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## **GB/T** 34528-2017

# **Regulation for filling of cylinder bundle**

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GB/T 34528-2017

**Preface**

This standard was drafted in accordance with the provisions of GB/T 1.1-2009.

It shall be noted that some contents in this document may involve patents. The issuing body of this document shall not be responsible for the identification of any or all such patent rights.

This standard is proposed by and under the centralized management of China Gas Cylinders Standardization Technical Committees (SAC/TC 31).

This standard was drafted by Hangzhou New Century Mixed Gas Co., Ltd., Beijing AP BAIF Gases Industry Co., Ltd., Beijing Praxair Utility Gas Co., Ltd., and China Industry Gases Industry Association.

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## **Regulation for filling of cylinder bundle**

**1 Scope**

This standard specifies the basic principles and safety technical requirements for filling of cylinder bundle.

This standard is applicable to the filling of cylinder bundles with total water capacity less than or equal to 3000L and medium of compressed gas, high pressure liquefied gas and mixed gas (gas-gas gas mixture) under the ambient temperature of -40℃ ~ 60℃.

This standard is not applicable to the filling of cylinder bundles with the liquid-liquid gas mixture as the medium and toxic or highly toxic gas, nor is it applicable to the filling of high-pressure liquefied gas (combustible) and cylinder bundles fixed on the vehicle.

**2 Normative references**

The following documents are essential to the application of this document. For dated references, only the dated versions shall be applicable to this document. For any undated references, the latest version (including all amendments) is applicable to this document.

GB/T 7144 Coloured cylinder mark for gases

GB/T 13005 Terminology of gas cylinders

GB/T 14193 Rules for filling of liquefied gas cylinder

GB/T 14194 Rules for filling of permanent gas cylinder

GB/T 15383 Connection types and dimensions for gas cylinder valve outlets

GB/T 28054 The bundles of seamless steel gas cylinders

**3 Terms and definitions**

Terms and definitions defined in GB/T 13005 and GB/T 28054 are applicable to this document.

**4 Requirements for cylinder bundle**

4.1 The cylinder in the bundle shall comply with the rules of corresponding standards, and have the same nominal working pressure, diameter, volume, and the same inspection cycle. The nominal working pressure shall not be greater than 30MPa, the nominal water capacity of a single cylinder shall not be greater than 150L, and the total water capacity of the cylinder in the bundle shall be less than or equal to 3000L. The nominal working pressure of the bundling device used for filling oxygen shall not be greater than 20MPa.

4.2 The type, model, technical requirements, test methods and requirements, inspection rules, marking requirements, coating requirements, storage, transportation, and safe use of the filled cylinder bundle shall comply with the regulations and requirements of GB/T 28054 and relevant standards.

**5 Inspection and treatment of cylinder bundle before filling**

5.1 The cylinder bundles before filling shall be in the charge of a specially assigned person and inspected one by one. The inspection and requirements shall at least include the following:

a) The nameplate on the cylinder bundles shall be complete and clear;

b) Cylinders shall be produced by units with "Special Equipment Manufacturing License";

c) Imported cylinders shall be approved by the Special Equipment Safety Supervision and Management Department;

d) The filled gas shall be consistent with the name of the filling medium and warning label on the nameplate;

e) The gas to be filled shall be consistent with the name or chemical formula of the filled gas described in the manufacturing steel seal mark of the cylinder;

f) The frame and pipeline system of the cylinder bundles have no obvious deformation and structural component detachment;

g) The outer surface of the cylinder in the cylinder bundles shall be free of cracks, serious corrosion, obvious deformation, and other serious external damage defects;

h) The cylinder in the cylinder bundle shall be within the specified inspection validity period, and the regular inspection date of the cylinder in the same bundling device shall be the same. It is specified that the earliest date of the cylinder produced shall be the base date for regular inspection;

i) Accessories in the cylinder bundle shall be in good condition and effective, and those equipped with pressure gauges and safety valves shall be within the validity period of the inspection;

j) The inflation and deflation valve, cylinder valve or cylinder connector in the cylinder bundle and the characteristics of the gas mixture shall be classified according to the corresponding national standards, and the connection type and size of the gas outlet shall meet the requirements of GB/T 15383;

k) The cylinder bundle to be filled shall be the one owned or managed by the filling station;

1) The color mark on the outer surface of the cylinder in the cylinder bundle shall comply with the regulations of GB/T 7144 and be clear and easy to recognize;

m) For the cylinder bundle filled with oxygen or other strong oxidizing gas, the cylinder body and valve shall not be contaminated with grease or other combustibles. The material of busbar shall be copper pipe or stainless steel seamless steel pipe without titanium;

n) The bundling device to be filled with high-pressure liquefied gas shall not be provided with a cylinder valve on its cylinder mouth. The cylinder shall be connected with the busbar by cylinder connectors. The inner diameter of the busbar branch pipe and the connector of the cylinder shall be greater than or equal to the diameter of the cylinder mouth of the cylinder so that the cylinders in the whole bundle form an interconnected whole.

5.2 Cylinder bundles not meeting the requirements of 5.1 are prohibited from filling.

5.3 For the cylinder with color or other marks and the thread at the outlet of the cylinder valve not in conformity with the regulations of the gas, the filling behavior is not allowed, and the cause shall be found out for treatment.

5.4 The cylinder bundle newly put into use or inflated for the first time after internal inspection shall be disposed according to regulations before filling, and can be filled only after it is confirmed to be qualified.

5.5 In terms of the cylinder bundle to be filled with combustible gas and oxidizing gas, if no residual pressure holding valve or cylinder without residual pressure is installed, it shall be vacuumized before refilling. The gas cylinder bundle to be filled with combustible gas shall be vacuumized to below -80kPa, and the one to be filled with oxidizing gas shall be vacuumized to below -50kPa.

5.6 During the validity period of the inspection, if the cylinder bundle is found with major defects in the visual inspection, it shall be sent to the inspection agency first for technical inspection and evaluation according to the regulations, and it can be reused only after passing the inspection. The cylinder bundle which has been in storage and out of service for more than one inspection cycle shall be inspected before use.

5.7 When the cylinder bundle imported from abroad is required to be filled in China, it shall be approved by the Special Equipment Safety Supervision and Management Department and pass the inspection of Inspection Agencies of Gas Cylinders before filling.

5.8 The unqualified cylinder bundle (including the one to be treated) shall be isolated from the qualified ones and marked clearly to prevent misuse.

**6 Filling of compressed gas and gas-gas gas mixture gas cylinder bundle**

6.1 The threaded connection shall be adopted for the connection between the filling gas piping of the cylinder bundle and the inflation and deflation valve, and clamp connection for filling is prohibited.

6.2 Pointer pressure gauges are adopted for filling systems of compressed gas cylinder bundles, with an accuracy of not less than level 1.6 and a dial diameter of not less than 100 mm. The accuracy of the pressure gauge used in the filling system of the gas mixture gas cylinder bundle shall not be less than level 0.4, and the dial diameter shall not be less than 150 mm. Pressure gauges for the filling system shall be checked in time according to relevant regulations.

6.3 The impurity content in the gas to be filled shall conform to the requirements of the corresponding gas standards, otherwise filling is prohibited.

6.4 When filling the gas into the cylinder bundle, the following regulations shall be strictly observed:

a) Checking and confirming that the cylinder bundle is qualified before inflation (records shall be kept);

b) When filling with the anti-misloading joint, carefully checking that the thread of the air outlet of the inflation and deflation valve is consistent with the thread type specified by the filled gas, and all parts of the anti-misloading joint shall be flexible and easy to use;

c) The operation of opening the inflation and deflation valve and cylinder valve shall be gently, and attention shall be paid to monitor the abnormal sound in the cylinder;

d) It is prohibited to knock the inflation and deflation valves, cylinder valves and pipelines with wrenches and other metal appliances;

e) The temperature of the cylinder body, which should be approximately the same, shall be checked one by one before the gas pressure in the cylinder reaches 7MPa. The inflation and deflation valves, the cylinder valves and the connecting parts shall be checked one by one and in good sealing condition before the gas pressure in the cylinder reaches 10MPa. In case of any abnormality found, properly treatment shall be carried out in time;

f) The filling flow of cylinders shall not be greater than 8m3/h (under standard state);

g) Inserting the cylinder bundle for filling during the filling process is strictly prohibited;

h) When filling all kinds of incompatible raw gases for gas mixture gas cylinder bundle, sufficient safety distance and isolation measures shall be provided;

i) The gas mixture to be prepared shall be checked for safety before filling the gas mixture gas cylinder bundle;

j) When filling the gas mixture gas cylinder bundle, the gases shall be successively filled in from low to high concentration components. During the filling process, the pressure in the filling bar shall not be lower than the pressure in the cylinder. When it approaches the required pressure, the total pressure shall rise slowly;

k) When filling the gas mixture gas cylinder bundle, combustible gas, oxidizing gas, acid gas, and alkaline gas shall not be filled in the same filling system;

1) When filling the gas mixture gas cylinder bundle, the filling system shall be provided with vent line to facilitate any residual gas vent in a safe way. The vent line shall be installed in such a way as to avoid any reaction between incompatible products, and shall be independent and equipped with an inert gas replacement device, and its joint form shall meet the provisions of GB/T 15383;

m) After the gas mixture gas cylinder bundle is filled, making ensure gases are uniformly mixed before shipments.

6.5 The filling quantity of the cylinder bundle shall be strictly controlled to ensure that the gas pressure in the cylinder will not exceed the allowable pressure of the cylinder at the maximum service temperature.

6.6 Regarding the various common compressed gas and gas mixture filled by domestic cylinder bundle, the filling pressure (gauge pressure) shall meet the filling requirements specified in GB/T 14194.

6.7 During the filling process of the cylinder bundle after vaporization of cryogenic liquid gases, the following provisions shall also be observed:

a) The gas outlet temperature of the cryogenic liquid vaporizer shall be checked, and the pressure control device shall be in a normal state before filling;

b) A cold pump process is required before opening the cryogenic liquid pump (the cold pump time shall be determined according to the pump's operating instructions);

c) During the filling process of cylinders, no serious icing phenomenon is allowed on the cryogenic liquid vaporizer, and the temperature from the gas outlet of vaporizer to the filling pipeline shall not be lower than -30℃. In case of the above phenomenon occurs, it shall be handled properly in time;

d) In the cryogenic liquid pressurized vaporization cylinder bundle, the discharge volume of the cryogenic pump shall match the heat exchange area and filling quantity of vaporizer, and the filling time of each cylinder shall not be less than 30min. When the outlet temperature of the vaporizer is lower than -30℃ and overpressure occurs, there shall be a system alarm and knock-off block;

e) The operator of cryogenic liquid filling station shall be equipped with reliable anti-freezing PPE.

**7 Filling of high pressure liquefied gas cylinder bundle**

7.1 The filling weighing apparatus shall be accurate, and its maximum weighing value shall not be more than 3 times of the actual mass of the cylinder bundle (including the mass of the cylinder bundle and the mass of the filling liquid), nor shall it be less than 1.5 times of that. Weighing apparatus shall be inspected regularly according to relevant regulations and rechecked before daily use. The weighing apparatus shall be provided with an interlock device for the over-loading alarm of cylinder bundles or automatic cut-off of air source.

7.2 When filling the high-pressure liquefied gas into the cylinder bundle, the following regulations shall be observed:

a) Checking and confirming that the cylinder bundle is qualified before inflation (records shall be kept);

b) When it is filled by connecting the anti-misloading filling joint, carefully checking and confirming that the thread of the outlet of the inflation and deflation valve is consistent with the screw type specified by the filled gas;

c) The operation of opening the inflation and deflation valves shall be gentle, and attention shall be paid to the filling speed and pressure, and to monitor the abnormal sound in the cylinder;

d) It is prohibited to knock the inflation and deflation valves and pipelines with wrenches and other metal appliances;

e) During the filling process, checking the sealing conditions of all parts of the cylinder bundle at any time, and the temperature of the cylinder body shall be normal. In case of any abnormality found, properly treatment shall be carried out in time.

7.3 The determination of the filling coefficient of high-pressure liquefied gas shall conform to the requirements specified in GB/T 14193.

7.4 The filling quantity of high-pressure liquefied gas shall be accurately measured and checked one by one according to the following provisions:

a) The filling quantity of the cylinder bundle shall not be greater than the calculated value of the product of the total volume of the cylinder and the filling coefficient, nor shall it be greater than the filling quantity specified by the gases of the total volume of the cylinder;

b) The filling quantity shall include all the media in the cylinder including the residual gas. In another word, the filling quantity of the cylinder bundle shall be the difference between the actual weight of the cylinder bundle after filling and the empty weight of the cylinder bundle.

7.5 The filling quantity of high-pressure liquefied gas shall be strictly controlled. In case of the cylinder is found overfilling, the overfilled liquid shall be discharged properly.

**8 Inspection of cylinder bundle after filling**

8.1 After filling, the cylinder bundles shall be in the charge of a specially assigned person and inspected one by one. When it does not meet the requirements, it is prohibited to leave the factory, and shall be handled properly.

8.2 The inspection shall at least include the followings:

a) The pressure (filling quantity) and mass in the cylinder shall meet the requirements of safety technical specifications and relevant standards;

b) Busbars, frames, and accessories of the cylinder bundle shall be free from obvious damage, deformation, leakage or other abnormal phenomena;

c) The cylinder of the cylinder bundle shall be free of serious defects such as bulging, deformation or leakage;

d) The filling label and warning label of the cylinder bundle shall be complete.

**9 Filling record**

9.1 The filling unit shall designate a specially assigned person to fill in the filling records of the cylinder bundle. Records of three types of cylinder bundles are as follows:

a) The records of the compressed gas cylinder bundle shall at least include: filling date, number of the cylinder bundle, filling medium, starting and ending time of filling, room temperature, nominal working pressure, filling pressure, filling temperature, the effective volume of the cylinder bundle, any abnormality found or not, filling and inspector.

b) The record contents of the gas mixture gas cylinder bundle shall at least include: filling date, number of the cylinder bundle, product name, filling medium, the content of each component, starting and ending pressure of each component filling, nominal working pressure, starting and ending time of filling, room temperature, the effective volume of the cylinder bundle, any abnormality found or not, filling and inspector.

c) The records of high pressure liquefied gas cylinder bundle shall at least include: filling date, number of cylinder bundle, filling medium, filling time, room temperature, the effective volume of cylinder bundle, net weight of cylinder bundle, the total weight of cylinder bundle after filling, the actual filling weight of cylinder bundle, the total weight of cylinder bundle after filling, any abnormality found or not, filling and inspector.

9.2 The filling unit shall keep the filling records in a proper manner, which shall be kept at least for 1 year.

**10 Others**

10.1 The cylinder valves and pipelines in the device shall be checked and all valves shall be closed before handling the cylinder bundle. In case of any leakage found, it shall be repaired or replaced in time.

10.2 Safe and reliable handling tools shall be used for the cylinder bundle during the process of handling, loading, and unloading. Making sure the loading and unloading are light. It is strictly prohibited to hoist the pipeline. In case of any leakage found, the operation shall be stopped and it shall be handled according to the accident treatment measures.

10.3 The cylinder bundle shall be stored in a place that is ventilated, dry, free from corrosive gas and sun exposure.

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