

APPLICATION NOTE

Leak testing of glove boxes with Sensistor ISH2000 Hydrogen Leak Detector

APPLICATION

Leak location on containment enclosures and glove boxes both in production and after commissioning. Also implemented for periodical tests during subsequent operation.

SOME USERS

- GlaxoSmithKline
- Bosch Packaging
- Sanofi Aventis
- Skan

BENEFITS

- Fast response
- Fast pin-pointing of the leak position
- No operator interpretation of the leak size, precise measurement obtained
- Repair only the relevant sites (those leaking above the reject level)
- All leaks detected even in hard to access areas
- Improves quality and saves time

SPECIFICATION

The leak specification for isolators and glove boxes is regulated by the ISO standard 10648-2. The appropriate class is selected according to the media in the enclosure. Typical leak specifications for the four classes are shown below. Tests are performed at low overpressure.



Fig. 1: Leak detection with Sensistor ISH2000 Hydrogen Leak Detector

CURRENT METHOD AND REASON FOR CHANGE

Tightness control of isolators and glove boxes is often performed using a pressure decay measurement. The problems encountered with these methods are:

- Pressure decay tests are volume dependant and therefore not suitable for testing soft/flexible components.
- Pressure decay measurements are temperature sensitive and can therefore result into erroneous measurements. According to ISO 10648-2, the temperature variation during test may not exceed ± 3 °C.

CHANGING TO HYDROGEN LEAK TESTING

The Hydrogen Method requires the injection of the diluted Hydrogen into the isolators and the glove boxes, similar to the helium test. The test using the INFICON Sensistor equipment is sequenced as follows:

Isolators and glove boxes are filled with a ready made gas mixture consisting of 5% Hydrogen and 95% Nitrogen at low pressure. A hand probe connected to the Hydrogen Leak Detector Sensistor ISH2000 is then used to inspect all critical areas (joints, sealing gaskets etc.). Audio and visual alarms are activated indicating the precise location of the leak. By connecting a reference leak to the isolator it is possible to quantify the leak size.

Class	Air renewal (h-1)	Leak rate mbarl/(s.m3)
1	$\leq 5 \times 10^{-4}$	$\leq 0,14$
2	$5 \cdot 10^{-4} < x < 2,5 \cdot 10^{-3}$	$0.14 < x < 0.7$
3*	$2.5 \cdot 10^{-3} < x < 10^{-2}$	$0.7 < x < 2.8$
4	$10^{-2} < x < 10^{-1}$	$2.8 < x < 27.8$

*See calculation example below

EXAMPLE OF APPLICATION

Class 3 containment enclosures having a 5 m³ volume

According to the ISO standard ISO 10648-2, the accepted leak rate is less than $2.5 \times 10^{-3} \text{ h}^{-1}$, which equates to:

$$0.0025 \text{ h}^{-1} \times 5 \text{ m}^3 = 0.0125 \text{ m}^3/\text{h} = 3.5 \text{ cm}^3/\text{s} \text{ (equal to } 3.5 \text{ mbarl/s)}$$

If you locate 100 single leaks, then the accepted leak rate will be:

$$3.5 \text{ cm}^3/\text{s} / 100 = 3.5 \times 10^{-2} \text{ cm}^3/\text{s} \text{ (mbarl/s)}$$

EQUIPMENT USED

Hydrogen Leak Detector Sensistor ISH2000

The Sensistor ISH2000 is virtually maintenance free (no moving parts) making it the ideal detector for the production floor. A microelectronic sensor that responds only to the Hydrogen gas ensures that true readings for the leak are obtained each and every time.



Reference leaks (optional)

Calibrating the Sensistor ISH2000 Hydrogen Leak Detector with a reference leak enables you to set the detector to give off an alarm everytime the located leak is above the leak limit. Reference leaks traceable to NIST, BIPM, NMIJ etc are available for calibrating the Sensistor ISH2000 in flow units and leak sizes of your choice.



FACTS ABOUT HYDROGEN AS A TRACER GAS

The gas used for testing is a mix of 5% Hydrogen and 95% Nitrogen which is inexpensive, non flammable (see ISO 10156), non toxic and with no environmental issues. With the hydrogen's unique dispersion characteristics it will not only quickly and evenly fill the isolator but will also quickly clear the test area allowing isolators to be continuously tested with no wasted time. Some gas suppliers have their own trade name for this gas mixture



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