



شرکت ملی گاز ایران

مدیریت پژوهش و فناوری

امور تدوین استانداردها

IGS

مشخصات فنی خرید

دستگاه فیلتر گاز (خشک)

Dry Gas Filter



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شرکت ملی گاز ایران



دفتر مدیر عامل



ابلاغ مصوبه هیأت مدیره



مدیر محترم پژوهش و فناوری



باسلام،

به استحضار می‌رساند در جلسه ۱۷۲۴ مورخ ۱۳۹۵/۱۲/۲۲ هیأت مدیره، نامه شماره گ.۹/۰۰۰/۱۷۹۱۵۸ مورخ ۹۵/۱۲/۱۶ مدیر پژوهش و فناوری در مورد تصویب نهایی استاندارد تحت عنوان "مشخصات فنی دستگاه فیلتر گاز (خشک)" به شماره استاندارد (1) IGS-M-PM-105 مطرح و مورد تصویب قرار گرفت .
این مصوبه در حکم مصوبه مجمع عمومی شرکت‌های تابعه محسوب و برای کلیه شرکت‌های تابعه لازم الاجرا می‌باشد .



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FOREWORD

This standard is intended to be mainly used by NIGC and 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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1. SCOPE

This specification covers the general requirements for the design, materials, manufacturing, testing, inspection, packing and Packaging for shipment of a dry gas filter and the required instrumentation. The vendor shall furnish complete operating units including all necessary items such as valves, etc to ensure satisfactory, safely operation.

The specification does not supersede the accepted pressure vessel codes but only supplements them with regard to certain conditions not fully covered in the codes.

The equipment shall be designed for full load, unattended continuous operation without the provision of special housing or shelters etc.

The unit shall be completely assembled, tested and painted according to the standards, codes and specification quoted here.

2. References

The latest revisions of all codes and standards their subsequent addenda are intended.

2.1. Normative References

ANSI ASME-VIII-D1 ASME Boiler and Pressure Vessel Code SECTION VIII "Rules for Construction of Pressure Vessels" Division 1

ANSI ASME-IX ASME Boiler and Pressure Vessel Code SECTION IX "Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Braziers ; and Welding, Brazing, and Fusing Operators"

ANSI ASME B.16.5 "Pipe Flanges and Flanged Fittings NPS 1/2 through NPS 24 Metric/Inch Standard"

ANSI ASME B.16.11 "Forged Fittings, Socket-Welding and Threaded".

ANSI ASME B.16.20 "Metallic Gaskets for Pipe Flanges Ring-Joint, Spiral-Wound, and Jacketed".

ANSI ASME B.16.21 "Non-Metallic Flat Gaskets for Pipe Flanges".

ANSI ASME B.18.2.1 "Square and Hex Bolts and Screws (Inch Series)".

ANSI ASME B.18.2.2 "Square and Hex Nuts (Inch Series)".

IGS-M-PM-111 "Cardtrige dry gas filter"

IGS-M-PL-002-1(3) Plug Valves size 2 to, 24", part(1)

IGS-M-PL-002(0): Part 2 Plug Valves size $\frac{1}{2}$ " to $1\frac{1}{2}$ "

IGS-O-CH-042: Painting Procedure for Gas Industry

IPS-G-GN-210: Packing & Packages

2.2. Informative References

ANSI ASME B31.3 ASME Code for Pressure Piping, B31 "Process Piping".

ANSI ASME B31.8 ASME Code for Pressure Piping, B31 "Gas Transmission and Distribution Piping Systems".

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

3. DEFINITIONS

Filter: A device is designed to remove particle size up to 5 μm diameters.

Actual elements Filtration Area: the measure of usable media in a filter.

Particle Size: Light scattering equivalent size expressed as a diameter in μm (10^{-6} m)

Pressure Drop: The resistance of a device to the flow of fluid through it. The pressure drop of a filter is measurement of its resistance to gas flow through it.

Cartridge: It is a part of dry gas filter element that can be easily remove and replaced when it is worn out.

Quick type closure: All traps shall be provided with quick opening end closure to allow one man operation for both opening and closing in approximately one Minute without use of additional device.

4. TECHNICAL SPESIFICATIONS

4.1. COMPONENTS

4.1.1. The dry gas filter shall be cast or fabricated construction and self supporting by means of feet, skirt or legs whichever, is the most suitable for this purpose.

4.1.2. Two Liquid drain valves as per clause 5.6 of this specification are required.

4.1.3. Differential pressure gauge (such as piston type), as per clause 5.8 of this specification are required.

4.1.4. A Quick type closure is preferable but bolted types are also acceptable for following body sizes and pressure ratings.

Flange Class	Body Size (Inches)*
ANSI 150	10
ANSI 300	6
ANSI 600	6

* (Other sizes are not including)

The closure shall have appropriate handles for lifting it by hand.

4.1.5. A Quick opening end closure as per 5.5 of this specification is required for sizes not mentioned in 4.1.4

4.2. Materials

4.2.1 The dry gas filter shall be fabricated acc. to ASME BOILER AND PRESSURE VESSEL CODE: SECTION VIII DIVISIONS 1 and section II.

5. DESIGN

5.1. Filter shall be designed, manufactured, painted, inspected and tested in accordance with the latest edition of the ASME boiler and pressure vessel code, section VIII, division 1 and its subsequent added. The filter shall be constructed under all considerations of the pressure vessels according to ASME SEC VIII, Div.1

The vessels will be operating in outdoor condition, under the sun and the rain and onshore condition.

5.2. Filter shall be designed to withstand the loads exerted by internal pressure, weight of the vessel, wind, earthquake, impact and the temperature. It shall be assumed that wind and earthquake loads do not occur simultaneously, so the vessel should be designed for either wind or earthquake loading whichever is greater.

The Gas flow should be as uniform as possible across the face of the filter velocity inside body cross section shall be less than velocity inside element bore cross section.

Design of the filter shall be so that gas flow at the entrance nozzle does not directly contact the element. Also the flow direction will be from out to inside of the cartridge element.

Filters should not be used beyond their specifications and shall be sized for worst condition of flow and pressure.

Surfaces of pressure parts, and non-pressure parts directly welded to the pressure shell or otherwise non-removable and exposed to the contained media shall have either corrosion allowance added, At least 1.6 mm, or be fabricated from corrosion resistance material. No corrosion allowance shall be added to replaceable non-pressure parts unless specified on the vessel data sheets or drawings.

5.3. For trapping and retaining finer particles, smaller than 5 μm diameter, which are the most damaging and have harmful effects on pressure equipments, gas penetration velocity is generally low, with a approximately of 0.1m/sec.

5.4. Filter shall be designed to remove entrained solid particles down to 5 μm diameter from the dry gas stream using a disposable cleanable cartridge element refer to the IGS-M-PM-111.

5.5. Elements are usually sized for a clean differential pressure (DP) gauge of 0–25 or 0–30 psig, and when this DP reaches 5-10 psi shall be check and if needed shall be replaced.

5.6. All filters except those of 4.1.4 shall be fitted with a quick and easy opening full bore end closure to allow rapid replacement of cartridge elements with the minimum of tie - down, closure to be fitted with davit.

5.6.1. Designing of dry gas filter closure must be according ASME SEC VIII, Div.1 Annex 24. Closures shall comply with ASME VIII division 1 sub section a part UG-35. Good condition and full engagement with uniformly distributed load of locking element should be checked by visual external observation when the closure is in the closed position, such as Yoke type.

5.6.2. Yoke type closures shall be defined as a double anchored retaining bridge with a single screw locking element such that the cover can be swung clear of the filter in more than one direction.

5.6.3. Quick opening closure shall be designed so that no tools, lifting gear or specialized knowledge a r e required for operation.

5.6.4. The filter shall be equipped with a vent valve to depressurize it prior to opening the closure (Safety bleed interlock).

5.6.5. Yoke type closures must however be designed so that on operation of the locking element the cover is lifted clear of the filter body, so giving visual indication that all residual pressure has been removed prior to releasing retaining bridge.

5.6.6. A 360 locking type closures shall incorporate a safety bleed interlock.

The safety bleed interlock shall ensure that the closures cannot be removed until the filter has been depressurized.

5.7. Two drain valve(s) as per clause 4.1.2 of this specification shall be flanged end lubricated plug type . Lubricated plug valve(s) size shall be min. 2 inches for 6 inches body size and larger and min. 1 inch for 4 inches body size and smaller . (Ref. IGS-M-PL-002-1(3)).

- 5.8. Differential pressure gauge should be either bellow or piston type. For bellow differential pressure gauge type, this specification shall be equipped with a 3-way valve for zero calibration. The differential pressure gauge must be connected to the filter body via needle valves in both the high and low pressure lines. Differential pressure indication shall be from 0 to 25 or 30 psig.
- 5.9. The maximum allowable working pressure for the vessels shall be limited by the shell or head.
- 5.10. Manufacturer of filter shall not commence prior to receipt of drawing and design approval from the purchaser.
- 5.11. All surfaces of pressure parts and non-pressure parts directly welded to the pressure shell or otherwise non-removable and exposed to the contained media shall have either the specified corrosion allowance added, or be fabricated from corrosion resistance material. No corrosion allowance shall be added to replaceable non-pressure parts unless specified on the vessel data sheets or drawings.
- 5.12. Pining in shells and heads shall be studded in accordance with the applicable code and shall be adequate for pressure and temperature to be stamped on the vessel. Each reinforcement pad or segment shall be provided with a $\frac{1}{4}$ UNC "Tell-tale" hole.
- 5.13. Fabricated vessels and heavy sections of vessels shall be provided with suitable lugs or eye-rings to facilitate handling during transport and erection.
- 5.14. Ax. Velocity through any cross section of filter such as inlet and outlet, inside filter case, and filter element, etc, shall not exceed 20 m/sec.
- 5.15. The filter shall be designed so that:
- 5.15.1. The ratio of element(s) outer surface area to element bore area shall not be less than 8, i.e. element(s) length divided by element inside diameter shall be greater than or equal to 2 (for Polypropylene or Polyester media element)
- 5.15.2. The cross sectional area of annulus between case and element shall be greater than element inner bore cross-sectional area.
- 5.15.3. Sufficient access should be provided for servicing the filters, such as ladder or platform.

6. WELDING (Manufacturing)

6.1.All fabricated vessels must be designed; manufacturer tested and inspected according to ASME code section VIII division 1.

6.2.All welds shall be made by the shielded metal arc welding are using electrodes of a composition and quality compatible with the vessel materials ,in accordance with “b” part UW of the ASME code, section VIII/ section IX divisional.

6.3. The suppliers shall specify the make and quality of electrodes which the proposes to utilize in fabrication. All welders shall be qualified under section IX of A S M E code work involving welding shall not be in conflict to any other codes without the prior approval of purchaser.

6.4.Welding by automatic or semi-automatic equipment is the gas bare wire, carbon – are or forged welding will not be permitted unless specified by the purchaser.

6.5. All nozzles and small connections and their utilities shall be attached to the vessel with full penetrate.

6.6. Circumferential welds shall be located so that all internals shall be fully fitted in place.

7. HEAT TREATMENT

7.1. Heat treatment including pre or post-weld heat treatment, of vessels shall be in accordance with ASME pressure vessel code, section VIII division 1.

7.2. All flanged facings and threaded connections must be adequately protected against oxidization during the heat treatment.

8. PAINTING

Surface preparation and painting shall be in accordance to IGS-O-CH-042.

9. TESTING

9.1. All vessels shall be tested in accordance with the ASME SEC VIII & IX, rules or regulations.

9.2. All welded attachments provided with “Tell – Tale” holes shall be tested by pneumatic pressure prior to the thermal stress relief and final hydrostatic test.

9.3. All test certificates must contain the purchaser's name and order number whether they emanate directly from the main supplier or a sub- contractor.

9.4. Test certificates must be approved by the purchaser before dispatch instructions are given.

10. INSPECTION

10.1. Inspection shall be done base on manufacturer QCP which is approved by client.

10.2. The purchaser reserves the right of inspection.

Mandatory inspection shall be carried out to meet the requirements of ASME code Section VIII Division 1.

10.3. In addition to any mandatory code inspection required, all materials and fabrication shall be subject to inspection by the purchaser if so desired.

10.4. Prior to final inspection , all slag , loose scale, dirt, grit , weld spatter, print , oil and other foreign matter shall be thoroughly removed so that inspection may be carried out to the best advantage.

10.5. Following inspection, any defects shall be repaired and the repair weld shall be re-heat treated, if originally required and re-examined by the prescribed method for freedom from defects (procedures shall be approved by purchaser). If correction is required and involves serious alteration, the written approval of the purchaser shall be obtained before proceeding with such corrections.

10.6. Inspection Notice

10.6.1. The supplier shall give adequate notice to the purchaser prior to all inspection/ test visits required by the specification and design codes.

10.6.2. Where the purchaser desires to visit the works to inspect the work of witness tests, adequate notice shall be given to the supplier.

11. PLANT ACCESS

11.1. The supplier shall allow free access to the purchaser to all parts of his or his sub-contractors works, for the purpose of carving out any inspection or witnessing test, etc.

11.2. The supplier shall afford the purchaser, without charge, all reasonable facilities to enable him to verify that vessels are being manufactured and tested in accordance with this specification.

12. ACCEPTANCE

12.1. The purchaser's approval of work and acceptance for shop tests etc. , and / or releasing shipment note shall in no way release or relieve supplier's responsibility for carrying out all provisions of the specification , codes and/or fulfillment of the guarantee, nor does the purchaser by such approval and/ or release, assume any responsibility whatsoever for such provisions and/or guarantee.

12.2. Release notes shall be issued by the purchaser for each vessel after final inspection and testing at the works and vessels shall not be dispatched until such release notes have been issued.

13. SHIPMENT

13.1. Prior to shipment , the vessel shall be thoroughly cleaned and all water , dirt, sand, weld metal spatter and other foreign matter shall be removed.

13.2. All testing liquids shall be removed and units dried before packing.

13.3. All flanged openings properly protected with suitable steel covers. Tapped openings shall be protected with threaded steel plugs screwed in.

13.4. All loose gaskets shall be packed in a separate wooden case.

13.5. Before shipment is made, the purchaser's written approval of the proposed method of shipment must be obtained.

13.6. Export packing shall be carried out in accordance with good practice, the minimum acceptable standard shall be as defined in the applicable parts of IPS-G-GN-210 standard. The packing shall be appropriate for storage without cover on site for up to three months prior to installation.

14. REPORTS AND DATA SHEETS (DOCUMENTATION)

14.1. The supplier shall provide the followings with quotation.

14.1.1. List of recommended spare parts with unit prices to cover:

- Initial commissioning
- First 2 years operation

14.1.2 .Installation, operating, maintenance and spare parts manuals.

14.2. "Construction drawings and material lists" shall be submitted by supplier after placing.

The order and prior to manufacturing for NIGC approval.

14.3. The following document are to be included in the manufacturer's data book. Which shall be provided by supplier.

14.3.1. A copy of the code calculation.

14.3.2. Design drawings and data.

14.3.3. Construction drawings including material lists.

14.3.4. Final construction drawings.

14.3.5. Welder's qualification procedures and certificates

14.3.6 . Welding procedures (including repair welding).

14.3.7. Production test procedures and certificates.

14.3.8. Material certification covering mechanical testing and chemical analysis of all pressure containing parts and attachments.

14.3.9. Stress relief or other heat treatment charts duly signed by the inspector.

14.3.10. Radiography and/or other non-destructive testing procedures and certification, including sketches showing test location as and where necessary.

14.3.11. Final, as fitted, general arrangement drawings approved by inspection authority.

14.3.12. ASME stamps or relevant national accreditation

14.3.13. Facsimile of nameplate and identification hard stamping.

14.3.14. Pressure testing certification.

14.3.15. General certificate of inspection copy obtained from inspection authority.

14.3.16. Final release note:

15. Documents

All following documents shall be submitted to the purchaser .

A . AT QUOTATION STAGE

- A.1- General arrangement drawings showing outline dimensions and weight. (Two sets).
- A.2- List of recommended spare parts with unit prices to cover initial commissioning and two years operation.
- A.3- Original catalogues.
- A.4- Maintenance, commissioning installation and operation manual.
- A.5- All documents shall be prepared in English.

B. AT ORDERING STAGE

- B.1- Final general arrangement drawings showing outline dimensions such as saddles, nozzles orientation, weight , foundation bolt holes, all piping systems shown on the data sheet , internal parts, etc .(transparencies)
- B.2- Certificates of inspection, weld procedure, welder and welding qualification, materials, non- destructive tests, hydrostatic test, heat treatment and specified safety relief valve capacity.
- B.3- Facsimile of nameplate and hard stamping.
- B.4- ASME U or relevant national accreditation forms.
- B.5- The supplier shall also forward to the purchaser, seven copies of all sub-orders. this , shall be endorsed with the purchaser's name and order number.
- B.6- Illustrated spare parts list with prices.
- B.7- Operating and installation instructions.
- B.8- Maintenance manual.

C - At delivering stage

- C.1- The final book regarding requested documents at ordering stage and whole control quality (QC) documents of manufacturing procedure.

The supplier shall also forward to the purchaser 3 copies of all orders and suborders. Theses shall be endorsed with purchaser name and order number and must indicate to the sub-

contractor that the purchaser reserves the right to expedite/ inspect if he so wishes at any time during working hours.

16. GUARANTEE

16.1. Manufacturer shall guarantee the compliance of material and performance of the supplied equipments with this specification.

16.2. The period of guarantee shall be one year after equipment goes on stream or eighteen months after date of shipment, whichever occurs first, or according to the contract.

16.3. Supplier shall agree to repair or replace any equipment which proves to be defective during the above mentioned period.

17. MISCELLANEOUS

17.1. Radiographic examination shall be performed when required by the ASME code.

17.2. The completed vessel shall be provided with a name plate securely attached to the vessel by welding. The name plate shall bear the following information:

- Manufacturer Name
- Type and Model
- Size / Class
- Working Pressure
- Design Pressure
- Test Pressure
- Working temp.
- Weight
- PWHT
- Month/year of built
- Filtration area

17.3. If the vessel is post-weld heat – treated, no welding is permitted after stress relieving.

17.4. Removable internals shall be installed after stress relieving.

APPENDIX

DESIGN CRITERIA DATA-SHEET

Table 1

ANSI Rating	ANSI 150 - OPERATING PRESSURE: 45 ~ 60 PSIG							
STD Flow rate, SCM/H	400	1,000	2,500	4,000	5,000	6,500	10,000	15,000
Nozzle Size, in.	2"	3"	4"	6"	6"	8"	10"	12"
G number of element	1	1.5	2.5	3	4	4	5	6
Element ID, mm	50	69	110	138	186	186	246	320
Element OD, mm	95	120	200	252	299	299	390	447
Element L, mm	165	210	283	320	415	415	470	625
Actual elements FA, m ²	0.25	0.46	1.45	1.9	2.9	2.9	4.6	8.4
The required number of elements depends on filtration area of the element material and is according to the latest edition of IGS-M-PM-111								

Table 2

ANSI Rating	ANSI 300 - OPERATING PRESSURE: 150 ~ 250 PSIG							
STD Flow rate, SCM/H	400	1,000	2,500	5,000	10,000	15,000	20,000	25,000
Nozzle Size, in.	2"	2"	3"	4"	6"	6"	8"	8"
G number of element	1	1	1.5	2.5	3	4	4	5
Element ID, mm	50	50	69	110	138	186	186	246
Element OD, mm	95	95	120	200	252	299	299	390
Element L, mm	165	165	210	283	320	415	415	470
Actual elements FA, m ²	0.25	0.25	0.46	1.45	1.9	2.9	2.9	4.6
The required number of elements depends on filtration area of the element material and is according to the latest edition of IGS-M-PM-111								

Table 3-A

ANSI Rating	ANSI 600 - OPERATING PRESSURE: 400 ~ 1050 PSIG					
STD Flow rate, SCM/H	2,500	4,000	5,000	10,000	15,000	25,000
Nozzle Size, in.	2"	2"	3"	4"	4"	6"
G number of element	1	1	1.5	2	2.5	3
Element ID, mm	50	50	69	86	110	138
Element OD, mm	95	95	120	165	200	252
Element L, mm	165	165	210	270	283	320
Actual elements FA, m ²	0.25	0.25	0.46	0.94	1.45	1.9
The required number of elements depends on filtration area of the element material and is according to the latest edition of IGS-M-PM-111						

Table 3-B

ANSI Rating	ANSI 600 - OPERATING PRESSURE: 400 ~ 1050 PSIG						
STD Flow rate, SCM/H	30,000	40,000	50,000	60,000	75,000	100,000	150,000
Nozzle Size, in.	6"	8"	8"	8"	10"	10"	12"
G number of element	3	4	4	4	5	5	6
Element ID, mm	138	186	186	186	246	246	320
Element OD, mm	252	299	299	299	390	390	475
Element L, mm	320	415	415	415	470	470	625
Actual elements FA, m ²	1.9	2.9	2.9	4.35	4.6	6.9	12.6
The required number of elements depends on filtration area of the element material and is according to the latest edition of IGS-M-PM-111							