

**Storage:**

To ensure maximum life, hoses should be stored in a dry, cool, dustfree, ventilated room with solid walls. Permissible ambient temperature range -30 to + 30°C.

Hoses should be placed on slatted racks or pallets to permit free air circulation. Open ends must be plugged to protect the lining from ozone contaminants.

Hoses should be stored free from kinks, twists or compression. Do not stack coils too high and avoid deforming the coil at the bottom. Care should be taken to avoid fittings or other hard objects pressing against the hose.

Ultraviolet light has an adverse effect on rubber - therefore a dark room is best. Alternatively windows can be painted red or orange, or be covered with suitable plastic film. Electrical equipment, which can produce sparks or a strong electric field, can produce harmful ozone and should not be placed in the same storage.

Cleaning of the Cover:

Do not use aggressive media like benzene, gasoline or turpentine, nor steam or water hotter than 90° C. Warm water and soap are suitable. Rubbing with glycerin will restore new appearance. Mild alkaline cleaners may be used. Never paint a hose.

Cleaning of the Bore:

Before the hose is put into operation it should be flushed with the medium.

Pressure Testing:

For aviation hoses specific regulations by the operation companies apply. See also the respective valid international standard, i.e. EN 1361.

Depending on the application and amount of wear in service, and on the hazardous nature of the product, hoses should be periodically tested at not more than half-yearly intervals. First make a visual inspection - then make a pressure test.

Conductivity Test:

According to EN 1361 the electrical resistance of an aviation hose must be in range of min. 10^3 and max. 10^6 Ohm - measured between the end fittings. The electrical resistance normally increases during the time of operation, therefore older hose assemblies should be checked that the value of 10^6 Ohm is not exceeded. Otherwise the hoses should be replaced.

Repairs:

Hoses can not be effectively and safely repaired by patching, wrapping or vulcanizing. Damaged sections should be cut. When hoses are shortened and fittings have to be moved, examine the newly cut edge. The hose must be cut back sufficiently to ensure that the layers of the carcass have not separated and that the fuel has not penetrated. Cut the hose with a sharp knife - do not use a saw. Press the wall of the hose between thumb and index finger. The cut edge and fabric must be dry, and must not be spongy.

If difficulties are experienced with putting on the end fittings, do not cut, trim or abrade the lining. Care must also be taken to avoid damaging the lining when the hose spigot is inserted. If necessary, the outer cover may be trimmed or abraded, but do not expose or damage the fabric reinforcement. An end fitting will require some physical effort to fit safely (if necessary, use water as lubricant). If the lining has swollen, allow it to dry out for 24 hours.

Kinking of Aviation Hoses:

Observation of these hints will give your hoses a longer life.

Permanent kinks of aviation hoses are often observed with into-plane deck hoses, riser system hoses and hydrant inlet hoses due to the construction of these systems, especially the too narrow bending radii. Kinks may also be caused by other reasons, e.g. the bad quality of a hose or its age. Safety officers of the oil companies generally raise the question of the safety of hoses with permanent kinks.

Please see overleaf for details:

1. Kinking and Safety Risk

- a. The safety is determined by the carcass (reinforcement). Damages in the outer or inner rubber only inflict safety problems if the medium, or outer influences like ozone or water, may penetrate the carcass and weaken it. The separation of the layers shown by bubbles and plies is an indication for the imminent damaging of the carcass.
- b. With this basic fact in view it can definitely not be maintained that permanent kinks are a general safety risk. Kinks will only become a danger if the outer or inner rubber has been so severely deteriorated that the the carcass may be attacked by outer influences. Although permanent kinks are a normal observation at airports, ELAFLEX, with their experience for decades, have not had one claim or report of a bursted ELAFLEX hose with a kink.
- c. ELAFLEX / CONTINENTAL do regularly effect kink resistance test. API 1529 C requires 1 000 cycles; ELAFLEX aviation hoses withstand more than 10 000 cycles without damages. The result usually is a permanent kink and softer material in the kinking area, but no separation of the layers. The adhesion values are as good as before. The hose will burst at pressures of more than 100 bar which is normal for ELAFLEX / CONTINENTAL hoses.

2. Control Actions

- a. Routine pressure tests may indicate damages of the inner rubber. Hoses with faults of the inner rubber show bubbles on the outside under test pressure. In such a case the hose must be replaced.
 - b. The regular daily sight control is of special importance.
- Damages and cracks of the outer rubber are so deep that the carcass becomes visible: Replace the hose.

- Bubbles and plies on the hose: Try the outer rubber with a finger in order to see whether there is just a compact thickening of material (not dangerous) or a hollow space under the bubble of ply (this means separation of the layers, so that the hose has to be replaced).
- The hose is softer in the area of the kink than elsewhere. A softness of the material without the above described characteristics is not dangerous. The replacement of the hose is not necessary, but critical regular control of the kink is recommended.

3. Hints to Avoid Kinking

- a. For new constructions choose wider bending radii.
- b. Choose a hose brand of good quality, especially with good adhesion between the layers - this is measurable. *)
- c. Try hoses with fortified walls. Because of kinking many of our customers take hoses with three instead of two braids (type VHD). Avoid hoses with spiralled and wrapped plies as reinforcement. *)
- d. Leave the fuel in the hose under a remaining pressure of min. 0.5 bar after operation. This helps to keep the hose round and prevents kinking.

4. Conclusion

It can definitely be stated that hoses with permanent kinks may stay in operation under the described conditions. Safety risks are only involved if there are signs of a separation of the layers. It is necessary to give special observation to the kinked part of a hose during the pressure tests and the regular sight controls.

*) For further characteristics of quality aircraft refuelling hoses see our information 6.05.