

12th January 2012

Guide to Flame Testing R-134a for Chlorine Contamination

Flame Halide Detector

The method is to check a small quantity of gas from each of the refrigerant bottles in stock using the described Flame Halide Detector. At present no other method has been found that will satisfactorily find mixtures of gases containing chlorinated products.

This test will detect if there are chlorine contaminants in the refrigerant, sensitivity 300ppm (parts per million). R-134a is fluorinated and does not change the colour of the flame. A green flame indicates the presence of chlorine. R-22, for example, will show a green flame. Halide detectors were commonly used by service engineers for more than twenty years but became largely obsolete when chlorine-free refrigerants, (like R-134a), were introduced.



To familiarise yourselves with this, try a test using a bottle of R-22. This link shows what you should expect: <http://www.youtube.com/watch?v=jHJU6UYM6Ug>

Any refrigerant bottles marked R-134a that show a green flame should be quarantined and NOT USED.

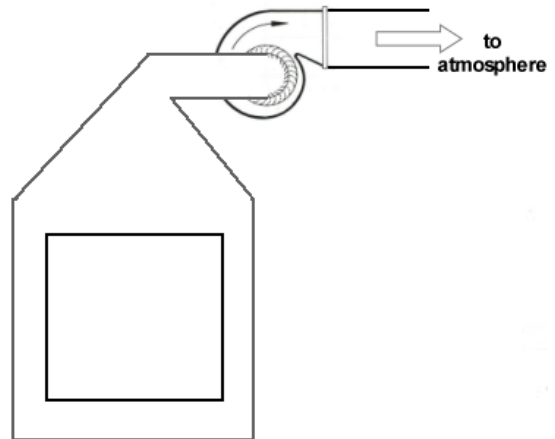
It is recommended that the contents be sent to a laboratory for analysis.

Procedure



To minimise the risks associated with the product of degradation fumes, fabricate a fume cupboard using an enclosure and extractor fan.

Vessels and depots could use existing air extraction devices such as welding or exhaust extractors.



To minimise the risks associated with flammable gases and to comply with F-gas regulations, (minimising release of F-gas) use a set of service gauges and a capillary as shown.

Bubble the gas through some water to ensure the flow rate is minimal. Just a few bubbles will suffice, as the test is very sensitive.

Please note a standard blowtorch cannot be used, as the copper reaction plate is required.



OK! Blue flame = R-134a



Bad! Green flame = contamination

List of Decomposition Products

Small quantities of the following chemicals may be produced as a result of the flame test. The following data could be used in any necessary risk assessment:

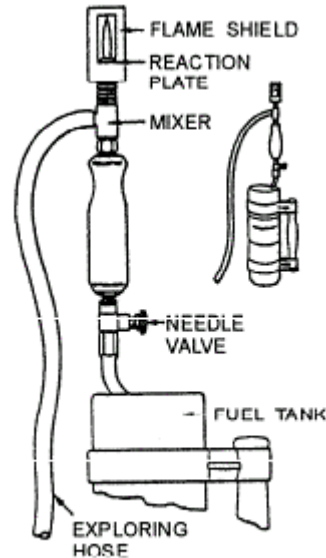
Chemical	Formulae	TLV ppm	Comments
Hydrofluoric acid	HF	5	Degradation acid from fluorinated chemicals
Hydrochloric acid	HCL	3	Degradation acid from chlorinated chemicals
Phosgene	COCl ₂	0.1	Toxic gas degradation from chlorinated chemicals
Carbonyl fluoride	COF ₂	2	Toxic gas degradation from fluorinated chemicals
Carbon monoxide	CO	25	Product of incomplete combustion

The threshold limit value (TLV) of a chemical substance is a level to which it is believed a worker can be exposed day after day for a working lifetime without adverse health effects. Strictly speaking, TLV is a reserved term of the American Conference of Governmental Industrial Hygienists (ACGIH). However, it is sometimes loosely used to refer to other similar concepts used in occupational health and toxicology. TLV's, along with biological exposure indices (BEI's), are published annually by the ACGIH.

Halide Torch Leak Detection

The use of a halide leak detector is the most positive method of detecting chlorine containing refrigerants, sensitivity about 300ppm. Such a detector consists essentially of a torch burner, a copper reactor plate, and a rubber exploring hose.

Refrigerant gas suspected of containing chlorine is drawn through the hose into the torch burner of the detector. Here the air passes over the copper reactor plate, which is heated to incandescence. If there is a minute trace of a chlorine refrigerant present, the colour of the torch flame changes from blue (neutral) to green as the chlorine containing refrigerant contacts the reactor plate. The shade of green depends upon the amount of halogen refrigerant; a pale green colour shows a small concentration and a darker green colour, a heavier concentration.



F-Gas Regulation (Europe)

Re: Deliberate release of F-Gas for Testing Purposes

For technical or research uses that are not specifically detailed in the EC F gas Regulation, it is the opinion of the F-gas support opinion that anyone using the equipment you describe needs to be aware of their obligations in relation to recovery under Article 4.3 of the EC F gas Regulation. Article 4.3 states:

"The fluorinated greenhouse gases contained in other products and equipment, including mobile equipment unless it is serving military operations, shall, to the extent that it is technically feasible and does not entail disproportionate cost, be recovered by appropriately qualified personnel, to ensure their recycling, reclamation or destruction." So it is considered that appropriate recovery of F gas does apply where possible – if it is not possible to recover the R134a during this process, we suggest that you document your rationale regarding technical or economic barriers that prevent proper recovery of the gas. There are no formal personnel qualifications specified for this type of activity, however "in-house" training that covers the necessity to do all possible to contain emissions and recover the gas/fluid where possible may be appropriate. So it would be a requirement to ensure that your engineers are aware to minimise any emissions and it would be good practice to use qualified personnel to do this work

In the method described above the release is minimised by regulating the flow by bubbling through water.

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This document is provided as a guideline only and should be used in conjunction with all other local legal requirements and safety procedures that apply in your country.
