IGS-M-IN-102(3)	Sep. 2021
Approved	مصوب

شرکت ملی گاز ایران

مدیریت پژوهش و فنآوری

امور تدوین استانداردها

IGS

مشخصات فنی خرید

کنتورهای گاز نوع توربینی

Turbine Meters

تاریخ : ۱۴۰۲/۰۷/۱۶
شماره : گ۹/۰۰۰/ ۱۲۲۳۴۱
پیوست :

مدیران‌عامل/ مدیران/ رؤسای محترم شرکت‌های گاز استانی ، پالایشی و مناطق عملیاتی
شرکت مهندسی و توسعه گاز ایران/ شرکت انتقال گاز ایران/ شرکت بازرگانی گاز ایران
مدیریت هماهنگی امور گازرسانی/ مدیریت هماهنگی و نظارت بر تولید/ مدیریت دیسپچینگ ملی گاز
مدیریت بهداشت، ایمنی، محیط زیست و پدافند غیرعامل/ مدیریت دارائی‌های‌فیزیکی
مدیریت سرمایه‌گذاری و کسب و کار/ امور تخصصی بازرگانی

موضوع : ابلاغ مصوبه شورای استاندارد

با سلام و احترام،

به استحضار می‌رساند بر اساس تصمیمات متخذه در نشست شماره ۶۳۹ مورخ ۱۴۰۲/۶/۲۰ شورای محترم استاندارد، مقرر گردید با توجه فقدان زیرساخت‌های لازم، در خصوص انجام آزمایش‌های HPC، الزام ردیف ۱ (Error of Indication) جدول ۷ ذیل بند ۵ استاندارد "مشخصات فنی خرید کنتورهای توربینی گاز (IGS-M-IN-102(3))"، تا مدت یک سال از تاریخ تصویب در شورای استاندارد، برای کلیه کنتورهای توربینی در شرایط اتمسفریک بصورت مشروط مورد پذیرش قرار گرفت و مقرر گردید به موازات برای محاسبه میزان خطای محاسباتی انجام تست‌ها با هوا و گاز برای تعداد مشخصی از کنتورهای توربینی با ارسال به مراکز معتبر خارجی اقدام گردد که سناریوی مورد نظر توسط کمیته‌ای متشکل از نمایندگان مدیریت هماهنگی امور گازرسانی و این مدیریت نهائی خواهد شد.

محسن مظلوم فارسی‌باف
مدیر پژوهش و فناوری

تهران، بلوار کشاورز، خیابان نادری، پایین تر از خیابان ایتالیا، پلاک ٤، کد پستی : ١٤١٦٦١٣٦٣١
تلفن: ٨٤٨٧٠
آدرس الکترونیک: http://research.nigc.ir

دفترمدیرعامل

شرکت ملی گازایران

تاریخ :۱۴۰۰/۰۹/۱۶
شماره :گ۰/د ب/۰۵۸۷-۲۰۵۷۸

ابلاغ مصوبه هیأت مدیره

مدیر محترم پژوهش و فناوری

باسلام،

به استحضار می‌رساند در جلسه ۱۹۴۸ مورخ ۱۴۰۰/۰۹/۰۱ هیات مدیره، نامه شماره گ۹/۹۱۸۴۶/۰۰۰ مورخ ۱۴۰۰/۰۷/۲۶ مدیر پژوهش و فناوری درمورد تصویب نهایی مقررات فنی شرکت ملی گاز ایران به شرح زیر مطرح و مورد تصویب قرار گرفت.

۱-مشخصات فنی کاتالیست های واحد مرکاپتان زدا IGS-M-CH-052(0)

۲-مشخصات فنی کاتالیست های واحد بازیافت گوگرد IGS-M-CH-054(1)

۳-مشخصات فنی خرید تجهیزات گرم کننده گاز غیرمستقیم آبی نوع مشعل دمنده دار IGS-M-PM-106(2)

۴-مشخصات فنی خرید کنتورهای نوع توربینی IGS-M-IN-102(3)

۵-مشخصات فنی خرید اتصال سه راهی انشعاب گرم IGS-M-PL-033(2)

۶-مشخصات فنی خرید اتصالات جوش لب به لب در اندازه های ۱/۲ الی ۵۶ اینچ IGS-M-PL-022(2)

۷- مشخصات فنی و نقشه های اجرایی انشعابات در شبکه های توزیع گازرسانی پلی اتیلن IGS-C-DN-011(0)

الهام ملکی

دبیر هیات مدیره

رونوشت : مدیرعامل محترم شرکت ملی گاز ایران و رئیس هیات مدیره
اعضای محترم هیات مدیره
مشاور و رئیس دفتر محترم مدیرعامل
سرپرست محترم امور حقوقی
رئیس محترم حسابرسی داخلی
سرپرست محترم امور مجامع

Foreword

This standard specification is intended to be mainly used by N.I.G.C. and contractors, and has been prepared based 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.

Website: http://igs.nigc.ir
E-mail: igs@nigc.ir

Contents

1. SCOPE

This document specifies the measuring conditions, requirements and tests for the construction, performance and safety of class 1 turbine gas meters with mechanical indicating devices, herein after referred to as a meter(s), having in-line pipe connections for gas flow measurement.

This specification covers the minimum requirements for design, material, manufacture, testing, painting, marking, packing and packaging of turbine gas meters class 1 with mechanical indicating devices herein after referred to as meter (s), used to measure the volume of natural gas, the composition of which is specified in IGS-M-CH-033 only the general requirements are given in this specification. The specific requirements, if any, will be given in Appendix, request for quotation, and purchase order.

2. REFERENCES

Throughout this standard specification the following standards are referred to. The editions of these standards that are in effect of the time of issue of this standard specification shall form part of this standard specification. The applicability of changes in standards that occur after the date of this standard specification shall be mutually agreed upon by the purchaser and the supplier.

2.1 ANSI/ASME B16.5 (2013) "Pipe Flanges and Flanged Fittings, NPS 1/2 through NPS 24"

2.2 EN 10204 (2004) "Metallic Products Type of Inspection Documents"

2.3 EN 12261 (2018) "Gas Meter, Turbine Gas Meters"

2.4 IEC 60079-01/EN 50014 (2007) "Electrical Apparatus for Potentially Explosive Atmospheres – General Requirements"

2.5 IEC 60079-11/EN 50020 (2007) "Electrical Apparatus for Potentially Explosive Atmospheres – Intrinsic Safety"

2.6 IEC 60529/EN 60529 (2013) "Degree of ` Protection Provided by Enclosures"

2.7 IGS-M-CH-033 (2014) "Iranian Natural Gas Quality"

2.8 IGS-M-IN-106 (1392) "Gas Meters, Gas Volume Electronic Conversion Device (PTZ)"

2.9 IPS- GN-210 (1386) "Packing and Packages"

2.10 ISO 9951(1393) "Specification for turbine meter**"**

2.11 IGS-M-IN-308" Mechanical Plumb"

2.12 ISO 6082 "aluminum alloy"

3. DEFINITIONS

For the purpose of this standard specification, in addition to terms and definition listed in EN 12261, the following definitions apply.

3.1 Base Condition

The preferred reference conditions are referred to as standard reference conditions and denoted by the subscript “s” (see ISO 13443) :

Ps=101.325 kPa Standard Pressure

Ts=15.56 ºC (60 ºF) = 288.71 K Standard Temperature

3.2 Nominal Pipe Size (NPS)

Numerical inches designation of size which is common to components in piping system of anyone size.

Note: The nominal pipe size is designated by the letters NPS followed by a number.

3.3 Pressure Class

Numerical pressure design class expressed in accordance with either the nominal pressure (PN) or ANSI class rating.

3.4 ANSI Class Rating

Numerical pressure design class defined in ANSI/ASME B16.5 and used for reference purpose.

3.5 Gas-Volume Conversion Device

Device that computes, integrates and indicates the volume increment measured by a gas meter if it were operating at base conditions, use as inputs the volume at measurement conditions, as measured by gas meter, and other parameters such as gas temperature and gas pressure.

3.6 Type Test

The tests made on a turbine meter which is representative of other turbine meters to demonstrate that these turbine meters comply with the specified requirements given in the relevant standard. The type test shall be valid if drawings, techniques and materials have no change.

3.7 Sample Test

The tests carried out on randomly selected turbine meters by inspector/purchaser of each batch.

3.8 Routine Test/Individual Factory Test

The tests which carried out on each individual turbine meter by manufacture.

3.9 Certificate

The test reports or approval documents that indicate conformity of equipment/accessory characteristics in accordance with standards specifications issued by NIGC accepted labs or certified body.

3.10 DN-designation

Numerical designation of size for components of a pipework system, which is used for reference purposes.

NOTE It comprises the letters DN followed by a dimensionless whole number which is indirectly related to the physical size, in millimeters, of the bore or outside diameter of the end connections.

3.11 class 1 meter

Meter which has an error of indication between –2% and + 2% for flow rates Q where $Q_{min} \leq Q < Q_t$, -1 % and +1 % for flow rates Q where $Q_t \leq Q \leq Q_{max}$.

3.12 Flange pressure ratings

Flanges shall be designed according to PN Designation or ANSI class rating (see Table 1).

TABLE 1 — Flange pressure ratings

PN Designation	ANSI class rating
10	125
16	-
20	150
25	-
40	-
50	300
64	-

100	-
110	600
150	900
250	-
260	1500
420	2500

NOTE This table is based on EN 1333 resp. ISO 7005-1.
The use of the following pressure ratings is recommended:
10 - 16 - 20 - 25 - 40 - 50 - 100 - 150 - 250 - 420.

4. REQUIEMENTS

This standard specification is primarily based on EN12261 and additional requirements are specified herein.

4.1 Design and Service Conditions

4.1.1 The ambient temperature range according to EN12261 shall be selected.

4.1.2 The gas temperature range should be assuming -10 ºC to +55 ºC.

4.1.3 Base condition for standard volume measurement is 1.01325 bara (14.696 psia) and 15.56 ºC (60 ºF).

4.1.4 The gas meter shall be tamper proof, gas tight and capable to sustain accuracy under the whole range of service conditions.

4.1.5 The Turbine meter shall be Flanged-end type.

4.1.6 Meter flanges shall be raised face, serrated finished according to ANSI/ASME B16.5 Flanges class ratings shall be 150, 300 or 600 as specified, according to datasheet.

The design pressure of meter body should be equal to flange class rating.

4.1.7 The overall length of the meter between inlet and outlet connections should be 3 DN.

4.1.8 Gas meters shall be classified according to maximum, minimum flow rates, range ability and nominal diameters as shown in Table 2.

TABLE 2 – Authorized Values of G Rates, Maximum Flow Rates, Corresponding Minimum Flow Rates and Nominal Diameters

Q_{max} (m3/h)	Range ability				Nominal diameters DN		
		1:20	1:30	1:50			
		Q_{min} (m3/h)					
		2	1,3	0,8	A 25	B	C 50
65		3	2	1,3		50	
100		5	3	2		50	80
160		8	5	3	50	80	100
250		13	8	5		80	100
400		20	13	8	80	100	150
650		32	20	13	100	150	
1 000		50	32	20		150	200
1 600		80	50	32	150	200	250
2 500		130	80	50	200	250	300
4 000		200	130	80	250	300	400
6 500		320	200	130	300	400	
10 000		500	320	200	400	500	
16 000		800	500	320	500	600	
25 000		1 300	800	500	600	750	

A high speed version

B normal speed version (preferred)

C low speed version

4.1.9 Each turbine meter shall be equipped with a test element according to clause 7.5 of EN 12261.

4.1.10 Prior to the shipment, each gas meter under this specification shall be subjected to the series of routine tests specified according in ANNEX D EN12261.

4.1.11 A turbine meter shall be equipped with a non-resettable and non-volatile indicating device directly indicating the volume of gas measured at metering conditions and expressed in cubic meters according to clause 6.5 EN12261.

4.1.12 The number of integer numerals in an indicating device shall be such that the device can show a throughput equal to at least 8000 h of operation at the maximum flow rate without passing twice to the same indication, plus two decimals.

Number of digits	Integer	Decimal
8	6	2
8	7	1
8	8	0

4.1.13 The meter indicating device shall be equipped with the back stop registrations at reverse flowing.

4.1.14 The maximum error of indication of the meters shall be according to Tables 3 and 4.

TABLE 3 – Maximum Permissible Errors

Flow Rate	Maximum permissible errors
$Q_{min} \leq Q < Q_t$	± 2%
$Qt \leq Q \leq Q_{max}$	± 1%

TABLE 4 – Transitional Flow Rate (Q_t)

Range ability	Q_t
1:20	0.2 Q_{max}
1:30	0.15 Q_{max}
≥ 1:50	0.1 Q_{max}

For a meter specified for measurement at a pressure lower than or equal to 4 bar, only one error of indication test is required with a gas at atmospheric conditions (± 100 mbar). For a meter specified for measurement in a pressure range extended above 4 bar, at least one error of indication test is carried out with a gas at a pressure as close as possible to the foreseen working pressure. This pressure shall be specified by the purchaser and shall be within the user's specified working pressure range, as defined in E.2.1 b). It shall also be within the working pressure range of the meter.

4.1.15 The weighted mean error (WME) shall have a value between -0.4% and +0.4%. The WME is calculated as follows:

$$WME = \frac{\Sigma\left(Q_i / Q_{max}\right) \cdot E_i}{\Sigma\left(Q_i / Q_{max}\right)}$$

Where Qi / Q_{max} is a weighting factor;

E_i is the error of indication at the flow rate Qi given as a percentage.

When Qi = Q_{max} a weighting factor of 0.4 instead of 1 shall be used.

If tests at more than one pressure are carried out, the difference between the results of the tests between 0.25 · Q_{max} and Q_{max} shall not exceed 0.5 % for meters with DN > 100 or 1.0 % for meters with DN ≤ 100.

If a meter has been certified for one working pressure range it is deemed to be certified for any smaller working pressure range.

If a meter is certified for one range ability it is deemed to be certified for any lower range ability.

4.1.16 In the flow rate range from 0.25 Q_{max} to Q_{max} the variation of the error of indication at each flow rate shall stay within a span of 0.2 %.

4.1.17 For the test flow rates from 0.25 Q_{max} to Q_{max} at each test pressure the differences between the highest and the lowest error of indication shall not exceed the values specified in Table 5.

TABLE 5 - Allowable Differences between the Highest and Lowest Error of Indication at each Test Pressure

Size	Pressure	
	≤ 4bar	> 4bar
≤ DN 100	1.0%	0.5%
> DN 100	1.0%	0.3%

4.1.18 Maximum pressure loss values across the meter at Q_{max} with atmospheric air as test media:

TABLE 6 - Maximum pressure loss values across the meter at Qmax with atmospheric air as test medium

Nominal diameters	Pressure loss (Pa) / (bar)
according to C	1000
according to B	1500
according to A	2500
NOTE Definitions A, B, C see Table 8	

4.1.19 The meter case shall be designed to withstand the internal pressure according to resistance to internal pressure test. (Clause 6.2.3 EN12261).

4.1.20 The assembled meters shall be leak tight according to leak tightness test (Clause 6.2.٤ EN12261).

4.1.21 At least one pressure tap shall be provided for measuring the static pressure at the turbine wheel of the meter. The meter pressure tapping shall be clearly and indelibly marked (p_m).

4.1.22 At least one temperature pocket or Thermowell with means for sealing it against unauthorized interference or removal shall be provided for measuring gas temperature in the meter. This Thermowell shall be clearly and indelibly marked (t_m).

4.1.23 The transmission system of the gas meter, which connects the measuring unit to the indicating device, shall be via a magnetic coupling.

4.1.24 Unless otherwise specified in Appendix, each meter shall be equipped with one low frequency pulse generator (voltage free contact) and one high frequently pulse generator.

4.1.25 The indicating device, pulse generator and related electrical wiring and accessories shall have a minimum protection class of IP65 (IEC 60529).

4.1.26 The pulse generator(s) shall be intrinsically safe according to IEC 60079-0 and IEC 60079-11.

4.1.27 Each meter shall be capable to be equipped with a volume conversion device according to IGS-M-IN-106 and related accessories.

4.1.28 Index and any pressure test point or tapping connection on the meter shall be capable of being sealed against unauthorized interference according to IGS-M-IN-308.

4.1.29 Each meter shall be equipped with oil pump expect 2” /150.

4.1.30 The maximum and minimum flow rates shall be specified for the gas density for which the meter will operate within the specifications of meter performance defined clause5.

4.2 Material

This material specification is primarily based on EN 12261 recommendations and additional requirements are specified herein.

4.2.1 All parts of meter including pressure containing parts, internal components, meter indicating device and related accessories shall be constructed of materials suitable for the

service conditions for which the meter is rated. All wetted parts of the meter shall be manufactured of material compatible with odorized natural gas.

4.2.2 The meter body shall be Cast Carbon Steel according to ASTM A 216, grade WCB/WCC, or Forged Carbon Steel according to ASTM A 105. For other material, it shall be confirmed that material is at least as equivalent as these standards.

4.2.3 Meter flanges shall be forged Carbon Steel according to ASTM A 105.

4.2.4 Bearing shall be at least stainless steel type 316.

4.2.5 Turbine wheel shall be aluminum alloy 6082, chemical composition according to BS EN 573-3: 2009 and mechanical properties according to BS EN 485-2: 2008 or BS EN 755-2: 2008.

5. INSPECTION AND TESTS

5.1 Each meter shall be checked during manufacture, according to the manufacturers' quality assurance system which shall conform to EN/ISO 9001 or an equivalent.

5.2 Each Individual meter testing, prior to dispatch, shall be carried out according to the Table 5. The test report shall be issued and submitted by the manufacturer for each meter.

5.3 Each type of meters (Q_{MAX} / Q_{MIN} /size/class) shall be subjected to the series of type tests.

5.4 The type tests should be done by a certified independent test laboratory or should be witnessed by a certification body.

5.5 For each type of meter, the approved type test certificates and type test reports shall be available and submitted by manufacturer.

5.6 Turbine gas meter type testing shall be carried out according to the Table 9 but in operating conditions that specified in this specification if differ from EN 12261.

TABLE 7 – List of Routine/Individual Tests

Item	Subject	Standard*	Reference Procedure
1	Error of indication test	EN 12261	Annex E.3
2	Linearity	EN 12261	Annex E.4
3	Pressure range	EN 12261	Annex E.2
4	Weighted mean error (WME)	EN 12261	Annex E.5
5	Resistance to internal pressure	EN 12261	Clause 6.2.3
6	External leak tightness	EN 12261	Clause 6.2.4
7	Visual and dimensional check of pressure tapping	EN 12261	Clause 6.6.1

8	Visual and dimensional check of temperature tapping	EN 12261	Clause 6.6.2
9	Adjustment	EN 12261	Annex E.5.3
10	Check on adjustment	EN 12261	Annex E.5.3.2
11	Marking	EN 12261	Clause 8

Note:

* The test conditions (ambient temperature range, gas temperature, base conditions and …) shall be considered in accordance with this specification.

TABLE 8 – List of sample Tests

Item	Subject	Standard*	Reference Procedure
1	Error of indication test	EN 12261	Annex E.3
2	Linearity	EN 12261	Annex E.4
3	Stability	EN 12261	Clause 5.2.2
4	Weighted mean error (WME)	EN 12261	Annex E.5
5	Resistance to internal pressure	EN 12261	Clause 6.2.3
6	External leak tightness	EN 12261	Clause 6.2.4
7	Visual inspection (dimensional check of pressure / temperature tapping,marking,paint and thickness, oil pump,LF/HF sensor, Plumb)	EN 12261	Clause 6.6.1
8	Visual and dimensional check of temperature tapping	EN 12261	Clause 6.6.2
9	Marking	EN 12261	Clause 8
10	Test element	EN 12261	Clause 7.5

TABLE 9 – List of Type Tests

Item	Subject	Standard*	Reference Procedure	Certificate Note
1	Resistance to internal pressure	EN 12261	Clause 6.2.3	1
2	External leak tightness	EN 12261	Clause 6.2.4	1
3	Bending and torsional moment	EN 12261	Clause 6.2.5	1
4	Resistance to impact	EN 12261	Clause 6.2.6	1
5	Transportation and storage	EN12261	Clause 6.2.7	1
6	Resistance to ultra-violet radiation	EN 12261	Clause 6.3.2	1
7	Resistance to external corrosion	EN 12261	Clause 6.3.3	1
8	Removable meter mechanisms	EN 12261	Clause 6.4	1
9	Magnetic drive unit	EN 12261	Clause 6.5.2	1
10	Visual and dimensional check of pressure tapping	EN 12261	Clause 6.6.1	1
11	Visual and dimensional check of temperature tapping	EN 12261	Clause 6.6.2	1
12	Meters lubrication system	EN 12261	Clause 6.7	1
13	Electrical specifications for pulse generators	EN12261	Clause 7.3.2	2
14	Electrical connections	EN60529	Clause 7.3.3	1

15	Test element	EN 12261	Clause 7.5	2
16	Ex-proof specification of electrical and electronic devices, components and connections	IEC 6079-IEC 60079-25	-	2
17	Degree of protection provided by enclosure	IEC 60529	-	2
18	Error of indication	EN 12261	Clause 5.2.1	1
19	Metrological stability	EN 12261	Clause 5.2.2	1
20	Linearity	EN 12261	Clause 5.2.3	1
21	Pressure range	EN 12261	Annex E.2	1
22	Weighted mean error (WME)	EN 12261	Annex E.5	1
23	Endurance	EN 12261	Clause 5.2.4	1
24	Meter position	EN 12261	Clause 5.2.5	1
25	Temporary over load	EN 12261	Clause 5.2.6	1
26	Temperature range	EN 12261	Clause 5.2.7	1
27	Installation condition	EN 12261	Clause 5.2.8	1
28	Maximum permissible pressure loss	EN 12261	Clause 5.2.9	1
29	Output shaft	EN 12261	Clause 5.2.10	1
30	Painting	ISO 2409		1
31	Marking	EN 12261	Clause 8	1

Notes:
(1): Means the test report or type approval test is required.
(2): Means the certificate of conformity is required.
*: The test conditions (ambient temperature range, gas temperature, base conditions and …) shall be considered in accordance with this specification.

5.8 Purchaser will require the presence of his nominated representative to witness the final factory tests. The supplier shall inform the date of such test at least four weeks in advance.

6. PAINTING REQUIREMENT

6.1 Preparation

The external surface of the meter shall be thoroughly cleaned by removing all rust and mill scale. Surface to be painted shall be completely free from grease, grit and all other foreign material. All parts of the meter shall be able to resist any corrosive substances contained in the internal and external atmosphere with which they may be in contact during normal conditions of use. Meters shall be protected from corrosion. The protection shall meet the requirements of Clause 6.3.3 from EN 12261.

6.2 Painting Inspection (Sample Check)

6.2.1 Visual check of the final coating of meter body including color, blistering, gurgle, and other defect.

6.2.2 Dry film thickness (DFT) of painting shall be measured at least at 5 point of different sides of the meter casing. None of measurements shall not be less than 100 micron.

6.2.3 The adhesion of painting shall be tested according to ISO 2409 paint adhesion shall be better than classification NO.1.

7. MARKING

7.1 General

The following marks and inscriptions shall be affixed to the meter distinctly grouped together. These markings shall be directly visible, easily legible and indelible under normal conditions of use of the meter. The meter shall have adequate facilities for the affixing of the EC mark of conformity and/or inscriptions. These shall be such that it is impossible to remove the mark and inscriptions without damaging them and that the mark and inscriptions are visible when the meter is in its regular working position.

7.1.1 The EC type approval mark and number, if appropriate

7.1.2 Manufacturers name and trade mark

7.1.3 The model number, serial number and year of manufacture

7.1.4 Meter class rating and body material

7.1.5 inlet/outlet size

7.1.6 Range ability

7.1.7 The maximum and minimum flow rate (m3/h)

7.1.8 The working pressure range p = ... to ...MPa (or bar)

7.1.9 The gas temperature range t …= -10 °C to +55 °C

7.1.10 Ambient Temperature range t …= according to EN 12261

7.1.11 The code of this Iranian gas standard, IGS-M-IN-102(3)

7.1.12 Accuracy class

7.1.13 Speed type

7.2 Pulse Generator

If the turbine meter is fitted with an electrical pulse generator, the pulse generator shall be labeled. It shall contain at least the type of generator, the pulse value given and the wiring diagram.

7.3 Flow Direction

The flow direction shall be shown on the meter by means of an indelible arrow.

8. SPARE PART

8.1 A complete set of spare parts shall be supplied for each meter. The supplied spare parts shall comply with same specifications as the original parts and shall be fully interchangeable with the original parts without and modification spare parts shall be preserved to prevent deterioration during transport and storage in a humid tropical atmosphere.

8.2 The vendor shall recommended and deliver the list of two years of operation spare parts.

9. DOCUMENTATIONS

9.1 The vendor shall supply the necessary information with the quotation to enable evaluation of the submitted proposal. General documents/drawings are not acceptable unless they are revised to show the equipment proposed.

The document to be supplied with the quotation shall at least include the following.

9.1.1 Completed enquiry Appendix

9.1.2 Summary of exceptions/deviations to this specification

9.1.3 Brochures and catalogues containing description of typical turbine gas meter

9.1.4 General dimensional drawings

9.1.5 Approximate shipping weights and sizes

9.1.6 Approval relevant certification documents

9.2 The manufacturer shall provide a declaration of conformity to this harmonized Standard and all relevant directives. The documents which shall be supplied together with the equipment shall at least include the following:

9.2.1 List of components, showing complete reordering information for all replaceable parts

9.2.2 Installation, operation and maintenance instructions

9.2.3 Recommended spare parts list for two years of operation

9.2.4 Test reports certificate for type tests and routine tests

9.2.5 For each turbine meter a test certificate according to 4.1.9 shall be issued, and three certified copies of test certificate shall be submitted to the purchaser. The test certificate shall include the following information:

9.2.5.1 The name of manufacturer

9.2.5.2 The date of the test

9.2.5.3 The name and location of test facility

9.2.5.4 The method of testing (Bell prover, sonic nozzle, other meters)

9.2.5.5 The serial number of the meter

9.2.5.6 The error of indication figure

9.2.5.7 The estimated uncertainty of the method

9.2.5.8 The nature and conditions (pressure, temperature, density) of the test gas

9.2.5.9 The mounting position of the meter during the test

9.2.5.10 Adjustment gear wheels, pulse value

9.2.6 Certificate of conformity for ex-proof pulse generators

9.3. Instruction Manual

Instruction manual shall be according to clause 9.3 EN 12261.

10. PACKING AND PACKAGING

Packing and Packaging is primarily based on IPS-G-GN-210 recommendations and additional requirements are specified herein.

10.1 The supplier of the equipment under this specification is the sole responsible for packing and preparation for shipment.

10.2 The packaging and preparation for shipment shall be adequate to avoid mechanical damage during transport and handling.

10.3 The meter connections shall be fitted with suitable plastic covers to prevent the entry of foreign mater during transportation and storage.

10.4 Depending on meter size and weight, meters with DN 100 connections and above shall be securely fastened to a hard wood skid of pallet suitable for fork truck handling and shall be covered for protection against dirt and moisture during transport and outdoor storage.

10.5 Each meter package container shall be provided with permanently attached identification tag containing necessary information.

10.6 Silica-gel of similar dehydrating compounds shall be enclosed in each meter package container.

10.7 The transportation and storage should be according to EN 12261, clause 6.2.6.

11. GUARANTEE

11.1 The supplier of gas meters under this specification shall guarantee the meters and shall replace any damaged meter parts from poor workmanship and/or faulty design

11.2 The supplier shall replace any meter part failed under commissioning tests and/or failed under normal usage for 12 months, not exceeding 18 months from the date of dispatch from the manufacturer's works.

APPENDIX
Data Sheet

Item	Description	To be Filled by NIGC	To be Filled by Manufacturer/Supplier
General	Manufacturer	……	……
	Gas inlet pressure (bar/psig)	Min….max…	Min….max…
	Ambient temperature range	-29 °C to 60 °C	
	Gas temperature range	-10 °C to 55 °C	
	Flow straightener (built in)	Yes□ No□	Yes□ No□
	Capacity with air at atmospheric conditions (±100 mbar) at max. pressure loss(CMH)	……	Yes□ No□
	Meter mounting	Horizontal□ Vertical□	Horizontal□ Vertical□
	Size (in)	……	……
	Class rating	150□ 300□ 600□	-
	Test pressure (psig)	412 psig (28 bar) for class 150□ 1080 psig (75 bar) for class 300□ 2160 psig (150 bar) for class 600□	-
	Length (F to F) (mm)	3D	-
	Minimum up stream length according to manufacturer recommendation (mm)		……
	Minimum downstream length according to manufacturer recommendation (mm)		……
	Connection type	Flanged-ends R.F, serrated finished acc. to ANSI B16.5	……..
Index	Type	Direct reading, numerical	……
	Transmission system	Magnetic coupling	-
	Frequency pulse generator	LF, HF	-
	Measuring unit	CMH	
	Ingress Protection	At least IP 65	……
EVC	Type	PTZ	-
	Standard	IGS-M-IN-106	-
	Manufacturer		……
	Model No.		……
	The compatibility of correction device with turbine meter	Shall be approved by the manufacturer of turbine meter	-
Material	Body	Acc to clause 4.2	-
	Bearing	At least Stainless steel type 316	……
	Turbine wheel	Aluminum acc. to ISO 6082	……
	Shaft	Stainless steel type 316	……
	Wet Part Internal Gearing	Stainless steel	……

Item	Description	To be Filled by NIGC		To be Filled by Manufacturer/Supplier
Design Condition	Range ability	1:20□		-
		1:30□		
		1:50□		
	Maximum permissible errors	$Q_{min} \le Q < Q_t$: ± 2%		-
		$Q_t \le Q \le Q_{max}$: ± 1%		-
	Transitional flow rate Q_t	for 1:20	0.2 Q_{max}	-
		for 1:30	0.15 Q_{max}	
		for 1:50	0.1 Q_{max}	
	Maximum pressure loss value at Q_{max} with atmospheric air	1000 □ 1500 Pa (P=15 mbar) □ 2500 □		……
Documentation	Necessary Document Acc to clause 9	required		
maintenance	Bearing lubrication	Only Self-lubricated for 2"/150 and 3"/150		Yes□ No□
		Lubricated by oil pump		Yes□ No□
	Special lubricating tools	Required□ Not required□		Yes□ No□
	Oil specification			----------
Certificate	The approval certification of meters according to IGS-M-IN-102(4)	required		-
guarantee	Meter	Acc to clause 11		-
Reference Standard	IGS-M-IN-102 latest edition	Yes□		-

Manufacturer signature and stamp: