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IGS

Iranian Gas Standards

مشخصات فنی خرید

کنترل خانگی مناسب برای فشار دوپوند

Domestic 2-PSI Gas Meters

FOREWORD

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

Iranian Gas Standards (**IGS**) are prepared , reviewed and ammended by technical standard committees within NIGC Standardization Div. and submitted to the **NIGC's "STANDARDS COUNCIL"** for approval .

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This standard must not be modified or altered by the end users within **NIGC** and her contractors. Any deviation from normative references and/or well known manufacturers specifications must be reported to Standardization div.

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 div.

2- "**COMPANY** " : refers to national iranian gas company .

3- "**SUPLIER**" : 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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پیشگفتار

- ۱- این استاندارد/دستورالعمل بمنظور استفاده اختصاصی در شرکت ملی گاز ایران و شرکتهای فرعی وابسته تهیه شده است.
- ۲- شرکت ملی گاز ایران در مورد نیازهای عمومی از استانداردهای وزارت نفت (IPS) و در مورد نیازهای اختصاصی از استانداردهای اختصاصی خود (IGS) استفاده می نماید.
- ۳- استانداردهای شرکت ملی گاز ایران (IGS) توسط کمیته های تخصصی استاندارد متشکل از کارشناسان بخش های مختلف و یا مشاور تهیه می شود و توسط شورای استاندارد (منتخب هیئت مدیره شرکت ملی گاز ایران) به تصویب میرسند.
- ۴- در تنظیم متن استانداردهای (IGS) از کلیه منابع شناخته شده استاندارد، اطلاعات فنی - تخصصی مربوط به صنایع گاز دنیا، مشخصات فنی تولیدات سازندگان معتبر جهانی و نیز از نتیجه تحقیقات و تجربیات کارشناسان و متخصصان داخلی بر حسب مورد استفاده می شود. همچنین بمنظور استفاده هر چه بیشتر از تولیدات داخلی قابلیت های سازندگان داخلی نیز مورد توجه قرار میگیرد.
- ۵- استانداردها از طریق پایگاه اینترنتی شرکت * و یالوح فشرده (CD) در اختیار واحدها و کاربران قرار می گیرد .
- ۶- استانداردها بطور متوسط هر ۵ سال یکبار و یادر صورت ضرورت زودتر، مورد بازنگری و بروزرسانی قرار میگیرند. بنابراین کاربران باید همیشه آخرین نگارش را مورد استفاده قرار دهند.
- ۷- هرگونه نظر و یا پیشنهاد اصلاح در مورد استانداردها مورد استقبال و بررسی قرار خواهد گرفت و در صورت تأیید، استاندارد مربوطه نیز مورد تجدیدنظر قرار خواهد گرفت .

تعاریف عمومی

در متن استانداردهای (IGS) از تعاریف و اصطلاحات زیر استفاده میشود.

- ۱- "شرکت" (COMPANY): منظور از شرکت "شرکت ملی گاز ایران" و یا شرکتهای فرعی وابسته میباشد.
- ۲- "فروشنده" (SUPPLIER/VENDOR): به فرد یا موسسه ای اطلاق میگردد که تعهدی رانسبت به شرکت تقبل نموده است.
- ۳- "خریدار" (PURCHASER): منظور از خریدار "شرکت ملی گاز ایران" و یا شرکتهای فرعی وابسته میباشد.
- ۴- "SHALL": در مواردی بکاربرده میشود که انجام خواسته مورد نظر اجباری است
- ۵- "SHOULD": در مواردی بکاربرده میشود که انجام خواسته مورد نظر ترجیحی و درعین حال اختیاری است
- ۶- "MAY": در مواردی بکاربرده میشود که انجام کار به شکل مورد بحث نیز قابل قبول میباشد

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1. SCOPE:

This specification together with the appendices there to covers the minimum requirements for design , material fabrication , testing , inspection , painting , marking , packing and packaging of diaphragm type gas meter to be used for measuring of natural gas (as per composition in appendix “C”) for commercial and industrial usages with 138 MBAR (2PSIG) working pressure.

For specific requirements see appendix “D” . in case of any exception to this specification , it shall be clearly stated on the technical quotation submitted by supplier.

2. REFERENCES

Throughout this standard specification the following standards and codes are referred to. The editions of these standards and codes that are in effect at the time of publication of this standard specification (1999) shall , to the extent specified herein, form a part of this standard specification . The applicability of changes in standards and codes that occur after the date of this standard specification shall be mutually agreed upon by the purchaser and supplier and/or manufacturer.

- 1- ASTM B117-1985 standard method of salt spray (fog) testing
- 2- ANSI B16.5 pipe flanges and flanged fittings .
- 3- ANSI B1.1 unified inch screw threads
- 4- BS 3900: part E6: 1992 methods of test for paints crosscut test.
- 5- BS 381.C specification for colours for identification coding and special purposes .

6- BS 4161 : part 5: 1990 specification for diaphragm meters for working pressures up to 7 bar .

7- EN 1359-1993 specification for diaphragm gas meter .

8- BS-EN – 549 : 1995 rubber materials for seals and diaphragms for gas appliances and gas equipment .

9- ISO 1817 rubber vulcanized – determination of the effect of liquids.

10-ISO 2409 :1992 methods of test for paints and varnishes .

11-OIML R61989 general provision for gas volume meters .

12-OIML : NO.31 diaphragm gas meters.

3. DEFINITIONS

DIAPHRAGM GAS METER : gas volume meter in which the gas volume is measured by means of measuring chambers with deformable walls.

difference between the pressure of the gas at the inlet of the meter and the atmospheric pressure.

MAXIMUM WORKING PRESSURE : upper limit of working pressure for which the meter has been designed , as declared by the manufacturer and marked on the meter index or data plate.

AMBIENT TEMPERATURE: the temperature of the surrounding air , at which the regulator may be operated.

DIAPHRAGM: A flexible member which , under the influence of the forces arising from loading and pressure, operates the valve.

PRESSURE ABSORPTION : difference between the pressure measured at the inlet and outlet connections of the meter whilst the meter is operating.

EXTERNAL LEAK TIGHTNESS: leak tightness of the gas carrying components of the gas meter with respect to the atmosphere.

ERROR OF INDICATION : value which shows the relationship in percentage terms of the difference between the volume indicated by the meter and the volume which has actually flowed through the meter, to the latter volume:

$$E = 100 \frac{V_i - V_c}{V_c}$$

Where

E is the error of indication, expressed as a percentage ,
V_i is the indicated volume and **V_c** is the volume which has actually flowed through the meter.

DISTRIBUTED GAS : gas locally available .

METERING CONDITIONS: conditions of the gas , the volume of which is to be measured , at the point of measurement (e.g. temperature and pressure of the measured gas).

4. REQUIREMENTS

4-1 DESIGN AND SERVICE CONDITIONS:

The meter shall have easy moving parts without stresses and be constructed of quality materials in a workmanlike manner in order to attain gas tightness , stability of performance and sustained accuracy over a period of time and over the

range of operating conditions with minimum of maintenance , when metering natural gas. Such meter shall have the general characteristics listed below:

- 4.1.1 The meter shall be tamper proof , gas tight and capable to sustain accuracy under the whole range of service conditions.
- 4.1.2 The meter shall be capable to register specified capacity at specified inlet and differential pressure.
- 4.1.3 Normal inlet pressure of meter is 138 MBAR (2PSIG).
- 4.1.4 Meter maximum working pressure shall be 500 MBAR.
- 4.1.5 The ambient temperature range for the meter is -29°C to 60°C (-20°F to 140°F) .
- 4.1.6 Pressure drop across the meter at rated capacity with air of density 1.2 kg/m³ shall be as shown in the following table :

TABLE 1: PRESSURE DROP

DESIGNATION OF METER	MAX. ALLOWABLE PRESSURE DROP (MBAR)
G 25 , G 40 INC.	3
G 65 , G 100	4

- 4.1.7 Meter accuracy shall be 3% for capacities up to 2 times the minimum capacity ($2 \times Q_{\min}$) and 2% for capacities over 2 times the minimum capacity.
- 4.1.8 The transmission system to index shall be magnetic coupling type.

4.1.9 Index shall be digital and direct – reading type , except decimal(s) which could be either digital or pointer type.

4.1.10 The index of the meter shall be sealed against from the gas inside the meter. The index window shall be sealed in its frame and vent to atmosphere through a small hole in the frame and positioned to prevent the ingress of water .

4.1.11 Uper and lower parts of the meter body shall be connected together by means of:

1- steel nuts & bolts or

2- steel band

Provisions shall be made by manufacturer for sealing purposes of upper and lower parts of meter in order to prevent tampering by unauthorized persons .

4.1.12 No sealant or grease shall be used for sealing purposes and valve covers or grids and diaphragm and pan assembly.

4.1.13 Inlet and outlet connections of meter shall be flange type, raised face , serrated finish. Meter flanges shall be in accordance with ANSI B16.5 to Match welding neck flanges ANSI class 150.

4.2 MATERIALS:

4.2.1 The materials of all components of meter whether specified or unspecified shall be suitable for pressure ,temperature and other operating conditions specified. In appendix “D” (DATA SHEET)

4.2.2 All parts of the meter shall be resistant to corrosion developing media normally tracked in air or gas including the continous attack of odorized natural gas.

4.2.3 Rubber parts material such as diaphragm shall be made of synthetic material resistant to odorized natural gas. Other rubber parts material such as sealings and sealing glands shall be from resilient materials.

Test requirements for rubber parts material shall be in acc. With appendix “B” item 9.

4.2.4 The index case shall be made of material same as those of body of meter or plastic . In case of plastic for index case , the expansion and contraction of the index due to temperature changes must be the same as the body of the meter.

4.2.5 The index window shall be made of suitable material to satisfy the test requirements specified in appendix “B” item 10.

4.2.6 All screws , bolts and nuts shall be stainless steel or corrosion resistant plated steel and shall conform to ANSI B1.1 .

4.2.7 The body of meter shall be made of steel plate with sufficient strength and thickness to meet the requirements of this specification.

4.2.8 Diaphragm casing shall be pressed steel and suitably protected from corrosion.

4.2.9 Plastic parts including , gears, levers , etc shall be from acetal materials acc. To (IGS-MS-CH-034 1998) app “E”.

4.2.10 Valve and valve seat of meter shall be bakelite.

4.2.11 Metallic internal linkages and levers shall be corrosion resistant.

5. INSPECTION , TEST & CERTIFICATION

The manufactured meter will be inspected and the inspection shall cover the following stages as specified in this specification and according to terms and conditions of purchase order.

Approximately 3% of each item and lot ready for presentation (unless otherwise specified by mutually agreed inspection procedure based on capacity and quantity of each lot) shall be selected randomly by identified NIGC inspector.

Manufacturer shall provide and present to NIGC inspector test results for different examinations and accuracy correlated to serial number and material test certificates acc. To requirements of NIGC specification:

- 1- Visual inspection.
- 2- Dimension test.
- 3- Accuracy test.
- 4- Capacity and differential pressure test.
- 5- Leak test.
- 6- Ambient temperature test.
- 7- Life test.
- 8- Cyclic volume test.
- 9- Diaphragm & other rubber parts test.
- 10- Index window test.
- 11- Salt spray test.
- 12- Paint test
- 13- Inlet /Outlet connection torque test.

6. PAINING:

The meter body shall be properly surface prepared and cleaned to allow subsequent treatment and uniform painting with minimum thickness of 100 microns.

In case of painting with epoxy resin by electrostatic method , the thickness of painting of meter casing shall be minimum 50 microns. Final colour shall be grey according to BS 381C-No. 631.

Test requirements for painting shall be in acc. With appendix “B” item 12.

7. MARKING:

Each meter must carry , grouped together , either on the index box plate or on a steel or aluminium badge plate(s) the following inscriptions:

- 1- Manufacturer’s name or trade mark.
- 2- Manufacturer’s serial number , type and model no.
- 3- Year of manufacture.
- 4- G-rating and max. capacity in SCM/H (as per appendix “A”) .
- 5- Cyclic volume.
- 6- Normal working pressure.
- 7- Maximum working pressure.
- 8- Inlet and outlet connection sizes⁽¹⁾
- 9- NIGC purchase order and item No.⁽¹⁾

These inscription must be directly visible , easily legible and indelible under the normal conditions of use of the meter.

(1) These labling to be in acc. To manufacturer’s standard.

8. PACKING AND PACKAGING

- A- Each meter shall be put in a plastic bag with all openings (such as inlet, outlet) covered by plastic caps.**
- B- Each plastic bag shall be housed in a cardboard box.**
- C- The cardboard boxes shall be housed in wooden cases according To NIGC packing instructions under protection, packing , marking and dispatching.**

9. DOCUMENTATION:

Supplier is required to complete and sign the attached data sheet(s) and as well as 2 sets of the following documentation in English together with technical quotation:

- 9.1 All technical information and original copies of printed catalogue(s).**
- 9.2 Full parts list catalogue(s)**
- 9.3 General drawing(s) showing outline dimensions.**
- 9.4 manuals for installation , commissioning , operation and maintenance.**
- 9.5 typical pressure drop curve for air with density of 1.2 kg/m^3 and also gas with specific gravity of 0.65 .**

Note:In case of order placement , the supplier shall submit 5 sets of above information (item 9.1 to 9.5) for each order.

APPENDIX “B”

TEST PROCEDURES

1- VISUAL INSPECTION:

Visual inspection including checking of colour, flanges, nameplate , etc.

2- **DIMENSIONS TEST:**

Randomly selected samples shall be checked for overall dimensions.

3- **ACCURACY TEST (AT 21±1 DEG.C. ROOM TEMPERATURE):**

A: The accuracy for each meter when passing air at Q_{max} shall not exceed ±2%.

B: The accuracy for each meter when passing air at Q_{min} shall not exceed ±3%.

4- **DIFFERENTIAL PRESSURE TEST (AT 21±1 DEG.C. ROOM TEMPERATURE):**

Differential pressure for each meter when passing air at Q_{max} shall be according to table 1 .

5- **LEAK TEST :**

meter shall be pneumatically tested with at least 750 MBAR for steel body while immersed in water. There shall be no evidence of any leakage. Test time shall be at least 2 minutes.

6- **AMBIENT TEMPERATURE TEST:**

Using air, check the meter for compliance with the registrational accuracy.

Subject the meter to three consecutive cycles consisting of the following phases.

(A) place the meter at rest , in a chamber maintained at a temperature of $-29 \pm 1^{\circ}\text{c}$ for 6 hr.

(B) operate the meter for 22 hr at the ambient temperature of $-29 \pm 1^{\circ}\text{C}$ using air at a flow rate of 50% of Q_{max} and maximum working pressure.

(C) stop the operation of the meter and raise the chamber temperature to $60 \pm 1^{\circ}\text{C}$.

(D) maintain the meter at rest for 6 hr at the ambient temperature of $60 \pm 1^{\circ}\text{C}$.

(E) operate the meter for 22 hr at the ambient temperature of $-60 \pm 1^{\circ}\text{C}$ using air at a flow rate of 50% of Q_{max} and maximum working pressure .

(F) stop the operation of the meter and return the chamber temperature to $-29 \pm 1^{\circ}\text{C}$.

NOTE: it is permissible to interrupt the test between each cycle. Upon completion of the three cycles, allow the meter to return to an ambient temperature of $20 \pm 5^{\circ}\text{C}$ before rechecking in accordance with test NOS. 3,4 and 5 .

7. LIFE TEST:

7.1 ENDURANCE TEST : A flow of air equal to its Q_{max} shall be passed through a new meter for a minimum of 30 minutes and checked the meter for compliance with tests NOS.3,4 and 5.

Then the meter shall operate at a flow rate of 115% of Q_{max} using natural gas for a period of 135 days in controlled ambient temperature of $20 \pm 5^{\circ}\text{C}$. At the end purge the meter by at least 3M^3 of air . Then the meter shall comply with tests NOS.3 , 4 and 5.

7.2 PRESSURE CYCLING TEST : when subjected to 2000 cycles at 30 cycles/hr at internal pressures varying from 0 MBAR to either maximum working pressure plus 200 MBAR, or 345 MBAR , whichever is the greater , the assembled meter shall suffer No visible permanent distortion and shall comply with test No.5 .

NOTE : The meter should attain the test pressure in 20s to 40s. The rate of change of pressure shall not exceed 345 MBAR/S.

7.3 LOAD TEST : the meter shall withstand an 80 kg load having a flat bottom surface area of 100 mm square , applied vertically , without shock, to any point on the top of the case.

When the load is removed the meter shall not be visibly deformed and shall comply with test No.5

7.4 IMPACT TEST:

7.4.1 Apparatus

The apparatus consists of a hardened steel hemispherically tipped striker and a rigid smooth bore tube in which the striker is capable of sliding freely (see figure 1).

The total mass of the striker is 3 kg. There are two sizes of striker tip , one having a radius of 1 mm, the other having a radius of 4 mm (see figure 2) . Each size of striker tip is used during the test , but no test area on any one meter sample shall be subjected to more than one impact. In the case of the same area being selected for

test with each size of striker tip , two meter samples are to be used.

7.4.2 Procedure

For each striker the meter is rigidly on a firm base with the intended area of impact (which can be any area of the meter case) horizontal , and the end of the guide tube resting on the meter . The striker is allowed to fall freely and vertically onto the test area , through the tube from A height of H mm.

Where

For the 1 mm striker , H is 175 mm, producing an impact energy of 5J.

For the 4 mm striker , H is 350 mm, producing an impact energy of 10 J.

NOTE: Impact energy (in joules) =

Mass of striker (in kg) x acceleration due to gravity (in M/S^2) x height of fall (in m).

Then , the meter shall comply with test No.5 .

8. CYCLIC VOLUME TEST :

The difference between the actual value of the cyclic volume of the meter and the value of this volume specified on the meter shall not exceed 5% of the latter.

9. DIAPHRAGM AND OTHER RUBBER PARTS MATERIALS:

9.1 DIAPHRAGM

Diaphragm shall be homogeneous , uniform , free from porosity grit, blisters and defects visible to the naked eye , even after cutting. The thickness variation of diaphragm shall not be greater than $\pm 10\%$.

9.1.1 Identification : the manufacturer name or trade marks , batch number and date of manufacture shall be indicated on the diaphragm.

9.1.2 Hydrocarbon mixture : when a test piece is immersed and allowed to swell freely in a mixture of toluene and heptane in the proportion 1:1 by volume at $20 \pm 5^\circ\text{C}$ for 7 days ,the change in area shall not be greater than 5% of the original area . After immersion and drying to constant mass at room temperature , the extracted material shall not exceed 12% by mass of the original mass of the test piece, and the area shall not differ from the original area by more than 5% .

The material shall not show any sign of delamination or blistering.

NOTE 1 : The volume ratio of liquid to test piece should be not less than 50:1

NOTE 2 : To measure the change in area , it is recommended that the liquid- soaked test piece be placed quickly between two microscope slides.

9.1.3 Water : when the test piece is immersed in distilled or deionized water and allowed to swell freely at $20 \pm 5^\circ\text{C}$ for 7 days, the change in area of the material shall not be greater than 5% of the original area of the test piece.

After immersion and drying to constant mass in air at room temperature , the extracted material shall not exceed 12% by mass of the original mass of the test piece and the area shall not differ from the original area by more than 5% . The difference in relative humidity between taking the original and final mass and area measurements shall not exceed $\pm 10\%$.

The material shall not show any sign of delamination or blistering.

9.1.4 Accelerated ageing : the stiffness of the test piece shall be measured at $20\pm 5^{\circ}\text{C}$, by torsion apparatus (app. “F” of BS 4161: part 5 : 1996) the stiffness, when remeasured at $20\pm 5^{\circ}\text{C}$ shall not have increased by more than 25% after the test piece has been subjected to a temperature of $70 \pm 2^{\circ}\text{C}$ in an air – circulating oven for 4 weeks. In addition , the test piece shall not show any sign of delamination , blistering or significant deterioration.

9.1.5 Low temperature flexibility : the stiffness of the test piece shall be measured at $20\pm 5^{\circ}\text{C}$ by torsion apparatus (app. “F” of BS 4161: part 5 : 1990) the stiffness when measured at $-20\pm 1^{\circ}\text{C}$ shall not have increased by more than 25% after the test piece has been subjected to this temperature in an environmental chamber for 20 minutes.

9.1.6 Porosity : Diaphragm shall withstand a pressure of 50 MBAR for 1 minute without any leakage. Test procedure acc. To app. “G” of BS 4161 : part 5 : 1990.

9.1.7 Ambient temperature tests : the meter shall comply with tests NOS.3 , 4 ,5 of app. “B” when tested in an ambient temperature of $20\pm 2^{\circ}\text{C}$ after each of the following periods of operation :

(A) 400 hr on air at $0.5 \times Q_{\text{max}}$ in an ambient temperature of $-29\pm 1^{\circ}\text{C}$.

(B) 400 hr on air at $0.5 \times Q_{\text{max}}$ in an ambient temperature of $60\pm 1^{\circ}\text{C}$.

NOTE: Care should be taken to prevent condensation in the meter.

9.2 ELASTOMERS

9.2.1 General

the tests shall be carried out with the finished component or with parts of the finished component.

The elastomeric material shall be homogeneous , free from porosity , inclusions , grit , blisters and surface imperfections visible with the naked eye.

9.2.2 resistance to lubricant

The test shall be carried out according to 8.2 ISO 1817:1985 concerning the gravimetric method but the duration of immersion shall be (168 ± 2) hr in oil No.2 (ISO 1817 : 1985 at the $100\pm 2^{\circ}\text{C}$ ambient temperature determine the relative change of mass , ΔM , using the following formula:

$$\Delta M = \frac{M_3 - M_1}{M_1} \times 100$$

Where

M₁ Is the initial mass of the test piece in air,

M₃ Is the mass of the test piece in air after immersion.

After this test , the change of mass shall be between –10% and +10%.

The test piece shall not show any sign of delamination , blistering or significant deterioration.

9.2.3 Resistance to gas

The test shall be carried out according to 8.2 of ISO 1817: 1985 concerning the gravimetric method and clause 9 concerning the determination of extracted soluble matter , but under the following conditions:

(A) the duration of immersion shall be (72±2) h at (23±2)°c in n-pentane (minimum 90% by mass of n-pentane , estimated by gas chromatography)

(B) dry the test pieces for a period of (168±2)h in an oven at (40 ±2)°c at atmospheric pressure:

(C) determine the relative change of mass, ΔM , with reference to the initial mass of the test piece, using the following formula:

$$\Delta M = \frac{M_5 - M_1}{M_1} \times 100$$

Where

M₁ Is the initial mass of the test piece in air,

M₅ Is the mass of the test piece in air after drying.

After this test the change of mass shall be between –15% and +5% .

The test piece shall not show any sign of delamination, blistering or significant deterioration.

9.2.4 The elastomer material shall be placed in chamber maintained at $-29\pm 1^{\circ}\text{C}$ for 1 hr. The test piece shall have sufficient flexibility for its service .

The test piece shall not show any sign of delamination, blistering or significant deterioration .

9.2.5 After the elastomer material has been subjected to a temperature of $70\pm 2^{\circ}\text{C}$ in an air- circulating oven for 168 ± 2 hr . The test piece shall not show any sign of delamination , blistering or significant deterioration.

10. INDEX WINDOWS TEST:

10.1 Both as supplied , and after being subjected to the accelerated ageing tests specified in 10.6 , samples of window panes or moulding shall comply with 10.2 , 10.3 and 10.4 the accelerated ageing tests shall be performed on samples that have not previously been subjected to the flammability test (9.5) .

10.2 Visual inspection . The window pane or moulding shall show no crazing or blisters. The portion through which the index is viewed shall be transparent , and shall not cause visual distortion of the matter to be viewed within an angle of 15° from the normal to the window.

10.3 RIGIDITY : With the window fitted on the meter as in operation , and at a temperature of $60\pm 2^{\circ}\text{C}$, a 10mm diameter timber rod applied normal to any external part of the window

or moulding with a force of 200 N shall not cause it to touch any moving part of the mechanism.

10.4 IMPACT: the window ,fitted in the meter as in operation and at a temperature of $-29\pm 1^{\circ}\text{c}$, shall withstand the impact of a 25mm diameter solid steel ball dropped three times from a height of 350 mm and striking the center of the window normal to its plane.

10.5 FLAMMABILITY : The window shall be tested in accordance with BS 2782 : method 140E : 1982 . for this test , the test piece shall be positioned centrally with its external face downwards on the center of the wire grid.

The material shall comply with the following requirements.

(A) the period of time for which the test piece glows or flames from the instant the ethanol burns out shall not exceed 5 seconds.

(B) Any material that may have dropped from the specimen shall not continue to burn.

(C) The percentage of the area of the underside of the test piece that is charred or scorched shall not exceed 20%.

(D) The length of that part of any edge of the underside of the test piece that is charred or scorched shall not exceed 50mm.

10.6 ACCELERATED AGEING TEST

10.6.1 General: subject one sample window pane or moulding to the ageing tests specified in 10.6.2. subject another sample to the tests specified in

10.6.3 after these ageing tests , and before being given the flammability test, the samples shall still fit the meter.

10.6.2 effects of ultraviolet light and loss of volatile plasticizer

10.6.2.1 **Radiation test :** the window pane or moulding shall be exposed for five periods each of 8 hr duration to the radiation of a suspended sun lamp that has been in use for not less than 50 hr and not more than 400 hr. The light source shall be a combination tungsten filament mercury are enclosed in glass that has a low-transmission below 280mm . The glass envelope shall be conical and silvered internally to form a reflector. The lamp shall be rated at 275 W to 300 W .

The window pane or moulding shall be positioned as designed , on its index with its outer face towards the lamp and 400mm from the bottom and on the axis of the lamp. The surrounding air shall not be confined and shall be free to circulate.

After each exposure except the last, the sample shall be immersed completely in distilled water for 16 hr. It shall be cleaned and carefully dried with cotton wool after each immersion period.

10.6.2.2 **Loss of volatile plasticizer :** the sample shall be heated in air at $100\pm 3^{\circ}\text{C}$ for 24hr . In this test the

window pane or moulding shall be reasonably supported so as not to encourage deformation.

10.6.3 Resistance to chemical substances: the sample shall be constrained as it will be in the meter and then totally immersed , in turn and in the order listed, in the following technically pure substances at $20 \pm 3^{\circ}\text{c}$:

(A) Sodium carbonate (20% m/m) for 2 hr:

(B) Paint thinners (approximately 50% aromatic and 50% aliphatic hydrocarbons , E.G 50% O-Xylene and 50% N-Heptane) for 1hr .

The sample shall be cleaned with distilled water and carefully dried with cotton wool after each immersion.

11. SALT SPRAY TEST:

All portions of the meter expose to the atmosphere and other internal metallic parts such as body , levers , pins , nut & bolts and etc shall be resistant to corrosion. All metallic parts shall pass salt spray test in acc. With EN 1359-1993 .

12- PAINT TEST:

Painting of gas meter shall be checked as follows:

A: The colour of paint shall be grey according to requirements as mentioned at “ painting “ section.

B: Thickness:

Thickness of paint shall be measured at five points on each side of meter. None of each individual point shall be less than 100 microns or (50 microns for painting with epoxy resin by electrostatic method) for steel casing and difference between minimum and maximum measured values shall not exceed 20% of minimum of measured value.

C: Paint adhesion:

The test shall be done in accordance with BS 3900 part E6 (1992) equivalent to ISO 2409 (1992).

13. TORQUE OF METER CONNECTIONS TEST:

The meter shall not leak when subjected to the leak test (test No.5) during and after following tests. And the connection shall not have a permanent deflection of more than 2° in any plane.

A: With the meter held firm, apply torque of 160 n.m to each boss in turn.

B: With the meter supported by one connection (as normal installation), apply a force of 500 N at right angle to the center line of the meter at 40mm up from the base on the side of the meter remote from the connection. Then the test shall be repeated for the other connection.

APPENDIX “C”

GAS COMPOSITION

COMPOSITION	MINIMUM VALUE	MAXIMUM VALUE
MAJOR AND MINOR COMPONENT MOL%		
Methane	80.0	100
Ethane	—	12.0
Propane	—	4.0

NOTE: This data sheet is an integrated part of STD. No. IGS-MS-IN-103(0):2003 and shall not be used separately .

DATA SHEET (CONTINUED)

ITEM	SUBJECT	Requirements	To be filled by supplier
SERVICE & DESIGN CONDITIONS	Gas inlet temperature	Min. 5°c ,max. 20°c	
	Normal gas inlet pressure	138 MBAR (2 PSIG)MBAR
	Max. working pressure	500 MBARMBAR
	Meter capacity	According to Appendix "A"	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Pressure drop at max. capacity	According to table 1	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Cyclic volume	According to appendix "A"	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Accuracy at atmospheric pressure	±3% from Q _{min} up to 2 Q _{min} . ±2% from 2 Q _{min} up to Q _{max} .	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Ambient temperature Range	Min. -29°c, Max.60°c	Min.°c , Max.....°c
	Meter installation	Weather proof for outdoor installation	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Standard conditions	1.01013 bar & 15.56°c (14.696 PSIA)& (60°F)	YES <input type="checkbox"/> NO <input type="checkbox"/>
Type of index	Direct reading & digital*	YES <input type="checkbox"/> NO** <input type="checkbox"/>	

	No. s of digits	According to appendix "A"	YES <input type="checkbox"/>	NO ^{**} <input type="checkbox"/>
	Transmission to index	Magnetic coupling type	YES <input type="checkbox"/>	NO <input type="checkbox"/>
	Registration mechanism	Mechanical	YES <input type="checkbox"/>	NO <input type="checkbox"/>
	Measuring unit	Cubic meter	YES <input type="checkbox"/>	NO <input type="checkbox"/>
	Meter connection including type , size standard and location	According to Appendix "A"	YES <input type="checkbox"/>	NO ^{**} <input type="checkbox"/>

DATA SHEET (CONTINUED)

ITEM	SUBJECTS	REQUIREMENTS	TO BE FILLED BY SUPPLIERS	
MATERIALS	Body	Plated steel	YES <input type="checkbox"/>	NO <input type="checkbox"/>
	Diaphragm casing	Pressed steel	YES <input type="checkbox"/>	NO <input type="checkbox"/>
	Diaphragm	Reinforced synthetic material , test requirements according to appendix "B" item 9.1	YES <input type="checkbox"/>	NO <input type="checkbox"/>
	Sealing & sealing glands etc	Rubber material , test requirements according to appendix "B" item 9.2	YES <input type="checkbox"/>	NO <input type="checkbox"/>
	Index window	Suitable material to satisfy the test requirements according to appendix "B" item 10	YES <input type="checkbox"/>	NO <input type="checkbox"/>
	Valve and valve seat	Bakelite	YES <input type="checkbox"/>	NO <input type="checkbox"/>
	Metallic internal linkages and levers	Shall be corrosion resistant	YES <input type="checkbox"/>	NO <input type="checkbox"/>
	Bearing	Self lubricated	YES <input type="checkbox"/>	NO <input type="checkbox"/>
	Screws, bolts & nuts	Stainles steel or corrosion resistance plated steel and shall conform to ANSI B1.1	YES <input type="checkbox"/>	NO <input type="checkbox"/>

DATA SHEET (CONTINUED)

ITEM	SUBJECTS	REQUIREMENTS	TO BE FILLED BY SUPPLIERS
TEST & CERTIFICATES	Visual inspection	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Dimension test	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Accuracy test	Required for each meter	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Differential pressure test	Required for each meter	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Leak test	Required for each meter	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Certificates ⁽¹⁾ for ambient temperature test	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Certificates ⁽¹⁾ for life test	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Cyclic volume test	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Test certificates ⁽¹⁾ for diaphragm according to appendix "B" item 9.1	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Test certificates ⁽¹⁾ for other rubber parts material such as sealing and sealing glands according to appendix "B" item 9.2	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Test certificates ⁽¹⁾ for index window according to appendix "B" item 10	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Test certificates ⁽¹⁾ for corrosion resistance of meter components (salt spray test) according to appendix "B" item 11	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Test certificates ⁽¹⁾ for plastic parts material acc. To appendix "E" ,(including gears, levers, etc)	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Paint test	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Torque of meter connections test	Required for each lot	YES <input type="checkbox"/> NO <input type="checkbox"/>
	Guarantee	Two years after shipment or one year after putting in service, whichever ends earlier	YES <input type="checkbox"/> NO <input type="checkbox"/>

* Exept decimal(s) which could be eighter digital or pointer type.

** Please specify

(1) Note. Certification: in all cases for certifications , they shall be issued by an impartial laboratory or authority.

APPENDIX “E”

**SPECIFICATION FOR ACETAL RESIN
(POLYOXYMETHYLENE) FOR MOULDED PLASTIC PARTS
OF GAS METERS (IGS-MS-CH-034(0):1998)**

TABLE OF CONTENT PAGE

- 1. SCOPE**
- 2. REFERENCES**
- 3. DEFINITION**
- 4. PROPERTIES**
- 5. INSPECTION AND CERTIFICATION**

1. SCOPE

This standard specification covers the minimum requirements for acetal materials selected for construction of molded plastic parts of gasmeter in accordance with the Iranian Gas Standard IGS-MS-IN-103(0).

2. REFERENCES

Throughout this standard specification the following standards and codes are referred to. The editions of these standards and codes that are in effect at the time of publication of this standard specification (1998) shall , to the extent specified herein, form a part of this standard specification. The

applicability of changes in standards and codes that occur after the date of this standard specification shall be mutually agreed upon by the purchaser and supplier and / or manufacturer.

ASTM (AMERICAN SOCIETY FOR TESTING AND MATERIALS)

D 696-91 “ Coefficient of linear thermal expansion of plastics between -30°c and 30°c .”

D 4364-84 “ Performing accelerated outdoor weathering of plastics using concentrated natural sunlight. “

ISO (INTERNATIONAL STANDARD)

62-1980 “ Plastics-Determination of water absorption “

75-2 : 1993 “ Plastics – Determination of temperature of deflection Under load “ . part 2 : “ Plastics and ebonite “

179-1993 “ Plastics-determination of charpy impact strength”

180-1993 “ Plastics- determination of izod impact strength of rigid materials”

527-1966 “ Plastics – determination of tensile properties”

1133-1991 “Plastics-determination of the melt mass-flow rate (MFR) and the melt volume – flow rate (MVR) of thermoplastics”

1183-1987 “Plastics –Methods for determining the density and relative density of non-cellular plastics”

3146-1985 “ Plastics – determination of melting behaviour (melting temperature or melting range) of semicrystalline polymers ”

3167-1993 “ Plastics-preparation and use of multipurpose
test specimens”

3. **DEFINITION**

POM (POLYOXYMETHYLENE) : Plastics based on polymers having a predominance of acetal linkage in the main chain, and acetal plastics based on polymers in which oxymethylene is essentially the sole repeated structural unit in the chains.

4. **PROPERTIES**

The acetal (POM) shall be weather and UV resistance in accordance with standard ASTM D 4364 and shall conform to the properties given in table 1 when tested as specified.

TABLE 1

PROPERTY	UNIT	VALUE	TEST METHOD
Melt-Mass Flow Rate (MFR=MFI)	g/10min	9-14	ISO 1133
Melt Volume Flow Rate (MVR)	MI/10 min	7-8	ISO 1133
Melting point	°c	160-180	ISO 3146
Water Absorption			
-50% relative humidity , max	%	0.25	ISO 62
- saturation , max	%	0.9	ISO 62
Density	g/cm³	1.38-1.43	ISO 1183
Tensile Strength , min	Mpa	65	ISO 527-1
Impact Strength (Charpy) at 23°c , min	Kj/m²	180	ISO 179-1eu
Heat deflection temperature under 1.8 MPa load , min	°c	104	ISO 75-2
Izod impact , min	kJ/m²	6	ISO 180-1A

Coefficient of linear thermal expansion , max	K ⁻¹	1.25x10 ⁻⁴ (23-80°C)	ASTM D 696*
Mold shrinkage, max	%	2.2	ISO 3167A

*** NOTE.**

With attention to clause 5” significance and use “

5. INSPECTION AND CERTIFICATION

- 5.1** Inspection and certification of the material supplied in accordance with this standard specification shall be in conformance with the requirements specified herein.
- 5.2** Lot-acceptance inspection shall be the basis on which acceptance or rejection of the lot is made . The lot- acceptance inspection shall consist of the test of melt flow rate.
- 5.3** Periodic check inspection shall consist of the tests specified for all requirements of the material under this standard specification . Inspection frequency shall be adequate to ensure the material is certifiable in accordance with 5.4 .
- 5.4** Certification shall be that the material was manufactured , Sampled , tested and inspected in accordance with this standard specification and that average values meet the requirements at a confidence level of 95% .
- 5.5** A report of the test results shall be furnished when requested. The report shall consist of the results of the lot-acceptance inspection for the shipment and the results of the most recent periodic – check inspection.

APPENDIX “ A “

TABLE 1: DESIGNATION, CAPACITY , CONNECTION, OF METER

ITEM	DESIGNATION OF METER	METER CAPACITY(SCM/H) WITH AIR ,D=1.2 KG/M ³		CYCLIC ⁽¹⁾² VOLUME (DM ³) (MINIMUM)	METER CONNECTION		
		Q _{MIN}	Q _{MAX}		INLET/OUTLET NOMINAL SIZE (IN)	TYPE	LOC
1	G 25	0.250	40	18	2	FLANGED	S
2	G 40	0.400	65	30	3	FLANGED	S
3	G 65	0.650	100	55	3	FLANGED	S
4	G 100	1.000	160	100	4	FLANGED	S

⁽¹⁾ Meters having a cyclic volume less than the value corresponding to the their designation in the table 1, can be approved provided that the pattern of these meters meets the endurance test (7.1) in 270 days and pressure cycling test (7.2) in 4000 cycles.