

Hose assembly

Safety - Installation - Inspection



ENGINEERING YOUR SUCCESS.

May 2014

Content



- **INTERNATIONAL STANDARDS FOR ASSEMBLIES**



- **SAFETY RULES**



- **HOSE / FITTING STORAGE**

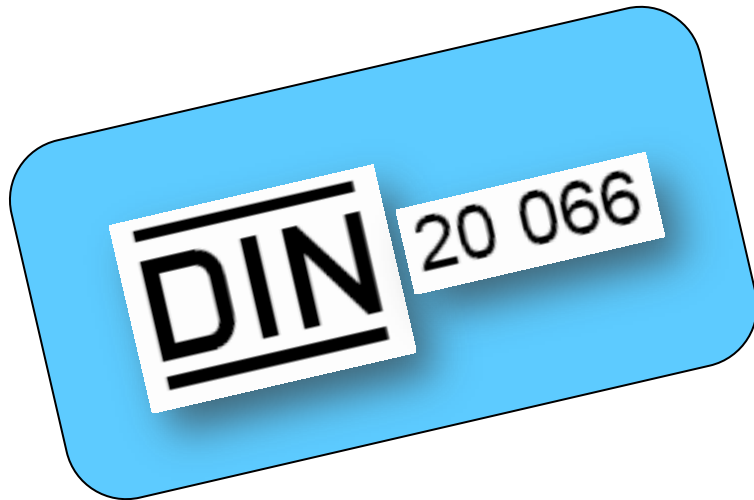


- **HA – INSTALLATION RULES**



- **HA – INSPECTION / HOSE FAILURES**

International Standards for HA's



Regulations / Directives from further National Organisations for HA's

Work Safety Associations

- BGR 237 (Germany)
- BFPA (UK)
-

Classification Bodies

- Det Norske Veritas (DNV)
- Mine Safety & Health Administration (MSHA)
-

National Law for Safety

- BetrSichV (Germany) → require experienced stuff (safety reason)
-

Requirements for manufacturer and users of hydraulic hose assemblies

- HA's have to meet the requirements of hose and fitting standards (e.g. SAE100 R2AT ; EN857-2SC ; ISO 18752-DC ; ISO12151-2-DKOS)
- The individual hose / fitting connection must be released by the hose-/fitting manufacturer.
- Proper hose product selection require overall knowledge of all application conditions (WP, Temp., Pressure cycle, fluid, ..)
- The assembler of hose assemblies have to follow the instruction of the hose- / fitting manufacturer.
- Never produce a hydraulic hose assembly with components which were already used before.

Requirements for manufacturer and users of hydraulic hose assemblies

- 1 The max. working pressure of the hose assembly is limited by the weakest component.
- 2 Take care, that the single components are still usable (don't obsolete).
- 3 Each hydraulic hose assembly must be identified by: assembler / max. WP / Production-Date (YY/MM).
- 4 Installation rules for hose assemblies secure optimal working condition, avoid health hazards and provide long service life.
- 5 Based on the individual risk assessment the machine builder define: inspection period / inspection criteria / max. usage time.

1. Safety First !!!



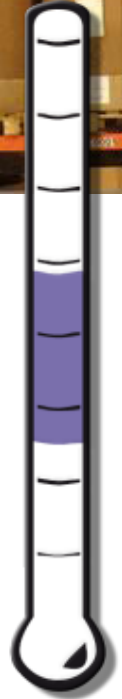
WARNING: Injuries in which hydraulic or other liquid is involved must be treated without delay and not the same way as an ordinary injury!

1. High pressure fluid injection can be almost invisible, leaking from a pinhole, but it can pierce the skin deep into the muscle!
2. If a fluid-injection accident occurs, search immediately for a medical treatment by a doctor!
3. Don't touch pressurized hydraulic hose assemblies and don't look at them from a short distance – especially not close to fittings!
4. Secure ends of hydraulic assemblies with high pulsing pressure and all high pressure air hose assemblies against blow-off of the hose from the fitting with appropriate whip restraints!
5. Stay out of hazardous areas while testing hose assemblies under pressure and wear proper protective clothing and goggles!

Hose and Fitting Storage

Hose storage best practice

- Store hoses and hose assemblies in a cool, dark and dry room
 - with capped ends in closed boxes (preferably in the original Parker packaging)
 - Logistic: first-in first-out (FIFO) inventory control system.
-
- a) **Temperature** - preferably between 15°C and 25°C, without rapid and frequent changes (days/nights).
 - b) **Humidity** - preferably not higher than 65%, protect hose against moisture and avoid atmospheric humidity condensation.
 - c) **Heat** - store hose away from heat sources.
 - d) **Light** - protect hose against direct sun light, light of discharge lamps and other ultraviolet sources.



Hose and Fitting Storage

Hose storage best practice



- e) **Corrosive liquids and fumes** - do not store in the same room with corrosive chemicals.
- f) **Ozone** - avoid using high power electrical equipment and electrical spark sources in the storage room.
- g) **Oils and greases** - avoid direct contact.
- h) **Space and bends** - keep hose in stress-free shape never bent below the min. bend radius.
- i) **Rodents and insects** - protect against rodents and insects.



Hose and Fitting Storage

Hose storage best practice

Rubber properties will change during the time of storage and service.

A system of hose age control should be maintained to ensure that hose is able to provide full capabilities for intended service.

However, the overall service life time is not fix (10years), it's depend on the whole working conditions.



DIN 20066 specifies bulk hose shelf life and hose assembly storage period and service life:

Bulk Hose	Hose Assembly
Shelf life – max. 4 years	Service life – max. 6 years Storage max. 2 years

Hose and Fitting Storage

Fitting storage best practice

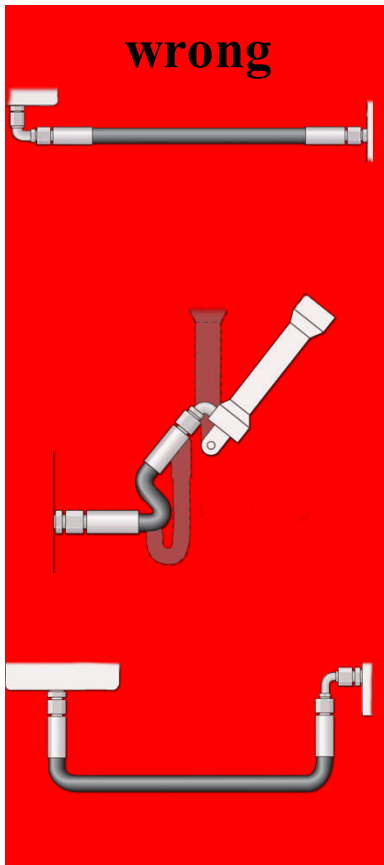
For storing fittings the same rules as for hose are applicable (especially for fittings with rubber sealing), in addition:

- a) **Mismatching and confusing** - avoid unnecessary repacking and store fittings in clearly marked closed containers (preferably in the original Parker packaging).
- b) **Damage of threads and sealing surfaces** - avoid unnecessary reloading and handling.
- c) **Fittings with O-rings** - assure that storage period of fittings with O-rings or other rubber sealing does not exceed 2 years (remember FIFO).
- d) **Caps** - hose assemblies fittings should be capped against damage and contamination

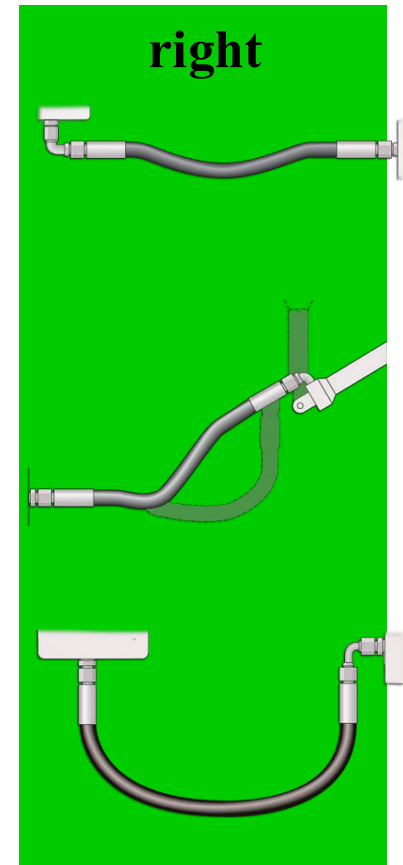


HA - Installation

Routing - best practice



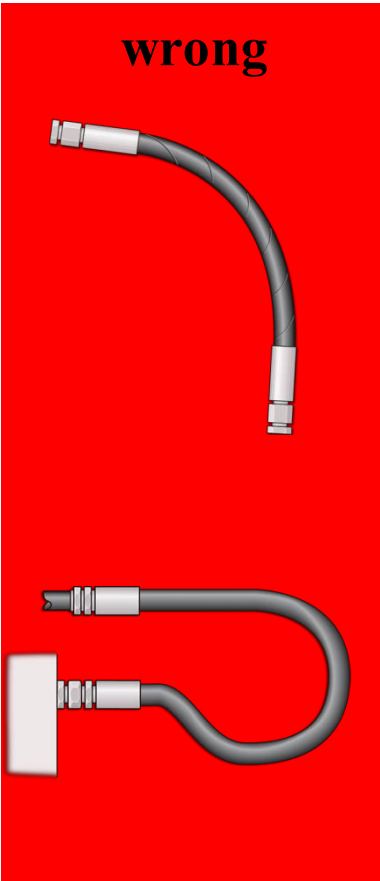
- The **routing** of the hose assembly and the environment in which the hose assembly operates directly influence the service life of the hose assembly.
- When hose installation is straight, it must be assured that there is enough hose length to allow for **changes in length** that occur when pressure is applied.
- Make sure, that the bend radius is according data sheet during **all situations of machine movement**.
- The **most critical area** of a hose assembly is the area direct behind the fitting.



HA - Installation

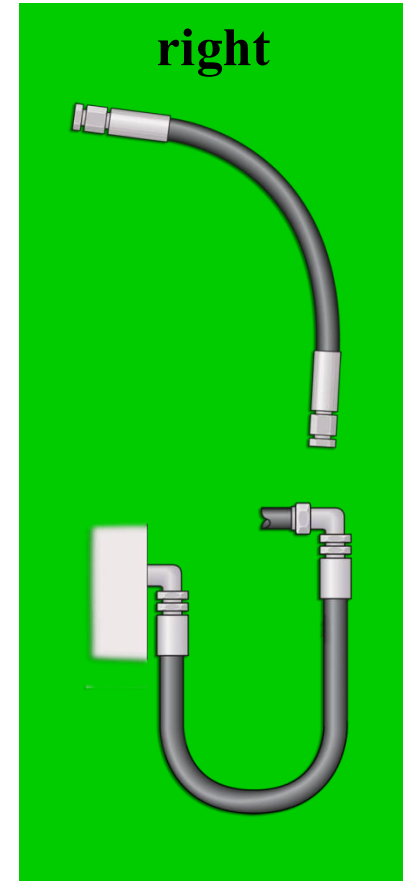
Routing - best practice

wrong



- **Don't twist the hose** – keep the hose assembly stress-free.
- Avoid hose twisting by:
 - Only one bended fitting on a hose assembly.
 - Take care during installation by using the screw-wrench.
- Selecting **bended fittings** will help for proper installations.

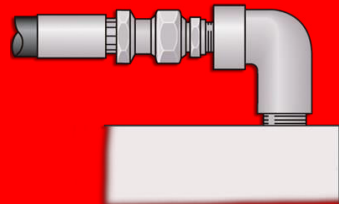
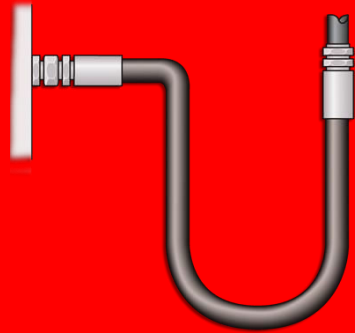
right



HA - Installation

Routing - best practice

wrong

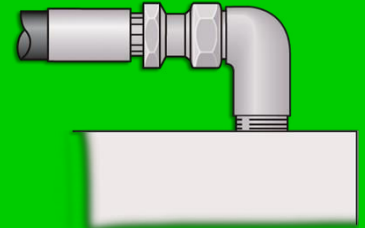
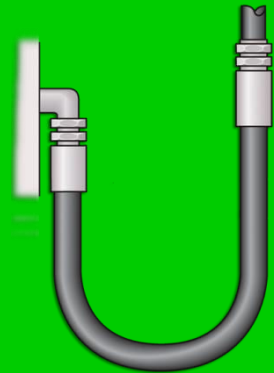


- Final good result by **using bended fittings** and sometimes tube adapters.

- Keep attention on the **hose weight**. Selecting bended fittings could avoid hose kinking affect.

- The available fitting range contain many **jump-size fittings**. Using the optimal fitting could help to avoid additional adapters.

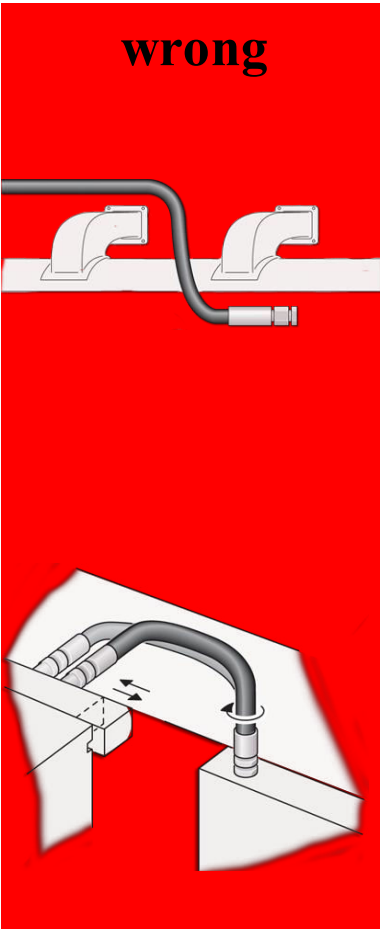
right



HA - Installation

Routing - best practice

wrong

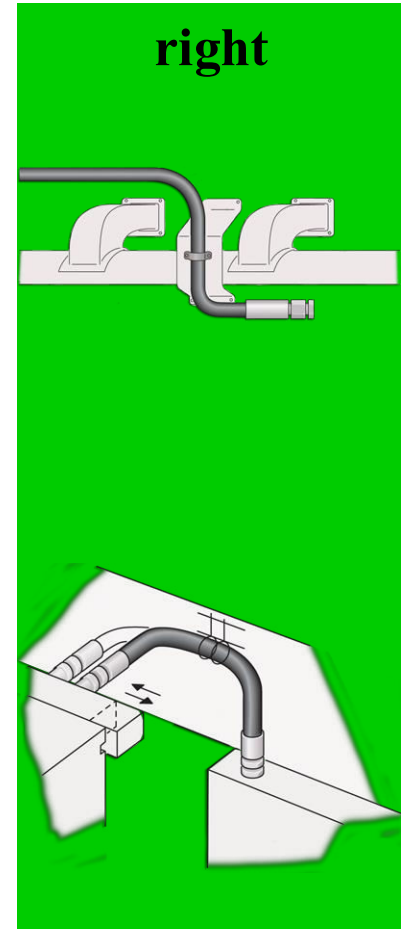


- **Correct clamping** (holding/supporting) of the hose should be exercised to securely route the hose or to avoid the hose contacting surfaces.

- It is however, vital that the hose be allowed to keep its functionality as a “flexible-pipe” and **not be restricted from changing in length** when under pressure.

- Hose should **not be bent in more than one plane**. If hose follows a compound bend, it shall be coupled into separate segments or clamped into segments that each flex in only one plane.

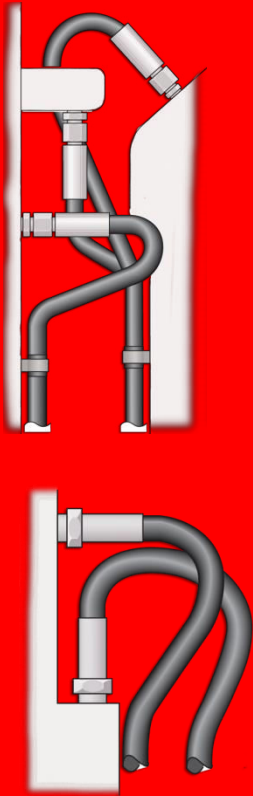
right



HA - Installation

Routing - best practice

wrong

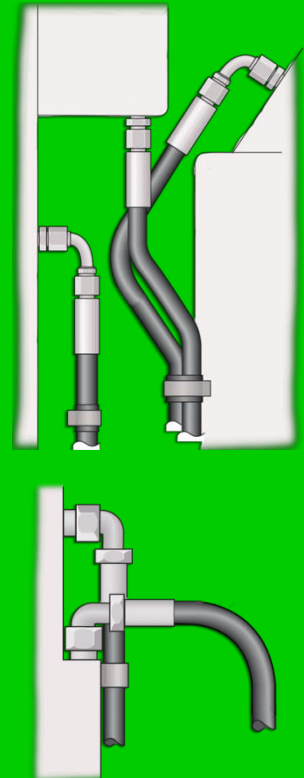


- Hoses should be **kept away from hot parts** as high ambient temperatures shorten hose life. **Protective insulation** may need to be used in unusually high ambient temperature areas.

- Whilst the importance of the functionality is prime the **aesthetics and practicality** of the installation should also be considered in the design.

- It should be considered that **maintenance might be necessary** at some stage in the future, so prohibitive design routings should be avoided.

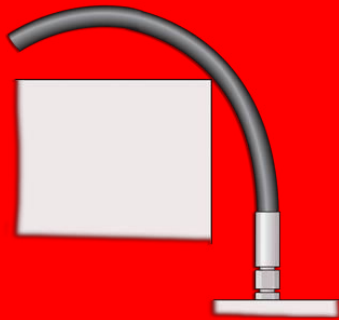
right



HA - Installation

Routing - best practice

wrong



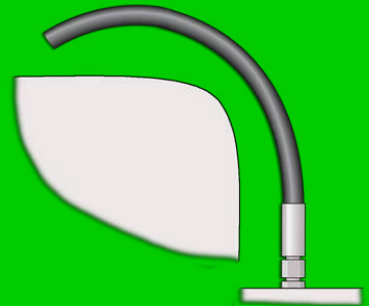
- In general care should be taken that the hose is **not exposed to direct surface contact** that will cause abrasive wearing of the outer cover.

- If however, the application is such that **this cannot be avoided**, either a hose with a higher abrasion resistant hose cover or a protective sleeve need to be used.

- Parker **TOUGH COVER (TC)** cover offers 80 times the abrasion resistance of standard rubber cover

- Parker **SUPER TOUGH (ST)** cover offers 450 times the abrasion resistance of standard rubber cover

right



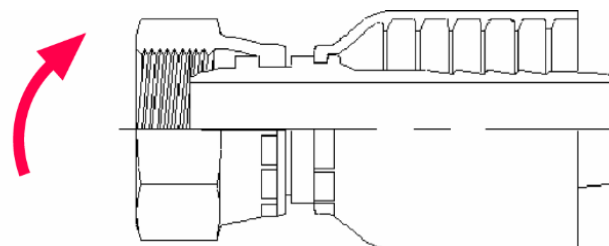
HA - Installation

Torque values

Spanner torque values

Metric swivel female

 Thread metric	 Tube O.D.	 Nm	
		nominal	min. - max.
M 12x1.5	06L	16	15 - 17
M 14x1.5	08L	16	15 - 17
M 16x1.5	10L	26	25 - 28
M 18x1.5	12L	37	35 - 39
M 22x1.5	15L	47	45 - 50
M 26x1.5	18L	89	85 - 94
M 30x2	22L	116	110 - 121
M 36x2	28L	137	130 - 143
M 45x2	35L	226	215 - 237
M 52x2	42L	347	330 - 363
M 14x1.5	06S	26	25 - 28
M 16x1.5	08S	42	40 - 44
M 18x1.5	10S	53	50 - 55
M 20x1.5	12S	63	60 - 66
M 22x1.5	14S	79	75 - 83
M 24x1.5	16S	84	80 - 88
M 30x2	20S	126	120 - 132
M 36x2	25S	179	170 - 187
M 42x2	30S	263	250 - 275
M 52x2	38S	368	350 - 385



Swivel nut by hand and afterwards
min 60° up to max 90° with the torque

The torque values for other materials are as follows:

- Brass fittings and adapters
 - 65 % of the torque value for steel.
 - Stainless steel and Monel
 - Use 5% higher than listed for steel.
- Threads to be lubricated for these materials.

Inspection / Maintenance

Be preventive – not reactive

- Even with proper selection and installation, hose life may be significantly reduced. Preventive maintenance checks could detect hose aging effects at the right time in advanced.
- The severity of the application, risk potential from a possible hose failure, and experience with any hose failures in the application or in similar applications should determine the frequency of the inspection and the replacement for the products so that products are replaced before any failure occurs.
- A maintenance program must be established and followed by the user

Inspection / Maintenance

Be preventive – not reactive

The Preventive Maintenance Program includes a scheduled plan of visual inspections and preventive replacement, in case the hose assembly shows signs of an impending failure:

- damaged, cracked, cut or abraded cover
- exposed reinforcement
- cracked, damaged or corroded fittings
- leaks in fitting, sweating hose cover close to fitting
- kinked, crushed, flattened or twisted hose
- hard, stiff, cracked or burnt hose
- blistered, soft, degraded or loose cover
- fitting slippage on hose
- ...



Inspection / Maintenance

Be preventive – not reactive

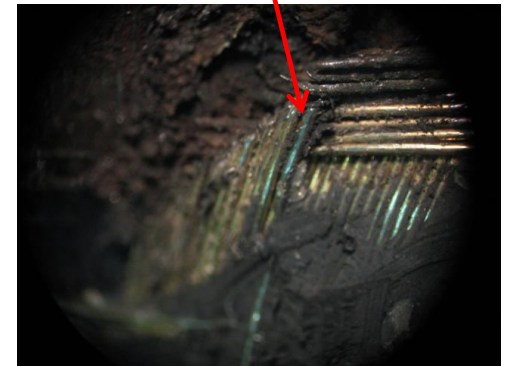
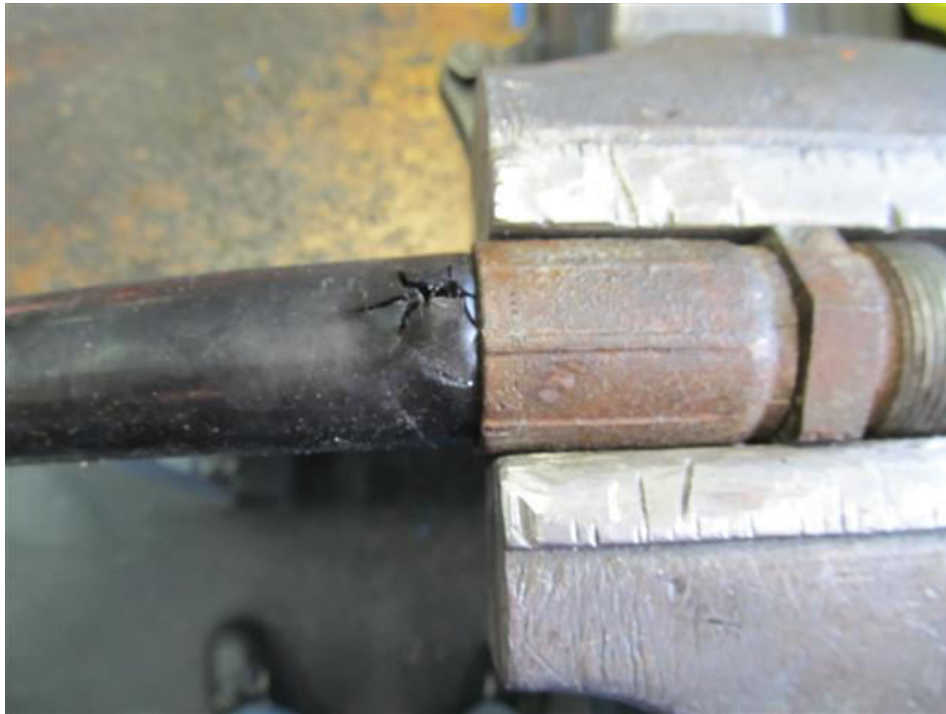
Hose cover damaged: abrasion → replacement shall be scheduled mid-term



Inspection / Maintenance

Be preventive – not reactive

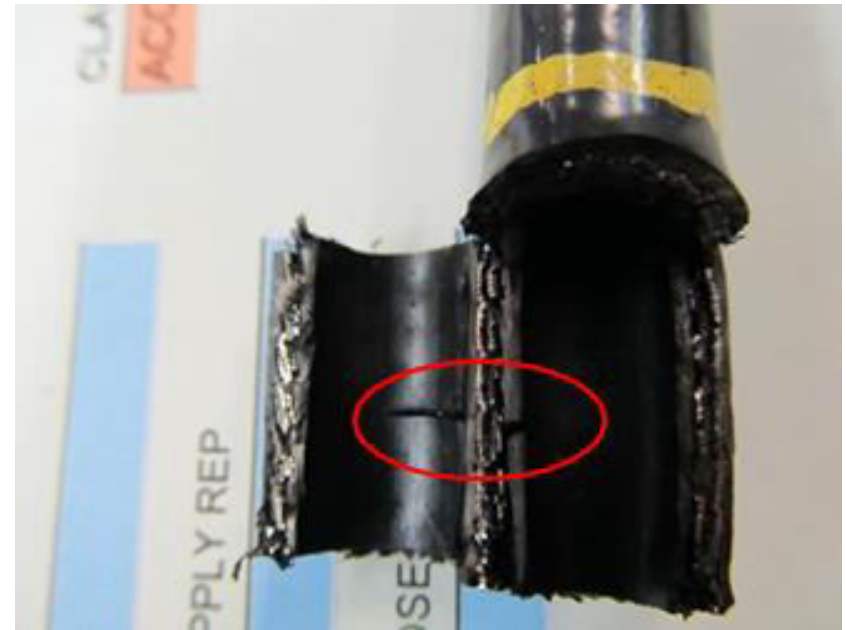
- Hose bursted, because of steel wire corrosion !!
- Also the hose fitting show strong corrosion !!



Inspection / Maintenance

Be preventive – not reactive

- Hose leakage because of external force on the hose (hose innertube cracked)
- Direct replacement nessesary !



Inspection / Maintenance

Be preventive – not reactive

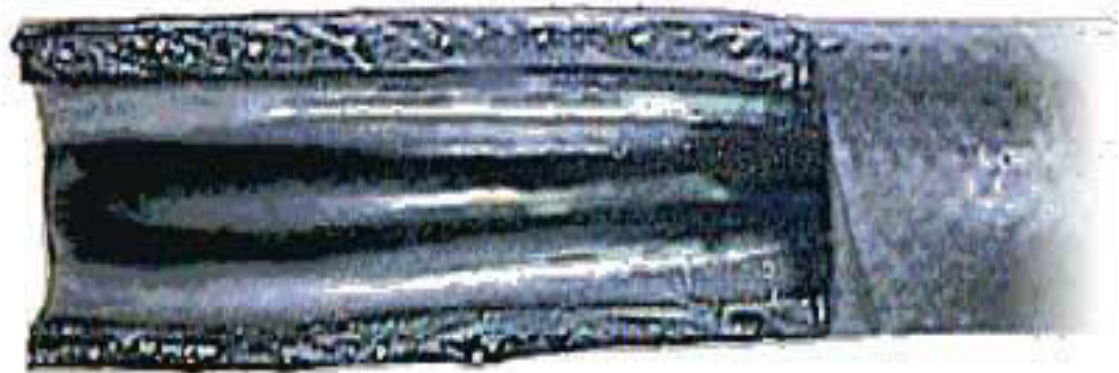
- Hose becomes to get stiff because of too much heat over long time.
- Replacement need to schedule.



Inspection / Maintenance

Be preventive – not reactive

- Hose damaged by too high velocity (hose innertube cracked)
- Direct replacement nessesary !



Inspection / Maintenance

Be preventive – not reactive

- Hose damaged by too much ozone within the pressed air (ozone cracks)
- Direct replacement necessary !



Inspection / Maintenance

Recommended Service Life

Bulk Hose

Shelf life
– max. 4 years

Hose Assembly

Service life – max. 6 years

Storage
max. 2 years

- Other standards e.g.:
 - ISO17165-2/SAE J1273
 - BS 5244
 - ISO 8331

recommend slightly different usage time. (please see more details in the catalogue 4400).

Final responsibility is at of the machine builders.

Tabelle 8: Empfohlene Auswechselintervalle

Anforderungen an die Hydraulik-Schlauchleitung	Empfohlenes Auswechselintervall
Normale Anforderungen	6 Jahre
Erhöhte Anforderungen an die Sicherheit, z.B. durch: - erhöhte Einsatzzeiten (z. B. Mehrschichtbetrieb) - starke äußere Einflüsse - Vorgaben des Maschinenherstellers für besondere schwerkraftbelastete Achsen	2 Jahre



Questions?





Thanks!

