BME, BMET

Installation and operating instructions

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. Symbols used in this document

Warning

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

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.

2. General information

Grundfos booster modules BME and BMET are supplied from the factory in boxes in which they should remain until they are to be installed. The modules are ready for installation.

2.1 Pumped liquids

Thin, non-explosive liquids, not containing solid particles or fibres. The liquid must not chemically attack the booster module materials. In case of doubt, contact Grundfos.

Warning

The booster modules must not be used for the pumping of inflammable liquids such as diesel oil, petrol or similar liquids.

We recommend that you filter the raw water to maximum 30 microns.

The booster modules must never operate with water/liquid containing substances which would remove the surface tension, e.g. soap. If this type of detergent is used for cleaning of the system, the water/liquid must be led around the modules via a bypass.

Caution

During transportation and storage, the booster modules must never be preserved with glycerine or similar liquids which are aggressive to the booster module materials.

Gr6721

Fig. 1 BME booster module

Gr6720

Fig. 2 BMET booster module

2.2 Preparation

Before installation, the following checks should be made:

1. **Check for transport damages**
   Make sure that the module has not been damaged during transportation.
2. **Type of booster module**
   Check that the type designation corresponds to order. See module nameplate.
3. **Power supply**
   The motor voltage and frequency details given on the nameplate should be compared with the actual power supply available.
4. **V-belt**
   Check that the V-belt has been tightened. See section *13. V-belt tension*.
5. **Lubrication**
   See section *17. Motor bearings*.
6. **Oil level**
   Check the oil level. See section *6.4 Monitoring of oil lubrication system*.
   Note: During periods of inactivity, the oil container may be empty. Check the oil level after 5 minutes of operation.

3. Installation

The booster module can be mounted directly on the floor or on a base frame. The module is adjusted by means of the four adjustable feet.

The inlet and discharge ports of the booster modules are shown in figs 3 and 4. Pipes are connected by means of Victaulic clamp couplings.

The BMET booster module also has a PJE clamp coupling on the concentrate inlet and a connection (∅300) for a hose for the concentrate outlet.

3.1 Hose for turbine

On BMET systems, the hose (∅300) is fastened to the outlet of the turbine housing with a strap. The hose is led to a drain tank, drain channel or a similar drain.

Caution The concentrate outlet must be kept free under all operating conditions.

The end of the hose should always be mounted above the highest possible water level in the drain. The hose should be supported. See fig. 4.

Caution If a discharge pipe is connected to the concentrate outlet, this pipe must have an air inlet.

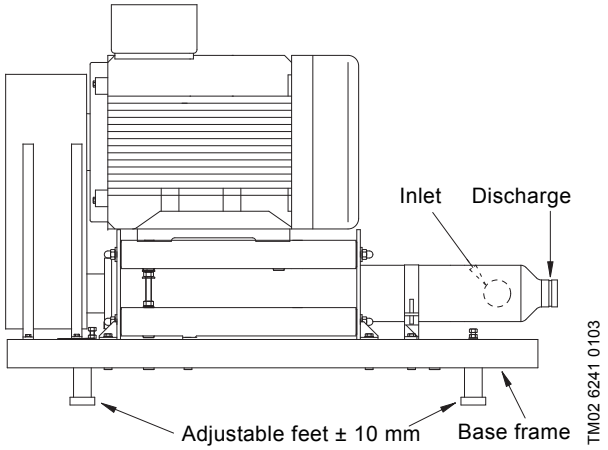

Fig. 3 BME booster module

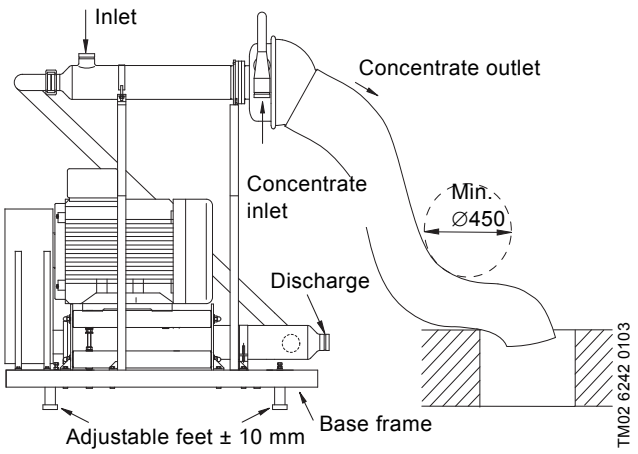

Fig. 4 BMET booster module

If the module is to be fastened, the following procedure is recommended:

Note Fasten the module with four foundation bolts. The base frame has additional holes for this purpose. The bolts can be secured to a concrete foundation or welded onto a steel floor. See figures 5 and 6.

Note Prior to startup, the nuts should be slackened. See fig. 5 concrete foundation and fig. 6 steel floor. The nuts must be counter-locked.

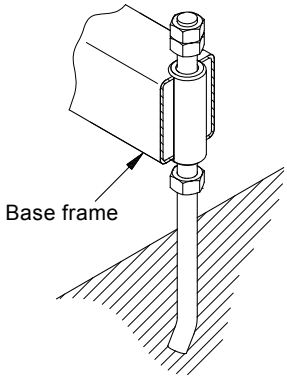

Fig. 5 Concrete foundation

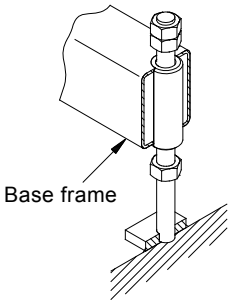

Fig. 6 Steel floor

The nuts must be tightened during transportation. See fig. 7.

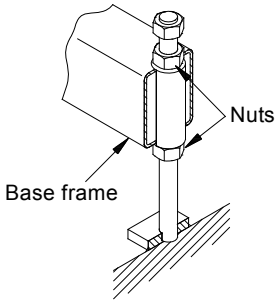

Fig. 7 Tightened nuts

4. Pipe connection

4.1 Inlet and discharge pipes

The booster modules are fitted with clamp liners for Victaulic clamp couplings on the inlet and discharge sides. Position the clamp liners as shown in fig. 8.

Caution Avoid any stress in the pipe system.

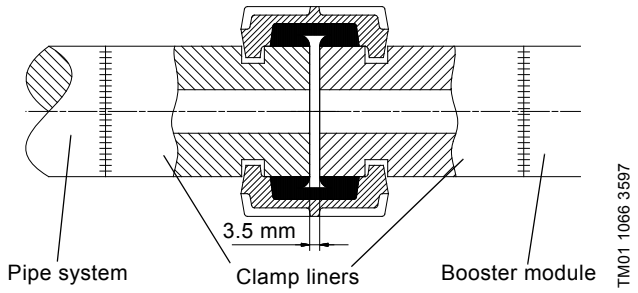

Fig. 8 Positioning of clamp liners

5. Electrical connection

Warning

Before starting work on the booster module, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

The booster module must be connected to an external mains switch.

The booster module must be earthed.

The electrical connection must be carried out by an authorised electrician in accordance with local regulations and the diagrams for the motor protection, starter and monitoring devices used. See fig. 9. The electrical connections are made in the terminal box.

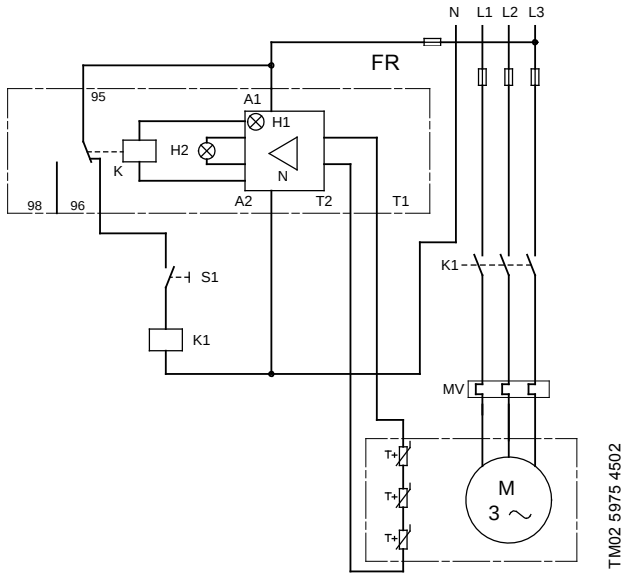

Fig. 9 Wiring diagram

The required voltage quality measured at the motor terminals is ± 5 % of the rated voltage during continuous operation.

There must be voltage symmetry, i.e. approximately same difference of voltage between the individual phases. See section *22. Checking of motor and cable*, point 1.

The motor is wound for star-delta starting.

The following starting methods can be used:

- star-delta starting
- soft starter
- frequency converter.

The maximum permissible run-up changeover time for star-delta starting is 2 seconds for motors up to and including 90 kW and 4 seconds for motors of 110 to 160 kW.

When starting up via a soft starter or frequency converter, the run-up time from 0 to 30 Hz should not exceed 6 seconds.

The run-out time from 30 to 0 Hz should not exceed 6 seconds.

During frequency converter operation, it is not advisable to run the motor at a frequency higher than the rated frequency (50 or 60 Hz). See motor nameplate.

6. Motor protection

The motor must be connected to an effective motor starter (MV) and an external amplifier relay (FR). See fig. 9. This protects the motor against damage from voltage drop, phase failure, quick and slow overloading and a locked rotor.

In power supply systems where undervoltage and variations in phase symmetry may occur, a phase failure relay should be connected. See section *22. Checking of motor and cable*.

6.1 Thermistor

Before starting up the system, the thermistors must be connected to terminals T1 and T2 on the terminal block. See fig. 9. The thermistors protect the motor windings against thermal overload.

6.2 Setting of motor starter

For cold motors, the tripping time for the motor starter must be less than 10 seconds at 5 times the rated current of the motor.

To ensure the best protection of the motor, the setting of the motor starter should be carried out as follows:

1. Set the starter overload to the rated current ($I_{1/1}$) of the motor.
2. Start the booster module and let it run for half an hour at normal performance.
3. Slowly grade down the scale indicator until the motor starter trips.
4. Increase the overload setting by 5 %, but not higher than the rated current ($I_{1/1}$).

For motors wound for star-delta starting, the starter overload unit should be set as described above, but the maximum setting must not exceed the following:

Starter overload setting = Rated current ($I_{1/1}$) x 0.58.

6.3 Generator operation

Motor-driven generators for standard motors are often available according to standard conditions, e.g.

- maximum height above sea level: 150 metres
- maximum air intake temperature: 30 °C
- maximum air humidity: 60 %.

6.4 Monitoring of oil lubrication system

The oil lubrication system is monitored by a level switch positioned as shown in fig. 10. The electrical connection to 0-250 V (with a maximum 10 A back-up fuse) is made in the terminal box.

Note During periods of inactivity, the oil container may be empty. Check the oil level after 5 minutes of operation. If necessary, refill the oil container.

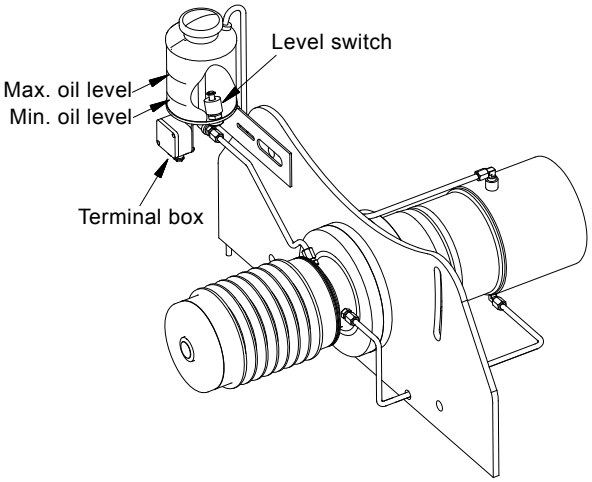

Fig. 10 Oil lubrication system

7. Before starting the booster module

Check the following:

1. Oil level. See section *6.4 Monitoring of oil lubrication system*.
2. Belt tension. See section *13. V-belt tension*.
3. Greasing. See section *17. Motor bearings*.
4. Power supply in accordance with nameplate.
5. Free movability.
   Rotate the motor and pump shafts manually by means of the V-belt.
6. Pipework according to the diagrams in figs 11 and 12.
7. Slacken the foundation bolt nuts.
8. **BMET:** Free discharge for the concentrate.
   Connection of concentrate hose. See fig. 4.

8. Startup

We recommend that you open the discharge valve 1/4 when starting the booster module.

8.1 BME

To start up a BME booster module, proceed as follows:

1. Start the feed pump and check that the inlet pressure of the booster module is higher than 1.0 bar (10 metres head) and lower than 30.0 bar (300 metres head).
2. Vent the booster module. See section *9. Liquid filling, venting and checking of direction of rotation*.
3. Start the high-pressure pump.
   Check that the oil level in the oil container stabilises between minimum and maximum.
4. Check the direction of rotation as described in section *9. Liquid filling, venting and checking of direction of rotation*.
5. Set the discharge pressure of the booster module to the desired value.
6. Check that the inlet pressure of the booster module is higher than 1.0 bar (10 metres head) and lower than 30.0 bar (300 metres head).

The booster module is now ready for operation.

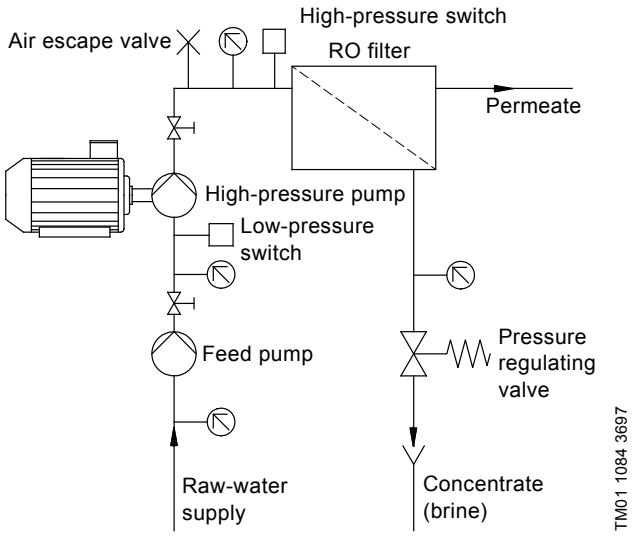

Fig. 11 BME booster system

8.2 BMET

Sound pressure level: Up to 105 dB(A)

Warning
The sound pressure level is so high that hearing protection must be used.

To start up a BMET booster module, proceed as follows:

1. Start the feed pump and check that the inlet pressure of the booster module is higher than 2.0 bar (20 metres head) and lower than 5.0 bar (50 metres head).
2. Vent the booster module. See section *9. Liquid filling, venting and checking of direction of rotation*.
   The module is fully vented when liquid runs out of the air escape valve.
3. Start the high-pressure pump.
   Check that the oil level in the oil container stabilises between minimum and maximum.
4. Check the direction of rotation as described in section *9. Liquid filling, venting and checking of direction of rotation*.
5. Set the discharge pressure of the booster module to the desired value.
6. Check that the inlet pressure of the booster module is higher than 2.0 bar (20 metres head) and lower than 5.0 bar (50 metres head).

The booster module is now ready for operation.

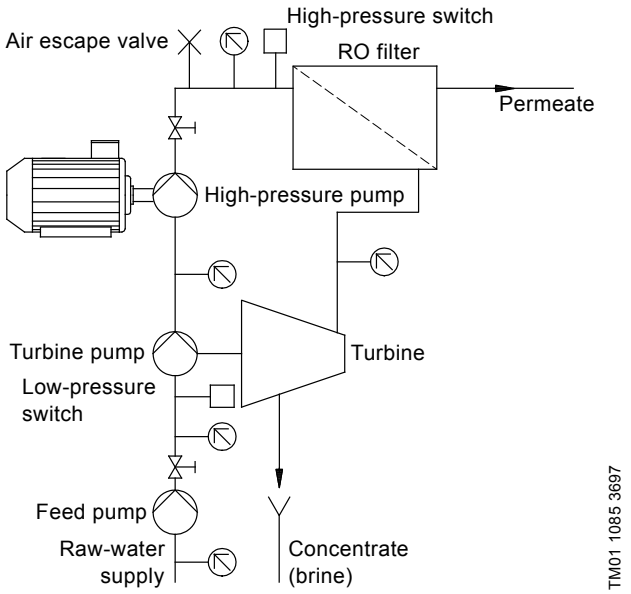

Fig. 12 BMET booster system

8.3 Operation settings

The flow and discharge pressure of the booster module should always be kept within the ranges for which it was originally designed. See "Technical specification" supplied with the system.

If the system requires flows and pressures outside the design range, changes are possible. Please contact Grundfos.

9. Liquid filling, venting and checking of direction of rotation

Procedure:

1. Open the valve on the inlet side of the module. The module is normally primed by the pressure from the feed pump.
2. Open the air escape valve on the discharge side of the module.
3. Continue the filling procedure until water runs out of the air escape valve. See figures 11 and 12.
4. If the system is fitted with an isolating valve on the discharge side of the high-pressure pump, open this valve approx. 1/4.
5. Start the module (for 1 sec. only) and check the direction of rotation. The correct direction of rotation is indicated on the cover of the V-belt screen. If necessary, interchange two phases to the motor.
   The direction of rotation of the turbine-driven pump is always correct.

10. Checking of operation

Check the following at suitable intervals:

- Flow and pressure.
- Current consumption.
- Lubricating oil level.
- Whether the oil container contains water (the lubricating oil should be changed every 2,000 operating hours or every 6 months, whichever comes first).
- Whether the motor ball bearings are being greased (check that excessive grease can escape through the drain hole in bearing cover).
- Whether the bearings are worn.
- Whether the V-belts are tightened correctly.
  Check every 6 months. See section *13. V-belt tension*.
- Whether the shaft seal is leaky.
  The drain hole underneath the pulley must be free from deposits. Flush with clean fresh water, if required.
  The shaft seal is lubricated by the pumped liquid. Small quantities of liquid are therefore drained via the drain hole.
- Whether the noise level has changed.

We recommend that you write the operating data into the log book supplied with the system. These data can be useful for maintenance purpose.

11. Pulleys and V-belts

11.1 Inspection of pulleys

Inspect the pulley grooves for wear. See fig. 13. Belt life will be reduced if the grooves are worn.

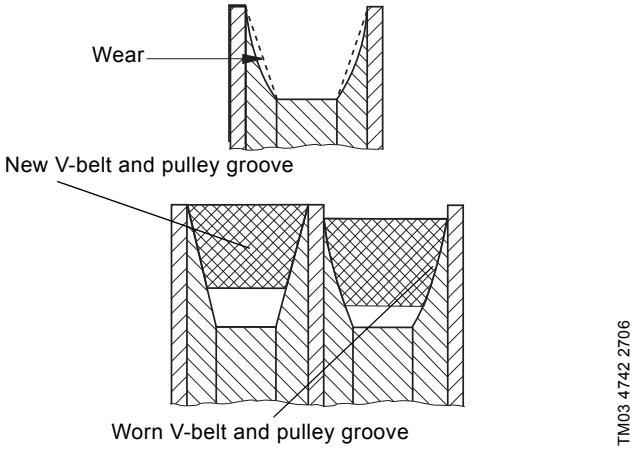

Fig. 13 Examples of new and worn pulley grooves

Use, for instance, pulley gauges to determine whether the grooves are worn. See fig. 14.

The motor pulley groove is 38 ° and the pump pulley groove is 34 °.

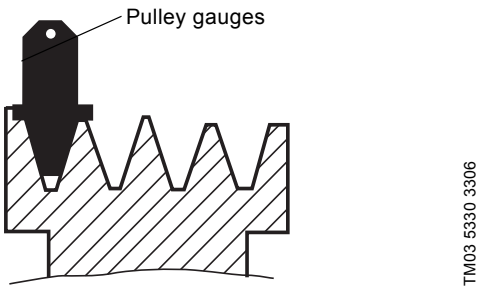

Fig. 14 Use of pulley gauges

A torch may be useful when inspecting the grooves. Do not be misled by shiny grooves. Grooves that are shiny are often polished because of heavy wear. Inspect the pulley grooves for corrosion or pitting. If corroded or pitted surfaces are found, the pulley should be replaced.

Caution Worn pulleys must be replaced to ensure trouble-free operation.

Checking and correcting pulley alignment

Misaligned pulleys will accelerate wear of belts and pulley grooves.

Check the alignment by placing a steel straightedge across the pulley faces so that it touches all four contact points. See fig. 15.

Correct the alignment, if required.

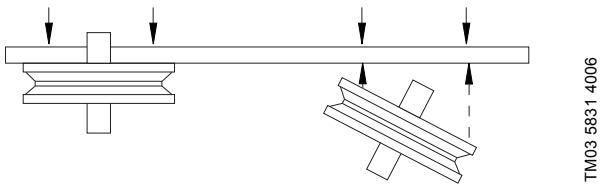

Fig. 15 Correct alignment

12. Replacement of V-belts

Procedure:

Caution All V-belts must be replaced by new belts.

1. Remove oil and impurities from the pulley grooves.
2. Place the V-belts loosely in the pulley grooves without using force or tools of any kind.
3. Adjust the V-belt tension to the value stated in section *15. Recommended V-belt tension*.

13. V-belt tension

Correct belt tension is decisive for long and trouble-free operation of the transmission unit.

This section refers to section *15. Recommended V-belt tension*.

1. Move the motor towards or away from the pump until the correct tension has been obtained, i.e. between $T_{min.}$-$T_{max.}$.
2. Rotate the motor and pump shafts a few times by means of the V-belt before checking the $T_{min.}$-$T_{max.}$ value.
3. Adjust the V-belt tension to the value stated.
4. Check the V-belt tension after 1 to 4 hours of operation at full load.
5. Adjust the V-belt tension to the value stated.
6. The belt tension should be checked regularly according to the recommended values.

The belt tension can be measured through a hole in the protective guard.

V-belts and pulleys must be checked every 6 months.

We recommend that you replace the V-belts once a year.

14. Using the tension tester

The tension tester supplied with the BME and BMET should be used as described below.

The use of the tension tester is illustrated in figs 16, 17 and 18.

The position numbers in this section refer to fig. 16.

1. Rotate the motor and pump shafts a few times before checking the belt tension.
2. Reset the pointer, pos. 1, and place the tension tester on the belt between the pulleys, pos. 4.
3. Use only one finger to operate the tension tester, pos. 2.
4. Gently press the tension tester until a "click" indicates that the tester has been activated.
5. Remove the tester from the belt and read the tension measured, pos. 3.
6. Adjust the V-belt tension to the value stated in section *15. Recommended V-belt tension*.

Caution Rotate the motor and pump shafts after each tension adjustment.

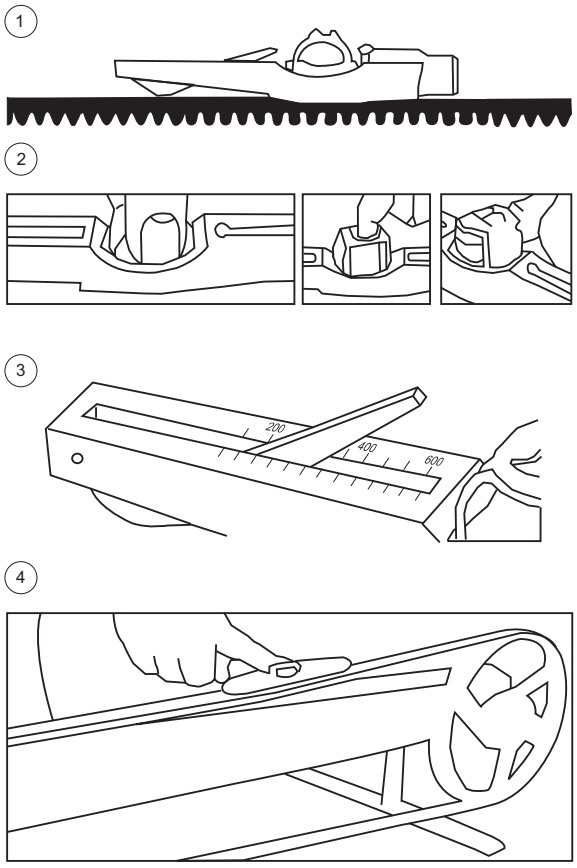

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Fig. 16 Tension tester

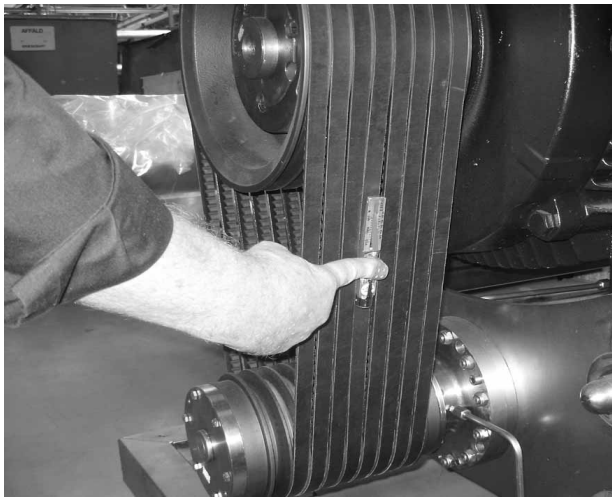

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Fig. 17 Using the tension tester

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Fig. 18 Reading the tension tester

15. Recommended V-belt tension

15.1 V-belt tension, 50 Hz

The table below shows the recommended tension of V-belts for BME and BMET:

V-belt tension, 50 Hz

Diameter of pulley [mm]		Number of V-belts	Belt length	V-belt tension [N]	
Motor	Pump		[mm]	New belts* $T_{min.}$-$T_{max.}$	Check** $T_{min.}$-$T_{max.}$
160 kW, 50 Hz, 400 V, 2976 min^{-1}					
300	150	9	1650	900-1000	650-700
280			1600	800-900	
265					600-700
250			1550		
236					
224					
132 kW, 50 Hz, 400 V, 2977 min^{-1}					
300	150	8	1650	850-900	650-700
280			1600	800-900	600-700
265					
250			1550		
236				700-800	
224					
212			1500		
110 kW, 50 Hz, 400 V, 2979 min^{-1}					
300	150	6	1650	900-1000	700-800
280			1600	800-900	650-700
265					
250			1550	700-800	
236		8			
224					500-600
212			1500		
90 kW, 50 Hz, 400 V, 2970 min^{-1}					
300	150	6	1550	800-900	600-700
280					
265			1500	700-800	
250					
236					500-600
224			1450		
212					
200			1400		
190					
75 kW, 50 Hz, 400 V, 2974 min^{-1}					
300	150	5	1550	800-900	600-700
280					
265			1500	700-800	
250					
236					500-600
224			1450		
212					
200			1400		
190					

Diameter of pulley [mm]		Number of V-belts	Belt length	V-belt tension [N]	
Motor	Pump		[mm]	New belts* $T_{min.}$-$T_{max.}$	Check** $T_{min.}$-$T_{max.}$
55 kW, 50 Hz, 400 V, 2960 min^{-1}					
300	150	4	1500	800-900	600-700
280					
265			1400	700-800	500-600
250					
236					
224					
212			1320	600-700	
200					
190					
45 kW, 50 Hz, 400 V, 2970 min^{-1}					
300	150	3	1500	800-900	600-700
280			1400	700-800	
265					
250					
236			1320		500-600
224					
212			1250		
200					
190					
37 kW, 50 Hz, 400 V, 2955 min^{-1}					
300	150	3	1400	800-900	600-700
280					
265			1320	700-800	500-600
250					
236					
224			1250	600-700	
212					400-500
200					
190					
30 kW, 50 Hz, 400 V, 2955 min^{-1}					
300	150	2	1400	800-900	600-700
280				700-800	
265			1320		
250					500-600
236					
224			1250		
212					
200					
190					

* V-belt tension within the first hour of operation.

** V-belt tension after more than one hour of operation.

15.2 V-belt tension, 60 Hz

The table below shows the recommended tension of V-belts for BME and BMET:

V-belt tension, 60 Hz

Diameter of pulley [mm]		Number of V-belts	Belt length	V-belt tension [N]	
Motor	Pump		[mm]	New belts* $T_{min.}$-$T_{max.}$	Check** $T_{min.}$-$T_{max.}$
150 kW, 60 Hz, 440 V, 3572 min^{-1}					
250	150	9	1550	850-900	650-700
236				800-900	
224			1500		
125 kW, 60 Hz, 440 V, 3575 min^{-1}					
250	150	8	1550	850-900	650-700
236				800-900	600-700
224			1500		
212					
200				700-800	
190			1450		
180					
103 kW, 60 Hz, 440 V, 3564 min^{-1}					
250	150	6	1500	900-1000	700-800
236			1450	800-900	650-700
224		8		700-800	
212					500-600
200			1400		
190				600-700	
180					
86 kW, 60 Hz, 440 V, 3568 min^{-1}					
250	150	5	1500	800-900	650-700
236			1450		600-700
224		6		700-800	
212					500-600
200			1400		
190					
180					
63 kW, 60 Hz, 440 V, 3568 min^{-1}					
250	150	4	1450	800-900	600-700
236			1400		
224					
212			1320	700-800	
200					
190					
180		5		600-700	500-600

Diameter of pulley [mm]		Number of V-belts	Belt length	V-belt tension [N]	
Motor	Pump		[mm]	New belts* $T_{min.}$-$T_{max.}$	Check** $T_{min.}$-$T_{max.}$
52 kW, 60 Hz, 440 V, 3564 min^{-1}					
250	150	4	1400	800-900	600-700
236			1320		
224					
212					
200			1250	700-800	
190					
180		5		600-700	500-600
43 kW, 60 Hz, 440 V, 3546 min^{-1}					
250	150	3	1320	800-900	600-700
236					
224			1250	700-800	
212					
190					500-600
35 kW, 60 Hz, 440 V, 3546 min^{-1}					
250	150	2	1320	900-1000	700-800
236				800-900	600-700
224		3	1250	700-800	
212					500-600
200				600-700	
190					

* V-belt tension within the first hour of operation.

** V-belt tension after more than one hour of operation.

16. Oil lubrication system

The BME and BMET booster modules have an oil lubrication system for the two ball bearings in the pulley head.

During operation, there must be a continuous flow of oil to the oil container. Check the flow by looking into the container, see fig. 19.

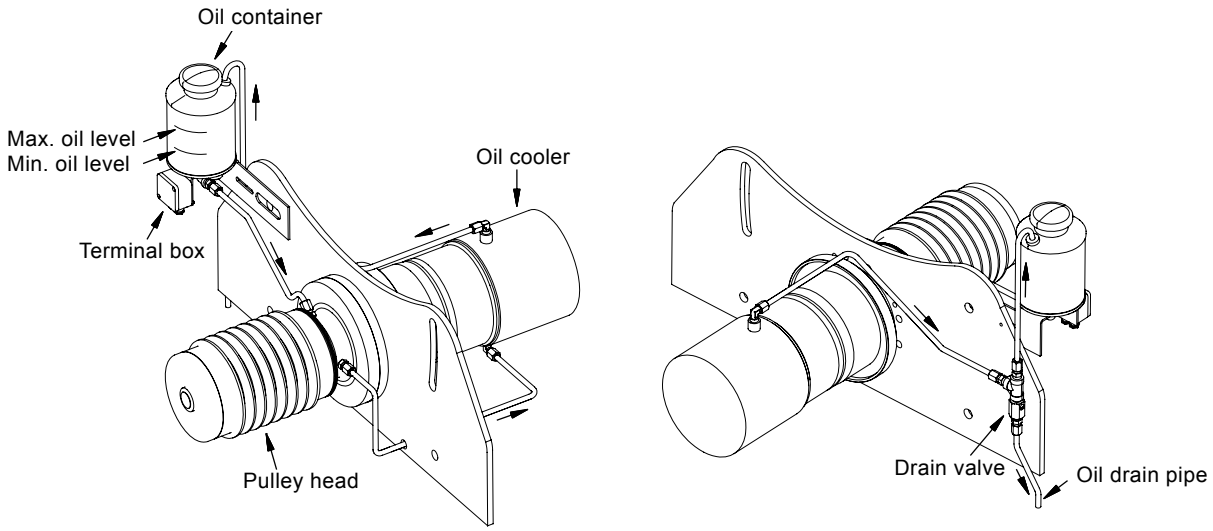


Fig. 19 Oil lubrication system

16.1 Oil change

The hydraulic oil should be changed every 2000 operating hours or every 6 months, whichever comes first. Total quantity of oil: Approx. 1.5 litres.

During operation, the oil must be changed as follows:

1. Switch off the level switch in the oil container or establish a time delay of approx. 10 minutes.
2. Open the drain valve. See fig. 19. Oil will now run out of the oil drain pipe.
3. Close the drain valve when the oil container is almost empty.
4. Fill in new oil up to the maximum level mark on the oil container.
5. Open the drain valve.
6. Close the drain valve when the oil container is almost empty.
7. Fill in oil up to the maximum level mark on the oil container.
8. Open the drain valve.
9. Close the drain valve when the oil container is almost empty.
10. Fill in oil up to the maximum level mark on the oil container. Approx. 1.5 litres of hydraulic oil has now been filled into the container.
11. Check the oil level after 1 to 2 hours of operation and refill, if required.

The oil has now been changed.

If the oil lubrication system has been dismantled during repair, the system must be filled as follows:

1. Check that the drain valve is closed. See fig. 19.
2. Fill new oil into the oil container, approx. 0.5 litres, and wait approx. 10 minutes until the oil level has fallen.
3. Fill in oil up to the maximum level mark on the oil container.
4. Start up the booster module.
   The oil level in the oil container will now fall.
5. During operation, fill in oil up to the maximum level mark on the oil container.
6. Check the oil level after 1 to 2 hours of operation and refill, if required.
   During operation, the oil level in the container must lie between the minimum and maximum marks.
   During inactivity, the oil level in the container may fall below the minimum mark.

The oil lubrication system is now filled with oil.

16.2 Type of lubricating oil

The oil system is factory-filled with hydraulic oil, type Mobil DTE 24.

Other types of hydraulic oil with a viscosity of 32 can be used.

17. Motor bearings

Under optimum operating conditions, the operating life of the motor ball bearings is approx. 20,000 operating hours. After that period, the bearings must be replaced. The new ball bearings must be filled with grease.

BME and BMET booster modules are factory-fitted with a manual motor bearing greasing system. For greasing intervals, etc., see motor nameplate or the installation and operating instructions supplied with the motor.

18. Shut-down procedure

See section *19. Periods of inactivity* for precautions to be taken when shutting down the system. These precautions must be taken to protect the system and ensure long life of all the system components.

Procedure

See fig. 11 or 12.

1. Stop the BME pump (high-pressure pump).
2. Wait for 5 seconds to ensure water supply while the BME pump is being shut down.
3. Stop the feed pump.

19. Periods of inactivity

In the case of periods of inactivity, various precautions must be taken to protect the system.

The precautions to be taken if the system is to be inactive for a certain period appear in the table:

Action	30 minutes	1 month	3 months	6 months
Flushing. See section *19.4 Flushing of the modules*	x	x	x	x
Fill the modules with fresh water	x	x	x	x
Preserve the pump*		x	x	x
Slacken and remove the V-belts. Preserve the pulleys against corrosion. See section *19.1 Preservation of pulleys and belts*		x	x	x
Rotate pump and motor shafts manually once a month			x	x

* Use the same solution that is used to preserve the membranes.

Caution The normal stop procedure must be followed step by step.

19.1 Preservation of pulleys and belts

When the belts have been removed, lubricate the pulleys with an anti-corrosive lubricating oil.

The belts must be kept at a temperature not exceeding 30 °C and at a relative air humidity not exceeding 70 %.

The belts must not be exposed to direct sunlight.

19.2 Startup after a period of inactivity

The precautions to be taken if the system has been inactive for a certain period appear in the table:

Action	1 month	3 months	6 months
Remove preservative from the pulleys. See section *19.3 Removal of preservative before restarting*	x	x	x
Check the V-belts	x	x	x
Mount the V-belts and adjust the tension according to the values in section *15. Recommended V-belt tension*	x	x	x

Caution The normal startup procedure must be followed step by step. For greasing of motor bearings, see section *17. Motor bearings*.

19.3 Removal of preservative before restarting

Before restarting the system, remove the preservative with a suitable solvent. The pulleys must be completely free from oil before the belt is refitted.

19.4 Flushing of the modules

The booster pumps must be stopped while the system is flushed.

The booster modules can be flushed through in or against the flow direction. See fig. 20 or 21.

Flush the system through with fresh water for approx. 10 minutes or until the salinity is below 500 ppm. The pressure during flushing must be minimum 2 bar. The flushing must be continued until the modules are completely filled with clean fresh water.

Caution If the flushing takes more than 10 minutes, the flow must be reduced to maximum 10 % of the rated flow.

Caution The booster modules must be filled with clean fresh water during periods of inactivity.

Caution To flush the pulley head of the BME pump, start the pump for 30 seconds to allow the fresh water to enter into the pulley head.

Caution The distributing pipe for nozzles must also be flushed through.

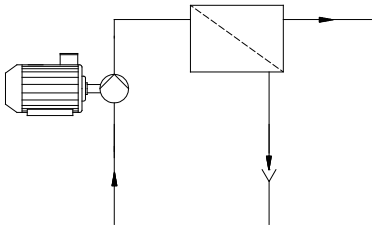


Fig. 20 BME booster module - flow direction when flushing

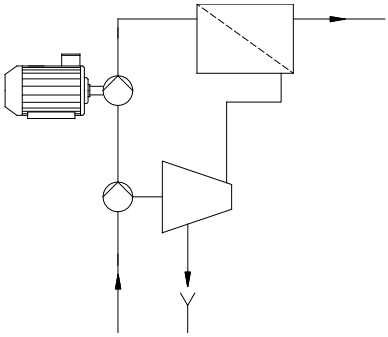


Fig. 21 BMET booster module - flow direction when flushing

20. Frequency of starts and stops

Minimum 1 per year is recommended.

Maximum 5 per hour.

Maximum 20 per day.

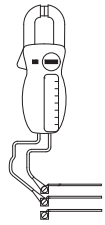
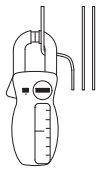
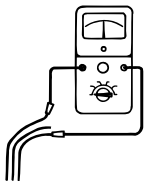
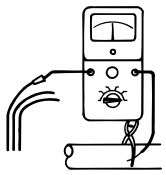
21. Fault finding

Warning

Before starting work on the booster module, make sure that the power supply has been switched off and that it cannot be accidentally switched on.

Fault	Possible cause	Remedy
1. The booster module starts/stops occasionally during operation.	a) No water supply. The low-pressure switch has cut out.	Check that the low-pressure switch functions normally and is adjusted correctly. Check that the minimum inlet pressure is correct. If not, check the feed pump. See section *8. Startup*.
	b) The lubricating oil level is too low.	Check that the oil level switch functions normally. If it is OK, check the oil system for leakage. See section *16. Oil lubrication system*.
2. The booster module stops during operation.	a) The fuses are blown.	After a cut-out, the cause of a possible short-circuit must be found. If the fuses are blown, check whether the motor starter has been set correctly or is faulty. If the fuses are hot when they are replaced, check that the load of the individual phases does not exceed the motor current during operation. Identify the cause of the load. If the fuses are not hot immediately after the cut-out, the cause of a possible short-circuit must be identified. Possible fuses in the control circuit must be checked and defective fuses must be replaced.
	b) The motor starter overload unit has tripped.	Reset the starter overload. See also sections *5. Electrical connection*, *6. Motor protection* and *7. Before starting the booster module*.
	c) The magnetic coil of motor starter/contactor is defective (not cutting in).	Replace the coil. Check the coil voltage.
	d) The control circuit has cut out or is defective.	Check the control circuit and the contacts in the monitoring devices (low-pressure switch, flow switch, etc.).
	e) The motor/supply cable is defective.	Check motor and cable. See section *6.2 Setting of motor starter*.
3. The booster module runs, but gives no water or develops any pressure.	a) No or insufficient water supply at the module inlet.	Check that the inlet pressure during operation is at least 1 bar for BME and 2 bar for BMET. See sections *8.1 BME* and *8.2 BMET*. Restart the booster module as described in section *8. Startup*. Check the function of the feed pump.
	b) The piping system, pump or nozzle is choked up.	Check the piping system, pump and nozzle.
	c) The pre-filter is choked up.	Clean the pre-filter.
4. The booster module runs at reduced capacity.	a) Wrong direction of rotation.	See section *9. Liquid filling, venting and checking of direction of rotation*.
	b) The valves on the discharge side are partly closed or blocked.	Check the valves.
	c) The discharge pipe is partly blocked by impurities.	Clean or replace the discharge pipe. Measure the discharge pressure and compare the value with the calculated data. See "Technical specification", supplied with the system.
	d) The pump is partly blocked by impurities.	Pull the pump out of the sleeve. Dismantle, clean and check the pump and module. Replace any defective parts.
	e) The pump is defective.	Pull the pump out of the sleeve. Dismantle, clean and check the pump and module. Replace any defective parts.
	f) The pre-filter is choked up.	Clean the pre-filter.

22. Checking of motor and cable

1. Supply voltage  TM00 1371 3597	Measure the voltage between the phases with a voltmeter. Connect the voltmeter to the terminals in the motor starter.	The voltage should, when the motor is loaded, be within ± 5 % of the rated voltage. The motor may burn if there are larger variations in voltage. If the voltage is constantly too high or too low, the motor must be replaced by one corresponding to the supply voltage. Large variations in the supply voltage indicate poor power supply, and the module should be stopped until the defect has been found. Resetting of the motor starter may be necessary.
2. Current consumption  TM00 1372 3597	Measure the current of each phase while the module is operating at a constant discharge pressure (if possible at the capacity where the motor is most heavily loaded). For normal operating current, see the "Technical specification".	The difference between the current of the phase with the highest amp consumption and the one with the lowest amp consumption must not exceed 10 % of the lowest amp consumption. If so, or if the current exceeds the full-load current, check these possible faults: • A damaged pump is causing the motor to be overloaded. Pull the pump out of the sleeve for overhaul. • The motor windings are short-circuited or partly disjointed. • Too high or too low supply voltage. • Poor connection in leads. Weak cables.
Points 3 and 4: Measurement not needed if supply voltage and current consumption are normal.		
3. Winding resistance  TM00 1373 3597	Remove the phase leads from the terminal box. Measure the winding resistance as shown on the drawing.	The highest value must not exceed the lowest value by more than 5 %. If the deviation is higher, and the supply cable is OK, the motor should be overhauled.
4. Insulation resistance  TM00 1374 3597	Remove the phase leads from the terminal box. Measure the insulation resistance from each phase to earth (frame). (Make sure that the earth connection is made carefully.)	The insulation resistance for a new, cleaned or repaired motor must be approx. 10 MΩ measured to earth. For a given motor the critical insulation resistance (R_{crit}) can be calculated as follows: $R_{crit} = U_N$ [kV] x 0.5 [MΩ/kV]. If the measured insulation resistance is lower than R_{crit}, the motor must be overhauled.

23. Technical data

See motor and module nameplates.

24. Disposal

This product or parts of it must be disposed of in an environmentally sound way:

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.

Subject to alterations.

Appendix

LOG BOOK for BME/BMET booster modules

Product no:	**Installation date:**	**Company/your ref.**	
		Country:	
Type:	**Start of operation:**	**City:**	
		VFD/Soft start: **Brand**	

Date	Amb. temp.	Liquid temp.	Feed flow/ pressure	Concent. flow/ pressure	Permeate flow	Current [A]	Voltage [V]	Comments

GRUNDFOS®

System sketch

GB: EC declaration of conformity

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

DK: EF-overensstemmelseserklæring

Vi, Grundfos, erklærer under ansvar at produkterne BME og BMET som denne erklæring omhandler, er i overensstemmelse med disse af Rådets direktiver om indbyrdes tilnærmelse til EF-medlemsstaternes lovgivning:

DE: EG-Konformitätserklärung

Wir, Grundfos, erklären in alleiniger Verantwortung, dass die Produkte BME und BMET, auf die sich diese Erklärung bezieht, mit den folgenden Richtlinien des Rates zur Angleichung der Rechtsvorschriften der EU-Mitgliedsstaaten übereinstimmen:

GR: Δήλωση συμμόρφωσης EC

Εμείς, η Grundfos, δηλώνουμε με αποκλειστικά δική μας ευθύνη ότι τα προϊόντα BME και BMET στα οποία αναφέρεται η παρούσα δήλωση, συμμορφώνονται με τις εξής Οδηγίες του Συμβουλίου περί προσέγγισης των νομοθεσιών των κρατών μελών της ΕΕ:

FR: Déclaration de conformité CE

Nous, Grundfos, déclarons sous notre seule responsabilité, que les produits BME et BMET, auxquels se réfère cette déclaration, sont conformes aux Directives du Conseil concernant le rapprochement des législations des Etats membres CE relatives aux normes énoncées ci-dessous :

ES: Declaración CE de conformidad

Nosotros, Grundfos, declaramos bajo nuestra entera responsabilidad que los productos BME y BMET, a los cuales se refiere esta declaración, están conformes con las Directivas del Consejo en la aproximación de las leyes de las Estados Miembros del EM:

IT: Dichiarazione di conformità CE

Grundfos dichiara sotto la sua esclusiva responsabilità che i prodotti BME e BMET, ai quali si riferisce questa dichiarazione, sono conformi alle seguenti direttive del Consiglio riguardanti il riavvicinamento delle legislazioni degli Stati membri CE:

TR: EC uygunluk bildirgesi

Grundfos olarak bu beyannameye konu olan BME ve BMET ürünlerinin, AB Üyesi Ülkelerin kanunlarını birbirine yaklaştırma üzerine Konsey Direktifleriyle uyumlu olduğunun yalnızca bizim sorumluluğumuz altında olduğunu beyan ederiz:

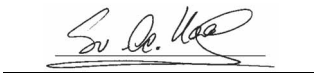
AR: إقـرار المطابقـة مـن EC (المجموعــة الأوروبيــة)

BME نقــر نحــن، جرونــدفوس، بمقتضــى مســؤوليتنا الفرديــة بــأن المنتجــات الــتي يختــص بهــا هــذا الإقــرار، تكــون مطابقــة لتوجيهــات المجلــس بشــأن BMETو، التقريــب بيــن قــوانين الــدول أعضــاء المجموعــة الأوروبيــة (EC):

— Machinery Directive (2006/42/EC).
Standard used: EN 809:1998 + A1:2009.

This EC declaration of conformity is only valid when published as part of the Grundfos installation and operating instructions (publication number 96421463 0915).

Bjerringbro, 23 September 2015



Svend Aage Kaae
Director
Grundfos Holding A/S
Poul Due Jensens Vej 7
8850 Bjerringbro, Denmark

Person authorised to compile the technical file and empowered to sign the EC declaration of conformity.

LENNTECH
info@lenntech.com Tel. +31-152-610-900
www.lenntech.com Fax. +31-152-616-289

96421463 0915
ECM: 1164740

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