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NATIONAL METROLOGICAL VERIFICATION

REGULATION

OF THE PEOPLE'S REPUBLIC OF CHINA

JJG 1073-2011

Pressure Type SF6 Gas Density Monitors

压力式六氟化硫气体密度控制器

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Verification Regulation of Pressure Type SF6 Gas Density Monitors

JJG 1073-2011

This Regulation was approved by the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China on December 28, 2011 and implemented on March 28, 2012.

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**Verification Regulation of Pressure Type SF₆
Gas Density Monitors**

1 Scope

This Regulation is applicable to the initial verification, subsequent verification and examination in service of pressure type SF₆ gas density monitors or gas density relay (hereinafter referred to as instrument) with measuring range of (-0.1~0.9) Mpa, the bourdon tube as measuring element, with temperature compensating device and contact output function.

2 Normative References

This Regulation quotes the following documents:

JJG 52-1999 Verification Regulation of Bourdon Tube Pressure Gauge Pressure - Vacuum Gauge and Vacuum Gauge for General Use

GB/T 22065-2008 Pressure Type SF₆ Gas Density Monitors

For dated references, only the edition cited applies; for undated references, the latest edition of the reference document (including any amendments) applies.

3 Terms and Definitions

3.1 Rating pressure

Under standard atmosphere pressure conditions, SF₆ gas pressure shall be filled to the air chamber of the equipment as required before the equipment is put into operation or air supply.

3.2 Alarm pressure

Where the SF₆ gas pressure in the air chamber of the equipment drops to a set value, the instrument will give alarm signal and the set value is referred to as alarm pressure.

3.3 Atresia pressure

Where the SF₆ gas pressure in the air chamber of the equipment drops to a set value, the instrument will give atresia signal and the set value is referred to as atresia pressure.

3.4 Upper-limit alarm pressure

Where the SF₆ gas pressure in the air chamber of the equipment exceeds a set value, the instrument will sent out alarm or control signal through the connecting and disconnecting at the connecting points and the set value is referred to as upper-limit alarm pressure.

3.5 Set-point deviation

The difference between the set value and the actual pressure at the signal switching of the instrument

3.6 Switching deviation

At the same set-point, the difference between the actual pressures of the signal switching on or switching off of the instrument

3.7 Static pressure test

The verification of indication error with the load removed after the instrument is pressurized to upper limit of the measurement and the pressure is kept for 4h.

4 General

The instrument monitors SF₆ gas density through the measurement of the SF₆ gas pressure in the airtight equipment.

The working principle and basic structure of the instrument is to add temperature compensation function based on electric contact pressure gauge. The working principle is as follows: that elastic deformation occurs to the internal spring under the pressure, so terminal movement is caused, amplified through driving mechanism and transferred to indication device after temperature compensation, and finally the measured pressure value is indicated on the index plate through the pointer. Where the pressure drop to the alarm pressure or atresia pressure, the instrument gives alarm or atresia signal through connecting and

$$\Delta t = |t_2 - t_1|, ^\circ\text{C};$$

t_2 - the ambient temperature with the arbitrary value within $-20^\circ\text{C}\sim 60^\circ\text{C}$, $^\circ\text{C}$;

$t_1=20^\circ\text{C}$;

K_1 - the temperature compensation coefficient ($0.02\text{ \%}/^\circ\text{C}$).

5.9.2 Where the ambient temperature is less than -20°C ,

$$\Delta_2 = \pm(\Delta_{-20} + K_2 \Delta t) \quad (2)$$

Where,

Δ_2 - the permissible value of temperature compensation error with ambient temperature less than -20°C (calculated according to the percentage of measuring range);

Δ_{-20} - the permissible value of temperature compensation error with ambient temperature being -20°C (calculated according to the percentage of measuring range);

$$\Delta t = |t_2 - t_1|, ^\circ\text{C};$$

t_2 - the ambient temperature with the arbitrary value less than -20°C , $^\circ\text{C}$;

$t_1=-20^\circ\text{C}$;

K_2 - the temperature compensation coefficient ($0.05\text{ \%}/^\circ\text{C}$).

6 General Technical Requirements

6.1 Exterior Structure

6.1.1 The instrument shall be assembled firmly and free from looseness; the thread joint shall be free from burr and damage; where the instrument filled with silicone oil is placed vertically, the liquid level shall be at $70\%\sim 75\%$ of the height of the instrument index plate and the instrument shall be free from oil leakage.

6.1.2 The instrument shall be provided with the following marks:

Measurement unit, model, delivery No. measuring range, accuracy grade, manufacturer, rated pressure value, alarm value, close down value and over-limit pressure alarm value.

Alarm value and close down value shall be in obvious different colors on the index plate of the instrument so as to make a distinction between them.

6.1.3 Instrument glass shall be colorless and transparent, free from the defects or damage hindering reading; the instrument index plate shall be smooth and clean with the digits and

After clean and dry SF₆ gas is filled to rated pressure, leak test shall be conducted with SF₆ gas leak detector with sensitivity no less than 10⁻⁸ and no leakage point shall be found. The instrument shall be covered in the cover for 24h in initial verification.

7.3.8 Smoothness examination of pointer deflection

Visual observation is conducted on the deflection condition during the process of indication error verification.

7.3.9 Set-point deviation verification

a) Set-point selection: alarm point and block system spot shall be selected as the set-point; as for the instrument with over-limit alarm function, alarm point of over-limit pressure shall be added as the set point.

b) Determination of the upper and lower switching values: pressure boosting or dropping is conducted uniformly and slowly - where the indication pointer approaches the set value, the speed of the pressure boosting or dropping shall not be greater than 0.001MPa/s; where the operation and output occurs at the electric contact, pressure boosting and dropping shall be stopped and the pressure value shall be read on the standard instrument and the value is the upper switching value or lower switching value.

c) The difference between the upper switching value and the set-point pressure value is the set-point deviation of pressure boosting while the difference between the lower switching value and the set point pressure value is the set-point deviation of pressure dropping.

7.3.10 Verification of switching deviation

Verification of switching deviation may be conducted at the same time as that of the set-point deviation, and the difference between the upper and lower switching values at the same set point is the switching deviation.

7.3.11 Verification of temperature compensation error

At ambient temperature of (20±2) °C, the instrument is vacuumed to 90% of the local vacuum limit, filled with SF₆ gas at rated pressure and kept for 3h; after it is inspected as free from air leakage, the indicated value of the instrument is recorded, and the device is put into the high and low temperature test box for the verification of temperature compensation error. Test temperature is respectively -30°C, 60°C or the temperature specified in the instrument

instructions; after each temperature spot is constant for 2h, the indicated value of the instrument shall be read and the difference between the value and the indicated value of the instrument at $(20\pm 2)^\circ\text{C}$ is just the temperature compensation error.

7.3.12 Insulation resistance

Two wires of the insulation resistance meter is connected with the instrument terminal and the enclosure; the test is conducted at the ambient temperature of $(20\pm 2)^\circ\text{C}$ and relative humidity no greater than 80%, and the insulation resistance shall not be less than $100\text{M}\Omega$.

7.3.13 Dielectric strength

The connecting point and enclosure are respectively connected to the voltage-withstanding tester, and the test voltage is boosted steadily until 2kV, keeping for 1min and the instrument and voltage-withstanding tester are observed.

7.4 Verification Results Processing

7.4.1 Qualified instrument is verified and the verification certificate is issued in accordance with the requirements of this Regulation.

7.4.2 Unqualified instrument is verified and the verification result notice is issued and unqualified items and contents are indicated in accordance with the requirements of this Regulation.

7.5 Verification Period

Verification period of instrument may be determined according to the service environment and service frequency time, but it generally shall not exceed one year.

Appendix C

Format of Content Page of Verification Result Notice

Measurement range: _____ MPa

Accuracy grade: Grade: _____

Appearance inspection: _____

Zero error: _____

Compression check: _____

Insulation resistance: _____

Dielectric strength: _____

Smoothness of pointer deflection: _____

Maximum indication error: _____

Maximum hysteresis error: _____

Rated pressure value error: _____

Maximum value of set-point deviation: _____

Maximum value of switching deviation: _____

Maximum temperature compensation error : _____

According to the verification result(s), the measuring device is unqualified, and the unqualified items and contents are as follows:

_____ END _____

References and Original Chinese Documents

[1] JJG 1073-2011 Pressure Type SF Gas Density Monitors.

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