

Technical Requirement for Environmental Products

The Certifiable Technical Requirement for Environmental Labelling Products

Metal welding Gas

HBC 13 - 2002

1 Scope

This technical requirement specifies definition, basic requirements, technical contents and test method for environmental labelling products of metal welding gas.

This technical requirement shall apply to hydrocarbon gases with function of metal welding, incision, heating or new metal welding gases use additive in the hydrocarbon gases.

2 Standards cited

Provisions in the following standards are cited in this technical requirement, and therefore form the provisions of the standard. When this technical requirement is published, all of the version of these standards are valid. All of these standards shall be revised, and parties use this technical requirement should take into consideration the possibility of using the latest edition of the following standards.

GB 9052.1 - 1998 Liquefied petroleum gas of oil and gas field

GB 9448 - 1999 Safety in welding and cutting

GB 12206 - 1990 Method of testing for calorific value of gas in urban areas

GB 17673 - 1999 Welded steel cylinders for liquefied propylene and propane gases

GB 18583 - 2001 Indoor decorating and refurbishing materials--Limit of harmful substances of adhesives

SH 0232 - 1993 Test method for Corrosion of Copper Strip in Liquefied Petroleum Gas

3 Basic requirements

3.1 Quality of main media of product (excluding additives) should accord with requirement in GB 9052.1-1998.

3.2 Safety performance in using the products should accord with requirement in GB9448-1999.

3.3 Pollutant emission of the company should conform with pollutant emission standards nationally or locally.

4 Technical contents

4.1 Acetylene gas produced by method of calcium carbide process should not be used in the products.

4.2 Benzene content in additive of products should be $\leq 5\text{g/kg}$, total contents of toluene and xylene should be $\leq 200\text{g/kg}$.

4.3 Flame temperature of the products when burning in oxygen should be higher than 3000 .

4.4 Caloricity of products should not less than 90MJ/m^3 .

4.5 Corrosivity level of containers due to the product should not higher than I level.

4.6 Residual in cylinder when ambient temperature and cylinder temperature is 0 and residual pressure of cylinder is 0.01 Mpa should be less than 3% of the total filled amount.

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5 Test

- 5.1 The technical contents in 4.1 shall be verified through field inspection.
- 5.2 Determination of benzene content in 4.2 of this technical contents should be conducted according to the method in annex B of GB 18583-2001, and according to annex C of GB 18583-2001 for toluene and xylene.
- 5.3 Section 4.3 in the technical contents should be verified by method in annex A.
- 5.4 Section 4.4 in the technical contents should be determined by the method of testing for calorific value of gas in urban areas (GB 12206-1990).
- 5.5 Section 4.5 in the technical contents should be determined by the method for corrosion of copper strip in liquefied petroleum gas (SH 0232-1993).
- 5.6 Section 4.6 in the technical contents should be verified by method in Annex B.

Annotations :

This technical requirement has been prepared by Department of science and technology, standards of State Environment Protection Administration.

The State Environment Protection Administration keeps the right of interpretation for this technical requirement.

Annex A (annex of the standard)

Determination for gas stream temperature by method of heat flow

A.1 Summary

Stagnation point heat transfer rate of mixed gases associates with mass ratio of each gas in the mixed gases. Stagnation point heat transfer rate have certain relation with stagnation point enthalpy of mixed gases, valid head radius of heat flow probe, stagnation pressure, as described in literature 1 :

$$q_s \cdot \sqrt{\frac{R_{eff}}{p_s}} = \left(\sum_i \frac{C_i}{K_i} \right)^{-1} (H_s - H_w) \quad (1)$$

Where : q_s —Stagnation point heat flow , cal/(cm².s); (1cal=4.1868J)

R_{eff} —Valid head radius of heat flow probe , cm ;

p_s —Absolute pressure of stagnation point , atm; (1atm = 101.325 kPa)

C_i —Mass ratio of single gas to mixed gas ;

K_i — Gas constants, as given in table 1 ;

H_s —Specific enthalpy of stagnation point , cal/g ;

H_w —Enthalpy of cold wall , cal/g .

Table 1 Thermal conduction constants of various gases

Gasses	K_i (g. cm ^{-3/2} . s ⁻¹ . atm ^{-1/2})
Air	0.1235
Carbon dioxide	0.1372
Hydrogen gas	0.0407
Nitrogen	0.1155
Water vapor	0.1436

From above, it is observed that specific enthalpy of stagnation point of mixed gas could be calculated from equation (1) so long as gas component after burning is known, and stagnation point heat flow and stagnation pressure in peak flame temperature area are measured; temperature of various gases could be obtained by looking up table of thermodynamic enthalpy & entropy, thereby temperature of mixed gas could be calculated from equation (2).

$$T_0 = \sum_i C_i T_i \quad (2)$$

A.2 Parameter measurement

A.2.1 Measure for q_s : by plug style calorimeter. Oxygen-free copper probe core, which is 3mm in diameter, 5 mm high and installed in stainless steel insulation cover; probe diameter is 6 mm after installed, its head is flat and valid head radius R_{eff} =6mm. Install probe on feed-in bracket; scan it to enter into high temperature flame area, stay for 0.5s and take back, record the temperature increase of thermocouple on back side of probe core. Figure out q_s according to equation (3).

$$\phi_s = C \rho \delta \frac{dT}{dt} \quad (3)$$

Where: C Oxygen-free copper specific-heat capacity, which is 0.092cal/ (g.);
 Oxygen-free copper density, 8.9g/cm³
 Thickness of probe core, cm

$\frac{dT}{dt}$ —Temperature change rate in unit time, /s。

A.2.2 Measuring ps: it is measured by scan pressure probe with 2mm head radius and 1 mm diameter pressure hole. There is proper pressure gauge installed on probe; scan falme and measure stagnation pressure.

A.2.3 Determination of Ci: If gas component can be measured directly, it should use measured result, or use that of gas component that the fuel gas has been completely combusted. Determine mass ratio of each gas component to mixed gas according to complete combustion chemical equation.

Annex B (Annex of the standard)

Method of measuring residual volume of fuel gas

B.1 Summary

After fuel gas has been burnt out, a certain mass of residual liquid will be certain to remain due to the effect of impurity of fuel gas and the ambient conditions. The residual liquid may cause severe environmental pollution and potential safety hazard after they are discharged into environment.

B.2 Measuring method

- (1) Draw 1-2 standard bottles (15kg/bottle) of fuel gas to be tested randomly on site, weighs the drawn fuel gas;
- (2) Use fuel gas in ambient condition of 15 till the pressure reducer installed on cylinder indicates 0.01MPa; and weigh the gas;
- (3) Calculate the percentage of weight of residual liquid to total fuel gas weight.