

Translated English of Chinese Standard: JJF 1363-2012

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**TECHNICAL SPECIFICATIONS FOR MEASUREMENT
OF THE PEOPLE'S REPUBLIC OF CHINA**

JJF 1363-2012

**Program of Pattern Evaluation of Sulfur
Hydrogen Gas Instruments
硫化氢气体分析仪型式评价大纲**

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Issued on: October 08, 2012

Implemented on: January 08, 2013

**Issued by: The General Administration of Quality Supervision, Inspection and
Quarantine (AQSIQ) of The People's Republic of China**

Program of Pattern Evaluation of Sulfur Hydrogen Gas Instruments

JJF 1363-2012

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Introduction

This program of pattern evaluation is prepared according to JJF 1016 "The Rules for Drafting Program of Pattern Evaluation of Measuring Instruments", JJF 1015 "General Norm for Pattern Evaluation and Pattern Approval of Measuring Instruments" and JJF 1001 "General Terms in Metrology and Their Definitions".

Technical regulations such as JJG 695-2003 "Verification Regulation of Sulfur Hydrogen Gas Detectors", GB 12358-2006 "Gas Monitors and Alarms for Workplace-General Technical Requirements" and GB/T 11606-2007 "Methods of Environmental Test for Analytical Instruments" are referenced by the technical index of this program of pattern evaluation.

This program of pattern evaluation is issued for the first time.

TECHNICAL SPECIFICATIONS FOR MEASUREMENT OF THE PEOPLE'S REPUBLIC OF CHINA

JJF 1363-2012

Program of Pattern Evaluation of Sulfur Hydrogen Gas Instruments

1 Scope

This program of pattern evaluation is applicable to the pattern evaluation of sulfur hydrogen gas instruments (which consists of sulfur hydrogen gas detection alarm instrument and sulfur hydrogen gas detector, hereinafter referred to as "instrument").

2 Normative References

JJG 695-2003 "Verification Regulation of Sulfur Hydrogen Gas Detectors"

GB/T 11606-2007 "Methods of Environmental Test for Analytical Instruments"

GB 12358-2006 "Gas Monitors and Alarms for Workplace-General Technical Requirements"

GB/T 17626.2-2006 "Electromagnetic Compatibility - Testing and Measurement Techniques-Electrostatic Discharge Immunity Test"

GB/T 17626.3-2006 "Electromagnetic Compatibility - Testing and Measurement Techniques-Radiated Radio-frequency Electromagnetic Field Immunity Test"

GB/T 17626.4-2008 "Electromagnetic Compatibility - Testing and Measurement Techniques-Electrical Fast Transient/Burst Immunity Test"

The provisions of above normative documents, through reference in this program, constitute provisions of this program. For dated references, subsequent amendments to (excluding any correction) or revisions are not applicable to this program. However, parties

who mutually agree to this program are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the respective normative document is applicable to this program.

3 General

Testing principle of instrument mainly consists of electrochemical profile and optical profile. The instrument mainly consists of transducer, amplifying circuit and display unit. It may be classified into non-continuous measuring instrument and continuous measuring instrument according to operating conditions; classified into diffusion type and inhalation type according to sampling type; or classified into portable type and fixed type according to the usage mode.

4 Technical Data and Experimental Prototype Submitted by Application Organization

4.1 Technical Data

- a) Prototype photo;
- b) Product standard (including inspection method);
- c) General assembly drawing, circuit diagram and drawing of key parts;
- d) Instruction for use;
- e) Test report by manufacturer or technical organization;
- f) Explosion proof certificate shall be provided where the products are indicated with function of explosion proof.

4.2 Experimental Prototype

The Application Organization shall provide the prototypes it manufactured and file an application for a single product or series products. In case of application for single product, three prototypes shall usually be provided (portable prototype); six fixed prototypes, of which

any three are used for long term stability test (fixed prototype). In case of application for series product, one third of the products, capable of representing product specifications, are sampled out of each series of products; the quantity of experimental prototypes of each specification shall follow “application for single product” principle - one application form for one product. Applying above principle, if total quantity of experimental prototypes is too large, required quantity may be reduced adequately.

5 Legal Management Requirements

5.1 Requirements for Measurement Unit

The instrument shall adopt the legal measurement units.

5.2 Requirements for Accuracy (Maximum Permissible Error)

The maximum permissible error of the instrument shall comply with JJG 695-2003.

5.3 Requirements for Legal Measurement Marking and Measuring Devices Identification

The legal measurement marking and measuring devices identification shall be indicated at easily-seen locations of instruments - such as nameplate, panel and gauge-head. Marking, serial number and description must be clearly distinguishable and firmly reliable.

5.3.1 The legal measurement marking generally includes:

——License marking and serial number for manufacturing and measuring devices (the position shall be reserved for the experimental prototype – only applicable to domestic-made instrument);

——Approved marking and serial number for measuring devices type (the position may be reserved for the experimental prototype - this item is not mandatorily required).

5.3.2 The measuring devices identification generally includes:

——Instrument name, specification (model), manufacturer name, manufacturing date and delivery number;

——Main technical indexes of the instrument;

$\pm 10\mu\text{mol/mol}$; where it is greater than $100\mu\text{mol/mol}$, the indicated error shall not exceed $\pm 10\%\text{FS}$.

7.6.4 High-temperature storage test

Test temperature: 55°C ;

Duration: 8 h.

After the test, the instrument shall be free from coating damage or corrosion; the indicated error shall comply with 6.1.

7.6.5 Low-temperature storage test

Test temperature: -40°C (test temperature for the instrument with LCD is -20°C);

Duration: 8 h.

After the test, the instrument shall be free from coating damage or corrosion; indicated error shall comply with 6.1.

7.7 Requirements for Mechanical Environment

7.7.1 Vibration test

In such case of 10 Hz~150 Hz, 5m/s^2 and 1 oct/min, three axes - ten sweep frequency turns are given for each axe; during the test, the portable instrument shall be able to work normally; after the test, the portable instrument and fixed instrument shall be free from mechanical damage or looseness at fastening position; the indicated error on the instrument shall be in accordance with those specified in 6.1.

7.7.2 Drop test

The drop height range shall meet the following requirements:

- a) Drop height range of 250mm for the instrument with mass under 1kg;
- b) Drop height range of 100mm for the instrument with mass between 1kg and 10kg;
- c) Drop height range of 50mm for the instrument with mass over 10kg.

The drop test is carried out once.

After the test, the instrument shall be free from mechanical damage and looseness at the fastening position and the indicated error shall be in accordance with those specified in 6.1.

7.8 Requirements for Electromagnetic Compatibility

7.8.1 Radio-frequency electromagnetic field radiation immunity test

9.1.1.2 Test conditions

Ambient temperature: $20^{\circ}\text{C}\pm 5^{\circ}\text{C}$;

Relative humidity: 45%RH~75%RH;

Supply voltage: $220\text{V}\pm 22\text{V}$ (AC) or rated value $\pm 10\%$ (DC);

Supply frequency: $50\text{ Hz}\pm 0.5\text{ Hz}$;

The gas and vibration having interference to the normal test on the instrument as well as the electromagnetic interference shall be avoided in the air nearby.

9.1.1.3 Test equipment

a) Gas reference materials: adopt the sulfur hydrogen gas reference materials with the concentration about 20%, 50% and 80% of the full span; the relative expanded uncertainty for the concentration of the gas reference material is not greater than 2% ($k=2$).

b) Zero gas: adopts the 99.999% pure nitrogen gas; or the clean air with sulfur hydrogen content less than $1\text{ }\mu\text{mol/mol}$.

c) Flow controller: span of $0\text{ L/min}\sim 1\text{ L/min}$ and the flowmeter has at least Grade 4 accuracy.

d) The reducing valve of supporting the standard gas cylinder shall be used; the reducing valve and the piping materials shall have no adsorption and chemical reaction to the tested gas.

e) The diffusion type instrument shall be provided with the diffusion cover assorted with the instrument for test use.

9.1.1.4 Test procedure

The instrument shall be preheated stably and adjusted for zero point and indication, accordance to the instruction for use of the instrument.

Flow control and requirements: the flow controller consists of two gas flowmeters, as shown in Figure 1.

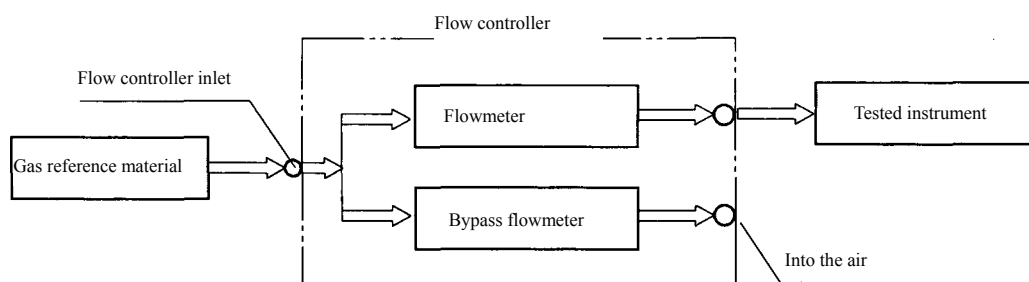


Figure 1 Diagram for Instrument Test

9.1.2.1 Test purposes

To test whether the measurement repeatability of the instrument complies with 6.2.

9.1.2.2 Test conditions

Same as 9.1.1.2.

9.1.2.3 Test equipment

Same as 9.1.1.3.

9.1.2.4 Test procedure

Provide the gas reference material with concentration being about 50% of the full span and record the indicated value on the instrument c_i after the reading is stable. Provide the zero gas and wait until the indicated value is stable. Provide gas reference material having the same concentration as above and measure for six times.

9.1.2.5 Data processing

The repeatability is expressed with the relative standard deviation in a single measurement and calculated by Formula (3).

$$s_r = \frac{1}{\bar{c}} \sqrt{\frac{\sum_{i=1}^n (c_i - \bar{c})^2}{n-1}} \times 100\% \quad (3)$$

Where,

s_r ——the relative standard deviation in a single measurement;

$\bar{c}$ ——the arithmetic mean of six indications, in mol/mol;

c_i ——the i^{th} indication, in mol/mol;

n ——the number of measurement.

9.1.2.6 Qualification criteria

It is qualified if the result is in accordance with those specified in 6.2.

9.1.3 Alarm setting error

9.1.3.1 Test purposes

To test whether the alarm setting error of the instrument complies with 6.3.

9.1.3.2 Test conditions

Same as 9.1.1.2.

9.2.1.1 Test purposes

To test whether the appearance of the instrument complies with 7.1.

9.2.1.2 Test conditions

Same as 9.1.1.2.

9.2.1.3 Test procedure

Inspect by hand feeling, visual observation and power on.

9.2.1.4 Qualification criteria

It is qualified if the result is in accordance with those specified in 7.1.

9.2.2 Functions

9.2.2.1 Test purposes

To test whether the function of the instrument complies with 7.2.

9.2.2.2 Test conditions

Same as 9.1.1.2.

9.2.2.3 Test procedure

Operate the self-checking function of the instrument or provide the gas reference material with the concentration exceeding that at the alarm setpoint and record sound and light alarm condition of the instrument. As for the battery-powered instrument, record the sound or lights index signal given by the instrument in case of under-voltage indication.

9.2.2.4 Qualification criteria

It is qualified if the result is in accordance with those specified in 7.2.

9.2.3 Long term stability

9.2.3.1 Test purposes

To test whether the long term stability of the instrument complies with 7.3.

9.2.3.2 Test conditions

Same as 9.1.1.2.

9.2.3.3 Test equipment

Same as 9.1.1.3.

9.2.3.4 Test procedure

9.1.2.1 Test purposes

To test whether the measurement repeatability of the instrument complies with 6.2.

9.1.2.2 Test conditions

Same as 9.1.1.2.

9.1.2.3 Test equipment

Same as 9.1.1.3.

9.1.2.4 Test procedure

Provide the gas reference material with concentration being about 50% of the full span and record the indicated value on the instrument c_i after the reading is stable. Provide the zero gas and wait until the indicated value is stable. Provide gas reference material having the same concentration as above and measure for six times.

9.1.2.5 Data processing

The repeatability is expressed with the relative standard deviation in a single measurement and calculated by Formula (3).

$$s_r = \frac{1}{\bar{c}} \sqrt{\frac{\sum_{i=1}^n (c_i - \bar{c})^2}{n-1}} \times 100\% \quad (3)$$

Where,

s_r ——the relative standard deviation in a single measurement;

$\bar{c}$ ——the arithmetic mean of six indications, in mol/mol;

c_i ——the i^{th} indication, in mol/mol;

n ——the number of measurement.

9.1.2.6 Qualification criteria

It is qualified if the result is in accordance with those specified in 6.2.

9.1.3 Alarm setting error

9.1.3.1 Test purposes

To test whether the alarm setting error of the instrument complies with 6.3.

9.1.3.2 Test conditions

Same as 9.1.1.2.

With stable power-on and preheating, provide the zero gas and the gas reference material with a concentration being about 80% and adjust the zero point and indication on the instrument. Run the instrument for continuous 28d and never adjust the zero point and indication during the period. At the last test day, provide the gas reference materials with concentration being about 20%, 50% and 80% of the full span respectively and determine the indicated error.

9.2.3.5 Data processing

Same as 9.1.1.5.

9.2.3.6 Qualification criteria

It is qualified if the result is in accordance with those specified in 7.3.

9.2.4 Adaptability of supply voltage

9.2.4.1 Test purposes

To test whether the instrument operates in accordance with 7.4 at the supply voltage fluctuation.

9.2.4.2 Test conditions

Same as 9.1.1.2.

9.2.4.3 Test equipment

- a) Same as 9.1.1.3;
- b) Voltmeter: AC voltage 0~1000V, DC voltage 0~200V; the accuracy higher than Grade 1.0.
- c) Voltage controlled power source: 0~300V for AC; 0~50V for DC.

9.2.4.4 Test procedure

- a) As for the AC powered instrument, connect the power line of the instrument on the adjustable power voltage which is set at the 220V. With the stable preheating, provide the zero gas and gas reference material with a concentration being about 80% of the full span into the instrument to adjust the zero point and indication on the instrument. Adjust the instrument to 187V and keep it for 20min, provide the gas reference materials with the concentration being about 20%, 50% and 80% of full span respectively and test their indicated errors. Adjust the instrument to 253V and keep it for 20min, provide the gas reference materials with

Insulation resistance meter, with the output voltage being 500V and the accuracy grade being Grade 10.

9.2.5.4 Test procedure

The instrument is not connected to the power supply, but its power switch shall be turned on. Connect the two wires of the insulation resistance test meter to the phase line (or the neutral line) and the ground terminal of the instrument respectively, apply 500-V D.C. voltage for 5 s, and then test the insulation resistance of the instrument with the meter.

Test the insulation resistance under damp heat conditions: place the instrument into the damp-heat test chamber with the temperature at $40^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and the relative humidity of 90%RH~95%RH for 48 h, during which period no dew drop or concentrate shall fall onto the instrument. After that, put the instrument for recovery under normal test conditions for 1 h, and then test the insulation resistance as per the method specified above.

9.2.5.5 Qualification criteria

It is qualified if the result is in accordance with those specified in 7.5.1.

9.2.6 Insulating strength

9.2.6.1 Test purposes

To test whether the insulating strength of the instrument meets the requirements of 7.5.2.

9.2.6.2 Test conditions

Same as 9.1.1.2.

9.2.6.3 Test equipment

Withstand voltage tester, with the A.C. voltage being 0 V ~1.5 kV, the frequency being 50 Hz and the accuracy being better than Grade 5.

9.2.6.4 Test procedure

The instrument shall not be connected to the power supply but the power switch shall be "on". Connect the two wires of the withstand voltage tester to the phase line (or neutral line) and the ground terminal of the instrument respectively, apply the sine wave A.C. voltage with the frequency of 50 Hz and the r.m.s voltage being at 1.5 kV for 1 min. After that, lower the voltage steadily to 0 V. Observe and record what happened during the test.

9.2.6.5 Qualification criteria

It is qualified if the result is in accordance with those specified in 7.5.2.

9.2.7 High-temperature test

9.2.7.1 Test purposes

To test whether the instrument operates in accordance with 7.6.1 under the high-temperature conditions.

9.2.7.2 Test conditions

Test temperature for the detection alarm instrument: $55^{\circ}\text{C}\pm 2^{\circ}\text{C}$;

Test temperature for the instrument: as specified in Table 2.

Duration: 2 h.

9.2.7.3 Test equipment

a) Temperature test chamber, which is capable of providing the temperature conditions as specified in Table 2 inside its operating space with the temperature deviation not exceeding $\pm 2^{\circ}\text{C}$; the volume of the chamber shall be 3 times greater than that of the instrument.

b) Same as 9.1.1.3.

9.2.7.4 Test procedure

7.6.5 under the low-temperature ambient conditions.

9.2.11.2 Test conditions

Temperature: $-40^{\circ}\text{C}\pm 2^{\circ}\text{C}$ or $-20^{\circ}\text{C}\pm 2^{\circ}\text{C}$;

Duration: 8 h.

9.2.11.3 Test equipment

a) Temperature test chamber: at the constant -40°C or -20°C , the temperature deviation shall not exceed $\pm 2^{\circ}\text{C}$; the volume of the test chamber shall be greater than 3 times the volume of the instrument.

b) Same as 9.1.1.3.

9.2.11.4 Test procedure

a) Place the instrument with package into normal position of the test chamber of which the temperature is same at that of the instrument.

b) Lower the temperature of the chamber at the rate not greater than $1^{\circ}\text{C}/\text{min}$ to the specified value and keep it for 8h.

c) Upon the test duration is reached, the temperature of the chamber is to be raised at the rate not greater than $1^{\circ}\text{C}/\text{min}$ to the initial temperature, and remove the instrument from the package out of the chamber. Leave it for recovery for 24h under test conditions and make the test according to 9.1.1.4.

9.2.11.5 Data processing

Same as 9.1.1.5.

9.2.11.6 Qualification criteria

It is qualified if the result is in accordance with those specified in 7.6.5.

9.2.12 Vibration test

9.2.12.1 Test purpose

To test whether the adaptability of the instrument to vibration and its structure comply with 7.7.1.

9.2.12.2 Test conditions

Same as 9.1.1.2.

9.2.12.3 Test equipment

a) Vibration test platform: with the frequency range being 1 Hz ~ 400 Hz, the amplitude being 0 mm ~ 5 mm and the maximum acceleration being 200 m/s^2 .

b) Same as 9.1.1.3.

9.2.12.4 Test procedure

Fasten the instrument onto the vibration test platform, per normal assembly and operation. Turn on the platform, within frequency 10 Hz ~ 150 Hz, acceleration of 5 m/s^2 and 1 oct/min, sweep for 10 times at the three axes X, Y and Z respectively. Portable instruments shall be subjected to such test under operating conditions and its state shall be monitored, while fixed instrument shall be subjected to such test under non-operating conditions. After the test, inspect the appearance and the fastened positions of the instrument and then make the test according to 9.1.1.4.

9.2.12.5 Data processing

Same as 9.1.1.5.

9.2.12.6 Qualification criteria

It is qualified if the result is in accordance with those specified in 7.7.1.

Make the test according to the requirements of Chapter 8 in GB/T 17626.2-2006. During the test, observe and record operating state of the instrument; after the test, make the test according to 9.1.1.4.

9.2.15.5 Data processing

Same as 9.1.1.5.

9.2.15.6 Qualification criteria

It is qualified if the result is in accordance with those specified in 7.8.2.

9.2.16 Electrical fast transient/burst immunity test

9.2.16.1 Test purpose

To test whether the electrical fast transient/burst immunity of the instrument complies with 7.8.3 under the test conditions.

9.2.16.2 Test conditions

Same as 9.1.1.2.

9.2.16.3 Test equipment

- a) In conformity with the requirements of Chapter 6 in GB/T 17626.4-2008.
- b) Same as 9.1.1.3.

9.2.16.4 Test procedure

Make the test according to the requirements of Chapter 8 in GB/T 17626.4-2008. During the test, observe and record operating state of the instrument; after the test, make the test according to 9.1.1.4.

9.2.16.5 Data processing

Same as 9.1.1.5.

9.2.16.6 Qualification criteria

It is qualified if the result is in accordance with those specified in 7.8.3.

10 Judgment of Pattern Evaluation Result

10.1 The judgment of the test results obtained for each specification is divided into the single judgment and comprehensive judgment.

10.2 In case of a single judgment, the technical requirements, measured data and conclusion for qualification or disqualification for each item shall be given. The individual test result is judged to be qualified until the results for all the three prototypes tested for a single item are qualified; in case of any unqualified prototype, the result for the individual test is judged to be disqualified.

10.3 The comprehensive judgment is based on the result of the single judgment. The result of comprehensive judgment is “qualified” only if all the single items are qualified, otherwise, the result of comprehensive judgment is “disqualified”.

10.4 As for the series products, this series is judged to be disqualified in case of any one type with unqualified specification.

11 Original Records Form for Pattern Evaluation

References and Original Chinese Documents

- [1] JJF 1363-2012 Program of Pattern Evaluation of Sulfur Hydrogen Gas Analyzers.
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