



TECHNICAL INFORMATION SHEET 31

GAS CLASSIFICATION CHANGES UNDER ISO 10156

Background

When filling compressed gases, gas companies follow national and international standards to determine the correct product classification and identification. A gas classified as non-flammable will have a different transport label to a flammable gas. In some countries, regulations regarding the cylinder valve connection, as well as the cylinder shoulder colour are also used to differentiate a flammable gas from a non-flammable gas.

ISO 10156: 2017

ISO 10156, *Gas cylinders. Gases and gas mixtures. Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets*, defines a standard method for determining the flammable or oxidising potential of a gas or gas mixture. ISO 10156 was revised and a new version published in 2017. There are no changes to the classification of pure gases or mixtures in this revision compared to the 2010 standard. ISO 10156 is consistent with the UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

NOTE: ISO 10156 provides a calculation method for determining whether a gas or gas mixture is flammable in air.

Tci Values

The Threshold combustion index (Tci) is defined as the maximum content of a flammable gas which, when mixed with nitrogen, is not flammable in air. Tci is also used as a reference parameter in any kind of mixture that contains a flammable component. The 2010 standard included changes to these Tci values for a number of gases. Within ISO 10156: 2010, new Tci values were assigned to a variety of existing mixtures and depending on the mixture, the Tci value may be higher (less restrictive) or lower (more restrictive) than in the previous 1996 version of the standard.

There are no changes to the Tci values in the 2017 version of the standard.

Direct implications of the 2010 standard are detailed below and these remain within the 2017 version of the standard:

- A new transportation identification label may have been required.
- In some countries, a new cylinder shoulder colour may have been required to indicate the change from either a non-flammable to a flammable mixture, or from a flammable to a non-flammable mixture.
- The Safety Data Sheet was updated to include the changes for cylinder safety and transport.
- In some countries, a different cylinder valve outlet may have been required.

Indirect implications for the user arising from the 2010 standard:

- Storage conditions may need to be reviewed.
- Transport conditions may need to be reviewed.

- Existing risk assessments may need to be reviewed or new risk assessments conducted.
- Gas control equipment and supply system compatibility may need to be checked, as changes may be required for both cylinder connections and supply line labelling.
- A roll out programme may be needed to change over equipment and cylinders.

Some examples

Gas	Tci ISO 10156: 1996	Tci ISO 10156: 2010 & ISO 10156: 2017
Hydrogen (H ₂)	5.7	5.5
Methane (CH ₄)	14.3	8.7
Ethylene (C ₂ H ₄)	6.0	4.1
Ethylene Oxide (C ₂ H ₄ O)	3.1	4.8
R152a	4.6	8.7

A mixture with 7.5 % methane in argon was classified as non-flammable according to ISO 10156:1996, but became flammable according to ISO 10156: 2010. This required a different UN number and proper shipping name, i.e. from UN1956 to UN1954, and where required, the shoulder colour was changed from green to red. As noted, a new cylinder valve designation may also have been required.

A mixture with 4 % ethylene oxide in nitrogen was classified as flammable according to ISO 10156: 1996, it became non-flammable according to ISO 10156: 2010. This required a different UN number and proper shipping name, i.e. from UN1954 to UN1956, and where required, the shoulder colour was changed from red to green. As noted, a new cylinder valve designation may also have been required.

In both cases there were changes required to the Safety Data Sheet.

Further information on the colour codes used to identify gas cylinders is available in BCGA TIS 6, *Cylinder identification. Label and colour code requirements*.

References:

- 1) ISO 10156: 1996, *Gases and gas mixtures. Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets*.
- 2) BS EN ISO 10156-2: 2005. *Gas cylinders. Gases and gas mixtures. Determination of oxidizing ability of toxic and corrosive gases and gas mixtures*.
- 3) BS EN ISO 10156: 2010, *Gases and gas mixtures. Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets*.
- 4) BS EN ISO 10156: 2017, *Gas cylinders. Gases and gas mixtures. Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets*.
- 5) BCGA TIS 6, *Cylinder identification. Label and colour code requirements*.

For more information:

British Standards Institute (BSI)

www.bsigroup.co.uk

British Compressed Gases Association (BCGA)

www.bcgaco.uk

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