



شرکت ملی گاز ایران  
مدیریت پژوهش و فناوری  
امور تدوین استانداردها

IGS

مشخصات فنی خرید

اتصالات چدنی مالیبیل / 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 ۱۶۹۱ مورخ ۱۳۹۵/۴/۲۷ هیأت مدیره، نامه شماره گ/۹۰۰/۰۰۰/۵۴۳۸۹ مورخ ۹۵/۴/۲۳ مدیر پژوهش و فناوری در مورد تصویب نهایی استانداردهای زیر مطرح و مورد تصویب قرار گرفت.

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این مصوبه در حکم مصوبه مجمع عمومی شرکت‌های تابعه محسوب و برای کلیه شرکت‌های تابعه لازم الاجرا می‌باشد.

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## **Foreword**

This standard is intended to be mainly used by NIGC and its affiliated companies which has been prepared on interpretation of recognized standards , technical documents, knowledge , backgrounds and experiences in gas industries at national & international levels .

Iranian Gas Standards (IGS) are prepared, reviewed and amended by technical standard committees within NIGC standardization div. and submitted to the "standard council of NIGC " for approval.

Iranian gas standards (IGS) are subject to revision, amendment or withdrawal, if required, thus the latest edition of IGS shall be checked/inquired by users.

Any comments from concerned parties on NIGC distributed IGS are welcome to technical standards committees and will receive serious attention and consideration should a revision to standards is recommended.

## **General definitions:**

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

- 1- STANDARDIZATION DIV.": has been organized to deal with all aspects of industrial standards in NIGC . Therefore, all queries for clarification or amendments are requested to be directed to the mentioned division .
- 2- "NIGC": refer to NIGS and its affiliated company as holding company.
- 3- "COMPANY": refers to National Iranian Gas Company .
- 4- "PURCHASER " :means the "company " where this standard is part of direct purchase order by the "company " , and , the " contractor " where this standard is a part of contract documents , part of procuremental set up organized to deal withend using of commodities of services specified in IGS.
- 5- "SUPPLIER": Refers to a firm who will supply the service , equipment or material according to IGS specification whether as the prime producer or manufacturer or a trading firm .

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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  $\frac{3}{4}$  to 2 inches.

## 2. Normative references

Throughout this standard specification, the following standards are referred to .The edition of these standards that are in effect at the time of Issues of this standard specification. The applicability of changes in standards & code that occur after the date of standards that referred shall be mutually agreed upon by the purchaser and supplier and/or manufacturer.

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

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

**BS 143 & 1256:2000** "Threaded pipe fittings in malleable cast iron and cast copper alloy".

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

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

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

**BS EN 10204:2004**"Metallic product's type of inspection documents"

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

## 3. Terms and definitions

### -Batch Release Test (BRT)

Test Performed by the manufacturer on a batch of same fitting which has to be satisfactorily completed before the batch can be released.

**- Ductile Cast Iron**

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

**- Malleable Cast Iron**

Cast iron which is cast white and then given a heat treatment. Any remaining graphite is in the form of temper 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 BSEN 1562.

**5.1.2. Ductile Cast Iron**

Ductile cast iron for fittings. Shall conform to BSEN 1563.

**5.2. Gasket material**

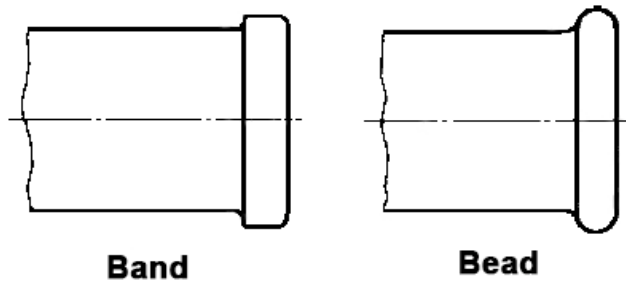
Gaskets shall be elastomeric material such as N.B.R or Viton which conform to Annex A.

**6. Design**

**6.1.** Fittings of all sizes shall be suitable for the maximum permissible working pressure 25 bar with service temperature -29 to 65 °C.

**6.2.** Fittings, including unions, shall be designed to withstand the design test pressure 100 bar .

**6.3.** 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**

**6.4.** 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° from center line (Annex B) may be considered if they satisfactory conform the requirements of these standard specifications.*

## **7. Batch release tests**

### **7.1. Hydrostatic test**

Fitting shall be tested at the design test pressure 100 bar without rupture or permanent deformation or any leakage.

### **7.2 Flattening test**

Flattening test shall be conducted at the ends of fittings. There shall be no cracks or breaks before the distance between the plates is less than 50% of the original outside diameter

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

#### **7.3 1. Tensile strength test**

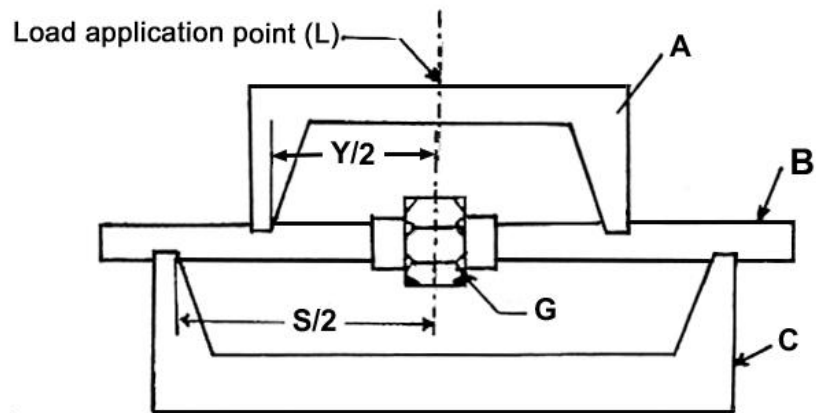
A union fitting shall withstand the tensile load specified in Table 1, when applied gradually to the ends, without rupture or permanent deformation that would after release of the tensile load, or cause it to leak to atmosphere.

**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

**7.3.2. 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, these shall be no rupture or permanent deformation or cause it to leak to atmosphere.



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.

**Figure 2- Bend test assembly**



**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 D/N 7168.

## 9. Coating

Black is acceptable.

## 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° 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° 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 BSEN 1563. The manufacturer shall conduct tests to ensure appropriate Microstructure.

### **11.3. Final visual inspection**

Fittings shall be smooth and free from sand, blow bores, cracks and other injurious 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 by application of an internal pneumatic pressure 5 bar, with the fitting completely immersed in water, Fittings shall not show any 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.
- Pneumatic leak tightness test for each fitting 5 bars 10 second
- 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**

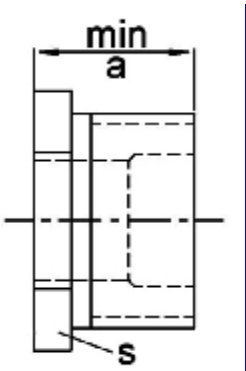
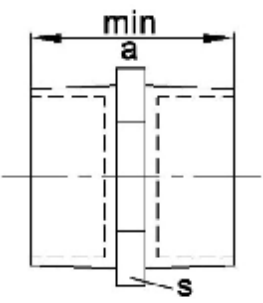
Fittings shall be marked, by casting, with at least the

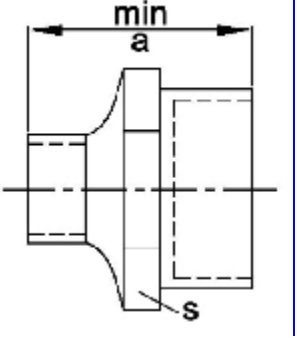
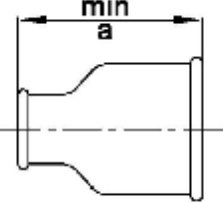
- The manufacturer's name or trademark
- The fitting size

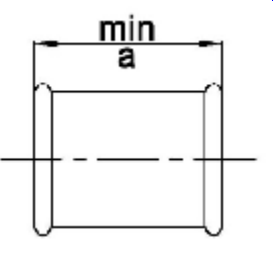
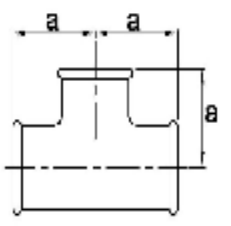
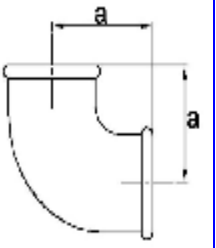
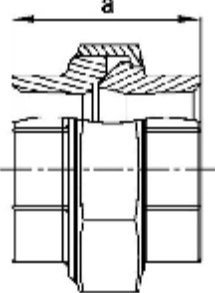
## **14. Packing**

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)
 <p>Bush, Hexagon, Reducing, male- female</p>		$1 \times \frac{3}{4}$	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
 <p>Hexagon nipple, male ends</p>	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

	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
 <p style="text-align: center;">Socket, concentric</p>	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	-		

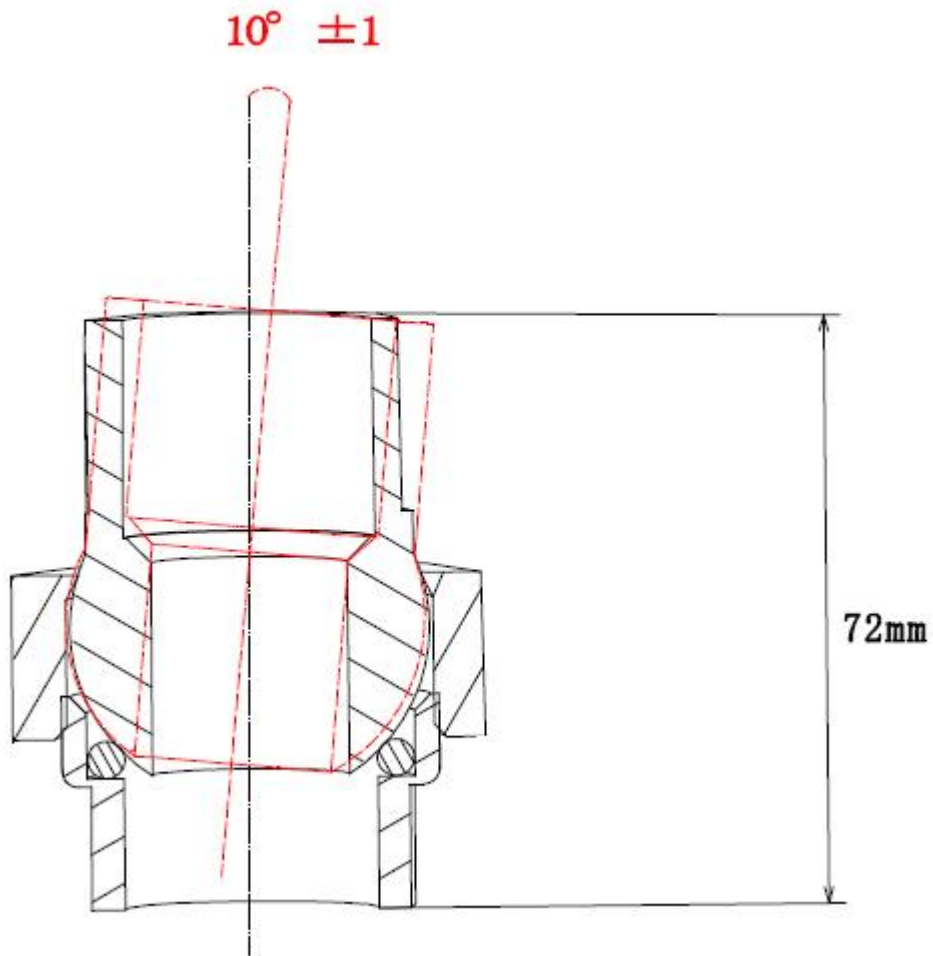
	equal	$\frac{3}{4}$	37	-
		1	43	-
		$1\frac{1}{4}$	48	-
		$1\frac{1}{2}$	52.5	-
		2	62.5	-
	Tee, equal, female ends	$\frac{3}{4}$	33	-
		1	38	-
		$1\frac{1}{4}$	45	-
		$1\frac{1}{2}$	50	-
		2	58	-
	Elbow, equal Female ends	$\frac{3}{4}$	33	-
		1	38	-
		$1\frac{1}{4}$	45	-
		$1\frac{1}{2}$	50	-
		2	58	-
	Union, flat seat,	$\frac{3}{4}$	52	-
		1	58	-
		$1\frac{1}{4}$	65	-
		$1\frac{1}{2}$	70	-
		2	78	-

**Annex A: Elastomeric characteristics**

Item	Property	Unit	Hardness Class					Test method
			50	60	70	80	90	
1	Hardness Tolerances on stated nominal hardness	IRHD	±5	±5	±5	±5	+3 -5	ISO 48
2	Tensile strength, min	MPa	6	9	9	10	10	ISO 37
3	Elongation at break, min	%	400	300	200	150	80	
4	Compression set <sup>a</sup> - at 70 °C, after 24h - Where applicable, at -10 °C after 24h or - at -20 °C after 24h		25	25	25	25	25	ISO 815
		%	40	40	40	40	40	
		%	50	50	50	50	50	
5	Resistance to ageing(70 °C,168 hr) - Change in hardness - Change in tensile strength - Change in elongation at break	IRHD	±10	±10	±10	±8	±6	ISO 48
			±15	±15	±15	±15	±15	
		%	+10/-25	+10/-25	+10/-25	+10/-25	+10/-25	
6	Resistance to gas (n-pentane) - Change in mass after immersion (72h,23 °C) - Change in mass after drying (168h 40 °C), max  No sign of delamination,bilistering or deterioration	%	+10/-5	+10/-5	+10/-5	+10/-5	+10/-5	ISO 1817
		%	+5/-10	+5/-10	+5/-10	+5/-8	+5/-8	
7	Resistance to lubricants (Oil IRM 902, 168 hr at 70 °C) - Change in hardness - Change in mass No sign of delamination,bilistering or deterioration	IRHD	±10	±10	±10	±10	±10	ISO 1817
		%	+15/-10	+15/-10	+15/-10	+15/-10	+15/-10	
8	Visual Examination	Homogeneous, free from porosity, inclusions, grit, blisters and surface imperfections visible with the naked eye.					---	
9	Low temperature flexibility at -29 °C after 6h	Sufficient flexibility and no sign of delaminating, blistering or significant deterioration.					---	

**Annex B- Informative**

***Schematic of 1" spherical Seat Union with tilt angle max 10 °.***



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