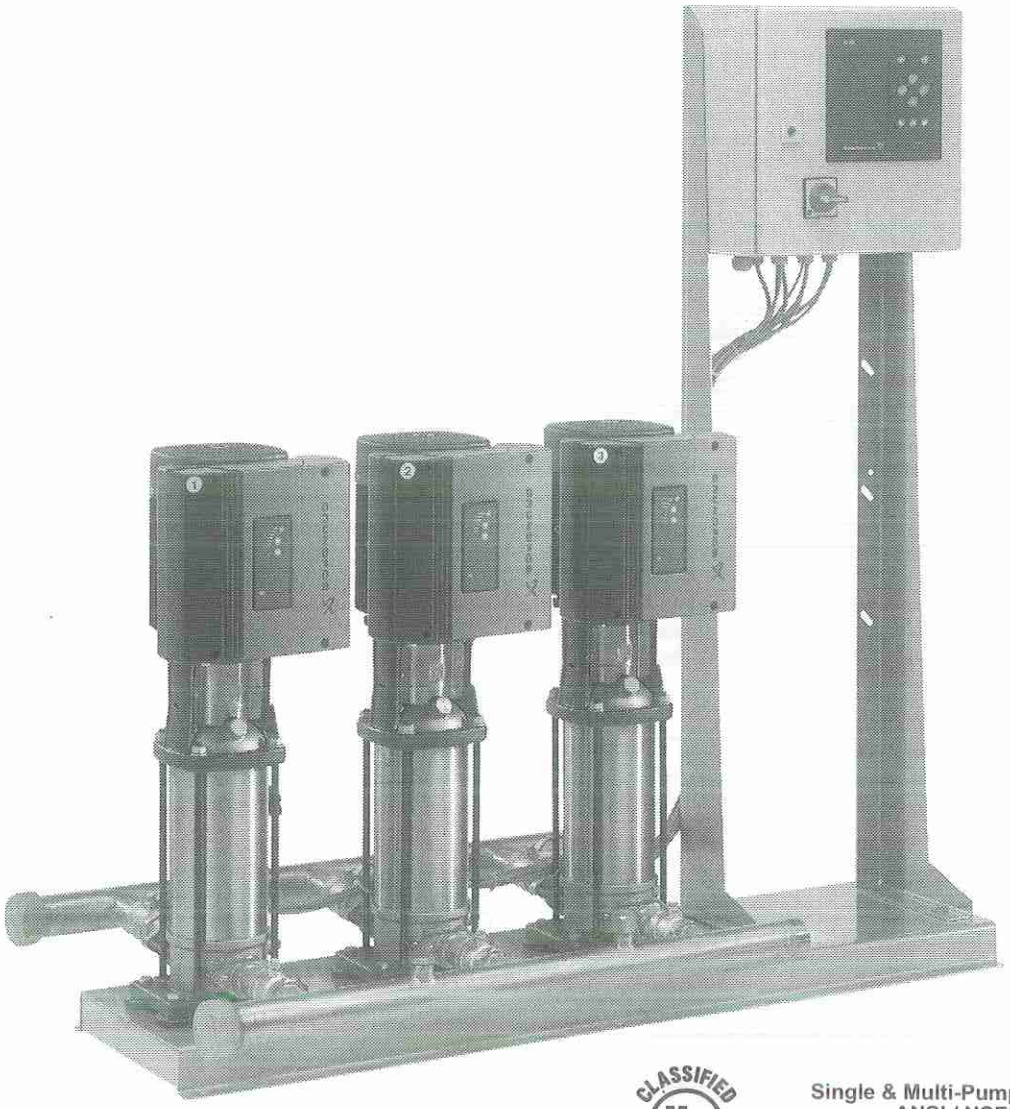
Hydro MPC BoosterpaQ®

Installation and operating instructions



CLASSIFIED C UL US
WATER QUALITY

Single & Multi-Pump Systems
ANSI / NSF61
65GM
Max. use Temp. 23°C / 73°F
Annex G

Declaration of conformity

Declaration of Conformity

We, Grundfos, declare under our sole responsibility that the products Hydro MPC, to which this declaration relates, are in conformity with these Council directives on the approximation of the laws of the EC member states:

—Machinery Directive (2006/42/EC).
Standards used: EN 809: 1998 and EN 60204-1: 2006.

—EMC Directive (2004/108/EC).
Attestation of conformity: Certificate Hydro MPC 2: 2009.

Bjerringbro, 29th December 2009

Svend Aage Kaae
Technical Director

Original installation and operating instructions.

CONTENTS

Warning

Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. Limited warranty

Products manufactured by GRUNDFOS PUMPS CORPORATION (Grundfos) are warranted to the original user only to be free of defects in material and workmanship for a period of 24 months from date of installation, but not more than 30 months from date of manufacture. Grundfos' liability under this warranty shall be limited to repairing or replacing at Grundfos' option, without charge, F.O.B. Grundfos' factory or authorized service station, any product of Grundfos' manufacture. Grundfos will not be liable for any costs of removal, installation, transportation, or any other charges which may arise in connection with a warranty claim. Products which are sold but not manufactured by Grundfos are subject to the warranty provided by the manufacturer of said products and not by Grundfos' warranty. Grundfos will not be liable for damage or wear to products caused by abnormal operating conditions, accident, abuse, misuse, unauthorized alteration or repair, or if the product was not installed in accordance with Grundfos' printed installation and operating instructions.

To obtain service under this warranty, the defective product must be returned to the distributor or dealer of Grundfos' products from which it was purchased together with proof of purchase and installation date, failure date, and supporting installation data. Unless otherwise provided, the distributor or dealer will contact Grundfos or an authorized service station for instructions. Any defective product to be returned to Grundfos or a service station must be sent freight prepaid; documentation supporting the warranty claim and/or a Return Material Authorization must be included if so instructed.

GRUNDFOS WILL NOT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, LOSSES, OR EXPENSES ARISING FROM INSTALLATION, USE, OR ANY OTHER CAUSES. THERE ARE NO EXPRESS OR IMPLIED WARRANTIES, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, WHICH EXTEND BEYOND THOSE WARRANTIES DESCRIBED OR REFERRED TO ABOVE.

Some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages and some jurisdictions do not allow limit actions on how long implied warranties may last. Therefore, the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from jurisdiction to jurisdiction.

2. Symbols used in this document

Warning

If these safety instructions are not observed, it may result in personal injury.

Warning

If these instructions are not observed, it may lead to electric shock with consequent risk of serious personal injury or death.

Caution *If these safety instructions are not observed, it may result in malfunction or damage to the equipment.*

Note *Notes or instructions that make the job easier and ensure safe operation.*

3. Product introduction

As standard, Hydro MPC booster systems consist of two to six CR(E) pumps coupled in parallel and mounted on a common base frame with all the necessary fittings and a control cabinet.

Note *A diaphragm tank is required in most installations.*

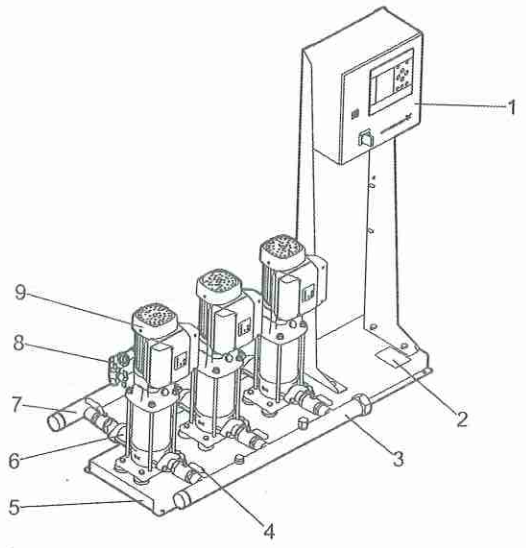


Fig. 1 Hydro MPC booster system

Pos.	Description	Quantity
1	Control panel	1
2	Nameplate	1
3	Suction manifold (stainless steel)	1
4	Isolating valve	2 per pump
5	Base frame (stainless steel)	1
6	Non-return valve	1 per pump
7	Discharge manifold (stainless steel)	1
8	Pressure transmitter/pressure gauge	1
9	Pump	2 - 6

3.1 Control variant

Hydro MPC booster systems are divided into three groups based on the control variant:

Control variant	Description
-E	Two to six electronically speed-controlled pumps. Hydro MPC-E systems equipped with CRE pumps include integrated frequency drive/motors. Horsepower range of CRE pumps depend on incoming power voltage, see note below. Hydro MPC-E equipped with CR pumps are connected to Grundfos CUE variable frequency drive (one per pump).
-F	Two to six CR pumps connected to a Grundfos CUE frequency drive. The speed-controlled operation alternates between the pumps.
-S	Two to six constant speed CR pumps.

Note: Horsepower range of CRE pumps depends on incoming power voltage.

- 1 x 230V / 60 Hz, 0.5 → 1.5 Hp
- 3 x 208-230V / 60 Hz, 1.5 → 7.5 HP
- 3 x 460V / 60 Hz, 1 → 30 Hp

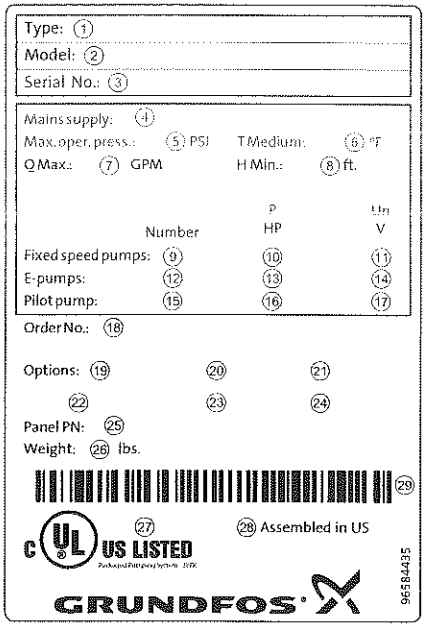
See also section *5. Overview of control variants.*

Hydro MPC booster systems always include application-optimized software for setting the booster system to the application in question.

4. Identification

4.1 Nameplate

The nameplate is fitted on the base frame. See position 2 in fig. 1.



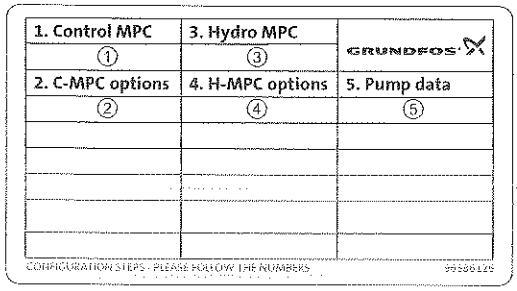
TM05 6482 4812

Fig. 2 Nameplate

Pos.	Description
1	Type designation
2	Model
3	Serial number
4	Supply voltage
5	Maximum operating pressure [psi]
6	Liquid temperature [°F]
7	Maximum flow rate [gpm]
8	Minimum head [ft]
9	Number of fixed speed pumps
10	Motor power [HP] of fixed speed pumps
11	Rated voltage [V] of fixed speed pumps
12	Number of pumps with frequency drive
13	Motor power [HP] of pumps with frequency drive
14	Rated voltage [V] of pumps with frequency drive
15	Number of pilot pumps
16	Motor power [HP] of pilot pumps
17	Rated voltage [V] of pilot pumps
18	Order number
19-24	Options
25	Panel part number
26	Weight in lbs.
27	Approval mark
28	Production location and date code
29	Barcode

4.2 Software label

The software label is placed on the back of the CU 352 controller.



TM03 1742 3105

Fig. 3 Software label

Pos.	Description
1	Control MPC - GSC file number
2	Control MPC options - GSC file numbers
3	Hydro MPC - GSC file number *
4	Hydro MPC options - GSC file numbers *
5	Pump data - GSC file numbers **

* Applies only to booster systems.

** Applies only to CR and CRE pumps.

Note ***A GSC (Grundfos Standard Configuration) file is a configuration data file.***

4.3 Type key

Example	Hydro MPC	-E	3 CRE 5-8	3 x 208-230 V, 50/60 Hz

Type range

Control variants
E: Pumps with integrated frequency drive
E: Pumps connected to a Grundfos CUE frequency drive - one per pump
F: Pumps connected to one Grundfos CUE frequency drive
S: Fixed speed pumps (start/stop)

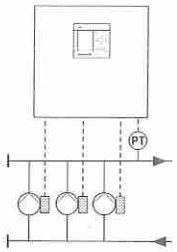
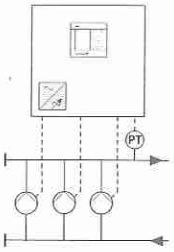
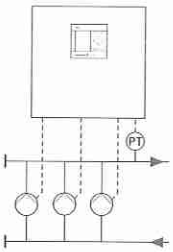
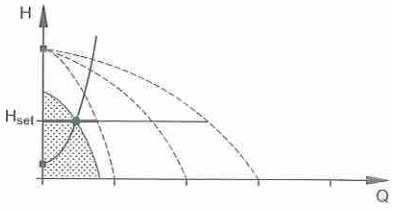
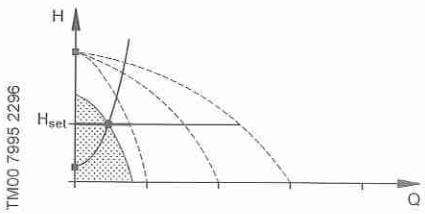
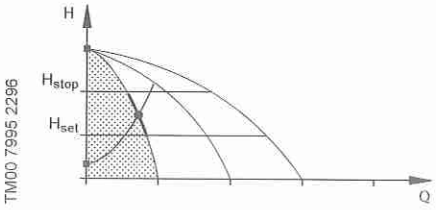
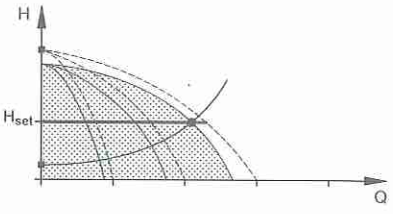
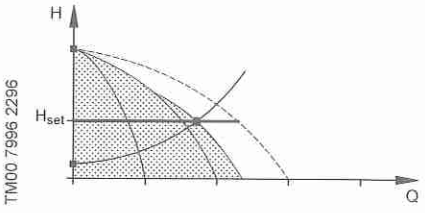
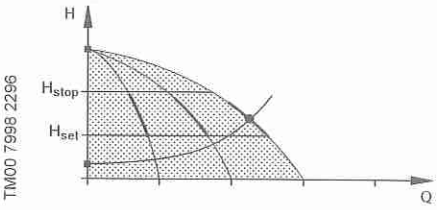
Number of pumps with integrated frequency drive and pump type

Number of fixed speed pumps and pump type

Supply voltage, frequency

5. Overview of control variants

The table shows examples.

Systems with speed-controlled pumps	Systems with pumps connected to one CUE frequency converter	Systems with fixed speed pumps
Hydro MPC-E	**Hydro MPC-F**	**Hydro MPC-S**
System with all speed controlled pumps. MPC-E (CRE) use CRE variable speed controlled pumps. MPC-E (CUE) use CR pumps and have a CUE VFD mounted in the control panel for each pump. MPC-E with CRE shown below.	System with three CR pumps connected to one Grundfos CUE frequency drive in the control panel. The speed-controlled operation alternates between the pumps.	System with three fixed speed CR pumps.
 TM03 0993 0905	 TM03 1265 1505	 TM03 0999 0905
One CRE pump in operation.	One CR pump connected to one Grundfos CUE frequency drive in operation.	One fixed speed CR pump in operation.
 TM00 7995 2296	 TM00 7995 2296	 TM03 9204 3507
Three CRE pumps in operation.	One CR pump connected to one Grundfos CUE frequency drive and two fixed speed CR pumps in operation.	Three fixed speed CR pumps in operation.
 TM00 7996 2296	 TM00 7998 2296	 TM03 9003 3507
• Hydro MPC-E maintains a constant pressure through continuous adjustment of the speed of the pumps. • The system performance is adjusted to the demand through cutting in/out the required number of pumps and through parallel control of the pumps in operation. • Pump changeover is automatic and depends on load, operating hours and fault. • All pumps in operation will run at equal speed.	• Hydro MPC-F maintains a constant pressure through continuous adjustment of the speed of the CR pump connected to the Grundfos CUE frequency drive. The speed-controlled operation alternates between the pumps. • One CR pump connected to the Grundfos CUE frequency drive always starts first. If the pressure cannot be maintained by the pump, one or two fixed speed CR pumps will be cut in. • Pump changeover is automatic and depends on load, operating hours and fault.	• Hydro MPC-S maintains a pressure differential through cutting in/out the required number of pumps. • The operating range of the pumps will lie between H_{set} and H_{stop} (cut-out pressure). • Pump changeover is automatic and depends on load, operating hours and fault.

6. Delivery and handling

6.1 Delivery

Depending on size, the booster system is delivered in an open wooden box or wooden/cardboard box designed for transport by forklift truck or a similar vehicle.

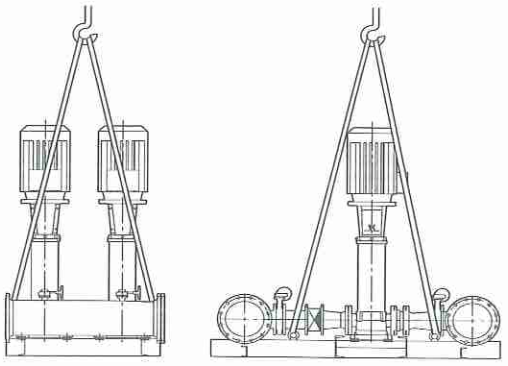
Hydro MPC booster systems with CR 120 or CR 150 pumps are secured by means of transport straps. Do not remove these transport straps until the booster system has been installed.

6.2 Handling

Hydro MPC booster systems with CR 120 or 150 pumps have eyebolts in the base frame. See fig. 4.

The lifting point should always be above the center of gravity of the booster system.

Each lifting strap must be at least three meters long.



TM04 4188 1009

Fig. 4 Correct lifting of Hydro MPC XL

Warning

When lifting Hydro MPC booster systems with CR 120 or CR 150 pumps, never use the eyebolts of the motors.

Do not lift the booster system by the manifolds, but according to fig. 4.

Use suitable lifting equipment that is in good condition and approved for the weight. The weight is stated on the nameplate of the booster system.

Caution ***Do not use chains for lifting booster systems with CR 120 or CR 150 pumps, as the motors of the pumps can be damaged.***

7. Installation

Before installation, check the following:

- That the booster system is as ordered.
- That no visible parts have been damaged.

7.1 Mechanical installation

7.1.1 Location

The booster system must be installed in a well-ventilated room to ensure sufficient cooling of the pumps and control cabinet.

Caution ***The Hydro MPC is not designed for outdoor installation unless protected, and must not be exposed to direct sunlight.***

The booster system must have a 3-foot clearance in front and on the two sides for inspection and dismantling.

7.1.2 Pipework

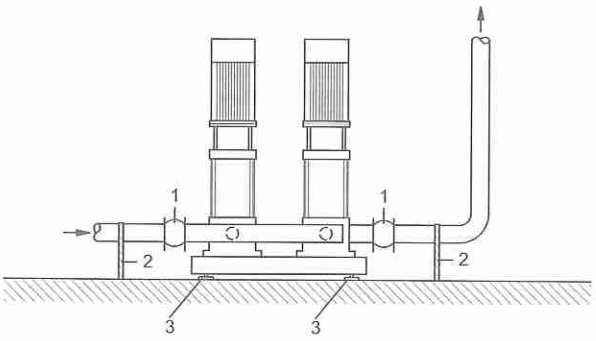
Arrows on the pump base show the direction of flow of water through the pump.

The pipework connected to the booster system must be of adequate size. The pipes are connected to the manifolds of the booster system. Either end can be used. Apply sealing compound to the unused end of the manifold, and fit the screw cap. For manifolds with flanges, fit a blanking flange with gasket.

To achieve optimum operation and minimiz6e noise and vibration, it may be necessary to consider vibration dampening of the booster system.

Noise and vibration are generated by the rotations in the motor and pump and by the flow in pipework and fittings. The effect on the environment is subjective and depends on correct installation and the state of the other parts of the system.

If booster systems are installed in blocks of flats or the first consumer on the line is close to the booster system, we recommend to fit expansion joints on the suction and discharge pipes to prevent vibration being transmitted through the pipework.



TM03 2154 3805

Fig. 5 Sketch showing the position of expansion joints, pipe supports and machine shoes

Pos.	Description
1	Expansion joint
2	Pipe support, and good location for system isolation valve (not shown)
3	Machine shoe

Note ***Expansion joints, pipe supports and machine shoes shown in the figure above are not supplied with a standard booster system.***

All nuts should be tightened prior to start-up.

Fasten the pipes to parts of the building to ensure that they cannot move or be twisted.

7.1.3 Foundation

The booster system should be positioned on an even and solid surface, for instance a concrete floor or foundation. If the booster system is not fitted with machine shoes, it must be bolted to the floor or foundation.

Note ***As a rule of thumb, the weight of a concrete foundation should be 1.5 x the weight of the booster system.***

7.1.4 Vibration dampers

To prevent the transmission of vibrations to buildings, it may be necessary to isolate the booster system foundation from building parts by means of vibration dampers.

Which is the right damper varies from installation to installation, and a wrong damper may increase the vibration level. Vibration dampers should therefore be sized by the supplier of vibration dampers. If the booster system is installed on a base frame with vibration dampers, expansion joints should always be fitted on the manifolds. This is important to prevent the booster system from "hanging" in the pipework.

7.1.5 Expansion joints

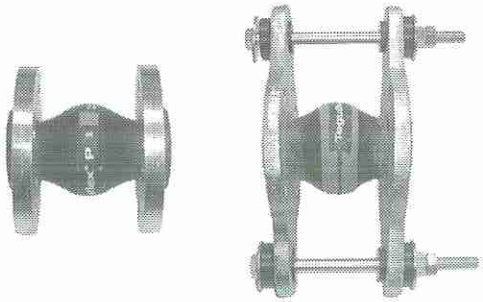
Expansion joints are installed for the following reasons:

- to absorb expansions/contractions in the pipework caused by changing liquid temperature
- to reduce mechanical strains in connection with pressure surges in the pipework
- to isolate mechanical structure-borne noise in the pipework (only rubber bellows expansion joints).

Note

Expansion joints must not be installed to compensate for inaccuracies in the pipework such as center displacement of flanges.

Fit expansion joints at a distance of minimum 1 to 1 1/2 times the nominal flange diameter from the manifold on the suction as well as on the discharge side. This prevents the development of turbulence in the expansion joints, resulting in better suction conditions and a minimum pressure loss on the pressure side.



TM02 4981 1902 - TM02 4979 1902

Fig. 6 Examples of rubber bellows expansion joints without and with limiting rods

Expansion joints with limiting rods can be used to minimize the forces caused by the expansion joints. Recommend expansion joints with limiting rods for flanges larger than 6 inches.

The pipework should be anchored so that it does not stress the expansion joints and the pump. Follow the supplier's instructions and pass them on to advisers or pipe installers.

7.2 Electrical installation

Warning

The electrical installation should be carried out by an authorized person in accordance with local regulations and the relevant wiring diagram.

- Make sure that the booster system is suitable for the electricity supply to which it is connected.
- Make sure that the wire cross-section corresponds to the specifications in the wiring diagram.

The connection of the electrical supply, transmitters and external monitoring equipment must be carried out by an authorized electrician in accordance with the NEC, local regulations and the BoosterpaQ wiring diagram.

Ensure that the Hydro MPC controls and the pumps are suitable for the electricity supply on which they will be used (see Technical Data). Please read the wiring diagram carefully. According to the NEC, if the motors cannot be seen from the control panel, they must be fitted with a disconnect switch.

Any BoosterpaQ that utilizes a variable frequency drive (E, ED, ES, EF, EDF, F) should be connected to an electrical supply with all phase lines electrically symmetrical with respect to ground. A "four wire wye" electrical supply with line impedance between 0.5% - 3% is recommended. If a variable frequency drive is connected to a delta transformer or if line impedance is not within the recommended 0.5% - 3%, the drive may not operate correctly and may not provide optimum performance (excessive faults, erratic behavior, or complete failure). "Open delta" power is not recommended. Ask your power company or electrician to determine what type of electrical supply is present. Generator supplied power must meet public utility power quality standards.

7.1.4 Vibration dampers

To prevent the transmission of vibrations to buildings, it may be necessary to isolate the booster system foundation from building parts by means of vibration dampers.

Which is the right damper varies from installation to installation, and a wrong damper may increase the vibration level. Vibration dampers should therefore be sized by the supplier of vibration dampers. If the booster system is installed on a base frame with vibration dampers, expansion joints should always be fitted on the manifolds. This is important to prevent the booster system from "hanging" in the pipework.

7.1.5 Expansion joints

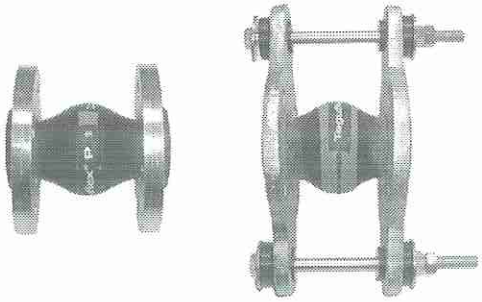
Expansion joints are installed for the following reasons:

- to absorb expansions/contractions in the pipework caused by changing liquid temperature
- to reduce mechanical strains in connection with pressure surges in the pipework
- to isolate mechanical structure-borne noise in the pipework (only rubber bellows expansion joints).

Note

Expansion joints must not be installed to compensate for inaccuracies in the pipework such as center displacement of flanges.

Fit expansion joints at a distance of minimum 1 to 1 1/2 times the nominal flange diameter from the manifold on the suction as well as on the discharge side. This prevents the development of turbulence in the expansion joints, resulting in better suction conditions and a minimum pressure loss on the pressure side.



TM02 4981 1902 - TM02 4979 1902

Fig. 6 Examples of rubber bellows expansion joints without and with limiting rods

Expansion joints with limiting rods can be used to minimize the forces caused by the expansion joints. Recommend expansion joints with limiting rods for flanges larger than 6 inches.

The pipework should be anchored so that it does not stress the expansion joints and the pump. Follow the supplier's instructions and pass them on to advisers or pipe installers.

7.2 Electrical installation

Warning

The electrical installation should be carried out by an authorized person in accordance with local regulations and the relevant wiring diagram.

- Make sure that the booster system is suitable for the electricity supply to which it is connected.
- Make sure that the wire cross-section corresponds to the specifications in the wiring diagram.

The connection of the electrical supply, transmitters and external monitoring equipment must be carried out by an authorized electrician in accordance with the NEC, local regulations and the BoosterpaQ wiring diagram.

Ensure that the Hydro MPC controls and the pumps are suitable for the electricity supply on which they will be used (see Technical Data). Please read the wiring diagram carefully. According to the NEC, if the motors cannot be seen from the control panel, they must be fitted with a disconnect switch.

Any BoosterpaQ that utilizes a variable frequency drive (E, ED, ES, EF, EDF, F) should be connected to an electrical supply with all phase lines electrically symmetrical with respect to ground. A "four wire wye" electrical supply with line impedance between 0.5% - 3% is recommended. If a variable frequency drive is connected to a delta transformer or if line impedance is not within the recommended 0.5% - 3%, the drive may not operate correctly and may not provide optimum performance (excessive faults, erratic behavior, or complete failure). "Open delta" power is not recommended. Ask your power company or electrician to determine what type of electrical supply is present. Generator supplied power must meet public utility power quality standards.

7.3 Start-up

1. Have a qualified person check for proper power supply and plumbing connections. Make sure the main power is off.
2. Check that the air pre-charge in the diaphragm tank is 0.7 times the required discharge pressure set-point (0.9 times for MPC-S systems). System pressure must not be applied to the tank connection during the tank precharge process. If water is supplied to the tank from the system, close the tank valve and bleed off the pressure in the tank before the pressurizing process.

Prime the system as follows

3. Suction pressure system (pumps are flooded at least as high as the highest part of the pumps)
   - close all discharge manifold pump isolation valves and open all inlet manifold pump isolation valves
   - open the vent plug on top of each pump. It is a small hex head screw in a large vent plug. Air and water will escape from the pump through a small hole in the large vent plug. When the air is out and water is flowing steadily, tighten the small hex head screw on the vent plug.

Note ***Expansion joints must not be installed to compensate for inaccuracies in the pipework such as center displacement of flanges.***

4. Suction lift system (the water source is below the pumps or does not flood the pumps to the highest point on the pumps).
   - close all discharge manifold pump isolation valves and open all inlet manifold pump isolation valves
   - for suction lift applications, a foot valve must be placed on the inlet piping at the water source (tank, etc). If there is a fill point above the highest point of the pumps, you may fill the system from this point. If there is no fill point above the highest point of the pumps, remove the large vent plug on each pump. Fill each pump until the water is up to the vent plug, then replace the vent plugs.
5. Ensure all circuit breakers are in the "on" position.
6. Make sure the discharge manifold pump isolation valves are closed. Switch on main power.

Caution ***The pumps may start at this time.***

7. If this is the first time the system has been powered on, the "Start-up wizard" may appear. Once you have completed the wizard, you may skip Step 8. If the wizard does not appear, please proceed to Step 8.
8. Run the "Start-up wizard" again by performing the following: Move top line display to "Settings". If prompted for password, enter "1234", next move down to "Functions, CU352" and press the "OK" button. Now move down to "Run wizard again" and press the "OK" button.
9. Vent the system by opening the vent plug on each pump (as in Step 3, while the pump is running starting in step 18 of the "Start-up wizard"). Venting with the pumps running ensures all air is removed from the suction piping. Do not run the system with the discharge manifold pump isolation valves closed more than five minutes to prevent over-heating of the pump liquid.
10. As pumps stop, check pump rotation. Repeat as necessary. If the area is dark, a flashlight may be required, or remove a coupling guard on each pump for better visibility. Disconnect the main power when removing coupling guards.

Warning

Do not touch the couplings while the pumps are turning as injury may result. Replace all coupling guards after the rotation check. Disconnect main power when removing and replacing coupling guards (or open service disconnect switches if this option was supplied).

If the rotation is incorrect on any 3 phase pumps, switch any 2 of the 3 power main wires supplied to the control panel (L1, L2, L3). If that doesn't correct the rotation, call your Grundfos representative.

Note ***If you are filling an empty piping system, do not allow the pumps to run with the discharge valves wide open as cavitation may occur.***

11. Upon completion of venting pumps and checking for correct rotation you are now ready to bring the BoosterpaQ into normal operation. With the discharge manifold isolation valves still closed, partially open each pump discharge isolation valve to allow water to enter into the discharge piping. Continue the process of filling the discharge piping until discharge piping pressure is approximately at the desired Setpoint pressure of the system.
12. Open pump discharge isolation valves completely. System is now ready for operation.

It may be necessary to clear alarms in the fault log. Follow the stops in paragraph sections 9.6 to clear arms.

Installation and Startup Notes