



شرکت ملی گاز ایران
مدیریت پژوهش و فناوری
امور تدوین استانداردها

IGS

مشخصات فنی خرید

کنتور گاز نوع اولتراسونیک

Multipath Ultrasonic Transit-Time Gas Flow Meter



تاریخ: ۱۳۹۳/۷/۹
شماره: گ/دب/۰-۲۳۹/۰-۱۷۱۰۷



دفتر مدیر عامل

ابلاغ مصوبه هیأت مدیره



مدیر محترم پژوهش و فناوری

باسلام،

به استحضار می‌رساند در جلسه ۱۵۹۹ مورخ ۱۳۹۳/۶/۲ هیأت مدیره، نامه شماره گ/۹/۰۰۰/۶۶۷۶۴ مورخ ۱۳۹۳/۵/۱۳ مدیر پژوهش و فناوری و رئیس شورای استاندارد در مورد استانداردهایی تحت عناوین ذیل مطرح و مورد تصویب قرار گرفت:

۱- ایستگاههای تقلیل فشار / اندازه گیری نوع کابینتی با حداکثر ظرفیت ۱۰۰۰۰ متر مکعب استاندارد بر ساعت به شماره ICS-M-IN-104

۲- کنتور گاز نوع اولتراسونیک به شماره IGS-M-IN-104(1)

ناصر آبگون

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FOREWORD

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

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

IGS Standards are subject to revision, amendment or withdrawal, if required, thus the latest edition of IGS shall be checked/inquired by NIGC employees and contractors.

This standard must not be modified or altered by NIGC employees or its contractors. Any deviation from normative references and / or well-known manufacturer's specifications must be reported to Standardization division.

The technical standard committee welcomes comments and feedbacks 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 NIGC 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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امور تدوین استانداردها

پیشگفتار

- ۱- این استاندارد/ دستورالعمل به منظور استفاده خصوصی 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 گازی ایران (IGS) توسط کمیته‌های 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 می رسند.
 - 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 برحسب مورد استفاده می شود. همچنین به منظور استفاده از هر چه بیشتر از تولیدات داخلی قابلیت های سازندگان داخلی نیز مورد توجه قرار می گیرد.
 - ۵- استانداردها از طریق پایگاه اینترنتی شرکت* و یا لوح فشرده (CD) در اختیار واحدها و کاربران قرار می گیرد.
 - ۶- استانداردها به طور متوسط هر ۵ سال یکبار و یا در صورت ضرورت زودتر ، مورد بازنگری و بروز رسانی قرار میگیرند. بنابراین کاربران باید همیشه آخرین نگارش را مورد استفاده قرار دهند.
 - ۷- هر گونه نظر و یا پیشنهاد اصلاح در مورد استانداردها مورد استقبال و بررسی قرار خواهد گرفت و در صورت تأیید ، استاندارد مربوطه نیز مورد تجدید نظر قرار خواهد گرفت.
- تعاریف عمومی
- در متن استانداردهای (IGS) از تعاریف و اصطلاحات زیر استفاده می شود .
- ۱- "شرکت" (COMPANY) : منظور از شرکت " شرکت ملی گاز ایران " و یا شرکتهای فرعی وابسته می باشد.
 - ۲- " فروشنده " (PUPPLIER / VENDOR) : به فرد یا موسسه ای اطلاق می گردد که تعهدی را نسبت به شرکت تقبل نموده است .
 - ۳- " خریدار " (PURCHASER) : منظور از خریدار " شرکت ملی گاز ایران " و یا شرکتهای فرعی وابسته می باشد.
 - ۴- "SHALL" : در مواردی بکاربرده می شود که انجام خواسته مورد نظر اجباری است.
 - ۵- "SHOULD" : در مواردی بکاربرده می شود که انجام خواسته مورد نظر ترجیحی و در عین حال اختیاری است .
 - ۶- "MAY" : در مواردی بکار برده می شود که انجام کار به شکل مورد بحث نیز قابل قبول می باشد.

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1. SCOPE

This specification together with the Appendix A there to covers the minimum requirements for design, material, fabrication, testing, inspection, painting, marking, packing and packaging of "Multi path ultrasonic transit-time flow meter (UM) according to AGA report No.9 but with following requirements which have been mentioned at this specification.

This specification is only used for UM with ANSI Class rating 600 and not applicable to clamp-on externally mounted meters.

2. REFERENCES

Throughout this standard specification the following standards, codes and reports are referred to. The editions of these standards and codes that are in effect at the time of publication of this standard specification (2014) 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.

AGA REPORT No.9 "Measurement of Gas by Multipath Ultrasonic Meter"

IGS-CH-033 (1) "Specification for Iranian Natural Gas Quality"

ISO 17089-1 "Measurement of Fluid in Closed Conduits-ultrasonic for gas – Part 1: Meters for Custody Transfer and Allocation Measurement"

3. DEFINITIONS

For the purposes of this standard, the terminology, definitions, and units apply according to AGA Report No.9: 2007 (Item2).

4. REQUIREMENTS

4.1 Design and Service Conditions

4.1.1 Multi path ultrasonic meters shall have at least four independent pairs of measuring transducers (acoustic path).

4.1.2 For specific requirements see data sheet (normative Appendix). In case of any exception to the specification, it shall be clearly stated on the technical quotation submitted by suppliers.

4.1.3 The UM shall be constructed of quality materials in a workmanlike manner in order to attain gas tightness, stability of performance and sustained accurate metering over a period of time and over the range of operating conditions with minimum of maintenance, when metering natural gas.

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

4.1.5 The natural gas which is used for the measurement by the UM, shall be according to IGS-CH-033(1). The UM shall, as a minimum requirement, operate with any of the "normal range" natural gas composition mixtures specified in that standard. This includes relative densities between 0.554 (pure methane) and 0.87.

4.1.6 Standard volume measured at 1.01325 bara (14.696 psia) and 15.56 °C (60 °F).

4.1.7 For each meter design and size, the minimum, transition and maximum gas flow rate (q_{\min} , q_t and q_{\max}) passing through the UM should be specified by the manufacturer.

4.1.8 As some pressure-reducing control valves, designed to reduce audible noise, may produce very high levels of ultrasonic noise under certain flowing conditions and the ultrasonic noise from these "quiet" control valves can interfere with the operation of a nearby ultrasonic meter, so the UM shall be installed at the upstream of the regulator and the control valve according to the manufacturer instructions.

4.1.9 Filtration of the flowing gas is necessary for UM Application for avoiding the accumulation of deposits to a mixture of dirt, mill scale, condensates, lubricating oil and construction debris (for new installations).

4.1.10 When the UM is installed according to the operator's piping system, it will perform with in the specified flow-rate measurement accuracy limits from q_{\min} to q_{\max} .

4.1.11 The UM's output is typically an uncorrected volume, either per unit of time or accumulated. Therefore, an associated flow computer must be installed by the designer to correct for pressure, temperature, compressibility, and accumulated uncorrected and corrected volumes, and to provide the necessary data retention and audit trail. Optionally, the flow computer functions could be integrated into the UM's SPU by the manufacturer.

For bi-directional applications, the UM should be treated as two separate meters, associated with two "meter runs" in a single flow computer or with two separate flow computers.

For other applicable flow computer requirements, the designer should reference API MPMS Chapter 21.1. Flow measurement using electronic metering systems. A UM would be considered a "Linear Meter" in that document.

4.1.12 UM flange shall be according to ANSI B16.5 up to 24 inches and ANSI B16.47 for above 24 inches.

4.2 Materials

4.2.1 Cable jackets, rubber, plastics and other exposed parts shall be resistant to ultraviolet light, water, oil and grease.

4.2.2 UM flange material shall be carbon steel according to ASTM A 105.

4.2.3 UM body material shall be carbon steel according to API 5L or cast carbon steel according to ASTM A 216 Gr. WCB/WCC.

5. INSPECTION, TEST AND CERTIFICATIONS

5.1 All inspections, tests and certifications shall be done on each UM according to AGA report No. 9 together with the following additional requirements.

5.1.1 Visual inspection

Visual inspection includes checking of colour, flanges, nameplate, etc. In visual inspection, the meter bore and transducer ports should be inspected for accumulation of solids, erosion or other damage that would affect meter performance.

5.1.2 Hydrostatic test

The UM body shall be designed to withstand the internal pressure using an appropriate safety factor for the body material at maximum inlet pressure (P_{max}). It shall be tested to ensure it has sufficient strength to operate safely.

Each UM body shall be subjected to the strength test specified in 5.1.2.1. A certificate shall be delivered by the manufacturer for each UM certifying conformity with this clause according to EN 10204. The UM body type test is specified in 5.1.2.2.

5.1.2.1 Individual test

The test equipment shall not subject the meter to externally applied stress which may significantly affect the result of this tests.

At the discretion of the test facility the tests can be carried out with water, kerosene or any other suitable liquid having a viscosity of not greater than that of water, or with gas (air or any other suitable gas).

The meter shall be free of entrapped air when testing with a liquid.

The test shall be performed on a meter without external painting or coating at a minimum internal pressure of 1.5 times the maximum working pressure with a minimum of 2 bar.

The test shall be performed by applying pressure inside the assembled meter body with the connections closed.

Detectable leakage through the casing is not acceptable. Test duration shall be for a minimum 5 min.

If pressure tests in the presence of a representative of the purchaser are specified, painted meters from stock may be retested without removal of paint.

5.1.2.2 Type test

Records of all design calculations shall be available for inspection to insure that the materials and design of the meter casing comply with a recognized standard. The design calculation shall fulfil the strength requirements at a minimum temperature of -29°C and at a maximum temperature of 60°C .

5.1.3 Paint test

Painting of UM 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 of UM. None of each individual point shall be less than 100 microns.

C- Paint adhesion:

The test shall be done in accordance with BS3900 part E6 (1992) equivalent to ISO 2409(1992). Paint adhesion shall be better than classification No.1.

5.2 Inspection and Certificates

The manufactured UM 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.

5% of each item and lot (minimum one sample) 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 correlated to serial number and material test certificates according to requirements of NIGC specification:

- 1- Visual inspection
- 2- Hydrostatic test
- 3- Leakage test
- 4- Dimensional test
- 5- Zero flow verification test (Zero test)
- 6- Flow calibration test
- 7- Field Verification test
- 8- Electronic design test
- 9- Paint test

6. PAINTING

The external surface of the UM shall be thoroughly cleaned by removing all rust and mill scale. Surfaces to be painted, shall be completely free from grease, grit and other foreign materials.

UM shall be painted with organic zinc rich system according to BS 5493 reference No. SD3 with total thickness of 100 microns.

Paint specification shall be in accordance with reference No. DF of BS-5493.

Final colour shall be grey according to BS 381 C No.631.
Test requirements for painting shall be in accordance with paint test.

7. MARKING

The marking of each UM shall be according to AGA report No. 9 (Item 4.3.7).

8. PACKING AND PACKAGING

A- Each UM 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 wooden support.

C- The wooden supports shall be housed in wooden cases according to NIGC packing instructions under protection, packing, marking and dispatching.

9. DOCUMENTATION

The Documentation with technical quotation, after receipt of order and before shipment shall be according to AGA report No.9 (item 4.7).

**APPENDIX A
Data Sheet
(Normative)**

To be Filled by NIGC					To be Filled by Manufacturer/Supplier				
Inquiry No.:					Quotation No.:				
Inquiry Date:					Quotation Date:				
NIGC Standard : IGS-M-IN-104(1):2014					Catalogue No.:				
					Standard:				
Item	Inquiry Data				Offered Data				
	Indent Item No.	Size (in)	Class Rating	Quantity Required	Item	Offered Item No.	Size (in)	Class Rating	Quantity Offered

Manufacturer and supplier signature and stamp:

¹ This data sheet is an integrated part of IGS-M-IN-104(1):2014 and should not be used separately.

Item	Subject	To be Filled by NIGC	To be Filled by Manufacturer/Supplier
General	Tag No.	-----	-----
	Application	Custody transfer <input type="checkbox"/> Non custody transfer <input type="checkbox"/>	-----
	Flow Direction	Uni - direction <input type="checkbox"/> Bi - direction <input type="checkbox"/>	Uni - direction <input type="checkbox"/> Bi - direction <input type="checkbox"/>
	Pipe Size (in)	-----	-----
	Manufacturer	-----	-----
	Model No.	-----	-----
	Hazardous Area Classification	Class I, Division 1, Group D	-----
	Manufacturer Recommendation for Installing UM Near a Pressure Reducing Control Valve	-----	Please specify
Process Data	Process Fluid	Natural gas	-----
	Flow Rate (scm/h)	min.:-----max.:-----	min.:-----max.:-----
	Operating Design Pressure (barg)	-----	-----
	Gas Inlet Pressure (barg)	min.:-----max.:-----:	min.:-----max.:-----
	Gas Inlet Temperature (°C)	min.: -25 max: +55 Otherwise please specify:	min.:-----max.:-----
	Operating Design Temperature (°C)	-----	-----
	Ambient Temperature Range (°C)	min.: -29 max.: +60	min.:-----max.:-----
	Specific Gravity	-----	-----
	Standard Conditions	1.01325 bara & 15.56 °C (14.696 psia & 60 °F)	Yes <input type="checkbox"/> No <input type="checkbox"/>

Manufacturer and supplier signature and stamp:

Item	Subject	To be Filled by NIGC	To be Filled by Manufacturer/Supplier
Meter Data	Type	Transit time	-----
	UM Size (in)	-----	-----
	UM Class Rating	ANSI Class 600	Yes <input type="checkbox"/> No <input type="checkbox"/>
	UM Connection Type	Flanged end, raised face serrated finish, acc. to ANSI B16.5 <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
		Flangeless <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Flange Class Rating	-----	Yes <input type="checkbox"/> No <input type="checkbox"/>
	UM Flange Material	Carbon steel acc. to ASTM A 105(at least)	Yes <input type="checkbox"/> No <input type="checkbox"/>
	UM Body Material	Carbon steel acc. to API 5L, or, Cast carbon steel acc. to ASTM A 216 WCB/WCC	Carbon steel acc. to API 5L <input type="checkbox"/>
			Cast Carbon Steel acc. to ASTM A216 WCB/WCC <input type="checkbox"/>
	UM Face to Face Length (mm)	-----	-----
	Inlet/Outlet Pipe Size (in)	-----	-----
	Inlet/Outlet Pipe Schedule	-----	-----
	Pipe Material	-----	-----
	Inlet/Outlet Upstream/Downstream Piping Configuration Requirements	Manufacturer recommendations is required	Yes <input type="checkbox"/> No <input type="checkbox"/>
	UM Mounting	Horizontal	Yes <input type="checkbox"/> No <input type="checkbox"/>
Flow Conditioner	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>	
UM Equipped With	Flow computer with all related necessary accessories <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Flow Computer Installation	Indoor	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Transducer (or) Sensor	Number of Paths/Channels	At least 4 pairs	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Transmitting & Receiving Type	-----	Head to head <input type="checkbox"/> Reflection <input type="checkbox"/>
	Transducer Replaceable in Operation	-----	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Process Connection	-----	-----
	Transducer Mounting	-----	-----
	Transducer Type/Model	-----	-----
	Transducer Material	Titanium	Titanium <input type="checkbox"/> Others* <input type="checkbox"/>
	Transducer Housing Material	-----	-----
	Transducer Power Supply	-----	-----
	Transducer Enclosure Protection	Weatherproof to IP 65	-----

Manufacturer and supplier signature and stamp:

Item	Subject	To be Filled by NIGC	To be Filled by Manufacturer/Supplier
	Transducer Manufacturer	-----	-----
	Transducer Model No.	-----	-----
Transducer (or) Sensor	Transducer Enclosure Certification	-----	-----
	Transducer Elec. Connection	-----	-----
	Transducer Cable Type	-----	-----
	Transducer Signal Cable Length	-----	-----
	Transducer Critical Dimensions	-----	-----
	Transducer Max. Allowable Operating Pressure	-----	-----
	Transducer Operating Pressure Range	-----	-----
	Transducer Operating Temperature Range	-----	-----
	Gas Composition Limitations	-----	-----
Pressure & Temperature Transmitters Data	Transmitter Manufacturer	-----	-----
	Transmitter Model No.	-----	-----
	Transmitter Type/Output Signal	-----	-----
	Transmitter Housing Material	-----	-----
	Transmitter Power Supply	-----	-----
	Transmitter Enclosure Protection	-----	-----
	Transmitter Enclosure Certification	-----	-----
	Transmitter Elec. Connection	-----	-----
	Transmitter Range	-----	-----
	Overall Accuracy/Repeatability	-----	-----
	Local Indication Requirement	-----	-----

Manufacturer and supplier signature and stamp:

Item	Subject	To be Filled by NIGC	To be Filled by Manufacturer/Supplier	
SPU Data	Power Supply	12 VDC <input type="checkbox"/> 24 VDC <input type="checkbox"/> 110 VAC , 50 Hz <input type="checkbox"/> 220 VAC , 50 Hz <input type="checkbox"/> Others* <input type="checkbox"/>	1) 12 VDC <input type="checkbox"/> 2) 24 VDC <input type="checkbox"/> 3) 110 VAC , 50 Hz <input type="checkbox"/> 4) 220 VAC , 50 Hz <input type="checkbox"/> 5) Others* <input type="checkbox"/>	
	Out Put of SPU, Two Serial Data Interface (Data Port)	2 × RS- 232 and 2 × RS- 485	RS-232 and RS-485 <input type="checkbox"/> or Equivalent-----	
	Meter Capability be Equipped with Analog (4-20 m A, DC)	Yes <input type="checkbox"/> No <input type="checkbox"/>	Yes <input type="checkbox"/> No <input type="checkbox"/>	
Tests	Hydrostatic Test	1. Individual Test	Required for each UM	Yes <input type="checkbox"/> No <input type="checkbox"/>
		2. Type Test	Test certificate ** is required	Yes <input type="checkbox"/> No <input type="checkbox"/>
	Leakage Test	Required for each UM	Yes <input type="checkbox"/> No <input type="checkbox"/>	
	Dimensional Measurements	Required for each UM	Yes <input type="checkbox"/> No <input type="checkbox"/>	
	Zero-Flow Verification Test (Dry Calibration)	Required for each UM	Yes <input type="checkbox"/> No <input type="checkbox"/>	
	Flow Calibration Test (Wet Calibration)	Required for each UM ***	Yes <input type="checkbox"/> No <input type="checkbox"/>	
	Field Verification Test	Procedure is required	Yes <input type="checkbox"/> No <input type="checkbox"/>	
	Electronics Design Testing as per AGA Report No.9 (Appendix "B")	Type test certificate is required ***	Yes <input type="checkbox"/> No <input type="checkbox"/>	
	Visual Inspection	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"/>		
Guarantee	Two years after shipment or one year after putting in service, whichever ends earlier	Yes <input type="checkbox"/> No <input type="checkbox"/>		

Manufacturer and supplier signature and stamp:

* Please specify.

** **Note:** Certification: In all cases for certifications, they shall be issued by an impartial laboratory or authority.

*** If it is not required, the technical reason shall be specified.