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شرکت ملی گاز ایران  
مدیریت پژوهش و فناوری  
امور تدوین استانداردها

# IGS

مشخصات فنی خرید

اتصالات چدنی مالibil / داکتیل

Malleable / Ductile Cast Iron Fittings



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شرکت ملی گاز ایران



دفتر مدیر عامل



## ابلاغ مصوبه هیأت مدیره



مدیر محترم پژوهش و فناوری



باسلام،

به استحضار می‌رساند در جلسه ۱۹۳۸ مورخ ۱۴۰۰/۰۶/۱۴ هیأت مدیره، نامه شماره گ ۶۸۷۹۶/۰۰۰/۹ مورخ ۱۴۰۰/۰۶/۰۶ آن مدیریت درمورد تصویب نهایی مقررات فنی شرکت ملی گاز ایران به شرح زیر مطرح و مورد تصویب قرار گرفت.

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## Foreword

This standard specification is intended to be mainly used by N.I.G.C. and contractors, and has been prepared base on interpretation of recognized standards and technical documents, as well as knowledge, backgrounds and experiences in gas industries at national and international levels.

Iranian Gas Specification (IGS) are prepared, reviewed and amended by technical standard committees within NIGC standardization division of research and technology management and submitted to "the standards council of NIGC" for approval.

IGSs are subjected to revision, amendment or withdrawal, if required, and thus the latest edition of IGS shall be checked / inquired by NIGC'S users.

This standard must not be modified or altered by NIGC employees or its contractors. Any deviation or conflicts between this specification and other applicable standards, codes, procedure or well-known manufacturer's specifications must be resolved in writing by the user or its representative through Manager, Engineering Department or standardization division of NIGC.

The technical standard committee welcomes comments and feedbacks from concerned or interested corporate and individuals about this standard, and may revise this document accordingly based on the received feedbacks.

## General Definitions

Throughout this standard the following definitions, where applicable, should be followed:

- 1- "STANDARDIZATION DIV." is organized to deal with all aspects of industry standards in NIGC. Therefore, all enquiries for clarification or amendments are requested to be directed to mentioned division.
- 2- "COMPANY": refers to National Iranian Gas Company (NIGC).
- 3- "SUPPLIER": refers to a firm who will supply the service, equipment or material to IGS specification whether as the prime producer or manufacturer or a trading firm.
- 4- "SHALL ": is used where a provision is mandatory.
- 5- "SHOULD": is used where a provision is advised only.
- 6- "MAY": is used where a provision is completely discretionary.

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## **1. Scope**

This Standard specifies minimum requirements for design and performance of threaded pipe fitting in malleable cast iron or ductile cast iron.

These fittings are for general purpose for Natural Gas distribution systems in Size 3/4 to 2 inches.

## **2. References**

Throughout this standard specification, the following standards are referred to. The edition of these standards and codes those are in effect at the time of Issuing of this standard specification are noted in the references. Applicability of any changes in standards & codes that may occur after issuing the current specification shall be mutually agreed upon by the purchaser and supplier and/or manufacturer.

**2.1-ASME B 1.20.1:** 2013 "Pipe Thread, General Purpose (inch)".

**2.2-ASME B 16.33:**2002 "Manually operated metallic gas Valve for use in gas Piping systems up to 125 psi".

**2.3-ANSI/ASQ Z1.4:** 2008 "Sampling Procedures and Tables for Inspection by Attributes".

**2.4-BS 143 & 1256:**2000 "Threaded Pipe Fittings in Malleable Cast Iron and Cast Copper Alloy".

**2.5-BS EN ISO 228/1:**2003 "Pipe Thread where Pressure-Tight joint are not made on the thread- part1: Dimension, Tolerance and Designation ".

**2.6-BS EN 1562:** 1997,"Founding-Malleable Cast Irons".

**2.7-BS EN 1563:** 1997,"Founding-Spheroidal Graphite Cast Iron".

**2.8-BS EN 10204:**2004, "Metallic Product's type of Inspection Documents".

**2.9-EN 13787:**2001, " Elastomers for Gas Pressure Regulators and Associated Safety Devices for Inlet Pressure up to 100 bar “.

## **3. Terms and Definitions**

### **3.1. Batch Release Test (BRT)**

Test Performed by the manufacturer on a batch of same fitting (size, thickness, heat No, heat treatment) which has to be satisfactorily completed before the batch can be released.

The batch size is specified by manufacturer in accordance with ANSI/ASQ Z1.4 or mutually agreement between manufacturer/supplier and purchaser.

### 3.2. Ductile Cast Iron

Cast Material, Iron and Carbon based, the latter element being present mainly in form of spheroidal graphite particles.

### 3.3. Malleable Cast Iron

Cast iron which is cast white and then given a heat treatment. Any remaining graphite is in the form of tempered carbon.

## 4. Abbreviations

IRHD: International Rubber Hardness Degree

N.B.R: Nitrile Butadiene Rubber

NPS: Nominal Pipe Size

Viton: Fluoro-elastomer materials

## 5. Materials

### 5.1. Fittings

#### 5.1.1. Malleable Cast Iron

Malleable Cast Iron for fittings shall conform to BS EN 1562.

#### 5.1.2. Ductile Cast Iron

Ductile cast iron for fittings. Shall conform to BS EN 1563.

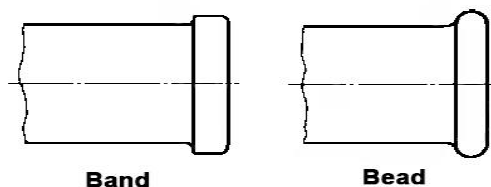
### 5.2. Gasket material

Elastomeric materials used for seals shall conform to the required values and tolerances given in Table 1, ISO 13787.

## 6. Design

**6.1.** All fittings, including unions, shall be designed to withstand the pressure 100 bar.

**6.2.** Bushes, Nipples, and Unions shall be provided with hexagonal flats for assembly purposes. Plugs shall be square. All other fittings shall be reinforced at the internally threaded end with a band or bead. (Figure 1)



**Figure 1- Forms of reinforcement**

**6.3.** Unions shall be flat seat type with gasket. Threads of union nut shall be straight type in accordance with BS EN ISO 228/1.

**Note:** Spherical seat unions with tilt angle maximum  $10^\circ$  from center line (Annex B) may be considered if they satisfactorily conform the requirements of these standard specifications.

## **7. Batch Release Tests**

### **7.1. Flattening Test**

Flattening test shall be conducted on ends of fitting. There shall be no cracks or breaks before the distance between the plates is less than 70% of the original outside diameter.

### **7.2. Union fitting shall be tested as follow:**

#### **7.2.1. Tensile Strength Test**

A union fitting shall withstand the tensile load specified in Table 1, when applied gradually to the ends, without rupture or permanent deformation that would after release of the tensile load, or cause it to leak to atmosphere.

**Table 1- Tensile load test**

NPS	Load	
	lb	N
$\frac{3}{4}$	6000	27000
1	8000	36000
$1\frac{1}{2}$	8000	36000
2	10,000	44000

#### **7.2.2. Bending Test**

A union fitting shall withstand the bending moment specified in Table 2 when applied as indicated in Figure 2. After the bending stress is relieved, there shall be no rupture or permanent deformation or cause it to leak to atmosphere.

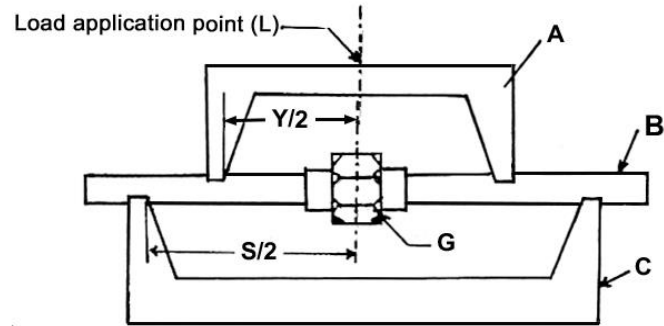


Figure 2- Bend test assembly

A= load application yoke

B= heavy wall thickness pipe

C= resistance yoke

G= union fitting

L= load

S= 24 in. span between points for load resistance.

Y= 12 in. span between points of load application.

**Table 2- Bending load test**

NPS	Load	
	lb	N
$\frac{3}{4}$	1060	4720
1	2000	8900
$1\frac{1}{2}$	4830	21500
2	8400	37400



## **8. Dimensions and Tolerances**

**8.1.** The face-to-face, face-to-center and center-to-center dimensions of fittings shall conform to tables 3.

**8.2.** All dimensions without individual tolerance shall be as per tolerance class "g" of DIN 7168.

## **9. Coating**

Coating are not required.

## **10. Threads**

### **10.1. Jointing threads**

Jointing threads, External or Internal, shall conform to ANSI/ASME B 1.20.1 (NPT)

### **10.2. Fastening threads**

Threads of union nuts, and mating threads of union nuts shall conform to BS EN ISO 228/1 (parallel).

### **10.3. Alignment of threads**

Axes of screw threads of fittings with two or more outlets shall be within  $\pm 0.5^\circ$  of the nominal angle between each outlet.

### **10.4. Chamfering of threads**

**10.4.1.** Outlets of fittings shall be chamfered.

**10.4.2.** On internal threads, the chamfer shall have an included angle of  $90^\circ$  and the diameter of the chamfer at the face of the fitting shall exceed the major diameter of the thread at the face.

**10.4.3.** On external threads, the chamfer shall have a minimum included angle of  $60^\circ$  and the diameter of the chamfer at the face of the fitting shall not exceed the minor diameter of the thread at the face.

## **11. Testing and Inspection**

### **11.1 Batch release tests**

For each fitting, batch release tests shall be conducted as per para 7.1 to 7.2.2.

### **11.2. Material**

The manufacturer shall ensure by testing that the material conforms to para 5.1 to 5.2

In addition to carrying out the tests described in BS EN 1562 or BS EN 1563. The manufacturer shall conduct appropriate tests to ensure that all fittings are satisfactorily malleabilized or having ductile microstructure.

**11.3. Final visual inspection**

Fittings shall be smooth and free from sand, blow bores, cracks and other visible casting or threading defects.

**11.4. Dimension and thread**

Dimensions shall be as per para 8.1 and 8.2. Jointing threads and fastening threads shall be gauged to ensure that threads conform to para 10.1 to 10.4.3

**11.5. Leak tightness test**

All fittings shall be tested after machining at final stage by one of the following methods:

- a) Application of an internal hydrostatic pressure of not less than 20 bar; or
- b) Application of an internal pneumatic pressure of not less than 5 bar with fitting completely immersed in water.

Fittings shall not show signs of leakage during the 10 seconds test period. Fittings that fail the test shall be rejected.

**12. Inspection Documents**

Inspection documents shall be as following:

- Batch release tests
- Material tests for both metallic and nonmetallic parts.
- Dimension and thread tests.
- Leak tightness test for each fitting.
- Final visual inspection

Documents in accordance with BS EN 10204 Type 2.2 for above items shall be submitted by the manufacturer, nevertheless, the Inspector (third party/ purchaser's inspector, according to purchaser order) can inspect directly the purchased consignment and check the quality control and production documents.

**13. Marking**

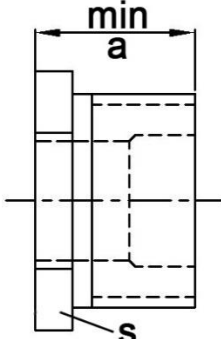
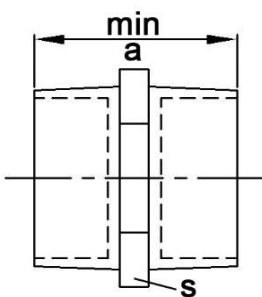
Fittings shall be marked, by casting, with at least the:

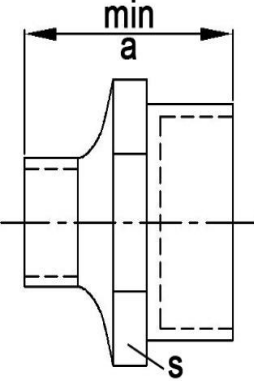
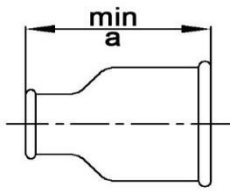
- The manufacturer's name or trademark.
- The fitting size.

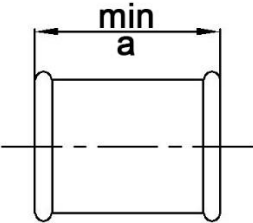
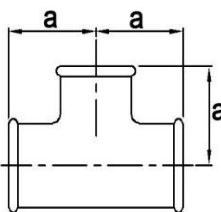
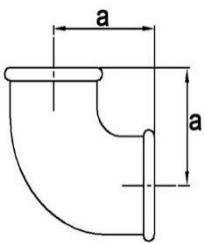
**14. Packing**

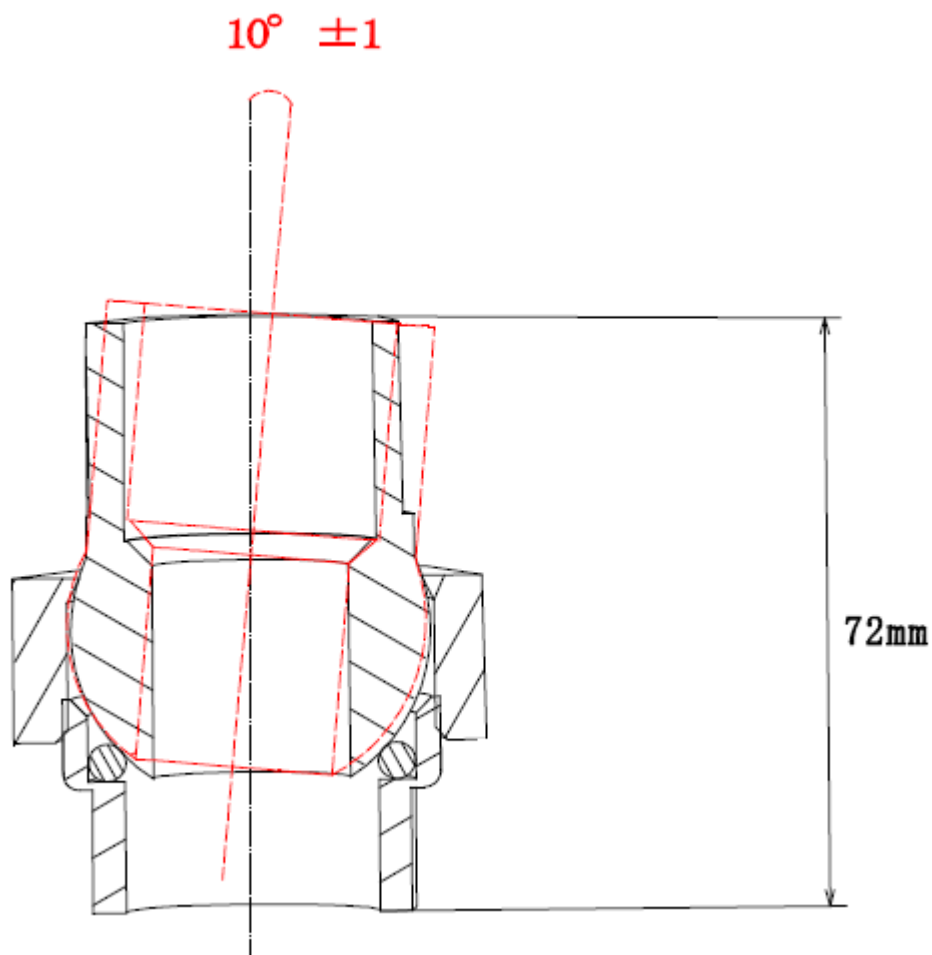
All fittings shall be packed in cartons. The cartons shall be at last one label with the manufacturer's name, type and size of fittings, number of units in box.

Table 3-Fitting's Dimensions

Fitting type		NPS	a (mm)	min S (mm)
 Bush, Hexagon, Reducing, male- female		$1 \times \frac{3}{4}$	29	6.0
		$1 \frac{1}{4} \times \frac{3}{4}$	31	6.5
		$1 \frac{1}{4} \times 1$	31	6.5
		$1 \frac{1}{2} \times \frac{3}{4}$	31	6.5
		$1 \frac{1}{2} \times 1$	31	6.5
		$1 \frac{1}{2} \times 1 \frac{1}{4}$	31	6.5
		$2 \times \frac{3}{4}$	35	7.0
		$2 \times 1$	35	7.0
		$2 \times 1 \frac{1}{4}$	35	7.0
		$2 \times 1 \frac{1}{2}$	35	7.0
	Hexagon nipple, male ends equal	$\frac{3}{4}$	45	5.5
		1	50.5	6.0
		$1 \frac{1}{4}$	54.5	6.5
		$1 \frac{1}{2}$	56.5	6.5
		2	65.5	7.0
	Hexagon nipple, male ends Reduce	$1 \times \frac{3}{4}$	50.5	6.0
		$1 \frac{1}{4} \times \frac{3}{4}$	54.5	6.5

		$1\frac{1}{4} \times 1$	54.5	6.5
		$1\frac{1}{2} \times \frac{3}{4}$	56.5	6.5
		$1\frac{1}{2} \times 1$	56.5	6.5
		$1\frac{1}{2} \times 1\frac{1}{4}$	56.5	6.5
		$2 \times 1$	65.5	7.0
		$2 \times 1\frac{1}{4}$	65.5	7.0
		$2 \times 1\frac{1}{2}$	65.5	7.0
 Socket, concentric Reduce		$1 \times \frac{3}{4}$	43	-
		$1\frac{1}{4} \times \frac{3}{4}$	48	-
		$1\frac{1}{4} \times 1$	48	-
		$1\frac{1}{2} \times \frac{3}{4}$	52.5	-
		$1\frac{1}{2} \times 1$	52.5	-
		$1\frac{1}{2} \times 1\frac{1}{4}$	52.5	-
		$2 \times \frac{3}{4}$	62.5	-
		$2 \times 1$	62.5	-
		$2 \times 1\frac{1}{4}$	62.5	-
		$2 \times 1\frac{1}{2}$	62.5	-

 equal	$\frac{3}{4}$	37	-
	1	43	-
	$1\frac{1}{4}$	48	-
	$1\frac{1}{2}$	52.5	-
	2	62.5	-
 Tee, equal, female ends	$\frac{3}{4}$	33	-
	1	38	-
	$1\frac{1}{4}$	45	-
	$1\frac{1}{2}$	50	-
	2	58	-
 El bow, equal Female ends	$\frac{3}{4}$	33	-
	1	38	-
	$1\frac{1}{4}$	45	-
	$1\frac{1}{2}$	50	-
	2	58	-

**Annex - Informative****Schematic of 1" spherical Seat Union with tilt angle max  $10^\circ$** 

**Note:** The above drawing is diagrammatic and should not limit the other design.