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مشخصات فنی خرید

سیلیکاژل انواع H و WS برای تنظیم نقطه شبنم هیدروکربونی و آب در گاز طبیعی

Silica Gel Types H and WS for Control of Hydrocarbon and Water  
Dew Point in Natural Gas



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شرکت ملی گاز ایران



دفتر مدیرعامل

## ابلاغ مصوبه هیأت مدیره

مدیر محترم پژوهش و فناوری و رئیس شورای استاندارد

باسلام،

به استحضار می‌رساند در جلسه ۱۴۸۳ مورخ ۱۳۹۰/۱۰/۱۸ هیأت مدیره، نامه شماره کی/۹۰۰۰/۱۳۸۹ مورخ ۱۳۹۰/۱۰/۶ آن مدیریت در مورد تصویب نهایی استاندارد تحت عنوان " مشخصات فنی خرید سیلیکاژل انواع H و WS برای تنظیم نقطه شبنم هیدروکربونی و آب در گاز طبیعی " به شماره تقاضای IGS-M-CH-021(0) مطرح و با عنایت به تائید آن در شورای استاندارد مورد تائید قرار گرفت .

این مصوبه در حکم مصوبه مجمع عمومی شرکتهای تابعه محسوب و برای کلیه شرکتهای تابعه لازم الاجراء می‌باشد.

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## FOREWORD

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

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

Any comments from concerned parties on NIGC distributed IGS are welcome to technical standards committees and will receive serious attention and consideration should a revision to standards is recommended .

## **GENERAL DEFINITIONS :**

Throughout this standard the following definitions, where applicable , should be followed :

1- "STANDARDIZATION DIV." has been organized to deal with all aspects of industrial standards in NIGC. Therefore, all queries for clarification or amendments are requested to be directed to mentioned div.

2- "COMPANY" : refers to national Iranian gas company .

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 .

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## 1. SCOPE

This standard specification covers the minimum requirements for industrial silica gel, types H and WS, (type H for controlling dew point and recovery heavy hydrocarbons from natural gas and type WS for dehumidifying the natural gas). This standard specification specifies physical and chemical properties, documentation, inspection, test methods and packaging of silica gel, types H and WS.

## 2. REFERENCES

Throughout this standard specification the following standards are referred to . The editions of these standards that are in effect at the time of issue of this standard specification (2011) shall, to the extent specified herein, form part of this standard specification. The purchaser and the supplier shall mutually agree upon the applicability of changes in standards that occur after the date of this standard specification.

**ASTM D 2766 (2005)** "Standard Test Method for Specific Heat of Liquids and Solids"

**ASTM D 3663 (2008)** "Standard Test Method for Surface Area of Catalysts and Catalyst Carriers"

**ASTM D 4058 (2006)** "Standard Test Method for Attrition and Abrasion Catalysts and Catalyst Carriers"

**ASTM D 4513 (2006)** "Standard Test Methods for Particle Size Distribution of Catalytic Materials by Sieving"

**ASTM D 4164 (2003)** "Standard Test Method for Mechanically Tapped Packing Density of Formed Catalysts and Catalyst Carriers"

**ASTM D 4179 (2006)** "Standard Test Methods for Single Pellet Crush Strength of Formed Catalyst Shapes"

**ASTM E 104 (2002)** "Standard Practice for Maintaining Constant Relative Humidity by Means of Aqueous Solutions"

**ASTM E 725 (2006)** "Standard Test Method for Sampling Granular Carriers and Granular Pesticides"

**ISO 9001 (2008)** "Quality System – Model for Quality Assurance in Design, Development, Production, Installation and Servicing"

**BS ISO 9277 (2010)** "Determination of specific surface area of solids by gas adsorption using the BET method"

**BS ISO 15901-2 (2006)** "Pore size distribution and porosity of solid material by mercury porosimetry and gas adsorption" "Part 2: Analysis of mesopores and macropores by gas adsorption"

**UOP 436-87 "Silica in Catalysts by Gravimetric Procedure"**

**UOP 879-87 "Aluminum in Catalysts by Atomic Absorption"**

### **3. DEFINITIONS**

#### **3.1 Silica gel**

Silica gel is an amorphous form of silicon oxide, which is synthetically produced in the form of hard irregular granules or hard regular beads. Silica gel is a highly porous form of silica or a mixture of silica and aluminum oxide. Silica gel is one of the oldest and most popular desiccant and adsorbent used for a wide number of industrial applications.

#### **3.2 Silica gel type WS**

Silica gel type WS is the 100% water resistant adsorbent with a high adsorption capacity. It is most frequently used as a protective layer in combination with silica gel type H and other adsorbents such as molecular sieves, activated catalysts in order to increase reliability of the system.

#### **3.3 Silica gel type H**

Silica gel type H is used for controlling dew point and recovery of heavy hydrocarbons from natural gas.

### **4. REQUIREMENTS**

#### **4.1 Properties**

The physical and chemical properties of silica gel types H and WS shall be in accordance with Table 1 when tested in accordance with specified test methods.

#### **4.2 Sampling**

The sampling shall be carried out in accordance with ASTM E 725.

### **5. DOCUMENTATION**

The manufacturer/supplier shall provide sufficient information and shall supply the technical information as a minimum requirement as follows:

- Approval test reports, original technical catalogues, manufacturing product data sheet and application procedure recommendation and guidelines;

- Silica gel loading and unloading procedure;

- ISO 9001: 2008 for quality control of offered silica gel types H and WS, issued by an internationally recognized body;

- Material Safety Data Sheet (MSDS);

- Filled, signed and stamped data sheets stating in Annex A.

**Table 1 – Physical and Chemical Properties**

Item	Characteristic		Unit	Requirement		Test Method
				H	WS	
1	Composition	SiO <sub>2</sub> , min	wt %	95	85	UOP 436 or XRF*
		Al <sub>2</sub> O <sub>3</sub> , max	wt %	5	15	UOP 879 or XRF*
2	Surface Area, min		m <sup>2</sup> /gr	650	550	ISO 9277 or ASTM D 3663
3	Bulk Density, min		gr/ cm <sup>3</sup>	0.7	0.7	ASTM D 4164
4	Average Pore Diameter, min		nm	2.5	2.5	ISO 15901-2
5	Pore Volume, min		cm <sup>3</sup> / gr	0.45	0.40	ISO 15901-2 or ASTM D 6761
6	Screen Analysis	On U.S. Sieve # 3 , max	wt %	0	0	ASTM D 4513
		On U.S. Sieve # 6 , min	wt %	65	65	
		On U.S. Sieve # 10 , max	wt %	35	35	
		Through U.S. Sieve # 10, max	wt %	0.5	0.5	
7	Average Particle Diameter, min		mm	3	3	ASTM D 4513
8	Equilibrium Adsorption Capacity for Water Vapor at 25 °C	%10 R.H. , min	wt %	6	3.5	ASTM E 104
		%20 R.H. , min	wt %	9	6	
		%60 R.H. , min	wt %	36	22	
		%80 R.H. , min	wt %	42	32	
9	Attrition Loss, max		wt %	0.05	0.05	ASTM D 4058
10	Crushing Strength, min		N	200	100	ASTM D 4179
11	Specific Heat** , min		kJ/ kg °k	1.05	1.05	ASTM D 2766

\* **Note 1:** X-ray fluorescence

\*\* **Note 2:** For type test, a certificate shall be submitted from an independent laboratory

## 6. INSPECTION

The purchaser reserves the right to perform any inspections set forth in this standard specification where such inspections are deemed necessary to assure that supplies and services conform to the prescribed requirements.

The purchaser's inspector reserve the right to have access to the material subject to inspection for the purpose of witnessing selection of the samples, preparation of the test samples according to ASTM E 725 and performance of the test(s).

For such tests, the inspector reserves the right to indicate the sample(s) from which the quantities will be taken in accordance with the provisions of this standard specification.

The manufacturer shall provide all means necessary for carrying out all inspections and tests as required by this standard specification.

The manufacturer shall set up and maintain such quality assurance and inspection systems to ensure that the material comply in all respects with the requirements of this standard specification.

The supplier shall furnish to the purchaser a certificate of quality stating that each batch has been sampled, tested, and qualified in accordance with this standard specification and has been found to meet the requirements specified.

Tests and qualification records shall be available for review by the purchaser.

Inspection or tests carried out by the purchaser's inspector, in no way relieves the supplier of his responsibilities and liabilities under the requirements of this standard specification.

## 7. MARKING

### 7.1 Marking of Containers

Each container shall be legibly marked with at least following information:

Composition

MESC No.

Handling Guidelines

Safety precautions

Storage Conditions

Date of Manufacture

Date of expiry

Batch No.

Order No.

Net weight

Gross weight

Name and Address of Manufacture

HMIS (including Health, Fire, Reactivity, Personal Protection, Specified Hazard, etc)



## 8. PACKAGING

**8.1** The silica gel types H and WS shall be suitably packed in approved containers. The containers shall be new steel drums with inner PE liner or Big Bags in accordance with the requirement of the contractor or order.

**8.2** The containers shall be protected against all damages or defects which may occur during handling.

## 9. STORAGE LIFE

The silica gel types H and WS shall meet all requirements of this standard specification at least 24 months from date of delivery.

**Note:** Typically silica gel store in dry places, preventing from sun, pollution, moisture and raining during storage and transportation.

**ANNEX A**  
**"Data Sheet for Silica Gel Types H and WS"**

Product designation	
Manufacturer's name	
Manufacturer's address	

**Table A – Physical and Chemical Properties**

Item	Characteristic		Unit	Value		Test Method	Remark
				H	WS		
1	Composition	SiO <sub>2</sub>					
		Al <sub>2</sub> O <sub>3</sub>					
2	Surface Area						
3	Bulk Density						
4	Average Pore Diameter						
5	Pore Volume						
6	Screen Analysis	On U.S. Sieve # 3					
		On U.S. Sieve # 6					
		On U.S. Sieve # 10					
		Through U.S. Sieve # 10					
7	Average Particle Diameter						
8	Equilibrium Adsorption Capacity for Water Vapor at 25 °C	%10 R.H.					
		%20 R.H.					
		%60 R.H.					
		%80 R.H.					
9	Attrition Loss						
10	Crushing Strength						
11	Specific Heat						

**Notes:**

1. This data sheet shall be filled, signed, and stamped by manufacturer/supplier.
2. Any deviation from this standard specification shall clearly be specified by manufacturer/supplier in the following table.

<b>DEVIATION(S)</b>

**AUTHORIZED SIGNATURE:**

**COMPANY'S STAMP:**