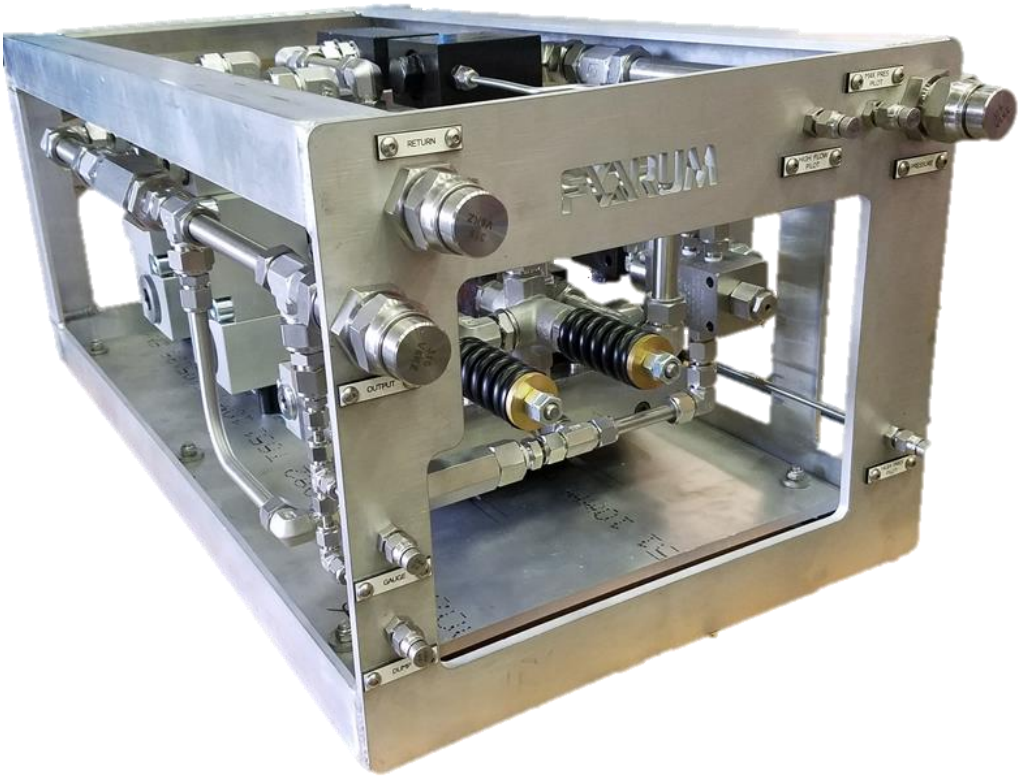
PART NUMBER	PART DESCRIPTION
SRTS-066-PRMA/01	BOP AT 300 OPERATION & MAINTENANCE MANUAL

BOP Actuation Tool 300 MkII

(BOP AT 300 MkII)

Operation & Maintenance Manual



CURRENT ISSUE	RECORD OF FIRST ISSUE	
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JFO	DM	DO CHECKED
JFO	-	TO CHECKED
JFO	DM	TO APPROVED
PROD	PROD	STATUS
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DOCUMENT TITLE

BOP AT 300 OPERATION & MAINTENANCE MANUAL

DOCUMENT NUMBER

SRTS-066-PRMA

ISSUE

4

KMS A4 Document.

CONTENTS

1 INTRODUCTION

1.1 SCOPE

The scope of this manual is to provide information regarding assembly and set up/operating instructions for the BOP Actuation Tool 300 MkII (BOPAT-300 MkII).

2 SAFETY RECOMMENDATIONS

2.1 GENERAL – OPERATIONS

Only authorised people and qualified personnel should work on the system and take suitable precautions to prevent injury.

Always adhere to authorised working practices and use the correct tools for the job. To facilitate this, make sure that these are available before commencing.

Ensure that overalls and other garments are kept clean and free of oil or chemicals. Ensure that any cuts or skin abrasions are protected before handling oil or chemicals to prevent ingress into the body. Protect the hands and arms with a suitable barrier cream and gloves and ensure that all system fluids or chemicals are removed from the skin as soon as possible.

Ensure that the working area is kept clear and uncluttered.

2.2 GENERAL – HYDRAULICS

Do not work on pressurised systems. Hydraulic systems contain a large amount of stored energy when pressurised, therefore the system (including any accumulators) should be de-pressurised, and the power pack switched off, prior to working on the system. Exceptions to this would be system adjustments to components requiring the presence of pressure and/or flow.

Any personnel authorised to work on the system must have a complete understanding of the operation of the hydraulic system, so that they will be aware of any system liable to remain pressurised or hazardous in any other way.

Ensure that all personnel are clear of any mechanical/hydraulic system likely to move if pressure to system actuators is released or applied.

Do not attempt to tighten any leaking fittings whilst under pressure. A rupture could result, leading to injury from flying components and/or oil jets.

Regularly inspect fittings and pipe-work for mechanical damage. If any such damage is found, the item must be repaired or replaced as necessary before pressure is applied to the system. Do not allow damaged fittings to remain in service.

Take care when inspecting, commissioning, repairing or maintaining the system to avoid jets of oil issuing from open orifices; pipe ends etc. if pressure is applied. Care should be taken to protect the eyes.

Hydraulic components may be heavy and slippery when covered in oil. Ensure that adequate protective clothing and footwear is used.

Any moving component should be treated with caution when the system is pressurised during operation, and especially during on-deck testing and repair. Keep clear of all moving components and take all necessary precautions to avoid injury when working on these systems by preventing movement of any components likely to cause injury.

2.3 GENERAL – MECHANICAL

Ensure that all the guards are in place before applying power to the system. The power must be turned off and any potential movement prevented before removal of any guard.

Beware of and keep clear of all moving components. Do not work on the system whilst power is applied, or if there is any potential for components to move.

Ensure that all load bearing components are adequately and regularly inspected. If damage is found the component must be repaired/replaced as necessary. Do not allow damaged components to remain in service.

Some mechanical components/assemblies are heavy and, if covered in oil/water, also slippery. Always ensure that items are correctly and adequately supported before removal, and that authorised lifting equipment and procedures are used.

Note: trying to lift heavy components in an awkward position by hand without the assistance of correct lifting equipment, or lifting any component without adopting the correct stance, can lead to serious injury.

Ensure that when working within or underneath the machine that your presence is known to your supervisor. If working underneath the machine, always ensure that there are no loose or unsupported assemblies, components or tools above.

3 QUALITY, HEALTH, SAFETY AND ENVIRONMENT (QHSE)

3.1 QUALITY

It is the prime objective of Forum Subsea Tooling to perform all work safely and efficiently in accordance with our Quality Procedure, Legislative and Client specifications and requirements. In performing this work, the quality system of Forum Subsea Tooling shall be adhered to, to ensure that Client requirements are met.

3.2 HEALTH AND SAFETY

The company considers that prevention of accidents incidents and hazardous occurrences resulting in injury to personnel, damage to equipment and the environment is essential to ensure employees safety. Reducing injuries and ill health, protecting the environment and reducing unnecessary losses and liability contributes to a good safety record which, goes hand in hand with safe operating practices and high-quality standards.

The Company is committed to continuous improvement involving the constant development of procedures, approaches to implementation and techniques of risk assessment and control.

To meet these criteria all personnel will be trained to identify, eliminate or control the effects of hazards in their area of work.

It is expected that all employees will exercise a personal responsibility in preventing injury to themselves, their fellow workers, the general public and the environment.

Only through close communication and co-operation by all personnel can safety performance be established and maintained.

It is the duty of all employees to confirm to the Company Safety Policies, codes, plans, procedures and manuals and to accept and undertake their responsibilities.

All employees and those of our sub-contractors have a legal duty to take reasonable care of themselves and any other person who may be affected by their acts and omissions whilst at work and to co-operate with the Company and any persons directly or indirectly involved in the Company's activities.

3.3 ENVIRONMENTAL

Forum Subsea Tooling pledges to comply with current environment legislation and best environmental practices, and achieve a balance between economic, social and environmental responsibilities. We are committed to avoiding damage to the environment by any of our actions and operations.

Forum Subsea Tooling is committed to continual improvement, and efficient use of resources, which will be achieved by setting and ensuring successful implementation of environmental objectives.

4 CONTACT DETAILS

All technical enquiries relating to the tooling should be addressed to:

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Repairs and Spares Telephone: +44 1751 431751 E-mail spares.uk@f-e-t.com E-mail repairs.uk@f-e-t.com	**Forum Energy Technologies (UK) Ltd.** Ings Lane, Kirkbymoorside, York, YO62 6EZ, UK Telephone: +44 1751 431 751

Web: www.f-e-t.com/subsea/hardware-tooling-and-components/tooling/

5 DESCRIPTION

The BOP-AT300 MkII is a unique tool designed to achieve maximum flow and maximum pressure from an ROV system which has a limited amount of power to give and is specifically designed to function BOPs.

A BOP-AT300 MkII can effectively double the input flow of the ROV system giving up to 300 L/min output of a secondary media.

The system is based on a 2-stage pumping circuit.

Circuit 1 - High flow at 1500 psi
Circuit 2 - High pressure up to 5000 psi

Combining these circuits provides a unit which can fully activate a BOP quickly and effectively in a very short space of time.

This unit can pump various types of media being seawater, glycol, mineral oils and various types of gels.

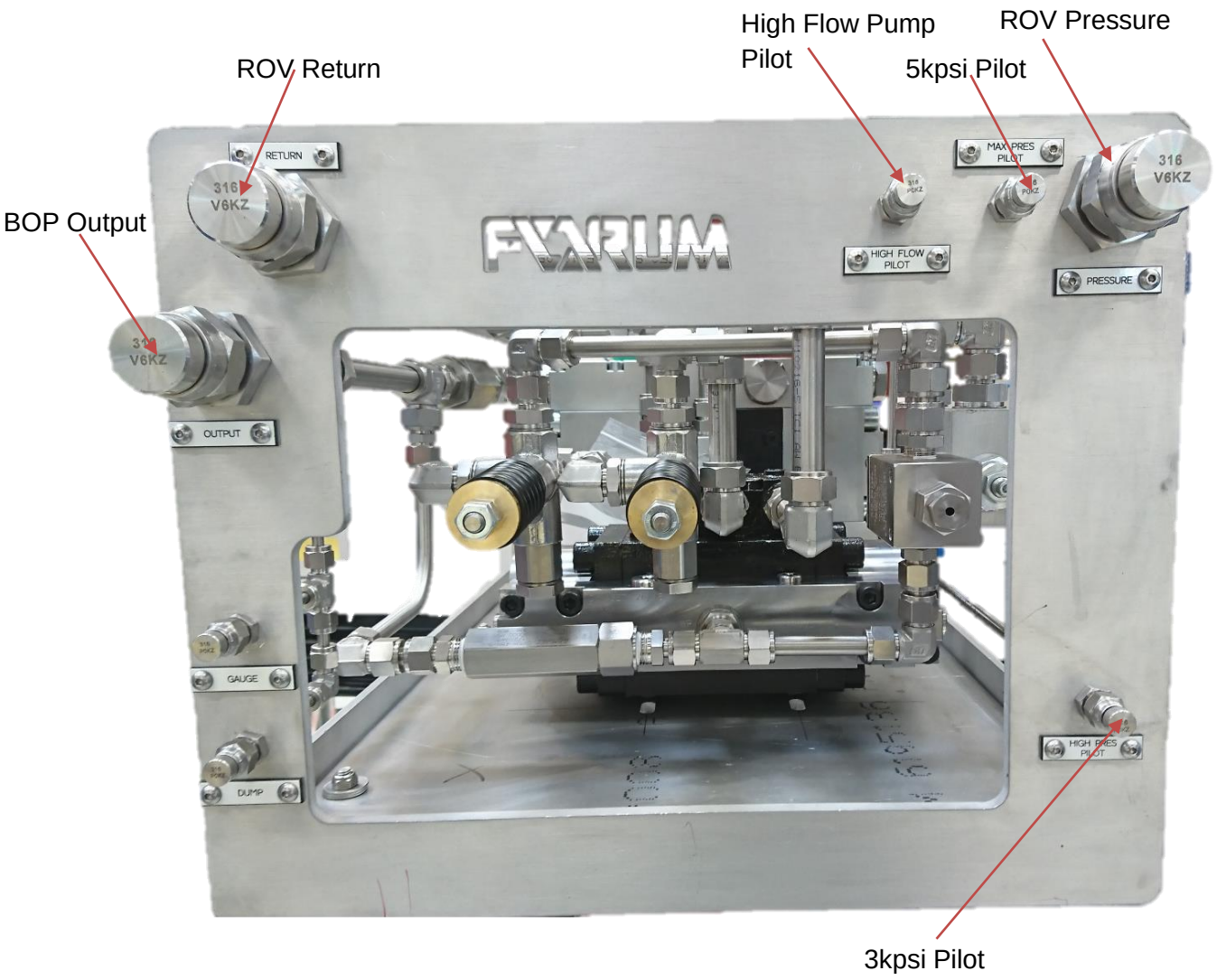
The BOP-AT unit can be fitted on to ROV system and setup to pump seawater or can be fitted on to a Specialist ROV Skid assembly and can discharge up to 400 litres of Glycol.

6 SPECIFICATIONS

Specification	Measure
ROV Input	
Pressure	150-210 bar (2200-3000psi)
Flow	100-150 l/min
Pilot Pressure	210 bar (3000psi)
BOP-AT 300 Output	
Pressure	350 bar (5000psi)
Fluids	Seawater Mineral Oil Water based Glycol
Dimensions (approx.) (without hoses)	(L) 970mm (W) 465mm (H) 375mm
Weight (approx.) (in air)	150kg

7 CONNECTION TO ROV

The unit is housed in an ROV friendly frame which can be bolted in position and hosed connections are as detailed in the following.



7.1 SEAWATER CONNECTION

8 OPERATION

- The BOP AT-300 consists of a high flow pump, a high-pressure pump and two unloader valves set at 3000psi and 5000psi respectively.
- The high flow pump will achieve approximately 300 lpm and produce 1200 to 1500psi. The high-pressure pump will generate up to 5000psi (limited by the unloader valve).
- To operate the high flow system, first activate the high flow pump by applying pressure to the “HIGH FLOW PILOT” port. This runs the high flow pumps. Once 1200 – 1500 psi is reached these pumps will stall. Remove the pressure from the “HIGH FLOW PILOT” port before operating the high-pressure pump.
- To operate the high-pressure system, apply pressure to the “HIGH PRESSURE PILOT” port, this starts the high-pressure pump is limited by the 3000psi unloader valve. If the pressure drops below 1200psi the high flow pumps may be restarted.
- To achieve 5000psi pressure should be applied to the “MAX PRESSURE PILOT” port which switches to the 5000psi unloader valve, whilst maintaining pressure to the “HIGH PRESSURE PILOT”.

  See schematic in Section 13 for more detail.

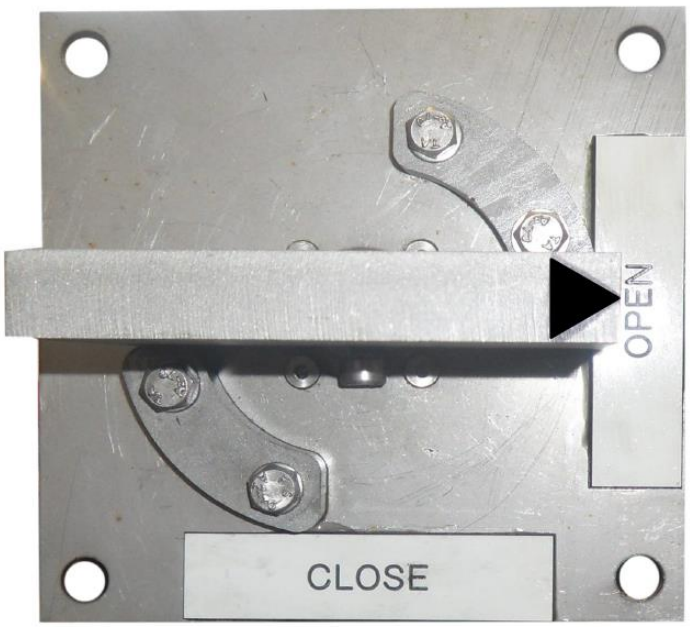
ENSURE UNIT IS FLUSHED AND CLEANED AFTER EVERY OPERATION!

8.1 PRESSURE TESTING

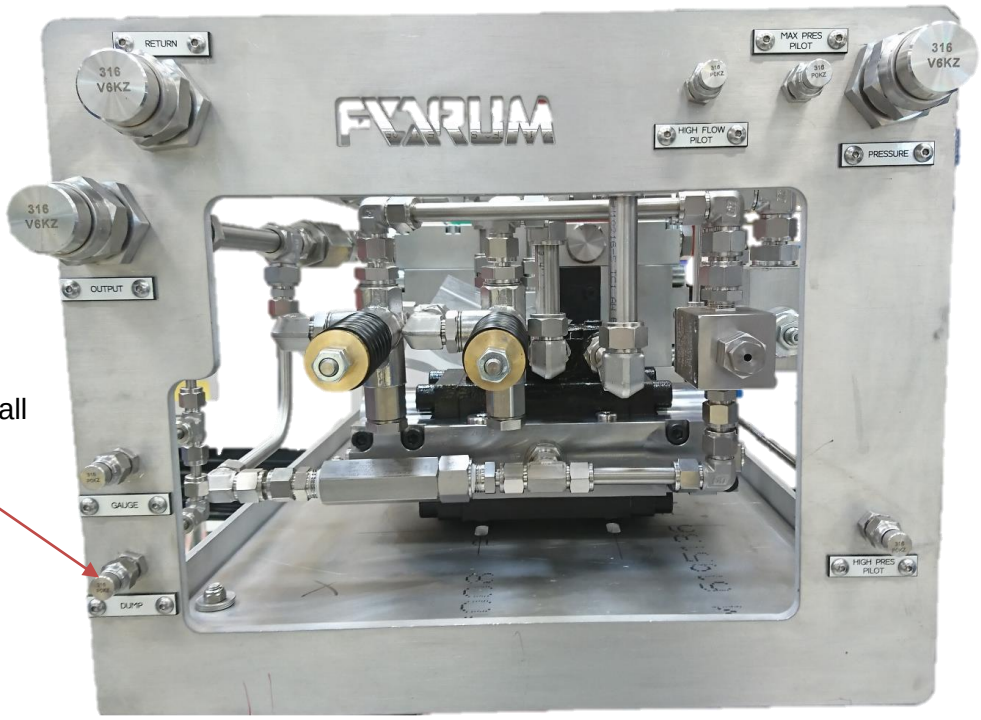
When pressure testing with the BOP AT-300 MkII ensure the manipulator operated ball valve (below) is in the CLOSE position. On completion of pressure test turn ball valve to OPEN in order to vent pressure in the line.

When using a reservoir bag connect the bag into the 16JIC port marked suction. To avoid water ingress when not using a reservoir bag ensure the cap is securely tightened on the suction port.

Manipulator
Operated Ball Valve



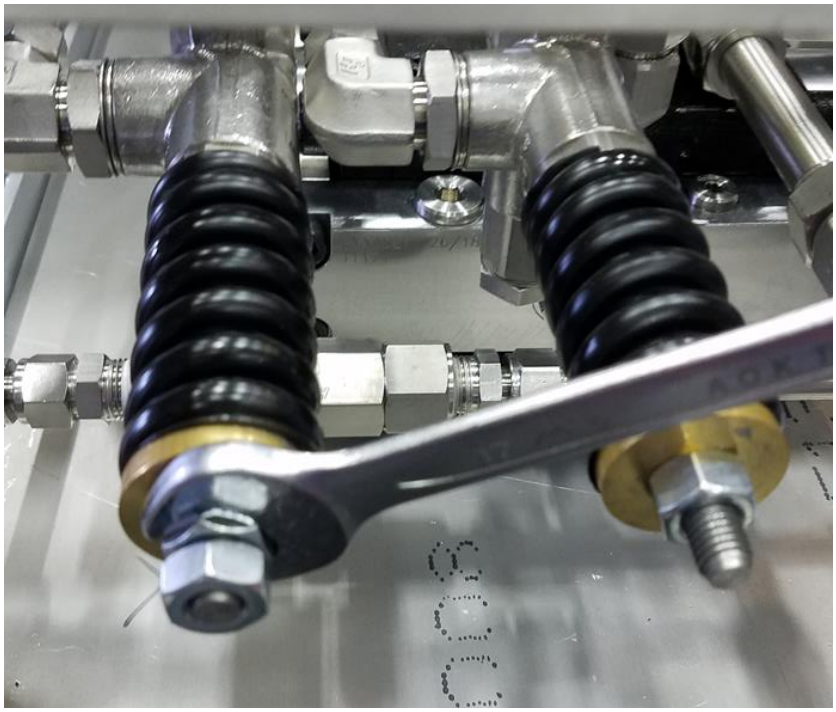
ROV operated ball valve connection



8.2 ADJUSTING MAXIMUM OUTPUT PRESSURE

Take 2 x 17 mm spanners and slacken lock nut.

Adjust nut nearest spring clockwise for higher pressure and counter clockwise for lower pressure.



Hydraulic flow control valve

9 MAINTENANCE

Due to small number of moving parts, in normal operating conditions HPW-pump do not require any other service, except replacement of seals or occasionally of water valves, which depends on content of abrasives in pumping fluid, as well as on cleanliness of hydraulic oil. (For changing seals guide, please refer to “CHANGING THE SEALS” Section of this manual).

Check constantly whether the fluid dropping from pump’s leakage detectors is growing and replace seals in
proper time to exclude intermixing of hydraulic oil and pumping fluid.

WHEN CARRYING OUT ANY SERVICE DISSASSEMBLING OR REPAIR OF HPWPUMP, ABSOLUTE CLEANLINESS MUST BE MAINTANED TO ENSURE RELIABLE AND TROUBLE-FREE OPERATION OF YOUR EQUIPMENT

10 SPARES

Please contact Forum Subsea Tooling for all spares requirements.

Code	Item
HYD-0555	CKEBXCN Check valve
HYD-0556	CKGBXCN Check valve
HYD-0557	2FR95 Flow priority valve
HYD-1220	NV1220A Flow Control Valve
HYD-0740	4.5” 0- 10000psi Subsea gauge
HYD-0550	HPW90 Seal kit
HYD-0551	HPW90 Water valve kit
HYD-0548	HPW460 Seal kit
HYD-0549	HPW460 Water valve kit
HYD-0552	Seawater Filter

11 TROUBLESHOOTING

11.1 PUMP

11.1.1 HPW-Pump does not work.	Too small hydraulic flow.	Enable or adjust the hydraulic flow
	Hydraulic pressure too low	Adjust the hydraulic pressure.
	Hydraulic flow reversed	Check and reconnect hydraulic hoses. Pressure hose should be connected to P-port and return hose to T-port.
	Hydraulic piston damaged mechanically	Replace damaged part.

11.1.2 HPW-Pump works but does not deliver water flow.	Water intake and pressure valves are open (jammed with debris) or damaged.	Check water valves and clean them thoroughly or replace when damaged.
	Regulator’s unloader valve open from intake to pressure.	Check the valve and repair failure.

11.1.3 HPW-Pump does not receive pumping fluid.	Intake hose detached or hose breathes.	Check and fix the hose and connectors.
	Water supply line clogged.	Check strainer or water filter and clean thoroughly.
	Suction head to high.	Check the performance with pressurised water supply when possible.

11.1.4 Water pressure line blocked	Nozzle clogged.	Check the nozzle and clean thoroughly.
	Regulator's check valve damaged, pressure line blocked.	Check the valve and repair failure.

11.1.5 Water flow rate too small	Insufficient hydraulic flow or pressure.	Adjust the hydraulic flow to the demanded level at required pressure.
	Nozzle of your pressure tool undersized.	Verify the nozzle sizing and replace with proper one.
	Pressure loss in delivery hose.	Verify the hose sizing and replace with proper one.

11.1.6 Water pressure too low	Insufficient hydraulic pressure or flow.	Adjust the hydraulic pressure to the demanded level at required hydraulic oil flow. Pressure loss should be minimized – do not use hoses of too small diameter or/and of an excessive length.
	Wear-out of nozzle.	Replace the nozzle.
	Water pressure unloader valve set too low.	Check and re-adjust to specification.

11.1.7 Intense pulsating of water pressure	Some of water intake and pressure valves are open or damaged.	Check water valves, clean thoroughly or repair.
	Water intake line breathes causing pump cavitation.	Check water intake line and fix the problem.
	Water intake line's diameter to small, resulting in pump cavitation.	Verify the hose sizing and replace with proper one.

11.1.8 Closing the water pressure line does not drop pressure to free circulation mode	Insufficient hydraulic pressure in relation to pumping fluid pressure, adjusted with water pressure unloader valve.	Adjust the hydraulic pressure up as much as necessary to enable proper operation of water pressure unloader valve. Note that the maximum hydraulic pressure should not be overrun! If boosting the hydraulic pressure is not possible, the water unloader pressure setting should be dropped.
	Defective water pressure unloader valve.	Repair or replace water pressure unloader valve.

11.1.9 Leakages	Hydraulic oil leakages.	Check the tightness of component mating, tighten screws. Replace when necessary sealings of pump's mated surfaces. Check and tighten/replace couplings.
	Pumping fluid leakages.	
	Hydraulic-pumping fluid commixture dropping from leakage detecting bores	If the draining from leakage detectors exceeds rate of 10 drops per minute, pump's sealings should be replaced.

11.2 UN-STICKING DYNASET PROCEDURE

Sometimes when a Dynaset is new it is prone to sticking a couple of times, after procedure is complete and Dynaset is running again this rarely happens.

The procedure to un-stick is:

Remove side plate from Dynaset, there is no preferable side.

You will see the piston in the middle of pump.

The piston will either need pushing forward or pulling back about 10mm.

Holding the pump steady push the piston forward, if it does not move then it will need to be pulled back.

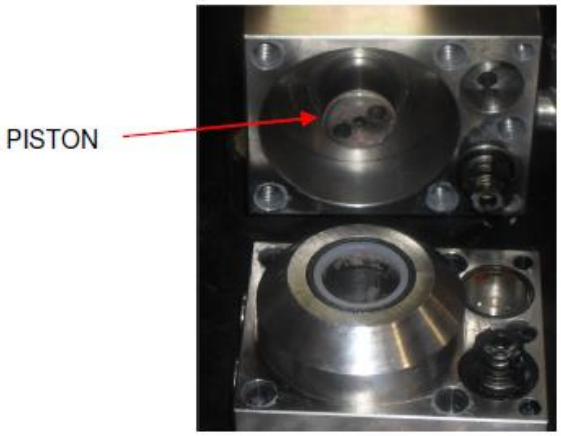
Screw one of the bolts removed from side plate into the piston.

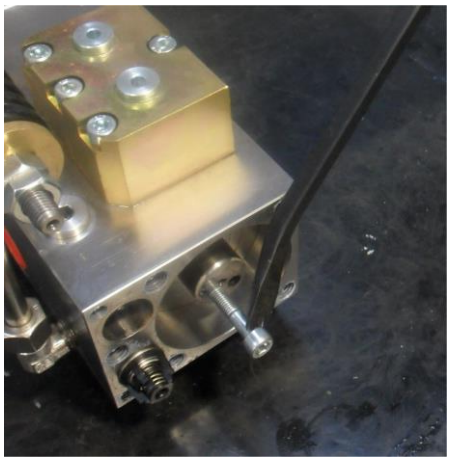
Use a lever to prise the piston back.

Place side plate back in position being careful not to trap any seals and tighten bolts.

Ensure correct flow (min 30 l/min) and pressure (200bar) is set on hydraulic system and the pump continues to operate.

It may be necessary to do this a couple of times.





12 SCHEMATICS & DRAWINGS

Drawing Ref.	Title
SRTS-066-GA	BOPAT 300 Mk II General Assembly
SRTS-066	BOPAT 300 Mk II Assembly
SRTS-066-SCH	BOPAT 300 Mk II Schematic

13 ADDITIONAL DRAWINGS

Dynaset HPW460 Pump Information

Unloader Valve Assembly

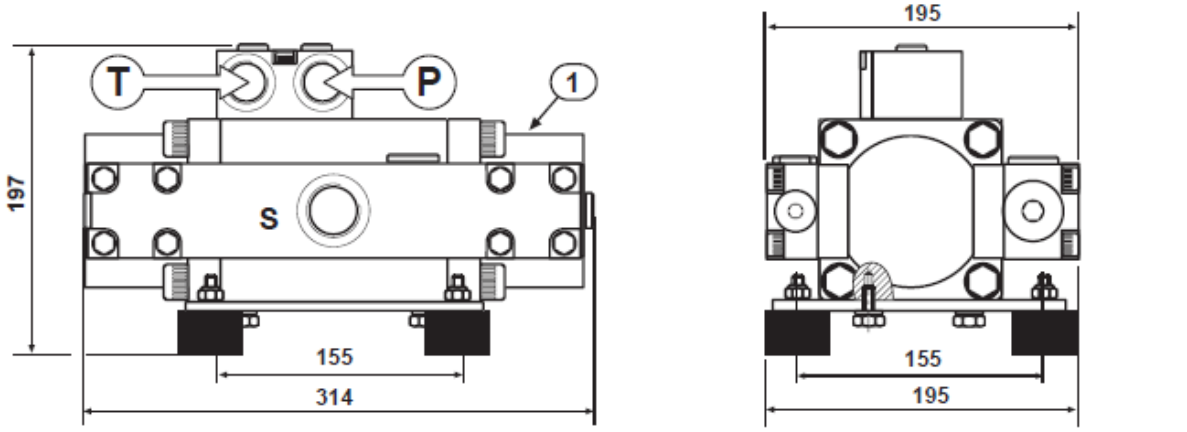
Dynaset HPW90 Pump Information

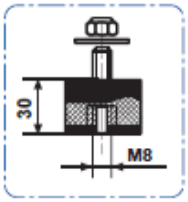
Dynaset Seal Changing

Dynaset Water Valve Replacement

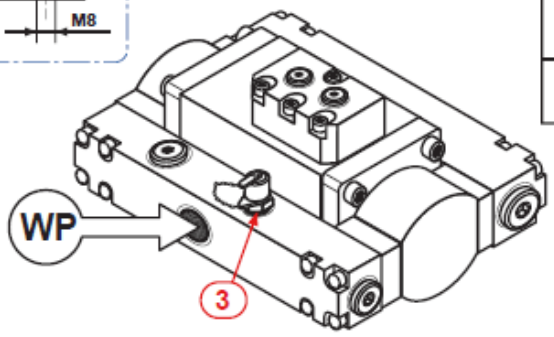
OUTLINE DIMENSIONS

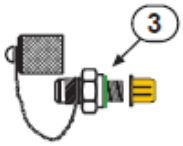
HIGH PRESSURE PUMP HPW 460/50-115



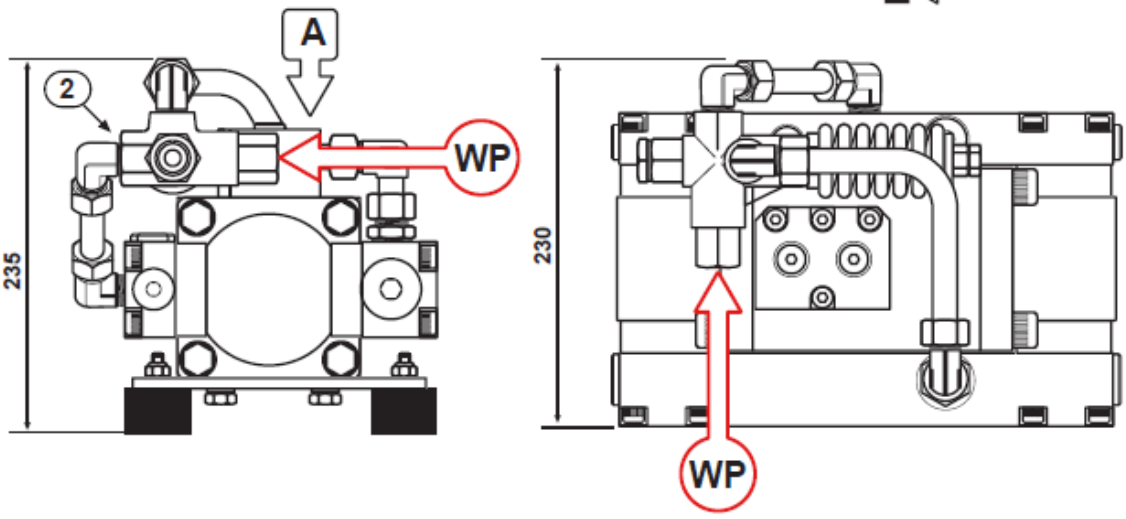


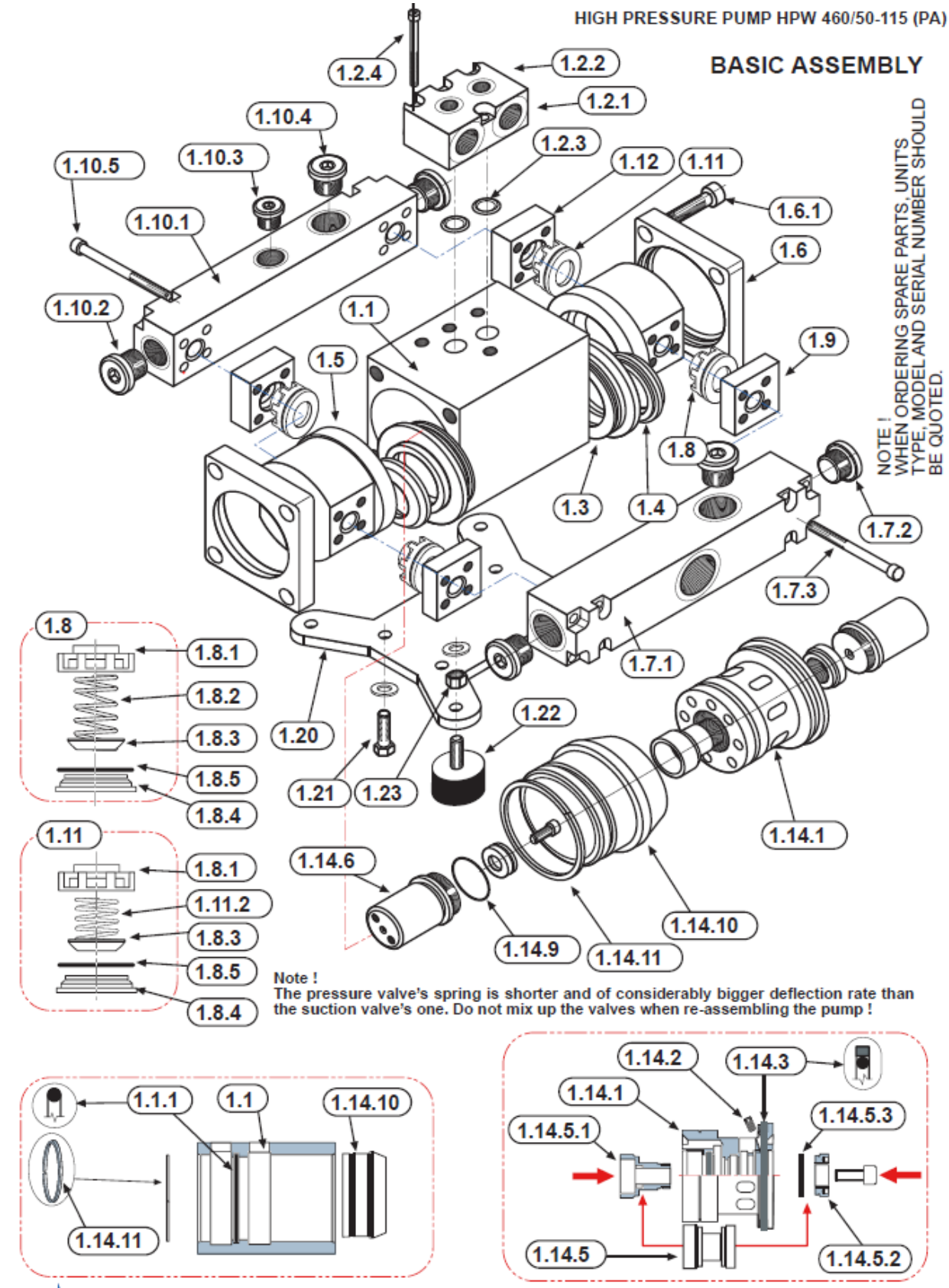
FLUID CONNECTIONS			
HYDRAULIC PORTS		PUMPING FLUID PORTS	
pressure P	return T	pressure WP	intake S
BSP 3/4"	BSP 3/4"	BSP 1/2"	BSP 1"





HIGH PRESSURE PUMP HPW 460/50-115-PA





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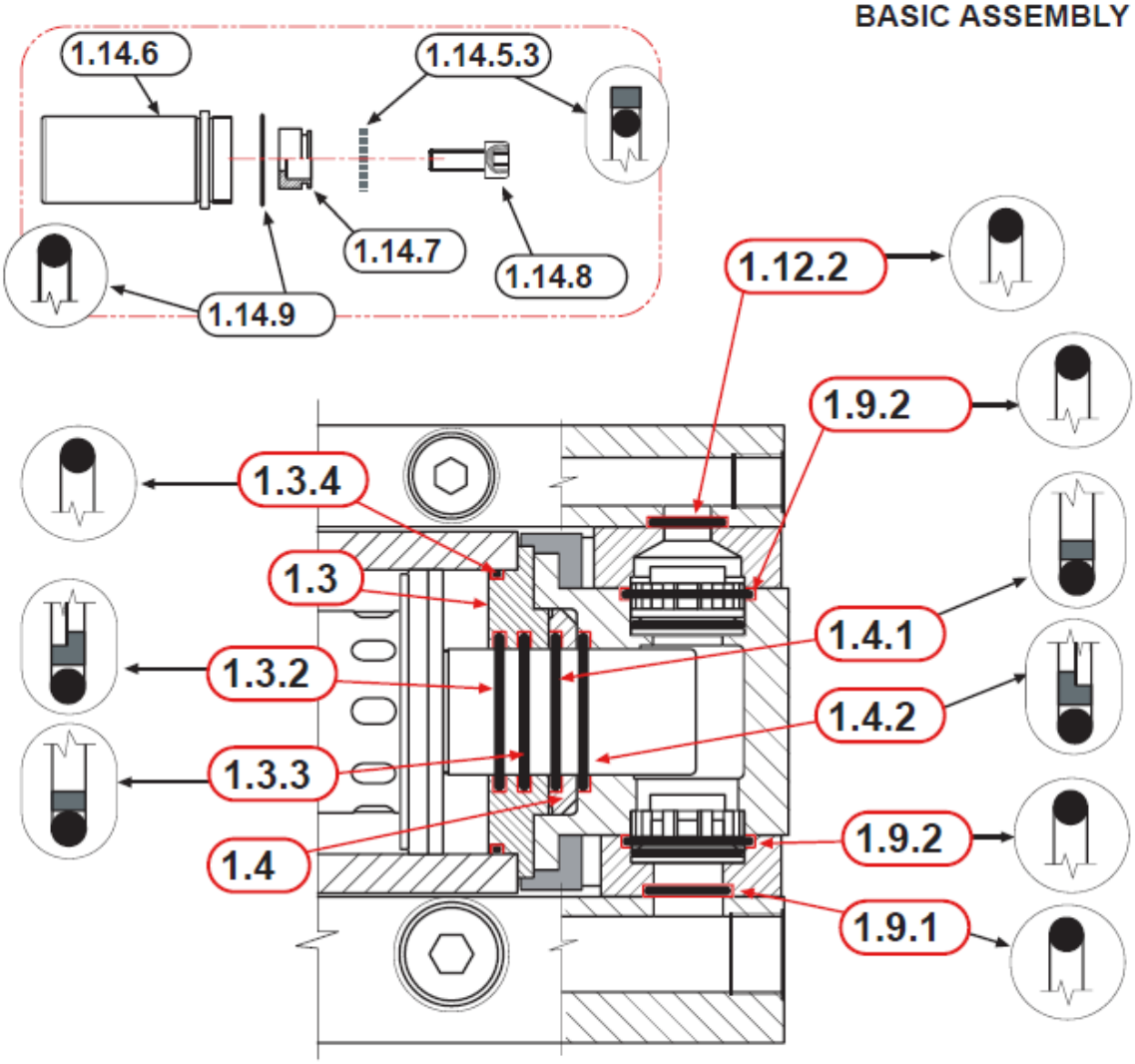
BASIC ASSEMBLY



Pos	STOCK NUMBER	DESIGNATION	DETAILS	QUANTITY HPW 460/50-115
1	D200102220	**HPW-PUMP, ASSEMBLY**		
1.1	0400061791	CENTRE BODY, ASSEMBLY	90	1
1.1.1	2204329000	O-RING 87	Included in seal kit	1
1.2	0409011305	P/T BLOCK		1
1.2.1	0409010736	P/T BODY	R 3/4"	1
1.2.2	1702695000	HF-PLUG	R 1/4"	2
1.2.3	2204109100	SEAL 21	Included in seal kit	2
1.2.4	8500412600	ALLEN SCREW	M8x45 8.8	4
1.3	0400071334	**SEAL DISK ASSEMBLY**	HPW460	2
1.3.1	0400070604	SEAL DISK 105		2
1.3.2	2104528000	WATER PISTON SEAL, 1T	Included in seal kit	2
1.3.3	2104529000	WATER PISTON SEAL, 2T	Included in seal kit	2
1.3.4	2204324000	O-RING 84	Included in seal kit	2

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PART LIST

Pos	STOCK NUMBER	DESIGNATION	DETAILS	QUANTITY
1.4	0400070605	**WATER SEAL COLLAR**	D65-AISI	2
1.4.1	2104529500	WATER PISTON SEAL, 2T	Included in seal kit	2
1.4.2	2104528500	WATER PISTON SEAL, 1T	Included in seal kit	2
1.5	0400070602	**WATER HEAD, LEFT/RIGHT**	HPW460	2
1.6	0400070609	MOUNTING FLANGE	HPW460	2
1.6.1	8500471300	ALLEN SCREW	M16x45 12.9	8
1.7		**SUCTION MANIFOLD R1**		1
1.7.1	0400071335	MANIFOLD BODY		1
1.7.2	1702730000	HF-PLUG	R 3/4"	3
1.7.3	8500464300	ALLEN SCREW	M10x70 12.9	8
1.8	0400001382	**SUCTION VALVE**	Imu D36-21.5	2
1.8.1	0400000600	VALVE CAP		2
1.8.2	0400050829	SPRING, SUCTION		2
1.8.3	0400030598	VALVE DISK 26		2
1.8.4	0400070599	VALVE SEAT 36		2
1.8.5	2204174000	O-RING 31		2
1.9	0400070607	**SUCTION MANIFOLD'S VALVE HOUSING**		2
1.9.1	2204164000	O-RING 23	Included in seal kit	2
1.9.2	2204184000	O-RING 37	Included in seal kit	2
1.10		**PRESSURE MANIFOLD R 1/2" AISI**		1
1.10.1	0400071336	MANIFOLD BODY		1
1.10.2	1702710000	HF-PLUG	R 3/8"	2
1.10.3	1702700000	HF-PLUG	R 1/4"	1
1.10.4	1702720000	HF-PLUG	R 1/2"	1
1.10.5	8500463900	ALLEN SCREW	M10x55 12.9	8
1.11	0400001381	**DISCHARGE VALVE**	D36-21.5	2
1.8.1	0400000600	VALVE CAP		2
1.11.2	0400070828	SPRING, PRESSURE		2
1.8.3	0400030598	VALVE DISK 26		2
1.8.4	0400070599	VALVE SEAT 36		2
1.8.5	2204174000	O-RING 31		2
1.12	0400070606	**PRESSURE MANIFOLD'S VALVE HOUSING**		2
1.12.2	2204149000	O-RING 20	Included in seal kit	2
1.9.2	2204184000	O-RING 37	Included in seal kit	2
1.14	0400061794	**PISTON ASSEMBLY**		1
1.14.1	0400071676	HYDRAULIC PISTON, ASSEMBLY		1
1.14.2	8500652400	SET SCREW	M5x10	2
1.14.3	2104694000	SEAL 90	Included in seal kit	1
1.14.5		**REVERSAL VALVE**		1
1.14.5.1	0400000890	VALVE SPOOL 36		1
1.14.5.2	0400000891	VALVE SEAT 35		1
1.14.5.3	2104614000	SEAL 28	Excluded from seal kit	1
1.14.6	0400061792	WATER PISTON 40		2
1.14.7	0400000960	REVERSAL VALVE GUIDE 28		1
1.14.8	8500412000	ALLEN SCREW	M8x16	1
1.14.9	0400061800	SEAL 36	Included in seal kit	1
1.14.10	0400070616	CYLINDER LINER 69		1
1.14.11	8107367000	LOCKING RING	85-2,5	1
1.20	0400070611	HPW MOUNTING	64x110	1
1.21	8500062300	HEX SCREW	M8x16 8.8	4
1.22	8307565000	RUBBER CUSHION	40/30 M8	4
1.23	8500905800	NUT	M8 Nyloc	4
2	0400061795	**UNLOADER VALVE**, COMPLETE	OPTIONAL	1
	6306421000	DYVB 80-400 (9010379)		1
3	1701715000	PRESSURE GAUGE CONNECTOR	M16x2- 1/4"/OPTIONAL	1

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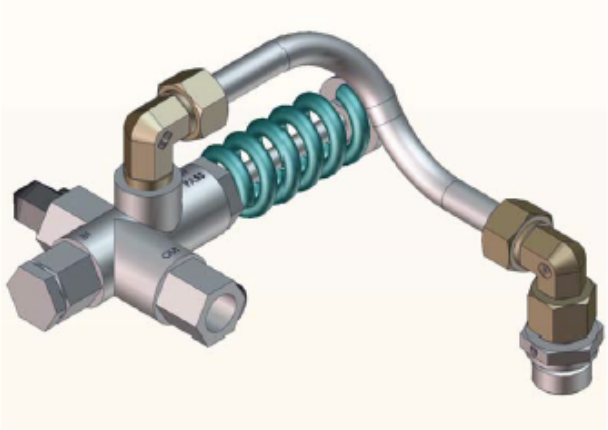
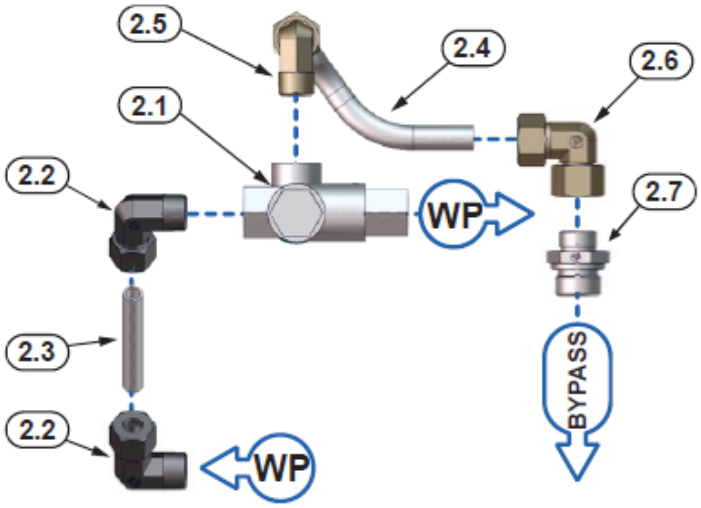
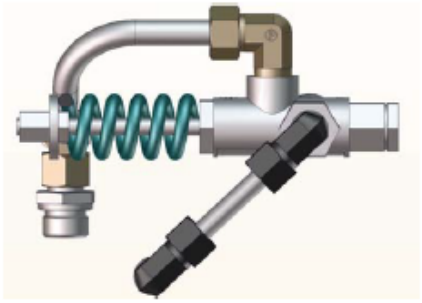
UNLOADER VALVE, ASSEMBLY







2. UNLOADER VALVE, ASSEMBLY 0400061795

2.1	6306421100	UNLOADER VALVE	DYVB 80-400	1
2.2	1702010200	ELBOW FITTING	12S RK 1/2" A4	2
2.3	0409016039	PRESSURE PIPE	D12 80	1
2.4	0409012954	BYPASS PIPE	D15 220	1
2.5	1702015000	ELBOW FITTING	15L RK 1/2"	1
2.6	1702120000	SWIVEL ELBOW FITTING	15 L	1
2.7	1701922000	MALE STUD CONNECTOR	15L - R 3/4"	1

SPARE PARTS

	SEAL KIT V100102275			
1.1.1	2204329000	O-RING 87	CENTRE BODY	1
1.2.3	2204109100	SEAL 21	P/T BLOCK	2
1.3.2	2104528000	WATER PISTON SEAL, 1T	OIL SEAL DISK	2
1.3.3	2104529000	WATER PISTON SEAL, 2T	OIL SEAL DISK	2
1.3.4	2204324000	O-RING 84	OIL SEAL DISK	2
1.4.1	2104529500	SEAL 2T	WATER SEAL COLLAR	2
1.4.2	2104528500	SEAL 1T	WATER SEAL COLLAR	2
1.8.5	2204174000	O-RING 31	SUCTION VALVE	2 + 2
1.9.1	2204164000	O-RING 23	INTAKE/VALVE HOUSING	2
1.9.2	2204184000	O-RING 37	INTAKE-DISCHARGE/VALVE HOUSING	2 + 2
1.12.2	2204149000	O-RING 20	DISCHARGE/VALVE HOUSING	2
1.14.3	2104694000	SEAL 90	HYDRAULIC PISTON	1
1.14.9	0400061800	SEAL 36	REVERSAL VALVE	1
	WATER VALVE KIT V100102355 (V100102356 Viton)			
1.8	0400001382	**INTAKE VALVE**		2
1.8.2	0400050829	SPRING, SUCTION		2
1.8.3	0400030598	VALVE DISK 26		2
1.8.4	0400070599	VALVE SEAT 36		2
1.8.5	2204174000	WATER VALVE SEAL 31		2
1.9.1	2204164000	SEAL 23		2
1.11	04001381	**DISCHARGE VALVE**		2
1.11.2	0400070828	SPRING, PRESSURE		2
1.8.3	0400030598	VALVE DISK 26		2
1.8.4	0400070599	VALVE SEAT 36		2
1.8.5	2204174000	WATER VALVE SEAL 31		2
1.12.2	2204149000	SEAL 20		2
	HYDRAULIC PISTON, ASSY V100102360			
1.14.1	0400071676	HYDRAULIC PISTON, ASSY		
1.14.5.1	0400000890	VALVE SPOOL 36		1
1.14.5.2	0400000891	VALVE SEAT 35		1
1.14.5.3	2104614000	SEAL 28		1
1.14.9	0400061800	SEAL 36		1
1.14.10	0400070616	CYLINDER LINER 69		1
1.14.11	8107367000	LOCKING RING 85		1
	SCREW KIT V100102352		**Tightening torques (torgue wrench)**	
1.2.4	8500412600	SCREW	M8x45 8.8 24Nm	4
1.6.1	8500471300	SCREW	M16x45 12.9 333 Nm	8
1.7.3	8500464300	SCREW	M10x70 12.9 79Nm	8
1.10.5	8500463900	SCREW	M10x55 12.9 79Nm	8
1.21	8500062300	SCREW	M8x16 8.8 24Nm	4
	AVAILABLE BY REQUEST:			
1.14.2	*8500652400*	*SET SCREW*	*M5x10*	*2*
1.14.8	8500412000	*SCREW*	*M8x16*	*1*

TECHNICAL SPECIFICATIONS

PARAMETERS			HPW 460/50-115
WATER POWER			
WATER FLOW	max	l/min	50
WATER PRESSURE	max	bar	460
WATER TEMPERATURE	max	°C	70 °C
PUMPING POWER	max	kW	38
SUCTION HEAD	max	m	3
WATER FEED PRESSURE	min-max	bar	-0,3 ...10
PRESSURE RATIO	water/hydraulic		2,03
SPEED RATIO		1/min	520
WATER PISTONS	outer diameter	mm	D 40
WATER CONNECTIONS			
PRESSURE LINE			BSP 1/2"
SUCTION / FEED LINE			BSP 1"
PRESSURE HOSE	recommendation		1/2"
SUCTION HOSE	recommendation		1"
WATER FILTER	min.	mesh	80
HYDRAULIC CONNECTIONS			
PRESSURE LINE		P	BSP 3/4"
RETURN LINE		T	BSP 3/4"
SERVICE LINE	pressure gauge/LS	S	BSP 1/4"
HYDRAULIC FLUID REQUIREMENTS			
VISCOSITY		cSt	10 - 200 / optimal 25 - 35
TEMPERATURE		°C	max. 70
FILTER RATIO	recommendation	um	min. 25
COOLING CAPACITY	recommendation	kW	5
HYDRAULIC POWER REQUIREMENTS			
HYDRAULIC FLUID FLOW		l/min	120
OPERATING PRESSURE	Δp	bar	240
MAXIMUM PRESSURE		bar	250
IDLE RUN PRESSURE		bar	10
RETURN LINE PRESSURE	max	bar	210
WEIGHT		kg	26
PRESSURE GAUGE			OPTIONAL
WATER PRESSURE UNLOADER	PA		OPTIONAL
LS-VALVE	LS		OPTIONAL

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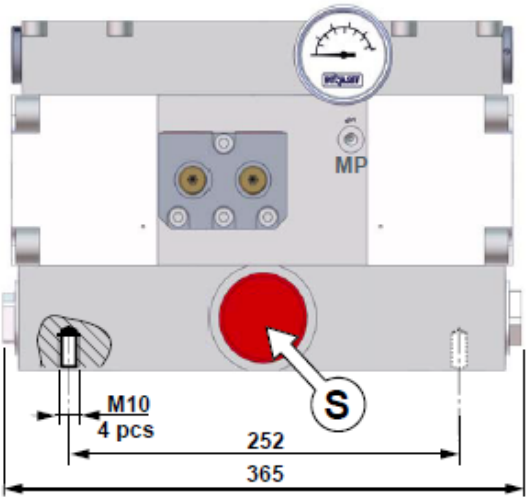
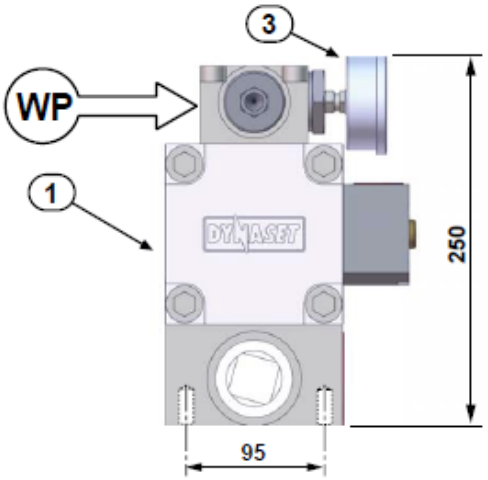
HIGH PRESSURE PUMP HPW 90/150-85

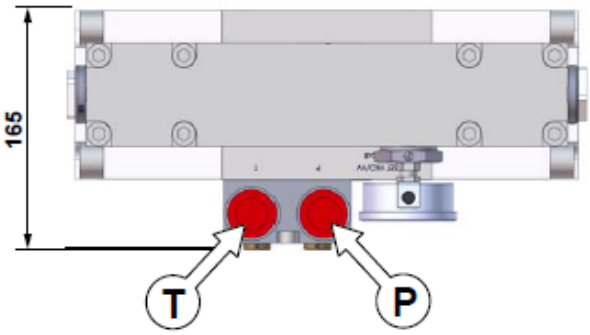
Dynaset HPW pump gives great waterpower with the best power to weight ratio in the World.

Small size, lightweight, outstanding durable construction with ingenious piston-to-piston action and low water consumption make the hydraulic high-pressure water pump very cost effective.

OUTLINE DIMENSIONS



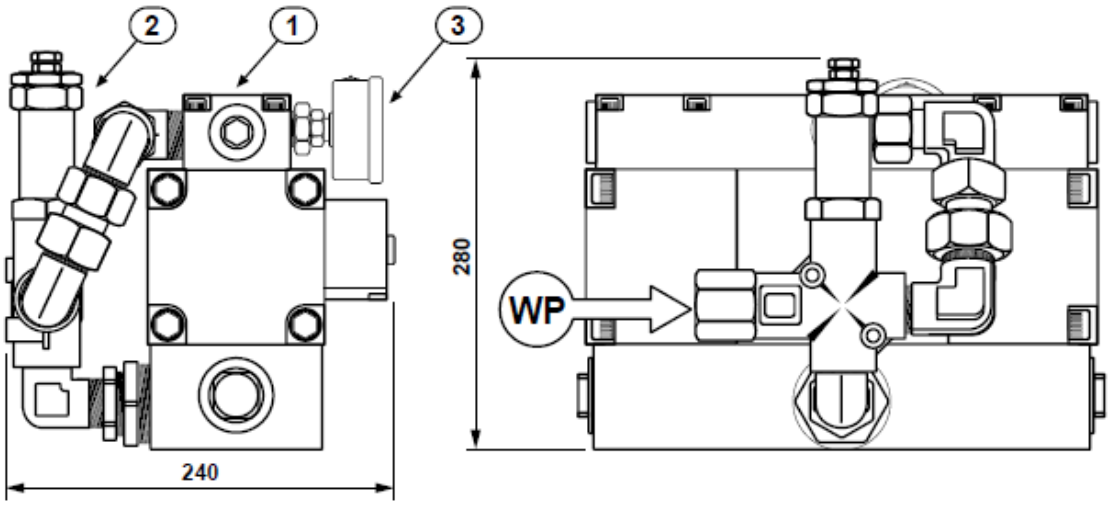




HYDRAULIC FLOW	l/min, max.	85
HYDRAULIC PRESSURE	bar, max.	210
WATER FLOW	l/min, max.	150
WATER PRESSURE	bar, max	90
WEIGHT	kg	31

FLUID CONNECTIONS			
HYDRAULICS		PUMPING FLUID	
pressure P	return T	outlet WP	intake S
BSP 3/4"	BSP 3/4"	BSP 3/4"	BSP 2"

HIGH PRESSURE PUMP HPW 90/150-85-PA



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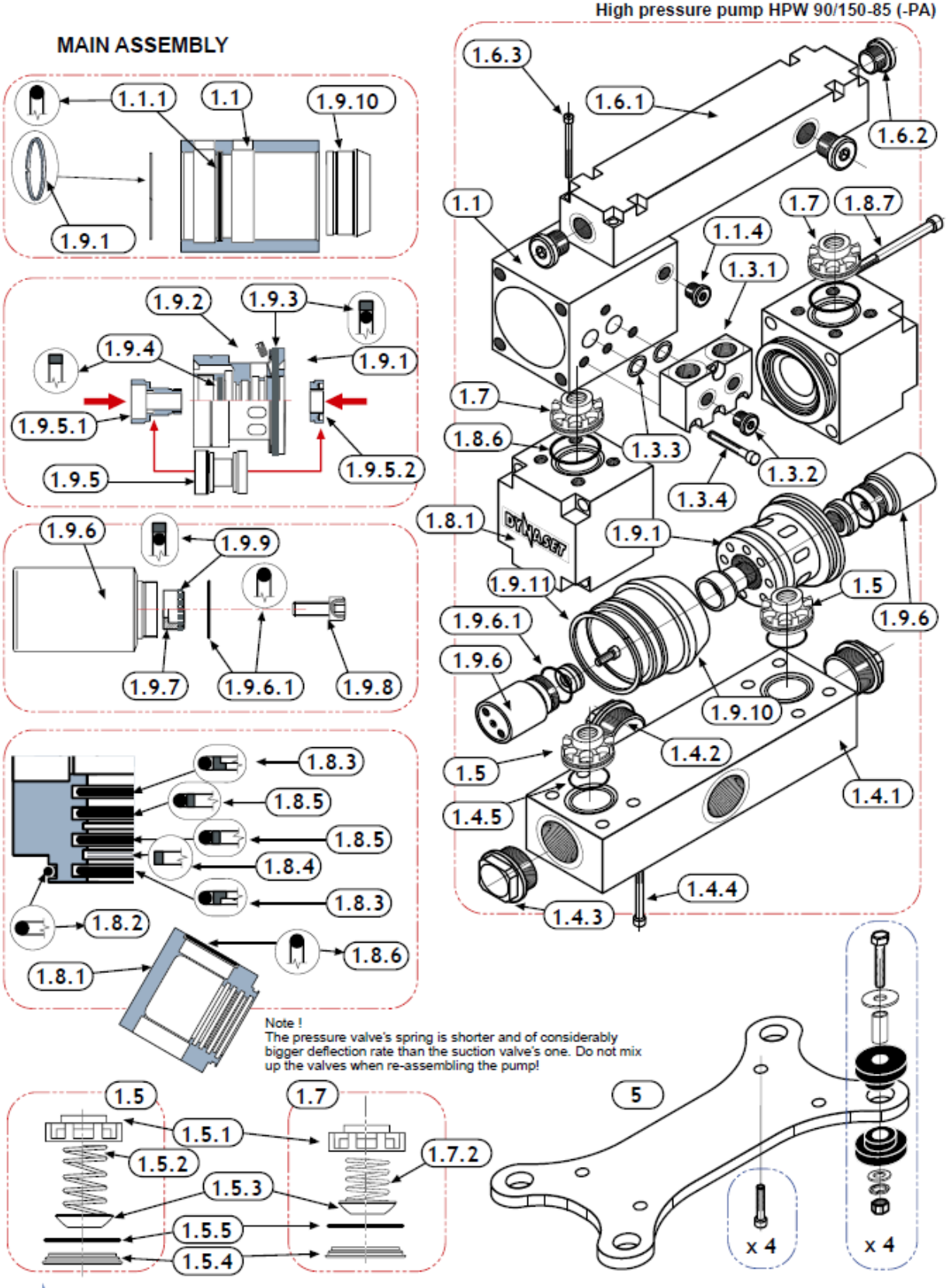
MAIN ASSEMBLY



Note !
The pressure valve's spring is shorter and of considerably bigger deflection rate than the suction valve's one. Do not mix up the valves when re-assembling the pump!

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PART LIST

POS	STOCK NUMBER	DESIGNATION	DETAILS	QUANTITY
1	D200101900 D200101820	HPW-PUMP, ASSEMBLY	HPW90/150-85 HPW90/150-85-PA	
1.1	0400000148	CENTRE BODY, ASSEMBLY		1
1.1.1	2204329000	O-RING 87	Included in seal kit	1
1.1.4	1702700000	PLUG	R1/4"	1
1.3	0400001273	P/T BLOCK		1
1.3.1	0400000613	P/T BODY	R 3/4"	1
1.3.2	1702695000	HF-PLUG	R 1/4"	2
1.3.3	2204109000	O-RING 21	Included in seal kit	2
1.3.4	8500412600	ALLEN SCREW	M8x45 8.8 24Nm	4
1.4		SUCTION MANIFOLD R2	HPW90	1
1.4.1	0400000256	BODY	HPW90	1
1.4.2	1702865000	PLUG	RK 2 "	1
1.4.3	1702860000	PLUG	RK 1 1/2"	2
1.4.4	8500416200	ALLEN SCREW	M10x75 8.8 47Nm	8
1.4.5	0490118600	SEAL 47	Included in seal kit	2
1.5		INTAKE VALVE	D58	2
1.5.1	0400000258	VALVE CAP		2
1.5.2	0700000881	SPRING, SUCTION		2
1.5.3	0400000245	VALVE DISK	D44	2
1.5.4	0400000246	VALVE SEAT	D58	2
1.5.5	2204204000	O-RING 53		2
1.6		DISCHARGE MANIFOLD	HPW90	1
1.6.1	0400000257	BODY	HPW90	1
1.6.2	1702730500	PLUG	R 1"	3
1.6.3	8500415800	ALLEN SCREW	M10x55 8.8 47Nm	8
1.7	0400001304	DISCHARGE VALVE		2
1.5.1	0400000258	VALVE CAP	D58	2
1.7.2	0700000880	SPRING, PRESSURE		2
1.5.3	0400000245	VALVE DISK	D44	2
1.5.4	0400000246	VALVE SEAT	D58	2
1.5.5	2204204000	WATER VALVE SEAL 53		2
1.8	0400001137	WATER HEAD, ASSEMBLY		2
1.8.1	0400000187	WATER HEAD BODY 63	HPW90	2
1.8.2	2204324000	O-RING 84	Incl. in seal kit	2
1.8.3	2104549000	WATER PISTON SEAL 1T	Incl. in seal kit	4
1.8.4	2104744000	SEAL STRIP 63	Incl. in seal kit	2
1.8.5	2104554000	WATER PISTON SEAL 2T	Incl. in seal kit	4
1.8.6	2204219000	DISCHARGE MANIFOLD O-RING 58	Incl. in seal kit	2
1.8.7	8500424400	ALLEN SCREW	M16x100 8.8 196Nm	8
1.9	0400001136	PISTON ASSEMBLY		1
1.9.1	0400000201	HYDRAULIC PISTON, ASSEMBLY		1
1.9.2	8500606400	SET SCREW	M5x10 5,7 Nm	2
1.9.3	2104694000	SEAL 90	Included in seal kit	1
1.9.4	0400061800	SEAL 36	Excluded from seal kit	1
1.9.5		REVERSAL VALVE		1
1.9.5.1	0400000890	VALVE SPOOL		1
1.9.5.2	0400000891	VALVE SEAT		1
1.9.6	0400000240	WATER PISTON		2
1.9.6.1	0400061800	SEAL	Included in seal kit	2
1.9.7	0400000960	REVERSAL VALVE GUIDE		1
1.9.8	8500412000	ALLEN SCREW	M8x16 24Nm	1
1.9.9	2104614000	SEAL 28	Excluded from seal kit	1
1.9.10	0400000255	CYLINDER LINER		1
1.9.11	8107367000	LOCKING RING	85-2,5	1
2	V100102850	WATER PRESSURE UNLOADER VALVE, COMPLETE DYVB 200-150	Optional	1
3	1501303000	PRESSURE GAUGE, complete	Optional	1
3.1	1702905500	REDUCER 1"/- 1/4"	Optional	1
5	0409011783	MOUNTING KIT HPW90/130	Optional	1

NOTE ! WHEN ORDERING PARTS, UNIT'S TYPE, MODEL AND SERIAL NUMBER SHOULD BE QUOTED, TOGETHER WITH THE PART DESCRIPTION.

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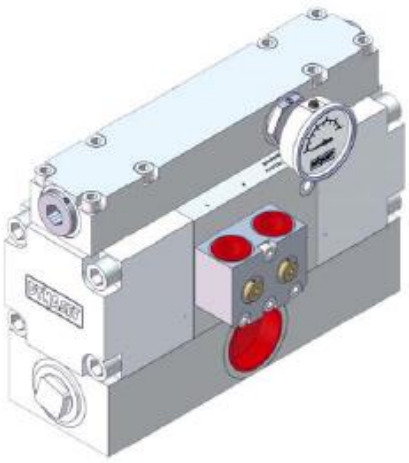
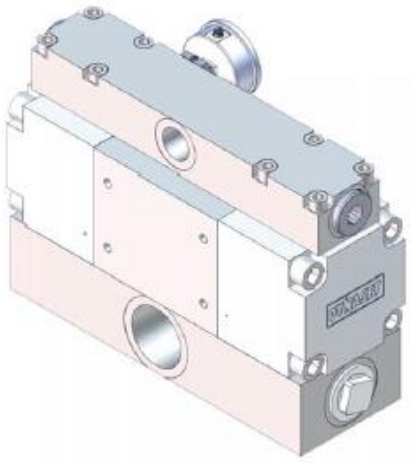
PART LIST

	SEAL KIT code V100101715			
1.1.1	2204329000	O-RING 87	CENTRE BODY	1
1.3.3	2204109000	O-RING 21	P/T BLOCK	2
1.4.5	0490118600	SEAL 47	SUCTION MANIFOLD	2
1.5.5	2204204000	SEAL 53	WATER VALVE	2 + 2
1.8.2	2204324000	O-RING 84	W-HEAD/W-PISTON	2
1.8.3	2104549000	SEAL 1T	W-HEAD/W-PISTON	2 x 2
1.8.4	2104744000	SEAL STRIP 63	W-HEAD/W-PISTON	2
1.8.5	2104554000	SEAL 2T	W-HEAD/W-PISTON	2 x 2
1.8.6	2204219000	O-RING 58	V-HEAD/DISCH.MANIF.	2
1.9.3	2104694000	SEAL 90	HYDRAULIC PISTON	1
	WATER VALVE KIT V100101795			
1.5.2	0700000881	SPRING, SUCTION		2
1.5.3	0400000245	VALVE DISK	D44	4
1.5.4	0400000246	VALVE SEAT	D58	4
1.5.5	2204204000	O-RING 53		4
1.7.2	0700000880	SPRING, PRESSURE		2
1.4.5	0490118600	SEAL 47		2
1.8.6	2204219000	DISCHARGE MANIFOLD O-RING	58	2
	SCREW KIT code V100101875			
1.3.4	8500412600	SCREW	M8x45 8.8	4
1.4.4	8500416200	SCREW	M10x75 8.8	8
1.6.3	8500415800	SCREW	M10x55 8.8	8
1.8.7	8500424400	SCREW	M16x100 8.8	4 x 2
	AVAILABLE BY REQUEST:			
1.9.2	8500606400	SET SCREW	M5x10	2
1.9.8	8500412000	SCREW	M8x16	1





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TECHNICAL CHARACTERISTICS

PARAMETERS			HPW 90/150-85
WATER POWER			
WATER FLOW	max	l/min	150
WATER PRESSURE	max	bar	90
WATER TEMPERATURE	max	°C	70 °C
PUMPING POWER	max	kW	22,5
SUCTION HEAD	max	m	3
WATER FEED PRESSURE	min-max	bar	-0,3 ...10
PRESSURE RATIO	water/hydraulic		0,52
SPEED RATIO		1/min	575
WATER PISTONS	outer diameter	mm	D 63
WATER CONNECTIONS			
PRESSURE LINE			BSP 3/4"
SUCTION / FEED LINE			BSP 2"
PRESSURE HOSE	recommendation		3/4"
SUCTION HOSE	recommendation		1 1/2"
WATER FILTER	min.	mesh	80
HYDRAULIC CONNECTIONS			
PRESSURE LINE		P	BSP 3/4"
RETURN LINE		T	BSP 3/4"
SERVICE LINE		S	BSP 1/4"
HYDRAULIC FLUID REQUIREMENTS			
VISCOSITY		cSt	10 - 200 / optimal 25 - 35
TEMPERATURE		°C	max. 70
FILTER RATIO	recommendation	um	min. 25
COOLING CAPACITY	recommendation	kW	4
HYDRAULIC POWER REQUIREMENTS			
HYDRAULIC FLUID FLOW		l/min	85
OPERATING PRESSURE	Δp	bar	190
MAXIMUM PRESSURE		bar	210
IDLE RUN PRESSURE		bar	10
RETURN LINE PRESSURE	max	bar	210
WEIGHT		kg	31
PRESSURE GAUGE			OPTIONAL
WATER PRESSURE UNLOADER	PA		OPTIONAL
LS-VALVE	LS		OPTIONAL

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THIRD ANGLE PROJECTION

IF IN DOUBT - ASK!

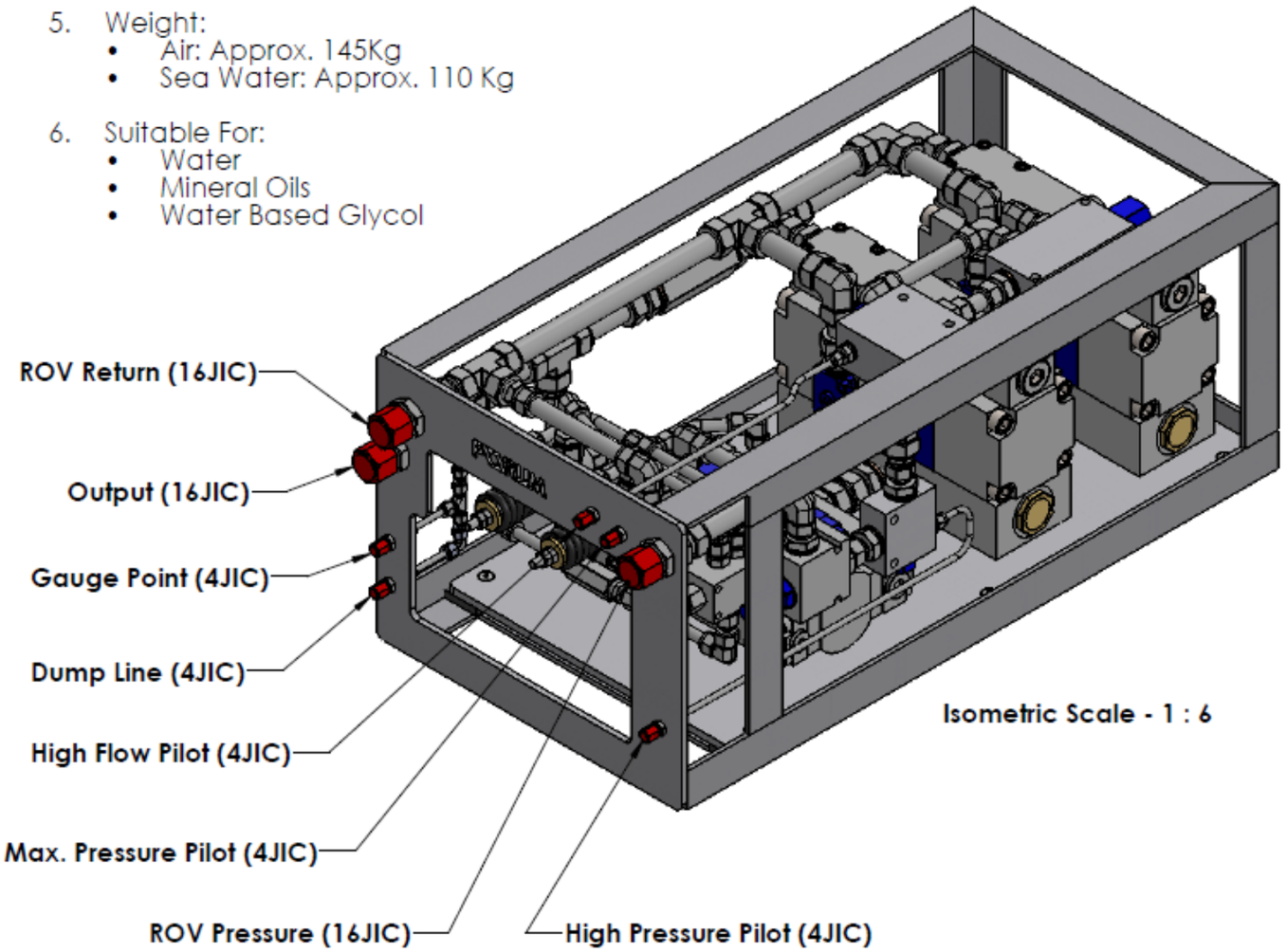
REMOVE SHARP EDGES

NOTES:

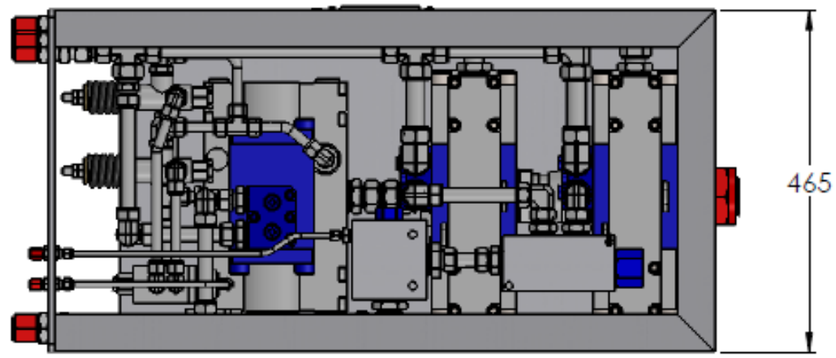
1. Pressure Required: 3000psi (210Bar)
2. Flow Required: 100-150Lmin
3. Output Pressure: 5000psi (345Bar)
4. Output Flow: 300Lmin

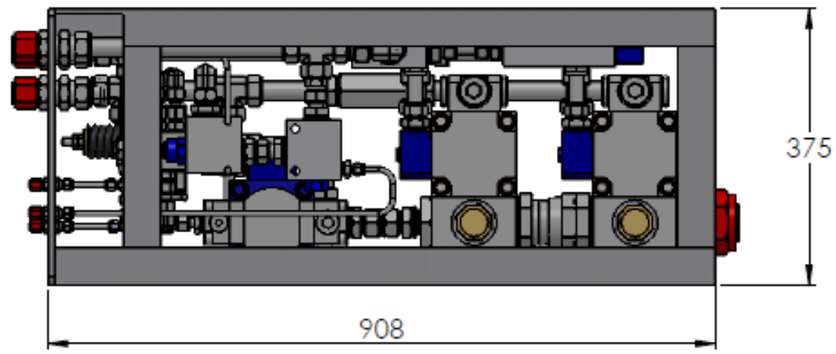
5. Weight:
   - Air: Approx. 145Kg
   - Sea Water: Approx. 110 Kg

6. Suitable For:
   - Water
   - Mineral Oils
   - Water Based Glycol



Isometric Scale - 1 : 6





REV	BY	DATE	DESCRIPTION	APP
1	GB	25/07/12	ISSUED FOR INFORMATION	

RECORD OF REVISIONS

MATERIAL: -

FINISH: -

USO, TOLERANCES TO BE: GENERAL ± 2.0 mm

WT AIR	WT WATER
- kg (E)	- kg (E)

DRAWN	GB
DATE	31/07/2012
CHECK	DM
APPRV.	DM
ENGR.	GB

FORUM ENERGY TECHNOLOGIES
Forum Subsea Tooling.
Unit 5 Insch Business Park, Insch,
Aberdeenshire AB52 6TA
Tel: ++44 (0) 1464 821595

SCALE (UOS): 1:8

ORIG. SIZE: A3

PROJECT: BOP-AT 300 MK2

TITLE: BOP-AT 300 MK2

GENERAL ARRANGEMENT DRAWING
Sheet 1 of 1

DOC. No. SRTS-066-GA

REV 1

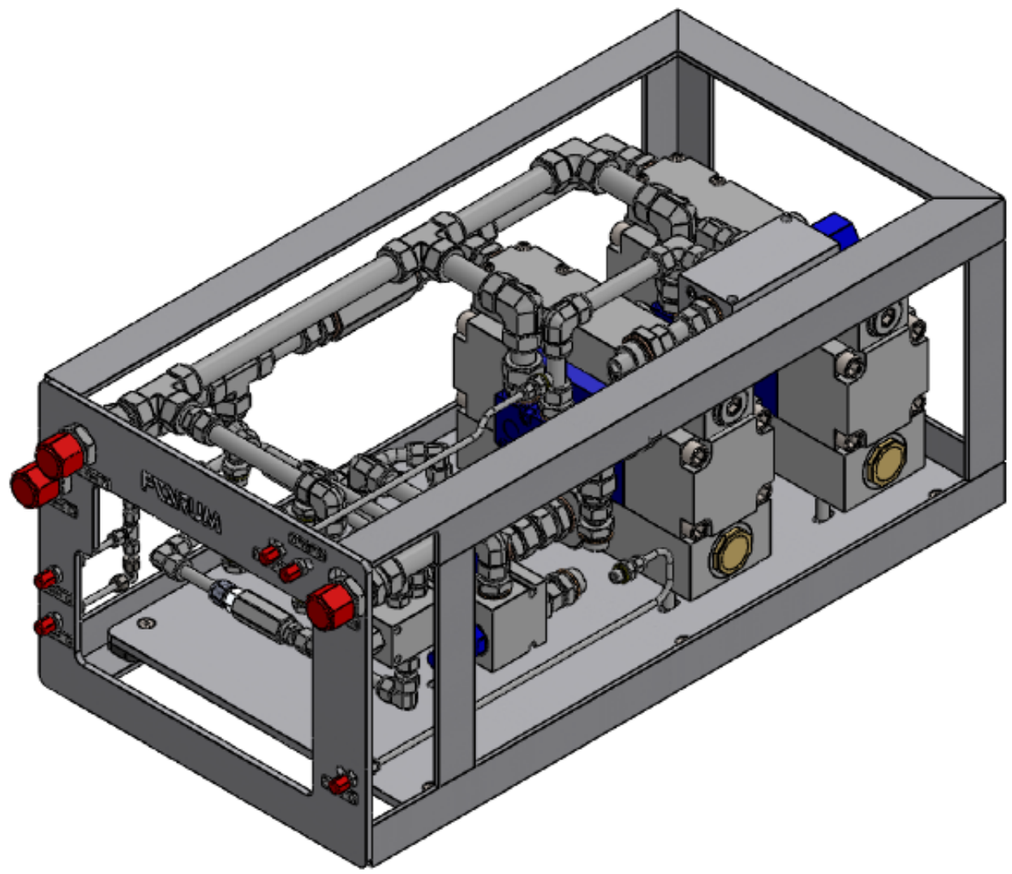
DOCUMENT REF A001-000-232/02 ISSUE 11 A2 LANDSCAPE SOLIDWORKS DRAWING SHEET

IF IN DOUBT, ASK, DO NOT SCALE

THIRD ANGLE PROJECTION

SPARE/MANUAL COLUMN: **R** = RECOMMENDED SPARES; **C** = CRITICAL SPARES; **M** = REQUIRED FOR MANUAL; **T** = TRACEABLE ITEM

ITEM	PART NUMBER	SPARE/ MANUAL	DESCRIPTION	COMMENTS	QTY/ 01	QTY/ 02	QTY/ 03	QTY/ 04	QTY/ 05	QTY/ 06
1	SRTS-066-001		BOP-AT 300 MK2 FRAME		1	1				
2	SRTS-066-002		BOP-AT 300 MK2 BASE PLATE		1	1				
3	SRTS-066-003		BOP-AT 300 MK2 PLATE SPACER		2	2				
4	SRTS-066-004		BOP-AT 300 MK2 PUMP SPACER HPW90		8	8				
5	SRTS-066-005		BOP-AT 300 MK2 PUMP SPACER HPW460		4	4				
6	HYD-0694		DYNASET HPW460 PUMP	HPW460/50-115-PA	1	1				
7	HYD-0695		DYNASET HPW90 PUMP	HPW90-150-85	2	2				
8	HYD-0555		3/4" BSP PILOT TO OPEN CHECK	CKEB-XCN-BCW	1	1				
9	HYD-0556		1" BSP PILOT TO OPEN CHECK	CKGB-XCN-HCX	1	1				
10	HYD-0656		FLOW DIVIDER 150LPM	2FP95P6W95	1	1				
11	HYD-0727		FLOW CONTROL 3/4"BSPF	NV1220A6BN C/W NV1	1	1				
12	HYD-0554		5ksi 1" BSPF CHECK VALVE	2260/6100 GAS	1	1				
13	HYD-0553		10ksi 1/2" NPTF CHECK VALVE	CV50S/HP	1	1				
14	HYD-0558		DYNASET RELIEF VALVE		2	2				
15	HYD-0657		1/4" PORTED BIS VALVE	382N-H1-SW-DV-10K	1	1				
16	009-24-002		HYLOK #4JIC – 1/4" TUBE BULKHEAD	CBFU 4-4-SS	5	5				
17	HYD-0580		1/4" JIC CAP	SC-500-4-SS	5	5				
18	HYD-0851		HYLOK #16JIC – 1" TUBE BULKHEAD	CBFU 16-16-SS	3	3				
19	HYD-0838		#16 JIC CAP		3	3				
20	HYD-0831		1/4" BSPM – 1/4" TUBE MALE CONNECTOR	CMC 4-4G-SS	2	2				
21	HYD-1297		1/4" NPTM – 1/4" TUBE ELBOW	CLMA 4-4N-SS	1	1				
22	009-24-008		1/4" TUBE ELBOW	CLA-4-SS	1	1				
23	HYD-0855		1/4" TUBE TEE	CTA-4-SS	1	1				
24	009-35-020		1/4" BSP DOWTY SEAL		2	2				
25	009-24-009		1/4" TUBE PORT CONNECTOR	CPC-4-SS	2	2				
26	009-24-017		1/2" STANDPIPE - 1/4" TUBE FITTING	CR 4-8-SS	1	1				
27	HYD-0858		1/2" BSPM – 1/2" STANDPIPE	CAM 8-8G-SS	3	3				
28	HYD-0569		1/2" TUBE – 3/4" BSPM CONNECTOR	CMC 8-12G-SS	1	1				
29	HYD-1313		1/2" TUBE – 1/4" NPTM CONNECTOR	CMC 8-4N-SS	3	3				
30	009-24-023		1/2" STANDPIPE – 1/2" NPTM	CAM 8-8N-SS	1	1				
31	009-24-027		1/2" TUBE-1/2" NPTM CONNECTOR	CMC 8-8N-SS	1	1				
32	009-24-006		1/2" TUBE ELBOW	CLA-8-SS	7	7				
33	009-24-019		1/2" TUBE TEE	CTA-8-SS	2	2				
34	HYD-0864		1/2" TUBE – 1/2" BSPM POSITIONABLE ELBOW	CSLA 8-8G-SS	2	2				
35	009-35-018		1/2" BSP DOWTY SEAL		7	7				
36	009-24-011		1/2" PORT CONNECTOR	CPC-8-SS	3	3				
37	007-02-002		1/2" BSPM PLUG		2	2				
38	HYD-0866		3/4" TUBE – 3/4" BSPM CONNECTOR	CMC 12-12G-SS	5	5				
39	HYD-0867		3/4" STANDPIPE – 3/4" BSPM	CAM 12-12G-SS	6	6				
40	HYD-0868		3/4" TUBE – 1" BSPM CONNECTOR	CMC 12-16G-SS	1	2				
41	HYD-0869		3/4" TUBE ELBOW	CLA-12-SS	8	8				
42	009-35-705		3/4" BSP DOWTY SEAL		14	14				
43	HYD-0870		1" TUBE – 3/4" BSPM CONNECTOR	CMC 16-12G-SS	2	2				
44	HYD-1334		1" TUBE – 3/4" TUBE REDUCER	CR 12-16-SS	2	2				
45	HYD-0872		1" TUBE – 1/2" TUBE REDUCER	CR 8-16-SS	2	-				
46	HYD-0873		1" TUBE – 1" BSPM CONNECTOR	CMC 16-16G-SS	3	2				
47	HYD-0874		1" STANDPIPE – 1" BSPM	CAM 16-16G-SS	3	3				
48	HYD-0180		1" BSP PLUG		6	6				
49	HYD-0876		1" TUBE ELBOW	CLA-16-SS	4	4				
50	HYD-1039		1" TUBE – 1" BSPM POSITIONABLE ELBOW	CSLA 16-16G-SS	1	1				
51	HYD-0878		1" TUBE TEE	CTA-16-SS	6	4				
52	HYD-0879		1" TUBE PORT CONNECTOR	CPC-16-SS	4	4				
53	009-35-700		1" BSP DOWTY SEAL		7	7				
54	HYD-0880		2" BSPM – 2" BSPM CONNECTOR	SSA 32BM 32BM	2	2				
55	HYD-1153		2" BSPM -2" BSPF ADAPTOR	SSA 32BM 32BF	1	1				
56	HYD-1393		2" BSP CAP	SSA 32BF	1	1				
57	009-35-703		2" DOWTY SEAL		4	4				
58	058-21-009		1/4" – 18G STAINLESS STEEL TUBE		A/R	A/R				
59	058-21-042		1/2" – 14G STAINLESS STEL TUBE		A/R	A/R				
60	058-21-091		1" – 10G STAINLESS STEEL TUBE		A/R	A/R				
61	071-13-197		C-SUNK SOCKET HEAD SCREW M8 x 25 LONG		6	6				
62	071-16-146		M10 PLAIN WASHER		12	12				
63	071-16-147		M10 SPRING WASHER		12	12				
64	071-09-317		HEX HEAD SCREW M10 x 50 LONG		8	8				
65	071-09-082		HEX HEAD SCREW M10 x 30 LONG		4	4				
66	058-21-071		3/4" – 12G STAINLESS STEEL TUBE		A/R	A/R				
67	009-24-031		3/4" TUBE TEE	CTA-12-SS	-	2				
68	009-24-032		1/2" TUBE – 3/4" TUBE REDUCER	CR 8-12-SS	-	2				
69	009-24-033		REDUCING PORT CONNECTOR 1" TUBE – 3/4" TUBE	CPR 16-12-SS	-	1				
70	009-32-1149		2" BSP MALE – 1" BSP FEMALE ADAPTOR	SSA 32BM 16BFF	1	1				
71										
72	SRTS-066-011/01		IDENTIFICATION LABEL SET		1	1				
73	DDI-SRTS-066/01		LABEL MOUNTING DETAIL - SRTS 066		1	1				



NOTES

1. USE ANTIGALLING COMPOUND ON ALL FASTENERS.
2. PAINT ALL UN-ANODISED VALVES AND NON STAINLESS PUMP PARTS

PART NUMBER	PART DESCRIPTION
SRTS-066/01	BOP-AT 300 MkII - NOW USE VARIANT /02
SRTS-066/02	BOP - AT 300 MKII

CURRENT ISSUE	RECORD OF FIRST ISSUE	
PCL	GB	DRAWN/ALT BY
PCL	DM	DO CHECKED
PCL	DM	TO CHECKED
PCL	GB	TO APPROVED
PROD	PROD	STATUS
16 Jan 2020	31-08-12	ISSUE DATE

FORUM™

ISSUE 4

TITLE: BOP-AT 300 MkII

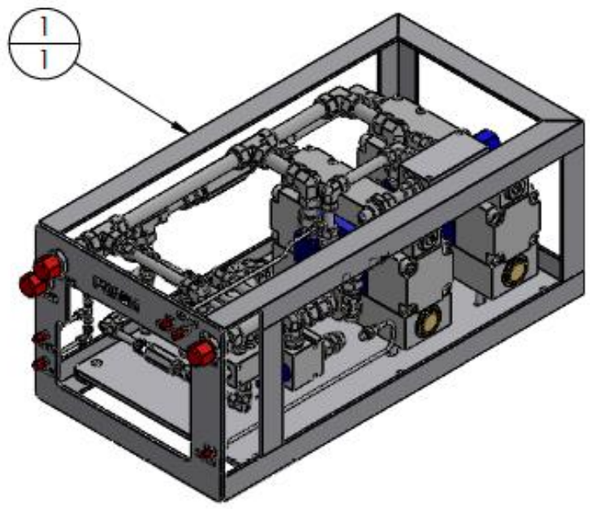
SIZE	MATERIAL	DWG. NO.
A2	-	SRTS-066

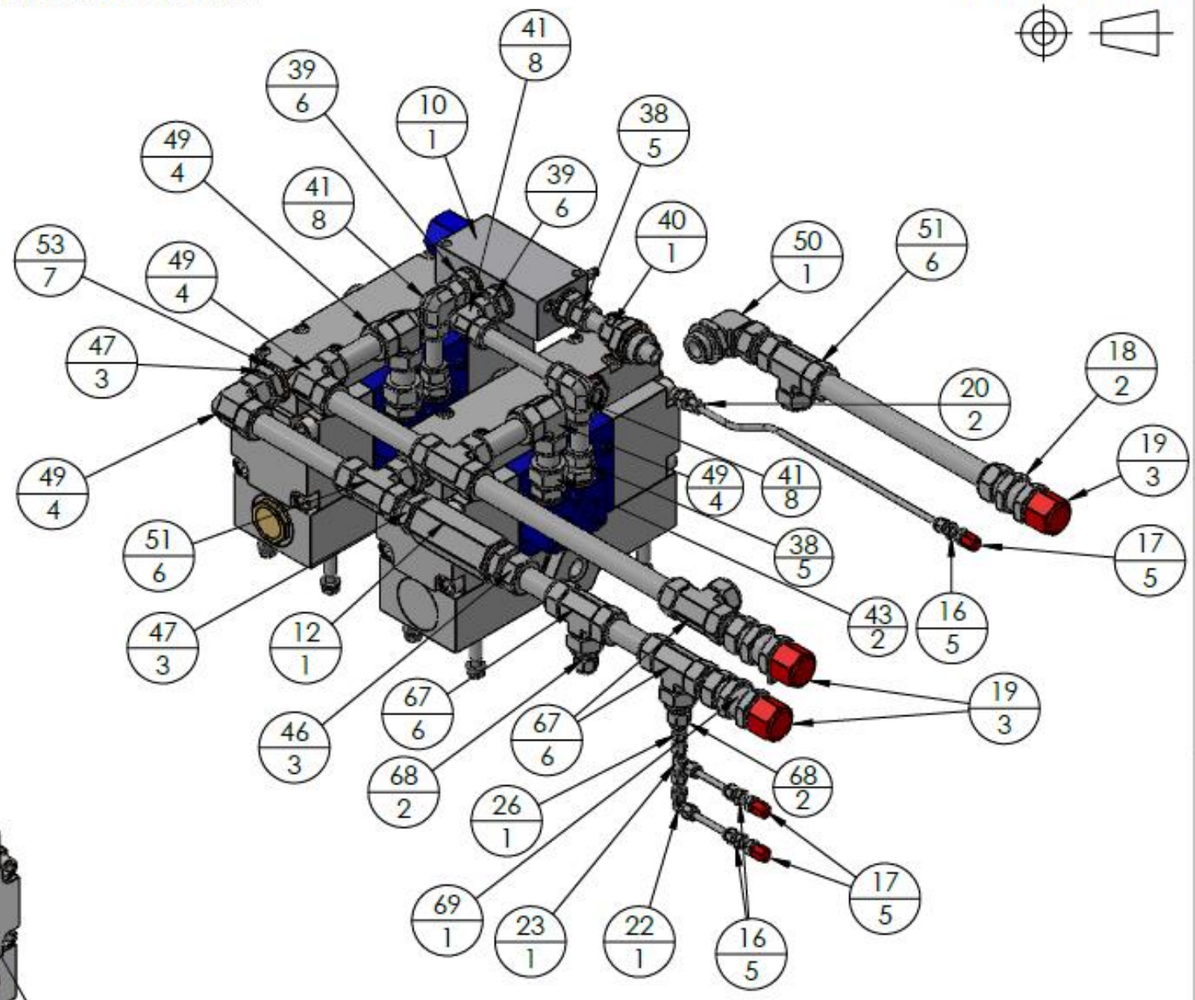
SCALE: 1:4 | MASS 158.45 kg | VOLUME 35.79 litre | SHEET 1 OF 3

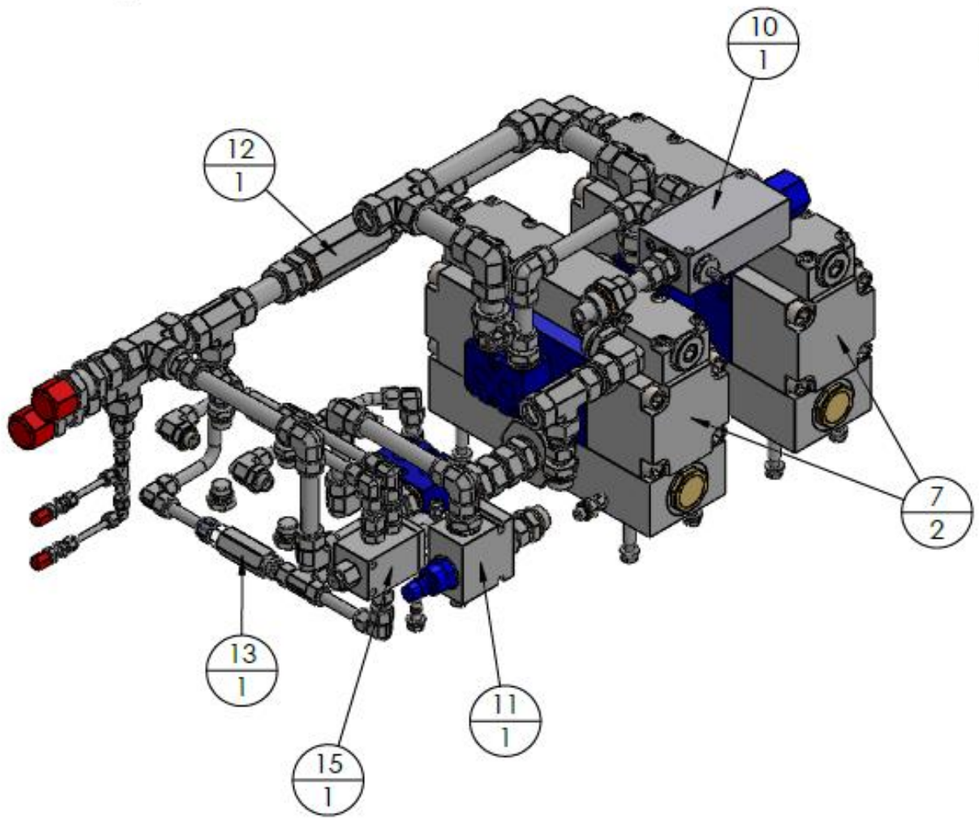
DOCUMENT REF A001-000-229/02 ISSUE 7 A3 LANDSCAPE SOLIDWORKS DRAWING SHEET

IF IN DOUBT, ASK, DO NOT SCALE

THIRD ANGLE PROJECTION







VARIANT /02 displayed DO NOT USE VARIANT/01
Frame and Some Pipework Removed For Clarity.

FORUM

ISSUE 4

TITLE: BOP-AT 300 MkII

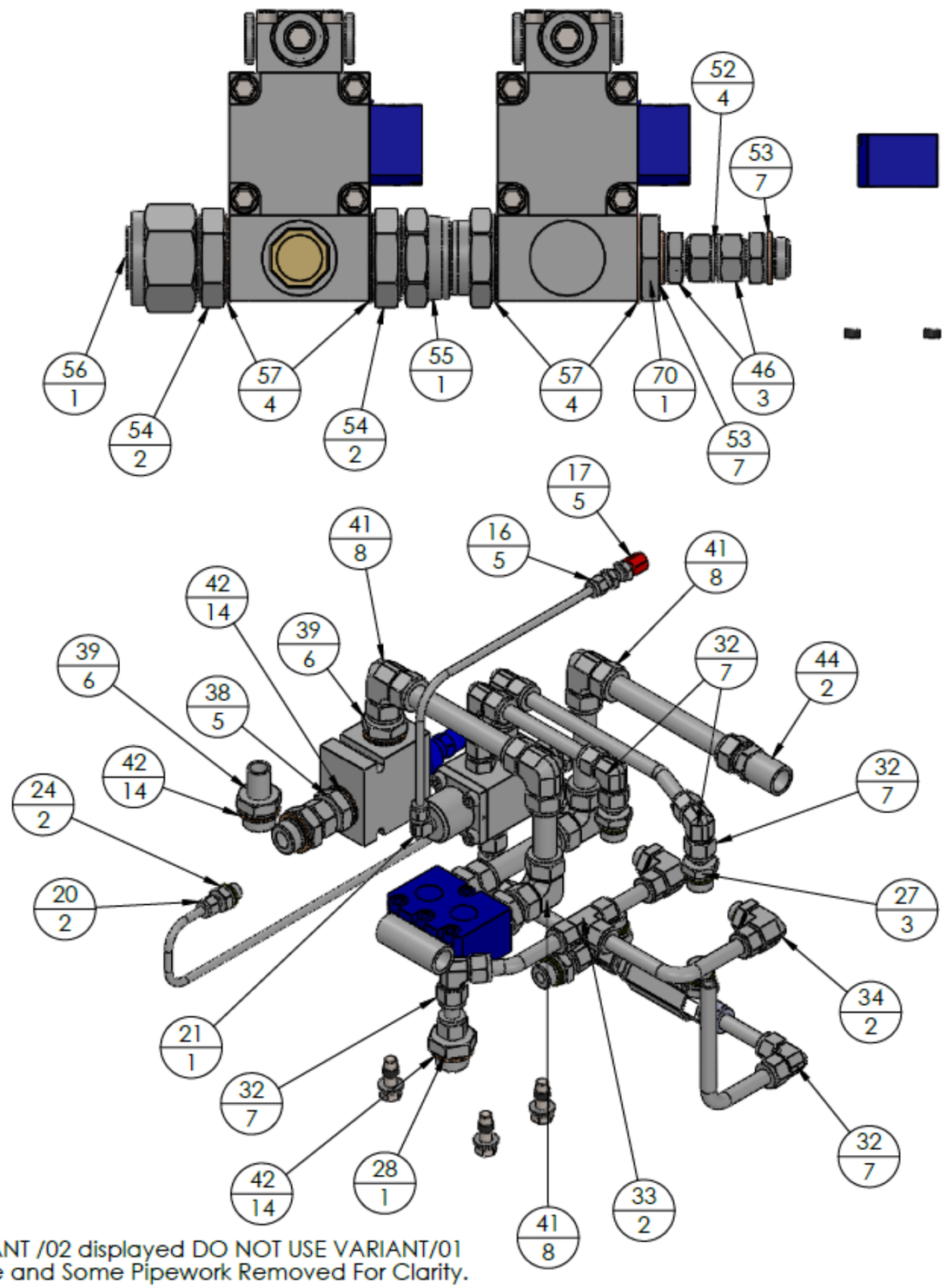
SIZE	MATERIAL	DWG. NO.
A3	-	SRTS-066

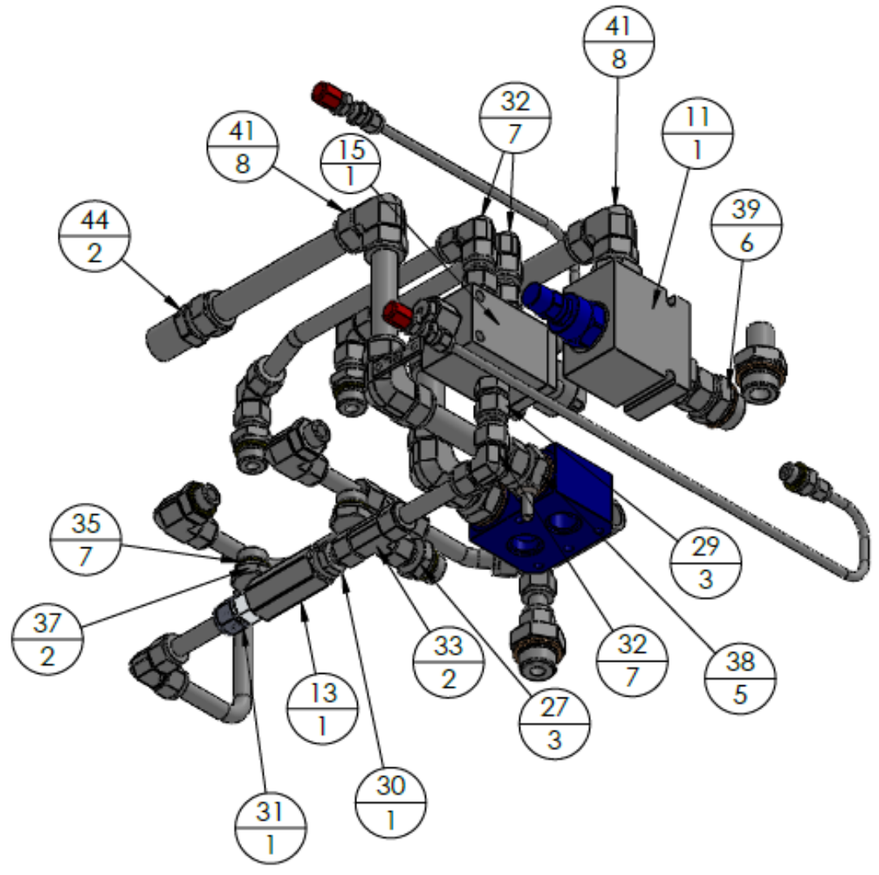
SCALE: 1:6	MASS 158.45 kg	VOLUME 35.79 litre	SHEET 2 OF 3

DOCUMENT REF A001-000-229/02 ISSUE 7 A3 LANDSCAPE SOLIDWORKS DRAWING SHEET

IF IN DOUBT, ASK, DO NOT SCALE

THIRD ANGLE PROJECTION





VARIANT /02 displayed DO NOT USE VARIANT/01
Frame and Some Pipework Removed For Clarity.

FORUM

ISSUE 4

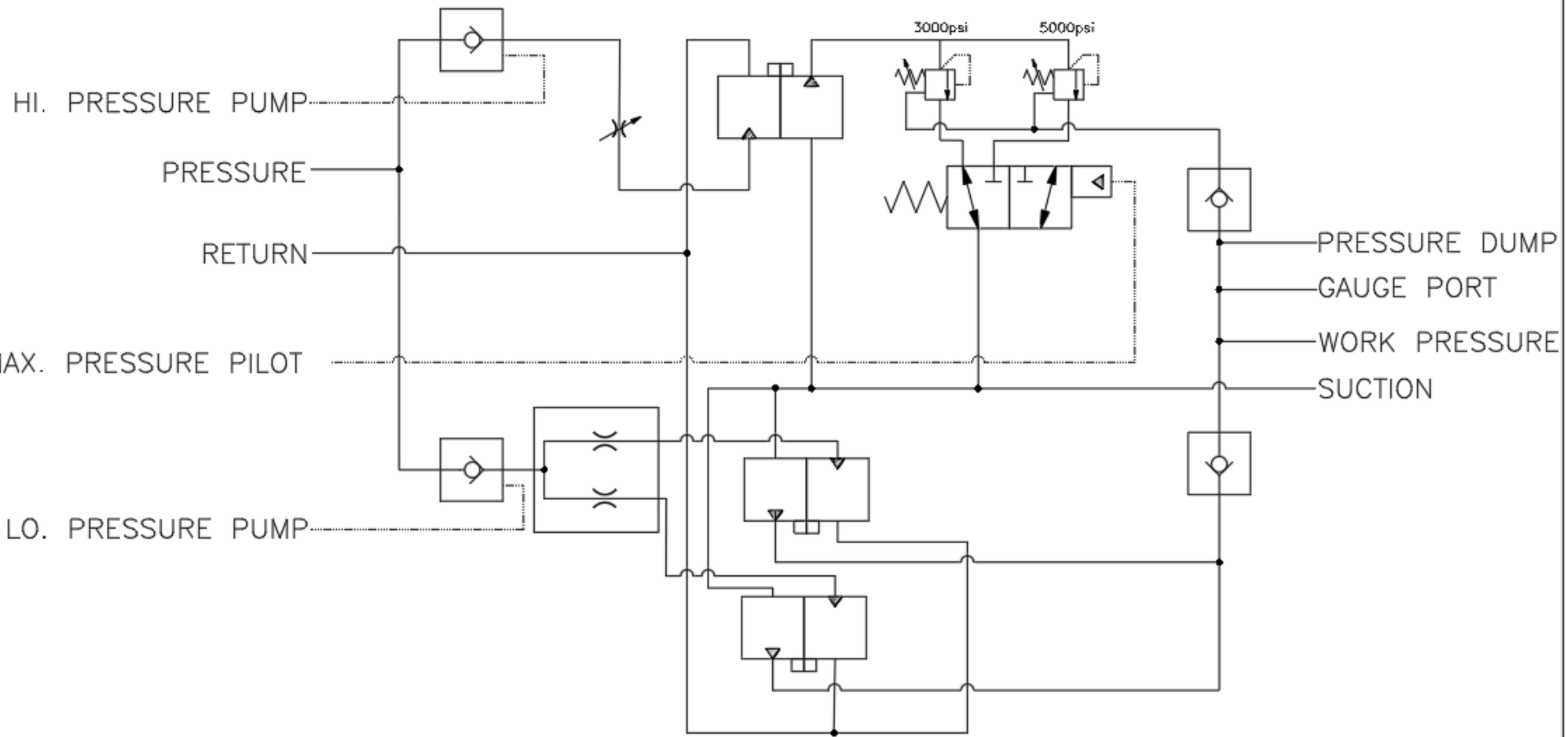
TITLE: BOP-AT 300 MkII

SIZE	MATERIAL	DWG. NO.
A3	-	SRTS-066

SCALE: 1:4	MASS 158.45 kg	VOLUME 35.79 litre	SHEET 3 OF 3

KMS AUTOCAD - SHEET A3

IF IN DOUBT, ASK



PART NUMBER	PART DESCRIPTION
SRTS-066-SCH	BOP AT 300 SCHEMATIC

NOTES

1 THREAD SEALING COMPOUNDS MUST NOT CONTAMINATE HYDRAULIC SYSTEM

2 PILOT PRESSURE TO BE EQUAL TO ROV SUPPLY PRESSURE.

CURRENT ISSUE	RECORD OF FIRST ISSUE	
ASA	IW	DRAWN/ALT BY
–	DM	ID CHECKED
–	–	TD CHECKED
–	DM	TD APPROVED
PROD	PROD	STATUS
–	06/07/12	ISSUE DATE

FORUM

ISSUE iss

TITLE: BOP AT 300 SCHEMATIC

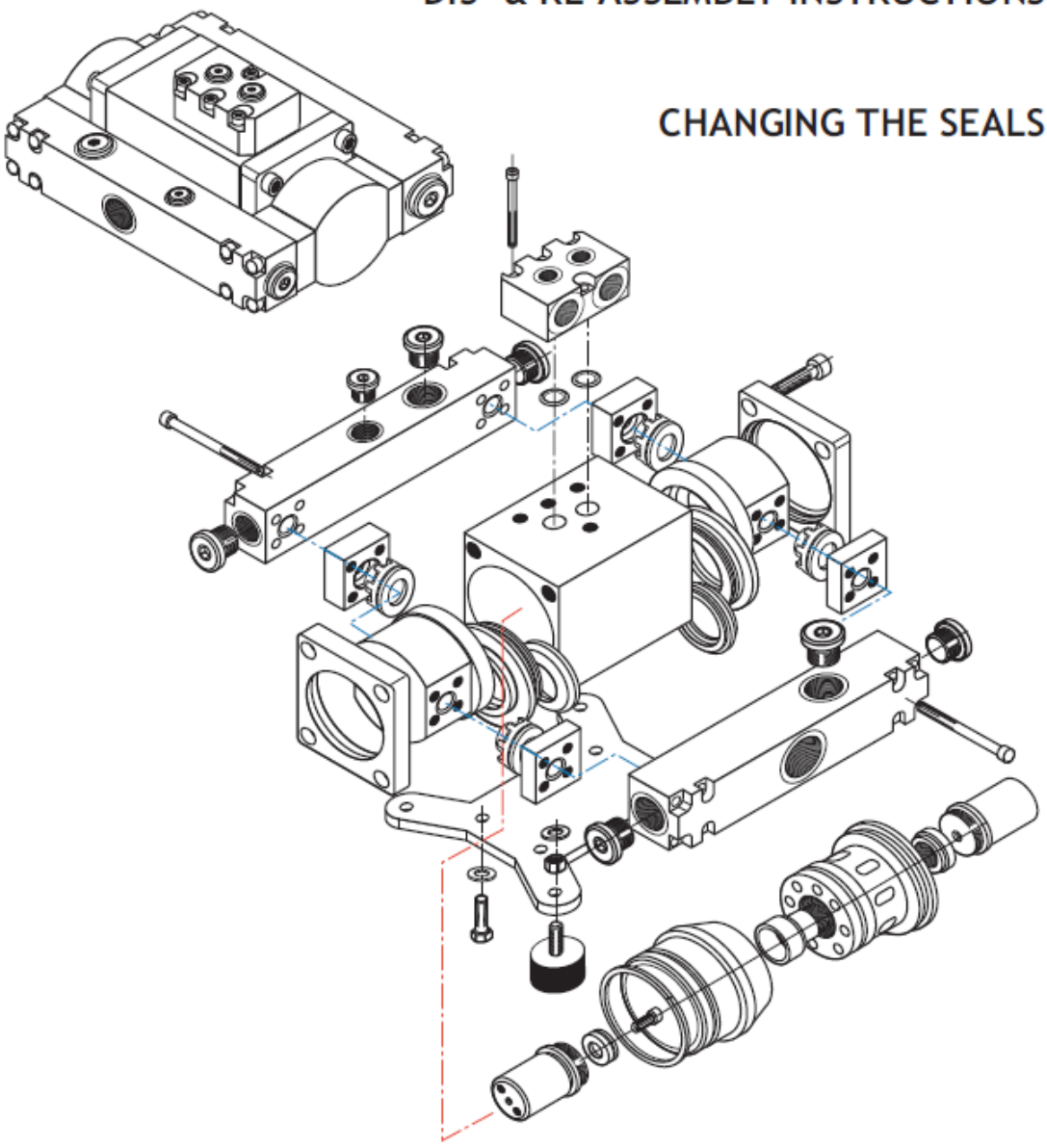
SIZE	MATERIAL	DWG. NO.
A3	MATERIAL	SRTS-066-SCH

SCALE: N/A | MASS: kg | VOLUME: litre | SHEET 1 OF 1

HPW HIGH PRESSURE PUMPS

DIS- & RE-ASSEMBLY INSTRUCTIONS

CHANGING THE SEALS



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E-mail: info @dynaset.com

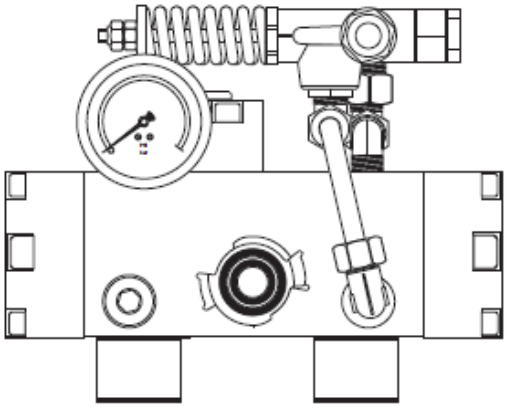
ATTENTION !
PRIOR TO DISASSEMBLING THE PUMP, MAKE SURE THAT THE CORRESPONDING SPARE PART PAGES ARE AT HAND FOR INSTANT REFERENCE AND AUTHENTICATION !

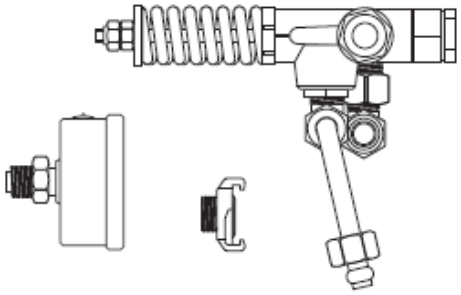
HPW-pumps may roughly divided into three groups with the reference to their construction:

1. Units with separate water suction and discharge manifolds but without separate sealing (water) flanges - TYPE I.
2. Units with separate water suction and discharge manifolds as well as with separate sealing (water) flanges - TYPE II.
3. Pumps with water suction and discharge channels integrated in pump body and water heads. Separate sealing flanges are used in this construction - TYPE III.

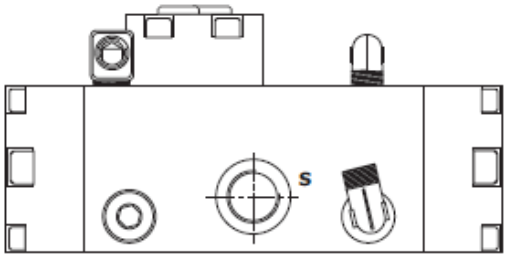
If you are going to clamp the pump in vice, slip jaws of aluminium or plactic should be used in order to exlude damaging of pump casing.

Ensure that both water and hydraulic circuit of the HPW-pump are depressurized.
Disconnect hydraulic and water lines and detach the HPW-pump from a carrier machine.



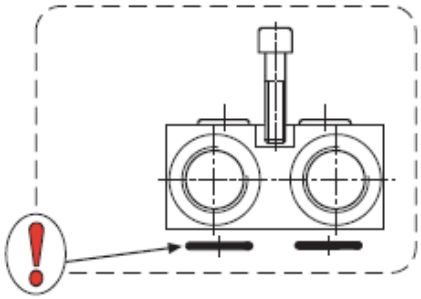


Prior to dissassembling the pump UNLOADER VALVE, PRESSURE GAUGE and hose coupling should be detached from the unit.



Detach the rubber cushions if you consider it necessary.

Open allen screws and detach P/T block:



ATTENTION !

Further on pump seals are marked with exclamation mark.

For proper seal identication refer to the spare part pages for Your HPW-unit.

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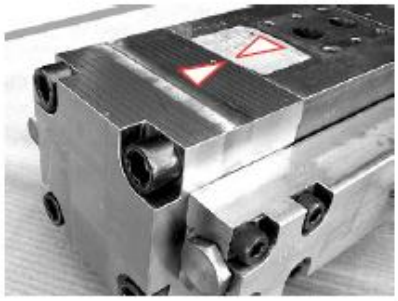
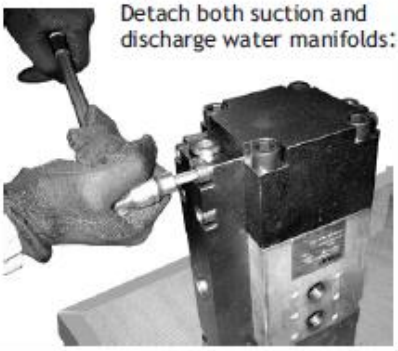
1. DETACHING WATER MANIFOLDS

TYPE I, II

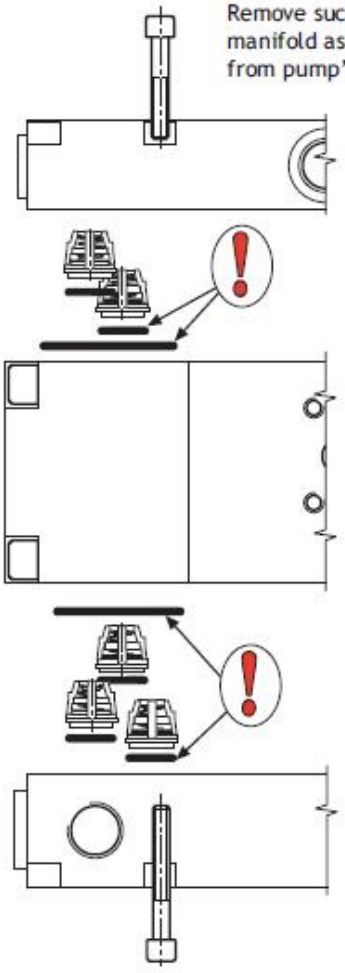
1.1
It is recommended to mark the water heads and corresponding ends of pump body to ensure that the unit will be re-assembled properly.



1.2
Detach both suction and discharge water manifolds:

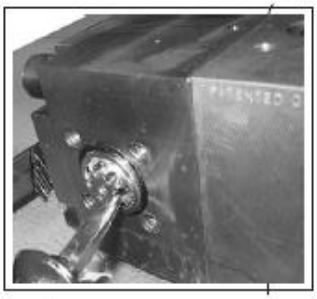


1.3
Remove suction water valves from suction manifold as well asdischarge water valves from pump's water heads.

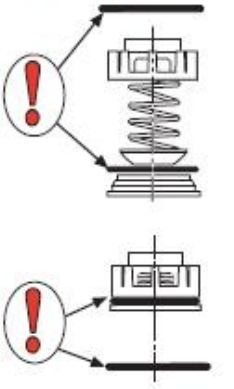


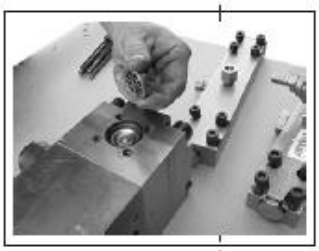
A pump with water valves of type A.

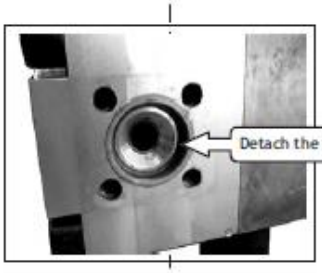
NOTE !
Water valves, used in HPW-pumps have the same construction, but differ by their appearance. On that ground we can divide them into two types: **type A** with plastic valve cap and **type B** with steel valve cap.



Water valves of type B.

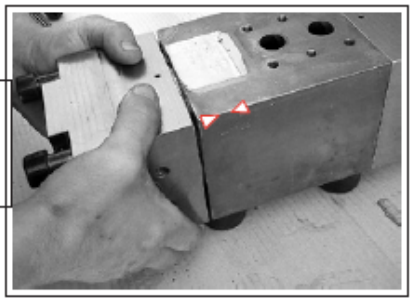




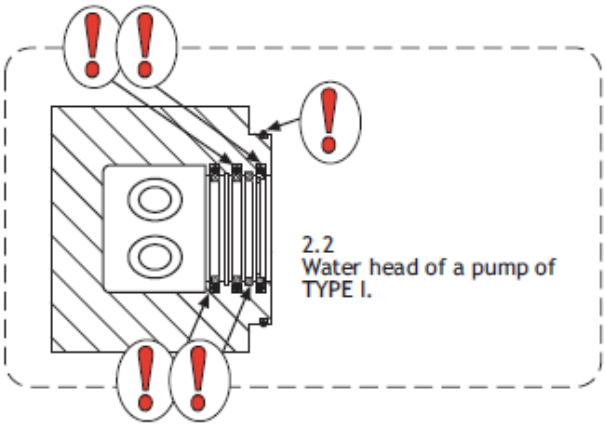


2. DETACHING WATER HEADS

PUMPS OF ALL TYPES

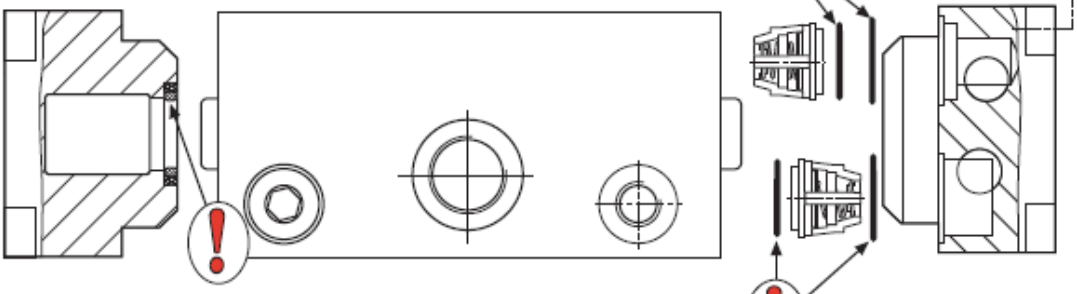


2.1.
Open allen screws and detach both water heads:



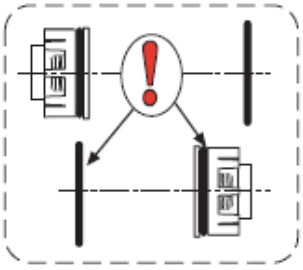
2.2
Water head of a pump of TYPE I.

2.3
Detaching water heads and water valves from a pump of TYPE III.

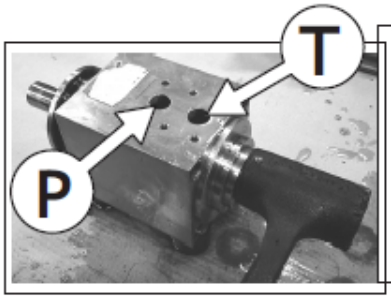


NOTE FOR ITEMS 1.3 AND 2.3 !

THE PRESSURE VALVE'S SPRING IS SHORTER AND OF CONSIDERABLY BIGGER DEFECTION RATE THAN THE SUCTION VALVE'S ONE.
DO NOT MIX UP THE VALVES WHEN RE-ASSEMBLING THE PUMP !

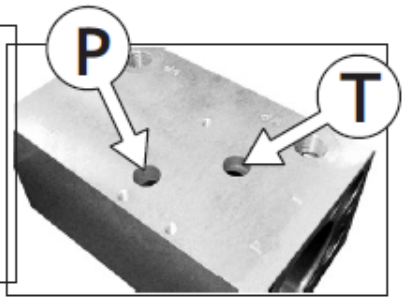


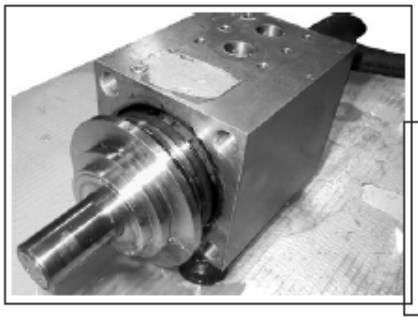
3. DETACHING THE PISTON ASSEMBLY



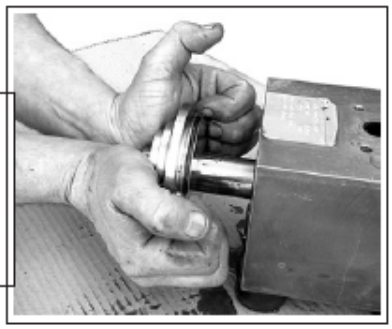
3.1
Drive out the piston assembly with PLASTIC OR WOODEN HAMMER:

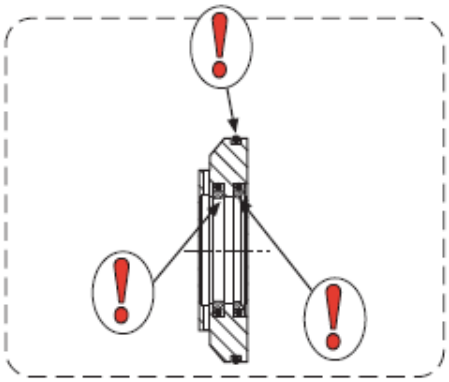
NOTE THE DIRECTION WHEN MAKING THIS PROCEDURE !
P - hydraulic pressure port
T - hydraulic return (tank) port.



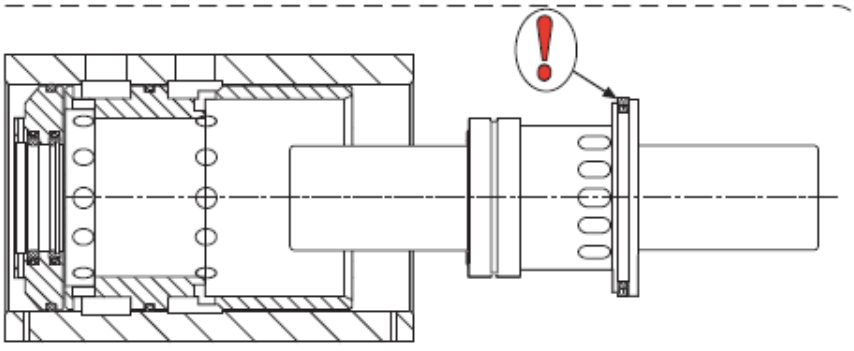


3.2.
Pull out the seal flange if your pump is provided with them:



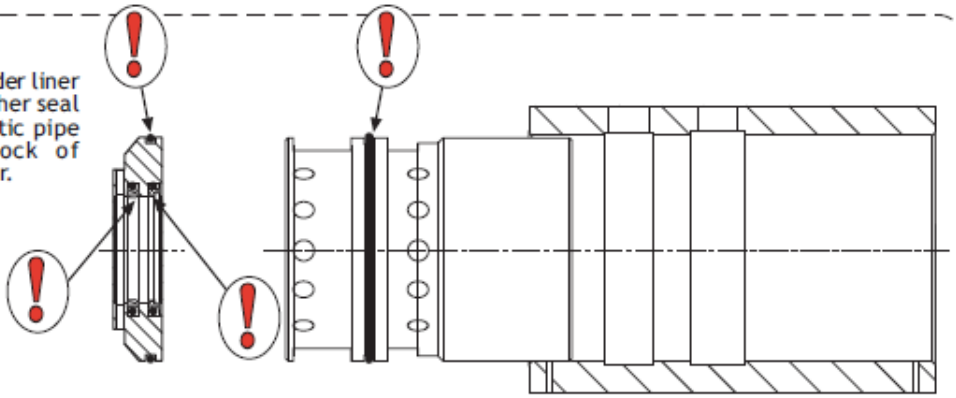


3.3
Pull the piston assembly out by hand:



4. DETACHING THE CYLINDER LINER

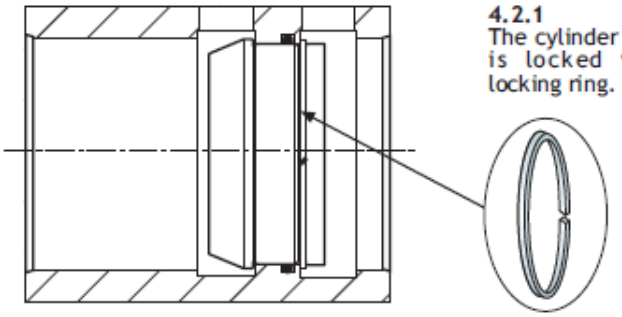
4.1
Tip out the cylinder liner together with other seal flange. Use plastic pipe or wooden block of suitable diameter.



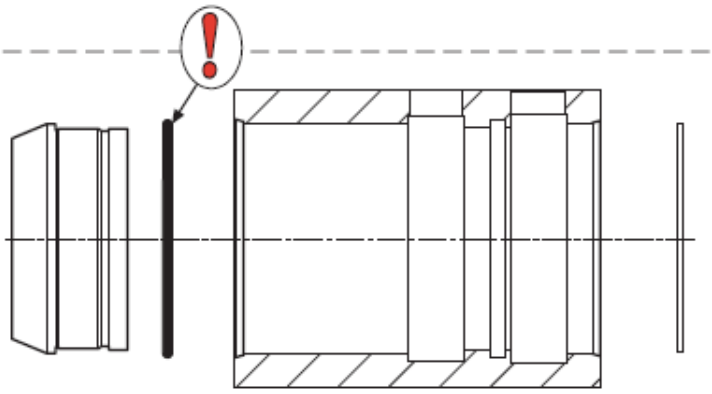
4.2
HPW-pumps equipped with steel body are usually provided with a cylinder liner of different appearance.

4.2.1
The cylinder liner is locked with locking ring.

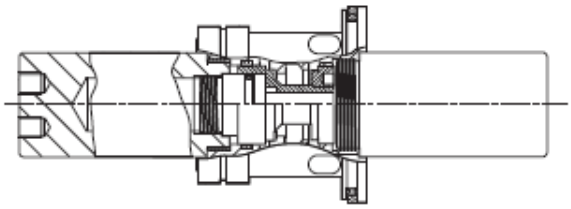
4.2.2
Prior to detaching the cylinder liner from pump body, remove the locking ring from it's annular groove using two screwdrivers.



4.2.3
Tip out the cylinder liner. Use plastic pipe or wooden block of suitable diameter.



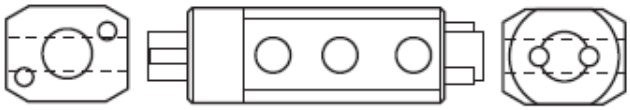
5. DISMANTLING THE PISTON ASSEMBLY



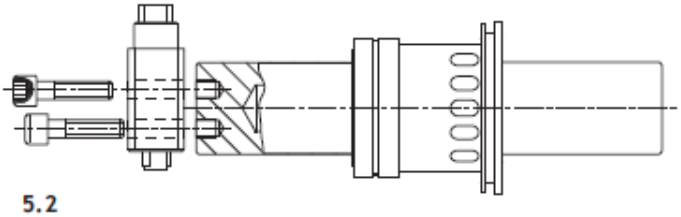
Sealings for reversal valve of hydraulic piston **are not included** into a SEAL KIT. Thereto, dismantling of the piston assembly requires special hand tools. If You either consider the necessity of seal change in piston assembly, or, for instance, the other water piston should be replaced, above seals and tools are to be ordered from DYNASET OY or their local representative.

Special piston key for dismantling and re-assembling a piston unit.

NOTE !
2 pcs required !



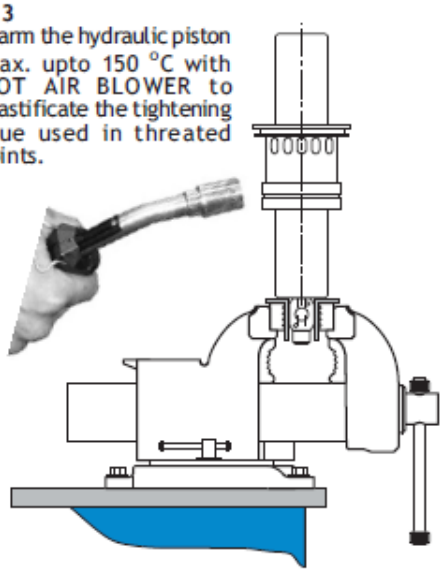
5.1
Remove the hydraulic piston's seal.

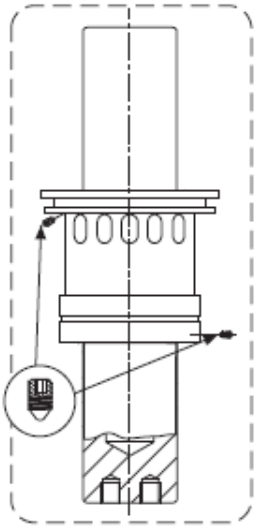


5.2
Attach the piston key to the water piston end as shown on the sketch and vice the assembly firmly.

NOTE !
If You are not going to change water pistons, it is recommended to mark them prior to detaching in order to restore an original installation.

5.3
Warm the hydraulic piston max. upto 150 °C with HOT AIR BLOWER to plastificate the tightening glue used in threated joints.



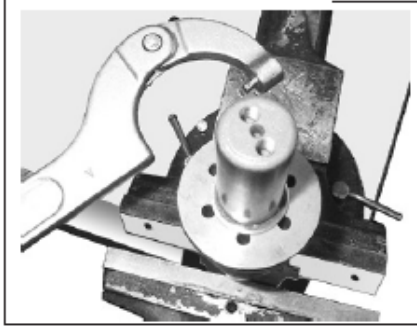


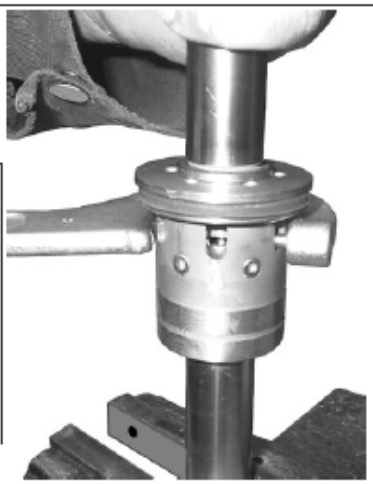
5.4
Use allen key of proper size to open set screws (2 pcs.) of water pistons *):

*) Check whether in your pump is used suchlike locking.

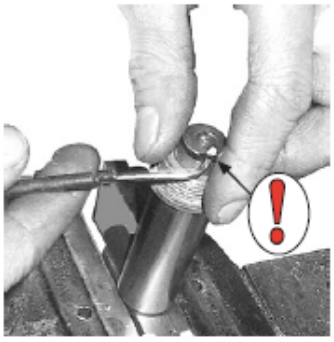
5. DISMANTLING THE PISTON ASSEMBLY

5.5
Using a hook wrench detach the hydraulic piston from the other water piston.

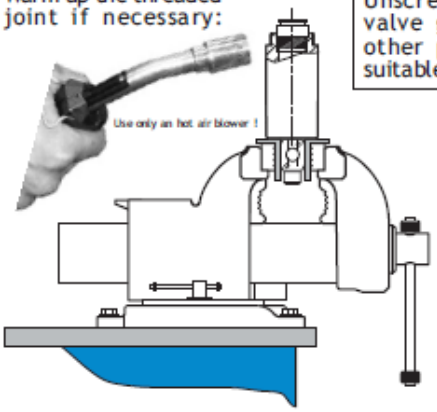


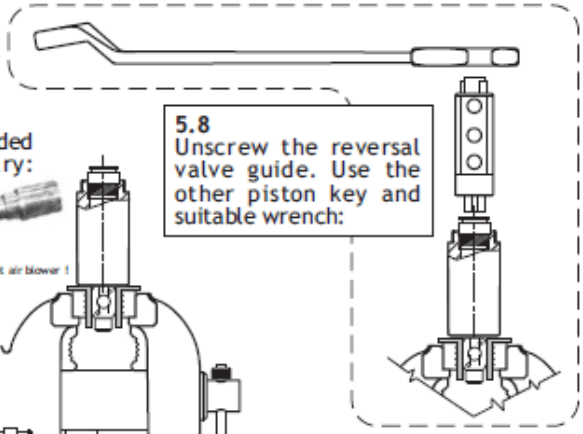


5.6
Detach the seal from the guide piece of reversal valve:

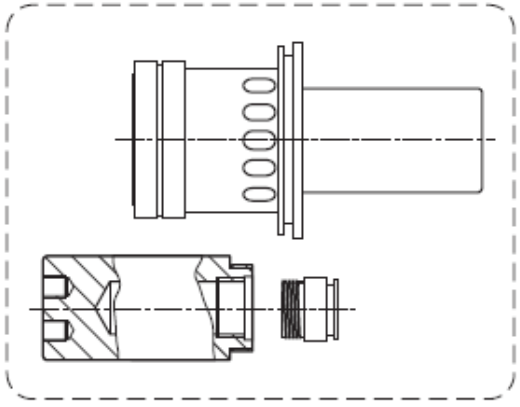


5.7.
Warm up the threaded joint if necessary:

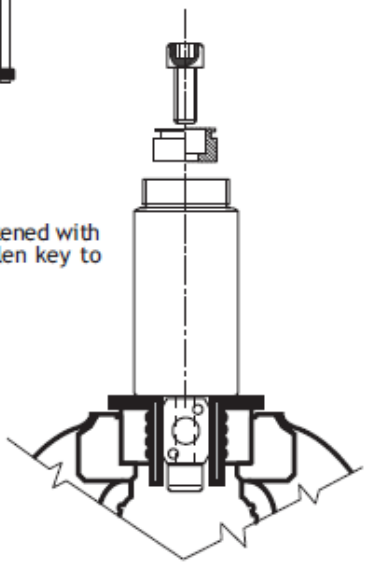




5.8
Unscrew the reversal valve guide. Use the other piston key and suitable wrench:

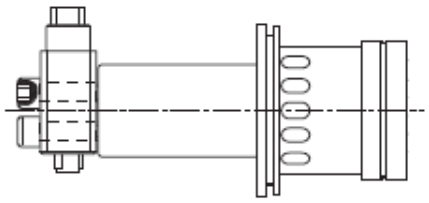


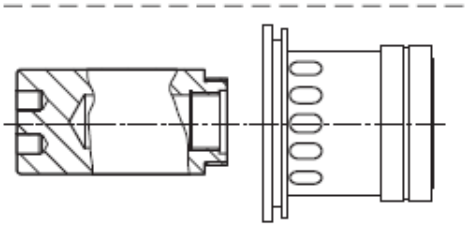
5.8.1
If valve guide is fastened with allen screw, use allen key to open the joint.



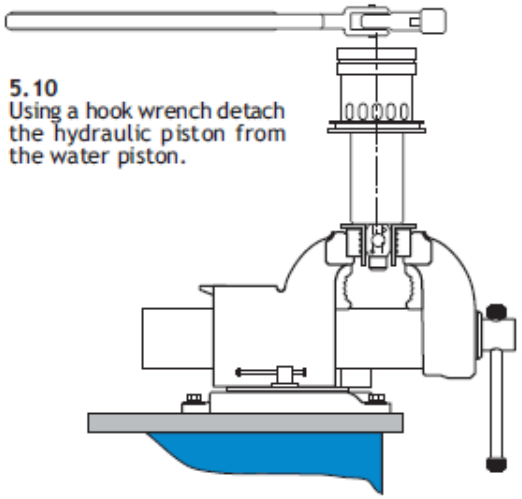
5. DISMANTLING THE PISTON ASSEMBLY

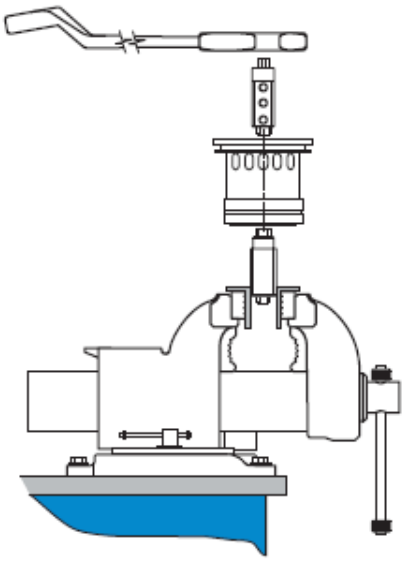
5.9
Attach the piston key to the other water piston and vice the assembly firmly.





5.10
Using a hook wrench detach the hydraulic piston from the water piston.



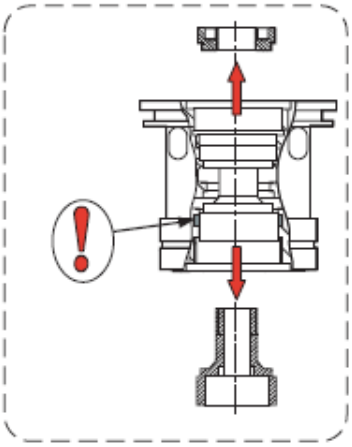


5.11
Vice the other piston key firmly.

5.12
Put the hydraulic cylinder onto viced key, fitting the key's pins into holes in valve's spool.

Fit the other key into holes in valve's seat and open the valve. Use suitable wrench.

You may have to warm up the unit if the joint is too tight. Use hot air blower only !



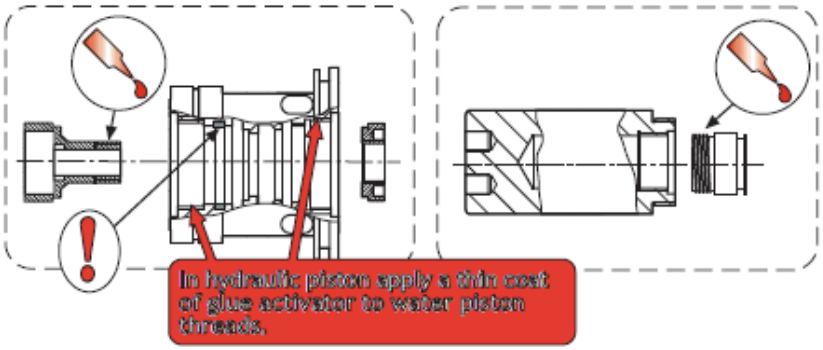
CLEAN ALL PARTS, CHANGE SEALS AND WORN COMPONENTS.

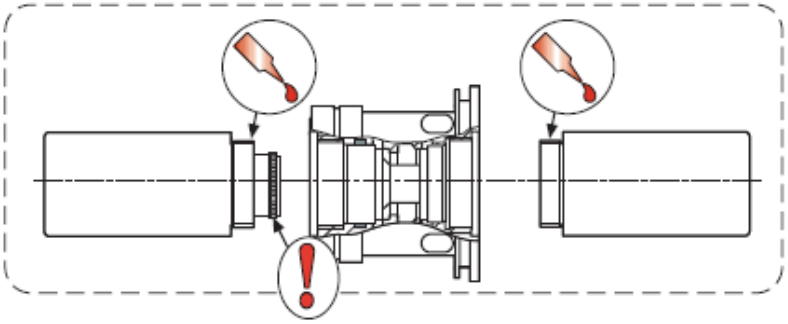
RE-ASSEMBLE THE PUMP IN OPPOSITE ORDER.

6. RE-ASSEMBLING THE PISTON UNIT

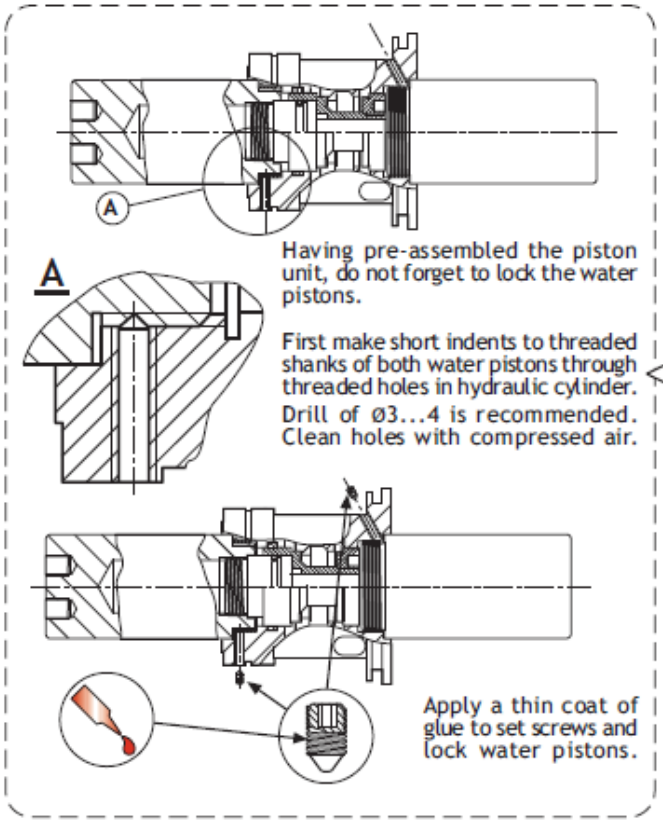
Assemble the hydraulic piston.
Refer to the previous page as well as to SPARE PART PAGES for your HPW-unit.

Thread joints in piston assembly should be locked with tightening glue approved to use in contact with hydraulic oil.





Apply a thin coat of glue to a thread. Ensure that the glue is spread uniformly.
Tighten joints with the appropriate tools by hand as tight as possible.



Having pre-assembled the piston unit, do not forget to lock the water pistons.

First make short indents to threaded shanks of both water pistons through threaded holes in hydraulic cylinder.
Drill of Ø3...4 is recommended.
Clean holes with compressed air.

Apply a thin coat of glue to set screws and lock water pistons.

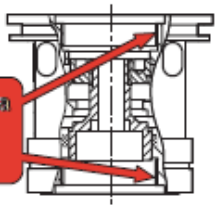
Allow the glue a sufficient time to cure, for example overnight.

6. RE-ASSEMBLING THE PISTON UNIT

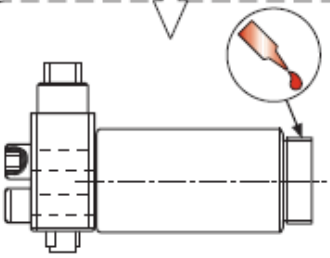
IF THE REVERSAL VALVE GUIDE SHOULD BE FASTENED WITH ALLEN SCREW :

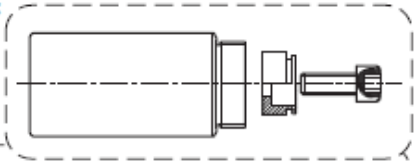
Assemble the hydraulic piston.
Refer to the previous page as well as to SPARE PART PAGES for your HPW-unit.

In hydraulic piston, apply a thin coat of glue activator to water piston threads.



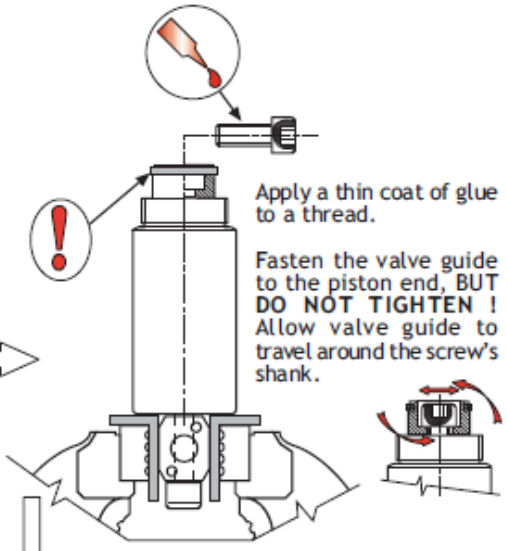
Attach the piston key to the water piston's end and apply a thin coat of glue to a thread. Ensure that the glue is spread uniformly.





Apply a thin coat of glue to a thread.

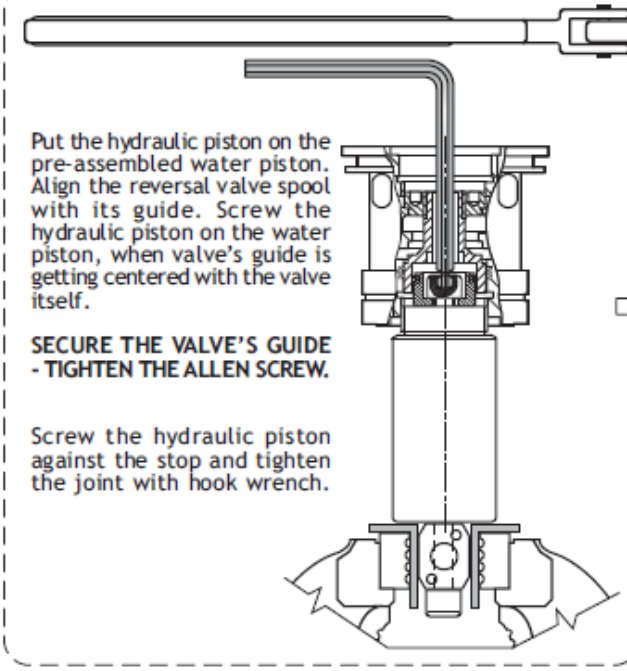
Fasten the valve guide to the piston end, BUT **DO NOT TIGHTEN !** Allow valve guide to travel around the screw's shank.



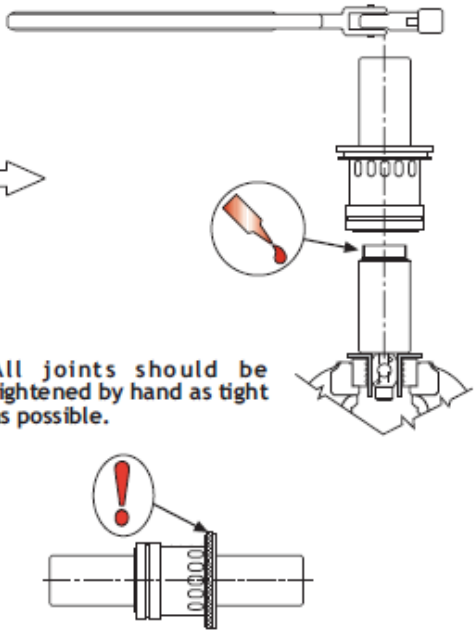
Put the hydraulic piston on the pre-assembled water piston. Align the reversal valve spool with its guide. Screw the hydraulic piston on the water piston, when valve's guide is getting centered with the valve itself.

SECURE THE VALVE'S GUIDE - TIGHTEN THE ALLEN SCREW.

Screw the hydraulic piston against the stop and tighten the joint with hook wrench.

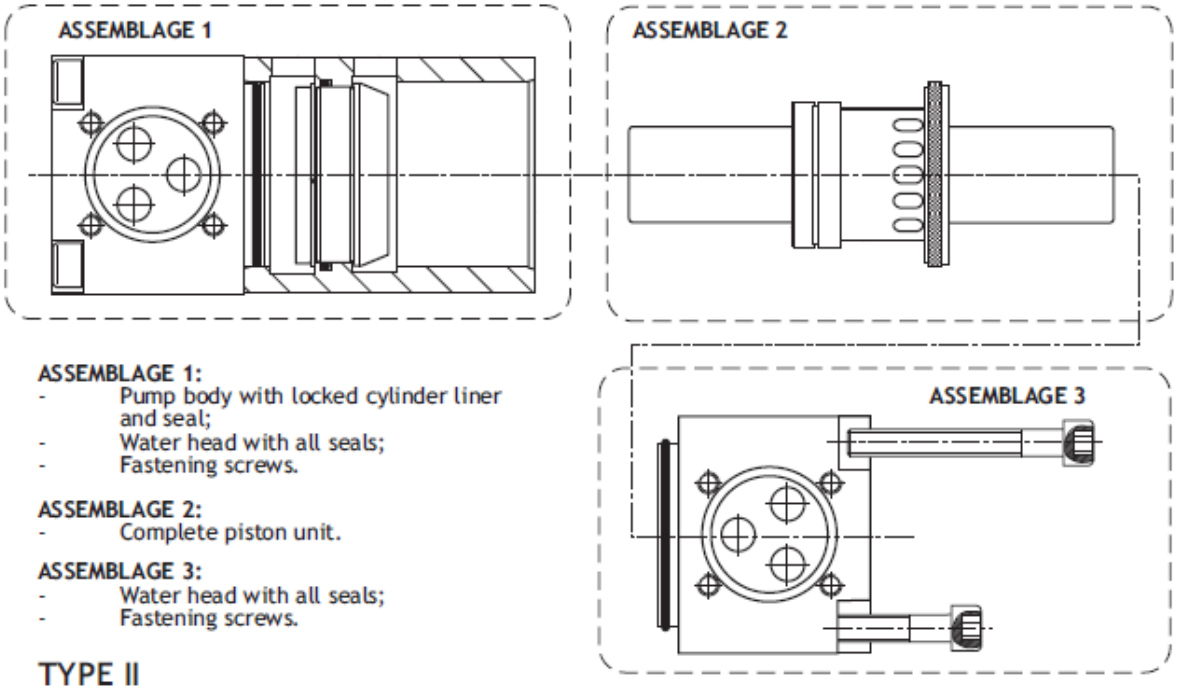


All joints should be tightened by hand as tight as possible.



7. RE-ASSEMBLING THE PUMP

TYPE I

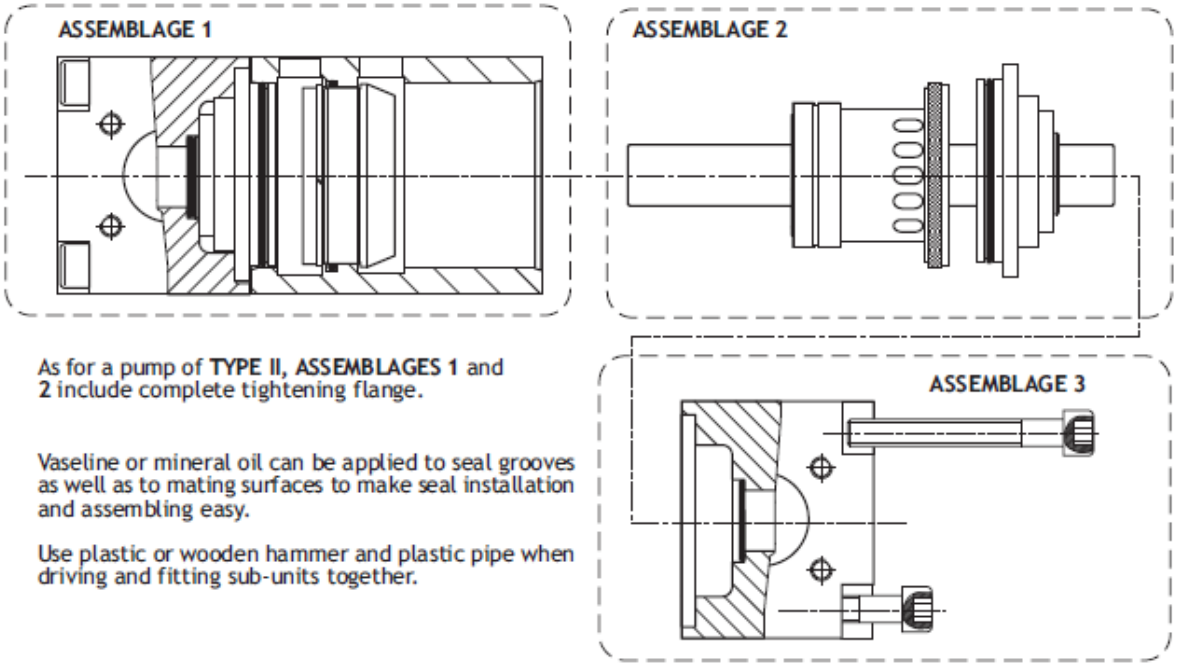


ASSEMBLAGE 1:
- Pump body with locked cylinder liner and seal;
- Water head with all seals;
- Fastening screws.

ASSEMBLAGE 2:
- Complete piston unit.

ASSEMBLAGE 3:
- Water head with all seals;
- Fastening screws.

TYPE II



As for a pump of **TYPE II, ASSEMBLAGES 1** and **2** include complete tightening flange.

Vaseline or mineral oil can be applied to seal grooves as well as to mating surfaces to make seal installation and assembling easy.

Use plastic or wooden hammer and plastic pipe when driving and fitting sub-units together.

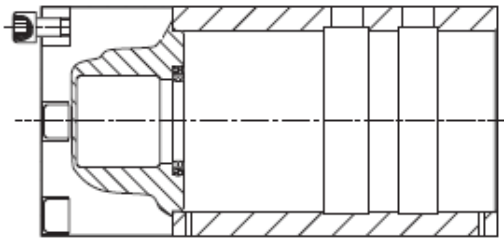
Assemble the water valves and insert them into annular groves in suction manifold and water heads in proper way (Ref. to pages 3 - 4). Attach water manifolds to the pump.
Finalise the pump assembly attaching P/T-block and other detached units and parts.

Test the pump prior to use.

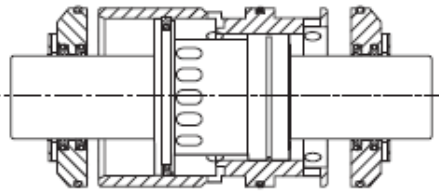
7. RE-ASSEMBLING THE PUMP

TYPE III

ASSEMBLAGE 1



ASSEMBLAGE 2

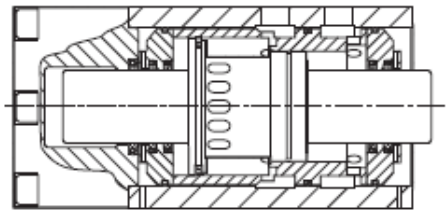


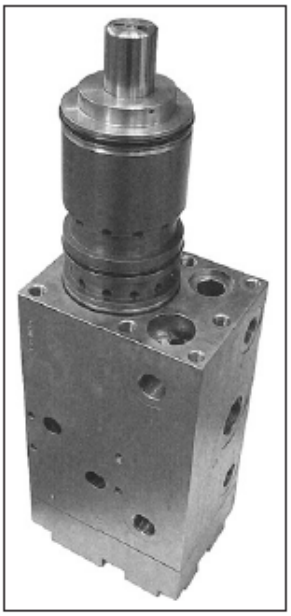
DO NOT FORGET TO INSTALL WATER VALVES IN ASSEMBLAGE 1 !

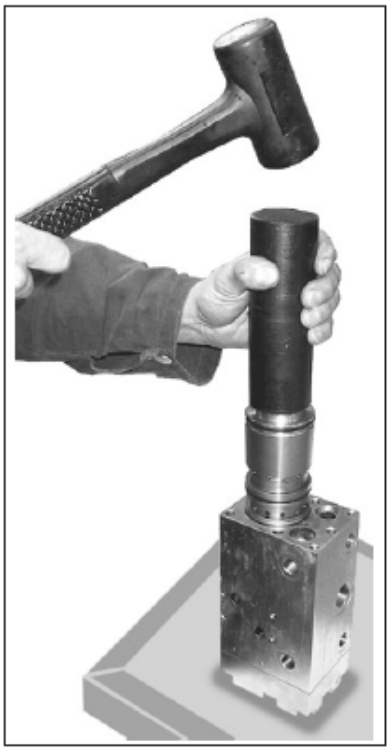
Vaseline or mineral oil can be applied to seal grooves to make seal installation easy.

Apply a thin coat of vaseline to mating surfaces and put the piston assembly with cylinder liner (ASSEMBLAGE 2) into a pump body (ASSEMBLAGE 1).

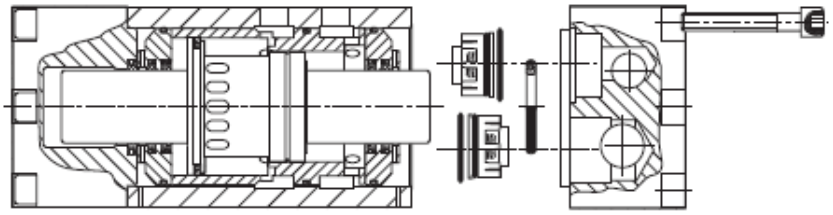
Drive the ASSEMBLAGE 2 against the stop with plastic or wooden hammer and plastic pipe.







After having installed remaining seals and water valves to the pump body and other water head, assemble the pump.



Finalise the pump assembly attaching P/T-block and other detached units and parts.

Test the pump priot to use.

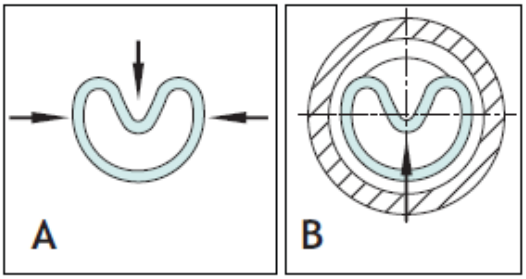
Alternatively, it is possible to assemble a pump of TYPE III broadly in a same way as TYPE II.

RECOMMENDED TIGHTENING GLUES			
MANUFACTURER	PRODUCT	ID	Notes
WÜRTH	saBesto	0893 545 XXX*)	upto 3/4"
LOCTITE	Loctite 542		
WEICONLOCK	AN 305-42		
*) retail package size			
TIGHTENING GLUE ACTIVATOR			
WEICONLOCK	ACTIVATOR F		

TIGHTENING TORQUES FOR BOLTS / SCREWS		
SIZE	STRENGTH CLASS	TIGHTENING TORQUE Nm
M6	8.8 12.9	8 16
M8	8.8 12.9	24 40
M10	8.8 12.9	35 75
M12	8.8 12.9	65 130
M14	8.8 12.9	90 220
M16	8.8 12.9	170 290

SEAL INSTALLATION IN CLOSED GROOVES

* Compress the seal into a kidney shape. Avoid making sharp bends on the seal - fig. A
* Place the seal ring in compressed form into the groove and push it by hand in the direction of the arrow - fig B.



ATTENTION !
WHEN CARRYING OUT ANY DISASSEMBLING, SERVICE OR REPAIR OF DYNASET-UNIT OR HYDRAULIC SYSTEM, ABSOLUTE CLEANLINESS MUST BE MAINTANED TO ENSURE RELIABLE AND TROUBLE-FREE OPERATION OF YOUR EQUIPMENT.

6.2. HYDRAULIC FLUIDS

Wide range of standard hydraulic fluids can be used with DYNASET hydraulic equipment. Depending on the operating temperature, following mineral hydraulic oils are recommended:

Mineral hydraulic oil	Operation temperature up to
ISO VG 32S	60 °C
ISO VG 46S	70 °C
ISO VG 68S	80 °C

Synthetic and bio-oils can also be used if their viscosity characteristics and lubricating efficiency are similar to the mineral oils.

Automatic transmission fluids and even engine oils can be used, provided that they are allowed to be used in hydraulic system of your base machine.

For the hydraulic fluid change interval follow the base machine's maintenance instructions.

To use special hydraulic fluids with DYNASET equipment, please contact the nearest DYNASET representative for more information.

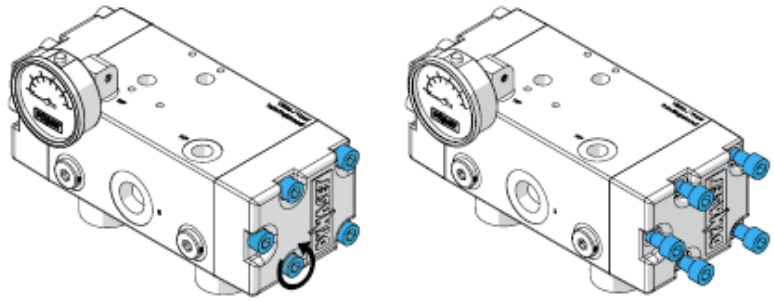
6.3. CLEANING THE HPW PUMP

⚠ ATTENTION!

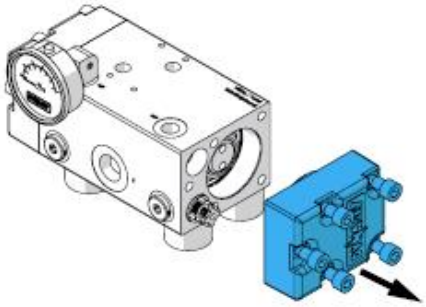
Keep the HPW pump clean to enable its safe and longlife operation. Check and clean your HPW pump after every work shift.

6.4. REPLACING WATER VALVES

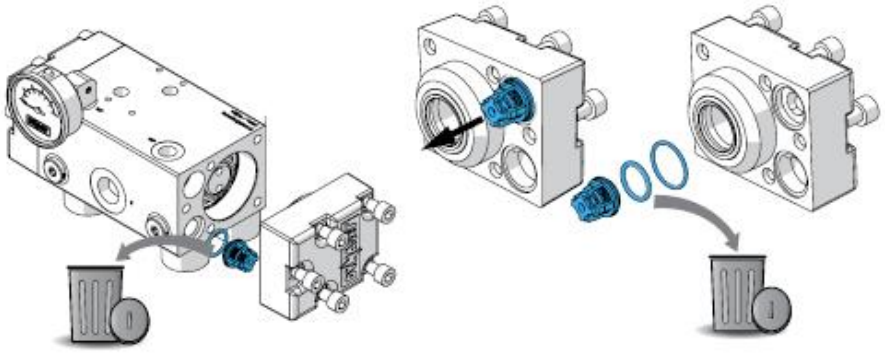
1. Remove screws from the head.



2. Pull out the head.

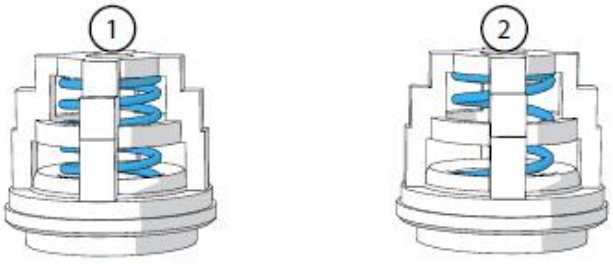


3. Remove water valves and O-rings.



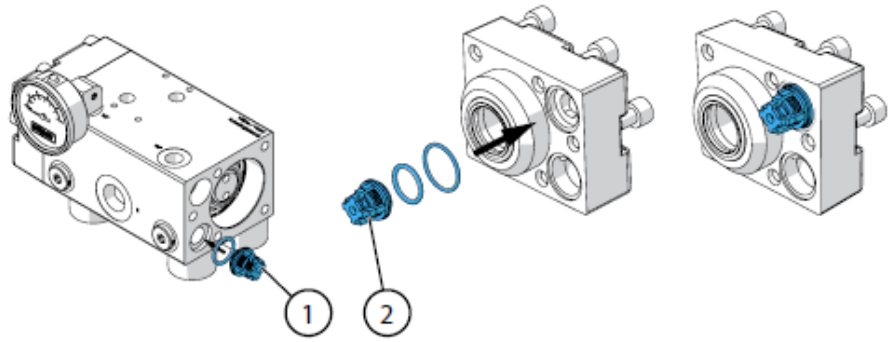
⚠ ATTENTION!

The pressure valve's spring has less turns than the suction valve's spring. Do not mix up the valves when re-assembling the pump!

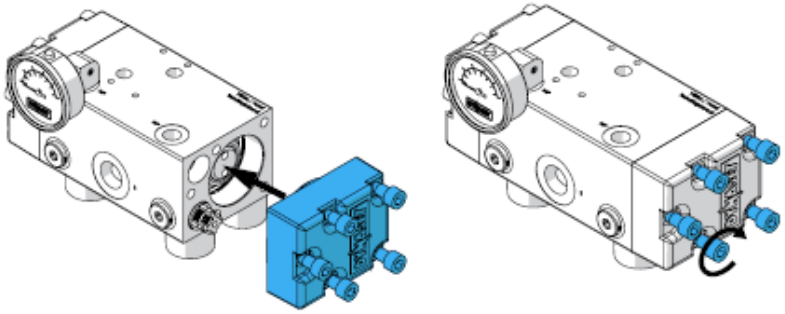


1. Suction valve
2. Pressure valve

4. Install new suction (1) and pressure (2) valves.



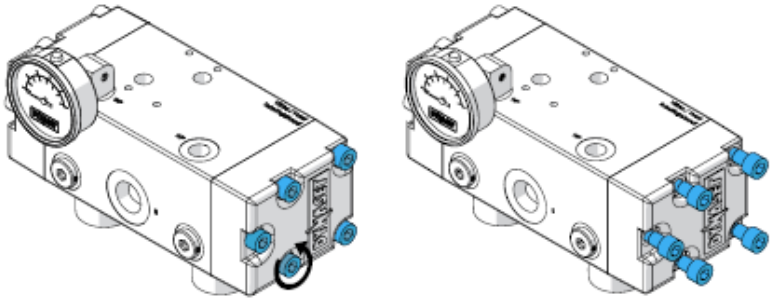
5. Install the head.



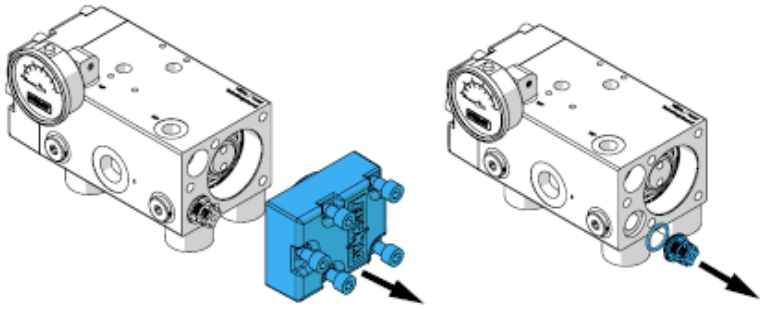
6. Repeat the operation to the other head.

6.5. REPLACING PUMP SEALS

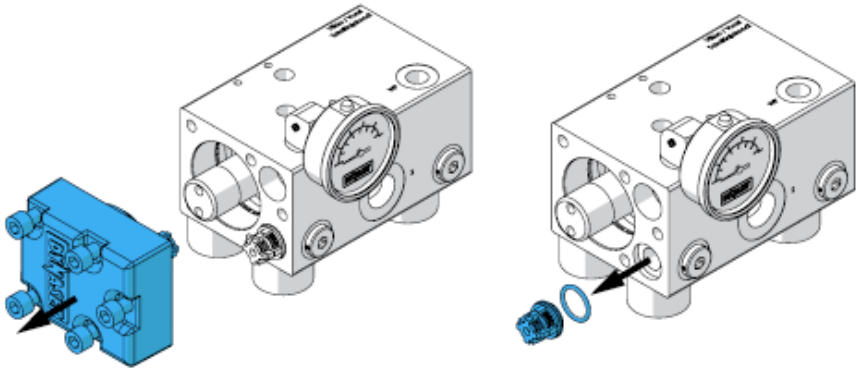
1. Remove screws from the head.



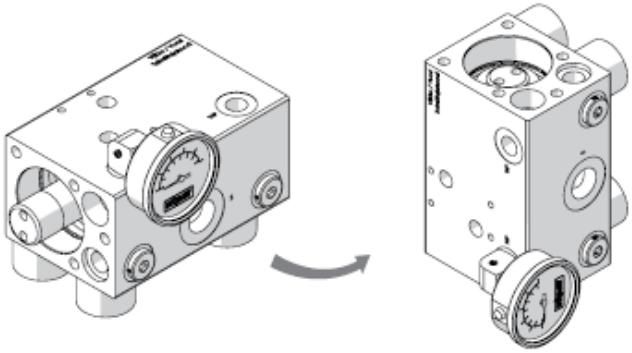
2. Pull out the head and remove water valves.



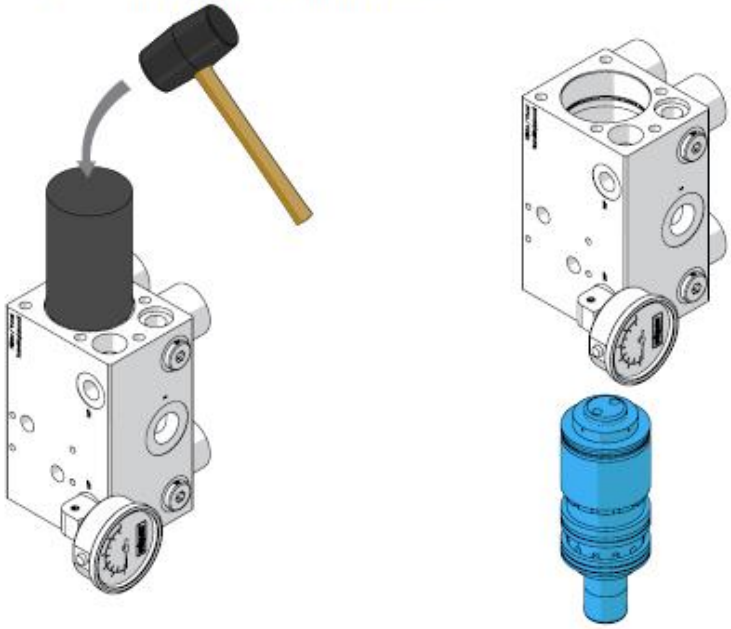
3. Remove the other head and water valves.



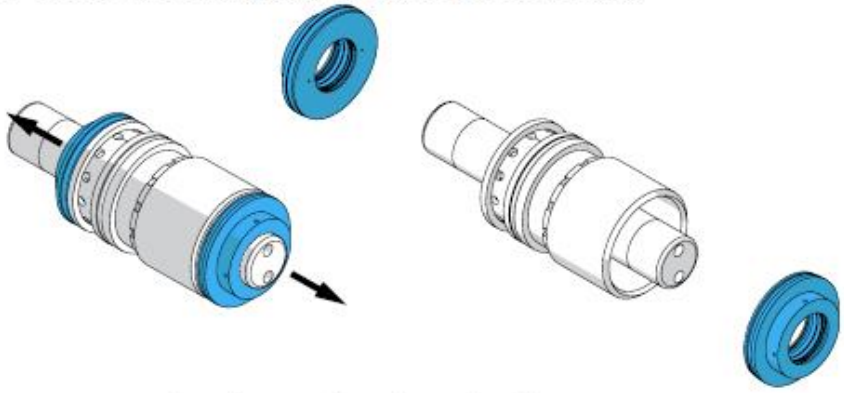
4. Turn the pump frame into a vertical position.



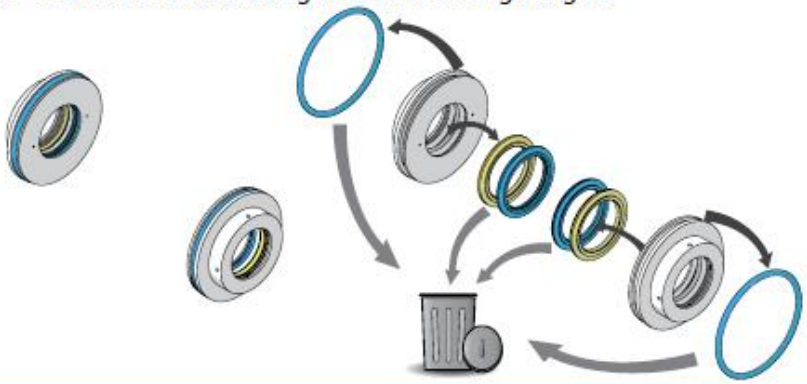
5. Use rubber hammer and special tool to remove piston assembly with cylinder and sealing flanges from the pump.



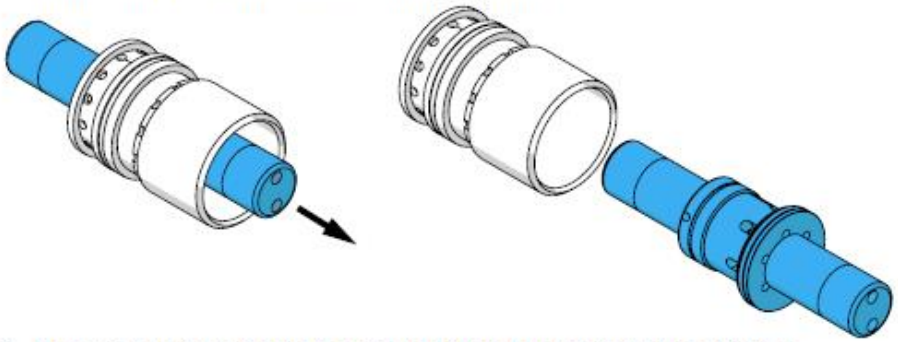
6. Remove the sealing flanges from the piston assembly.



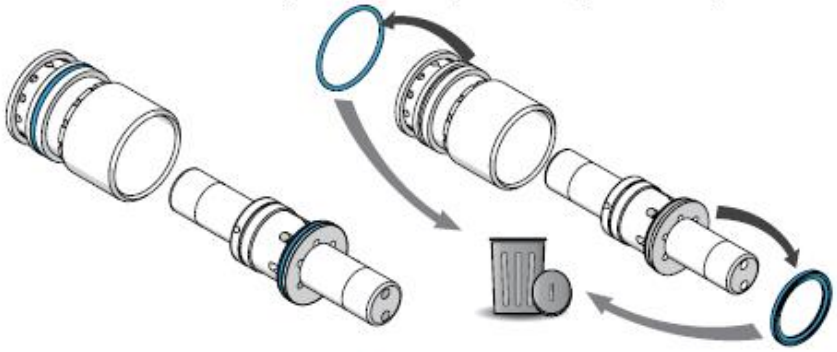
7. Remove seals and o-rings from the sealing flanges.



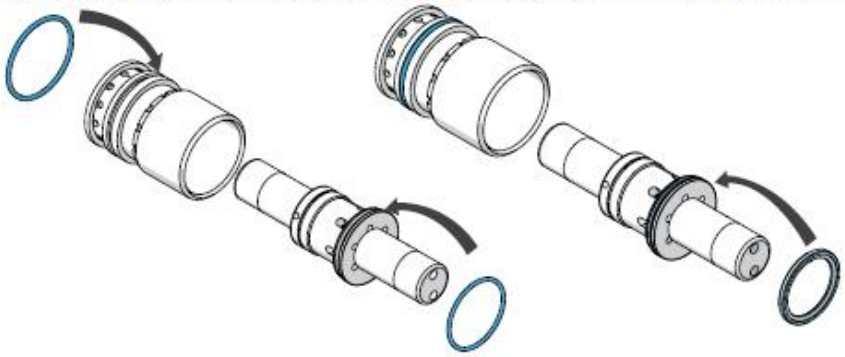
8. Remove the piston assembly from the cylinder.



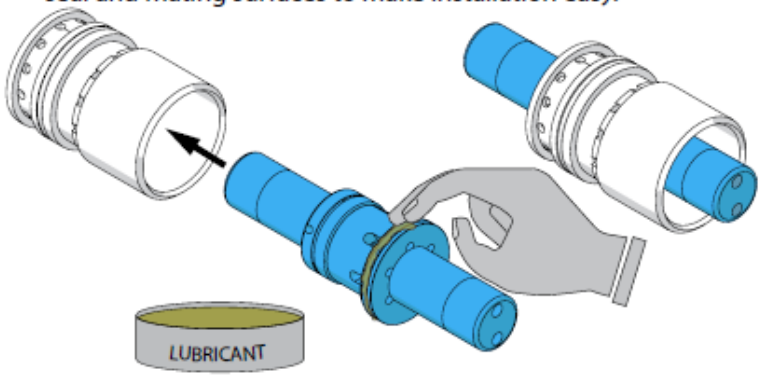
9. Remove seal from the piston assembly and o-ring from the cylinder.



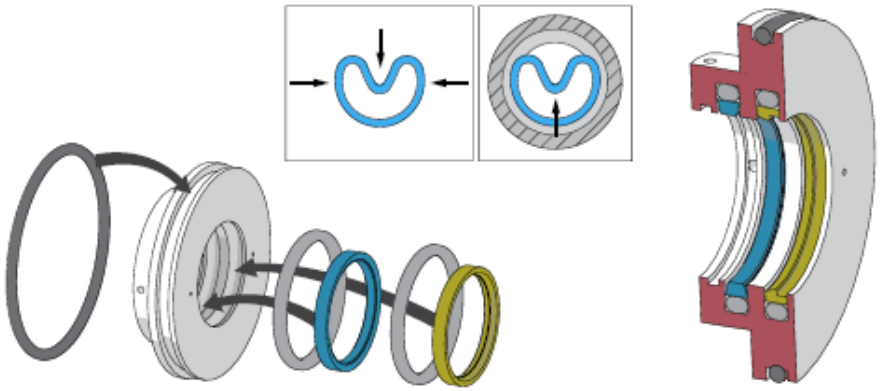
10. Install new o-ring to the cylinder, new o-ring and seal to the piston assembly.



11. Install the piston assembly to the cylinder. Use vaseline or mineral oil on the seal and mating surfaces to make installation easy.



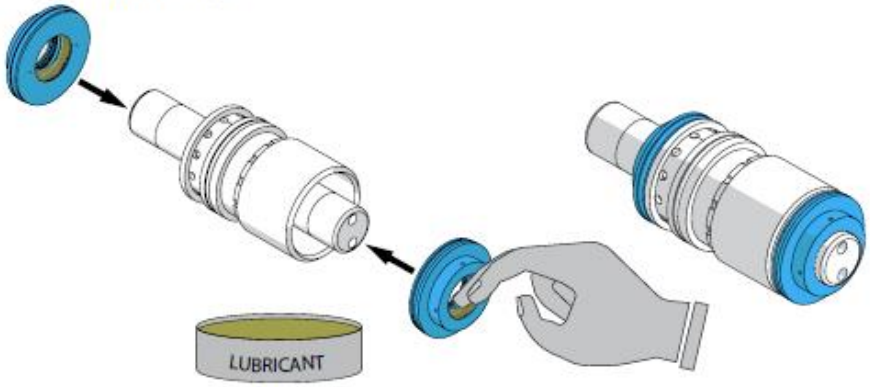
12. Install new o-rings and seals to the sealing flanges. First install o-rings and then the seals. Compress the seal into a kidney shape, place it into groove and push it back to normal shape. Avoid making sharp bends on the seal.



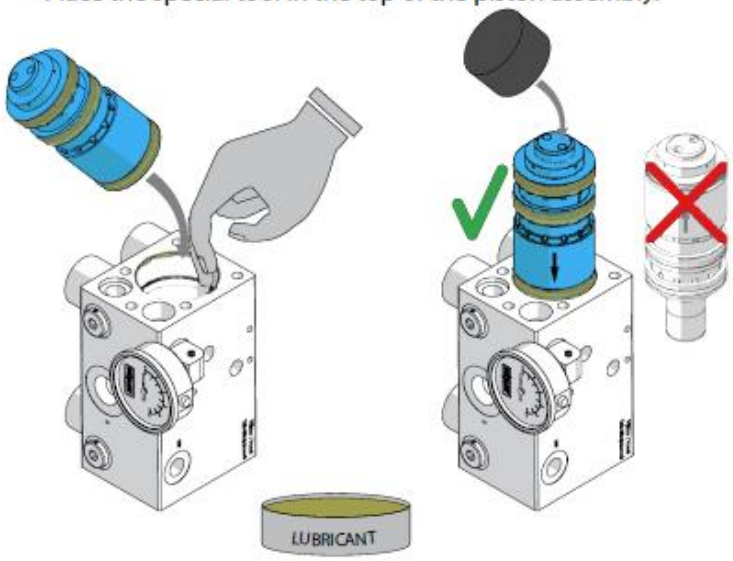
⚠ ATTENTION!

Seals of the sealing flange differs from each other, make sure that correct seal is installed into correct place.

13. Install sealing flanges into the piston assembly. Use lubricant to make the installation easy.



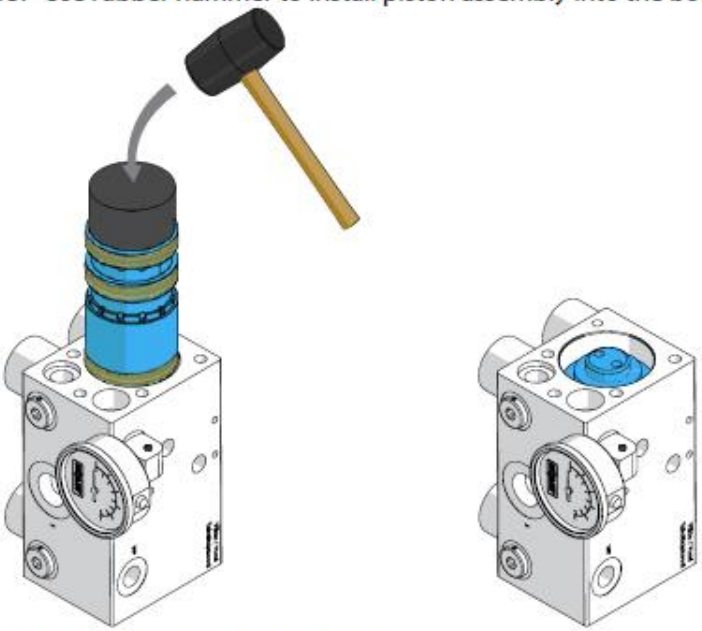
14. Lubricate mating surfaces of the piston assembly and insert it to the body. Place the special tool in the top of the piston assembly.



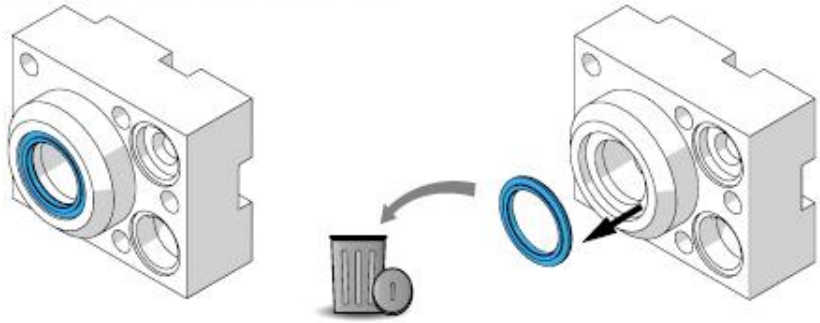
NOTE!

Make sure that the piston assembly is installed correctly.

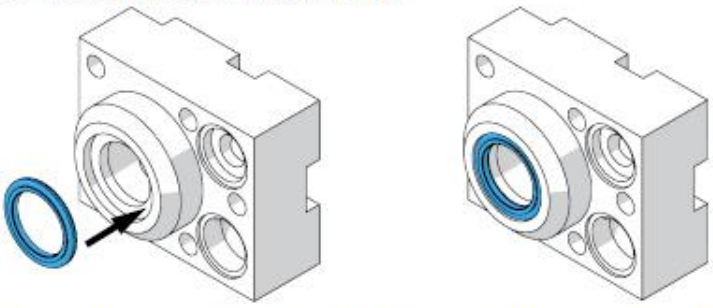
15. Use rubber hammer to install piston assembly into the body.



16. Remove seals from the heads.



17. Install new seals into the heads.

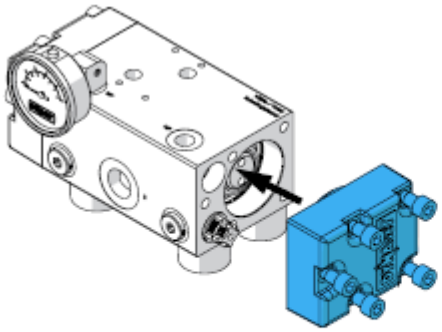


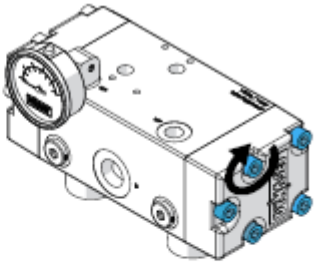
18. Install water valves. SEE CHAPTER "6.4. Replacing water valves".

NOTE!

DYNASET recommends replacing the water valves at the same time as the pump seals.

19. Install both heads into the body.





20. Test run the pump and make sure that there are no leakages.