Gas Industry Standard

GIS/F9:2020

Specification for

Metric and Imperial Stainless Steel Single and Twin Ferrule Compression Fittings for Tubes

Contents

Foreword

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Compliance with this engineering document does not confer immunity from prosecution for breach of statutory or other legal obligations.

Mandatory and non-mandatory requirements

For the purposes of a GIS the following auxiliary verbs have the meanings indicated:
can indicates a physical possibility;
may indicates an option that is not mandatory;
shall indicates a GIS requirement;
should indicates best practice and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment needs to be completed to show that the alternative method delivers the same, or better, level of protection.

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Brief history

First published as T/SP/F9: Part 1	August 1999
Revised	July 2000
Editorial update to reflect demerger November 2000	June 2001
Editorial update to comply with GRM	August 2004
Edited by BSI in accordance with BS 0-3:1997	August 2006
Revised and updated to incorporate twin ferrule fittings	June 2020

1 Scope

This Gas Industry Standard (GIS) defines the characteristics of, and performance requirements for, single or twin ferrule compression fittings made of stainless steel. The ferruled connectors in this standard are suitable for use with fully annealed stainless steel tubing in conformance with ASTM A269 which has:

- an outside diameter in the size ranges ¼” (6mm) to 1” (25mm) inclusive for twin ferrule fittings;
- an outside diameter in the size ranges ¼” (6mm) to ¾” (22mm) inclusive for single ferrule fittings;
- a maximum outside diameter surface hardness of HV180 (HRB80);
- an operating temperature in the range of -20°C to +120°C inclusive;
- a wall thickness within the suitable range specified by the fitting manufacturer.

NOTE 1 GIS/F9 is intended to have a maximum pressure limit of 100 bar for UK gas onshore use.

NOTE 2 For operating pressures in excess of 100 bar, BS 7993 should be used.

NOTE 3 Negative (vacuum) pressures are excluded from this standard.

The requirements apply to compression fittings of a single or twin ferrule design in which the joint is made, and the tube is held, by the compression of the ferrule(s) against the outside of the tube.

This standard does not cover installation or assembly of fittings, which should conform to the fitting instructions of the specific manufacturer.

2 Normative references

The following referenced documents are indispensable for the application of this document. In all cases, the latest edition of the referenced document (including any amendments) applies.

BS 1580-1, *Unified screw threads. Screw threads with diameters ¼ in and larger. Requirements.*

BS 1936-1, *Undercuts and runouts for screw threads. Inch screw threads.*

BS 1936-2, *Undercuts and runouts for screw threads. ISO metric screw threads.*

BS 3643-1, *ISO metric screw threads. Principles and basic data.*

BS 3643-2, *ISO metric screw threads. Specification for selected limits of size.*

BS 7993, *Twin ferrule connectors and associated tubing for 316 stainless steel systems – specification and test methods*

BS EN 10226-1, P*ipe threads where pressure-tight joints are made on the threads. Taper external threads and parallel internal threads. Dimensions, tolerances and designation.*

BS EN 10226-2, P*ipe threads where pressure-tight joints are made on the threads. Taper external threads and taper internal threads. Dimensions, tolerances and designation.*

BS EN 10226-3, P*ipe threads where pressure-tight joints are made on the threads. Verification by means of limit gauges.*

BS EN 10243-1, *Steel die forgings — Tolerances on dimensions — Drop and vertical press forgings.*

BS EN 10243-2, *Steel die forgings — Tolerances on dimensions — Upset forgings made on horizontal forging machines.*

BS EN 10250-4, *Open steel die forgings for general engineering purpose — Stainless steels.*

BS EN ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation.*

BS EN ISO 228-2, *Pipe threads where pressure-tight joints are not made on the threads — Part 2: Verification by means of limit gauges.*

BS EN ISO 2819, *Metallic coatings on metallic substrates — Electrodeposited and chemically deposited coatings — Review of methods available for testing adhesion.*

BS EN ISO 3497, *Metallic coatings — Measurement of coating thickness — X-ray spectrometric methods*.

BS EN ISO 4521, *Metallic and other inorganic coatings. Electrodeposited silver and silver alloy coatings for engineering purposes. Specification and test methods.*

BS EN ISO 6158, *Metallic and other inorganic coatings. Electrodeposited coatings of chromium for engineering purposes.*

PD 970, *Wrought steels for mechanical and allied engineering purposes. Requirements for carbon, carbon manganese and alloy hot worked or cold finished steels.*

ASTM A182, *Specification for forged or rolled alloy-steel pipe flanges, forged fittings, and valves and parts for high-temperature service.*

ASTM A269, *Specification for seamless and welded austenitic stainless steel tubing for general service.*

ASTM A276, *Specification for stainless steel bars and shapes.*

ANSI/ASME B1.20.1, *Pipe threads, general purpose (inch).*

ANSI/ASME B31.3, *Chemical plant and petroleum refinery piping.*

3 Fitting Requirements

3.1 Design, construction and materials

3.1.1 Fittings shall conform to one of the following specifications:

a) Single ferrule fittings as detailed in Annex A;
b) Twin ferrule fittings in accordance with BS 7993, or:
c) Twin ferrule fittings not in accordance with BS 7993 and as detailed in Annex B.

NOTE Consideration should be given to the range of fittings currently in use and stocked by the gas transporter.

3.1.2 The fittings chosen shall be compatible in terms of size (metric or imperial), thread pattern and manufacturer's product range. They shall also be compatible with existing fittings used within an existing installation unless all the fittings are to be replaced. Intermixing of different manufacturer's fitting components is not permitted.

3.1.3 The fitting shall transfer minimal torque to the tube, and should any torque be transferred to the tube it shall not cause any twisting or deformation of the tube.

3.1.4 The fitting shall have a degree of fire resistance that is consistent with that of the installations they are being used.

3.1.5 The fittings' performance shall be proven by testing, witnessed by an independent body recognised as such by the gas network, and the fitting shall carry the appropriate third-party certification in line with the Evaluation Procedure detailed in Clause 4.

3.2 Pressure and temperature requirements

3.2.1 The pressure rating of the fitting shall be that of the tube with the highest pressure rating to which it can be attached, as specified in BS 7993.

3.2.2 Fittings shall be capable of operating, as a minimum, within the ambient temperature range of -20°C to +60°C and operational temperature range of -20°C to +120°C.

3.2.3 The fitting shall have a minimum of 4:1 safety factor against the tube maximum working pressure under static test conditions.

3.3 Marking

As a minimum, the following requirements for marking shall be met. For fittings compliant with BS 7993 the requirements detailed in BS 7993 shall be maintained.

3.3.1 Designation of fittings

Fittings shall be designated by the fitting type, the outside diameter of the tube with which they are to be used e.g. ½" (12 mm) OD, the thread type i.e. BSP taper, BSP parallel or NPT and whether male or female, and the thread size.

3.3.2 Identification of fittings

Each fitting assembly shall be clearly marked with the manufacturer's trade name, or trademark, and identified with a "mm" stamp for metric sizes to ensure any mixing of components from fittings produced by different manufacturers is apparent.

NOTE Stainless steel bodies and nuts shall be hard marked with a traceable cast code identification.

4 Evaluation Procedure

Compression fittings shall be subjected to the evaluation procedure detailed in this standard. The selection of test specimens and the testing shall be witnessed by a third-party surveyor, appointed by the gas transporter, who shall be allowed to observe the selection of the test specimens and the tests in progress at any agreed time. The third-party surveyor shall be an approved Pressure Equipment Directive Notified Body.

The test requirements listed in BS 7993 shall be carried out with the exception of:

a) Vacuum test (A.11)
b) Deep water submersion test (A.19)

Annex A – Single Ferrule Fittings, General Requirements

A.1 Design

The general features of the fitting are illustrated in Figure A.1. Specific features are:

a) The fittings shall comply with the relevant dimensions given in Clause A.4.
b) The compression joint shall be a low assembly torque design. Provision for tightening by means of a spanner shall be made on all fittings with screwed connecting ends.
c) The fittings shall have a controlled tube bite incorporated in the design, to allow correct assembly on both thin and thick walled tubes without reducing the performance of the joint.
d) The ferrule shall have an anti-vibration swage feature to ensure long-term safety and integrity of the joint.
e) The fittings' range shall include a gauge that will allow the fitting joint to be inspected for correct assembly tightness.
f) The fitting shall be capable of being over tightened without affecting joint performance, i.e. excessive deformation of tube outside diameter.
g) The fittings' performance shall be proven by testing, witnessed by an independent body recognised as such by the gas transporter, and the fitting shall carry the appropriate third-party approval in line with the Evaluation Procedure detailed in Clause 4.
h) Upon completion of making the joint, the ferrule should stay in position on the tube when the fitting is subsequently disassembled.
i) The blanking plug shall be of a blow-out proof design.
j) The fitting shall be capable of being disassembled and remade 10 times, and at all times joint integrity shall be maintained.

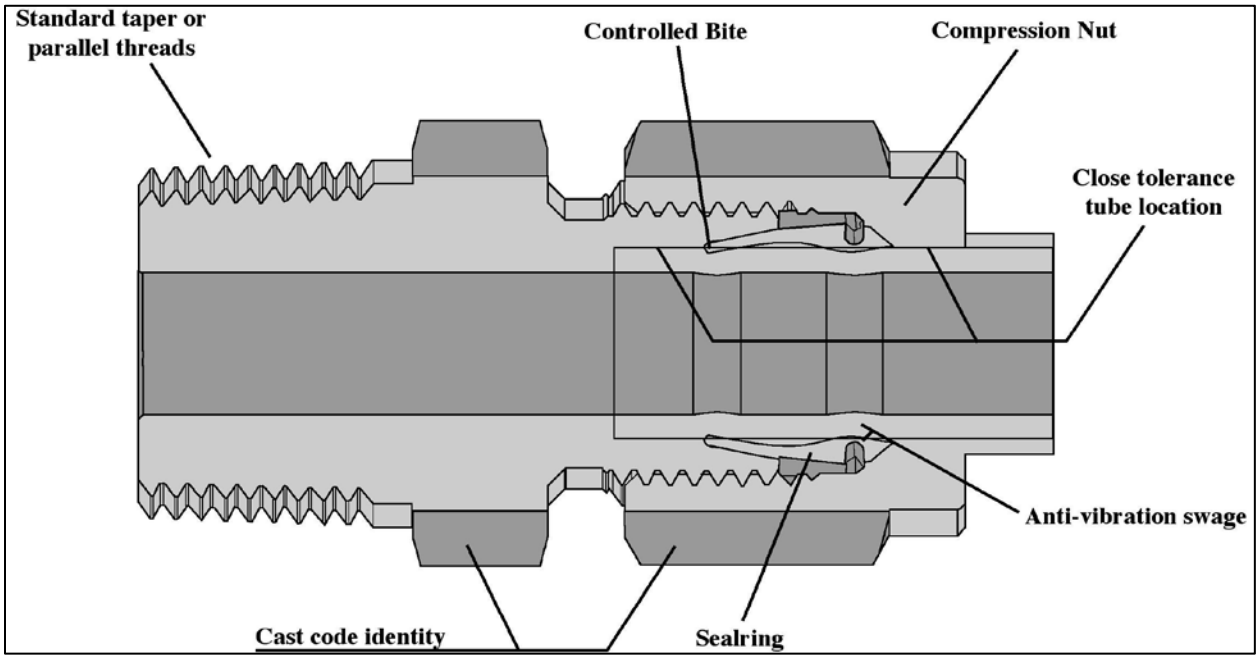


Figure A.1 — Compression fitting: general features

A.2 Workmanship/quality

The fitting shall be cleanly and neatly finished, totally free from any internal and external burrs, sharp edges and other defects that may adversely affect the performance of the fitting joint. Mating surfaces of the ferrule and body cone shall have a surface finish of 32µ'' CLA / 0.8 µmm or better, to ensure a consistent gas tight seal.

A.3 Materials

A.3.1 General

All fitting components shall be manufactured from stainless steel conforming to the following standards:

a) ASTM A276 or BS EN 10250-4 and PD 970 for cold drawn 316 stainless steel hexagon bar components (bodies or nuts).
b) ASTM A276 or BS EN 10250-4 and PD 970 for 316 stainless steel round bar components (ferrules).
c) ASTM A182 for "as-forged" and "electro polished" 316 stainless steel forged components (elbows and tee bodies), with improved mechanical properties (a minimum cross sectional hardness of 96 Rockwell B) conforming to BS EN 10243-1 and BS EN 10243-2 for dimensional tolerances.

A.3.2 Ferrules

All ferrules for use in stainless steel fittings shall be manufactured from 316 stainless steel.

Ferrules shall have a biting edge hardened by hard chrome plating conforming to BS EN ISO 6158, with the plating tested for adhesion in compliance with BS EN ISO 2819.

A.3.3 Compression nuts

Compression nuts shall be silver plated on all internal surfaces conforming to BS EN ISO 4521, with the plating tested for adhesion and thickness in compliance with BS EN ISO 4521 and BS EN ISO 3497.

A.4 Detailed dimensions of compression fittings

A.4.1 Compression end details

Compression end details shall be as illustrated in Figure A.2 and be in accordance with Tables A.1 and A.2.

Compression threads shall conform to BS 1580-1 and BS 1580-2 (imperial) and BS 3643-1 and BS 3643-2 (metric).

Thread undercuts shall conform to BS 1936-1 and BS 1936-2.

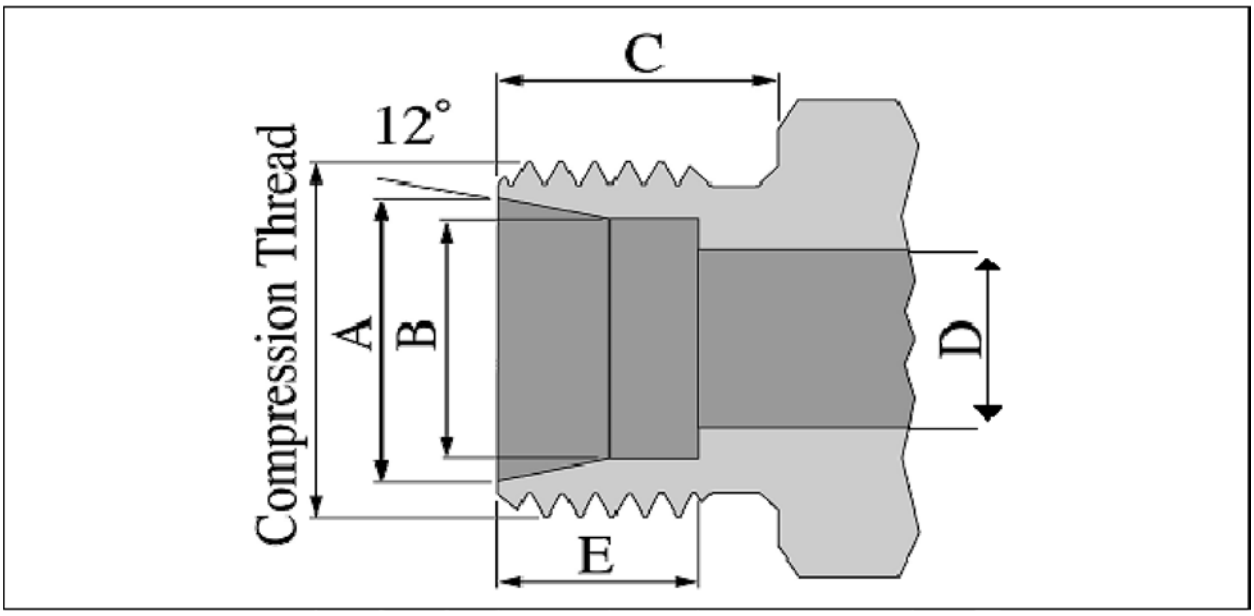


Figure A.2 — Compression end details

Table A.1 —Compression end dimensions: imperial tube sizes

Size OD	UN Thread Class-2A	A	B	C	D	E
		in	in	in	in	in
1/4″	7/16 x 20	0.32	0.26	0.41	0.19	0.29
5/16″	1/2 x 20	0.40	0.32	0.41	0.22	0.29
3/8″	5/8 x 18	0.46	0.38	0.50	0.25	0.35
1/2″	3/4 x 16	0.60	0.51	0.53	0.38	0.38
5/8″	7/8 x 16	0.72	0.63	0.59	0.50	0.41
3/4″	1-1/16 x 16	0.85	0.76	0.66	0.59	0.44
7/8″	1-3/16 x 16	0.99	0.88	0.66	0.72	0.45
1″	1-5/16 x 16	1.12	1.01	0.72	0.84	0.51

Table A.2 — Compression end dimensions: metric tube sizes

Size OD	ISO Thread Class-6g	A mm	B mm	C mm	D mm	E mm
6 mm	M12 x 1.5	8.1	6.2	10	4	7
8 mm	M14 x 1.5	10.1	8.2	10	6	8
10 mm	M16 x 1.5	12.3	10.2	11	8	8.5
12 mm	M18 x 1.5	14.3	12.2	11	10	8.5
15 mm	M22 x 1.5	17.3	15.2	12	12	9
18 mm	M26 x 1.5	20.3	18.2	12	15	9
22 mm	M30 x 2.0	24.3	22.2	14	19	9

A.4.2 Basic dimension of fittings

Basic dimensions of fittings shall be as illustrated in Figure A.3 and in accordance with Table A.3.

Table A.3 — Basic dimensions of fittings

Tube OD	Pipe thread size	Compression thread	F1 Hex A/F		F2 Hex A/F		F3 Hex A/F		F4 Hex A/F		F5 Forging A/F
			in	mm	in	mm	in	mm	in	mm	in
1/4″	1/8	7/16 x 20 UN	9/16	14	9/16	14	9/16	14	9/16	14	1/2
3/8″	1/4	5/8 x 18 UN	11/16	17	11/16	17	3/4	19	3/4	19	5/8
1/2″	3/8	3/4 x 16 UN	7/8	22	7/8	22	7/8	22	7/8	22	13/16
5/8″	1/2	7/8 x 16 UN	15/16	24	15/16	24	1-1/8	28	1-1/8	28	1-1/16
3/4″	3/4	1-1/16 X 16 UN	1-1/8	28	1-1/8	28	1-5/16	32	1-5/16	32	1-1/16
1″	1	1-5/16 X 16 UN	1-1/2	38	1-1/2	38	1-11/16	42	1-1/2	38	1-3/8
6 mm	1/8	M12 x 1.5	1/2	12	9/16	14	9/16	14	9/16	14	1/2
8 mm	1/4	M14 x 1.5	9/16	14	11/16	17	3/4	19	11/16	17	1/2
10 mm	1/4	M16 x 1.5	11/16	17	11/16	17	3/4	19	3/4	19	5/8
12 mm	3/8	M18 x 1.5	3/4	19	3/4	19	7/8	22	7/8	22	5/8
15 mm	1/2	M22 x 1.5	15/16	24	15/16	24	1-1/8	27	1-1/8	27	13/16
18 mm	1/2	M26 x 1.5	1-1/16	27	1-1/16	27	1-1/18	27	1-1/4	32	1-1/16
22 mm	3/4	M30 x 2.0	1-5/16	32	1-5/16	32	1-5/16	32	1-3/8	35	1-1/16

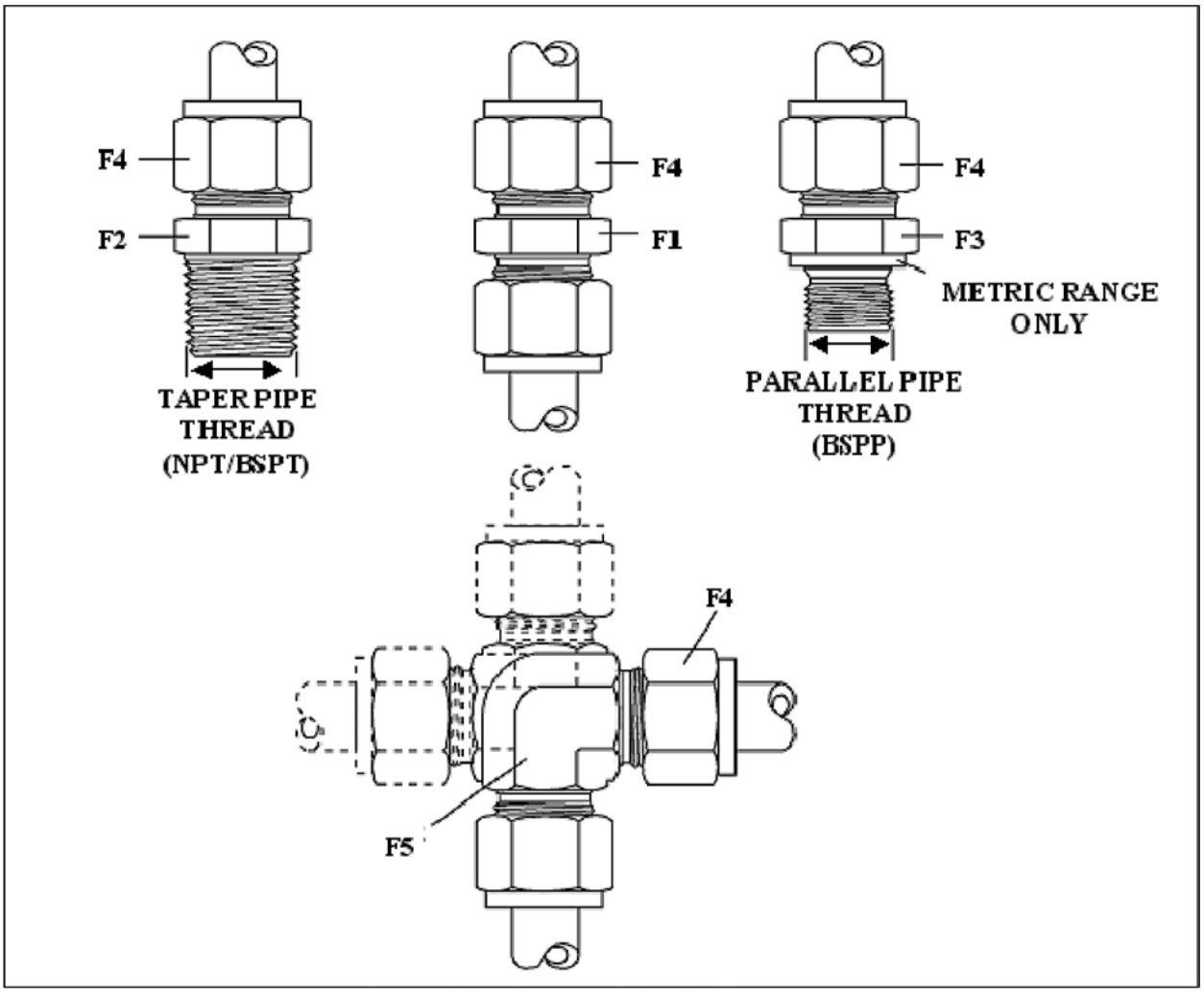


Figure A.3 — Basic dimensions of fittings

A.4.3 End to centre dimensions

A.4.3.1 Equal elbow, equal tee and equal cross

End to centre dimensions for equal elbows, equal tees and equal crosses shall be as illustrated in Figure A.4 and be in accordance with Table A.4.

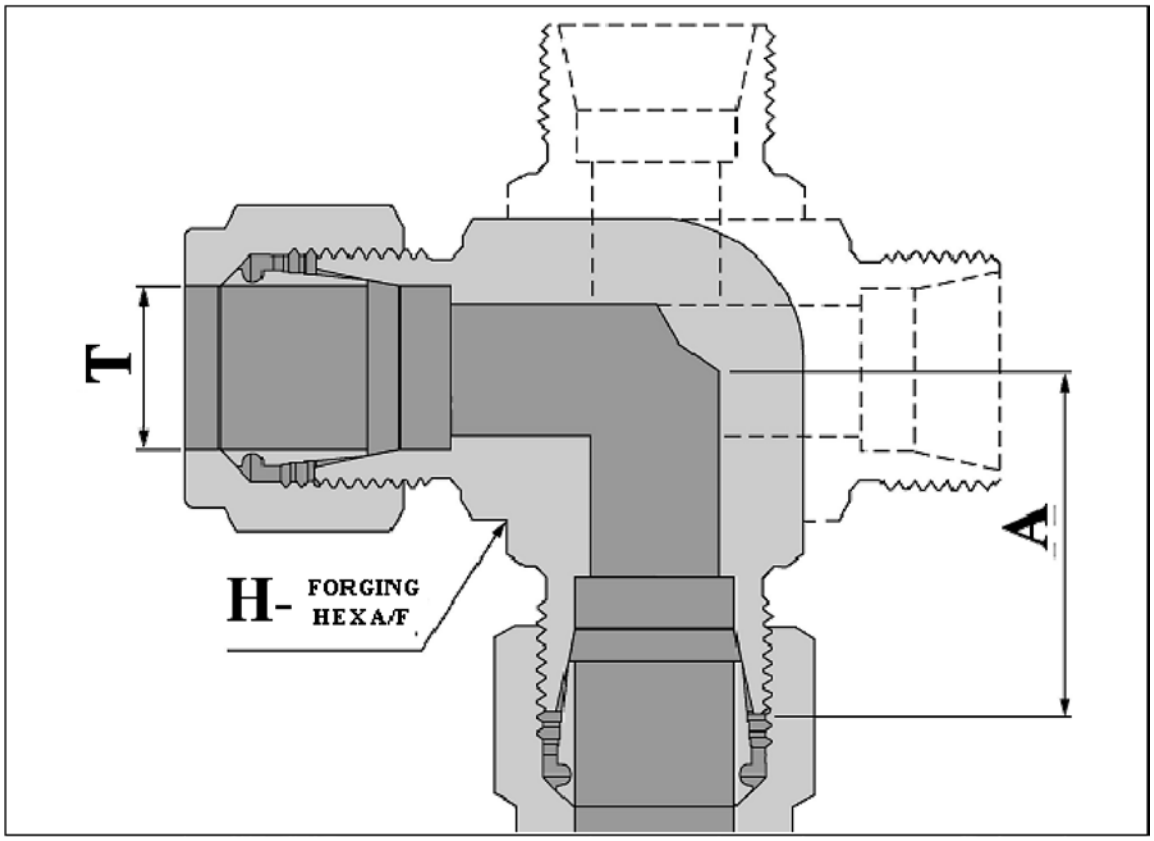


Figure A.4 — End to centre dimensions: equal fittings

Table A.4 — End to centre dimensions: equal fittings

T Tube OD Imperial	A in	H A/F in
1/4″	0.77	1/2
5/16″	0.77	1/2
3/8″	0.94	5/8
1/2″	1.08	13/16
5/8″	1.30	1-1/16
3/4″	1.36	1-1/16
7/8″	1.36	1-1/16
1″	1.61	1-3/8

T Tube OD Metric	A in	H A/F in
6 mm	0.76	1/2
8 mm	0.76	1/2
10 mm	0.88	5/8
12 mm	0.88	5/8
15 mm	1.02	13/16
18 mm	1.17	1-1/16
22 mm	1.25	1-1/16

A.4.3.2 Male stud elbow, male run tee and male branch tee

End to centre dimensions for male stud elbows, male run tees and male branch tees shall be as illustrated in Figure A.5 and be in accordance with Table A.5.

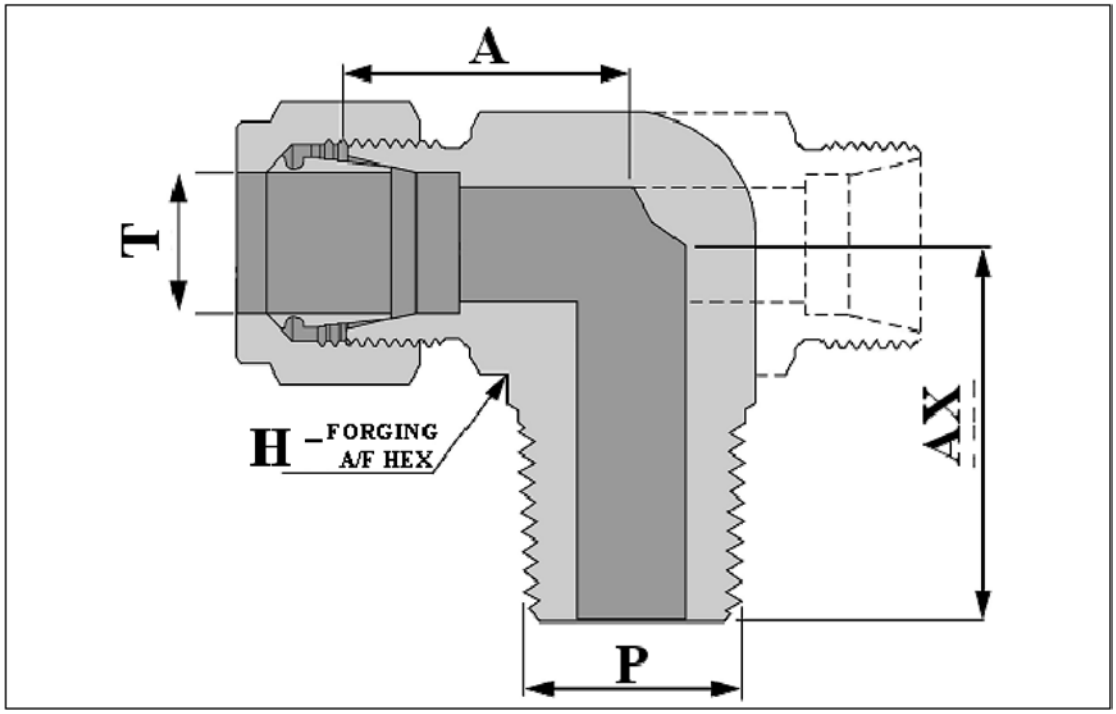


Figure A.5 — End to centre dimensions: male fittings

Table A.5 — End to centre dimensions: male fittings

10		P Thread size	A		AX NPT	H A/F
Imperial	Metric	in	Imperial	Metric	in	in
¼″	6 mm	1/8	0.77	0.76	0.74	1/2
¼″	6 mm	1/4	0.77	0.76	0.92	1/2
5/16″	8 mm	1/4	0.77	0.76	0.92	1/2
3/8″	10 mm	1/4	0.94	0.88	1.03	5/8
3/8″	10 mm	3/8	0.94	0.88	1.03	5/8
	12 mm	3/8		0.88	1.03	5/8
1/2″		3/8	1.08		1.11	13/16
1/2″	12 mm	1/2	1.08	0.99	1.30	13/16
	15 mm	1/2		1.02	1.30	13/16
5/8″		1/2	1.30		1.44	1-1/16
3/4″	18 mm	1/2	1.36	1.17	1.44	1-1/16
	22 mm	3/4		1.25	1.44	1-1/16
1″		3/4	1.61		1.64	1-3/8

A.4.3.3 Female stud elbow, female run tee and female branch tee

End to centre dimensions for female stud elbows, female run tees and female branch tees shall be as illustrated in Figure A.6 and be in accordance with Table A.6.

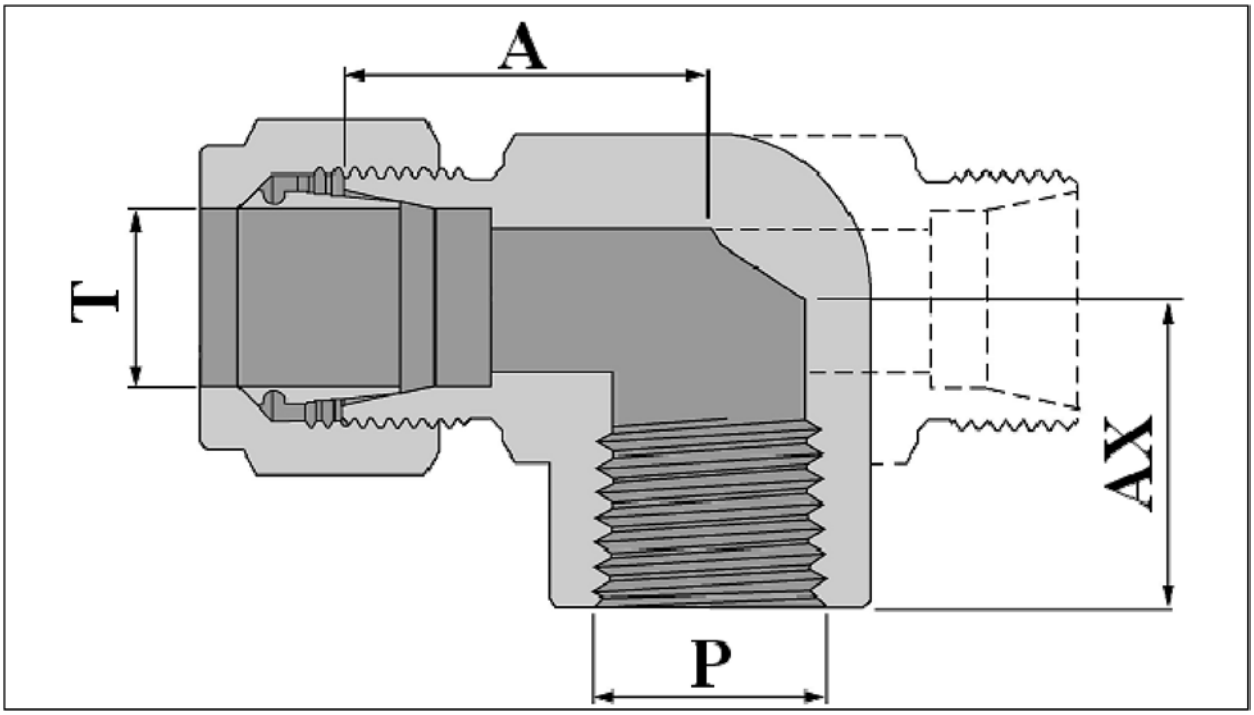


Figure A.6 — End to centre dimensions: female fittings

Table A.6 — End to centre dimensions: female fittings

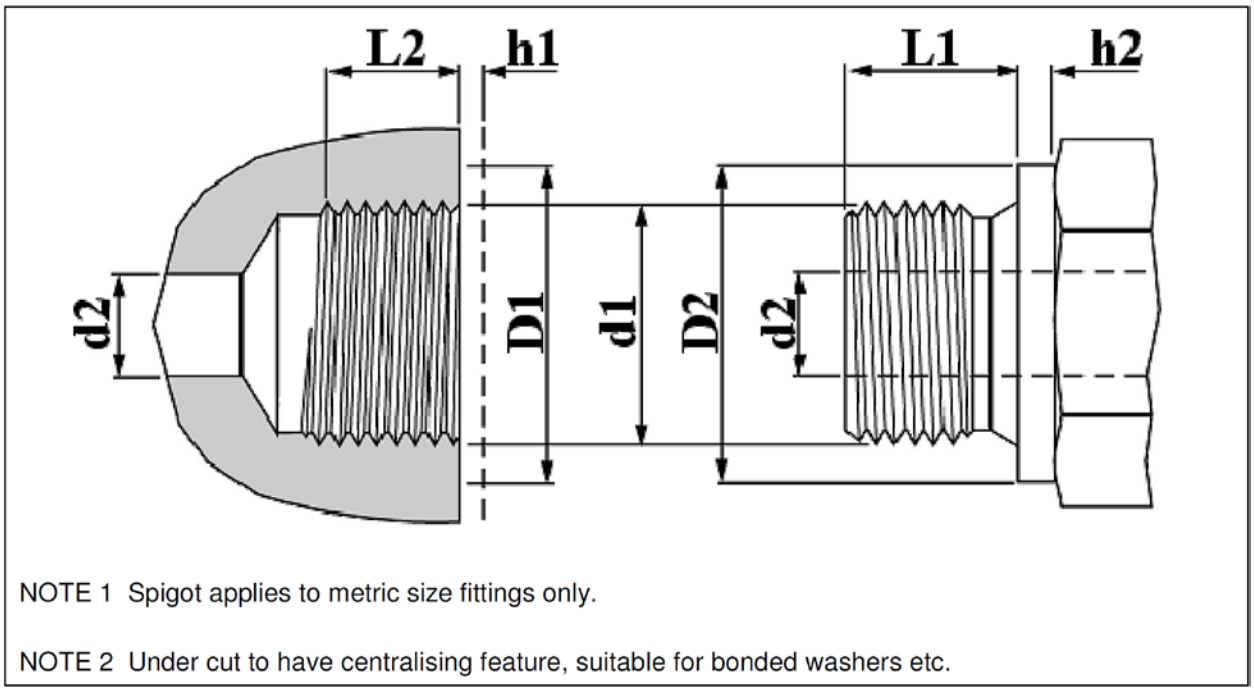
T Tube OD		P Thread size	A		AX NPT	H A/F
Imperial	Metric	in	Imperial	Metric	in	in
1/4″	6 mm	1/8	0.77	0.76	0.75	1/2
1/4″	6 mm	1/4	0.85	0.84	0.88	5/8
5/16″	8 mm	1/4	0.85	0.84	0.88	5/8
3/8″	10 mm	1/4	0.94	0.88	0.88	5/8
3/8″	10 mm	3/8	1.05	0.99	0.88	13/16
1/2″	12 mm	3/8	1.08	0.99	0.88	13/16
5/8″	15 mm	1/2	1.30	1.17	1.12	1-1/16
3/4″	18 mm	1/2	1.36	1.17	1.12	1-1/16
1″	22 mm	3/4	1.61	1.44	1.25	1-3/8

A.4.4 Connecting threads

A.4.4.1 Parallel connecting threads

Parallel connecting threads for use on compression fittings shall be BSP parallel in conformance to BS EN ISO 228-1 and BS EN ISO 228-2, as illustrated in Figure A.7, and be in accordance with Table A.7.

Note: care to be taken when using parallel threads, additional measures may have to be employed to ensure a gas/pressure tight seal is achieved.



NOTE 1 Spigot applies to metric size fittings only.

NOTE 2 Under cut to have centralising feature, suitable for bonded washers etc.

Figure A.7 — BSP parallel connecting threads

Table A.7 — BSP parallel connecting threads

BSP Thread size d1	Bore (max.) d2	Thread length L1 male (max.) L2 female (min.)	D1 (min.)	h1 (max.) h2 (min.)	Spigot D2
	in	mm	mm	mm	mm
1/8	5/32	8	15	1	14
1/4	7/32	12	19	1.5	18
3/8	11/32	12	23	2	22
1/2	7/16	14	27	2.5	26
3/4	5/8	16	33	2.5	32
1	7/8	18	40	2.5	39

A.4.4.2 Taper connecting threads

A.4.4.2.1 Taper connecting threads for use on compression fittings shall be either:

a) BSP taper in conformance to BS 21 and BS EN 10226; or
b) NPT taper in conformance to ANSI/ASME B1.20.1;

as illustrated in Figure A.8, and be in accordance with Table A.8.

A.4.4.2.2 Taper threads shall be of half the standard tolerance, i.e. both male and female threads shall be of mid-maximum gauge limit, to ensure adequate thread engagement and pressure tight seal on assembly.

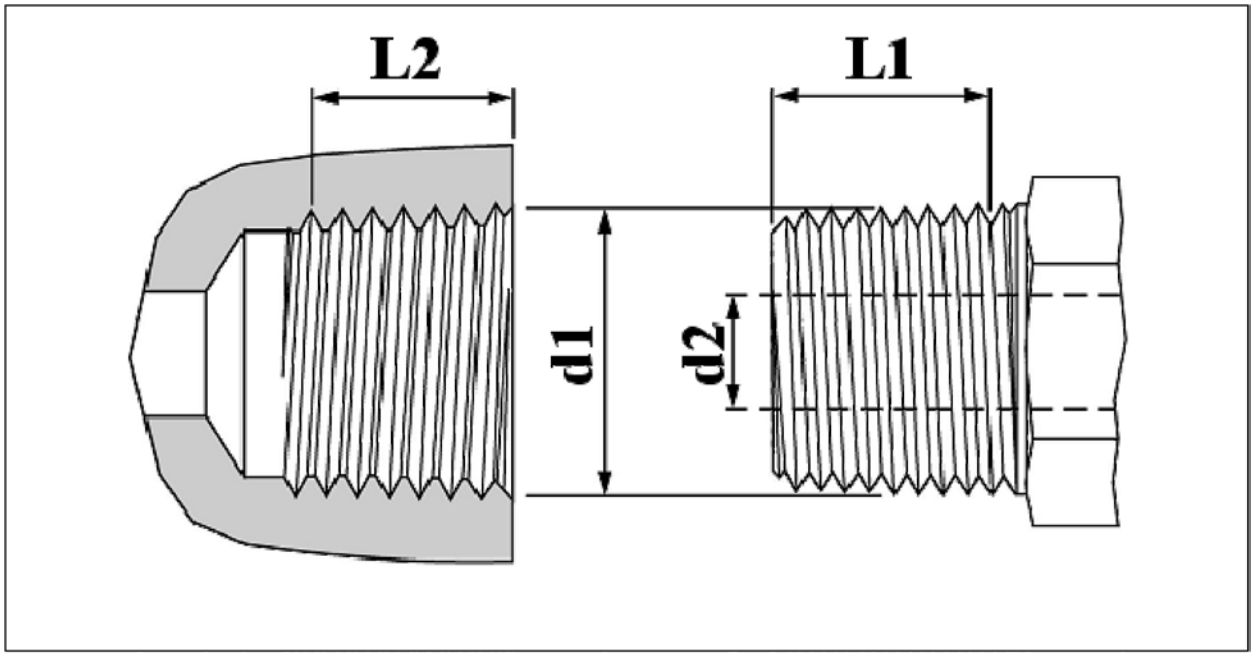


Figure A.8 — BSP taper and NPT taper connecting threads

Table A.8 — BSP taper and NPT taper connecting threads

Thread size d1	Bore (max.) d2 in		Useful thread L1 external (min.) L2 internal (min.) in	
	BSP Tr	NPT	BSP Tr	NPT
1/8	5/32	3/16	0.23	0.23
1/4	7/32	9/32	0.34	0.37
3/8	11/32	13/32	0.35	0.37
1/2	7/16	½	0.46	0.48
3/4	5/8	23/32	0.50	0.50
1	7/8	7/8	0.59	0.61

Annex B – Twin ferrule fittings not in accordance with BS 7993, General Requirements

B.1 Fittings shall comply with the pressure and temperature design requirements of ASME B31.3.

B.2 Fittings shall be manufactured from grade UNS S31600/S31603 Dual Certified 316/316L material. Bar stock shall conform to ASTM A276 and forgings to ASTM A182 requirements.

B.3 Double ferrule type compression fittings not conforming to BS7993 shall be qualified by independent Type Approval Testing, witnessed and verified by a Notified Body (NoBo) acceptable to the gas network, e.g. DNV-GL, Lloyds Register, Bureau Veritas etc.

B.4 The chemical composition of the fitting material shall have a restricted minimum chromium content of 17.0% and a minimum nickel content of 12.0% with a maximum carbon content of 0.05% for improved corrosion resistance.

B.5 The tube fitting shall be a controlled phase, sequential-gripping device consisting of four machined components – the body, front ferrule, back ferrule and nut that are produced by a single manufacturer.

B.6 The design shall be that the front ferrule provides a gas seal by a burnishing action between itself, the tube fitting body and the tubing.

B.7 The back ferrule shall have a uniform surface hardening. The surface hardening shall be achieved by a low temperature carburisation process, avoiding carbide formation. This process shall follow a disclosed and auditable process procedure.

B.8 There shall be no machined ferrule stops. Assembly of parts shall provide for ferrule movement during tightening. The tube fitting components shall be engineered to provide appropriate controlled phased sequential ferrule movement during tightening and negate the opportunity for stress risers to develop during assembly. Upon proper installation, the tube fitting shall be capable of disassembly and reassembly, producing a leak-tight seal.

B.9 The back ferrule shall hold the tube with a hinging and colleting action. This radial hinging colleting action of the back ferrule grips the tube adjacent to and outboard from the swaging point to enhance the vibration endurance.

B.10 The hinging and colleting action shall cause the mid portion of the back ferrule to press onto the tube while keeping the back end of the back ferrule away from the tube surface. The back ferrule shall not bow during assembly.

B.11 The sealing and gripping actions of the fitting shall provide a compensating action between ferrules that shall accommodate the allowed ranges of tube wall thickness, diameter and material hardness. For example: on thin walled tubing the back ferrule will grip the wall of the tube with less indentation than is necessary on heavy wall tube. The front ferrule will move

farther down the body ramp to burnish or polish a seal on the tube more than is required on a heavy wall tube.

B.12 The tube fitting nut shall be internally silver plated to eliminate galling of body threads during assembly.

B.13 Tube fittings shall have a gaugeable shoulder to check for sufficient pull-up on initial installation. The gaugeable shoulder shall allow a gap inspection gauge to be inserted between the hex of the nut and hex of the body shoulder. Consistently, the gap inspection gauge shall not fit between the nut and shoulder hexes of a sufficiently tightened fitting on the initial installation.

Annex C – BS 7993 Identification System (informative only)

BS 7993 utilises the following identification system, it is recommended that all fittings are marked using the same or an equivalent marking system:

Twin ferrule connectors shall be designated by an alphanumeric code to facilitate ordering. The code shall begin with the number of this British Standard, i.e. BS 7993. This shall be followed by a hyphen, and then the connector style designation letter symbols (see Table C.1), then a hyphen, immediately followed by the outside diameter of the tube to which they are to be connected. For stud ends (connector ends), another hyphen followed by the thread designation of the stud end and the sealing type shall be added.

EXAMPLE *A male stud connector (SDM), straight (S), for use with an outside diameter of 12 mm and a half-inch NPT thread, conforming to BS 7993, is designated as follows:*

BS 7993-SDMS-M12-8N

The letter symbol designation of the connector style (see Table C.1) shall have two parts: the connector end type, immediately followed by the shape of the connector.

Reducing connectors and reducing elbows shall be designated by specifying the larger tube end first.

Stud connectors shall be designated by specifying the tube end first, then the thread size for the stud end.

For tee connectors, the order of designation of the connector ends shall be from larger to smaller on the run, followed by the branch end.

For cross connectors, the order of designation of the connector ends shall be from left to right, followed by top to bottom, with the larger ends on the left and at the top. If the connector has a tube union connection, it shall be designated first, and then the designation shall proceed clockwise.

The letter symbols specified in Table C.1 shall be used.

NOTE Marking BS 7993:2011 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 solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.

Tube sizes shall be designated as follows.

a) Metric tube sizes shall be designated with a capital M, followed by the outside diameter of the tube in millimetres.

   EXAMPLE 1 A tube with an outside diameter of 20 mm would be designated as M20.

b) Imperial tube sizes shall be designated in increments of 1/16 in (or 1/16").

   EXAMPLE 2 A tube with an outside diameter of ¾" in would be designated 12.

Table C.1 Letter symbols for connectors

Category	Type	Letter
Connector end type	Bulkhead	BH
	Socket weld	CSW
	Butt weld	CBW
	Port	P
	Stud male	SDM
	Stud female	SDF
	Reducing	RE
Shape	Straight	S
	Elbow	E
	45° elbow	E45
	Tee	T
	Run tee	RT
	Branch tee	BT
	Cross	K
Component type	Nut	N
	Union twin ferrule x twin ferrule	U
	Reducing union – twin ferrule x smaller twin ferrule	RU
	Bulkhead union	BU
	Bulkhead stud	BCM and BCF
	Bulkhead tube end – also known as adapter	BAU
	Flange connector	CFL[A)]
	Positionable	SW
	Ferrule	F
	Front ferrule	FF
	Rear ferrule	RF
	Locknut	LN
	Plug	PL
	Cap	CP
	Metric	M
	Inch	- [B)]
Thread type	NPT to ANSI B1.20.1	N
	BS PP to BS EN ISO 228-1	G
	BS PT to ISO 7-1	R

[A)] Flange specification to be designated.
[B)] Intentionally left blank.