

***IGEM/GM/PRS/6
Communication 1794***

Meter connectors



*Founded 1863
Royal Charter 1929
Patron: Her Majesty the Queen*

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Communication 1794**

Meter connectors



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SECTION 1 : INTRODUCTION

1.1 This Specification is part of a series of Institution of Gas Engineers and Managers (IGEM) publications, providing a specification for selecting meter connectors.

1.2 British Gas and latterly, National Grid Metering (NGM) developed a series of specifications for key metering components based on its own suite of product requirements. These documents were made available to meter installers and purchasers under the title of Pressure Regulator Specification (PRS) 'e' documents. Originally these Specifications were made available through Advantica, as they were known at the time.

NGM has transferred the ownership of these documents to IGEM to make them available to the wider industry. It is some years since the original 'e' documents were updated and these have been withdrawn.

1.3 This Specification has been drafted by an IGEM Working Group, appointed by IGEM's Gas Measurement Committee, and has been approved by IGEM's Technical Coordinating Committee on behalf of the Council of IGEM.

1.4 Manufacturers supplying connectors for gas meters for gas flow rates not exceeding $6 \text{ m}^3 \text{ h}^{-1}$ and inlet pressures not exceeding 75 mbar and not exceeding 2 bar are to conform to the requirements of this Specification and to any other relevant documents to which reference is made herein.

1.5 Details on the installation of domestic-sized gas meters and associated components are given in BS 6400-1.

1.6 Terms such as "maximum operating pressure" (MOP), "maximum incidental pressure" (MIP) and "operating pressure" (OP) are used to reflect gas pressure terminology used in European standards. These terms will arise in all relevant IGEM Standards and, possibly, in other standards. Other terms have been introduced to assist in recognition of design information to be transferred between interested parties.

1.7 This Specification makes use of the term "must", "shall" and "should" when prescribing particular procedures.

- the term "must" identifies a requirement by law in Great Britain (GB) at the time of publication
- the term "shall" prescribes a procedure which, it is intended, will be complied with in full and without deviation
- the term "should" prescribes a procedure which, it is intended, will be complied with unless, after prior consideration, deviation is considered to be acceptable.

Such a term may have different meanings when used in legislation, or Health and Safety Executive (HSE) Approved Codes of Practice (ACoPs) or guidance, and reference needs to be made to such statutory legislation or official guidance for information on legal obligations.

1.8 New and improved practices may be adopted prior to this Specification being updated. Amendments to this Specification will be issued when necessary and their publication will be announced in the Journal of IGEM and elsewhere as appropriate.

1.9 Requests for interpretation of this Specification in relation to matters within its scope, but not precisely covered by the current text, should be addressed to Technical Services, IGEM, IGEM House, High Street, Kegworth, Derbyshire, DE74 2DA. Such requests will be submitted to the relevant Committee. Any advice given by or on behalf of IGEM does not imply acceptance of any liability, and does not relieve any party of their obligations.

1.10 This Specification was published in December 2016.

SECTION 2 : SCOPE

2.1 SCOPE

Connectors covered by this Specification have a nominal bore of the corrugated hose of 20, 25, 32, 50, 80 and 100 mm and are suitable for use with 1st, 2nd and 3rd family gases at pressure given in Table 1.

PRESSURE TIER	MAXIMUM OPERATING PRESSURE (MOP)	MAXIMUM INCIDENTAL PRESSURE (MIP)	TEST PRESSURE
Low	75 mbar	200 mbar	350 mbar
Medium	2.0 bar	2.7 bar	3.5 bar

TABLE 1 – SUMMARY OF PRESSURE RATINGS

- 2.2 Connectors are for meter installations in buildings and in meter boxes. Table 2 item number LS03, LS04, LS05, LS07, LS08, LS09 and LS10 connectors are suitable for use in semi-concealed meter boxes.
- 2.3 This Specification sets out the requirements for type testing (see Section 7).
- 2.4 This Specification requires consideration of the life cycle of the product and its potential effect on the environment.
- 2.5 All pressures quoted in this Specification are gauge pressure.
- 2.6 Italicised text is informative and does not represent formal requirements.
- 2.7 Appendices are informative and do not represent formal requirements unless specifically referenced in the main sections via the prescriptive terms “must”, “shall” or “should”.

SECTION 3 : LEGAL AND ALLIED CONSIDERATIONS

- 3.1 This Specification is set out against a background of Legislation in force in GB at the time of publication. The devolution of power to the Scottish, Welsh and Northern Ireland Assemblies means that there may be variations to the Legislation described below for each of them and consideration of their particular requirements must be made. Similar considerations are likely to apply in other countries where reference to appropriate national Legislation is necessary.
- 3.2 All relevant Legislation must be applied and relevant ACoPs, official Guidance and referenced codes, standards, etc. have to be taken into account.
- 3.3 Unless otherwise stated, the current editions of Legislation and standards apply.
- 3.4 In the absence of specific Legislation, it is essential that installations are designed, constructed, installed, operated and maintained so as to be safe.
- 3.5 The Legislation appropriate to any installation will depend largely upon its location. Advice will need to be sought from the relevant Authorities.
- 3.6 Appendix 2 lists Legislation, Guidance Notes, Standards etc. which are identified within this Specification as well as further items of Legislation that may be applicable. Where British Standards, etc. are quoted, equivalent national or international standards, etc. equally may be appropriate.

SECTION 4 : MATERIALS

4.1 CORRUGATED HOSE

Corrugated hose shall be made from:

- for connectors for medium pressure and for semi-concealed meter box installations (item number from Table 2 LS03, LS04, LS05, LS06, LS07, LS08, LS09, LS10 and Table 3 MA21 to MA27); austenitic stainless steel to BS EN 10028-7 number 1.4404 (grade X2CrNiMo17-12-2)
- for other connectors; austenitic stainless steel to BS EN 10028-2 number 1.4404 (grade X2CrNiMo17-12-2) or number 1.4541 (grade X6CrNiTi18-10).

4.2 NUTS

Nuts for use on connectors shall be made from one of the following:

- material which complies with Sub-Section 4.1 of BS 746
- malleable iron grade EN-GJMB-350-10 to BS 1562 with a hot dipped zinc coating complying with BS EN 10242 (coating thickness approx. 70 µm). The zinc coating shall be applied evenly across the surface of the nut. Nuts shall have internal threads protected with an anti-corrosion wax-oil coating or suitable alternative. This anti corrosion wax-oil coating shall be compatible with other materials used (including elastomeric seals)
- free cutting steel grade 230 M07Pb to PD 970:2005 or BS EN 10087 with a zinc plated and chromate passivated corrosion protection coating, grade Fe/Zn/12/Ca to BS EN 12329 (nominal 12 µm thick electroplated zinc coating, chromate coating code C, 'a' indicates trivalent chromium). The coating system shall be capable of providing effective long-term protection from corrosion in environments up to service condition class 3. The material shall not cause corrosion issues when in contact with the aluminium regulator body.

4.3 LINER

The liner shall be made from one of the following:

- a) for connectors intended for semi-concealed meter box installations (Table 2 item number LS03, LS04, LS05, LS07, LS08, LS09 and LS10)
 - steel to BS EN 10217-1, ERW or S, 320, 360 or 410
 - steel of any grade with a content not exceeding 0.01% for lead, 0.06% for sulphur and 0.06% for phosphorous and which is suitable for welding, and forming or machining, as appropriate
 - austenitic stainless steel to PD 970-316S11.
- b) for other connectors:
 - steel to BS EN 10217-1, ERW or S, 320, 360 or 410
 - steel of any grade with a content not exceeding 0.01% for lead, 0.06% for sulphur and 0.06% for phosphorous and which is suitable for welding and forming or machining, as appropriate
 - austenitic stainless steel to PD 970-316S11 or 321S31.

4.4 NIPPLE END

The nipple end shall be of one of the following:

- a) for connectors intended for use in semi-concealed meter installations (Table 2 item number LS03, LS04, LS07 and LS08)
 - steel to BS EN 10255 3.2 mm wall thickness
 - austenitic stainless steel to PD 970-316S11 and with a minimum wall thickness of 2.6 mm.

b) for other connectors:

- steel to BS EN 10255, or any of the steels specified in the second bullet of clause 4.3 a) for the liner, 3.2 mm wall thickness.

4.5 **FLANGES**

Flanges shall be of steel to clause 5.1 of BS EN 1092-1.

4.6 **FILLER METAL**

Filler metal, where used in the construction of semi-rigid connectors, shall have:

- a total alloy content high enough to prevent martensite formation in the weld after dilution by any carbon steel and preserve residual amounts of ferrite to minimise the possibility of hot cracking occurring
- mechanical properties at least equal to the minimum specified for the lower strength parent metal.

Note: For carbon steel end fittings, filler rod 19 9 L, 23 12 L or 22 12 H to BS EN 12072 is recommended.

SECTION 5 : FINISH

5.1 GENERAL

5.1.1 Hose and components welded thereto shall not be zinc plated or zinc coated.

Note 1: Zinc is detrimental to fire resistance.

Note 2: Owing to the applied heat for welding, the protective finish requirements specified in clause 9 of BS 746 for metal components cannot be applied to the liner.

Note 3: The nuts used on hoses may be zinc plated or coated.

5.1.2 Hot pressings (brass stampings) shall be sound and solid without laminations and shall be smooth and well finished with a surface finish tolerance of 3.2 µm (see also clause 5.2).

5.1.3 Where appropriate, machining of end fittings shall be of a fine finish and free from scores and harmful surface defects. Machined surfaces shall have a surface finish tolerance of 1.6 µm.

5.1.4 Gravity die-castings shall be sound in all respects, free from laps, blow holes, pitting and other injurious defects and all surfaces not machine finished shall be clean and smooth (3.2 µm). The castings shall be neatly dressed and no casting shall be rectified by burning, plugging, stopping or patching.

5.1.5 Gasways and washer seatings shall be free from burrs and sharp edges.

5.1.6 Welds shall be properly fused with the parent metal with no significant undercutting (less than 10%) or overlapping of the welds. Any undercutting shall be intermittent and shall not create any sharp notches. The start and stop of any welds should merge smoothly and there shall be no pronounced humps or craters in the weld surface. Welds shall be free from splatter (globular deposits) greater than 1 mm above the surface of the parent metal and there shall be no discontinuities or porosity.

5.1.7 There shall be no trace of swarf or other foreign matter left in the interior of any connector.

5.1.8 Connectors shall be free from damage likely to cause a malfunction of the component.

Note: Examples of what could constitute damage are scores, dents, cuts, weld spatter and arc strikes.

5.1.9 All threads shall comply with the requirements of the appropriate British Standard (see BS EN 10226, BS 746 or BS EN ISO 10806). For BS EN 10226 threads, see also clause 6.5.

5.2 SURFACE FINISH

Nuts shall have a clean and uniform surface finish, which shall be in accordance with the appropriate requirements of BS 1134.

SECTION 6 : DESIGN, DIMENSIONS AND TOLERANCES

6.1 DIMENSIONS AND TOLERANCES

6.1.1 The dimensions and combinations of end fittings for connectors shall be in accordance with Table 2 for connectors of MOP not exceeding 75 mbar (see Appendix 4) and Table 3 for connectors of MOP not exceeding 2 bar (see Appendix 5) and the relevant drawing referenced therein.

Note: BS EN 10226 thread types:

- R - taper external;
- R_s - parallel external
- R_c - taper internal; R_p - parallel internal
- 'EXT' - External
- 'INT' - Internal.

6.1.2 Hot pressings (brass stampings) shall have design dimensions and tolerances in accordance with BS EN 12420.

ITEM No.	DRWG No.	END FITTINGS		LENGTH (mm)	NOM. BORE OF HOSE (mm)	MIN. THICKNESS OF FINISHED HOSE (mm)	MAX. PITCH OF CORRUGATIONS (AVE. OF 10) (mm)
LA01	6045	BS 746 $\frac{3}{4}$	BS EN 10226 $R\frac{3}{4}$	400	20	0.25	7
LA02	6045	BS 746 $\frac{3}{4}$	BS EN 10226 21 $R\frac{3}{4}$	460	20	0.25	7
LS03	6177	BS 746 1*	BS EN 10226 $R\frac{3}{4}$	70	20	0.25	3.5
LS04	6151	BS 746 1*	BS EN 10226 $R\frac{3}{4}$	90	20	0.25	3.5
LS05	6192	BS EN 10226 $R\frac{3}{4}$	BS 746 1**	260	20	0.25	7
LS06	6192	BS EN 10226 $R\frac{3}{4}$	BS 746 1**	400	20	0.25	7
LS07	6052	BS EN 10226 $R\frac{3}{4}$	BS 746 1	330	20	0.25	7
LS08	6052	BS EN 10226 $R\frac{3}{4}$	BS 746 1	400	20	0.25	7
LS09	6187	BS 746 1	BS EN 10226 $R\frac{3}{4}$	340	20	0.25	7
LS10	6150	BS 746 1	BS 746 1	300	20	0.25	7
LA11	6047-1	BS 746 1 $\frac{1}{4}$	BS EN 10226 $R1\frac{1}{4}$	400	32	0.25	7.5
LA12	6047-2	BS 746 1 $\frac{1}{2}$	BS EN 10226 $R1\frac{1}{4}$	500	32	0.38	7.5
LA13	6048	BS 746 2	BS EN 10226 $R2$	600	50	0.38	9
LA15	6168	BS EN 10226 $R3$	BS EN 10226 $R3$	600	80	0.40	10
LA17	6152	BS 746 2***	DN 80 fixed	600	80	0.40	10
LA18	6153	DN 80 loose***	DN 80 fixed	600	80	0.40	10
LA19	6154	DN 100 loose***	DN 100 fixed	600	100	0.43	18

LA20	6155	DN 100 loose***	DN 100 fixed	300	100	0.43	18
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Note 1: * with hexagon
 ** with groove
 *** suitable for IGEN/GM/6 meter installations.

Note 2: Item number format is; L for MOP not exceeding 75 mbar; M for MOP not exceeding 2 bar; A for above ground installations; S for below ground installations.

TABLE 2 – CONNECTORS OF MOP NOT EXCEEDING 75 MBAR

ITEM No.	DRWG No.	END FITTINGS		LENGTH (mm)	NOM. BORE OF HOSE (mm)	MIN. THICKNESS OF FINISHED HOSE (mm)	MAX. PITCH OF CORRUGATIONS (AVE. OF 10) (mm)
MA21	6179	BS 5200 19 F	BS 5200 19 M	160	20	0.25	7
MA22	6179	BS 5200 19 F	BS 5200 19 M	270	20	0.25	7
MA23	6180	BS EN 10226 R ³ / ₄	12.7 mm plain stainless steel	400	20	0.25	7
MA25	6181	BS 5200 19 M BS EN ISO 10806	12.7 mm plain stainless steel	270	20	0.25	7
MA26	6181	BS 5200 19 M BS EN ISO 10806	12.7 mm plain stainless steel	300	20	0.25	7
MA27	6181	BS 5200 19 M BS EN ISO 10806	12.7 mm plain stainless steel	320	20	0.25	7

Note: Item number format is; L for MOP not exceeding 75 mbar; M for MOP not exceeding 2 bar; A for above ground installations; S for below ground installations.

TABLE 3 – CONNECTORS OF MOP NOT EXCEEDING 2 BAR

6.1.3 Unless otherwise specified in British Standards or drawings, machined parts of end fittings shall have:

- a tolerance of ± 0.4 mm on basic dimensions
- a concentricity tolerance of 0.4 mm
- a surface finish tolerance of 1.6 μm on sealing faces of washer seatings
- a maximum of 0.5 mm internal and external radii.

6.2 PRESSURE ABSORPTION (TYPE TEST)

6.2.1 The connectors in Table 2 are designed to provide a pressure absorption not more than that given in Table 4 at an inlet pressure of 19 mbar and the gas flow rate for 2nd family gas.

6.2.2 The connectors in Table 3 shall have a pressure absorption of not more than 1 mbar at an inlet pressure of 50 mbar and a flow rate of 6 m³ h⁻¹.

BORE (mm)	FLOW RATE (m³ h⁻¹)	MAX. PRESSURE ABSORPTION (mbar)
20	6	0.40
32	16	0.25
50	40	0.25
80	100	0.25
100	160	0.25

TABLE 4 – PRESSURE ABSORPTION**6.3 CORRUGATED HOSE**

6.3.1 Hose of construction types 1 and 3 to BS EN ISO 10380 meet the requirements of this clause. See relevant drawing in Appendix 4 and 5 for appropriate construction type. Hoses shall be of single ply construction and shall be annularly corrugated from:

- seamless tube or
- single longitudinally butt-welded tube.

6.3.2 Transverse joining of strip or circumferential joining of tube prior to or after corrugating shall not be permitted.

6.3.3 Corrugations shall be of uniform height and pitch along the complete length of the hose. Variations to height and pitch shall be less than 10%.

6.4 LINER AND NIPPLE END

6.4.1 For domestic sized flexible connections (3/4" and 1" Nominal Bore) machining or forming of the ends of the liner or nipple end to facilitate welding is permissible but the minimum thickness of any mild steel on the finished item in the weld and the immediate surrounding areas shall be not less than:

- for connectors for semi-concealed meter installations, 2.1 mm
- for other connectors; 1.5 mm.

6.4.2 The tail of the liner shall be of sufficient length such that, when the nut is held against the corrugated hose or any expanded tail (see clause 6.4.3), the sealing face of the liner shoulder extends beyond the end of the nut.

6.4.3 Where the tail of the liner is smaller in diameter than the corrugated hose and the alteration required to enable the two components to be welded together involves expanding the tail:

- the tail diameter increase shall not exceed 40%
- the subsequent cone formed shall not exceed an included angle of 40°.

6.5 **BS EN 10226 THREADS**

6.5.1 The gauging system for BS EN 10226 threads on nipple end fittings should be in accordance with the method described in BS EN 10226-3.

Note 1: Other gauging systems may be used, but in this case the manufacturer is to be able to demonstrate that the system used gives equivalent gauging results.

Note 2: This is to avoid the possibility of fouling between a threaded component and the bottom of a counter bored tapped hole.

6.5.2 Chamfers on BS EN 10226 threads shall be angled at 45°.

6.6 **FLANGES**

Flanges shall comply with Table PN 16 of BS EN 1092-1. The loose flange on connector Table 2 item number LA18, LA19 and LA20 should be machined to also allow connection to a flange to Table D of BS 10 and ANSI-150, as shown on the appropriate drawing (see Appendix 4).

Note: Where required the slotting of the loose flange is to be specified by the purchaser

6.7 **WELDING**

6.7.1 The corrugated hose and any stainless steel machined parts, which are subsequently formed in any way, shall be bright annealed before welding.

6.7.2 General welding practices shall be in accordance with BS EN 1011-1. Welding procedures shall comply with BS 2633 or BS EN 288-9, as appropriate.

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