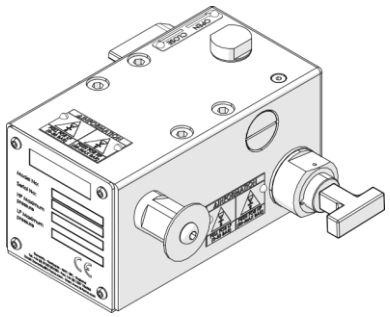
Operating Instruction Manual: OM-MHX-01	Serial Numbers: All

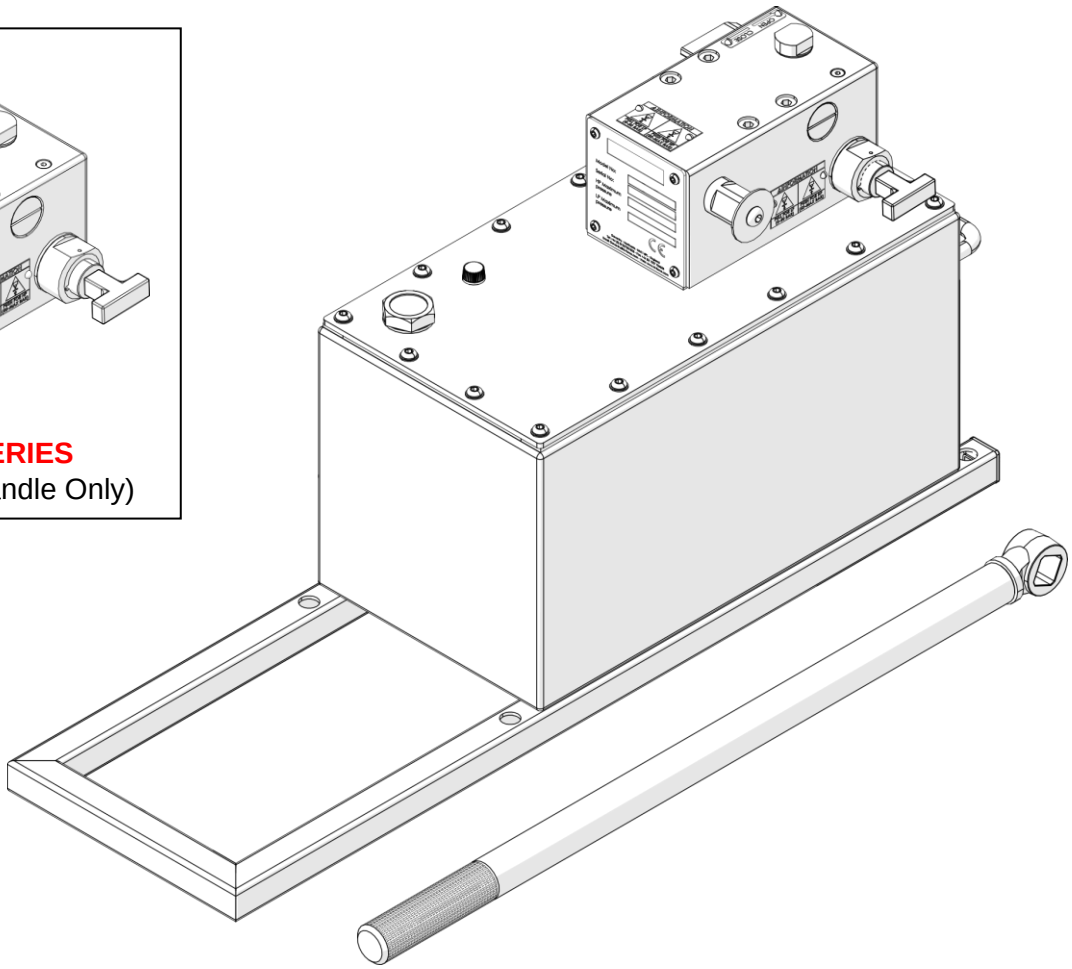
This 'Original instructions' document assumes that the operator carrying out any operation with this product is trained and competent to do so. This manual does not attempt to cover all details or variations in the equipment. Nor does this manual claim to provide for every possible contingency met in connection with the installation, operation, or maintenance thereof. Should further information be desired, or should a particular problem arise which is not covered in sufficient detail, the matter should be referred to Hi-Force.

OPERATING INSTRUCTION MANUAL

MHX SERIES | MANUALLY OPERATED HYDROTEST PUMPS
&
MHX-PU SERIES | MANUALLY OPERATED HYDROTEST PUMP UNITS



MHX-PU SERIES
(Pump Unit & Handle Only)



Hi-Force MHX & MHX-PU series Manually Operated Hydrotest Pumps are designed for pressure testing hydraulic systems up to a maximum working pressure of 1000 bar (14,500 psi). The series features 5 models, ranging from 100 bar (1,450 psi) to 1000 bar (14,500 psi). This manual applies to the Hi-Force MHX & MHX-PU series, Manually Operated Hydrotest Pumps Only. It contains the latest product information available at the time of publication and approval. For information relating to the servicing of a manually operated hydrotest pump, see the servicing instructions, which are available on the Hi-Force website. Hi-Force reserves the right to make changes to this document at any time without notice.

Table of Contents

NOTE: Images contained within this document are for illustrative purposes **ONLY**.
Images show an MHX model. MHX-PU models would have a customer supplied reservoir fitted.

1.0 Inspection upon Receipt

Upon receipt of the product, visually inspect the item for any evidence of shipping damage. Please note: the warranty does not cover shipping damage. Notify the courier immediately if shipping damage is found and refrain from putting the product into service. The carrier is responsible for repair and replacement costs resulting from damage that occurred in transit.

2.0 Safety Precautions

2.1 Introduction

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

2.2 Work Area Safety

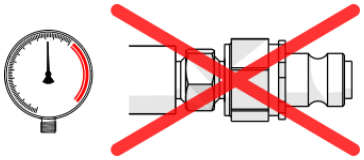
- Keep work areas clean and well lit. Cluttered spaces and inadequate lighting can result in unnecessary accidents.
- Keep bystanders clear of any hydraulic tool activity. People working in close-range should be made aware of high-pressure work before commencing.

2.4 General Hydraulic System Safety Precautions

⚠ WARNING! Failure to observe and obey the following safety precautions could result in property damage, significant personal injury or death;

- When operating any hydraulic equipment, all operators should ensure that all necessary personal protective equipment (PPE) is worn, as specified by their employer. Steel toe-cap safety shoes, safety glasses / visor, and protective gloves should be worn at all times. All relevant risk assessments should be completed before the use of the equipment.
- Keep hydraulic equipment away from open flames and direct heat.
- **NEVER** use a coupler as a tool handle, especially if the system is pressurised.

- **NEVER** handle a pressurised hydraulic hose. Hydraulic fluid escaping under pressure from a ruptured hose can penetrate the skin and lead to a significant medical emergency, and in some cases, death. Should this incident occur, seek out medical attention immediately.
- Seek medical attention immediately if a hydraulic injection injury (no matter how minor) occurs.
- The system operating pressure **MUST NOT** exceed the pressure rating of the lowest-rated component in the system. It is good practice to use a pressure gauge to monitor the entire system.
- **NEVER** attempt to pressurise a system that is not correctly coupled to its operational pump.

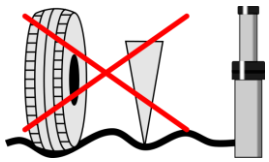


- **NEVER** pressurise an unconnected male coupler/s.
- **NEVER** attempt to disconnect a hose from a hydraulic system until the system's pressure has been completely released. Doing so can result in that pressure becoming trapped within the system and relieving trapped pressure can be dangerous.
- **NEVER** try to relieve trapped hydraulic pressure in the system 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 result in serious personal injury or death.
- Loosening a coupler under pressure can result in the escape of hydraulic fluid at high pressure, which can penetrate the skin and cause significant injury or death.
- **NEVER** use a hammer and punch to unseat a coupler check valve that is under pressure. Doing so could result in the sudden, uncontrolled release of hydraulic fluid at high pressure, which could cause significant injury or death.
- **NEVER** attempt to solve, or clean-up leaks in the system while the system is pressurised.
- Immediately replace any worn or damaged parts using genuine Hi-Force parts only.
- Do not use any hydraulic equipment if you are under the influence of alcohol, drugs or medication. Lack of attention whilst operating high-pressure hydraulic tools can result in personal injury or death.

⚠ CAUTION! **Failure to observe and obey the following safety precautions could result in property damage, equipment damage or minor/moderate personal injury;**

- **NEVER** lift, carry or move any hydraulic components by the hose or hoses connected to them.
- Avoid damaging hydraulic hoses. **ALWAYS** route hoses to ensure that they are free from sharp bends and kinks. Using a sharply bent or kinked hose will result in severe back-pressure, which can lead to hose failure.
- **NEVER** use a coupler/s to lift, carry or position a tool.

- Servicing of hydraulic equipment must only be undertaken by a qualified technician.



- **DO NOT** drop or place heavy objects on a hydraulic hose, as this may cause internal damage, which could result in rupture of the pressurised hose. A ruptured hose could cause significant damage to components and possible severe injury to personal operating nearby.

- **DO NOT** let familiarity gained with any hydraulic tools allow you to become complacent. Complacency with any tooling can result in a lack of discipline toward working guidelines and safety principles.

- **DO NOT** remove any labels from the product. Replace any damaged or unreadable labels immediately.

- Avoid loose clothing and jewellery that could get caught in moving parts, tie back long hair.

2.3 Hydraulic Pump Specific Safety Precautions

⚠ WARNING! Failure to observe and obey the following safety precautions could result in property damage, serious personal injury or death;

- **NEVER** invert the pump or lay it on its side, either in use, in transport or in storage.

- **DO NOT** weld any items to the pump or modify it in any way from its delivered condition. Your warranty may be invalidated, and it could lead to serious personal injury.

- **NEVER** exceed the maximum rated capacity of any hydraulic pump / circuit. See Section 8.1 for model-specific pressure capacity ratings.

- **DO NOT** overload hydraulic systems. The pump relief valve only protects against overloading of the pump. It does not protect against overloading of the system.

⚠ CAUTION! Failure to observe and obey the following safety precautions could result in property damage, equipment damage or minor / moderate personal injury;

- **ALWAYS** stand the pump on a stable, level surface during operation.

- To protect your warranty, only use operating fluids deemed suitable by Hi-Force (See Section 5.2). If in doubt, contact your nearest Hi-Force Office or distributor.

3.0 Declaration of Incorporation / Conformity

Hi-Force declares that this product has been tested and complies with the standards set out in the relevant EU directives. The EU Declaration of Incorporation / Conformity is included as Annex A to this instruction document and is supplied with all shipments of this product.

4.0 Component Identification

1	Fluid Reservoir *	**7**	Pressure Release Valve
2	High / Low Pressure Changeover Valve	**8**	Air Vent Screw *
3	Filter Retaining Screw	**9**	'Optional Gauge' Port (Plugged)
4	Filler Cap (dipstick attached) *	**10**	Outlet Port
5	Operating Lever	**11**	Reservoir Handle *
6	Extended Foot Reaction Bar *	**-**	

* Not included with MHX-PU models.

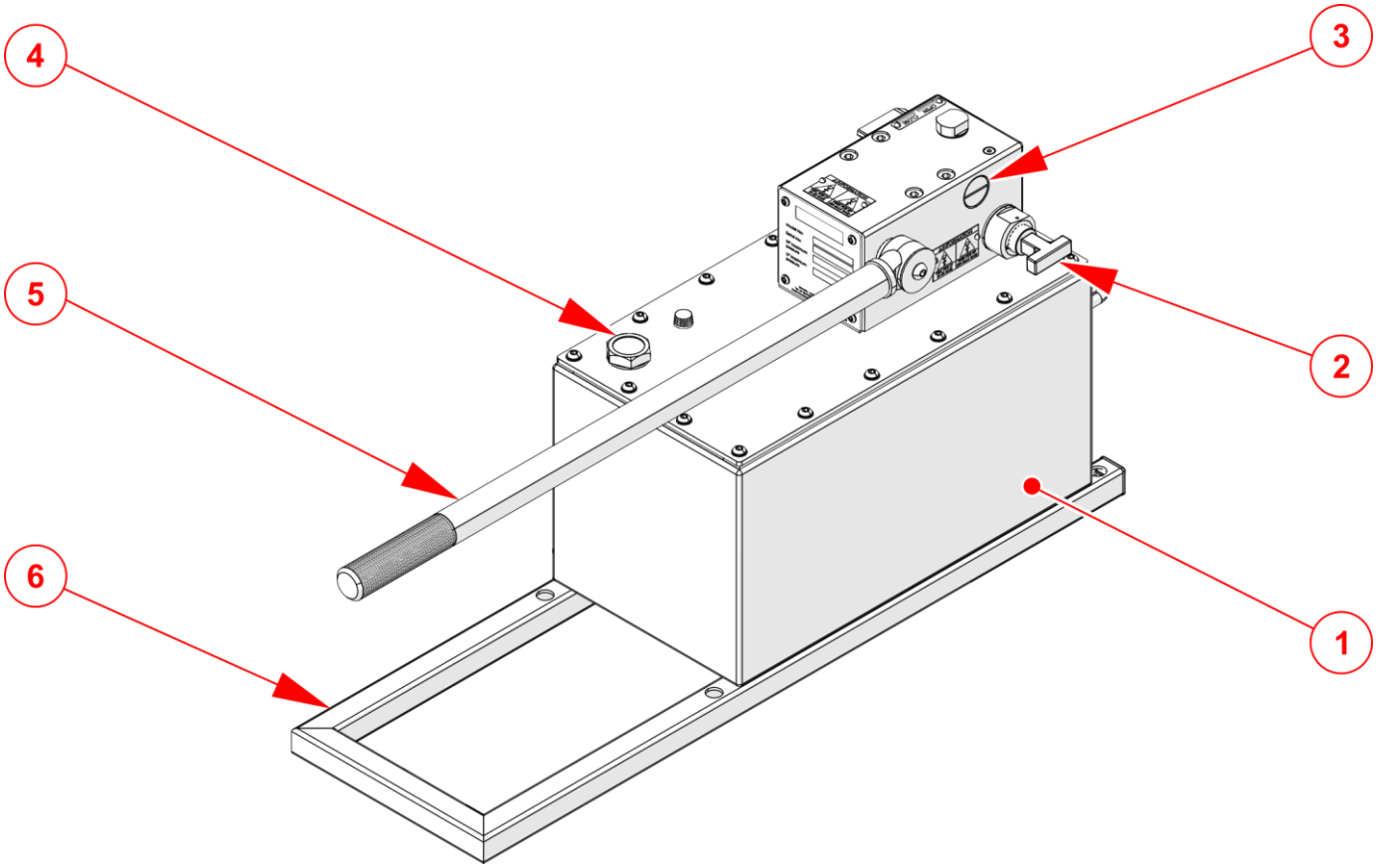


Figure 4.1: Component Identification

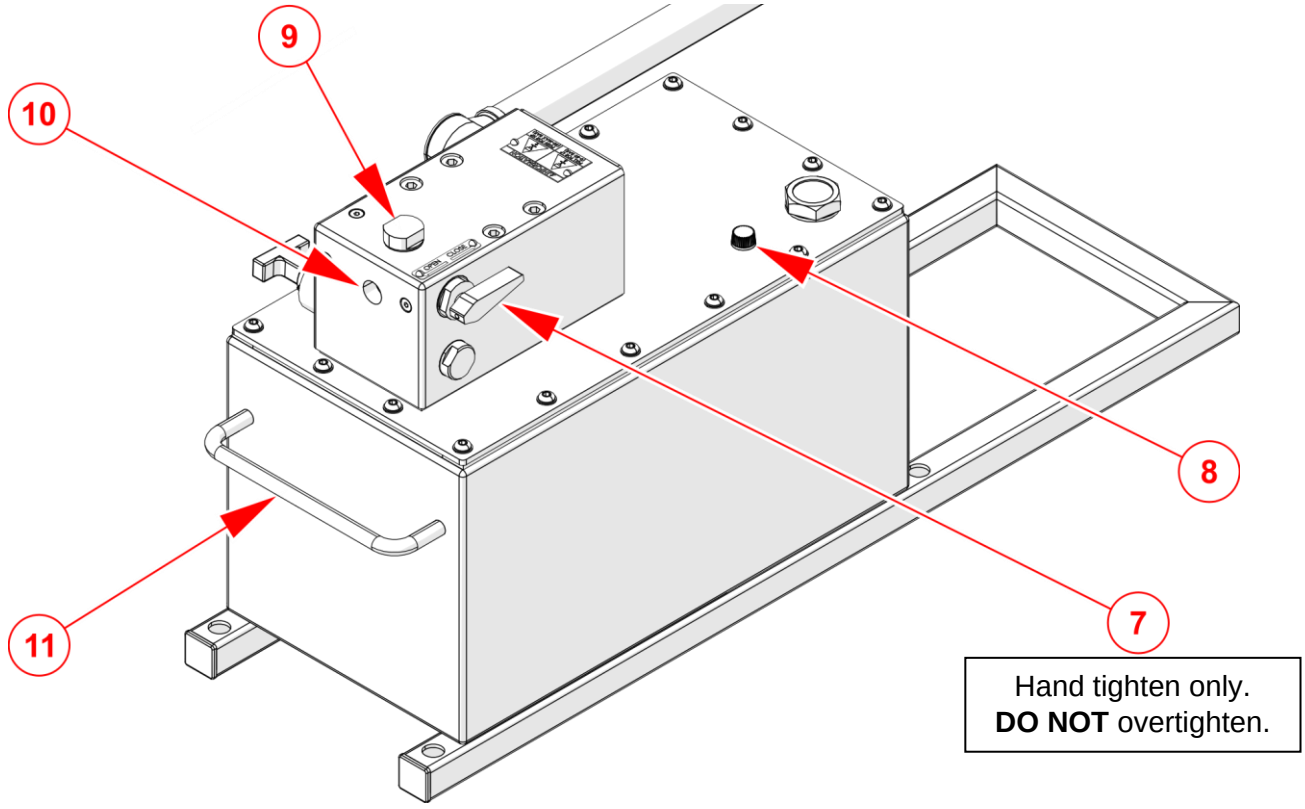


Figure 4.2: Component Identification

5.0 Installation / Setup

5.1 Before First Use / Preparation

- Fit the operating lever using the bolt and washer provided. (*See figure 5.1*)

  The operating lever can be attached in multiple positions. Choose the one most comfortable for the operator, ensuring the lever can be operated through its entire stroke.

  NOTE: A small amount of free handle movement is normal and is due to clearances in the manufacturing processes of the working parts of the pump. This should not be confused with the loss of effective stroke due to other causes.

- Make sure all hoses, pipes and fittings are compatible with the operating fluid.

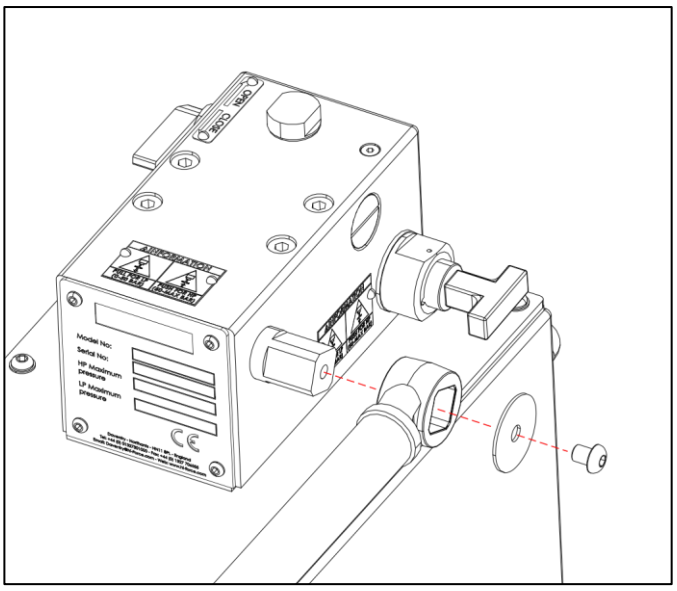


Figure 5.1 - Attaching the Operating Lever

- The standard factory acceptance test for MHX pumps uses oil. The pumps are drained after testing, but some oil residue will remain. This should be flushed out by pumping the working fluid through the pump before connecting to a system.

5.2 Operating Fluids

The following fluids are suitable for use with MHX hydrotest pumps.

- Hydraulic Mineral Oil.
- Demineralised, distilled and 'filtered mains supplied' water.
- Other fluids are possible but may require special seals to be fitted.

IMPORTANT: If in doubt about the suitability of the operating fluid you intend to use, please consult your nearest Hi-Force office or distributor. Use of unsuitable operating fluids **WILL** void your warranty.

⚠ **CAUTION!** **NEVER** use saltwater in an MHX Hydrotest pump.

⚠ **CAUTION!** When using water as the operating fluid, avoid using brass and copper components in the system. They can promote internal corrosion of the aluminium pump body.

⚠ **CAUTION!** Make sure the pump is properly-flushed / clean when changing the working fluid. Mixing of fluids can cause sludge to build up in the pump, which can lead to pump failure.

5.3 Filling the Pump with Fluid

Fill / top-up the pump as follows:

- Stand the pump on a firm, level surface.
- Remove the filler cap (4) from the reservoir.
- Fill the reservoir with clean, high quality operating fluid, leaving a small air space of approximately 1-2cm between the top of the fluid and the filler plug.
- Replace the filler cap (4).

IMPORTANT: Only add fluid to the reservoir when the connected system is fully de-pressurised. Failure to do so will result in the system containing more fluid than the reservoir can hold.

5.4 Hydraulic Connections

Remove the steel or plastic hexagon headed plug and make a hydraulic connection to the outlet port (10). This port has a 3/8" NPT or 3/8" BSP female thread (See section 8.2), and the connection should be sealed, as appropriate, with a suitable thread sealant or a bonded washer.

⚠ **WARNING!** **DO NOT** overtighten this fitting. It can cause damage to the aluminium pump housing or lead to failure of the fitting at below rated pressure.

Connect a suitably rated hydraulic hose between the system and the pump, ensuring that the coupler/s (if fitted) are **fully hand-tightened only**. **NEVER** use wrenches in an attempt to connect the coupler/s. Incorrectly connected couplers are one of the most common causes of faulty operation.

IMPORTANT: Make sure that all coupler threads are fully engaged.

⚠ **WARNING!** Only use hoses with a 4:1 safety rating on burst pressure.

5.5 Priming the Pump (*See figures 6.1 - 6.5*)

Once installed, the pump **MUST** be primed to remove any internal air. Prime the pump as follows:

Preferred Method (if circumstances permit)

1. Connect an open hose to the pump. I.e. no fitting attached to the delivery end.

   IMPORTANT: If a male coupler is fitted, connect a female coupler to it to allow the fluid to flow through the hose freely. **NEVER** pressurise an unconnected male coupler.

2. Loosen the air vent screw (8). Close the Pressure Release Valve (7) on the pump by turning it clockwise.

3. Place the open end of the hose into a suitably sized bucket / container.

4. Pull out the High / Low-Pressure Changeover Valve (2) to select low-pressure mode.

5. Operate the pump (slow, smooth strokes) in 'low-pressure mode' until a steady stream of fluid flows.

6. Push in the High / Low-Pressure Changeover Valve (2) to select high-pressure mode.

7. Operate the pump (slow, smooth strokes) in 'high-pressure mode' until a steady stream of fluid flows.

The pump should now be primed and ready for use.

Alternatively;

1. Loosen the air vent screw (8). Open the Pressure Release Valve (7) on the pump by turning it anti-clockwise.

2. Pull out the High / Low-Pressure Changeover Valve (2) to select low-pressure mode.

3. Operate the pump through its entire stroke slowly and smoothly at least 10 times.

4. Push in the High / Low-Pressure Changeover Valve (2) to select high-pressure mode.

5. Once again, operate the pump through its entire stroke slowly and smoothly at least 10 times.

The pump should now be primed and ready for use.

5.6 Bleeding Trapped Air from the Hydraulic System

⚠ **WARNING!** The bleeding of trapped air from a hydraulic system must only be performed by qualified personnel who have been trained and are competent to do so.

The method of air removal will depend on the hydraulic system under test. Safe, effective methods of air removal, must be established before starting any operation. Pressure testing with air trapped in the hydraulic system can lead to an increased risk to the equipment and the operator.

NOTE: To reduce the likelihood of introducing air into the hydraulic system, make sure that all hoses are pre-filled with fluid before connecting them to the hydraulic system.

6.0 Operation

Hi-Force will not always be aware of what equipment this pump will be used with. It is the responsibility of the owner and all operators to read, understand and comply with all appropriate safety warnings and operating instructions relating to the equipment used.

NOTE: A small amount of 'free' handle movement is typical due to clearances in the pump mechanism. A large amount of 'free' handle movement may be a sign of air in the pump.

NOTE: Every pump is factory-fitted with an adjustable pressure relief valve. The valve is factory set to the maximum working pressure of the pump model specified. (See section 8)

This valve can be adjusted by the customer, to any desired pressure within the rating of the pump. Details for the method of adjustment for this valve are available on request.

⚠ **WARNING!** **NEVER** set the pressure relief valve above the rated maximum working pressure of the pump (as displayed on the specification plate) or above the maximum pressure for the system.

IMPORTANT: Before use, make sure the reservoir has sufficient capacity for the required operation.

⚠ **CAUTION!** Make sure the fluid level does not drop below the minimum operating level, as this may cause air to be pumped into the system. Fluids levels can be checked using the dipstick attached to the reservoir filler cap (4).

- Loosen the air vent screw (8).
- Turn the pressure release valve (7) clockwise to close it. (*See figure 6.1*)
- Start the pump operation in low-pressure mode to rapidly fill the system under test. (*See figure 6.2*)
- Pressurise the system by operating the pump handle. (*See figure 6.4*)

⚠ **CAUTION!** Only use the pump handle supplied. **DO NOT** use handle extensions.

⚠ **CAUTION!** **NEVER** jerk the handle during operation. This makes the pump inefficient and can cause unexpected pressure range change over. A smooth, steady action produces the best results and will reduce operator fatigue.

- When the operating effort reaches approximately 50 bar or the operator effort becomes excessive, select High-pressure mode by [1] lining up the tab on the handle with the slot in the housing and [2] pushing the pressure changeover valve in, [3] then twist the handle to lock it in place. (*See figure 6.3*)

IMPORTANT: The operating lever must be stationary during any pressure changeover.

- Release the system pressure by turning the pressure release valve (7) anti-clockwise. (*See figure 6.5)*

IMPORTANT: After operation, fully return all hydraulic fluid to the pump. Monitor the hydraulic fluid level in the reservoir to prevent over-filling of the tank. Tighten the air vent screw (8).

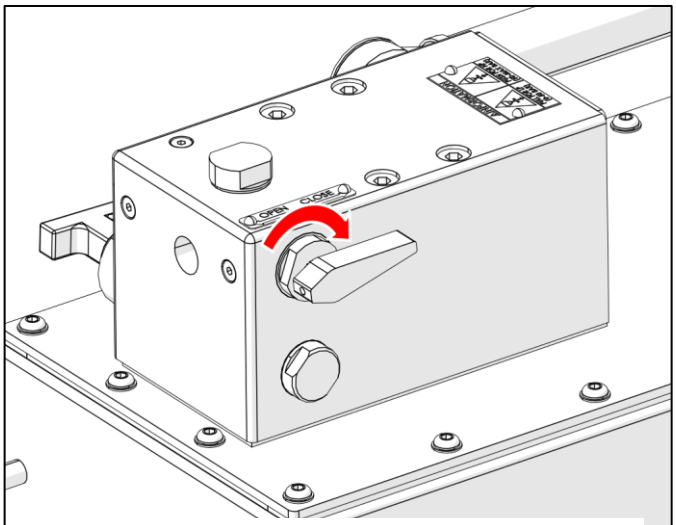


Figure 6.1 – Closing Pressure Release Valve

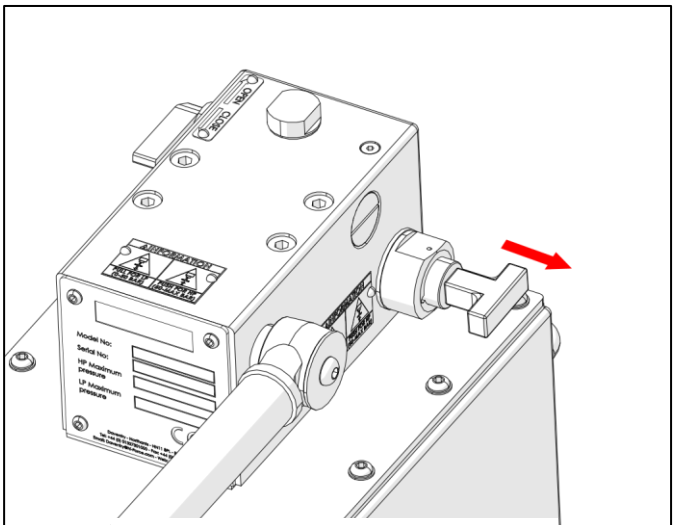


Figure 6.2 - Low Pressure Mode

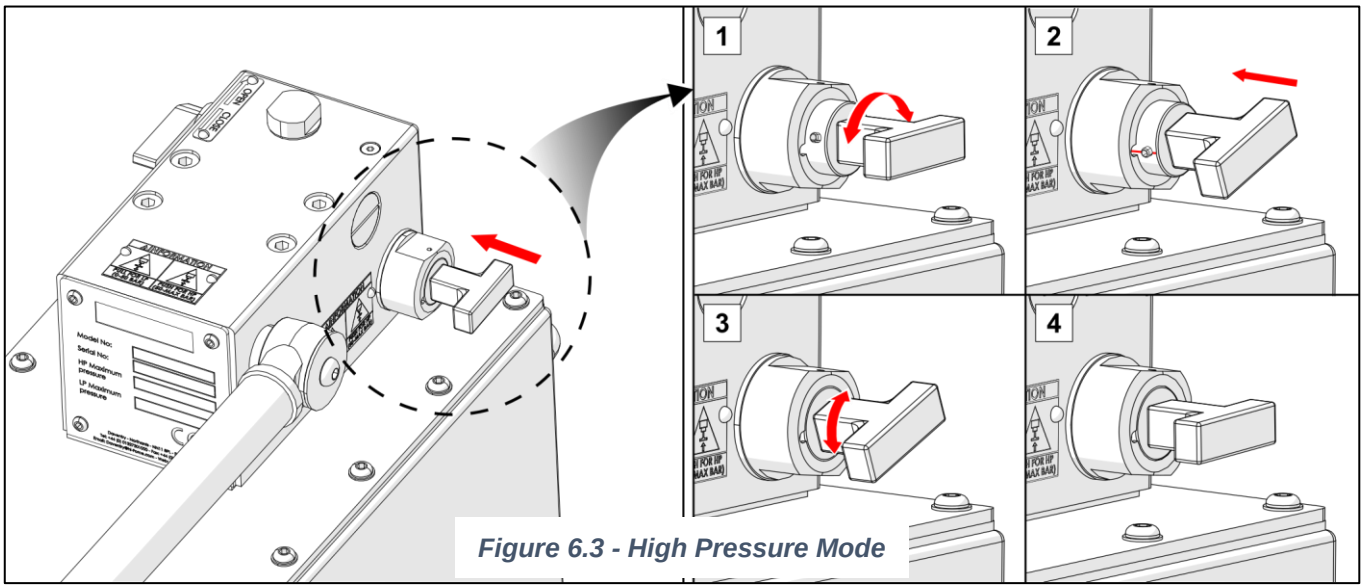


Figure 6.3 - High Pressure Mode

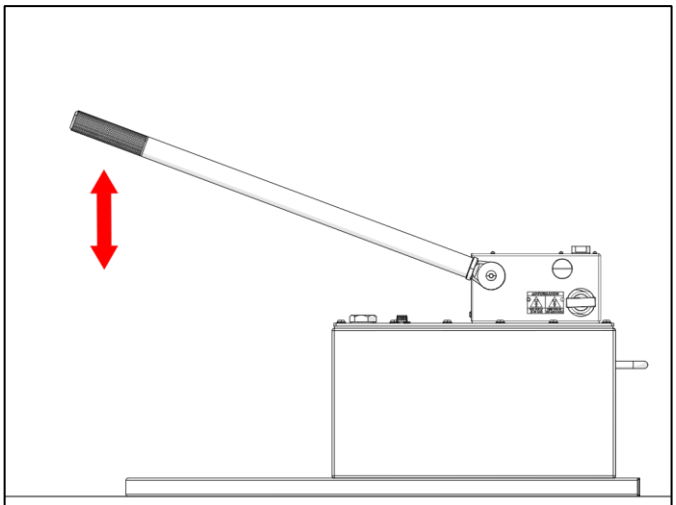


Figure 6.4 - Operating the Pump

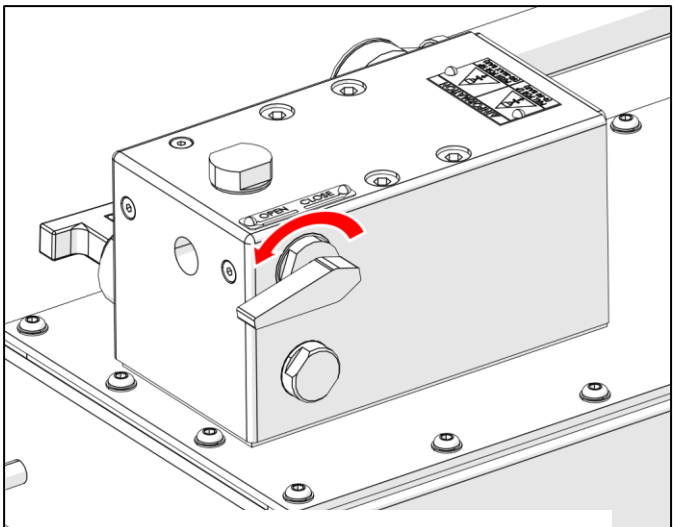


Figure 6.5 - Releasing System Pressure

7.0 Maintenance and Storage

- Inspect the pump for damage after each use.
- Keep hydraulic fluid clean. Change as necessary. Change frequently if using water.
- Keep contaminants from entering the system, by fitting dust caps to couplers and blanking off open ports.
- Zero the pump pressure before storing.
- Have the pump serviced regularly, by a Hi-Force authorised repair centre.
- If the pump is to be stored dry for an extended period after use with water. A small quantity of oil should be pumped through it to prevent corrosion or build-up of solid residues from the evaporation of water left in the pump.
- After heavy use, it may be necessary to clean the filter (See figure 7.1). Before removing the filter element from the pump, make sure that the system has been fully depressurised.
    - Unscrew the filter retainer screw.
    - Remove the filter, clean and replace.
- Occasionally lubricate the rocker shaft with a medium grade grease. To do this, remove the back-plate and apply grease to all accessible surfaces (See figure 7.2). Replace the back-plate.

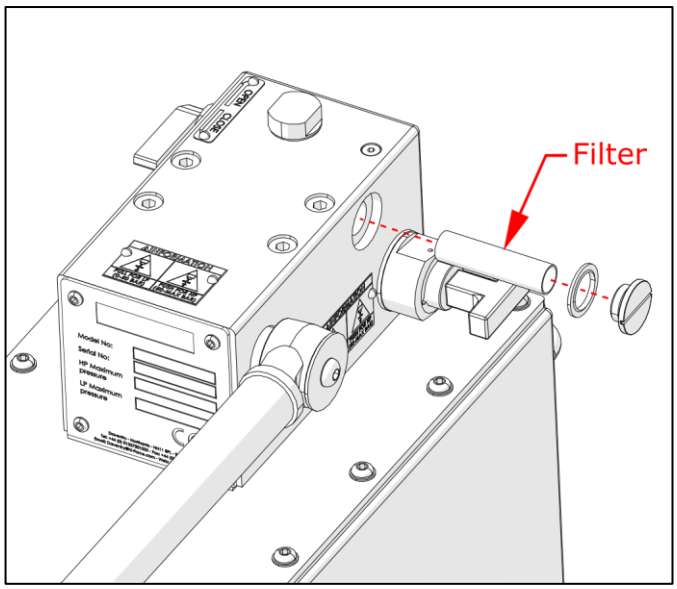


Figure 7.1: Filter Removal / Replacement

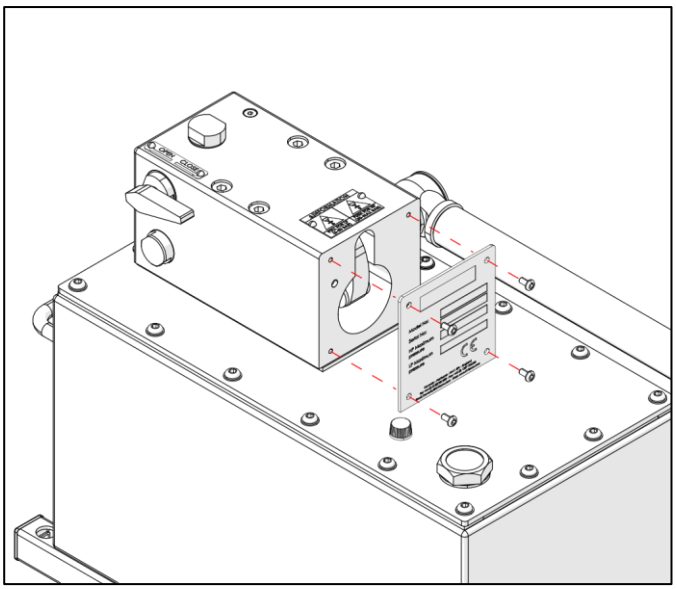


Figure 7.2: Greasing the Rocker Shaft

8.0 Specifications

Refer to the nameplate on the pump for model identification.

MHX | Manually Operated Hydrotest Pumps (Including Reservoir)						
Model Number including reservoir	Working Pressure (bar)	Displacement per Stroke (cm^3)		Changeover Pressure (bar)	Outlet Port	*Weight including reservoir (kg)
		1st Stage	2nd Stage			
MHX100	100	50	22	50	⅜" NPT	20
MHX300	300	50	8	50	⅜" NPT	20
MHX500	500	50	4	50	⅜" NPT	20
MHX700	700	50	3	50	⅜" NPT	20
MHX1000	1000	50	2	50	⅜" BSP	20

* Excluding fluid.

MHX-PU | Manually Operated Hydrotest Pump Units							
Model Number	Working Pressure (bar)	Displacement per Stroke (cm^3)		Changeover Pressure (bar)	Outlet Port	Suction Port	Weight (kg)
		1st Stage	2nd Stage				
MHX100PU	100	50	22	50	⅜" NPT	⅜" NPT	5
MHX300PU	300	50	8	50	⅜" NPT	⅜" NPT	5
MHX500PU	500	50	4	50	⅜" NPT	⅜" NPT	5
MHX700PU	700	50	3	50	⅜" NPT	⅜" NPT	5
MHX1000PU	1000	50	2	50	⅜" BSP	⅜" NPT	5

9.0 System Components / Accessories

(*Refer to the Hi-force website or latest Hi-Force catalogue, for further details*)

- High Pressure Hydraulic Hoses
- Pressure Gauges
- High-Pressure Couplers and Fittings
- Fluid Reservoir

10.0 Troubleshooting

Hi-Force MHX Hydrotest pumps should be serviced and repaired only by authorised Hi-Force repair centres. The following table gives possible causes and solutions for common problems.

TROUBLESHOOTING GUIDE

Problem	Possible Cause	Solution
1. No delivery of operating fluid.	a. Suction valves not sealing.	Remove contaminants or have seal/s replaced.
	b. Relief valve sticking or not sealing.	Remove contaminants or have seal/s replaced.
	c. Delivery valve seal failure.	Have seal replaced.
2. Handle drops rapidly* on its own.	a. Suction ball not sealing correctly.	With the release valve open, pump fluid around the pump. This may dislodge the dirt. If this does not work, contact your local Hi-Force office / distributor.
3. Handle rises when left.	a. Delivery valve not sealing correctly.	With the release valve open, pump fluid around the pump. This may dislodge the dirt. If this does not work, contact your local Hi-Force office / distributor.
4. Loss of effective pumping stroke, and/or high-pressure building while the pump is in low-pressure mode.	a. Air trapped in the pump.	Check these areas where air may be drawn into the pump. 1. Release Valve Joint Washer. 2. Release Valve Spindle Seal. 3. Suction pipe connection. 4. Low / High-pressure changeover valve. Under normal circumstances, should any of the above cause air to be drawn into the pump unit, there will be visible leakage of the operating fluid from that area.

* It is common for the handle to drop slowly on its own, or with slight force. This does not indicate a fault.

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