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شرکت ملی گاز ایران  
مدیریت پژوهش و فناوری  
امور تدوین استانداردها

# IGS

مشخصات فنی خرید

تجهیزات گرم کننده گاز ( غیر مستقیم-آبی)، نوع مشعل دمنده دار

ابلاغ مصوبه هیأت مدیره

## مدیر محترم پژوهش و فناوری

باسلام،

به استحضار می‌رساند در جلسه ۱۹۴۸ مورخ ۱۴۰۰/۰۹/۰۱ هیأت مدیره، نامه شماره گ.۹/۰۰۰/۹۱۸۴۶ مورخ ۱۴۰۰/۰۷/۲۶ مدیر پژوهش و فناوری در مورد 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)

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## Foreword

This standard specification replaces IGS-M-PM-106(1), which has been technically revised based on API specification 12k (2009), and up dated, it 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 minimum requirements for designing, material, fabrication, testing, inspection, marking, packing and shipment of indirect water bath heaters with forced draft burner to be used in natural gas pressure reducing stations.

Each deviation of this specification, shall be clearly stated on the technical information submitted by the supplier/manufacturer. The supplier/manufacturer shall furnish unit completely, including all necessary parts to insure satisfactory, economical and safe operation.

## 2. REFERENCES

Supplier shall refer to the latest editions of all the following mentioned standards.

All heaters shall be in design and fabrication in accordance to:

**API 12K (2009)** "Specification for Indirect Type Oilfield Heaters"

**DIN 580(2007)** "Lifting eye bolts"

**DIN 4788-1(1977)** "Gas Burners without Blowers June; Superseded in Parts by DIN EN 298"

**EN 50156-1(2015)** "Electrical Equipment for Furnaces and Ancillary Equipment, Requirements for Application Design and Installation"

**EN 676(2003)** "Amd 1 Automatic Forced Draft Burners for Gaseous Fuels AMD 9857"

**EN 837-1(1998)** "Standard pressure gauges"

**EN 60529(1992)** "AMD 2 Degrees of Protection Provided by Enclosures (IP Code) AMD 10931"

**EN 303-1(2003)** "Heating Boilers with forced draft burners"

**EN161 (2007)** "Automatic shut off valves for gas burners and gas appliances"

**ISRI 7595(1387)** "Automatic forced draft burners for gaseous fuels- specification and test methods"

**IEC 60034-1(1998)** "Rotating Electrical Machines"

**IEC 60079(2007)** "Exclusive Atmosphere"

**IEC 60529C (1992)** "Degrees of protection provided by enclosures (IP Code)"

**IEC 60770-1(1999)** “Transmitters for Use in Industrial-Process Control Systems”

**IEC 61520(2000)** “Metal Thermo wells for Thermometer Sensors - Functional Dimensions”

**IEC/EN 60204-1(ISO/IEC/EN 81346:2010)** “Safety of Machinery - Electrical Equipment of Machines - Part 1: General Requirements”

**EN 12953-11(2003)** “Shell boilers. Acceptance tests”

**IPS-c-el-115(1386)** “Construction Standard for Electrical Installation”

**IPS-c-tp-101(1386)** “Surface Preparation”

**IPS-c-tp-102(1)(1388)** “Construction standard for painting”

**IPS-g-gn-210(1997)** “General standard for packing & packages”

**IPS-m-pm-115(1386)** “Material & equipment standard for centrifugal pumps for general services”

**IGS-O-CH-042(1385)** "Painting Procedure for Gas Industry Installations"

**IGS-R-CH-055(1395)** "Fluid Condition Monitoring of Indirect Water Bath Heaters in City Gate Stations"

**IGS-M-CH-033(1)(1393)** “Specification for Iranian Natural Gas Quality”

**IGS-M-IN-103(2002)** “Domestic 2-PSI gas”

**IGS-M-IN-102(2) (2015)** “Turbine meters”

**IGS-E-EL- 032(0) (1396)** “Explosion proof electrical equipment’s layout in risk areas for pressure reduction stations (TBS/CGS) and measuring stations (MS)”

### **3. DEFINITIONS**

#### **Ambient Temperature**

Usually used to refer to the temperature of the air in which a structure or a device operates.

#### **Burner Turn Down**

An important function of burners is turndown. This is usually expressed as a ratio and is based on the maximum firing rate divided by the minimum controllable firing rate.

#### **Forced Draft Indirect Water Bath Heater**

Indirect Water bath heater that equipped with burner in which the total air for combustion is supplied by means of a fan.

**Instrumentation**

Any system or combination for measurement and control.

**Fail – Safe**

The action of a device to go to a safe operating condition when a failure occurs.

**Pressure Relief Device**

A device which is installed to vent gas from a system being protected in order to prevent the gas pressure from exceeding a predetermined limit by venting the gas into atmosphere.

**Primary Gas Pressure Regulator**

Device on pressure skid which maintains the outlet pressure constant independent of the variation in inlet pressure and/or flow rate within defined limits.

**Inlet Pressure**

Pressure at the inlet of the regulator.

**Outlet Pressure**

Pressure at the outlet of the regulator.

**Heater Capacity**

The rate of flow through station under standard condition with minimum inlet pressure.

**Burner Capacity**

Heat input range of the burner the maximum and minimum heat inputs shall be measured under the standard conditions and shall be in accordance with the values stated by the manufacturer within  $\pm 5\%$ .

**Shut off device**

An ancillary designed to quickly shut off the gas flow in the event of an abnormal pressure being detected within system it protects.

**Burner System**

System for firing the heater designed for the specific fuel to be used.

**Coil Area**

Heat transfer area and is normally calculated using the outside surface area of the pipe.

**Heater Bath**

Indirect heating medium, limited to water or water solutions.

**Shell**

The vessel which contains the coil, fire-tube and heater bath.

**Stack Rain Shield**

Device attached to the top of the stack to prevent rain from falling directly into the stack. It may also serve as a stack downdraft diverter.

**Expansion Tank**

A chamber that may be directly connected to the heater shell to permit the shell to be completely filled with water.

**Forced Draft Burner**

Burner in which the total air for combustion is supplied by means of a fan.

**Fire Tube**

Part of the appliance in which the combustion takes place. It consists of combustion chamber and flue gas return.

**Filter**

Device that enables foreign elements, which might otherwise cause failures in the system, to be collected.

**Standard Condition**

The conditions to which a volume of gas is converted (i.e. base gas temperature 15.56°C (60°F) base pressure 1013.25 mbar (14.696 psi).

**Natural Gas**

The natural gas Specification is according to IGS-M-CH-033(1).

**4. TECHNICAL SPECIFICATION****4.1 Heater Shell**

Shell material may be ASTM A36 or equivalent. All bolt and nuts materials used in shell flanges shall be ASTM A193 & ASTM A194 respectively. Heater shell shall provide in normal operation a homogenate temperature in the water bath. Therefore, the unit should be equipped with mixers, circulation pumps or other temperature homogenizing devices.

**4.1.1** An expansion tank shall be provided on top of heater shell.

**4.1.2** A ladder including platform, if any, with handrail and back protection, shall be provided for easy access to the expansion tank.

**4.1.3** A 2" gate valve (class 150) with blind flange shall be provided at the bottom of shell for drain purposes.

**4.1.4** The shell and heads shall be insulated with 50mm thickness fiber glass insulation.

equivalent having an aluminum cladding with min. thickness 0.8mm.

**4.1.5** Before insulation, shell shall be painted according to painting procedure in this standard (sec.8).

**4.1.6** Shell permissible out of roundness after welding shall be according to ASME sec. VIII, Div.1 part UG-80.

**4.1.7** Insulating gaskets used in the shell flanges shall be suitable in high temperature services and durability specification in outdoor conditions. It shall have good characteristics in water and ethylene glycol mixtures.

**4.1.8** All T joints welds shall be 100% tested by radiography. for other welds (longitudinal and circumferential) one spot shall be examined on each vessel for each 50 ft. (15m) radiography accordance with UW-52 of ASME SEC.VIII Div.1.

100% of nozzle welded connections to shell shall be tested by LPT (Liquid Penetrate Test) method.

**4.1.9** Tightening procedure shall be considered by manufacturer for flanges bolt & nuts fastening.

**4.1.10** Shell shall be reinforced enough to prevent any deformation because of coils, fire-tubes and water-ethylene glycol mixture weight.

**4.1.11** Heater shell shall include permanent lifting lugs.

**4.1.12** Shell shall be equipped with suitable thread-o-let for measuring water temperatures. For performance test calculations according to ANNEX (E) (or some methods that will be approved in related future standards), That should be between coil and fire tube and not to be near the shell. Additionally, equipped with 1/2" thermo-well with 1/2" NPT male, stainless steel temperature gauges, 100mm dial an appropriate stem length with safety glass and red and black lettering, dual scale in centigrade and Fahrenheit, adjustable pointer. (Gauge range -20°C ~ +100°C).

**4.1.13** Shell shall be equipped with 1/2" thread-o-let and 1/2" thermowell with 1/2" NPT male temperature sensor (by transmitting capability), also an appropriate stem length for controlling of shell high temperature. Thermometer shall be installed on shell via adequate thermo-well and thread-o-let.

**4.1.14** Construction of heater shall be such that the removal of the coil and fire tube/fire box shall be from opposite ends of the shell.

**4.1.15** If pump is utilized for homogenizing temperature, it shall be as follow:

- Single-stage in line centrifugal casing pump according to IPS-M-PM-115.

- Preferred canned rotor type, without shaft seal and with bearings lubricated by the pump liquid.

## **4.2 Expansion Tank**

**4.2.1** Expansion tank material may be ASTM A36 or equivalent. All bolts and nuts materials used in expansion tank flanges shall be ASTM A193 & ASTM A194 respectively.

**4.2.2** The expansion tank is designed to reduce internal corrosion within the heater shell by keeping the heater shell liquid packed and moving the wet dry interface of the expanding bath media from the heater shell into the expansion tank.

**4.2.3** The expansion tank is designed to contain 100% of the expanded bath media from a temperature of 40°C to the maximum operating temperature. Whereas manufacture a client agreement is preferred.

**4.2.4** Bath media expansion reservoir designed to hold 6% of the total bath media. Whereas manufacturer and client agreement is preferred.

**4.2.5** Expansion tank shall be insulated same as main shell insulation instruction. Shell heads shall be insulated same as main shell insulation instruction (mass loss should be Consider).

**4.2.6** Expansion tank shall be equipped with low level alarm and filling connection. Also for prevention of mass lost, the roof of expansion tank shall be always closed.

## **4.3 Skid**

**4.3.1** Skid material may be ASTM A36 or other carbon steel material recommended by manufacturer.

**4.3.2** Lifting lugs shall be provided with sufficient strength to allow lifting the entire assembly without causing any damage to the shell and the other parts.

**4.3.3** The heater should be self-contained and skid mounted.

**4.3.4** Structural strength of skid shall be sufficient to withstand forces due to shipping and handling as well as support the vessel and equipment. Skid shall be self-supporting rigid steel assemblies having adequately sized members to permit handling of the unit without deformation of the skid members.

**4.3.5** Before insulation, skid shall be painted according to painting procedure as follow by sec. 8

#### 4.4 Fuel Pressure Reducing Skid

**4.4.1** The purpose of the pressure reducing skid is to reduce the natural gas pressure to provide low pressure fuel gas to feed the secondary regulator.

**4.4.2** All components shall be easily accessible and removable. For that reason, all in-line components shall be flanged. Threaded ends are allowed for small components smaller than 1" such as drain and vent valves, manometer valves, and valves on water circuit.

**4.4.3** The pressure reducing skid shall be provided with suitable earth lugs.

#### 4.5 Coil

**4.5.1** Coil shall be made of seamless pipe, ASTM A53 Gr. B or ASTM A106 Gr. B/C or API 5L Gr.B, Schedule No.80.

**4.5.2** Inter connections of coil passes and header shall be fabricated according to ANSI/ASME B16.9 or standard bend collector according to TEMA, same size and schedule of coil pipe, seamless and with ASTM A234 WPB/C material.

**4.5.3** Proprietary fittings should be ASTM A105 or ASTM A182 material.

**4.5.4** Coil shall be easily field removable and shall be such that the removal of the coil and fire tube/fire box shall be from opposite ends of the shell for periodic inspection and maintenance.

**4.5.5** Supporting wheels shall be run on guiding rails, for coil section weight is over than 2000Kg.

**4.5.6** The entire coil shall be supported on wheels or roll bearing which shall withstand 15 years of operation.

**4.5.7** Precaution shall be taken against buoyancy of the coil.

**4.5.8** All coil tubes shall be supported having allowances for thermal expansion.

**4.5.9** Maximum allowable gas velocity in coil shall be 20 m/sec.

**4.5.10** Inside coil header cross sectional area shall be at least equal to total inside coil branched area.

**4.5.11** Inlet and outlet flanges shall be welding neck, raised face, ANSI 600.

**4.5.12** All joints, shall be butt welded and tested 100% by radiography test methods according to ASME Section IX, V and VIII.

**4.5.13** All weldolet and thredolet shall be down 100% NDT (for accessible parts 100% RT).

**4.5.14** All 4" and smaller connections between coils and headers shall be used welded

and more than 4" shall be used sweepolet or standard tee for  $d \geq 1/3D$  and weldolet for  $d < 1/3D$ , according to MSS SP-97.

**4.5.15** Inlet and outlet shall be equipped with 1/2" threadolet and 1/2" thermowell with 1/2" NPT male, stainless steel temperature gauge, 100mm dial with safety glass and red and black lettering, dual scale in centigrade and Fahrenheit, adjustable pointer.

(Gauge range  $-20^{\circ}\text{C} \sim +100^{\circ}\text{C}$ ).

**4.5.16** Coil outlet header shall be equipped with 1/2" threadolet and 1/2" thermowell with 1/2" NPT male temperature control device for monitoring of gas outlet temperature.

**4.5.17** Inlet and outlet shall be equipped with 1/2" NPT male, stainless steel pressure gauge, 100mm dial with safety glass and red and black lettering, dual scale in psi and bar, bourdon tube type, oil filled, adjustable pointer. Gauge ranging shall be 1.5 times the operating pressure.

**4.5.18** Inlet and outlet shall be equipped with 1/2" NPT ball valve as a drain.

**4.5.19** All threaded connection on headers shall be done by threadolet class 6000lb rating.

**4.5.20** Coil shall be supported. Spacing, holes diameters and thickness of support baffle plates shall be considered base on TEMA requirements.

**4.5.21** Coil weight shall be supported by traverse pipe/U beam which are connected to inside shell. Coil shall not have any mechanical stress on its removable flange bolts.

**4.5.22** The Telltale holes on U Turn bend shall be considered accordance with API 12k.

## **4.6 Fire Tube**

**4.6.1** Fire tubes material shall be according to EN 303-1.

**4.6.2** The fire tube shall be fully welded. According to EN 303-1 Complete penetration shall be down on all joints and visually inspected by a welding inspector.

**4.6.3** Penetrant test (PT) shall be done for 100% of welded joints by qualified NDT personnel.

**4.6.4** Fire tube shall be field removable.

**4.6.5** Supporting wheels shall be run on guiding rails.

**4.6.6** Fire tube will be fastened on one of the end trays of the Water Bath. It shall be easily removable for periodic inspection and cleaning.

It shall be equipped with:

4.6.6.1 a flame sight glass

4.6.6.2 an evacuation pipe for condensates to be taken outside the frame