

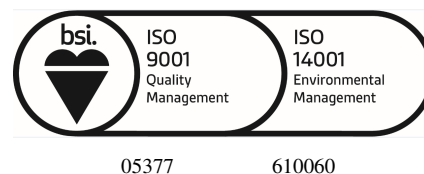
Aeroflex Hose and Engineering Ltd	
Hose Assembly Maintenance and Handling	Issue C

Industrial Gas – Flexible Hose Assemblies

Maintenance and Handling

User Manual, Technical Guidance Notes

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[1.0](#) [Overview](#)

The following documentation provides correct installation and maintenance guidelines for all flexible hoses.

The key points in this document are to provide an understanding of when it is appropriate to replace a flexible hose.



Proper handling, combined with routine maintenance is critical to ensure the life expectancy of the product and its performance.

By following these guidelines, operators can be ensured that the products surpasses requirements.

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[2.0 Selection and Application](#)

[2.1 PTFE \(Polytetrafluoroethylene\) & Other Co-Polymer Hoses](#)

PTFE hoses for high pressure gas applications have a smooth bore finish that provides a lower permeability rate, very high thermal degradation threshold and auto-ignition temperature. They also offer excellent flexibility, flex fatigue and resistance to chemicals and solvents.

Capable of absorbing vibration, the hose can operate in a variety of aggressive environments, whilst maintaining performance and life cycle. Suitable for a range of applications, they are ideal for Oxygen, Nitrogen, Argon, Carbon Dioxide and inert gases. However for Helium or Hydrogen a polymeric hose liner is more effective.

Multiple braid hoses types can be supplied with or without flame retardant coverings available in polyester Elastomer, polyurethane and polyolefin (supplied perforated).

Hoses can be fitted with a variety of end connections, bend limiters, and anti-whip cables which conform to ISO14113.



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2.2 [Convolutd – Corrugated Metallic Hoses](#)

Metallic convoluted hoses are well suited for high purity gas applications, especially recommended for high pressure applications. They are vacuum and pressure tight on account of their material structure, which allows for excellent corrosion resistance under the most extreme conditions. They can withstand extreme temperatures which makes them particularly well suited for conveying hot and cold substances.

Close pitch annular corrugations can produce highly flexible stainless steel hoses, without compromising performance.

Metallic hoses are acceptable for Helium or Hydrogen applications, also medical and special gas applications and can be fabricated with various end connections and safety features such as anti-whips cables all of which confirm to ISO10380.



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3.0 [Fittings, Collars & Torsional Loading](#)

To ensure that the hose assembly will perform to its designed standard, minimising any risk of failures is very important.

Signs of damage to the threads, including corrosion, can cause end fittings to lose integrity. Each part is individually inspected, tested and passed as part of procedures at Aeroflex before delivery to the customer.

Excessive torsional loading shall be apparent from the liner line of the anti-whip cable and swaged ferrules. If visual inspection shows movement of these parts, i.e. the cable is wrapped or moved around the hose in 180-360° and the swaging ferrule has been disturbed, the assembly will need to be returned immediately to Aeroflex for inspection.



Aeroflex strongly recommends that the hose assemblies are not subjected to aggressive torsional loading and twisting. Although polymer hoses can withstand a degree of twisting, prolonged exposure leading to torsional loading can eventually cause a leak path in the compression zone of the ferrule.

Torsional loading tests are regularly performed by AHE.

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[4.0 Service Life](#)

The service life of the hose is based on the analysis that the hoses shall not be subjected to misuse, damage with clean media passed through the liner.

AHE holds the rights to asses and recommend the service life of each hose assembly, application dependent.

The following suggests the recommended service life for each product.

[4.1 PTFE \(Polytetrafluoroethylene\) & Other Co-Polymer Hoses](#)

For PTFE products, AHE currently recommends a maximum service life of 7 years.

[4.2 Elastomer Hoses](#)

For Elastomer products, AHE currently recommends a maximum service life of 5 years.

[4.3 Convoluted – Corrugated Metallic Hoses](#)

For Metallic products, AHE currently recommends a maximum service life of 3 years.



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5.0 [Storage Requirements](#)

High pressure hoses in storage can be adversely affected by temperature, humidity, ozone, sunlight, oils and solvents, corrosive liquids and fumes, insects, rodents and radioactive materials.

The appropriate method for storing hoses depends to a great extent on its size (diameter and length), the quantity to be stored, and the way in which it is packaged. Hoses should not be piled or stacked to such an extent that the weight of the stack creates distortion on the lengths stored at the bottom.

Whenever feasible, hoses should be stored in their original shipping containers, especially when such containers are wooden crates or cardboard cartons, which provide protection against the deteriorating effects of oils, solvents and corrosive liquids. Shipping containers also afford some protection against ozone and sunlight.

Certain rodents and insects will damage hose products, and adequate protection from them should be provided.

The ideal temperature of the storage of hose products ranges from 10°C to 21°C with a maximum limit of 38°C.

Hoses should not be stored near sources of heat, such as radiators, base heaters, etc.

To avoid the adverse effects of high ozone concentration, hoses should not be stored near electrical equipment that may generate ozone or be stored for any lengthy period in geographical areas of known ozone concentration. Exposure to direct or reflect sunlight, even through windows, should also be avoided.

Uncovered hose should not be stored under fluorescent or mercury lamps which generate light waves harmful to rubber and elastomeric materials.

Storage areas should be relatively cool and dark, free of dampness and mildew. Items should be stored on a first-in, first-out basis.

Generally the recommended storage life of PTFE and convoluted metallic hose assemblies is 10 years providing you adhere to the storage information listed above.

The storage life of Polyamide hoses, elastomeric hoses, is more complex. These hose products have a total life of 7 years. Therefore if you store them for 5 years you can only use them in service for 2 years.

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6.0 [Identification Markings](#)

The bands and markings for each product assists identification of the type of hose and in which application it is to be used with. Typical identification is to classify the date of manufacture/test, the individual part or serial number, batch record and design parameters.



In the event that there is a hose with no band or marking the following actions must be taken:

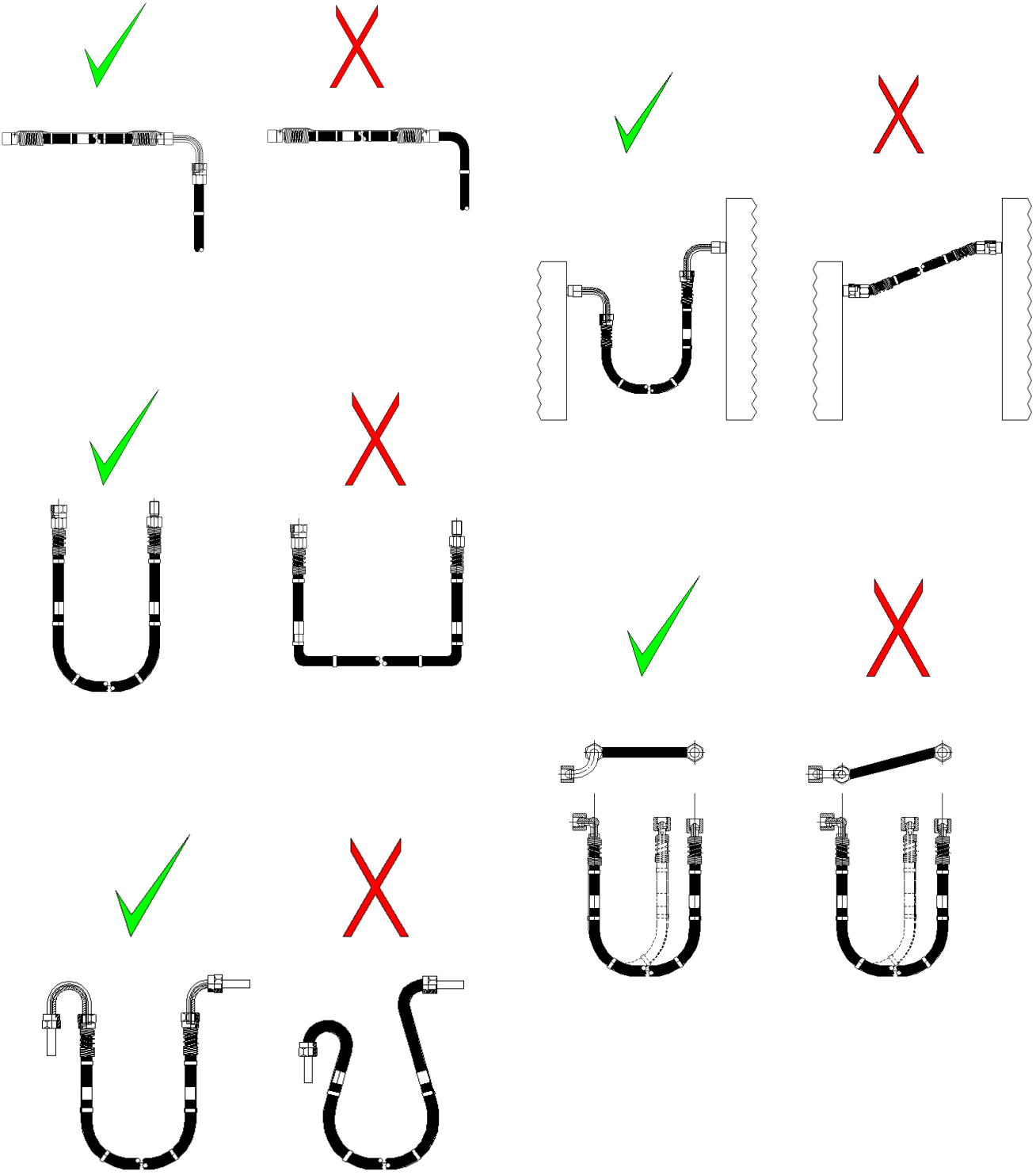
- The hose must isolated and not used until it has been identified.
- Determine the maximum operating parameters for the application and verify the hose assembly can meet the estimated requirements.
- Check supply or manufacture records for product order and specification
- If verifying the hose application against the estimated parameters is not possible, then the hose must be returned to manufacture for verification or to be replaced.

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7.0 [Installation](#)

Ensuring the safety of the product and its service life, it is essential that the installation is designed and operated within the following guidelines:-

- Avoid twisting of the hose.
- Avoid localized bend strain concentrations.
- Avoid tension of the hose, particularly when pressurized.
- Do not manipulate the hose when pressurized.
- If a hose is crushed or locally 'kinked' it should be quarantined and either submitted for validation by manufacture or ultimately replaced.
- Allow sufficient slack in hose assembly length for manufacturing tolerance and for a shortening effect of up to 4% when pressurized.
- Avoid abrasion/chaffing, in particular the reinforcement braids.
- Provide adequate support clamps to assist installation of long length hose assemblies. Support clamps are not be located of the bends of the products.
- Refer to and respect the minimum bend radius specified for each type of hose.
- Tight bends in a product are to be avoided. The use of an angled end fittings are available to assist in the manipulation during service. If this becomes unavoidable, gentle, sweeping bends of the hose assembly are recommended.
- When hose assemblies are not static in service, the flex is to be kept on a single plane.
- Ensure that the hose assemblies avoid coming into contact with any source of excessive cold or heat supplies, subjected to the conditions outside of the design specification.
- Avoid repetitive bending. Especially when using convoluted metal hose assemblies.
- Ensure oxygen hose assemblies are maintained in a clean, degreased state, with no dirt or contaminant incurred on end fittings.



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8.0 [Avoiding Kinks, Minimum Bend Radius's](#)

A 'kink' is a term used when a hose has surpassed its minimum bend radius. This is caused by mechanical loading, whereby the internal structure has surpassed the working parameters.

Details of hose assemblies bend radiuses are available from Aeroflex.

The hose assembly should never surpass its minimum bend radius as the resulting mechanical load can cause premature failure due to the collapse of the internal hose bore. The pressure build up, combined with the weakening of the reinforcement structure can compromise the pressure vessels integrity, which may result in a catastrophic failure.

Operators should never manipulate the product past its bend radius in order to install or lift (load baring) equipment, please refer to section 5.0 Installation for guidance.

To prevent this form of failure, all high pressure hoses are available with bend restrictors (spring guards) which protects the mechanical compression join between the ferrule and the hose, and minamises the potential risk of premature failures.



Image shows that although the assembly has been subjected to excessive loading and has thus surpassed its minimum bend radius, the mechanical join between the ferrule and hose is protected by

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the spring guard.

9.0 Maintenance, Frequency & Leak Checks

All flexible hose assemblies are to be leak checked periodically to ensure product integrity. The operation procedure for the leak check is to apply an approved solution to the assembly in service. (Guidelines from the leak solution manufacturer are available highlighting use recommendations, limitations and concentrations.)

Monthly maintenance is recommended;

- Thorough leak detection over the complete length of the hose.
- Hose exterior is visually examined for kinks and signs of torsional loading along the cover of the hose, signs of damage to the cover; cuts, abrasion marks, exposed braiding, blisters, bulges, soft spots etc.
- End fittings should be examined for damage, such as crossed threads, excessive marks across flats of the hexagon face and damage to the installation design of the assembly.
- Evidence of movement within the hose end fittings, reference 3.0 Fittings, Collars & Torsional Loading.

If able to hydrostatically pressure test an assembly, use industry standards;

- The test pressure should be 1.5 times the maximum working pressure when testing hydrostatically.
- Static pressure shall be applied for 1 minute with no leakage.
- Correct safety precautions must be enforced when pressure testing to avoid injury.

10.0 Warranty

All flexible hose assemblies come with a 12 month warranty, providing the user adheres to the maintenance and handling guideless detailed in this document.

Other conditions may apply for specific customers at point of contract.

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11.0 Cleanliness

The cleanliness criteria of the hose assembly is to be specified by the customer upon product order and quotation.

Oxygen cleaning standards can be achieved by AHE whereby a product is fit for service with oxygen use.

In general, there shall be no visual contamination apparent in under both white and ultra violet light.

Cautionary Note: Not all oils or greases fluoresce under UV light.

Wipe testing shall be used where practical and there shall be no evidence of contamination.

Quantitative tests shall show in addition that there shall be;

- $\leq 100\text{mg/m}^2$ of contamination: for general oxidizing gas service
- $\leq 75\text{mg/m}^2$ of contamination: for gas cylinders in industrial service
- $\leq 50\text{mg/m}^2$ of contamination: for gas cylinders in medical service
- $\leq 50\text{mg/m}^2$ of contamination: for medical pipelines



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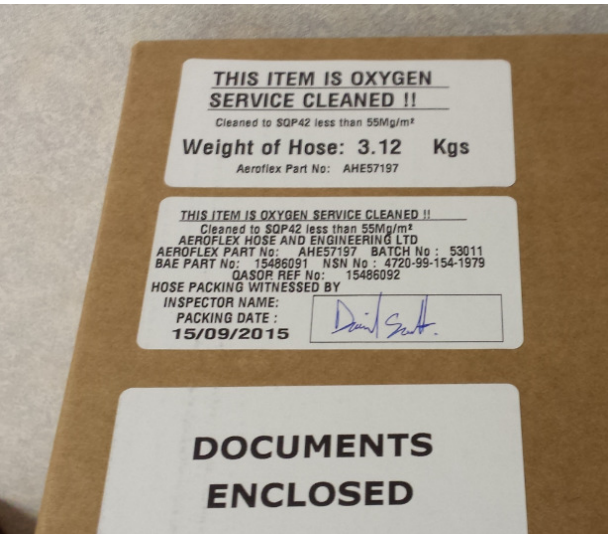
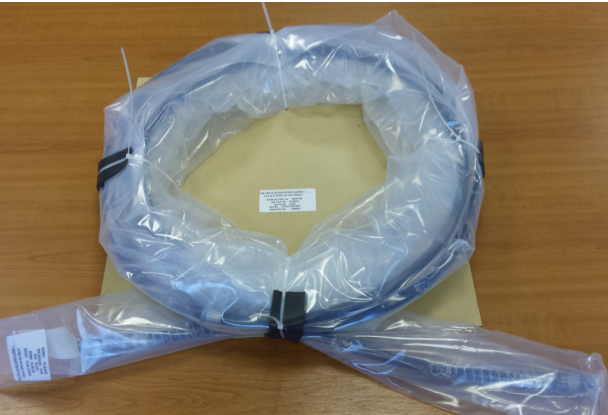
[12.0](#) [Packaging](#)

Customer packaging requirements can be met by AHE providing supporting evidence of documentation is supplied.

The use of Teflon Sleeves as a method of adding protection to end fittings can be adhered to if required. The Teflon sleeve will be heat shrunk onto the product and will be required to be cut off by an operator in the field. This is a single use item only.

The Teflon sleeve will leave a residue once removed. UV Black Light Testing proves that the residue left behind is not an oil based compound and will still qualify as an oxygen cleaned product.

Further packaging requirements can be met and the use of hard board to locate and protect products during transport can be achieved.



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[13.0](#) [Replacements](#)

Typically a hose is the last item to be specified in a system, but making regular replacements of hoses, based on its application and use, shall reduce down time of equipment and increased safety for all employees.



Ensuring that records are kept available shall enable products to be replaced promptly.

These standard guidelines are applicable providing the hose is in good working order and does not show signs of leaks or mechanical damage. If any doubts arise, products should be returned to manufacture for validation or replacement. This shall not only ensure the safety of operators but also reduce the risk of equipment failures.

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[14.0](#) [Summary](#)

Visual inspection is the recommended method for determining whether a product should be replaced. The things that should be checked for are;

- Broken braid wires
- Kinks
- Discoloration
- Fitting damage
- Marking



Ensure that products are leak checked on a regular basis;

- Leak check monthly, (unless instructed otherwise), or before next use if hose assembly is stationed between use.
- Replace hose assemblies on a periodic bases on application and use, (Even hoses in good working condition must be replaced periodically).

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