

International Standard



407

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Small medical gas cylinders — Yoke-type valve connections

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

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 407 was developed by Technical Committee ISO/TC 58, *Gas cylinders*, and was circulated to the member bodies in October 1981.

It has been approved by the member bodies of the following countries:

Australia	India	Netherlands
Belgium	Israel	South Africa, Rep. of
Canada	Italy	Sweden
Czechoslovakia	Jamaica	Switzerland
Egypt, Arab Rep. of	Korea, Rep. of	USA
Germany, F.R.	Morocco	

The member bodies of the following countries expressed disapproval of the document on technical grounds:

France
United Kingdom

This International Standard cancels and replaces ISO Recommendation R 407-1964, of which it constitutes a technical revision.

Small medical gas cylinders — Yoke-type valve connections

0 Introduction

The field of application of this International Standard has now been extended, in comparison with ISO/R 407, to cover a system of two pins in a double row, thereby allowing inclusion of new gases and gas mixtures, which will be used for medical purposes in the future.

This International Standard may therefore later be extended to list such new gases and gas mixtures.

1 Scope and field of application

This International Standard concerns yoke-type valve connections for small medical gas cylinders, with a maximum filling pressure of 200 bar.

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 Valve

Each small medical gas cylinder shall be fitted with a yoke valve (see clause 4). The yoke valve shall have location holes of the dimensions and in the positions indicated in clause 6 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 mixtures	Chemical symbol
Oxygen	O ₂
Oxygen/carbon dioxide (CO ₂ < 7 %)	O ₂ + CO ₂
Oxygen/helium (He < 80 %)	O ₂ + He
Ethylene	C ₂ H ₄
Nitrous oxide	N ₂ O
Cyclopropane	C ₃ H ₆
Helium and helium/oxygen (O ₂ < 20 %)	He
Carbon dioxide and carbon dioxide/oxygen (CO ₂ > 7 %)	CO ₂
Medical air	Air
Nominal mixture 50 % oxygen/50 % nitrous oxide (47,5 % < N ₂ O < 52,5 %)	O ₂ + N ₂ O
Nitrogen	N ₂

3 Yoke

The connecting yoke shall conform to the requirements and dimensions given in clauses 4 and 5. 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 6 for the appropriate gas or gas mixture.

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

Examples of the alternative designs for the connecting yoke are given in 5.2.

NOTE — In figures 3, 4 and 9 to 18, the circled numbers and letters are the pin-hole positions.

4 Basic dimensions

The basic dimensions for yoke-type valve connections are shown in figures 1, 2, 3 and 4, and table 2.

4.1 Yoke-type valve connection

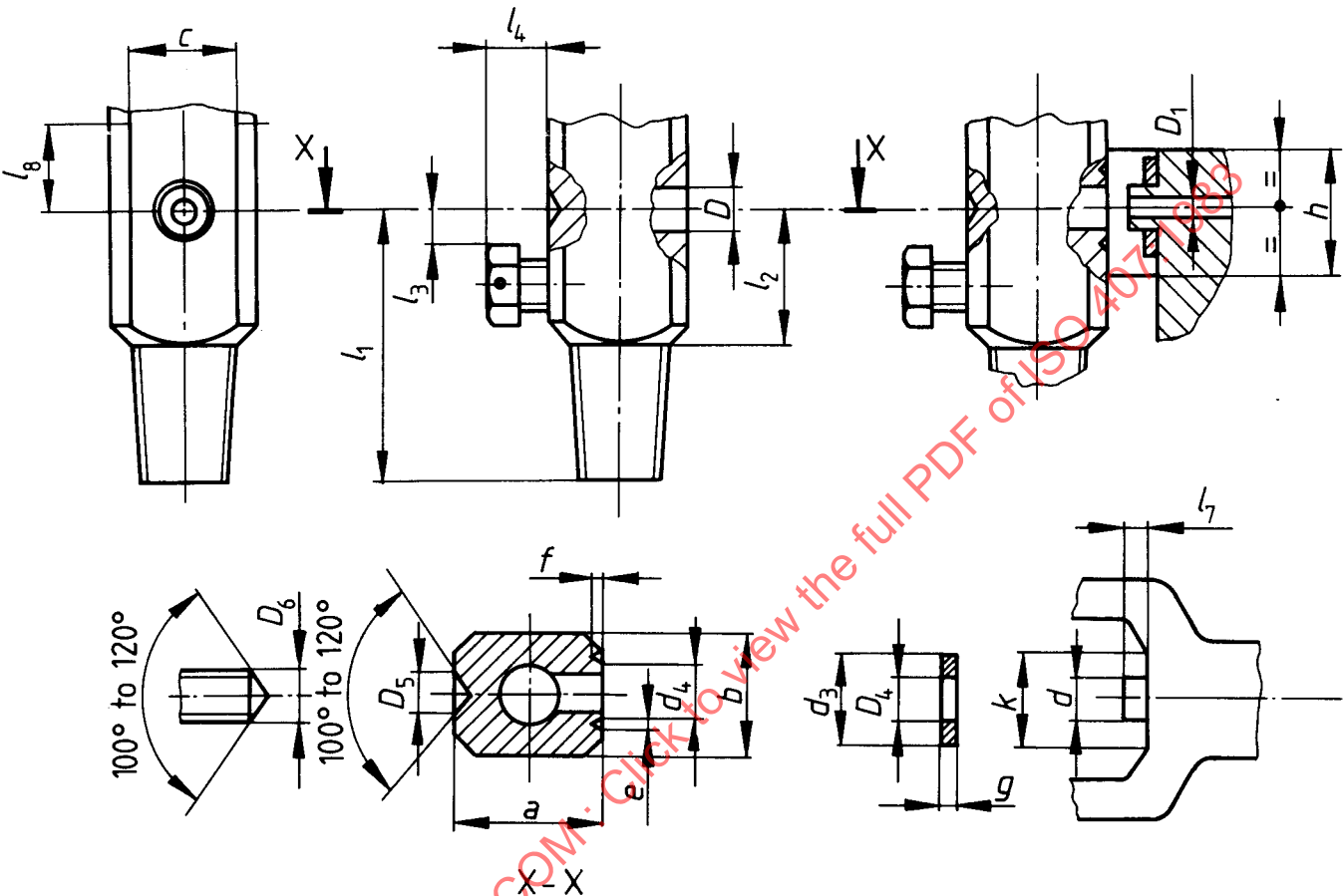


Figure 1 — Yoke-type valve connection

4.1.1 Single-pin system

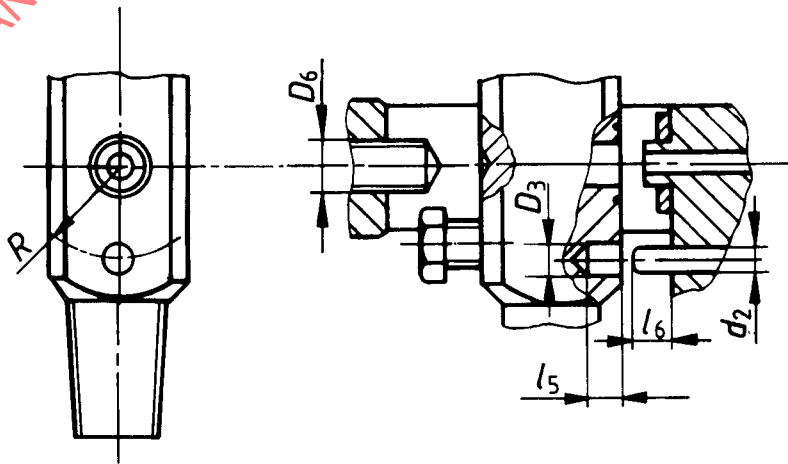


Figure 2 — Single-pin system

4.1.2 Two-pin system with the pins in a single row

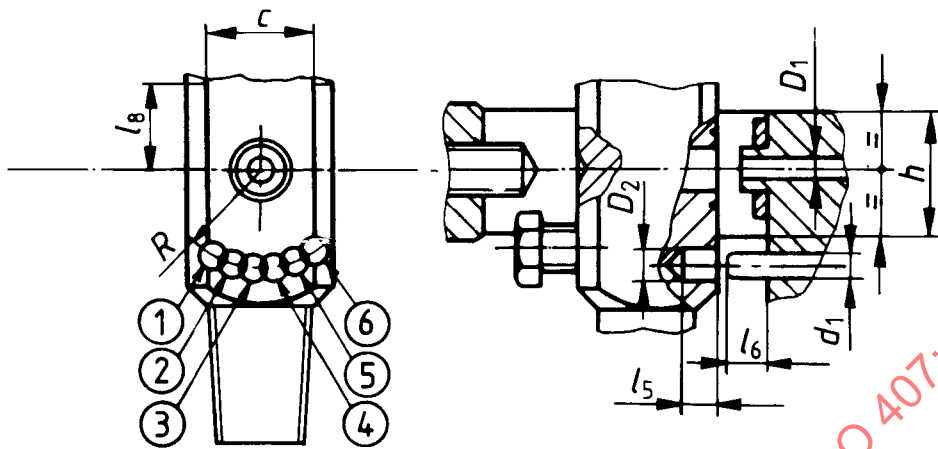


Figure 3 — Two-pin system with the pins in a single row

4.1.3 Two-pin system with the pins in a double row

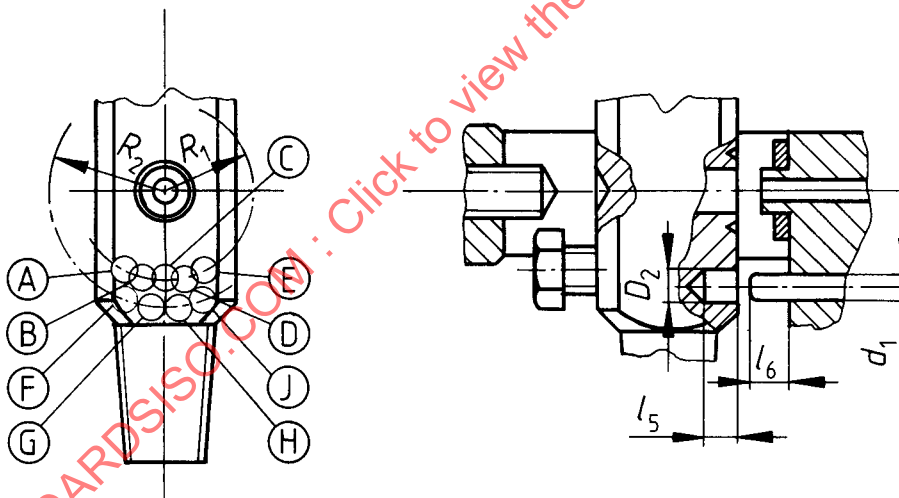


Figure 4 — Two-pin system with the pins in a double row

4.2 Table of basic dimensions

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

Dimension	mm	Dimension	mm
<i>a</i>	25 ^{+0,8} _{-0,2}	<i>e</i>	0,8 max.
<i>b</i>	22,2 ^{+0,4} ₀	<i>f</i>	0,8 max.
<i>c</i>	16 min.	<i>g</i>	1,6 ± 0,4
<i>D</i>	7 ^{+0,2} ₀	<i>h**</i>	20 ± 0,5
<i>D</i> ₁	2,4 ± 0,8	<i>k</i>	16,5 min.
<i>D</i> ₂	4,75 ^{+0,1} ₀	<i>l</i> ₁	44,5 min.
<i>D</i> ₃	5,8 to 5,9	<i>l</i> ₂	22 min.
<i>D</i> ₄	6,3 ⁰ _{-0,2}	<i>l</i> _{3***}	8 min.
<i>D</i> ₅	6 ⁰ _{-0,5}	<i>l</i> _{4***}	9,6 max.
<i>D</i> _{6*}	7 min.	<i>l</i> ₅	5,5 ^{+0,5} ₀
<i>d</i>	6,5 ⁰ _{-0,2}	<i>l</i> ₆	5,5 ⁰ _{-0,5}
<i>d</i> ₁	4 ± 0,1	<i>l</i> ₇	3,0 to 3,6
<i>d</i> ₂	5,4 ⁰ _{-0,1}	<i>l</i> ₈	15 min.
<i>d</i> ₃	16 ± 0,5	<i>R</i>	14,3 nom.
<i>d</i> ₄	9 ± 0,2	<i>R</i> ₁	12 nom.
		<i>R</i> ₂	17,5 nom.

• Dimension *D*₆ is the dimension at the top of the cone.

** Dimensions *h* and *q*, *q*₁ (see clause 5). As an alternative these dimensions may be varied so as to limit the rotation of the cylinder valve relative to the yoke to 6° about the vertical axis prior to pin engagement.

*** Applicable only if a projecting type safety plug is used.

5 Requirements for alternative designs of yoke-type valve connections

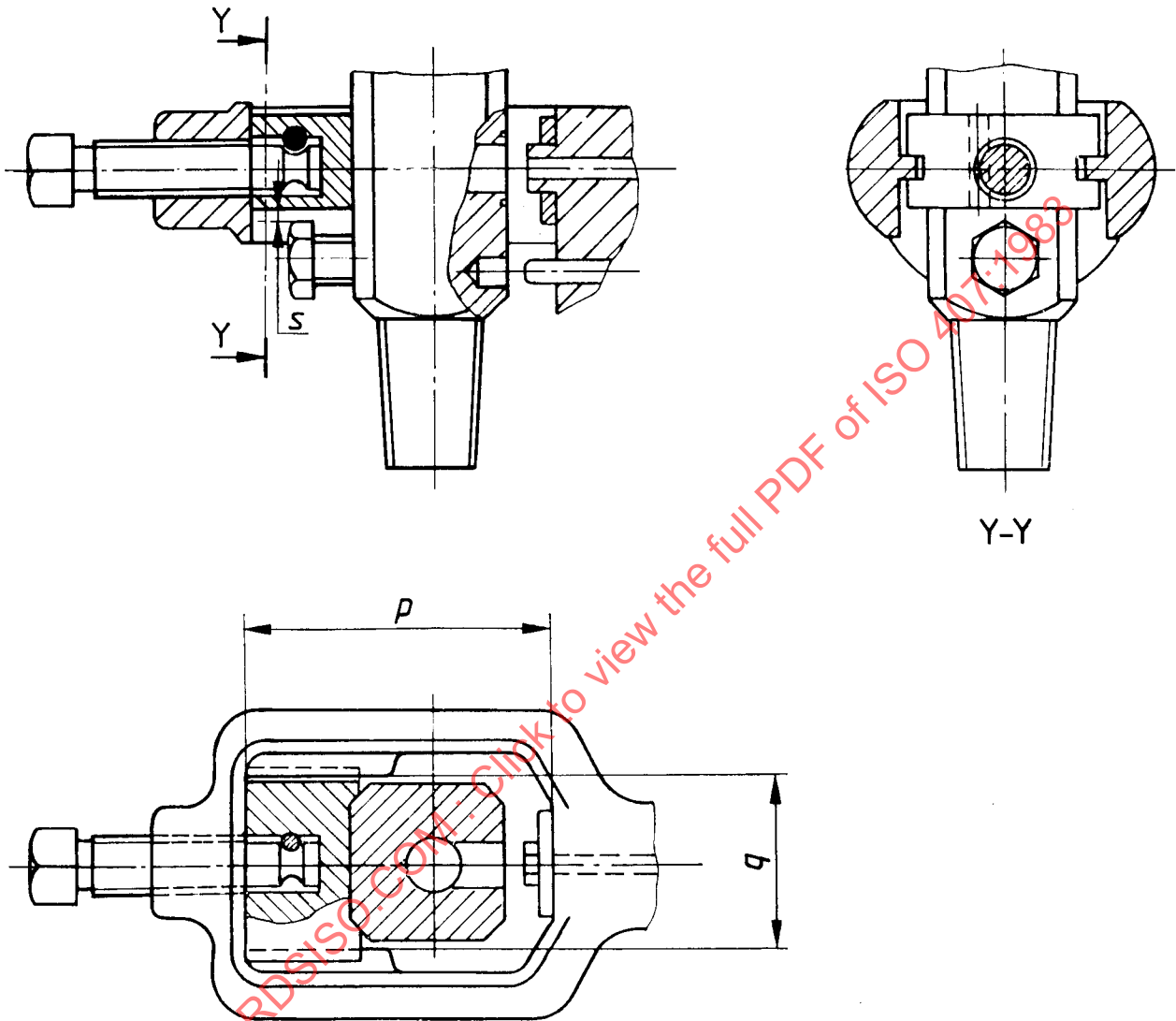
5.1 Requirements for the design of the connecting yoke

The design of the connection 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 not be removable or assembled in such a manner that they can 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 designed to accommodate a safety plug in the valve.
- g) 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.
- h) The dimensions of the yoke shall limit the movement of the valve in the yoke to a maximum of 6° about the vertical axis prior to pin engagement.

5.2 Examples of alternative construction for the connecting yoke

Three alternative designs of the pin-index yoke-type connections are shown in figures 5, 6 and 7.



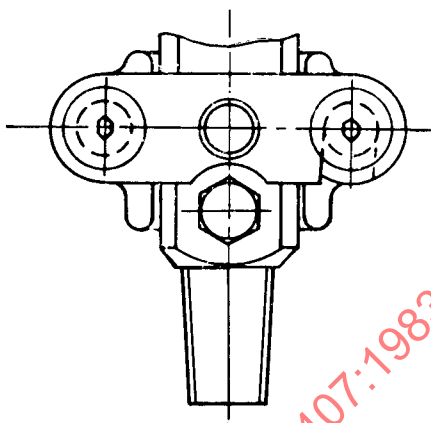
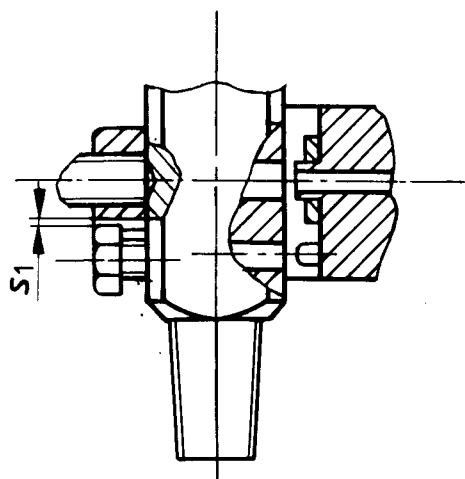
Dimension	mm
p^*	44,5 max.
q^{**}	24 max.
s^{***}	0,8 min.

* May be reduced to 35 mm if clearance is provided for projecting type safety plug.

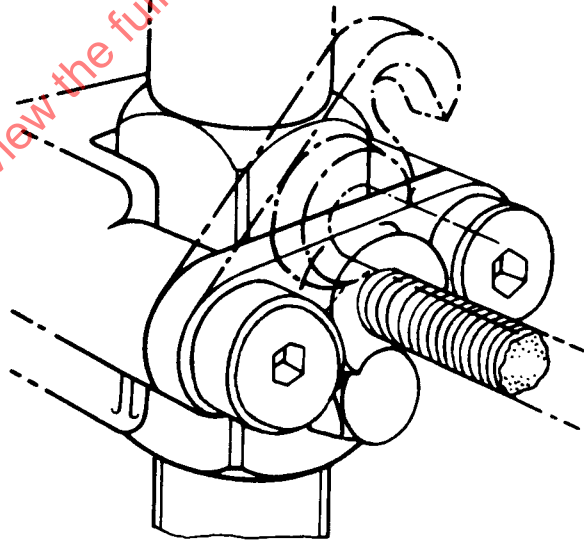
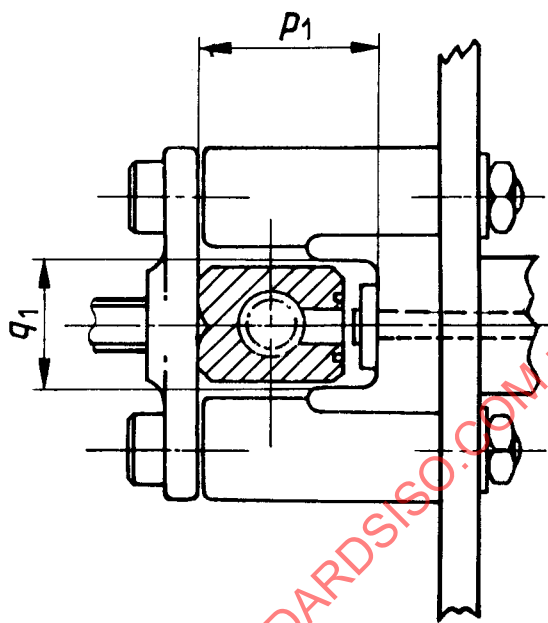
** See the note for dimension h in table 2.

*** Applicable only if a projecting type safety plug is used.

Figure 5 — First alternative



View with clamping screw removed



Dimension	mm
p_1	30,2 max.
q_1^*	23,0 max.
s_1^{**}	0,8 min.

* See the note for dimension h in table 2.

** Applicable only if a projecting type safety plug is used.

Figure 6 — Second alternative

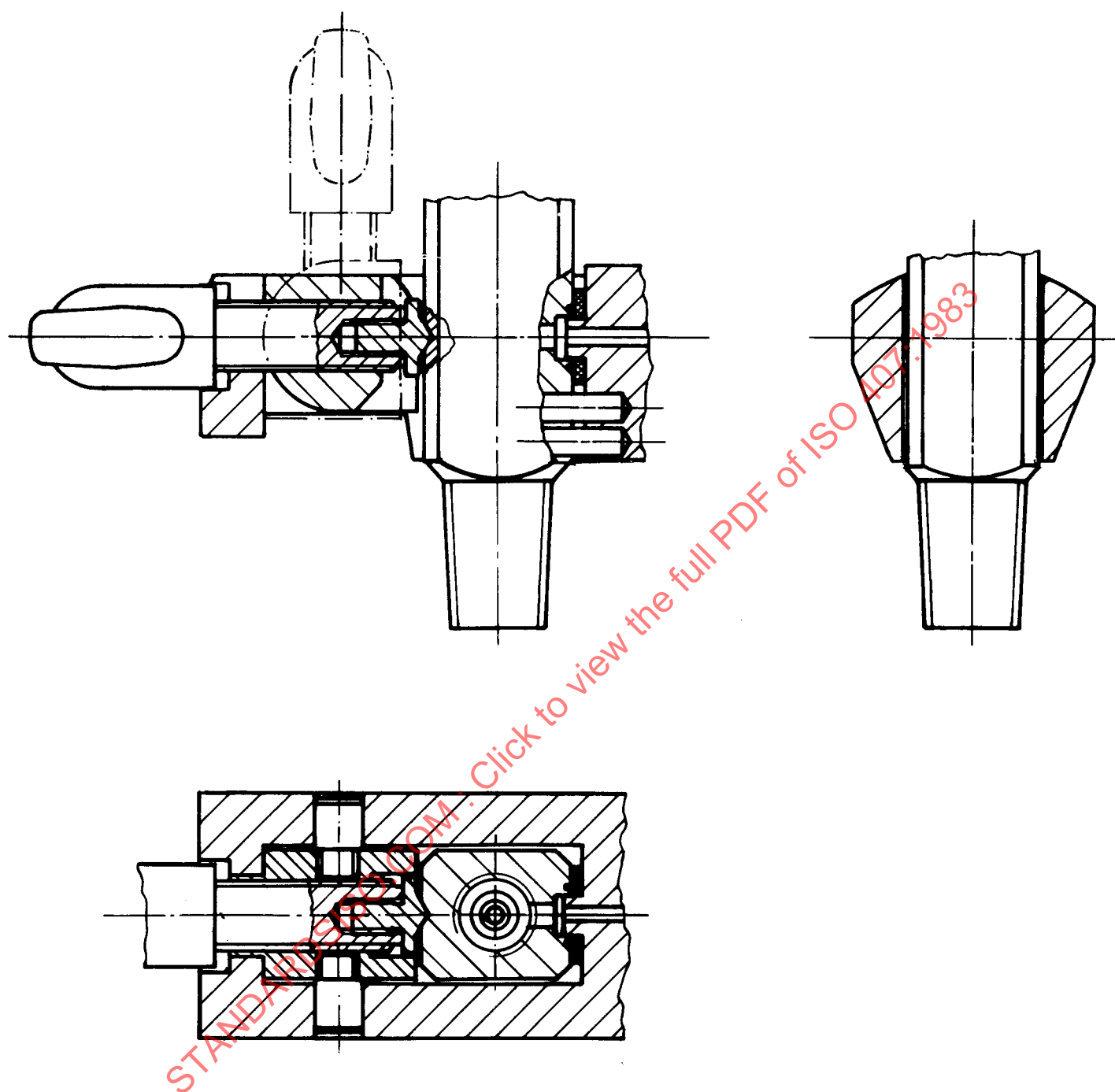


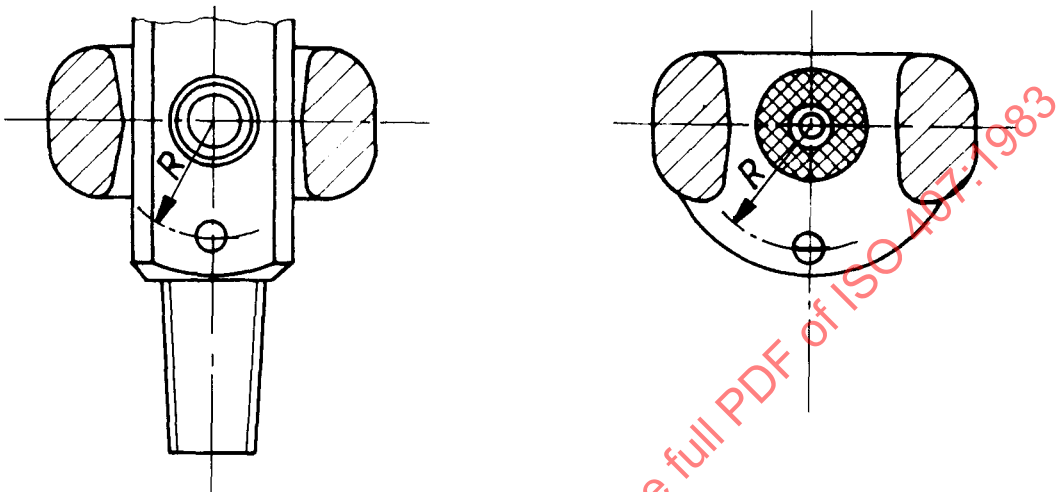
Figure 7 — Third alternative

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

The dimensions and positions of the holes and pins for yoke-type valve connections are shown in figures 8 to 18.

6.1 Outlet connection single-pin system

6.1.1 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 special mixture of 50 % oxygen/50 % nitrous oxide

6.2 Outlet connections two-pin/single-row system

6.2.1 Outlet connection for oxygen

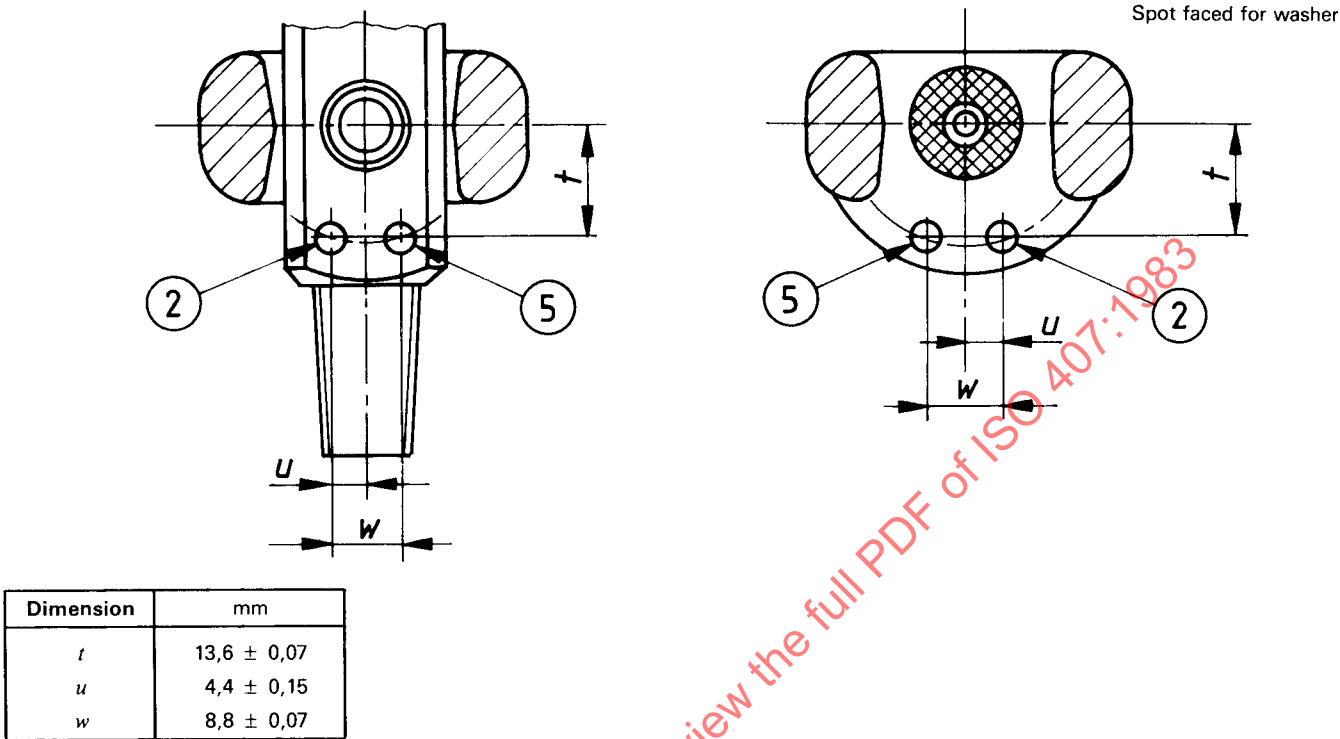


Figure 9 — Outlet connection for oxygen

6.2.2 Outlet connection for oxygen/carbon dioxide mixture ($\text{CO}_2 < 7\%$)

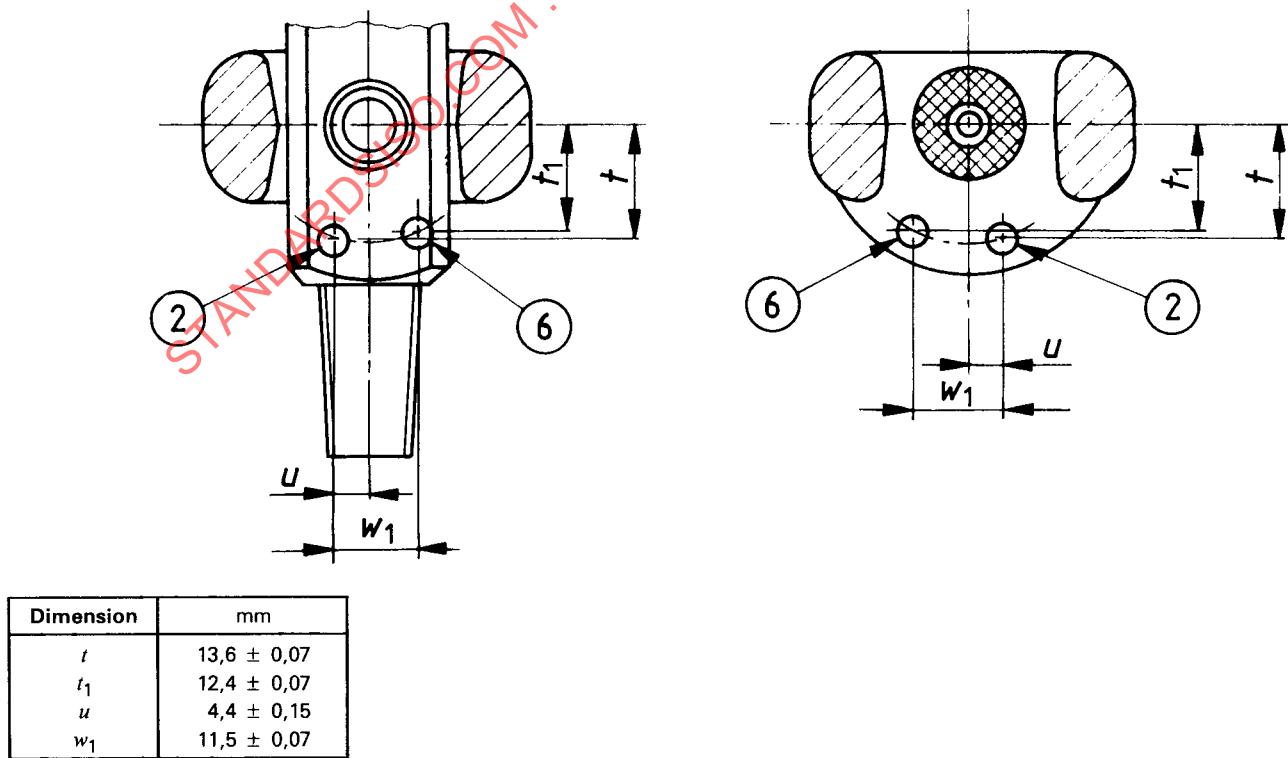


Figure 10 — Outlet connection for oxygen/carbon dioxide mixture (carbon dioxide not exceeding 7 %)

6.2.3 Outlet connection for oxygen/helium mixture (He < 80 %)

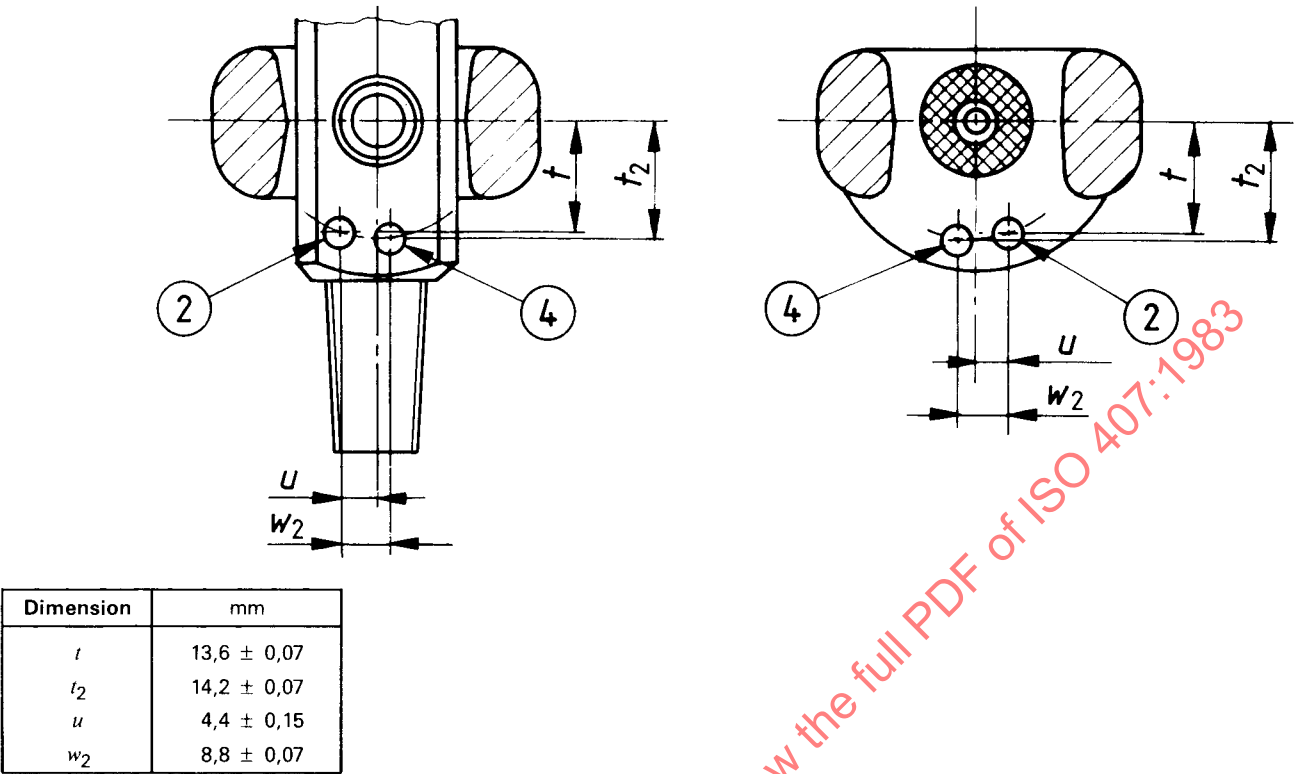


Figure 11 — Outlet connection for oxygen/helium mixture (helium not exceeding 80 %)

6.2.4 Outlet connection for ethylene

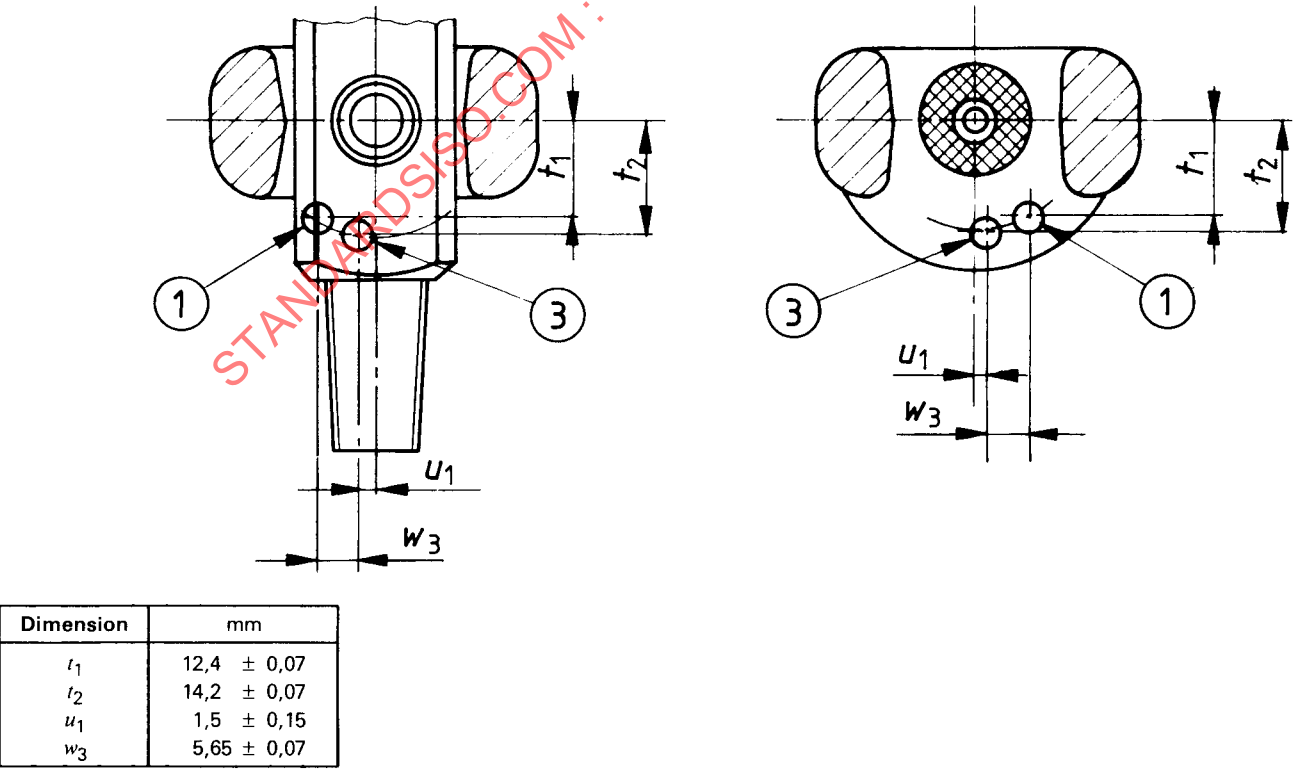


Figure 12 — Outlet connection for ethylene

6.2.5 Outlet connection for nitrous oxide

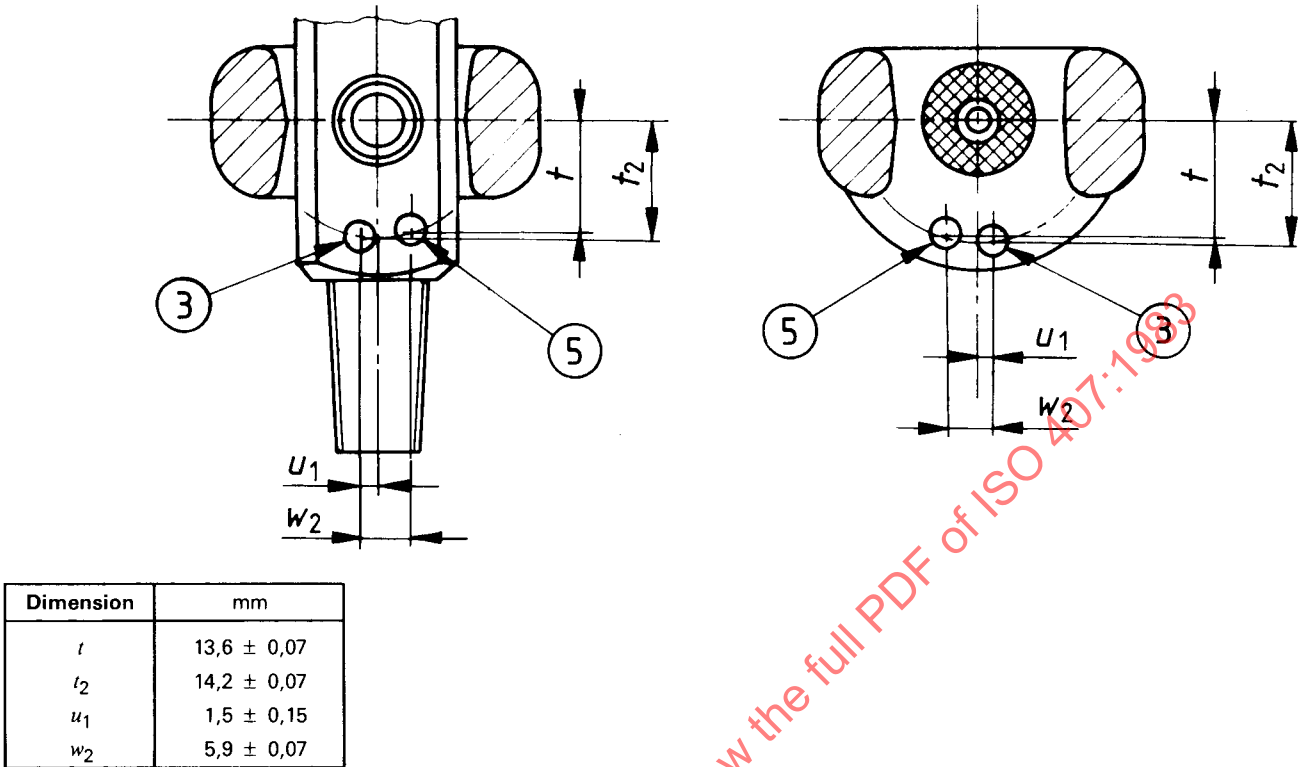


Figure 13 — Outlet connection for nitrous oxide

6.2.6 Outlet connection for cyclopropane

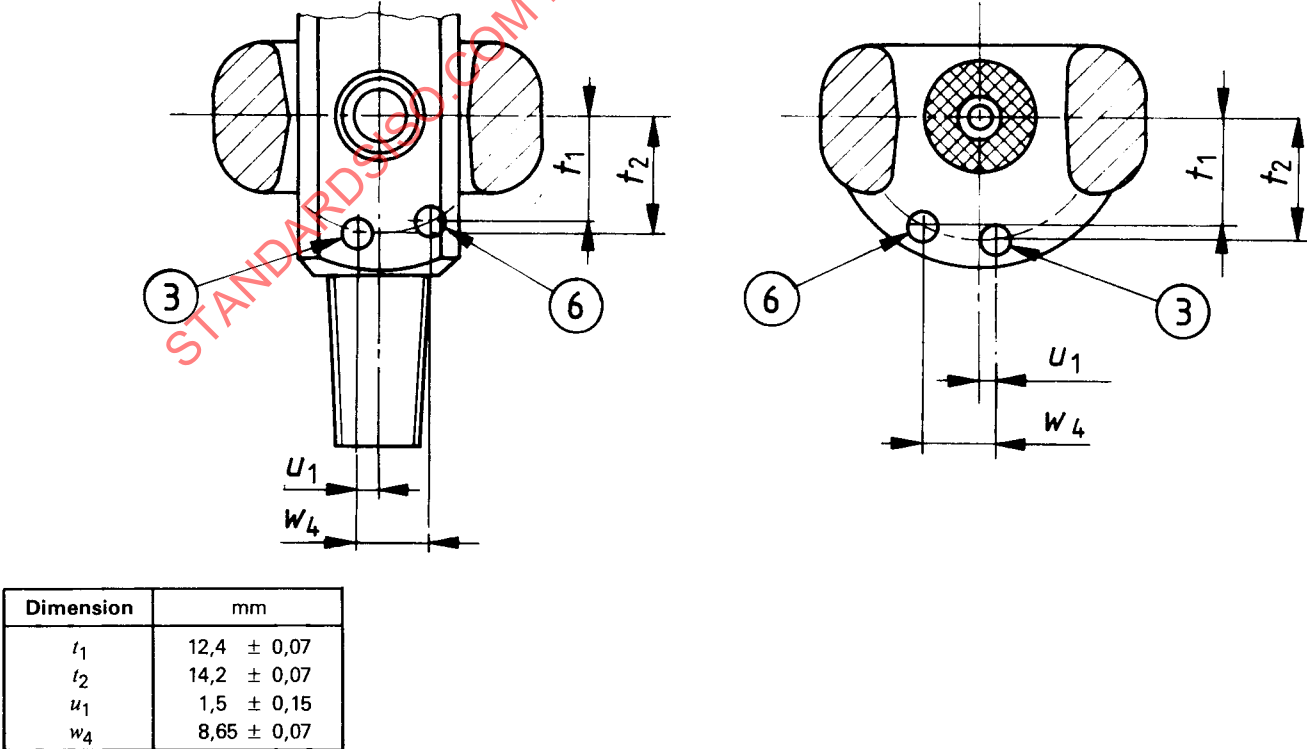


Figure 14 — Outlet connection for cyclopropane

6.2.7 Outlet connection for helium/oxygen mixture ($O_2 < 20\%$)

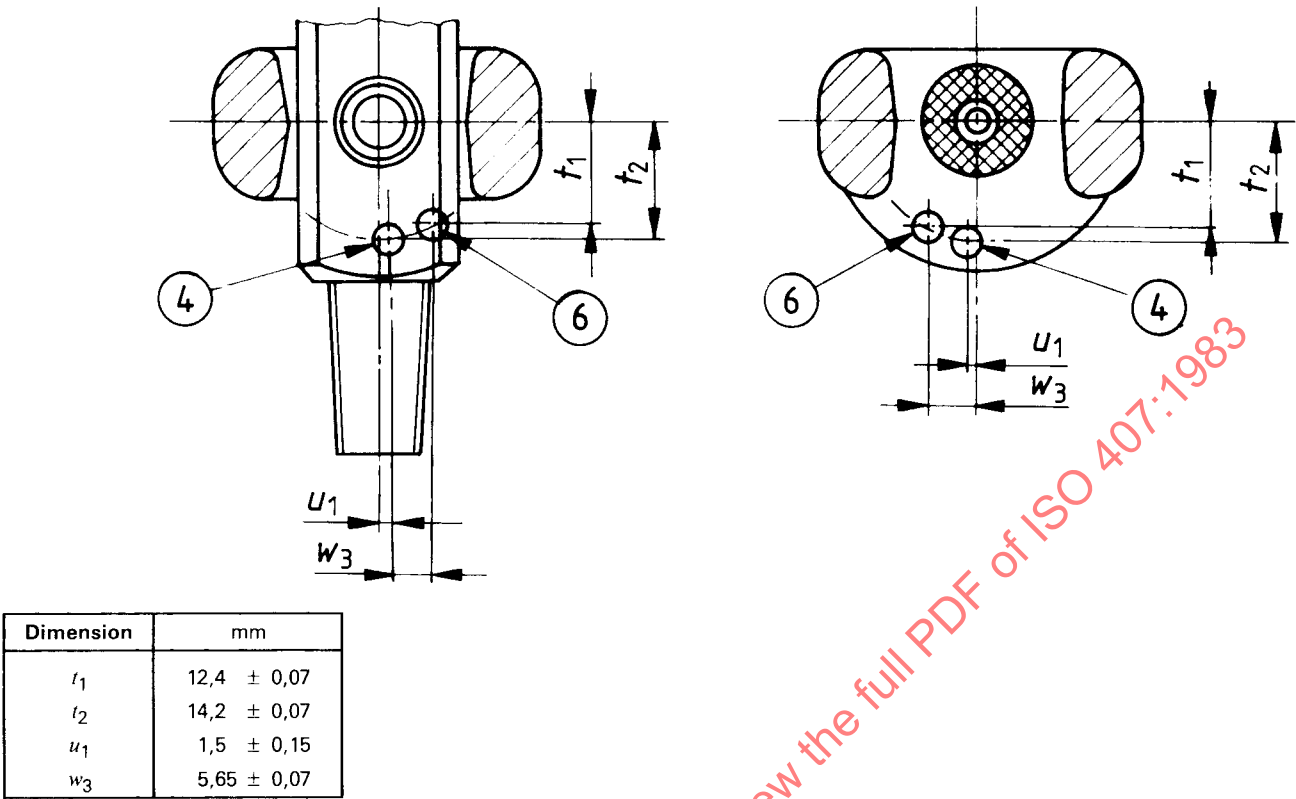


Figure 15 — Outlet connection for helium/oxygen mixture (oxygen less than 20 %)

6.2.8 Outlet connection for carbon dioxide and carbon dioxide/oxygen mixture ($CO_2 > 7\%$)

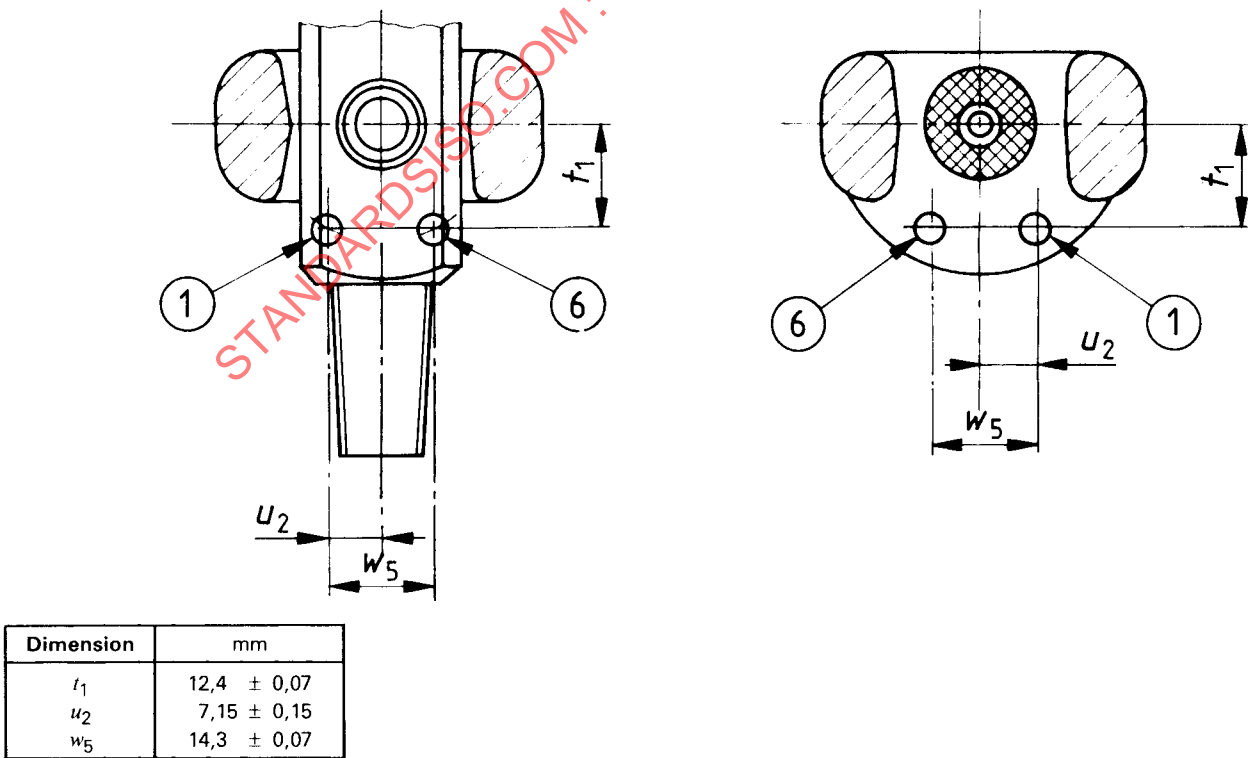


Figure 16 — Outlet connection for carbon dioxide and for carbon dioxide/oxygen mixture (carbon dioxide exceeding 7 %)

6.2.9 Outlet connection for medical air

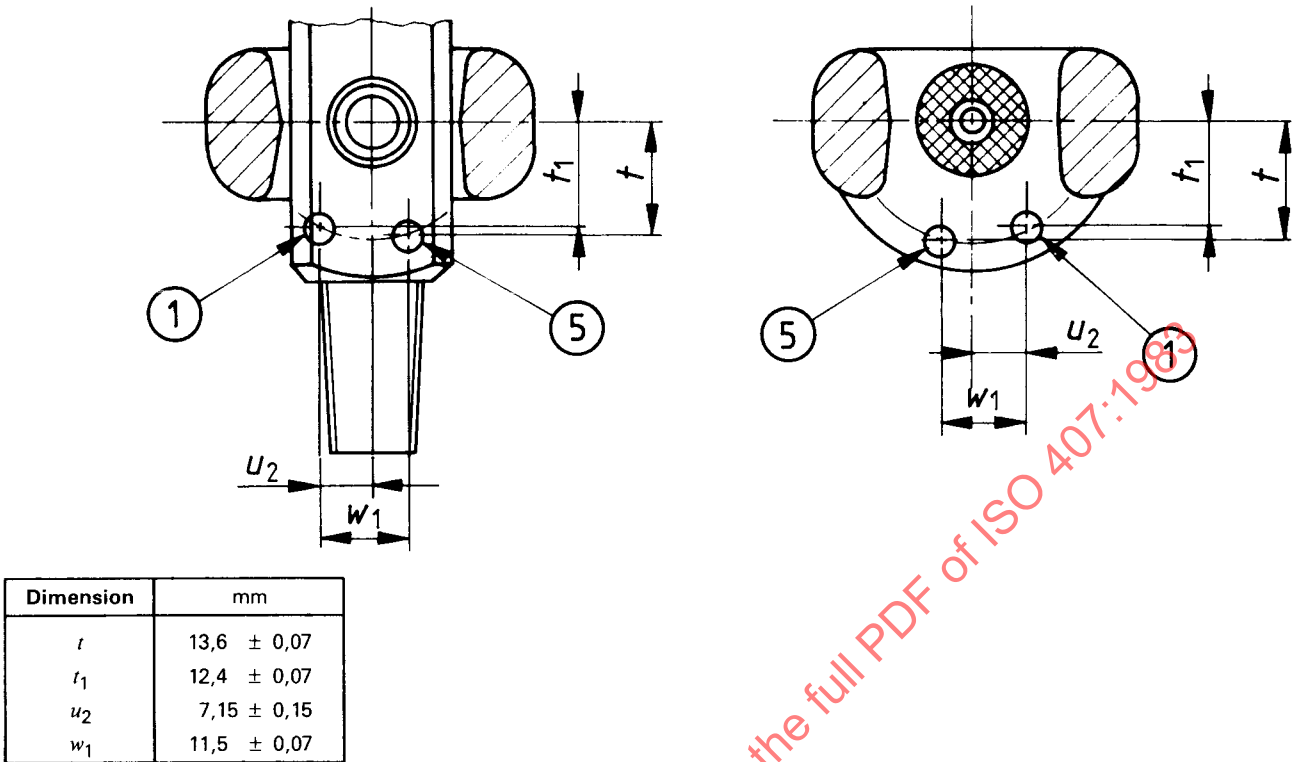


Figure 17 — Outlet connection for medical air

6.2.10 Outlet connection for nitrogen

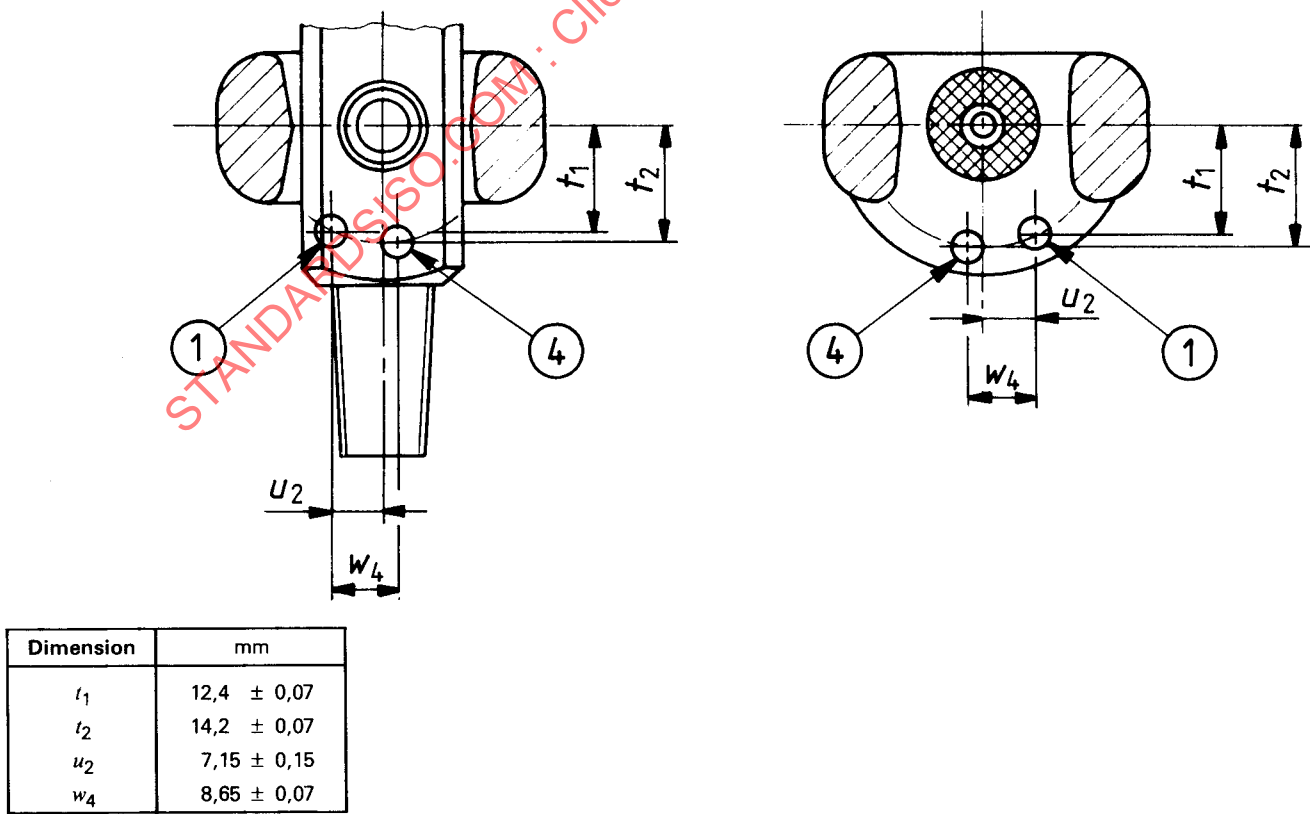


Figure 18 — Outlet connection for nitrogen