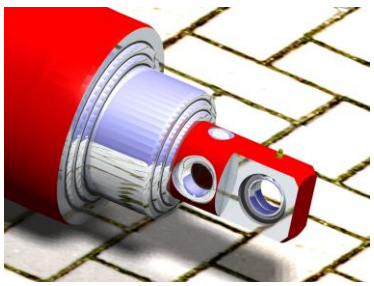
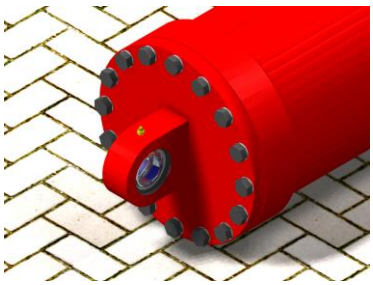
DELTA HYDRAULICS PTY LTD
MANUFACTURING HYDRAULIC ENGINEERS

DELHOIST

TELESCOPIC CYLINDERS

DOUBLE-ACTING TELESCOPIC CYLINDERS





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INTRODUCTION

This manual provides instructions on how to handle your double acting telescopic cylinder from the moment of receiving it, through installation and commissioning, and how to correctly maintain it for it's working life.

Applying these instructions as a minimum will ensure the maximum life of the telescopic hoist. Failure to apply these instructions may cause damage and therefore void the warranty.

RECEIPT INSPECTION

Upon receipt, the hoist should be inspected for damage. For example:

- Is the hoist dented or heavily marked?
- Are the stage hardchrome surfaces damaged?
- Are the stage wipers damaged?
- Are any components missing or damaged?
- Is the valving damaged? (if applicable)
- Are all components still installed correctly?
- Are there any oil leaks from the cylinder? (Plastic plugs may leak slightly)
- Does the supplied cylinder meet the order requirements?

In the case of damage during transit under FOB supply, it is the customer's responsibility to rectify any problems. In the case of a manufacturing fault detected during the warranty period, the supplier must be immediately contacted according to the Warranty Procedure. In the case of a design fault detected in or outside of the warranty period, the supplier must be immediately contacted.

HOIST IDENTIFICATION

Each hoist is fitted with an identification plate (ID plate) which states the part number and the serial number. This is located near the port on the outer stage. These numbers should be quoted in case of servicing or spare part needs.

STORAGE

Short term storage (up to 12 weeks)
The residual oil in the cylinder from testing during manufacture will prevent internal corrosion. The storage of the cylinder must be as follows:

- cylinder protected from damage, with stages retracted & ports plugged
- cylinder mounted in vertical orientation (if practical)
- in non-corrosive atmosphere
- ambient temperature -10 to 45°C, preferably not in direct sunlight

Long term storage (over 12 weeks)
The residual oil in the cylinder from testing during manufacture will not prevent internal corrosion for extended periods. In the case of long term storage, the storage of the cylinder must be as follows:

- cylinder filled with storage oil and all air bled out
- cylinder protected from damage, with rod retracted & ports plugged

- cylinder mounted in vertical orientation (if practical) with appropriate supports
- in non-corrosive atmosphere
- ambient temperature -10 to 45°C, preferably not in direct sunlight

At 12 month intervals the cylinder is to be cycled 5 times, the storage oil replaced and all air bled out. Following this the cylinder is to be returned to the storage condition as above. After 5 years in storage the cylinder is to be disassembled and inspected, and seals replaced according to their condition and life expectancy.

INSTALLATION REQUIREMENTS

The cylinder must always be handled in such a way so as to avoid damage, especially the types of damage as described in “Receipt Inspection” (page 3).

Mechanical Mounting of Cylinder

- The cylinder must clear surrounding parts during all points of travel.
- For cylinders without self aligning ball bushes fitted, all mount pin centrelines must be parallel one another within 0.05mm over the width of the cylinder end clevises (dependant on bush clearances). If self aligning ball bushes are fitted, it is recommended that pin centrelines are parallel to one another within 0.5mm over the width of the cylinder end clevises.
- No bending moments are to be introduced into the cylinder, unless the cylinder has been specifically designed by the manufacturer to do so.
- Use high tensile bolts of the maximum size practicable for mounting holes. *Do not* drill out mounts to suit oversize bolts.
- Care must be taken if the hardchromed surface of the stages is exposed, as any damage to this surface will cause cylinder leakage.
- All hose connections to the cylinder must have enough length to allow for full cylinder movement and must not rub on any equipment during operation.
- Travel stops must be used to protect the cylinder from any extreme loads which can occur at travel limits. These are required unless the cylinder has been specifically designed by the manufacturer to handle these loads.

Hydraulic System Connection to Cylinder

- Basic hydraulic fitting skills are required for the fitting of the cylinder into the system.
- Extension *and* retraction hoses must be connected to the cylinder before actuating the cylinder.
- *Quick disconnect fittings are not recommended*, as failure of the fittings to operate correctly or improper connection can severely damage cylinders by pressure intensification. If quick disconnect fittings are to be used, relief protection must be provided on the cylinder side of the fittings. More details regarding this are included in the section *Guarding Against Intensification* on page 5.
- The cylinder must be assembled into the system in a dust free environment, to minimise contamination entering the ports.
- Oil cleanliness is of the utmost importance. *Do not* remove the port plug from the hoist until immediately prior to connection to the system. All elements of the system (hoses and tanks included) must be flushed with clean hydraulic fluid prior to connection to the other elements of the system. In addition the oil used to fill the system must be clean.
- All hydraulic fittings must be free from burrs and have smoothly finished threads. (Note that when screwing into aluminium some fittings and valves may cause a fine slither of aluminium ‘wire’ to enter into the system, so action must be taken to avoid contamination of the system in this way).

WARNINGS:

- Impact loads on the cylinder may cause damage to the cylinder.
- The cylinder must be protected from physical damage.
- The cylinder hardchrome surfaces must be protected from damage (note that some chemicals can damage the hardchrome surface eg. caustic).
- Do not weld directly on the cylinder without first seeking advice from the manufacturer.
- Do not weld near the cylinder so that the welding current passes through the cylinder, as this will damage the cylinder internally.
- The hose sizes and pressure ratings must be correct for the application.

OPERATING CONDITIONS

Oil Type

Mineral based hydraulic oil of ISO viscosity grade 32 or 46 is recommended.

Oil Cleanliness

A minimum fluid cleanliness level of ISO 20/18/15 is recommended, noting that other elements of the system may require a higher cleanliness level than this. Also refer to *Hydraulic System Connection to Cylinder* (page 4) regarding cleanliness.

Oil Pressure

The hydraulic system must be provided with relief valve protection, to ensure that the working pressure of the cylinder (as marked on the general assembly drawing) is not exceeded. If you do not have this information, please request a copy of the general assembly drawing, prior to any operation.

Oil Temperature

Standard hydraulic systems are designed to operate at a normal maximum oil temperature of 65°C, with the optimum oil temperature being 50 to 55°C. Exceeding this maximum operating temperature continuously will reduce seal and oil life dramatically. In this case a heat exchanger should be fitted to the system.

Air Breathers

Good quality air breathers must be fitted to hydraulic systems at any openings to the atmosphere, to reduce contamination in the system.

Operating Speed

The operating speed in extension is generally limited only by port sizing. As such, the cylinders can generally be operated in extension with an extension port flow speed of up to 6 m/s.

The maximum retraction speed of any stage must be limited to 200mm/s (the smallest stage is generally the controlling factor). Exceeding this speed will cause internal damage to the cylinder, unless retraction cushioning is fitted to the cylinder stage in question.

General

It has been observed in the past that hoists have been pushed back by the use of excavators etc. This practice is not recommended as it can cause excessive pressures to build up in the hoist. The pressures created can be great enough to cause permanent deformation.

GUARDING AGAINST INTENSIFICATION

Intensification

Intensification occurs in hydraulic cylinders when the cylinder has a pressure supply to the extension port when the retraction port becomes blocked. The forces in the cylinder have to equal out, and the result is that the pressure applied to the bore area (via the extension port) is reacted against by an opposing pressure in the annulus area (retraction port side). As the annulus area is smaller than the full bore area, a higher pressure is required in the annulus. In a typical double acting multi-stage hoist, the pressure ratio can be as high as 8:1 as the annulus is quite thin.

Quick disconnect couplings

The common problem which occurs is due to quick disconnect couplings being used to connect the hoist into the remainder of the system. If the retract side coupling either fails to operate correctly or is not completely coupled, the built in check in the coupling will block the retract side flow from the hoist, causing intensification. With an operating pressure of only 2000psi, pressures up to 15,000 psi can be generated quite easily. This will distort the tubes permanently by raising stresses above the material yield point.

If quick disconnect couplings are to be used, overpressure protection (eg. rupture valve) on the annulus side of the cylinder is required *between the cylinder retraction port and the coupling.* This provides protection from intensification in case of quick disconnect coupling failure.

Misphasing

Another potential cause of intensification in multi-stage double acting hoists is misphasing. This can occur in a hoist when the porting on one stage is blocked by the next stage piston travelling across those ports. This does not allow the retraction side oil to escape internally within the hoist, so intensification between stages occurs.

To protect against this, Delta double acting hoists are equipped with anti-misphasing holes (when the application requires it). These holes are sized so that at maximum operating speeds the pressure drop through them is at most 2500psi. This protects against the normal case of only one stage port being blocked, but dual misphasing will cause even greater pressures (ie. 5000psi) and with incorrect use even triple misphasing is possible. For most normal operating flow rates, triple misphasing would be required to cause permanent deformation of stages by intensification. However it is recommended that multiple misphasing be avoided at all times.

To avoid multiple misphasing, it is required that the following operating notes are adhered to:

- the hoist must be fully retracted prior to extension
- whenever the cylinder is retracted, including from a partially extended position, it must be retracted fully.
- should the cylinder be required to extend under no load, it is required that the cylinder is operated at half speed.
- extending the cylinder against a load will ensure in-phase extension.

In applications where straight extension under load/full retraction is the normal operation mode, anti-misphasing holes are not included. In this case particular operating requirements exist as follows:

- the hoist must be fully retracted prior to any extension
- the hoist must only be extended under load.

The preference is to not use anti-misphasing holes where possible, to provide maximum performance.

COMMISSIONING

1. Bleed the cylinder according to the instructions in the next section.
2. Cycle the cylinder once slowly and check for adequate mechanical clearances, hose lengths etc. and general operation. This may be done in conjunction with the bleeding operation, above.
3. Cycle the cylinder 5 times with no load, checking for:
    - smooth operation
    - external leakage from cylinder (if leakage is found contact the supplier - do not attempt to correct the problem yourself as this will void the warranty). Refer to the warranty procedure.
    - general operation and condition of the cylinder.
4. Cycle the cylinder under load and check as per step 3, above. In addition check that the relief valve settings are correct so that the cylinder will not be over pressurised.
5. If all is operating correctly, the cylinder is now ready for service. Inspect the cylinder regularly during the first 10 to 20 cycles in service. Ensure that the cylinder temperature does not exceed allowable levels.

BLEEDING

It is of particular importance to fully bleed the air from telescopic hoists, as failure to do so can result in reduced hoist life or damage to the hoist. This has been observed in the field, where telescopic hoists containing air in the oil have failed due to a phenomenon called *dieseling*.

Dieseling occurs when pressure spikes in the hydraulic system compress air in the oil, to a point where ignition occurs. This is the same mechanism by which a diesel engine operates. In a telescopic hoist, any air in the oil is held in the upper end of the annulus area, directly adjacent to the gland seals. If a pressure spike occurs, the seals can actually burn due to the ignition and then begin to leak.

The result of air being present in the hoist is obvious – reduced hoist life or damage. As such the following procedure must be followed to ensure that air is fully bled from the hoist.

Procedure

Double acting telescopic hoists are bled by cycling several times to full extension & full retraction. If air continues to be evident in the cylinder, further cycling is required until all air is bled from the cylinder.

PERIODIC INSPECTION & MAINTENANCE

- For cylinders in frequent use under dusty conditions, the mount pivots should be greased weekly. Inspect the hoist weekly for significant dust buildup indicating oil leakage.
- Check hardchrome surface for damage every 12 months. Surface should be free from dents and scratches.
- Check hoist seals by inspecting for leakage at stage ends and around the base every 12 months.
- The oil should be replaced every 12,000 hours of operation. The seal type used in these cylinders is expected to provide a minimum of 10,000 vehicle operating hours.

IN CASE OF FAILURE

If the cylinder is still in the warranty period, do not attempt to disassemble and fix the cylinder yourself, as this will void the warranty. Please refer to the Delta Hydraulics Warranty Policy for instruction on handling the situation of warranty claims.

Please note that it is far preferable for the hydraulic cylinder to be returned to the manufacturer for inspection, to determine the reason for failure. If this is not done, the investigation may not be complete and the possibility exists that the problem will re-occur.

If the cylinder is out of the warranty period, only experienced hydraulic fitters should disassemble and work on the cylinder. The reason for this is to avoid unnecessary damage to the cylinder.

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A.C.N. 009 567 186
MANUFACTURING HYDRAULIC ENGINEERS

➔ ***DESIGN***
➔ ***MANUFACTURE***
➔ ***SALES***
➔ ***SERVICE***
➔ ***SPARE PARTS***