BS EN 148-1:2018

BSI Standards Publication

Respiratory protective devices - Threads for facepieces

Part 1: Standard thread connection

bsi.

National foreword

This British Standard is the UK implementation of EN 148-1:2018. It supersedes BS EN 148-1:1999, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PH/4, Respiratory protection.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Atemschutzgeräte - Gewinde für Atemanschlüsse - Teil 1: Rundgewindeanschluss

This European Standard was approved by CEN on 17 September 2018.

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European foreword

This document (EN 148-1:2018) has been prepared by Technical Committee CEN/TC 79 “Respiratory protective devices”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2019, and conflicting national standards shall be withdrawn at the latest by June 2019.

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

This document supersedes EN 148-1:1999.

The following main technical changes have been made compared to EN 148-1:1999:

a) ISO 17420-3 taken as basis for the revision of EN 148-1;

b) description and additional requirements for thread connector with sockets are added;

c) sealing surface adapted and a new drawing for socket sealing included;

d) pull force in 4.4.1 reduced to 50 N;

e) Annex ZA deleted.

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1 Scope

This document specifies standard threads for respiratory protective devices and the description of test devices necessary for the assessment of some of the requirements.

This document does not apply to diving equipment and to positive pressure demand breathing apparatus.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 48-4, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 4: Indentation hardness by durometer method (Shore hardness)*

ISO/DIS 815-1, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO/DIS 16972, *Respiratory protective devices —Definitions of terms and pictograms*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/DIS 16972 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1.1
thread connection
shape and dimensions of the standard connection between RPD components with a male thread connector and respiratory interfaces with a female thread connector

3.1.2
socket
inner component that can rotate independently of the outer male thread connector

3.2 Symbols

For the purposes of this document, the following symbols apply (see Figure 1 to Figure 20).

d_1	major diameter of male thread
d_2	minor diameter of male thread
d_3	inner dimension for gauge
d_4	outer dimension for gauge
D_1	major diameter of female thread
D_2	minor diameter of female thread
h	pitch
t_1	thread height
r	radius
b	thickness of gauge (GO gauge or NO-GO gauge)
w	permissible surface degradation due to wear and tear for d_1 and d_2
H_a	thickness of ring A
H_b	thickness of ring B

4 Requirements

4.1 Elements of thread connection

The thread connection shall consist of the following three elements.

1) A male thread connector without sockets which forms the connecting element of a filter or a male thread connector with socket for connectors other than for filters.

2) A female thread connector which forms the connecting element of the respiratory interface.

3) A sealing element which is retained within the female thread connector.

4.2 Sealing element

The sealing element shall be retained in place, correctly centred, and it shall not be possible to dislodge it during normal use.

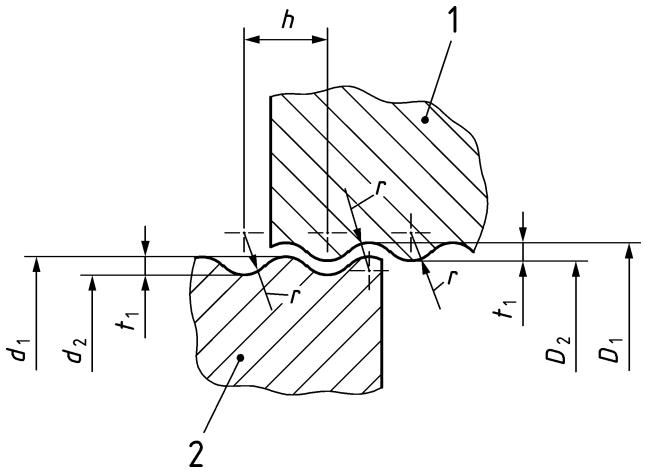
It shall be easy to check that the sealing element is in place (e.g. sealing element of a different colour from the female thread connector).

Testing shall be performed in accordance with 5.1.

4.3 Geometry of thread profile

4.3.1 General

The profile of the thread shall have a diameter of 40x1/7 as defined by the female and male threads profile geometry (Figure 1) and thread dimensions given in Table 1.



Key

1 female thread
2 male thread

Figure 1 — Geometry of thread profile

Table 1 — Thread dimensions for the mechanical connection interface

Dimensions in millimetres

Thread	Male thread			Female thread			Pitch	No. of threads per 25,4 mm	Thread height	Radius
	Major diameter		Minor diameter	Major diameter	Minor diameter					
	d_1		d_2	D_1	D_2					
	max.	min.	max.	min.	min.	max.	h	z	t_1	r
⌀ 40x1/7	40,00	39,70	38,40	40,16	38,56	38,86	3,629	7	0,65 to 0,8	1,225

Testing shall be performed in accordance with 5.1, 5.3, 5.4 and 5.5.

4.3.2 Circularity of threads

4.3.2.1 General

The circularity tolerance of the threads shall be 0,15 mm referred to the major radius of the male thread and 0,15 mm referred to the minor radius of the female thread.

4.3.2.2 Circularity of the male thread

When approached perpendicular to the axis of the thread in any angular orientation, the limit snap gauge with single-ended jaws shall not pass over the thread (see Figure 8).

Testing shall be performed in accordance with 5.2.1.

4.3.2.3 Circularity of the female thread

When approached parallel to the axis of the thread in any angular orientation, the sector NO-GO gauge shall not enter the thread (see Figure 9).

Testing shall be performed in accordance with 5.2.2.

4.3.3 Male thread connector

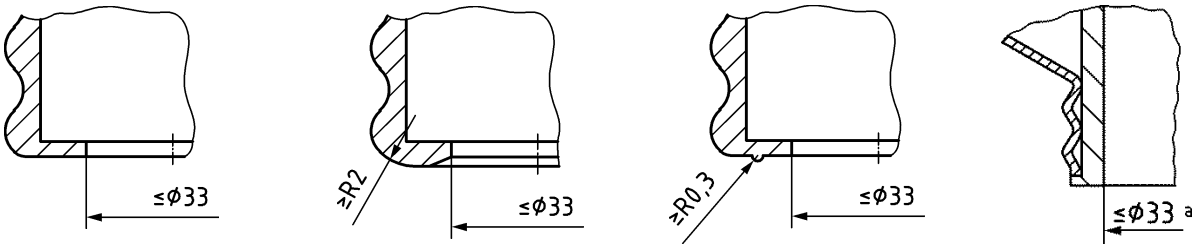
4.3.3.1 General

The material used for the male thread connector and its thickness is left to the manufacturer's choice.

4.3.3.2 Sealing surface

The shape of the sealing surface of the male thread connector shown in Figure 2 with the enlarged detail of Figures 2 a, 2 b, 2 c, 2 d that interfaces with the sealing element, is left to the manufacturer's choice. For example, it can be flat (see Figure 2 a), rounded with a radius ≥ 2 mm (see Figure 2 b), flat with a raised sealing ring (see Figure 2 c) or socket sealing (see Figure 2 d). If there is a raised sealing ring, it shall have a radius ≥ 0,3 mm.

Dimensions in millimetres



a) flat sealing surface **b) rounded sealing surface** **c) raised sealing surface** **d) socket sealing surface**

a The outlet diameter in Figure 2 d is specified for the upper limit to allow a minimum area for the sealing. The lower limit is not specified because it is covered indirectly by other performance requirements, such as breathing resistance.

Figure 2 — Sealing surface of the male thread connector

4.3.3.3 Dimensions

The axial dimensions of the male thread connector shall be measured starting from the most protruding part of the sealing surface (including raised sealing ring, if present).

The beginning of the thread, up to a maximum of 2 mm of length, is not considered as effective thread and it shall be left to the manufacturer's design choice. The initiation of the thread shall be smooth.

When the GO gauge is screwed by hand without excessive force onto the male thread connector, at least 2 mm of the connector shall extend from the surface of the gauge.

The effective length of thread shall be ≥ 14,5 mm (see Figure 3 and 4).

When gauged with the effective length ring gauge, the distance from the top of the gauge to the top of the thread shall be ≥ 8 mm (see Figure 20 and 21).

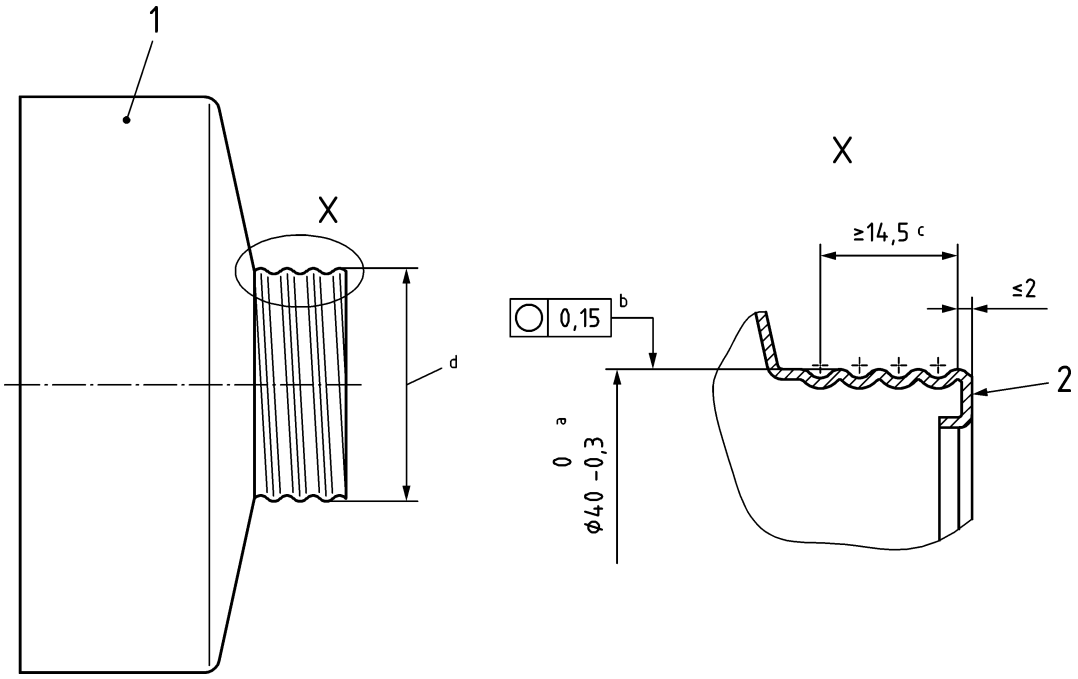
The internal diameter (minimum diameter of the sealing surface area) of the male thread connector shall be ≤ 33,0 mm (see Figure 2).

It shall not be possible to fit the NO-GO gauge onto the male thread connector.

Without excessive force, the NO-GO gauge shall bind after initial engagement.

Testing shall be performed in accordance with 5.1, 5.3 and 5.5.

Dimensions in millimetres

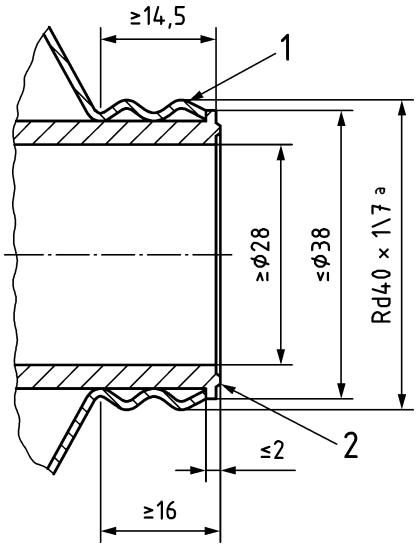


Key

1 filter
2 sealing surface
a major diameter
b reference to radius
c effective thread
d thread ⌀40 mm x 1/7”

Figure 3 — Male thread connector without socket for filters

Dimensions in millimetres



Key

1 thread up to edge

2 sealing surface section left to the choice of the manufacturer

a specification see 4.3

Figure 4 — Male thread connector with socket for filters

4.3.4 Female thread connector

4.3.4.1 General

The material used for the female thread connector and its thickness is left to the manufacturer's choice.

4.3.4.2 Dimensions

The axial dimensions of the female thread connector shall be measured starting from the sealing surface of the sealing element.

The available length of the thread of the female thread connector shall be (13,0 ± 0,5) mm extended to the edge of the connector (see Figure 5).

When the GO side of the gauge, with ring A in place, is screwed by hand without excessive force into the female thread connector (with the sealing element correctly in place), ring A shall block.

When the GO side of the gauge, with ring B in place, is screwed by hand without excessive force into the female thread connector (with the sealing element correctly in place), ring B shall remain loose.

The internal diameter of the female thread connector (minimum diameter of the sealing area) shall be ≤ 30 mm (see Figure 5).

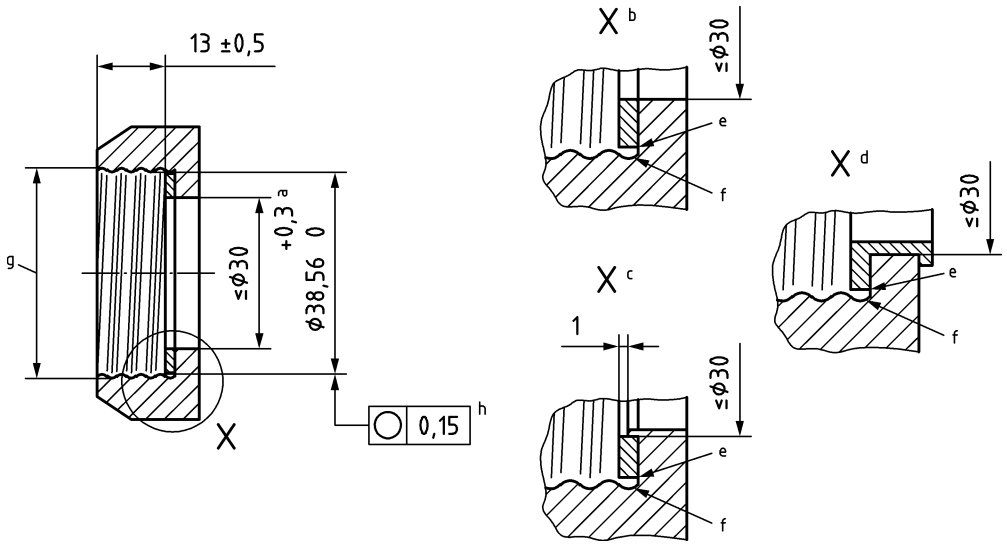
It shall not be possible to fit the NO-GO side of the gauge into the female thread connector without excessive force. It shall bind after initial engagement.

If the central hole of the connector on the respiratory interface has a rim for retention and centring of the sealing element, it shall end at least 1 mm below the surface of the sealing element interfacing the filter.

The part of the female thread connector below the level of the upper surface of the sealing element shall not invade the surface defined by the extension of the thread towards the lower surface of the sealing element (see enlarged detail of Figure 5).

Testing shall be performed in accordance with 5.1 and 5.4.

Dimensions in millimetres



Key

a minor diameter
b example A
c example B
d example C
e the external diameter of the sealing element shall be ≥ 37,5 mm
f the female thread connector shall not invade beyond the line
g thread ⌀40 mm x 1/7”
h reference to radius

Figure 5 — Female thread connector

4.3.5 Sealing element

The sealing element shall be annular with a flat surface towards the filter.

The external diameter of the sealing element shall be ≥ 37,5 mm.

The internal diameter of the sealing element shall be ≤ 30,0 mm.

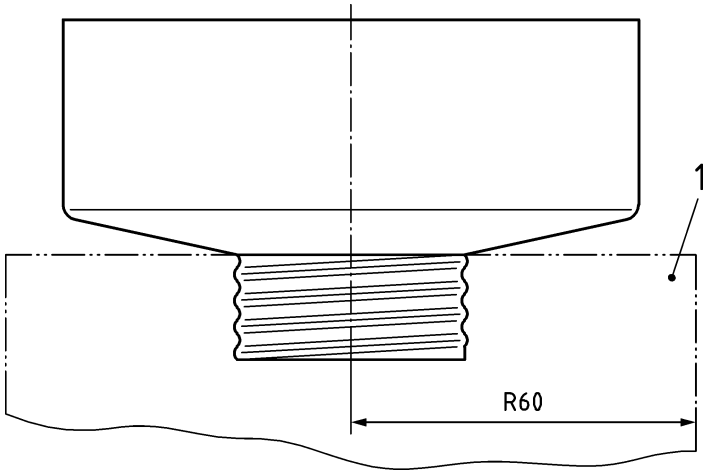
Its thickness shall be (2,0 + 0,5) mm.

Testing shall be performed in accordance with 5.1.

4.3.6 Absence of geometric interference

The back face of the filter shall not protrude beyond the plane perpendicular to the axis of the filter, passing at the end of the effective length of the thread in a circular area of at least 60 mm of radius (see Figure 6).

Dimensions in millimetres



Key

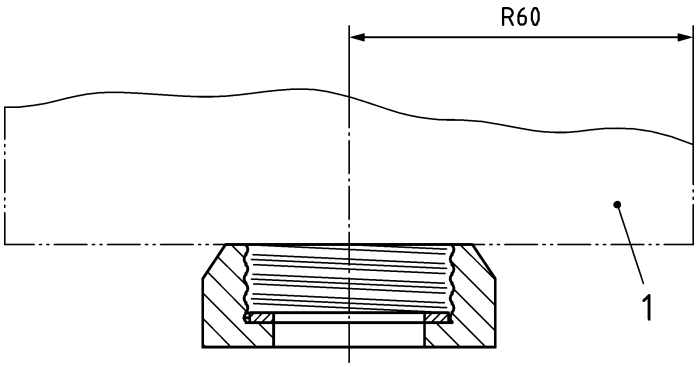
1 area, which shall not be invaded by the filter body

Figure 6 — Absence of geometric interference of the filter body

The front face of the female thread connector of the respiratory interface shall not protrude beyond the plane perpendicular to the axis of the female thread connector, passing at the end of the effective length of the connector in a circular area of at least 60 mm of radius (see Figure 7).

Testing shall be performed in accordance with 5.1, 5.3 and 5.4.

Dimensions in millimetres



Key

1 area, which shall not be invaded by the female thread connector and the respiratory interface

Figure 7 — Absence of geometric interference of the female thread connector

4.4 Physical and mechanical requirements of the thread connection

4.4.1 Resistance of the connectors to pull forces

The male and the female thread connectors shall withstand an axial pull force of 50 N for 10 s.

No connection shall separate, break or be permanently deformed as a result of the applied forces.

Permanent deformation shall be assessed with the gauges in accordance with Figure 8, Figure 9 and Figure 11.

Testing shall be performed in accordance with 5.6.

4.4.2 Physical and mechanical requirements of the sealing element

4.4.2.1 Hardness

The Shore hardness of the material used for the sealing element shall be between 55A and 70A.

Testing shall be performed in accordance with ISO 48-4.

4.4.2.2 Compression set

Compression set after 22 h at 68 °C shall be not greater than 25 %.

Testing shall be performed in accordance with ISO/DIS 815-1.

5 Testing

5.1 Inspection

Where no specific test method is presented for making measurements on the connection, measurements shall be performed using standard laboratory methods.

The gauges described can be used to assess the geometric requirements of the connector. Alternative methods, e.g. optical methods, may be used.

All samples are subject to visual inspection as specified within this document.

5.2 Circularity of threads

5.2.1 Circularity of male threads

With the limit snap gauge with single-ended jaws (shown in Figure 8) perpendicular to the axis of the thread at all times, attempt to pass the gauge over the thread in at least three different angular orientations to check the circularity of the thread.

The results shall be recorded.

Dimensions in millimetres

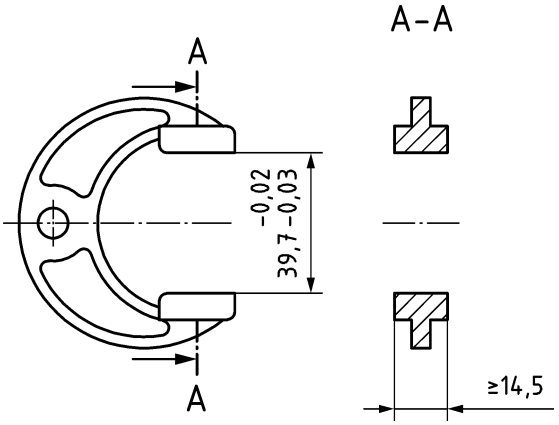


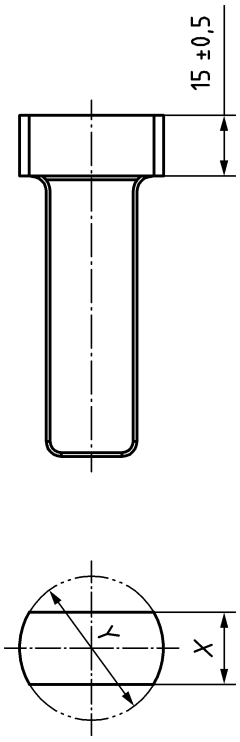
Figure 8 — Limit snap gauge with single-ended jaws

5.2.2 Circularity of female threads

With the sector NO-GO gauge (shown in Figure 9) parallel to the axis of the thread at all times, attempt to pass the gauge into the thread in at least three different angular orientations to check the circularity of the thread.

Record the results.

Dimensions in millimetres



Key

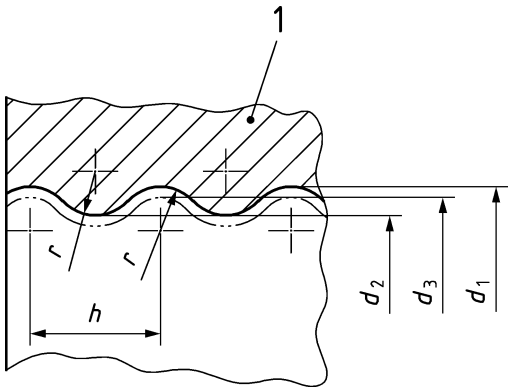
Y = 38,96 mm (+0,04;+0,02) mm

X = 1/2 of Y

Figure 9 — Sector NO-GO gauge

5.3 Geometry of male thread connector

Absence of physical interference and the shape and dimensions of the thread and length of the male thread connector (Figure 10) are checked with the GO gauge (Table 2, Figure 11) and the NO-GO gauge (Table 3, Figure 12).



Key
1 ring gauge

Figure 10 — Profile of male thread connector

Table 2 — Dimensions of GO gauge for male thread connector

Dimensions in millimetres

Thread	GO gauge							
	d_1	$d_{1\,w}$ [a]	d_2	$d_{2\,w}$ [a]	h	r	d_4	b
⌀ 40x1/7	$40^{+0,04}_{+0,02}$	$40^{0}_{+0,05}$	$38,40^{+0,04}_{+0,02}$	$38,40^{0}_{+0,05}$	$3,629 \pm 0,009$	1,225	$120^{+0,50}$	12,5
[a] Diameter including permissible degradation due to wear and tear.								

Table 3 — Dimensions of NO-GO gauge for male thread connector

Dimensions in millimetres

Thread	NO-GO gauge		
	d_3	d_4	b
⌀ 40x1/7	$39,70^{-0,02}_{-0,03}$	$120^{+0,50}$	$12,5^{+0,50}$

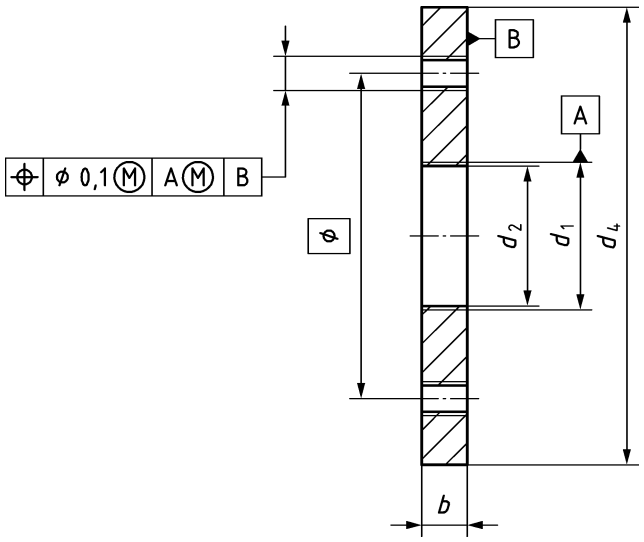


Figure 11 — GO gauge

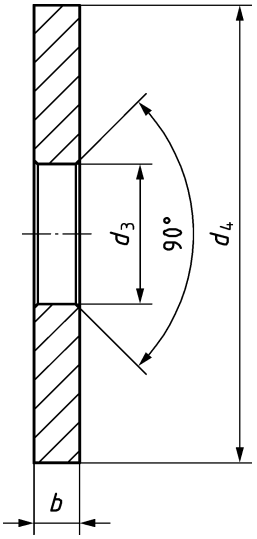


Figure 12 — NO-GO gauge

Without using excessive force, screw the GO gauge onto the male thread connector, check for physical interference and measure the length of the thread protruding from the surface of the gauge as shown in Figure 13.

Record the results.

Try to insert the male thread connector into the NO-GO gauge without excessive force. It shall not be possible to extend it into the NO-GO gauge by more than 6 mm, measured from the back of the gauge as shown in Figure 14.

Dimensions in millimetres

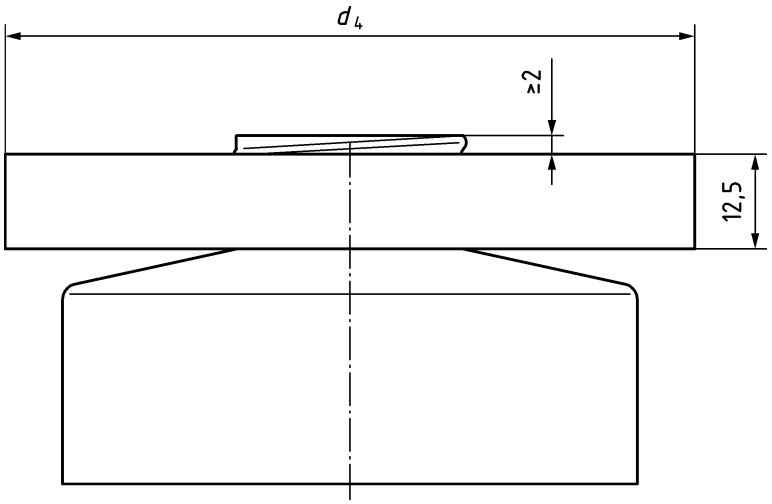


Figure 13 — Measurement of protruding thread

Dimensions in millimetres

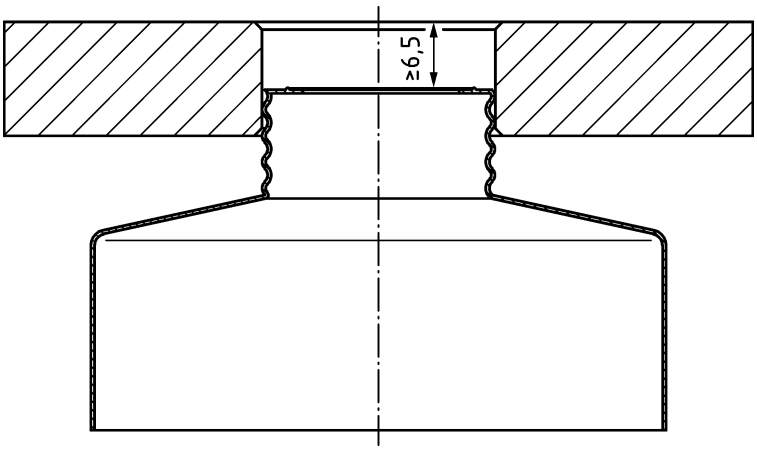
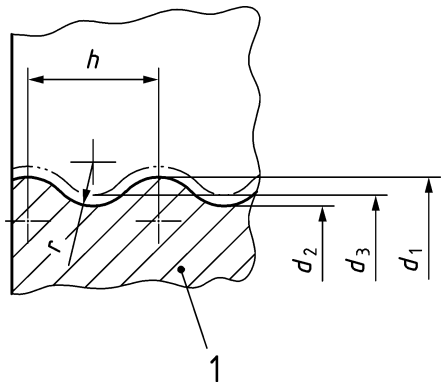


Figure 14 — Measurement of extension into NO-GO gauge

5.4 Geometry of female thread connector

Absence of physical interference and the shape and dimensions of the thread and depth of the female thread connector are checked with the GO gauge (see Table 4, Figure 15, Figure 16 and Figure 17) and the NO-GO gauge (see Table 5, Figure 18 and Figure 19).



Key
1 plug gauge

Figure 15 — Profile of female thread connector

Table 4 — Dimensions of GO gauge for female thread connector

Dimensions in millimetres

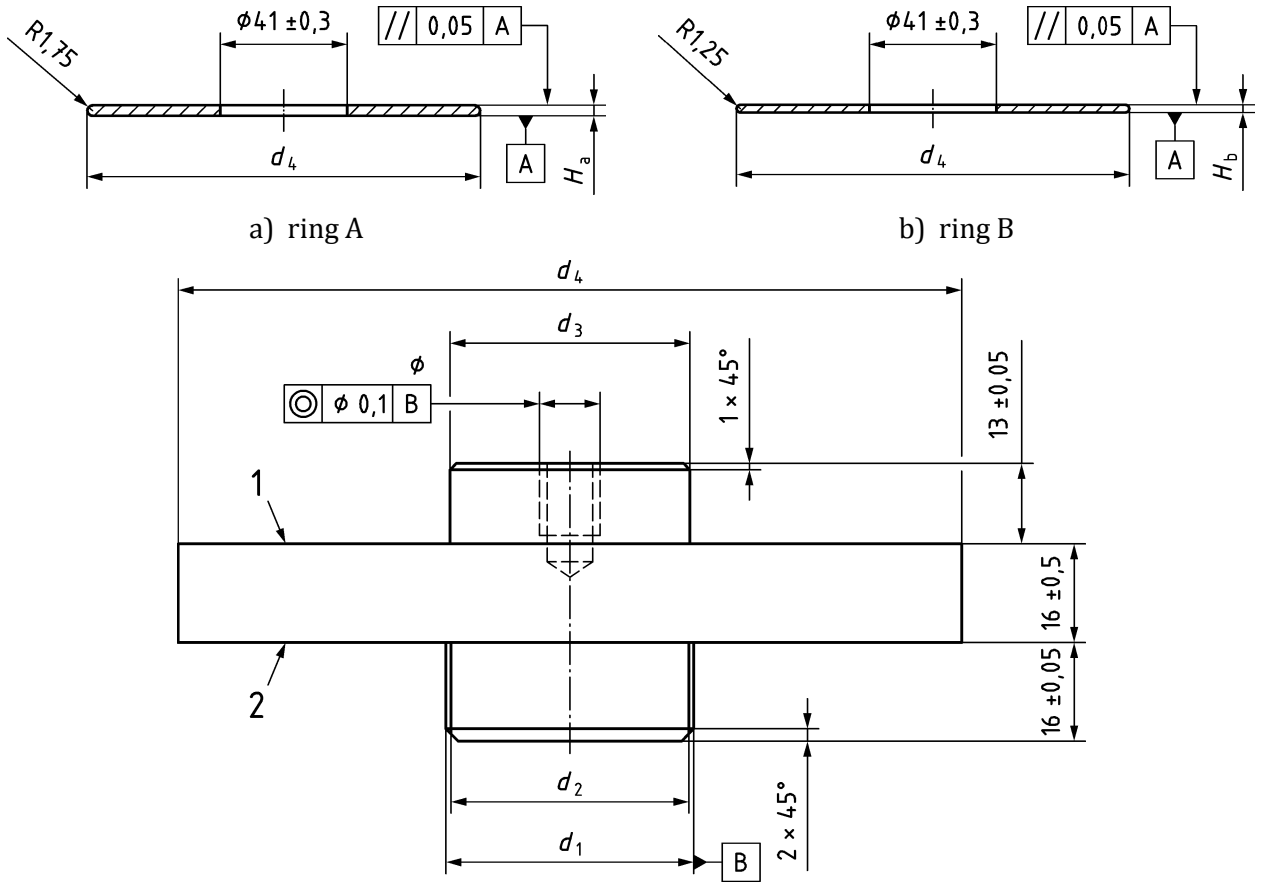
Thread	GO gauge					
	d_1	$d_{1\,w}$ [a]	d_2	$d_{2\,w}$ [a]	h	r
⌀ 40x1/7	$40,16^{-0,02}_{-0,04}$	$40,16^{0}_{-0,05}$	$38,56^{-0,02}_{-0,04}$	$38,56^{0}_{-0,05}$	$3,629^{\pm 0,009}$	1,225
[a] Diameter including permissible degradation due to wear and tear.						

Table 5 — Dimensions of NO-GO gauge for female thread connector

Dimensions in millimetres

Thread	NO-GO gauge	Ring A	Ring B	
	d_3	H_a	H_b	d_4
⌀ 40x1/7	$38,86^{+0,02}_{+0,04}$	$3,5^{+0,02}_{0}$	$2,5^{-0,05}_{-0,15}$	$120^{+0,50}$

Dimensions in millimetres



Key

1 NO-GO side

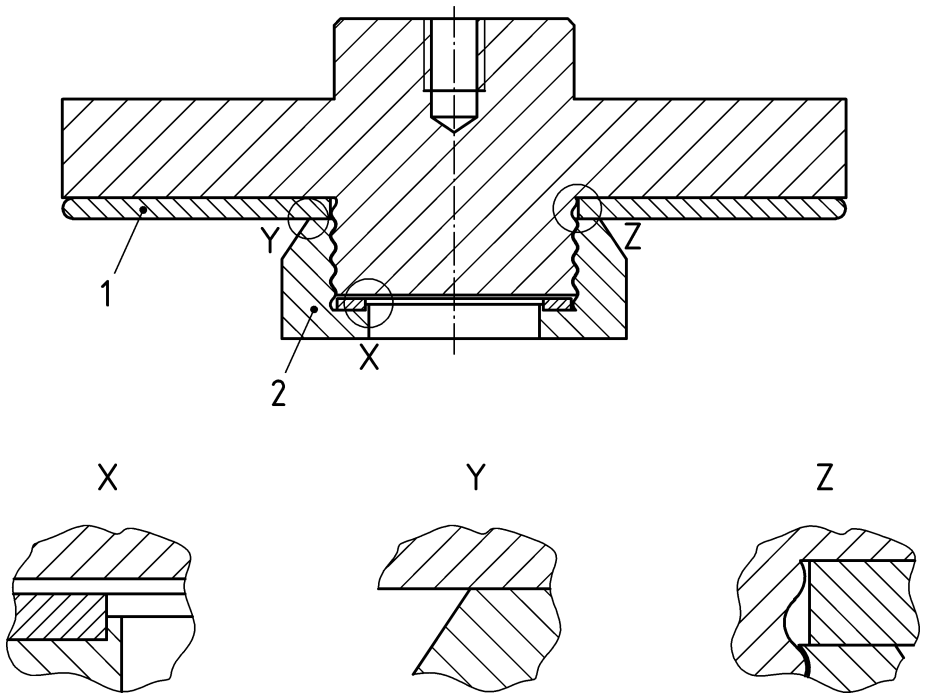
2 GO side

Figure 16 — Gauge dimensions for check of female thread connector

Dimension d_3 for the NO-GO side of the gauge in Figure 16 is to be taken from Table 5.

Without using excessive force, screw the GO side of the gauge fitted with ring A into the female thread connector (with the sealing element correctly in place) as shown in Figure 17.

Check for any physical interference and record the results.



Key

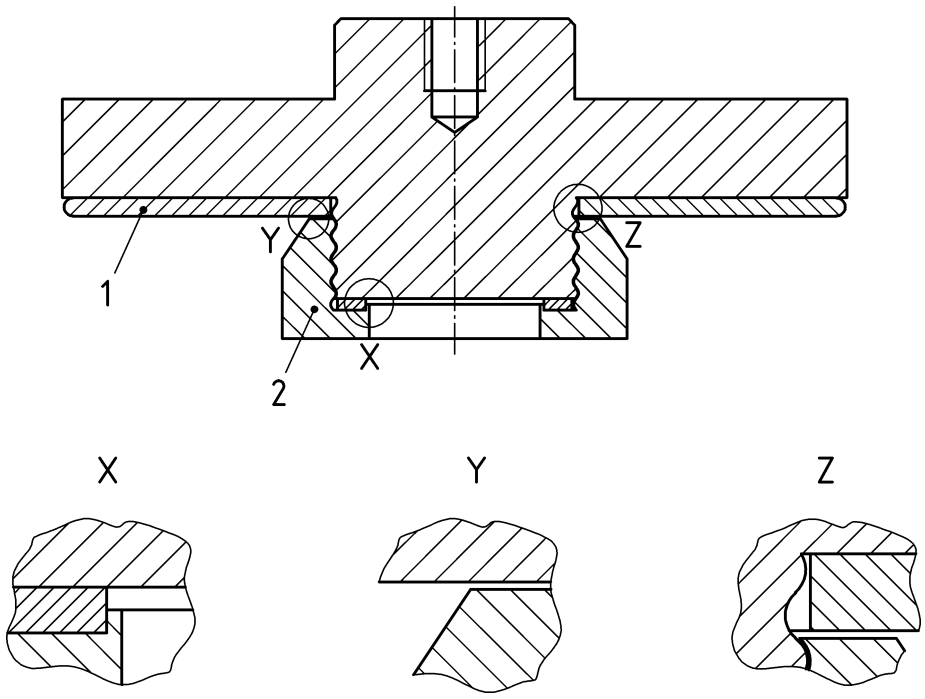
1 ring A

2 female thread connector

Figure 17 — Application of ring A

Without using excessive force, screw the GO side of the gauge fitted with ring B into the female thread connector (with the sealing element correctly in place) as shown in Figure 18.

Check for any physical interference and record the results.



Key

1 ring B

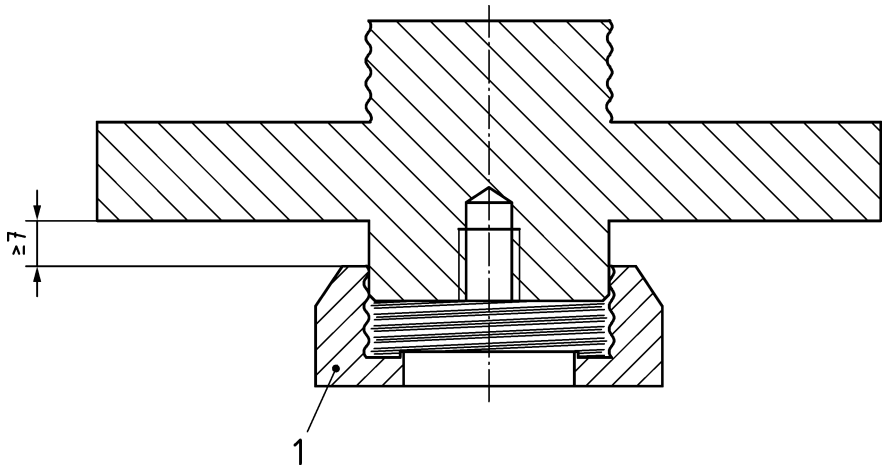
2 female thread connector

Figure 18 — Application of ring B

It shall not be possible to insert the NO-GO gauge into the female thread connector by more than 6 mm without excessive force as shown in Figure 19.

Record the results.

Dimensions in millimetres



Key

1 female thread connector

Figure 19 — Measurement of insertion of NO-GO gauge

5.5 Beginning of the effective thread of the male connection

With the thread of the male thread connector placed vertically upwards in a stable position, fit the effective length ring gauge (as shown in Figure 20 and Figure 21) onto the thread (as shown in Figure 21) and allow it to settle under the action of its own mass. Measure and record the distance between the top of the gauge and the top of the threads.

Dimensions in millimetres

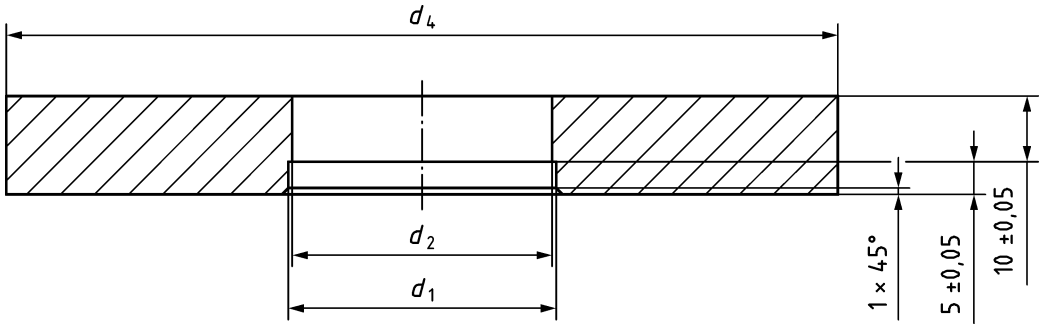


Figure 20 — Effective length ring gauge

Dimension d_1 and relative tolerances, are taken from Table 2.

Dimension d_2 and relative tolerances, are taken from Table 2.

Dimension d_4, and relative tolerances, are to be taken from Table 5.

Dimensions in millimetres

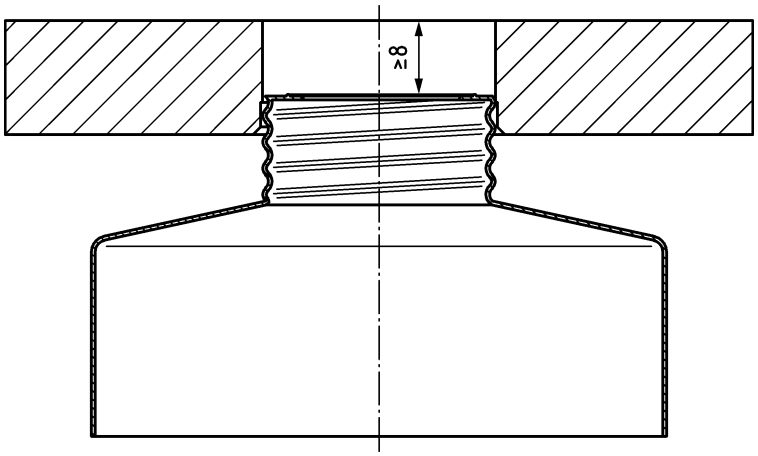


Figure 21 — Fitting of effective length ring gauge

5.6 Resistance of the connectors to pull forces

Testing of the male thread connector shall be performed using the GO gauge in accordance with Figure 11 where two threaded hooks and a wire are added to suspend the additional mass which, when added progressively, produces a total force of 50 N.

Testing of the female thread connector shall be performed using the GO/NO-GO gauge in accordance with Figure 16 (without ring A or ring B), where a threaded hook is added to suspend the additional mass which, when added progressively, produces a total force of 50 N.

Both tests shall be performed with the axis of the connectors orientated vertically.

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