

Pressure Booster System

Installation/Operating Manual

Hydro-Unit Economy Line

Hydro-Unit Economy Line VFD MMe Di



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Original operating manual Hydro-Unit Economy Line

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Glossary

Accumulator

The accumulator serves to compensate for pressure losses in the piping system downstream of the pressure booster system which may be caused by the consumption of small quantities of water. As a result, the frequency of starts of the pressure booster system is minimised.

Certificate of decontamination

A certificate of decontamination is enclosed by the customer when returning the product to the manufacturer to certify that the product has been properly drained to eliminate any environmental and health hazards arising from components in contact with the fluid handled.

Dry running protection

Dry running protection devices prevent the pump from being operated without the fluid to be handled, which would result in pump damage.

IE3

Efficiency class to IEC 60034-30: 3 = Premium Efficiency (IE = International Efficiency)

1 General

1.1 Principles

This operating manual is valid for the type series and variants indicated on the front cover.

The manual describes the proper and safe use of this equipment in all phases of operation.

The name plate indicates the type series, the main operating data and the serial number. The serial number uniquely describes the product and is used as identification in all further business processes.

In the event of damage, immediately contact your nearest DP Service centre to maintain the right to claim under warranty.

1.2 Installation of partly completed machinery

To install partly completed machinery supplied by DP refer to the sub-sections under Servicing/Maintenance.

1.3 Target group

This operating manual is aimed at the target group of trained and qualified specialist technical personnel. [⇒ Section 2.3, Page 8]


1.4 Other applicable documents

Table 1: Overview of other applicable documents

Document	Contents
Sub-supplier product literature	Operating manuals, logic diagram and other product literature of accessories and integrated machinery components







1.5 Symbols

Table 2: Symbols used in this manual

Symbol	Description
✓	Conditions which need to be fulfilled before proceeding with the step-by-step instructions
▷	Safety instructions
⇒	Result of an action
⇨	Cross-references
1.	Step-by-step instructions
2.	
	Note Recommendations and important information on how to handle the product

1.6 Key to safety symbols/markings

Table 3: Definition of safety symbols/markings

Symbol	Description
 DANGER	DANGER This signal word indicates a high-risk hazard which, if not avoided, will result in death or serious injury.
 WARNING	WARNING This signal word indicates a medium-risk hazard which, if not avoided, could result in death or serious injury.
 CAUTION	CAUTION This signal word indicates a hazard which, if not avoided, could result in damage to the machine and its functions.
	General hazard In conjunction with one of the signal words this symbol indicates a hazard which will or could result in death or serious injury.
	Electrical hazard In conjunction with one of the signal words this symbol indicates a hazard involving electrical voltage and identifies information about protection against electrical voltage.
	Machine damage In conjunction with the signal word CAUTION this symbol indicates a hazard for the machine and its functions.

2 Safety



DANGER

All the information contained in this section refers to hazardous situations.

In addition to the present general safety information the action-related safety information given in the other sections must be observed.

2.1 General

This operating manual contains general installation, operating and maintenance instructions that must be observed to ensure safe operation of the system and prevent personal injury and damage to property.

The safety information in all sections of this manual must be complied with.

The operating manual must be read and understood by the responsible specialist personnel/operators prior to installation and commissioning.

The contents of this operating manual must be available to the specialist personnel at the site at all times.

Information attached directly to the product must always be complied with and kept in a perfectly legible condition at all times. This applies to, for example:

- Arrow indicating the direction of rotation
- Markings for connections
- Name plate

The operator is responsible for ensuring compliance with all local regulations not taken into account in this operating manual.

2.2 Intended use

- The pressure booster system must only be operated within the operating limits described in the other applicable documents.
- Only operate pressure booster systems which are in perfect technical condition.
- Do not operate partially assembled pressure booster systems.
- The pressure booster system must only handle the fluids described in the product literature of the respective design variant.
- Never operate the pressure booster system without the fluid to be handled.
- Observe the information on minimum flow rates specified in the product literature (to prevent overheating, bearing damage, etc).
- Observe the maximum flow rates indicated in the data sheet or product literature (to prevent overheating, cavitation damage, bearing damage, etc).
- Do not throttle the flow rate on the suction side of the pressure booster system (to prevent cavitation damage).
- Consult the manufacturer about any other modes of operation not described in the product literature.

2.3 Personnel qualification and personnel training

All personnel involved must be fully qualified to install, operate, maintain and inspect the machinery this manual refers to.

The responsibilities, competence and supervision of all personnel involved in installation, operation, maintenance and inspection must be clearly defined by the operator.

Deficits in knowledge must be rectified by means of training and instruction provided by sufficiently trained specialist personnel. If required, the operator can commission the manufacturer/supplier to train the personnel.

Training on the pressure booster system must always be supervised by technical specialist personnel.

2.4 Consequences and risks caused by non-compliance with this manual

- Non-compliance with these operating instructions will lead to forfeiture of warranty cover and of any and all rights to claims for damages.
- Non-compliance can, for example, have the following consequences:
 - Hazards to persons due to electrical, thermal, mechanical and chemical effects and explosions
 - Failure of important product functions
 - Failure of prescribed maintenance and servicing practices
 - Hazard to the environment due to leakage of hazardous substances

2.5 Safety awareness

In addition to the safety information contained in this manual and the intended use, the following safety regulations shall be complied with:

- Accident prevention, health regulations and safety regulations
- Explosion protection regulations
- Safety regulations for handling hazardous substances
- Applicable standards, directives and laws

2.6 Safety information for the operator/user

- Fit protective equipment (e.g. contact guards) supplied by the operator for hot, cold or moving parts, and check that the equipment functions properly.
- Do not remove any protective equipment (e.g. contact guards) during operation.
- Eliminate all electrical hazards. (In this respect refer to the applicable national safety regulations and/or regulations issued by the local energy supply companies.)
- If shutting down the pump does not increase potential risk, fit an emergency-stop control device in the immediate vicinity of the pump (set) during pump set installation.

2.7 Safety information for maintenance, inspection and installation

- Modifications or alterations of the pressure booster system are only permitted with the manufacturer's prior consent.
- Use only original spare parts or parts authorised by the manufacturer. The use of other parts can invalidate any liability of the manufacturer for resulting damage.
- The operator ensures that maintenance, inspection and installation is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.
- Carry out work on the pressure booster system during standstill only.
- The pump casing must have cooled down to ambient temperature.
- Pump pressure must have been released and the pump must have been drained.
- When taking the pressure booster system out of service always adhere to the procedure described in the manual.
- Decontaminate pressure booster systems which handle fluids posing a health hazard.

-
- As soon as the work has been completed, re-install and/or re-activate any safety-relevant and protective devices. Before returning the product to service, observe all instructions on commissioning.
 - Make sure the pressure booster system cannot be accessed by unauthorised persons (e.g. children).
 - Prior to opening the device, pull the mains plug and wait for at least 10 minutes.

2.8 Unauthorised modes of operation

Always observe the limits stated in the product literature.

The warranty relating to the operating reliability and safety of the pressure booster system supplied is only valid if the equipment is used in accordance with its intended use.

[⇒ Section 2.2, Page 8]

3 Software changes

The software has been specially created for this product and thoroughly tested. Making changes or additions to the software or parts of the software is prohibited. This does not, however, apply to software updates supplied by DP.

4 Transport/Temporary Storage/Disposal

4.1 Checking the condition upon delivery

1. On transfer of goods, check each packaging unit for damage.
2. In the event of in-transit damage, assess the exact damage, document it and notify DP or the supplying dealer and the insurer about the damage in writing immediately.

4.2 Transport



NOTE

The pressure booster system is bolted to a pallet and wrapped in plastic film for shipping and temporary storage. All connecting points are capped.



DANGER

Pressure booster system tipping over

Danger to life from falling pressure booster system!

- Never suspend the pressure booster system by its power cable.
- Do not lift the pressure booster system by its manifold.
- Observe the applicable local accident prevention regulations.
- Observe the information on weights, centre of gravity and fastening points.
- Use suitable and permitted transport equipment, e.g. crane, forklift or pallet jack.

- ✓ The pressure booster system has been checked for in-transit damage.
1. Make sure the transport equipment is suitable for safely carrying the indicated load.
 2. Transport the pressure booster system to the place of installation.
 3. Attach the pressure booster system to the lifting tackle. Lift it off the pallet. Dispose of the pallet.
 4. Use suitable lifting equipment to lift the pressure booster system and carefully place it down at the place of installation.

4.3 Storage/preservation

If commissioning is to take place some time after delivery, the following measures are recommended when storing the pressure booster system:



CAUTION

Damage during storage due to frost, moisture, dirt, UV radiation or vermin

Corrosion/contamination of pressure booster system!

- Store the pressure booster system in a frost-proof room. Do not store outdoors.



CAUTION

Wet, contaminated or damaged openings and connections

Leakage or damage of the pressure booster system!

- Only open the openings of the pressure booster system at the time of installation.



NOTE

Rotate the shaft by hand every three months, e.g. via the motor fan.

Store the pressure booster system in a dry, protected room where the atmospheric humidity is as constant as possible.

4.4 Return to supplier

1. Drain the pressure booster system as per operating instructions.
2. Always flush and clean the pressure booster system, particularly if it has been used for handling noxious, explosive, hot or other hazardous fluids.
3. If the pressure booster system has handled fluids whose residues could lead to corrosion damage in the presence of atmospheric humidity or could ignite upon contact with oxygen, the pressure booster system must also be neutralised, and anhydrous inert gas must be blown through the pressure booster system to ensure drying.
4. Always complete and enclose a certificate of decontamination when returning the pressure booster system. [⇒ Section 13, Page 41]
Always indicate any safety and decontamination measures taken.

4.5 Disposal



WARNING

Fluids handled, consumables and supplies which are hot and/or pose a health hazard

Hazard to persons and the environment!

- Collect and properly dispose of flushing fluid and any fluid residues.
- Wear safety clothing and a protective mask if required.
- Observe all legal regulations on the disposal of fluids posing a health hazard.

1. Dismantle the pressure booster system.
Collect greases and other lubricants during dismantling.
2. Separate and sort the pump materials, e.g. by:
 - Metals
 - Plastics
 - Electronic waste
 - Greases and other lubricants
3. Dispose of materials in accordance with local regulations or in another controlled manner.

5 Description

5.1 General description

- Pressure booster system

5.2 Designation

Example: Economy line HU2 DPHM6/6 B VFD MMe Di

Table 4: Designation key

Code	Description
Economy line	Type series
HU2	Number of pumps
DPHM6	Pump size
6 B	Number of pump stages
VFD MMe Di	Design
	VFD MMe Di

5.3 Name plate

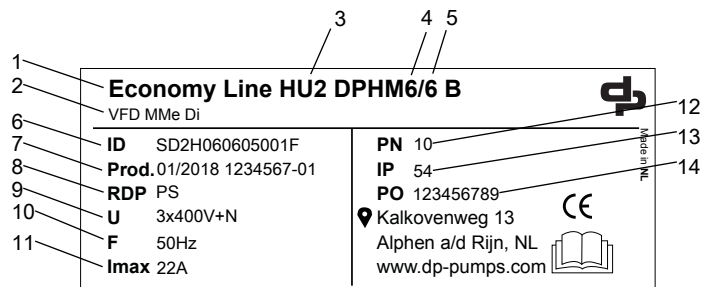


Fig. 1: Name plate (example)

1	Type series	8	Dry running protection
2	Design	9	Power supply voltage
3	Number of pumps	10	Power supply frequency
4	Size	11	Maximum current input
5	Number of stages	12	Maximum operating pressure
6	Serial number	13	Enclosure
7	Month of production / year of production, consecutive number	14	Order number

5.4 Design details

Design

- Fully automatic pressure booster package system
- Either 1 or 2 horizontal centrifugal pumps with frequency inverters
- Baseplate-mounted
- Membrane-type accumulator (direct-flow) to DIN 4807-5 on the discharge side, approved for drinking water, with shut-off element and drain valve.
- 1.5-metre power cable with shockproof plug (single-pump system)
- Check valve per pump
- Shut-off element upstream and downstream of each pump (two-pump system)
- Pressure gauge

Installation

- Stationary dry installation

Drive

- Three-phase motor
- To IEC 60034-7
- Efficiency class IE3 to IEC 60034-30 (for three-phase motors ≥ 0.75 kW)
- Frequency 50 Hz/60 Hz (pump frequency = 50 Hz)
- Enclosure IP55

Automation

- Frequency inverter for speed control, IP55, for pressure-controlled starting and stopping
- Function/fault indicated
- Setting the pressure via buttons or via bluetooth using an app
- Dry running protection

5.5 Configuration and function



Fig. 2: Configuration

1	Fuse box
2	Check valves
3	Frequency inverter
4	Baseplate
5	Accumulator
6	Connections
7	Pump

Design The fully automatic pressure booster system pumps the fluid to the consumer installations in the set pressure range using one or two non-self-priming horizontal high-pressure pumps (7).

Function Automatic mode One or more pumps (2) are controlled and monitored by motor-mounted frequency inverters. As the demand increases or decreases, pumps are started and stopped automatically. As soon as the demand increases again after one pump has been stopped, another pump which has not been in operation before is started up. The stand-by pump is also included in the alternating cycle.¹⁾ The standard setting is for the pressure booster system to start automatically as a function of pressure; the actual pressure is measured by an analog pressure measuring device (pressure transmitter).

As long as the pressure booster system is in operation, the pumps are started and stopped as a function of demand (standard setting). In this way it is ensured that the individual pumps operate only in line with actual demand. The use of variable speed pumps reduces wear as well as the frequency of pump starts in parallel operation. If a duty pump fails, the next pump is started up immediately. A fault is output, which can be

1) Multiple pump systems only

reported via volt-free contacts (e.g. to the control station).
 If the demand drops towards 0, the pressure booster system slowly runs down to the stop point and stops.

As standard, one of the pumps is on stand-by. The control system defines each of the pumps as stand-by pump in alternation. This prevents stagnation of water in any of the pumps.

The pressure booster system is designed with dry running protection.

**Function
Manual mode**

In manual mode, a minimum flow is required to protect the pump against overheating.

5.6 Noise characteristics

For the noise level of the individual pumps please refer to the pump's operating instructions.

5.7 Scope of supply

The following items are included in the scope of supply:

Pressure booster system

- Either 1 or 2 horizontal centrifugal pumps
- Check valve per pump
- Membrane-type direct-flow accumulator on the discharge side
- Integrated dry running protection

Control cabinet

- Single-phase frequency inverter, motor-mounted

5.8 Dimensions and weight

For dimensions and weights please refer to the type series booklet of the pump (set).

5.9 Terminal diagram

For the terminal assignment refer to the circuit diagram.²⁾

5.10 Potential equalisation



Fig. 3: Earth symbol

A terminal marked with the earth symbol is provided on the baseplate for connecting a PE conductor.³⁾

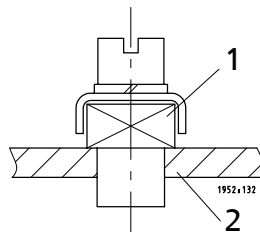


Fig. 4: PE connection

1	Earthing terminal	2	Baseplate
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2) Multiple pump systems only

3) Multiple pump systems only

6 Installation at Site

6.1 Installation

Install pressure booster systems either in the technical equipment room or in a well-ventilated, frost-free, lockable room used for no other purpose. No harmful gases are allowed to enter the installation room. An adequately sized drain (leading to a sewer or equivalent) must be provided.

The pressure booster system is designed for a maximum ambient temperature of 0 °C to +40 °C at a relative humidity of 50 %.



NOTE

Do not install pressure booster systems next to sleeping or living quarters.



NOTE

The installation room must provide for suitable drainage.

If expansion joints (see accessories) are used for damping vibrations, their fatigue strength (endurance limit) must be given due consideration. Expansion joints must be installed to allow quick and easy replacement.

6.2 Checks to be carried out prior to installation

Place of installation



WARNING

Installation on mounting surface which is unsecured and cannot support the load

Personal injury and damage to property!

- Use a concrete of compressive strength class C12/15 which meets the requirements of exposure class XC1 to EN 206-1.
- The mounting surface must be set, flat, and level.
- Observe the weights indicated.



NOTE

The anti-vibration mounts of the pressure booster system provide adequate insulation against solid-borne noise. Thanks to level-adjustable feet (KSB accessory) the pressure booster system can also be installed in a horizontal position on uneven floors.

1. Check the structural requirements.
All structural work required must have been prepared in accordance with the dimensions stated in the outline drawing.

6.3 Installing the pressure booster system



WARNING

Top-heavy pressure booster system

Risk of personal injury by pressure booster system tipping over!

- Pressure booster systems awaiting final installation must be secured against tipping over.
- Firmly anchor the pressure booster system.

Remove all packaging before installing the pressure booster system. Connect the pressure booster system's inlet line and discharge line to the corresponding site distribution lines.



NOTE

In order to avoid transmission of piping forces onto the pressure booster system and transmission of solid-borne noise, we recommend installing length-limited expansion joints.

Allow sufficient space for maintenance and repair work.

- ✓ All structural work required has been checked.
 - ✓ The dimensions of the concrete foundation are correct, and the concrete has set firmly.
1. Mark out the anchoring holes on the floor as shown in the outline drawing.
 2. Drill the holes (max. diameter: 12 mm).
 3. Insert plug fixings of appropriate size.
 4. Set the pressure booster system down in its correct installation position.
 5. Use suitable bolts to firmly anchor the pressure booster system.

6.4 Installing the piping

Make sure that piping is installed without transmitting any stresses or strains. The use of length-limited expansion joints (see accessories) is recommended.

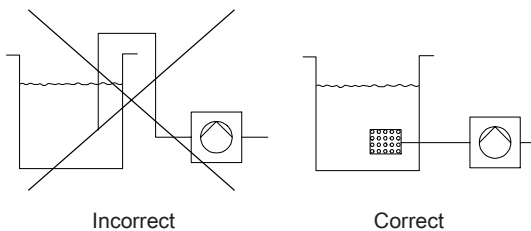


CAUTION

Air pockets in suction line

Pressure booster system cannot prime!

- Lay piping with a continuously rising slope (as shown).



Incorrect

Correct



NOTE

For single-pump systems, the shut-off valves must be fitted directly at the system's suction-side connection and discharge-side connection, respectively. This will enable straightforward replacement and servicing.

6.4.1 Fitting an expansion joint



⚠ DANGER

Sparks and radiant heat

Fire hazard!

- Take suitable precautions to protect the expansion joint if any welding work is carried out nearby.



CAUTION

Wet, contaminated or damaged openings and connections

Damage to the pressure booster system!

- Do not open the pressure booster system openings until just prior to installation.

- ✓ The expansion joint has a length limiter with solid-borne sound insulation so as to be able to absorb reaction forces.
1. Install the expansion joint in the piping free of twist or distortion. Never use the expansion joint to compensate for misalignment or mismatch of the piping.
 2. Tighten the bolts evenly and crosswise during assembly. The ends of the bolts must not protrude from the flange.
 3. Do not apply paint to the expansion joint. Protect it from any contact with oil.
 4. The position of the expansion joint within the pressure booster system must allow easy access and inspection and it must, therefore, not be insulated along with the piping.
 5. Expansion joints are subject to wear.

6.5 Installing unpressurised inlet tanks

Installation and location of an unpressurised inlet tank together with the pressure booster system are governed by the same rules applicable to the pressure booster system.

Install the closed tank (under atmospheric pressure) available from us as an accessory as described in the installation instructions supplied with the tank.



CAUTION

Contamination in the pressure booster system

Damage to the pumps!

- Clean the tank before filling it.

The tank must be connected mechanically and electrically to the pressure booster system prior to commissioning of the system.

6.6 Electrical connection



⚠ WARNING

Incorrect connection to the mains

Damage to the mains network, short circuit!

- Observe the technical specifications of the local energy supply companies.

Connection to power supply of the single-pump systems is effected by means of a 230 V plug in accordance with VDE 0100.

Site-supplied fusing: 16 A (max.)

Connection to power supply of the dual-pump systems is effected at the master switch by connecting L1, L2 and N, both for 3~400 V+N and 1~230 V.

Site-supplied fusing: 32 A (max.)



NOTE

In individual cases, an earth leakage circuit breaker may trip when the pressure booster system is first commissioned. This may be caused by total discharge of the intermediate circuit.

6.6.1 Sizing the power cable

The cross-section of the power cable must be sized for the total rated power requirement.

6.6.2 Connecting the external dry running protection device (optional)

- ✓ An M12 plug is included in the scope of supply (the pressure booster system has a connection for an external, operator-supplied dry running protection device.)



NOTE

Pressure booster system does not start up

If the pressure booster system is equipped with a connection for an external dry running protection device, an external, operator-supplied dry running protection device must be connected. When the external dry running protection device (e.g. float switch) is not connected, the pressure booster system will not start.

1. Connect the cores of the external dry running protection device at pin 2 and pin 4 of the M12 plug. The contact must be a normally closed contact.

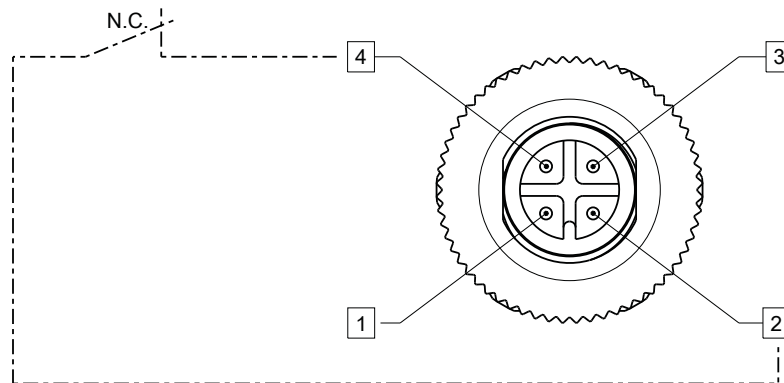


Fig. 5: Connecting the external dry running protection equipment

Table 5: Pin assignment of the M12 plug

Pos.	Status	Function
1	Not used	-
2	Normally closed contact	Connected to DI1
3	Not used	-
4	Normally closed contact	Connected to GND

7 Commissioning/Start-up/Shutdown

7.1 Commissioning/Start-up

7.1.1 Prerequisites for commissioning/start-up

Before commissioning/start-up of the pressure booster system make sure that the following requirements are met:

- The pressure booster system has been properly connected to the electric power supply and is equipped with all protection devices.
- All relevant VDE standards and/or regulations applicable in the country of use are complied with.



NOTE

The competent authorities must be informed in due time prior to commissioning/test running the system.

7.1.2 Commissioning/start-up of pressure booster system



CAUTION

Foreign matter in the piping

Damage to the pump/pressure booster system!

- Before commissioning/starting (or even test running) the pressure booster system, make sure that there is no foreign matter in the pressure booster system or piping.



NOTE

Commissioning of the pressure booster system - even test running - shall only be carried out in full compliance with all pertinent VDE (German Association of Electrical Engineers) regulations.



NOTE

In individual cases, an earth leakage circuit breaker may trip when the pressure booster system is first commissioned. This is caused by total discharge of the intermediate circuit.

- ✓ The pipe unions between the pump and the piping have been re-tightened.
 - ✓ The cooling air inlet and outlet openings on the motor are unobstructed.
 - ✓ All shut-off valves of the pressure booster system are open.
 - ✓ The pre-charge pressure of the membrane-type accumulator has been checked. [⇒ Section 9.2.3, Page 29]
1. Open or loosen the vent plugs on the pump (refer to the pump's installation/operating manual).
 2. Slowly open the inlet-side shut-off element and prime the pressure booster system until the fluid to be handled escapes through all vent holes.
 3. Insert and slightly tighten the pump vent plugs.
 4. Plug in the mains plug or set the master switch to I.
 5. Close the discharge-side shut-off element slowly and check whether the pressure booster system stops.
 6. Run the pump again, with the discharge-side shut-off element open, and loosen the vent plug to let any remaining air escape.

7. Then re-tighten the vent plug firmly.
8. Verify that the pump is running smoothly.
9. Close the discharge-side shut-off element in order to verify whether the pump reaches its maximum shut-off head.
10. Make sure that the dry running protection device is working properly.



NOTE

Minor leakage of the mechanical seals during commissioning is normal and will cease after a short period of operation.

7.2 Switching on the pressure booster system

Plug in the mains plug or set the master switch to I to energise the pump.
Readiness for operation is signalled by a permanently lit red LED and a flashing green LED.

7.3 Checklist for commissioning/start-up

Table 6: Checklist

Actions	Done	
1	Read the operating instructions.	
2	Check power supply and compare against the name plate data.	
3	Check the earthing system (by measuring).	
4	Check the mechanical connection to the water mains. Re-tighten the flange bolting and pipe unions.	
5	Prime and vent the pressure booster system from the inlet side.	
6	Check inlet pressure.	
7	Check the start-up pressure, re-adjust if necessary.	
8	Test the proper function of the lack-of-water and dry running protection equipment.	
9	Vent the pump for a second time after it has been running for 5 to 10 minutes.	
10	Check the pre-charge pressure.	
11	Record all system conditions that do not correspond to our specifications or to the purchase order in the commissioning report (i.e. inlet pressure + max. pressure of pressure booster system higher than 16 bar).	
12	Complete the commissioning report together with the operator/user and instruct the operator/user as to the function of the unit.	

7.4 Shutdown



NOTE

As long as the pressure booster system is out of operation, water is supplied directly at p_{inl} through the pressure booster system.

The pressure booster system remains installed

- ✓ Sufficient fluid handled is supplied for the operation check run of the pressure booster system.
- 1. Pull the mains plug or set the master switch to 0.



DANGER

Voltage at the pressure booster system

Danger to life!

- Prior to opening the device, wait at least 10 minutes for any residual voltage to dissipate.

- 2. Start up the pressure booster system regularly between once a month and once every three months for approximately five minutes during prolonged shutdown periods. This will prevent the formation of deposits within the pump and the pump intake area.

The pressure booster system is removed from the pipe and stored

- ✓ The pressure booster system has been properly drained.
- 1. Spray-coat the inside wall of the pump casings, and in particular the impeller clearance areas, with a preservative.
- 2. Spray the preservative through the suction and discharge nozzles. It is advisable to then close the pump nozzles (e.g. with plastic caps or similar).
- 3. Oil or grease all exposed machined parts and surfaces of the pressure booster system to protect them against corrosion.

8 Operating the Pressure Booster System



CAUTION

Incorrect operation

Water supply is not assured!

- Make sure to comply with all local regulations, particularly the EC Machinery Directive and the EC Directive on Low-Voltage Equipment.

8.1 Design of the frequency inverter

The frequency inverter is motor-mounted and self-cooling. Its display and control panel feature the following:

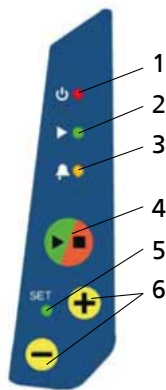


Fig. 6: Economy Line display and control panel

1	Red LED indicating stand-by The red stand-by LED is lit when the motor is energised.
2	Green LED indicating the operating status The green operating status LED flashes at different frequencies. The closer the measured pressure to the set pressure, the higher the flashing frequency.
3	Yellow alarm LED
4	The start/stop button serves to start up the pump.
5	Green SET LED The green SET LED starts flashing when the pressure booster system is ready for constant-pressure mode.
6	+/- buttons for setting the pressure +/- buttons for adjusting the motor speed in manual mode

8.2 Pressure booster systems with configured frequency inverter drives

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Drives supplied as part of the pressure booster system are already configured for operation. The information on default settings is provided for information only; it is only required if the drive needs replacing.

Table 7: Nastec Mida VFD technical data

Model	V _{In}	Max. V _{Out}	Max. I _{In}	Max. I _{Out}	Motor rating P ₂
	[VAC]	[V]	[A]	[A]	[kW]
MIDA 203	1~230 +/- 15 %	3~230	5	3	0,55
MIDA 205	1~230 +/- 15 %	3~230	8	5	1,1
MIDA 207	1~230 +/- 15 %	3~230	11	7,5	2,0



8.3 Programming

The red stand-by LED (1) lights up when the pressure booster system is energised.

The green SET LED (5) starts flashing to indicate that the system is ready for operation.

Press the Start/Stop button to start the pump. The green operating status LED (2) starts flashing at different frequencies. The closer the measured pressure to the set pressure, the higher the flashing frequency.

When the set value is reached, the green operating status LED (2) is lit continuously.

To stop the pump press the Start/Stop button (4). The green operating status LED (2) extinguishes.

Adjusting the pressure

A pressure gauge is fitted in the discharge line. Slightly opening one of the consumer installations facilitates pressure adjustment.

Adjusting the pressure

- Start up the pump (press the Start/Stop button).
- If the Set LED (5) flashes, press the Plus button or Minus button until the Set LED lights up continuously.
- Set the pressure by pressing the Plus button or Minus button as required.

Manual mode – Starting the pump at fixed speed

A disconnected or damaged pressure sensor causes the corresponding alarm to be triggered. [⇒ Section 10, Page 36] The pump can be started up manually at fixed speed by pressing the Start/Stop button for a minimum of 5 seconds. The pump starts at a frequency of at least 20 Hz. Press the Plus button or Minus button to adjust the frequency. If the SET LED is not lit, press the Plus button or Minus button continuously until the SET LED lights up.

9 Servicing/Maintenance

9.1 General information/Safety regulations

The operator ensures that maintenance, inspection and installation is performed by authorised, qualified specialist personnel who are thoroughly familiar with the manual.



⚠ DANGER

Unintentional start-up of pressure booster system

Danger to life!

- The pressure booster system must be de-energised before repair or maintenance work is carried out.



⚠ DANGER

Voltage at the pressure booster system

Danger to life!

- Prior to opening the device, wait at least 10 minutes for any residual voltage to dissipate.



⚠ WARNING

Improper lifting/moving of heavy assemblies or components

Personal injury and damage to property!

- Use suitable transport devices, lifting equipment and lifting tackle to move heavy assemblies or components.



⚠ WARNING

Unintentional start-up of pressure booster system

Risk of injury by moving parts!

- Make sure the pressure booster system has been de-energised before commencing work on the pressure booster system.
- Make sure that the pressure booster system cannot be started up unintentionally.



⚠ WARNING

Unqualified personnel performing work on the pressure booster system

Risk of personal injury!

- Always have repair and maintenance work performed by specially trained, qualified personnel.



CAUTION

Incorrectly serviced pressure booster system

Function of pressure booster system not guaranteed!

- Regularly service the pressure booster system.
- Prepare a maintenance schedule for the pressure booster system, with special emphasis on lubricants, shaft seals and pump couplings.

Always observe the safety instructions and information.

Observe the operating manual of the pump when performing work on the pumps.

In case of damage you can always contact our service staff.

A regular maintenance schedule will help avoid expensive repairs and contribute to trouble-free, reliable operation of the pressure booster system with a minimum of maintenance expenditure and work.

Never use force when dismantling and re-assembling the pressure booster system.

9.2 Servicing/Inspection

9.2.1 Supervision of operation



CAUTION

Increased wear due to dry running

Damage to the pump set!

- Never operate the pump set without liquid fill.
- Never close the shut-off element in the suction line and/or supply line during pump operation.



CAUTION

Impermissibly high temperature of fluid handled

Damage to the pump!

- Prolonged operation against a closed shut-off element is not permitted (heating up of the fluid).
- Observe the temperature limits in the data sheet and in the section on operating limits.

While the system is in operation, observe and check the following:

- Verify the start-up pressure of the pumps (at the pressure gauge).
- Compare the pre-charge pressure of the accumulator with the recommended data.
[⇒ Section 9.2.3, Page 29]
Close the shut-off elements under the accumulator and drain the accumulator via the drain valve.
Remove the protective cap of the accumulator valve and check the pre-charge pressure with the aid of a tyre pressure gauge.
Add nitrogen as necessary.



WARNING

Wrong gas

Danger of poisoning!

- Use only nitrogen to charge the accumulator.

- Check the rolling element bearings for running noises.
Vibrations, noise and an increase in current input occurring during unchanged operating conditions indicate wear.
- Check the correct functioning of any auxiliary connections.

9.2.2 Checklist for inspection

In the event that you decide to conduct your own inspections, proceed according to the following checklist at least once a year:

1. Check the pump and drive for smooth running and the mechanical seal for integrity.
2. Check the shut-off, drain and check valves for proper functioning and tightness.
3. Clean the strainer in the pressure reducer (if applicable).
4. Check expansion joints for wear (if applicable).

5. Verify the pre-charge pressure level and check the accumulator for integrity if required. [⇒ Section 9.2.3, Page 29]
6. Check the automatic switching functionality.
7. Check the start and stop points of the pressure booster system.
8. Check the water inflow, inlet pressure, lack-of-water monitoring, flow monitoring and pressure reducer.
9. Check the inlet tank and the float valve (if applicable). Check the overflow for integrity and cleanliness.

9.2.3 Setting the pre-charge pressure



WARNING

Wrong gas

Danger of poisoning!

- Use only nitrogen to charge the accumulator.

The pre-charge pressure in the accumulator should be set to a value below the set start-up pressure.

The setting can be effected via a valve located under the cover at the top of the accumulator.

Example: Pre-charge pressure 10 % lower than start-up pressure

Pre-charge pressure of accumulator $p = 0.9 \times p_{\text{start}}$
 p_{start} = start-up pressure of pressure booster system

Recommendation

The stated values are average values. Tests on accumulators have shown that the best storage volumes are achieved with the following factors:

pressures >3 bar: factor 0.9 and

pressures <3 bar: factor 0.8

Example:

$p_{\text{start}} = 5$ bar: pre-charge pressure $5 \times 0.9 = 4.5$ bar

$p_{\text{start}} = 2$ bar: pre-charge pressure $2 \times 0.8 = 1.6$ bar



CAUTION

Pre-charge pressure too high

Damage to accumulator!

- Observe data provided by accumulator manufacturer (see name plate or operating manual of accumulator).

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9.2.4 Replacing the non-return valve



DANGER

Voltage at the pressure booster system

Danger to life!

- Prior to opening the device, wait at least 10 minutes for any residual voltage to dissipate.

1. De-energise the pump set and secure it against unintentional start-up. Comply with the local regulations.
2. Close the shut-off valve of the pump.

3. Place a suitable container under the drain connection.
4. Open the drain connections. To do so, observe the pump's operating manual.

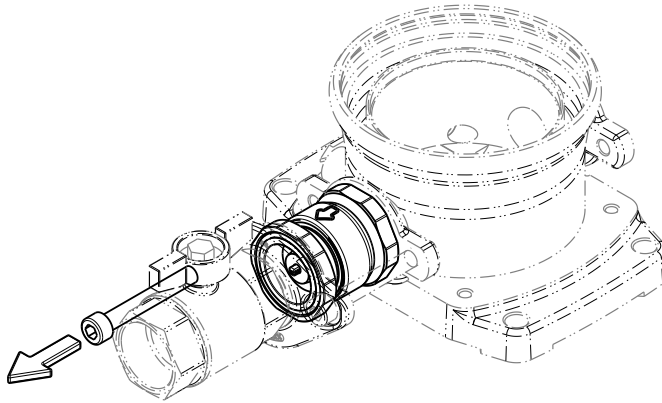


Fig. 7: Removing the screw

5. Remove the screw.

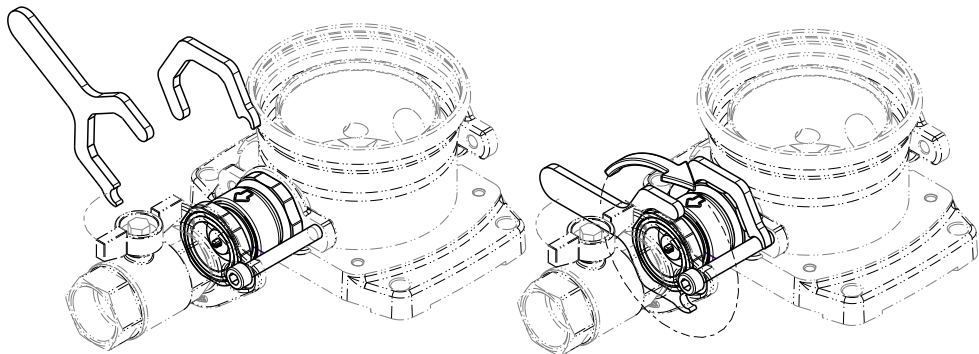


Fig. 8: Screwing the valve's body parts into each other

6. Use a suitable tool to screw the body parts of the non-return valve into each other to shorten the length of the body.

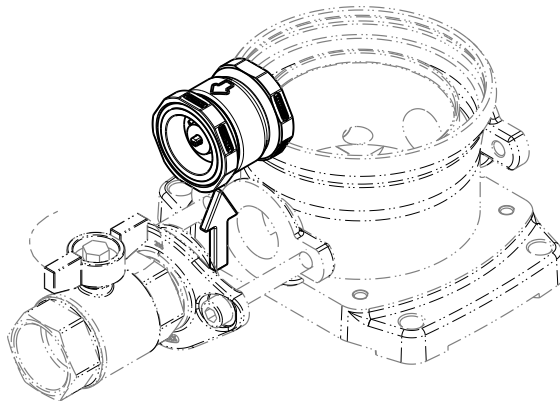


Fig. 9: Removing the body

7. Remove the body of the non-return valve.
8. Remove the insert check valve including O-rings.
9. Remove excessive contamination or deposits with a clean cloth.
10. Re-insert the insert check valve into the body. Apply a sealant to new O-rings. See table below.

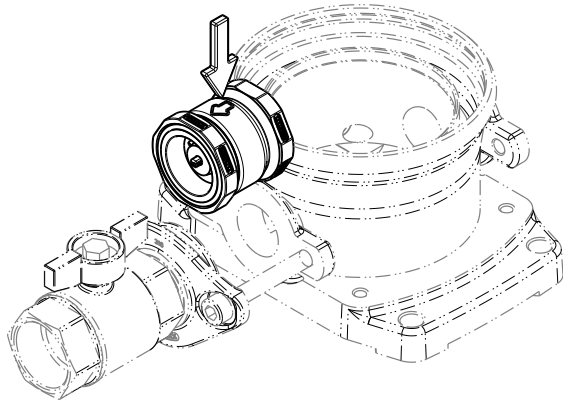


Fig. 10: Mounting the body

11. Mount the body of the non-return valve.

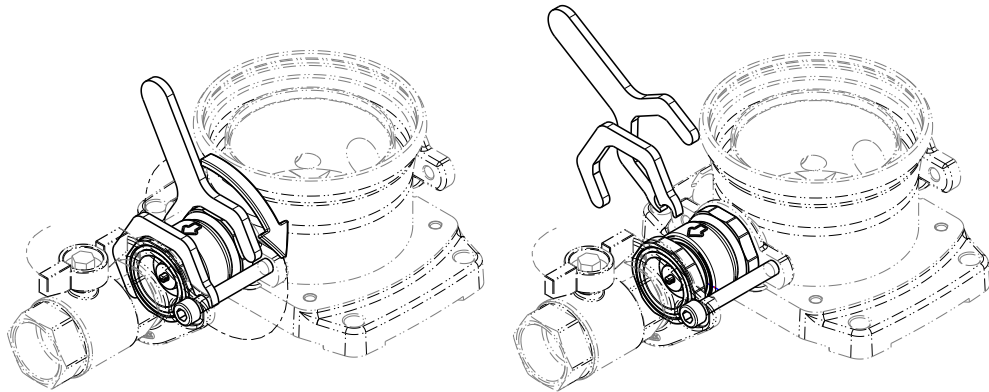


Fig. 11: Loosening the screwed connection of the body parts

12. Use a suitable tool to loosen the screwed connection of the body parts of the non-return valve to extend the body length.

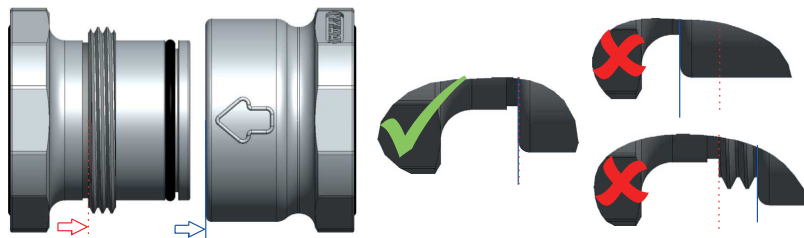


Fig. 12: Verifying the alignment

13. Verify the correct alignment.

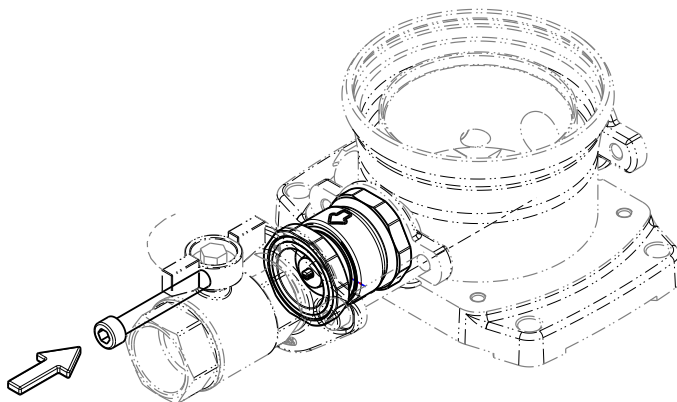


Fig. 13: Fitting the screw

14. Fit and tighten the screw.

15. Close the drain plugs of the pump. Properly dispose of the fluid collected.
16. Slowly open the shut-off valve and check for any leakage.

Table 8: Spare parts for servicing non-return valves, per pump

Material number	Description	Non-return valve	O-rings	Sealant for O-rings (not water-soluble)
71630405	ER non-return valve DN 32	Watts industries IN 032 DN 32	1x Eriks 12711456 2x Eriks 12711457	Molykote® G-5511 ⁴⁾
71630410	ER non-return valve DN 50	Watts industries IN 050 DN 50	1x Eriks 12192264 2x Eriks 12711459	

9.2.5 Mounting the manifold in a mirrored position



⚠ DANGER

Voltage at the pressure booster system

Danger to life!

- Prior to opening the device, wait at least 10 minutes for any residual voltage to dissipate.

1. De-energise the pump set and secure it against unintentional start-up. Comply with the local regulations.
2. Close the shut-off valves in the discharge line and suction line of the pressure booster system.
3. Place a suitable container under the drain connections.
4. Open the drain connections. To do so, observe the pump's operating manual.

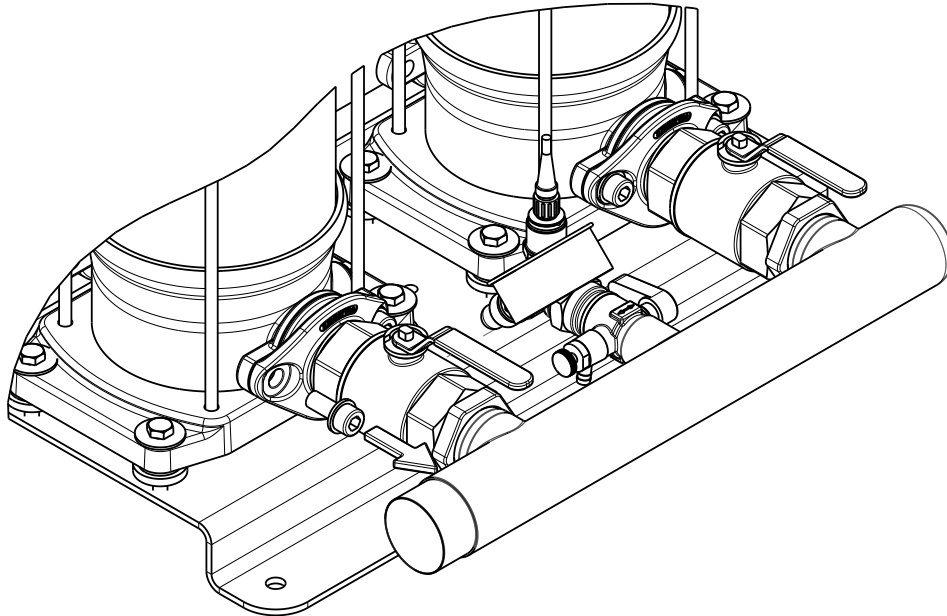


Fig. 14: Removing the bolts

5. Remove the bolts connecting the two oval flanges to the pumps.

4) Sealant for taps

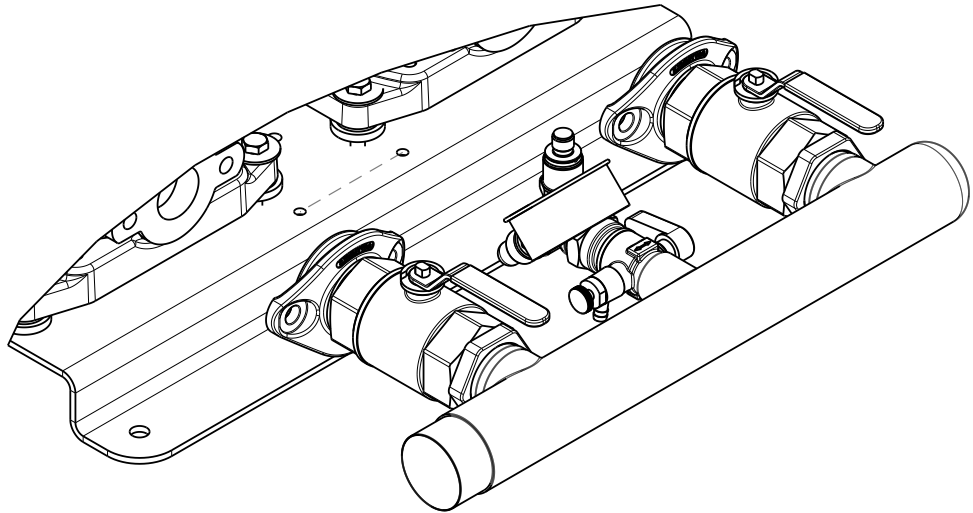


Fig. 15: Removing the manifold

6. Remove the complete manifold including valves

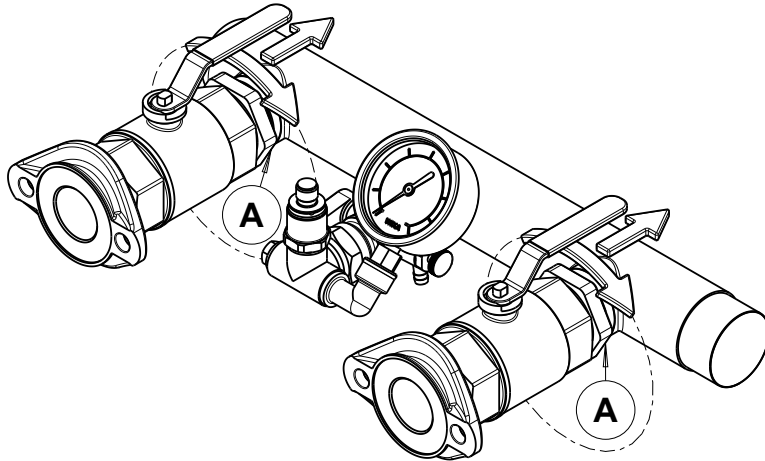


Fig. 16: Loosening the EF locknuts

A	EF locknut
---	------------

7. Loosen the EF locknuts at the shut-off valves by half a turn, exposing the O-ring.

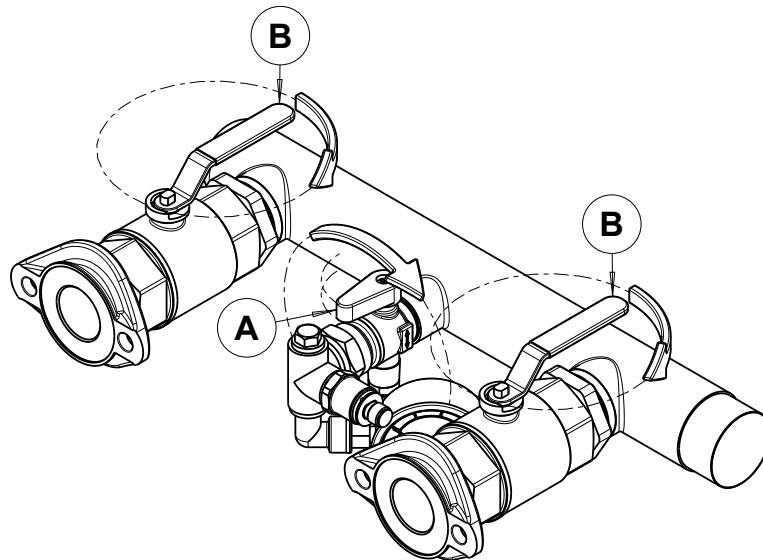


Fig. 17: Turning the pressure measuring set

A	Pressure measuring set
B	Lever of the shut-off valve

8. Close the lever of the shut-off valve about half way to enable the 180° turn required in the next step.
9. Turn the pressure measuring set by 90°.



NOTE

For some variants, the pressure gauge or a pressure sensor need to be removed to be able to turn the pressure measuring set.

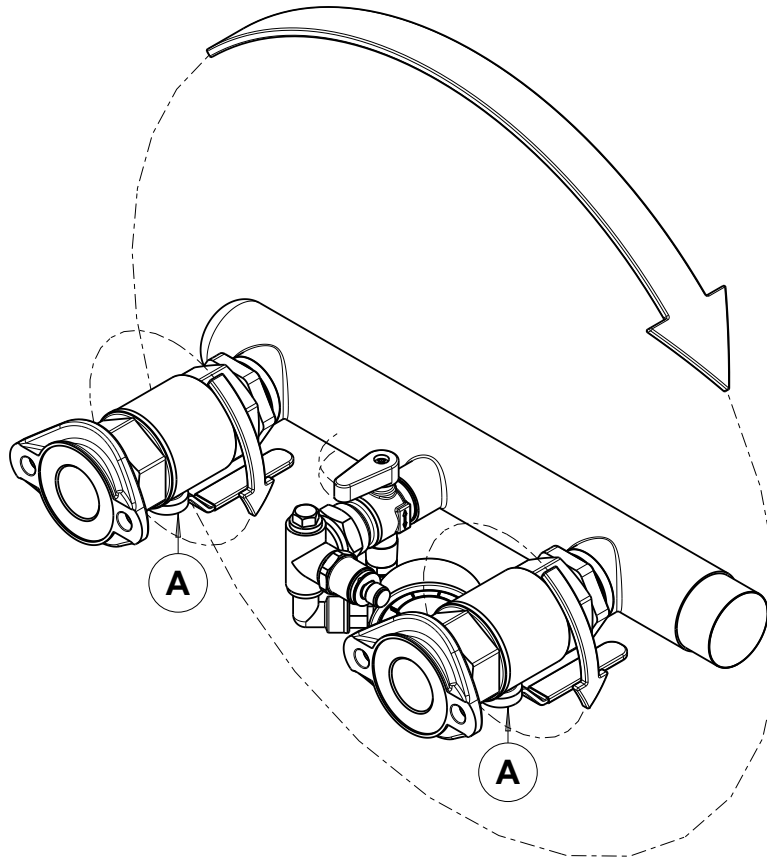


Fig. 18: Turning the shut-off valves

A	Shut-off valve
---	----------------

10. Turn the shut-off valves by 180°. Now, turn the complete manifold including valves by 180°.

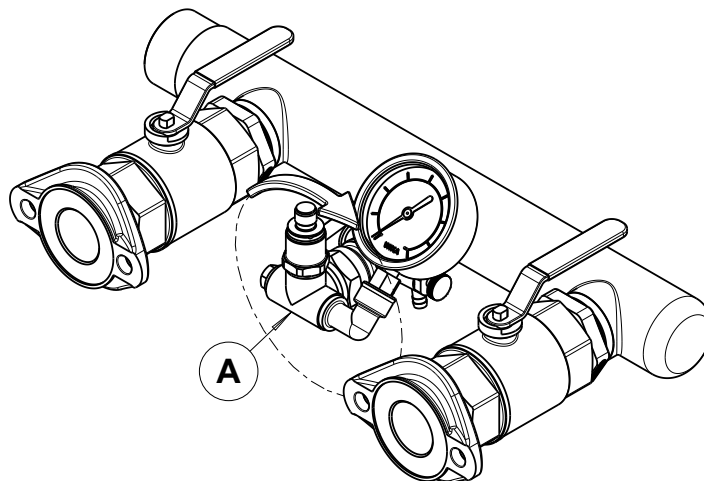


Fig. 19: Turning the pressure measuring set

A	Pressure measuring set
---	------------------------

11. Turn the pressure measuring set by a last 90°.

12. If the pressure gauge and/or pressure sensors have been removed, connect them again.

⇒ The manifold is now fitted in a mirrored position.

10 Trouble-shooting



NOTE

Before performing any work on the pump's internal parts during the warranty period please always consult the manufacturer. Our after-sales service will be at your disposal. Non-compliance will lead to forfeiture of any and all rights to claims for damages.

Table 9: Pump faults

Fault	Possible cause	Remedy	Action
Leakage along the shaft	Worn shaft seal	Replace the shaft seal.	Check the pump for impurities.
	Pump has been operated without water.	Replace the shaft seal.	
Pump does not run smoothly (noise and vibrations).	No water in the pump		Prime and vent the pump.
	No water supply	Re-establish water supply.	Check supply lines for clogging.
	Bearings of pump and/or motor defective	Have bearings replaced by certified company.	
	Hydraulic pump components defective	Replace hydraulic pump components.	
System/pump does not start.	Wrong direction of rotation of the pump	Interchange two phases of the power supply between frequency inverter and motor. Caution: Prior to opening the device, wait at least 10 minutes for any residual voltage to dissipate.	
	No voltage at the terminals	Check power supply.	
	Dry running protection has tripped.	Re-establish water supply. Reset system.	Check that the supply tank is filled with water and that the supply line to the pressure booster system is not clogged.
	Wrong setting of pressure setpoint	Adjust pressure setpoint.	
Insufficient flow rate and/or pressure of the system/ pump	Drive fault	Reset drive and note down error code.	
	Air inside the pump	Vent the pump.	
	Wrong direction of rotation of the pump	Interchange two phases of the power supply between frequency inverter and motor. Caution: Prior to opening the device, wait at least 10 minutes for any residual voltage to dissipate.	
	Flow rate of water meter in suction line too low	Increase flow rate of water meter.	
	System-side filter clogged	Clean filter or check filter for obstruction. If required, replace filter.	
	Shut-off valve in outlet and/ or inlet closed	Open both shut-off valves.	
Pumps start and stop too frequently.	Accumulator leakage or wrong pressure setting		Have system checked by the manufacturer.
Pump 1 not running, pump 2 running.	Pump 1 has been stopped, and pump 2 has assumed the master function.	Disconnect the system from the power supply. Then re-connect it.	

The yellow alarm LED indicates different alarm messages by flashing at different frequencies followed by a 3-second pause.

Table 10: Error codes of the frequency inverter

Flashing frequency	Description	System re-start
1x	Lack of water. Automatic re-start after 5-10-20-40-80 minutes. The alarm signal starts after the last re-start attempt.	De-energise the system (pull the mains plug or set the master switch to 0). Only after the system has been de-energised can it be re-started.
2x	The maximum motor current is higher than the set limit.	
3x	Sensor alarm (sensor not connected or incorrectly connected, or output current below 2 mA)	
4x	Overheating alarm (temperature at NTC thermistor exceeds 70 °C)	
5x	Frequency inverter alarm (current too high)	De-energise the system (pull the mains plug or set the master switch to 0). Only after the system has been de-energised can it be re-started.
6x	Communication error between master and slaves (check the DIP switch position). Caution: After switching off the frequency inverter, wait 10 minutes until dangerous voltages have discharged.	
7x	The alarm value for the maximum pressure has been reached. (Determine the cause of the maximum pressure exceeding the alarm value).	
8x	The alarm value for minimum pressure has been reached. (Determine the cause of the minimum pressure falling below the alarm value).	
Rapid flashing without any pauses	The digital inputs have been disconnected.	

11 Related Documents

11.1 General assembly drawings/exploded views with list of components

11.1.1 Hydro-Unit Economy Line VFD MMe Di, single-pump system

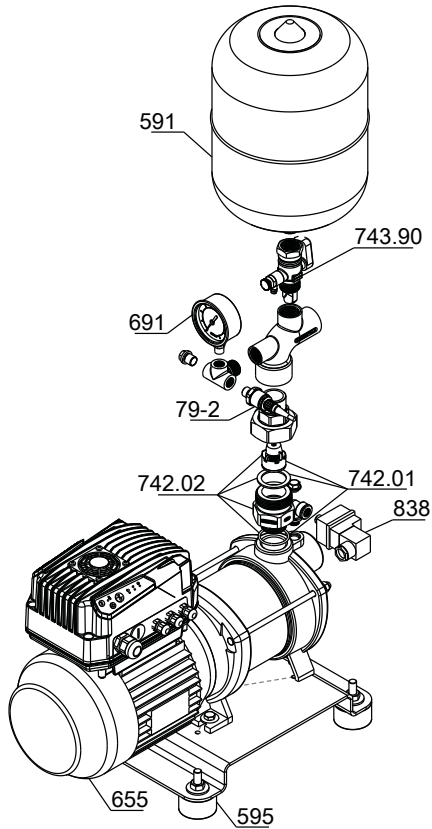


Fig. 20: Hydro-Unit Economy Line VFD MMe Di, single-pump system

Table 11: List of components

Part No.	Description	Part No.	Description
79-2	Measuring transducer	691	Pressure gauge
591	Accumulator	742.01/02	Check valve
595	Anti-vibration pad	743.90	Ball/plug valve
655	Pump	838	Switch

11.1.2 Hydro-Unit Economy Line VFD MMe Di, multiple pump system

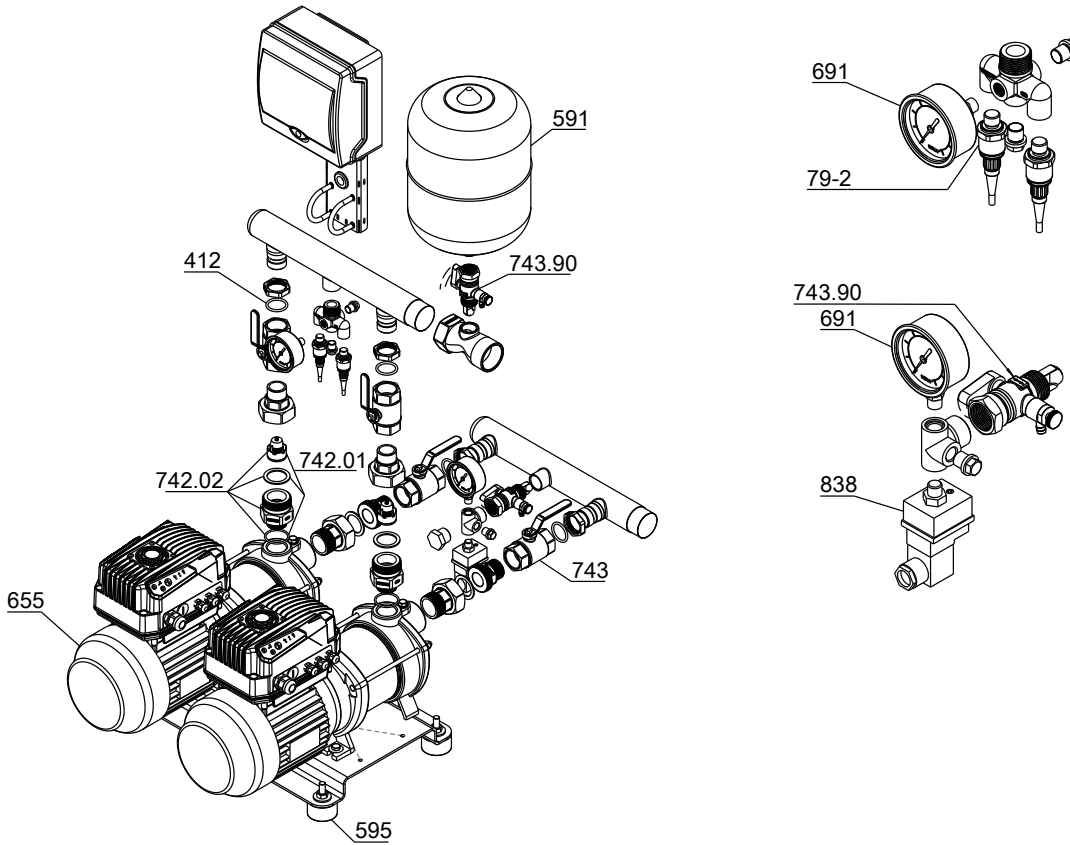


Fig. 21: Hydro-Unit Economy Line VFD MMe Di, multiple pump system

Table 12: List of components

Part No.	Description	Part No.	Description
79-2	Measuring transducer	691	Pressure gauge
412	O-ring	742.01/.02	Check valve
591	Accumulator	743/.90	Ball/plug valve
595	Anti-vibration pad	838	Switch
655	Pump		

The individual parts of the pump set are shown in the product literature of the pump set.

12 EU Declaration of Conformity

Manufacturer:

D.P. Industries B.V.
Kalkovenweg 13
2401 LJ Alphen aan den Rijn (The Netherlands)

The manufacturer herewith declares that **the product**:

Hydro-Unit Economy Line (VFD MMe Di)

Serial numbers: 06/2018 0000000-0001 - 52/2020 9999999-9999

- is in conformity with the provisions of the following Directives as amended from time to time:
 - Pump set: EC Machinery Directive 2006/42/EC
 - Pump set: Electromagnetic Compatibility Directive 2014/30/EU

The manufacturer also declares that

- the following harmonised international standards have been applied:
 - ISO 12100
 - EN 809
 - EN 60204-1
 - EN 806-2

Person authorised to compile the technical file:

Menno Schaap
Manager Product Development
D.P. Industries B.V.
Kalkovenweg 13
2401 LJ Alphen aan den Rijn (The Netherlands)

The EU Declaration of Conformity was issued in/on:

Alphen aan den Rijn, 1 June 2018



Menno Schaap
Manager Product Development
D.P. Industries B.V.
2401 LJ Alphen aan den Rijn

13 Certificate of Decontamination

Type:

Order number/









Order item number⁵⁾:

Delivery date:

Field of application:

Fluid handled⁵⁾:

Please tick where applicable⁵⁾:

- | | | | |
|------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
| 
<input type="checkbox"/>
Radioactive | 
<input type="checkbox"/>
Explosive | 
<input type="checkbox"/>
Corrosive | 
<input type="checkbox"/>
Toxic |
| 
<input type="checkbox"/>
Harmful | 
<input type="checkbox"/>
Bio-hazardous | 
<input type="checkbox"/>
Highly flammable | 
<input type="checkbox"/>
Safe |

Reason for return⁵⁾:

Comments:

.....

The product/accessories have been carefully drained, cleaned and decontaminated inside and outside prior to dispatch/ placing at your disposal.

We herewith declare that this product is free from hazardous chemicals, biological and radioactive substances.

For mag-drive pumps, the inner rotor unit (impeller, casing cover, bearing ring carrier, plain bearing, inner rotor) has been removed from the pump and cleaned. In cases of containment shroud leakage, the outer rotor, bearing bracket lantern, leakage barrier and bearing bracket or adapter have also been cleaned.

For canned motor pumps, the rotor and plain bearing have been removed from the pump for cleaning. In cases of leakage at the stator can, the stator space has been examined for fluid leakage; if fluid handled has penetrated the stator space, it has been removed.

- No special safety precautions are required for further handling.
- The following safety precautions are required for flushing fluids, fluid residues and disposal:

.....

.....

We confirm that the above data and information are correct and complete and that dispatch is effected in accordance with the relevant legal provisions.

.....
Place, date and signature

.....
Address

.....
Company stamp

5) Required fields



14 Commissioning Report

The DP pressure booster system specified below was today commissioned by the undersigned, authorised DP customer service engineer who created this report.

Pressure booster system details

Type series
 Size
 Serial number
 Order No.

Purchaser/place of installation

Purchaser	Place of installation
Name
Address
.....

Operating data

For further details please refer to the circuit diagram.

Start-up pressure p_{start} bar

Inlet pressure monitoring $p_{inl} - x$
 (setting of inlet pressure switch)

Stop pressure p_{stop} bar

Inlet pressure p_{inl} bar

Pre-charge pressure of accumulator $p_{pre-charge}$ bar

The system operator/operator's representative herewith confirms to have received instructions on how to operate and service the pressure booster system. The relevant circuit diagrams and operating instructions have been handed over.

Non-conformities found during commissioning	Deadline for remedial action
Non-conformity 1
.....
.....
.....

Name of DP representative	Name of purchaser or representative
Place	Date

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DP Pumps

11/09/2018

BE00001072 (1983.842/01-EN)

