

**TECHNICAL STANDARD FOR COMPONENTS OF COMPRESSED
HYDROGEN VEHICLE FUEL DEVICES JARI S 002
(2004)**

CHAPTER 1 GENERAL PROVISIONS

(Scope)

Article 1

Of the technical contents which should fulfill the technical requirements prescribed in Article 16 and Article 17 of the Safety Regulations for Containers (MITI Ordinance No. 50 of 1966) (hereinafter "Regulations"), this Technical Standard for Components of Containers for Compressed Hydrogen Vehicle Fuel Devices (hereinafter "Standard") describes as specifically as possible the components to be attached to containers for fuel devices of compressed hydrogen vehicles (hereinafter "Components").

(Definition of Terms)

Article 2

The terms used in this standard, in addition to the examples of terms used in the Regulations, shall be defined as indicated in each entry below.

- (1) "Design confirmation test" Of the tests performed in components inspection, these are tests performed one time only for each component type prior to the batch test.
- (2) "Batch tests" Of the tests performed in components inspection, these are tests performed on each single component and/or on components collectively making up a fixed quantity.
- (3) "Type" All components for which all of the following items apply shall be regarded as being of the same type.
 - A. The components shall be manufactured by the same components manufacturing plant and shall have the same structure as each other. The "same structure" shall cover the following ranges.
 - a) The forging die for the components shall be the same. However, components which have a difference only in a container attaching part and only in a section relating to the thread on the filling opening can be handled as the same components.
 - b) The major internal dimensions of the components shall be the same among the components.
 - B. The materials of the main body of the components shall have the same chemical ingredients and the same mechanical properties among the components.
 - C. The pressure for the pressure test shall not increase.

CHAPTER 2 DESIGN CONFIRMATION TEST AND BATCH TEST

(Components Inspection)

Article 3

The methods of the components inspection referred to Items 1 and 2 of Article 16 of the Regulations are the methods given in Paragraph 2 of the next Article; Paragraph 2, Article

5; Paragraph 2, Article 6; Items 1 to 4, Paragraph 2 and Items 1 to 4, Paragraph 3 of Article 7; Paragraph 2 and Item 1, Paragraph 3 of Article 8.

2. The "components having strength in accordance with application pressure and application temperature" specified in Item 1, Paragraph 1, Article 17 of the Regulations shall be the components which pass the pressure cycle test for safety valves in the design confirmation test specified in Paragraph 1 and Paragraph 3 of the next Article; which pass the tensile test in the batch test specified in Paragraph 1 and Paragraph 3, Article 6; and which pass the pressure test in the batch test specified in Item 1, Paragraph 1 and Item 5, Paragraph 2 of Article 7.

3. The "components having no defect harmful to use" specified in Item 2, Paragraph 1, Article 17 of the Regulations shall be the components which pass the external appearance inspection in the batch test specified in Paragraph 1 and Paragraph 3 of Article 5.

4. The "components which are suitable for the types of high-pressure gas, application pressure, application temperature, and application environment" specified in Item 4, Paragraph 1, Article 17 of the Regulations shall be the components given in the following paragraphs.

(1) The material of the components shall be limited to those given in (a) to I(i) (hereinafter "Standard materials"), or the material given in (j) (hereinafter "Equivalent material"). In the case of aluminum alloy, here, the constituent components of lead and bismuth shall each be 0.01% or less. In the case of aluminum alloy of surplus silicon, if the yield strength exceeds 250 N/mm^2 , it shall not be used.

(a) Japanese Industrial Standard G3214 (1991) Stainless steel forgings for pressure vessels (limited to SUSF316L)

(b) Japanese Industrial Standard G3459 (1994) Stainless steel pipes (limited to SUS316LTP-S)

(c) Japanese Industrial Standard G4303 (1991) Stainless steel bars (limited to SUS316L)

(d) Japanese Industrial Standard G4304 (1991) Hot-rolled stainless steel plates, sheets and strips (limited to SUS316L)

(e) Japanese Industrial Standard G4305 (1991) Cold-rolled stainless steel plates, sheets and strips (limited to SUS316L)

(f) Japanese Industrial Standard H4000 (1998) Aluminum and aluminum alloy sheets and plates, strips and coiled sheets (limited to A6061PT6)

(g) Japanese Industrial Standard H4040 (1988) Aluminum and aluminum alloy rods, bars and wires (limited to A6061BET6 and A6061BDT6)

(h) Japanese Industrial Standard H4080 (1988) Aluminum and aluminum alloy extruded tubes and cold-drawn tubes (limited to A6061TET6 and A6061TDT6)

(i) Japanese Industrial Standard H4140 (1988) Aluminum and aluminum alloy forgings

(limited to A6061FDT6 and A6061FHT6)

(j) Equivalent materials shall be equivalent to standard materials referred to in the previous items in terms of chemical ingredients and mechanical properties. Test methods and test sampling methods shall be similar.

(2) The materials given in the preceding item shall be subjected to solution heat treatment for stainless steels and T6 aging treatment for aluminum alloys.

5. The "components having air tightness in accordance with the application pressure" specified in Item 5, Paragraph 1, Article 17 of the Regulations shall be the ones which pass the pressure test and other tests in the batch test specified in Item 2, Paragraph 1 and Item 5, Paragraph 3 of Article 7.

6. The "components which surely operate" specified in Item 6, Paragraph 1, Article 17 of the Regulations shall be the ones which pass the performance test in the batch test specified in Item 1, Paragraph 1 and Paragraph 2 of Article 8.

7. The "components which appropriately operate according to the pressure or the temperature above the normal application range of the container, to which the safety valve is attached" specified in Item 7, Paragraph 1, Article 17 of the Regulations shall be the ones specified in the following items.

(1) The components shall pass the performance test in the batch test specified in Item 2, Paragraph 1 and Item 2, Paragraph 3 of Article 8.

(2) The safety valve to be attached to the container shall be the fusible-plug type.

(Pressure Cycle Test on Safety Valves in Design Confirmation Test)

Article 4

Safety valves shall be subjected to the pressure cycle test on safety valves in accordance with the next paragraph and Paragraph 3 of this Article, for five safety valves sampled from a group of the same type, and shall pass the test.

2. The pressure cycle test on safety valves described in the preceding paragraph shall be conducted in accordance with the following items.

(1) A pressure at or above the maximum filling pressure shall be applied 10,000 times or more at a rate of up to 10 times per minute, and then the air tightness test shall be performed under a pressure of the air tightness test pressure or above.

(2) The test shall be conducted by pressurizing/depressurizing between atmospheric pressure and a pressure at or above the maximum filling pressure by the cycles specified in the preceding item.

(3) The "pressure at or above the maximum filling pressure" described in Item 1 shall be a constant pressure. Before applying the pressure in Paragraph 1, a pressure above the maximum filling pressure shall not be applied.

3. Safety valves which showed no leak in the pressure cycle test on safety valves in

Paragraph 1 shall be regarded as having passed the test.

(External Appearance Test in Batch Test)

Article 5

The components manufactured from the same charge on the same day at the same components manufacturing plant, and having the same size and shape, shall form a single batch. A specified number of the components arbitrarily sampled from the batch (the sample number specified in the following table corresponding to the number constituting the single batch given in the table), shall be subjected to the external appearance test in accordance with the next paragraph and Paragraph 3, and they shall pass the test.

Number constituting a single batch

20 or less

21 up to 100

101 up to 300

301 up to 700

701 or more

Number of samples

All

2. The external appearance test performed in the preceding paragraph shall be conducted in accordance with the following items.
 - (1) The external appearance test shall be performed on the components which are in a operative state. For an component which shows abnormality, parts concerned can be removed before the test.
 - (2) The external appearance test shall be conducted by visual inspection, by a magnifier, or by other means.
3. The appearance test of Paragraph 1 shall accept components which have a smooth finish and show no corrosion, cracking, streaks, wrinkles, or the like that adversely affect the use of them.

(Tensile Test in Batch Test)

Article 6

The materials of components, manufactured from the same charge at the same components manufacturing plant and having the same size and shape, shall be subjected to the tensile test in accordance with the next paragraph and Paragraph 3, and shall pass the test.

2. The tensile test of the preceding paragraph shall be conducted by confirming that the tensile strength, yield strength, and elongation percentage of the body of the component are at or above the respective standard values of the Standard material, referring to the Certificate of Tensile Test issued by the material manufacturing plant for the materials specified in (a) through (j) in Item 1, Paragraph 4, Article 3.
3. The tensile test of Paragraph 1 shall accept materials whose tensile strength, yield strength, and elongation percentage are equal to or higher than the standard values of the

Standard material.

(Pressure Test and Other Tests in Batch Test)

Article 7

The components manufactured from the same charge on the same day at the same components manufacturing plant, and having the same size and shape, shall form a single batch. A specified number of components arbitrarily sampled from the batch (the sample number specified in the following table corresponding to the number constituting the single batch given in the table), shall be subjected to the tests in accordance with the following items (hereinafter "pressure test and other tests"), and shall pass all of these tests.

- (1) The pressure test in accordance with the next paragraph (limited to valves)
- (2) The air tightness test in accordance with Paragraph 3

Number constituting a single batch

10 or less

11 up to 100

101 up to 300

301 up to 700

701 or more

Number of samples

All

2. The pressure test of Item 1 of the preceding Paragraph shall be conducted in accordance with the following items.

- (1) The test shall be conducted by applying a pressure at or above the pressure of the pressure test for the container to which the component is attached.
- (2) The test shall be conducted by applying a blind plate to each of the gas inlet, the gas outlet, and other openings of the component, and by applying the pressure to the valve box and other parts in the valve-opened state, or with some parts removed if necessary.
- (3) The test shall be conducted using water. After filling the valve box with water to remove all air, a pressure at or above the pressure of the pressure test shall be gradually applied to the component. For an component for which water cannot be used (limited to components for which the product of the pressure test pressure (MPa) and the internal volume (liter) is 100 or smaller), air or an inert gas can be used.
- (4) The test shall be conducted by holding the test pressure for 30 seconds or more, and shall be done by visual inspection.
- (5) The test shall accept components that show no leak, deformation, or other abnormality.

3. The air tightness test in Item 2, Paragraph 1 shall be conducted in accordance with the following items.

- (1) The test shall be conducted by applying a pressure at or above the pressure of the air tightness test of the container to which the component is attached.
- (2) The test shall be conducted by applying a pressure at or above the pressure of the air tightness test from the gas inlet of the component in the valve-closed state, thus testing the air tightness of the valve box, valve seat, and other parts at the gas inlet side. Furthermore, the test shall be conducted by applying a blind plate to each of the gas inlet, the gas outlet, and other openings in the valve-opened state, and by applying a pressure at or above the pressure of the air tightness test from the inlet or the outlet of the valve, thus testing the air tightness at the joints of the valve box, lid, gland, and other parts.
- (3) The test shall use air or an inert gas. The test shall be conducted by applying a pressure at or above the pressure of the air tightness test, and by holding the pressure for 30 seconds or more. The test shall be done by visual inspection.
- (4) The test shall be conducted by immersing the component, which is pressurized in advance, in a water bath. Alternatively, the test shall be conducted by coating a foaming liquid or the like onto the component.
- (5) The test shall accept components which show no leak or other abnormality.

(Performance Test in Batch Test)

Article 8

The components manufactured from the same charge on the same day at the same components manufacturing plant, and having the same size and shape, shall form a single batch. A specified number of components arbitrarily sampled from the batch (the sample number specified in the following table corresponding to the number constituting the single batch given in the table), shall be subjected to the tests in accordance with the following paragraphs (hereinafter "performance test"). The components tested shall pass the test.

- (1) The open-close operation test conducted in accordance with the next paragraph (limited to valves)
- (2) The safety valve operation test conducted in accordance with Paragraph 3 (limited to safety valves)

Number constituting a single batch

- 10 or less
- 11 up to 100
- 101 up to 300
- 301 up to 700
- 701 or more

Number of samples

All

Remark: For safety valves, the sample number can be 2 or more independent of the number constituting a single batch.

2. The open-close operation test of Item 1 of the preceding paragraph shall be conducted by the valve open-close action while applying to the valve a pressure at or above that of the air tightness test. The test shall accept valves which are easy to fully open and close, which show no abnormal resistance, slip, clearance, or other abnormalities, and which surely operate.
3. The safety valve operation test in Item 2, Paragraph 1 shall be conducted in accordance with the following items.
 - (1) The test shall be conducted by applying a temperature at or below the temperature which produces the pressure of the pressure test of the container to which the safety valve is attached. The test shall be conducted by immersing a fusible plug, pressurized in advance, in water, glycerin, or silicone oil (in the Item, hereinafter "test liquid"), and by gradually heating the test liquid while stirring it. When the test liquid becomes close to the operating temperature of the safety valve, the temperature rise shall be controlled to a rate of 1°C rise during the period from 1 to 3 minutes.
 - (2) The test shall accept safety valves which operate at the temperature specified in the preceding item.

CHAPTER 3 TYPE TEST

(Type Test)

Article 9

The "Type Test" specified in Paragraph 2, Article 17 of the Regulations includes the pressure cycle test on safety valves, external appearance test, tensile test, pressure test, and performance test which are conducted in accordance with the specifications of the next paragraph to Paragraph 6.

2. The safety valves tested in pressure cycle test in the preceding paragraph shall be defined as a single batch. The test of test pieces sampled from an appropriate section of a single component arbitrarily sampled from the batch (if it is not appropriate to sample a test piece from the component, a test piece sampled from materials manufactured from the same charge), shall be conducted in accordance with the pressure cycle test on safety valves in the design confirmation test of Article 4.
3. The external appearance test of Paragraph 1 shall be conducted in accordance with the external appearance test in the batch test of Article 5. In Paragraph 1 of Article 5, however, the clauses, "The components manufactured from the same charge on the same day at the same components manufacturing plant, and having the same size and shape, shall form a single batch. A specified number of components arbitrarily sampled from the batch (the sample number specified in the following table corresponding to the number constituting the single batch given in the table)" shall be read as "Five components sampled from the same type".
4. The tensile test of Paragraph 1 shall be conducted in accordance with the tensile test in the batch test of Article 6. The clause in Paragraph 1 of Article 6, "The materials of components manufactured from the same charge in the same components manufacturing plant, and having the same size and shape" shall be read as "The test pieces sampled from the same type of components (if it is not appropriate to sample test pieces from the components, the test pieces sampled from materials of the same type)."

5. The pressure test and other tests in Paragraph 1 shall be conducted in accordance with the pressure test and other tests in the batch test of Article 7. However, the clause in Paragraph 1 of Article 7, "The components manufactured from the same charge on the same day in the same components manufacturing plant, and having the same size and shape, shall form a single batch. A specified number of components arbitrarily sampled from the batch (the sample number specified in the following table corresponding to the number constituting the single batch given in the table)," shall be read as "Five components sampled from the same type".

6. The performance test in Paragraph 1 shall be conducted in accordance with the performance test in the batch test of Article 8. However, the clause in Paragraph 1 of Article 8, "The components manufactured from the same charge on the same day at the same components manufacturing plant, and having the same size and shape, shall form a single batch. A specified number of components arbitrarily sampled from the batch, (the sample number specified in the following table corresponding to the number constituting the single batch given in the table)" shall be read as "Five components sampled from the same type".