

Stainless steel tubes and fittings for the food industry and other hygienic applications —

Part 4: Specification for threaded (IDF type) couplings

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Piping Systems Components Standards Policy Committee (PSE/-) to Technical Committee PSE/8, upon which the following bodies were represented:

- Adhesive Tape Manufacturers' Association
- British Compressed Air Society
- British Gas plc
- British Malleable Tube Fittings Association
- British Steel Industry
- British Valve and Actuator Manufacturers' Association
- British Welded Steel Tube Association
- Engineering Equipment and Materials Users' Association
- Food and Drink Federation
- Institution of Civil Engineers
- Institution of Gas Engineers
- Institution of Water and Environmental Management
- Large Diameter Steel Tube Association
- Mechanical Handling Engineers' Association
- Stainless Steel Fabricators' Association of Great Britain
- Steel Tube Fittings Manufacturers' Technical Association
- Water Companies Association
- Water Research Centre
- Water Services Association of England and Wales
- Coopted member

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- Brewers Society
- Dairy Trade Federation
- Institution of Production Engineers
- Milking Machine Manufacturers' Association

This British Standard, having been prepared under the direction of the Piping Systems Components Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 31 January 1992

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Contents

	Page
Committees responsible	Inside front cover
Foreword	iii
1 Scope	1
2 Information to be supplied by the purchaser	1
3 Definitions	1
4 Symbols	1
5 Design	2
6 Materials	10
7 Dimensions and tolerances	10
8 Surface finish	10
9 Assembly	10
10 Hygiene	10
11 Manufacturer's certificate	10
Appendix A Essential information to be supplied by the purchaser in the enquiry and/or order	11
Appendix B Purchaser options	11
Appendix C Trapezoidal threads intended for threaded couplings	11
Appendix D Cross section of threaded coupling assemblies	14
Appendix E Grooves for expanded type male parts and liners	14
Appendix F Lock rings for expanded type male parts and liners	14
Appendix G Guide for expanding with straight tube	16
Appendix H Effect of non-metallic products on water quality	17
Appendix J Marking	17
Figure 1 — Expanded type male part	2
Figure 2 — Expanded type liner	3
Figure 3 — Welded type male part	4
Figure 4 — Welded type liner	5
Figure 5 — Hexagon nut	6
Figure 6 — Round nut	7
Figure 7 — Specification of seals	8
Figure 8 — Support ring	9
Figure 9 — Trapezoidal thread form	12
Figure 10 — Limiting thread profile	12
Figure 11 — Thread form of male part	13
Figure 12 — Thread form of nut	13
Figure 13 — Cross section of expanded type coupling	14
Figure 14 — Cross section of welded type coupling	14
Figure 15 — Dimensions of grooves	15
Figure 16 — Lock ring	15
Figure 17 — Positioning of tube and the fitting of male part or liner	16
Figure 18 — Expansion of tube onto male part or liner	17
Figure 19 — Facing off expanded tube	18
Table 1 — Expanded type male part	2
Table 2 — Expanded type liner	3
Table 3 — Welded type male part	4
Table 4 — Welded type liner	5
Table 5 — Hexagon nut	6
Table 6 — Round nut	7

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	Page
Table 7 — Specification of seals	8
Table 8 — Support ring	9
Table 9 — Thread diameters for male parts	12
Table 10 — Thread diameters for nuts	12
Table 11 — Male part thread dimensions	13
Table 12 — Nut thread dimensions	13
Table 13 — Dimensions of grooves	14
Table 14 — Dimensions of lock ring	14
Table 15 — Steel hardness	16
Publication(s) referred to	Inside back cover

Foreword

This Part of BS 4825 has been prepared under the direction of the Piping Systems Components Standards Policy Committee. It is a revision of BS 4825-4:1977 which is withdrawn.

BS 4825 is published in five Parts:

- *Part 1: Specification for tubes;*
- *Part 2: Specification for bends and tees;*
- *Part 3: Specification for clamp type couplings;*
- *Part 4: Specification for threaded (IDF type) couplings;*
- *Part 5: Specification for recessed ring joint type couplings.*

This Part of BS 4825 has been prepared taking into account ISO 2853 published by the International Organization for Standardization (ISO).

Couplings specified in BS 4825 are intended for the following uses:

- Part 3, where either in-place cleaning or frequent dismantling is necessary;
- Part 4, where cleaning in-place techniques are normally practised;
- Part 5, where piping systems are frequently dismantled.

The essential differences between this Part of BS 4825 and BS 4825-4:1977 are as follows.

- a) This edition has been simplified by excluding reference to tube outside diameters not in current use.
- b) Tube sizes of 1.6 mm wall thickness have been introduced for welded type male parts and liners for tube outside diameters of 50.8 mm and below.
- c) The 101.6 mm outside diameter coupling is now 6 TPI (instead of 8 TPI) and reflects common UK usage. It is not interchangeable with the ISO 2853 coupling of the same diameter.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 18, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This Part of BS 4825 specifies the dimensions, tolerances, surface finish, materials, assembly and hygienic requirements for welded and expanded type male parts and liners, and nuts and seals for threaded IDF type fittings for the food industry and other hygienic applications.

NOTE 1 The male parts and liners specified are intended to be used with stainless steel tubes specified in BS 4825-1.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Information to be supplied by the purchaser

2.1 The purchaser is to provide to the supplier the information given in Appendix A to enable products to be supplied in accordance with this standard.

2.2 A number of options are permitted by this standard as given in Appendix B.

Both the definitive requirements specified throughout this standard and the options selected by the purchaser shall be satisfied by the manufacturer before a claim of compliance with this standard can be made and verified. In the event that the purchaser does not indicate his requirements at the time of enquiry and order the manufacturer shall select the option where appropriate.

3 Definitions

For the purposes of this Part of BS 4825, the following definitions apply.

3.1

expanded male part

externally threaded part of coupling providing a sealing face. To be attached to a tube end by expansion

3.2

expanded liner

coupling part having a shoulder and providing a sealing face. To be attached to a tube end by expansion

3.3

welded male part

externally threaded part of coupling providing a sealing face. To be attached to a tube end by a butt weld

3.4

welded type liner

coupling part having a shoulder and providing a sealing face. To be attached to a tube end by a butt weld

3.5

seal

an elastomer which provides a liquid tight joint when compressed between the liner and male part

3.6

nut

an internally threaded component providing the clamping of the coupling and compressing the seal between the liner and the male part. May have either a round or hexagonal external form

4 Symbols

For the purposes of this Part of BS 4825 the following symbols apply:

<i>A</i>	allowance of male part thread
<i>B</i> ₁	inside diameter of support ring
<i>B</i> ₂	outside diameter of support ring
<i>C</i> ₁	spigot diameter of expanded type male part and liner
<i>C</i> ₂	spigot diameter of welded type male part and liner
<i>C</i> ₃	inside diameter of hexagon and round nut
<i>C</i> ₄	inside diameter of seal
<i>C</i> ₅	inside diameter of expanded type male part and liner
<i>C</i> ₆	inside diameter of welded type male part and liner
<i>C</i> ₇	outside diameter of expanded and welded type liner
<i>C</i> ₈	outside diameter of round nut
<i>C</i> ₉	centring inside diameter of nut
<i>C</i> ₁₀	outside diameter of neck of welded type male part and liner
<i>d</i>	major diameter of male part thread
<i>d</i> ₁	minor diameter of male part thread
<i>d</i> ₂	pitch diameter of male part thread
<i>D</i>	major diameter of nut thread
<i>D</i> ₁	minor diameter of nut thread
<i>D</i> ₂	pitch diameter of nut thread
<i>E</i>	inside diameter of seal lip
<i>F</i> ₁	total length of expanded type male part
<i>F</i> ₂	total length of welded type male part and liner
<i>F</i> ₃	total length of expanded type liner
<i>F</i> ₄	total length of hexagon and round nut
<i>F</i> ₅	inside width of support ring
<i>G</i> ₁	length of external thread of expanded and welded type male part
<i>G</i> ₂	length of internal thread of hexagon and round nut
<i>H</i>	height of fundamental triangle of thread
<i>J</i>	chamfer diameter of round nut
<i>K</i>	length of spigot of expanded and welded type male part and liner

- L_1 flange thickness of expanded and welded type liner
- L_2 inside flange thickness of hexagon and round nut
- M_1 outside diameter of lip of seal to be used with support ring
- M_2 outside diameter of lip of seal to be used without support ring
- N_1 width across slots of round nut
- N_2 width across flats of hexagon nut
- O width of slot of round nut
- P pitch of thread
- R_1 fillet radius of welded type male part
- R_2 fillet radius of welded type liner
- S outside diameter of seal (lip excluded) to be used with support ring
- T_2 length of lip seal to be used with support ring
- T_3 wall thickness of support ring
- U total thickness of seal
- V compression thickness of seal
- w root width of male part threads on GO side profile
- W root width of nut threads on GO side profile
- X_1 lock ring groove diameter
- X_2 lock ring outside diameter
- α_1 angle of chamfer of round nut
- α_2 angle of flange of support ring

5 Design

NOTE The purchaser should specify whether expanded or welded type couplings are required in his enquiry and/or order (see Appendix A).

5.1 The dimensions of the couplings shall be as given in Table 1 to Table 8 and Figure 1 to Figure 8.

5.2 Provision shall be made for the tightening of the coupling by hexagonal or round nuts as specified by the purchaser in his enquiry and/or order (see Appendix B).

5.3 The screwed ends of the coupling shall be of trapezoidal form as shown in Appendix C; the cross section of screwed coupling assemblies is detailed in Appendix D.

5.4 The design of the coupling shall be such as to ensure satisfactory operation in a properly assembled pipeline system operating at a maximum working pressure of 1.6 MPa.

5.5 The use of support rings is optional but provision for their use shall be made in fittings greater than 63.5 mm nominal size intended for use at pressure greater than 1 MPa (see Table 8).

Table 1 — Expanded type male part
(see Figure 1)

Tube outside diameter	C_1	C_5	F_1
mm	mm	mm	mm
25.4	29.0	25.4	16.5
38.1	42.5	38.1	19.5
50.8	56.0	50.8	19.5
63.5	69.7	63.5	25.0
76.2	82.3	76.2	30.0

Tolerances (see BS 4500-1.1 and BS 4500-1.2)
Spigot diameter C_1 : h10
Inside diameter C_5 : A10
Total length F_1 : ± 0.2 mm
Length of thread G_1 : ± 0.2 mm
Length of spigot K : ± 0.1 mm

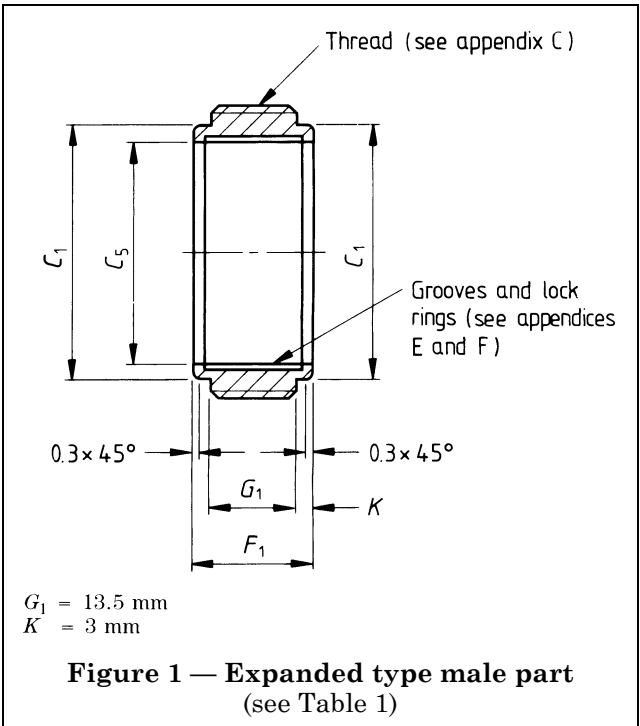
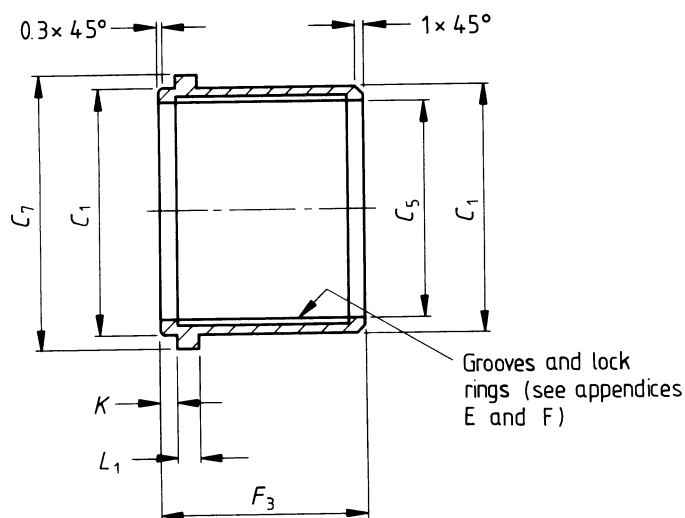


Table 2 — Expanded type liner (see Figure 2)

Tube outside diameter	C_1	C_5	C_7	F_3
mm	mm	mm	mm	mm
25.4	29.0	25.4	33.8	20
38.1	42.5	38.1	47.0	20
50.8	56.0	50.8	60.5	25
63.5	69.7	63.5	74.0	30
76.2	82.3	76.2	87.5	30

Tolerances (see BS 4500-1.1 and BS 4500-1.2)Spigot diameter C_1 : h10Inside diameter C_5 : A10Outside diameter C_7 : h10Length of spigot K : ± 0.1 mmFlange thickness L_1 : ± 0.2 mmTotal length F_3 : ± 0.2 mm

$K = 3$ mm
 $L_1 = 4$ mm

Figure 2 — Expanded type liner (see Table 2)

Table 3 — Welded type male part (see Figure 3)

Tube outside diameter	C_6	C_2	C_{10}	F_2	G_1	K
mm	mm	mm	mm	mm	mm	mm
25.4	22.2	29.2	25.65	21.5	13.5	3.0
38.1	34.9	42.7	38.35	21.5	13.5	3.0
50.8	47.6	56.2	51.05	21.5	13.5	3.0
63.5	60.3	69.9	63.75	21.5	13.5	3.0
76.2	73.0	82.6	76.45	21.5	13.5	3.0
101.6	97.6	111.1	101.85	30.0	16.0	3.2
Tolerances (see BS 4500-1.1 and BS 4500-1.2)						
Spigot diameter C_2 : h10		Length of spigot K : ± 0.1 mm				
Inside diameter C_6 : N11		Fillet radius R_1 : ± 0.2 mm				
Total length F_2 : ± 0.2 mm		Outside diameter of neck C_{10} : h11				
Length of external thread G_1 : ± 0.2 mm						

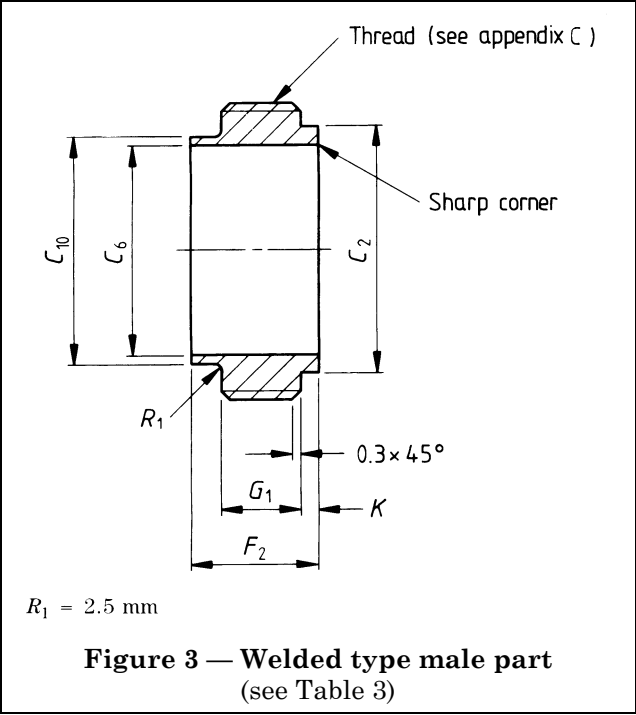


Table 4 — Welded type liner (see Figure 4)

Tube outside diameter	C_6	C_2	C_{10}	C_7	F_2	K	L_1
mm	mm	mm	mm	mm	mm	mm	mm
25.4	22.2	29.2	25.65	33.8	21.5	3.0	4.0
38.1	34.9	42.7	38.35	47.0	21.5	3.0	4.0
50.8	47.6	56.2	51.05	60.5	21.5	3.0	4.0
63.5	60.3	69.9	63.75	74.0	21.5	3.0	4.0
76.2	73.0	82.6	76.45	87.5	21.5	3.0	4.0
101.6	97.6	111.1	101.85	120.6	30.0	3.2	4.75

Tolerances (see BS 4500-1.1 and BS 4500-1.2)
 Spigot diameter C_2 : h10
 Inside diameter C_6 : N11
 Outside diameter C_7 : h10
 Length of spigot K : ± 0.1 mm

Flange thickness L_1 : ± 0.2 mm
 Total length F_2 : ± 0.2 mm
 Fillet radius R_2 : ± 0.2 mm
 Outside diameter of neck C_{10} : h11

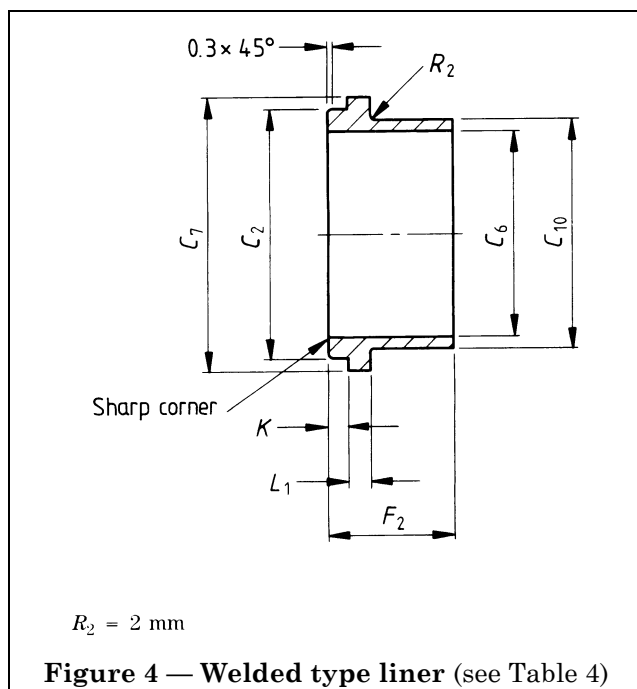


Table 5 — Hexagon nut (see Figure 5)

Tube outside diameter	C_3	C_9	N_2	F_4	G_2	L_2
mm	mm	mm	mm	mm	mm	mm
25.4	30.5	34.34	46	30	16	3.5
38.1	43.5	47.86	60	30	16	3.5
50.8	57.0	61.37	75	30	16	3.5
63.5	70.7	74.88	90	30	16	3.5
76.2	83.3	88.40	105	30	16	3.5
101.6	112.0	122.00	133	35	20	4.7
Tolerances (see BS 4500-1.1 and BS 4500-1.2) Inside diameter C_3 : H11 Centring inside diameter C_9 : + 0.16, - 0 mm Total length F_4 : ± 0.2 mm Length of internal thread G_2 : ± 1 mm Inside flange thickness L_2 : ± 0.2 mm Width across flats N_2 : h15						

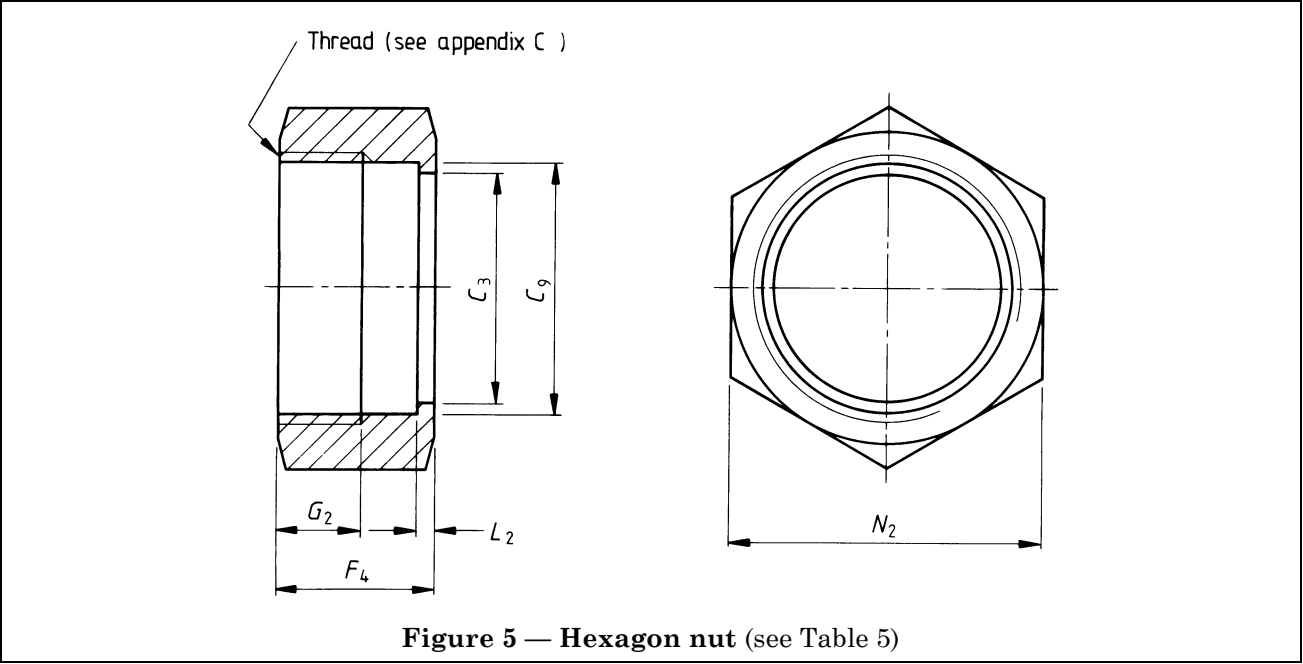
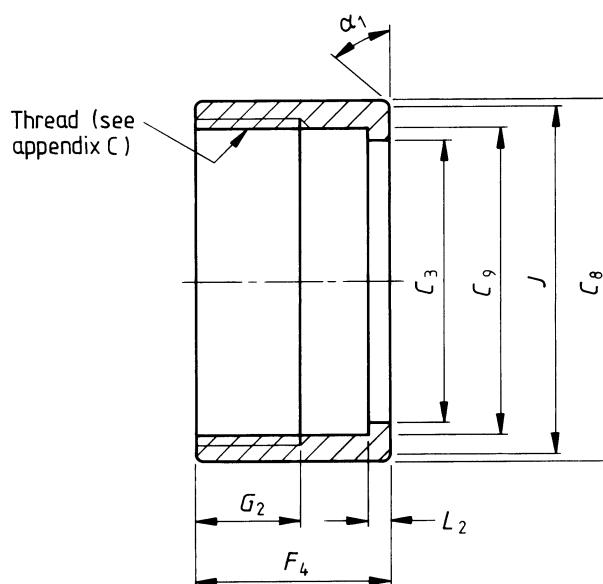


Table 6 — Round nut (see Figure 6)

Tube outside diameter	C_3	C_8	C_9	J
mm	mm	mm	mm	mm
25.4	30.5	44.5	34.34	41
38.1	43.5	57.2	47.86	55
50.8	57.0	70.0	61.37	68
63.5	70.7	86.0	74.88	82
76.2	83.3	102.0	88.40	97

Tolerances (see BS 4500-1.1 and BS 4500-1.2)
 Outside diameter C_8 : h13
 Chamfer diameter J : ± 1 mm
 Inside diameter C_3 : H11
 Length of internal diameter G_2 : ± 1 mm
 Inside flange thickness L_2 : ± 0.2 mm
 Total length F_4 : ± 0.2 mm
 Centring diameter C_9 : ± 0.16 mm



$F_4 = 30$ mm
 $G_2 = 16$ mm
 $L_2 = 3.5$ mm
 $\alpha_1 = 50^\circ$

Figure 6 — Round nut (see Table 6)

Table 7 — Specification of seals (see Figure 7)

Tube outside diameter	C_4	E	M_1	M_2	S	U_1	W
mm	mm	mm	mm	mm	mm	mm	mm
25.4	23.2	29.2	32.2	32.5	29.5	7.0	3.0
38.1	35.9	42.7	45.7	46.0	43.0	7.0	3.0
50.8	48.6	56.2	59.2	59.5	56.5	7.0	3.0
63.5	61.3	69.9	72.9	73.2	70.2	7.0	3.0
76.2	74.0	82.6	85.6	86.5	82.9	7.0	3.0
101.6	98.6	111.0	118.0	119.0	115.5	9.6	5.0

Tolerances (see BS 4500-1.1 and BS 4500-1.2)

Inside diameter of seal C_4 : + 0.5, - 0 mm	Length of gasket lip T_2 : ± 0.1 mm
Inside diameter of seal lip E : + 0, - 0.5 mm	Total thickness of seal U : ± 0.1 mm
Outside diameter of seal lip M_1 and M_2 : ± 0.25 mm	Compression thickness of seal V : ± 0.1 mm
Outside diameter of seal S (lip excluded): + 0, - 0.5 mm	

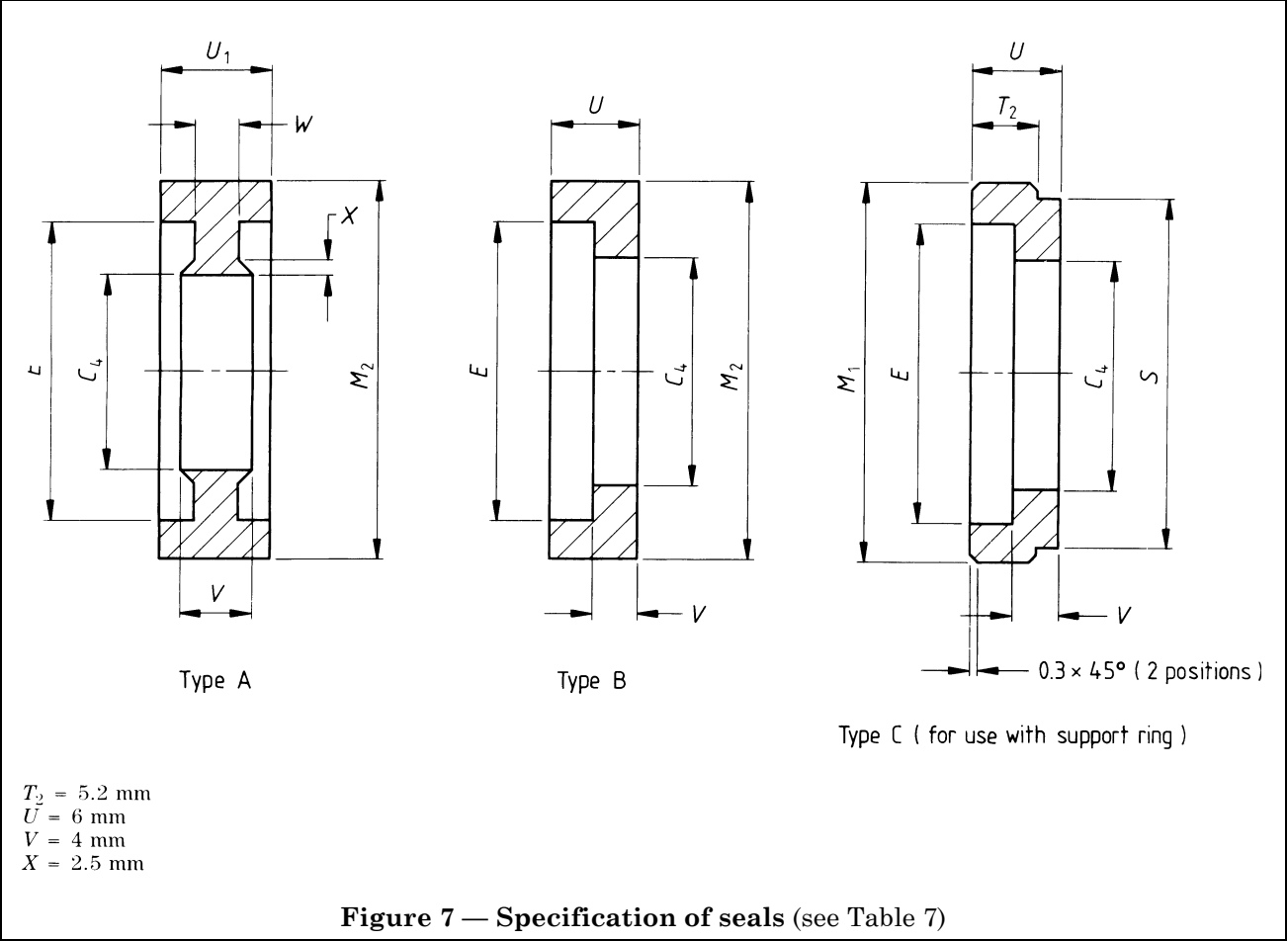
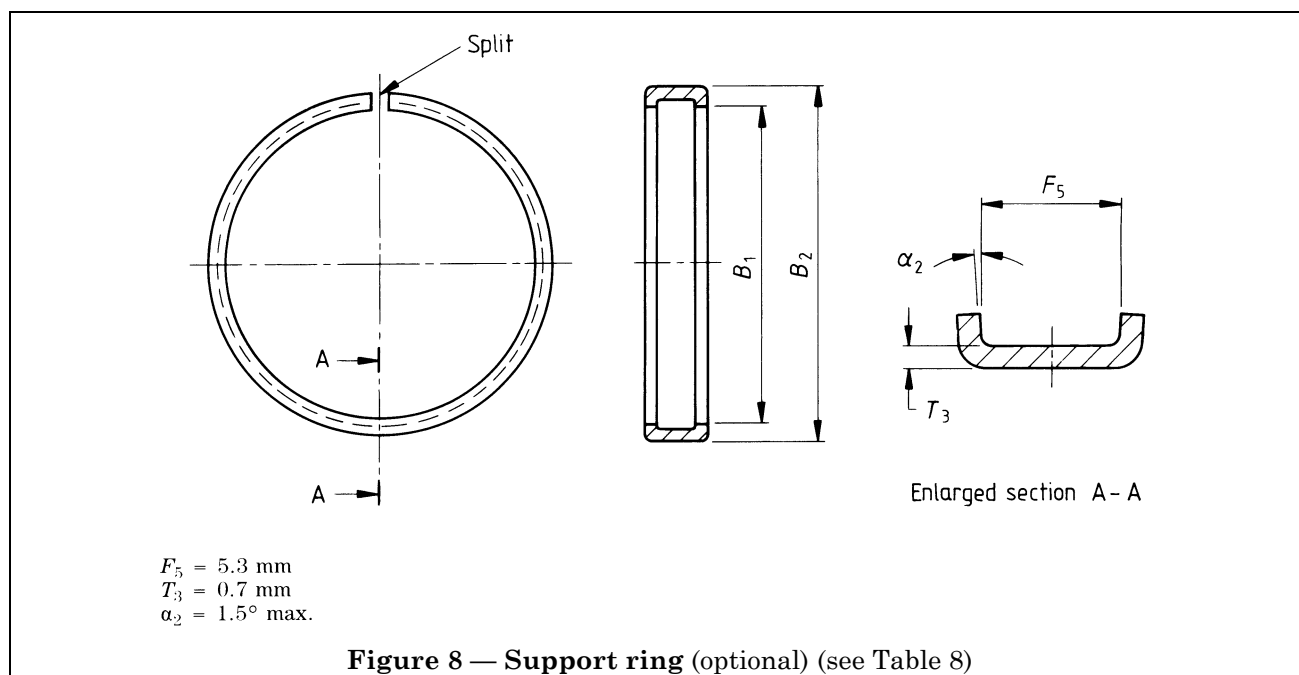


Table 8 — Support ring (optional)
(see Figure 8)

Tube outside diameter	B_1	B_2
mm	mm	mm
25.4	29.8	33.6
38.1	43.3	47.1
50.8	56.8	60.6
63.5	70.5	74.3
76.2	83.2	87.0
101.6	115.8	119.6

Tolerances (see BS 4500-1.1 and BS 4500-1.2)
 Inside diameter of support ring B_1 : ± 0.13 mm
 Outside diameter of support ring B_2 : ± 0.13 mm
 Inside width of support ring F_5 : ± 0.04 mm
 Wall thickness of ring T_3 : ± 0.05 mm



6 Materials

6.1 Male parts, liners and nuts

Male parts, liners and nuts shall be made from austenitic stainless steel equivalent to those listed in BS 4825-1.

NOTE Grades of austenitic stainless steel, comparable in chemical composition to those listed in Table 1 of BS 4825-1:1991 are recommended.

6.2 Seals

The seal material shall be compatible with the processing conditions (temperature/pressure/chemical).

NOTE The purchaser should specify the processing conditions (temperature/pressure/chemical) in his enquiry and/or order (see Appendix A).

If synthetic rubber seals are specified the material shall have a hardness range 75 IRHD to 85 IRHD in accordance with BS 903-A26. (See 10.3.)

7 Dimensions and tolerances

7.1 The dimensions and tolerances of expanded and welded type male parts, liners, nuts and seals shall be as given in Table 1 to Table 8, as appropriate.

NOTE The purchaser should specify the dimensions in his enquiry and/or order (see Appendix A).

7.2 Expanded type male parts and liners shall be provided with grooves on the internal surface to give adequate strength to the expanded joint between the male part or liner and the tube.

NOTE 1 Appendix E gives details of grooves suitable for sizes from 25.4 mm up to and including 76.2 mm only.

NOTE 2 Appendix F gives details of lock rings which may be used in conjunction with expanded type male parts and liners.

8 Surface finish

The surface finish of contact and sealing surfaces shall have surface roughness value, R_a , of not more than 1.0 μm as defined in BS 1134-1.

9 Assembly

9.1 Expansion

Expanded type male parts and liners shall be attached to the tube ends by expansion of the tube as described in Appendix G.

NOTE The method is suitable for sizes up to and including 76.2 mm.

9.2 Welding

Welded type male parts and liners shall be attached to the tube ends by a butt weld.

10 Hygiene

10.1 All surfaces of the coupling in contact with the product shall be accessible for cleaning, either by cleaning in place (CIP) methods or by manual cleaning when disassembled. Removable parts shall be readily demountable.

NOTE Care should be taken to ensure that no deposit of any material which might prove harmful during subsequent use and/or fabrication is permitted to remain on the couplings.

10.2 The seal shall be of a material compatible under processing conditions with the foodstuffs and/or cleaning fluids. The seal material shall not constitute a toxic hazard, shall not support microbial growth and shall not give rise to unpleasant taste or odour.

10.3 If the seal material comes, or is likely to come, into contact with potable water then it shall comply with the requirements in Appendix H.

11 Manufacturer's certificate

The manufacturer shall supply, when requested by the purchaser in the enquiry and/or order, a certificate stating that the couplings comply with the requirements of this standard for the appropriate type of coupling (see Appendix B).

Appendix A Essential information to be supplied by the purchaser in the enquiry and/or order

The purchaser should provide the following information in the enquiry and/or order:

- a) the number and date of this British Standard, i.e. BS 4825-4:1991;
- b) the normal working pressure, temperature and chemical conditions of the pipe system (see clause 6);
- c) type of coupling (see clause 5);
- d) size of coupling (see clause 7);
- e) seal type (see Table 7).

Appendix B Purchaser options

This standard lists certain options. The purchaser should state in the enquiry and/or order whether the following are required. If no such statement is made, supply is at the option of the manufacturer:

- a) whether hexagon or round nuts are required (see 5.2);
- b) whether a manufacturer's certificate is required (see clause 11).

Appendix C Trapezoidal threads intended for threaded couplings

C.1 Explanation of terms

C.1.1 Basic profile

Joint profile to which tolerances are referred for male parts and nut threads (see Figure 9).

C.1.2 Pitch (P)

Axial lead per turn of the screw thread. Nominal values for the pitch are:

- a) for 25.4 mm to 76.2 mm outside diameter tube, 8 threads per inch, where $P = 3.175$ mm;
- b) for 101.6 mm outside diameter tube, 6 threads per inch, where $P = 4.233$ mm.

C.1.3 Major diameter

Diameter over crests of the male part thread and over roots of the nut thread (see Figure 9).

C.1.4 Pitch diameter

Pitch diameter is shown in Figure 9.

C.1.5 Minor diameter

Minor diameter is shown in Figure 9.

C.1.6 GO side profile

Profile forming the limiting thread profile of the GO side (see Figure 10).

C.2 Determination of thread limiting dimensions

C.2.1 Thread diameters

C.2.1.1 Male parts

The thread diameters for male parts are shown in Table 9.

C.2.1.2 Nuts

The thread diameters for nuts are shown in Table 10.

C.2.2 Root width of threads, (w , W) on GO side profile

C.2.2.1 Male parts

Root width of threads w (in mm) are given by

$$w = 0.3707P - 0.127 + 0.008\,064\sqrt{d}$$

C.2.2.2 Nuts

Root width of threads W (mm) are given by

$$W_{\text{mm}} = 0.3707P - 0.135$$

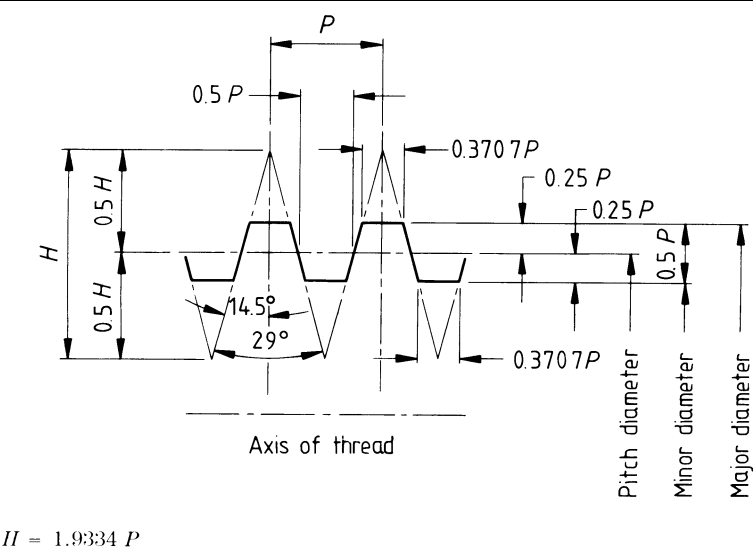
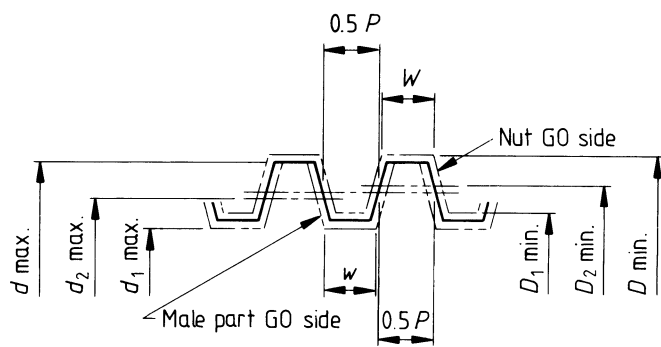


Figure 9 — Trapezoidal thread form



NOTE The thick line indicates the basic profile.

Figure 10 — Limiting thread profile

Table 9 — Thread diameters for male parts

Major diameter d		Pitch diameter $d_2 = d - 0.5P$		Minor diameter $d_1 = d - P$	
GO side limit	Lower limit	GO side limit	Lower limit	GO side limit	Lower limit
mm	mm	mm	mm	mm	mm
0	$-0.05P$	$-A$	$-(A + T)$	-0.508	$-(0.508 + 1.5T)$
Tolerances, T (in mm) $T = 0.070\,56\sqrt{P} + 0.014\,11\sqrt{d}$ Allowances, A (in mm) $A_{\text{mm}} = 0.030\,24\sqrt{d}$					

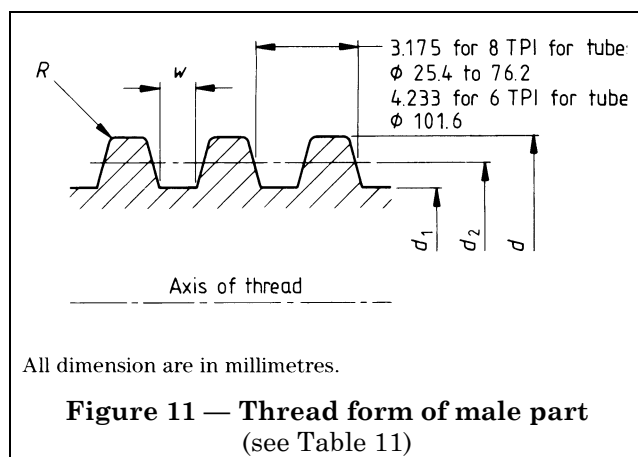
Table 10 — Thread diameters for nuts

Major diameter $D (= d)$		Pitch diameter $D_2 = D - 0.5P$		Minor diameter $D_1 = D - P$	
GO side limit	Upper limit	GO side limit	Upper limit	GO side limit	Lower limit
mm	mm	mm	mm	mm	mm
$+0.889$	$+1.397$	$+0.368$	$+(0.368 + T)$	$+0.381$	$+(0.381 + 0.05P)$
Tolerances, T (in mm) $T = 0.070\,56\sqrt{P} + 0.014\,11\sqrt{d}$ Allowances, A (in mm) $A_{\text{mm}} = 0.030\,24\sqrt{d}$					

C.3 Thread dimensions

C.3.1 Male part

Male part thread dimensions are shown in Table 11. Male part threads shall be provided with a radius, R , 0.2 mm max. or a corresponding chamfer at an angle of 45° to the axis (see Figure 11).



C.3.2 Nut

Nut thread dimensions are shown in Figure 12 and Table 12.

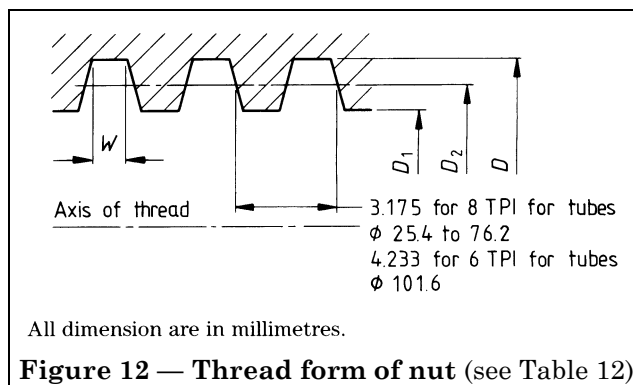


Table 11 — Male part thread dimensions (see Figure 11)

Tube outside diameter	d		d_2		d_1		w
	max.	min.	max.	min.	max.	min.	
mm	mm	mm	mm	mm	mm	mm	mm
25.4	37.13	36.97	35.36	35.15	33.45	33.13	1.097
38.1	50.65	50.49	48.85	48.62	46.97	46.63	1.107
50.8	64.16	64.00	62.33	62.09	60.48	60.12	1.115
63.5	77.67	77.51	75.82	75.57	73.99	73.61	1.121
76.2	91.19	91.03	89.31	89.05	87.51	87.12	1.127
101.6	125.9	125.69	123.44	123.13	121.16	120.70	1.532

NOTE 101.6 mm o.d. dimensions are based on 6 TPI.

Table 12 — Nut thread dimensions (see Figure 12)

Tube outside diameter	D		D_2		D_1		w
	max.	min.	max.	min.	max.	min.	
mm	mm	mm	mm	mm	mm	mm	mm
25.4	38.53	38.02	36.12	35.91	34.49	34.34	1.042
38.1	52.05	51.54	49.66	49.43	48.01	47.86	1.042
50.8	65.56	65.05	63.18	62.94	61.52	61.37	1.042
63.5	79.07	78.56	76.70	76.45	75.03	74.88	1.042
76.2	92.59	92.08	90.23	89.97	88.55	88.40	1.042
101.6	127.30	126.79	124.45	124.15	122.20	122.05	1.434

NOTE 101.6 mm o.d. dimensions are based on 6 TPI.

Appendix D Cross section of threaded coupling assemblies

The assembly of welded and expanded type couplings is illustrated in Figure 13 and Figure 14.

Appendix E Grooves for expanded type male parts and liners

E.1 General

NOTE This appendix is applicable to sizes 25.4 mm up to and including 76.2 mm. The use of the lock ring is optional for expanded type male parts and liners.

Expanded type male parts and liners shall be provided internally with some form of groove to give adequate strength to the joint between male part or liner and tube end. Figure 15 and Table 13 show the dimensions of the grooves.

E.2 Dimensions

Table 13 gives the lock ring groove dimensions.

Table 13 — Dimensions of grooves (see Figure 15)

Tube outside diameter	Lock ring groove diameter X_1
mm	mm
25.4	27.65
38.1	40.35
50.8	53.05
63.5	65.65
76.2	78.35

E.3 Tolerances (see BS 4500-1.1 and BS 4500-1.2)
The tolerance on the lock ring groove diameter X_1 is N12.

Appendix F Lock rings for expanded type male parts and liners

F.1 Conditions of use

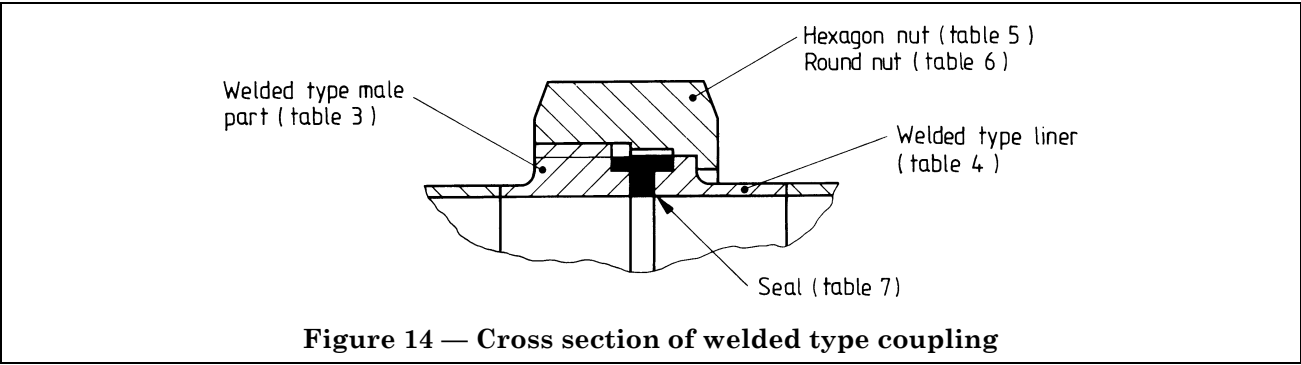
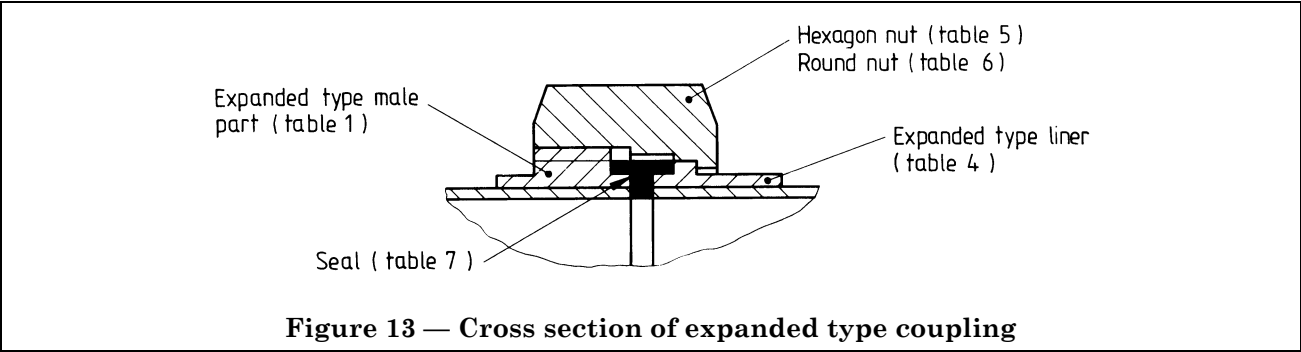
The use of a lock ring is recommended in special cases (for instance under conditions of high pressure, high temperatures or large thermal expansion with long lengths of tubing).

F.2 Dimensions

The dimensions of lock rings are shown in Figure 16 and Table 14.

Table 14 — Dimensions of lock ring (see Figure 16)

Tube outside diameter	Lock ring outside diameter X_2
mm	mm
25.4	27.65
38.1	40.35
50.8	53.05
63.5	65.65
76.2	78.35



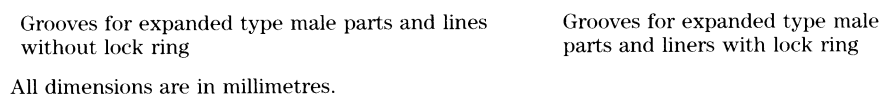


Figure 15 — Dimensions of grooves (see Table 13)

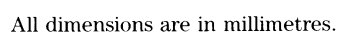


Figure 16 — Lock ring (see Table 14)

F.3 Materials

A steel with the hardness shown in Table 15 should be used.

Table 15 — Steel hardness

Hardness		BS reference
Scale	No.	
Vickers	450 to 480	BS 427
Brinell	425 to 445	BS 240
Rockwell C	44.5 to 47	BS 891

Appendix G Guide for expanding with straight tube

G.1 General

This appendix describes a method of expansion for assembling expanded type male parts and liners with nominal sizes 25.4 mm up to and including 76.2 mm or straight tubes of the dimensions given in BS 4825-1.

G.2 Tools

The tools shown in Figure 17 to Figure 19 are suitable for male parts and liners with or without lock ring.

The set of tools consists of the following:

- a) base plate (Figure 17);
- b) clamp block (Figure 17);
- c) split cutting ring (Figure 17);
- d) assembly punch (Figure 17);
- e) spigot locating ring (Figure 18);

- f) expander (Figure 18);
- g) torque wrench and sockets (not illustrated);
- h) levers (not illustrated);
- i) facing cutter holder (Figure 19);
- j) facing cutter (Figure 19);
- k) facing ring (Figure 19);
- l) centring pilot (Figure 19).

The following tools are also required: hacksaw, spanners for clamp block nuts, file, mallet.

G.3 Procedure

G.3.1 Preparation

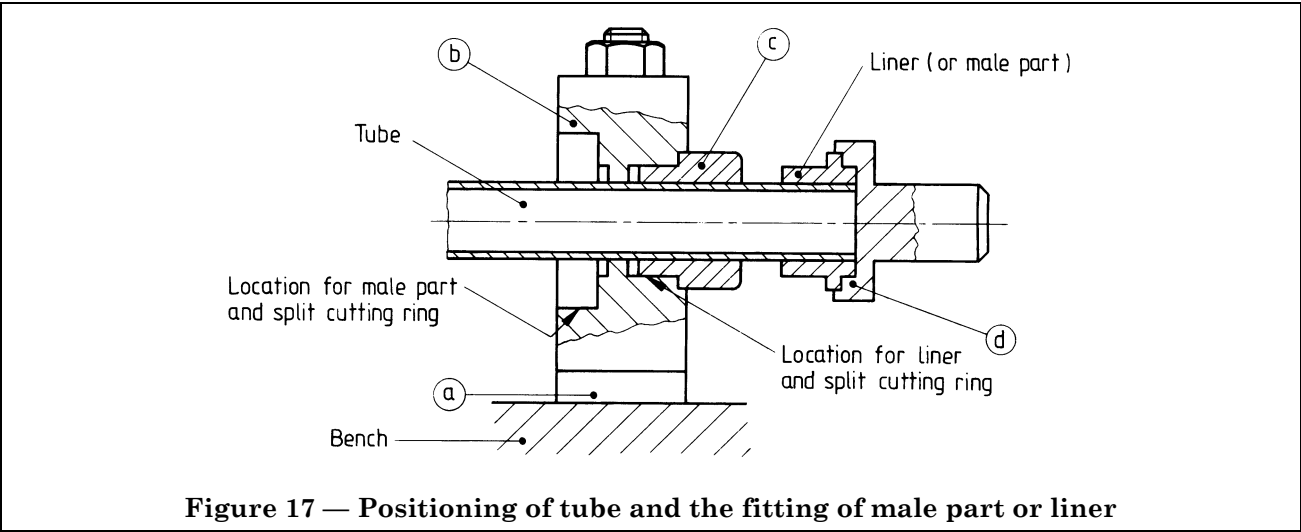
Fasten the base plate a) to the bench. Put a clamp block b) of the required size on to the base plate with the location for the split cutting ring towards the front (see Figure 17). If long lengths of tubes are to be used, an additional support is required to keep the tube level.

G.3.2 Cutting the tube

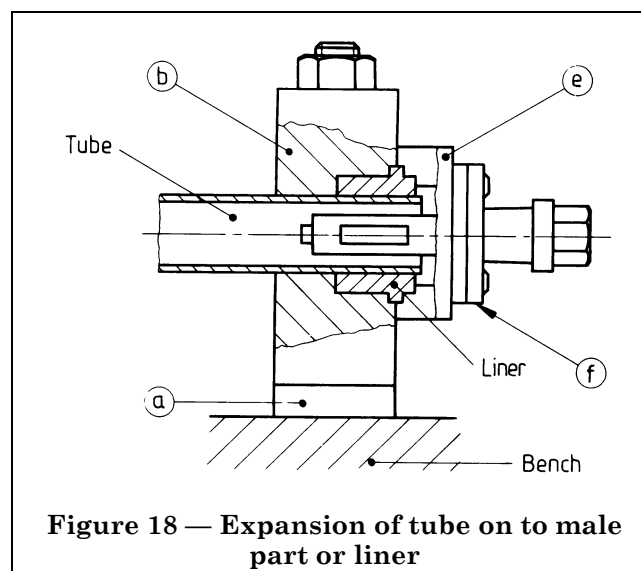
NOTE When assembling a male part and liner on a tube, the length required is the distance between the male part and liner less 8 mm, i.e. twice the compression thickness of the seal.

G.3.2.1 Mark the tube to the length required. Push the tube through the centre hole of the clamp block. Fit the split cutting ring c) in the clamp block. Place the cutting mark on the tube in line with the face of the cutting ring. Tighten the clamp block (see Figure 17).

NOTE The end of the polished tube tends to be tapered. Cut off the tapered portion before marking off the length of the tube.



G.3.2.2 Cut the tube with a hacksaw. File the tube end square against the split cutting ring.



G.3.3 Expansion

G.3.3.1 Release the clamp block, push the tube forward and reclamp. Place the liner or male part on the end of the tube, the spigot facing outwards, and use the assembly punch d) to drive the male part or liner into the tube (see Figure 18).

G.3.3.2 Release the clamp block and remove the split cutting ring. Position the male part or liner in the location for the male part or for the liner and reclamp (see Figure 18).

G.3.3.3 Place the spigot locating ring e) over the male part or liner and insert the expander f) through the ring into the tube (see Figure 18).

NOTE The expander rollers should be lightly oiled and never used dry.

G.3.3.4 Set the torque wrench in accordance with the manufacturer's instructions. Apply the wrench and rotate the expander in a clockwise direction until the wrench releases.

G.3.3.5 Release the expander by an anticlockwise rotation.

G.3.3.6 Use the levers to remove the expander and spigot locating ring.

G.3.4 Facing off

G.3.4.1 To face off the expanded tube, fit the correct size facing cutter j) and centring pilot l) to the facing cutter holder i). Put the facing ring k) over the spigot of the male part or liner, then insert the pilot of the facing tool into the tube about 10 mm beyond its end. Lock the pilot tight in the core of the tube, bring up the cutter and adjust the spring pressure to keep the cutter against the edge of the tube. Rotate the cutter and remove the surplus metal. If, for any reason, the cutter is out of square, the facing ring will correct this.

G.3.4.2 Release the centring pilot and withdraw the cutter, holder and attachment as one unit, and remove the facing ring.

G.3.4.3 Release the clamp block and remove the tube male part or liner assembly.

Appendix H Effects of non-metallic products on water quality

When used under the conditions for which they are designated, non-metallic products in contact with or likely to come in contact with potable water shall comply with BS 6920-1.

NOTE Non-metallic products for installation and use in the United Kingdom which are verified and listed under the UK Water Fittings Byelaws Scheme are deemed to satisfy 10.3. Details of the Scheme are obtainable from the Water Research Centre Byelaws Advisory Service 660 Ajax Avenue, Slough SL1 4BG.

Appendix J Marking

It is recommended that each coupling is legibly and indelibly marked with the following:

- the manufacturer's name or identification mark;
- the number of this British Standard, i.e. BS 4825-4¹⁾;
- the grade of stainless steel used.

¹⁾ Marking BS 4825-4 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

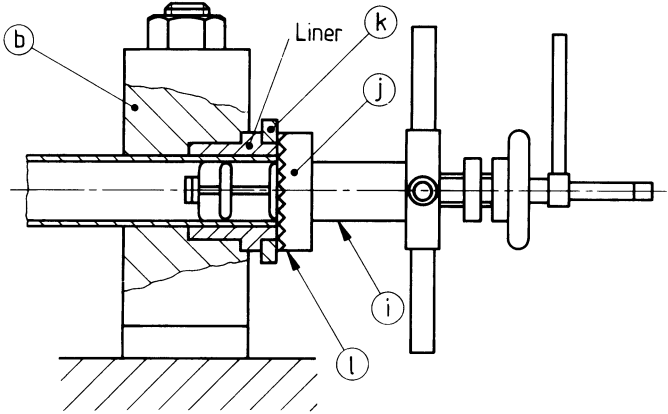


Figure 19 — Facing off expanded tube

Publication(s) referred to

BS 240, *Method for Brinell hardness test and for verification of Brinell hardness testing machines.*

BS 427, *Method for Vickers hardness test and for verification of Vickers hardness testing machines.*

BS 891, *Method for hardness test (Rockwell method) and for verification hardness testing machines (Rockwell method).*

BS 903, *Physical testing of rubber.*

BS 903-A26, *Determination of hardness.*

BS 1134, *Assessment of surface texture.*

BS 1134-1, *Methods and instrumentation.*

BS 4500, *ISO limits and fits.*

BS 4500-1.1, *Specification for bases of tolerance, deviations and fits.*

BS 4500-1.2, *Tubes of commonly used tolerance grade and limit deviations for tubes and shafts.*

BS 4825, *Stainless steel tubes and fittings for the food industry and other hygienic applications.*

BS 4825-1, *Specification for tubes.*

ISO 2853, *Metal pipes and fittings — stainless steel screwed couplings for the food industry²⁾.*

²⁾ Referred to in the foreword only.

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