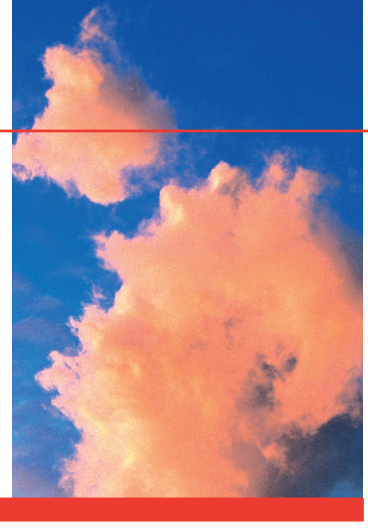

Gas Mixtures for Flammability Monitoring

WHAT LEVELS DO I USE?

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CoGDEM
The Council of Gas Detection and Environmental Monitoring

The use of gas mixtures is widespread for the calibration and function checking of gas detection systems. Historically, the flammability levels have been determined by a single standard, ISO10156 (Gases and gas mixtures – Determination of fire potential and oxidizing ability for the selection of cylinder valve outlets). However, recent changes have resulted in new standards that are being applied on a territory basis, meaning that ambiguity can arise on specifying calibration gas mixtures.

Using LEL Levels for Calibration

The most common method for specifying gas mixtures has been to quote a percentage of the Lower Explosive Limit – the LEL. For example, the use of 50% LEL Methane in Air is widespread throughout many safety applications and the default is often to order gas mixtures based on that specification.

This has been the status quo for many years and has caused no problems whilst the accepted standard for flammability limits has been ISO10156. Users, equipment manufacturers and gas companies have become au fait with the terminology over the years and it has been the norm to reorder mixtures of 50% LEL Methane etc. It is noteworthy that the gas company will need to convert the LEL value taken at the point of order placement to a molar volume value for filling purposes. The mechanism here is that this is referenced versus ISO10156, calculated and then cross-checked to ensure no safety issues exist. Thus, using the example of 50% LEL Methane in Air, your gas supplier would have converted this to a concentration of 2.5% Methane in Air based on the fact that the accepted LEL value for methane was 5.0%.

IEC79-20 the Upset Applecart

The problem started with the publication of IEC79-20 (Data for flammable gas and vapours relating to the use of electrical apparatus), a technical report that utilises a different test regime to ISO10156, where the latter is heavily biased to gas mixture production and not to electrical equipment. Due to the differing test methods, the LEL values in IEC79-20 vary in certain cases from ISO10156, which is causing considerable confusion in the marketplace,

1. Non refillable range. "Calibration gases in non-refillable canisters are the most common method of field calibration for flammable gas monitors."

2. Filling Room. "The requirements for filling gas mixtures safely differ to the electrical standards used for setting limits for gas monitors."

particularly now the IEC79-20 figures are being referenced in EN61779 (now also a BS EN). The latter standard has recently been published in The Official Journal of the European Communities and will inevitably be more generally applied in the marketplace.

The table below shows some of the notable difference in values between the two standards. It is not intended to be fully comprehensive and the relevant standards should be referenced for the full information.

Substance	50% LEL ISO10156	50% LEL IEC79-20 or BS EN61779
Butane	0.9	0.7
IsoButane	0.9	0.65
Carbon Monoxide	6.25	5.45
Ethane	1.5	1.25
Ethene	1.35	1.15
Methane	2.5	2.2
Propane	1.05	0.85

It can be clearly seen that the 50% LEL of Methane in BS EN61779 calculates to a 2.2% concentration in air. If you are calibrating to this standard and use a mixture of 50% LEL methane made to ISO10156, then you could be incurring a 13.6% error, potentially invalidating the calibration. In fact, with non-linear infrared gas detectors, the error could be even greater. Plus, when it comes to reorder point, what will you get when you order a 50% LEL mixture, the ISO10156 or EN61779 values?

How are the Standards Being Applied?

European manufacturers and users of flammable gas detection instruments and systems are moving to the new values of LEL. Under the ATEX Directive, covering the certification and use of equipment in flammable atmospheres, it is important that manufacturers and users comply with up-to-date Standards. This implies use of the new LEL values listed in EN61779, rather than the older figures that were referenced under the superseded Standard EN50054.

Worldwide certification under the IECEx scheme is now gaining in popularity, and the IEC Standards that cover gas detector performance have been in place for many years with the new LEL values.

Despite the EN61779 standard rapidly becoming the norm for Europe, ISO10156 is still heavily used in the US and the values contained within it are most relevant to the production of gas standards. Both equipment and gas suppliers are supplying product across many markets and this co-existence of standards is likely to remain for the foreseeable future.

3. Manhole shot. "Users need to be aware of the differing standards to ensure correct calibration of fixed and portable equipment."

Another awkward transition may have to occur in the mining industry, where methane detection is crucial. Traditionally, this industry has not adopted the LEL approach, preferring to refer to gas concentrations in % volume terms. So, flammable gas detection instruments used in mining applications often have a correction factor so that they can display within the range 0 – 5.0% Methane, but be switched back to display in LEL units. Once the rest of the world adopts the new values, such that 100% LEL is only 4.4% volume methane, the mining industry will be out of step.

Dealing With Your Gas Supplier

The gas suppliers will be operating to strict guidelines regarding what concentration levels of flammable gas mixture can be produced. A typical production method involves adding the constituent gases sequentially to cylinders, potentially providing a risk element if the level of flammable gas is too high. The relevant industry body for the UK is the British Compressed Gases Association, and member companies operate to specific standards and codes of practise regarding gas mixture production.

The only accepted LEL values for the production of gas mixtures will be those that relate to the typical conditions experienced when filling a cylinder. In that respect the new BS EN61779 is irrelevant to gas suppliers since the test regime does not model that scenario.

Consequently, the communication of user requirements to the gas companies is vital. The best method is not to specify the LEL value, but to request the mixture using the molar concentration value, i.e. 2.2% Methane in air for compliance with BS EN61779. If however, the LEL value is unknown, then the standard should be specified and acknowledgement of the standard should be gained from the person taking the order.

How the Equipment Manufacturers Can Help

Gas detection equipment is typically calibrated at the factory at the correct setting for market conditions. Information regarding the concentration of gas used should be available from the manufacturer, and this should be the first point of contact if you are uncertain regarding what standard to use for calibrating you instrument.

What to do if you Need More Information?

CoGDEM represent the interests of all parties involved in gas detection for industrial and domestic applications. Representatives from gas detection equipment manufacturers, gas suppliers and regulatory bodies work together to help improve clarity and information provision on all aspects of gas detection. For further information visit www.cogdem.org.uk or e-mail cogdem@aol.com .

The Author

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