

Gas Industry Standard

GIS/C6:2006

Specification for

Distribution pipe fittings cast in ductile iron for use up to 7 bar maximum operating pressures



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Foreword

Gas Industry Standards (GIS) are revised, when necessary, by the issue of new editions. Users should ensure that they are in possession of the latest edition. Contractors and other users external to Gas Transporters should direct their requests for copies of a GIS to the department or group responsible for the initial issue of their contract documentation.

Comments and queries regarding the technical content of this document should be directed in the first instance to the contract department of the Gas Transporter responsible for the initial issue of their contract documentation.

This standard calls for the use of procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

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.

Disclaimer

This engineering document is provided for use by Gas Transporters and such of their contractors as are obliged by the terms of their contracts to comply with this engineering document. Where this engineering document is used by any other party, it is the responsibility of that party to ensure that the engineering document is correctly applied.

Brief history

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1 Scope

This Gas Industry Standard specifies performance requirements and test methods for distribution pipe fittings, cast in ductile iron, for use up to 7 bar operating pressures. It covers fittings in the DN 40 to DN 600 size range and applies to fittings which are manufactured with socketed, flanged or spigot ends for jointing by means of various types of gaskets, which are not within the scope of this standard.

Split tee or collar type fittings, in accordance with GIS/C8, are not within the scope of this standard.

2 Normative references

The following referenced documents are indispensable for the application 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.

Formal standards

BS 3416:1991, *Specification for bitumen-based coatings for cold application, suitable for use in contact with potable water.*

BS 4164, *Specification for coal-tar-based hot-applied coating materials for protecting iron and steel, including a suitable primer.*

BS EN 969:1996, *Specification for ductile iron pipes, fittings, accessories and their joints for gas pipelines — Requirements and test methods.*

3 Term and definition

For the purposes of this standard the following term and definition applies.

3.1

ductile iron (spheroidal graphite cast iron)

iron in which the graphite is present substantially in spheroidal form

4 Composition

If the phosphorus content of the pipe fittings is ≤ 0.08 % by weight, the maximum silicon content of the pipe fittings shall be 3.2 % by weight. If the phosphorus content lies in the range 0.08 % by weight to 0.1 % by weight the maximum silicon content shall be 3 % by weight.

5 Freedom from defects

Visual examination of all castings shall be made to check that the castings are sound, clean, free from all defects and that they are well dressed and fettled.

Pipe fittings and accessories shall be free from defects and surface imperfections which could lead to non-compliance with BS EN 969:1996, Clauses 4 and 5.

6 Repair of defects in castings

6.1 The repair of castings by impregnation processes shall be carried out using a resin based filler only. This shall not cause a deterioration in the mechanical strength of the castings.

6.2 Proprietary metal fillers shall not be used before all pressure testing is complete.

NOTE Proprietary metal fillers may be used to enhance the appearance of castings.

6.3 Upon completion of repairs in accordance with **6.1**, and **6.2** they shall be tested in accordance with Clauses **10** and **11**.

6.4 Repairs to remove surface imperfections and localized defects shall not affect the entire wall thickness provided that the repairs meet the requirements of BS EN 969:1996, **4.1.2**.

7 Acceptance tests

Testing shall be carried out in accordance with BS EN 969:1996, Clauses **5** and **6**.

NOTE 1 This includes tests on joints, dimensions, straightness of pipes, tensile test, Brinell hardness and works leaktightness tests.

Fittings and joints shall be designed to be leaktight at their maximum operating pressure and shall conform to the requirements for performance and testing specified in BS EN 969:1996, Clause **5**, **6.5** and Clause **7**.

Where castings are not subject to heat treatment, each test sample shall be an integral part of a casting or runner system.

NOTE 2 In the event of 'as-cast' products failing acceptance tests as a result of structures containing pearlite and/or carbide, the ladle of castings may be mixed with others with similar faulty microstructures and heat-treated in the appropriate manner.

A minimum of one and a maximum of three test pieces from the ladles being heat-treated shall be included in the heat-treatment batch.

8 Frequency of sampling

8.1 General

The maximum batch sizes shall be in accordance with BS EN 969:1996, Table 9.

NOTE The frequency of testing is related to the system of production and quality control used by the manufacturer.

8.2 As-cast products

If castings are not subsequently heat-treated, metallographic samples and chemical analysis for each treated ladle shall be provided or alternatively, one test piece per ladle for mechanical properties shall be provided. A minimum of one test piece shall be provided for every third ladle.

The products from each ladle shall be identifiable until the results of the acceptance tests are shown to be satisfactory.

8.3 Heat-treated products

If castings are subsequently heat-treated, metallographic samples and analysis for each treated ladle shall be provided and test pieces shall be cast at the minimum rate of one every 2 h of casting production. For each heat-treated batch, a test piece for each ladle or for each 2 h production, which ever is applicable, shall be heat-treated with the castings they represent.

The products of each heat-treated batch shall be identifiable until the results of the acceptance tests are shown to be satisfactory.

9 Mechanical properties

9.1 Tensile strength

Properties shall be in accordance with BS EN 969 as follows:

- a) tensile strength: not less than 420 N/mm²;
- b) 0.2 % proof stress: not less than 300 N/mm²;
- c) elongation: not less than 5 % (calculated on a gauge length equal to $5.65 \sqrt{S_0}$ where S_0 is the original cross-sectional area of test piece).

NOTE One proof stress determination only need be made on material from the production of each shift.

9.2 Hardness

Where castings are not subject to heat treatment, hardness tests shall be made at a frequency to be agreed with the purchaser.

The hardness of the material shall not exceed 230 HB.

10 Hydraulic testing

Before the application of any internal or external coating each pipe fitting shall be subjected to hydraulic testing in accordance with BS EN 969:1996, **6.5.3**, except that the minimum test pressures shall be in accordance with Table 1.

Following hydraulic testing, as specified, there shall be no visible signs of damage, deformation or leakage.

Table 1 — Works hydraulic test minimum pressures

Pipe fitting nominal internal diameter mm	Minimum pressure bar
80 to 600	14
700 to 1 200	10

11 Pneumatic testing

Following hydraulic testing and before the application of any internal or external coating, each pipe fitting shall be subjected to an air test at a minimum gauge pressure $1.5 \times \text{MOP}$ (maximum operating pressure). Where castings are submerged in water for examination, this test pressure shall be maintained for not less than 30 s after submersion. Where castings are examined by covering the outer surface with a soap solution, the test pressure shall be maintained for not less than 4 min after soaping. There shall be no leaking or weeping in either instance.

The above tests and pressures are applicable to all fittings intended for use on gas distribution systems operating at gauge pressures not exceeding 7 bar.

12 Coating

All pipe fittings shall be coated internally and externally by either hot-applied coal tar-based material in accordance with BS 4164 or cold-applied black bitumen paint in accordance with BS 3416. Coating shall not be applied to the casting until the surfaces are clean, dry and free from rust.

13 Marking

Products conforming to GIS/C6 shall be permanently marked with the following information:

- a) the number and date of this standard, i.e. GIS/C6:2013 ¹⁾;
- b) the name or trademark of the manufacturer or their appointed agent;
- c) the manufacturer's contact details;
- d) where authorized, the product conformity mark of a third party certification body, e.g. BSI Kitemark.

NOTE Attention is drawn to the advantages of using third party certification of conformance to a standard.

- e) "DUCTILE" or "DUCT" or the symbol SG cast on, or painted in red, on the body of the casting.

Metric fittings shall be identified by a band of blue paint approximately 100 mm wide on one end of the casting.

14 User instructions

User instructions shall be provided with each item of equipment.

Bibliography

GIS/C8, *Specification for grey or ductile iron castings for split tee type fittings, including collars, for use at pressures up to 7 bar.*

¹⁾ Marking GIS/C6:2013 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.