INTERNATIONAL STANDARD

ISO 11933-1

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Components for containment enclosures —

Part 1:
Glove/bag ports, bungs for glove/bag ports, enclosure rings and interchangeable units

Composants pour enceintes de confinement —

Partie 1: Ronds de gant et de sac, obturateurs de ronds de gant et de sac, bagues d'enceintes et éléments interchangeables à distance

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Reference number
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Contents

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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 preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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.

International Standard ISO 11933-1 was prepared by Technical Committee ISO/TC 85, *Nuclear energy*, Subcommittee SC 2, *Radiation protection*.

ISO 11933 consists of the following parts, under the general title *Components for containment enclosures*

— *Part 1: Glove/bag ports, bungs for glove/bag ports, enclosure rings and interchangeable units*

— *Part 2: Gloves, welded bags, gaiters for remote-handling tongs and manipulators*

— *Part 3: Transfer systems such as plain doors, double doors for leaktight transfer, airlock chambers, leaktight connections for waste drums*

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Introduction

A great number of leaktight mechanical components for containment enclosures are presently offered on the market. These components:

- may have different geometric dimensions;
- may require holes of different diameters for attachment on the containment enclosure wall;
- may be attached to this wall by different methods;
- may use different mounting systems for their associated leaktight elements, such as gloves, welded bags, bungs, transfer systems.

These components are generally not mutually compatible, but nevertheless often have the same performance level; therefore it was not possible to select only one system as the International Standard.

As a consequence, the aim of this part of ISO 11933 is to present general principles of design and use, and to fully describe the different existing systems in order to:

- avoid new parallel systems based on identical principles and differing only in details or geometric dimensions;
- make possible interchangeability between existing equipment;
- demonstrate consistency among the various parts of the same system such as the basic elements (described in ISO 11933-1), the elements associated with leaktightness (described in ISO 11933-2), or the transfer systems (described in ISO 11933-3).

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Components for containment enclosures —

Part 1: Glove/bag ports, bungs for glove/bag ports,enclosure rings and interchangeable units

1 Scope

This part of ISO 11933 specifies the designation and characteristics of the various components for containment enclosures which are fixed to the containment enclosure wall or which can be used in conjunction with the lead shielding units described in ISO 7212 and ISO 9404 and used in the construction of containment enclosures for protection against ionizing radiation.

These components may also be used alone, without any shielded enclosure. In addition, some similar units are included which can be used with or without shielding, but not in conjunction with units given in ISO 7212 and ISO 9404.

The units covered by this part of ISO 11933 are:

- glove/bag ports,
- bungs for glove/bag ports,
- enclosure rings,
- interchangeable units which are either leaktight ejectable units (support rings for gloves, welded bags, gaiters for remote-handling tongs and for manipulators, circular windows) or rigid plugs or securing units (securing rings),

Independent systems which do not use the same support ring are described separately in this part of ISO 11933 (support rings for manipulator and tong gaiters and for circular windows and rigid plugs).

The associated leaktight components (gloves, welded bags, gaiters for remote-handling tongs and for manipulators) are described in ISO 11933-2.

Transfer systems (plain doors, double doors, airlock chambers, leaktight connections for waste drums) are dealt with in ISO 11933-3.

Accessories for the ventilation of containment enclosures such as filters and traps, pressure regulators and safety valves, are dealt with in ISO 11933-4.

Penetrations for electrical and fluid circuits will be described in ISO 11933-5.

The elements constituting the framework of containment enclosures (metallic walls, framework, transparent panels) are dealt with in ISO 10648-1.

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2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 11933. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11933 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7212:1986, *Enclosures for protection against ionizing radiation - Lead shielding units for 50 mm and 100 mm thick walls.*

ISO 9404-1:1991, *Enclosures for protection against ionizing radiation – Lead shielding units for 150 mm, 200 mm and 250 mm thick walls – Part 1: Chevron units of 150 mm and 200 mm thickness.*

ISO 10648-1:1996, *Containment enclosures - Part 1: Design principles.*

ISO 10648-2:1994, *Containment enclosures - Part 2: Classification according to tightness and associated checking methods.*

ISO 11933-2: –[1] *Components for containment enclosures - Part 2: Gloves, welded bags, gaiters for remote-handling tongs and for manipulators.*

ISO 11933-3: –[1] *Components for containment enclosures - Part 3: Transfer systems such as plain doors, double doors for leaktight transfer, airlock chambers, leaktight connections for waste drums.*

3 Definitions

For the purposes of this part of ISO 11933, the following definitions apply:

3.1 glove port or bag port: Plastic or metal profiled flange with grooves, fitted on containment enclosures or glove box walls using threaded components or by welding or bonding. They can receive directly a glove or another flexible component terminating with a bead or a snap ring of the same diameter.

Bag ports can be of larger diameter to allow transfer of larger components.

3.2 enclosure ring: Plastic or metal profiled ring which is mounted on containment enclosures or glove box walls using threaded components or by welding or bonding. The ring is used to allow fitting of interchangeable leaktight units mounted on a support ring (e.g. gloves, rigid plugs).

Interchangeability of these ejectable units is achieved by using an ejecting device of appropriate dimensions and operating mode. This device allows ejection of each worn leaktight component by pushing it into the enclosure and replacing it with a new component of the same diameter, without breaking the leaktightness.

3.3 support ring: Plastic or metallic interchangeable unit with grooves, which is mounted in an enclosure ring, and equipped with a glove or other plastic component, terminated with a snap ring, a bead or a lip seal of same diameter.

3.4 interchangeable elements: Parts of components of containment enclosures which may be exchanged with one another or replaced

- either manually by, mounting, dismounting or substitution operations (for example, threaded enclosure rings which may be replaced by threaded glove ports of the same diameter);

- or by a remote-controlled operation and/or using an automatic or manual ejecting device (for example, support rings equipped with gloves, welded bags, tong or manipulator gaiters, bungs or rigid plugs).

These elements are designed in such a way that their replacement of one by another

- does not reduce the containment enclosure tightness;

- and does not need any modification or replacement of the containment enclosure wall.

1) To be published.

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3.5 ejectable elements: Components of containment enclosures which may be exchanged by a remote-controlled operation, generally through the use of an appropriate mechanical device. The new element takes the place of the old one, pushing it into the containment enclosure by a simple translatory motion.

These components are installed on enclosure rings such as support rings equipped with gloves, welded bags, gaiters for tongs or manipulators, circular windows, rigid plugs, etc.

They are designed in such a way that the leaktightness between the parts attached to the wall (enclosure rings) and the mobile parts (ejectable elements) is never broken during the exchange operation.

These operations are fully described in this part of ISO 11933.

4 Designation

4.1 General designation

The designation of a component for containment enclosures consists of its name written in full, the reference to this part of ISO 11933 and the reference number.

The reference number consists of a four digit number fixed by the Series Allocation defined in table 1 here after. It shall be followed by one or several alphanumerical codes characterizing the mounting procedure and/or the material of construction.

4.1.1 Series allocation

Series allocation corresponding to the component described in this part of ISO 11933 are given in table 1. The differentiation between the various types of components in the same family is explained in clauses 7 and 8.

4.1.2 Alphabetical codes corresponding to the mounting procedures

The equipment can be mounted on the enclosure wall by different techniques.

The letter codes for the mounting procedure of the fixed component are the following:

- B for bonded types,
- W for welded types,
- T for threaded types[2].

4.1.3 Alphabetical codes corresponding to the construction materials

The equipment can be manufactured using different materials.

The letter codes for the material used are the following:

- M for polymethyl methacrylate (PMMA),
- V for polyvinyl chloride (PVC),
- X for stainless steel,
- A for light alloy,
- C for polycarbonate (PC),
- E for polyethylene (PE),
- P for polypropylene (PP),
- S for glass.

In this part of ISO 11933, widely used materials will be designated by their standard abbreviations as listed above.

2) In this design, the containment unit is secured by an independent threaded ring.

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Table 1 - Series allocation

Containment units	Series	Clause or subclause
Glove/bag ports	1000 - 1019	5
Bungs for glove/bag ports	1020 - 1099	6
Enclosure rings of:		
- type 1	1100 - 1119	7.2
- type 2	1120 - 1129	7.3
- type 3 [1)]	1000 - 1019	7.4
Interchangeable units:		
• Ejectable support rings of:		
- type 1	1130 - 1149	8.2
- type 2	1150 - 1159	8.3
- type 3 for gaiters	1160 - 1169	8.4
- type 3 for circular windows	1170 - 1179	8.4
• Rigid plugs of:		
- type 1	1200 - 1219	8.2
- type 2	1220 - 1229	8.3
- type 3	1230 - 1239	8.4
• Circular windows of:		
- type 2	1240 - 1249	8.3
• Securing rings of:		
- type 1	1250 - 1269	8.2
- type 2	1270 - 1279	8.3

1) Enclosure rings of type 3 consist in fact of glove/bag ports having a profile corresponding to that in figures 1c, 2c or 5. They have the corresponding reference numbers 1001,1005,1007 and 1008.

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4.2 Designation - Examples and explanation

4.2.1 Glove/bag port reference numbers

Designation example:

ISO Glove/bag port 1002 T G 2 X s

The last digit of the reference number indicates the useful internal diameter of the glove/bag port, in accordance with table 2.

Table 2 - Correlation between the reference numbers and the useful diameters of glove/bag port

Useful diameter, *U* mm	156	180	186	200	249	254 (10")	330	340	400
Reference number	1000	1001	1002	1003	1004	1005	1006	1007	1008

The alphanumeric code indicates the following information:

The first code letter indicates the mounting procedure as explained in 4.1.2.

The second code letter indicates the glove or bag attachment system:

- D for double (both attachment methods),
- G for glove or bag fixed directly to the grooves,
- R for attachment via ejectable ring.

The second code digit indicates the number of external grooves per port (1, 2 or 3)[3] .

The next code letter indicates the material of manufacture as explained in 4.1.3.

The last code letter (optional) indicates a particular type of glove/bag port:

- c for ports with internal centring ring (see figure 7c),
- s for ports with a longer flange intended for use behing shielding (see figure 7e).

4.2.2 Bungs for glove/bag port reference numbers

Designation example:

ISO Bung for glove/bag port with single clamp plate 1032 X

The third digit of the reference number is allocated according to the type of bung selected as follows:

- bung with mechanical expansion: 2 (see 6.2),
- bung with single clamp plate: 3 (see 6.3.1),
- bung with single clamp plate and flange: 4 (see 6.3.2),
- bung with single clamp plate and inner centring ring: 5 (see 6.3.3),
- bung with single clamp plate and single hinge: 6 (see 6.3.4),
- bung with single clamp plate and double hinge: 7 (see 6.3.5),
- bung with a clip and a single hinge: 8 (see 6.4).

The last digit of the reference number corresponds to the last digit of the reference number of the glove/bag ports on which the bung is mounted and then to a given useful internal diameter as stated in table 2 (for example the following units: bung 1032 X and glove/bag port 1002 T 2 X, have the same useful diameter of 186 mm).

The alphanumeric code includes a letter indicating the material of construction (see 4.1.3).

4.2.3 Enclosure ring reference numbers

Designation example:

ISO Enclosure ring 1102 A

The last digits of the reference number correspond to the last digit of the reference number of the ejectable support ring onto which it can be mounted (e.g. ISO Enclosure ring 1102 A can accept an ejectable support ring equipped with a glove referenced ISO Support ring 1132 E).

NOTE 1: When the enclosure ring is used in conjunction with a standard shielding unit (see ISO 7212 and ISO 9404) we can find, **but not in every case**, a corresponding reference number for the two associated elements (see table 10).

3) When the number 1 is used, in fact it corresponds to 1 external groove and to 2 internal grooves.

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NOTE 2: Certain enclosure rings have the same design as glove/bag ports; these rings retain the same designation as described in 4.2.1.

The code letter indicates the material of manufacture (see 4.1.3).

4.2.4 Reference numbers for interchangeable ejectable and securing units

Designation example:

ISO Support ring 1132 E.

The last digit of the reference number corresponds to the last digit of the reference number of the associated enclosure ring (see 4.2.3) onto which the interchangeable unit of interest is mounted (e.g., support ring 1132 E may be mounted in enclosure ring 1102 A).

The code letter indicates the material of manufacture (see 4.1.3).

5 Glove/bag ports

5.1 General

5.1.1 Various categories of glove/bag ports

There are three categories of glove/bag ports:

a) glove/bag ports for direct attachment of gloves or bags,

b) glove/bag ports designed to receive ejectable support rings for gloves, bags, gaiters for remote-handling tongs and manipulators or any other ejectable device,

c) glove/bag ports designed as mixed systems which may receive gloves or bags either directly or using an ejectable support ring.

These three categories of glove/bag ports may be bonded or welded or threaded onto the wall of the containment enclosure.

5.1.2 Different types of glove/bag ports

There are three types of glove/bag ports:

a) bonded ports (see figure 1),

b) welded ports (see figure 2),

c) ports threaded by an independent ring (see figure 3)[4].

The port type is chosen according to the technique used, the kind of product handled and the required leaktightness of the enclosure.

5.1.2.1 Bonded ports

Bonded ports are generally manufactured from PMMA (or possibly PC or PVC). These types of port are generally only fitted on plastic walls of similar material and are not reusable.

It is important for all bonded surfaces to be continuous and smooth on the "hot" side for ease of decontamination.

4) Threaded system with an independent ring (not directly threaded onto the containment wall).

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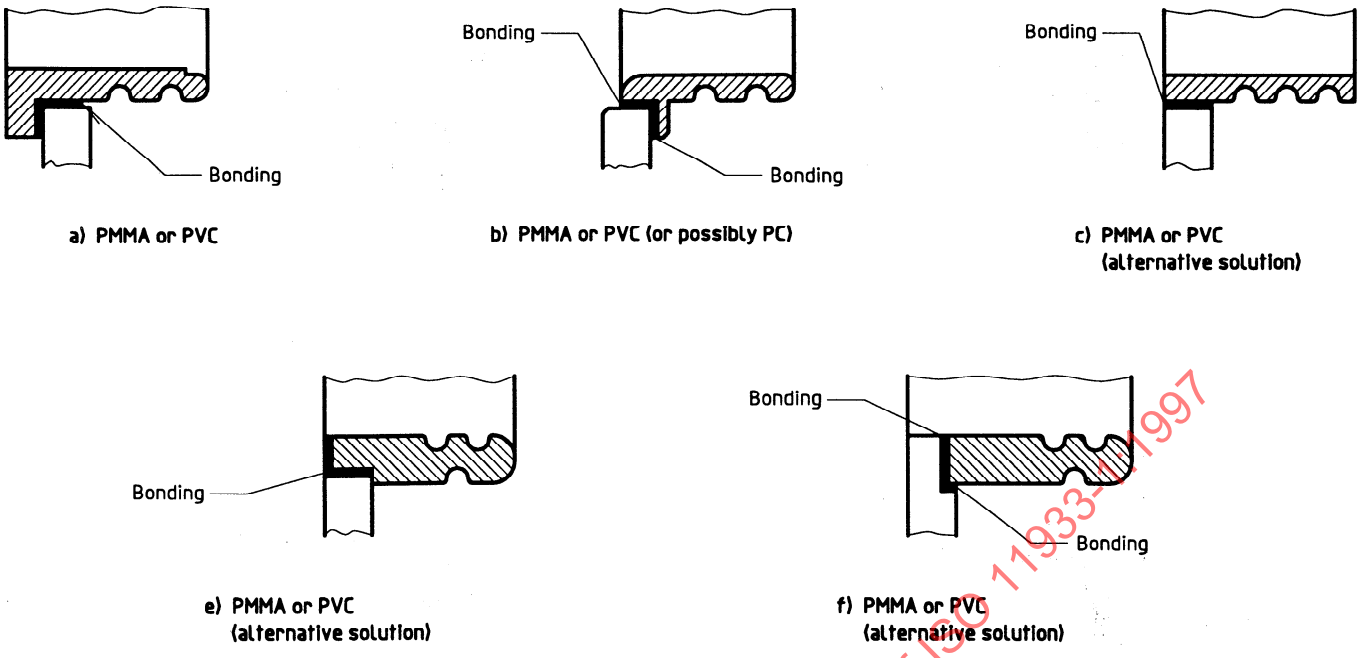


a) PMMA or PVC

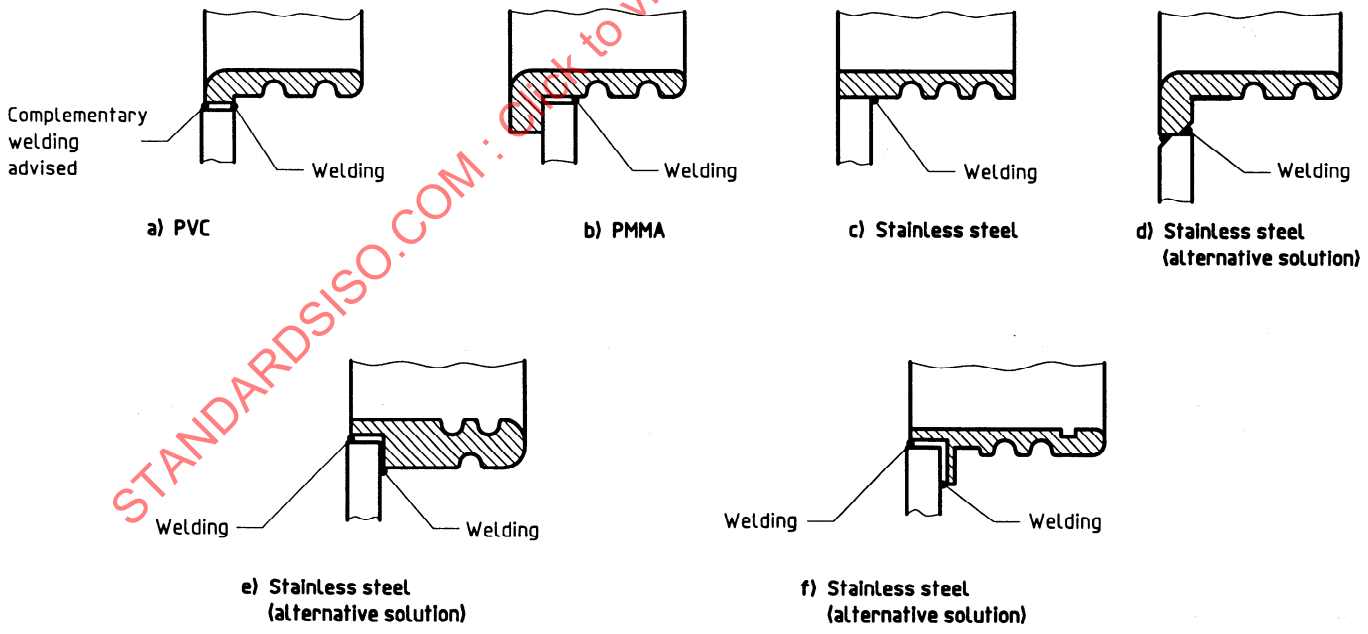
b) PMMA or PVC (or possibly PC)

c) PMMA or PVC (alternative solution)

e) PMMA or PVC (alternative solution)

f) PMMA or PVC (alternative solution)

Figure 1 - Bonded ports - Different solutions



a) PVC

b) PMMA

c) Stainless steel

d) Stainless steel (alternative solution)

e) Stainless steel (alternative solution)

f) Stainless steel (alternative solution)

Figure 2 - Welded ports - Different solutions

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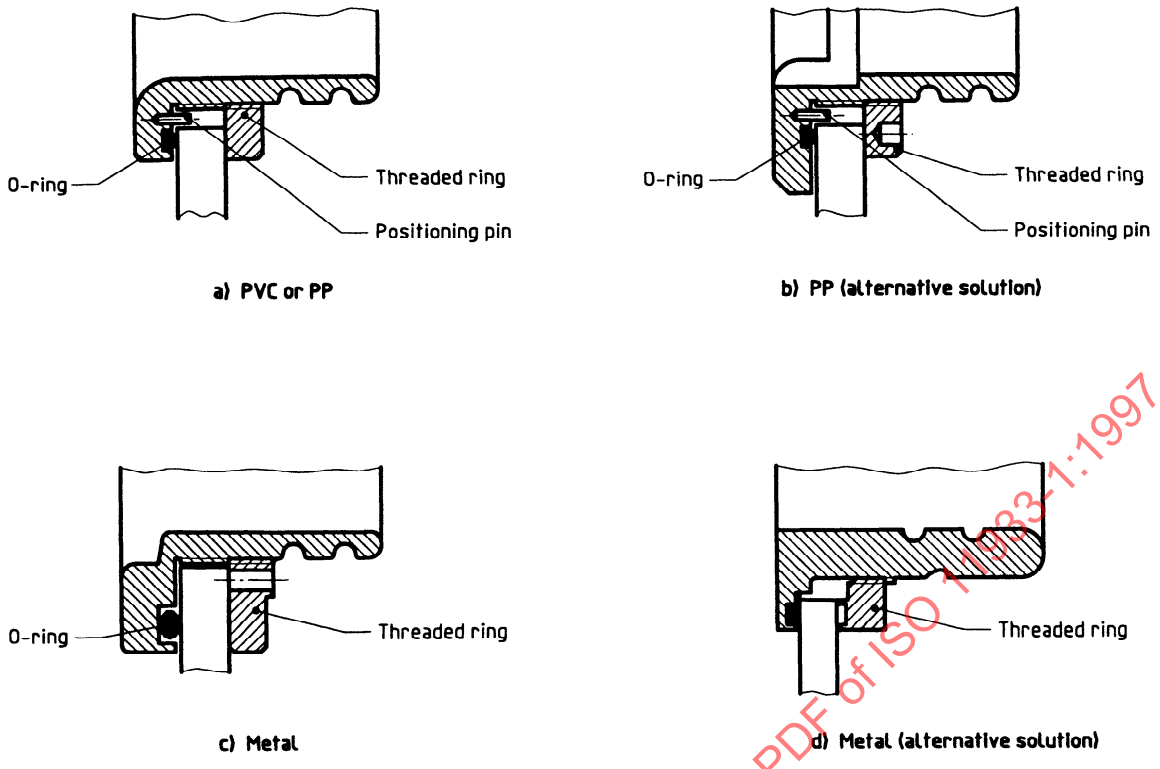

Figure 3 - Threaded ports - Alternative solutions

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5.1.2.2 Welded ports

Welded ports are generally manufactured from PMMA, PVC or stainless steel.

It is important for all welded surfaces to be continuous and smooth on the "hot" side for ease of decontamination.

5.1.2.3 Threaded ports

These are made of metal or plastic materials and fit on any type of enclosure wall.

The port is passed through the enclosure wall and secured by an independent threaded ring. A device is required to secure the ring to prevent any loosening during use.

5.2 Glove/bag port assembly

5.2.1 PMMA ports are bonded (or welded) to walls of similar material. When additional ports are fitted on containment enclosures in use, the adhesive and the bonding (or welding) process shall be selected in accordance with the manufacturer's instructions.

5.2.2 PVC ports may be welded or threaded; PP ports may be threaded.

Welded ports should preferably be welded to the inside and the outside enclosure wall surfaces as well (see figure 2b).

Threaded ports may be fitted onto any enclosure wall of 13 mm thickness or less ; they include a positioning pin (see figure 3a). The surface finish of the sealing surface of the wall shall be better than 0,3 mm in order to ensure correct tightness of the port.

5.2.3 Metal ports (light alloy or stainless steel) may be welded or threaded.

Stainless steel ports are welded onto stainless steel walls,

Threaded ports shall meet the same requirements as plastic ports (described above).

5.3 Glove/bag port design

The usual profiles have two (see figures 4 and 7) or three (see figures 5 and 8) external grooves depending on the mounting procedure for gloves or bags given in ISO 11933-2.

There is a special glove/bag port profile with one external and two internal grooves (see figures 6 and 9). In this system, gloves or bags are kept in position with two inner O-rings. The complete mounting procedure is described in ISO 11933-2.

There are special glove ports with supplementary shielding which allow equipment to be posted into the enclosure. These ports have longer flanges (see figure 7e).

Other glove ports allow gloves to be mounted either directly on two external grooves or indirectly using an ejectable support ring (see figures 9a and 9b).

5.4 Requirements related to the construction of glove/bag ports

Glove/bag ports may include on their internal side a groove (figure 7d) to accommodate bungs with clamp plates (see clause 6) and/or threaded holes to accommodate bungs with hinges.

Surfaces in contact with gloves and the inside of the enclosure shall be accessible for decontamination, the corners being rounded to protect gloves from tearing and facilitate decontamination (minimum radius: 0,5 mm).

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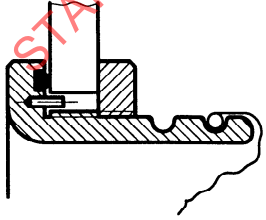


Figure 4 — Glove/bag port with 2 external grooves

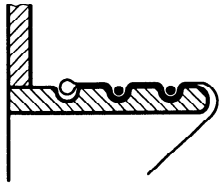


Figure 5 — Glove/bag port with 3 external grooves

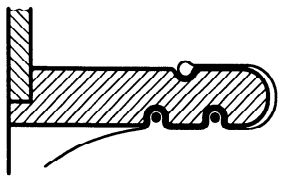
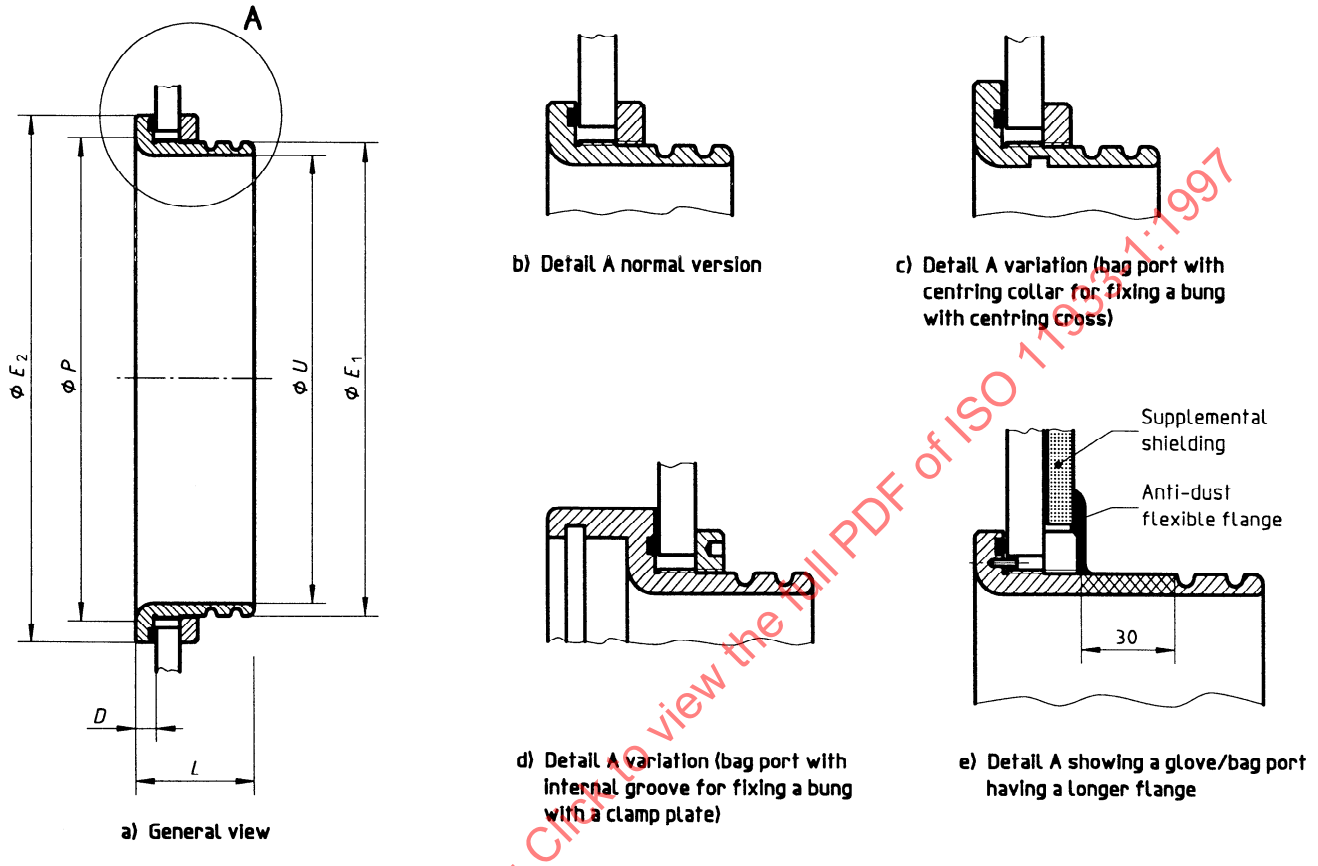


Figure 6 — Glove/bag with port with 1 external groove and 2 internal grooves

Dimensions in millimetres



a) General view

b) Detail A normal version

c) Detail A variation (bag port with centring collar for fixing a bung with centring cross)

d) Detail A variation (bag port with internal groove for fixing a bung with a clamp plate)

e) Detail A showing a glove/bag port having a longer flange

Figure 7 - Examples and dimensions of threaded glove/bag ports having two external grooves

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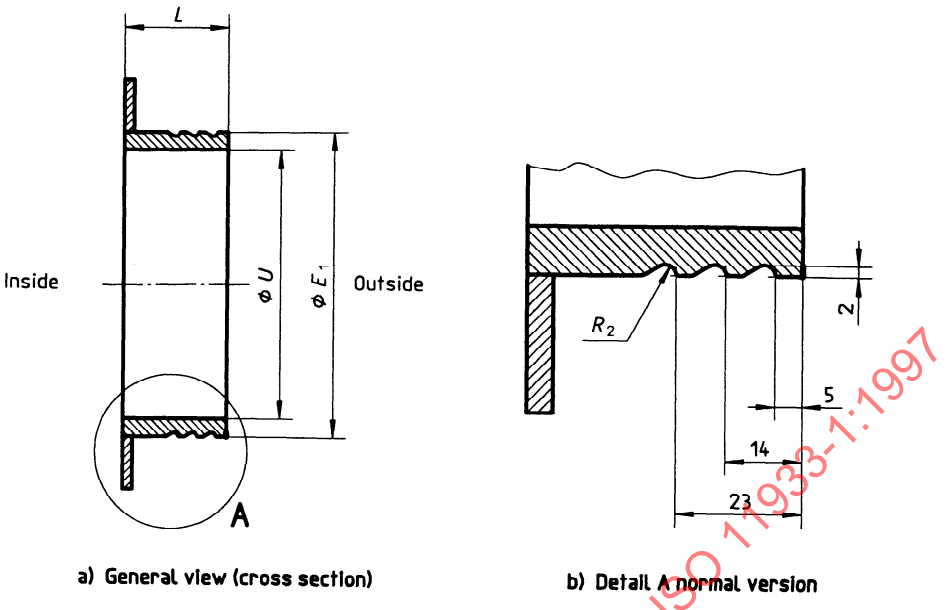
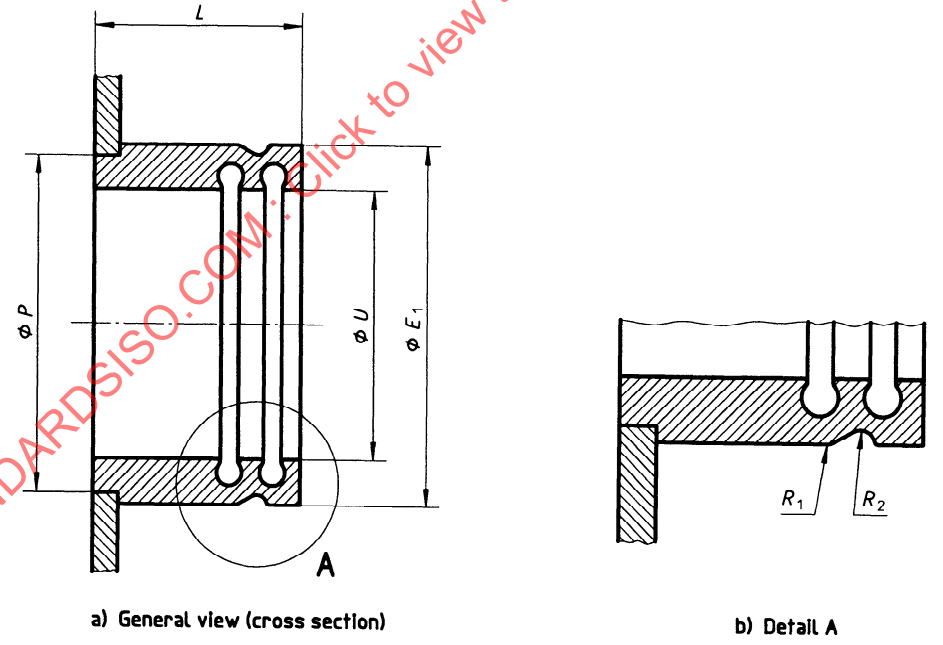
Dimensions in millimetres



a) General view (cross section)

b) Detail A - Normal version

Figure 8 - Example and dimensions of bonded or welded glove/bag ports having three external grooves



a) General view (cross section)

b) Detail A

Figure 9 - Example and dimensions of welded glove/bag port having two internal and one external groove

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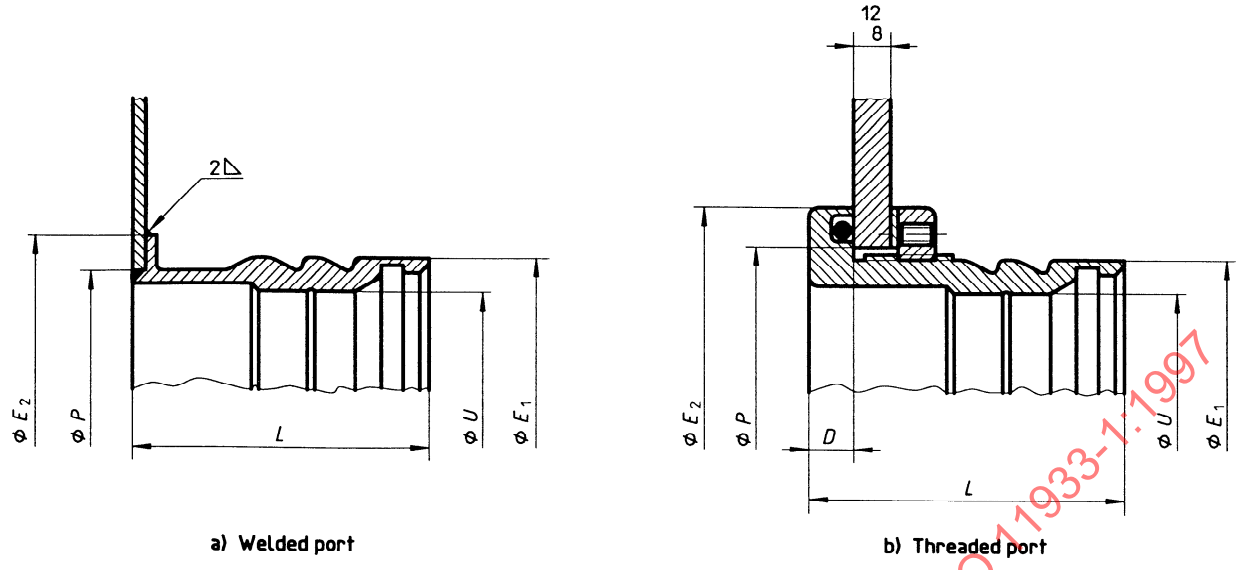
Dimensions in millimetres



a) Welded port

b) Threaded port

Figure 10 - Example and dimensions of glove/bag port which can accept two types of gloves/bags either directly on external grooves or with an ejectable support ring

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5.5 Dimensions

The standard dimensions of ISO glove/bag ports are given in table 3.

6 Bungs for glove/bag ports

6.1 General

Bungs are designed to be fitted on glove/bag ports and provide protection for the mounted glove or bag against mechanical, chemical, thermal and radiation damage when not in use.

They can be fitted from the outer or the inner side of the containment enclosure.

When mounted from the outer side of the glove/bag port, the overall leaktightness of the enclosure may be improved by using a seal.

When mounted from the inner side, a seal is not permitted

- for safety reasons, to allow the internal volume of glove/or bag to be submitted to the same negative pressure as the containment enclosure,

- for quality reasons, in order to maintain the required purity and to allow a renewal of the atmosphere inside the glove/bag by the ventilation system of the containment enclosure.

Table 3 — Standard dimensions of glove/bag ports

Dimensions in millimetres

References			Diameter of hole in containment wall, P	Number of external grooves	Port dimensions [1) 2)]					Related containment units
					U	E_1	E_2	L	D	
1000	BG 2 M	3)	172,5	2	156	169,4	190	47	10	Gloves and bags
	WG 2 M	4)	"	"	"	"	190	47	10	
	WG 2 V	5)	"	"	"	"	174	47	0	
	WG 2 X	6)	"	"	"	"	200	66	0	
	WG 2 Xs	7)	"	"	"	"	200	96	0	
	TG 2 V	8)	"	"	"	"	200	66	10	
	TG 2 m	9)	"	"	"	"	200	66	10	
	TG 2 ms	10)	"	"	"	"	200	96	10	
1001	BG 1 M	11)	200	1 [21)]	180	200	—	48	0	Gloves and bags
	BG 1 M	11)	195	"	"	"	—	57	0	
	WG 1 X	12)	185	"	"	"	—	58	0	
	TG 1 m	13)	220	"	"	"	250	64	12	
1001	BD 3 M	15)	200	3	180	200	—	55	0	Gloves, bags[13)] directly mounted (or circular windows or support rings)
	WD 3 X	16)	"	"	"	"	—	55	0	
1002	BG 2 M	3)	204	2	186	200	220	47	10	Gloves and bags
	WG 2 M	4)	"	"	"	"	220	47	10	
	WG 2 V	5)	"	"	"	"	206	47	0	
	WG 2 X	6)	"	"	"	"	258	66	0	
	WG 2 Xs	7)	"	"	"	"	258	96	0	
	TG 2 V	8)	"	"	"	"	234	66	10	
	TG 2 m	9)	"	"	"	"	258	66	10	
	TG 2 ms	10)	"	"	"	"	258	66	10	
	TG 2 P	19)	204 to 224	"	"	"	250	70	12	
	TG 2 Ps	19)	"	"	"	"	250	100	12	
1003	WD 2 X	17)	217	2	200	216	224	63	0	Gloves, bags directly mounted or support rings or bags, gloves, tong gaiters
	WD 2 Xs	17)	217	2	200	216	224	120	0	
	TD 2 X	18)	224	2	200	216	250	100	12	
1004	BG 2 M	3)	267,5	2	249	263	295	47	10	Gloves and bags
	WG 2 M	4)	"	"	"	"	295	47	10	
	WG 2 V	5)	"	"	"	"	269	47	0	
	WG 2 X	6)	"	"	"	"	322	66	0	
	WG 2 Xs	7)	"	"	"	"	322	96	10	
	TG 2 V	8)	"	"	"	"	300	66	10	
	TG 2 m	9)	"	"	"	"	322	66	10	
	TG 2 ms	10)	"	"	"	"	322	96	10	
1004	TG 2 Xc	14)	267,5	2	249	263	322	98	42	Bags
	WG 2 Ac	14)	"	"	"	"	"	"	"	
	TG 2 P	19)	"	"	"	"	330	76	15	
	TG 2 Ps	19)	"	"	"	"	"	106	15	
1005	BG 1 M	11)	274	1 [21)]	254	274	—	48	0	Bags
	BG 1 M	11)	269	"	"	"	—	57	0	
	WG 1 X	12)	257	"	"	"	—	58	0	
	TG 1 m	13)	294	"	"	"	325	64	12	
1005	BD 3 M	15)	274	3	254	274	—	55	0	Bags directly mounted (or circular windows or support rings)
	WD 3 X	16)	"	"	"	"	—	"	0	

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References			Diameter of hole in containment wall, P	Number of external grooves	Port dimensions [1) 2)]					Related containment units
					U	E_1	E_2	L	D	
1006	WG 2 M	6)	354	2	330	346	410	66	0	Gloves and bags
	WG 2 Xs	7)	"	"	"	"	410	96	0	
	TG 2 M	8)	"	"	"	"	390	66	10	
	TG 2 m	9)	"	"	"	"	410	66	0	
1006	TG 2 mc	14)	354	2	330	346	410	98	42	Bags
1007	WD 3 X	16)	360	3	340	360	—	55	0	Bags directly mounted (or circular windows or support rings)
1008	WG 2 X	6)	430	2	400	416	468	66	0	Bags
	WG 2 Xs	7)	"	"	"	"	468	96	0	
	TG 2 mc	14)	"	"	"	"	468	98	42	
	TG 2 X	20)	"	"	"	"	470	76	12	
1008	WD 3 X	16)	420	3	400	420	—	55	0	Bags directly mounted (or circular windows or support rings)

1) Usually glove ports have internal diameters U of 156, 180 or 186 mm. Exceptionally, bag ports with larger diameters can be used for glove ports.

2) Usually bag ports have internal diameters U of 249, 254, 330 or 400 mm only. Exceptionally, glove ports with smaller diameters can be used for bag ports.

3) The profile of the port corresponds to that in figure 1a. It can also be made of polycarbonate ; in this case, its reference is 100*i* BG 2 C with i = 1, 2 or 4.

4) Glove/bag port having a profile corresponding to that in figure 2 b).

5) Glove/bag port having a profile corresponding to that in figure 2 a).

6) Glove/bag port having a profile corresponding to that in figure 2 d).

7) Stainless steel welded glove/bag port having an extended length of 30 mm to be used behind shielding [see figures 2 d) and 7 e)].

8) Glove/bag port having a profile corresponding to that in figure 3 a).

9) Glove/bag port having a profile corresponding to that in figure 3 b). According to the code given in clause 4, m is an alphabetical index corresponding to the material of construction (m = X, A, ...).

10) Metallic threaded glove port having a extended length of 30 mm to be using behind a shielding [figure 7 e)]. According to the code given in clause 4, m is an index corresponding to the material of construction (m = X, A, ...).

11) Glove/bag port having a profile corresponding to that in figures 1 d) or 1 e).

12) Glove/bag port having a profile corresponding to that in figure 2 e).

13) Glove/bag port having a profile corresponding to that in figure 3 d). According to the code given in clause 4, m is an alphabetical index corresponding to the material of construction (m = X, A, ...).

14) Glove/bag port having a special profile for use with bags only [figure 7 c)]. According to the code given in clause 4, m is an alphabetical index corresponding to the material of construction (m = X, A, ...).

15) Glove/bag port having a profile corresponding to that in figure 1 c).

16) Glove/bag port having a profile corresponding to that in figure 2 c).

17) Glove/bag port having a profile corresponding to that in figure 10 a).

18) Glove/bag port having a profile corresponding to that in figure 10 b).

19) Glove/bag port having a profile corresponding to that in figure 3 b).

20) Glove/bag port having a profile corresponding to that in figure 3 c).

21) Glove/bag port having 1 external and 2 internal grooves.

NOTE — Only internal useful diameters U of the glove/bag ports are standardized. Other dimensions E1, E2, L and D are outside of the scope of this part of ISO 11933 and are only given as information.

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6.2 Bung types

There are inner bungs (assembly from inside the enclosure) and outer bungs (assembly from outside the enclosure) and bungs which can be used from both inside and outside ; locking is carried out from inside or outside, in the same way as assembly.

Bungs are usually fitted from outside the enclosure on glove ports and from inside on bag ports.

The choice between either of these systems is made:

a) according to the desired protection function to be achieved:

- internal damage (environment, temperature),

- external damage (tearing, shocks).

b) by the way it is locked (from the inside or the outside),

c) by the space available inside the enclosure (double-hinge system needs less space than single-hinge system).

Inner bungs are introduced through openings of larger dimensions or should be designed in order to be introduced through openings of the same dimension (profile corresponding to that of figure 11a). Each containment enclosure should have at least one bung providing access from outside the enclosure.

6.3 Mechanical expansion bungs

6.3.1 General

These bungs are made of two plates with bevelled surfaces facing each other with/without a flange to prevent pushing into the enclosure. An O-ring seal is compressed between the two plates by a lever or by a threaded knob in order to form a seal within the glove/bag port (see figures 11b and 11c) and to ensure leaktightness. When a knob is used, a pin fixed to one of the plates, and penetrating the other plate, prevents the plates turning independently.

6.3.2 Material

According to type, bungs for glove/bag ports are made of metal (light alloy or stainless steel) and/or of plastic material (PVC or PMMA).

6.3.3 Assembly

Insertion and fixing of the bungs inside the glove/bag ports and disengaging and removal are carried out by hand or in certain cases, using a special tool.

Some types can accommodate supplementary shielding on their internal side (see figure 11b).

6.3.4 Dimensions

The standard dimensions of ISO mechanical expansion bungs are given in table 4.

6.4 Bungs with clamp plate

There are several types of bungs with a clamp plate, all of which are metallic (light alloy or stainless steel):

- bung with a single clamp plate (see figure 12),
- bung with a single clamp plate and detachable flanges (see figure 13),
- bung with a cruciform clamp plate and an inner centring cross (see figure 14),
- bung with a single clamp plate and a single hinge (see figure 15),
- bung with a single clamp plate and a double hinge (see figure 16).

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Table 4 — Standard dimensions of mechanical expansion bungs

Dimensions in millimetres

References	Associated units		Assembly and locking	Port useful diameter	Bung dimensions [1]				
	Glove ports (enclosure bricks)	Aperture bricks [2]		U	E_1	E_2	L	D	D_1
1020 M	1000		Outside or inside	156	153	168	70	45	110
1020 V	1000		Outside or inside	156	153	168	70	45	110
1020 A	1000		Outside	156	153	168	67	43	130
1020 X	1000		Outside	156	153	168	67	43	130
1021 V	1001	VO 509	Outside or inside	180	178	178	70	32	—
1021 X	1001	VO 509	Outside or inside	180	178	178	70	32	—
1022 M	1002		Outside or inside	186	183	198	70	45	110
1022 V	1002		Outside or inside	186	183	198	70	45	110
1022 A	1002		Outside	186	183	198	67	43	130
1022 X	1002		Outside	186	183	198	67	43	130
1023 A	1003		Outside or inside	200	172	214	—	—	—
1023 X	1003			200	172	214	—	—	—
1024 M	1004		Outside or inside	249	246	260	70	45	110
1024 V	1004		Outside or inside	249	246	260	70	45	110
1024 A	1004		Outside or inside	249	246	258	67	43	130
1024 X	1004		Outside or inside	249	246	258	67	43	130
1025 V	1005	VO 513	Outside or inside	254	252	252	70	32	—
1025 X	1005	VO 513	Outside or inside	254	252	252	70	32	—
1027 V	1007	VO 517	Outside or inside	340	338	338	70	32	—
1027 X	1007	VO 517	Outside or inside	340	338	338	70	32	—
1028 V	1008		Outside or inside	400	398	398	70	32	—
1028 X	1008		Outside or inside	400	398	398	70	32	—

1) According to the useful diameters of glove/bag ports, only the external diameters of bungs (E1) are standardized. The other dimensions E2, L, D and D1 are outside of the scope of this part of ISO 11933 and are only given as information.

2) Standard lead aperture bricks are described in ISO 7212 and ISO 9414-1.

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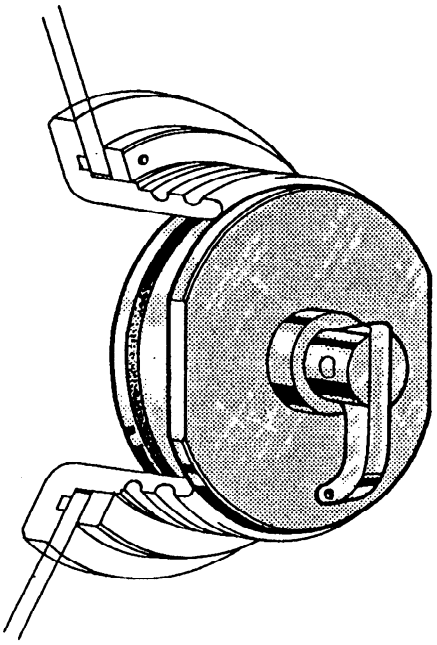
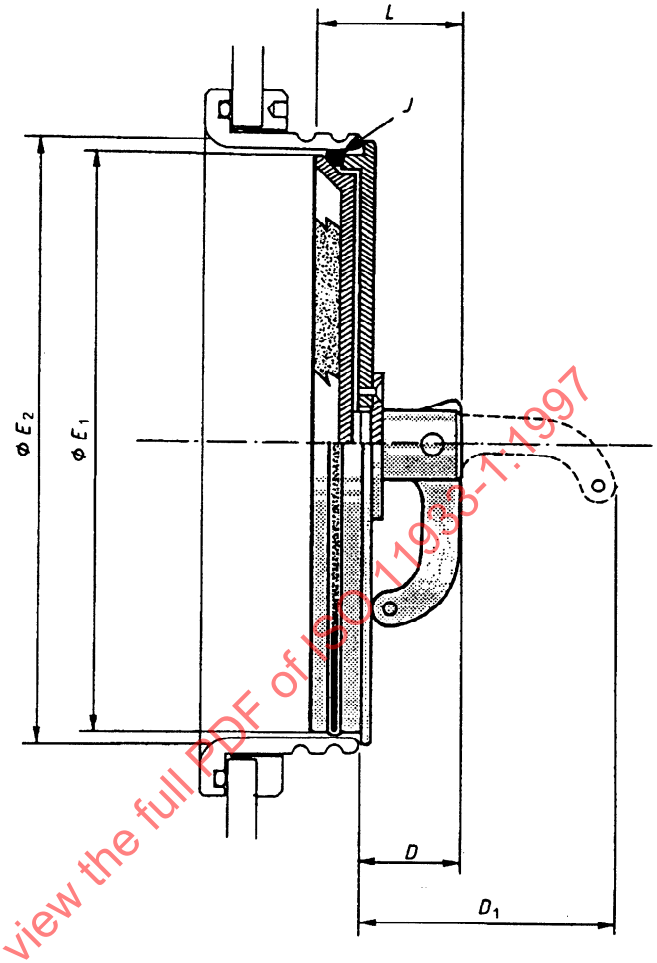
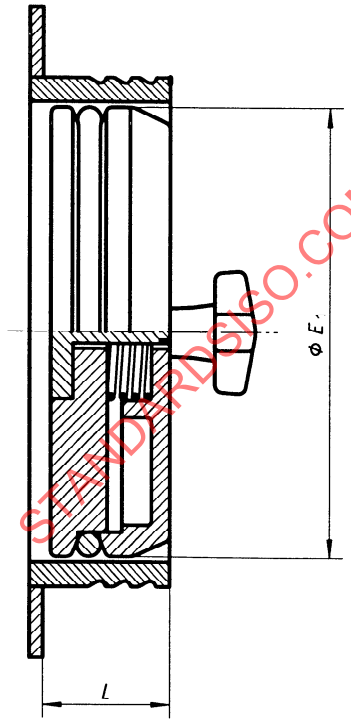


a) Perspective with lever



b) Cross-section with lever and additional shielding



c) Cross-section with threaded knob

Figure 11 - Mechanical expansion bung types

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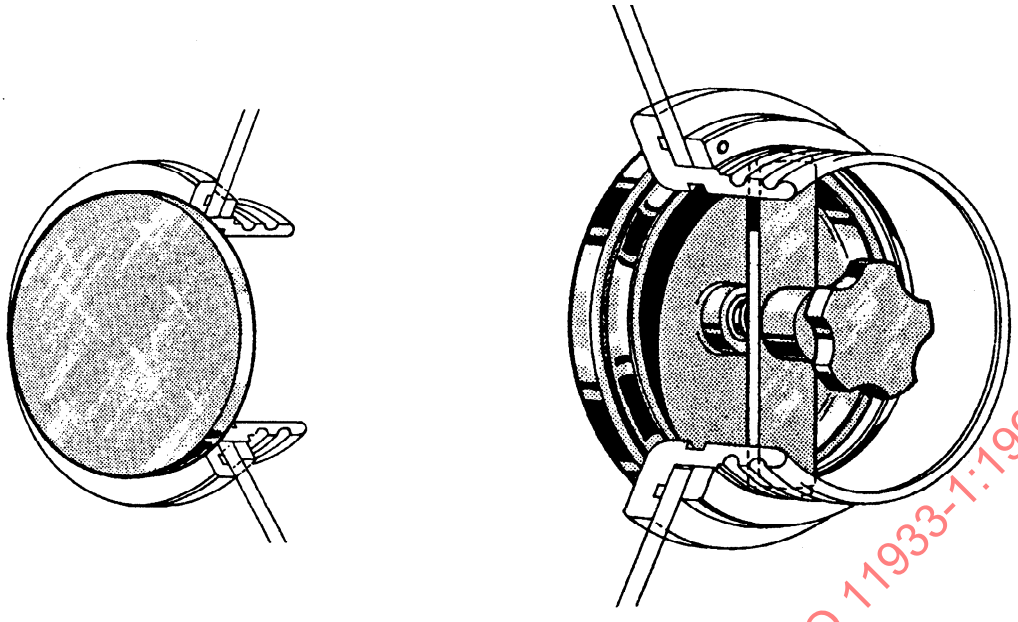
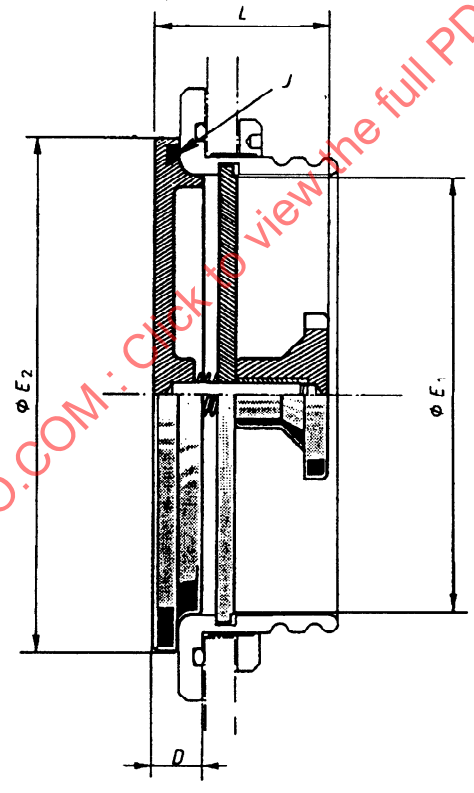


a) View from inside containment enclosure

b) View from outside containment enclosure



c) Cross-section

Figure 12 - Bungs with single clamp plate

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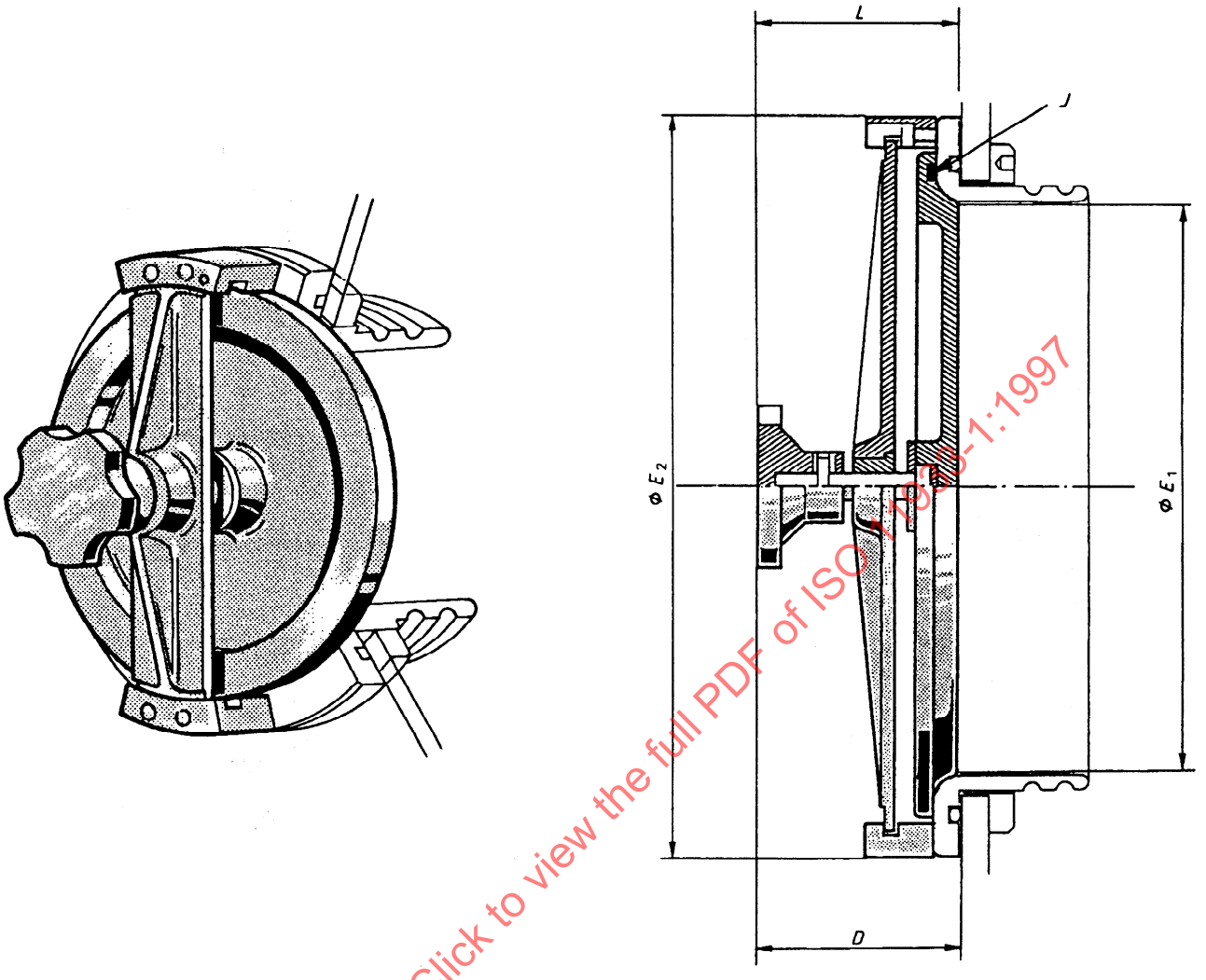

a) View from inside containment enclosure

b) Cross-section

Figure 13 - Bung with single clamp plate and detachable flanges

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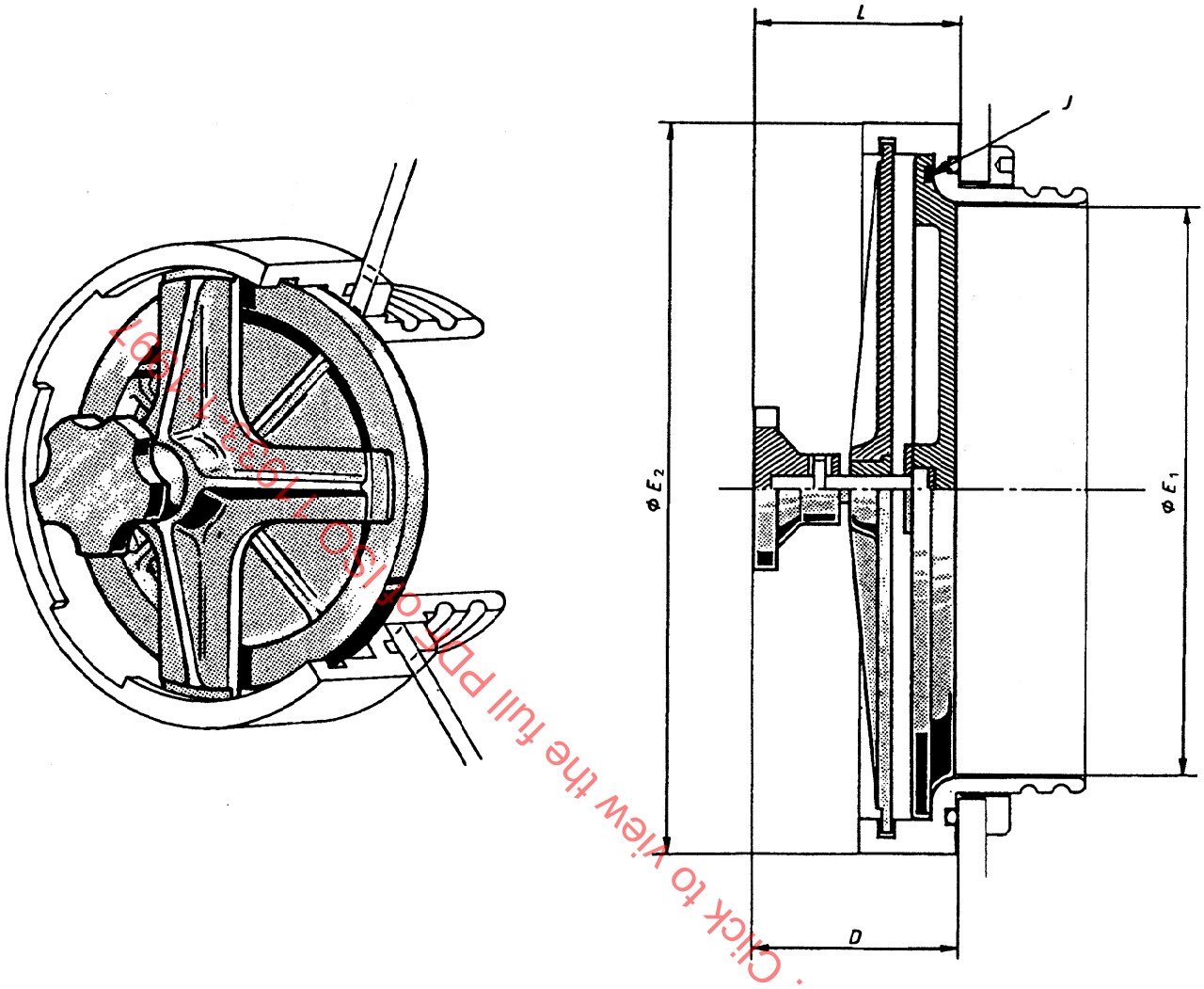

a) View from inside containment enclosure

b) Cross-section

Figure 14 - Bungs with cruciform clamp plate and inner centring cross

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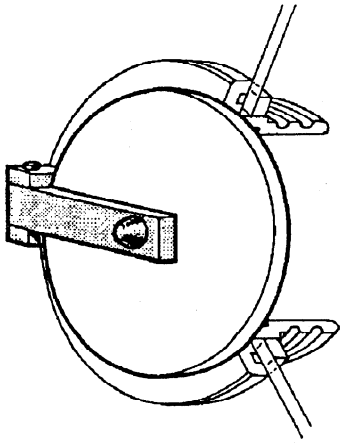
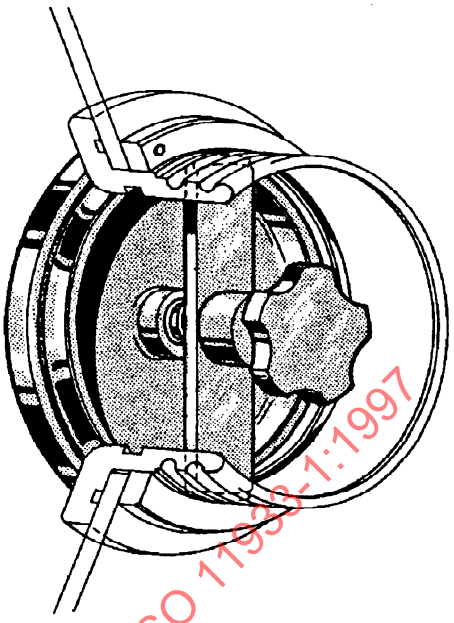
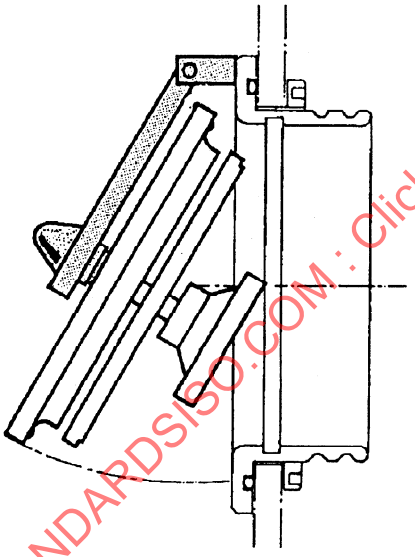


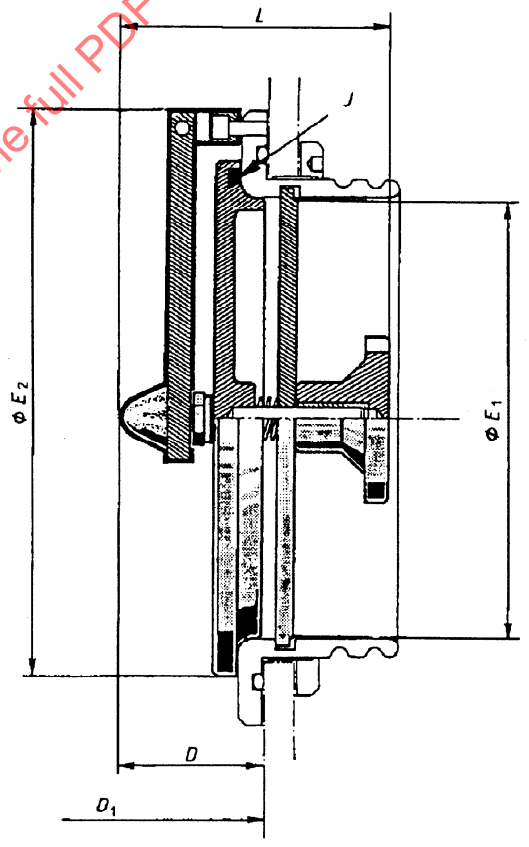
a) View from inside containment enclosure



b) View from outside containment enclosure



c) Cross-section showing opening of bung



d) Cross-section

Figure 15 - Bungs with single clamp plate and single hinge

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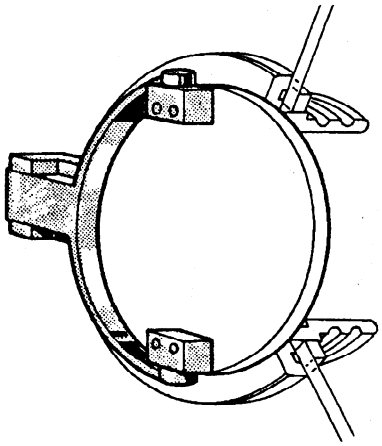
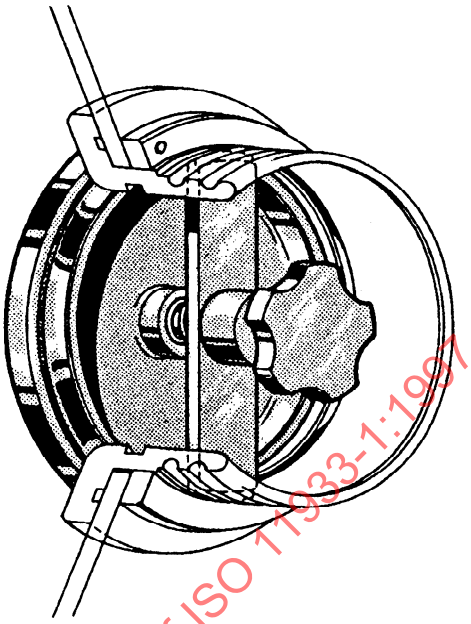
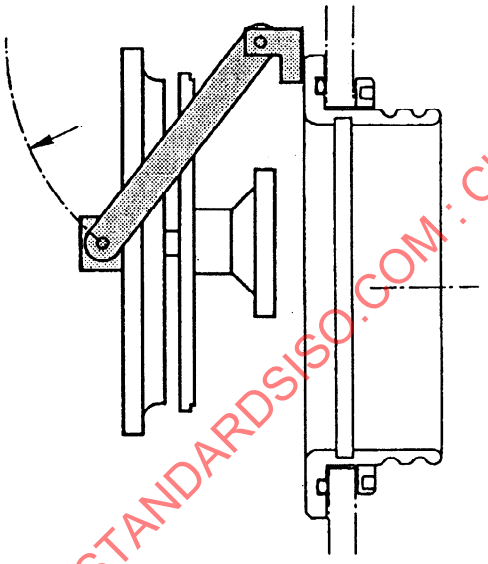


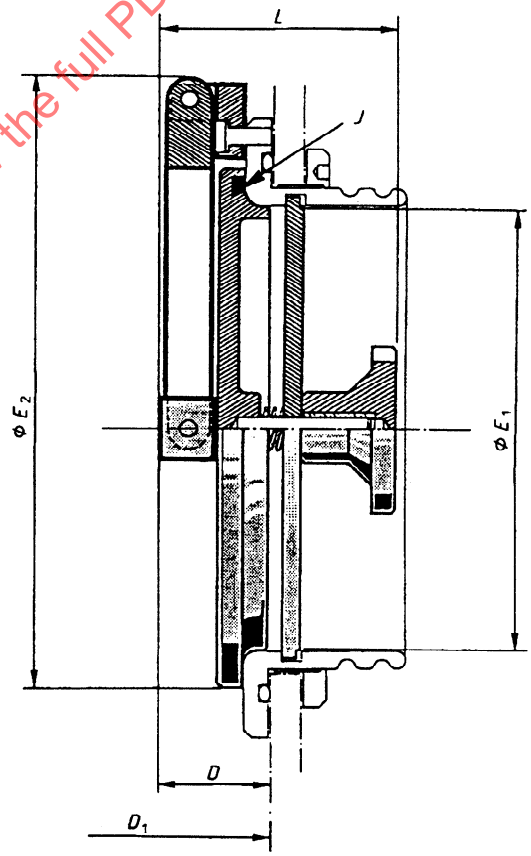
a) View from inside containment enclosure



b) View from outside containment enclosure



c) Cross-section showing opening of bung



d) Cross-section

Figure 16 - Bungs with single clamp plate and double hinge

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6.4.1 Bungs with single clamp plate (outside handscrew)

These types are suitable for glove ports. They are fitted from inside the enclosure and locked from outside. They are generally made of light alloy or stainless steel.

The standard dimensions of ISO bungs with a single clamp plate are given in table 5.

Table 5 - Standard dimensions of bungs with single clamp plate

Dimensions in millimetres

References	Associated glove/bag ports	Assembly	Locking	Port useful diameter	Bung dimensions [1]			
				U	E_1	E_2	*L*	*D*
1030 A	1000	inside	outside	156	155	184	72	22
1030 X	1000	inside	outside	156	155	184	72	22
1032 A	1032	inside	outside	186	185	216	72	22
1032 X	1032	inside	outside	186	185	216	72	22

1) According to the useful diameters of glove/bag ports, only the external diameters of bung (E_1) are standardized. The other dimensions E_2, *L*, *D*, and D_1 are outside of the scope of this part of ISO 11933 and are only given as information.

6.4.2 Bungs with single clamp plate and detachable flanges (inside handscrew).

These types are suitable for glove ports. They are fitted and locked from inside the enclosure. They are generally made of light alloy.

The standard dimensions of ISO bungs with a single clamp plate and detachable flanges are given in table 6.

Table 6 - Standard dimensions of bungs with single clamp plate and detachable flanges

Dimensions in millimetres

References	Associated glove/bag ports	Assembly	Locking	Port useful diameter	Bung dimensions [1]				
				U	E_1	E_2	*L*	*D*	D_1
1040 A	1000	inside	inside	156	155	220	90	90	-
1042 A	1002	inside	inside	186	185	258	90	90	-
1044 A	1004	inside	inside	249	248	322	90	90	-

1) According to the useful diameters of glove/bag ports, only the external diameters of bung (E_1) are standardized. The other dimensions E_2, *L*, *D*, and D_1 are outside of the scope of this part of ISO 11933 and are only given as information.

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6.4.3 Bungs with cruciform clamp plate and inner centring cross (inside handscrew)

These types are suitable for glove ports. They are fitted and locked from inside the enclosure. They are generally made of light alloy.

The standard dimensions of ISO bungs with a cruciform clamp plate and an inner centring cross are given in table 7.

Table 7 - Standard dimensions of bungs with cruciform clamp plate

Dimensions en millimetres

References	Associated glove/bag ports	Assembly	Locking	Port useful diameter	Bung dimensions [1]				
				U	E_1	E_2	L	D	D_1
1056 A	1006	inside	inside	330	329	400	90	90	-
1058 A	1008	inside	inside	400	399	468	90	90	-

1) According to the useful diameters of glove/bag ports, only the external diameters of bung (E_1) are standardized. The other dimensions E_2, L, D, and D_1 are outside of the scope of this part of ISO 11933 and are only given as information.

6.4.4 Bungs with single clamp plate and single hinge (outside handscrew)

These types are suitable for glove ports. They are fitted from inside the enclosure and locked from outside. They are made of light alloy or stainless steel.

The standard dimensions of ISO bungs with a single clamp plate and a single hinge are given in table 8.

Table 8 - Standard dimensions of bungs with single clamp plate and single hinge

Dimensions in millimetres

References	Associated glove/bag ports	Assembly	Locking	Port useful diameter	Bung dimensions [1]				
				U	E_1	E_2	L	D	D_1 [2]
1060 A	1000	inside	outside	156	155	205	110	57	230
1060 X	1000	inside	outside	156	155	205	110	57	230
1062 A	1002	inside	outside	186	185	240	110	57	265
1062 X	1002	inside	outside	186	185	240	110	57	265

1) According to the useful diameters of glove/bag ports, only the external diameters of bung (E_1) are standardized. The other dimensions E_2, L, D, and D_1 are outside of the scope of this part of ISO 11933 and are only given as information.

2) D_1 is the whole distance needed to fully open the bung.

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6.4.5 Bungs with single clamp plate and double hinge (outside handscrew)

These types are suitable for glove ports. They are fitted from inside the enclosure and locked from outside. They are generally made of light alloy or stainless steel.

The standard dimensions of ISO bungs with a single clamp plate and a double hinge are given in table 9.

Table 9 - Standard dimensions of bungs with single clamp plate and double hinge

Dimensions in millimetres

References	Associated glove/bag ports	Assembly	Locking	Port useful diameter	Bung dimensions [1]				
				U	E_1	E_2	L	D	D_1 [2]
1070 m [2]	1000	inside	outside	156	155	220	90	40	160
1072 m [2]	1002	inside	outside	186	185	250	90	40	175

1) According to the useful diameters of glove/bag ports, only the external diameters of bung (E_1) are standardized. The other dimensions E_2, L, D, and D_1 are outside of the scope of this part of ISO 11933 and are only given as information.

2) According to the code given in clause 4, m is an alphabetical index corresponding to the material of construction (m = P, X, A, etc.).

3) D_1 is the whole distance needed to fully open the bung.

6.5 Bungs with clip and single hinge (inside handscrew)

These bungs are suitable for glove or bag ports. They are fitted from inside the enclosure and locked from inside or outside, by changing the location of the knob (see figure 17). They are made of PP, light alloy or stainless steel.

The standard dimensions of ISO bungs with a clip and a single hinge are given in table 10.

Table 10 - Standard dimensions of bungs with clip and single hinge

Dimensions in millimetres

References	Associated glove/bag ports	Assembly	Locking	Port useful diameter	Bung dimensions [1]					
				U	E_1	E_2	L_1	L_2	D	D_1 [2]
1080 m [2]	1000 TG 2	inside	inside/ outside	156	149,5	200	55	77	57	223
1082 m [2]	1002 TG 2	"	" "	186	197	240	52	77	57	263
1084 m [2]	1004 TG 2	"	inside	249	246	323	55	82	55	332
1086 m [2]	1006 TG 2	"	"	330	320	390	55	82	55	399
1088 m [2]	1008 TG 2	"	"	400	390	455	58	85	55	450

1) According to the useful diameters of glove/bag ports, only the external diameters of bung (E_1) are standardized. The other dimensions E_2, L_1, L_2, D and D_1 are outside of the scope of this part of ISO 11933 and are only given as information.

2) According to the code given in clause 4, m is an alphabetical index corresponding to the material of construction (m = P, X, A, etc.).

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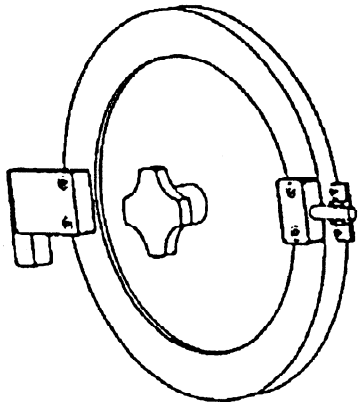
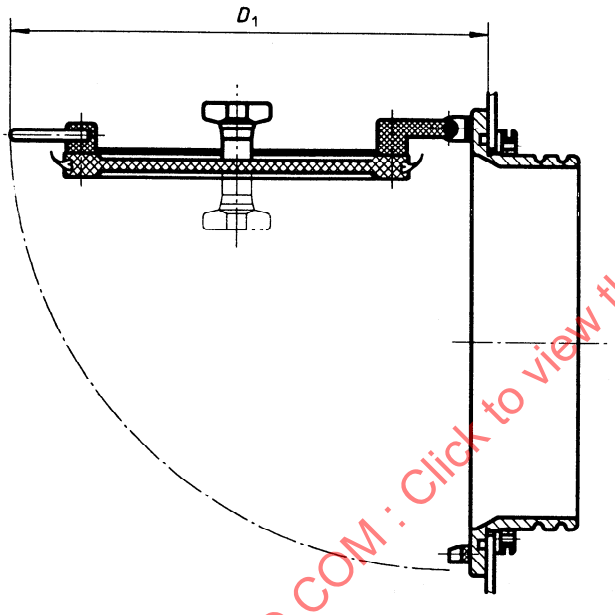
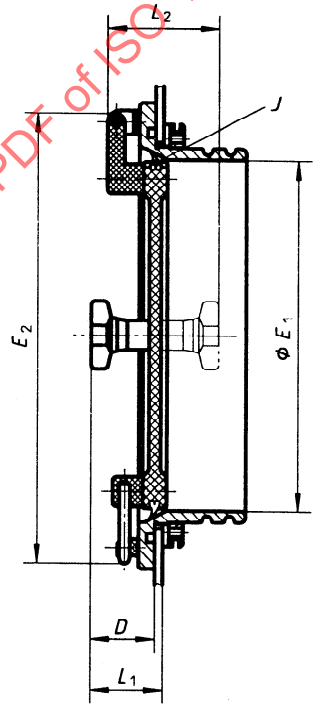


a) View from inside containment enclosure



b) Cross-section showing opening of bung



c) Cross-section

Figure 17 - Bungs with clip and single hinge

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7 Enclosure rings

7.1 General

7.1.1 Classification of the various models of enclosure rings

There are several models of enclosure rings which differ as follows:

- in the way of mounting on the enclosure wall,
- in the design of the associated interchangeable systems,
- in the way of mounting of the support rings,
- in the profile of the seals,
- in the procedure of ejection of the interchangeable units.

Presently three different types may be found:

a) **Type 1** enclosure rings and associated interchangeable units.

This type of enclosure ring is **threaded** on the enclosure wall and may receive ejectable support rings for gloves, bags, tong or manipulator gaiters and if necessary rigid plugs, circular windows and securing rings.

In this system, the ejectable support ring is a one-piece component.

b) **Type 2** enclosure rings and associated interchangeable units.

This type of enclosure ring is **threaded** onto the enclosure wall and may receive ejectable support rings for gloves, bags, tong and manipulator gaiters and if necessary rigid plugs, circular windows and securing rings.

In this system, the ejectable support ring is made of two pieces.

NOTE — A variation of the type 2 system, is a welded or threaded enclosure ring having the same profile as the glove/bag ports shown in figures 10a and 10b; in this document, both receive the same associated interchangeable units as mentioned previously (type 2 interchangeable units).

For this special system, the enclosure rings are arbitrarily designated glove/bag ports since they are the same as those described in clause 5. The associated interchangeable accessories are referenced as previously for type 2.

c) **Type 3** enclosure rings and associated interchangeable units.

This type of enclosure ring is welded or bonded onto the enclosure wall. It consists in fact of a glove/bag port having the same profile as shown in figure 7 and receives ejectable support rings for tong or manipulator gaiters, circular windows and if necessary bags or gloves.

For this type 3 system, the enclosure rings are arbitrarily designated glove/bag ports, since they are the same as those described in clause 5. Only the associated interchangeable accessories are specific to this type.

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7.1.2 Mounting of enclosure rings on enclosure wall

The three types of enclosure ring may be mounted either onto a containment enclosure, (with or without a shielding wall) or onto a shielding wall alone [4].

---

4) Special case of lead, steel or concrete β, γ shielded enclosures on which manipulator accessories similar to those mounted on containment enclosures can be used.

The interior generated surface shall be manufactured so that the interchangeable units are located in the enclosure rings and maintain leaktightness.

7.1.3 Interchangeability of ejectable units

The exchange of ejectable units is achieved through an ejecting device of suitable dimensions and according to a specific operating mode: each new element replaces the previous one by pushing it into the enclosure without breaking the leaktightness.

7.2 Type 1 enclosure rings

7.2.1 General

Type 1 enclosure rings are mounted onto enclosure containment walls using threaded components; they can accommodate only ejectable containment units such as support rings or rigid plugs (see figure 18).

The interchangeable units are held in their operating position by a securing ring.

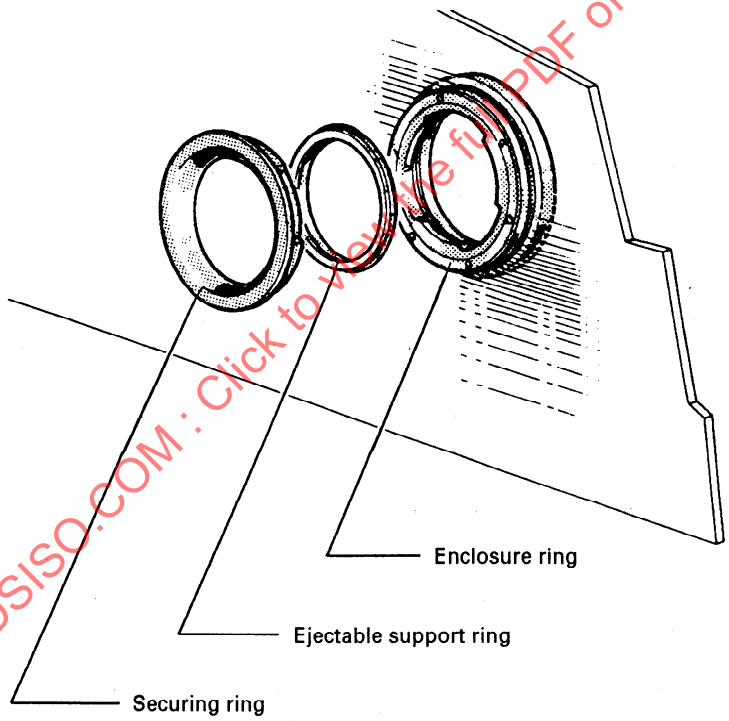

Figure 18 - General view of type 1 enclosure rings and interchangeable containment units

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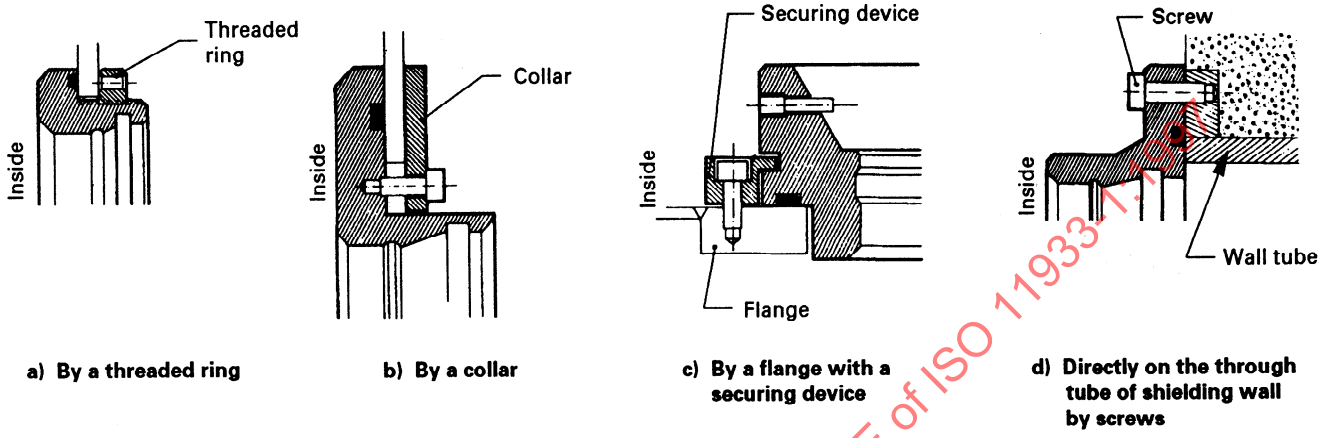
7.2.2 Assembly

Except in special circumstances, these enclosure rings are mounted directly onto the containment enclosure wall using a threaded ring. A notch is provided at the bottom, in line with the centre, to accommodate a securing device.

Enclosure rings may be fixed onto the containment wall in four different ways, as shown in figure 19.



a) By a threaded ring

b) By a collar

c) By a flange with a securing device

d) Directly on the through tube of shielding wall by screws

NOTE — In the case where the enclosure ring is mounted on the shielding wall directly, it is screwed on the edge of the through-wall tube of concrete shielding wall or lead wall, with screws.

Figure 19 - Methods of assembly of enclosure rings

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7.2.3 Material

These enclosure rings are made of metal (stainless steel or light alloy).

7.2.4 Dimensions

These enclosure rings are available in suitable dimensions for use with standardized shielding aperture bricks and also in dimensions matching manipulator ports.

The standard dimensions of ISO enclosure rings of type 1 are given in table 11.

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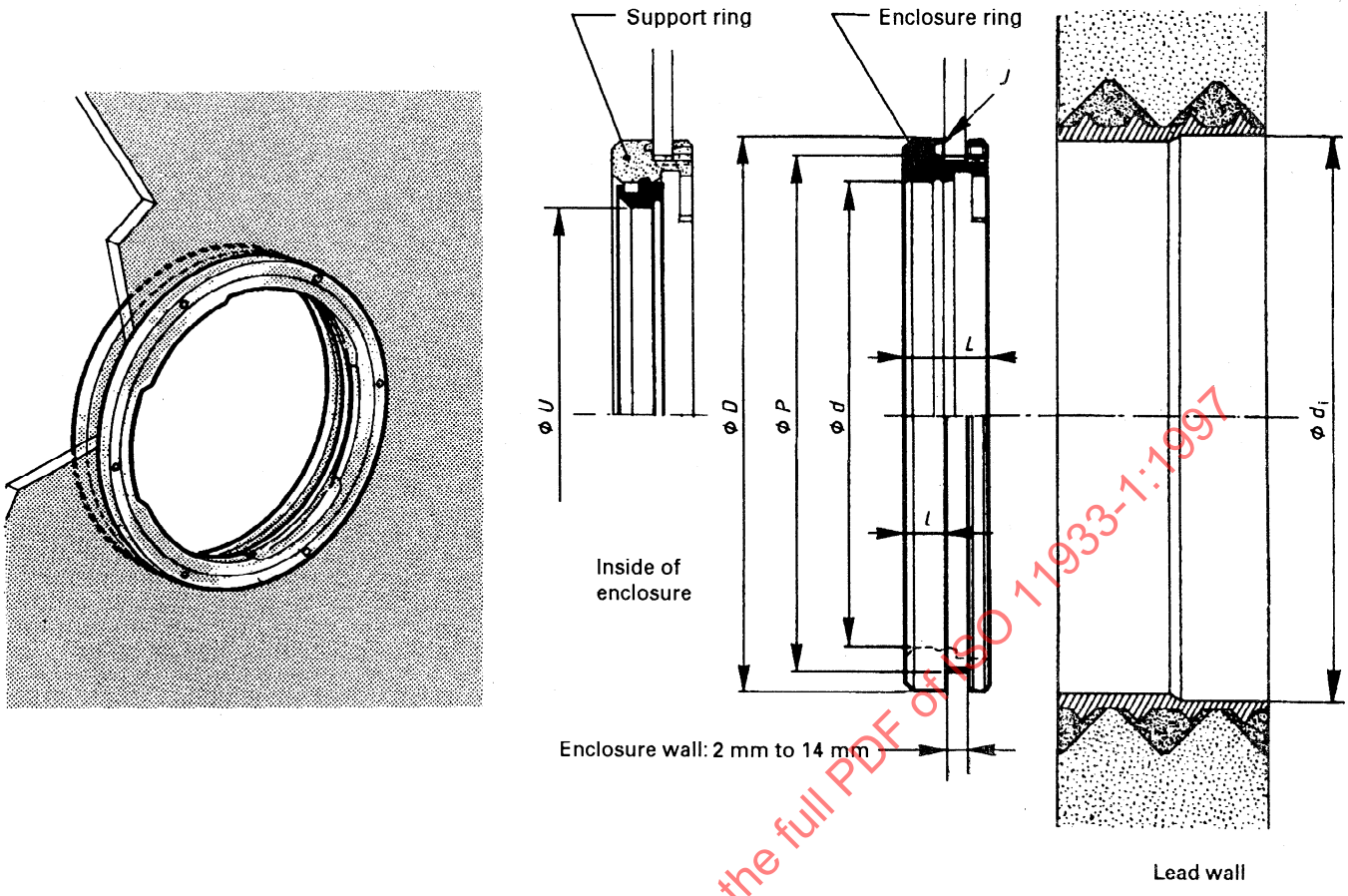

Figure 20 - Type 1 enclosure rings

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Table 11 — Standard dimensions of type 1 enclosure rings

Dimensions in millimetres

Enclosure rings						Related containment units	Associated lead aperture bricks [1]		Diameter of hole through containment enclosure wall, P
References	Dimensions				Mounting mode		Type	Diameter of hole through lead shielding, d_i	
	d	D	L	I					
1100 m [2]	150	195	35	12	Securing nut	Gloves, bags, tong and manipulator gaiters	VO 200	170 210	172,5
1101 m [2] [3]	175	226	30	10	Securing nut	Manipulator gaiters	VO 202	266 266	196,5
1102 m [2]	175	235	35	10	Securing nut	Gloves, bags	VO 202	266 266	204
1104 m [2]	225	270	38	15	Securing nut	Gloves, bags, manipulator gaiters	VO 202	266 266	245,5
1105 m [2] [3]	240	345	50	15	Securing nut	Bags, manipulator gaiters	VO 204	366	298
1106 m [2] [3]	265	355	50	15	Securing nut	Bags, manipulator gaiters	VO 204	366	315
1107 m [2]	272	330	33	17	Securing nut	Bags	VO 204	366	306
1108 m [2]	325	400	38	18	Collar	Bags, tong gaiters	VO 204	366	370,5
1109 m [2] [4]	400	463	62	45	Flange	Bags, manipulator gaiters		—	430

1) Chevron units are described in ISO 7212 and ISO 9404-1.

2) According to the code given in clause 4, m is an alphabetical index corresponding to the material of construction (m = X ou A).

3) Enclosure ring for manipulator gaiter used for shielded and leaktight cells. If the shielding wall is made of concrete or lead panels, the through-wall tube should be of the required dimensions. If standard lead elements are used, an adapted flange on the shielding shall be provided.

4) Enclosure ring for manipulator gaiter adapted for use only on leaktight enclosures. If associated shielding is required, this shall be made of lead, concrete or steel with a wall-through tube diameter of suitable dimensions.

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7.3 Type 2 enclosure rings

7.3.1 General

Type 2 enclosure rings are mounted on enclosure containment walls using threaded components; they can accommodate only ejectable containment units such as support rings and rigid plugs.

The interchangeable elements are held in their operating position by a securing ring.

7.3.2 Mounting on enclosure wall

Usually these enclosure rings are directly threaded on the containment enclosure wall, as shown in figure 21b. In special circumstances they are welded on containment walls, as shown in figure 23b.

7.3.3 Material

These enclosure rings are made of metal (stainless steel or light alloy).

7.3.4 Dimensions

These enclosure rings are available in one dimension which is in accordance with glove port dimensions of useful diameter of 186 mm. They can be used with standard shielding aperture bricks and also in dimensions suitable for manipulator ports.

The standard dimensions of ISO enclosures rings of type 2 are given in table 12.

7.3.5 Variation of type 2 enclosure rings

As mentioned in 7.1.1, this type 2 system can also combine a glove/bag port having a special profile and the same associated interchangeable units as previously.

In this case the characteristics of the enclosure rings/glove/bag ports are the following:

7.3.5.1 General

These special enclosure rings have a longer flange with external grooves in order to receive directly gloves or bags as for glove/bag ports with the same profile.

The traditional mounting with internal ejectable support ring remains possible.

7.3.5.2 Mounting on an enclosure wall

These enclosure rings may be directly threaded on the enclosure wall as standard rings (see figure 23a) or welded on metallic enclosure walls (see figure 23b).

7.3.5.3 Material

These enclosure rings are made of metal (stainless steel or light alloy).

7.3.5.4 Dimensions/reference number

Enclosure rings have the same profile as glove/bag ports described in figures 9a-9b. They are respectively designated 1003 TD 2 X - 1003 WD 2 X.

The standard dimensions of these variations of ISO enclosure rings of type 2 are given in table 13.

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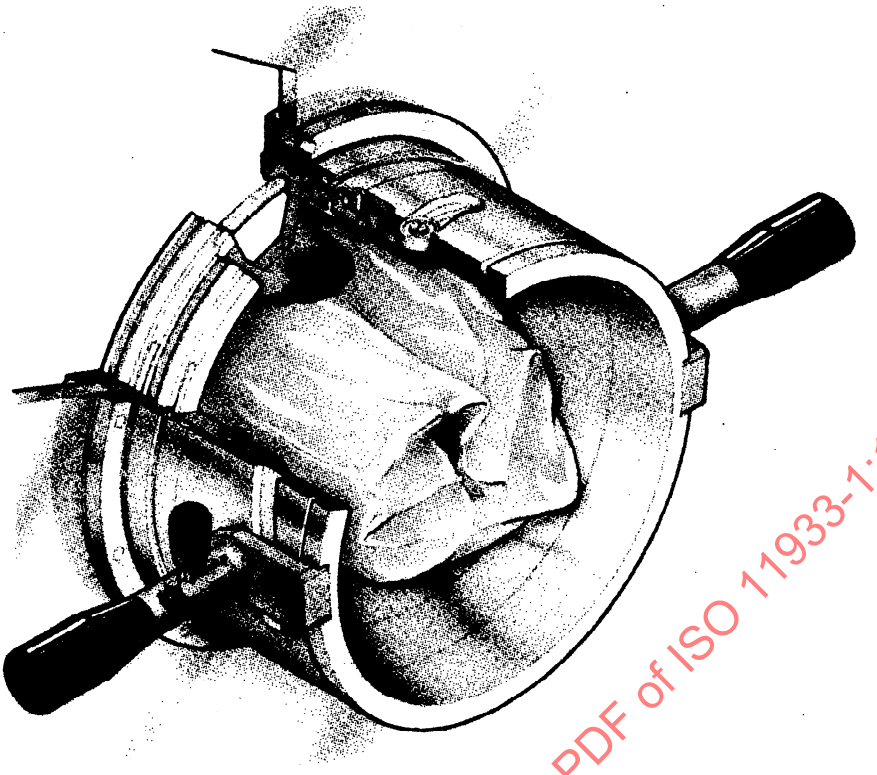
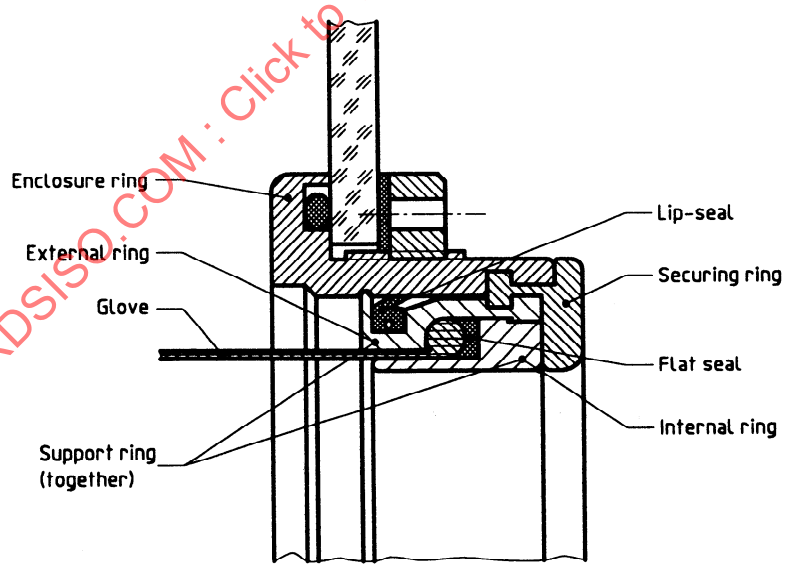


a) General view of the ejecting device



b) Detail of cross-section

Figure 21 - Type 2 enclosure rings and interchangeable containment units

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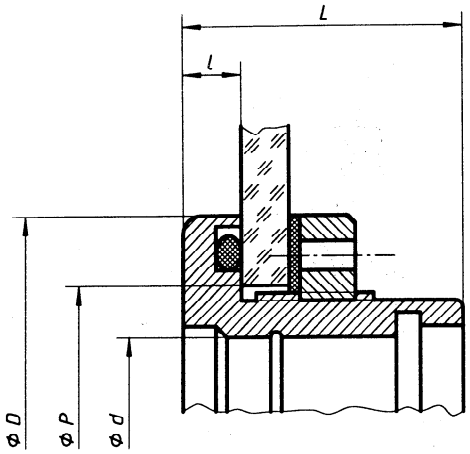
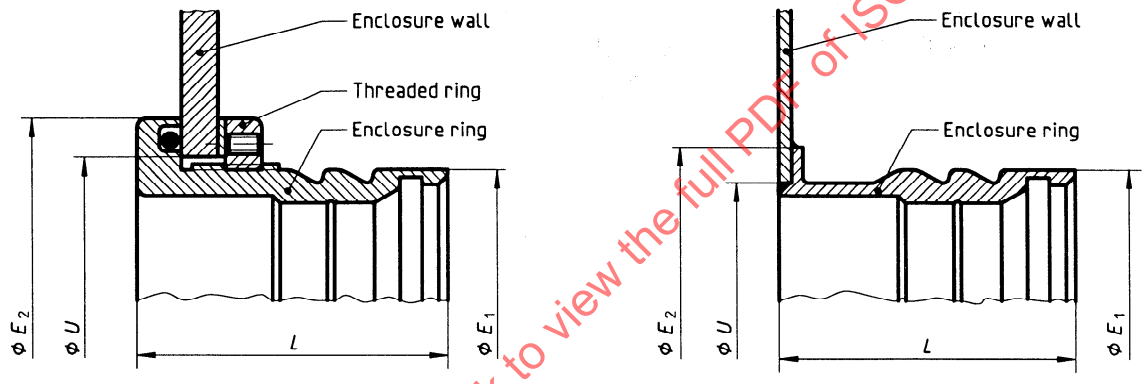


Figure 22 - Dimensions of type 2 enclosure rings



a) Variation enclosure ring of type 2, threaded on enclosure containment wall

b) Variation enclosure ring of type 2, welded on enclosure containment wall

Figure 23 - Variation of type 2 enclosure ring

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Table 12 - Standard dimensions of type 2 enclosure rings

Dimensions in millimetres

Enclosure rings					Associated lead aperture brick		Diameter of hole in containment enclosure wall	Related containment units
References	Dimensions				Type	Diameter of hole through lead shielding		
	d	*D*	*L*	*l*			*P*	
1123 m [1]	200	250	60	12	VO 202	266	224	Gloves, bags, rigid plugs, windows

1) According to the code given in clause 4, m is an alphabetical index corresponding to the material of construction (m = X or A).

Table 13 - Standard dimensions of variation of type 2 enclosure rings

Dimensions in millimetres

Glove port (enclosure rings)						Associated lead aperture brick		Diameter of hole in containment enclosure wall	Related containment units
Reference	U	E_1	E_2	L	D	Type	Diameter of hole through lead shielding	P	
1003 TD 2 X	200	216	244	88	12	VO 202	266	224	Gloves, bags, plugs, windows
1003 WD 2X	200	216	228	63	0	VO 202	266	217	

7.4 Type 3 enclosure rings

7.4.1 General

Type 3 enclosure rings being glove ports, as described in figure 8 (double fixing system of gloves) are dealt with in clause 8 of this document. Only special information concerning glove ports used as enclosure rings is given below.

They include three grooves and accommodate internally interchangeable containment accessories described in clause 8.

7.4.2 Mounting on enclosure wall

Assembly in the containment enclosure is carried out by welding or bonding, depending on the material used.

7.4.3 Material

The material of the enclosure rings may be either stainless steel or plastic. The selected material shall be the same as that used for the containment enclosure in which the enclosure rings are assembled.

7.4.4 Dimensions

The standardized dimensions of ISO glove ports used as type 3 enclosure rings are given in table 14.

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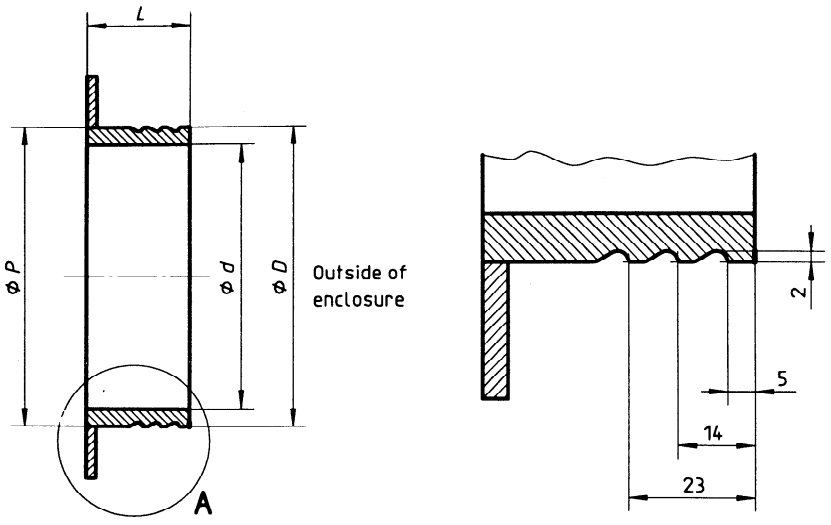
Dimensions in millimetres



a) General view (cross section) b) Detail A

Figure 24 - Type 3 enclosure rings

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Table 14 - Standard dimensions of type 3 enclosure rings[1)]

Dimensions in millimetres

Glove/ports/enclosure rings				Associated lead aperture brick		Diameter of hole in containment enclosure wall *P*	Related containment units
References	*d*	*D*	*L*	Type	Diameter of hole through lead shielding		
1001 BD 3M	180	200	55	VO 209	195	200	Support rings for tong gaiters, circular windows
1001 WD 3X	180	200	55	VO 209	185		
1005 BD 3M	254	274	55	VO 213	285	274	Idem
1005 WD 3X	254	274	55	VO 213	275		
1006 WD 3X	340	360	55	VO 217	365	360	Idem
1008 WD 3X	400	420	55			420	Suport rings for bags, bags

1) These devices are in fact glove/bag ports, and thus have the same reference number as in table 3.

8 Interchangeable units

8.1 General

8.1.1 Classification of the different interchangeable units

According to the enclosure rings classification given in 7.1.1, three interchangeable unit types may be defined according to:

- the method of fixing to the enclosure rings,
- the shape of the seal,
- the method of ejection of interchangeable systems.

These three interchangeable unit families are:

a) type 1 family: All elements associated with type 1 enclosure rings;

b) type 2 family: All elements associated with type 2 enclosure rings;

c) type 3 family: All elements associated with type 3 enclosure rings.

8.1.2 Contents of the different families of interchangeable units

8.1.2.1 Type 1 interchangeable units, compatible with type 1 enclosure rings, include ejectable units such as support rings for gloves or welded bags, circular windows, rigid plugs, tong or manipulator gaiters, and securing rings.

8.1.2.2 Type 2 interchangeable units, compatible with type 2 enclosure rings or with special glove/bag ports profiled as represented in figure 10, include ejectable units such as support rings for gloves or welded bags, rigid plugs, circular windows, tong or manipulator gaiters, and securing rings.

8.1.2.3 Type 3 interchangeable units, compatible with type 3 enclosure rings (in fact special glove or bag ports as described in figure 8) include special rings for remote-handling tong gaiters and circular windows.

NOTE — All the leaktight components mounted on these interchangeable units are described in ISO 11933-2.

8.2 Type 1 interchangeable units compatible with type 1 enclosure rings

8.2.1 General

Examples of interchangeable units are given in figure 25.

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8.2.1.1 Ejectable interchangeable containment units

These include:

a) ejectable support rings which retain interchangeable units in the enclosure ring's groove such as gloves, welded bags, circular windows, tong or manipulator gaiters (see figure 25) or other flexible units including a seal.

b) rigid plugs used as an ejectable holder for leakproof penetrations (fluid, electrical current, etc.) or sealing units; they are made of one single piece and are provided with a lip seal in the neck (see figure 25c).

8.2.1.2 Interchangeable containment-securing units

These are the securing rings used to hold type 1 interchangeable units in type 1 enclosure rings. They can be positioned manually or by the use of an ejecting device (see ISO 11933-2).

8.2.2 Seals

The purpose of the seals is to ensure leaktightness of the assembly between the enclosure ring and ejectable support ring.

Their shape and profile depend on the kind of material (PVC or elastomer). Assembly instructions for each seal type shall be carefully observed.

8.2.2.1 PVC seal (see figure 26a)

This seal type with lip profile is fitted onto flexible PVC items (welded bags, circular windows, tong gaiters, etc.).

For assembly, the seal requires a progressive application of force in order to be stretched and fitted into the support ring groove (immersion in hot water at about 60 °C makes fitting easier).

8.2.2.2 Elastomer seal (see figure 26b)

This flanged seal type fits on elastomer gloves. It requires a groove profile larger than the PVC seal type (8 mm instead of 6 mm). The leaktightness in the support ring is achieved by compression of the toroidal-shaped seal.

As considerable effort is required to fit them, gloves or bags equipped with such seals are supplied already fitted to the support ring.

8.2.2.3 Seals for rigid plugs (see figure 26c)

This PVC seal has the same shape as the seal fitted onto flexible elements. It shall be mounted and checked in the same way as described in 8.2.2.1.

8.2.3 Assembly (see figure 27)

Ejectable support rings and rigid plugs are installed in enclosure rings using a suitable ejecting device. They are held in place by a securing ring, which can be mounted either manually or with an ejecting device according to type.

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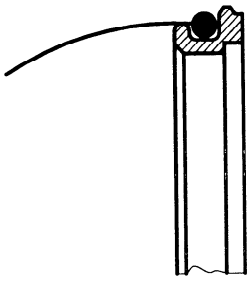
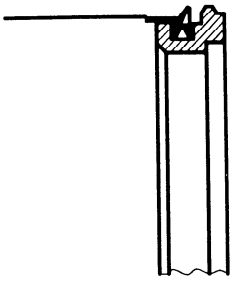
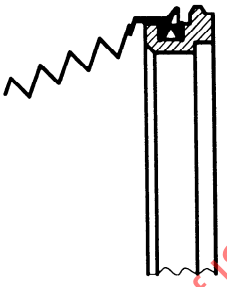
a) Support ring



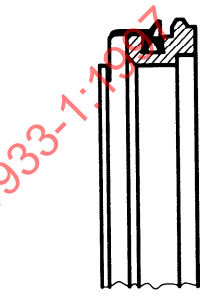
b1) Support rings equipped with: glove (or tong gaiter) made of elastomer



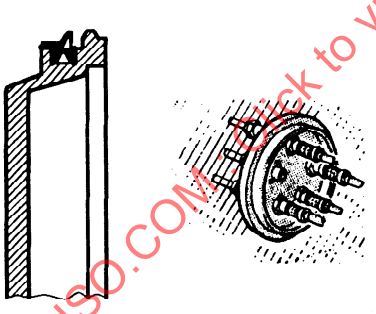
b2) Support rings equipped with: welded bag



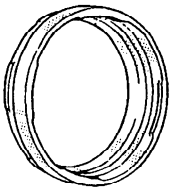
b3) Support rings equipped with: protective manipulator gaiter (or tong gaiter) made of PVC



b4) Support rings equipped with: circular window



c) Rigid plug



d) Securing ring

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Figure 25 - Type 1 interchangeable units

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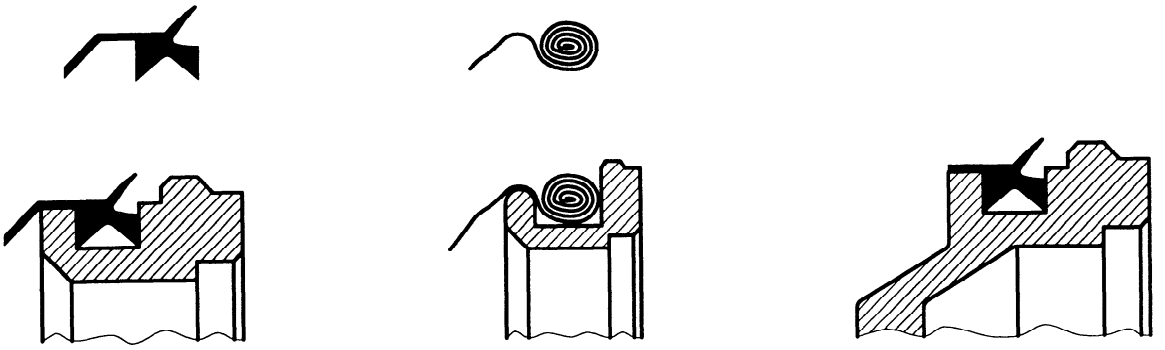
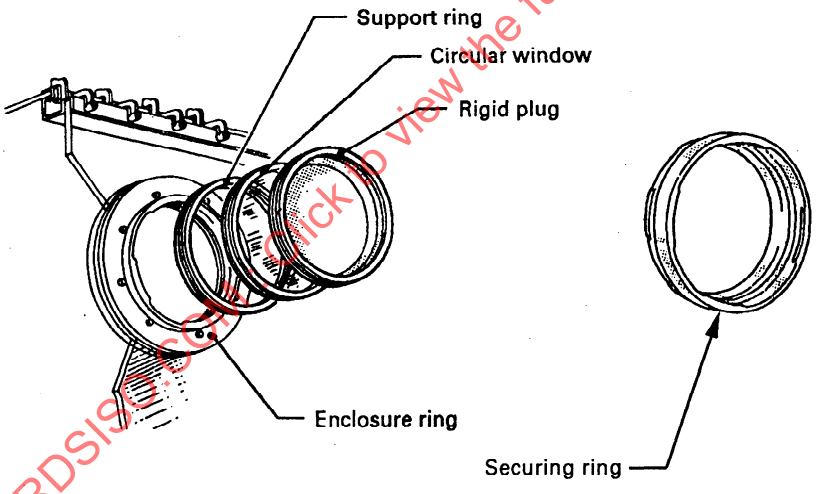


a) PVC seal for bags, gaiters or circular windows

b) Elastomer seal for gloves

c) PVC seal for rigid plug

Figure 26 - Seals and assembly of seals



a) Sub-assemblies

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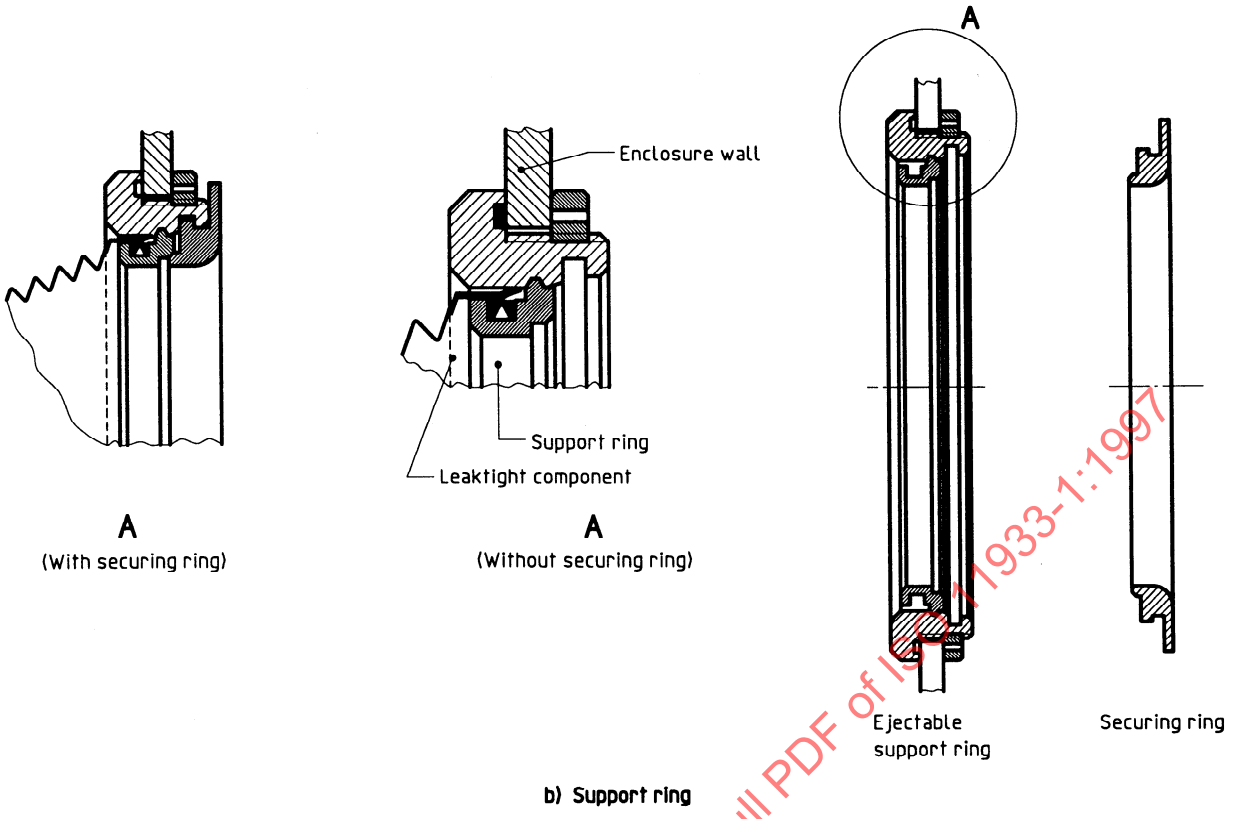
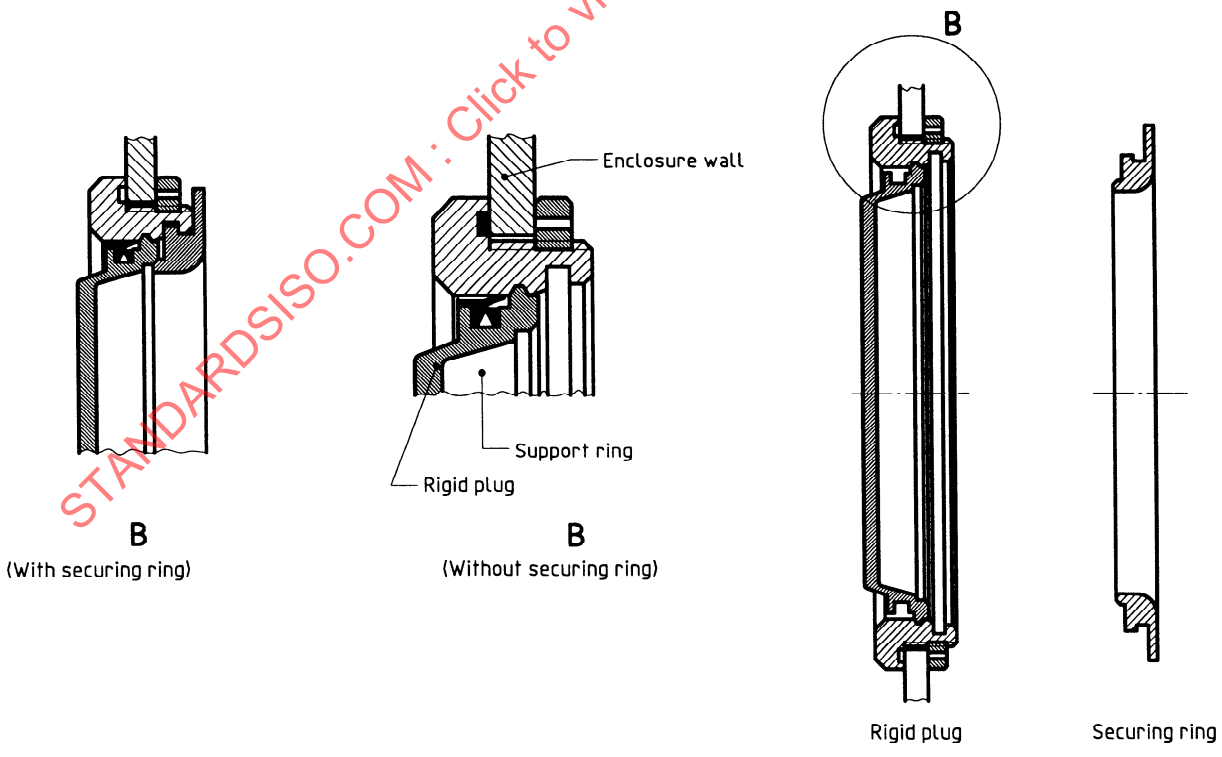


b) Support ring



c) Rigid plug

Figure 27 - Assembly of type 1 interchangeable units

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8.2.4 Material

Ejectable support rings and rigid plugs are made of PE. Circular windows are made of transparent PVC.

The securing rings are made of light alloy or PP.

8.2.5 Dimensions

The standard dimensions of type 1 ISO support rings, rigid plugs and securing rings are given in tables 15, 16 and 17 respectively.

Table 15 - Standard dimensions of type 1 support rings

Dimensions in millimetres

Support rings							Associated enclosure rings		Related containment units
References	d	D_g	D_e	L	Width of groove e [3]		References	d'	
1130 E	130	135,5	154	18	6	8	1100 m [2]	150	Bags, circular windows, tong and manipulator gaiters Gloves, tong gaiters
1131 E [1]	155	160,5	179	18	6		1101 m	175	Bags, manipulator gaiters, circular windows
1132 E	155	160,5	179	18	—	8	1102 m	175	Gloves, tong gaiters
1134 E	205	210,5	229	20	6	8	1103 m	225	Bags, tong and manipulator gaiters, circular windows Gloves, tong gaiters
1135 E [1]	221	220,5	244	20	6	—	1104 m	240	Bags, manipulator gaiters, circular windows
1136 E [1]	246	261,5	269	20	6	—	1105 m	265	Bags, manipulator gaiters, circular windows
1137 E	248	258,5	276	20	6	—	1106 m	272	Bags, circular windows
1138 E	300	311,5	329	25	6	—	1107 m	325	Bags, tong gaiters, circular windows
1139 E	362	386,5	404	30	6	—	1108 m	400	Bags, manipulator gaiters

1) Special interchangeable unit associated with an enclosure ring for manipulator gaiter (see table 10).

2) According to the code given in clause 4, m is an alphabetical index corresponding to the material of construction (m = X or A).

3) The width of groove is dependent on the type and profile of the associated interchangeable unit (see 8.2.2.2).

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Table 16 - Standard dimensions of type 1 rigid plugs

Dimensions in millimetres

Rigid plugs							Associated enclosure rings
References	L	l	d	D_u	D_g	Width of groove, e	References [1]
1200 E	28	11	6	126	135,5	6	1100 m [3]
1201 E [2]	28	10	6	151	160,5	6	1101 m [3]
1202 E	28	10	6	151	160,5	6	1102 m [3]
1204 E	30	10	6	196	210,5	6	1104 m [3]
1205 E [2]	30	10	6	212	226,5	6	1105 m [3]
1206 E [2]	30	10	6	237	261,5	6	1106 m [3]
1207 E	30	10	6	239	258,5	6	1107 m [3]
1208 E	35	10	6	297	311,5	6	1108 m [3]

1) There is no rigid plug for the enclosure ring referenced 1109.

2) Special interchangeable unit associated with an enclosure ring for manipulator gaiter (see table 10).

3) According to the code given in clause 4, m is an alphabetical index corresponding to the material of construction (m = X or A).

Table 17 - Standard dimensions of type 1 securing rings

Dimensions in millimetres

Securing rings					Associated enclosure rings
References [3]	D	d	L	l	References [1]
1250 n [3]	167	130	28	13,5	1100 m [4]
1251 n [2] [3]	188	155	28	12	1101 m [4]
1252 n [3]	188	155	28	12	1102 m [4]
1254 n [3]	244	205	38	18,5	1104 m [4]
1255 n [2] [3]	253	221	34	8	1105 m [4]
1256 n [2] [3]	278	247	34	10	1106 m [4]
1257 n [3]	292	259	27	12	1107 m [4]
1258 n [3]	345	300	32	15	1108 m [4]

1) There is no securing ring for the enclosure ring referenced 1109.

2) Special interchangeable unit associated with an enclosure ring for manipulator gaiter (see table 10).

3) According to the code given in clause 4, n is an alphabetical index corresponding to the material of construction (n = A or P).

4) According to the code given in clause 4, m is an alphabetical index corresponding to the material of construction (m = X or A).

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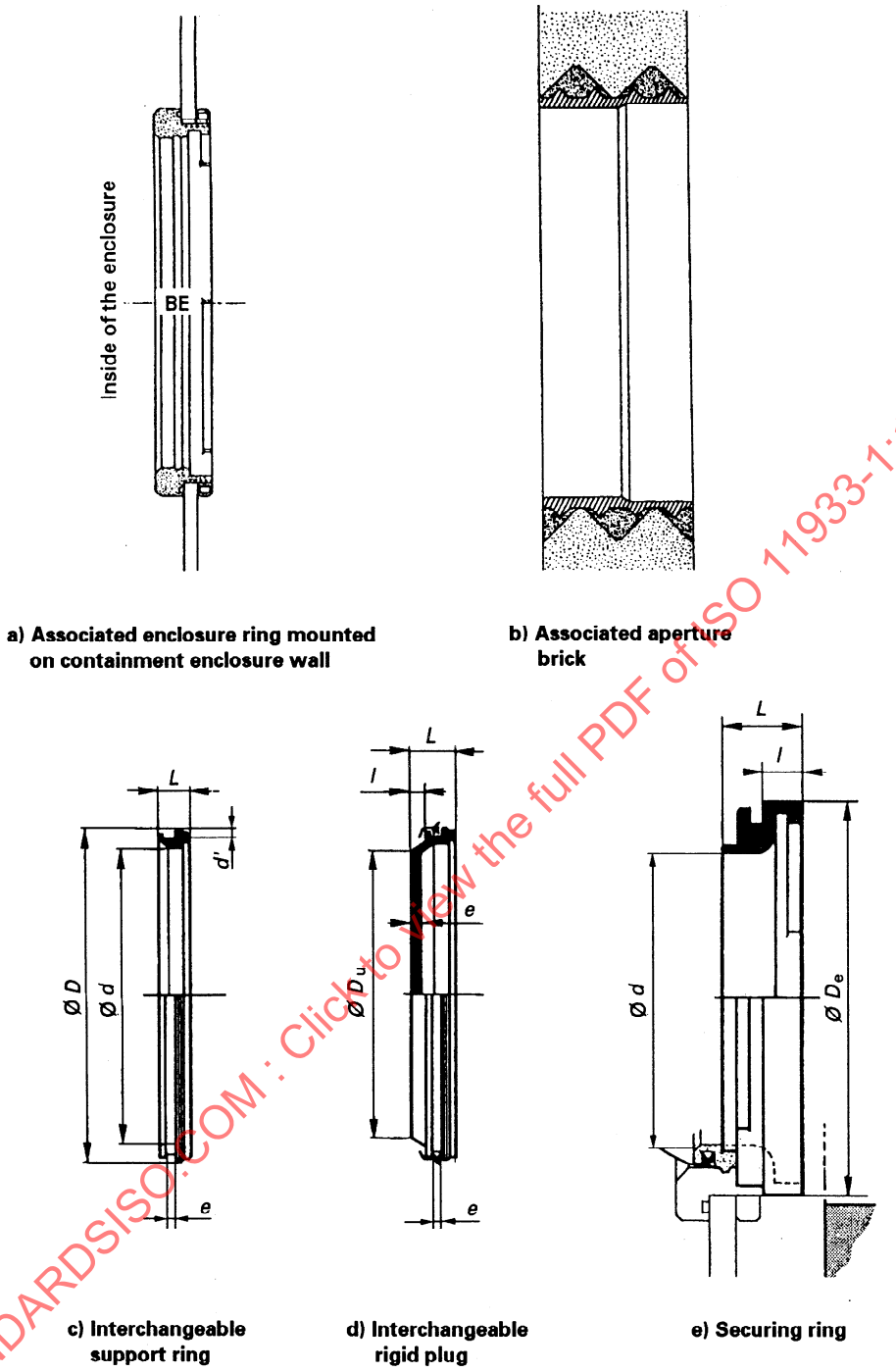

a) Associated enclosure ring mounted on containment enclosure wall

b) Associated aperture brick

c) Interchangeable support ring

d) Interchangeable rigid plug

e) Securing ring

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Figure 28 - Type 1 interchangeable units with associated units