

Gas cylinder valves

rated for test pressures up to 300 bar
Types, sizes and outlets

DIN
477
Part 1

Gasflaschenventile für Prüfdrücke bis max. 300 bar; Bauformen,
Baumaße, Anschlüsse, Gewinde

Supersedes
February 1990 edition.

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

This standard includes safety requirements within the meaning of the *Druckbehälterverordnung* (German Pressure Vessels Regulation).

This standard is valid from 1 February 1990.

Contents

	Page		Page
1 Scope and field of application	1	6 Scope of supply	18
2 Types, sizes and designation	2	7 Marking	18
3 Valve outlet dimensions	5	Appendix A	19
4 Screw threads	16	Appendix B	20
5 Materials	18		

Dimensions in mm

1 Scope and field of application

This standard applies to gas cylinder valves rated for test pressures up to 300 bar and designed for use on cylinders containing compressed gases, or gases liquefied and dissolved under pressure ('valves', for short), and, in conjunction with the relevant TRG Codes of practice, specifies the valve outlet connections. The specification of different types of connection for each gas or group of gases is intended to preclude errors when filling or emptying such cylinders.

Note. Gas cylinders for use with breathing apparatus may also be provided with valves having a cylindrical stem, as specified in DIN 477 Part 6.

Valves with a connection based on the system specified in DIN 477 Part 8 may be used for gas cylinders intended for medical use.

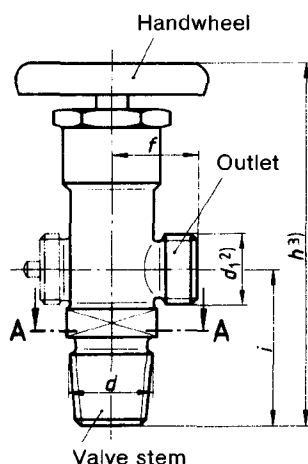
Continued on pages 2 to 28

2 Types, sizes and designation

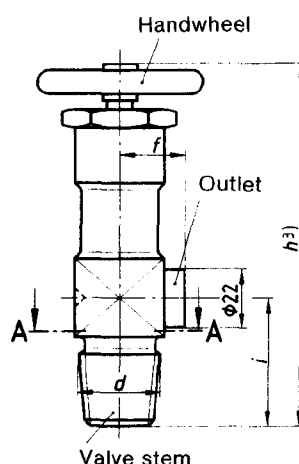
Valves are not expected to conform to the designs illustrated here; compliance is only required in the case of the dimensions specified.

Valves for industrial use shall be of type A, C or D.

Type A, valve with outlet
(external thread) ¹⁾



Type C, valve with yoke-type
connection



Type D, valve with outlet
(internal thread)

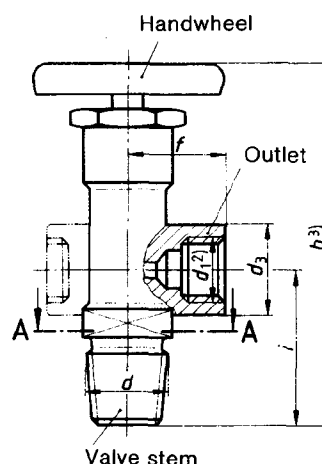


Figure 1. Valve types

Examples of designation:

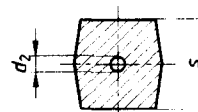
Designation of an oxygen gas cylinder valve rated for a test pressure of 300 bar and with a nominal size (i.e. stem thread nominal diameter, d) of 28,8 mm:

Gas cylinder valve DIN 477 – Oxygen 28,8

Designation of an acetylene gas cylinder valve rated for a test pressure of 300 bar and with a nominal size of 31,3 mm:

Gas cylinder valve DIN 477 – Acetylene 31,3

Section A – A



d_3 min.	Outlet No.
32	12
30	13 15

Table 1. Valve dimensions

Valve size (d)	type	Minimum bore diameter, d_2	f max.	$h^{1)}$ max.	i max.	s min.
19,8	A	2	26	110	42	22
	D	2	32	110	42	22
28,8	A	3,5 ²⁾	29 ³⁾	135	53	30
	D	3,5	33	135	53	30
31,3 ⁴⁾	C	3,5	22 ⁵⁾	135	45	32

1) With handwheel in the fully open position.

2) For oxygen valves, d_2 shall not exceed 5 mm, and for chlorine, 8 mm.

3) For valves with 1 inch thread, f shall not exceed 35 mm.

4) For valves intended for use in fire extinguishing systems, this size is irrelevant.

5) For acetylene valves only.

¹⁾ Where type A valves for carbon dioxide are to be supplied with a bursting disk and valves for propane as safety valves, this shall be agreed at the time of ordering.

²⁾ Outlet diameter as specified in tables 2 and 3.

Valves shall be provided with outlets as specified in tables 2 and 3 as a function of the gas type.

Table 2. **Valves for spontaneously flammable gases**

Gases ¹⁾	Valve			
	size ²⁾ (d)	type	outlet thread size (d ₁) as in clause 4	No.
Ethane; ethylamine; ethyl chloride (R160); ethylene; ethylene oxide; 1,2-butadiene; 1,3-butadiene; 1-butylene; chlorodifluoroethene (R1426); chlorotrifluoroethylene (R1113); cis-2-butylene; cyclopropane; deuterium; 1,1-difluoroethane (R152 a); 1,1-difluoroethylene (R1132 a); dimethyl ether; dimethylamine; dimethylsilane; isobutane; isobutylene; methane; methylamine; methyl chloride (R40); methylsilane; n-butane; phosphorous hydride; pure propane; pure propylene; silicone hydride; trans-2-butylene; 1,1,1-trifluoroethane (R143 a); 3,3,3-trifluoro-1-propene; trimethylamine; trimethylsilane; vinyl bromide (R1140 B1); vinyl chloride (R1140); vinyl fluoride (R1141); vinylmethyl ether; hydrogen	28,8 or 19,8	A	W21,80 × 1/14 LH	1
Isobutane, n-butane and pure propane for cylinders up to 33 l capacity	19,8	A	W21,80 × 1/14 LH	2
Dissolved acetylene	31,3	C	Yoke-type connection	3 or 3.1
Dissolved acetylene, isobutane, n-butane; pure propane for cylinders up to 1 l capacity	19,8	A	G 3/8 LH	4
Hydrogen cyanide; dichlorosilane; cyanogen; carbon monoxide; methyl mercaptan; hydrogen sulfide	28,8 or 19,8	A	1 LH	5
Gas mixtures ¹⁾				
Technical butane; technical butylene; liquefied gas; carbon dioxide containing not more than 17 % (m/m) of ethylene oxide; hydrocarbons containing methane; mixtures containing not less than 2 % (V/V) of methane, with noble gases (except xenon) and/or nitrogen as the remainder; hydrocarbon mixtures (mixtures A, A 0, A 1, B, and C); methyl silanes; technical propane; technical propylene; town gas; mixtures containing not less than 2 % (V/V) of hydrogen, with noble gases (except xenon) and/or nitrogen as the remainder; hydrogen/methane mixtures	28,8 or 19,8	A	W21,80 × 1/14 LH	1
¹⁾ The names of gases and gas mixtures used here in accordance with TRG 101 and TRG 102 correspond to the designations to be marked on the cylinders. Gases and gas mixtures not listed here shall be designated in compliance with TRG 102. ²⁾ Valves of size 19,8 mm shall only be used subject to type approval.				

Table 3. Valves for nonflammable and not spontaneously flammable gases and test gases

Gases ¹⁾		Valve			No.
		size ²⁾ (d)	type	outlet thread size (d ₁) as in clause 4	
Ammonia; argon; bromochlorodifluoromethane (R 12 B 1); bromotrifluoromethane (R 13 B 1); chlorodifluoromethane (R 22); chloropentafluoroethane (R 115); chlorotetrafluoroethane (R 124 a); chlorotrifluoroethane (R 133 a); chlorotrifluoromethane (R 13); dichlorodifluoromethane (R 12); dichlorofluoromethane (R 21); dichlorotetrafluoroethane (R 114); helium; heptafluoropropane (R 227); hexafluoropropylene; carbon dioxide; krypton; neon; octafluorocyclobutane (R C 318); sulfurhexafluoride; tetrafluoromethane (R 14); trifluoromethane (R 23); xenon		28,8 or 19,8	A	W 21,80 × 1/14	6
Sulfur dioxide		28,8 or 19,8	A	G 5/8	7
Boron trichloride; boron trifluoride; hydrogen bromide; chlorine; cyanogen chloride; phosgene; hydrogen chloride; fluorine; methyl bromide (R 40 B 1); nitrogen oxide; dinitrogen tetroxide; nitrogen trifluoride; trifluoroacetyl chloride; tungsten hexachloride		28,8 or 19,8	A	1	8
Oxygen ³⁾		28,8 or 19,8	A	G 3/4	9
Nitrogen		28,8 or 19,8	A	W 24,32 × 1/14	10
Dinitrogen monoxide ⁴⁾	For cylinders above 3 l capacity (standard connection)	28,8 or 19,8	A	G 3/8	11
	For cylinders up to 3 l capacity	19,8	D	G 3/4 internal thread	12
Carbon dioxide (for fire extinguishing systems)		28,8 or 19,8	A	W 21,80 × 1/14	No specifi- cations.
Gas mixtures ²⁾					
Gas mixtures that are not otherwise classified		28,8 or 19,8	A	W 21,80 × 1/14 LH	1
Mixtures of not less than 20 % (V/V) of noble gases, except xenon, and nitrogen and/or less than 20 % (V/V) carbon dioxide; mixtures of carbon dioxide and not more than 10 % (m/m) of oxygen, nitrogen or air; gas mixtures R 500, R 502, R 503, F 1, F 2, and F 3		28,8 or 19,8	A	W 21,80 × 1/14	6
Mixtures of not less than 20 % (V/V) of oxygen and noble gases (except xenon) and/or nitrogen and/or not more than 20 % (V/V) of carbon dioxide; mixture of oxygen and 5 % carbon dioxide		28,8 or 19,8	A	G 3/4	9
Mixtures of more than 80 % (V/V) of nitrogen and oxygen and/or noble gases (except xenon) and/or carbon dioxide; mixtures of nitrogen containing not more than 5 % (V/V) of ethylene		28,8 or 19,8	A	W 24,32 × 1/14	10
For 1) and 2), see page 3.					
3) Special design for breathing apparatus, etc., as specified in DIN 3174 Part 1.					
4) For dinitrogen monoxide valves, the size shall be specified (e.g. valve DIN 477 – dinitrogen monoxide D 19,8).					

Table 3 (concluded).

Gases ¹⁾	Valve			
	size ²⁾ (d)	type	outlet thread size (d ₁) as in clause 4	No.
Compressed air	28,8 or 19,8	D	G 5/8 internal thread	13
Test gases	28,8 or 19,8	A	M 19 × 1,5 LH	14
Methylacetylene/propadiene mixture I; Methylacetylene/propadiene mixture III; Methylacetylene/propadiene mixture IV; Methylacetylene/propadiene mixture V; Methylacetylene/propadiene mixture VI;	28,8 or 19,8	D	W 21,80 × 1/14 LH (internal thread)	15
For ¹⁾ and ²⁾ , see page 3.				

3 Valve outlet dimensions

Gas cylinder valves shall be provided with outlets as specified below. Outlets of valves for use with spontaneously flammable gases (except acetylene) shall have a left-hand thread (LH) and those of valves for use with other gases, a right-hand thread (RH).

The type of thread undercut shall be at the manufacturer's discretion. Nuts with left-hand thread shall be marked either by a groove running around the circumference or with an arrow and the word 'Fest' (indicating direction of tightening).

Note. Manual connection of pressure reducers for flammable gases and gas mixtures (outlet No. 1), carbon dioxide (outlet No. 6), oxygen (outlet No. 9), nitrogen (outlet No. 10), dinitrogen monoxide (outlets Nos. 11 and 12), compressed air (outlet No. 13), and for test gases (outlet No. 14) for noble gases is permitted if suitability of that method of connection has been verified by a recognized test house³⁾. Valve outlets are not expected to conform to the designs illustrated here; compliance is only required in the case of the dimensions specified.

For general tolerances, accuracy grade m as specified in DIN 7168 shall apply.

Outlet No. 1: to be used for spontaneously flammable gases and gas mixtures as listed in tables 2 and 3.

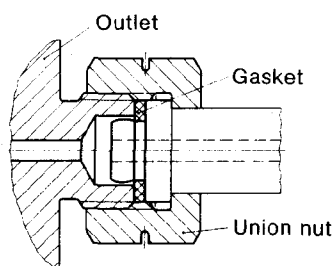


Figure 2. Assembly

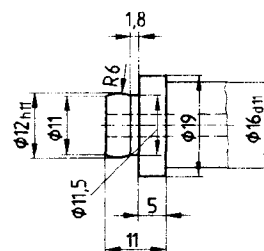


Figure 3. Connector

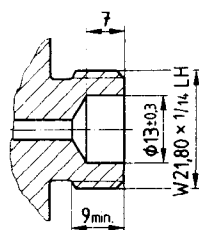


Figure 4. Outlet

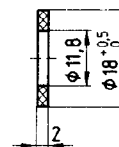


Figure 5. Gasket

³⁾ The addresses of test houses are obtainable from the *Normenausschuß Druckgasanlagen im DIN*, Burggrafenstraße 6, D-1000 Berlin 30.

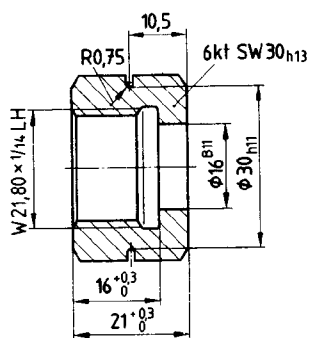


Figure 6. Union nut

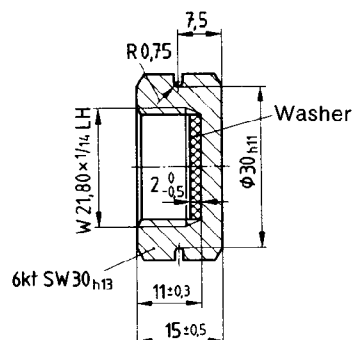


Figure 7. Screw cap

Outlet No. 2: to be used for propane/butane, and for use on gas cylinders up to 33 l capacity (the outlet has been specified in DIN 4661 Part 1 for use on steel cylinders containing gas for cooking, heating and lighting purposes⁴).

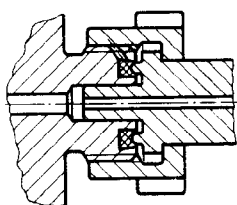


Figure 8. Assembly

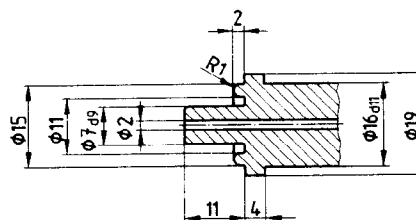


Figure 9. Connector

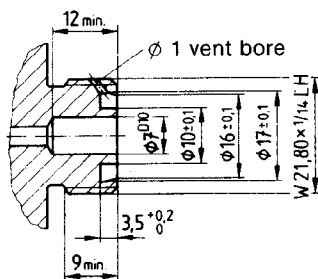


Figure 10. Outlet

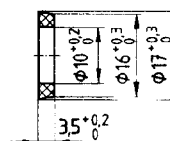
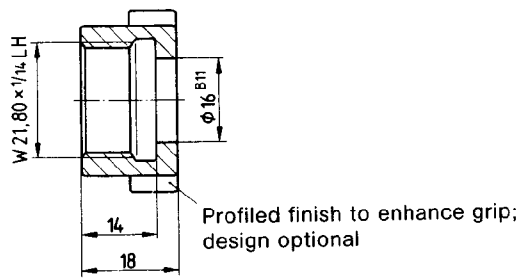
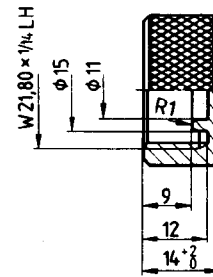


Figure 11. Gasket

The gasket shall be made of propane/butane-resistant rubber or plastic and be of Shore A hardness 70 ± 5 (cf. DIN 53 505).

⁴) Cf. TRG 605, No. 2.1.

Figure 12. Union nut⁵⁾Figure 13. Screw cap⁵⁾

Outlet No. 3: yoke-type connection; to be used for acetylene. The gasket shall be a component of the valve and must be replaced every time the cylinder is filled.

Dimensions and design features not specified shall be selected as required.

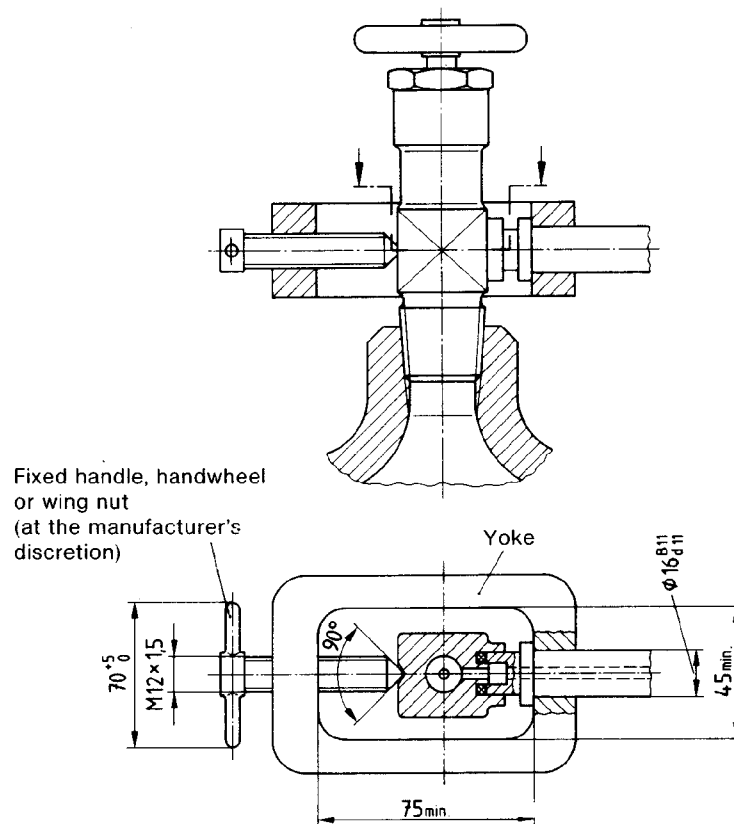


Figure 14. Assembly

⁵⁾ The nut end face shall be marked with an arrow and the word 'Fest'.

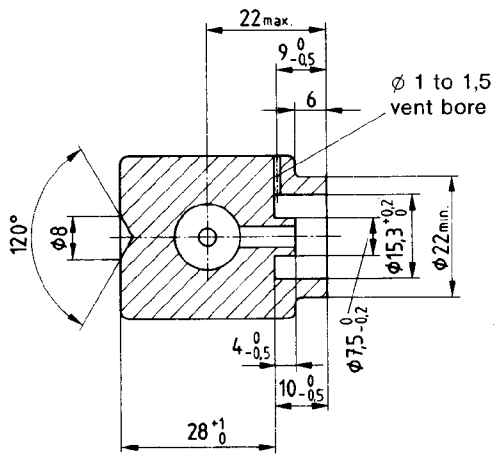


Figure 15. Outlet

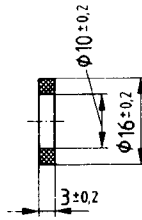


Figure 16. Gasket

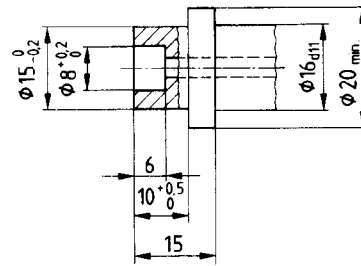


Figure 17. Connector

The gasket shall be made of acetone- and dimethylformamide-resistant rubber or plastic and have a Shore A hardness 80 to 90 (as in DIN 53 505).

Outlet No. 3.1, with M24 × 2 external LH thread: to be used for acetylene.

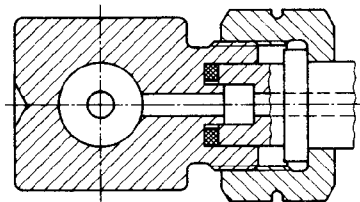


Figure 18. Assembly

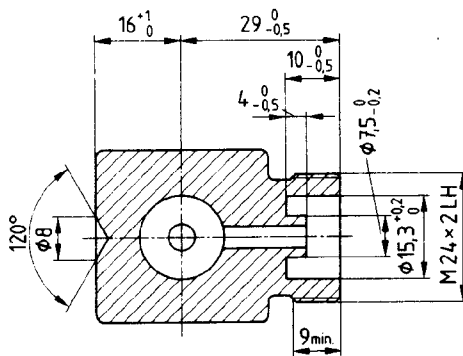


Figure 19. Outlet

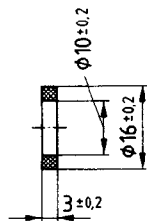


Figure 20. Gasket

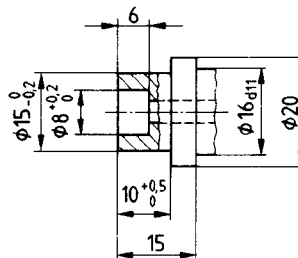


Figure 21. Connector

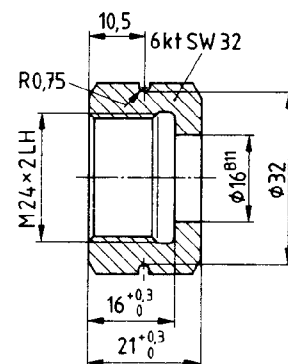


Figure 22. Union nut

For gasket material, see specifications for outlet No. 3.

Outlet No. 4: to be used for acetylene, propane and butane, and for use on gas cylinders up to 1 l capacity (cf. DIN 8542).

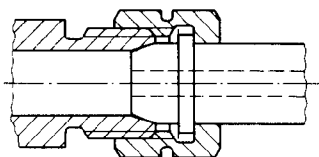


Figure 23. Assembly

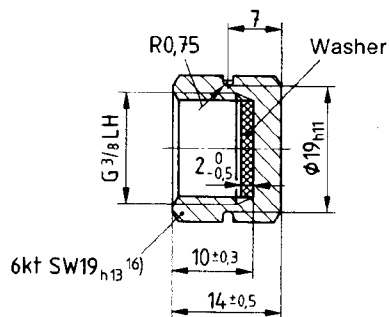


Figure 24. Screw cap

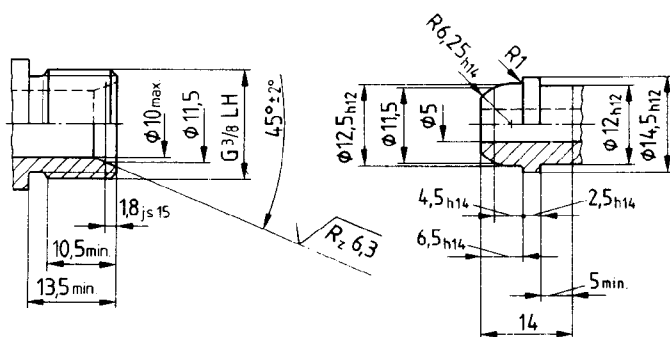


Figure 25. Outlet

Figure 26. Connector

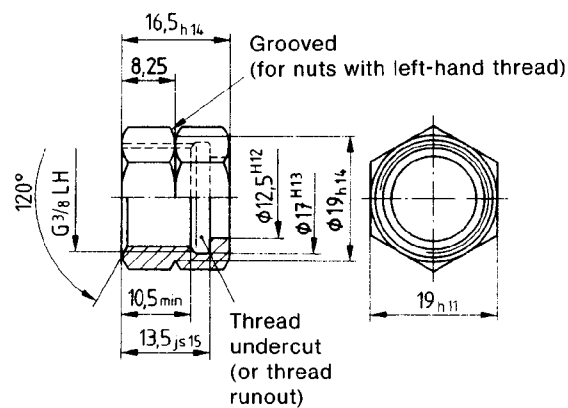


Figure 27. Union nut

Outlet No. 5: to be used for hydrogen cyanide, cyanogen; dichlorosilane, carbon monoxide, methyl mercaptan and hydrogen sulfide.

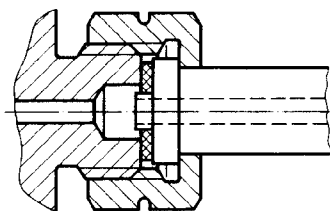


Figure 28. Assembly

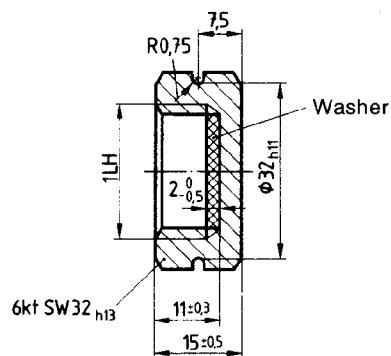


Figure 29. Screw cap

⁶⁾ 6 kt 22 hexagon is permitted subject to approval.

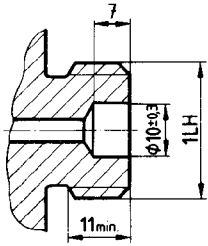


Figure 30. Outlet

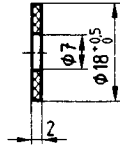


Figure 31. Gasket

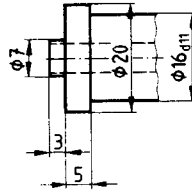


Figure 32. Connector

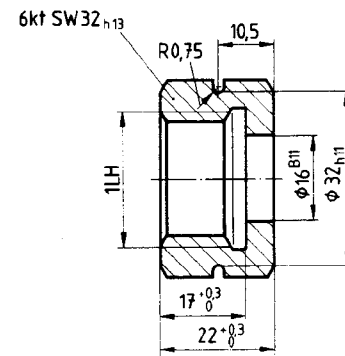


Figure 33. Union nut

Outlet No. 6: to be used for nonflammable or not spontaneously flammable gases, as listed in table 3.

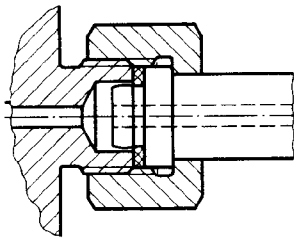


Figure 34. Assembly

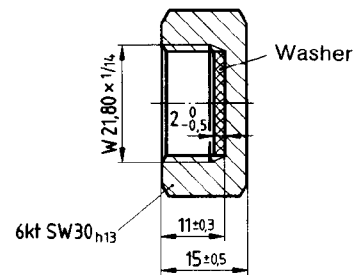


Figure 35. Screw cap

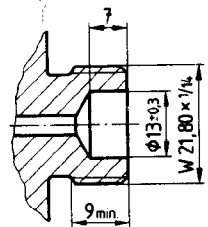


Figure 36. Outlet

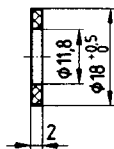


Figure 37. Gasket

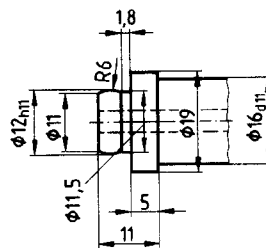


Figure 38. Connector

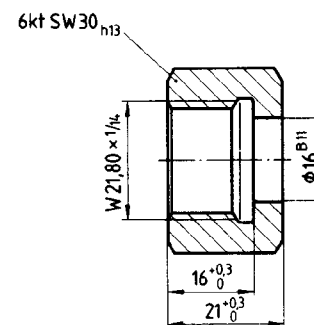


Figure 39. Union nut

Outlet No. 7: to be used for sulfur dioxide.

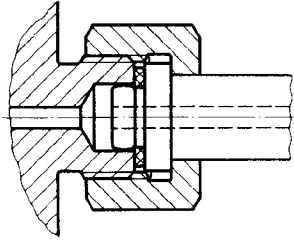


Figure 40. Assembly

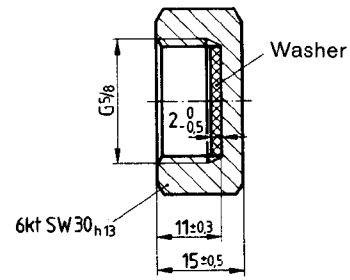


Figure 41. Screw cap

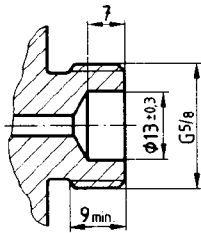


Figure 42. Outlet

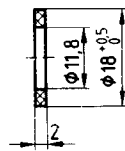


Figure 43. Gasket

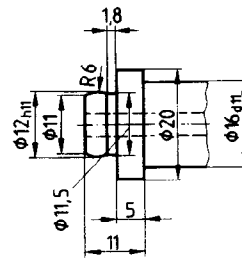


Figure 44. Connector

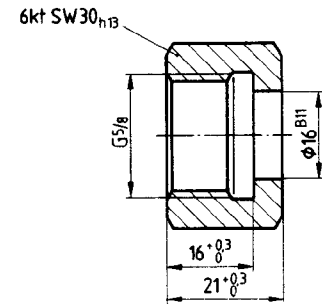


Figure 45. Union nut

Outlet No. 8: to be used for nonflammable or not spontaneously flammable toxic or corrosive gases, as listed in table 3.

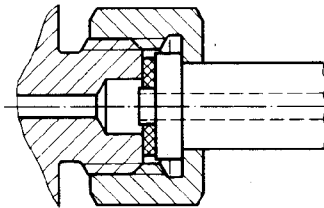


Figure 46. Assembly

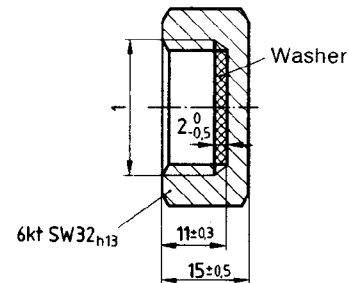


Figure 47. Screw cap

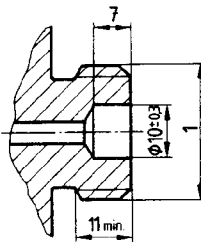


Figure 48. Outlet

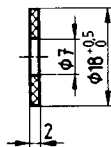


Figure 49. Gasket

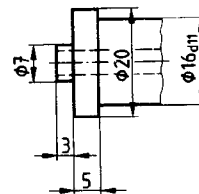


Figure 50. Connector

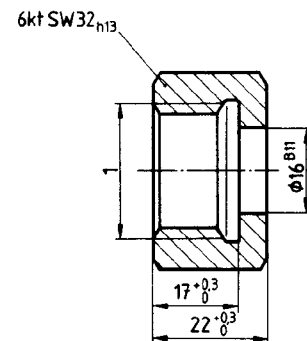


Figure 51. Union nut

Outlet No. 9: to be used for oxygen.

Note. Contamination with oil and grease shall be prevented.

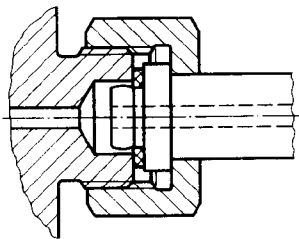


Figure 52. Assembly

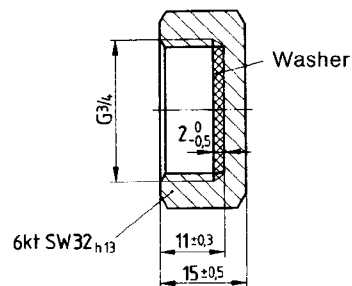


Figure 53. Screw cap

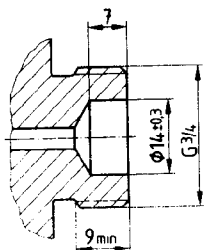


Figure 54. Outlet

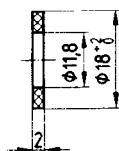


Figure 55. Gasket

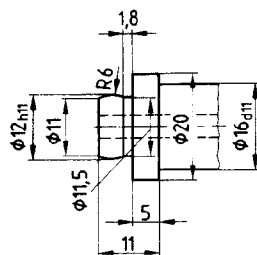


Figure 56. Connector

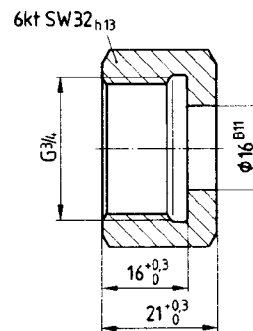


Figure 57. Union nut

Outlet No. 10: to be used for nitrogen.

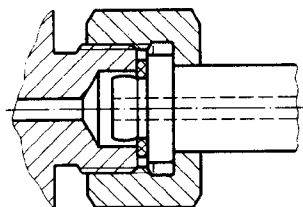


Figure 58. Assembly

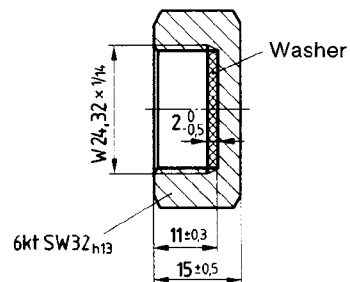


Figure 59. Screw cap

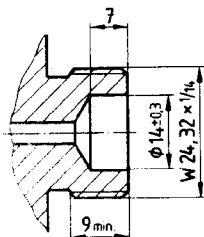


Figure 60. Outlet

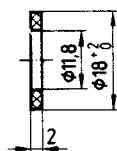


Figure 61. Gasket

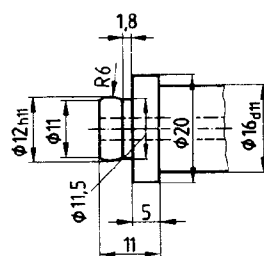


Figure 62. Connector

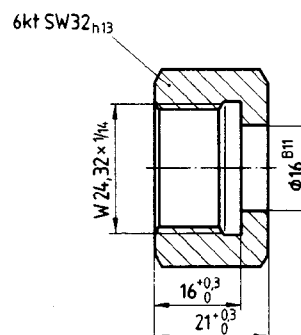


Figure 63. Union nut

Outlet No. 11: to be used for dinitrogen monoxide.

Note. Contamination with oil and grease shall be prevented.

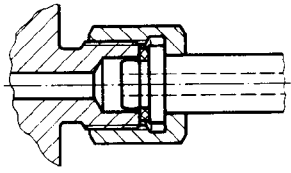


Figure 64. Assembly

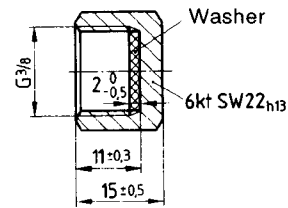


Figure 65. Screw cap

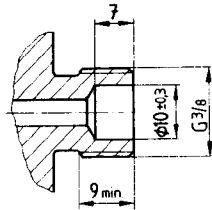


Figure 66. Outlet

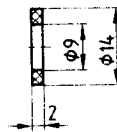


Figure 67. Gasket

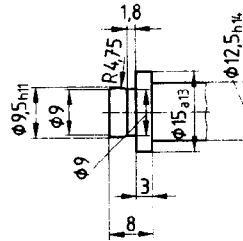


Figure 68. Connector

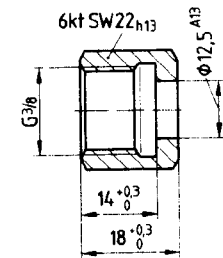


Figure 69. Union nut

Cf. footnote 4 in table 3 for designation.

Outlet No. 12: to be used for dinitrogen monoxide for gas cylinders with a capacity not exceeding 3 l.

Note. Contamination with oil and grease shall be prevented.

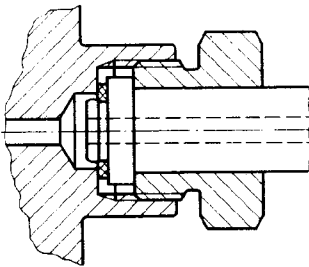


Figure 70. Assembly

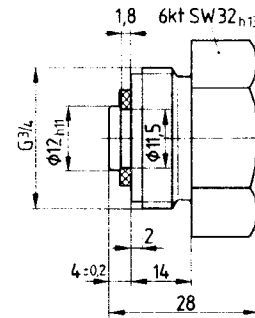


Figure 71. Screw plug

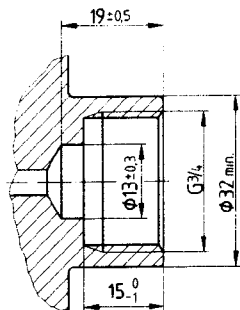


Figure 72. Outlet

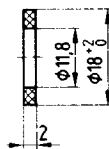


Figure 73. Gasket

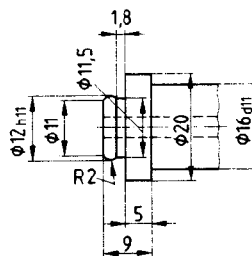


Figure 74. Connector

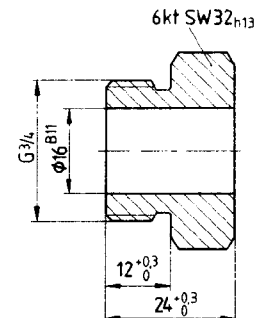


Figure 75. Union nut

Cf. footnote 4 in table 3 for designation.

Outlet No. 13: to be used for compressed air.

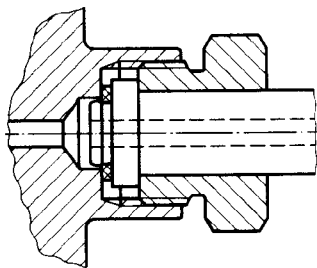


Figure 76. Assembly

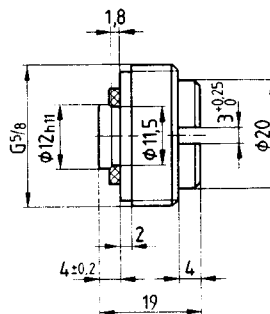


Figure 77. Screw plug

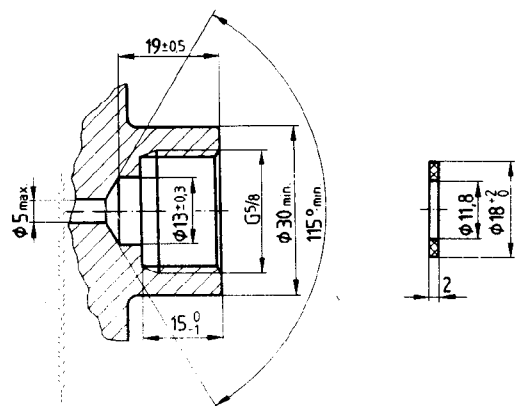


Figure 78. Outlet

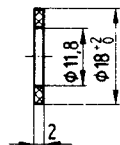


Figure 79. Gasket

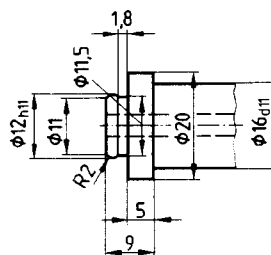


Figure 80. Connector

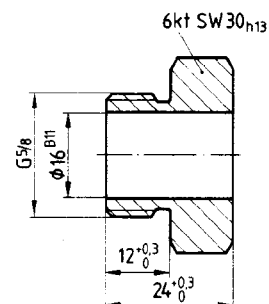


Figure 81. Union nut

Filling connection

Filling connections rated for pressures up to 200 bar (i.e. for test pressures up to 300 bar) are also suitable for filling pressures of up to 300 bar (i.e. test pressures up to 450 bar).

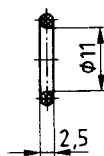


Figure 82. O-ring ⁷⁾

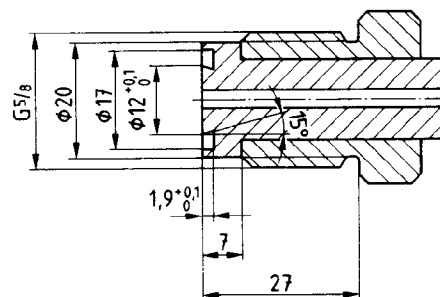


Figure 83. Filling connection

The outlet shall be provided with a G 5/8 thread (tolerance class A), as specified in ISO 228 Part 1.

The gasket shall be made of rubber or special-grade plastic and be of Shore A hardness 85 ± 5 (as in DIN 53 505).

⁷⁾ Use of seal rings other than O-rings is permitted.

Outlet No. 14: to be used for test gases (i.e. gases and gas mixtures used for metrological purposes).

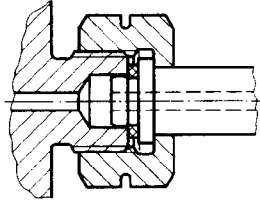


Figure 84. Assembly

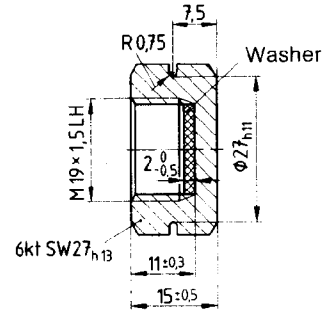


Figure 85. Screw cap

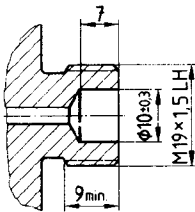


Figure 86. Outlet

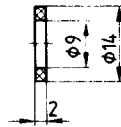


Figure 87. Gasket

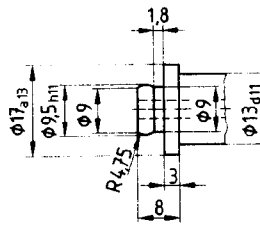


Figure 88. Connector

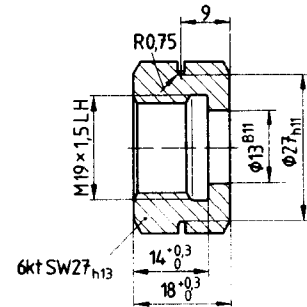


Figure 89. Union nut

Outlet No. 15: to be used for methyl acetylene and propadiene mixtures stabilized with C₃- and C₄-hydrocarbons.

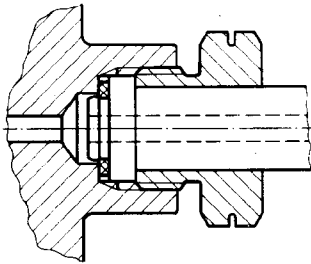


Figure 90. Assembly

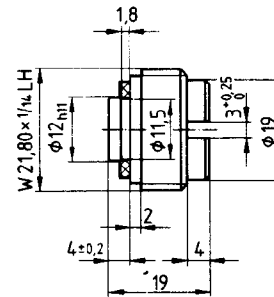


Figure 91. Screw plug

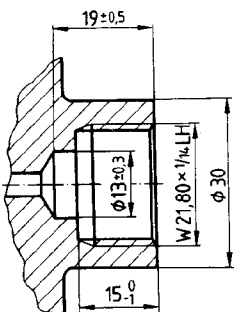


Figure 92. Outlet

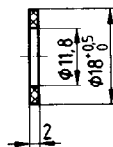


Figure 93. Gasket

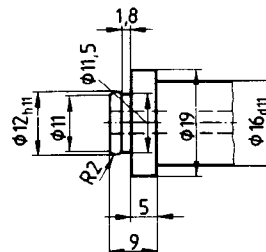


Figure 94. Connector

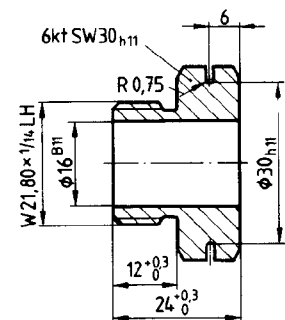


Figure 95. Union nut

4 Screw threads

4.1 Valve stem and gas cylinder neck screw threads

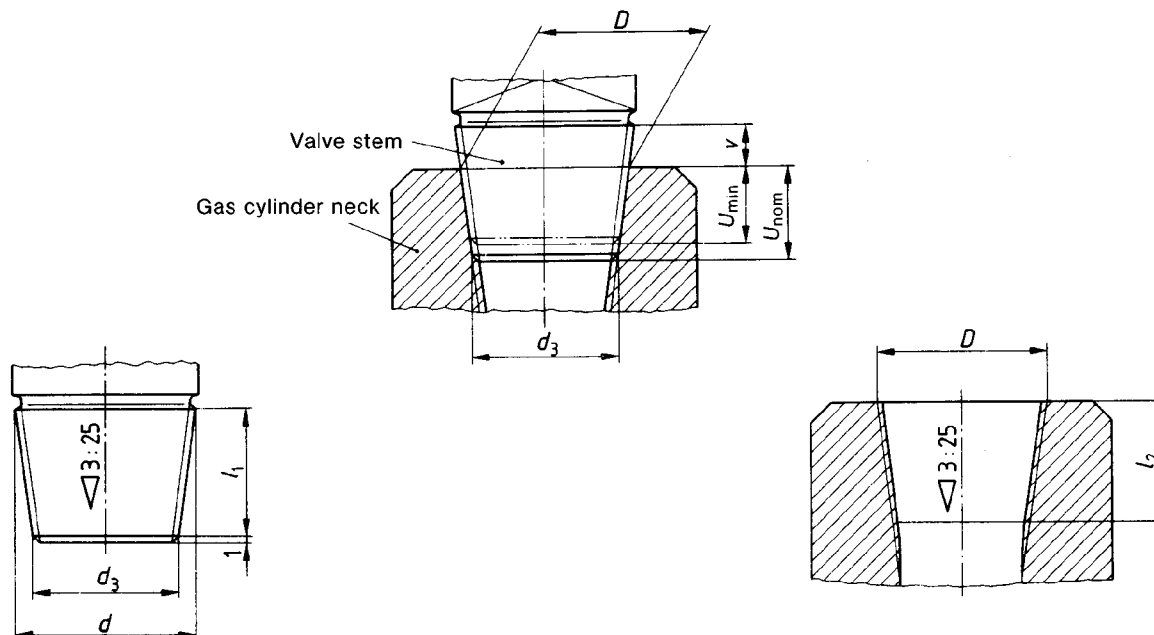


Figure 96. Valve stem and gas cylinder neck

Designation of a taper thread for valve stem of size W 28,8 × 1/14 tap:

Thread DIN 477 – W 28,8 × 1/14 tap

Table 5. Thread dimensions

Valve		External thread (valve stem)					Internal thread (gas cylinder)						v
size	type	Major diam- eter (large end)	Pitch diam- eter	Minor diam- eter	Major diam- eter (small end)	l_1	Major diam- eter	Pitch diam- eter	Minor diam- eter	l_2	U_{nom}	U_{min}	for U_{nom}
		d	d_2	d_1	d_3		D	D_2	D_1				
		$+0,12$ 0	$+0,12$ 0	$+0,12$ 0	$+0,12$ 0		$-0,12$	$-0,12$	$-0,1$				
W 19,8 × 1/14 tap	A, D	19,8	18,638	17,476	17,4	20	19,2	18,038	16,878	17	16,0	15,0	5,0
W 28,8 × 1/14 tap	A, D	28,8	27,638	26,476	25,8	25	27,8	26,638	25,476	22	17,67	15,67	8,33
W 31,3 × 1/14 tap	C	31,3	30,138	28,976	28,3	25	30,3	29,138	27,976	22	17,67	15,67	8,33

The screw thread shall be a 3/25 taper right-hand thread with 14 threads per 25,4 mm.

Cf. DIN 477 Part 7 for associated taper plug gauges.

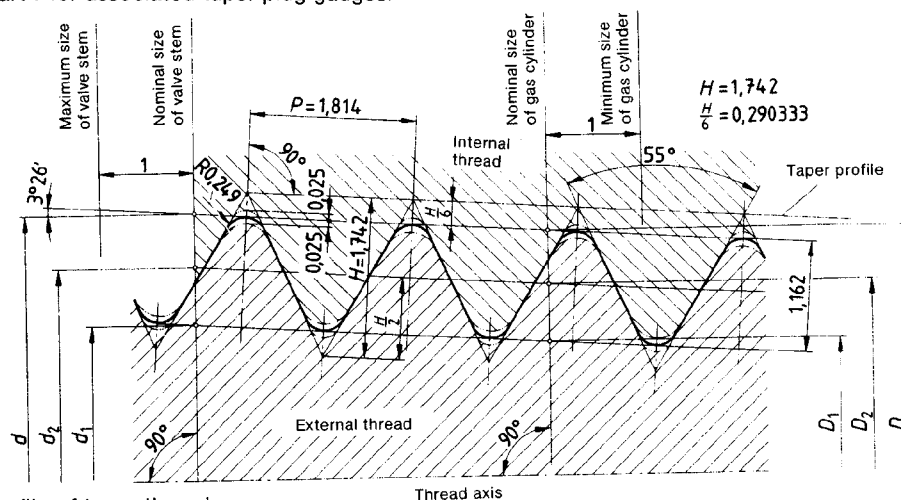


Figure 97. Profile of taper thread

4.2 Screw threads for valve outlets and accessories

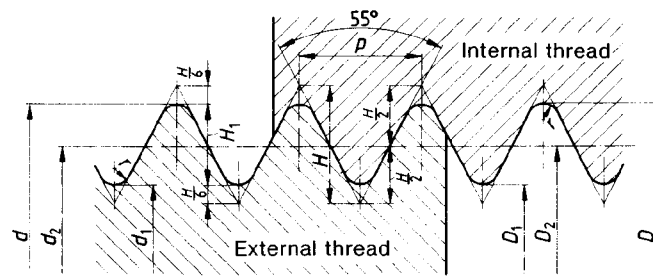


Figure 98. Profile of pipe thread

$$P = \frac{25,4}{z}$$

$$r = 0,137329 P$$

$$H = 0,960491 P$$

$$H_1 = 0,640327 P$$

Designation of a pipe thread of size 21,80, with 14 threads per 25,4 mm (W 21,80 × 1/14):

Thread DIN 477 – W 21,80 × 1/14

Table 6. Thread dimensions

Thread size	Thread dimensions						
	Major diameter, $d = D$	Pitch diameter, $d_2 = D_2$	Minor diameter, $d_1 = D_1$	Pitch, P	Threads per 25,4 mm, z	Thread height, H_1	Root radius, r , \approx
W 21,80 × 1/14 ¹⁾	21,800	20,638	19,476	1,814	14	1,162	0,249
W 24,32 × 1/14	24,320	23,158	21,996	1,814	14	1,162	0,249
1 ¹⁾ 2)	25,400	23,368	21,336	3,175	8	2,032	0,436

1) Right-hand and left-hand thread.
2) This thread size is identical with size 1 in.-8 BSW as specified in British Standard BS 84 : 1956.

Table 7. Thread tolerances (in μm)

Thread size	External thread				Internal thread					
	Major diameter tolerance, T_d		Pitch diameter tolerance, T_{d2}		Minor diameter tolerance, T_{d1}		Pitch diameter tolerance, T_{D2}		Minor diameter tolerance, T_{D1}	
	Upper	Lower	Upper	Lower	Upper	Lower	Lower	Upper	Lower	Upper
W 21,80 × 1/14 ¹⁾	-20	-413	0	-135	0	-159	0	+135	+20	+590
W 24,32 × 1/14	-20	-413	0	-135	0	-359	0	+135	+20	+590
1 ¹⁾ 2)	0	-303	0	-114	0	-231	0	+173	0	+813

For 1) and 2), see table 6.

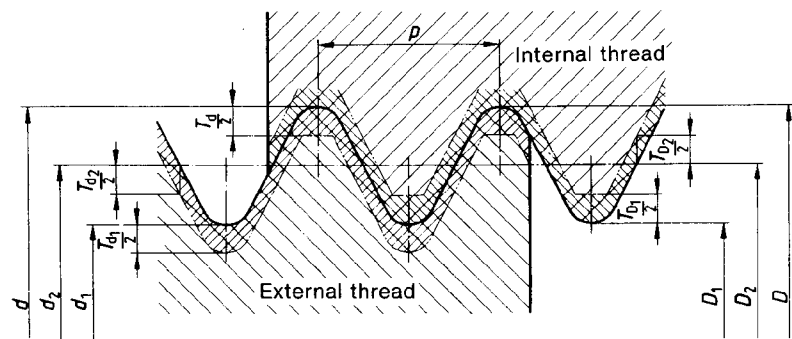


Figure 99. Limits of size

Table 8. Limits of size

Thread size	External thread						Internal thread				
	Major diameter, d		Pitch diameter, d_2		Minor diameter, d_1		Minimum major diameter, D	Pitch diameter, D_2		Minor diameter, D_1	
	max.	min.	max.	min.	max.	min.		min.	max.	min.	max.
W 21,80 \times 1/14 ¹⁾	21,780	21,387	20,638	20,503	19,476	19,117	21,800	20,638	20,773	19,496	20,066
W 24,32 \times 1/4	24,300	23,907	23,158	23,023	21,996	21,673	24,320	23,158	23,296	22,016	22,586
1 ¹⁾ 2)	25,400	25,197	23,368	23,254	21,336	21,105	25,400	23,368	23,541	21,336	22,149

For ¹⁾ and ²⁾, see table 6.

5 Materials

5.1 Handwheels

Handwheels on valves designed for flammable gases are subject to special requirements (cf. TRG 770, Appendix 1).

5.2 Screw caps and plugs

Screw caps and plugs shall be manufactured from suitable metallic materials (cf. TRG 253), use of other materials (e.g. plastics) being permitted if proof of their suitability has been provided in a type test.

5.3 Gaskets and washers

Unless otherwise specified for the particular outlet, the gasket or valve material chosen shall be suitable for the type of gas concerned.

6 Scope of supply

Valves shall be supplied with handwheels (as specified in DIN 4674 Part 1 or as selected by the manufacturer) and valves with threaded connection designed for spontaneously flammable and for highly toxic gases (cf. table in Appendix B), with screw caps fitted. Valves for other gases are to be provided with screw caps (or screw plugs) only if so expressly agreed.

Unless otherwise agreed, types A and D valves need not be supplied with a protective cap fitted on the outlet. Valves for acetylene are normally to be supplied without screw cap.

7 Marking

Valves that conform to the requirements of this standard may, in conjunction with the manufacturer's mark or a test mark, be marked with the **DIN** symbol.

Appendix A

Table A.1. Threaded connections

		Right-hand/left-hand thread	Thread size	Thread type as specified in	Thread size and tolerance
Valve outlet (including nuts and caps) No.	1	Left-hand thread	W 21,80 × 1/14 LH	DIN 477 Part 1	As in subclause 4.2 (tables 6 and 7).
	2				
	3.1		M 24 × 2 LH	DIN 13 Part 7	Medium
	4		G 3/8 LH	ISO 228-1	Tolerance class A
	5		1 LH ¹⁾	DIN 477 Part 1	As in subclause 4.2 (tables 6 and 7).
	6	Right-hand thread	W 21,80 × 1/14	DIN 477 Part 1	As in subclause 4.2 (tables 6 and 7).
	7		G 5/8	ISO 228-1	Tolerance class A
	8		1 ¹⁾	DIN 477 Part 1	As in subclause 4.2 (tables 6 and 7).
	9		G 3/4	ISO 228-1	Tolerance class A
	10		W 24,32 × 1/14	DIN 477 Part 1	As in subclause 4.2 (tables 6 and 7).
	11		G 3/8	ISO 228-1	Tolerance class A
	12		G 3/4	ISO 228-1	Tolerance class A
	13		G 5/8	ISO 228-1	Tolerance class A
	14	Left-hand thread	M 19 × 1,5 LH	DIN 13 Part 6	Medium
	15		W 21,80 × 1/14 LH	DIN 477 Part 1	As in subclause 4.2 (tables 6 and 7).
Valve nominal size	19,8	Right-hand thread	W 19,8 × 1/14 tap	DIN 477 Part 1	As in table 5.
	28,8		W 28,8 × 1/14 tap		
	31,3		W 31,3 × 1/14 tap		

For ¹⁾, see table 6.

Appendix B

Table B.1. List of pressurized gases, as specified in TRG 101, Appendices 1 to 4, approved for use with gas cylinder valves

1	2	3	4	5	6	7	8	9	10	11	12
Name of gas	Chemical symbol	Gas group as in TRG 101	State (as in the Gefährdungsverordnung)	Boiling point at 1013 mbar (absolute), in °C	Critical temperature, in °C	Flammable (Yes/No)	Maximum permissible filling pressure at 15 °C, P_{15} , in bar	Minimum test pressure for cylinders, in bar	Filling factor, in kg/l	Outlet No.	Safety notes
Acetylene (dissolved)	C_2H_2	4	Dissolved.	– 84,0 (sublimated)	+ 35,9	Yes	–	60	Dependent on porous material	3,4	Not to be used with acetone-soluble rubber and plastics, copper and copper alloys containing more than 70 % (m/m) Cu.
Ethane	C_2H_6	2.2	Liquefied.	– 88,6	+ 32,3	Yes	–	95 120 300	0,25 0,29 0,39	1	–
Ethylamine	$C_2H_5NH_2$	3.2	Liquefied.	+ 16,6	+ 183,4	Yes	–	10	0,61	1	Not to be used with copper and copper alloys.
Ethyl chloride (R160)	C_2H_5Cl	3.2	Liquefied.	+ 12,3	+ 187,2	Yes	–	10	0,80	1	–
Ethylene	C_2H_4	2.2	Compressed.	– 103,8	+ 9,2	Yes	–	225 300	0,34 0,37	1	–
Ethylene oxide	C_2H_4O	3.3	Liquefied.	+ 10,5	+ 195,8	Yes	–	10	0,78	1	Unsuitable material: copper.
Ammonia	NH_3	3.2 4	Liquefied or dissolved.	– 33,4	+ 132,4	Yes	–	33 12	0,53 0,77	6	Not to be used with copper and copper alloys.
Argon	Ar	1.1	Compressed.	– 185,9	– 122,4	No	300	450	–	6	–
Boron trichloride	BCl_3	3.1	Liquefied.	+ 12,5	+ 178,8	No	–	10	1,24	8	–
Boron trifluoride	BF_3	1.1	Liquefied.	– 100,3	– 12,2	No	–	300	0,86	8	–
Bromo-chloro-difluoromethane (R12B.1)	$CBrClF_2$	3.1	Liquefied.	– 3,3	+ 154	No	–	10	1,61	6	–
Bromotri-fluoro-methane (R13B.1)	$CBrF_3$	2.1	Liquefied.	– 57,9	+ 66,8	No	–	42 120 250	1,13 1,44 1,60	6	–

Table B.1 (continued).

1	2	3	4	5	6	7	8	9	10	11	12
Name of gas	Chemical symbol	Gas group as in TRG 101	State (as in the Gefährdungsverordnung)	Boiling point at 1013 mbar (absolute), in °C	Critical temperature, in °C	Flammable (Yes/No)	Maximum permissible filling pressure at 15 °C, P_{15} , in bar	Minimum test pressure for cylinders, in bar	Filling factor, in kg/l	Outlet No.	Safety notes
Hydrogen bromide	HBr	3.1	Liquefied.	– 66,7	+ 89,9	No	–	60	1,20	8	Not to be used with light metal alloys.
1,2-butadiene	C ₄ H ₆	3.3	Liquefied.	+ 10,85	+ 170,6	Yes	–	10	0,55	1	–
1,3-butadiene	C ₄ H ₆	3.3	Liquefied.	– 4,5	+ 152	Yes	–	10	0,55	1	–
1-butylene	C ₄ H ₈	3.2	Liquefied.	– 6,2	+ 146,4	Yes	–	10	0,53	1	–
Chlorine	Cl ₂	3.1	Liquefied.	– 34,1	+ 144	No	–	22	1,25	8	Keep valve free from tin, tin solder, wax, oil, or grease.
Cyanogen chloride	CICN	3.3	Liquefied.	+ 12,9	(+ 215)	No	–	20	1,03	8	–
Chlorodi-fluoroethane (R 142b)	CH ₃ CClF ₂	3.2	Liquefied.	– 9,6	+ 137,1	Yes	–	10	0,99	1	–
Chlorodi-fluoromethane (R 22)	CHClF ₂	3.1	Liquefied.	– 40,6	+ 96,2	No	–	29	1,03	6	–
Phosgene	COCl ₂	3.1	Liquefied.	+ 7,4	+ 182,3	No	–	20	1,23	8	Rubber gaskets not to be used.
Chloropenta-fluoroethane (R 115)	C ₂ ClF ₅	3.1	Liquefied.	– 39,1	+ 80	No	–	25	1,06	6	–
Chlorotetra-fluoroethane (R 124a)	CClF ₂ CHF ₂	3.1	–	– 10,8	+ 12,5	No	–	11	1,18	6	–
Chlorotri-fluoroethane (R 133a)	CH ₂ ClCF ₃	3.1	Liquefied.	+ 6,9	+ 150	No	–	10	1,18	6	–

Table B.1 (continued).

1	2	3	4	5	6	7	8	9	10	11	12
Name of gas	Chemical symbol	Gas group as in TRG 101	State (as in the Gefährdungsverordnung)	Boiling point at 1013 mbar (absolute), in °C	Critical temperature, in °C	Flammable (Yes/No)	Maximum permissible filling pressure at 15 °C, P_{15} , in bar	Minimum test pressure for cylinders, in bar	Filling factor, in kg/l	Outlet No.	Safety notes
Chlorotrifluoroethylene (R 1113)	C_2ClF_3	3.3	Liquefied.	– 28,4	+ 105,8	Yes	–	19	1,13	1	–
Chlorotrifluoromethane (R 13)	$CClF_3$	2.1	Liquefied.	– 81,9	+ 28,8	No	–	100 120 190 250	0,83 0,90 1,04 1,10	6	–
Hydrogen chloride	HCl	2.1	Liquefied.	– 85,0	+ 51,5	No	–	100 120 150 200	0,30 0,56 0,67 0,74	8	–
Cis-2-butylene	C_4H_8	3.2	Liquefied.	+ 3,7	+ 162,4	Yes	–	10	0,55	1	–
Hydrogen cyanide (hydrocyanic acid)	HCN	3.3	Liquefied.	+ 25,7	+ 183,5	Yes	–	100	0,55	5	–
Cyclopropane	C_3H_6	3.2	Liquefied.	– 32,9	+ 124,6	Yes	–	20	0,53	1	–
Deuterium (heavy hydrogen)	D_2	1.2	Compressed.	– 249,5	– 234,8	Yes	200	300	–	1	–
Dichlorodifluoromethane (R 12)	CCl_2F_2	3.1	Liquefied.	– 24,9	+ 112	No	–	18	1,15	6	–
Dichlorofluoromethane (R 21)	$CHCl_2F$	3.1	Liquefied.	+ 8,9	+ 178,5	No	–	10	1,23	6	–
Dichlorosilane	$CHCl_2$	3.1	Liquefied.	+ 8,9	+ 178,5	No	–	10	1,23	5	–

Table B.1 (continued).

1	2	3	4	5	6	7	8	9	10	11	12
Name of gas	Chemical symbol	Gas group as in TRG 101	State (as in the Gefährdungsverordnung)	Boiling point at 1013 mbar (absolute), in °C	Critical temperature, in °C	Flammable (Yes/No)	Maximum permissible filling pressure at 15 °C, P_{15} , in bar	Minimum test pressure for cylinders, in bar	Filling factor, in kg/l	Outlet No.	Safety notes
Dichlorotetrafluoroethane (R 114)	$C_2Cl_2F_4$	3.1	Liquefied.	+ 3,5	+ 145,7	No	—	10	1,30	6	—
Cyanogen	$(CN)_2$	3.3	Liquefied.	— 21,2	+ 126,6	Yes	—	100	0,70	5	—
1,1-di-fluoroethane (R 152a)	CH_3CHF_2	3.2	Liquefied.	— 25,0	+ 113,5	Yes	—	18	0,79	1	—
1,1-di-fluoroethylene (R 1132a)	$C_2H_2F_2$	2.3	Liquefied.	— 84	+ 29,7	Yes	—	250	0,77	1	—
Dimethyl ether	C_2H_6O	3.2	Liquefied.	— 24,8	+ 126,9	Yes	—	18	0,58	1	—
Dimethylamine	$(CH_3)_2NH$	3.2	Liquefied.	+ 7,4	+ 164,6	Yes	—	10	0,59	1	Not to be used with copper and copper alloys.
Dimethylsilane	$(CH_3)_2SiH_2$	3.2	Liquefied.	— 19,6	(+ 125)	Yes	—	225	0,39	1	—
Dinitrogen monoxide	N_2O	2.1	Liquefied.	— 88,5	+ 36,4	No	—	180 225 250	0,68 0,74 0,75	11,12	—
Fluorine	F_2	1.1	Compressed.	— 188,1	— 129	No	28	200	—	8	Not to be used with aluminium and aluminium alloys, Alpac and cast Alpac containing more than 16% (m/m) alpac, chromium, aluminium and chromium-molybdenum steel.
Helium	He	1.1	Compressed.	— 268,9	— 268,0	No	200	300	—	6	—
Heptafluoropropane (R 227)	$CF_3CH_2CF_3$	3.1	—	— 17	(+ 100)	No	—	15	1,20	6	—

Table B.1 (continued).

1	2	3	4	5	6	7	8	9	10	11	12
Name of gas	Chemical symbol	Gas group as in TRG 101	State (as in the Gefahrgutverordnung)	Boiling point at 1013 mbar (absolute), in °C	Critical temperature, in °C	Flammable (Yes/No)	Maximum permissible filling pressure at 15 °C, P_{15} , in bar	Minimum test pressure for cylinders, in bar	Filling factor, in kg/l	Outlet No.	Safety notes
Hexafluoroisobutene	$(CF_3)_2C=CH_2$	3.1	Liquefied.	+ 14,1	(+ 150)	No	—	10	1,18	—	—
Hexafluoropropylene	C_3F_6	3.1	Liquefied.	— 29,6	+ 86,2	No	—	22	1,11	6	—
Isobutane	C_4H_{10}	3.2	Liquefied.	— 11,7	+ 135,0	Yes	—	10	0,49	1,2,4	—
Isobutylene	C_4H_8	3.2	Liquefied.	— 7,1	+ 144,7	Yes	—	10	0,52	1	—
Carbon dioxide	CO_2	2.1	Liquefied.	— 78,5 (sublimated)	+ 31,0	No	—	190 250	0,66 0,75	6	—
Carbon monoxide	CO	1.2	Compressed.	— 191,5	— 140,2	Yes	150	225	—	5	—
Krypton	Kr	1.1	Compressed.	— 153,4	— 63,8	No	200	300	—	6	—
Methane	CH_4	1.2	Compressed.	— 161,5	— 82,5	Yes	200	300	—	1	—
Methylamine	CH_3NH_2	3.2	Liquefied.	— 6,3	+ 156,9	Yes	—	13	0,58	1	Not to be used with copper and copper alloys.
Methyl bromide (R 40B1)	CH_3Br	3.2	Liquefied.	+ 3,6	+ 194	Yes	—	10	1,51	8	—
Methyl chloride (R 40)	CH_3Cl	3.2	Liquefied.	— 23,8	+ 143	Yes	—	17	0,81	1	—
Methyl mercaptan	CH_4S	3.2	Liquefied.	+ 6,0	+ 196,8	Yes	—	10	0,78	5	—
Methylsilane	CH_3SiH_3	3.2	Liquefied.	— 57,5	+ 79,3	Yes	—	225	0,39	1	—
Neon	Ne	1.1	Compressed.	— 248,1	— 228,7	No	300	450	—	6	—

Table B.1 (continued).

1	2	3	4	5	6	7	8	9	10	11	12
Name of gas	Chemical symbol	Gas group as in TRG 101	State (as in the <i>Gefährdungsverordnung</i>)	Boiling point at 1013 mbar (absolute), in °C	Critical temperature, in °C	Flammable (Yes/No)	Maximum permissible filling pressure at 15 °C, P_{15} , in bar	Minimum test pressure for cylinders, in bar	Filling factor, in kg/l	Outlet No.	Safety notes
n-Butane	C_4H_{10}	3.2	Liquefied.	– 0,5	+ 152,0	Yes	–	10	0,51	1,2,4	–
Octafluorocyclobutane (RC318)	C_4F_8	3.1	Liquefied.	– 6,4	+ 115,3	No	–	11	1,34	6	–
Phosphorus hydride (phosphine)	PH_3	2.2	Liquefied.	– 87,8	+ 51,9	Yes	–	225	0,30	1	–
Pure propane	C_3H_8	3.2	Liquefied.	– 42,1	+ 96,8	Yes	–	25	0,42	1,2,4	Rubber gaskets not to be used.
Pure propylene	C_3H_6	3.2	Liquefied.	– 47,7	+ 91,8	Yes	–	30	0,43	1	–
Oxygen	O_2	1.1	Compressed.	– 183,0	– 118,4	No	200	300	–	9	Keep valve free from oil or grease.
Sulfur dioxide	SO_2	3.1	Liquefied.	– 10,0	+ 157,5	No	–	14	1,23	7	Not to be used with nickel.
Sulfur hexafluoride	SF_6	2.1	Liquefied.	– 63,8 (sublimated)	+ 45,6	No	–	70	1,04	6	–
Hydrogen sulfide	H_2S	3.2	Liquefied.	– 60,2	+ 100,4	Yes	–	55	0,67	5	Not to be used with fine silver, copper and copper alloys.
Silicon hydride	SiH_4	2.2	Compressed.	– 111,4	– 3,5	Yes	–	225	0,32	1	–
Nitrogen	N_2	1.1	Compressed.	– 195,8	– 146,9	No	200	300	–	10	–
Nitrous oxide	NO	1.1	Compressed.	– 151,8	– 92,9	No	50	225	–	8	–
Dinitrogen tetroxide	N_2O_4	3.1	Liquefied.	+ 21,1	+ 158,2	No	–	10	1,30	8	Not to be used with steel. Valve to be kept free from oil and grease.

Table B.1 (continued).

1	2	3	4	5	6	7	8	9	10	11	12
Name of gas	Chemical symbol	Gas group as in TRG 101	State (as in the Gefährdungsbeurteilung)	Boiling point at 1013 mbar (absolute), in °C	Critical temperature, in °C	Flammable (Yes/No)	Maximum permissible filling pressure at 15 °C, P_{15} , in bar	Minimum test pressure for cylinders, in bar	Filling factor, in kg/l	Outlet No.	Safety notes
Nitrogen trifluoride	NF ₃	1.1	–	– 129,0	– 39,3	No	165	297	–	8	–
Tetrafluoromethane (R 14)	CF ₄	1.1	Compressed.	– 128	– 45,7	No	185	300	–	6	–
Trans-2-butylene	C ₄ H ₈	3.2	Liquefied.	+ 0,9	+ 155,5	Yes	–	10	0,54	1	
Trifluoroacetyl chloride	CF ₃ COCl	3.1	Liquefied.	– 24,8	(+ 109)	No	–	17	1,15	8	–
1,1,1-trifluoroethane (R 143a)	CH ₃ CF ₃	3.2	Liquefied.	– 47,6	+ 73,1	Yes	–	35	0,73	1	–
Trifluoromethane (R 23)	CHF ₃	2.1	Liquefied.	– 82,2	+ 26,0	No	–	190 250	0,87 0,95	6	–
3,3,3-trifluoro-1-propene (TFP)	CF ₃ CHCH ₂	3.2	–	– 30	(+ 107)	Yes	–	19	0,85	1	–
Trimethylamine	(CH ₃) ₃ N	3.2	Liquefied.	+ 2,9	+ 160,2	Yes	–	10	0,56	1	Not to be used with copper and copper alloys.
Trimethylsilane	(CH ₃) ₃ SiH	3.2	Liquefied.	+ 6,7	(+ 155)	Yes	–	225	0,39	1	–
Vinyl bromide (R 1140B1)	C ₂ H ₃ Br	3.3	Liquefied.	+ 15,7	+ 198	Yes	–	10	1,37	1	–
Vinyl chloride (R 1140)	C ₂ H ₃ Cl	3.3	Liquefied.	– 13,7	+ 156,5	Yes	–	12	0,81	1	–

Table B.1 (concluded).

1	2	3	4	5	6	7	8	9	10	11	12
Name of gas	Chemical symbol	Gas group as in TRG 101	State (as in the Gefahrgutverordnung)	Boiling point at 1013 mbar (absolute), in °C	Critical temperature, in °C	Flammable (Yes/No)	Maximum permissible filling pressure at 15°C, P_{15} , in bar	Minimum test pressure for cylinders, in bar	Filling factor, in kg/l	Outlet No.	Safety notes
Vinyl fluoride (R 1141)	C_2H_3F	2.3	Liquefied.	– 72,2	+ 54,7	Yes	–	250	0,64	1	–
Vinyl-methyl ether	C_3H_6O	3.3	Liquefied.	+ 6	+ 200	Yes	–	10	0,67	1	–
Hydrogen	H_2	1.2	Compressed.	– 252,8	– 239,9	Yes	200	300	–	1	–
Tungsten hexafluoride	WF_6	3.1	Liquefied.	+ 17,1	+ 170,0	No	–	10	2,70	8	–
Xenon	Xe	2.1	Liquefied.	– 108,1	+ 16,6	No	–	130	1,24	6	–

Standards and other documents referred to

DIN 13 Part 6	ISO metric screw threads; 1,5 mm fine pitch threads with diameters from 12 mm to 300 mm; nominal sizes
DIN 13 Part 7	ISO metric screw threads; 2 mm fine pitch threads with diameters from 17 mm to 300 mm; nominal sizes
DIN 477 Part 6	Gas cylinder valves rated for test pressures up to 300 bar and up to 450 bar, with parallel thread valve stem for use with breathing apparatus; overall dimensions and screw threads
DIN 477 Part 7	Gas cylinder valves; taper threads and thread gauges
DIN 477 Part 8	Gas cylinder valves; outlets for medical gas cylinders up to 3 l capacity (pin system)
DIN 477 Part 9	(at present at the stage of draft) Gas cylinder valves for high purity gases; sizes, outlets and screw threads
DIN 3174 Part 1	Breathing apparatus; cylinder valves for compressed oxygen
DIN 4661 Part 1	Pressurized gas cylinders; welded steel cylinders rated for test pressures of 30 bar
DIN 4674 Part 1	Handwheels for gas cylinder valves
DIN 7168 Part 1	General tolerances; linear and angular dimensions
DIN 8542	Hose connections and hose couplers for equipment for welding, cutting and allied processes
DIN 53 505	Testing of rubber, elastomers and plastics; Shore hardness testing A and D
ISO 228-1 : 1982	Pipe threads where pressure-tight joints are not made on threads; designation, dimensions and tolerances

Druckbehälterverordnung

Gefahrgutverordnung

TRG *) 101	<i>Druckgase</i> (Compressed gases)
TRG *) 102	<i>Druckgase; Gasgemische</i> (Compressed gases; gas mixtures)
TRG *) 253	<i>Allgemeine Anforderungen an Druckgasbehälter, Ausrüstung und Absperrrichtungen</i> (General requirements for compressed gas cylinders, fittings and shutoff valves)
TRG *) 605	<i>Ergänzende Bestimmungen für Ausrüstungsteile von Druckgasbehältern</i> (Supplementary requirements for compressed gas cylinders)
TRG *) 770	Appendix 1. <i>Prüfen der Baumuster; Spindelventile für Gasflaschen</i> (Type testing of screwed stem valves for gas cylinders)
BS 84 : 1956	Parallel screw threads of Whitworth form

Previous editions

DIN 4672 and DIN 4673: 01.44; DIN 4813: 06.38, 08.54; DIN 1909: 04.25; DIN 8547: 06.53; DIN 477: 04.22, 01.33, 01.44; DIN 477 Part 3: 11.63; DIN 477 Part 5: 11.72; DIN 477 Part 1: 11.63, 09.79, 02.90.

Amendments

The following amendments have been made to the September 1979 and February 1990 editions and to the November 1963 edition of DIN 477 Part 3.

- Methylacetylene/propadiene mixtures have been included in table 3 for the first time.
- For type D valves with $d_3 = 30$ mm, outlet No. 15 is now specified.
- Outlet No. 6 instead of outlet No. 8 is now to be used with gases R 115 and R 14.
- In table A.1, thread size M 24 × 2 LH has been specified for outlet No. 3.
- The list of permissible gases in Appendix B has been adopted from DIN 477 Part 3, and the specifications given in tables 2 and 3 harmonized with this appendix.
- Outlet No. 5 is now also to be used with dichlorosilane and methyl mercaptan.
- High-purity gas valve outlets are now dealt with in DIN 477 Part 9.

Explanatory notes

This standard has been prepared by the NDG Technical Committee *Gasflaschenventile*.

International Patent Classification

F 17 C 13/04

F 16 K 1/30

G 01 B

G 01 M

*) TRG: Codes of practice for compressed gases; obtainable from *Beuth Verlag GmbH*, Burggrafenstraße 6, D-1000 Berlin 30.