

# Hi-Force® HYDRAULIC TOOLS

## INSTRUCTION MANUAL – HYDRAULIC CYLINDERS:

Model Series: HVL, HPS, HLS, HSS, HAS, HHA, HHS, HHR, HDA, HFL, HFG, HSG, HGG, HPC.



**NOTE:** Spare parts sheets for these products are available from the Hi-Force website at:

[www.hi-force.com](http://www.hi-force.com)

or from your local regional Hi-Force Sales office or authorized local Hi-Force distributor.

### 1.0 Inspection of the product upon receipt:

On receipt of the product, visually inspect the item for any evidence of shipping damage. Please note shipping damage is not covered by warranty. If shipping damage is found notify the carrier immediately and refrain from putting the product into service. The carrier is responsible for repair and replacement costs resulting from damage in transit shipment.

### 2.0 Safety Precautions:



Read and follow all the instructions and safety warnings carefully prior to use of the equipment. Failure to do so could result in equipment damage or failure of the equipment or personal injury. Hi-Force will not be held responsible for any damage to the equipment or personal injury resulting from unsafe use of the product, lack of maintenance or incorrect operation. If in doubt on the correct usage of any Hi-Force equipment, contact your nearest Hi-Force office or distributor. If the operator has not been trained on high pressure hydraulic equipment and its safe use consult your local Hi-Force sales office who can offer you training courses for operators.



All operators should ensure that all necessary personal protective equipment as specified by their employer is worn when operating any hydraulic equipment. Safety shoes, safety glasses/ visor and

protective gloves should be worn at all times. All relevant risk assessments should be completed prior to use of the equipment.



**Warning:** Do not work under a load supported only by hydraulic means. A cylinder, when used as a lifting device should not be used as a load holding device. All loads once lifted, should be supported by rigid mechanical means. If load holding is required by the application where external mechanical means cannot be used, HFG/HFL Failsafe cylinders should be considered. To avoid personal injury keep hands and feet clear of the cylinder and workpiece during operation.



Do not exceed the rated capacity of the hydraulic cylinder and never attempt to lift a load greater than the stated capacity of the cylinder. Hi-Force hydraulic cylinders are designed for a maximum working pressure of 700 BAR (10,000 PSI). Do not connect a pump with a higher rated pressure capacity to any Hi-Force cylinder of this model series.



Keep hydraulic equipment away from flames and direct heat.

Hydraulic equipment must only be serviced by a qualified technician.

To protect your warranty, only use Hi-Force's hydraulic oil.

Immediately replace any worn or damaged parts using genuine Hi-Force parts only.

Do not adjust the external pressure relief valve on any Hi-Force cylinder.

The system operating pressure must not exceed the pressure rating of the lowest component in the system. Where possible, use a pressure gauge to monitor the system.

Avoid damaging hydraulic hose. Always route hoses to ensure that they are free from sharp bends and kinks. Using a bent or kinked hose will cause severe back-pressure and can also lead to the failure of the hose.



**Never** lift or carry any hydraulic components by the hose or hoses connected to them.

**Do not** handle a pressurized hydraulic hose. Oil escaping under pressure from a ruptured hose can penetrate the skin and lead to a serious medical emergency and in certain cases death. Should this incident happen medical attention must be sought immediately.

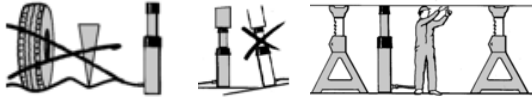
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**Always** operate the system under no load condition prior to the actual lift to ensure that no air is trapped in the hydraulic circuit.

**Do not** drop or place heavy objects on a hydraulic hose as this will cause internal damage to the hose which could result in rupture when the hose is pressurized and could result in serious damage to components, and possible serious personal injury to operating personnel.



Lifting cylinders should always be placed on a flat even surface that can support the load to be applied.

Avoid lifting loads that are not central to the lifting piston. Avoid offset loading as this can damage the cylinder bores and piston rods, and also lead to unstable load lifting.

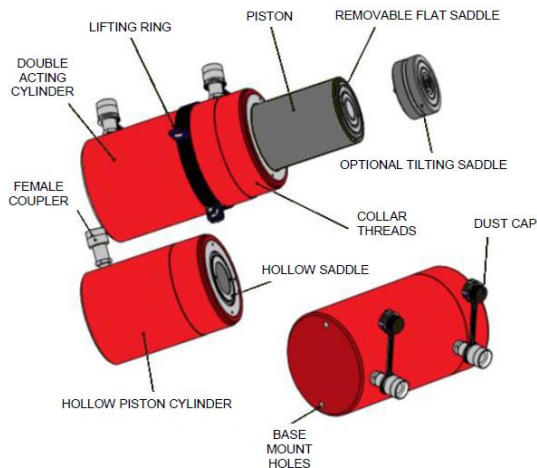
Where applicable, use an additional cylinder support base to assist in supporting the load to be lifted.

Do not weld items to the cylinder or modify the cylinder in any way from its delivered condition. This will invalidate your warranty, and could lead to serious personal injury.

Only use hydraulic cylinders in a completed, tested coupled system. Never attempt to use a cylinder that is not correctly coupled to its operational pump.

**!** If hydraulic cylinders are overloaded to extreme degrees, this could in extreme cases to component failure and may lead to serious personal injury.

### 3.0 Cylinder Type Components:



### 4.0 Installation – Connection and Bleeding:

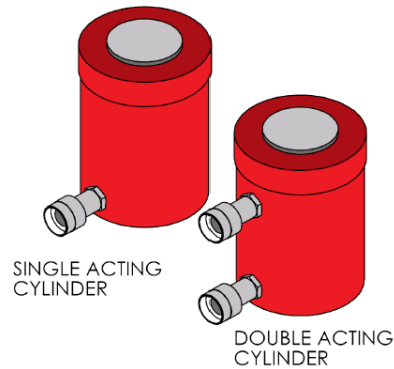
Ensure that the hydraulic pump being used is suitable for the cylinder/s it is to be connected to. For single acting cylinders (one pressure coupling connection), a hydraulic pump with a 2 way or 3 way valve and one single correctly rated hose must be used.

For double acting cylinders (two pressure coupling connections), a hydraulic pump with a 4 way valve and two correctly rated hoses must be used.



#### **DANGER:**

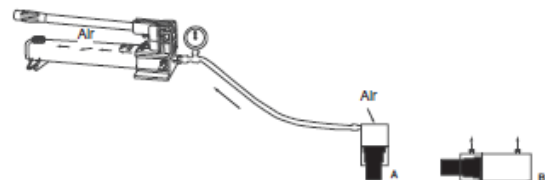
Double Acting cylinders must always have both coupling connections securely and correctly made prior to use. Never attempt to pressurize a double acting cylinder, if only one connection has been made.



Connect the hoses between the cylinder and the pump ensuring that the coupling/s are fully **hand tightened** only. **Never** use wrenches to attempt to connect the coupling/s, incorrectly connected coupling/s is one of the most common causes of faulty operation.

Before putting the cylinder into operation, it is important that the system is bled to ensure that all the air is removed.

To remove air from the cylinder proceed as below:-



Single Acting Cylinders: Position the cylinder below the level of the hydraulic pump with the piston of the cylinder pointed downwards (as in A, in the diagram above.) Fully extend and retract the piston

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of the cylinder several times until the operation is smooth.

Double Acting Cylinders: Position the cylinder below the level of the hydraulic pump. On its side with the couplings facing upwards (as in B. in the diagram above). Fully extend and retract the piston several times until the operation is smooth.

**Note:** When long hoses are used (especially in the case of smaller capacity cylinders) the above procedure may not completely remove all the air from the system. In these cases contact your Hi-Force representative for advice on pre-filling hoses with hydraulic oil.

**Note:** Fitting adaptors to cylinders. The collar threads are designed to facilitate the full capacity of the cylinder when the adaptors are fully engaged over the full collar thread length.


 **Warning:** Some cylinder attachments require that the cylinder be used at no more than 50% of its rated capacity. Refer to the accessory instructions for additional information.


### 5.0 Operation.

A hydraulic is required to operate the cylinder ranges covered by this instruction. Please refer to relevant Hi-Force hydraulic pump operation instructions for full details of the chosen pumps relevant instructions.


Single Acting cylinders have different methods of return of the piston, these are either spring assisted return or load assisted return.


Double Acting cylinders have the piston powered in both directions by means of the hydraulic pump used.


 The cylinder stop ring where fitted is designed to withstand the full load of the cylinder. However it is advisable to reduce wear and extend the service life of the cylinder that the operator uses less than the full stroke and load wherever possible.


 On models of cylinder where a stop ring is fitted it is imperative that the piston is not over extended. On these models, Hi-Force, employs a red marker band on the piston which will become visible when the maximum stroke length of the piston has been achieved. Any attempt to extend the piston beyond this point will cause hydraulic oil

to by-pass via the overflow hole in the cylinder. This action when performed with the cylinder under pressure can damage the seals. Should this action have taken place the cylinder must be returned to your local Hi-Force authorized service centre for the seals to be replaced.

 Base Mounting holes (where provided) are **not** suitable for withstanding the full retraction force of double acting cylinders. These mounting holes are for location purposes only.


 When lowering loads on both single and double acting cylinders, the load may descend faster than expected. The use of a manual check valve (HFV66) is recommended for precise load lowering control.

 Tilting saddles are fitted as standard to certain models of Hi-Force cylinders and are available as an operational accessory on other models. These saddles accommodate up to 5° of misalignment of load, and will reduce (but not eliminate) the risk of cylinder damage due to lateral loading.


 Always ensure that the piston of the cylinder contacts the load to be lifted as squarely as possible – this also applies when tilting saddles are used.

### HFL and HFG – Failsafe cylinders

Hi-Force HFL and HFG Models are fitted as standard with a failsafe locking ring. The purpose of this feature is should the application requires that the cylinder becomes the load holding device, the locking collar can be screwed down the piston until it comes in contact with the cylinder barrel. Applying the lock ring in this manner provides a mechanical support to the load that is being lifted. With the lock ring fully engaged, the hydraulic pressure can be released from the system and the cylinder becomes a solid mechanical support.

 Always ensure that the lock ring is in full contact with the cylinder barrel before releasing the system pressure.

### HPC Pull Cylinders:

 All Pull cylinders must be operated with the full Clevis/Eyelet attachments engagement utilized.



**HVL Cylinders:**

Never extend HVL Cylinders unless the base of the cylinder is fully supported and an external load is present.

**6.0 Relieving Trapped Pressure in the cylinder:**

It is possible that on occasion pressure can become trapped in the hydraulic cylinder, if a hydraulic hose is disconnected before the system pressure has been completely released.



**Danger:** Never attempt to relieve trapped hydraulic pressure in the cylinder by loosening or attempting to remove the coupler. Trapped hydraulic pressure can cause a loosened coupler to dislodge unexpectedly with great force. This action could cause serious personal injury or death, as the coupler could become a projectile and hit operatives in the working area.



**Loosening** a coupler may result in the escape of hydraulic oil at high pressure that can penetrate the skin and could cause serious injury or death.



**Never** use a hammer and punch to unseat a coupler check valve that is under pressure. Doing this could result in the release of sudden uncontrolled escape of hydraulic oil at high pressure which could cause serious injury or death.

**7.0 Maintenance:**

Always use genuine Hi-Force hydraulic oil with the cylinders. The use of other fluids may invalidate your warranty.

After use, always retract the pistons fully, and disconnect hoses. When disconnections have been made always fit dust caps to the couplings.

Visually inspect the cylinders for signs of general damage.

Store in clean and dry conditions. If storage is to be for a prolonged period it is advisable to apply grease to exposed metal surfaces. NEVER store cylinders with in piston in the extended position.



**Caution:** Double Acting cylinders can become pressurized whilst in storage due to temperature rise above the ambient temperature the item was stored at. The approximate calculation for this is 10 bar pressure for every 1°C rise in temperature. In certain cases this could cause difficulty in re-connecting couplings after storage.

**8.0 Trouble Shooting:**

Refer to the trouble shooting chart for a list of typical cylinder problems and the possible causes for those problems. The chart is neither, exhaustive or definitive and should only be used as an aid to help diagnose the most common problems.

Hydraulic cylinders should only be serviced and repaired by trained and experienced hydraulic engineers.

TROUBLESHOOTING CHART	
PROBLEM	POSSIBLE CAUSE
Cylinder will not advance.	Pump release valve open. Coupler not fully tightened. Oil level in pump is low. Pump malfunctioning. Load is too heavy for cylinder. Cylinder seals leaking.
Cylinder advances part way.	Oil level in pump is low. Coupler not fully tightened. Cylinder plunger binding.
Cylinder advances in spurts.	Air in hydraulic system. Cylinder plunger binding.
Cylinder advances slower than normal.	Leaking connection. Coupler not fully tightened. Pump malfunctioning.
Cylinder advances but will not hold.	Pump malfunctioning. Leaking connection. Incorrect system set-up. Cylinder seals leaking.
Cylinder leaks oil.	Worn or damaged seals. Internal cylinder damage. Loose connection.
Cylinder will not retract or retracts slower than normal.	Pump release valve is closed. Coupler not fully tightened. Pump reservoir over-filled. Narrow hose restricting flow. Broken or weak retraction spring (if equipped). Cylinder damaged internally.
Oil leaking from external relief valve.	Coupler not fully tightened. Restriction in return line.