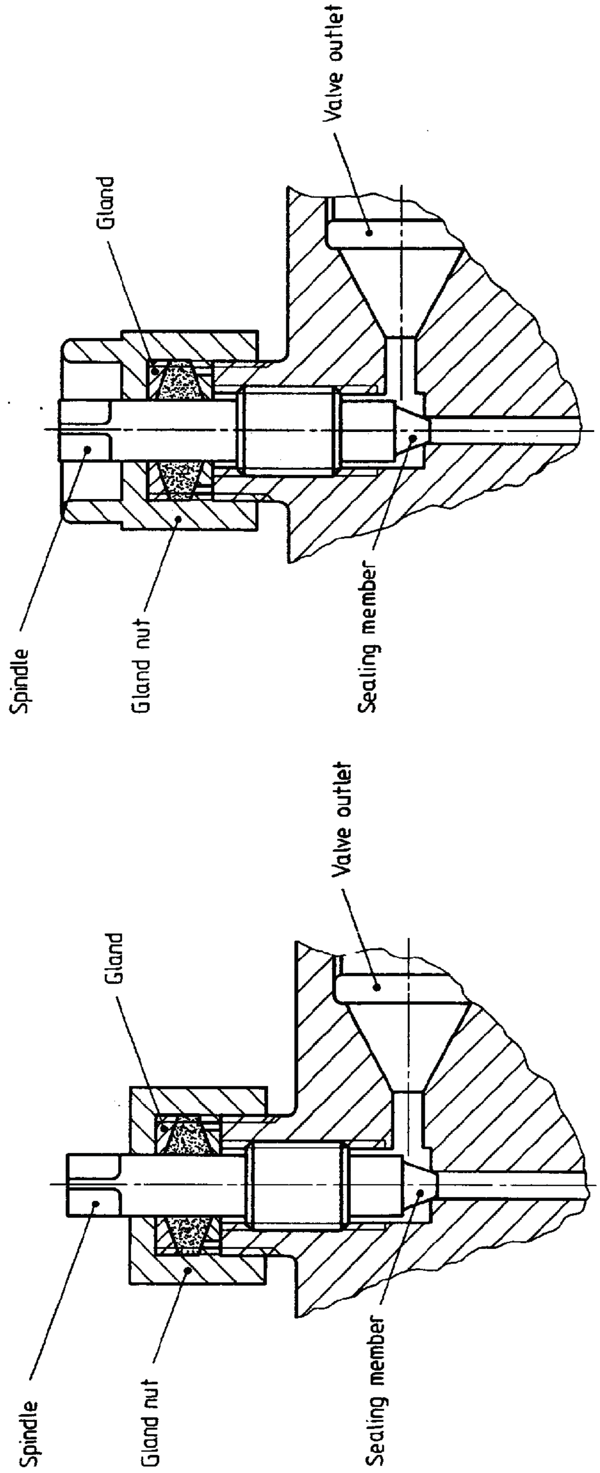


Figure 3. Illustration of a typical valve with diaphragm gland



a) With unshrouded spindle

b) With shrouded spindle

Figure 4. Illustrations of typical key operated valves

1.6 Information and requirements to be agreed and to be documented

1.6.1 Information to be supplied by the purchaser

The following information to be supplied by the purchaser shall be fully documented. Both the definitive requirements specified throughout the standard and the following documented items shall be satisfied before a claim of compliance with the standard can be made and verified:

a) name(s) of gas(es) to be contained (see table 1);

b) service application including any adverse condition (see **3.1.15**);

c) outlet connection number in accordance with this standard (see table 1);

1 d) valve inlet working pressure at 15 °C, or developed pressure in the container at the appropriate reference temperature (see **3.1.1**);

e) container hydraulic test pressure (see **3.1.2**);

f) material of construction of container to which the valve is to be fitted (see **2.1**);

g) stem thread size and method of sealing (see **3.3**);

h) relief devices, if required, with nominal rated flow capacity (see **4.1**);

i) cleaning or decontamination standards required (see **5.5**);

j) external/internal finish required (see **5.4**);

k) details of optional markings required (see **7.1**);

l) details of any valve protection (see **7.2** and **3.1.16**);

m) details of lubrication for operating threads and seals (see **5.6**).

1.6.2 Information to be supplied by the manufacturer

The manufacturer shall, on request, supply to the purchaser the following:

a) a drawing showing the significant dimensions of the container valve (see note 3 to **3.2.1**);

b) details of all materials of construction (see table 1);

c) the valve body hydraulic test pressure (see **6.2.2**);

d) layout and details of stamped markings (see **7.1**);

e) test certificates (see **7.3**);

f) flow characteristics of valve when fully opened and discharging to atmosphere at an inlet pressure specified by the purchaser and at 15 °C as determined by prototype test and proving test (see **4.1**).

Table 1. Outlet connections and preferred materials for use with industrial gases

Gas (see note 1)	Valve body material (see notes 2 to 4)		Outlet connection number (see note 3)	Thread	Synonym
	Steel containers	Aluminium containers			
Acetylene (marine lighting use only)	B2	[1]	1	RH	Ethyne
Acetylene	B2	[1]	2 and 18[2]	LH and RH	
Air	B2	B2	3	RH	
Ammonia[3]	CS1	CS1	10	RH	
Argon	B2	B2	3	RH	
Bromomethane[3][4]	B2		6 and 16[2]	RH	Methyl bromide
Buta-1,3-diene	B1	B1	2 and 15	LH	Butadiene[2]
Carbon dioxide	B1	B1	8	RH	
Carbon monoxide[3]	B2	B2	4	LH	
Chlorine[3][4]	CS1		6 and 14[2]	RH	
Chlorine trifluoride[3][4]	CS1		6	RH	
Chloroethane	B2	[1]	7 and 17[2]	LH	Ethyl chloride
Chloromethane[3][4]	CS1		7 and 17[2]	LH	Methyl chloride
Coal gas[3]	B2	B2	2	LH	
Cyanogen chloride[3]	CS1	[1]	6	RH	
Cyclopropane	B1	B1	2	LH	
Nitrous oxide	B2	B2	13	RH	Dinitrogen oxide
1,2-epoxypropane	CS1	[1]	4	LH	Propylene oxide
Ethylamine[4]	CS1		11	LH	Monoethylamine
Ethylene	B2	B2	2	LH	
Ethylene oxide[3]	B2	[1]	7 and 15[2]	LH	
Mixture 12 % ethylene oxide 88 % R12[3]	B2	B2	6	RH	
Helium	B2	B2	3	RH	
Hydrogen	B2	B2	2	LH	
Hydrogen chloride[3]	CS1	[1]	6 and 14[2]	LH and RH	
Hydrogen cyanide[3]	CS1	CS1	14	RH	
Hydrogen fluoride[3][4]	CS1		6	RH	
Hydrogen selenide[3]	ST1	ST1	2	LH	
Hydrogen sulphide[3]	CS1	CS1	15	LH	
Isobutane	B1	B1	2	LH	2-methyl propane
Krypton	B2	B2	3	RH	

Table 1. Outlet connections and preferred materials for use with industrial gases *(continued)*					
Gas (see note 1)	**Valve body material** (see notes 2 to 4)		**Outlet connection number** (see note 3)	**Thread**	**Synonym**
	Steel containers	**Aluminium containers**			
Methane	B2	B2	2	LH	
Methylamine[4]	CS1		11	LH	Monomethylamine
2-methyl propene	B1	B1	2	LH	Isobutene
Neon	B2	B2	3	RH	
Nitric oxide[3]	CS1	ST1	14	RH	
Nitrogen	B2	B2	3	RH	
Oxygen	B2	B2	3	RH	
Perfluoropropane	B2	ST1	3	RH	
Phosgene[3]	CS1	[1]	6 and 14[2]	RH	Carbonyl dichloride
Phosphine[3]	B2	B2	4	LH	
Propene	B1	B1	4	LH	Propylene
Refrigerant 12	B2	B2	6	RH	
Refrigerant 12B1	B2	B2	6	RH	Bromochlorodifluoromethane
Refrigerant 13B1	B2	B2	6	RH	Bromotrifluoromethane
Refrigerant 14	B2	B2	3	RH	Tetrafluoromethane
Refrigerant 21	B2	B2	6	RH	Dichlorofluoromethane
Refrigerant 22	B2	B2	6	RH	Chlorodifluoromethane
Refrigerant 23	B2	B2	6	RH	Fluroform
Refrigerant 133a	B2	B2	6	RH	2-chloro-1,1,1-trifluoroethane
Refrigerant 114	B2	B2	6	RH	1,2-dichlorotetrafluoroethane
Refrigerant 115	B2	B2	6	RH	Chloropentafluoroethane
Refrigerant 116	B2	B2	6	RH	Hexafluoroethane
Refrigerant 142b	B2	B2	7	LH	1-chloro-1,1-difluoroethane
Refrigerant 152a	B2	B2	7	LH	1,1-difluoroethane
Refrigerant 500	B2	B2	6	RH	73.8 % R12, 26.2 % R152a
Refrigerant 502	B2	B2	6	RH	48.8 % R22, 51.2 % R115
Refrigerant 503	B2	B2	6	RH	40.1 % R23, 59.9 % R13
Silane	B2	B2	3	RH	
Simulated town gas	B2	B2	2	LH	
Sulphur dioxide[3]	B2	B2	10 and 16[2]	RH	
Sulphur hexafluoride	B2	B2	6	RH	

Table 1. Outlet connections and preferred materials for use with industrial gases (*concluded*)

Gas (see note 1)	Valve body material (see notes 2 to 4)		Outlet connection number (see note 3)	Thread	Synonym
	Steel containers	Aluminium containers			
Town gas[3)]	B2	B2	2	LH	
Trimethylamine[4)]	CS1		11	LH	
Vinyl chloride	CS1	CS1	7	LH	Chloroethylene
Xenon	B2	B2	3	RH	

[1)] Only dry gases (see BS 5045 : Part 3) may be put in aluminium containers. The Health and Safety Executive should be consulted with regard to the suitability of such gases being contained in aluminium containers and for the recommended material of construction of the valve body.

[2)] Intended for use with small capacity containers (see note 1 to **3.4**).

[3)] Toxic gases.

[4)] Not to be used with aluminium containers, or valves.

NOTE 1. If materials other than the preferred materials listed in table 1 are used, they have to be compatible with the gas service specified (see **2.1**).

NOTE 2. Other gases not listed in table 1 are used within the UK. These are normally imported in containers having valve outlets applicable to the country of origin (see annexes C and D).

NOTE 3. Figures 5 and 6 detail the dimensions of the recommended outlet connections.

NOTE 4. The material codes referred to in this table are intended to be used for marking on the valve body.

Section 2. Material requirements

2.1 General

All materials used in the manufacture of valves, their fittings and their protective coatings shall be compatible with the gas service specified and with the material of construction of the container, as stated by the purchaser (see **1.6.1f)**).

NOTE 1. A list of preferred materials is given in table 1. Subject to agreement between the manufacturer and purchaser an alternative material or grades of material may be used. The material supplier should provide test certificates showing the mechanical properties.

NOTE 2. In selecting an appropriate material for valve fittings, not only is it important to design for adequate strength and toughness in service but also consideration should be given to other modes of possible metallic failure, such as corrosion, stress corrosion or dezincification.

2.2 Pressure containing components

2.2.1 General

When preferred materials are used, they shall conform to the requirements of **2.2.2** to **2.2.5** as appropriate.

2.2.2 Carbon steels

CS1 carbon steel valve bodies shall be machined from forged carbon steel that has been normalized to grade 070M20 of BS 970 : Part 1 : 1983, except that the sulphur and phosphorus content of the material shall be within the range 0.025 % to 0.050 %.

When Charpy V-notch impact tests are carried out in accordance with BS EN 10045-1 : 1990 on sample CS1 valve bodies selected in accordance with **1.10** of BS 970 : Part 1 : 1983, impact values of not less than 34 J shall be attained.

Sample CS1 valve bodies for macroscopic examination shall be prepared from the full cross section of the top end of the top billet and the bottom end of the bottom billet rolled from each ingot to be used in the manufacture of the valve body. The macrosections shall show the material to be sound and free from laps, large non-metallic inclusions or other harmful defects.

If any of the samples do not comply with the above, a retest shall be carried out in accordance with **1.16** of BS 970 : Part 1 : 1983.

2.2.3 Austenitic stainless steel

ST1 austenitic stainless steel valve bodies shall be machined from austenitic stainless steel conforming to grade 302S31 of BS 970 : Part 1 : 1983, except that the minimum 0.2 % proof stress shall be 196 N/mm^2 and the hardness value shall be within the range HB 140 to HB 143.

2.2.4 Copper alloys

B1 copper alloys shall be machined from leaded brass conforming to either designation CZ122 or designation CZ128 of BS 2872 : 1989 and BS 2874 : 1986. B2 copper alloy valve bodies shall be machined from leaded brass conforming to designation CZ115 of BS 2872 : 1989 and BS 2874 : 1986.

Test certificates of the 'as supplied' material shall be obtained by the manufacturer to show that it conforms to either BS 2872 : 1989 or BS 2874 : 1986.

The copper alloy for dissolved acetylene container valves shall not form dangerous acetylides and the copper content shall not exceed 70 % (*m/m*). The valve manufacturing process shall not employ any process that will result in surface enrichment of copper.

NOTE. B2 brass is not recommended for use in cylinders containing liquid carbon dioxide. ⚠1

2.2.5 Aluminium alloys

Valve bodies shall be machined from either forgings conforming to BS 1472 : 1972 or extruded bar conforming to BS 1474 : 1987 or IAA6351 [2]. The lead content of the alloy shall be limited to a maximum of 30 p.p.m. (*m/m*) and the minimum elongation of forgings conforming to BS 1472 : 1972 shall be 6 % (*m/m*).

2.3 Protective finishes

Protective finishes used shall not adversely affect the valve performance or the materials of construction.

NOTE. Suitable recommended protective finishes for copper alloy valves are described in annex A.

Valves made from aluminium alloy shall be hard anodized in accordance with BS 5599 : 1978.

Allowance shall be made for the thickness of the protective finish on all machined surfaces and threads (see BS 919 and BS 3382 as applicable).

Section 3. Design

3.1 Design criteria

3.1.1 Valves shall be designed to operate under the extreme conditions of an environment which could cause a pressure rise in the container contents of up to the maximum developed pressure stated by the manufacturer (see **1.6.1d)**) as specified in BS 5355 : 1976.

3.1.2 Valve bodies shall be capable of withstanding the test pressure of any container to which they are fitted. In the case of valves to be used in containers for permanent gases the minimum test pressure shall be the container test pressure or 300 bar, whichever is the greater.

3.1.3 Materials of construction, including gaskets and seals, shall be compatible with each other, the gas to be contained and the design temperature and pressure range of the valve.

3.1.4 Gland assemblies shall be secured by a method that prevents loosening as a result of vibration or shock during conveyance or use. When a gland assembly is not locked, its security in service shall be satisfactorily demonstrated (see **6.1.1.5**).

NOTE. The conveyance test described in annex E is a suitable method of satisfactorily demonstrating security.

3.1.5 Design and manufacture of valves shall be such that they do not leak during transit as a result of vibration or shock (see the conveyance test in annex E and **6.1.1.5**).

3.1.6 It shall not be possible to withdraw the spindle under normal service operating conditions.

3.1.7 When fitted, pressure relief devices shall conform to section **4** of this Part of BS 341.

3.1.8 Dip (or syphon) tubes and any other internal device shall be secured in a manner that will prevent them from becoming loose or detached during transit (see annex E) and use.

3.1.9 Handwheel or key operating torques shall not exceed those which are compatible with the materials of construction and valve design.

3.1.10 No spanner longer than 150 mm shall be required for manually fitting any item of equipment to a valve outlet.

3.1.11 The valve stem shall be of sufficient strength to withstand the valving torque (see **6.1.1.4** and annex B).

3.1.12 Manufacturing tolerances of component parts shall be established to enable interchangeability between units of the same design.

3.1.13 All pressure containing parts fitted to the valve body shall be capable of withstanding the hydraulic test pressure (see **6.2.2**) specified for the valve.

3.1.14 Diameters of main gas passages in valve stems shall be not larger than the values shown in table 2.

Table 2. Maximum diameter of valve stem gas passages

Stem thread size not exceeding:	Maximum diameter of hole through valve body stem	
	For pressures up to 34 bar	For pressures above 34 bar and up to 300 bar
mm	mm	mm
19.00	11.5	9.0
26.00	17.0	14.0
32.00	Not in use	18.0

NOTE. In selecting a suitable diameter, consideration should be given to the strength required to withstand the valving torques, to general handling and to the problems resulting from a total fracture of the valve stem.

In the case of vapour/liquid valves with two passages through the stem, the sum of the hole areas shall not exceed 80 % of the area of the hole of maximum diameter for the relevant stem thread size shown in table 2.

3.1.15 Seats and seals shall be capable of withstanding the effects of such repeated operations as are agreed between the manufacturer and purchaser (see **1.6.1b)**) and the sample test specified in **6.1.1.7**.

3.1.16 Where the container does not have valve protection, and where the valve is not to be protected by the provision of a shroud, the valve shall be capable of withstanding an impact test (see **1.6.1l)** and **6.1.1.3**).

NOTE. BS 5045 specifies when valve protection for a container is necessary.

3.1.17 It shall not be possible for the valve gland nut to be loosened by turning the spindle under normal service operating conditions.

3.1.18 Where connections include a jointing washer, the material shall be compatible with the gas service and shall not creep or flow beyond design limits as agreed between the manufacturer and the purchaser.

3.2 Dimensions

3.2.1 Valve dimensions

The valve dimensions and connector bore diameters shall be determined by the application of the gas, the rate of flow required, the gas service pressure, the required mechanical strength of the connection and any other safety aspects (see note 1). Thread runouts and undercuts shall be in accordance with BS 1936 : Part 1 : 1952 or BS 1936 : Part 2 : 1991.

Dimensions shall be as shown in figure 5.

NOTE 1. The ability of the connection and valve to withstand all mechanical pressure and thermal stresses under all anticipated service conditions is paramount.

NOTE 2. All valve stems, valve outlets and connections detailed in this Part of BS 341 are compatible with those in the 1962 edition of BS 341 : Part 1. Connector shank diameters and nut bores are also interchangeable with existing equipment. The valve spindle details for key operated valves specified in this standard are compatible with those specified in BS 341 : Part 1 : 1962.

NOTE 3. This Part of BS 341 does not give detailed dimensions for the valves, but only those for the inlet and outlet connections that provide for interchangeability of equipment. Unspecified dimensions and machine finishes should be agreed by the purchaser and manufacturer.

Dimensions of valve stems shall conform to **3.3**.

3.2.2 Spindle ends for key operated valves

Spindle ends for key operated valves shall be made square and be either 7 mm or 9.5 mm across flats.

3.3 Valve stems

3.3.1 Tapered stems

1 Dimensions and manufacturing tolerances of the valve body tapered stem and container neck threads shall be as given in figure 6.

NOTE 1. Annex F gives cross-references to inlet connections conforming to BS 341 : Part 1 : 1962.

NOTE 2. *A* is the diameter at the intersection of the cone and the end plane of the stem.

3.3.2 Oversized tapered stems

Where oversized dimensions for valve stem/container neck threads are specified, the datum diameters A, B, E and F given in figure 6 shall be increased by 1.66 mm.

NOTE. There are valves in service manufactured to BS 341 : 1962. Oversize threads for these valves are in accordance with BS 5430 : Part 1 : 1977.

3.3.3 Parallel stems

Detailed dimensions and manufacturing tolerances of the valve body parallel stem and container neck threads shall be as given in figure 7.

3.3.4 Seals for parallel threaded stems

An adequate valve seal shall be used for parallel threaded stems.

NOTE 1. The preferred type is the 'O'-ring seal.

NOTE 2. In selecting the material for the seal, consideration should be given to its compatibility with the gas service in which it will be used, the pressure to which it will be subjected and the conditions under which it will operate.

Detailed dimensions and manufacturing tolerances of 'O'-ring seals shall be as given in figure 7.

3.4 Valve outlets and connectors

Valve outlets and connectors shall be selected in accordance with table 1. The dimensions and tolerances shall be in accordance with figure 5.

NOTE 1. Table 1 lists alternative outlet connections (see footnote 2) to table 1) that are currently in service for containers with a maximum capacity of 11.5 L. Although these connections are listed for the particular gas with which they are used, they should be taken out of service and replaced with the outlet connections given in table 1.

NOTE 2. Annex C details outlet connections conforming to CGA Standard V-1-1977 [3]. These connections are used in limited numbers within the UK.

NOTE 3. For refrigerant gases it is established practice to use right-hand threaded valve outlets for non-flammable gas mixtures having flammable components.

The marking of outlet connections shall be in accordance with **7.1**.

Left-handed threads shall be indicated by 'V' grooves machined in the nut. (See outlets 3, 7, 11, 15 and 17 of figure 5).

Container valves for gases or gas mixtures not listed in table 1 shall have valve outlets with left hand threads for flammable gases or gas mixtures having a flammable component except for refrigerant gases. Non-flammable gases or gas mixtures without flammable components shall have valve outlets with right-hand threads.

3.5 Tolerances

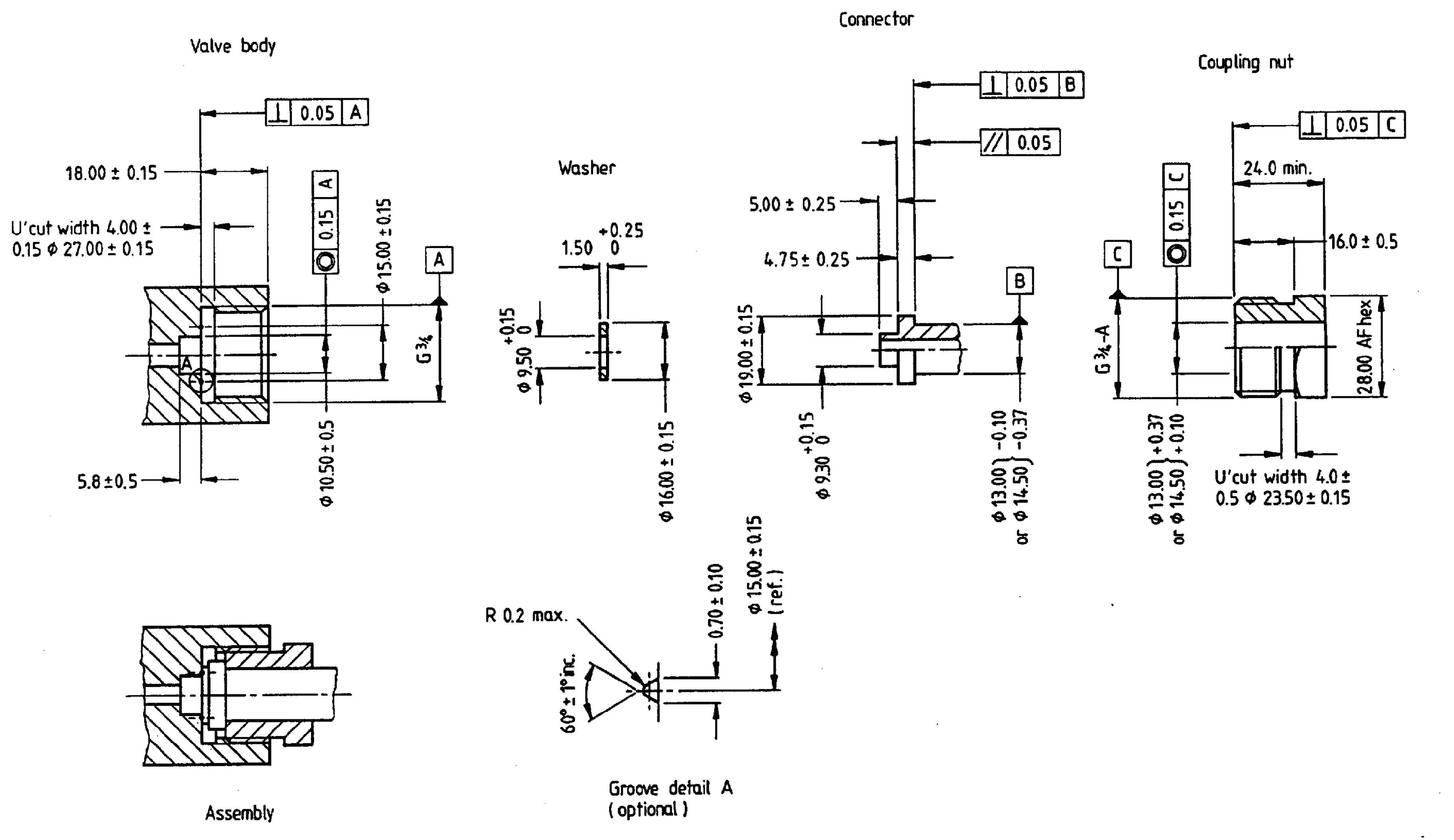
Tolerances on stem threads, cylinder neck threads, valve outlets and connectors shall be in accordance with the following British Standards.

BS 84 : 1956 (obsolescent)
BS 308 : Part 3 : 1990
BS 2779 : 1973
BS 3643 : 1981
BS 4500 : Section 1.1 : 1991
BS 4500 : Section 1.2 : 1990
BS 4500 : Part 3 : 1973
BS 4500 : Part 4 : 1985
BS 4500 : Part 5 : 1988

The following conventions shall be adopted where machining tolerances are not specified on outlets 1 to 4, 5 to 8, 10, 11 and 13 to 18 (see figure 5):

a) where there is one digit after the decimal point the tolerance shall be ± 0.50 mm;

b) where there are two digits after the decimal point the tolerance shall be ± 0.050 mm.

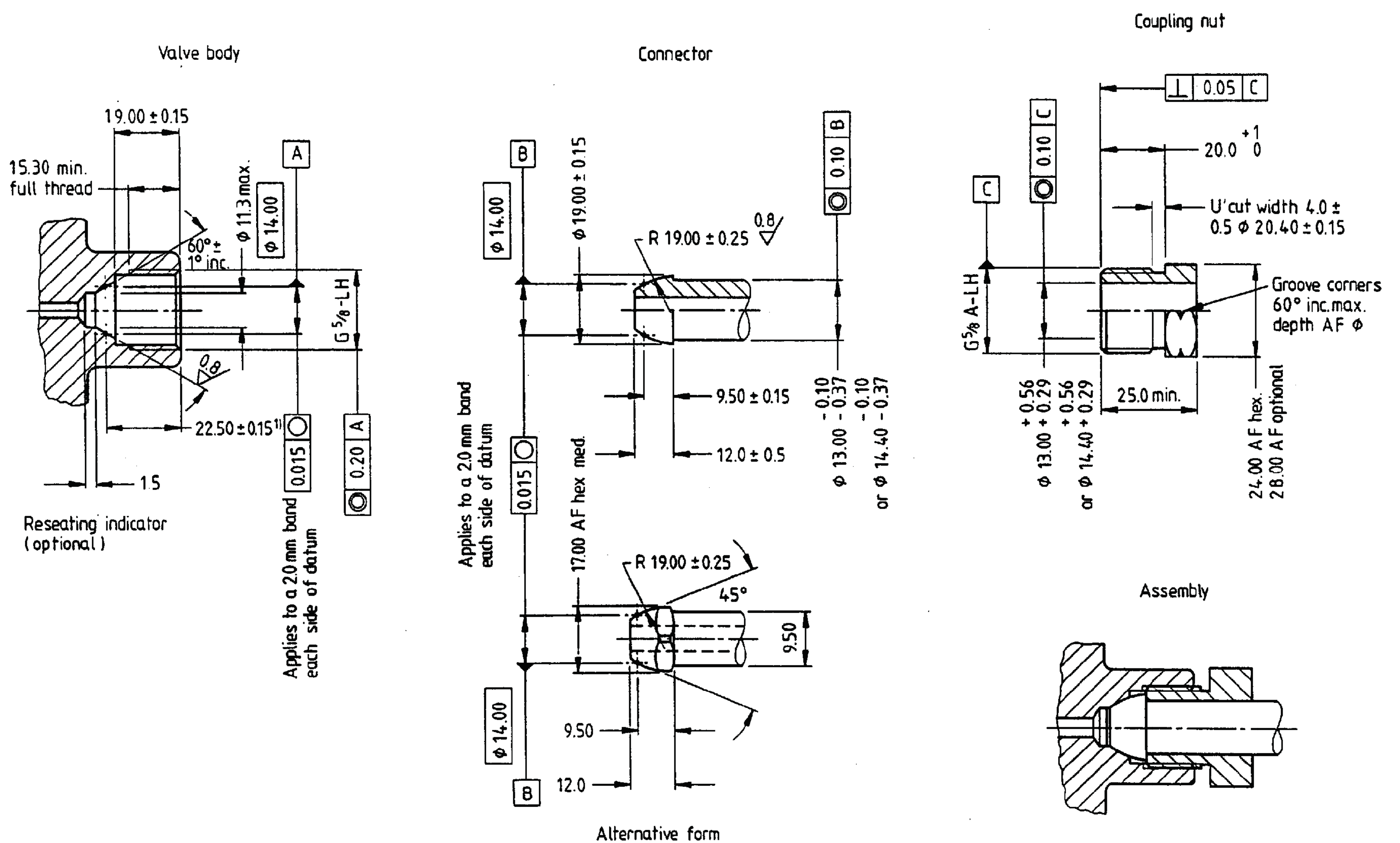


Linear dimensions are in millimetres.

NOTE. Fitting thread G ¾ conforms to BS 2779.

a) Outlet connection number 1

Figure 5. Dimensions and tolerances of outlet connections



1) Cone datum dimension may be increased during routine valve servicing as damage occurs for cone sealing face : maximum permissible 23.00.

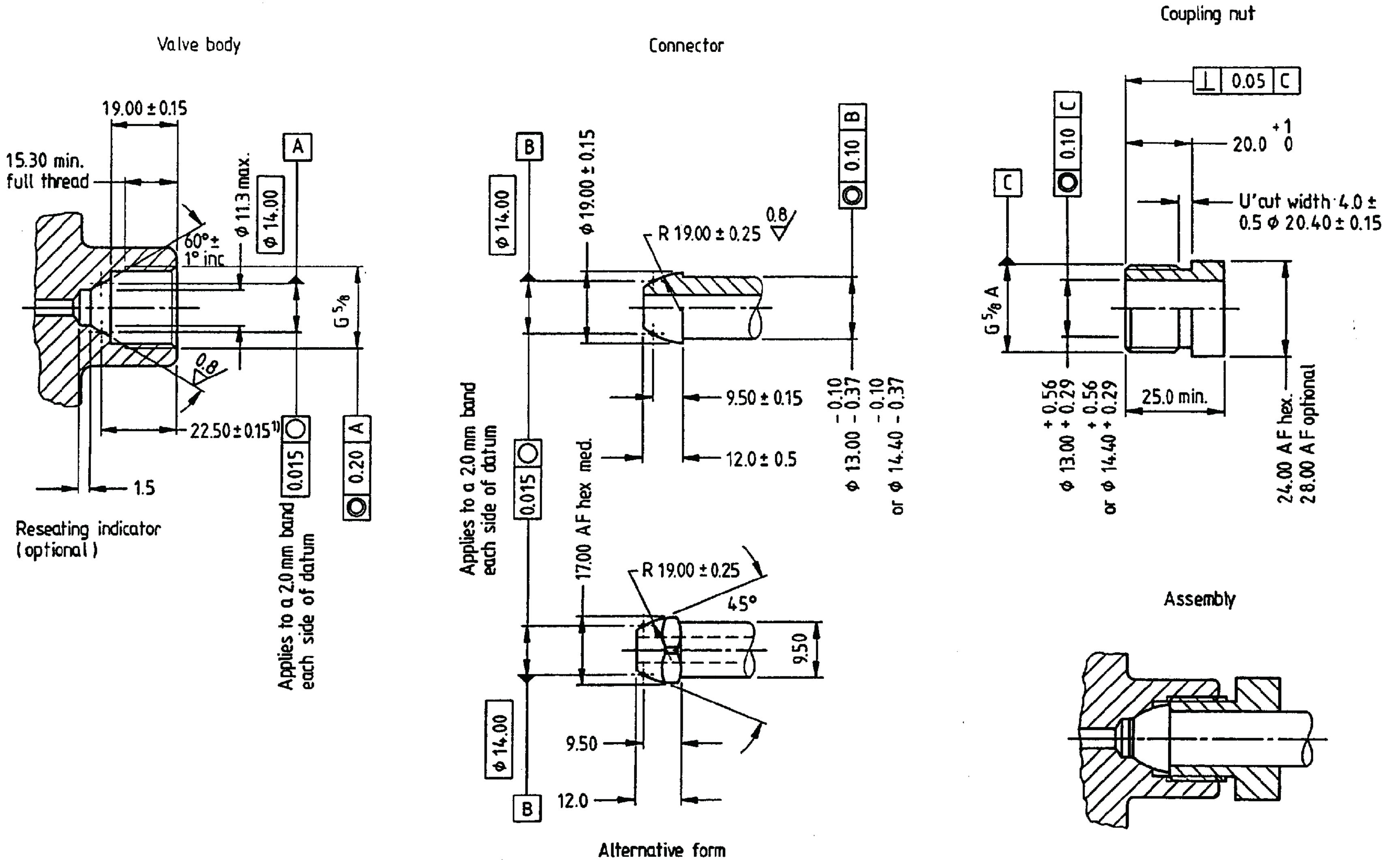
Linear dimensions are in millimetres.

NOTE. Fitting thread G $\frac{5}{8}$ conforms to BS 2779.

b) Outlet connections 2 and 4

Figure 5. Dimensions and tolerances of outlet connections (*continued*)

1



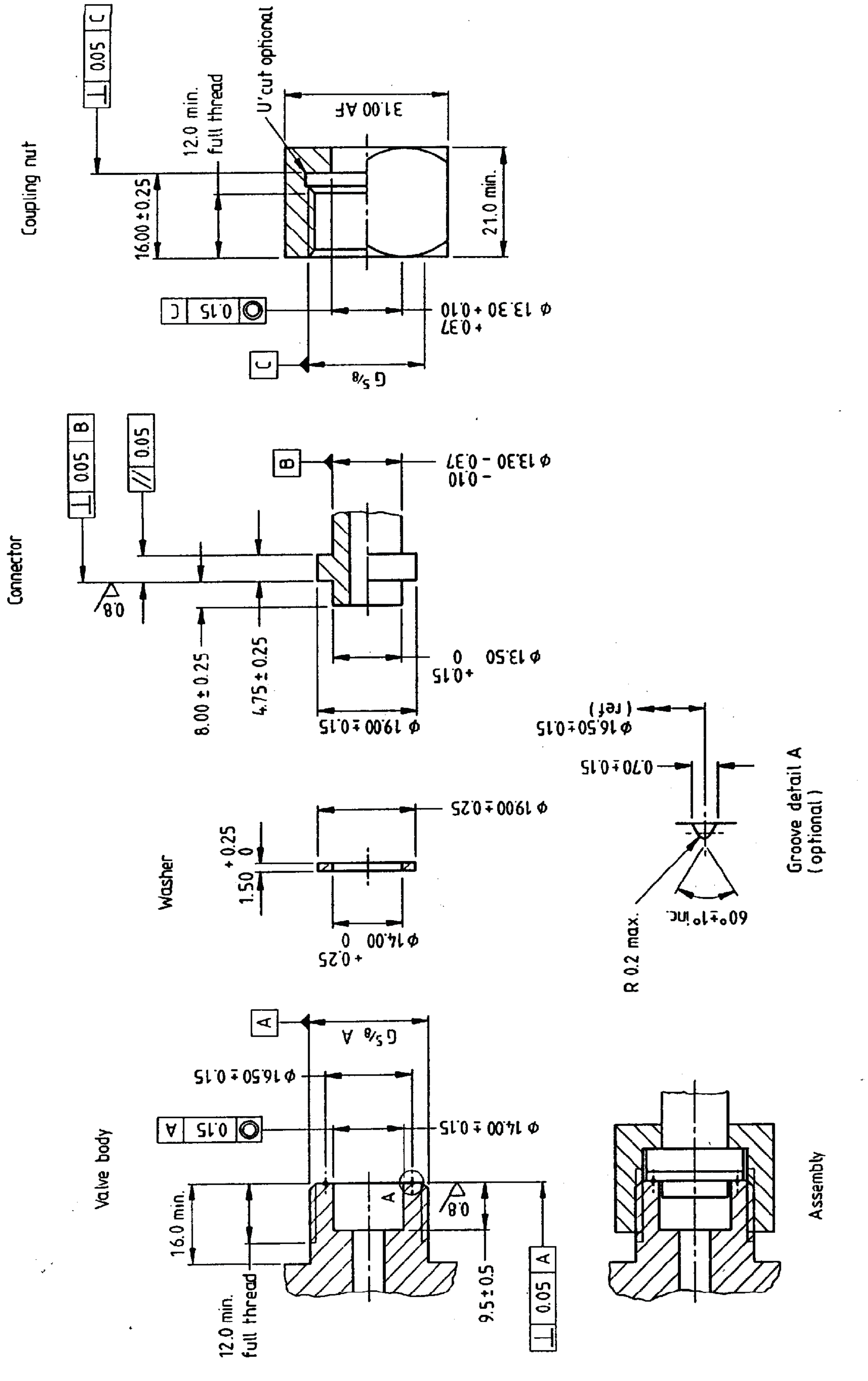
1) Cone datum dimension may be increased during routine valve servicing as damage occurs to cone seating face : maximum permissible 23.00.

Linear dimensions are in millimetres.

NOTE. Fitting thread G 5/8 conforms to BS 2779.

c) Outlet connection 3

Figure 5. Dimensions and tolerances of outlet connections (*continued*)

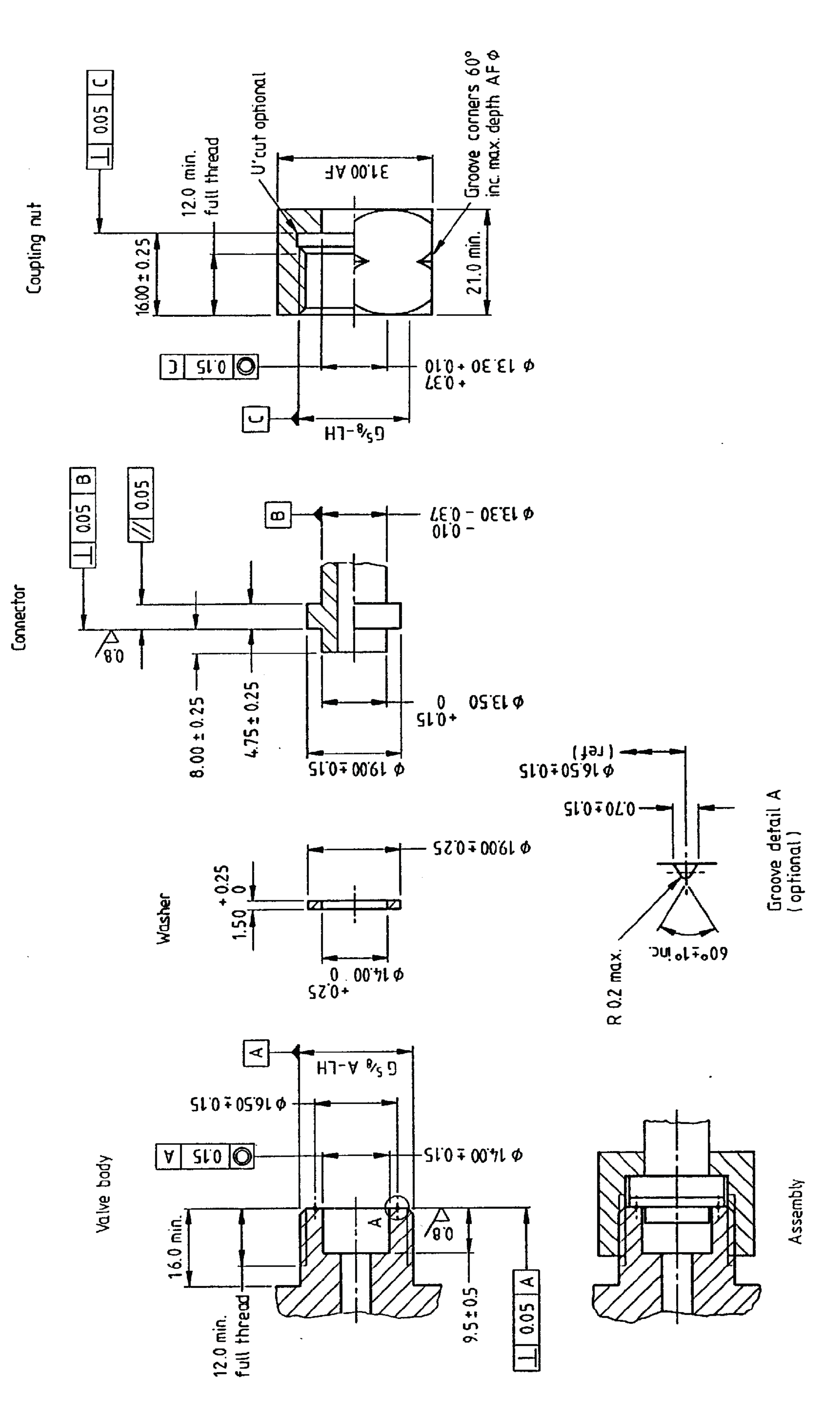


Linear dimensions are in millimetres.

NOTE. Fitting thread G $\frac{5}{8}$ conforms to BS 2779.

d) Outlet connection 6

Figure 5. Dimensions and tolerances of outlet connections (*continued*)

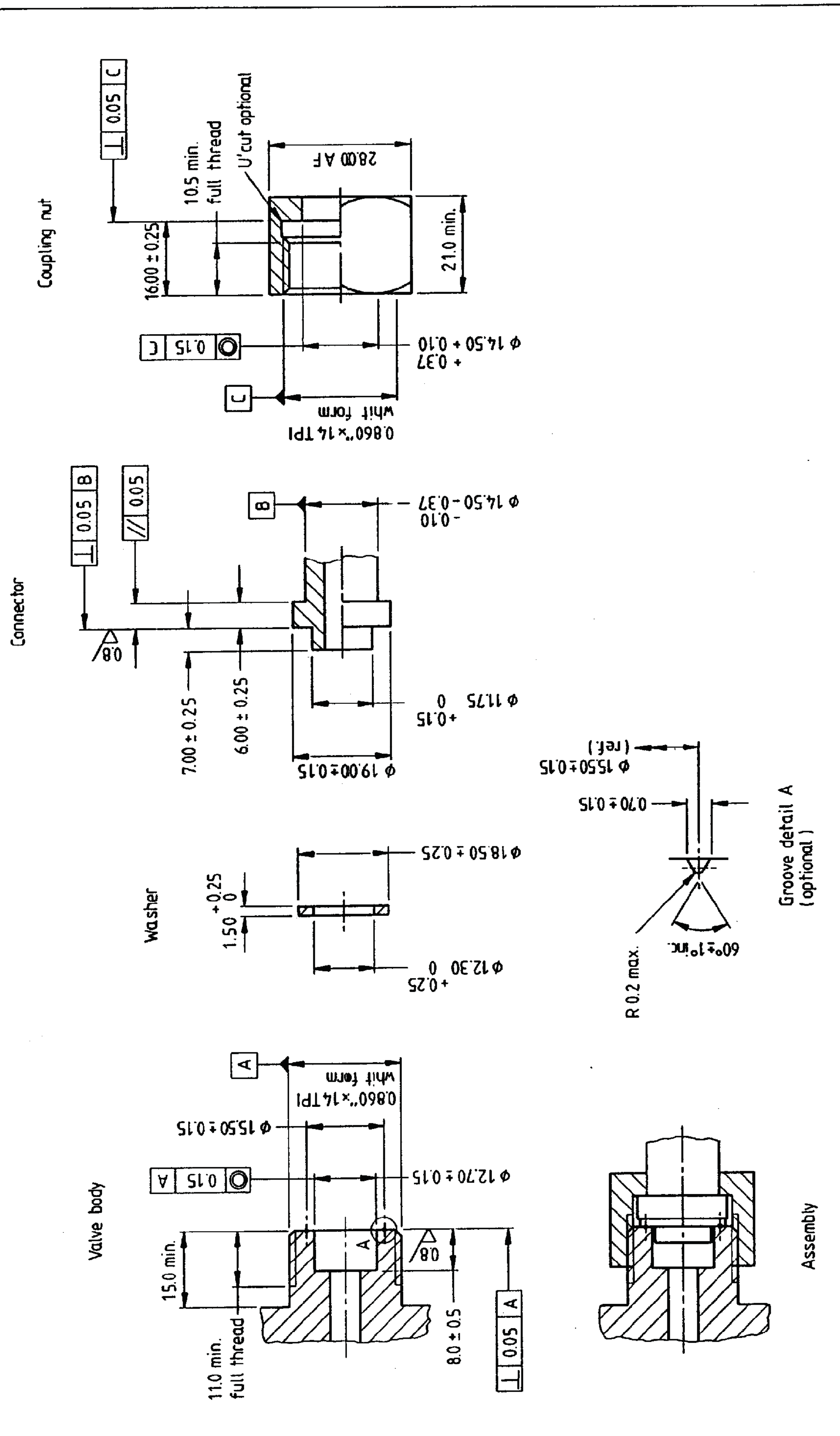


Linear dimensions are in millimetres.

NOTE. Fitting thread G 5/8 conforms to BS 2779.

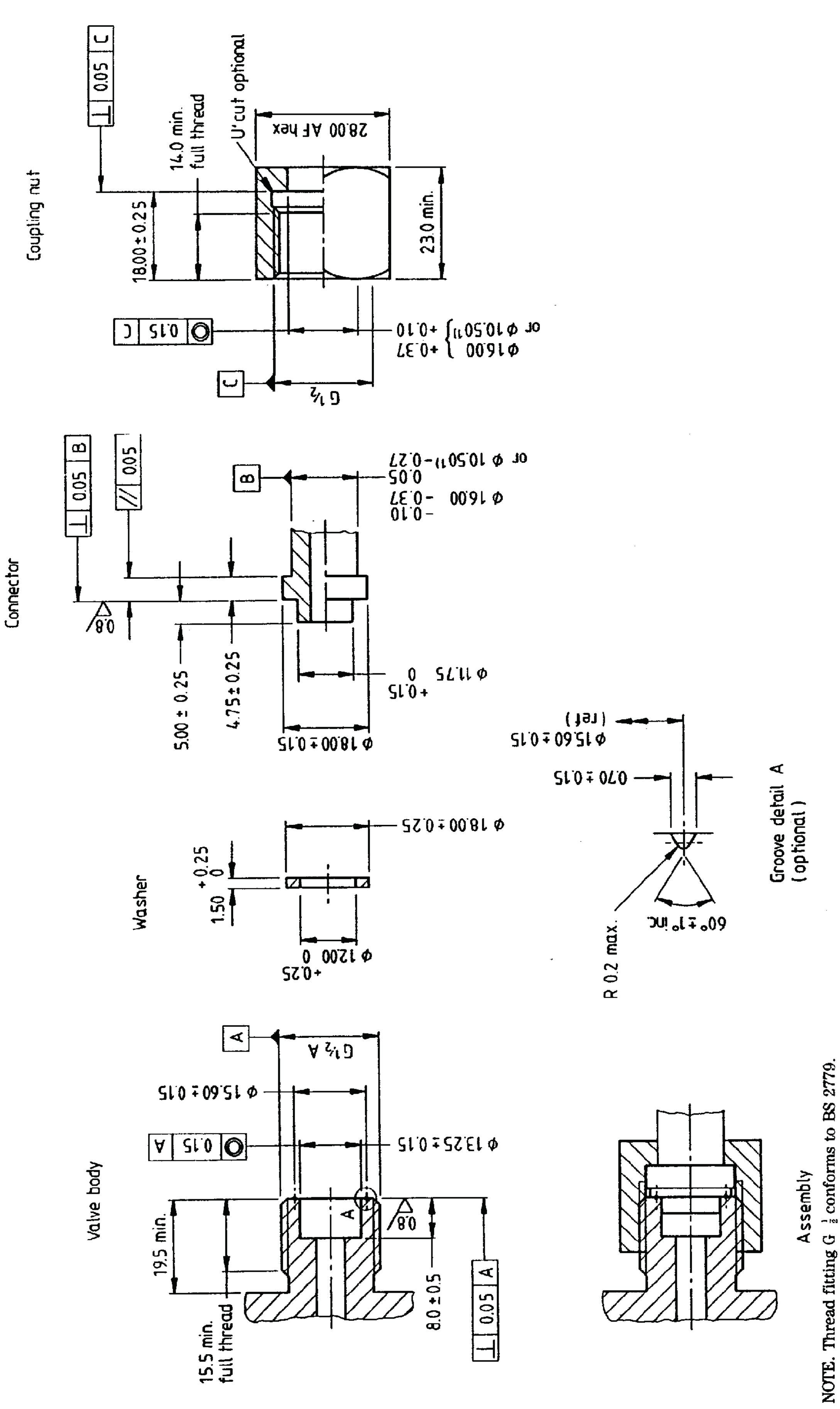
e) Outlet connection 7

Figure 5. Dimensions and tolerances of outlet connections ***(continued)***



f) Outlet connection 8

Figure 5. Dimensions and tolerances of outlet connections (*continued*)

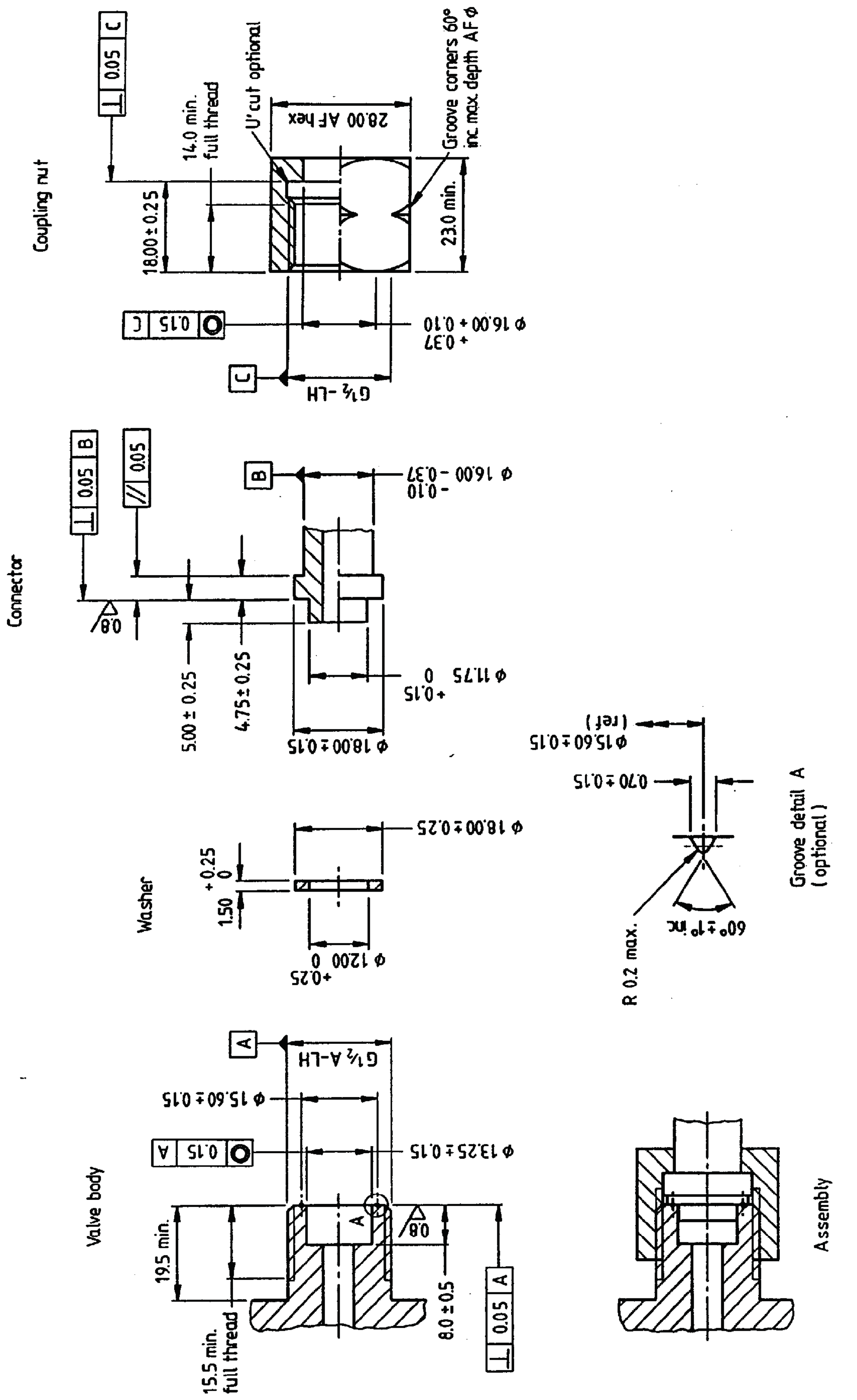


NOTE. Thread fitting G ½ conforms to BS 2779.

1) φ10.50 replaces connection no 12 in BS 341 : Part 1 : 1962.

g) Outlet connection 10

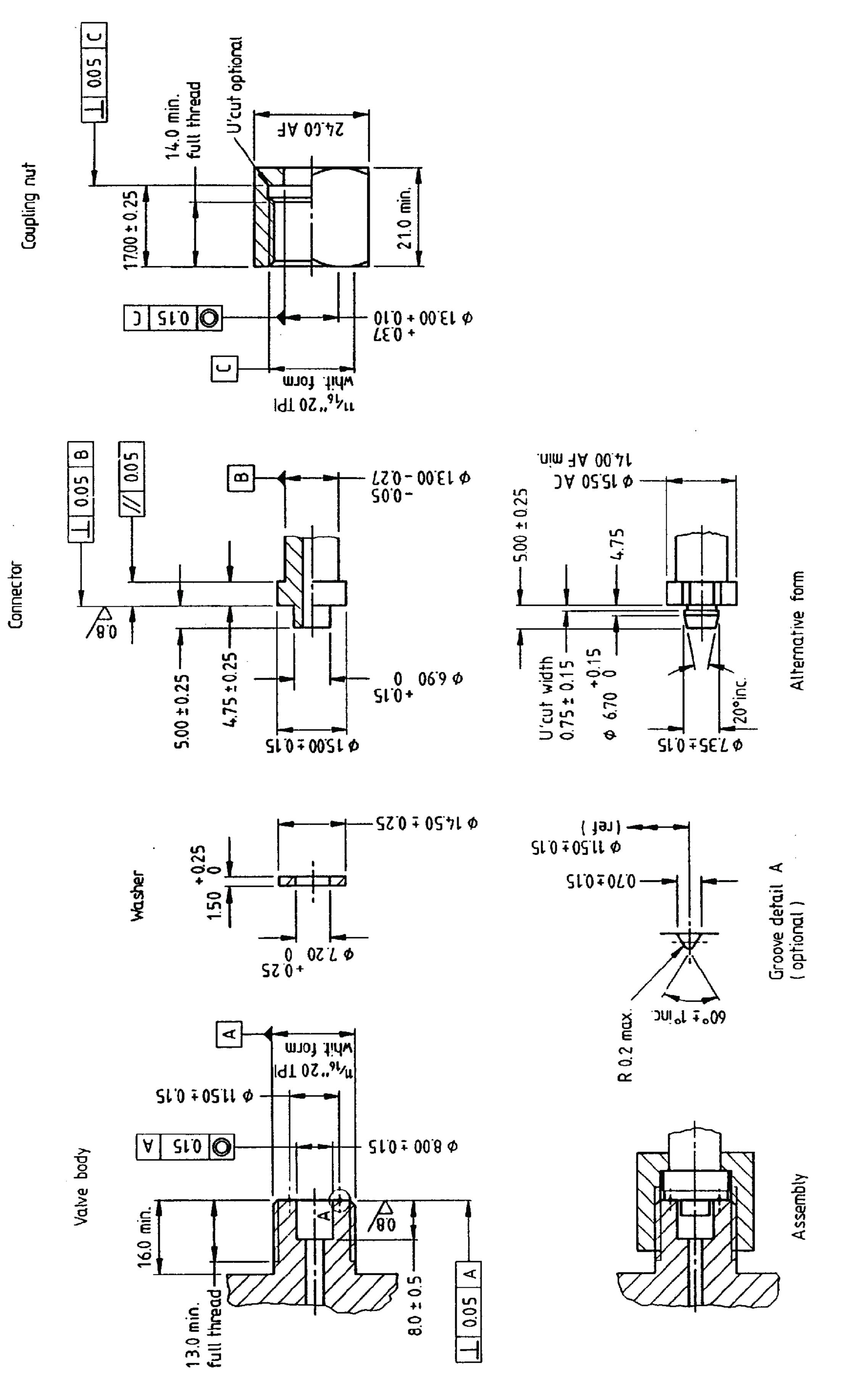
Figure 5. Dimensions and tolerances of outlet connections *(continued)*



NOTE. Thread fitting G ½ conforms to BS 2779.

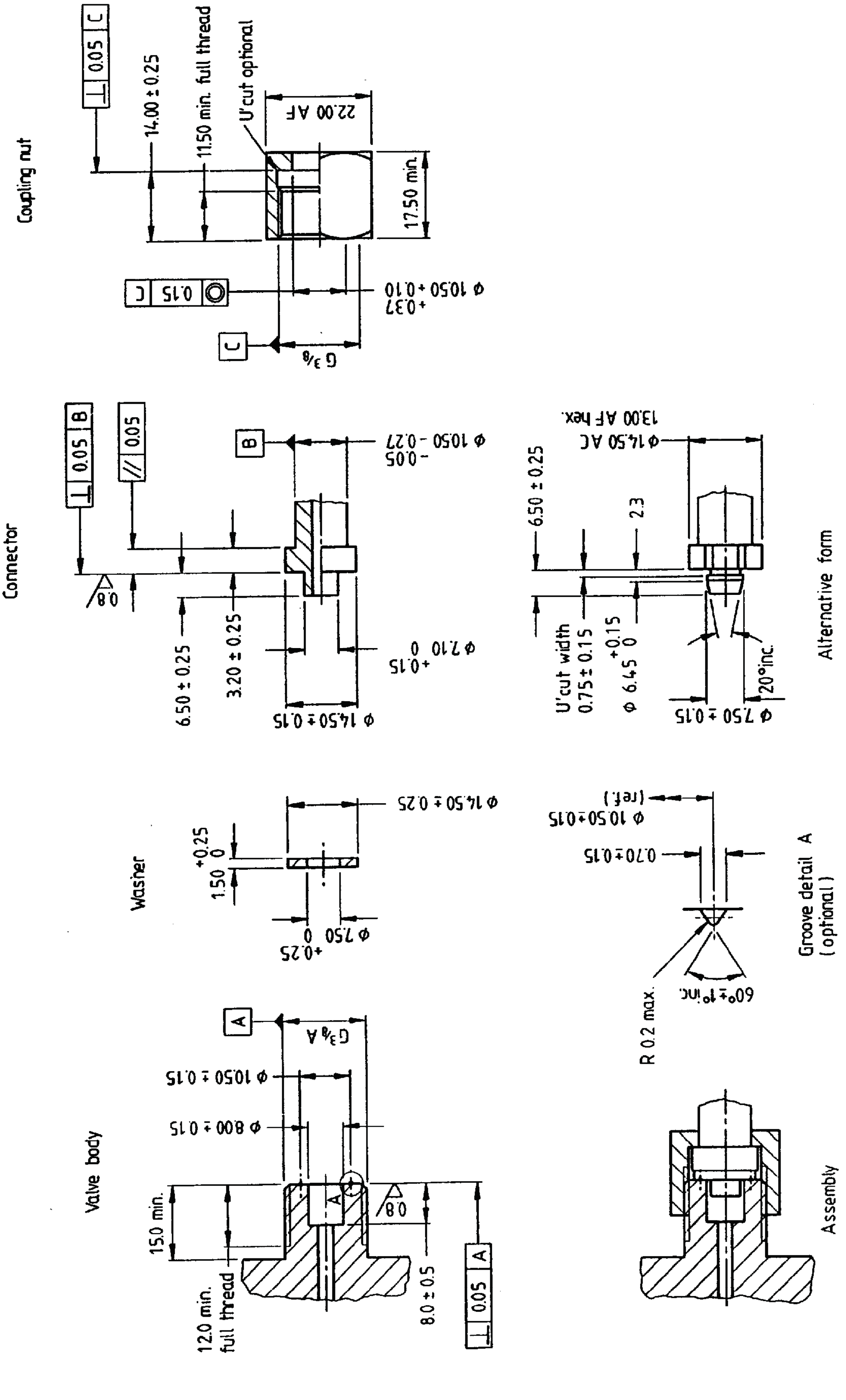
h) Outlet connection 11

Figure 5. Dimensions and tolerances of outlet connections *(continued)*



i) Outlet connection 13

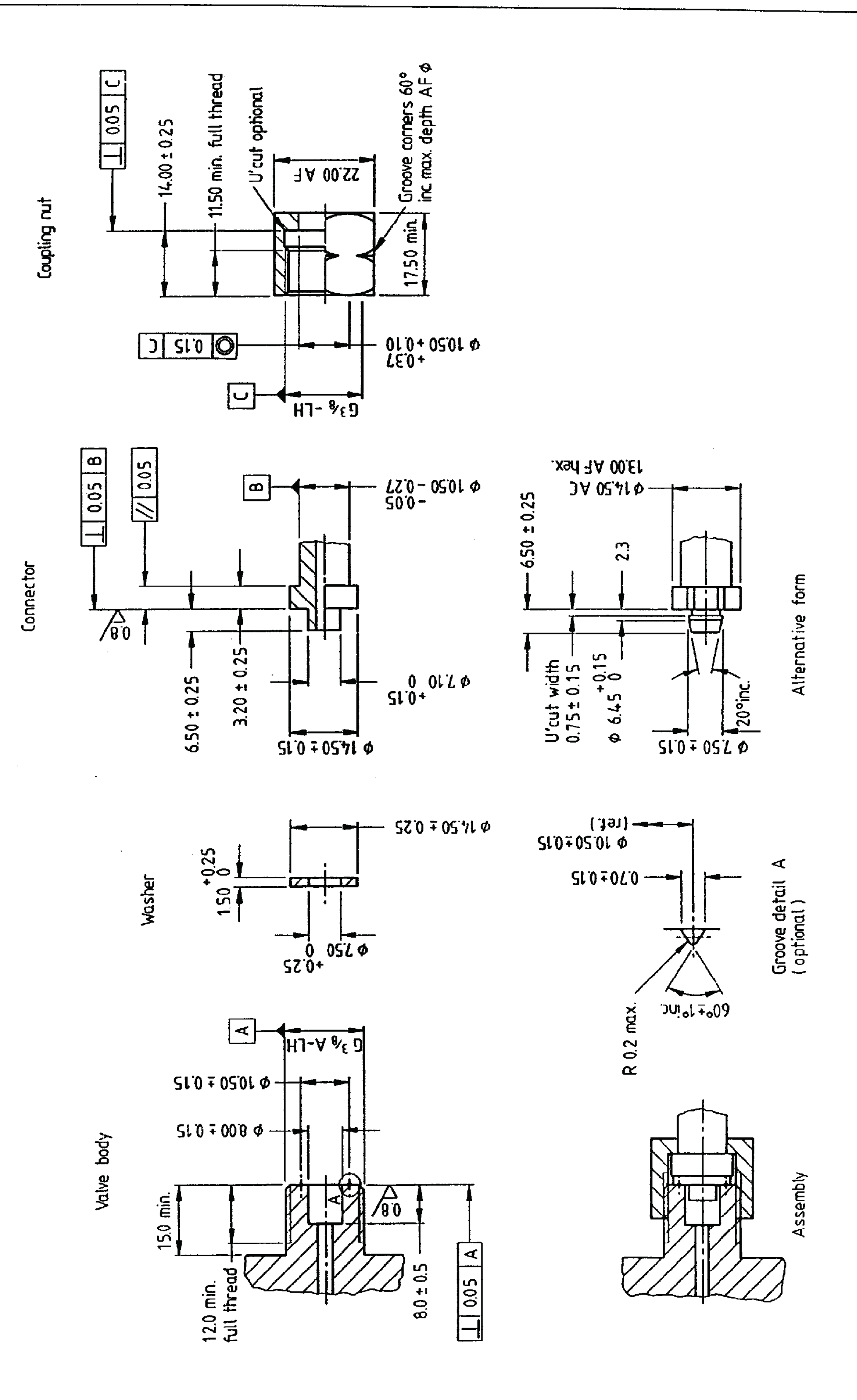
Figure 5. Dimensions and tolerances of outlet connections (*continued*)



NOTE. Fitting thread G 3/8 conforms to BS 2779.

j) Outlet connection 14

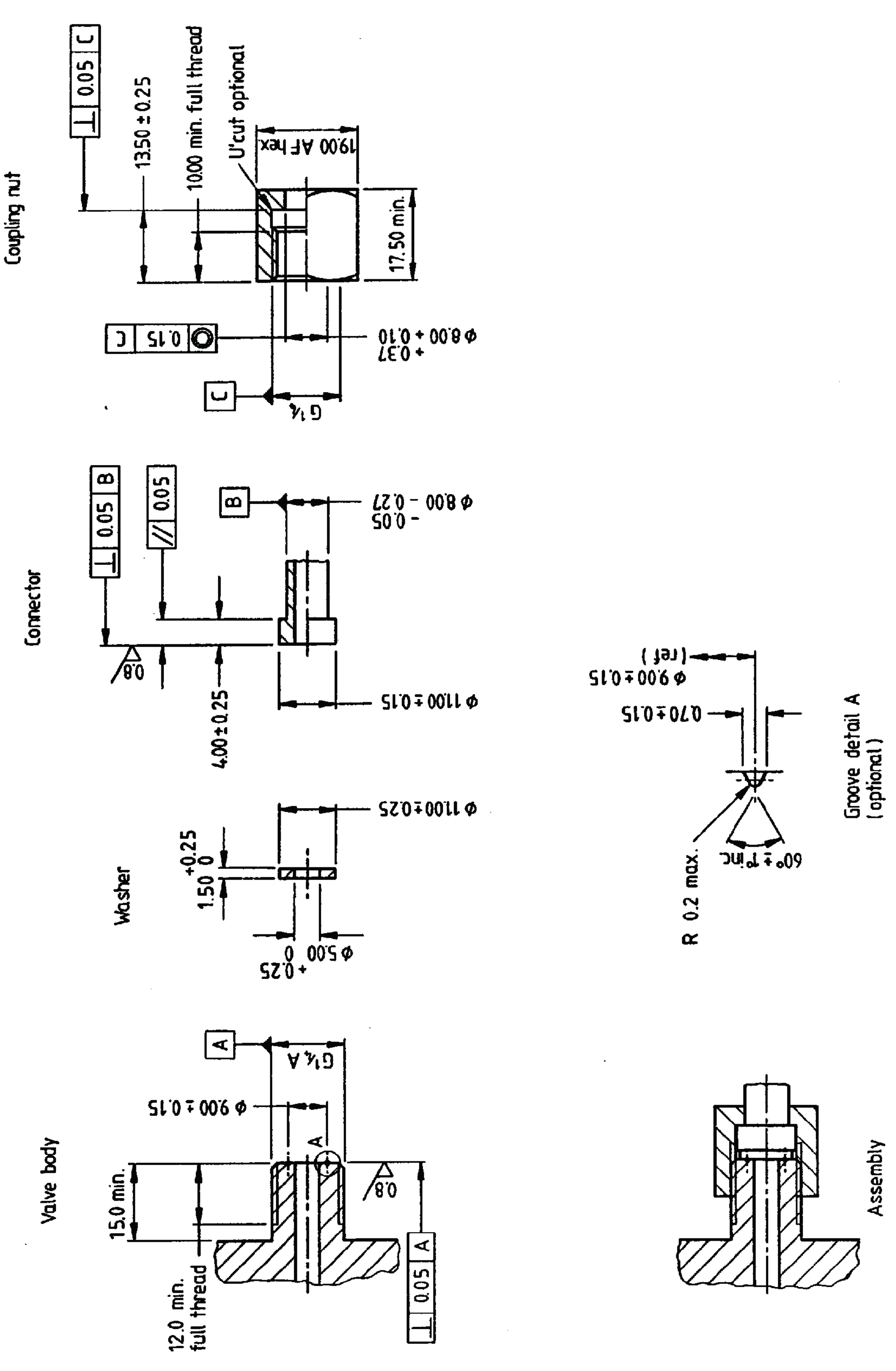
Figure 5. dimensions and tolerances of outlet connections (*continued*)



NOTE. Fitting thread G 3/8 conforms to BS 2779.

k) Outlet connection 15

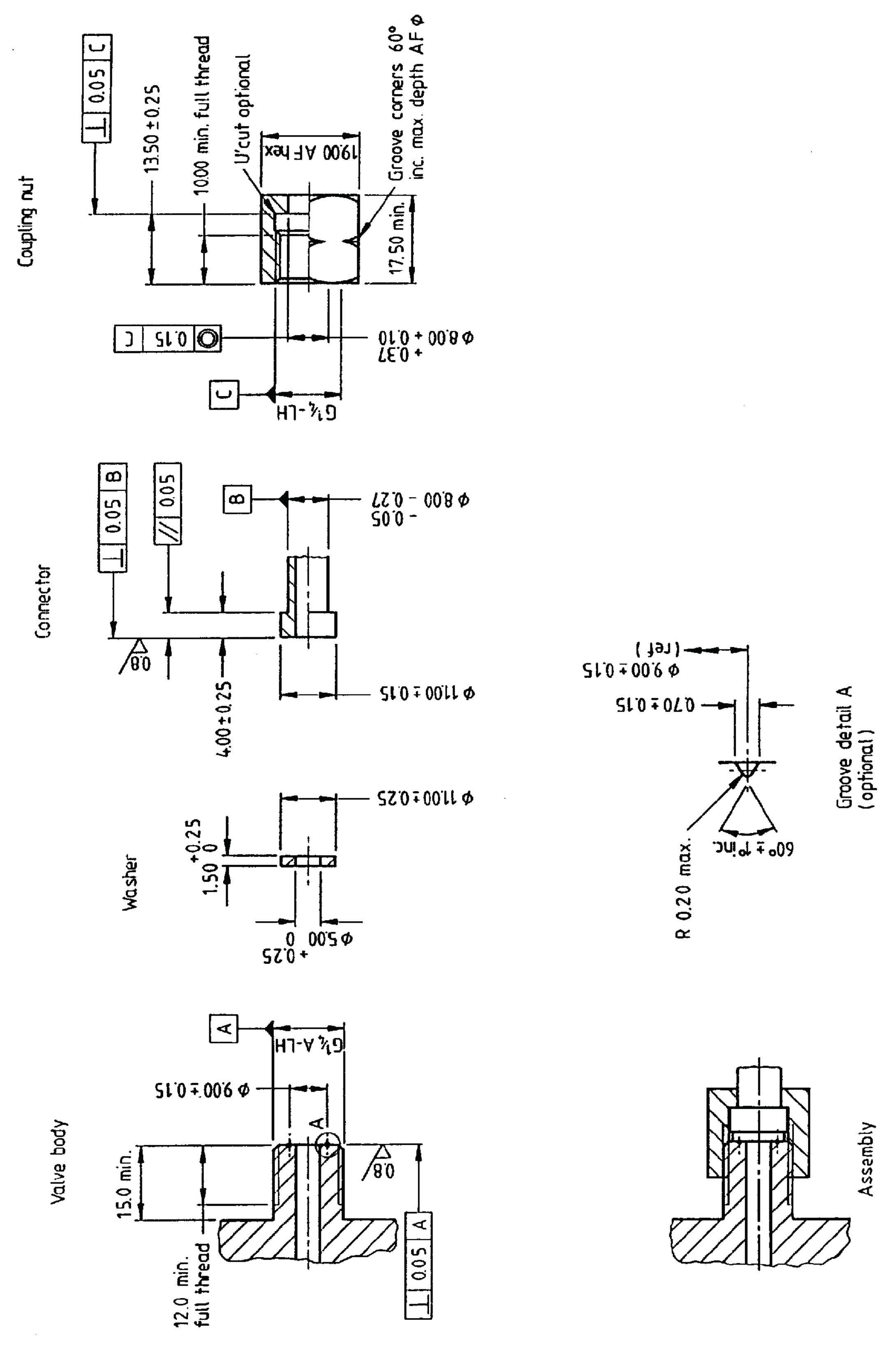
Figure 5. Dimensions and tolerances of outlet connections *(continued)*



NOTE. Fitting thread G ¼ conforms to BS 2779.

1) Outlet connection 16

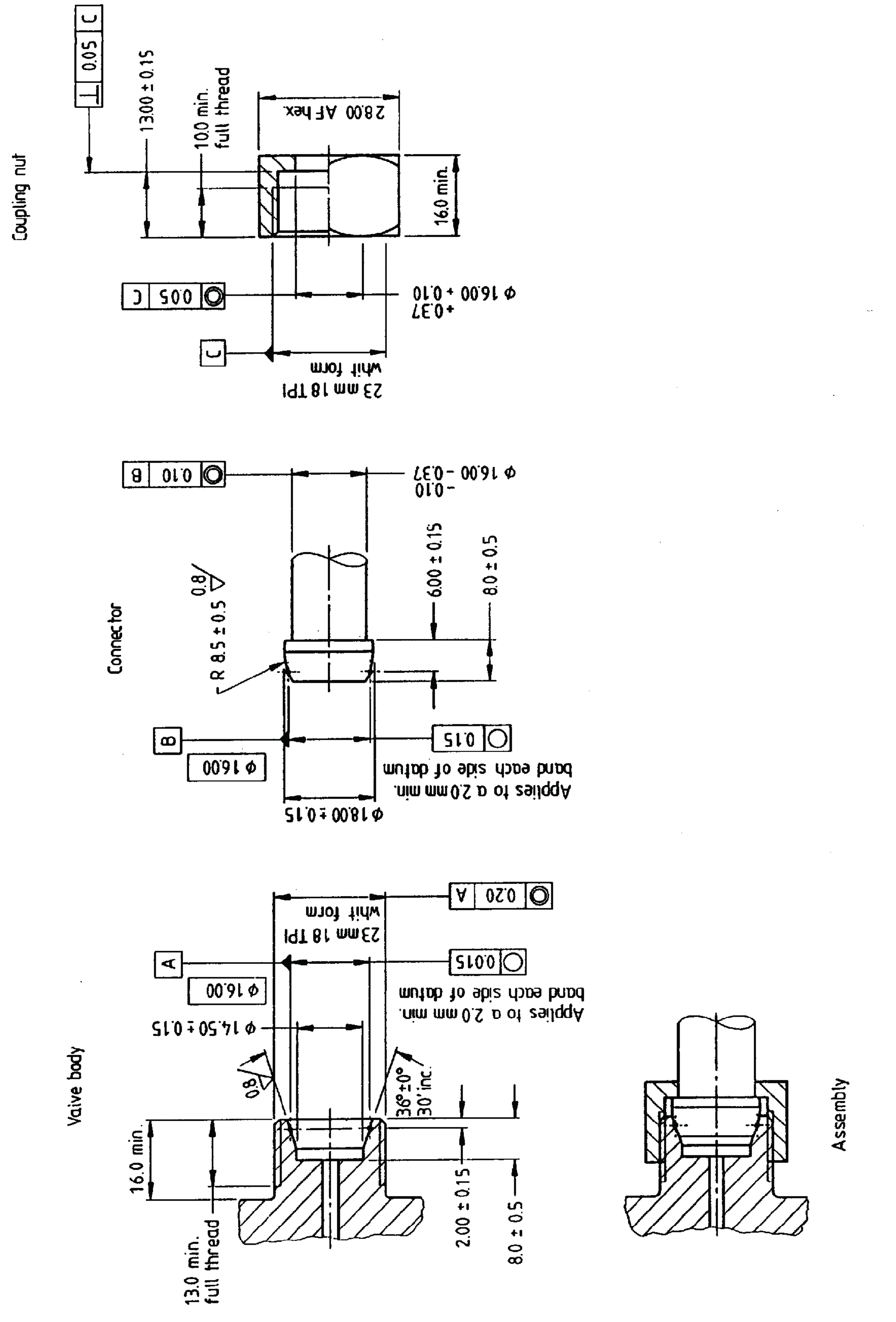
Figure 5. Dimensions and tolerances of outlet connections (*continued*)



NOTE. Fitting thread G ¼ conforms to BS 2779.

m) Outlet connection 17

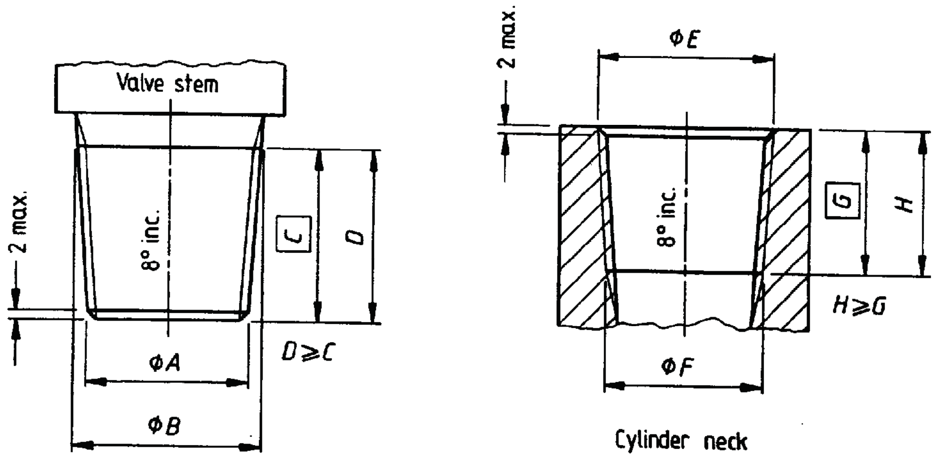
Figure 5. Dimensions and tolerances of outlet connections (*continued*)



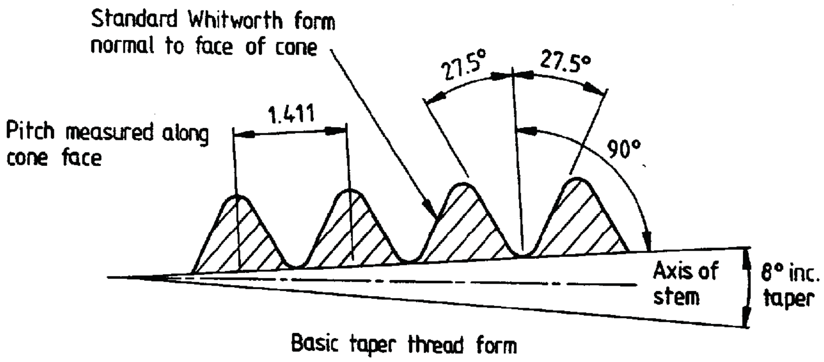
n) Outlet connection 18

Figure 5. Dimensions and tolerances of outlet connections *(concluded)*

⚠1



NOTE. To be read in conjunction with annex H.



Linear dimensions are in millimetres.

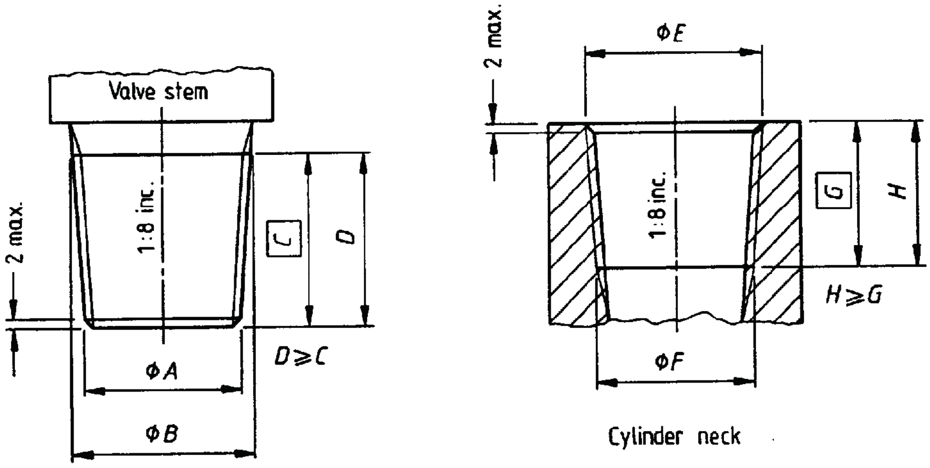
Valve stem dimensions									
Type	**Size**	*A*			*B*			*C*	*D*
		Maj. +0.15 0	**Eff. +0.15 0**	**Min. +0.15 0**	**Maj. +0.15 0**	**Eff. +0.15 0**	**Min. +0.15 0**	**Datum length**	**Min. full thread**
	in	mm	mm	mm	mm	mm	mm	mm	mm
16T	0.635	15.975	15.071	14.167	17.975	17.071	16.167	14.30	14.30

Cylinder neck dimensions									
Type	**Size**	*E*			*F*			*G*	*H*
		Maj. 0 −0.15	**Eff. 0 −0.15**	**Min. 0 −0.15**	**Maj. 0 −0.15**	**Eff. 0 −0.15**	**Min. 0 −0.15**	**Datum length**	**Min. full thread**
	in	mm	mm	mm	mm	mm	mm	mm	mm
16T	0.635	17.445	16.542	15.638	15.446	14.542	13.638	14.30	14.30

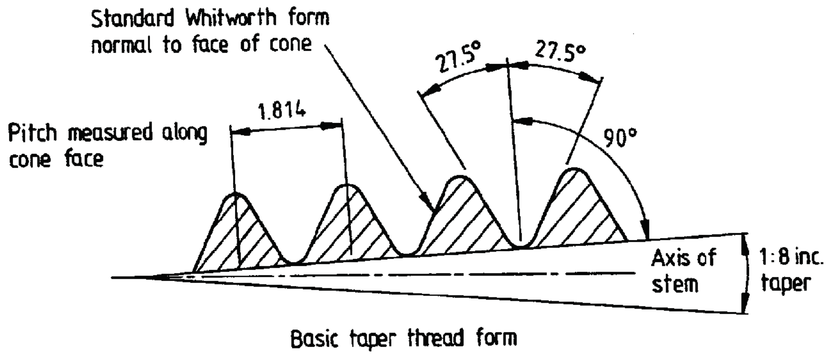
a)

Figure 6. Dimensions and manufacturing tolerances of valve body tapered stem/container neck threads

1



NOTE. To be read in conjunction with annex H.



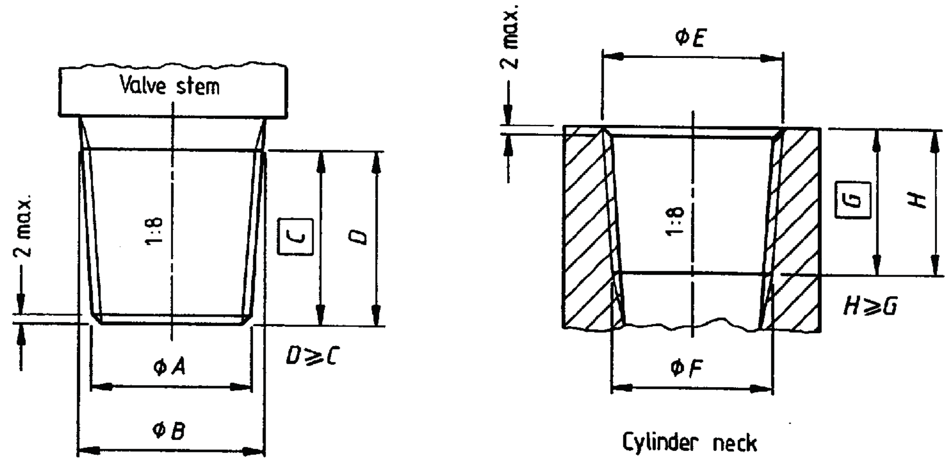
Linear dimensions are in millimetres.

Valve stem dimensions									
		A			*B*			*C*	*D*
Type	**Size**	**Maj. +0.13 0**	**Eff. +0.13 0**	**Min. +0.13 0**	**Maj. +0.13 0**	**Eff. +0.13 0**	**Min. +0.13 0**	**Datum length**	**Min. full thread**
	in	mm	mm	mm	mm	mm	mm	mm	mm
18T	0.715	18.027	16.865	15.704	20.777	19.615	18.453	22.00	22.00

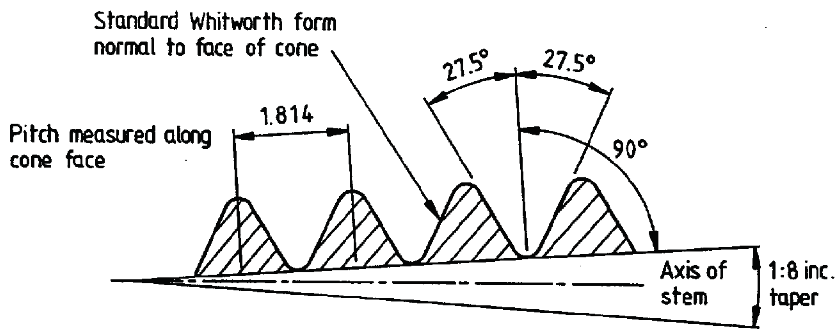
Cylinder neck dimensions									
		E			*F*			*G*	*H*
Type	**Size**	**Maj. 0 −0.13**	**Eff. 0 −0.13**	**Min. 0 −0.13**	**Maj. 0 −0.13**	**Eff. 0 −0.13**	**Min. 0 −0.13**	**Datum length**	**Min. full thread**
	in	mm	mm	mm	mm	mm	mm	mm	mm
18T	0.715	20.273	19.111	17.949	17.523	16.361	15.199	22.00	22.00

b)

Figure 6. Dimensions and manufacturing tolerances of valve body tapered stem/container neck threads (*continued*)



NOTE. To be read in conjunction with annex H.



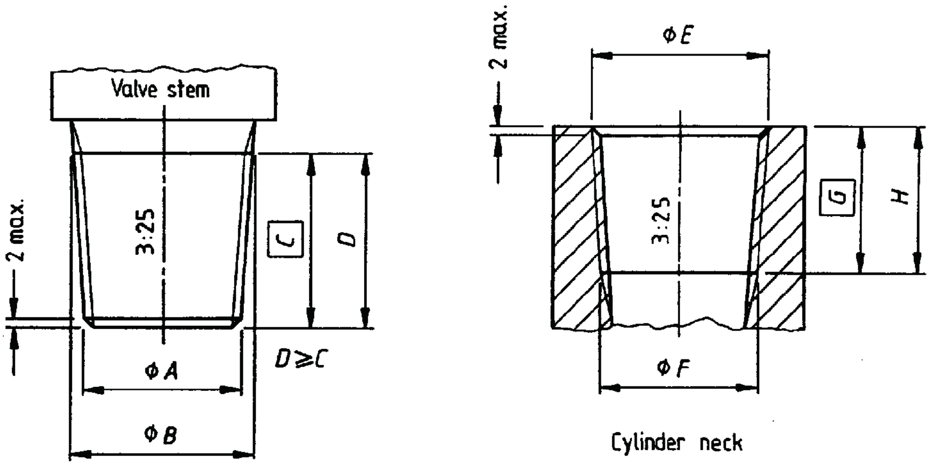
Linear dimensions are in millimetres.

Valve stem dimensions									
Type	**Size**	*A*			*B*			*C*	*D*
		Maj. **+0.13** **0**	**Eff.** **+0.13** **0**	**Min.** **+0.13** **0**	**Maj.** **+0.13** **0**	**Eff.** **+0.13** **0**	**Min.** **+0.13** **0**	**Datum length**	**Min. full thread**
	in	mm	mm	mm	mm	mm	mm	mm	mm
19T	0.735	18.535	17.373	16.212	21.285	20.123	18.961	22.00	22.00

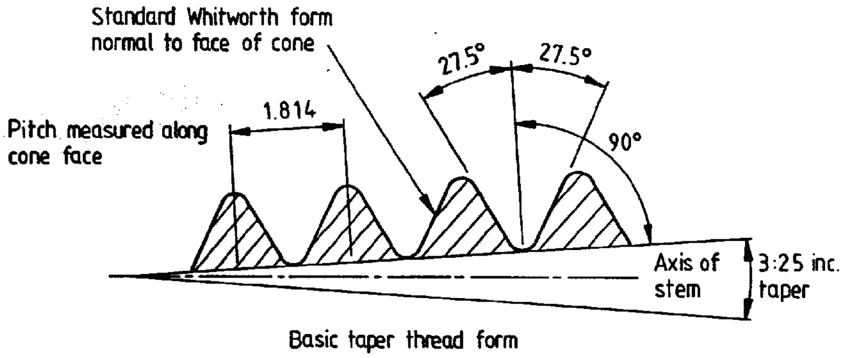
Cylinder neck dimensions									
Type	**Size**	*E*			*F*			*G*	*H*
		Maj. **0** **−0.13**	**Eff.** **0** **−0.13**	**Min.** **0** **−0.13**	**Maj.** **0** **−0.13**	**Eff.** **0** **−0.13**	**Min.** **0** **−0.13**	**Datum length**	**Min. full thread**
	in	mm	mm	mm	mm	mm	mm	mm	mm
19T	0.735	20.781	19.619	18.457	18.031	16.869	15.707	22.00	22.00

c)

Figure 6. Dimensions and manufacturing tolerances of valve body tapered stem/container neck threads (*continued*)



NOTE. To be read in conjunction with annex H.



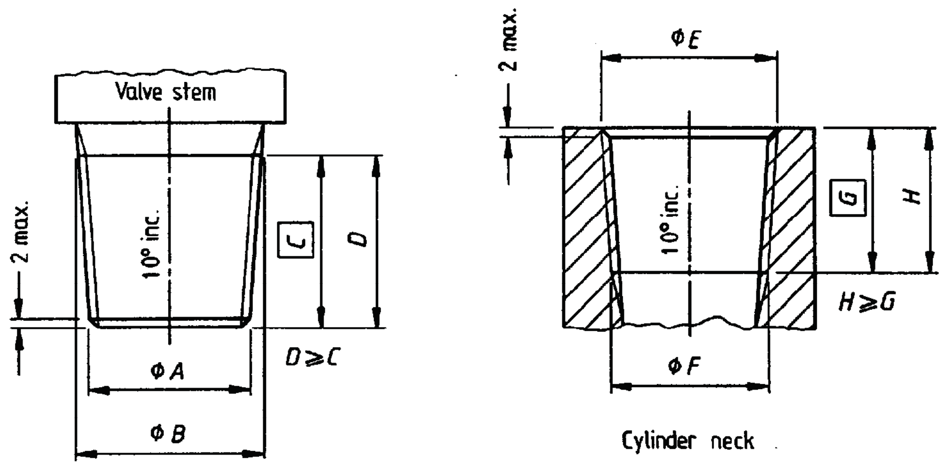
Linear dimensions are in millimetres.

Valve stem dimensions									
		A			*B*			*C*	*D*
Type	**Size**	**Maj. +0.12 0**	**Eff. +0.12 0**	**Min. +0.12 0**	**Maj. +0.12 0**	**Eff. +0.12 0**	**Min. +0.12 0**	**Datum length**	**Min. full thread**
	in	mm	mm	mm	mm	mm	mm	mm	mm
25T	1.000	25.680	24.518	23.355	28.800	27.638	26.476	26.00	26.00

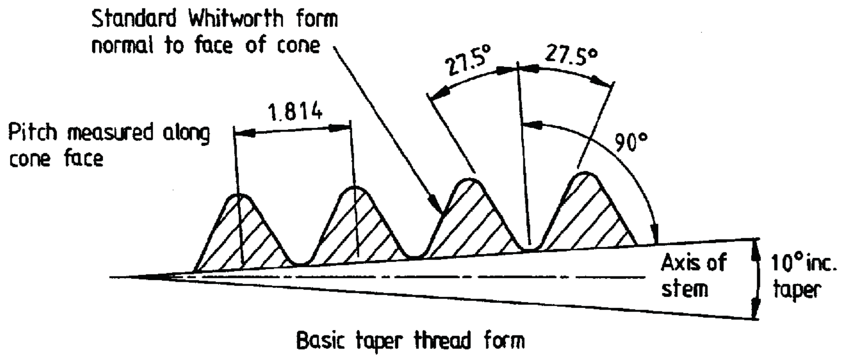
Cylinder neck dimensions									
		E			*F*			*G*	*H*
Type	**Size**	**Maj. 0 −0.12**	**Eff. 0 −0.12**	**Min. 0 −0.12**	**Maj. 0 −0.12**	**Eff. 0 −0.12**	**Min. 0 −0.12**	**Datum length**	**Min. full thread**
	in	mm	mm	mm	mm	mm	mm	mm	mm
25T	1.000	27.800	26.638	25.476	25.160	23.998	22.836	22.00	24.00

d)

Figure 6. Dimensions and manufacturing tolerances of valve body tapered stem/container neck threads (*continued*)



NOTE. To be read in conjunction with annex H.



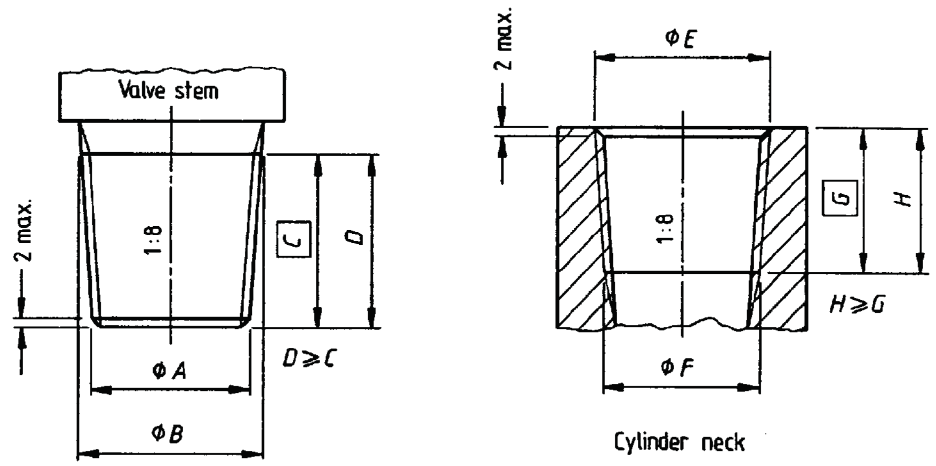
Linear dimensions are in millimetres.

Valve stem dimensions									
		A			*B*			*C*	*D*
Type	Size	Maj. +0.19 0	Eff. +0.19 0	Min. +0.19 0	Maj. +0.19 0	Eff. +0.19 0	Min. +0.19 0	Datum length	Min. full thread
	in	mm	mm	mm	mm	mm	mm	mm	mm
26T	1.025	25.842	24.680	23.518	30.286	29.125	27.962	25.40	25.40

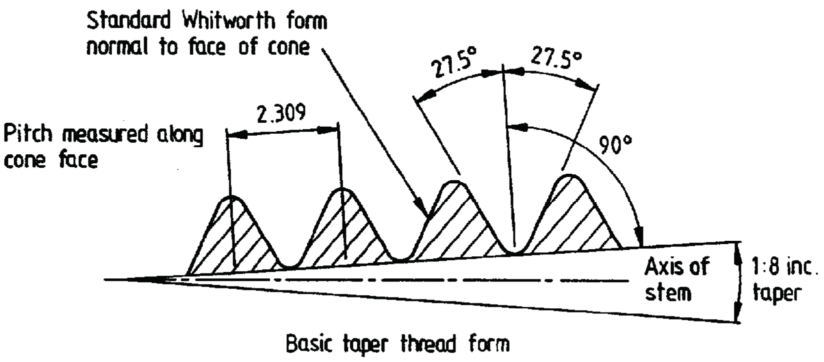
Cylinder neck dimensions									
		E			*F*			*G*	*H*
Type	Size	Maj. 0 −0.19	Eff. 0 −0.19	Min. 0 −0.19	Maj. 0 −0.19	Eff. 0 −0.19	Min. 0 −0.19	Datum length	Min. full thread
	in	mm	mm	mm	mm	mm	mm	mm	mm
26T	1.025	28.943	27.781	26.619	24.499	23.337	22.175	25.40	25.40

e)

Figure 6. Dimensions and manufacturing tolerances of valve body tapered stem/container neck threads (*continued*)



NOTE. To be read in conjunction with annex H.



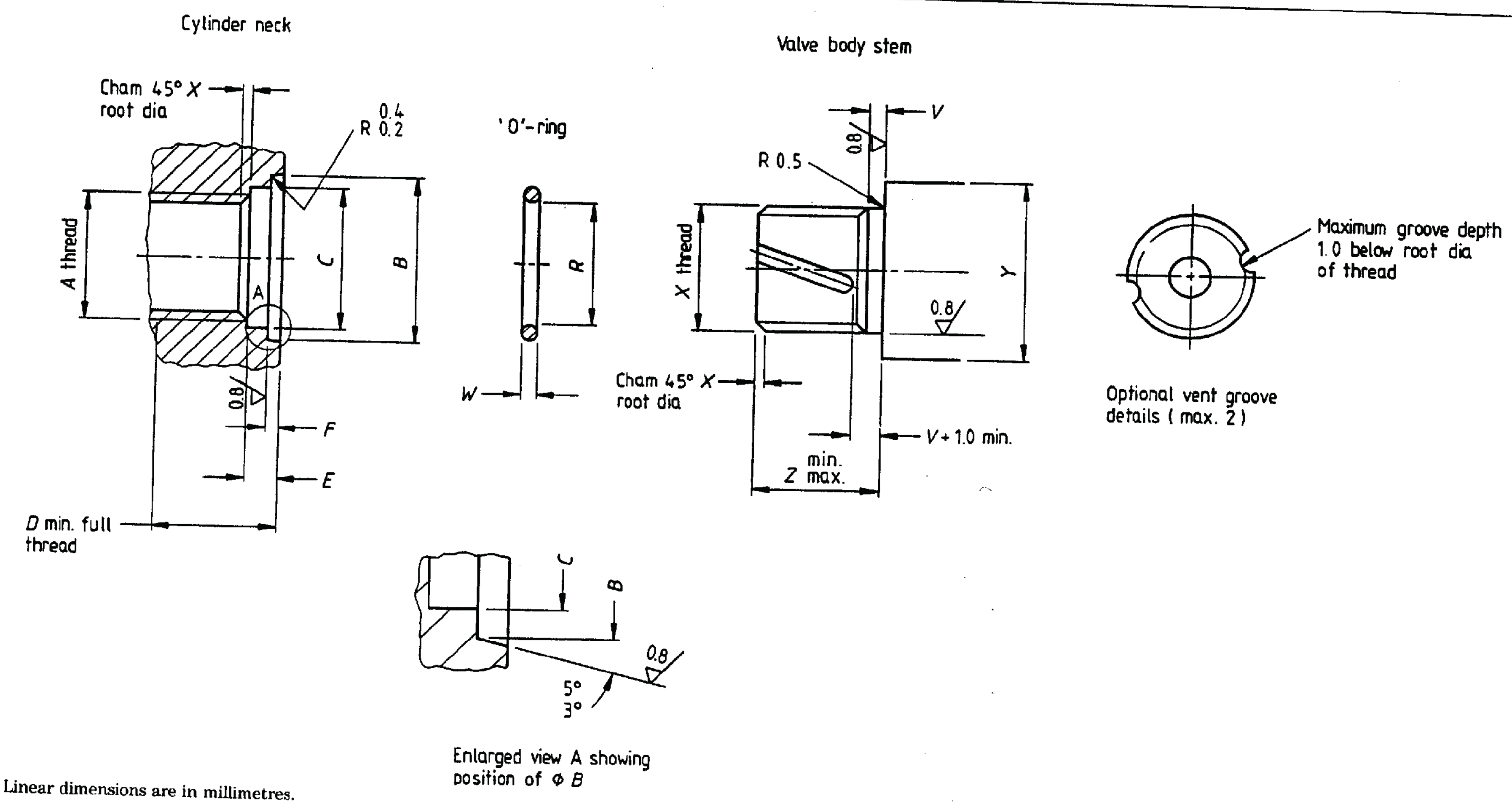
Linear dimensions are in millimetres.

Valve stem dimensions									
		A			*B*			*C*	*D*
Type	**Size**	**Maj. +0.18 0**	**Eff. +0.18 0**	**Min. +0.18 0**	**Maj. +0.18 0**	**Eff. +0.18 0**	**Min. +0.18 0**	**Datum length**	**Min. full thread**
	in	mm	mm	mm	mm	mm	mm	mm	mm
32T	1.250	31.569	30.090	28.612	35.538	34.059	32.580	31.75	31.75

Cylinder neck dimensions									
		E			*F*			*G*	*H*
Type	**Size**	**Maj. 0 −0.18**	**Eff. 0 −0.18**	**Min. 0 −0.18**	**Maj. 0 −0.18**	**Eff. 0 −0.18**	**Min. 0 −0.18**	**Datum length**	**Min. full thread**
	in	mm	mm	mm	mm	mm	mm	mm	mm
32T	1.250	35.102	33.623	32.145	31.133	29.654	28.175	31.75	31.75

f)

Figure 6. Dimensions and manufacturing tolerances of valve body tapered stem/container neck threads (*concluded*)



Linear dimensions are in millimetres.

Ref.	*A* thread	*B*	*C*	*D* min.	*E* ± 0.5	*F*	*W* ± 0.1	*R*	*X* thread	*Y* min.	*Z*	*V* min.
18P	M18X1.5-6H	ϕ23.0 A11 $\left(^{+0.43}_{+0.30}\right)$[1]	ϕ18.0 A13 $\left(^{+0.63}_{+0.33}\right)$[1]	24.0	5.5	$1.9^{+0.4}_{-0.0}$	2.62	ϕ17.86 ± 0.21	M18X1.5-6g	ϕ28.0	22.0 24.0	2.5
25P	M25X2.0-6H	ϕ31.5 A11 $\left(^{+0.47}_{+0.31}\right)$[1]	ϕ25.0 A13 $\left(^{+0.63}_{+0.33}\right)$[1]	27.0	6.5	$2.7^{+0.5}_{-0.0}$	3.53	ϕ25.0 ± 0.25	M25X2.0-6g	ϕ35.0	25.0 27.0	3.5
30P	M30X2.0-6H	ϕ36.5 A11 $\left(^{+0.47}_{+0.31}\right)$[1]	ϕ30.0 A13 $\left(^{+0.63}_{+0.33}\right)$[1]	30.0	8.0	$2.7^{+0.5}_{-0.0}$	3.53	ϕ29.75 ± 0.29	M30X2.0-6g	ϕ43.0	25.0 30.0	3.5

[1] See BS 4500 : Part 1.

NOTE 1. Thread form conforms to BS 3643.

NOTE 2. Maximum value of *V* has to be compatible with *E* and *X* thread runout.

Figure 7. Dimensions and manufacturing tolerances of valve body parallel stem/container neck threads

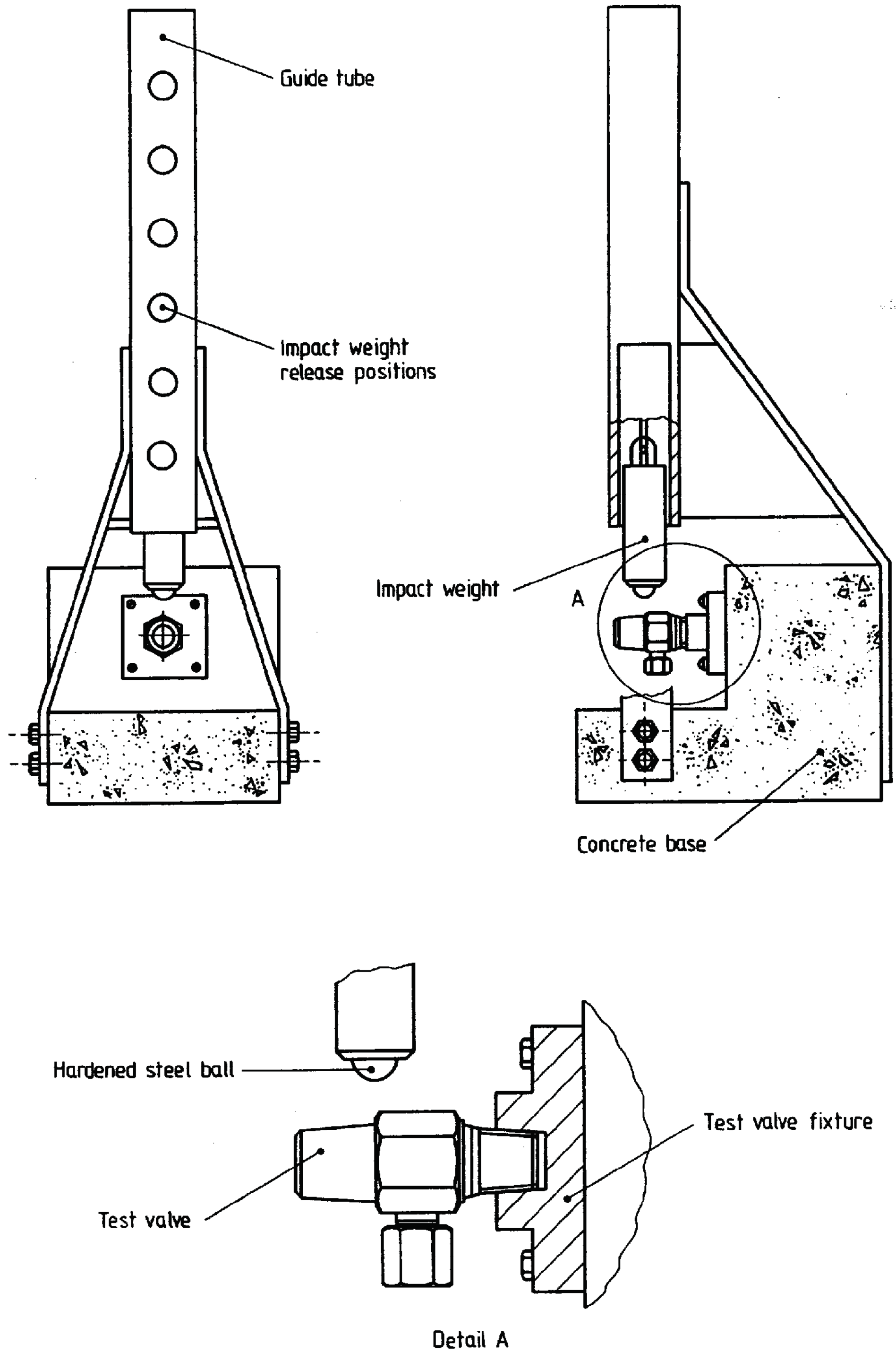


Figure 8. Typical test rig for valve impact test

Section 4. Pressure relief devices

4.1 Design of pressure relief devices

The materials, design and construction of a pressure relief device shall be such that the following conditions are met.

a) There shall be no significant change in the function of the device and no detrimental corrosion or deterioration of the materials due to normal service conditions of the container to which it is fitted within the following period:

1) for valves fitted to seamless steel containers (excluding dissolved acetylene containers) of water capacity 0.5 L and above, the period for external inspection in table 1 of BS 5430 : Part 1 : 1990;

2) for valves fitted to welded steel containers (excluding dissolved acetylene containers) of water capacity from 0.5 L up to 150 L, the period specified for external inspection in table 1 of BS 5430 : Part 2 : 1990;

3) for valves fitted to seamless aluminium alloy containers (excluding dissolved acetylene containers) of water capacity 0.5 L and above, the period specified for external inspection in table 1 of BS 5430 : Part 3 : 1990;

4) for valves fitted to dissolved acetylene containers, the period specified in **4.1** and clause **13** of BS 6071 : 1981.

b) The breakage or failure of any internal component shall not obstruct free and full discharge of the gas through the pressure relief device.

The materials of construction shall be mutually compatible and compatible with the gas(es) to be conveyed and other service conditions.

The design shall be such as to deter unauthorized interference with the assembly and/or setting of the device.

The outlets from all pressure relief devices shall be so designed and constructed as to minimize the collection of moisture or other foreign matter that could adversely affect the performance of the valves. The outlets from all pressure relief devices shall be so sited that free discharge from the devices is not impaired.

All pressure relief devices shall be designed and fitted so as to ensure that the cooling effect of the contents of the container during discharge shall not prevent the effective operation of the devices.

Pressure relief devices shall be capable, under the most severe temperature requirements (including exposure to fire), of a discharge rate that prevents the pressure of the container contents exceeding the test pressure of the container.

The minimum rated flow capacity of each new design or any subsequent modification to an existing design shall be as stated by the purchaser (see **1.6.1h)**) and shall be determined by flow test as agreed between the manufacturer and purchaser (see **1.6.2**).

The yield temperature for fusible plugs used with acetylene containers shall be 100 °C ± 2 °C.

The methods of manufacture, inspection and test shall conform to those specified in sections **5** and **6**.

NOTE 1. Bursting discs may be fitted to any container intended for the conveyance of non-toxic and non-flammable gases.

Bursting discs shall conform to BS 2915 : 1990, except that flat discs may be used, and shall be designed so as to ensure that rupture occurs at a pressure not greater than the test pressure of the container. If a container is liable to be subject to vacuum conditions during service the bursting disc shall be fitted with vacuum supports.

NOTE 2. Pressure relief devices fitted to dissolved acetylene containers should be either one or more fusible plugs set to operate at 100 °C ± 2 °C or by means of other such pressure relief device as approved by the Health and Safety Executive.

The Health and Safety Executive should be consulted if it is proposed to fit containers, other than dissolved acetylene containers, with fusible plugs. Where practicable, fusible plugs should be externally marked to indicate the temperature at which they are designed to relieve pressure.

The minimum rated flow capacity for pressure relief devices fitted to non-insulated containers having water capacities of 11 L or more shall be as follows.

a) For permanent gases:

$$Q_1 = 0.00967 W_c$$

where

Q_1 is the rated flow capacity in cubic metres per minute of free air at 7 bar absolute;

W_c is the water capacity of the container in litres.

b) For liquefiable gases: the rated flow capacity of the pressure device shall be twice that given by the equation in item a).

For containers having water capacities of less than 11 L, the rated flow capacity shall be as given in items a) and b), except that the value of W_c shall be 11, i.e. the rated flow capacity shall be 0.10637 m^3/min.

4.2 Relief pressures

Where the pressure relief device is a bursting disc fitted to valves of seamless or welded containers, the maximum bursting pressure shall not exceed the test pressure of the container.

The bursting pressure range for bursting discs fitted to carbon dioxide container valves shall be 180 bar to 200 bar.

4.3 Installation and application of pressure relief devices

Valves to be fitted to containers filled with a toxic gas shall not be fitted with a pressure relief device.

The design and location of the pressure relief device shall be compatible with the intended duty.

NOTE. The effect of the resultant thrust when the device operates should be taken into account.

Containers of 3.5 L water capacity and above, which are filled with CO_2 for industrial purposes, shall be fitted with pressure relief devices.

Section 5. Manufacture and workmanship

5.1 Machining

All components shall be free from burrs and sharp edges.

Sealing faces shall be checked to ensure that there are no surface imperfections to impair sealing.

Concentricity of related features and components shall be checked to ensure correct operation.

Machining dimensions shall allow for plating where applicable.

There shall be thickness limits between passageways of vapour/liquid valves to avoid cracking or drilling through.

5.2 Screw threads

Screw threads on metal components shall be formed by cutting or rolling. The stem and outlet threads shall be selected in accordance with figures 6 or 7 and table 1 together with figure 5.

NOTE. For recommended gauging for taper threads, see annex G.

5.3 Heat treatment of valve bodies

5.3.1 Hot formed B2 copper alloy valve bodies shall be cooled in still air and stress relieved by heating for 1 h at a temperature in the range 280 °C to 320 °C followed by cooling in still air.

5.3.2 Aluminium alloy valve bodies shall be heated for $1\frac{1}{2}$ h to 4 h at a temperature in the range 520 °C to 540 °C and then immersed in water. They shall then be aged by heating for 6 h to 12 h at a temperature in the range 160 °C to 190 °C followed by cooling in still air.

5.3.3 CS1 carbon steel valve bodies shall be normalized by heating for 45 min to 1 h at a temperature in the range 880 °C to 910 °C followed by cooling in still air.

5.3.4 ST1 stainless steel valve bodies shall be heated for 30 min to 45 min at a temperature in the range 1050 °C to 1120 °C and then immersed in oil or water.

5.4 Protective finishes

5.4.1 Where protective finishes are to be used they shall be agreed between the purchaser and manufacturer (see **1.6.1j)**). They shall be compatible with the parent metal, the container material and intended service.

5.4.2 Aluminium alloy components shall be anodized and operating threads hard anodized to prevent galling.

5.5 Cleaning

All components, subassemblies and assemblies shall be free from foreign matter, e.g. swarf, grit, cleaning agents, flux residues, adhered scale and organic material such as oil, grease or paint and shall meet the standards specified by the purchaser (see **1.6.1i)**).

WARNING. There is a high risk of combustion or explosion, if oil, grease, or other organic substances come into contact with high pressure oxygen (or other powerful oxidants).

5.6 Lubrication

Lubricants, when used on operating threads and seals, shall be compatible with the products to be contained and shall be agreed between the manufacturer and purchaser (see **1.6.1m**) and warning to **5.5**).

5.7 Assembly and assembly torques

All components shall be assembled, with particular attention being given to the application of the manufacturer's specified assembly torques, to ensure the correct and proper operation of the valve in service.

Section 6. Inspection and testing

6.1 Prototype and proving tests

6.1.1 Prototype tests

6.1.1.1 *General*

Representative samples of each new valve design shall be tested in accordance with **6.1.1.2** to **6.1.1.7**. The number of samples to undergo such tests shall be subject to agreement between purchaser and manufacturer.

6.1.1.2 *Hydraulic pressure test*

Prototype valve bodies shall undergo a hydraulic pressure test as follows:

a) at three times the charging pressure of the gas to be contained or 300 bar, whichever is the greater; and either

b) for permanent gases, at the container test pressure or 300 bar, whichever is the greater; or

c) for liquefiable gases, at the container test pressure or 20 bar, whichever is the greater.

The number of valve bodies to undergo such tests shall be subject to agreement between purchaser and manufacturer.

The test pressure shall be held for a period of not less than 2 min, and valve bodies that do not leak or show signs of cracking or permanent deformation shall be deemed to have passed the test.

Valve bodies that fail any of the tests a), b) or c) shall be tested in accordance with **6.4.2**.

Valve bodies that pass test a) shall be tested in accordance with **6.4.1**.

6.1.1.3 *Valve impact test*

A hardened steel weight (figure 8 illustrates a typical test rig) shall be dropped through a height so as to deliver an impact in accordance with table 3 at a minimum impact velocity of 3 m/s. This shall be achieved either by mounting the weight in a pendulum or by allowing it to fall vertically.

The point of impact shall be approximately two-thirds of the distance from the first exposed stem thread to the top of the valve body. The impact shall be in such a position that the blow from a 13 mm diameter hardened steel ball is normal to the centreline of the valve, and not cushioned by protrusions.

The valve shall not crack or shear to the extent that container charging pressure is not maintained.

6.1.1.4 *Valving torque test*

Valves shall be subjected to a torque test in a test rig using a torque value that is 50 % in excess of the maximum given in annex B.

There shall be no sign of cracking or permanent deformation of the valve body or cracking of the valve stem.

NOTE. Deformation of the valve stem thread is allowable.

Table 3. Impact test values (1)

Stem size not exceeding mm	Impact values 'J'.
19.00	80
26.00	200
32.00	300

6.1.1.5 *Gland leakage test*

Samples of valve assemblies shall be set in the open position with the outlet sealed off. A pneumatic leakage test on the gland shall be carried out at whichever is the greater of the following:

a) 20 bar;

b) the lower of the container test pressure and the maximum pressure compatible with the design of the valve.

Any valve with a leakage rate exceeding 10^{-3} torr·L/s shall be rejected.

6.1.1.6 *Valve seat leakage test*

Samples of valve assemblies shall be set in the closed position at the design closing torque and with the outlet open to atmosphere. A pneumatic leakage test shall be carried out at whichever is the greater of the following:

a) 20 bar;

b) the lower of the container test pressure and the maximum pressure compatible with the design of the valve.

Any valve with a leakage rate exceeding 10^{-3} torr·L/s shall be rejected.

6.1.1.7 *Wear test*

Sample valves shall be subjected to a wear test entailing 2000 operations of fully opening and closing the valve at the maximum service pressure at which the valve is intended to be used. After each complete opening and closing operation, which shall not take less than 1 min, the pressure at the valve outlet shall be reduced to atmospheric pressure.

The closing torque used shall be 7 N·m for all valves except key operated and diaphragm valves for which the closing torque used shall be not more than 1.5 times the torque intended to be used to close the valve in service.

The test valve shall be deemed to have passed the test if the test is completed without seizure of the valve operating mechanism or if, on subsequent examination, valve components such as spindles, seats, 'O'-rings, bellows, diaphragms, etc. do not show signs of wear which will affect the operating characteristics of the valve.

6.1.2 Performance test

Samples of the prototype and first production batch of each new valve design shall be tested to prove compliance with the purchaser's design specification.

NOTE. It is recommended that valves, unless they can be regarded as proven from results of previous tests or experience, should be subjected to a conveyance test. Such a test is described in annex E.

6.1.3 Test results

Valves that fail any of the tests described in **6.1** shall be examined to determine the cause of failure. If the failure is due to breakdown of test equipment, or suspected inaccurate readings, the tests shall be repeated. If the failure is due to faulty materials and/or workmanship on the valves, the tests shall be repeated.

If the failure is due to a design fault, the design shall be rejected.

6.2 Production sample testing

6.2.1 Stress corrosion test for copper alloy valve bodies

One valve body per 1000 or, where the batch is less than 1000, one valve body per batch shall, prior to machining and stamp marking, be subjected to a mercurous nitrate test and shall be destroyed after the test.

The valve body shall first be degreased and then dipped in a solution of 50 % (*V*/*V*) distilled water and 50 % (*V*/*V*) concentrated nitric acid 16 mol/L for a period not exceeding 30 s to remove all traces of carbonaceous matter and oxide film. It shall be well rinsed in cold water and immediately immersed in a solution of 1 % (*m*/*m*) mercurous nitrate in distilled water to which 1 mL of concentrated nitric acid 16 mol/L has been added for each 100 mL of solution. It shall remain in the solution for 30 min then removed, rinsed well in cold water, carefully wiped and checked for cracks.

The sample shall show no signs of cracking after the test. Should it fail to meet the test, the batch shall be subjected to a further stress relieving operation and a further sample tested.

If the second sample fails the test the batch shall be rejected.

6.2.2 Hydraulic test

On the first production batch of a new design either one in 1000 valve bodies or three valve bodies, whichever is the greater, shall be subjected to a hydraulic test which shall not be less than the test pressure of any container to which they may be fitted. On separate subsequent production batches, the sampling level shall be that specified by the purchaser.

In the case of valves to be used in containers for permanent gases, the minimum test pressure shall be the container test pressure or 300 bar, whichever is the greater.

6.3 Production inspection and testing

6.3.1 All materials and components shall be visually examined for surface flaws, laps, inclusions and other imperfections, the acceptance criteria for which shall be agreed between the manufacturer and purchaser.

6.3.2 Random sampling inspection on all components shall be carried out in accordance with BS 6001 : Part 1 : 1991, BS 6001 : Part 2 : 1984 or BS 6001 : Part 3 : 1986 during manufacture.

6.3.3 After assembly, each valve shall be inspected to ensure that it has been correctly assembled and that threads, etc. have not been damaged during manufacture. Each valve shall be opened and closed to check ease and smoothness of operation.

6.3.4 There shall be random sampling of assembled valves in accordance with BS 6001 : Part 1 : 1991, BS 6001 : Part 2 : 1984 or BS 6001 : Part 3 : 1986. The sample valves shall be dismantled and all parts inspected to check compliance with sections **3**, **4** and **5** of this Part of BS 341.

6.3.5 Where the passageways of valves are known or estimated to be less than 1 mm from the outer surface of the valve body, or from each other, one finished machined body per 500 or, where the batch is less than 500, one finished machined body per batch, shall be sectioned and the distance between passageways and outer surface checked for thickness and freedom from cracking.

6.4 Gland leakage test

6.4.1 Every valve assembly shall be set in the open position with the outlet sealed off. A pneumatic leak test of the gland shall be carried out at charging pressure or 20 bar, whichever is the greater. Any valve with a leakage rate exceeding 10^{-3} torr·L/s shall be rejected.

6.4.2 Every valve assembly shall be set in the open position with the outlet sealed off. A pneumatic leak test of the gland shall be carried out at container test pressure or 20 bar, whichever is the greater. Any valve with a leakage rate exceeding 10^{-3} torr·L/s shall be rejected.

Valves equipped with pressure relief devices shall have the pressure relief device rendered inoperative for this test. Following this test the pressure relief device shall be restored and retested in accordance with **6.4.1**.

WARNING. When the valve is intended for oxygen (or other powerful oxidant) service, the gas used for this test should be free from oil and other organic matter. The gas is considered to be oil-free when the oil vapour present is less than 2 p.p.m. (*V*/*V*).

6.5 Valve seat leakage test

6.5.1 Every valve assembly shall be set in the closed position at the design closing torque and with the outlet open to atmosphere. A pneumatic leak test of the seat shall be carried out at charging pressure or 20 bar, whichever is the greater. Any valve with a leakage rate exceeding 10^{-3} torr·L/s shall be rejected.

6.5.2 Every valve assembly shall be set in the closed position at the design closing torque and with the outlet open to atmosphere. A pneumatic leak test of the seat shall be carried out at container test pressure or 20 bar, whichever is the greater. Any valve with a leakage rate exceeding 10^{-3} torr·L/s shall be rejected.

Valves equipped with pressure relief devices shall have the pressure relief device rendered inoperative for this test. Following this test the pressure relief shall be restored and retested in accordance with **6.5.1**.

WARNING. When the valve is intended for oxygen (or other powerful oxidant) service, the gas used for this test should be free from oil and other organic matter. The gas is considered to be oil-free when the oil vapour present is less than 2 p.p.m. (*V/V*).

6.6 Bursting disc test

A number of bursting discs shall be subjected to a burst test in accordance with BS 2915 : 1990 to check that disc rupture occurs within its prescribed range (see **4.2**).

The number of bursting discs to undergo this test shall be subject to agreement between purchaser and manufacturer.

NOTE. These burst tests should preferably be carried out with the disc mounted in a valve body.

6.7 Final inspection

On satisfactory completion of the tests specified in **6.4** and **6.5**, each valve shall be dried and stamped with the date of test in accordance with **7.1**. Each valve shall then be visually examined for any signs of external damage, particularly to threads, before being packed for despatch.

Valves used for oxygen service shall be dried in oil-free gas (see **6.4** and **6.5**).

Section 7. Marking and packing

7.1 Marking

NOTE 1. The markings detailed in this clause may be coded, by agreement between the purchaser and manufacturer, in order that they can be accommodated on the valve body.

Each valve and outlet connection shall have the following information marked on it; stamped characters shall be 2.5 mm high and embossed characters shall be 4 mm high where practicable (see figure 9):

a) for permanent liquefiable gases and high pressure liquefiable gases: gas leakage test pressure in bar;

b) rate of manufacture and date of test (indicating the month and year of manufacture and of test);

c) valve manufacturer's mark;

d) an indication of the direction for opening and/or closing the valve;

e) on the relief valve or on the valve body, the pressure at which the relief valve is designed to start lifting;

f) on the bursting disc holder or on the valve body, the pressure at which the bursting disc is designed to rupture;

g) the number of this British Standard, i.e. BS 341 : Part 1[3].

NOTE 2. The following additional information may, at the purchaser's request, be marked on each valve (see figure 9 and **1.6.1k**)):

1) the valve body material in accordance with the code given in table 1 (this information may be applied by either the valve body manufacturer or the valve manufacturer);

2) the outlet connection number;

3) if there is a dip (syphon) tube, the symbol 'DT';

4) the hydraulic test pressure in bar;

5) the owner's mark;

6) the valve body manufacturer's mark.

7.2 Packaging and protection

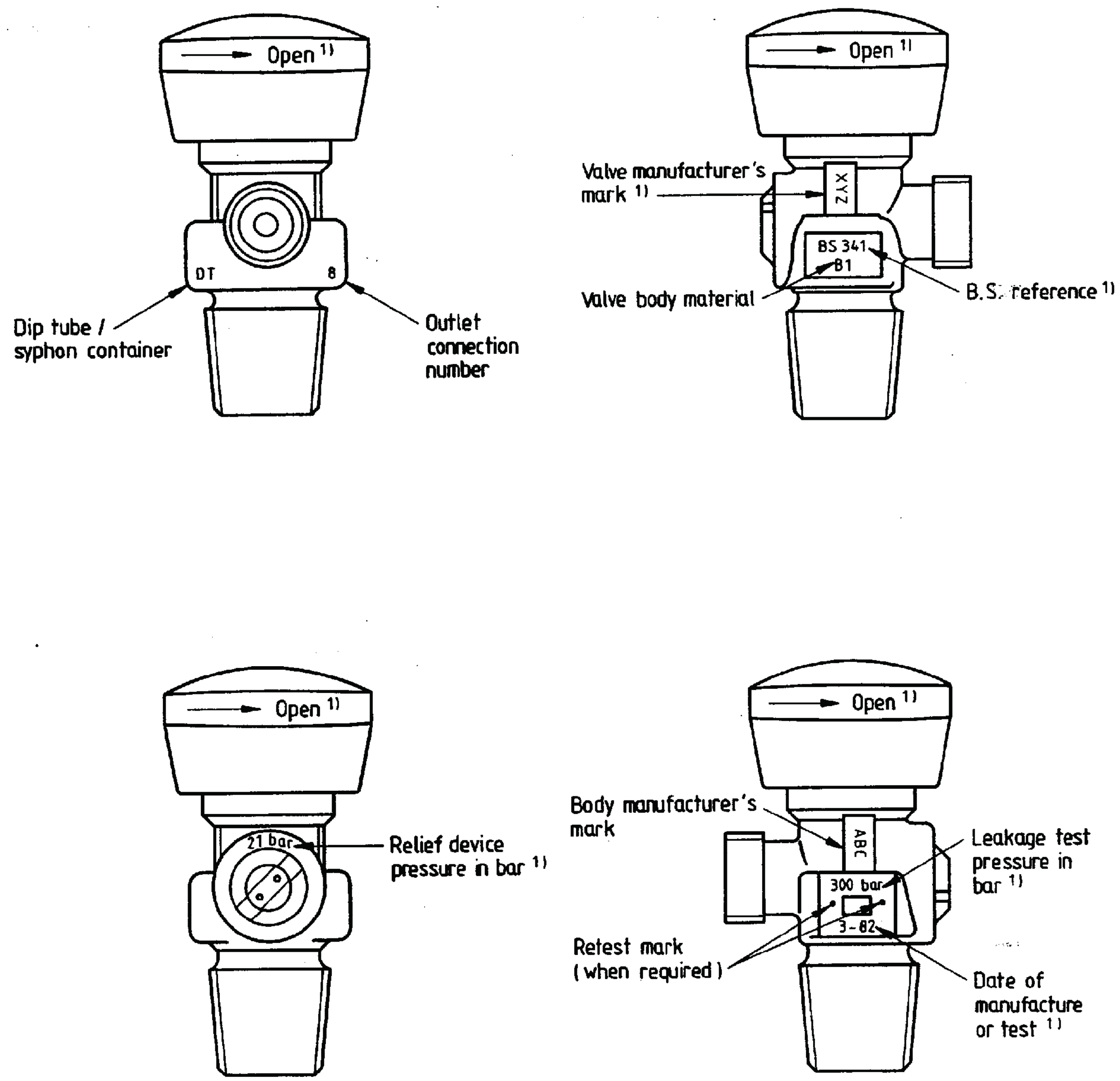
Valves shall be prepared for despatch so as to minimize the possibility of damage to internal or external parts during storage and transit (see **1.6.1l**)).

NOTE. Particular attention should be given to the packaging and protection of valves intended for oxygen service (see the warning in **5.5**).

7.3 Certification

The manufacturer shall, on request, certify that valves conform to this standard (see **1.6.2**).

[3] Marking BS 341 : Part 1 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.



[1] These items are requirements (see **7.1**).

Figure 9. Typical example of marking layout for gas container valves

Section 8. Periodic inspection, testing and maintenance of valves

8.1 General

Valves shall be subjected to either an in service inspection in accordance with **8.2** or a full inspection and test in accordance with **8.3**. Except for valves for corrosive or highly toxic gases that are subjected to a full inspection and test at each cylinder refill, the test shall be carried out at the time of the external inspection of the container as follows:

a) for seamless steel containers (excluding dissolved acetylene containers) of water capacity 0.5 L and above, as specified in table 1 of BS 5430 : Part 1 : 1990;

b) for welded steel containers (excluding dissolved acetylene containers) of water capacity from 0.5 L up to 150 L, as specified in table 1 of BS 5430 : Part 2 : 1990;

c) for seamless aluminium alloy containers (excluding dissolved acetylene containers) of water capacity 1.5 L and above, as specified in table 1 of BS 5430 : Part 3 : 1990;

d) for dissolved acetylene containers, as specified in **4.1** and clause **13** of BS 6071 : 1981.

Before a valve is subjected to in service performance inspection and test (see **8.2**) or full inspection and test (see **8.3**), the markings on it shall be scrutinized to establish whether it conforms to this Part of BS 341.

NOTE. If the markings do not conform to section 7 of this Part of BS 341, it may be possible to ensure that the valve is suitable for its intended service by referring to the original manufacturer's specification and checking that the valve conforms to sections 2 to 5 of this Part of BS 341.

8.2 In service performance, inspection and test

8.2.1 External examination

The valves shall be examined for defects including the following:

a) bent, deformed, corroded, badly marked and scored bodies or those with cracks;

b) bent or damaged handwheels and/or spindles;

c) cross-threaded, damaged or stripped valve stem threads;

d) cross-threaded, damaged or stripped valve outlet threads;

e) any indication of having been subjected to excessive heat or of having been in a fire.

Valves with any of the defects listed in items a) to e) above shall be subject to a full inspection, test and maintenance.

8.2.2 Cleaning

The following actions shall be carried out preparatory to inspection.

a) All residual jointing compound shall be removed from the valve stem and/or outlet threads.

b) Foreign bodies and corrosive products shall be removed from the valve bore and outlet.

c) Plastic handwheels shall be cleaned.

NOTE. Brushing and washing in a detergent solution is a suitable method.

WARNING. Owing to the high risk of combustion or explosion, if oil, grease or other organic substances come into contact with high pressure oxygen (or other powerful oxidants), it is essential that the valve should be cleaned thoroughly.

8.2.3 Valve inspection

The stem thread of each valve body shall be inspected visually and/or by using gauges to assess whether it has been subjected to excessive damage, deformation, wear or 'wasting'. After any rectification the thread shall be subjected to a further inspection.

The outlet connection threads of each valve body shall be inspected to confirm freedom from corrosion, damage or wear. After any rectification the thread shall be checked with the appropriate gauges.

Internal passageways shall be inspected, so far as is possible without dismantling the valve, to check that they are not obstructed and are free of foreign matter.

The valve outlet sealing face shall be inspected for damage, wear or corrosion. If the design of the valve permits any of these defects to be corrected by refurbishing, the valve shall be set aside for refurbishing in accordance with **8.3.4**.

The valve operation shall be checked to ensure that it operates smoothly and without excessive resistance. Valves in which the spindle resists turning or which turn too easily shall be subject to full inspection, test and maintenance in accordance with **8.3**.

Gland nuts shall be checked for security and re-torqued to the manufacturer's recommended value, if required.

8.2.4 Protective finishes

8.2.4.1 The protective finish of the valve body and external components shall be inspected to check that they are satisfactory for further service. Bodies needing to be retreated shall be set aside.

8.2.4.2 Any retreatment shall be compatible with the original manufacturer's design specification.

NOTE. Annex A details recommended plating procedures for copper alloy valves.

8.2.5 Testing

8.2.5.1 *General*

The following tests shall be carried out either before or after the valve is fitted to the container.

WARNING. When the valve is intended for oxygen (or other oxidants) service, the gas used for these tests should be free from oil and other organic matter. The gas is considered to be oil-free when the oil vapour present is less than 2 p.p.m. (*V*/*V*).

8.2.5.2 *Gland leakage test*

Every valve assembly shall be set in the open position with the outlet sealed and a gland leakage test carried out in accordance with **6.4**.

For valves with diaphragm glands (see figure 3) testing shall be carried out at either the maximum pressure compatible with the design of the valve or 20 bar, whichever is the greater.

8.2.5.3 *Valve seat leakage test*

Every valve shall be set in the closed position using the design closing torque and, with the outlet open, a seat leakage test shall be carried out in accordance with **6.5**.

For valves with diaphragm glands (see figure 3) testing shall be carried out at the maximum pressure compatible with the design of the valve or 20 bar, whichever is the greater.

8.2.5.4 *Bursting disc and/or pressure relief valve test*

Each bursting disc and/or pressure relief valve assembly shall be leak tested in accordance with **8.3.6.4**.

8.2.6 Rejection

Any valve that fails the tests specified in **8.2.5.2**, **8.2.5.3** or **8.2.5.4** shall be subjected to remedial action and retesting before going into service or shall be rendered incapable of further use.

8.2.7 Replacement parts

Valve handwheels, outlet caps and outlet joint seals shall be replaced as necessary.

8.3 Full inspection, test and maintenance

8.3.1 Preliminary examination

Valves shall be examined for defects in accordance with **8.2**.

8.3.2 Cleaning

Valves shall be cleaned in accordance with **8.2**.

8.3.3 Inspection

8.3.3.1 *General*

Valves shall be inspected in accordance with **8.2.3**.

NOTE. Re-valving of containers should be carried out in accordance with annex B.

8.3.3.2 *Valve bodies*

The stem thread of each valve body shall be inspected visually and/or by using gauges to ensure that it has not been subjected to excessive damage, deformation, wear or 'wasting'. After any rectification the thread shall be subjected to a further inspection.

The outlet connection threads of each valve body shall be inspected to assess freedom from corrosion, damage or wear. After any rectification the thread shall be checked with gauges and any defects shall be corrected.

NOTE. Appropriate gauges are described in annex G.

Internal passageways shall be inspected to check that they are not obstructed and are free of foreign matter.

Sealing and seating faces shall be inspected for damage, wear or corrosion. If the design of the valve permits any of these defects to be corrected by refurbishing, this work shall be carried out in accordance with **8.3.4**.

All other valve body threads shall be inspected for cross-threading, corrosion, damage or wear. Any threads that show signs of corrosion, damage or wear shall be inspected and approved in accordance with **8.2**.

NOTE. If the design of valve permits, threads may be subjected to rectification or re-forming.

8.3.3.3 *Valve components*

NOTE. If a valve spindle is satisfactory, the sealing member may be replaced without scrapping the spindle.

Metallic valve components shall be inspected to confirm that they are suitable for further service. Components that do not conform to sections **2** to **5** of this Part of BS 341, shall be rendered incapable of further use. Any components that are re-used or replace the original components shall comply with the original manufacturer's design specification for the valve.

8.3.3.4 *Protective finishes*

The protective finish of the valve body and components shall be inspected to check that they are satisfactory for further service. Bodies shall be retreated after any machining operations.

Any retreatment shall be compatible with the original manufacturer's design specification.

NOTE. Annex A details recommended plating procedures for copper alloy valves.

8.3.4 Valve body refurbishing

Where the design permits the re-machining of damaged valve body spindle seats or outlet sealing faces, the work shall be carried out in accordance with section **5** of this Part of BS 341. The dimensions and surface finishes of the body shall be inspected to check that they conform to the original manufacturer's design specification and this Part of BS 341.

Any bodies that do not conform to sections **2** to **5** of this Part of BS 341 shall be rendered incapable of further use.

8.3.5 Assembly

Valve bodies and components that have been cleaned, have been refurbished where necessary and have passed inspection shall be re-assembled in accordance with **5.7**.

During the re-assembly process, valve spindles shall be checked for freedom from excessive movement.

All components shall be free from foreign matter such as swarf, grit, cleaning agents, flux residues, adhered scale and organic material such as oil, grease and paint.

WARNING. Owing to the high risk of combustion or explosion of oil, grease or other organic substances that come into contact with high pressure oxygen (or other powerful oxidants), attention is directed to the need for strict observance of cleanliness in assembly.

8.3.6 Cylinder valve testing

8.3.6.1 *General*

The following tests shall be carried out after the valve has been re-assembled. The tests described in **8.3.6.2** and **8.3.6.3** shall be carried out either before or after the valve is fitted to the container.

WARNING. When the valve is intended for oxygen (or other oxidants) service, the gas used for these tests should be free from oil and other organic matter. The gas is considered to be oil-free when the oil vapour present is less than 2 p.p.m. (*V*/*V*).

8.3.6.2 *Gland leakage test*

This test shall be carried out in accordance with **6.4**.

NOTE. A suitable test method is to use a 0.5 % solution of detergent in water which can be applied over the valve, or to immerse the valve in water for a period of not less than 10 s.

The leakage rate shall not exceed 10^{-3} torr·L/s.

For valves with diaphragm glands (see figure 3) testing shall be carried out at either the maximum pressure compatible with the design of the valve or 20 bar, whichever is the greater.

8.3.6.3 *Valve seat leakage test*

This test shall be carried out in accordance with **6.5**.

NOTE. A suitable test method is to use a 0.5 % solution of detergent in water which can be applied over the valve, or to immerse the valve in water for a period of not less than 10 s.

The leakage rate shall not exceed 10^{-3} torr·L/s. For valves with diaphragm glands (see figure 3) testing shall be carried out at the maximum pressure compatible with the design of the valve or 20 bar, whichever is the greater.

8.3.6.4 *Bursting disc and/or pressure relief valve assembly*

Each bursting disc and/or pressure relief valve assembly shall be leak tested at filling pressure.

NOTE. A suitable test method is to use a 0.5 % solution of detergent in water.

The leakage rate shall not exceed 10^{-3} torr·L/s.

8.3.7 Rejection

Any valve that fails to meet the requirements of **8.3.6.2**, **8.3.6.3** or **8.3.6.4** shall be subjected to remedial action before going into service or rendered unsuitable for further use.

8.4 Marking and certification

8.4.1 Marking

The valve shall be marked with the date of test and pressure in accordance with **7.1**. In addition the tester's mark shall be applied.

8.4.2 Certification

The tester and reconditioner shall certify that the valves have been subjected to inspection, test and maintenance in accordance with this Part of BS 341.

8.5 Packaging and protection

Where the valves are not being immediately fitted to cylinders, they shall be treated in accordance with **7.2**.

Annexes

Annex A (informative) Recommendations for plating of copper alloy valves

A.1 General

If plating of copper alloy valves is required it should be carried out in accordance with the procedures laid down in **A.2** or **A.3**.

A.2 Cadmium plating of copper alloy valves

For cadmium plating, the following procedure should be followed.

a) *Surface preparation*

1) Degreasing: freshly plated or heat treated components do not require degreasing; degrease other components in trichloroethylene.

2) Cleaning: freshly plated or heat treated components do not require cleaning; immerse other components for 5 min to 15 min in a boiling solution containing 20 g/L to 50 g/L (3.2 oz/UKgal to 8 oz/UKgal) trisodium phosphate in water.

3) Washing: wash the component in cold running water to remove all electrolyte or cleaning solution; allow them to drain; immediately before passivation immerse them for not more than 10 s in a weak solution of nitric or sulphuric acid containing not more than 1 mL/L of concentrated acid.

b) *Plating*

1) Flash or electrotin internally and externally.

2) Cadmium plating of thickness from 0.010 mm to 0.0025 mm on the body stem thread.

3) Cadmium plating of thickness 0.0075 mm on all other internal and external parts of the valve body.

c) *Passivation.* Immerse the component for 5 s to 10 s in either of the following solutions at room temperature:

1) 150 g to 200 g sodium dichromate crystals and 5.5 mL to 10.0 mL sulphuric acid (18 mol/L) per litre of water; or

2) 20 g to 30 g anhydrous sodium sulphate and 200 g to 250 g chromic acid per litre of water.

d) *Final washing and drying*

1) Transfer the components immediately after passivation to a tank of running water at room temperature for a few seconds.

2) Transfer them to a second tank of running water at room temperature for approximately 1 min.

NOTE. It is permissible to transfer to a third tank of warm water at 50 °C for 30 s maximum to assist drying.

3) Dry them in circulating air having a maximum temperature of 50 °C.

A.3 Chromium plating of copper alloy valves

For chromium plating, the following procedure should be followed.

a) *Degrease.* Immerse the components in boiling trichloroethylene, with agitation, for a period of not less than 45 s.

b) *Hydrochloric acid dip.* Immerse the components in a 50 % (*V*/*V*) solution of concentrated hydrochloric acid (12 mol/L) in water for a suitable period (usually 3 min to 4 min), to remove oxide scale.

c) *Cold water swill.* Cold water swill in counter-flow rinse bath.

d) *Bright acid dip*

1) Immerse the components for 3 s to 4 s in spent bright dipping acid (see note 2).

2) Cold water swill in counter-flow rinse bath.

3) Immerse the component in bright dipping acid for 3 s to 4 s.

Components should be contained in stainless steel wire baskets and spun during immersion.

NOTE 1. Bright dipping acid can be obtained from any plating supply house and is often known under the name Aqua Fortis. A suitable composition is as follows:

Sulphuric acid (18 mol/L) 500 mL

Nitric acid (16 mol/L) 185 mL

Sodium chloride 1.5 g

Water 350 mL.

NOTE 2. The acid used for step d)3) may be retained and used as spent bright dipping acid in step d)2) the following day.

e) *Cold water swill.* Cold water swill in counter-flow rinse bath.

f) *Cyanide dip.* Immerse the components in a 50 g/L solution of sodium cyanide at room temperature for 2 s.

g) *Cold water swill.* Cold water swill in counter-flow rinse bath.

h) *Hot water swill.* Immerse the components in clean hot water until they attain the bath temperature (80 °C).

i) *Dry off.* Dry the components with a clean air blast.

j) *Polishing*

1) Emery wheel bobbing: offer up the components to a felt bob dressed with 120 emery grit and lubricated with bobbing grease following the component contours.

2) Mopping: offer up the components to a white cutting mop of suitable size (e.g. 250 mm dia. × 3-fold) lubricated with a polishing composition suitable for brass. The components should be so manipulated that the mopping cut is across the cut established by the previous bobbing operation.

3) Degrease: this should be accomplished by immersion in boiling trichloroethylene with manual agitation for a period of not less than 45 s. Prior to removal from the tank the components should be suspended in trichloroethylene vapour for a period of not less than 20 s. This vapour suspension will prevent 'drying on' stains.

4) Colouring off: offer up the components to a soft calico finishing mop (e.g. 200 mm dia. × 75-fold) lubricated with a suitable white finish using where necessary Vienna lime to clear the surface of grease.

k) *Cleaning process*

1) First clean (hot soak cleaner): immerse the components in a hot soak cleaner (suitable for non-ferrous metals and silicate-free) for a period of 3 min to 4 min at approximately 65 °C.

2) Cold water swill: cold water swill in counter-flow rinse bath.

3) Hydrochloric acid dip: immerse the components in a 10 % (*V*/*V*) solution of concentrated hydrochloric acid (12 mol/L) in water for 1 s to remove traces of dried-on salts from the hot soak cleaner.

4) Cold water swill: cold water swill in counter-flow rinse bath.

5) Cathodic electrolytic clean: immerse the components in a cathodic electrolytic cleaner (suitable for non-ferrous metals) for 3 min to 4 min at 6 V, room temperature.

6) Cold water swill: cold water swill in counter-flow rinse bath.

7) Flash copper: flash copper plate in a cyanide copper plating solution according to the supply house's recommendations.

NOTE 3. Plating time is normally 4 s to 5 s.

8) Cold water swill: cold water swill in counter-flow rinse bath.

9) Activate: immerse the components for 5 s to 8 s in a 10 % (*V*/*V*) solution of concentrated sulphuric acid (18 mol/L) in water at room termperature.

10) Thorough cold water swill: cold water swill thoroughly in counter-flow rinse bath.

NOTE 4. It is important that the water tank used for step k)8) is not used for this operation, otherwise passivation may occur.

l) *Plating process*

1) Bright nickel plate: immerse the components in a proprietary bright nickel solution for the period recommended by the supply house to produce a coating of 0.015 mm thickness on significant surfaces.

2) Cold water swill: cold water swill in counter-flow rinse bath.

3) Bright chromium plate: plate in a proprietary chromium plating solution under the conditions specified by the supply house, to a thickness of 0.3 to 0.5 μm.

4) Thorough cold water swill: cold water swill thoroughly in counter-flow rinse bath.

NOTE 5. This may be preceded by a chromium drag-out bath.

5) Chromium neutralizer: immerse the components in any suitable neutralizer to prevent chromic acid stains.

6) Thorough cold water swill: cold water swill thoroughly in counter-flow rinse bath.

7) Dry off: this may be accomplished by:

i) immersion in clean hot water (65 °C) until the components reach water temperature, followed by clean air blast; or

ii) the use of a proprietary process.

NOTE 6. If polished chrome finishing is required offer up the components to a soft calico mop lubricated with chrome gloss.

Annex B (informative)
Valving

B.1 General

B.1.1 Before a container is valved, it should be visually inspected to check that it is not due for an external examination (see **8.1**), fit for service and not contaminated with water, oil, swarf or other contaminants. The container valve should be visually inspected to check that it is fit for service.

B.1.2 Container neck and valve stem threads should be inspected to check conformity to **3.3**, and to check that they are compatible with each other.

B.1.3 Valves with oversized stem threads (see **3.3**) should not be used with containers unless the containers have oversized neck threads.

B.1.4 A compatible thread sealant should be used.

WARNING. Owing to the high risk of combustion or explosion of oil, grease or other organic substances that come into contact with high pressure oxygen (or other powerful oxidants) it is essential that the valve should be cleaned thoroughly.

NOTE. Before fitting a valve into a container, a periodic inspection and test date ring may be fitted over the valve stem. This ring will indicate the date when the cylinder is subject to its next periodic inspection and/or test (see BS 5430).

B.1.5 Taper stems should have an adequate stand out in order that only fully formed threads are engaged.

B.2 Torque values

Either a torque spanner or a valving machine should be used to ensure that a valve is satisfactorily tightened into the container neck.

Table B.1 gives a range of recommended valving torques for valves with tapered stems, and table B.2 gives recommended valving torques for valves with parallel stems. The actual valving torque selected for any valve and container is dependent upon a number of factors such as the thread tolerance and thread sealant used.

After the valve has been fitted to the container, a check should be made to confirm that the main body of the valve above a tapered stem thread does not bottom on the top of the container or test date ring if fitted.

Torque spanners and valving machines should be calibrated in accordance with their manufacturer's recommendations and be traceable to a national standard.

Table B.1 Range of recommended valving torques for 18T and 25T tapered stem threads

Valve material	Valve stem size	Valve torque					
		Steel containers up to 35 bar max. service pressure		Steel containers from 35 bar to 300 bar max. service pressure		Aluminium containers up to 300 bar max. service pressure	
	mm	Min. N·m	Max. N·m	Min. N·m	Max. N·m	Min. N·m	Max. N·m
Copper alloy	18.161 (18T)	60	150	100	150	60	95
	25.40 (25T)	110	240	250	380	80	110
Plated copper alloy	18.161 (18T)	—	—	100	150	60	95
	25.40 (25T)	—	—	270	380	80	110
Carbon steel	18.161 (18T)	135	150	135	150	60	95
	25.40 (25T)	340	380	340	380	80	110
Stainless steel	25.40 (25T)	120	135	340	380	80	110
Aluminium alloy	18.161 (18T)	—	—	—	—	60	95
	25.40 (25T)	—	—	—	—	80	110

NOTE 1. The torque figures quoted are for use with PTFE tape thread sealant.
When torque figures have been specified by a manufacturer of container valves for a particular valve the manufacturer's torque values should be applied in place of those specified in this table.

NOTE 2. The table serves as a guide for the conditions stated in note 1. If different sealants or pressure ranges are introduced the torque figures shown in the table may have to be changed to ensure a gas tight joint.

Table B.2 Range of recommended valving torques for parallel stem threads

Valve material	Valve stem size	Valve torque			
		Steel containers up to 300 bar max. service pressure		Aluminium containers up to 300 bar max. service pressure	
		Min. N·m	Max. N·m	Min. N·m	Max. N·m
Copper alloy	M18	60	80	—	100
	M25	80	100	—	130
	M30	—	—	—	130
Plated copper alloy	M18	—	—	—	100
	M25	—	—	75	130
	M30	—	—	—	130
Stainless steel	M18	—	—	—	100
	M25	—	—	—	130
	M30	—	—	—	130
Aluminium alloy	M18	—	60	—	100

Annex C (informative)
American (CGA) valve outlet connections used in the UK

Certain gases are sometimes conveyed in containers having valves with outlet connections that conform to CGA Standard V-1-1977 [3].

The following connections are used with the gases listed. Reference should be made to CGA Standard V-1-1977 for details of the connections.

Connection number 330

boron trifluoride
carbonyl sulphide
hydrogen bromide
hydrogen chloride[4)]
hydrogen sulphide[4)]
methyl mercaptan
phosphorous pentafluoride
silicon tetrafluoride
sulphur tetrafluoride

Connection number 350

arsine
deuterium
ethane
silane[4)]

Connection number 580

helium[4)]

The Compressed Gas Association of America have kindly agreed that reference can be made to the above three outlet connections when used for the conveyance of the above gases in the United Kingdom.

Annex D (informative)
Gases conveyed in containers having outlet connections not covered in this standard

The following gases are not used in sufficient quantities to enable a standard outlet connection to be recommended. The gases are normally imported into the UK, conveyed in containers having outlets applicable to the country of origin. An outlet connection complying with its country of origin standard is acceptable for UK service, provided that a satisfactory and safe provision is made for the user to ensure a sound connection.

acetylene (as a component in mixtures up to 0.60 bar (9 p.s.i.) partial pressure)
arsine[5)]
boron trichloride
boron trifluoride[5)]
bromine trifluoride
bromotrifluoroethylene
but-1-ene
but-2-ene
cis-but-2-ene
trans-but-2-ene
but-1-yne (ethyl acetylene)
carbonyl fluoride
carbonyl disulphide
carbonyl sulphide[5)]
chlorotrifluoroethylene
cyanogen
deuterium[5)]
diborane
dimethylamine
dimethyl ether
dinitrogen trioxide (nitrous acid anhydride)
2,2-dimethylpropane
ethane[5)]
fluorine
hydrogen bromide[5)]
iodine pentafluoride
2-methylpropene (isobutene)
3-methylbutylene
methyl mercaptan
monogermane (germane)
neopentane
nickel carbonyl
nitrogen dioxide (nitrogen peroxide; nitrogen tetroxide)
nitrogen trioxide
nitrosyl chloride
perfluorobut-2-ene
phosphorous pentafluoride[5)]
propadiene (allene)
propyne (methyl acetylene)
silicon tetrafluoride[5)]
sulphur tetrafluoride[5)]
sulphuryl fluoride
tetrafluorohydrazine
tungsten hexafluoride
vinyl bromide
vinyl fluoride
vinyl methyl ether

[4)] These gases may also be conveyed in containers fitted with valves having outlets in accordance with this standard.
[5)] See also annex C.

Annex E (informative)

Conveyance test

Fit three prototype valves to clearly identified gas containers and charge the containers to normal operating pressure with an appropriate inert gas.

Close each container valve by applying a normal closing torque.

Check the valve outlet connections, the screwed connections between the valve body stems and container necks, and all other screwed connections that are subject to gas pressure for leakage.

NOTE. A soap and water solution may be suitable depending on the service gas.

The leakage rate shall not exceed 10^{-3} torr·L/s.

Mark the position of each valve spindle relative to the valve body and the position of the valve body relative to the container neck as applicable, so that any movement can be detected.

Load the containers on a standard delivery vehicle and subject them to a journey period of 5 days or 500 miles (800 km) whichever is the longer. At the end of the test period check the points of leakage again with the above solution. The maximum permitted leakage should not exceed 10^{-3} torr·L/s. Check the relationship of the spindle to the valve and the valve body to the container neck as applicable. There should have been no movement.

Any leakage of gas in excess of that permitted or movement of the valve spindle, gland or valve body, should be cause for the valve to be rejected and the design and manufacture re-examined prior to the test being repeated.

Annex F (informative)

Comparison between valve tapered inlet connections in the current edition and the nominal sizes in BS 341 : Part 1 : 1962

Table F.1 relates the BS 341 : Part 1 : 1962 tapered inlet connection nominal sizes to the type references adopted in this edition.

Table F.1 Comparison between valve tapered inlet connections in the current edition and the nominal sizes in BS 341 : Part 1 : 1962

Valve inlet type	Nominal size in BS 341 : Part 1 : 1962 in
16T[1)]	0.635
—	0.694
18T	0.715
19T[2)]	—
25T	1.00
26T[1)]	1.025
32T	1.25

NOTE. See figure 6 for detailed dimensions.

1) Stems 16T and 26T are non-preferred.

2) This valve has a nominal size of 0.735 in.

Annex G (informative)

Recommended gauging for taper threads

G.1 Introduction

This appendix recommends types and dimensions of gauges for use in conjunction with the taper threads defined in this standard.

Taper threads are more difficult to gauge than parallel threads. It is not practical to provide a gauging system which will gauge all aspects of a taper thread.

Manufacturers and users of these taper threads should be aware that the gauges specified do not check the following aspects:

- the minor diameter on the stem;
- the major diameter on the neck;
- ovality of threads;
- die withdrawal lines;
- surface finish.

Error in any of the above could cause difficulties in achieving a gas tight seal in service.

The two part gauging system recommended in this annex is considered the minimum practical gauging to verify dimensions of a taper thread. The purchaser may wish additional gauging to be carried out, in which case this should be by special agreement between purchaser and supplier.

G.2 Gauge materials

All gauges should be manufactured from material of suitable strength, stability and hardness.

G.3 Thread form of threaded gauges

The thread form of threaded inspection and check gauges should be as shown in figures G.1 to G.3.

NOTE. This thread form provides clearance on major and minor diameters. It is designed to inspect thread effective diameter only.

G.4 Dimensions

Dimensions for inspection plug gauges, inspection ring gauges and check gauges are shown in figures G.4 to G.6.

G.5 Tolerances

Tolerances on gauges should be as follows:

a) ± 0.01 mm on all lengths;

b) ± 0.01 mm on diameters of inspection gauges;

c) − 0.01, −0.02 mm on diameters of check gauges.

NOTE. For threaded gauges effective diameters only are stated. For minor and major diameters refer to figures G.1 to G.3.

Unspecified dimensions should be chosen by the manufacturer of the gauges.

G.6 Marking of gauges

G.6.1 ***Inspection gauges***

Inspection gauges should be marked with the following information:

- the number 341-1;
- the nominal diameter;
- the letter 'I'.

G.6.2 ***Check gauges***

Check gauges should be marked with the following information:

- the number 341-1;
- the nominal diameter;
- the letter 'C'.

G.7 Use of inspection gauges

G.7.1 ***Smooth gauges***

Smooth gauges should be lightly pressed into or over the thread being gauged. Undue force should not be used.

G.7.2 ***Threaded gauges***

Threaded gauges should be screwed into or over the thread being gauged. Undue force should not be used.

G.7.3 ***Accept/reject criteria for plug gauges***

Thread acceptability to gauge is determined by the position of the plane at the mouth of the cylinder neck relative to the test surfaces of the gauge.

The thread should be considered acceptable to the gauge if this plane is flush with or falls between the test surfaces of the gauge when the gauge is fitted to the thread. See figure G.7.

G.7.4 ***Accept/reject criteria for ring gauges***

Thread acceptability to gauge is determined by the position of the plane at the flat small end of the stem cone base relative to the test surfaces of the gauge.

The thread should be considered acceptable to the gauge if this plane is flush with or falls between the test surfaces of the gauge when the gauge is fitted to the thread. See figure G.8.

G.8 Maintenance of inspection gauges

G.8.1 ***General***

During use, inspection gauges can be subjected to wear and damage. The user should check the gauges regularly to ensure that they stay within the specified dimensions. Frequency of checks required will depend upon usage and should be the responsibility of the user.

G.8.2 ***Plug gauges***

Measurement of inspection plug gauges should be carried out directly using optical or other suitable measuring equipment.

G.8.3 ***Ring gauges***

Measurement of inspection ring gauges cannot be carried out directly. Two check plug gauges to the dimensions shown in figure G.6 should be used.

G.8.4 ***Use of check gauges***

The smooth check plug gauge should be placed into the smooth inspection ring gauges and the threaded check plug gauge should be screwed into the threaded inspection ring gauges. The inner stepped surface of the inspection ring gauge test surface should be flush with or within the two test surfaces of the check gauge. Undue force should not be used. See figure G.9.

Annex H (informative)

Notes on the calculation of thread data given in figures 6a) to 6f)

H.1 General

The cone of the taper threads covered by this standard is controlled by specifying diameters at both large and small ends of the thread. The taper angle is given for information only.

This differs from BS 341 : Part 1 : 1962, in which it was controlled by specifying one diameter only, with a nominal taper being given.

The method used in this standard, together with the gauges specified in annex G, gives greater control over thread dimensions.

H.2 16T, 18T, 26T and 32T threads

Thread data for the 16T, 18T, 26T and 32T threads have been derived from BS 341 : Part 1 : 1962 but tolerance on major and minor diameters has been tightened, therefore differences exist between the two versions. Conversion from the 1962 standard to the 1991 standard has been made on the following basis.

a) *Diameters*. The nominal (mid-point between upper and lower limits) effective diameters of threads conforming to this standard exactly match threads conforming to BS 341 : Part 1 : 1962.

The nominal major diameter has been calculated from the effective diameter using the following equation.

Major diameter = effective diameter + h

where

h is the basic depth of Whitworth form thread defined in BS 84 : 1956 of $h = 0.640327/p$ where p = pitch.

The nominal minor diameter has been calculated from the effective diameter using the following equation.

Minor diameter = effective diameter − h

b) *Tolerance*. The tolerance band (difference between upper and lower limits) on effective diameters is identical for threads conforming to this standard and for threads conforming to BS 341 : Part 1 : 1962.

This tolerance band has also been applied on both major and minor diameters in line with European and ISO practice.

c) *Taper angle*. The nominal taper angle is the same for threads conforming to this standard and for threads conforming to BS 341 : Part 1 : 1962.

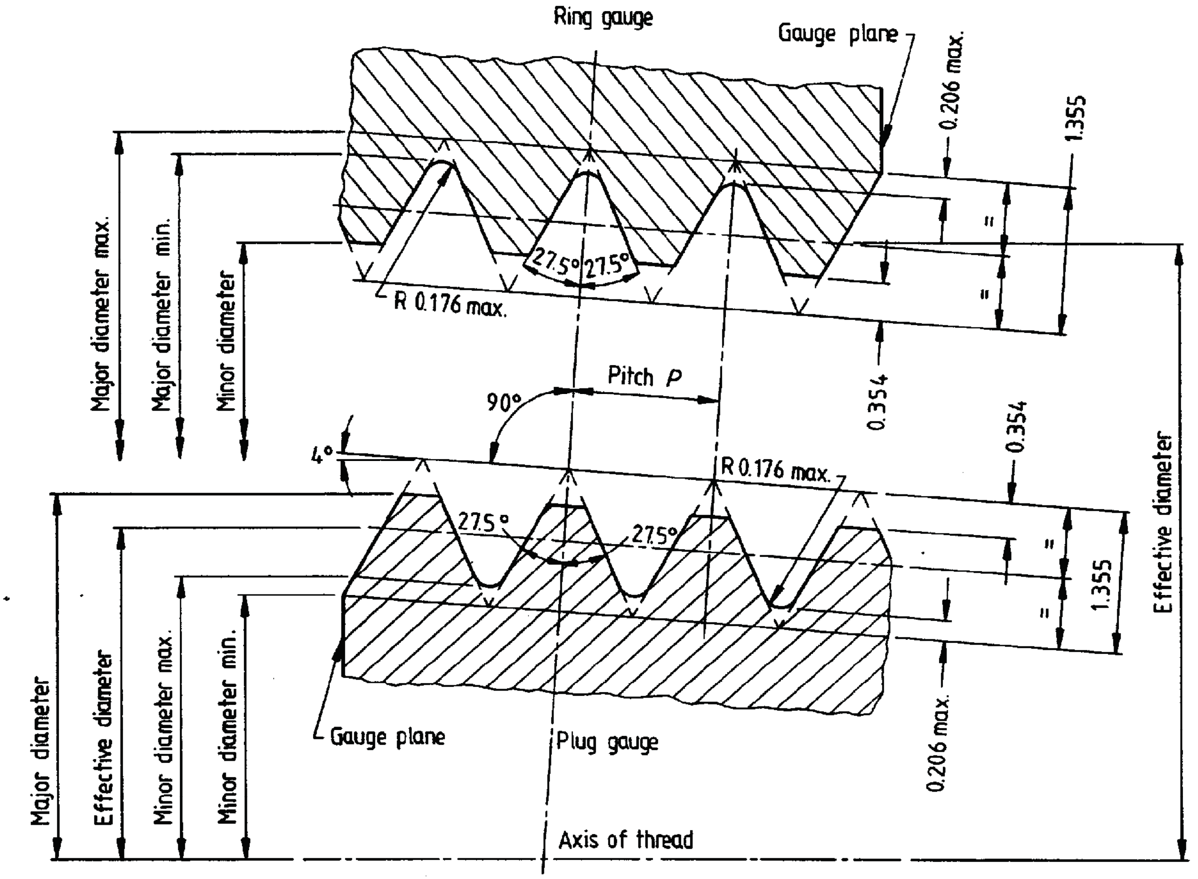
H.3 25T Thread

The 25T thread has been derived directly from the DIN 28.8 thread.

H.4 19T Thread

The 19T thread has no equivalent in BS 341 : Part 1 : 1962. It has been derived by adding 0.508 mm to the diameters of the 18T thread. The 18T tolerance bands have also been adopted for the 19T thread.

1

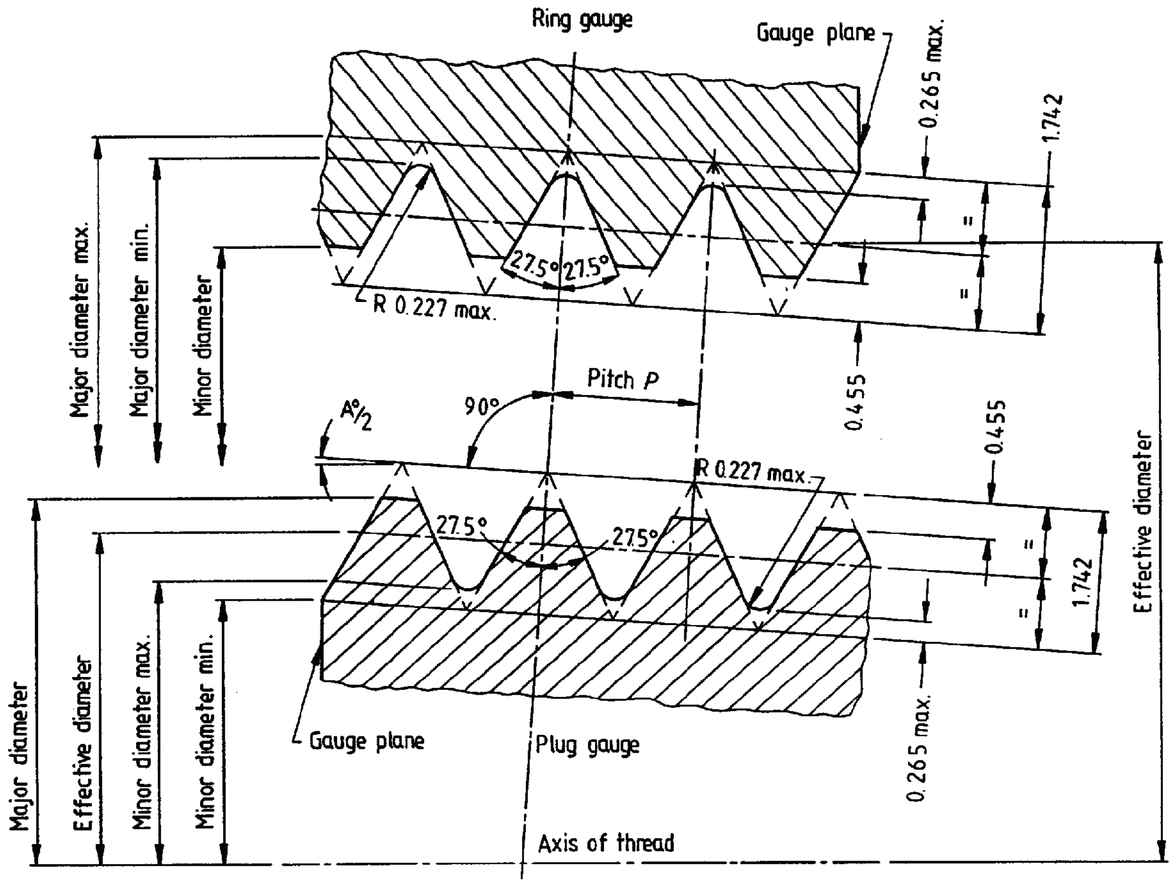


NOTE. Pitch $P = \frac{25.4}{18}$ mm ≈ 1.411 mm.

Taper; 8° included angle.

Figure G.1 Thread form for 16T plug and ring gauges

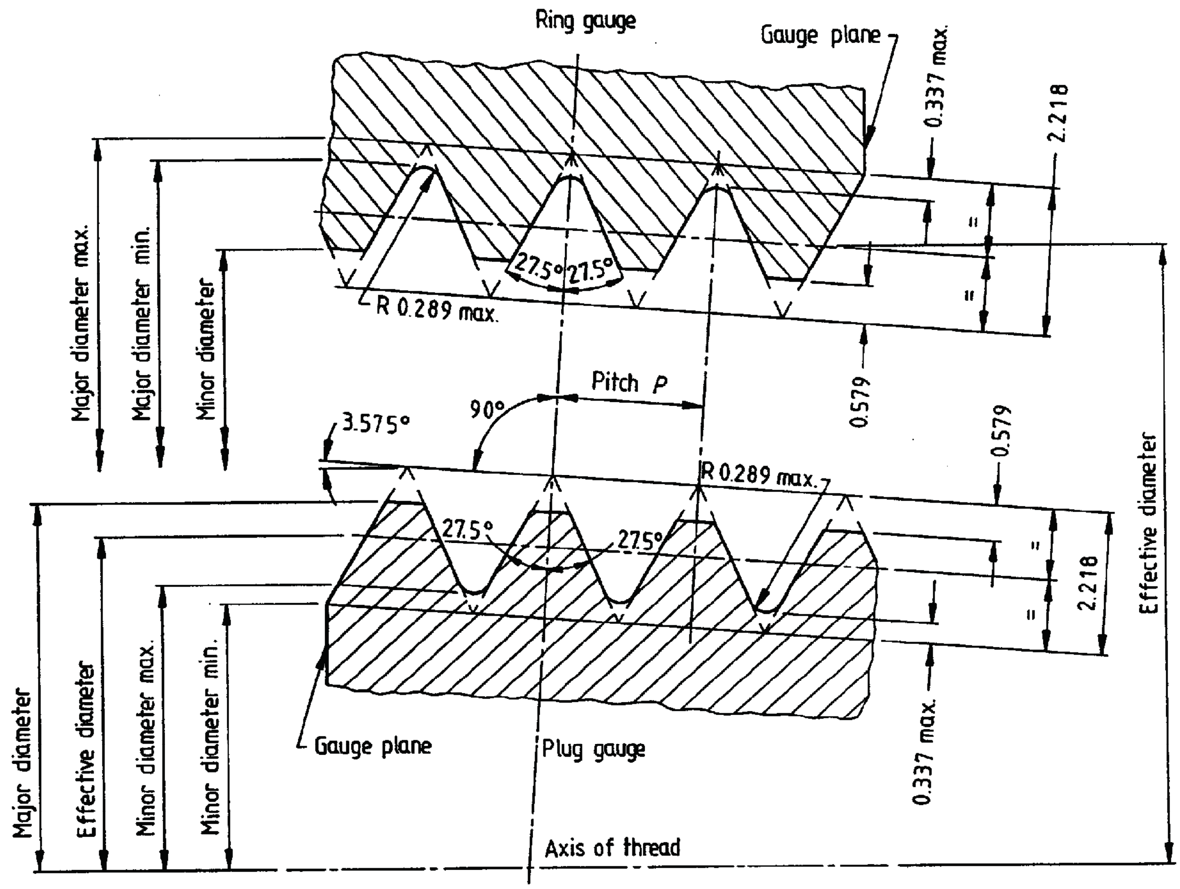
△1



Thread	Taper ratio	Taper angle A
18T	1 in 8	Approx. 7° 9′
19T	1 in 8	Approx. 7° 9′
25T	3 in 25	Approx. 6° 52′
26T	–	10°

NOTE. Pitch $P = \frac{25.4}{14}$ mm ≈ 1.814 mm.

Figure G.2 Thread form for 18T, 19T, 25T and 26T plug and ring gauges

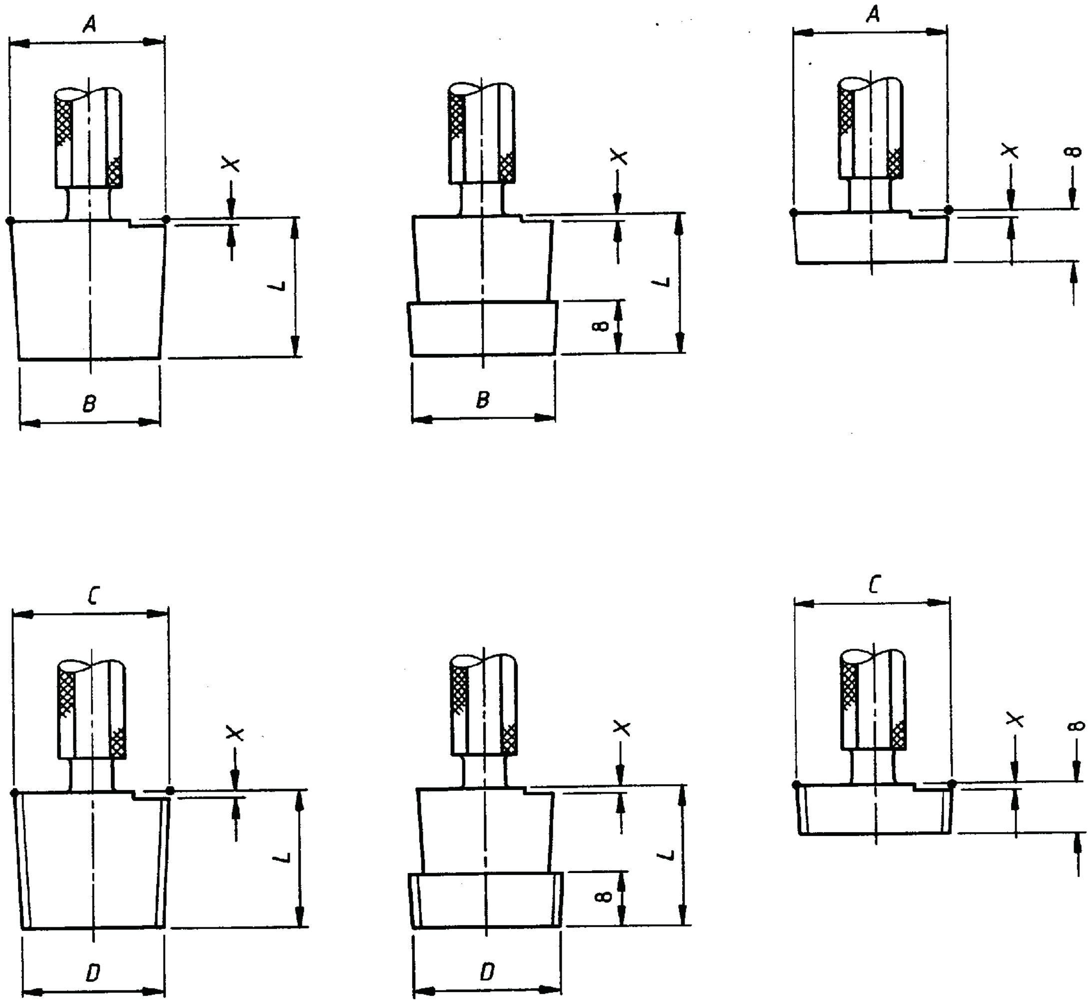


NOTE. Pitch $P = \frac{25.4}{11}$ mm ≈ 2.309 mm.

Taper ratio 1:8.

Taper angle approximately 7° 9′.

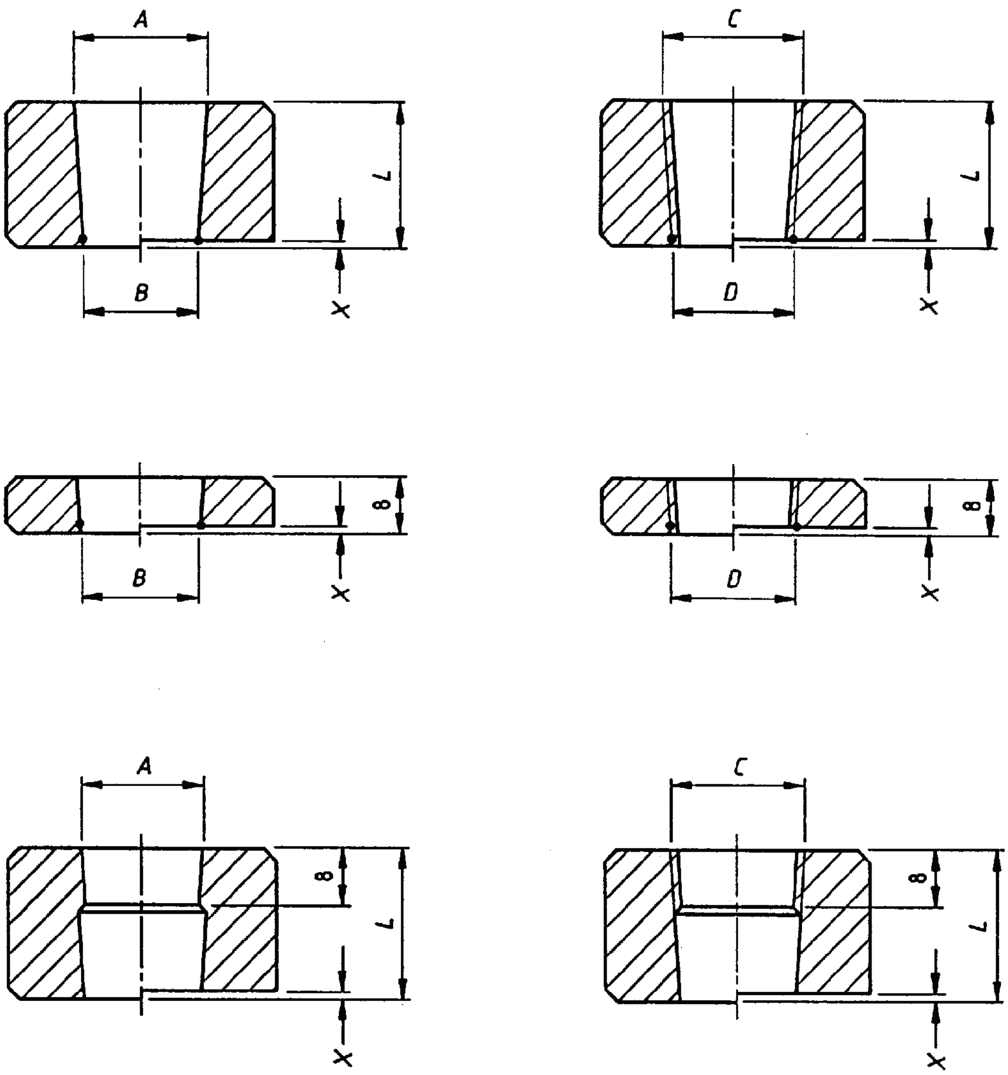
Figure G.3 Thread form for 32T plug and ring gauges



Dimensions in millimetres.

Type	Plain plugs		Threaded plugs effective diameters		Length	Step
	A	*B*	*C*	*D*	*L*	*X*
16T	15.638	13.638	16.542	14.542	14.30	1.07
18T	17.949	15.199	19.111	16.361	22.00	1.04
19T	18.457	15.707	19.619	16.869	22.00	1.04
25T	25.476	22.836	26.638	23.998	22.00	1.00
26T	26.619	22.175	27.781	23.337	25.40	1.09
32T	32.145	28.175	33.623	29.654	31.75	1.44

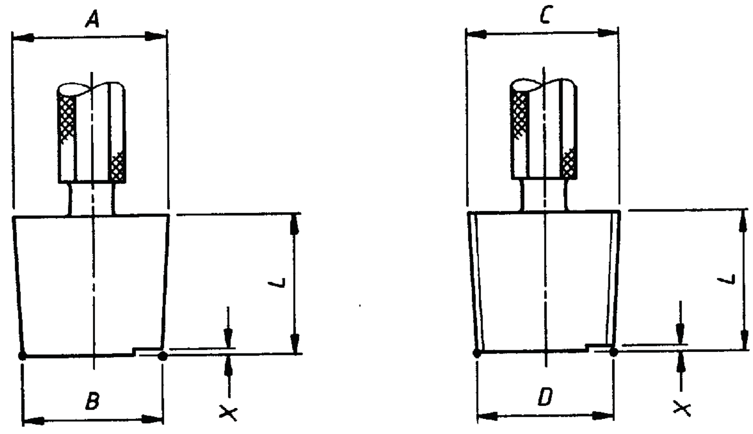
Figure G.4 Inspection plug gauges



Dimensions in millimetres.

Type	Plain ring		Threaded ring effective diameters		Length	Step
	A	*B*	*C*	*D*	*L*	*X*
16T	17.975	16.125	17.071	15.221	14.30	1.07
18T	20.777	18.157	19.615	16.995	22.00	1.04
19T	21.285	18.665	20.123	17.503	22.00	1.04
25T	28.800	25.800	27.638	24.638	26.00	1.00
26T	30.286	26.032	29.124	24.871	25.40	1.09
32T	35.538	31.749	34.059	30.270	31.75	1.44

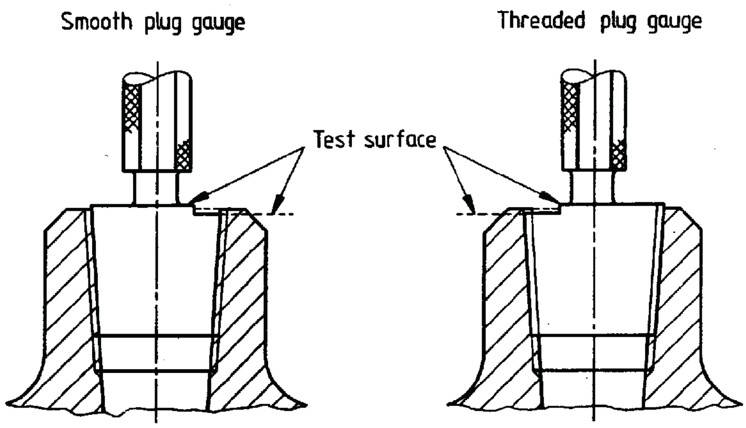
Figure G.5 Inspection ring gauges



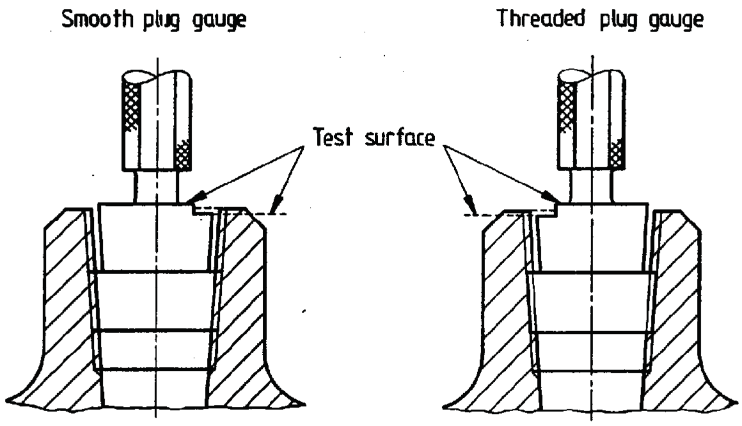
Dimensions in millimetres.

Type	Plain plugs		Threaded plugs effective diameters		Length	Step
	A	*B*	*C*	*D*	*L*	*X*
16T	17.975	16.125	17.071	15.221	13.23	0.21
18T	20.777	18.157	19.615	16.995	20.96	0.24
19T	21.285	18.665	20.123	17.503	20.96	0.24
25T	28.800	25.800	27.638	24.638	25.00	0.25
26T	30.286	26.032	29.124	24.871	24.31	0.17
32T	35.538	31.749	34.059	30.270	30.31	0.24

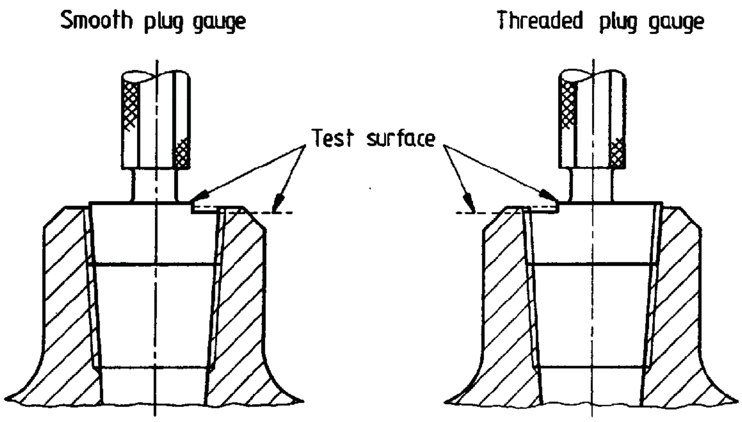
Figure G.6 Check gauges for inspection ring gauges



(a) Use of the single-part plug gauges

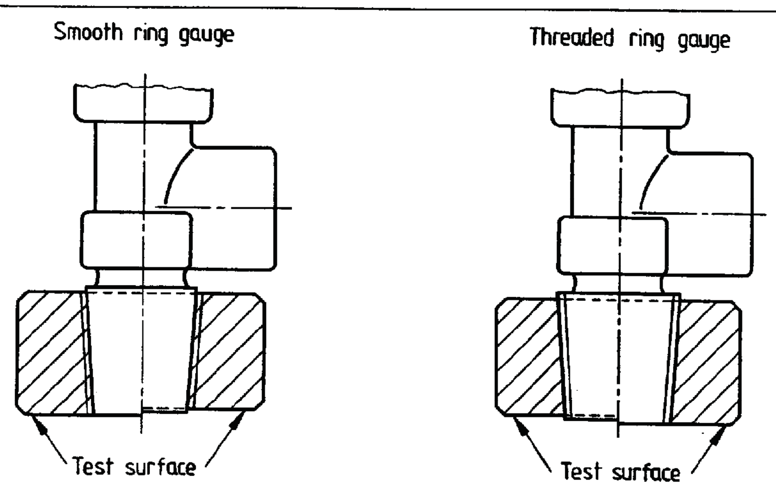


(b) Two-part plug gauge

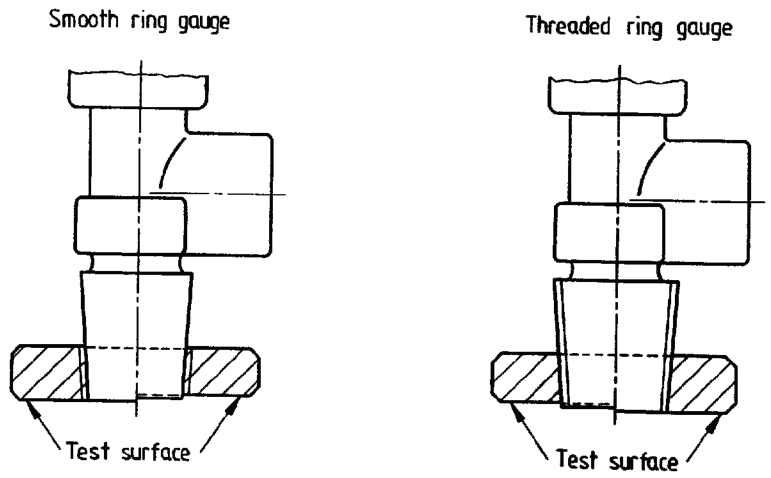


(c) Use of the two-part plug gauges

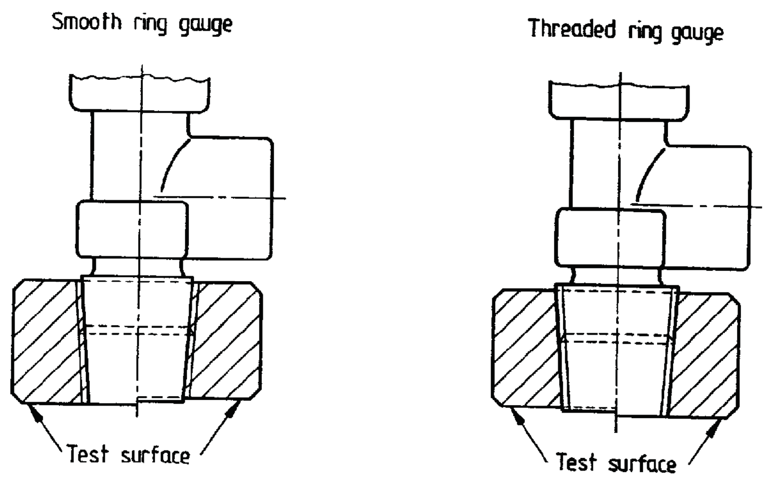
Figure G.7 Use of inspection plug gauges



(a) Use of the single-part ring gauges



(b) Two-part ring gauges



(c) Use of the two-part ring gauges

Figure G.8 Use of inspection ring gauges

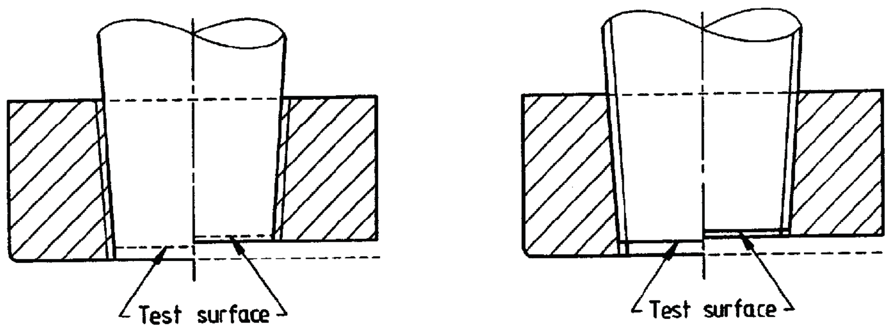


Figure G.9 Use of check gauges

List of references (see 1.2)

Normative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 84 : 1956	Specification for parallel screw threads of Whitworth form (obsolescent)
BS 308 :	Engineering drawing practice
BS 308: Part 3 : 1990	Recommendations for geometrical tolerancing
BS 970 :	Specification for wrought steels for mechanical and allied engineering purposes
BS 970 : Part 1 : 1983	General inspection and testing procedures and specific requirements for carbon, carbon manganese, alloy and stainless steels
BS 1472 : 1972	Specification for wrought aluminium and aluminium alloys for general engineering purposes - forging stock and forgings
BS 1474 : 1987	Specification for wrought aluminium and aluminium alloys for general engineering purposes: bars, extruded round tubes and sections
BS 1936 :	Specification for undercuts and runouts for screw threads
BS 1936 : Part 1 : 1952	Inch screw threads
BS 1936 : Part 2 : 1991	Specification for ISO metric screw threads
BS 2779 : 1986	Specification for pipe threads for tubes and fittings where pressure-tight joints are not made on the threads (metric dimensions)
BS 2872 : 1989	Specification for copper and copper alloy forging stock and forgings
BS 2784 : 1986	Specification for copper and copper alloy rods and sections (other than forging stock)
BS 2915 : 1990	Specification for bursting discs and bursting disc devices
BS 3643 :	ISO metric screw threads
BS 3643 : Part 1 : 1981	Principles and basic data
BS 3643 : Part 2 : 1981	Specification for selected limits of size
BS 4500 :	ISO limits and fits
BS 4500 : Section 1.1 : 1990	Specification for bases of tolerances, deviations and fits
BS 4500 : Section 1.2 : 1990	Tables of commonly used tolerance and grades and limits deviations for holes and shafts
BS 4500 : Part 3 : 1973	Working limits on untoleranced dimensions
BS 4500 : Part 4 : 1985	Specification for system of cone (taper) fits for cones from C = 1:3 to 1:500, lengths from 6 mm to 630 mm and diameters up to 500 mm
BS 4500 : Part 5 : 1988	Specification for system of cone tolerances for conical workpieces from C = 1:3 to 1:500 and lengths from 6 mm to 630 mm
BS 5355 : 1976	Specification for filling ratios and developed pressures for liquefiable and permanent gases
BS 5430 :	Periodic inspection, testing and maintenance of transportable gas containers (excluding dissolved acetylene containers)
BS 5430 : Part 1 : 1990	Specification for seamless steel containers of water capacity 0.5 litres and above
BS 5430 : Part 2 : 1990	Specification for welded steel containers of water capacity 0.5 L up to 150 L
BS 5430 : Part 3 : 1990	Specification for seamless aluminium alloy containers of water capacity 0.5 litres and above
BS 5559 : 1978	Specification for identification of apparatus terminals and general rules for a uniform system of terminal marking, using an alphanumeric notation

BS 6001 :	Sampling procedures for inspection by attributes
BS 6001 : Part 1 : 1991	Specification for sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection
BS 6001 : Part 2 : 1984	Specification for sampling plans indexed by limiting quality (LQ) for isolated lot inspection
BS 6001 : Part 3 : 1986	Specification for skip-lot procedures
BS 6071 : 1981	Specification for periodic inspection and maintenance of transportable gas containers for dissolved acetylene
BS EN 10045-1	Charpy impact test on metallic materials Part 1 : 1990 Test method (V- and U-notches)

Other references

[2] IAA 6351

Informative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 919 :	Specification for screw gauge limits and tolerances
BS 919 : Part 1 : 1960	Gauges for screw threads of Unified form
BS 919 : Part 2 : 1971	Gauges for screw threads of Whitworth and BA forms (obsolescent)
BS 919 : Part 3 : 1968	Gauges for ISO metric screw threads
BS 919 : Part 4 : 1964	Limits of size for gauges for screw threads of unified form, diameters ¼ in and larger
BS 1319 : 1976	Specification for medical gas cylinders, valves and yoke connections
BS 3382 :	Specification for electroplated coatings on threaded components
BS 3382 : Parts 1 & 2 : 1961	Cadmium on steel components. Zinc on steel components
BS 3382 : Parts 3 & 4 : 1965	Nickel or nickel plus chromium on steel components. Nickel or nickel plus chromium on copper and copper alloy (indluding brass) components
BS 3382 : Parts 5 & 6 : 1967	Tin or copper and copper alloy (including brass) components. Silver on copper and copper alloy (including brass) components
BS 3382 : Part 7 : 1966	Thicker platings for threaded components
BS 5045 :	Transportable gas containers
BS 5045 : Part 1 : 1982	Specification for seamless steel gas containers above 0.5 litre water capacity
BS 5045 : Part 2 : 1989	Specification for steel containers of 0.5 L up to 450 L water capacity with welded seams
BS 5045 : Part 3 : 1984	Specification for seamless aluminium alloy gas containers above 0.5 litre water capacity and up to 300 bar charged pressure at 15 °C
BS 5045 : Part 5 : 1986	Specification for aluminium alloy containers above 0.5 litre up to 130 litres water capacity with welded seams
BS 5045 : Part 6 : 1987	Specification for seamless containers of less than 0.5 litre water capacity

Other references

[1] HOME OFFICE FIRE DEPARTMENT. Report of the Home Office Gas Cylinders and Containers Committee. London: Home Office, 1969. Obtainable from HMSO, 7 Trinity St, London SE1[6)]

[3] CGA V-1-1977 American National, Canadian and Compressed Gas Association Standard; Compressed gas cylinder valve outlet and inlet connections. 1977. Obtainable from The Compressed Gas Association Inc., 1235 Jefferson Davis Highway, Arlington, VA 22202, USA.

[6)] Referred to in the foreword only.

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Amendment No. 1
published and effective from 15 May 1993
to BS 341 : Part 1 : 1991

Transportable gas container valves
Part 1. Specification for industrial valves for working pressures up to and including 300 bar

NOTE. This amendment comprises essential corrections covering safety related matters for gas container outlets and their thread forms.

Corrections

AMD 7641
May 1993

Contents

Under the entry for annex G, insert the following new entry.

'H (informative) Notes on the calculation of thread data given in figures 6a) to 6f)'

AMD 7641
May 1993

Foreword

In paragraph 1, line 6, after 'gases' insert ', except those for liquefied petroleum gas (LPG) applications'.

Delete paragraph 3 including items a) to f) entirely.

AMD 7641
May 1993

Clause 1.1 Scope

At the end of the clause, insert the following new paragraph.

'This Part of BS 341 does not cover valves for liquefied petroleum gas (LPG).'

AMD 7641
May 1993

Clause 1.3.16 start-to-discharge pressure

In footnote 2), line 2, delete '10 2.5 mm' and substitute 'ten 2.5 mm'.

AMD 7641
May 1993

Clause 1.6.1 Information to be supplied by the purchaser

In item d), line 2, delete the comma after 'pressure'.

AMD 7641
May 1993

Table 1. Outlet connections and preferred materials for use with industrial gases

In column 1, delete 'Dinitrogen oxide' and substitute 'Nitrous oxide' and in column 6 delete 'nitrous oxide' and substitute 'Dinitrogen oxide'.

In column 4 against 'Nitrogen', delete '13' and substitute '3'.

AMD 7641
May 1993

Clause 2.2.4 Copper alloys

In the note, line 2, after 'containing' insert 'liquid'.

AMD 7641
May 1993

Clause 3.3.1 Tapered stems

In the existing note, delete 'NOTE' and substitute 'NOTE 1'.

After note 1, insert the following new note.

'NOTE 2. *A* is the diameter at the intersection of the cone and the end plane of the stem.'

AMD 7641
May 1993

Figure 5. Dimensions and tolerances of outlet connections

Delete the existing figures 5a) and 5c) and substitute the new figures 5a) and 5c) attached.

AMD 7641
May 1993

Figure 6. Dimensions and manufacturing tolerances of valve body tapered stem/container neck threads

Delete the existing figures 6a) to 6f) and substitute the new figures 6a) to 6f) attached.

AMD 7641
May 1993

Table 3. Impact test values

In column 2, immediately under the heading 'Impact values' insert 'J'.

AMD 7641
May 1993

Figure G.1 Thread form for 16T plug and ring gauges

Delete the existing figure and substitute the new figure G.1 attached.

AMD 7641
May 1993

Figure G.2 Thread form for 18T, 19T, 25T and 26T plug and ring gauges

Delete the existing figure and substitute the new figure G.2 attached.

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May 1993

Figure G.3 Thread form for 32T plug and ring gauges

Delete the existing figure and substitute the new figure G.3 attached.

AMD 7641
May 1993

Figure G.4 Inspection plug gauges

Delete the existing figure and substitute the new figure G.4 attached.

AMD 7641
May 1993

Figure G.5 Inspection ring gauges

Delete the existing figure and substitute the new figure G.5 attached.

AMD 7641
May 1993

Figure G.6 Check gauges for inspection ring gauges

Delete the existing figure and substitute the new figure G.6 attached.

AMD 7641
May 1993

New annex H

After the existing annex G, insert the following new annex H.

'Annex H (informative)

Notes on the calculation of thread data given in figures 6a) to 6f)

H.1 General

The cone of the taper threads covered by this standard is controlled by specifying diameters at both large and small ends of the thread. The taper angle is given for information only.

This differs from BS 341 : Part 1 : 1962, in which it was controlled by specifying one diameter only, with a nominal taper being given.

The method used in this standard, together with the gauges specified in annex G, gives greater control over thread dimensions.

H.2 16T, 18T, 26T and 32T threads

Thread data for the 16T, 18T, 26T and 32T threads have been derived from BS 341 : Part 1 : 1962 but tolerance on major and minor diameters has been tightened, therefore differences exist between the two versions. Conversion from the 1962 standard to the 1991 standard has been made on the following basis.

a) *Diameters*. The nominal (mid-point between upper and lower limits) effective diameters of threads conforming to this standard exactly match threads conforming to BS 341 : Part 1 : 1962.

The nominal major diameter has been calculated from the effective diameter using the following equation.

Major diameter = effective diameter + h

where

h is the basic depth of Whitworth form thread defined in BS 84 : 1956 of $h = 0.640327/p$ where p = pitch.

The nominal minor diameter has been calculated from the effective diameter using the following equation.

Minor diameter = effective diameter − h

b) *Tolerance*. The tolerance band (difference between upper and lower limits) on effective diameters is identical for threads conforming to this standard and for threads conforming to BS 341 : Part 1 : 1962.

This tolerance band has also been applied on both major and minor diameters in line with European and ISO practice.

c) *Taper angle*. The nominal taper angle is the same for threads conforming to this standard and for threads conforming to BS 341 : Part 1 : 1962.

H.3 25T Thread

The 25T thread has been derived directly from the DIN 28.8 thread.

H.4 19T Thread

The 19T thread has no equivalent in BS 341 : Part 1 : 1962. It has been derived by adding 0.508 mm to the diameters of the 18T thread. The 18T tolerance bands have also been adopted for the 19T thread.'