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Compressed natural gas dispenser for vehicles

汽车用压缩天然气加气机

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Compressed natural gas dispenser for vehicles

1 Scope

This Standard specifies the requirements, test methods, inspection rules, marking, label, instructions for use and sealing, packaging, transportation, and storage of compressed natural gas dispenser for vehicles.

This Standard applies to the design, manufacture and acceptance of compressed natural gas dispenser for vehicles with rated working pressures of 20 MPa and 35 MPa.

2 Normative references

The following documents are indispensable for the application of this document. For the dated references, only the editions with the dates indicated are applicable to this document. For the undated references, the latest edition (including all the amendments) are applicable to this document.

GB/T 191 Packaging - Pictorial marking for handling of goods

GB/T 2423.1 Environmental testing for electric and electronic products - Part 2: Test methods - Tests A: Cold

GB/T 2423.2 Environmental testing for electric and electronic products - Part 2: Test methods - Tests B: Dry heat

GB/T 2423.4 Environmental testing for electric and electronic products - Part 2: Test method - Test Db: Damp heat, cyclic (12 h+12 h cycle)

GB/T 3683 Rubber hoses and hose assemblies - Wire-braid-reinforced hydraulic types for oil-based or water-based fluids - Specification

GB 3836.1 Explosive atmospheres - Part 1: Equipment - General requirements

GB 3836.2 Explosive atmospheres - Part 2: Equipment protection by flameproof enclosures d

GB 3836.3 Explosive atmospheres - Part 3: Equipment protection by increased safety “e”

GB 3836.4 Explosive atmospheres - Part 4: Equipment protection by intrinsic

GB 50156 Code for design and construction of filling station

JJG 996 Verification Regulation of Compressed Natural Gas Dispensers

JTG B01 Technical Standard of Highway Engineering

SY/T 6535 The underground storage well for high-compression gas

TSG 21-2016 Supervision Regulation on Safety Technology for Stationary Pressure Vessel

3 Terms and definitions

The following terms and definitions apply to this document.

3.1

Compressed natural gas dispenser for vehicles

Special equipment for fuelling (defuelling) compressed natural gas into (from) the gas storage vessel for vehicles, and with functions such as metering and pricing.

Note: Compressed natural gas dispenser for vehicles is abbreviated as dispenser. A dispenser with a maximum flow rate of not more than 30 kg/min is called a small-flow dispenser. A dispenser with a maximum flow rate greater than 30 kg/min and not greater than 70 kg/min is called medium-flow dispenser. A dispenser with a maximum flow rate greater than 70 kg/min is called a large-flow dispenser. Medium-flow dispensers and large-flow dispensers are also called fuelling (defuelling) columns.

3.2

Minimum measured amount

The minimum filling amount which can meet the metrological performance requirements of the dispenser during one gas filling process.

3.3

Minimum specified indication deviation

The minimum mass resolution of the filling volume displayed by the dispenser indicating device.

3.4

b) The unit of the payment amount for the dispenser is yuan. The unit of the unit price is yuan per kilogram (yuan/kg).

4.2.2 Value indicating function

The dispenser shall have a value indicating function.

The requirements for the value indicating function of the dispenser are as follows:

a) The reading of the indicated value shall be correct, easy to read, and clear.

b) The minimum specified indication deviation of the filling volume shall be expressed in the form of 1×10^n, 2×10^n or 5×10^n kg; where n is a positive integer or a negative integer or zero.

c) The dispenser shall display the filling volume, unit price, and payment amount:

1) The integer place of a single filling volume shall be no less than 3 digits; the decimal place shall be 2 digits;

2) The integer place of the payment amount for a single filling volume shall be no less than 3 digits; the decimal place shall be 2 digits;

3) The integer place of the unit price shall be no less than 2 digits; the decimal place shall be 2 digits;

4) The integer place of accumulative filling volume shall be no less than 6 digits; the decimal place shall be 2 digits.

d) The unit of measurement symbol of the dispenser shall be close to the indicated value.

e) When the dispenser has 2 or more display values, the display of each indicated value shall correspond respectively.

f) During the filling process, the dispenser shall continuously display the indicated value of the gas filling amount.

4.2.3 Return-to-zero function

The dispenser shall have the functions of automatic and manual return-to-zero for indicated value. During the filling period, the indicated value shall not return to zero.

4.2.4 Metering adjustment function

4.3.9 Power supply adaptability

The dispenser shall be able to maintain normal operation in a power supply environment, where the amplitude of the nominal voltage variation is -15% to +10% and the frequency change is ±1 Hz.

4.3.10 Electromagnetic compatibility

4.3.10.1 General

The complete dispenser shall be subjected to the following five electromagnetic compatibility tests. During and after the electromagnetic compatibility tests, the dispenser shall meet the following requirements:

a) Within the limit ranges specified in this Standard, the dispenser shall maintain normal performance, or temporarily reduces or loses its function and performance; but be able to recover on its own. Or, it temporarily reduces or loses its function and performance; and requires operator intervention or system reset.

b) For the equipment under test with data storage or with standard interfaces that can be used for data transmission, data must not be lost during and after the test. The stored program must not be changed. The state is not allowed to change. The level of each point on the interface is not allowed to change.

4.3.10.2 Electrostatic discharge immunity

According to GB/T 17626.2-2018 test level 4 (contact discharge: test voltage 8 kV; air discharge: test voltage 15 kV), test the dispenser.

4.3.10.3 Radiated, radio-frequency, electromagnetic field immunity

According to GB/T 17626.3-2016 test level 2 (test field strength is 3 V/m; the frequency range is 80 MHz~1000 MHz), test the dispenser.

4.3.10.4 Electrical fast transient/burst immunity

According to GB/T 17626.4-2018 test level 3 (at the power port and the ground port, the peak value of the open-circuit output test voltage is 2 kV; the pulse repetition frequency is 5 kHz. At the signal port and control port, the peak value of the open-circuit output test voltage is 1 kV; the pulse repetition frequency is 5 kHz), test the dispenser.

4.3.10.5 Surge immunity

According to GB/T 17626.5-2019 test level 3 (line-line open-circuit test voltage

e) No bypass piping shall be attached downstream of the mass flowmeter in the dispenser.

4.4.2 Electronic count controller

The electronic count controller is the calculation, display and control device of the dispenser. It shall be able to accept the flow signal transmitted by the mass flowmeter and the pressure signal transmitted by the pressure sensor; and according to the set and preset parameters of the dispenser, perform calculation, display and control.

4.4.3 Accessory devices

4.4.3.1 Fuelling nozzle

The requirements for fuelling nozzle are as follows:

a) The fuelling nozzle shall meet the relevant requirements of GB/T 19236;

b) A dispenser, which is equipped with more than one fuelling nozzle, shall be marked with the fuelling nozzle number.

4.4.3.2 Fuelling (defuelling) hoses

The requirements for fuelling (defuelling) hoses are as follows:

a) The fuelling (defuelling) hoses shall have resistance to natural gas corrosion; shall meet the relevant requirements in GB/T 3683 and GB/T 5563;

b) The electrostatic conduction performance of the fuelling (defuelling) hose assemblies shall meet the relevant requirements in GB/T 10543;

c) The length of fuelling (defuelling) hoses shall not be greater than 6 m.

4.4.3.3 Breakaway valve

4.4.3.3.1 A breakaway valve shall be provided on the fuelling (defuelling) hose of the dispenser.

4.4.3.3.2 The separation tension range of the breakaway valve of the small-flow dispenser should be 400 N~600 N. The separation tension range of the breakaway valve of the fuelling (defuelling) column should be 600 N~900 N.

4.4.3.3.3 After the breakaway valve is separated under the action of external force, it shall be ensured that both ends are self-sealed immediately.

4.4.3.3.4 The two parts, which the breakaway valve is automatically divided into

An emergency shut-off valve shall be installed on the upstream piping of the dispenser, which is used to quickly shut off the filling process by manual operation in an emergency.

The requirements for the emergency shut-off valve are as follows:

a) The emergency shut-off valve shall be installed in an obvious position of the dispenser; so that it can cut off the gas source in time in the event of an accident;

b) The opening and closing of the emergency shut-off valve shall be flexible and reliable, without internal leakage and external leakage;

c) From fully open to fully closed, the rotation angle of the handle of the emergency shut-off valve shall not be greater than 90°.

4.4.3.8 Pressure sensor

A pressure sensor shall be installed at the outlet of the piping of the dispenser, to detect the pressure at the outlet of the piping; to ensure that, when the filling pressure of the gas cylinder reaches the end pressure, the dispenser shall automatically stop refilling. The pressure sensor shall obtain a valid explosion-proof conformity certificate.

4.4.3.9 Pressure gauge

A pressure gauge shall be installed on the piping of the dispenser, to detect the pressure in the piping. The range of the pressure gauge should be 1.5 to 2 times the rated working pressure. Its measurement accuracy shall not be lower than class 1.5.

4.4.3.10 Piping and its components

The requirements for piping and its components are as follows:

a) The compressed natural gas piping in the dispenser shall be made of high-pressure stainless steel seamless steel pipes. Its performance shall meet the relevant requirements of GB/T 14976.

b) The material of the piping components in the dispenser, which are in contact with the compressed natural gas, shall be compatible with the compressed natural gas medium.

c) The compressed natural gas piping in the dispenser can be connected with equipment and valves by using ferrule, flange or taper pipe thread. The thread type shall be matched with the connecting valve.

requirements for contact current in GB 4943.1.

5.2.4.2 The dielectric strength of the dispenser is tested in accordance with the requirements for dielectric strength in GB 4943.1.

5.2.4.3 The connecting resistance between the protective earth terminal of the dispenser and the parts that need to be grounded shall be tested in accordance with the requirements for connecting resistance in GB 4943.1.

5.2.4.4 The corrosion resistance of the conductive parts, which are in contact with the protective earth terminal and the connection end of the dispenser, shall be tested in accordance with the requirements for corrosion resistance in GB 4943.1.

5.2.5 Test of metrological performance

5.2.5.1 Test of indication error

5.2.5.1.1 Test medium

The indication error test of the filling volume of the dispenser can use compressed natural gas, compressed air or nitrogen as the test medium.

5.2.5.1.2 Test equipment

The requirements for the test equipment are as follows:

a) The indication error test of the filling volume of the dispenser shall use the mass method high-pressure gas flow standard device (see Appendix B); or can use the standard meter method high-pressure gas flow standard device (see Appendix C). When there are objections to the test results, the mass method is the arbitration method.

b) The expanded uncertainty (coverage factor k=2) of the measurement result of the indication error of the high-pressure gas flow standard device shall not exceed 1/3 of the absolute value of the maximum allowable error of the dispenser.

5.2.5.1.3 Test method

5.2.5.1.3.1 Rated working pressure, flow-test region, filling pressure control range, and number of tests

According to the rated working pressure of the dispenser, the different flow-test regions are tested, which are R(1), R(2) and R(3), respectively. The correspondence BETWEEN the rated working pressure of dispenser AND the flow-test region and the filling pressure control range of gas cylinder is shown

It shall be carried out in accordance with the requirements of GB/T 17626.11-2008.

5.2.11 Test of explosion-proof performance

In accordance with the obtained complete-machine explosion-proof conformity certificate and test report and related attachments, check whether the explosion-proof electrical components used in the complete machine are consistent with the approved explosion-proof technical documents.

5.2.12 Durability test

5.2.12.1 Test medium

The durability test of the dispenser can use compressed natural gas, compressed air or nitrogen as the test medium.

5.2.12.2 Test method

The durability test method is as follows:

a) According to the use requirements of the dispenser, select the flow-test region R(2); repeatedly fill the gas cylinder with the test medium 2000 times;

b) During each filling process, all solenoid valves shall be opened and closed;

c) According to the test methods in 5.2.5.1 and 5.2.5.2, test the dispenser again.

5.2.13 Test of transportation adaptability

Put the dispensers, which have passed the exit-factory inspection, under the packaging and transportation conditions. Use the truck transportation test. The test road configuration is carried out in accordance with the requirements of JTG B01 for secondary highway 200 km, tertiary highway 100 km, and speed 30 km/h~40 km/h. It is also possible to place the dispenser on the vibration test bench for simulated transportation test. According to the requirements of GB/T 4798.2, the mechanical environmental condition level is 2M2 (steady-state sinusoidal vibration frequency 10 Hz; acceleration amplitude 10 m/s^2). The vibration time is up and down 2 h, left and right 1 h, front and back 1 h. After the test, open the box to inspect whether the parts are loose or damaged. Then according to the methods of 5.1, 5.2.1, 5.2.2, 5.2.3, 5.2.4, 5.2.5.1 and 5.2.5.2, inspect and test item by item.

5.3 Test of components

c) Exhaust the gas in the separated two parts and reconnect them.

5.3.3.4 Test of safety valve

5.3.3.4.1 Test medium

The safety valve test of the dispenser can use compressed natural gas, compressed air or nitrogen as the test medium.

5.3.3.4.2 Test method

The test method of the safety valve is as follows:

a) Connect the inlet of the dispenser to the gas source;

b) In the case of turning off the fuelling nozzle, gradually increase the pressure to reach the constant pressure of the safety valve. The safety valve shall be able to open immediately and release the pressure. When the pressure drops below the constant pressure, it shall be automatically closed.

6 Inspection rules

6.1 Exit-factory inspection

6.1.1 The dispenser shall be subjected to the exit-factory inspection one by one by the quality inspection department of the manufacturing company. Only after passing the inspection and the product conformity certificate is issued, can it leave the factory.

6.1.2 Inspection items: See Table 4.

6.1.3 Determination rule: If all the exit-factory inspection items are qualified, the product is determined conformity. If there are nonconformity items in the exit-factory inspection, it shall be re-inspected after rework. If there are still nonconformity items, the product shall be determined as nonconformity.

6.2 Type inspection

6.2.1 In any of the following situations, type inspection shall be carried out:

a) When the new product is finalized;

b) When there are major changes in product design, process, and materials used that may affect product performance;

c) When the exit-factory inspection result is significantly different from the

mechanism shall be set.

8.2 Packaging

8.2.1 The packaging of the dispenser shall include accompanying documents such as the product conformity certificate, product packing list, product exit-factory inspection report, and product instructions for use.

8.2.2 The packaging protection and packaging pictorial marking for handling of the dispenser shall meet the relevant requirements of GB/T 191 and GB/T 13384. At least the following contents shall be included on the outer packing box:

a) Name of the sending station and name, address, and postal code of the manufacturing company;

b) Name of the receiving station and name, address, and postal code of the receiving organization;

c) Product name and model;

d) Explosion-proof conformity certificate mark and number;

e) Implementation standard number;

f) Net weight and gross weight of the product;

g) Geometric dimensions of the outer packing box (length×width×height);

h) Pictorial markings such as "Avoid rain", "Upward", "Do not roll".

8.3 Transportation

Suitable for general transportation means. During loading-unloading and transportation, the direction signs shall be paid attention to. The inclination of the packing box shall not exceed 30°.

8.4 Storage

Packaged or unpackaged dispensers shall be placed in a dry, ventilated and covered place. There shall be no harmful gases corrosive to metals in the storage place of the dispenser.

Appendix B

(Normative)

Mass method high-pressure gas flow standard device

B.1 Expanded uncertainty

The expanded uncertainty (coverage factor k=2) of the measurement result of the indication error of the mass method high-pressure gas flow standard device shall not exceed 1/3 of the absolute value of the maximum allowable error of the dispenser.

B.2 Test medium

The test medium requirements are as follows:

a) Compressed natural gas, compressed air or nitrogen can be used as the test medium;

b) When the test medium is compressed air, it is required that the dust particle size be less than 5 μm; the oil content be less than 5 mg/m^3; the atmospheric dew point be less than -50 °C.

B.3 Fixed gas storage facilities

The requirements for fixed gas storage facilities are as follows:

a) Fixed gas storage facilities shall use gas cylinder groups or gas storage wells.

b) The rated working pressure of fixed gas storage facilities shall meet the relevant requirements of GB 50156.

c) The fixed gas cylinder group should use large-volume gas cylinders of the same specification and model.

d) The gas cylinder group shall be fixed on an independent support. The gas cylinder group on the ground should be placed horizontally.

e) The design and construction of gas storage wells shall meet the relevant requirements of SY/T 6535. The gas storage wellhead shall be easy to open for testing.

f) According to the operating pressure, the fixed gas storage facilities should

Appendix C

(Normative)

Standard meter method high-pressure gas flow standard device

C.1 Expanded uncertainty

The expanded uncertainty (coverage factor k=2) of the measurement result of the indication error of the standard meter method high-pressure gas flow standard device shall not exceed 1/3 of the absolute value of the maximum allowable error of the dispenser.

C.2 Test medium

The test medium requirements are as follows:

a) Compressed natural gas, compressed air or nitrogen can be used as the test medium;

b) When the test medium is compressed air, it is required that the dust particle size be less than 5 μm; the oil content be less than 5 mg/m^3; the atmospheric dew point be less than -50 °C.

C.3 Fixed gas storage facilities

The requirements for fixed gas storage facilities are as follows:

a) Fixed gas storage facilities shall use gas cylinder groups or gas storage wells.

b) The rated working pressure of fixed gas storage facilities shall meet the relevant requirements of GB 50156.

c) The fixed gas cylinder group should use large-volume gas cylinders of the same specification and model.

d) The gas cylinder group shall be fixed on an independent support. The gas cylinder group on the ground should be placed horizontally.

e) The design and construction of gas storage wells shall meet the relevant requirements of SY/T 6535. The gas storage wellhead shall be easy to open for testing.

f) According to the operating pressure, the fixed gas storage facilities should

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