INTERNATIONAL STANDARD

ISO 407

Third edition
2004-11-01

Small medical gas cylinders — Pin-index yoke-type valve connections

Petites bouteilles à gaz médicaux — Raccords de robinets du type à étrier avec ergots de sécurité

Reference number
ISO 407:2004(E)

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Published in Switzerland

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 407 was prepared by Technical Committee ISO/TC 58, *Gas cylinders*, Subcommittee SC 2, *Cylinder fittings*.

This third edition cancels and replaces the second edition (ISO 407:1991), which has been technically revised.

Small medical gas cylinders — Pin-index yoke-type valve connections

1 Scope

This International Standard concerns pin-index yoke-type valve connections for small medical gas cylinders, with a maximum working pressure (filling pressure at 15 °C) of 200 bar. This type of connection is typically used for small cylinders (5 l or below). In some cases, it may be used for larger cylinders. In this latter case, consideration shall be given to the need for valve protection.

It specifies:

— basic dimensions;

— requirements for alternative designs of the yoke-type valve connections;

— dimensions and positions for the holes and pins for the outlet connections.

It also specifies the dimensions and positions for the holes and pins for the outlet connections for the gases and gas mixtures given in Table 1.

This International Standard applies to small medical gas cylinders used for patient care, including therapeutic, diagnostic and prophylactic applications, in hospitals and for emergency treatment.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 32:1977, *Gas cylinders for medical use — Marking for identification of content*

3 Valve

Each small medical gas cylinder can be fitted with a yoke valve (see Clause 5). The yoke valve shall have location holes of the dimensions and in the positions indicated in Clause 7 for the appropriate gas or gas mixture.

The name or chemical symbol of the gas or gas mixture shall be clearly and indelibly stamped on the valve.

Table 1 — Allocated gases and gas mixtures

Gas or gas mixture	Chemical symbol
Oxygen	O_2
Oxygen/carbon dioxide ($CO_2 \leqslant 7$ %)	$O_2 + CO_2$,
Oxygen/helium (He $\leqslant$ 80 %)	$O_2 + He$
Ethylene	C_2H_4
Nitrous oxide (with and without draw-off)	N_2O
Cyclopropane	C_3H_6
Helium and helium/oxygen ($O_2 < 20$ %)	He
Carbon dioxide (with and without draw-off) and carbon dioxide/oxygen $CO_2 > 7$ %)	CO_2
Medical air	Air
Nominal mixture 50 % oxygen/50 % nitrous oxide (47,5 % < N_2O < 52,5 %)	$O_2 + N_2O$
Nitrogen	N_2
Mixture of air, helium and carbon monoxide (CO < 1 %)	Air + He + CO

4 Yoke

The connecting yoke shall conform to the requirements and dimensions given in Clauses 5 and 6. The yoke shall be fitted with pins, the dimensions and the positions of which correspond to the holes in the valve as indicated in Clause 7 for the appropriate gas or gas mixture.

The name or chemical symbol of the gas or gas mixture shall be clearly and indelibly stamped on the yoke. If an identification colour is used, it shall be in conformity with ISO 32.

Examples of the alternative designs for the connecting yoke are given in 6.2.

In Figures 3 and 4, the circled numbers and letters are the pin-hole positions.

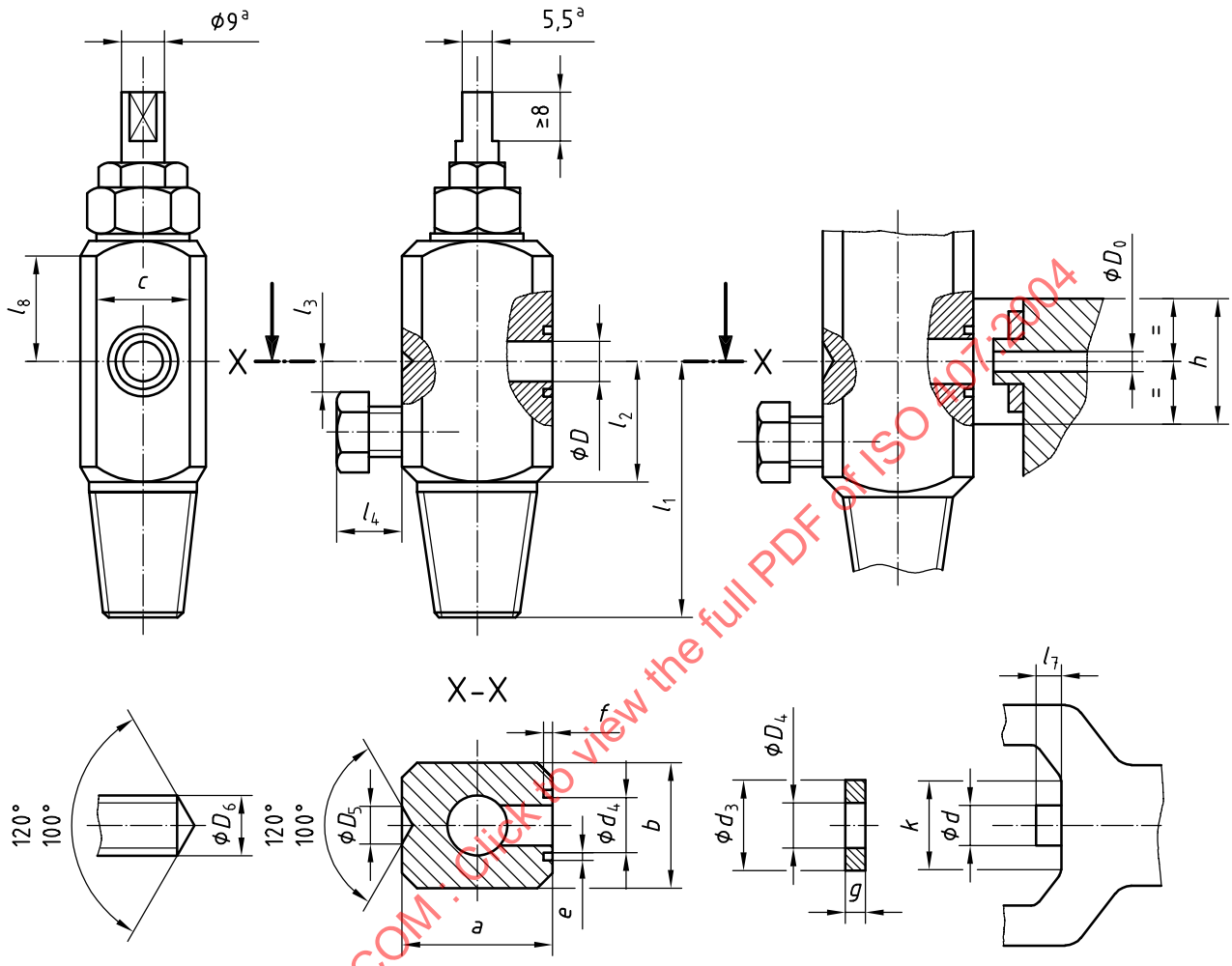
5 Basic dimensions

5.1 General

The basic dimensions for pin-index yoke-type valve connections are shown in Figures 1 to 4, and are listed in Table 2.

5.2 Pin-index yoke-type valve body

Dimensions in millimetres



a Applicable only to single-key valves.

Figure 1 — Pin-index yoke-type valve body

5.3 Single-pin yoke-type valve connection system

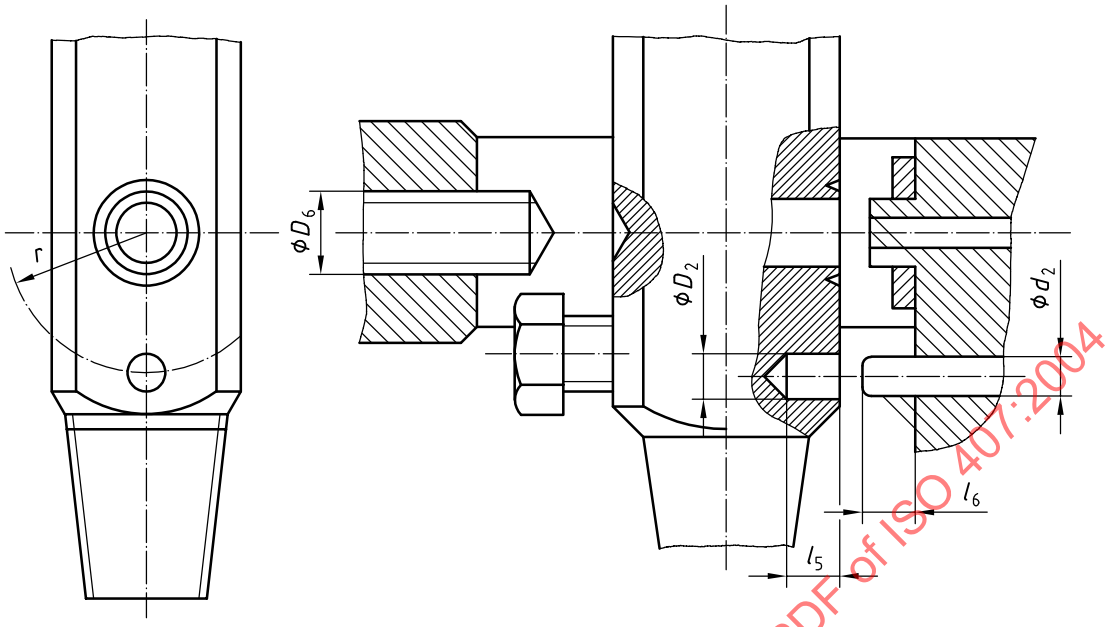


Figure 2 — Single-pin yoke-type valve connection system

5.4 Two-pin yoke-type valve connection system with the pins in a single row

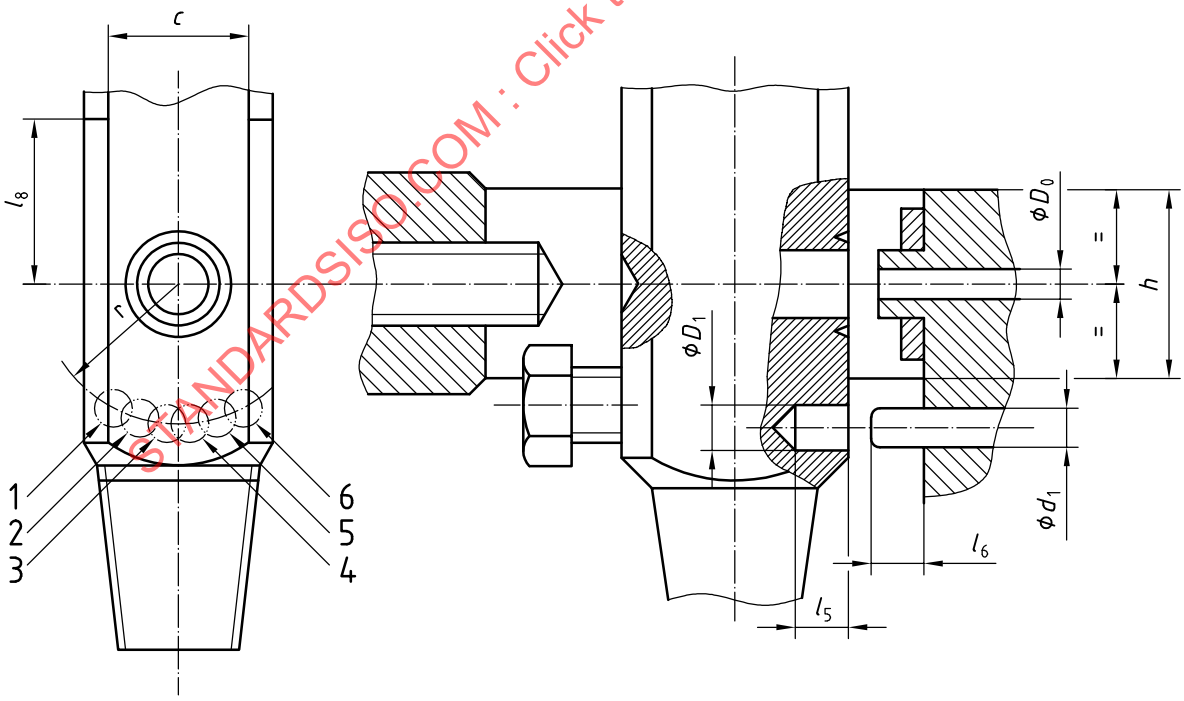


Figure 3 — Two-pin yoke-type valve connection system with the pins in a single row

5.5 Two-pin yoke-type valve connection system with the pins in a double row

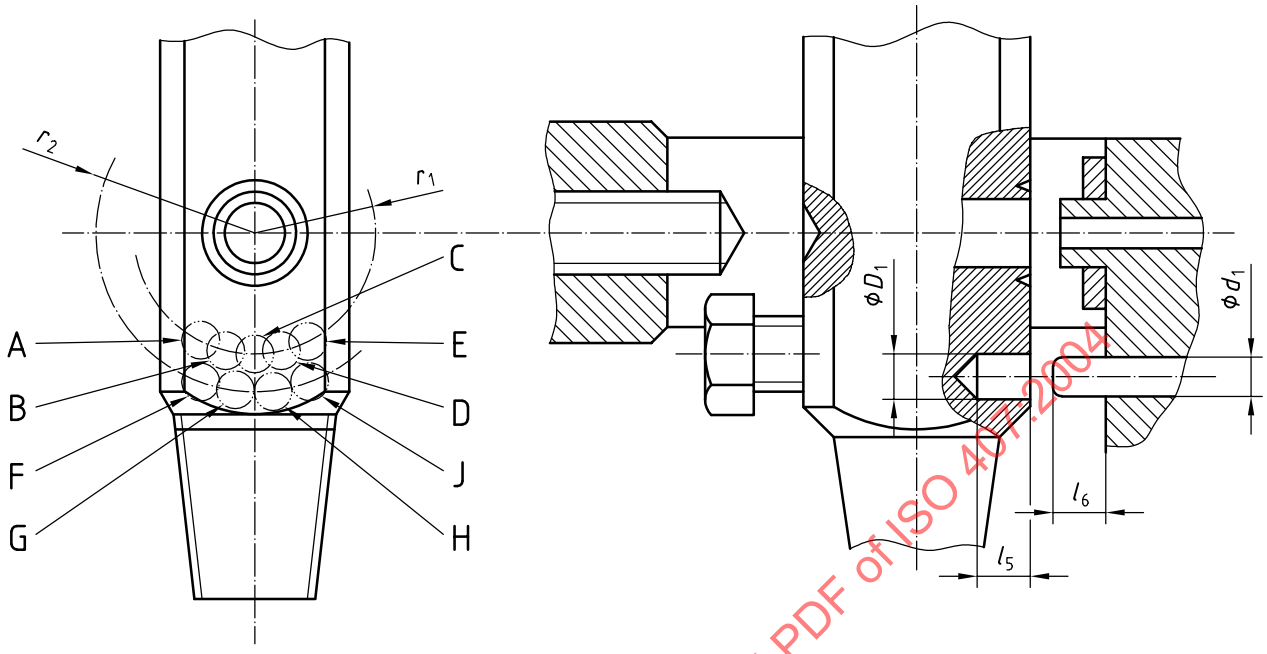


Figure 4 — Two-pin yoke-type valve connection system with the pins in a double row

5.6 Basic dimensions

See Table 2.

Table 2 — Basic dimensions for pin-index yoke-type valve connections

Dimension	mm	Dimension	mm
a	$25^{+0,8}_{-0,2}$	e	0,8 max
b	$22,2^{+0,4}_{-0}$	f	0,8 max
c	16 min	g	1,6 ± 0,4
D	$7^{+0,2}_{-0}$	h [a]	20 ± 0,5
D_0	2,4 ± 0,8	k	16,5 min
D_1	$4,75^{+0,1}_{-0}$	l_1	44,5 min
D_2	5,8 to 5,9	l_2	22 min
D_4	$6,3^{\ 0}_{-0,2}$	l_3 [b]	8 min
D_5	$6^{\ 0}_{-0,5}$	l_4 [b]	9,6 max
D_6 [c]	7 min	l_5	$5,5^{+0,5}_{\ 0}$
d	$6,5^{\ 0}_{-0,2}$	l_6	$5,5^{\ 0}_{-0,5}$
d_1	4 ± 0,1	l_7	3 to 3,6
d_2	$5,4^{\ 0}_{-0,1}$	l_8 [d]	15 min
d_3	16 ± 0,5	r	14,3 nom.
d_4	9 ± 0,2	r_1	12 nom.
		r_2	17,5 nom.

[a] Dimensions h and q, q_1 (see Clause 6). As an alternative, these dimensions may be given in order to satisfy the requirements of 6.1 g).

[b] Applicable only if a projecting-type safety plug is used.

[c] Dimension D_6 is the dimension at the top of the cone.

[d] This dimension is very important.

6 Requirements for alternative designs of yoke-type valve connections

6.1 Requirements for the design of the connecting yoke

The design of the connecting yoke shall meet the following requirements.

a) A gas-tight seal shall only be possible when the pins in the yoke correspond to the holes in the valve;

b) when the pins in the yoke do not correspond to the holes in the valve, a gas-tight seal shall not be possible and damage to the yoke or the valve shall be prevented;

c) pins shall be fixed or assembled in such a manner that they cannot be removed by the user or become loose in service;

d) the sealing washer shall be a retained fit on the yoke spigot;

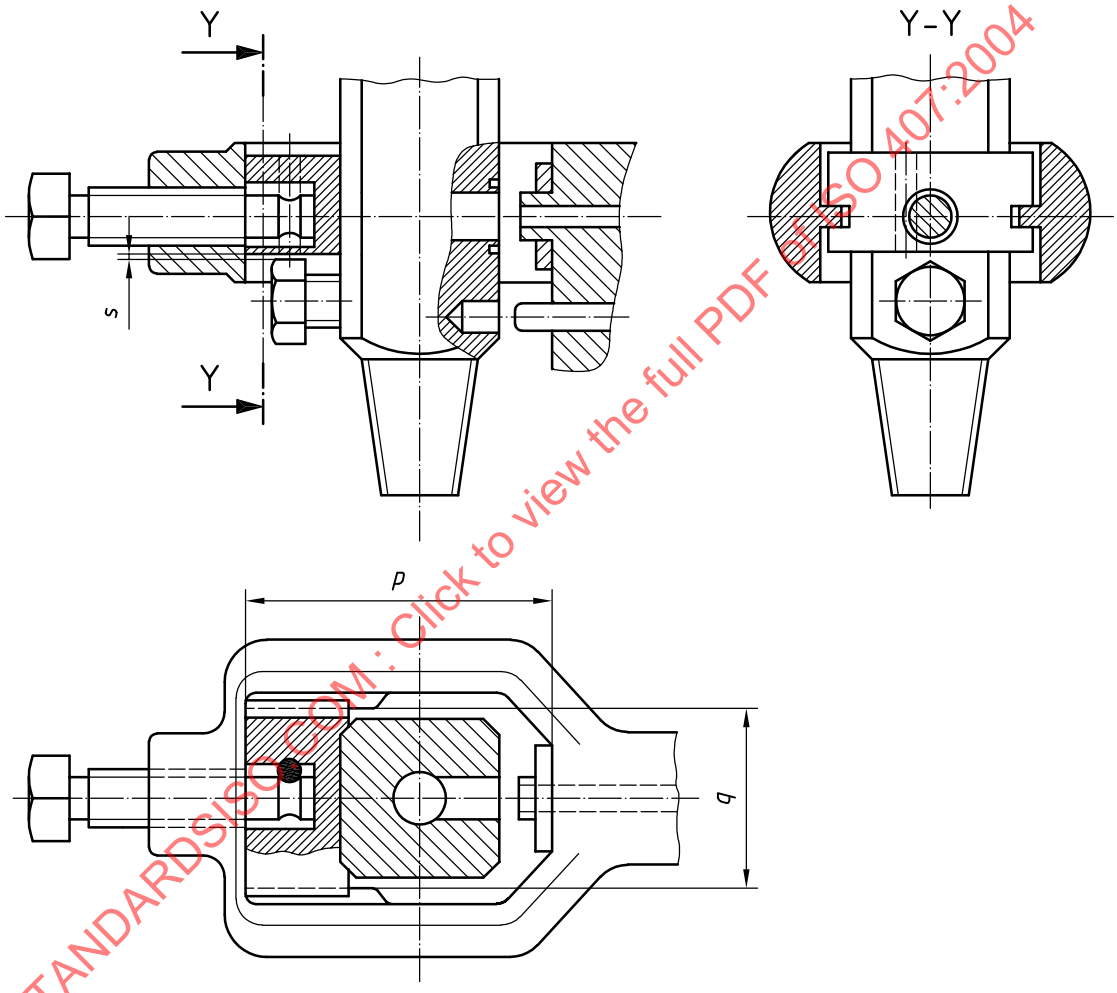
e) the use of more than one sealing washer is not permitted;

f) the yoke shall be able to resist, without permanent deformation, the load resulting from a torque of 50 N·m applied to the valve clamping screw or locking device;

g) the dimensions of the yoke shall limit the movement of the valve in the yoke to a maximum of 6° about the long axis prior to pin engagement.

6.2 Examples of alternative construction for the connecting yoke

Three alternative designs of pin-index yoke-type connections are shown in Figures 5 to 7.



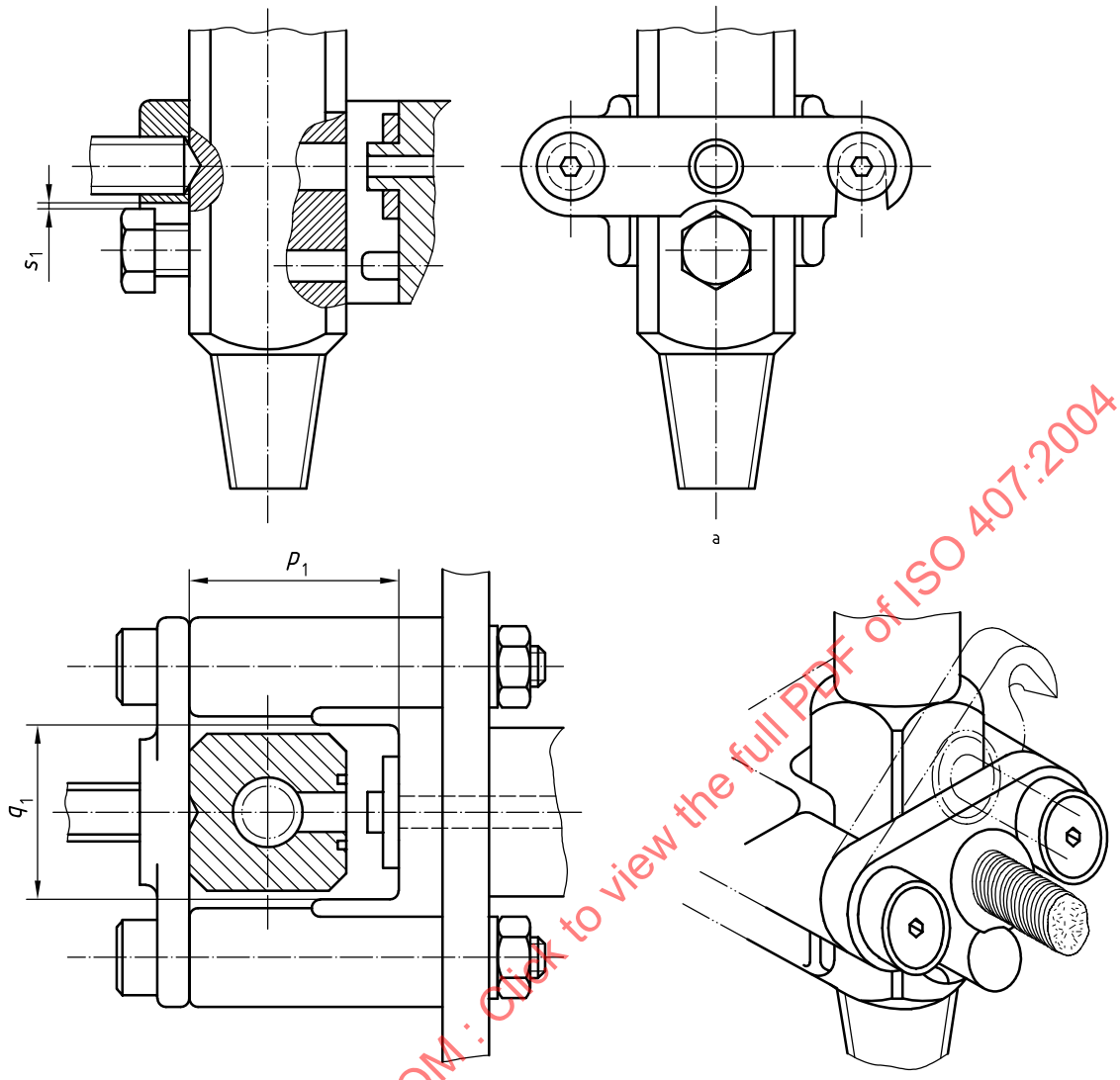
Dimension	mm
p [a]	44,5 max
q [b]	$24^{+0,50}_{0}$
s [c]	0,8 min

[a] May be reduced to 35 mm if clearance is provided for projecting-type safety plug.

[b] See the note for dimension h in Table 2.

[c] Applicable only if a projecting-type safety plug is used.

Figure 5 — First alternative



Dimension	mm
p_1	30,2 max
q_1 [a]	$24^{+0,50}_{0}$
s_1 [b]	0,8 min

[a] See the note for dimension h in Table 2.

[b] Applicable only if a projecting-type safety plug is used.

[a] View with clamping screw removed.

Figure 6 — Second alternative

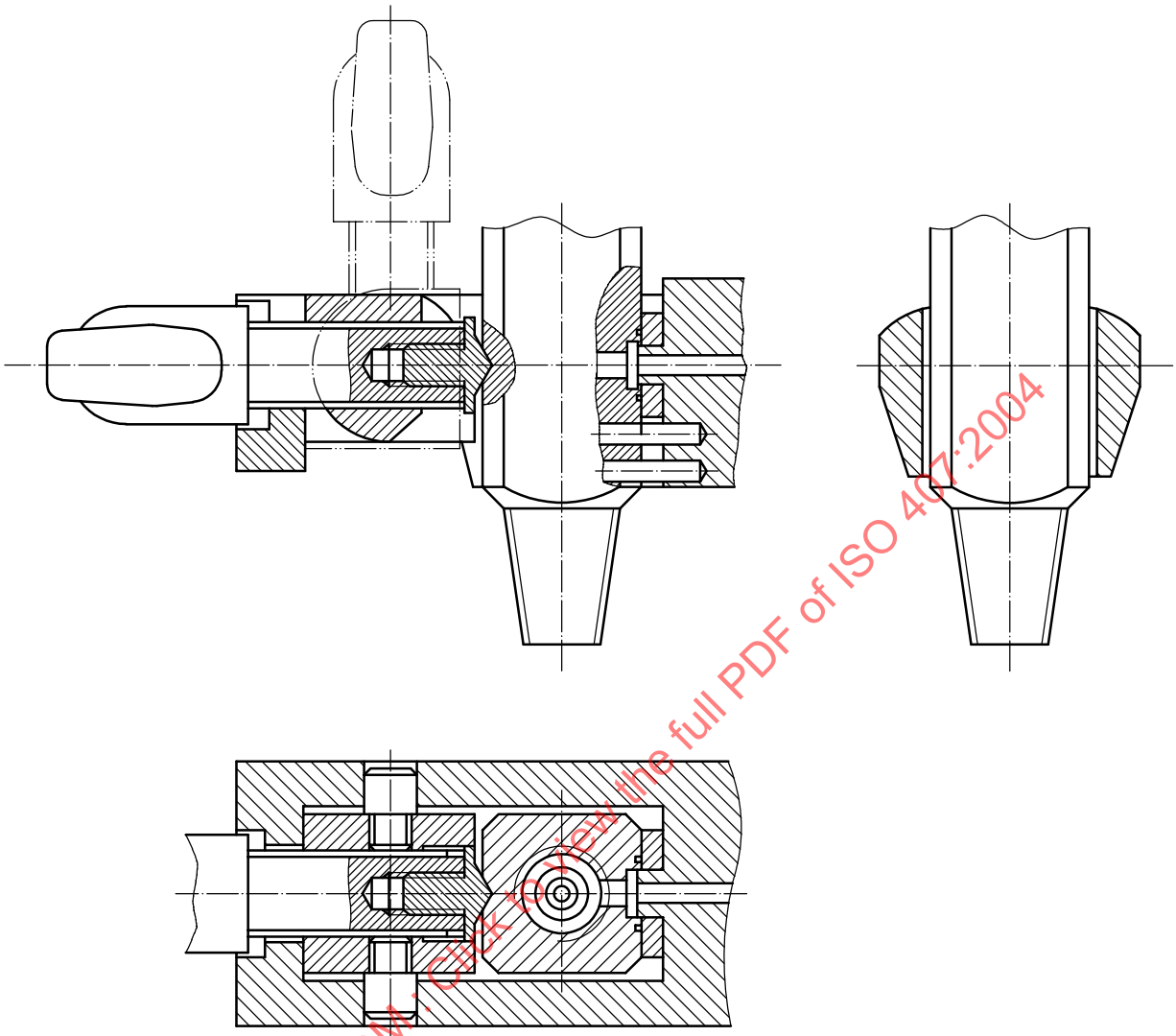


Figure 7 — Third alternative

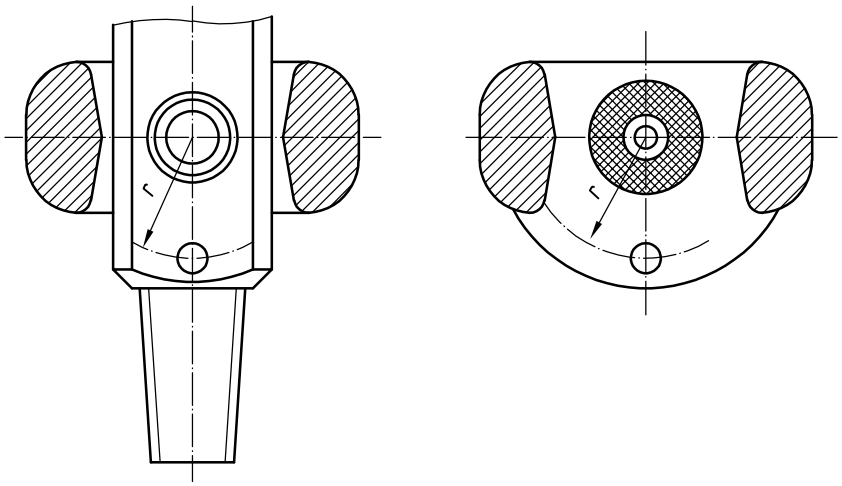
7 Dimensions and positions of the holes and pins for yoke-type valve connections

7.1 General

The dimensions and positions of the holes and pins for yoke-type valve connections are shown in Figures 8 to 18. In Figures 9 to 18, the circled numbers are the pin-hole positions.

7.2 Outlet connection with single-pin system

Outlet connection for a nominal mixture of 50 % oxygen/50 % nitrous oxide (47,5 % < N_2O < 52,5 %).

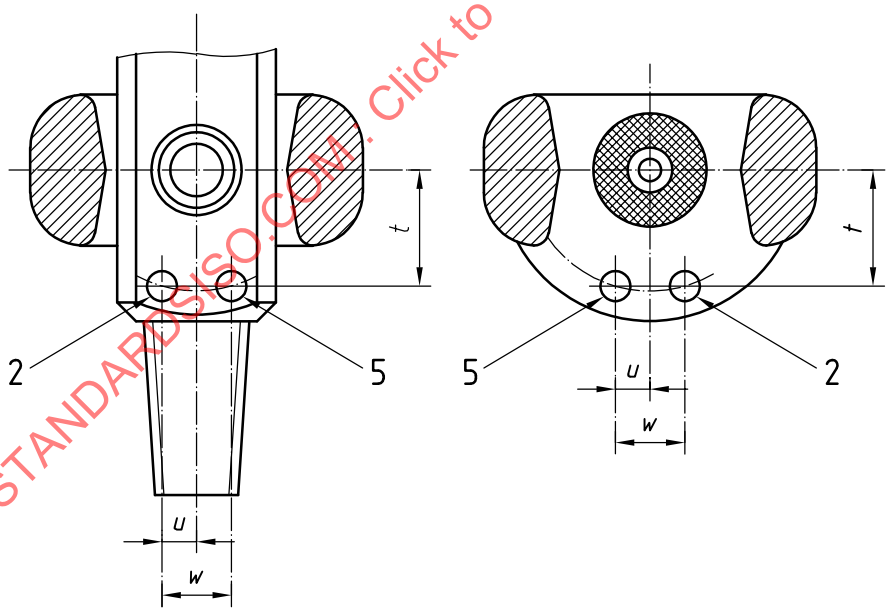


Dimension	mm
r	14,3 nom

Figure 8 — Outlet connection for a nominal mixture of 50 % oxygen/50 % nitrous oxide

7.3 Outlet connections with two-pin/single-row system

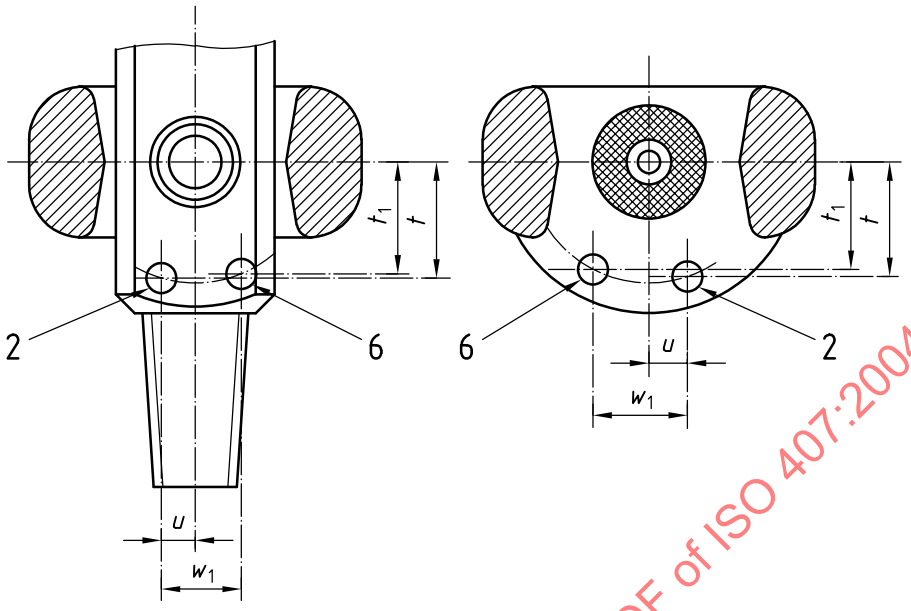
7.3.1 Outlet connection for oxygen



Dimension	mm
t	13,6 ± 0,07
u	4,4 ± 0,15
w	8,8 ± 0,07

Figure 9 — Outlet connection for oxygen

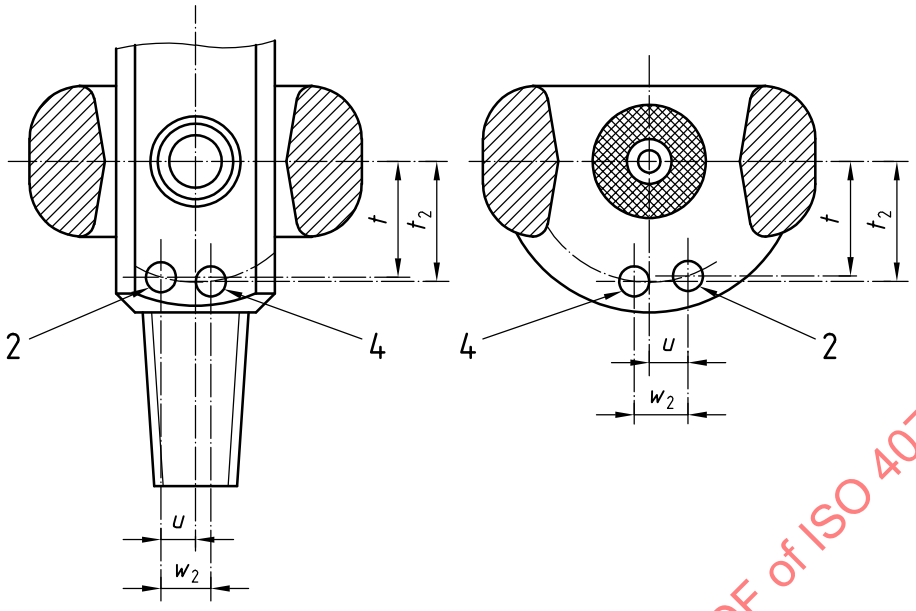
7.3.2 Outlet connection for oxygen/carbon dioxide mixture ($CO_2 \leqslant 7$ %)



Dimension	mm
t	13,6 ± 0,07
t_1	12,4 ± 0,07
u	4,4 ± 0,15
w_1	11,55 ± 0,07

Figure 10 — Outlet connection for oxygen/carbon dioxide mixture ($CO_2 \leqslant 7$ %)

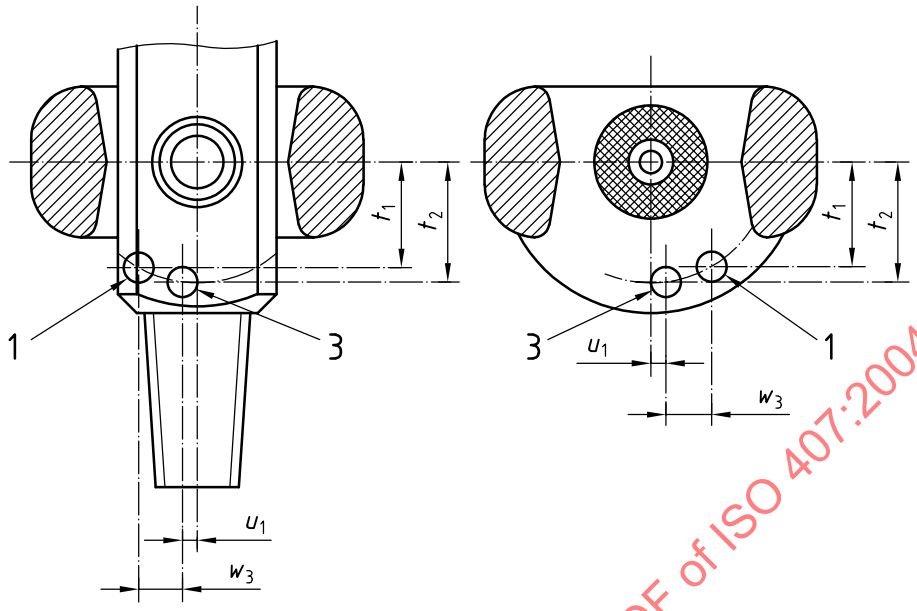
7.3.3 Outlet connection for oxygen/helium mixture (He ⩽ 80 %)



Dimension	mm
t	13,6 ± 0,07
t_2	14,2 ± 0,07
u	4,4 ± 0,15
w_2	5,9 ± 0,07

Figure 11 — Outlet connection for oxygen/helium mixture (He ⩽ 80 %)

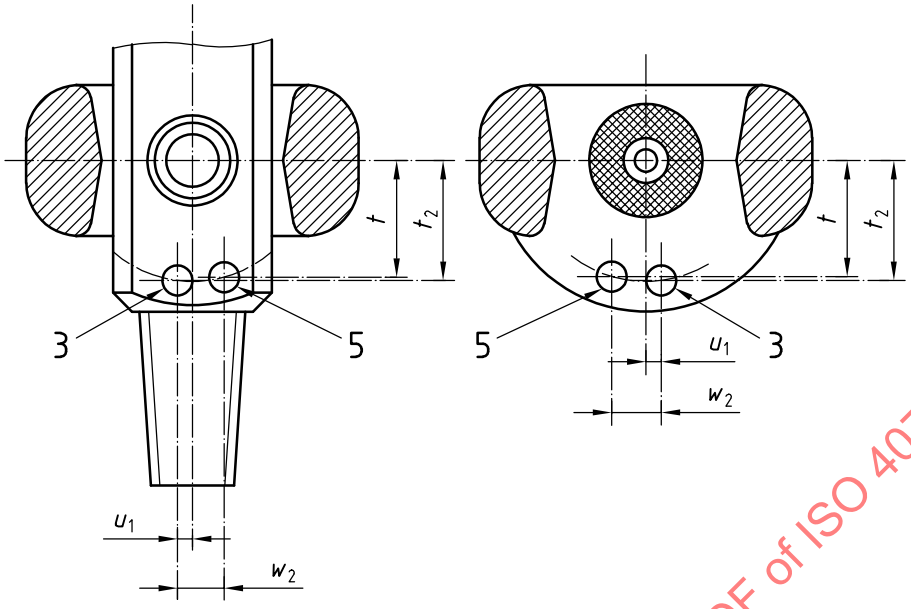
7.3.4 Outlet connection for ethylene



Dimension	mm
t_1	12,4 ± 0,07
t_2	14,2 ± 0,07
u_1	1,5 ± 0,15
w_3	5,65 ± 0,07

Figure 12 — Outlet connection for ethylene

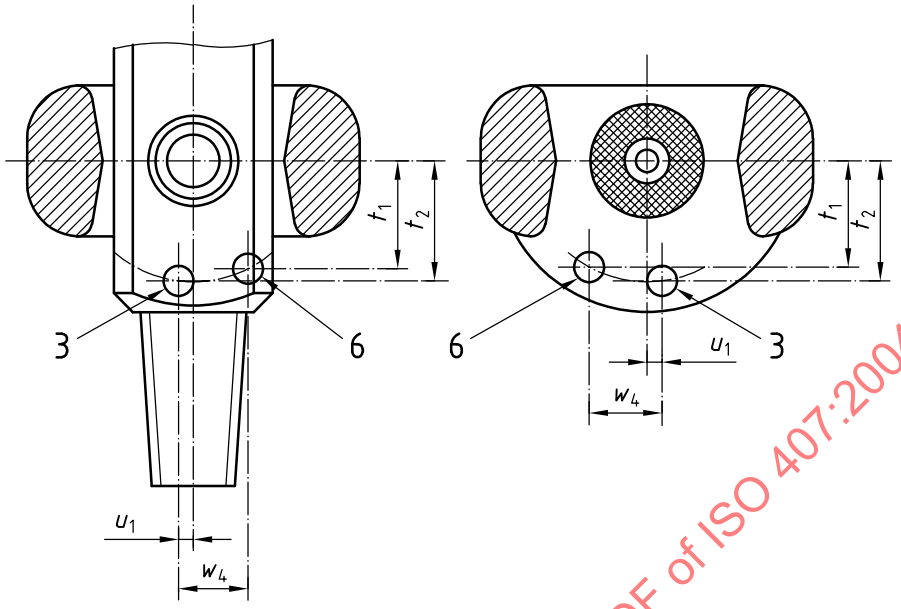
7.3.5 Outlet connection for nitrous oxide



Dimension	mm
t	13,6 ± 0,07
t_2	14,2 ± 0,07
u_1	1,5 ± 0,15
w_2	5,9 ± 0,07

Figure 13 — Outlet connection for nitrous oxide (with gas draw-off)

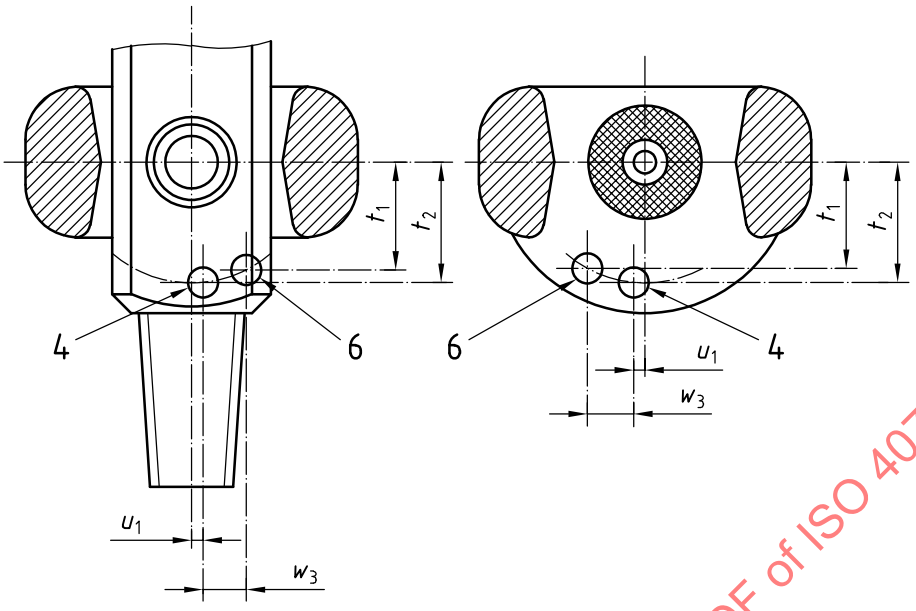
7.3.6 Outlet connection for cyclopropane



Dimension	mm
t_1	12,4 ± 0,07
t_2	14,2 ± 0,07
u_1	1,5 ± 0,15
w_4	8,65 ± 0,07

Figure 14 — Outlet connection for cyclopropane

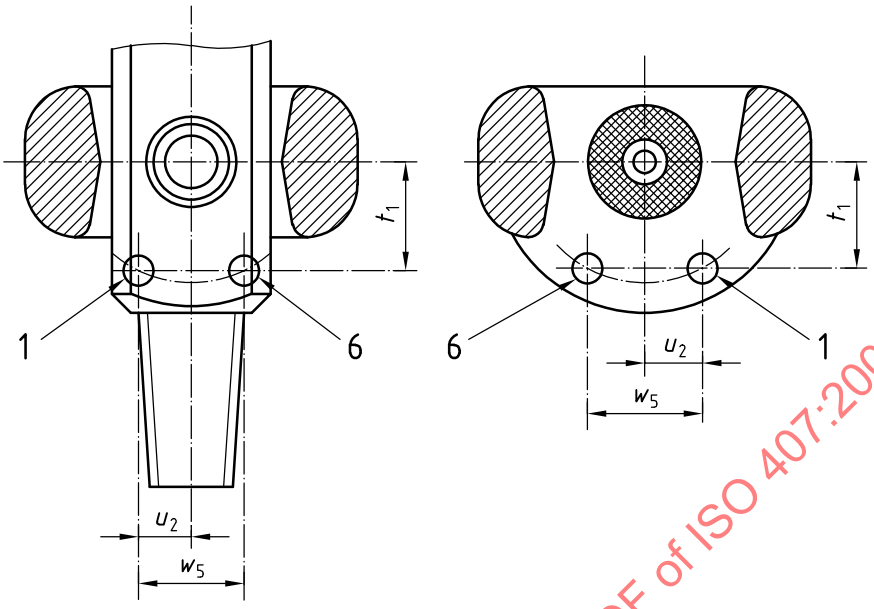
7.3.7 Outlet connection for helium/oxygen mixture (O_2 < 20 %)



Dimension	mm
t_1	12,4 ± 0,07
t_2	14,2 ± 0,07
u_1	1,5 ± 0,15
w_3	5,65 ± 0,07

Figure 15 — Outlet connection for helium/oxygen mixture (O_2 < 20 %)

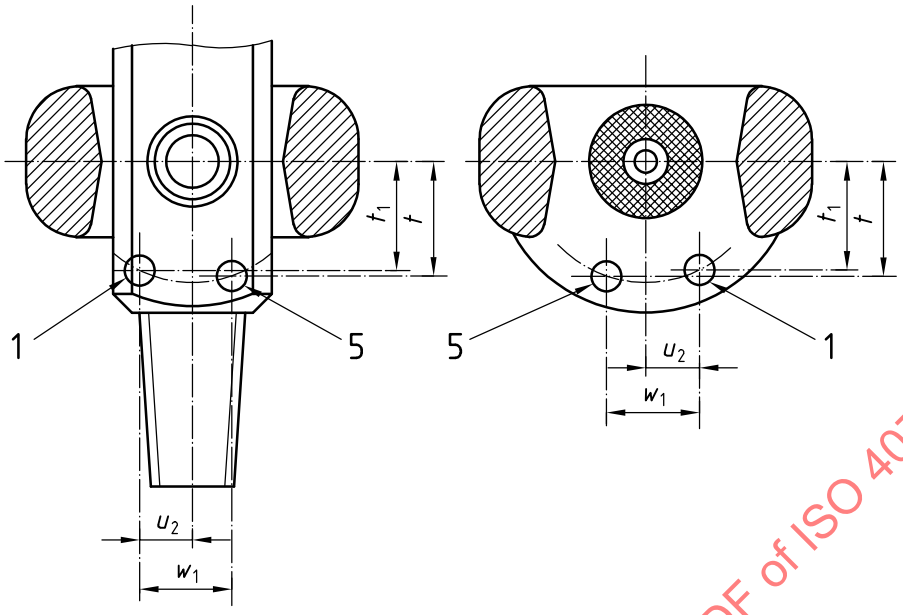
7.3.8 Outlet connection for carbon dioxide and carbon dioxide/oxygen mixture (CO_2 > 7 %)



Dimension	mm
t_1	12,4 ± 0,07
u_2	7,15 ± 0,15
w_5	14,3 ± 0,07

Figure 16 — Outlet connection for carbon dioxide and for carbon dioxide/oxygen mixture (CO_2 > 7 %) (gas draw-off)

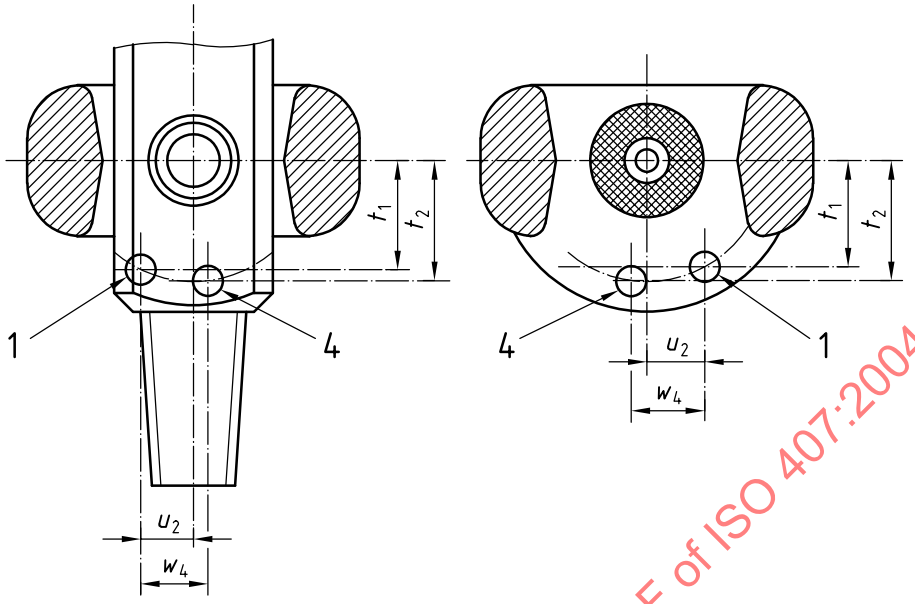
7.3.9 Outlet connection for medical air



Dimension	mm
t	13,6 ± 0,07
t_1	12,4 ± 0,07
u_2	7,15 ± 0,15
w_1	11,55 ± 0,07

Figure 17 — Outlet connection for medical air

7.3.10 Outlet connection for nitrogen



Dimension	mm
t_1	12,4 ± 0,07
t_2	14,2 ± 0,07
U_2	7,15 ± 0,15
w_4	8,65 ± 0,07

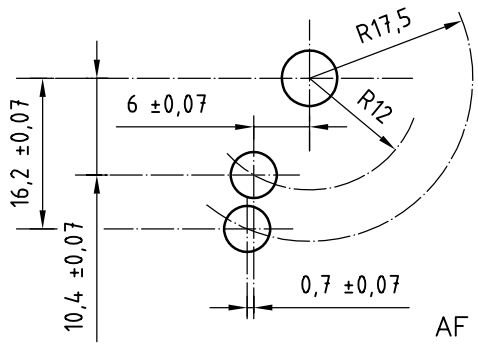
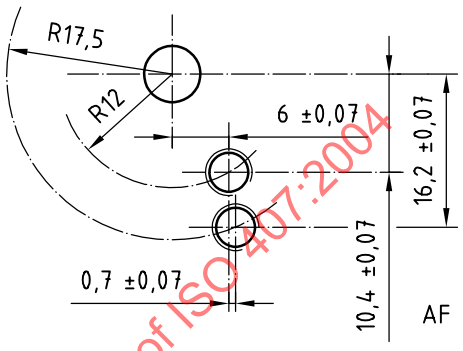
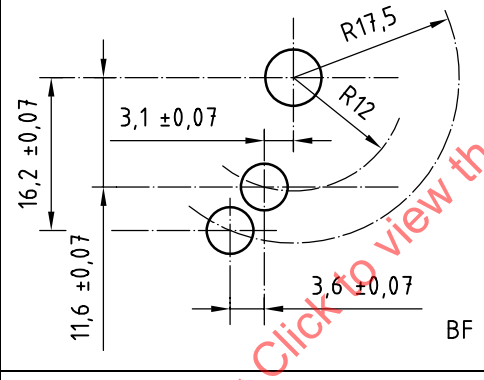
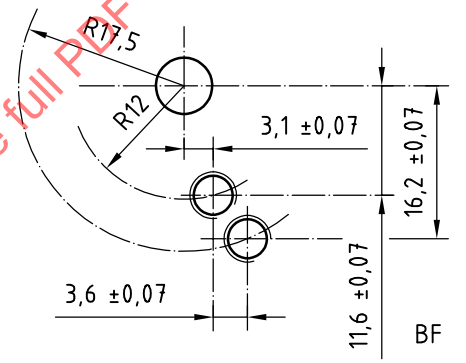
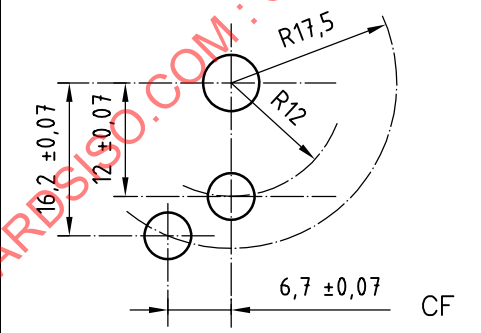
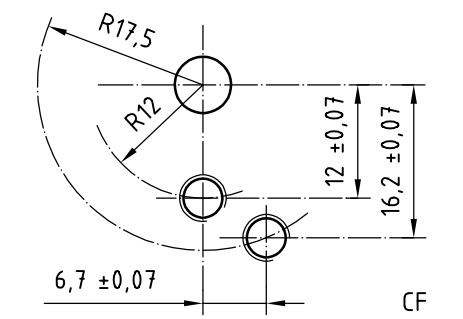
Figure 18 — Outlet connection for nitrogen

7.4 Outlet connection with two-pin/double-row system

See Table 3 in which the left-hand column includes, where appropriate, the allocated gas or gas mixture.

Table 3 — Outlet connection with two-pin/double-row system

Dimensions in millimetres

Gas	Holes in valve	Holes in yoke
A – F Mixture of air, He, CO: CO < 1 %		
B – F CO_2 with liquid draw-off		
C – F N_2O with liquid draw-off		
D – F Nitrogen/nitrogen monoxide (NO < 0,01 %) (NO < 100 ppm by volume)