

Fig. 9: Pump assignment

Electrical interface for pin 1 "Pause" - pin 2 "External contact" - pin 5 "Auxiliary frequency"

Data	Value	Unit
Voltage with open contacts	5	V
Input resistance	10	kΩ
Max. pulse frequency	25	pulse/s
Min. pulse duration	20	ms
Min. pause between pulses	3	ms

Control via:

- potential-free contact (load: 0.5 mA at 5 V) or
- Semiconductor switch (residual voltage < 0.7 V)

Electrical interface for pin 3 "mA input" (with identity code characteristic "Control version": A - "External Analogue")

Data	Value	Unit
Input apparent ohmic resistance, approx.	120	Ω

Behaviour of the pump

At **approx. 0.1 mA (4.1 mA)** the metering pump makes its **first metering stroke**.

At **approx. 19.9 mA** the pump moves to continuous operation at **180 strokes / min**.

With current signals **above 23 mA**, the red fault indicator lights up, the pump stops and any fault indicating relay fitted switches (a **fault** is pending).

Only with 4...20 mA: With current signals **below 3.8 mA**, the red fault indicator lights up, the pump stops and any fault indicating relay fitted switches (**Fault** for example with a cable break).

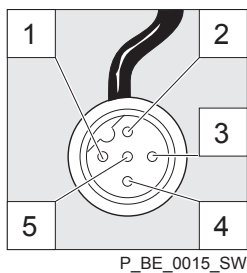


Fig. 10: Cable assignment

Pin	Function	5-wire cable	2-wire cable
1	Pause	brown	bridged at pin 4
2	External contact	white	brown
3	mA input*	blue	-
4	Earth GND	black	white
5	Auxiliary frequency	grey	-

* with identity code characteristic "Control version": A - "External Analogue"



Refer to the functional description for the hierarchy of functions and operating modes.

"Pause" function

The pump does not work if:

- the cable is connected and pin 1 and pin 4 are open.

The pump works if:

- the cable is connected and pin 1 and pin 4 are connected.
- no cable is connected.

"External contact" operating mode

The pump performs one or more strokes if:

- Pin 2 and pin 4 are connected to each other for at least 20 ms. At the same time, pin 1 and pin 4 must also be connected to each other.

"External Analogue" operating mode

- The metering pump makes its first metering stroke at approx. 0.1 mA (4.1 mA) and enters into continuous operation at approx. 19.9 mA.

"Auxiliary frequency" operating mode

The pump works at a pre-set stroke rate if:

- Pin 5 and pin 4 are connected to each other. At the same time, pin 1 and pin 4 must also be connected to each other. The auxiliary frequency is factory-preset to the maximum stroke rate.

9.3.2 "Level switch" terminal

There is a connecting option for a 2-stage level switch with pre-warning and limit stop.

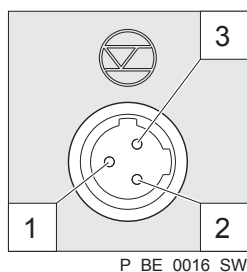


Fig. 11: Pump assignment

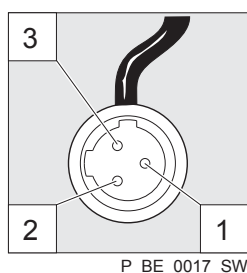


Fig. 12: Cable assignment

Electrical interface

Data	Value	Unit
Voltage with open contacts	5	V
Input resistance	10	kΩ

Control via:

- potential-free contact (load: 0.5 mA at 5 V) or
- Semiconductor switch (residual voltage < 0.7 V)

Pin	Function	3-wire cable
1	Earth GND	black
2	Minimum pre-warning	blue
3	Minimum limit stop	brown

9.4 Relay

9.4.1 Relay functions

Beta b BT4b/BT5b

Identity code	Description	Type	Maximum voltage	Maximum current	Behaviour of relay type when retrofitting, as standard
0	no relay	-	-	-	-
1	Fault indicating relay	NC changeover contact	230 V	8 A	X
3	Fault indicating relay	NO changeover contact	230 V	8 A	-
4	Fault indicating relay	N/O	24 V	100 mA	X
	Pacing relay	N/O	24 V	100 mA	-
5	Fault indicating relay	N/O	24 V	100 mA	-
	Pacing relay	N/O	24 V	100 mA	-

Relay type switches in the event of...

Relay type	level Warning	level low	Calibrated stroke length Error	Processor Error
Fault indicating relay:	X	X	X	X

9.4.2 "Fault indicating relay" output (identity code 1 + 3)

A fault indicating relay can optionally be ordered. It is used to emit a signal when there is a fault with the pump and for the "Liquid level low, 1st stage" warning message and "Liquid level low 2nd stage" fault message.

A cut-off relay works when there are fault alerts from the pump and in the event of the "Liquid level low 2nd stage" alert.

The fault indicating relay can be retrofitted and is operational once attached to the relay board - refer to the "Operating Instructions for Retrofitting Relays for Beta b and delta".

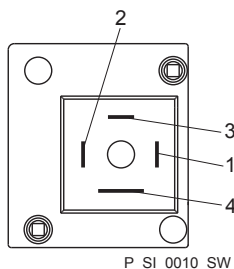


Fig. 13: Pump assignment

Electrical interface

Data	Value	Unit
Maximum contact load at 230 V and 50/60 Hz:	8	A
Minimum mechanical lifespan:	200,000	switching operations

Identity code 1 + 3

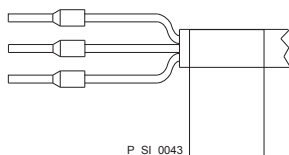


Fig. 14: Cable assignment

Pin assignment

To pin	VDE cable	Contact	CSA cable
1	white	NO (normally open)	white
2	green	NC (normally closed)	red
4	brown	C (common)	black

9.4.3 "Fault indicating relay" + "Pacing relay" output (identity code 4 + 5)

A fault indicating / pacing relay can optionally be ordered. The pacing output is electrically-isolated by means of an optocoupler with a semiconductor switch. The second switch is a relay.

The fault indicating /pacing relay can be retrofitted and is operational once attached to the relay board - refer to the "Operating Instructions for Retro-fitting Relays for Beta b and delta".

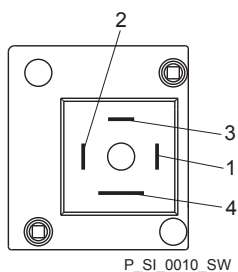


Fig. 15: Pump assignment

Electrical interface

for fault indicating relays:

Data	Value	Unit
Maximum contact load at 24 V and 50/60 Hz:	8	A
Minimum mechanical lifespan:	200,000	switching operations

for semiconductor switch pacing relay:

Data	Value	Unit
Residual voltage max. at $I_c = 1 \text{ mA}$	0.4	V
Maximum current	100	mA
Maximum voltage	24	VDC
Pacing pulse duration, approx.	100	ms

Identity code 4 + 5

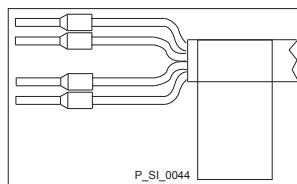


Fig. 16: Cable assignment

Pin assignment

To pin	VDE cable	Contact	Relay
1	yellow	NO (normally open)	Fault indicating relay
4	green	C (common)	Fault indicating relay
3	white	NO (normally open)	Pacing relay
2	brown	C (common)	Pacing relay

10 Start up

**WARNING!****Dangerous reactions are possible due to contact of feed chemical with water**

The feed chemical can mix and react in the liquid end with water remaining after testing in the factory.

- Read the safety data sheet on the feed chemical.
- Blast the liquid end with compressed air.
- Flush the liquid end with a suitable medium through the suction connector.

**WARNING!****Fire hazard with flammable media**

Only with combustible media: These may start to burn when combined with oxygen.

- During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.

**CAUTION!****Danger with dangerous feed chemicals**

Contact with the feed chemical is possible provided the following handling instructions are adhered to.

- If the feed chemical is dangerous, take appropriate safety precautions when carrying out the following handling instructions.
- Adhere to the feed chemical safety data sheet.

**CAUTION!****Warning of feed chemical spraying around**

An unsuitable feed chemical can damage the parts of the pump that come into contact with the chemical.

- Take into account the resistance of the materials that will come into contact with the medium when selecting the feed chemical - refer to the ProMinent® Resistance List in the Product Catalogue or at www.prominent.com.



- *Reliable metering cannot be guaranteed after the metering pump has been idle for some time, as the feed chemical can crystallise in the valves and on the diaphragm. Regularly check the valves and diaphragm.*
- *Only adjust the stroke length when the pump is running.*
- *The metering pump should prime at 100% stroke length, as the priming lift depends on the stroke volume when the liquid end is empty. If the metering pump has to prime at a smaller stroke length and is not priming, reduce the priming lift (i.e. briefly lift up the storage tank with the feed chemical).*
- *SEK-type only: The suction lift corresponds to the priming lift, as some gas always remains in the liquid end with gaseous media.*

Starting up the metering pump

1. ➤ Fill the liquid end - ☞ 'Filling the liquid end' on page 35.
2. ➤ Check the pump connectors and connections for leak-tightness.
3. ➤ Check the suction valve and discharge valve for leak-tightness and tighten if necessary.
4. ➤ Check the liquid end for leak-tightness and tighten the screws on the dosing head if necessary - see below for starting torque.
5. ➤ Only with bleed valve: Check whether the bleed valve is closed.
6. ➤ Start up the relief valve in the system in line with its operating instructions.
7. ➤ Start up the system.
8. ➤ After 24 hours of operation: Tighten the screws on the dosing head - see below for tightening torque.

Tightening torque

Data	Value	Unit
Tightening torque for screws:	4.5 ... 5.0	Nm

Draining the liquid end**With feed chemicals that should not come into contact with water.**

1. ➤ Turn the pump so that the pressure connector is facing downwards.
2. ➤ Allow water to flow out of the liquid end.
3. ➤ Flush the suction connector from above with a suitable medium or blast with compressed air.

Filling the liquid end**With liquid ends without bleed valve:**

1. ➤ Connect the suction line to the liquid end but not yet to the discharge line.
2. ➤ If fitted: Close the shut-off valve on the discharge side.
3. ➤ Connect a short, transparent section of hose to the discharge valve.
4. ➤ Switch on the metering pump and allow to work at maximum stroke length and stroke rate until some feed chemical becomes visible in the short section of hose.
 - ⇒ The liquid end has been filled completely without bubbles.
5. ➤ Switch off the metering pump.
6. ➤ Connect the discharge line to the liquid end.
 - ⇒ The metering pump is ready for operation.

With liquid ends with bleed valves (not SEK):

1. ➤ Connect the suction and discharge line to the liquid end.
2. ➤ Connect the return line.
3. ➤ Open the bleed valve by turning the star-shaped handle in a counter-clockwise direction.
 - ⇒ You can now use the return line to bleed the pump.
4. ➤ Switch on the metering pump and allow to work at maximum stroke length and stroke rate until some feed chemical becomes visible in the return or discharge line.
 - ⇒ The liquid end has been filled completely without bubbles.
5. ➤ Switch off the metering pump.
6. ➤ Close the bleed valve.
 - ⇒ The metering pump is ready for operation.

With self-bleeding metering pumps (SEK type):



- The return line is connected to the vertical valve on the top of the liquid end. It is labelled with a red sleeve ex-works.
- The discharge line is connected to the horizontal valve.

1. ➔ Switch on the metering pump and allow to work at maximum stroke length and stroke rate until some feed chemical becomes visible in the return or discharge line.
 - ⇒ The liquid end has been filled completely without bubbles.
2. ➔ Switch off the metering pump.
 - ⇒ The metering pump is ready for operation.

Setting the precise dosage



Stroke length and stroke rate

- Select as large a stroke length as possible with gaseous feed chemicals.
- Select as high a stroke rate as possible for good mixing.
- Do not set the stroke length to less than 30 % for precise metering using quantity-proportional metering.

11 Operation



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

- During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.



WARNING!

Danger of electric shock

Incompletely installed electrical options can allow moisture into the inside of the housing.

- Knock-out openings in the pump housing must be equipped with matching modules or be sealed in a leak-tight manner.



WARNING!

Danger of electric shock

A mains voltage may exist inside the pump housing.

- If the pump housing has been damaged, you must disconnect it from the mains immediately. It may only be returned to service after an authorised repair.

11.1 Manual

Personnel: ☒ Instructed personnel

11.1.1 Capacity

The capacity is determined by the stroke length and the stroke rate.

The stroke length is adjusted by the stroke length adjustment knob within a range of 0 ... 100 %. A stroke length of between 30 ... 100 % (SEK type: 50 ... 100 %) is recommended to achieve the specified reproducibility!

Data	Value	Unit
Recommended stroke length, standard type	30 ... 100	%
Recommended stroke length, SEK type	50 ... 100	%

The stroke rate can be set within a range of 10 ... 100 % using the multi-functional switch.

11.1.2 Functions

The pump has the following functions:

"Pause" function

The pump can be remotely stopped via the "External Control" terminal. The "Pause" function only works via the "External Control" terminal.

"Stop" function (optional)	The pumps can be stopped by turning the multifunctional switch to "Stop" without disconnecting it from the mains power supply.
"Priming" function	Priming (transient conveyance at maximum frequency) can be provided by turning the multifunctional switch to "Test".
"Level switch" function	Information about the liquid/powder level in the feed chemical container is reported to the pump. To do so, a two-stage level switch must be fitted; it is connected to the "Level switch" terminal.
"Auxiliary rate" function	Enables switching of a stroke rate via the "External control" jack. This auxiliary rate has priority over the operating mode stroke rate settings. In the standard version, the "Auxiliary frequency" function is programmed to 100 % stroke rate.

11.1.3 External contact

"Extern" operating mode:	In the Extern Contact operating mode, either a series of strokes can be triggered or an inbound series of contacts can be stepped down via the pulse control switch by a single contact on the "External control" terminal. To do so, the multifunctional switch has to be turned to "Extern".
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Explanation of the stepped-down values:

Settable values	Incoming contacts	Strokes performed
1:1	1	1
1:2	2	1
1:4	4	1
1:8	8	1
1:16	16	1
1:32	32	1
1:64	64	1

Explanation of stepped-up values:

Settable values	Incoming contacts	Strokes performed
1:1	1	1
2:1	1	2
4:1	1	4
8:1	1	8
16:1	1	16
32:1	1	32
64:1	1	64

11.1.4 External analog

"External Analogue" operating mode

In "External Analogue" operating mode, the stroke rate can be controlled by an mA signal via the pulse control switch. To do so, the multifunctional switch has to be turned to "Extern".

In the same way, a single contact via the pulse control switch at the "external control" terminal can either be used to trigger a series of strokes or to step down an incoming series of contacts. To do so, the multifunctional switch has to be turned to "Extern".

Explanation of the stepped-down values:

Settable values	Incoming contacts	Strokes performed
such as "External Analogue"	such as "External Analogue"	such as "External Analogue"
...	...	...
01:16	16	1
01:32	32	1
0-20 mA	-	corresponding to the mA signal

Explanation of stepped-up values:

Settable values	Incoming contacts	Strokes performed
such as "External Analogue"	such as "External Analogue"	such as "External Analogue"
...	...	...
16:1	1	16
32:1	1	32
4-20 mA	-	corresponding to the mA signal

11.2 Remote operation

There is an option to control the pump remotely via a signal cable - refer to your system documentation and to "Electrical Installation".

12 Maintenance

**WARNING!**

It is mandatory that you read the safety information and specifications in the "Storage, Transport and Unpacking" chapter prior to shipping the pump.

**WARNING!****Fire hazard with flammable media**

Only with combustible media: These may start to burn when combined with oxygen.

- During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.

**CAUTION!****Warning of feed chemical spraying around**

Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.



Third party spare parts for the pumps may lead to problems when pumping.

- *Use only original spare parts.*
- *Use the correct spare parts kits. In the event of doubt, refer to the exploded views and ordering information in the appendix.*

Standard liquid ends:

Interval	Maintenance work	Personnel
Quarterly*	■ Check the metering diaphragm for damage** - refer to "Repair". ■ Check that the hydraulic lines are fixed firmly to the liquid end. ■ Check that the suction valve and discharge valve are fitted tightly. ■ Check the tightness of the entire liquid end - particularly around the leakage hole - refer to  'Standard liquid ends:' on page 40! ■ Check that the flow is correct: Allow the pump to prime briefly - turn the multifunctional switch briefly to "Test" ■ Check that the electrical connections are intact. ■ Check the integrity of the housing. ■ Check that the dosing head screws are tight.	Technical personnel

* Under normal loading (approx. 30 % of continuous operation)

Under heavy loading (e.g. continuous operation): Shorter intervals.

** Check the diaphragm frequently with feed chemicals that put particular pressure on the diaphragm, e.g. those containing abrasive additives.

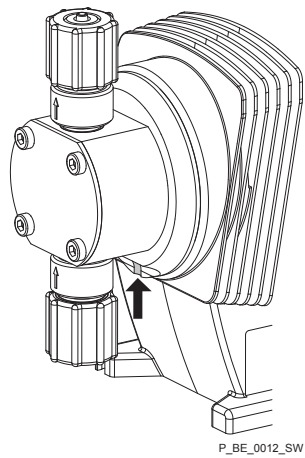


Fig. 17: Leakage hole

Liquid ends with bleed valve:

Interval	Maintenance work
Quarterly*	In addition: ■ Check that the bypass line is fixed firmly to the liquid end ■ Check that the bleed valve is tight. ■ Check the discharge and bypass line for kinks ■ Check that the bleed valve is operating correctly.

* Under normal loading (approx. 30 % of continuous operation)
 Under heavy loading (e.g. continuous operation): Shorter intervals.

Tightening torque

Data	Value	Unit
Tightening torque for screws:	4.5 ... 5.0	Nm

13 Repairs

Safety Information



WARNING!

Danger of electric shock

Unauthorised repairs inside the pump can result in an electric shock.

For this reason, only allow a ProMinent branch or representative to perform repair inside the pump, in particular the following:

- Replacement of damaged mains connection lines
- Replacement of fuses
- Replacement of electronic control



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

- During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.



WARNING!

It is mandatory that you read the safety information and specifications in the "Storage, Transport and Unpacking" chapter prior to shipping the pump.



WARNING!

Contact with the feed chemical

Parts that come into contact with the feed chemical are exposed and touched during repair work.

- Protect yourself against the feed chemical in case it is hazardous. Read the safety data sheet on the feed chemical.



CAUTION!

Warning of feed chemical spraying around

Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.

Repairs that may be carried out by qualified technical personnel, in accordance with the operating instructions:

- Cleaning valves
- Replacing the diaphragm

All other repairs: Contact the responsible ProMinent branch!

13.1 Cleaning valves



Warning of faulty operation

Refer to the exploded drawings in the appendix when working on the unit.

Cleaning a discharge valve or a suction valve on types (PP, PV, NP) 1000, 1601, 1602, 1604, 2504



Warning of faulty operation

- *Discharge and suction valves differ from each other! Only take them apart one after each other, so that you do not confuse the components!*
- *Only use new components which fit your valve - both in terms of shape and chemical resistance!*
- *Recalibrate the pump after replacing a valve!*
- *Using an Allen key or similar, insert it into the smaller hole of the discharge connector and push the valve inserts out of it.*

A suction valve is constructed in almost the same way as a discharge valve.

Please note, however, that:

- the two valve inserts are identical here
- There is an additional spacer between the valve inserts.
- There is a shaped seal in the dosing head instead of an O-ring.
- The flow direction of the suction connector is the opposite to that of the discharge connector.

Cleaning a discharge valve or a suction valve on types (PP, PV, NP) 0708, 1008, 0220, 0420, 0413, 0713, 0232



Warning of faulty operation

- *Discharge and suction valves differ from each other! Only take them apart one after each other, so that you do not confuse the components!*
- *Only use new components which fit your valve - both in terms of shape and chemical resistance!*
- *With the PVT material version, the ball seat is integrated in the dosing head and so has to be cleaned separately!*
- *On the PVT material version, the discharge valve is a double ball valve!*
- *Using an Allen key or similar, insert it into the smaller hole of the discharge connector and push the valve inserts out of it.*

A suction valve is constructed in almost the same way as a discharge valve.

Please note, however, that:

- The flow direction of the suction connector is the opposite to that of the discharge connector.

13.2 Replacing the diaphragm



WARNING!

A little feed chemical may have accumulated behind the diaphragm in the backplate following a leak - depending on the design!

- Take this feed chemical into consideration when you are planning a repair - especially if it is hazardous!

- If necessary take protective measures.
 - Adhere to the material safety data sheet for the feed chemical.
 - Ensure that the system is at atmospheric pressure.
1. ➤ Empty the liquid end (turn the liquid end upside down and allow the feed chemical to run out; flush out with a suitable medium; flush the liquid end thoroughly when using hazardous feed chemicals!)
 2. ➤ Turn the stroke adjustment dial as far as 0% stroke length when the pump is running (the drive axle is then difficult to turn).
 3. ➤ Switch off the pump.
 4. ➤ Unscrew the hydraulic connectors on the discharge and suction side.
 5. ➤ With PP types with bleed valve: Firstly remove the bleed valve (grip), then lift off the cover of the liquid end with a screw driver.
 6. ➤ Remove the screws (1).
 7. ➤ Loosen the dosing head (2) and the backplate (4) from the pump housing (6) - but only loosen!
 8. ➤ Hold the pump housing (6) with one hand and clamp the diaphragm (3) with the other hand between the dosing head (2) and the backplate (4).
 9. ➤ Loosen the diaphragm (3) from the drive axle with a gentle backwards turn of the dosing head (2), diaphragm (3) and backplate (4) in an anticlockwise direction.
 10. ➤ Unscrew the diaphragm (3) completely from the drive axle.
 11. ➤ Remove the backplate (4) from the pump housing (6).
 12. ➤ Check the condition of the safety diaphragm (5) and replace if necessary.
 13. ➤ Push the safety diaphragm (5) onto the drive axle only until it lies flush with the pump housing (6) and no further!
 14. ➤ Tentatively screw the new diaphragm (3) onto the drive axle until it can go no further.
⇒ The diaphragm (3) is now sitting at the stop of the thread.
 15. ➤ Should this not work, remove dirt or swarf from the threads and screw the diaphragm (3) onto the drive axle correctly this time.



Ensure that the diaphragm is screwed exactly onto the drive axle otherwise the pump will subsequently not meter accurately!

16. ➤ Unscrew the diaphragm (3) again.
17. ➤ Place the backplate (4) on the pump housing (6).

**CAUTION!****Leakage may become apparent at a later stage.**

- Make sure that the leakage hole points downwards when the pump is installed later - please refer to !
- Place the backplate (4) immediately into the correct position on the pump housing (6)! Do not twist the backplate on the pump housing to prevent the safety diaphragm (5) becoming warped!

- 18.** ► Place the diaphragm (3) into the backplate (4).

**CAUTION!****Leakage may become apparent at a later stage.**

- Do not over-tighten the diaphragm (3) in the following step!
- Ensure that the backplate (4) remains in its position so that the safety diaphragm does not become warped!

- 19.** ► Hold the backplate (4) firmly and screw the diaphragm (3) in a clockwise direction until it is sitting tightly (the twisting resistance of the return spring can be felt).
- 20.** ► Set the stroke length to 100%.
- 21.** ► Place the dosing head (2) with the screws (1) onto the diaphragm (3) and the backplate (4) - ensure that the suction connector points downwards when the pump is in its subsequent fitting position.
- 22.** ► Gently tighten the screws (1) and then tighten them diagonally. See below for the tightening torque.
- 23.** ► With PP types with bleed valve: Allow the cover of the liquid end to rest in the dosing head, then press the grip on the bleed valve into the dosing head.

**CAUTION!****Leakage possible**

- Check the tightening torque of the screws after 24 hours of operation!
- With PP and PV dosing heads, check the tightening torque again after three months!

Tightening torque

Data	Value	Unit
Tightening torque for screws:	4.5 ... 5.0	Nm

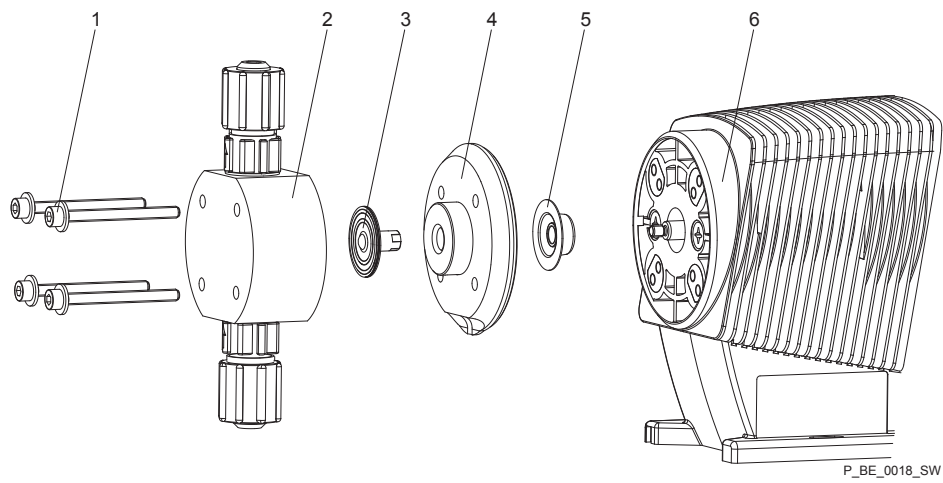


Fig. 18: Partially exploded view of liquid end

14 Troubleshooting

Safety Information



WARNING!

Warning of dangerous or unknown feed chemical

Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

- Take appropriate protective measures before working on the pump (e.g. safety glasses, safety gloves, ...). Observe the safety data sheet for the feed chemical.
- Drain and flush the liquid end before working on the pump.



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

- During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.



CAUTION!

Warning of feed chemical spraying around

Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.

14.1 Faults without a fault message

Fault description	Cause	Remedy	Personnel
Pump does not prime in spite of full stroke motion and bleeding.	Minor crystalline deposits on the ball seat due to the valves drying out.	Take the suction hose out of the storage tank and thoroughly flush out the liquid end.	Technical personnel
	Serious crystalline deposits on the ball seat due to the valves drying out.	Dismantle the valves and clean them - refer to "Repair"	Technical personnel
Fluid is escaping from the backplate.	The screws in the dosing head are too loose.	Tighten the screws in the dosing head crosswise - refer to "Repair" for tightening torque.	Instructed personnel
	The diaphragm is not leak-tight.	Replace the diaphragm - refer to "Repair".	Technical personnel
Green LED display (operating indicator) does not light up.	The wrong mains voltage or no mains voltage is connected.	Connect the pump correctly to the specified mains voltage - according to the specification on the nameplate	Electrician

14.2 Fault messages

Fault description	Cause	Remedy	Personnel
Red LED indicator (fault indicator) lights up and the pump stops	The fluid level in the storage tank has reached "Liquid level low 2nd stage".	Fill the storage tank.	Instructed personnel
	The pump is in "External Analogue" operating mode and the control current has risen above 23 mA (fault signal).	Clear the cause of the fault on the pump.	
	The pump is in "External Analogue" operating mode, set to "4-20 mA" and the control current has fallen below 4 mA.	Clear the cause of the low control current (e.g. cable break).	
	The multifunctional switch is not turned to "Extern" but an external cable is connected and the pump has the identity code feature "Control type" - "1" "with lock".	Either turn the multifunctional switch to "Extern" or remove the Extern cable from the pump	Technical personnel

14.3 Warning messages

Fault description	Cause	Remedy	Personnel
Yellow LED indicator (warning indicator) lights up	The fluid level in the storage tank has reached "Liquid level low 1st stage".	Fill the storage tank.	Instructed personnel

14.4 All Other Faults

Please contact the responsible ProMinent branch or representative!

15 Decommissioning

Decommissioning



WARNING!

Danger from chemical residues

There is normally chemical residue in the liquid end and on the housing after operation. This chemical residue could be hazardous to people.

- It is mandatory that the safety notes in the "Storage, Transport and Unpacking" chapter are read before shipping or transport.
- Thoroughly clean the liquid end and the housing of chemicals and dirt. Adhere to the material safety data sheet for the feed chemical.



WARNING!

Warning of dangerous or unknown feed chemical

Should a dangerous or unknown feed chemical be used: It may escape from the hydraulic components when working on the pump.

- Take appropriate protective measures before working on the pump (e.g. safety glasses, safety gloves, ...). Observe the safety data sheet for the feed chemical.
- Drain and flush the liquid end before working on the pump.



WARNING!

Fire hazard with flammable media

Only with combustible media: These may start to burn when combined with oxygen.

- During filling and draining of the liquid end, an expert must ensure that feed chemical does not come into contact with oxygen.



CAUTION!

Warning of feed chemical spraying around

Feed chemical can spray out of the hydraulic components if they are manipulated or opened due to pressure in the liquid end and adjacent parts of the system.

- Disconnect the pump from the mains power supply and ensure that it cannot be switched on again by unauthorised persons.
- Depressurise the system before commencing any work on hydraulic parts.



Danger of damage to the device

Take into account the information in the "Storage, Transport and Unpacking" chapter if the system is decommissioned for a temporary period.

1. ➡ Disconnect the pump from the mains/power supply.
2. ➡ Drain the liquid end by turning the pump upside down and allowing the feed chemical to run out.

3. ➞ Flush the liquid end with a suitable medium; flush the dosing head thoroughly when using hazardous feed chemicals!

Disposal



CAUTION!

Environmental hazard due to electronic waste

There are electronic components in the pump, which can have a toxic effect on the environment.

- Separate the electronic components from the remaining parts.
- Note the pertinent regulations currently applicable in your country!

16 Technical data

16.1 Performance data

Beta b operating at 180 strokes/minute
and 100% stroke length

Type	Minimum pump capacity at maximum back pressure			Minimum pump capacity at medium back pressure			Conne- ction size outside Ø x inside Ø	Suction lift*	Priming lift**	Max- imum priming pressure on suc- tion side
	bar	l/h	ml/ stroke	bar	l/h	ml/ stroke				
Beta b										
1000	10	0.74	0.069	5.0	0.82	0.076	6x4	6.0	1.8	8
0700	7	0.8	0.074	3.5	0.88	0.074	6x4	6.0	1.8	8
0400	4	0.84	0.078	2.0	0.92	0.078	6x4	6.0	1.8	8
2001	20	0.96	0.089	10	1.5	0.13	6x3	6.0	2.0	8
1601	16	1.1	0.10	8.0	1.40	0.13	6x4	6.0	2.0	8
1001	10	1.3	0.12	5.0	1.5	0.14	6x4	6.0	2.0	8
0701	7	1.4	0.13	3.5	1.7	0.14	6x4	6.0	2.0	8
0401	4	1.5	0.14	2.0	2.0	0.18	6x4	6.0	2.0	8
2002	20	1.7	0.16	10	2.8	0.26	6x3	6.0	2.5	5.5
1602	16	2.2	0.20	8.0	2.5	0.24	6x4	6.0	2.5	5.5
1002	10	2.4	0.22	5.0	2.8	0.26	6x4	6.0	2.5	5.5
0702	7	2.6	0.24	3.5	3.1	0.29	6x4	6.0	2.5	5.5
0402	4	2.8	0.26	2.0	3.6	0.36	6x4	6.0	2.5	5.5
1604	16	3.6	0.33	8.0	4.3	0.40	6x4	5.0	3.0	3
1004	10	3.9	0.36	5.0	4.7	0.44	6x4	5.0	3.0	3
0704	7	4.2	0.39	3.5	5.1	0.47	6x4	5.0	3.0	3
0404	4	4.5	0.42	2.0	5.6	0.52	6x4	5.0	3.0	3
0708	7	7.1	0.66	3.5	8.4	0.78	8x5	4.0	2.0	2
0408	4	8.3	0.77	2	10.0	0.93	8x5	4.0	2.0	2
0413	4	12.3	1.14	2.0	14.2	1.31	8x5	3.0	2.5	1.5
0220	2	19.0	1.76	1.0	20.9	1.94	12x9	2.0	2.0	1
2504	25	2.9	0.27	12.5	3.7	0.34	8x4 ¹	4.0	3.0	3
1605	16	4.1	0.38	8.0	4.9	0.45	8x5	4.0	3.0	3
1008	10	6.8	0.63	5.0	8.3	0.76	8x5	3.0	3.0	2
0713	7	11.0	1.02	3.5	13.1	1.21	8x5	3.0	3.0	1.5
0420	4	17.1	1.58	2.0	19.1	1.77	12x9	3.0	3.0	1
0232	2	32.0	2.96	1.0	36.2	3.35	12x9	2.0	2.0	0.8
Beta b Metering pumps with self-bleeding dosing head SEK***										
1601	16	0.59	0.055	8.0	0.80	0.072	6x4	6.0	2.0	0.5
1001	10	0.72	0.067	5.0	0.60	0.08	6x4	6.0	2.0	0.5
0701	7	0.84	0.078	3.5	1.12	0.10	6x4	6.0	2.0	0.5

Type	Minimum pump capacity at maximum back pressure			Minimum pump capacity at medium back pressure			Conne- ction size outside Ø x inside Ø	Suction lift*	Priming lift**	Max- imum priming pressure on suc- tion side
	bar	l/h	ml/ stroke	bar	l/h	ml/ stroke				
0401	4	0.9	0.083	2.0	1.2	0.11	6x4	6.0	2.0	0.5
2002	20	0.78	0.07	10.0	1.8	0.17	6x4	6.0	2.5	0.5
1602	16	1.40	0.13	8.0	1.70	0.16	6x4	6.0	2.5	0.5
1002	10	1.7	0.16	5.0	2.0	0.18	6x4	6.0	2.5	0.5
0702	7	1.8	0.17	3.5	2.2	0.20	6x4	6.0	2.5	0.5
0402	4	2.1	0.19	2.0	2.5	0.23	6x4	6.0	2.5	0.5
1604	16	2.7	0.25	8.0	3.6	0.33	6x4	6.0	3.0	0.5
1004	10	3.3	0.30	5.0	3.9	0.36	6x4	6.0	3.0	0.5
0704	7	3.6	0.33	3.5	4.0	0.37	6x4	6.0	3.0	0.5
0404	4	3.9	0.36	2.0	4.2	0.39	6x4	6.0	3.0	0.5
0708	7	6.60	0.61	3.5	7.50	0.69	8x5	6.0	2.0	0.5
0408	4	7.5	0.64	2.0	8.1	0.77	8x5	6.0	2.0	0.5
0413	4	10.8	1.0	2.0	12.6	1.17	8x5	6.0	2.5	0.5
0220	2	16.2	1.5	1.0	18.0	1.67	12x9	6.0	2.0	0.5
1008	10	6.3	0.58	5.0	7.5	0.69	8x5	6.0	3.0	0.5
0713	7	10.5	0.97	3.5	12.3	1.14	8x5	6.0	2.5	0.5
0420	4	15.6	1.44	2.0	17.4	1.61	12x9	6.0	2.5	0.5
Beta b metering pumps with self-bleeding dosing head SER****										
1002	10	1.40	0.13	8.0	1.70	0.174	6x4	6.0	1.8	0.5
1004	10	2.7	0.25	8.0	3.6	0.33	6x4	6.0	1.8	0.5
0708	7	6.60	0.61	3.5	7.50	0.69	8x5	6.0	1.8	0.5
0413	4	10.8	1.0	2.0	12.6	1.17	8x5	6.0	1.8	0.5
0220	2	16.2	1.5	1.0	18.0	1.67	12x9	6.0	2.0	0.5
1008	10	6.3	0.58	5.0	7.5	0.69	8x5	6.0	1.8	0.5
0713	7	10.5	0.97	3.5	12.3	1.14	8x5	6.0	1.8	0.5
0420	4	15.6	1.44	2.0	17.4	1.61	12x9	6.0	1.8	0.5

- * - Suction lift with a filled suction line and filled liquid end. With self-bleeding dosing head with air in the suction line.
- ** - Priming lift with clean and moist valves. Priming lift at 100% stroke length and free outlet or opened bleed valve.
- *** - The given performance data constitutes guaranteed minimum values, calculated using water as the medium at room temperature. The bypass connection with a self-bleeding dosing head SEK is 6x4 mm.
- *** - The given performance data constitutes guaranteed minimum values, calculated using water as the medium at room temperature.
- ¹ - The connector width is 6 mm on SST material versions.

Beta b Metering pumps with dosing heads for higher-viscosity media (HV) have a 10-20% lower capacity and are not self-priming. Connection G 3/4-DN 10 with hose nozzle d16-DN10.

16.2 Accuracy

16.2.1 Standard Liquid End

Data	Value	Unit
Capacity range of the series	-5 ... +10	% *
Reproducibility	±2	% **

- * - at max. stroke length and max. operating pressure for all material versions
- ** - at constant conditions and min. 30 % stroke length

16.2.2 Self-Bleeding Liquid End

As the self-bleeding liquid end is used with outgassing media and when operating with air bubbles, no dosing accuracy or reproducibility can be provided.

The recommended minimum stroke length with self-bleeding dosing pumps is 50 %.

16.3 Viscosity

The liquid ends are suitable for the following viscosity ranges:

Version	Range	Unit
standard	0 ... 200	mPas
With valve springs	200 ... 500	mPas
Self-bleeding (SEK)	0 ... 50	mPas
HV (highly viscous)	500 ... 3000*	mPas

* Only when the installation is correctly adjusted

16.4 Material Data

Standard liquid ends

Version	Dosing head	Suction/Discharge connector	Seals	Valve balls
PPE	Polypropylene	Polypropylene	EPDM	Ceramic
PPB	Polypropylene	Polypropylene	FPM	Ceramic
PPT	Polypropylene	PVDF	PTFE	Ceramic
NPE	Acrylic glass	PVC	EPDM	Ceramic
NPB	Acrylic glass	PVC	FPM	Ceramic
NPT	Acrylic glass	PVDF	PTFE	Ceramic
PVT	PVDF	PVDF	PTFE	Ceramic
TTT	PTFE with carbon	PTFE with carbon	PTFE	Ceramic
SST	Stainless steel 1.4404	Stainless steel 1.4404	PTFE	Ceramic

Only the self-bleeding version in PPE, PPB, NPE and NPB material models with a valve spring made of hastelloy C and a valve insert made of PVDF. Diaphragm with a PTFE coating.

FPM = fluororubber

Pump

Housing parts: polyphenyl ether (PPE with fibreglass)

16.5 Electrical data

Version: 100 - 230 V $\pm 10\%$, 50/60 Hz, Beta b BT4b

Data	Value	Unit
Nominal power, approx.	6.4 ... 16.5	W
Current I eff	0.65 ... 0.1	A
Peak current	4.2 ... 1.3	A
Switch on peak current, (within approx. 50 ms falling)	15	A
Fuse*	0.8	AT

Version: 100 - 230 V $\pm 10\%$, 50/60 Hz, Beta b BT5b

Data	Value	Unit
Nominal power, approx.	20 ... 25	W
Current I eff	0.9 ... 0.3	A
Peak current	5.9 ... 2.3	A
Switch on peak current, (within approx. 50 ms falling)	15	A
Fuse*	0.8	AT

* Fuses must have VDE, UL and CSA certification. E.G. type 19195 manufactured by Wickmann in compliance with IEC Publ. 127 - 2/3.

Power consumption

Type	Performance	Type	Performance	Type	Performance
	W		W		W
1000	7.6	1602	12.2	0408	12.7
0700	6.4	1002	10.6	0413	16.5
0400	5.7	0702	9.3	0220	16.5
2001	10.5	0402	7.9	2504	21.2
1601	10.0	1604	16.5	1008	20.3
1001	8.3	1004	12.7	0713	21.2
0701	7.5	0704	11.1	0420	21.2
0401	6.9	0404	9.5	0232	24.9
2002	13.5	0708	16.5		

Design: 12 - 24 VDC# -8/+24 %, identity code M

Parameter	Beta b BT4b
Nominal power, approx.	17.4 W.
Nominal current (averaged at 180 H/min)	3.9 ... 1.9 A.
Peak current	15.6... 8.7 A.
closed current (no stroke)	32 ... 24 mA.
Fuse*	5 AT

SELV in accordance with EN 60335-1

* 5 AT, 5x20 mm, order no. 712028



The pump only works if the polarity is correct.

Design: 24 VDC# -15/+24 %, identity code N

Parameter	Beta b BT5b
Nominal power, approx.	24.4 W.
Nominal current (averaged at 180 H/min)	2.5 A.
Peak current	11.7 A.
Closed current (no stroke)	24 mA.
Fuse*	5 AT

SELV in accordance with EN 60335-1

* 5 AT, 5x20 mm, order no. 712028



The pump only works if the polarity is correct.

16.6 Temperatures

Pump, fully assembled

Data	Value	Unit
Storage and transport temperature:	-10 ... +50	°C
Ambient temperature in operation (power end/drive and control):	-10 ... +45	°C

Liquid end, long-term*

Maximum temperature, liquid end

Material version	Value	Unit
PP	50	°C
NP	40	°C
PV	50	°C
TT	50	°C
SS	50	°C

* long term at max. operating pressure, dependent on the ambient temperature and the feed chemical temperature

Minimum temperature, liquid end

Minimum temperature, liquid end

Material version	Value	Unit
All	-10	°C

Liquid end, short-term*

Maximum temperature, liquid end

Material version	Value	Unit
PPT	100	°C
NPT	60	°C
PVT	120	°C
TTT	120	°C
SST	120	°C

* Temp. max., for 15 min at max. 2 bar, dependent on the ambient and feed chemical temperatures

16.7 Climate

Data	Value	Unit
Maximum air humidity *:	95	% rel. humidity

* non-condensing

Exposure in a humid and alternating climate:
FW 24 according to DIN 50016

16.8 Degree of Protection and Safety Requirements

Degree of protection

Protection against accidental contact and humidity:
IP 65 according to DIN EN 60529

Safety requirements

Degree of protection:
1 - mains power connection with protective earth conductor

16.9 Compatibility

Some hydraulic parts of the Beta[®] b are identical to those of the Beta[®] a, gamma/ L and delta[®].

There is most compatibility with pumps of the Beta[®] a, gamma/ L and delta[®] series with the following components and accessories:

- Signal cable gamma/Vario 2-, 4- and 5-wire for the "Extern" function
- Level switch 2-stage (gamma / Vario / Beta[®])
- Dosing line cross-sections
- Standard gamma connector kit
- Chemical feed container
- Overall height (distance between the suction and discharge connector)
- Same use of accessories, such as back pressure valves, multifunctional valves, dosing monitor and flushing equipment

16.10 Sound pressure level

Sound pressure level

Sound pressure level LpA < 70 dB according to EN ISO 20361
at maximum stroke length, maximum stroke rate, maximum back pressure (water)

16.11 Shipping weight

Shipping weight of Beta b types - in kg

Material	BT4b						BT5b		
	1000, 0700, 0400	2001, 1601, 1001, 0701, 0401	2002, 1602, 1002, 0702, 0402	1604, 1004, 0704, 0404	0708, 0408, 0413	0220	2504, 1008, 0713	0420	0232
PP, NP, PV, TT	2.5	2.9	2.9	3.1	3.1	3.3	4.5	4.7	5.1
SS	3.0	3.6	3.6	3.9	3.9	4.4	5.3	5.8	6.6

17 Dimensional drawings



- Compare the dimensions on the dimensional drawing and pump.
- All dimensions are in mm.

Dimensional drawing Beta b, material version PP

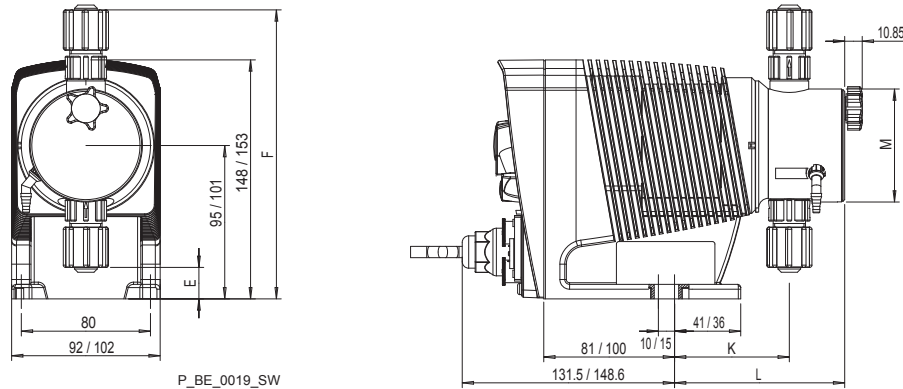


Fig. 19: Dimension drawing Beta b BT4b/BT5b, material version PP - dimensions in mm

	1000 - 1604	0708 - 0220	1008 - 0420	0232
E	19.5	7	14	1.5
F	179	186.5	191.5	200.5
K	71	77.5	74	77.5
L	105.5	111	107.5	94.5
M	Ø 70	Ø 90	Ø 90	Ø 110

Dimensional drawing Beta b, material version PP

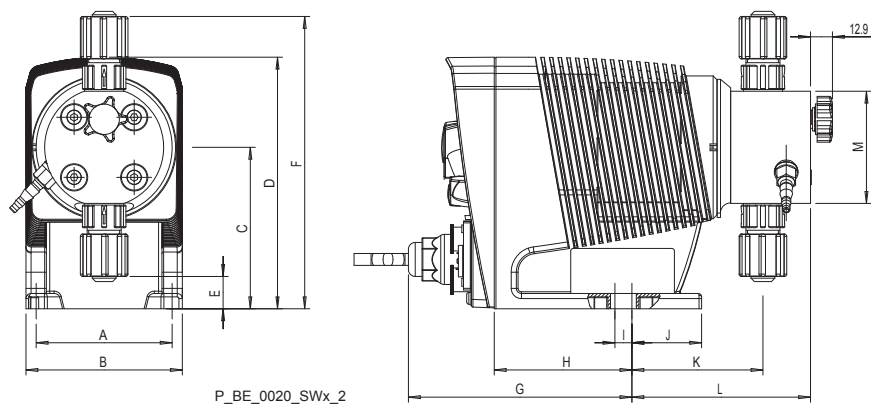


Fig. 20: Dimension drawing Beta b BT4b/BT5b, material version PP - dimensions in mm

	1000 - 1604	0708 - 0220	2504	1008 - 0420	0232
A	80	80	80	80	80
B	92	92	102	102	102
C	95	95	101	101	101
D	148	148	153	153	153
E	19	7.2	24.6	14	3.2
F	172	182.8	178.4	188	198.8
G	131.5	131.5	148.6	148.6	148.6
H	81	81	100	100	100
I	10	10	15	15	15
J	41	41	36	36	36
K	77	77.5	77.1	74.1	76
L	105	105.5	105.1	102.1	104.5
M	Ø 70	Ø 90	Ø 70	Ø 90	Ø 110

Dimensional drawing Beta b, material version PP and NP SEK

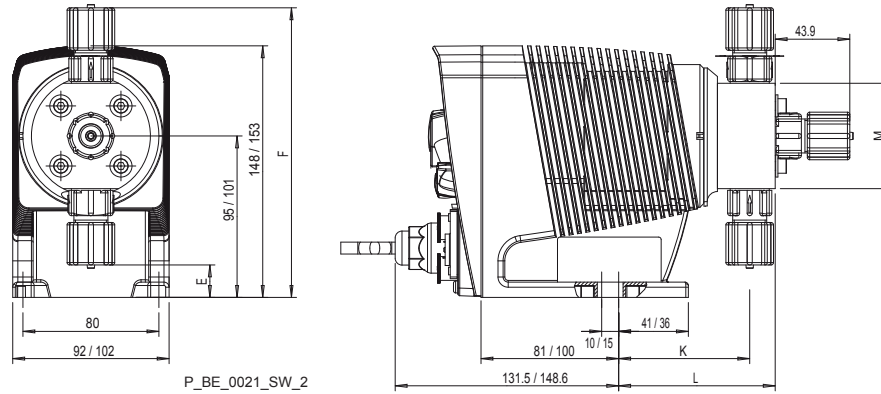


Fig. 21: Dimensional drawing Beta b BT4b/BT5b, material versions PP and NP with self-bleeding dosing head SEK - dimensions in mm

	1604	0708 - 0220	1008 - 0232
E	19	7.5	13.6
F	170.5	182.5	188.4
K	77	74	74
L	92	105.5	89
M	Ø 70	Ø 90	Ø 90

Dimensional drawing Beta b, material version PV

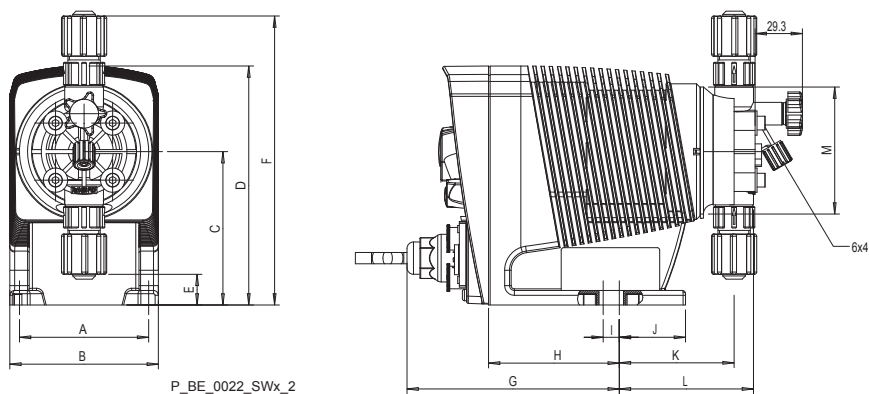


Fig. 22: Dimension drawing Beta b BT4b/BT5b, material version PV - dimensions in mm

	1604	0708 - 0220	1008 - 0420	0232
A	80	80	80	80
B	92	92	102	102
C	95	95	101	101
D	148	148	153	153
E	19	8.1	14.1	3.2
F	179	185.5	191.5	199
G	131.5	131.5	148.5	148.5
H	81	81	100	100
I	10	10	15	15
J	41	41	36	36
K	71	73	73	76
L	83	90	90	93
M	Ø 70	Ø 90	Ø 90	Ø 110

Dimensional drawing Beta b, material version PV HV

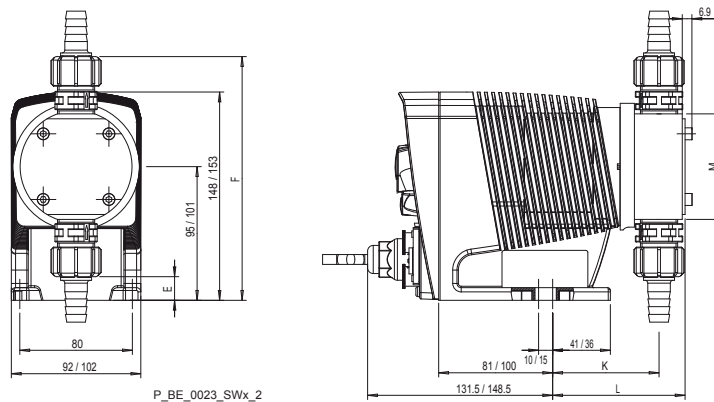


Fig. 23: Dimensional drawing Beta b BT4b/BT5b, material version PV for highly viscous feed chemicals - dimensions in mm

	1604	0708 - 0413	0220	1008 - 0713	0420
E	17	13	13	22.8	19
F	173	177	177	179.2	183
K	75.5	77	77	75.5	78.5
L	94	95	95	94	96.5
M	Ø 70	Ø 80	Ø 85	Ø 85	Ø 85

Dimensional drawing Beta b, material version TT

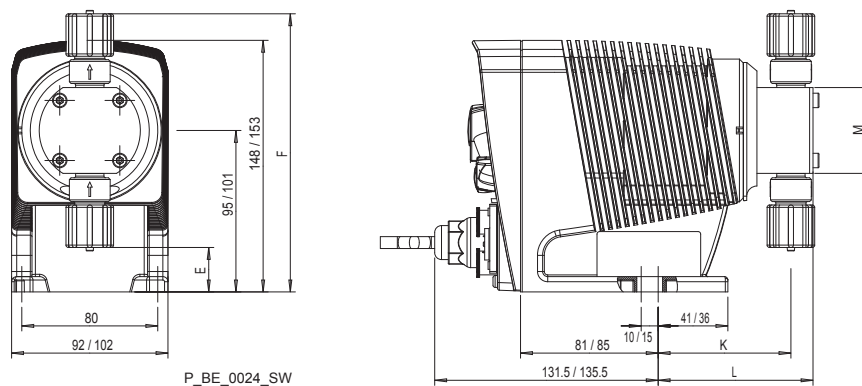


Fig. 24: Dimension drawing Beta b BT4b/BT5b, material version TT - dimensions in mm

	1000 - 1601	1602 - 1604	0708 - 0220	1008 - 0420	0232
E	26.2	21.3	-13.2	-7.2	-14.2
F	163.7	168.8	202.7	208.7	215.7
K	78	72	77	77.1	78
L	91	86	94	94	97
M	Ø 60	Ø 70	Ø 85	Ø 85	Ø 100

Dimensional drawing Beta b, material version SS

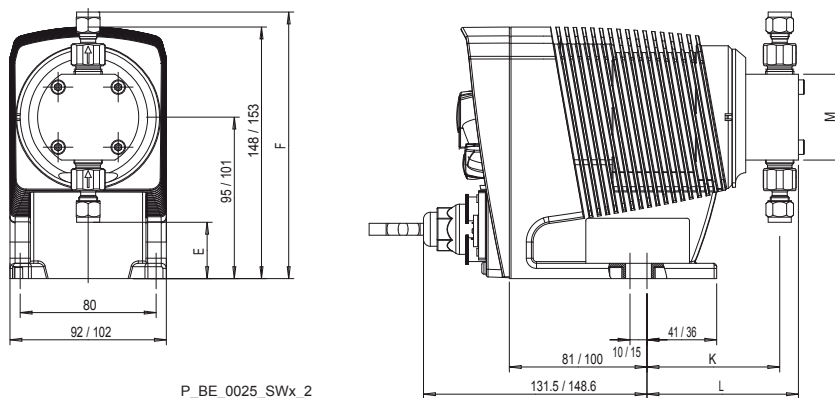


Fig. 25: Dimensional drawing Beta b BT4b/BT5b, material version SS - dimensions in mm

	1000 - 1601	1602 - 1604	0708 - 0220	2504	1008 - 0420	0232
E	33.2	24.4	-7.8	31.7	-1.8	-8
F	156.9	165.6	197.3	170.4	203.3	210
K	78	75	82	72	77	78
L	89	87	97	84	92	95
M	Ø 60	Ø 70	Ø 85	Ø 70	Ø 85	Ø 110

18 Diagrams for setting the metering capacity

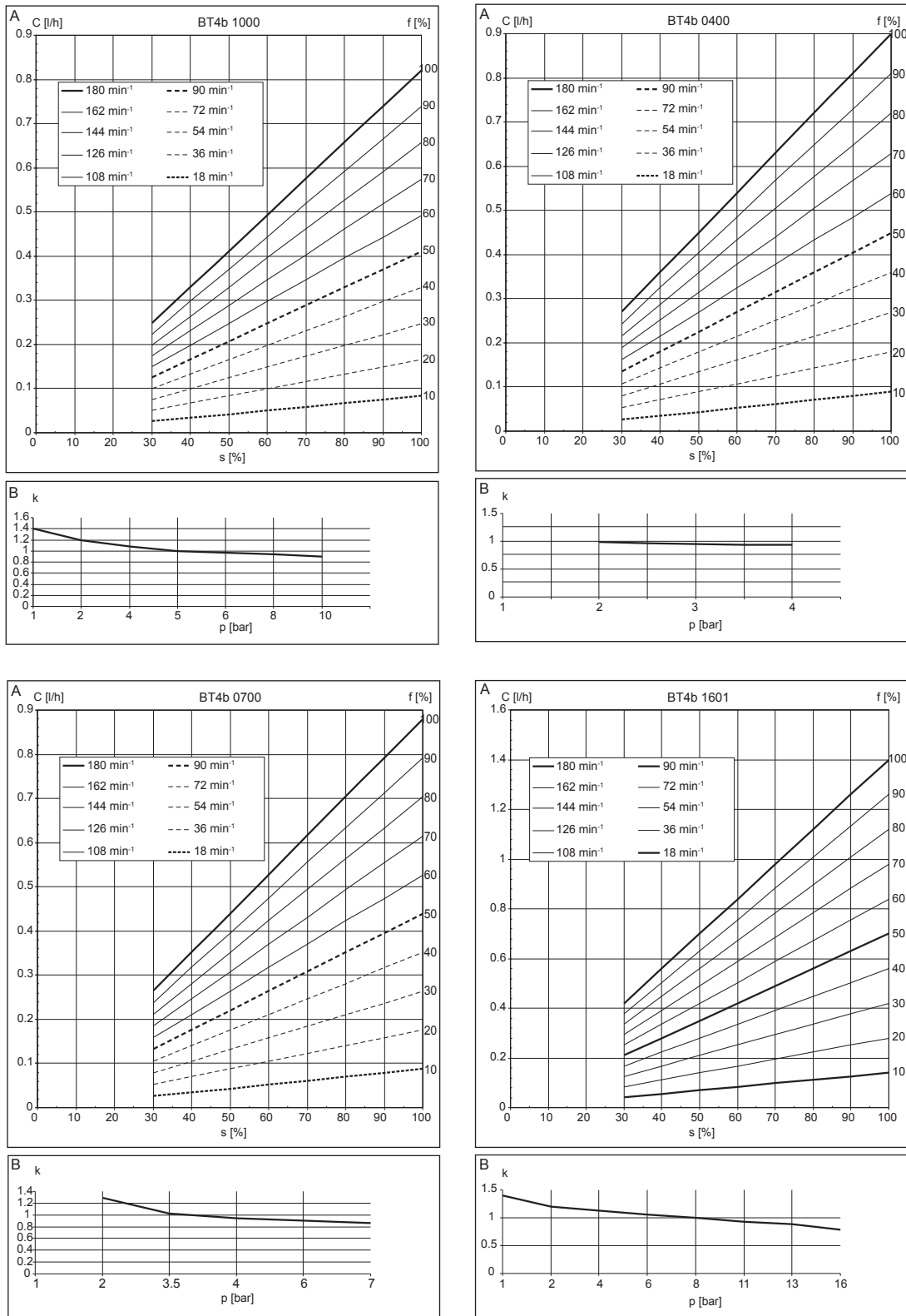


Fig. 26: A) Metering capacity C for medium back pressure dependent on the stroke length s for different stroke rates f . B) Corresponding correction factors k dependent on back pressure p .

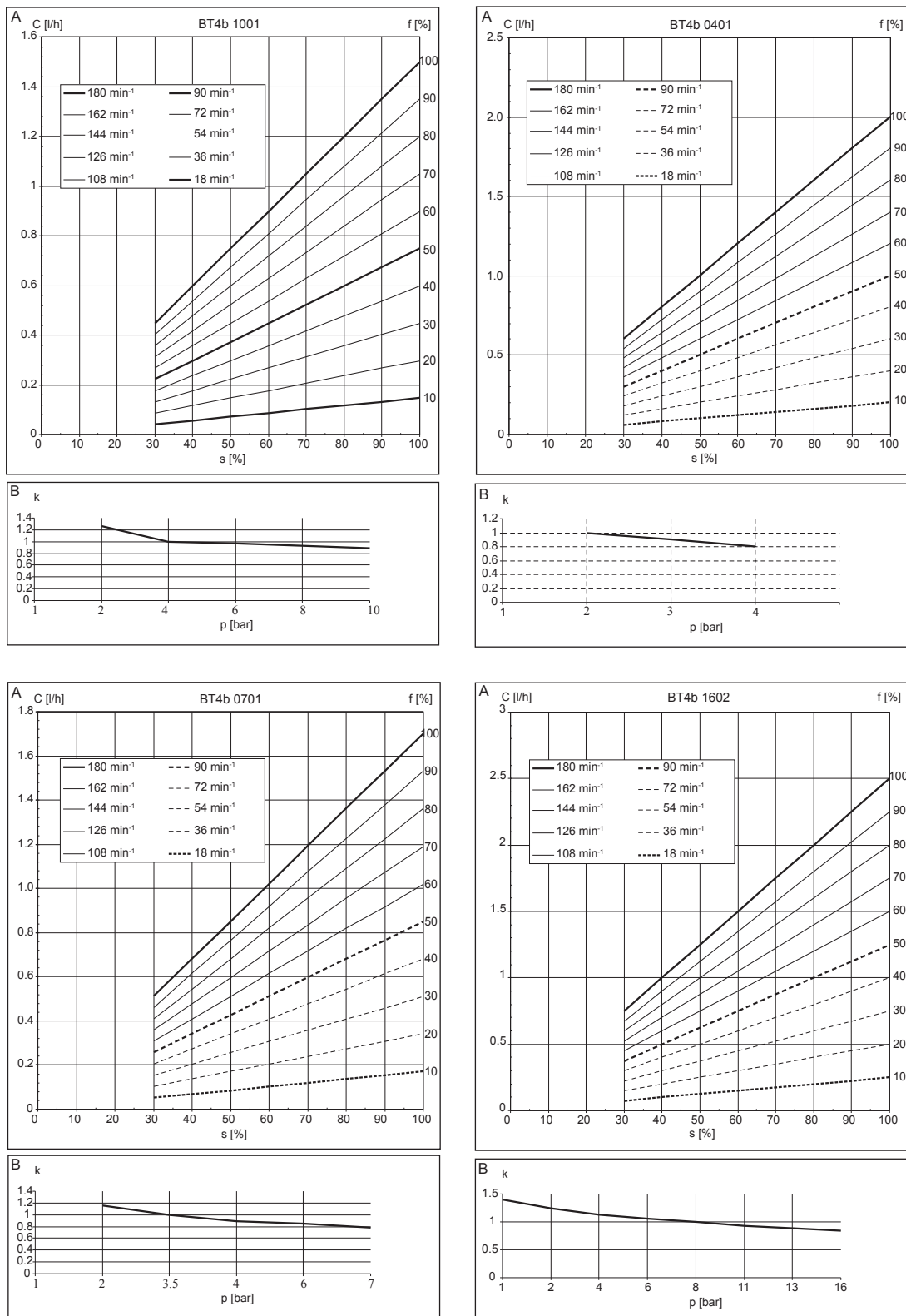


Fig. 27: A) Metering capacity C for medium back pressure dependent on the stroke length s for different stroke rates f . B) Corresponding correction factors k dependent on back pressure p .

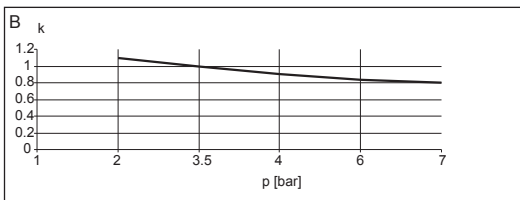
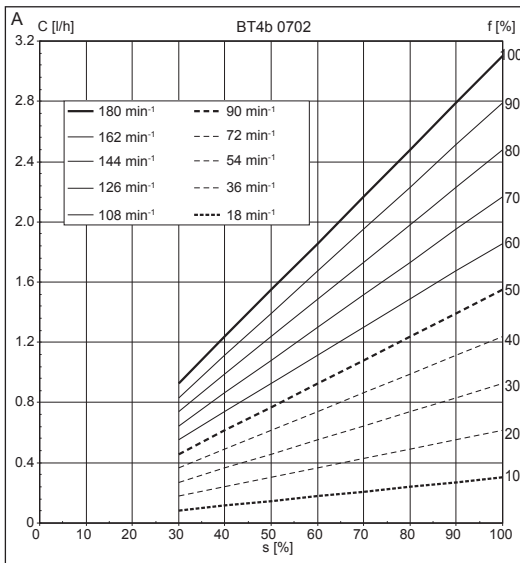
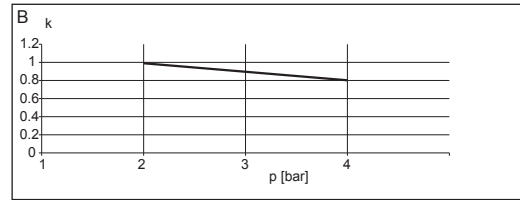
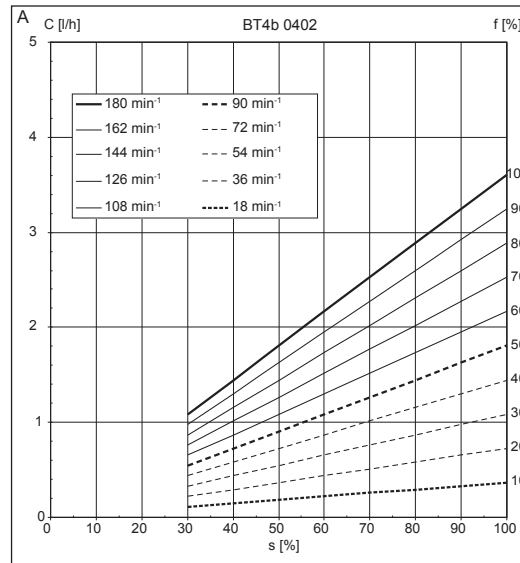
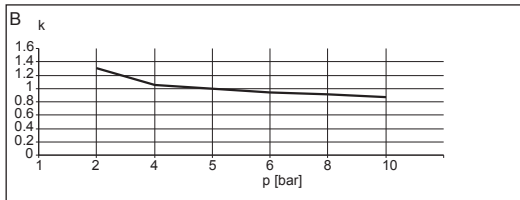
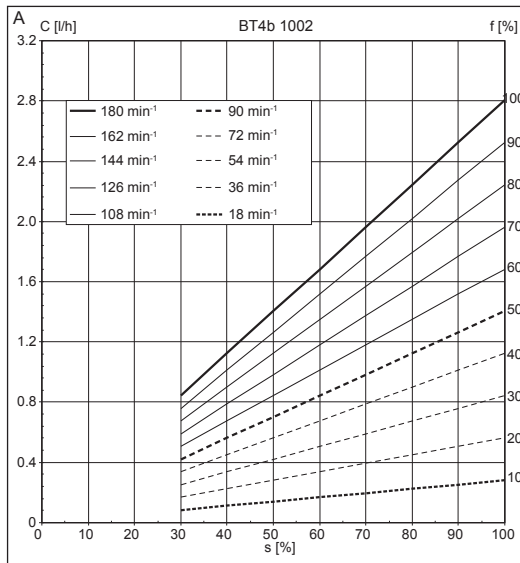


Fig. 28: A) Metering capacity C for medium back pressure dependent on the stroke length s for different stroke rates f . B) Corresponding correction factors k dependent on back pressure p .

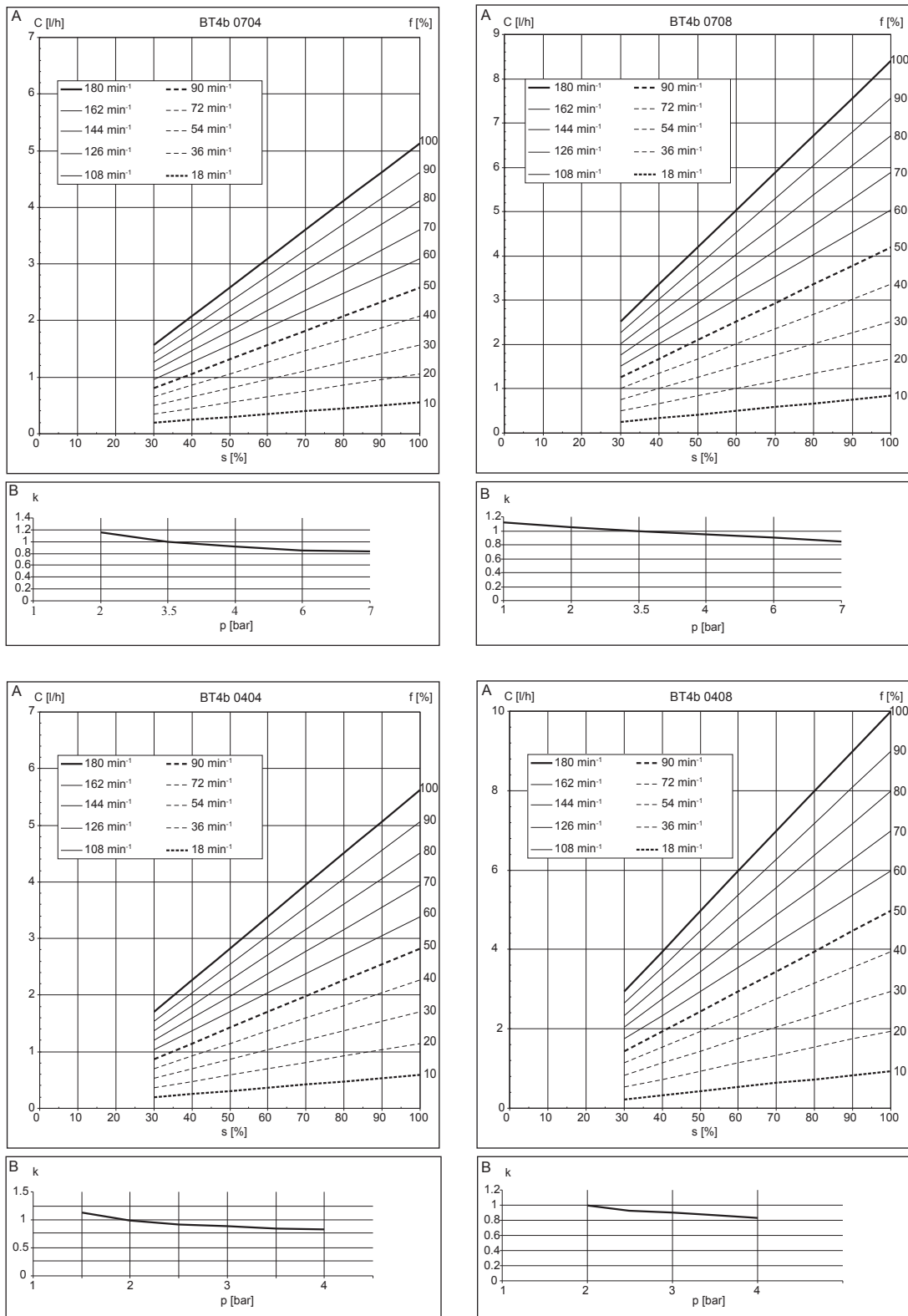


Fig. 29: A) Metering capacity C for medium back pressure dependent on the stroke length s for different stroke rates f . B) Corresponding correction factors k dependent on back pressure p .

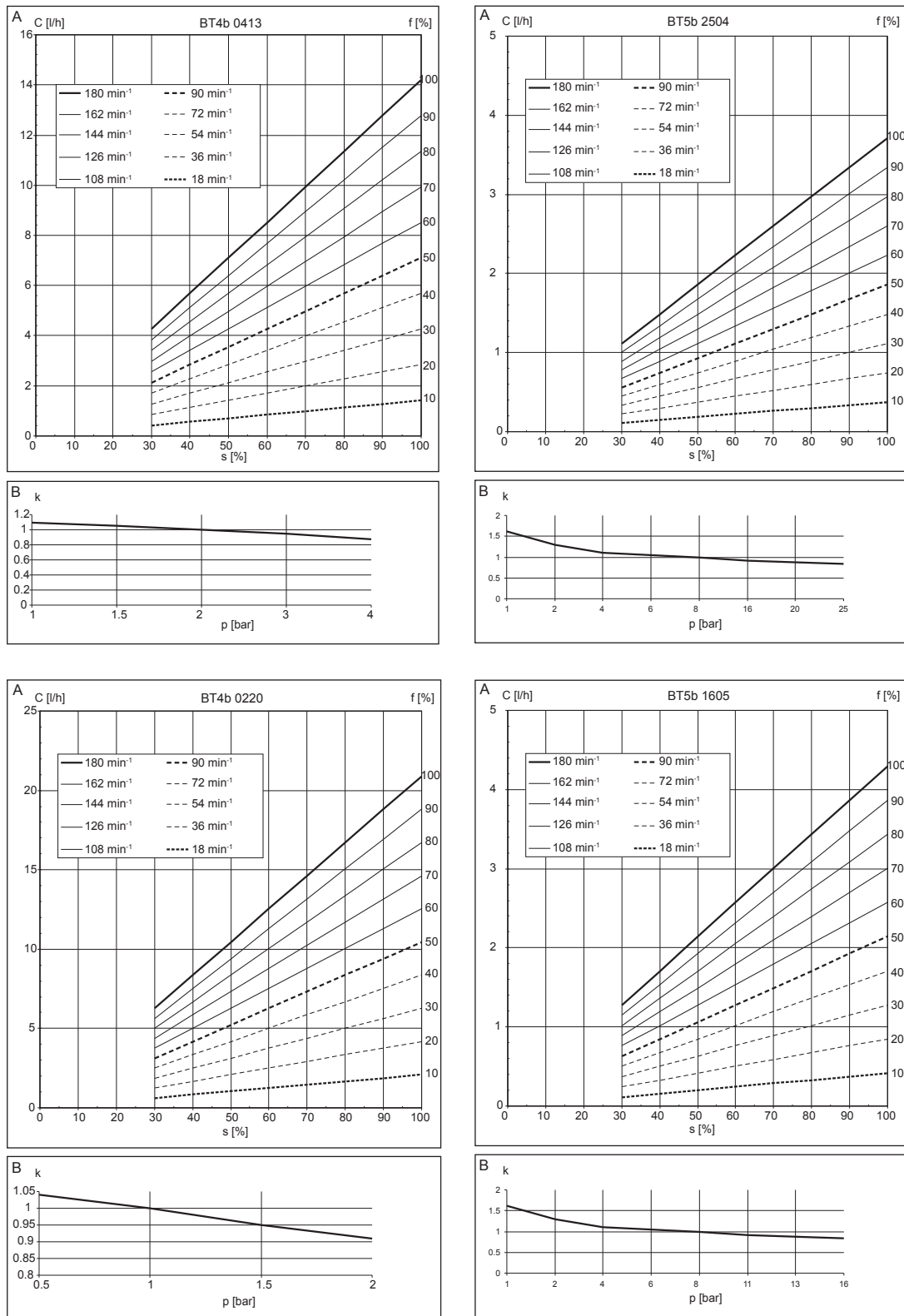


Fig. 30: A) Metering capacity C for medium back pressure dependent on the stroke length s for different stroke rates f . B) Corresponding correction factors k dependent on back pressure p .

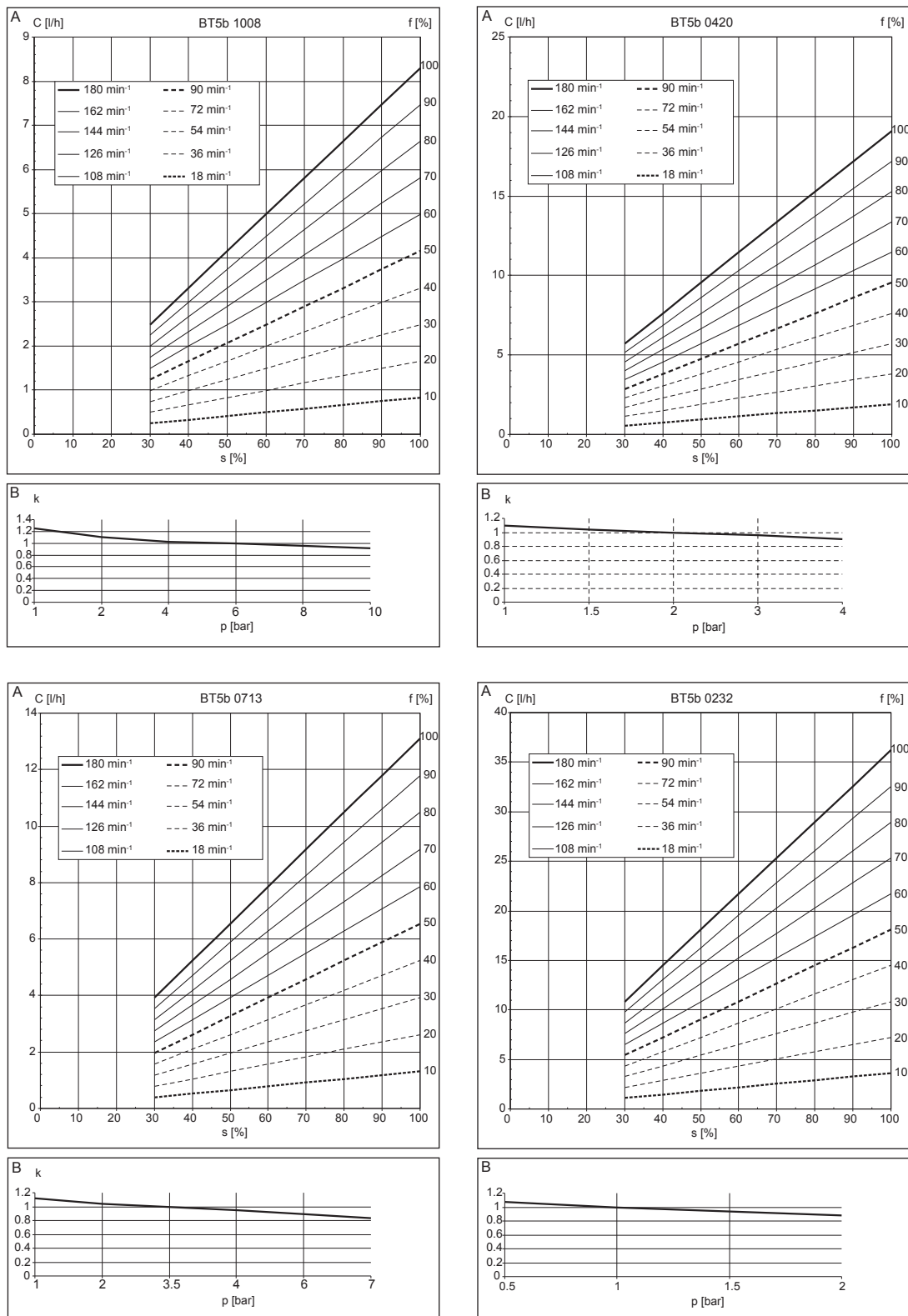


Fig. 31: A) Metering capacity C for medium back pressure dependent on the stroke length s for different stroke rates f . B) Corresponding correction factors k dependent on back pressure p .

19 Exploded Views of Liquid Ends

Liquid end Beta® 1000 - 1604 PP with bleed valve

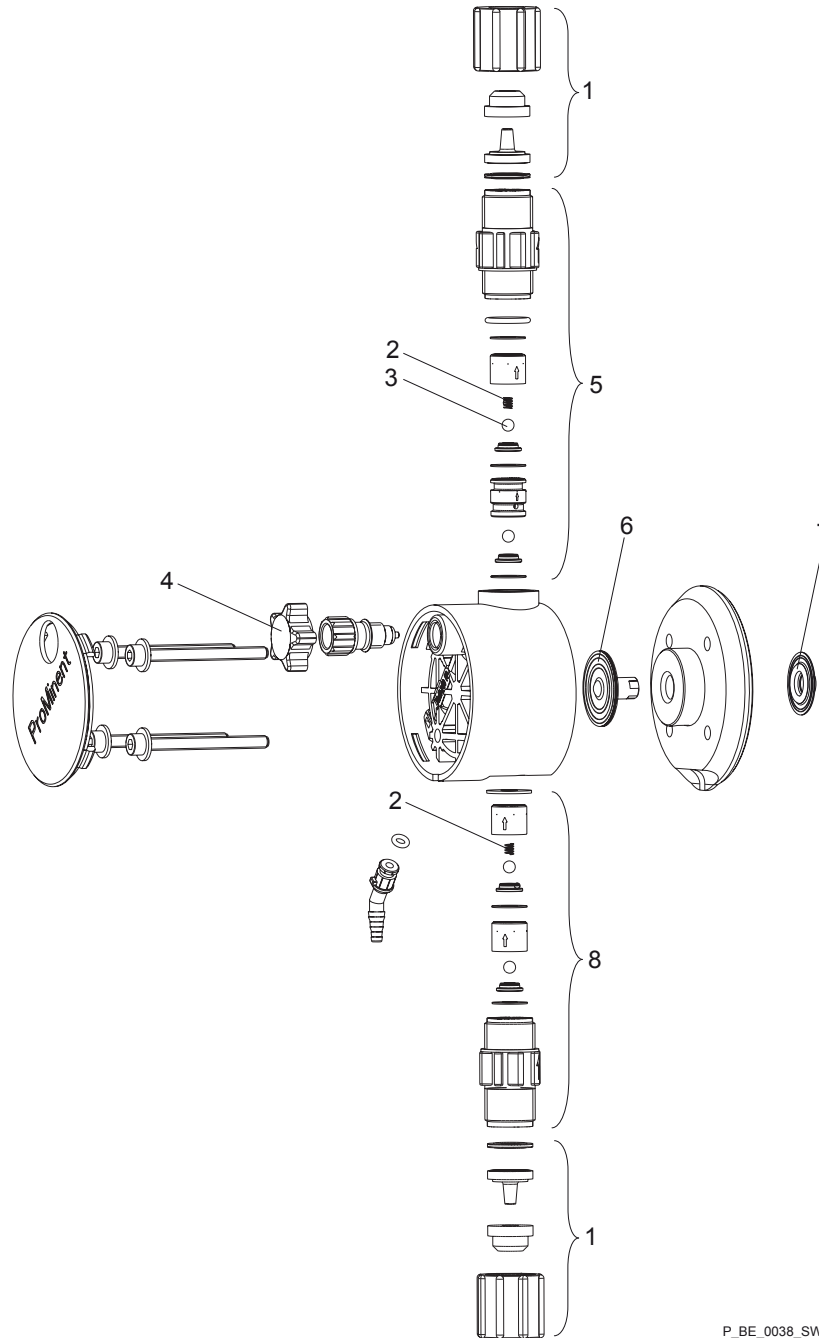


Fig. 32

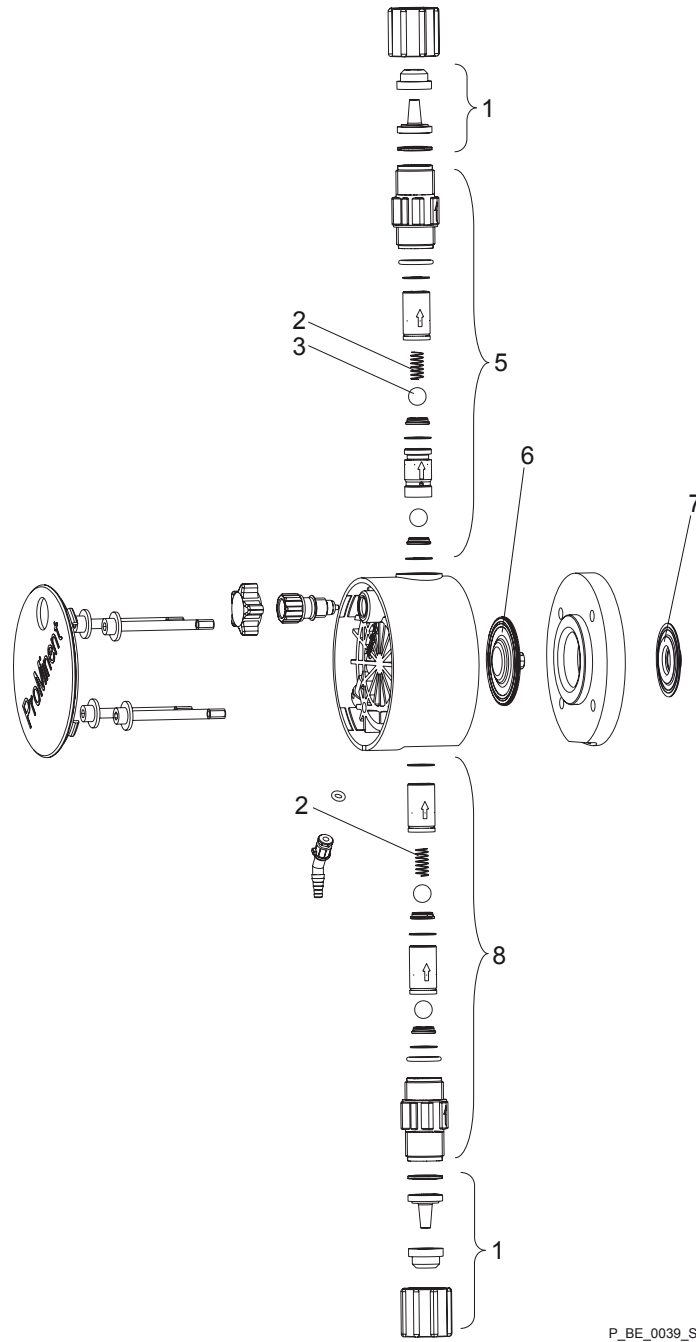
Item	Description	Type 1000	Type 1601	Type 1602	Type 1604
1	Connector kit 6/4 PVT	1023246	1023246	1023246	1023246
3	4 Valve balls	404201	404201	404201	404201
4	Bleed valve	1021662	1021662	1021662	1021662

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Item	Description	Type 1000	Type 1601	Type 1602	Type 1604
5	Discharge valve, compl. 4.7-2 PVT	1023127	1023127	1023127	1023127
6	Diaphragm	1000244	1000245	1000246	1034612
7	Safety diaphragm	1006061	1006061	1006061	1006061
8	Suction valve, compl. 4.7-2 PVT	1023128	1023128	1023128	1023128

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 0708 (1008) - 0220 (0420) PP with bleed valve



P_BE_0039_SW

Fig. 33

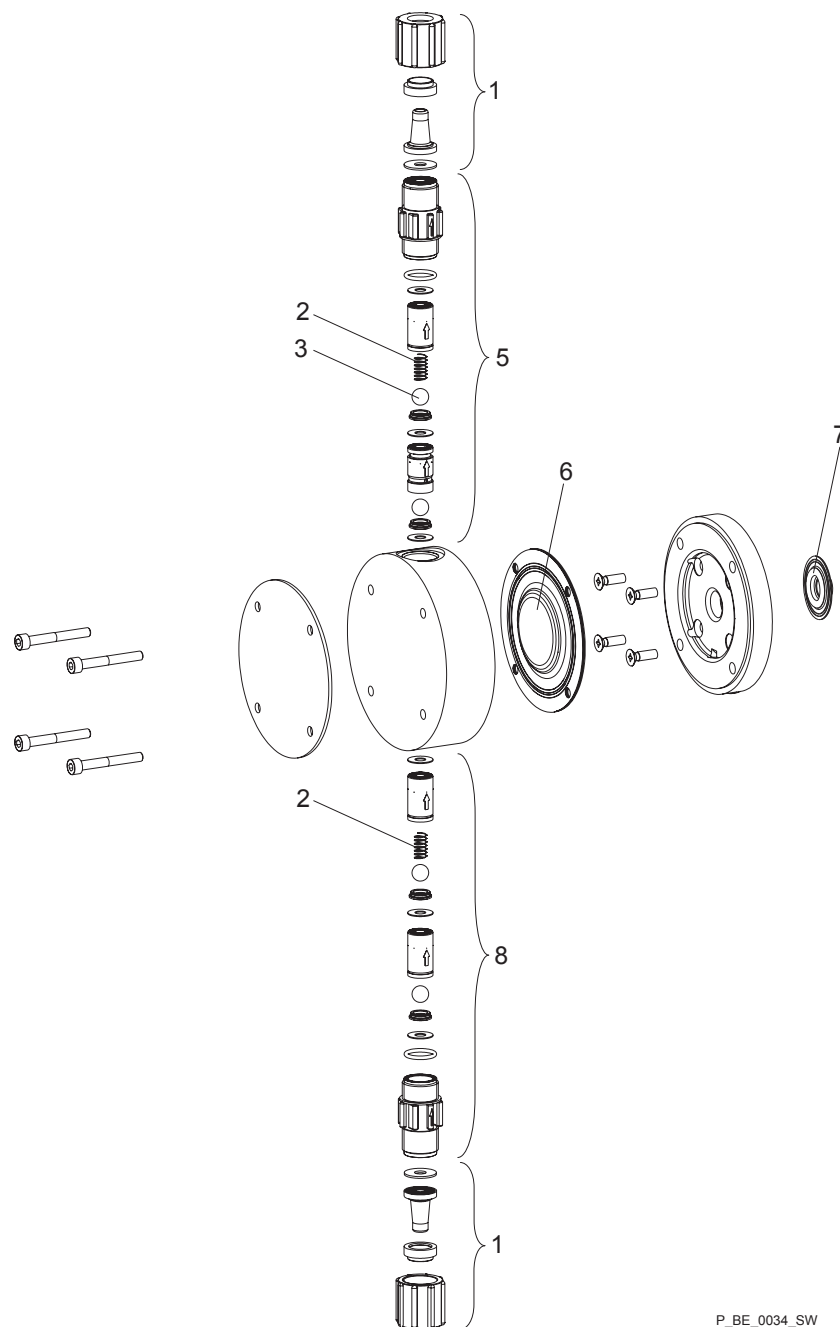
Item	Description	Type 0708 (1008)	Type 0413 (0713)	Type 0220 (0420)
1	Connector kit 8/5 PVT	1023247	1023247	1023247
3	4 Valve balls	404281	404281	404281
4	Bleed valve	1021662	1021662	1021662
5	Discharge valve, compl. 9.2-2 PVT	1023125	1023125	1023125

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Item	Description	Type 0708 (1008)	Type 0413 (0713)	Type 0220 (0420)
6	Diaphragm	1000248	1000249	1000250
7	Safety diaphragm	1006061	1006061	1006061
8	Suction valve, compl. 9.2-2 PVT	1023126	1023126	1023126

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 0232 PP without bleed valve



P_BE_0034_SW

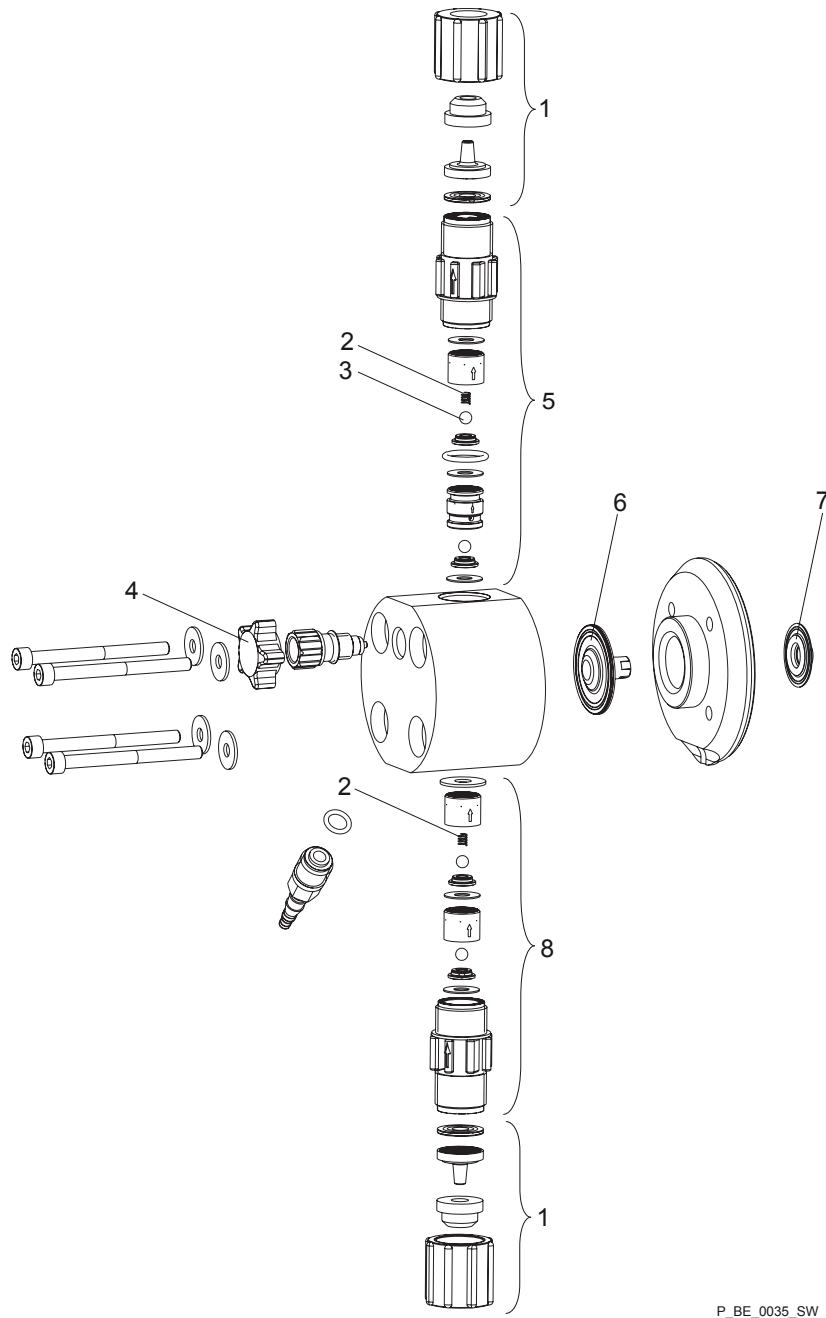
Fig. 34

Item	Description	Type 0232
1	Connector kit 12/9 PVT	1023248
3	4 Valve balls	404281
5	Discharge valve, compl. 9.2-2 PVT	1023125
6	Diaphragm	1000251

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Item	Description	Type 0232
7	Safety diaphragm	1006061
8	Suction valve, compl. 9.2-2 PVT	1023126
Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.		

Liquid end Beta® 1000 - 1604 NP with and without bleed valve



P_BE_0035_SW

Fig. 35

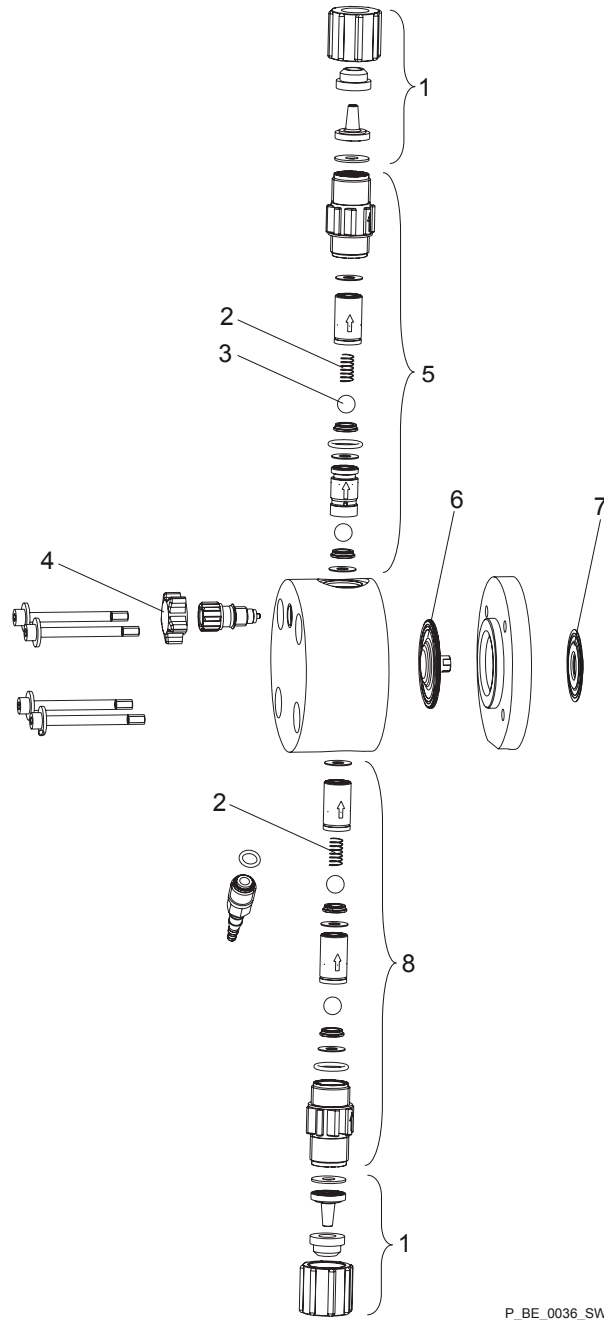
Item	Description	Type 1000	Type 1601	Type 1602	Type 1604
1	Connector kit 6/4 PVT	1023246	1023246	1023246	1023246
3	4 Valve balls	404201	404201	404201	404201
4	Bleed valve	1021662	1021662	1021662	1021662
5	Discharge valve, compl. 4.7-2 PVT	1023127	1023127	1023127	1023127

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Item	Description	Type 1000	Type 1601	Type 1602	Type 1604
6	Diaphragm	1000244	1000245	1000246	1034612
7	Safety diaphragm	1006061	1006061	1006061	1006061
8	Suction valve, compl. 4.7-2 PVT	1023128	1023128	1023128	1023128

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 0708 (1008) - 0220 (0420) NP with and without bleed valve



P_BE_0036_SW

Fig. 36

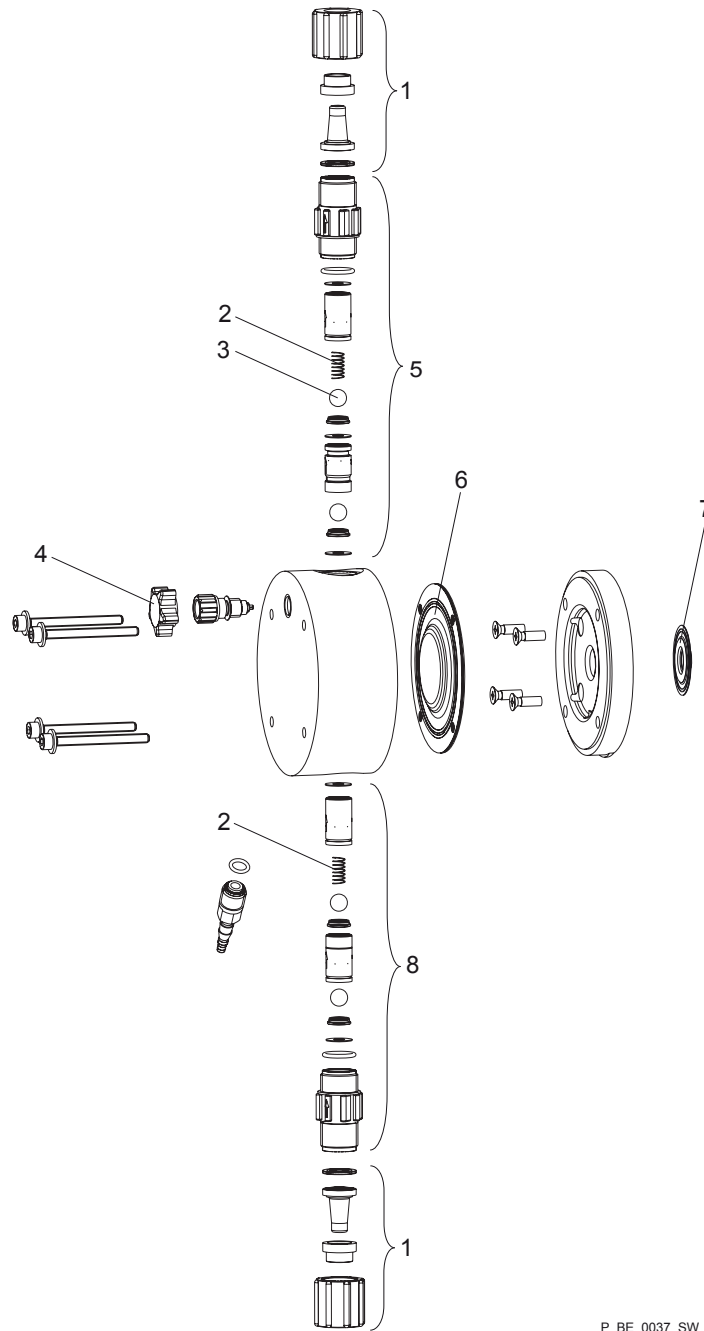
Item	Description	Type 0708 (1008)	Type 0413 (0713)	Type 0220 (0420)
1	Connector kit 8/5 PVT	1023247	1023247	1023247
3	4 Valve balls	404281	404281	404281
4	Bleed valve	1021662	1021662	1021662
5	Discharge valve, compl. 9.2-2 PVT	1023125	1023125	1023125

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Item	Description	Type 0708 (1008)	Type 0413 (0713)	Type 0220 (0420)
6	Diaphragm	1000248	1000249	1000250
7	Safety diaphragm	1006061	1006061	1006061
8	Suction valve, compl. 9.2-2 PVT	1023126	1023126	1023126

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 0232 NP with and without bleed valve



P_BE_0037_SW

Fig. 37

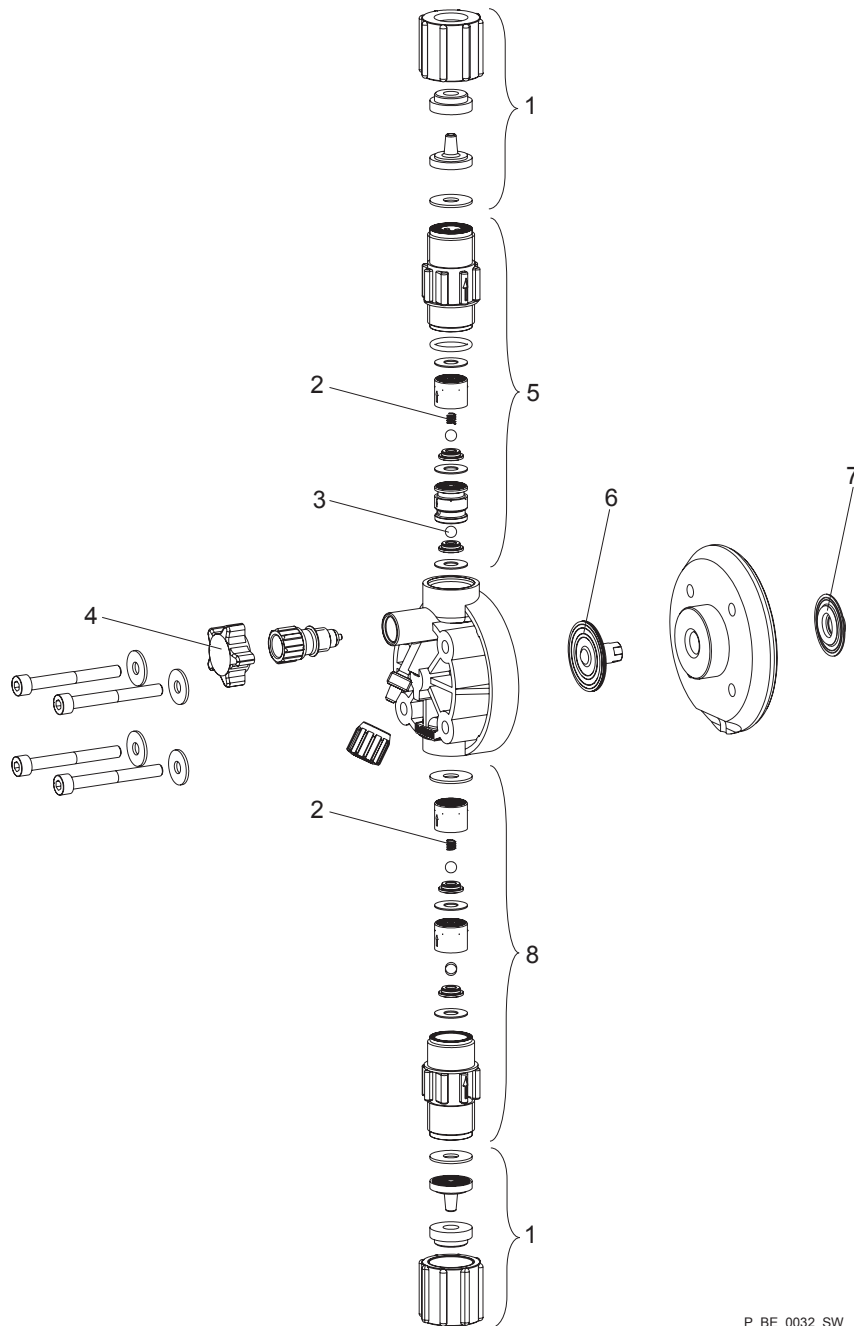
Item	Description	Type 0232
1	Connector kit 12/9 PVT	1023248
3	4 Valve balls	404281
5	Discharge valve, compl. 9.2-2 PVT	1023125
6	Diaphragm	1000251

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Item	Description	Type 0232
7	Safety diaphragm	1006061
8	Suction valve, compl. 9.2-2 PVT	1023126

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 1000 - 1604 PV with bleed valve



P_BE_0032_SW

Fig. 38

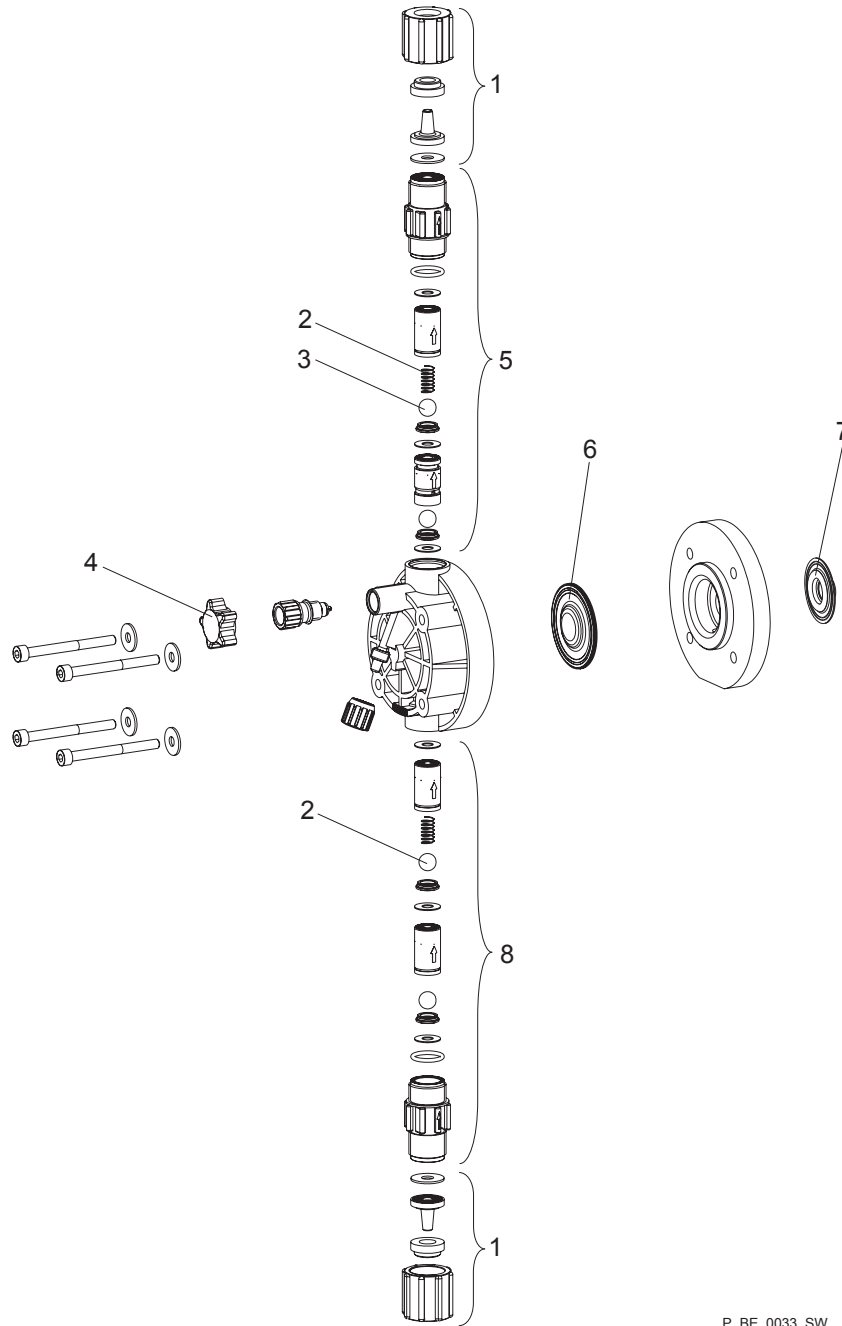
Item	Description	Type 1000	Type 1601	Type 1602	Type 1604
1	Connector kit 6/4 PVT	1035660	1035660	1035660	1035660
3	4 Valve balls	404201	404201	404201	404201
4	Bleed valve	1021662	1021662	1021662	1021662
5	Discharge valve, compl. 4.7-2 PVT	1023127	1023127	1023127	1023127

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Item	Description	Type 1000	Type 1601	Type 1602	Type 1604
6	Diaphragm	1000244	1000245	1000246	1034612
7	Safety diaphragm	1006061	1006061	1006061	1006061
8	Suction valve, compl. 4.7-2 PVT	1023128	1023128	1023128	1023128

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 0708 (1008) - 0220 (0420) PV with bleed valve



P_BE_0033_SW

Fig. 39

Item	Description	Type 0708 (1008)	Type 0413 (0713)	Type 0220 (0420)
1	Connector kit 8/5 PVT (0220/0420: 12/9)	1035661	1035661	1035659
3	4 Valve balls	404281	404281	404281
4	Bleed valve	1021662	1021662	1021662
5	Discharge valve, compl. 9.2-2 PVT	1023125	1023125	1023125

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Item	Description	Type 0708 (1008)	Type 0413 (0713)	Type 0220 (0420)
6	Diaphragm	1000248	1000249	1000250
7	Safety diaphragm	1006061	1006061	1006061
8	Suction valve, compl. 9.2-2 PVT	1023126	1023126	1023126

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 0232 PV without bleed valve

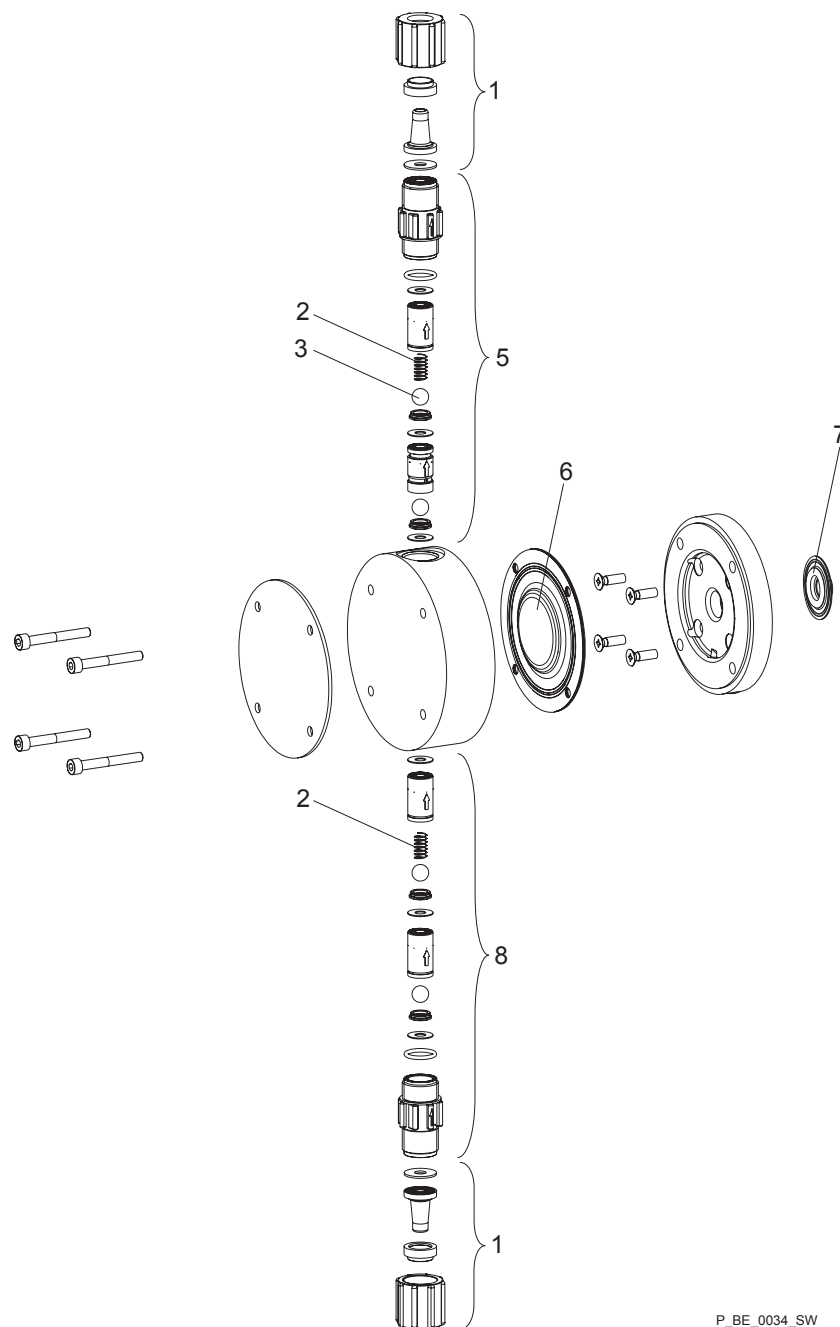


Fig. 40

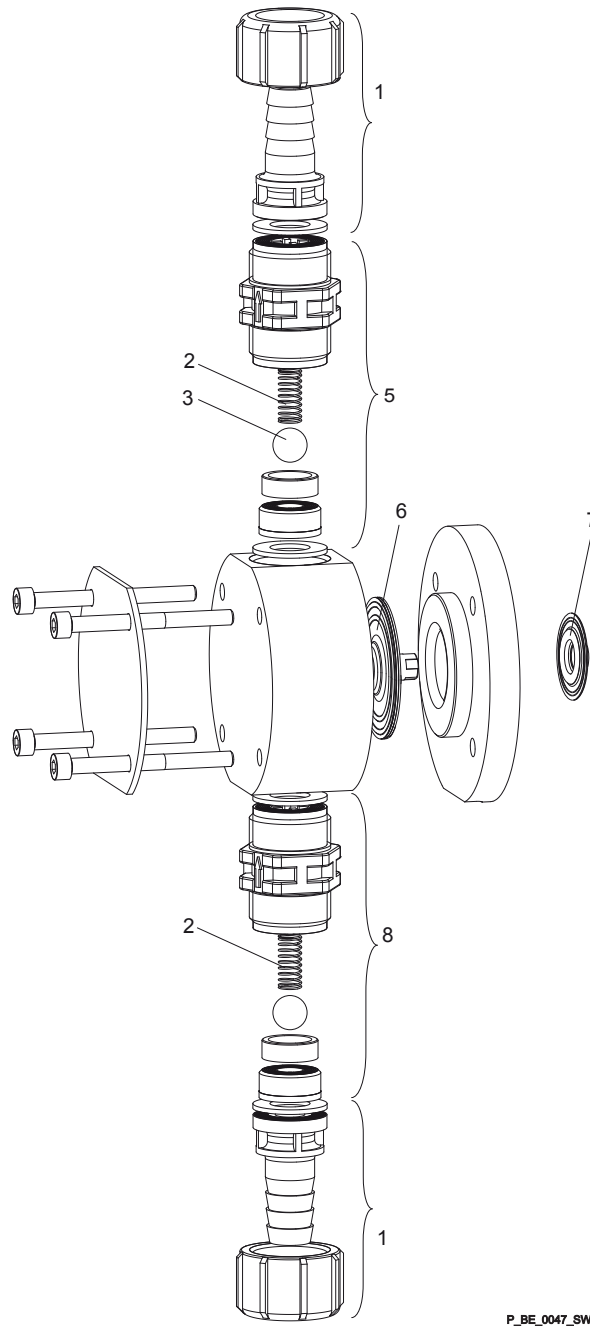
Item	Description	Type 0232
1	Connector kit 12/9 FVD PVT	1035659
3	4 Valve balls	404281
5	Discharge valve, compl. 9.2-2 PVT	1023125
6	Diaphragm	1000251

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Item	Description	Type 0232
7	Safety diaphragm	1006061
8	Suction valve, compl. 9.2-2 PVT	1023126

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 1604 - 0220 (0420) PV
HV, for highly viscous feed chemicals



P_BE_0047_SW

Fig. 41

Item	Description	Type 1604	Type 0708	Type 0413	Type 0220
1	Connector kit DN10 HV with PVT tube nozzle	1017405	1017405	1017405	1017405
3	4 Valve balls	404277	404277	404277	404277
6	Diaphragm	1006061	1006061	1006061	1006061
7	Safety diaphragm	1027414	1027414	1027414	1027414

The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 1000 - 1604 TT

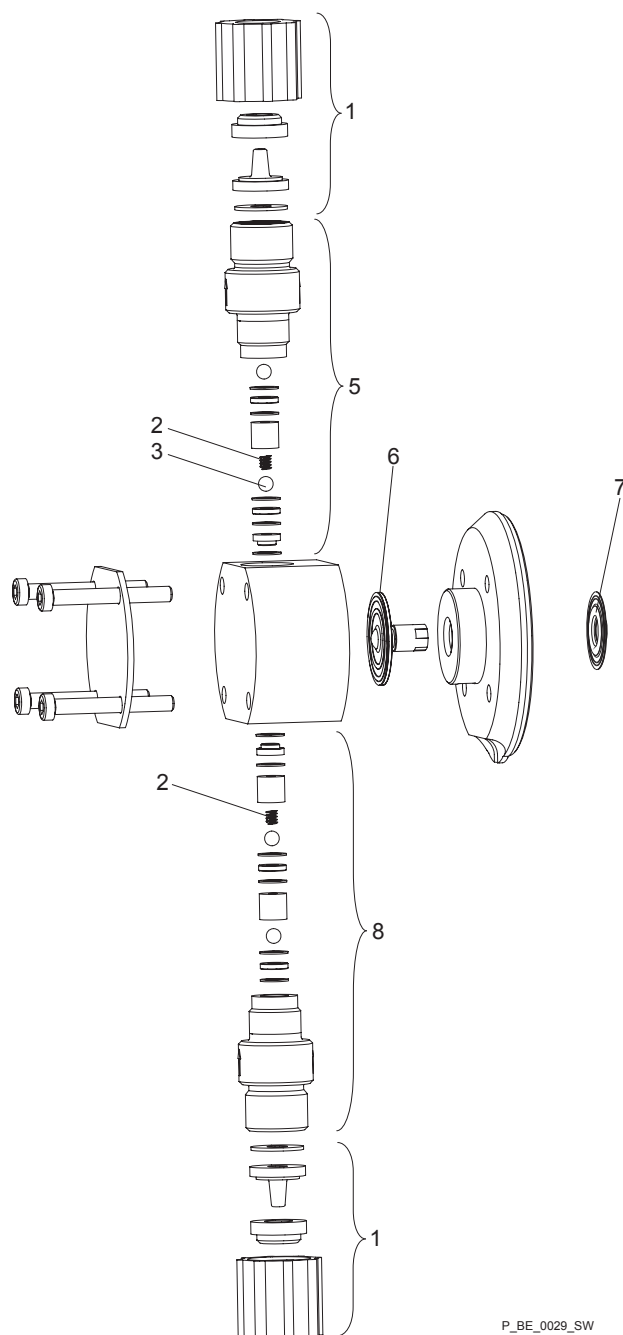


Fig. 42

Item	Description	Type 1000	Type 1601	Type 1602	Type 1604
1	Connector kit 6/4 TTT	817201	817201	817201	817201
3	4 Valve balls	404201	404201	404201	404201
5	Discharge valve, compl. 4.7-2 TTT	809406	809406	809406	809406
6	Diaphragm	1000244	1000245	1000246	1034612

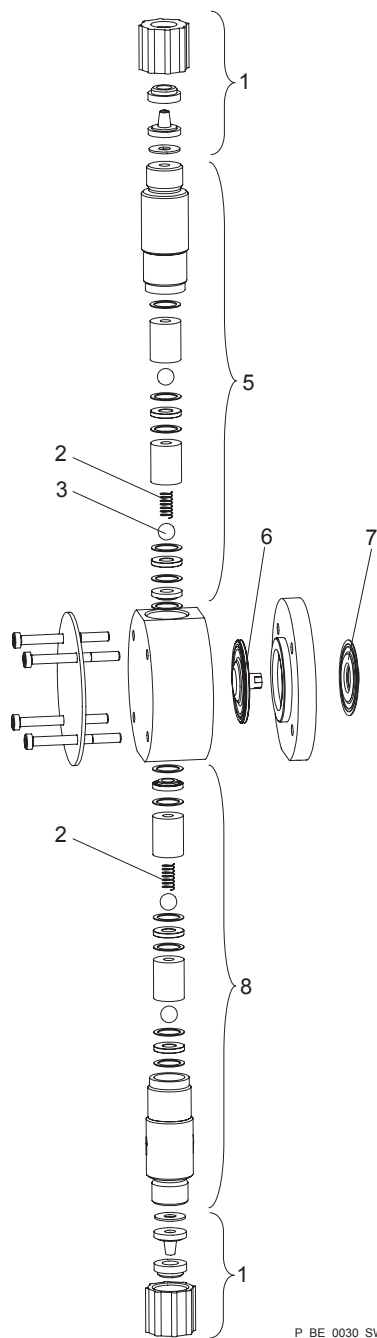
Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Exploded Views of Liquid Ends

Item	Description	Type 1000	Type 1601	Type 1602	Type 1604
7	Safety diaphragm	1006061	1006061	1006061	1006061
8	Suction valve, compl. 4.7-2 TTT	809407	809407	809407	809407

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 0708 (1008) - 0220
(0420) TT



P_BE_0030_SW

Fig. 43

Item	Description	Type 0708 (1008)	Type 0413 (0713)	Type 0220 (0420)
1	Connector kit 8/5 TTT	817204	817204	817204
3	4 Valve balls	404281	404281	404281
5	Discharge valve, compl. 9.2-2 TTT	809444	809444	809444
6	Diaphragm	1000248	1000249	1000250

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Exploded Views of Liquid Ends

Item	Description	Type 0708 (1008)	Type 0413 (0713)	Type 0220 (0420)
7	Safety diaphragm	1006061	1006061	1006061
8	Suction valve, compl. 9.2-2 TTT	809445	809445	809445

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 0232 TT

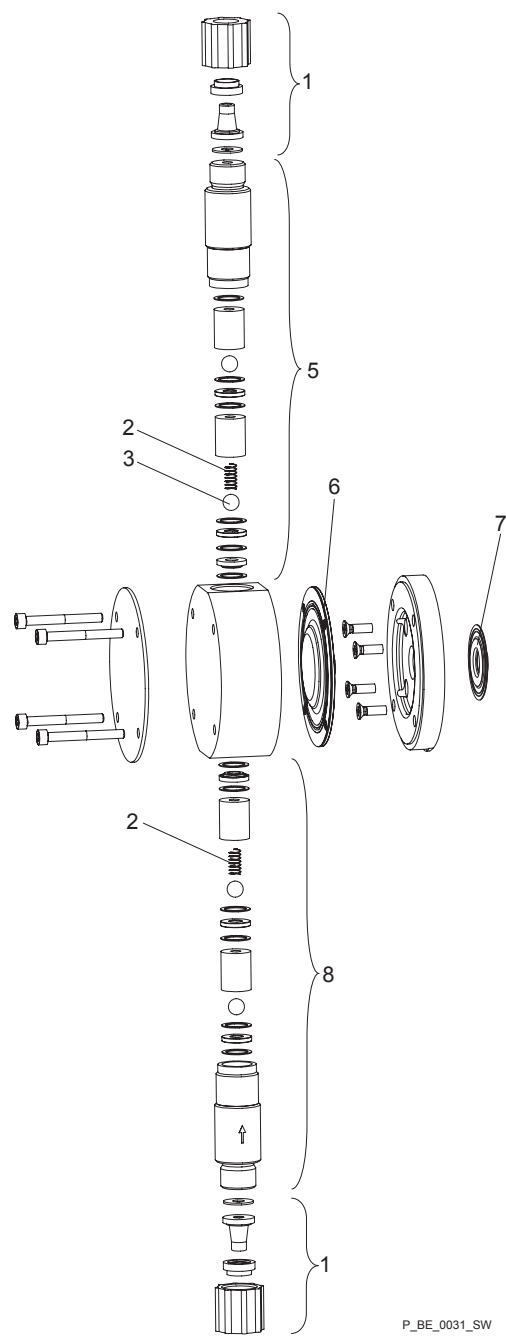


Fig. 44

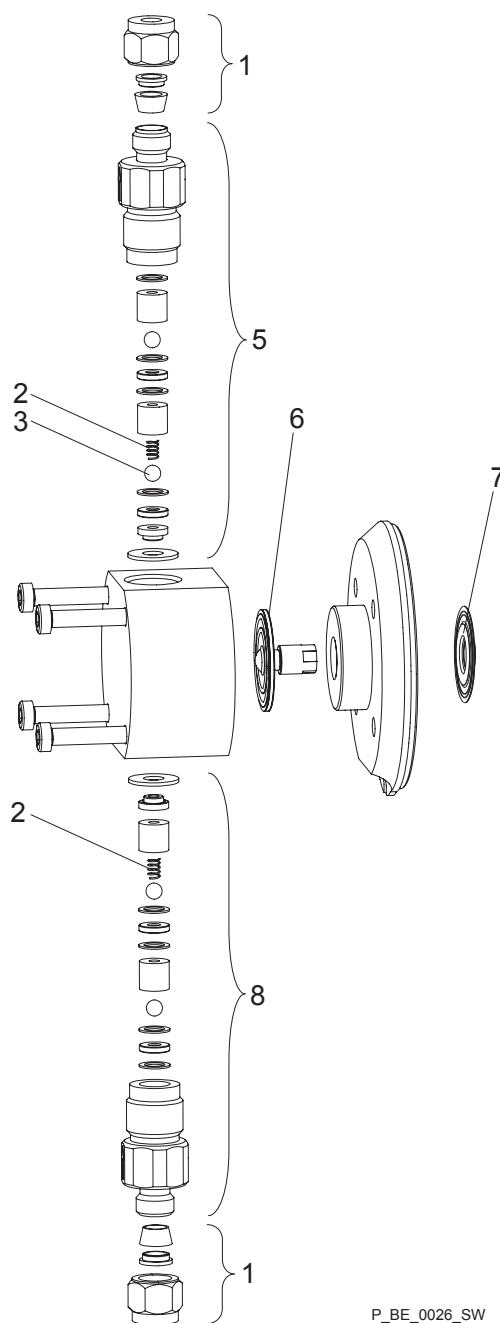
Item	Description	Type 0232
1	Connector kit 12/9 TTT	817202
3	4 Valve balls	404281
5	Discharge valve compl. TTT	809444
6	Diaphragm	1000251
Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.		

Exploded Views of Liquid Ends

Item	Description	Type 0232
7	Safety diaphragm	1006061
8	Suction valve compl. TTT	809445

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 1000 - 1604 SS



P_BE_0026_SW

Fig. 45

Item	Description	Type 1000	Type 1601	Type 1602	Type 1604
1	Connector kit 6 mm SS	104233	104233	104233	104233
3	4 Valve balls	404201	404201	404201	404201
5	Discharge valve compl. 6 mm SST	809418	809418	809418	809418
6	Diaphragm	1000244	1000245	1000246	1034612

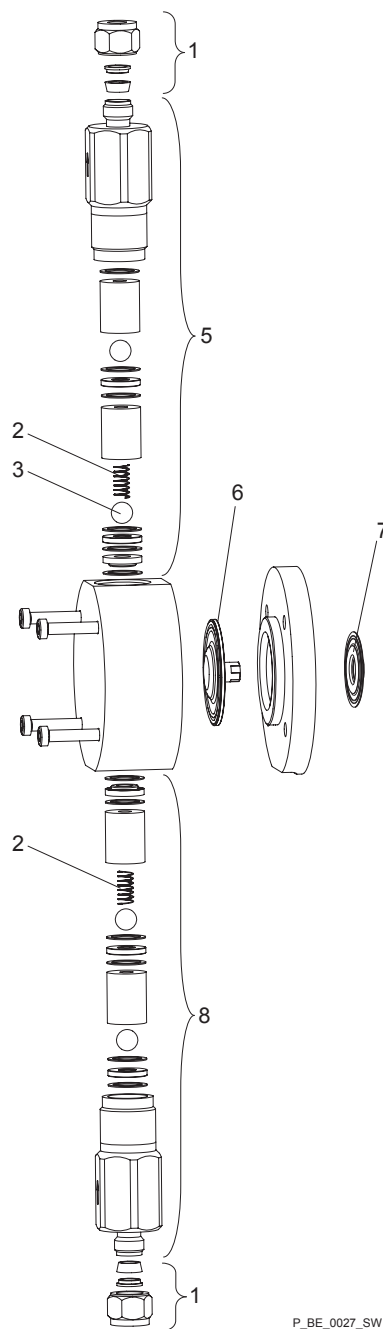
Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Exploded Views of Liquid Ends

Item	Description	Type 1000	Type 1601	Type 1602	Type 1604
7	Safety diaphragm	1006061	1006061	1006061	1006061
8	Suction valve compl. 6 mm SST	809419	809419	809419	809419

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 0708 (1008) - 0220
(0420) SS



P_BE_0027_SW

Fig. 46

Item	Description	Type 0708 (1008)	Type 0413 (0713)	Type 0220 (0420)
1	Connector kit SS	104237	104237	104245
3	4 Valve balls	404281	404281	404281
5	Discharge valve compl. SST	809494	809494	809446
6	Diaphragm	1000248	1000248	1000250

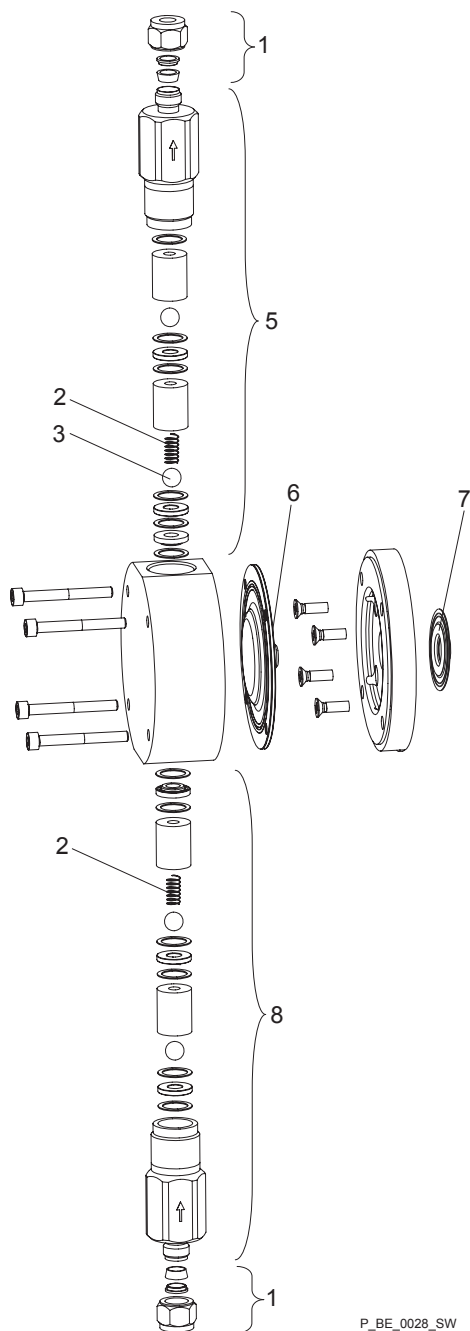
Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Exploded Views of Liquid Ends

Item	Description	Type 0708 (1008)	Type 0413 (0713)	Type 0220 (0420)
7	Safety diaphragm	1006061	1006061	1006061
8	Suction valve compl. SST	809495	809495	809447

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Liquid end Beta® 0232 SS



P_BE_0028_SW

Fig. 47

Item	Description	Type 0232
1	Connector kit 12 mm SS	104245
3	4 Valve balls	404281
5	Discharge valve compl. 12 mm SST	809446
6	Diaphragm	1000251
Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.		

Exploded Views of Liquid Ends

Item	Description	Type 0232
7	Safety diaphragm	1006061
8	Suction valve compl. 12 mm SST	809447

Spring (item 2) is a special accessory. The positions listed are included in the spare parts kit. Technical changes reserved.

Item	Part	Material version	Part no.
9, 10	Connector kit 8/5	PCE	792058
9, 10	Connector kit 8/5	PCB	817066
9	With 2504: Connector kit 8/4	PCB	1035844
10	With 2504: Connector kit 6/4	PCE	791161
10	With 2504: Connector kit 6/4	PCB	817065
3	4 Valve balls		404201
4	Bleed valve	PPE	1001063
4	Bleed valve	PPB	1001062
4	Bleed valve	PCE	1001061
4	Bleed valve	PCB	1001060
5	Discharge valve compl.	PPE	1001067
5	Discharge valve compl.	PPB	1001066
5	Discharge valve compl.	PCE	1001065
5	Discharge valve compl.	PCB	1001064
6	Diaphragm 1601		1000245
6	Diaphragm 1602		1000246
6	Diaphragm 1604		1034612
7	Safety diaphragm		1006061
8	Suction valve compl.	PPE	792644
8	Suction valve compl.	PPB	792646
8	Suction valve compl.	PCE	792119
8	Suction valve compl.	PCB	792026

Spare parts kits for type:	Material version	Part no.
1601	PPE	1001756
1602	PPE	1001757
1604 with spring	PPE	1035335
1604 without spring	PPE	1035339
1601	PPB	1001762
1602	PPB	1001763
1604 with spring	PPB	1035336
1604 without spring	PPB	1035340
1601	NPE	1001660
1602	NPE	1001661

Spare parts kits for type:	Material version	Part no.
1604 without spring	NPE	1035337
1604 with spring	NPE	1035333
1601	NPB	1001666
1602	NPB	1001667
1604 without spring	NPB	1035338
1604 with spring	NPB	1035334

Sealing sets	Material	Part no.
1 Sealing set	EPDM	1001674
1 Sealing set	FPM	1001672

The positions listed are included in the spare parts kit.

Technical changes reserved.

Liquid end Beta® 0708 (1008) - 0220
(0420) PP / NP SEK, self-bleeding

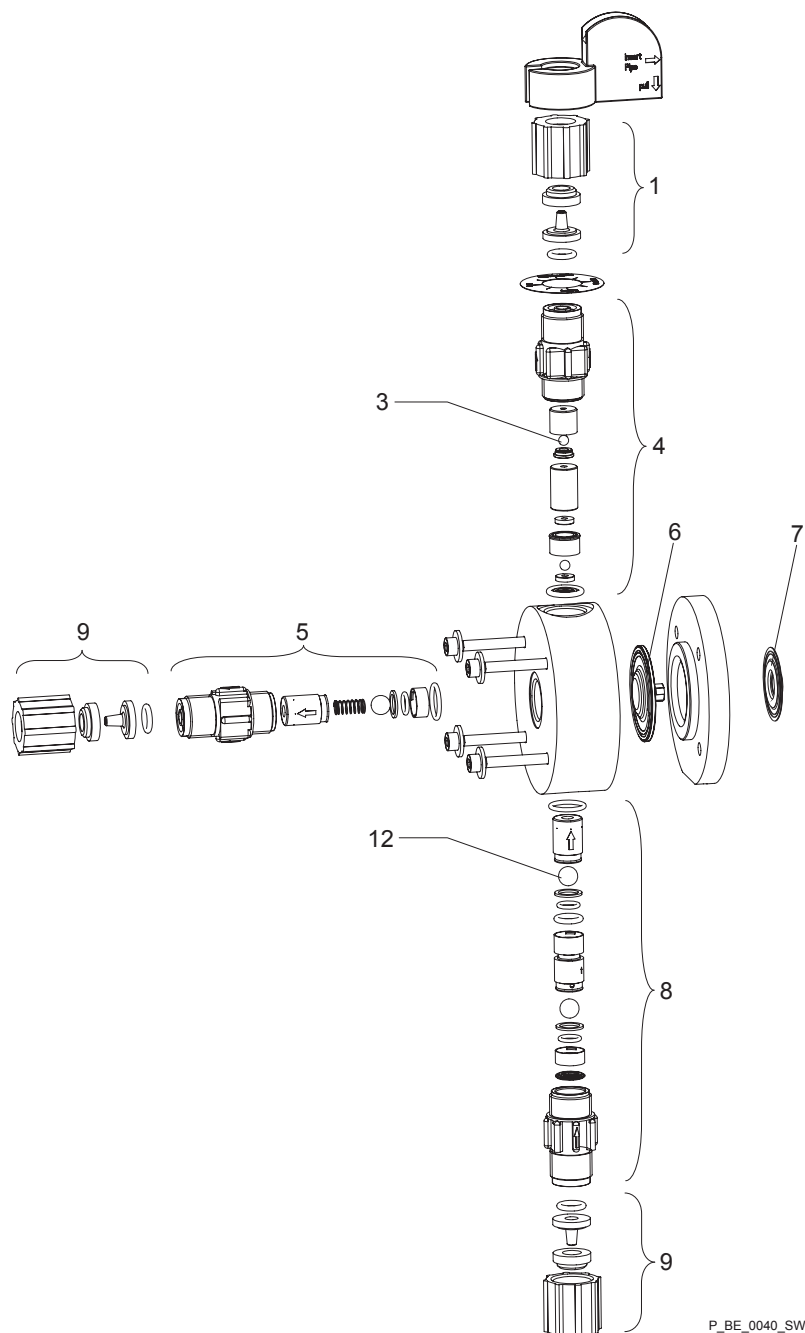


Fig. 49

Item	Part	Material version	Part no.
1	Connector kit 6/4	PPE	817160
1	Connector kit 6/4	PPB	817173
1	Connector kit 6/4	PCE	791161
1	Connector kit 6/4	PCB	817165
9	Connector kit 8/5	PPE	817161
9	Connector kit 8/5	PPB	817174

Item	Part	Material version	Part no.
9	Connector kit 8/5	PCE	792058
9	Connector kit 8/5	PCB	817066
9	Connector kit 12/9	PPE	817162
9	Connector kit 12/9	PPB	817175
9	Connector kit 12/9	PCE	790577
9	Connector kit 12/9	PCB	817067
3	4 Valve balls		404201
4	Bleed valve	PPE	1001063
4	Bleed valve	PPB	1001062
4	Bleed valve	PCE	1001061
4	Bleed valve	PCB	1001060
5	Discharge valve compl.	PPE	1001071
5	Discharge valve compl.	PPB	1001070
5	Discharge valve compl.	PCE	1001069
5	Discharge valve compl.	PCB	1001068
6	Diaphragm 0708		1000248
6	Diaphragm 0413		1000249
6	Diaphragm 0220		1000250
7	Safety diaphragm		1006061
8	Suction valve compl.	PPE	1001437
8	Suction valve compl.	PPB	1001436
8	Suction valve compl.	PCE	1001435
8	Suction valve compl.	PCB	1001434

Spare parts kits for type:	Material version	Part no.
0708 (1008)	PPE	1001759
0413 (0713)	PPE	1001760
0220 (0420)	PPE	1001761
0708 (1008)	PPB	1001765
0413 (0713)	PPB	1001766
0220 (0420)	PPB	1001767
0708 (1008)	NPE	1001663
0413 (0713)	NPE	1001664
0220 (0420)	NPE	1001665
0708 (1008)	NPB	1001669
0413 (0713)	NPB	1001670
0220 (0420)	NPB	1001671

Sealing sets	Material	Part no.
1 Sealing set	EPDM	1001674
1 Sealing set	FPM	1001672

The positions listed are included in the spare parts kit.

Technical changes reserved.

20 Further order information

Spare parts kits for SEK types

The information is given in the corresponding exploded views.

Spare parts kits for SER types

Type	NPT7 / PVT7
1602	1047830
1604	1047858
0708 (1008)	1047832
0413 (0713)	1047833
0220 (0420)	1047837

Spare parts kits for other types

Type	PP, NP, PV	TT	SS	HV types
1000	1023107	1001737	1001729	-
1601	1023108	1001738	1001730	-
1602	1023109	1001739	1001731	-
1604 (2504)	1035332	1035330	1035331	1035342
0708 (1008)	1023111	1001741	1001733	1019067
0413 (0713)	1023112	1001742	1001734	1019069
0220 (0420)	1023113	1001754	1001735	1019070
0232	1024124	1001755	1001736	-

Sealing sets for SEK types

The information is given in the corresponding exploded views.

Sealing sets for other types

Type	PP, NP	PV	TT, SS
1000, 1601, 1602, 1604	1023130	1023130	483907 *
0708 (1008) 0413 (0713) 0220 (0420)	1023129	1023129	483975
0232	1023129	1023129	483975
All HV types	-	1019364	-
* 11-part			

Relay retrofit kit for Beta® b

Name	Part no.
Fault indicating relay for Beta® b	1029309
Fault indicating and pacing relay for Beta® b	1029310

Further order information

Interference suppression aids

Product	Part no.
Varistor:	710912
RC Gate, 0.22 µF / 220 Ω:	710802

Further sources of information

Further information on spare parts, accessories and options can be found in:

- the exploded drawings
- the identity code
- under www.prominent.com
- the ProMinent product catalogue

21 EC Declaration of Conformity for Machinery

In accordance with DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, Appendix I, BASIC HEALTH AND SAFETY REQUIREMENTS, section 1.7.4.2. C.

We,

- ProMinent GmbH
- Im Schuhmachergewann 5 - 11
- D - 69123 Heidelberg,

hereby declare that the product specified in the following, complies with the relevant basic health and safety requirements of the EC Directive, on the basis of its functional concept and design and in the version distributed by us. Any modification to the product not approved by us will invalidate this declaration.

Extract from the EC Declaration of Conformity

Designation of the product:	Metering pump, product range Beta/4 and Beta/5
Product type:	BT4b _____ U BT5b _____ U
Serial number:	see nameplate on the device
Relevant EC directives:	Machinery Directive (2006/42/EC) EMC Directive (2004/108/EC) Compliance with the protection targets of the Low Voltage Directive 2006/95/EC according to Appendix I, No. 1.5.1 of the Machinery Directive 2006/42/EC RoHS Directive (2011/65/EU)
Harmonised standards applied, in particular:	EN 809: 2010 EN ISO 12100: 2010 EN 61010-1: 2010 EN 61000-6-2: 2005 EN 61000-6-3: 2011 EN 50581: 2013
Place, Date:	Heidelberg, 22.07.2014

You will find the EC Declaration of Conformity to download on our homepage.

22 EC Declaration of Conformity for Machinery

In accordance with DIRECTIVE 2006/42/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, Appendix I, BASIC HEALTH AND SAFETY REQUIREMENTS, section 1.7.4.2. C.

We,

- ProMinent GmbH
- Im Schuhmachergewann 5 - 11
- D - 69123 Heidelberg,

hereby declare that the product specified in the following, complies with the relevant basic health and safety requirements of the EC Directive, on the basis of its functional concept and design and in the version distributed by us. Any modification to the product not approved by us will invalidate this declaration.

Extract from the EC Declaration of Conformity

Designation of the product:	Metering pump, product range Beta/4 and Beta/5
Product type:	BT4b _____ M BT4b _____ N BT5b _____ N
Serial number:	see nameplate on the device
Relevant EC directives:	EC Machinery Directive (2006/42/EC) EC EMC Directive (2004/108/EC) EU RoHS Directive (2011/65/EU)
Harmonised standards applied, in particular:	EN 809: 2010 EN ISO 12100: 2010 EN 61010-1: 2010 EN 61000-6-2: 2005 EN 61000-6-3: 2011 EN 50581: 2013
Place, Date:	Heidelberg, 22.07.2014

You will find the EC Declaration of Conformity on our homepage.

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P-610x - Pump, Metering, Parts, Multi-function ValvePVDF, 87PSIG Size 2

Betriebsanleitung / Operating Instructions

Mode d'emploi / Instrucciones de servicio

ProMinent® Mehrfunktionsventil

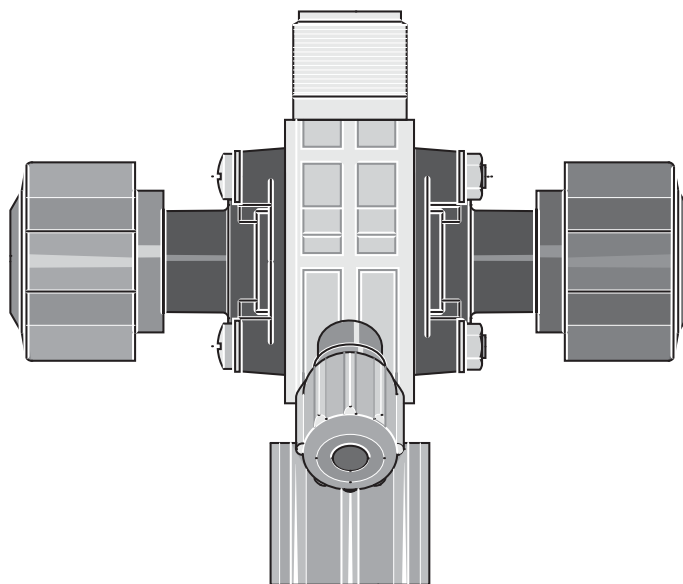
ProMinent® Multi-Function Valve

Vanne multifonctions ProMinent®

Válvula multifuncional ProMinent®



D/GB/F/E



-
-
- D** Betriebsanleitung in Deutsch
von Seite 4 bis 8
 - GB** Operating Instructions in English
from page 9 to page 14
 - F** Mode d'emploi en français
de la page 15 à la page 20
 - E** Instrucciones de servicio en español
de página 21 hasta página 26

Impressum:

Betriebsanleitung ProMinent® Mehrfunktionsventil
© ProMinent Dosiertechnik GmbH, 2000

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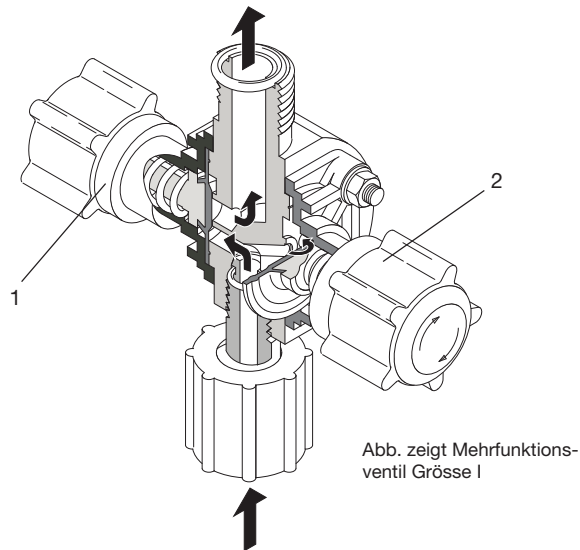
Technische Änderungen vorbehalten.

**Betriebsanleitung bitte zuerst vollständig durchlesen.
Nicht wegwerfen! Bei Schäden durch Bedienungsfehler
erlischt die Garantie!**

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1 Aufbau

Die Funktionen des Mehrfunktionsventils werden durch je eine federbelastete Membran erzeugt. Es ist je ein Entlastungsmechanismus für die Druckhalte-Funktion und für die Überdruckfunktion vorgesehen.



2 Funktionsbeschreibung

Funktionen

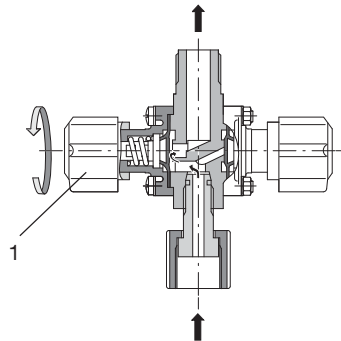
- Erzeugung eines definierten Gegendrucks bei Dosierung gegen freien Auslauf.
Das Aufheben dieser Funktion erfolgt durch Drehen am schwarzen Drehknopf im Uhrzeigersinn (1).
- Verhindern von Durchhebern aus dem Vorratsgebilde bei Unterdruck an der Dosierstelle.
Das Aufheben dieser Funktion erfolgt durch Drehen am schwarzen Drehknopf im Uhrzeigersinn (1).



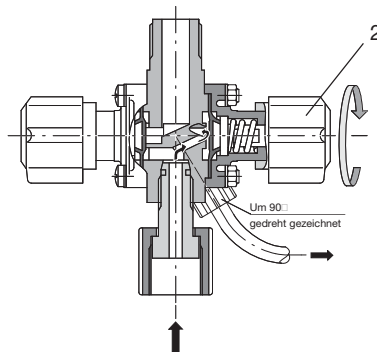
ACHTUNG

- Multifunktionsventile sind keine absolut dicht schließende Absperrorgane.

Wenn absolut kein Dosiermedium zur Dosierstelle gelangen darf, so ist ein zusätzliches Absperrorgan saugseitig der Pumpe vorzusehen.



- Ansaughilfe bei der Inbetriebnahme der Pumpe gegen Druck. Das Lösen der Druckleitung ist nicht erforderlich. Dies erfolgt durch Drehen am roten Drehknopf (2).



ACHTUNG

- **An der Dosierstelle muß ein Rückschlagventil installiert werden, da bei der Betätigung des Ventils der gesamte Inhalt der Anlage über den Bypass zurückfließen kann.**
- Entlastung der Dosierleitung bei Stillstand der Anlage (z.B. Reparatur). Dies erfolgt durch Drehen am roten Drehknopf (2).
- Überströmventil zum Schutz der Anlage gegen unzulässigen Überdruck, der von der Dosierpumpe verursacht wird. Rückführung über eine Bypassleitung. Diese Funktion erfolgt automatisch.

3 Bestimmungsgemäßer Gebrauch

Bestimmungsgemäßer Gebrauch

Schutz der Dosierleitung vor unzulässigem Überdruck, der durch die Dosierpumpe erzeugt wird, wenn ein in der Dosierleitung befindlicher Absperrhahn geschlossen wird.

- Das Multifunktionsventil darf nicht verwendet werden zum Schutz der Dosierleitung vor unzulässigem Überdruck, der andere Ursachen hat als der von der Dosierpumpe erzeugte Druck.
- Das Ventil darf **nicht** als Absperrorgan verwendet werden.

4 Montage / Installation

Sicherheitsanforderung, Sicherheitshinweise



ACHTUNG

- Bei druckbeaufschlagten Systemen muss an der Dosierstelle ein Rückschlagventil installiert sein, da sonst bei Betätigung des Ventils der gesamte Inhalt der Anlage über den Bypass zurückfließen kann.
- Die Bypassleitung muß immer angeschlossen sein, da es beim Betrieb des Ventils nahe der Überdruckfunktion zu einem minimalen Überströmen in die Bypassleitung kommen kann.
- Multifunktionsventile sind keine absolut dicht schließenden Absperrorgane!

Montagebeschreibung mechanisch/hydraulisch

Das Mehrfunktionsventil wird direkt auf den Druckanschluß der Pumpe aufgeschraubt. Das Ventil kann um 360° gedreht und ausgerichtet werden.

Abgangsseitig wird mittels Anschlußset bzw. GF-Verschraubung die Dosierleitung bzw. Dosierschlauch befestigt. Werkseitig ist in der O-Ringnut am Abgang ein EPDM O-Ring eingelegt. Für Anwendungen, bei denen EPDM nicht beständig ist, wird die Montage eines Viton® B O-Rings empfohlen. Dieser O-Ring (bräunlich) ist dem Ventil beigelegt.

Die Bypassleitung wird in den Vorratsbehälter zurückgeführt. Befestigung über Schlauchtülle und Überwurfmutter.

5 Betrieb / Bedienung



ACHTUNG

- Die Bypassleitung muß immer angeschlossen sein, da es beim Betrieb des Ventils nahe der Überdruckfunktion zu einem minimalen Überströmen in die Bypassleitung kommen kann.
- Multifunktionsventile sind keine absolut dicht schließenden Absperrorgane!

Bedienung und Einstellung Ansaughilfe

Durch Drehen des roten Drehknopfes (2) in Pfeilrichtung (Uhrzeigersinn) wird der Weg zum Bypass frei. Das Medium fließt in den Vorratsbehälter zurück.

HINWEIS

- Dabei wird auch die Druckleitung teilweise entlastet und es kann Flüssigkeit am Bypass austreten.

Die ProMinent Dosierpumpe ist jetzt auf „Ansaugen“ zu stellen (s. hierzu auch Betriebsanleitung der Pumpe), bis Flüssigkeit in der Bypassleitung sichtbar wird.

Die Pumpe hat angesaugt und kann in Betrieb genommen werden. Nach dem Loslassen des roten Drehknopfes (2) geht dieser selbständig in die Ausgangsstellung zurück.

Entlastung der Druckleitung

Durch Herausdrehen des roten Drehknopfes (2) und des schwarzen Drehknopfes (1) im Uhrzeigersinn wird der Weg von der Druckleitung zum Bypass frei. Wird nur der rote Drehknopf (2) betätigt, so fällt der Druck in der Leitung auf ca. 1,5 bar ab.

Die beiden Knöpfe müssen solange herausgedreht bleiben, bis keine Flüssigkeit mehr an der Bypassöffnung austritt bzw. keine Flüssigkeit mehr in den Vorratsbehälter zurückfließt. Die Dosierleitung ist jetzt druckentlastet. Nach dem Loslassen der beiden Drehknöpfe, drehen sich beide wieder selbständig in ihre Ausgangsstellung zurück.

6 Technische Daten / Bestellhinweise

Mediumberührte Werkstoffe

Ventilkörper	PVDF
Membrane	PTFE-beschichtet
Dichtungen	Viton® oder EPDM
Adapter bei Größe III	PVC

Viton® ist ein eingetragenes Warenzeichen von DuPont Dow Elastomers.

Typ	Best. Nr.	Überström- Öffnungsdruck*	Anschluß- größe	Bypass- Anschluß
Größe I	792011.9	16 bar	6-12 mm	6/4 mm
Größe I	791715.6	10 bar	6-12 mm	6/4 mm
Größe I	1005745	6 bar	6-12 mm	6/4 mm
Größe II	792203.4	10 bar	6-12 mm	12/9 mm
Größe II	740427.0	6 bar	6-12 mm	12/9 mm
Größe III	792215.6	10 bar	DN 10	12/9 mm

* Der hier angegebene Überström-Öffnungsdruck ist der Druck, bei dem das Ventil zu öffnen beginnt. Je nach Pumpentyp kann der Druck bis zum vollständigen Öffnen des Ventils um bis zu 50 % höher liegen.

Einsatzbereich

Größe I	CONCEPT, Pneumados und Beta® 4: alle Typen gamma/ L: Typ 1000, 1601, 1602, 1005, 0708, 0413, 0220 und 1605
Größe II	alle Typen unter Größe I Beta® 5: Typ 1008, 0713, 0420 und 0232 gamma/ L: Typ 1008, 0713, 0420 und 0232
Größe III	Sigma/ 1 mit Anschlussgewinde DN 10

Technische Änderungen vorbehalten.

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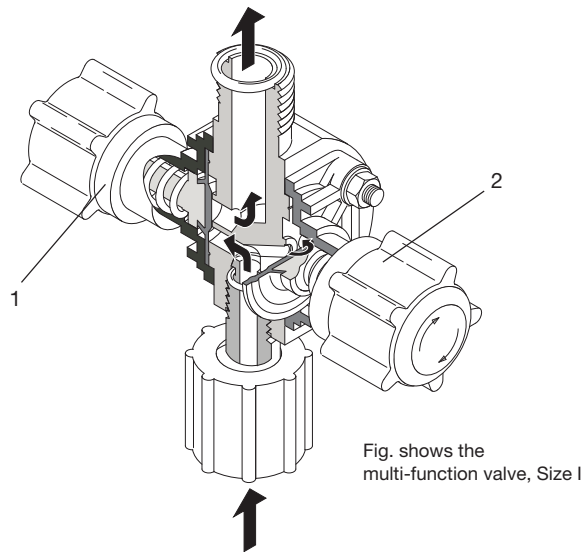
Please completely read through these operating instructions. Do not discard! The warranty shall be invalidated by damage caused by operating errors!

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Design / Functional Description

1 Design

Each of the functions of the multi-function valve is produced by a spring-loaded diaphragm. The valve features a pressure relief mechanism for both the pressure retaining function as well as for the pressure relief function.



2 Functional Description

Functions

- Producing a defined backpressure for metering with respect to free outlet.
Turn the black rotary knob clockwise (1) to disable this function.
- Prevents lift-through from the supply vessel in the case of vacuum at the metering point.
Turn the black rotary knob clockwise (1) to disable this function.

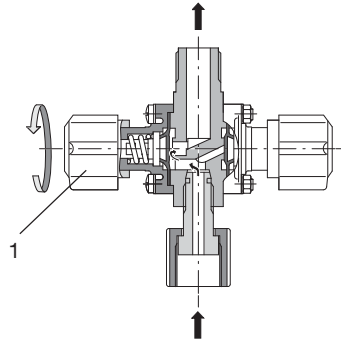


IMPORTANT

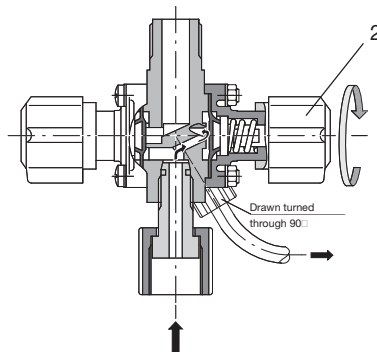
- **Multi-function valves are not intended to act as fully sealing stop taps.**

If it is imperative that no metering chemical reaches the metering point, fit an additional stop cock to the suction side of the pump.

Functional Description



- Intake aid to prevent pressure when starting up pumps. It is not necessary to release the delivery line. Turn the red rotary knob (2) for this purpose.



IMPORTANT

- **A non-return valve must be installed at the metering point since the entire content of the system can flow via the bypass when the valve is operated.**
- Depressurizing the metering line when the relevant system is at a standstill (e.g. repairs). Turn the red rotary knob (2) for this purpose.
- Overflow valve to protect the system from impermissible overpressure caused by the metering pump. Return flow via a bypass line. This function operates automatically.

3 Use for Intended Purpose

Use for Intended Purpose

To protect the metering line from impermissible overpressure caused by the metering pump when a stop cock valve is connected in the metering line.

- The multi-function valve may not be used to protect the discharge line from inadmissible excess pressure caused by anything other than the pressure generated by the metering pump.
- The valve must **not** be used as a shut-off.

4 Mounting / Installation

Safety Requirements, Notes on Safety



IMPORTANT

- **Pressurised systems must have a non-return valve fitted at the metering point because the entire contents of the system can flow back via the bypass when the valve is operated.**
- **The bypass line must always be connected since minimum overflow into the bypass line can occur during operation of the valve close to the pressure relief function.**
- **Multi-function valves are not intended to act as fully sealing stop taps!**

Mounting Description, Mechanical/Hydraulic

The multi-function valve is screwed directly on to the pressure connection of the pump. The valve can be turned and aligned through 360°.

The metering line or metering hose is secured on the outlet end by means of a connection set or GF screw fitting. An EPDM O-ring is fitted at the factory in the O-ring groove at the outlet. For applications in which EPDM is not suitable, it is advisable to fit a Viton B O-ring. This O-ring (brown) is supplied together with the valve.

The bypass line is routed into the supply vessel. It is secured by means of a hose grommet and union nut.

5 Operation



IMPORTANT

- The bypass line must always be connected since minimum overflow into the bypass line can occur during operation of the valve close to the pressure relief function.
- Multi-function valves are not intended to act as fully sealing stop taps!

Operation and Setting

Intake Aid

Turn the red rotary knob (2) in the direction of the arrow (clockwise) to open the way to the bypass. The medium flows back into the supply tank.

NOTE

- In this case, the delivery line is partly depressurized and liquid can flow out of the bypass.

The ProMinent metering pump must now be set to “intake” (refer to pump operating instructions) until liquid can be seen in the bypass line.

The pump is now primed and ready for use. After being released, the red rotary knob (2) reverts of its own accord back to its initial position.

Depressurizing the Delivery Line

The passage from the delivery line to the bypass is cleared by turning the red rotary knob (2) and the black rotary knob (1). The pressure drops in the line to approx. 1.5 bar if only the red rotary knob (2) is turned.

Both knobs must remain unscrewed until no more liquid flows out of the bypass line or no more liquid flows back into the supply tank. The metering line is now depressurized. Once released, both rotary knobs turn of their own accord back to their initial position.

Technical Data / Ordering Notes

6 Technical Data / Ordering Notes

Materials in Contact with Medium

Valve housing	PVDF
Diaphragm	PTFE-coated
Seals	Viton® or EPDM
Adapter for size III	PVC

Viton® is a registered trademark of DuPont Dow Elastomers.

Type	Order No.	Overflow opening pressure*	Connection size	Bypass connection
Size I	792011.9	16 bar	6-12 mm	6/4 mm
Size I	791715.6	10 bar	6-12 mm	6/4 mm
Size I	1005745	6 bar	6-12 mm	6/4 mm
Size II	792203.4	10 bar	6-12 mm	12/9 mm
Size II	740427.0	6 bar	6-12 mm	12/9 mm
Size III	792215.6	10 bar	DN 10	12/9 mm

* The overflow opening pressure stated here is the pressure at which the valve starts to open. Depending on the pump type, the pressure may be higher up to 50 % until complete opening of the valve.

Operating range

Size I	CONCEPT, Pneumados and Beta® 4: all types gamma/ L: type 1000, 1601, 1602, 1005, 0708, 0413, 0220 and 1605
Size II	all types below size I Beta® 5: type 1008, 0713, 0420 and 0232 gamma/ L: type 1008, 0713, 0420 and 0232
Size III	Sigma/ 1 with threaded connection DN 10

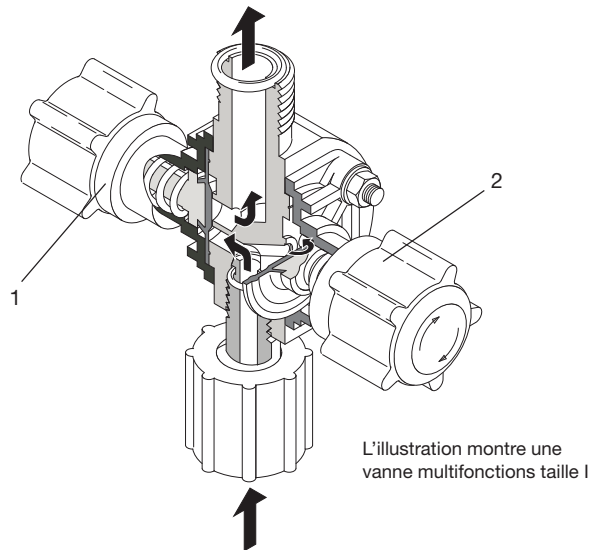
Subject to technical modifications.

Veillez lire en premier lieu entièrement ce mode d'emploi. Ne surtout pas le jeter ! En cas de dommages occasionnés par des erreurs d'utilisation, il y a automatiquement perte du droit de garantie !

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1 Structure

Les fonctionnalités de la vanne multifonctions sont générées à chaque fois par une membrane équipée d'un ressort. Un mécanisme de décharge est prévu pour la fonction de maintien en pression et pour la fonction de surpression.



2 Description fonctionnelle

Fonctionnalités

- Génération d'une contre-pression définie pour un dosage contre une sortie libre.
Cette fonction peut être arrêtée en tournant le bouton rotatif noir en sens horaire (1).
- Eviter les coups de siphon du réservoir en présence d'un vide au point de dosage.
Cette fonction peut être arrêtée en tournant le bouton rotatif noir en sens horaire (1).

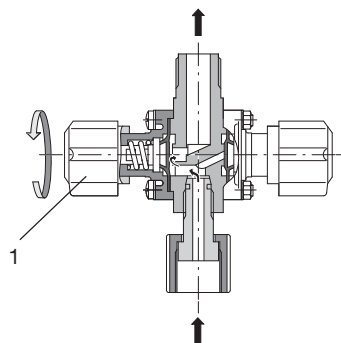


ATTENTION

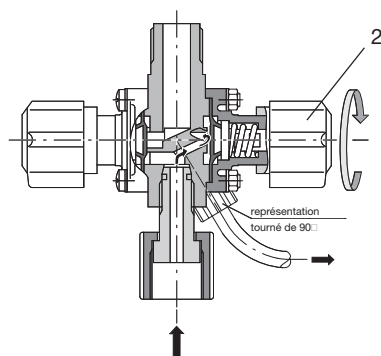
- **Les vannes multifonctions ne sont pas des organes d'arrêt à fermeture absolument étanche.**

Si aucune quantité de fluide ne doit parvenir au point de dosage, il faut prévoir un organe d'arrêt supplémentaire côté aspiration de la pompe.

Description fonctionnelle



- Dispositif auxiliaire d'aspiration pour la mise en service de la pompe contre pression. Pas besoin de desserrer le tuyau de refoulement. Tourner à cet effet le bouton rotatif rouge (2).



ATTENTION

- **Un clapet anti-retour doit être installé au point de dosage étant donné qu'en actionnant la vanne, le contenu total de l'installation est susceptible de recouler via la dérivation.**
- Décharge de la conduite de dosage à l'arrêt de l'installation (réparation par exemple). Tourner à cet effet le bouton rotatif rouge (2).
- Soupape de décharge pour protéger l'installation contre une surpression inadmissible provoquée par la pompe doseuse. Retour via une conduite de dérivation (bypass). Cette fonction s'exécute automatiquement.

3 Utilisation conforme

Utilisation conforme

Protection de la conduite de dosage contre une surpression non autorisée, générée par la pompe doseuse après la fermeture d'un robinet d'arrêt monté dans la conduite de dosage.

- La vanne multifonctions ne doit pas être utilisée pour la protection de la conduite de dosage contre une surpression inadmissible ayant d'autres causes que la pression générée par la pompe doseuse.
- La vanne **ne doit pas** être utilisée en tant qu'organe d'arrêt.

4 Montage / Installation

Exigences concernant la sécurité, consignes de sécurité



ATTENTION

- Lors d'injection dans un système sous pression, un clapet anti-retour doit être installé au point de dosage sinon un retour de flux est susceptible d'être refoulé via le bypass de la vanne multifonctions lorsque celle-ci est actionnée.
- La conduite de bypass doit toujours être raccordée. Lorsque la pression d'exploitation de la pompe est proche de la pression de décharge de la vanne, il se peut qu'un peu de produit s'écoule du raccord de bypass.
- Les vannes multifonctions ne sont pas des organes d'arrêt à fermeture absolument étanche.

Description du montage de l'installation mécanique/hydraulique

La vanne multifonctions se visse directement sur le raccord de refoulement de la pompe. La vanne peut être tournée et alignée de 360°.

Côté sortie, il convient de fixer le tuyau ou resp. la conduite de dosage au moyen du lot de raccordement ou via un raccord vissé GF. Un joint torique en EPDM est posé départ usine dans la rainure du joint torique en sortie. En cas d'utilisations pour lesquelles l'EPDM ne serait pas résistant, nous recommandons le montage d'un joint torique en Viton B. Ce joint torique (brunâtre) est joint à la vanne.

La conduite de dérivation est ramenée dans le réservoir. Elle est fixée par un embout de tuyau flexible et un écrou-raccord.

5 Mise en service / Commande



ATTENTION

- La conduite bypass doit toujours être raccordée étant donné qu'en cas d'exploitation de la vanne à proximité de la fonction de surpression, un débordement minimal est susceptible de se produire dans la conduite de dérivation.
- Les vannes multifonctions ne sont pas des organes d'arrêt à fermeture absolument étanche.

Commande et réglage Dispositif auxiliaire d'aspiration

Tourner le bouton rotatif rouge (2) dans le sens de la flèche (sens horaire) pour dégager la voie vers le (bypass). Le milieu s'écoule de nouveau dans le réservoir.

REMARQUE

- Ce faisant, la conduite de refoulement est partiellement déchargée et du liquide peut sortir du bypass.

Dès à présent, commuter la pompe doseuse ProMinent® sur „Amorçage“ (voir à cet effet également le mode d'emploi de la pompe), jusqu'à ce que du liquide devienne visible dans la conduite de dérivation.

La pompe s'est amorcée et peut être mise en service. En laissant revenir le bouton rotatif rouge (2), celui-ci reprend automatiquement sa position d'origine.

Décharge de la conduite de refoulement

En sortant le bouton rotatif rouge (2) et le bouton rotatif noir (1) par rotation dans le sens des aiguilles d'une montre, le parcours allant de la conduite de refoulement vers le bypass est libéré. En actionnant uniquement le bouton rotatif rouge (2), la pression dans la conduite tombe à 1,5 bar environ.

Les deux boutons doivent demeurer tournés jusqu'à ce que plus aucun liquide ne sorte de l'ouverture du bypass ou que plus aucun liquide ne soit refoulé dans le réservoir. La conduite de dosage est maintenant hors pression. En relâchant les deux boutons rotatifs, ceux-ci se remettent à tourner automatiquement sur leur position d'origine.

Caractéristiques techniques/Remarques concernant la commande

6 Caractéristiques techniques / Remarques concernant la commande

Matériaux en contact avec le milieu

Corps de la vanne	PVDF
Membranes	revêtues de PTFE
Joints	Viton® ou EPDM
Adapteur taille III	PVC

Viton® est une marque déposée de DuPont Dow Elastomers.

Type	N° de commande	Pression d'ouverture de décharge*	Grandeur de raccordement	Raccord bypass
taille I	792011.9	16 bar	6-12 mm	6/4 mm
taille I	791715.6	10 bar	6-12 mm	6/4 mm
taille I	1005745	6 bar	6-12 mm	6/4 mm
taille II	792203.4	10 bar	6-12 mm	12/9 mm
taille II	740427.0	6 bar	6-12 mm	12/9 mm
taille III	792215.6	10 bar	DN 10	12/9 mm

* La pression d'ouverture de décharge indiquée ici constitue la pression à laquelle la vanne commence à s'ouvrir. En fonction du type de pompe, la pression jusqu'à l'ouverture complète de la vanne peut être jusqu'à 50 % plus élevée.

Domaine d'utilisation

taille I	CONCEPT, Pneumados et Beta® 4: tous types gamma/ L: type 1000, 1601, 1602, 1005, 0708, 0413, 0220 et 1605
taille II	tous types inférieurs à la taille I Beta® 5: type 1008, 0713, 0420 et 0232 gamma/ L: type 1008, 0713, 0420 et 0232
taille III	Sigma/ 1 avec taraudage de raccordement DN 10

Sous réserve de modifications.

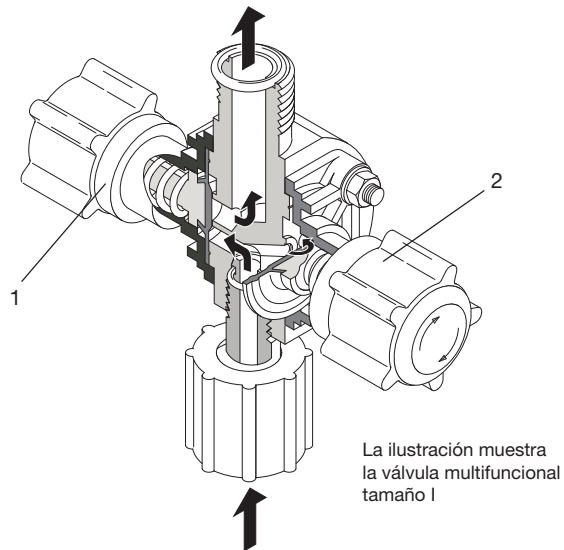
Índice de contenido

Le rogamos lea primeramente en su totalidad las instrucciones de servicio. No las tire. En caso de daños ocasionados por error en el manejo del equipo, desaparece la garantía.

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1 Principio de funcionamiento

Las funciones de la válvula multifuncional son generadas, en cada caso, por una membrana sometida a la presión de un muelle. Están previstos un mecanismo de descarga para la función de mantenimiento de la presión y otro para la de sobrepresión.



2 Características funcionales

Funciones

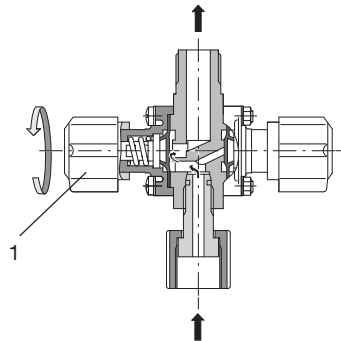
- Generar una contrapresión definida en la dosificación a salida libre.
La supresión de esta función se realiza girando el botón giratorio negro en sentido horario (1).
- Evitar el "efecto sifón" desde el depósito dosificador en caso de presión negativa en el punto de dosificación.
La supresión de esta función se realiza girando el botón giratorio negro en sentido horario (1).



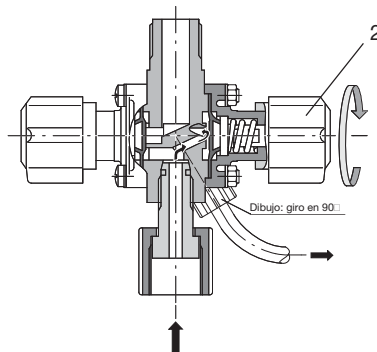
ATENCIÓN

- Las valvulas multifuncionales no son órganos de cierre absolutamente herméticos.

Si no debe llegar absolutamente ningún medio de dosificación al punto de dosificación debe instalarse un órgano de cierre adicional en el lado de aspiración de la bomba.



- Ayudar en la aspiración en la puesta en servicio de la bomba contra presión. No es necesario aflojar el tubo de presión. Esto se realiza girando el botón giratorio rojo (2).



ATENCIÓN

- En el punto de dosificación se debe instalar una válvula de retención, ya que al operar la válvula, todo el contenido de la instalación puede refluir a través de la derivación.
- Descargar el tubo de dosificación cuando la instalación esté parada (p.ej. por motivos de reparación). Esto se realiza girando el botón giratorio rojo (2).
- Válvula de seguridad para proteger la instalación contra sobrepresiones inadmisibles generadas por la bomba dosificadora. Retorno a través de un tubo de derivación. Esta función es automática.

3 Uso conforme a los fines previstos

Uso conforme a los fines previstos

Protección del tubo dosificador contra sobrepresiones inadmisibles generadas por la bomba dosificadora al cerrar una llave de retención ubicada en el tubo dosificador.

- La válvula multifuncional no debe utilizarse para protección de la tubería de dosificación contra sobrepresión indebida, que tiene otras causas que la presión generada por la bomba dosificadora.
- La válvula **no** debe ser empleada como órgano de cierre.

4 Montaje / Instalación

Requisitos e indicaciones de seguridad



ATENCIÓN

- En sistemas presurizados debe estar instalada una válvula antirretorno en los puntos de dosificación, ya que de lo contrario, al operarse la válvula todo el contenido de la instalación puede refluir a través de la derivación.
- El tubo de derivación debe mantenerse siempre conectado, ya que al operar la válvula cerca de la función de sobrepresión es posible que rebase una pequeña cantidad de líquido hacia el tubo de derivación.
- Las válvulas multifuncionales no son órganos de cierre absolutamente herméticos.

Descripción del montaje mecánico / hidráulico

La válvula multifuncional se enrosca directamente en la conexión de presión de la bomba. La válvula tiene un giro de 360° y puede orientarse según conveniencia.

En el lado de salida, se fija el tubo o conducto dosificador mediante un juego de conexiones o bien la unión roscada GF. En la ranura anular en O del lado de salida, viene colocada de fábrica una junta toroidal de EPDM. Para las aplicaciones en las que el EPDM no sea resistente a los líquidos utilizados, se recomienda el montaje de una junta toroidal de Viton B. Esta junta toroidal (de color marrón) viene adjunta a la válvula.

El tubo de derivación se lleva nuevamente al depósito dosificador. Fijarlo mediante boquilla portatubo y tuerca de racor.

5 Operación / Manejo



ATENCIÓN

- El tubo de derivación debe mantenerse siempre conectado, ya que al operar la válvula cerca de la función de sobrepresión es posible que rebase una pequeña cantidad de líquido hacia el tubo de derivación.
- Las válvulas multifuncionales no son órganos de cierre absolutamente herméticos.

Operación y puesta a punto Ayuda en la aspiración

Mediante giro del botón giratorio rojo (2) en la dirección de la flecha (sentido horario) queda libre la vía al bypass. El líquido a dosificar retorna al depósito dosificador.

NOTA

- Se produce una descarga parcial del tubo de presión, por lo que puede salir líquido en la derivación.

La bomba dosificadora ProMinent debe ponerse entonces en "aspirar" (véase también al respecto las instrucciones de servicio de la bomba), hasta que aparezca líquido en el tubo de derivación.

La bomba ha aspirado y puede ser puesta en marcha. Al soltar el botón giratorio rojo (2), éste retorna automáticamente a la posición inicial.

Descarga del tubo de presión

Girando hacia fuera el botón giratorio rojo (2) y el botón giratorio negro (1) en el sentido de las agujas del reloj, queda libre el recorrido de la tubería de impulsión hasta el bypass. Si sólo es accionado el botón giratorio rojo (2), la presión en la tubería bajará hasta 1,5 bar, aproximadamente.

Ambos mandos deben permanecer en esa posición hasta que ya no salga líquido por el orificio de derivación ni que retorne líquido al depósito dosificador. El tubo de dosificación está entonces descargado de presión. Al soltar los dos mandos giratorios, éstos retornan automáticamente a su posición inicial.

Características técnicas/Instrucciones para el pedido

6 Características técnicas / Instrucciones para el pedido

Materiales empleados para los elementos en contacto con el líquido a dosificar

Cuerpo de válvula	PVDF
Membrana	revestida de Teflón
Juntas	Viton® o EPDM
Pieza de ajuste para tamaño III	PVC

Viton® es una marca registrada de DuPont Dow Elastomers.

Tipo	No. de ref.	Presión de apertura de rebose*	Tamaño de conexión	Conexión de derivación
Tamaño I	792011.9	16 bar	6-12 mm	6/4 mm
Tamaño I	791715.6	10 bar	6-12 mm	6/4 mm
Tamaño I	1005745	6 bar	6-12 mm	6/4 mm
Tamaño II	792203.4	10 bar	6-12 mm	12/9 mm
Tamaño II	740427.0	6 bar	6-12 mm	12/9 mm
Tamaño III	792215.6	10 bar	DN 10	12/9 mm

* La presión de apertura de rebose indicada aquí es la presión a la que empieza a abrirse la válvula. Según el tipo de bomba, la presión hasta la apertura total de la válvula puede ser hasta el 50 % mayor.

Aplicaciones

Tamaño I	CONCEPT, Pneumados y Beta® 4: todos los tipos gamma/ L: tipo 1000, 1601, 1602, 1005, 0708, 0413, 0220 y 1605
Tamaño II	todos los tipos bajo tamaño I Beta® 5: tipo 1008, 0713, 0420 y 0232 gamma/ L: tipo 1008, 0713, 0420 y 0232
Tamaño III	Sigma/ 1 con rosca de unión DN 10

Sujeto a modificaciones técnicas.

Anschriften- und Liefernachweise durch den Hersteller /
Addresses and delivery through manufacturer /
Adresses et liste des fournisseurs fournies par le constructeur /
Para informarse de las direcciones de los distribuidores, dirigirse al fabricante:

ProMinent Dosiertechnik GmbH
Im Schuhmachergewann 5-11 · 69123 Heidelberg
Germany
Tel.: +49 6221 842-0
Fax: +49 6221 842-419
info@prominent.com · www.prominent.com



**OPERATION
&
MAINTENANCE
MANUAL
FOR
THREE PHASE
INDUCTION
MOTORS**

TECO-Westinghouse Motor Company
5100 North IH-35
Round Rock, Tx. 78681

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1. INTRODUCTION

This and the following instruction address the more common situations encountered in motor installation, operation and maintenance. For the TWMC motor warranty to be and to remain in effect, the motor must be installed and operated in strict accordance with the outline drawing, motor nameplates and these instructions and must not be altered or modified in any unauthorized manner.

During the installation and operation of motors in heavy industrial applications there is a danger of live electrical parts and rotating parts. Therefore to prevent injury and/or damage the basic planning work for installation, transportation, assembly, operation, etc... needs to be done and checked by authorized and competent personnel only.

Since these instructions cannot cover every eventuality of installation, operation and maintenance, the following points should be considered and checked.

- The technical data and information on permissible use such as assembly, connection, ambient and operating conditions given in the related catalogue, operating instructions, nameplates and other production documentation.
- The general erection and safety regulations.
- The local and plant-specific specifications and requirements.
- The proper use of transport, lifting devices and tools.
- The use of personal protective equipment.

Following indications should be observed when reading these instructions.

Safety instructions are marked as follows:



Warning of electric hazards for personnel.



Warning of dangers for personnel.

ATTENTION!

Warning of damage for the motor or installation.

2. ACCEPTING, INSPECTION, STORAGE, TRANSPORTATION

Inspection upon receipt

Check to following points upon receipt:

- Are the nameplate ratings identical with what you ordered?
- Are dimensions and color in compliance with your specifications?
- Are the nameplate ratings for space heater, thermal protector, temperature detector, etc. identical with what you ordered?
- Is there any damage?
- Are all accessories and accompanying instruction manuals in good order?
- Please ensure that the arrow head indicator really indicates direction of rotation.
- If there are any specific requirements, please ensure they are in conformity with your specifications.

2.1 Storage

When motors are not in operation, the following precautionary measures should be undertaken to assure best performance.

2.2 Place

- (a) High and dry, well ventilated without direct sun, dust or corrosive gas.
- (b) Not located near to a boiler or freezer.
- (c) Entirely free from vibration and easy for movements.
- (d) Motors should be put on pallets to prevent moisture.

2.3 Moisture prevention

Since moisture can be very detrimental to electrical components, the motor temperature should be maintained about 3°C above the dew point temperature by providing either external or internal heat. If the motor is equipped with space heaters, they should be energized at the voltage shown by the space heater nameplate attached to the motor. Incandescent light bulbs can be placed within the motor to provide heat. However, if used, they must not be allowed to come in contact with any parts of the motor because of the concentrated hot spot that could result.

2.4

Even during storage, the insulation resistance should be kept above the specified values.

- (a) For measurement of insulation resistance and acceptable standard values, please refer to measures stated in 3.1.2 "Measurement of insulation resistance".
- (b) Insulation resistance test should be performed once every three months.

2.5

If the motor is not in operation for a long period (one week and above) after installation or has been in operation but stopped for a period of time, the following precautions must be taken.

- (a) Protect the motor as measures stated in 2.2.3.
- (b) Insulation resistance test should be performed as stated in 2.2.4.

2.6 Bearing protection

- (a) If the motor has been provided with a shaft shipping brace to prevent shaft movement during transit, it must be removed before operating the motor. It is very important that this brace be re-installed exactly as it was originally, before the motor is moved from storage or any time when the motor is being transported. This prevents axial rotor movement that might damage the bearings.
- (b) Motors equipped with sleeve bearings are shipped from the factory with the bearing oil reservoirs drained. In storage, the oil reservoirs should be properly filled to the center of the oil level gauge with a good grade of rust inhibiting oil. To keep the bearing journals well oiled and to prevent rusting, the motor shaft should be rotated several revolutions about every month ensuring the shaft does not come to rest in its original position. While the shaft is rotating, it should be pushed to both extremes of the endplay.
- (c) Motors with anti-friction bearings are properly lubricated with the correct grade of grease at the factory and no further greasing is required in storage. The shaft should be rotated several revolutions about every month to maintain proper distribution of the grease within the bearings.
- (d) Tilt-pad bearings are a type of sleeve bearing used in special design applications. Due to the nature of this bearing, a loose oil ring for delivering lubricant cannot be provided. Therefore, during the storage interval, oil must be periodically manually introduced into the pads and housing to prevent the occurrence of oxidation of the precision machined components.
 - (1) Remove the pipe plug from the bearing cap located above the tilt-bearing shell.
 - (2) Pour in approximately one cup of oil every month and rotate the shaft a few revolutions about every two (2) weeks.
 - (3) For long periods of storage, the oil that accumulates in the housing should be removed.

ATTENTION!

Care should be taken to keep parts such as fitting surfaces, key, shaft extension and axial central hole from any collision with foreign matter. Grease should also be generously applied to prevent rusting.

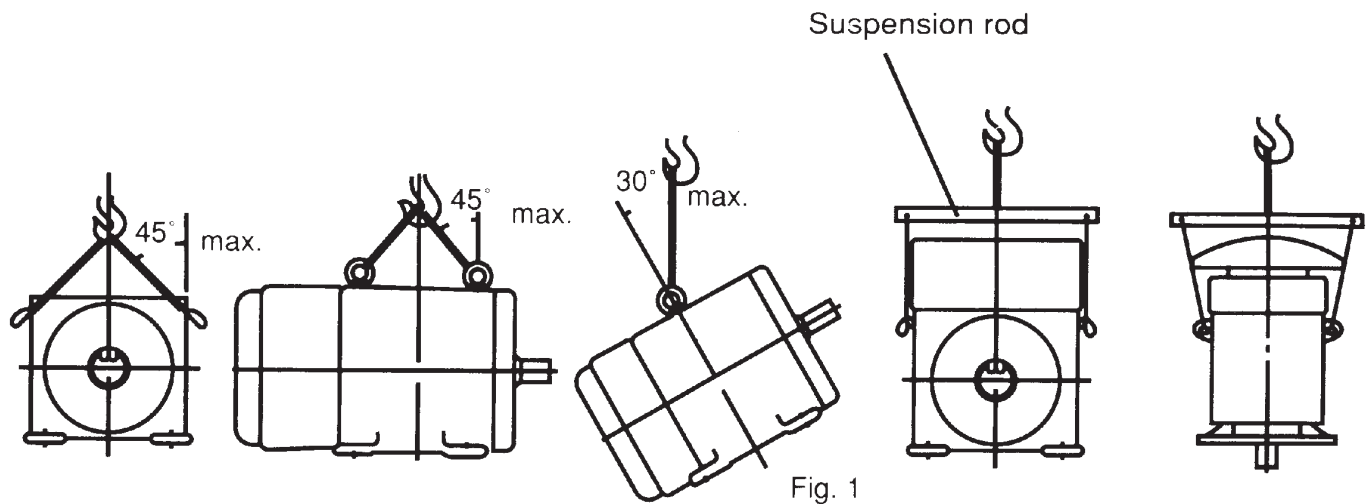
2.7 Transportation

To keep the rotating parts of motors from moving, thus preventing damage and scratching during transportation, they should be held securely with a locking device. Remove all transit clamps before operating the motor. It is very important that this device be reinstalled exactly as it was originally, before the motor is moved from storage or any time when the motor is being transported. The vertical mounting type motors should be transported in the vertical position.



Do not use the hoisting hook/eyebolts to lift more than the motor itself. They are designed to support the motor only. Make sure the hoisting hook is correctly attached to the eyebolt(s)/lug(s) are fully screwed in before hoisting. Also note such parts as fan cover, ventilation box, bracket, slip-ring, etc. may have their own hoisting lugs which can only carry their own weight. Nothing extra should be attached while hoisting.

Do not twist the steel wires and make sure the eyebolts have been firmly screwed and the sling angle is correct.



3 INSTALLATION

Site and environment for motor installation

3.1.1

Standard environment and site conditions for the installation of motors are usually set as follows:

- (a) Ambient temperature: $-10\sim 40^{\circ}\text{C}$
- (b) Humidity: Relative humidity below 90%RH for totally enclosed types, and below 80%RH for semi-enclosed types.
- (c) Elevation: below 1000 meters or 3300 feet.
- (d) Harmful gases, liquids, dusts, high moisture should be absent.
- (e) Foundations should be strong and free of vibration.

If there are any special environmental conditions, please inform TWMC prior to ordering.

3.1.2 Ventilation and space

- (a) Installation area should be well ventilated.
- (b) The installation space should be large enough to facilitate heat dissipation and maintenance.

3.2 Foundation

3.2.1

Use rigid and solid sole plate or common bed as foundation.

For best motor performance, it is advisable to use a sole plate or common bed, particularly when using a shaft coupling.

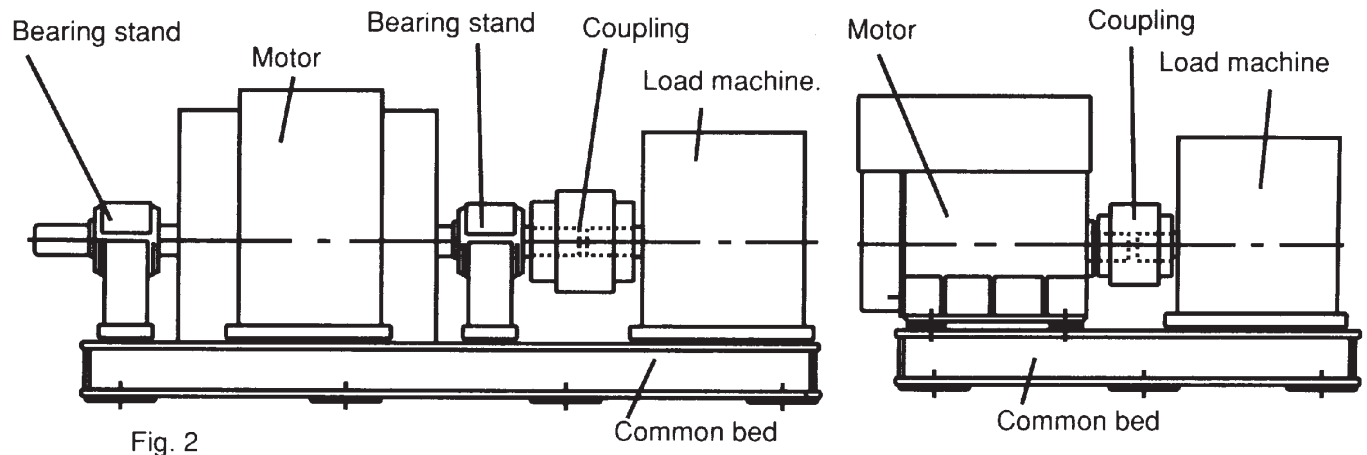


Fig. 2

3.2.2 Installation

- Select an appropriate foundation surface for the sole plate or common bed, which will be, considered the ultimate level.
- Align the position of the common bed with reference to that level.
- Align the level accuracy at least at four points such as bearing mounting, shaft extension etc. The accuracy should be within 0.04mm or .0015 inches
- Sole plate or common bed should be embedded in concrete foundation as illustrated in Fig. 3. Stiff pads should also be installed beneath the wedges, which are welded together at various spots about 400-500mm (15.75-19.70 inches) apart etc., to enable the foundation to carry evenly the weight of the whole motor.
- The base should be sturdy and rigid to keep it flat and level.
- Make sure the mortar and concrete are completely dry, and the precision of the level is acceptable, and then set the motor on the mounting foundation.
- Accurately install shaft couplings, belt sheaves etc., then weld the wedges solid to prevent untoward change in position.

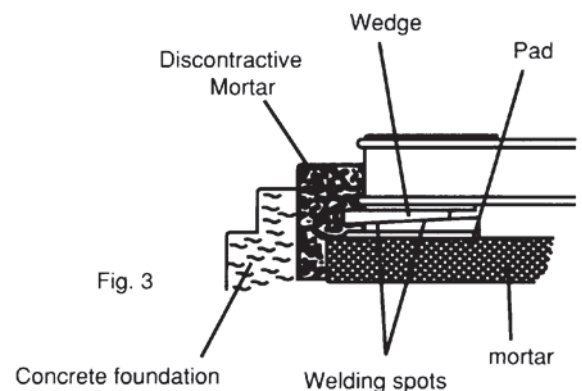


Fig. 3

3.2.3 The foundation of vertical induction motors: (Also the foundation of pump)

- Foundation of motor/pump must be rigid and secure to provide adequate support. There must be no vibration, twisting, misalignment etc. due to inadequate foundations.
- A massive concrete foundation is preferred in order to minimize vibration. Rigidity and stability are enhanced by prop plate and foundation bolt. As shown in Fig. 4.

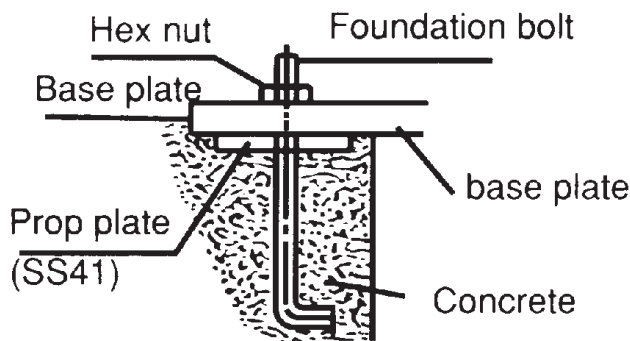


Fig. 4

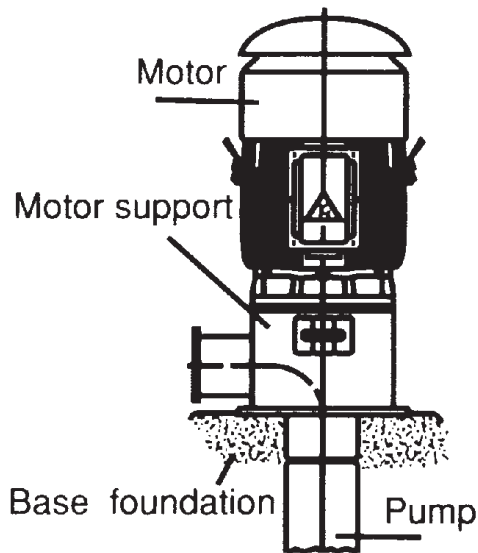


Fig. 5

3.2.4 Installation of vertical motors:

- (a) All mounting surfaces must be clean and level.
- (b) Foundation must be leveled at least at 4 points and guaranteed to be below 0.04mm (.0015 in.) flat and level.
- (c) Make sure the mortar and concrete are completely dry, and the precision of the level is acceptable, and then set the motor on the mounting foundation.
- (d) Accurately install shaft couplings.

3.3 Installation of shaft coupling

ATTENTION!

Motors must always be accurately aligned, and this applies especially where they are directly coupled.

Incorrect alignment can lead to bearing failure, vibration and even shaft fracture. As soon as bearing failure or vibration is detected, the alignment should be checked.

3.3.1

Field application of a coupling to the motor shaft should follow the procedures recommended by the coupling manufacturer. The motor shaft extension must not be subjected to either extreme heat or cold during coupling installation.

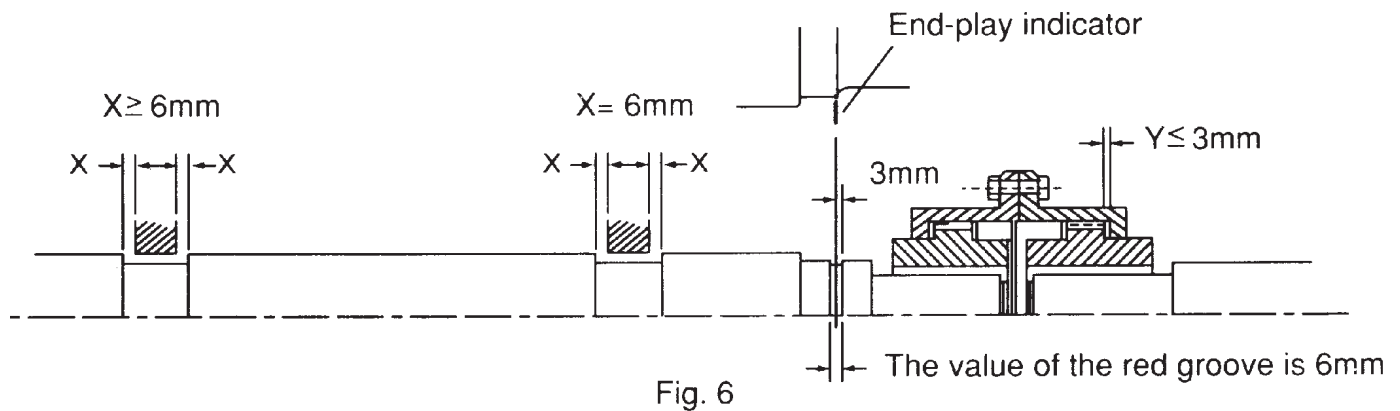
ATTENTION!

Basically, the coupling should be heated and pushed onto the shaft extension with slight axial force. Do not hammer coupling to prevent bearing damage.

3.3.2

Although the sleeve bearings are equipped with thrust faces, these are intended only to provide momentary axial restraint of rotor movement either during start-up or when operating the motor disconnected from the driven equipment. They must not be operated under a constant thrust load unless they were originally designed for this condition.

Motors with either sleeve or anti-friction bearings are suitable for connection to the driven load through a flexible coupling. Coupling solidly to the load is not acceptable. With sleeve bearings, the flexible coupling should be of the limited end float type to prevent the possibility of any end thrust from load being transmitted to the motor bearings, which could cause bearing damage. The recommended limits of end float are as follows:



- When the motor is in operation after installation, be sure that the end-play indicator is within the 6mm (.236 in.) of the groove on the shaft or aligned to the shaft shoulder immediately outboard of the drive-end bearing to assure there is low friction between shaft and bearing.
- Unless otherwise specified, the designed end-play value X of the groove for TWMC motors in general is within 6mm (.236 in.) as illustrated in Fig. 6. In essence, the endplay indicator is adjusted to point at the center of the groove or the drive-end shaft shoulder; thus X equals to 6 ± 1 mm or so, and the endplay value (Y) of the couplings should equal or be smaller than 3mm (.118 in.).
- If the desired value Y is greater than 3mm (.118 in.) caused for instance by a thrust load and/or load machine with large end-play, please inform TWMC prior to entering an order.

3.3.3

In aligning the motor (and rotor) axially with the driven equipment, consideration should be given not only to the endplay indicator position but also to axial shaft expansion and increase in shaft centerline height due to thermal effects. In general, the axial shaft growth for motors can be disregarded since neither bearing is fixed and any shaft growth due to temperature increase will produce an elongation away from the coupling.

Shaft height growth (change in shaft centerline elevation) for TEFC machines can be calculated as follows:

$$\Delta = (0.0005") \times (\text{motor foot to shaft } \text{£} \text{ dimension})$$

For non-TEFC machines, divide the number by 2.

3.3.4

It is desirable, in normal operation that the motor operates on its magnetic center, so that no axial force is exerted on the coupling.

The motor shaft and the driven shaft should be aligned within the following tolerances in both angular and parallel alignment:

Unit: mm

TIR	Range of rotating speed	Solid coupling	Flexible coupling
C	2500 rpm and above	0.03	0.03
	Below 2500 rpm	0.04	0.05
A	2500 rpm and above	0.03	0.03
	Below 2500 rpm	0.03	0.04

Angular misalignment is the amount by which the centerlines of driver and driven shafts are skewed. It can be measured using a dial indicator set up as shown in Fig. 7. The couplings are rotated together through 360 degrees so that the indicator does not measure runout of the coupling hub face. The shafts should be forced against either the in or out extreme of their end float while being rotated.

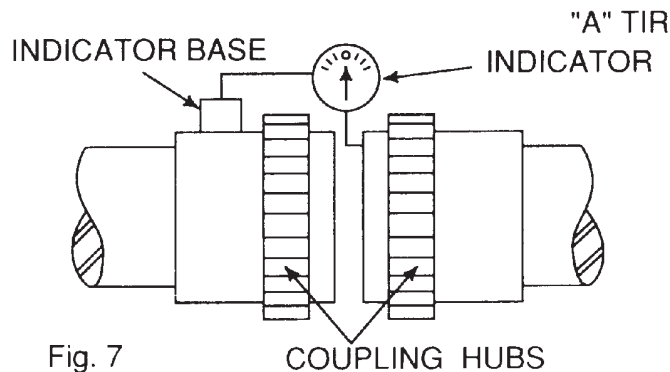


Fig. 7
TIR=Total indicator reading (by dial indicator)

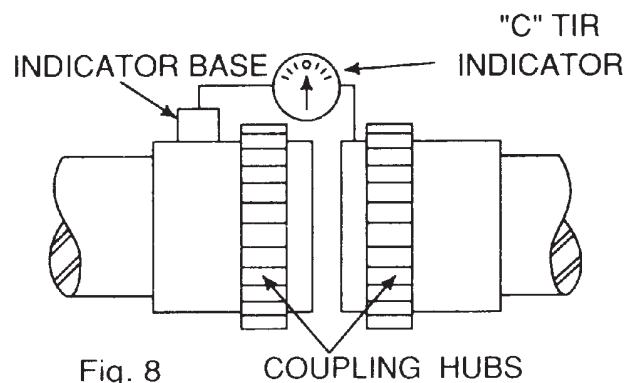


Fig. 8

Parallel misalignment is the amount by which the centerlines of the driver and driven shafts are out of parallel. It can be measured using a dial indicator set up as shown in Fig. 8. Again, the couplings are rotated together through 360 degrees so that the indicator does not measure runout of the coupling hub outside diameter.

3.3.5

After the motor has been properly aligned with the driven equipment and the hold-down bolts have been installed and tightened, for motors with fabricated frames, at least two dowel pins should be installed in two diagonally opposite motor feet.

3.3.6 Installation of shaft coupling: (Vertical hollow shaft motor only)

Bolted Coupling as shown in Fig. 9

- Bearings are provided to absorb some upward shaft thrust when the coupling is fitted.
- The coupling is fastened with bolts.
- This coupling type is not auto-release type.

Note: Standard high thrust motors can absorb momentary up-thrust load up to 30% of the standard down thrust load. If the up-thrust is long in duration (over 10 Seconds) and/or exceeds 30% of the standard high thrust rating, special design arrangements are required and standard motor is not suitable.

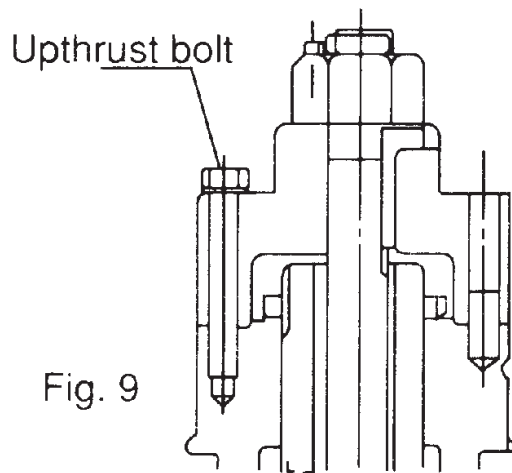


Fig. 9

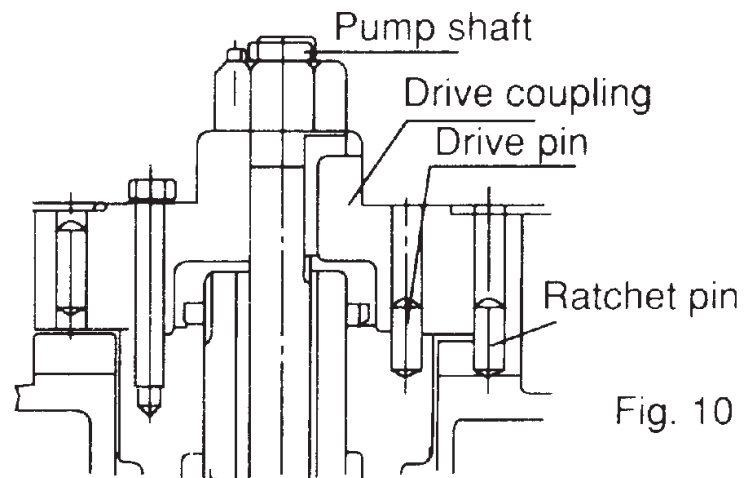


Fig. 10

3.3.7 Non-reverse ratchet/coupling, as Fig. 10 (If necessary)

The non-reverse coupling is also a bolted type and,

- (a) It prevents the pump and motor from rotating in the reverse direction.
- (b) It also prevents damage form over speeding and damage to pump shaft and bearings.
- (c) The ratchet pins are lifted by the ratchet teeth and are held clear by centrifugal force and friction as the motor comes up to speed.
- (d) When power is removed, speed decreases, and the pins fall. At the instant of reversal, a pin will catch in a ratchet tooth and prevent backward rotation.
- (e) When installing the non-reverse coupling, do not use lubricant. Lubricant will interfere with proper operation. The top half of the coupling should seat solidly on the lower half and the pins should touch the bottom of the pockets between the teeth in the plate.
- (f) As with the bolted coupling, the up-thrust capabilities are 30% of the standard high thrust rating for down thrust.

ATTENTION!

Do not apply non-reverse ratchets on applications in which the pump reversal time from shutdown (the instant the stop button is pressed) to zero speed is less than one second.

3.4 Installation for belt drive

In general, power transmission though direct flexible coupling is appropriate for large motors. Such motors are not suitable for belt, chain or gear connection unless specially designed for such service. However, for small and medium motors of which outputs within the ranges shown on table below, it is acceptable to use belt transmission as indicated. Beyond these ranges, do not apply belt sheaves unless specially designed.

3.4.1

The diameter ratio between conveyance sheaves should not be greater than 5 to 1 for flat belts, and 8 to 1 for V-belts. It is also advisable to limit the belt velocity to under 35m/sec (115 ft/sec) to limit belt abrasion and vibration. The smaller the outer diameter of the V-belt sheave, the greater the shaft bending stress will be. If the bending stress is in excess of the shaft fatigue stress, the shaft may break. Therefore, please inform TWMC when you have decided the size of the sheaves and the length of the belts upon ordering.

ATTENTION!

Place the sheave and belt as close as possible to the motor body (it is advisable to make x as shown in Fig. 11 equal to 0) to reduce the bending moment and improve shaft life.



Fig. 11

3.4.2 Table of belt-sheave application for general electric motors

Output (KW/HP)			V-Belt Sheave							
			Conventional V-Belts				Narrow V-Belts			
4P	6P	8P	V-Belt Type	Number Of Belts	Min. PCD (mm)	Max Width (mm)	V-Belt Type	Number Of Belts	Min. PCD (mm)	Max Width (mm)
11/15	-	-	B	4	160	82	3V	4	125	48
-	11/15	-	B	5	170	101	3V	5	140	59
-	-	11/15	B	5	190	101	3V	6	160	69
15/20	-	-	B	5	170	101	3V	6	125	69
-	15/20	-	B	5	224	101	3V	6	160	69
-	-	15/20	C	4	224	111	5V	3	180	60
18.5/25	-	-	B	5	200	101	3V	6	140	69
-	18.5/25	-	C	4	224	111	5V	3	180	60
-	-	18.5/25	C	5	224	136	5V	4	180	78
22/30	-	-	B	5	224	101	5V	6	160	69
-	22/30	-	C	5	224	136	3V	4	180	78
-	-	22/30	C	5	250	136	5V	4	200	78
30/40	-	-	C	5	224	136	5V	4	180	78
-	30/40	-	C	5	265	136	5V	4	224	78
-	-	30/40	C	6	265	162	5V	5	224	95
37/50	-	-	C	6	224	162	5V	4	200	78
-	37/50	-	C	6	265	162	5V	4	224	78
-	-	37/50	C	7	280	187	5V	5	250	95
45/60	-	-	C	6	265	162	5V	4	224	78
-	45/60	-	C	7	280	187	5V	5	224	95
-	-	45/60	C	7	315	187	5V	6	250	113
55/75	-	-	C	7	265	187	5V	5	224	95
-	55/75	-	C	8	300	213	5V	6	250	113
-	-	55/75	D	5	355	196	5V	6	280	113
75/100	-	-	C	8	315	213	5V	6	250	113
-	75/100	-	D	6	355	233	5V	6	315	113
-	-	75/100	D	6	400	233	5V	6	355	113
-	90/120	-	D	6	400	233	5V	6	355	113
-	-	90/120	D	6	425	233	8V	4	355	124
-	110/150	-	D	7	400	270	8V	4	355	124
-	132/175	110/150	D	7	450	270	8V	4	400	124
-	160/200	132/175	D	9	450	344	8V	4	450	124

3.5 Conveyance with chain or gear**3.5.1**

Make sure the loading capacity of shaft and bearings is appropriate for the size and installation position (overhung) of chain and gear. If necessary, please contact us to ensure the shaft and bearings will meet your requirements.

3.5.2

Pay close attention to ensure the parallelism of shafts.

3.5.3

The teeth of couplings should be correctly and precisely matched; the force conveyance centers should lie on the same line.

3.5.4

There should be no skip, jumping, vibration or unusual noises.

ATTENTION!

Do not hammer the conveyance devices such as couplings, belt sheaves, chain wheels, gears etc. onto the shaft. Those shaft fitments should be fitted and removed only by means of suitable devices. Heat shrinking may be a better alternative to avoid damaging bearings and components.



The exposed rotating parts should be covered to prevent accidents.

3.6 Electrical connections

All interconnecting wiring for controls and grounding should be in strict accordance with local requirements such as the USA National Electrical Code and UK IEE wiring regulations. Wiring of motor and control, overload protection and grounding should follow the instructions of connection diagrams attached to the motor.

3.6.1 Power

The rated conditions of operation for the motor are as shown on the nameplate. Within the limits, given below, of voltage and frequency variation from the nameplate values, the motor will continue to operate but with performance characteristics that may differ from those at rated conditions:

±10% of rated voltage

±5% of rated frequency

±10% combined voltage and frequency variation so long as frequency variation is no more than ±5% of rated.

Operating the motor at voltages and frequencies outside of the above limits can result in both unsatisfactory motor performance and damage to or failure of the motor.

3.6.2

The main lead box furnished with the motor has been sized to provide adequate space for the make-up of the connections between the motor lead cables and the incoming power cables.



The bolted joints between the motor lead and the power cables must be made and insulated in a workman-like manner following the best trade practices.

3.6.3

Either fabricated motors or fan cooled cast frame, motors are all provided with grounding pads or bolts.



The motor must be grounded by proper connection to the electrical system ground.

3.6.4

The rotation direction of the motor will be as shown by either a nameplate on the motor or the outline drawing. The required phase rotation of the incoming power for this motor rotation may also be stated. If either is unknown, the correct sequence can be determined in the following manner: While the motor is uncoupled from the load, start the motor and observe the direction of rotation. Allow the motor to achieve full speed before disconnecting it from the power source. Refer to the operation section of these instructions for information concerning initial start-up. If resulting rotation is incorrect, it can be reversed by interchanging any two (2) incoming cables.

3.6.5 Auxiliary devices

Auxiliary devices such as resistance temperature detectors, thermocouples, thermoguards, etc., will generally terminate on terminal blocks located in the auxiliary terminal box on the motor. Other devices may terminate in their own enclosures elsewhere on the motor. Such information can be obtained by referring to the outline drawing. Information regarding terminal designation and the connection of auxiliary devices can be obtained from auxiliary drawings or attached nameplates.

If the motor is provided with internal space heaters, the incoming voltage supplied to them must be exactly as shown by either a nameplate on the motor or the outline drawing for proper heater operation.



Caution must be exercised anytime contact is made with the incoming space heater circuit as space heater voltage is often automatically applied when the motor is shutdown.

4. OPERATION

4.1 Examination before start

4.1.1

When motors are installed in good manner, ensure the wiring is according to the diagram. Also, the following points should be noted:

- (a) Make sure all wiring is correct.
- (b) Ensure the sizes of cable wires are appropriate and all connections are well made for the currents they will carry.
- (c) Ensure all connections are properly insulated for the voltage and temperature they will experience.
- (d) Ensure the capacity of fuses, switches, magnetic switches and thermo relays etc. are appropriate and the contactors are in good condition.
- (e) Make sure the frame and terminal box are grounded.
- (f) Make sure that the starting method is correct.
- (g) Make sure switches and starters are set at their right positions.
- (h) Motor heaters must be switched off when the motor is running.

4.1.2 Measurement of insulation resistance



During and immediately after measuring, the terminals must not be touched as they may carry residual dangerous voltages. Furthermore, if power cables are connected, make sure that the power supplies are clearly disconnected and there are no moving parts.

- (a) For rated voltage below 1000V, measured with a 500VDC megger.
- (b) For rated voltage above 1000V, measured with a 1000VDC megger.
- (c) In accordance with IEEE 43, clause 9.3, the following formula should be applied:

$$R \geq \left(\frac{\text{Rated voltage (v)}}{1000} + 1 \right) \times 10(\text{M}\Omega)$$

- (d) On a new winding, where the contaminant causing low insulation resistance is generally moisture, drying the winding through the proper application of heat will normally increase the insulation resistance to an acceptable level. The following are several accepted methods for applying heat to the winding:
 - (1) If the motor is equipped with space heaters, they can be energized to heat the winding.
 - (2) Direct current (as from a welder) can be passed through the winding. The total current should not exceed approximately 50% of rated full load current. If the motor has only three leads, two must be connected together to form one circuit through the winding. In this case, one phase will carry the fully applied current and each of the others, one-half each. If the motor has six leads (3 mains and 3 neutrals), the three phases should be connected into one series circuit.



Ensure there is adequate guarding so live parts cannot be touched.

- (3) Heated air can either blown directly into the motor or into a temporary enclosure surrounding the motor. The source of heated air should preferably be electrical as opposed to fueled (such as kerosene) where a malfunction of the fuel burner could result in carbon entering the motor.

ATTENTION!

Caution must be exercised, when heating the motor with any source of heat other than self contained space heaters, to raise the winding temperature at a gradual rate to allow any entrapped moisture to vaporize and escape without rupturing the insulation. The entire heating cycle should extend over 15-20 hours.

Insulation resistance measurements can be made while the winding is being heated. However, they must be corrected to 40°C for evaluation since the actual insulation resistance will decrease with increasing temperature. As an approximation for a new winding, the insulation resistance will approximately halve for each 10°C increase in insulation temperature above the dew point temperature.

- (e) Should the resistance fail to attain the specified value even after drying, careful examination should be undertaken to eliminate all other possible causes, if any.

4.1.3 Power Source

- (a) Ensure the capacity of the power source is sufficient.
- (b) Ensure the supply voltage and frequency ratings are identical to those on the nameplate.
- (c) Voltage variation should be confined to within $\pm 10\%$ of the rated value and the phase to phase voltages should be balanced.

4.1.4 Bearing lubrication

- (a) For sleeve bearing motors, the oil reservoir must be filled with oil to the correct level. On self-lubricated bearings, the standstill oil level will be at the center of the oil gauge. The proper oil is a rust and oxidation inhibited, turbine grade oil. Refer to the lubrication nameplate for the recommended viscosity.
- (b) Motors, which are supplied with provision for flood lubrication, have an inlet orifice to meter the oil flow to the bearing. Refer to the outline drawing for these values. If the supply pressure does not match that stated on the outline, the orifice size must be adjusted to produce the specified flow rate. The drain adapter (also provided) has a weir plate fixed to the inside of the pipe to permit the establishment of the proper oil level. This weir plate must be located at the bottom of the pipe and must be parallel to the plane of the motor feet. To ensure optimum flow, the drain line should be vented to the atmosphere.
 - Oil inlet temperature: Normal below 50°C
 - Alarm 60°C
 - Trip 65°C
- (c) If the motor is in storage for over three (3) months, refilling of some new oil should be undertaken before operation to prevent bearing damage due to dry friction. The oil level should be kept at the center of the oil gauge. If necessary, drain some oil after refilling.
- (d) Motors that have been designed with anti-friction bearings for use with an oil mist lubrication system have been packed at the factory with a small amount of grease for short test runs. Continuous running should not be considered unless the oil mist system is installed and operating.
- (e) Grease lubricant type
 - (1) The bearings have been well greased at the factory before delivery. However, regreasing is required if a significant period has elapsed between manufacture and use or in storage
 - (2) **All motors with ZZ bearings will have SHELL Alvania R3 (Lithium base grease).** All motors with open bearings will have Polyrex EM (polyurea base grease).

4.1.5 Cooling water for the cooler on water-cooled motors

Make sure the quality, volume and inlet temperature of cooling water for the motors are normal before the machine is in operation.

Water: General tower water or industrial water.

Volume: Please see outline drawing

Inlet temperature: Normal below 30°C
 Alarm 35°C
 Trip 40°C

ATTENTION!

Make sure all locks, which fasten the movable parts of the motors during transportation, are dismantled and the shaft can rotate freely.

ATTENTION!

Ensure there is no foreign matter or tools inside the motors before starting motors.

4.1.6

Make sure the transmission system, including belts, screws, bolts, nuts and set pins are in good condition.



The keys fitted to the shaft extensions are held by plastic tape only to prevent them from falling out during transportation or handling. The shaft key shall be removed to avoid flying out, when the motor is operated prior to the couplings etc. being fitted to the shaft extension.

4.1.7

Make sure the items above are examined. Test the motor running with or without load. Record and check according to "Maintenance" at 15-minute intervals during the first three hours of operation. Then regular examinations should take place at longer intervals. If all goes well the motor can be classified as "in good order".

4.2 Starting operation

4.2.1 Starting load

Initially run the motor unloaded prior to coupling to other machines. Unless otherwise specified, a motor usually starts with light load, which is then gradually increased, proportional to the square of the speed and at last reaches 100% load at full load speed.

4.2.2 Starting

Too frequent starts can be harmful to the motors. The following restrictions should be observed:

- (a) Motor can be restarted should the initial start fail. Two starts are generally permissible when the motor is cold.
- (b) Motor can be started only once when it is at normal running temperature.
- (c) Should additional starts be necessary beyond the conditions stated above, the following restrictions should be noted:
 - (1) Let the motor cool down for 60 minutes before restarting, fully loaded.
 - (2) Let the motor cool down for 30 minutes before restarting, unloaded.
 - (3) Two inching starts can be regarded as one normal start.

ATTENTION!

If the motor rotor fails to start turning within one or two seconds, shut off the power supply immediately.

Investigate thoroughly and take corrective action before attempting a restart.

Possible reasons for not starting are:

- (1) Too low a voltage at the motor terminals.
- (2) The load is too much for the rotor to accelerate.
- (3) The load is frozen up mechanically.
- (4) All electrical connections have not been made.
- (5) Single-phase power has been applied.
- (6) Any combination of the above.

4.2.3 Rotating direction

- (a) Most TWMC motors are bi-directional. However, when some special types, such as high speed 2-Pole, certain large capacity motors, those with a non-reversing ratchet etc., should rotate in one direction, please ensure the rotation is in conformity with the directional arrow-mark shown on the attached nameplate.
- (b) To reverse a bi-directional motor, cut the power and wait until the motor stops. Then interchange any two of the three phases.

4.2.4 Power source, Voltage, Current

- (a) Ensure the voltage and frequency of the power source are identical to the ratings shown on the nameplate.
- (b) Voltage variation should be confined to within $\pm 10\%$ of the rating and the three phase voltages should be in full balance
- (c) Ensure the motor phase currents, when without load, are within $\pm 5\%$ of the average values.

4.2.5

Frequency variation should be confined to within $\pm 5\%$ of the rating. The aggregate variation of voltage and frequency should be confined to within $\pm 10\%$ of the absolute value of the ratings.

Starting time and unusual noises

ATTENTION!

Starting time is longer for the motors with large inertia. However, if starting time is longer than usual or if there is difficulty in starting, or there is abnormal noise, do not run the motor and refer to TWMC Service representative.

4.2.6 Sleeve bearing oil rings (sleeve bearing types only)

As the oil ring is used to carry lubricant to sleeve bearings, frequently check to ensure the oil ring is in motion.

4.2.7 Bearing temperature rise

Following the initial start-up, the bearing temperatures should be closely monitored. The rate of rise in bearing temperature is more indicative of impending trouble than is the actual temperature.

ATTENTION!

If the rate of rise in temperature is excessive or if the motor exhibits excessive vibration or noise, it should be shut down immediately and a thorough investigation made as to the cause before it is operated again.

If the bearing temperature rise and motor operation appear to be normal, operation should continue until the bearing temperature stabilizes.

Recommended limits on bearing temperature are as follows:

Sleeve Bearings

- By permanently installed detector 90°C
- By temporary detector on top of the bearing sleeve near the oil ring 85°C

Total measured temperature

Anti-Friction Bearings

- By permanently installed detector
- By temporary detector measuring the outside of the bearing housing

Total measured temperature

100°C
95°C

ATTENTION! (For sleeve bearing)

- (1) It must be noted that when operating flood lubricated sleeve bearings without outside lubrication supplied, the bearing temperature must not be allowed to exceed 85°C total temperature
- (2) Under normal condition, for the self-lube bearing, the rate of temperature rise should be from 11 to 14°C for the first ten (10) minutes after starting up and approximately 22°C at thirty (30) minutes. The rate of bearing temperature rise is a function of the natural ventilation and operating conditions.
- (3) When the rate of bearing temperature rise is less than 1°C per half-hour, the bearing temperature is considered to be stabilized.
- (4) If the total bearing temperature exceeds 95°C, the motor should be shut down immediately.

Noise and Vibration

ATTENTION!

Any abnormal noise or vibration should be immediately investigated and corrected. Increased vibration can be indicative of a change in balance due to mechanical failure of a rotor part, a stator winding problem or a change in motor alignment.

5. MAINTENANCE

5.1 Major points in regular inspections and maintenance.



For safety, maintenance and repairs must only be carried out by properly trained personnel.



Some testing, such as insulation resistance, usually requires the motor to be stopped and isolated from power supply(ies).

Routine inspection and maintenance are usually performed by looking, listening, smelling and simple meters.



High temperature may arise under operating conditions on the motor surfaces, so that touching should be prevented or avoided. Keep away from moving and live parts. Unless deemed necessary, do not remove guards whilst assessing the motor.

Timely replacement of worn parts can assure longevity and prevent breakdown.

Routine inspection and regular inspection and maintenance are important in preventing breakdown and lengthening service life.

Owing to the varied time and circumstances, motors are used, it is difficult to set the items and periods for regular inspection and maintenance. However, as a guide it is recommended to be performed periodically according to factory maintenance program. Generally, the inspection scope determined by the following factors:

- (a) Ambient temperature.
- (b) Starting and stopping frequency.
- (c) Troublesome parts usually affecting motor functions.
- (d) Easily abraded parts.
- (e) The important position of motor in the operational system of a factory should be duly recognized. Therefore, its health and wellbeing should be fully protected especially when it is operating in severe conditions.

5.2 Motor windings:

- (a) Measurement of insulation resistance and standards to determine quality of insulation resistance, please refer to measures stated in 3.1.2 "Measurement of insulation resistance".
- (b) Inspection of coil-ends:
 - (1) Grease and dust accumulated on coils may cause insulation deterioration and poor cooling effect.
 - (2) Moisture must not accumulate. Keep coils warm when motor is not in use if moisture can be seen.
 - (3) Discoloring. This is mainly caused by overheating.
- (c) Ensure no untoward change of wedges from original position.
- (d) Ensure the binding at the coil end is in its normal position.

5.3 Clean the interior of the motor:

- (a) After a motor is in operation for some time, accumulation of dust, carbon powder and grease etc., on the inside is unavoidable, and may cause damage. Regular cleaning and examination is necessary to assure top performance.
- (b) Points to note during cleaning:
 - (1) If using compressed air or blower:
 - (a) Compressed air should be free of moisture.
 - (b) Maintain air pressure at 4 kg/cm², since high pressure can cause damage to coils.
 - (2) Vacuum
Vacuum cleaning can be used, both before and after other methods of cleaning, to remove loose dirt and debris. It is a very effective way to remove loose surface contamination from the winding without scattering. Vacuum cleaning tools should be non-metallic to avoid any damage to the winding insulation
 - (3) Wiping
Surface contamination on the winding can be removed by wiping using a soft, lint-free wiping material. If the contamination is oily, the wiping material can be moistened (not dripping wet) with a safety type petroleum solvent. In hazardous locations, a solvent such as inhibited methyl chloroform may be used, but must be used sparingly and immediately removed. While this solvent is non-flammable under ordinary conditions, it is toxic and proper health and safety precautions should be followed while using it.

ATTENTION!

Solvents of any type should never be used on windings provided with abrasion protection. Abrasion protection is a gray, rubber-like coating applied to the winding end-turns.



Adequate ventilation must always be provided in any area where solvents are being used to avoid the danger of fire, explosion or health hazards. In confined areas (such as pits) each operator should be provided with an airline respirator, a hose mask or a self-contained breathing apparatus. Operators should wear goggles, aprons and suitable gloves. Solvents and their vapors should never be exposed to open flames or sparks and should always be stored in approved safety containers.

- (4) Keep core ducts completely clean. The difference in temperature rise could be around 10°C before and after cleaning

5.4 Clean the exterior of the motor:

- (a) On open ventilated motors, screens and louvers over the inlet air openings should not be allowed to accumulate any build-up of dirt, lint, etc. that could restrict free air movement.

ATTENTION!

Screens and louvers should never be cleaned or disturbed while the motor is in operation because any dislodged dirt or debris can be drawn directly into the motor.

- (b) If the motor is equipped with air filters, they should be replaced (disposable type) or cleaned and reconditioned (permanent type) at a frequency that is dictated by conditions. It is better to replace or recondition filters too often than not often enough.
- (c) Totally enclosed air to air cooled and totally enclosed fan cooled motors require special cleaning considerations. The external fan must be cleaned thoroughly since any dirt build-up not removed can lead to unbalance and vibration. All of the tubes of the air-to-air heat exchanger should be cleaned using a suitable tube brush having synthetic fiber bristles (not wire of any type).

5.5 Maintenance of anti-friction bearings**5.5.1 Frequency of re-lubrication:**

The life of grease varies greatly as a result of types of model, revolution speed, temperature, operational conditions etc. It is, therefore, impossible to be precise about replenishment intervals. However, for normal direct coupling transmission, the periods shown as Table 1 may be used as a guide.

Remarks:

- (a) The periods shown in Table 1 should be halved where bearings are used for belt drive and/or in dirty or high ambient temperature or high humidity environments.
- (b) Please refer to the lubrication nameplate, if attached to the motor.
- (c) For bearing numbers outside the range of Table 1, please contact TWMC

- (d) If the periods referred to in Table 1 for drive-end bearing and opposite drive-end are different, for the convenience of maintenance operation, please take the shorter one the required grease replenishment period of these bearings.

5.5.1 Kinds of grease:

All motors with ZZ bearings will have SHELL Alvania R3 (lithium base grease). All motors with open bearings will have Polyrex EM (polyurea base grease).

Certain T-frame models will utilize special grease and will be noted on the lubrication nameplate. Please use identical grease or its equivalents when maintaining lubrication schedule.

ATTENTION!

Do not mix different kinds of grease.

Mixing grease with different type of thickeners may destroy its composition and physical properties. Even if the thickeners are of the same type, possible differences in the additive may cause detrimental effects.

5.5.2 Grease quantity

The amount of grease per replenishment depends on the type, size and construction of the bearings. The maximum amount of one replenishment for each bearing is shown in Table 2.

5.5.3 Re-greasing



If re-lubrication is to be performed when the motor is running, stay clear of rotating parts.

It is advisable to re-grease when the motor is running to allow the new grease to be evenly distributed inside the bearing.

Before re-greasing, the inlet fitting should be thoroughly cleaned to prevent any accumulated dirt from being carried into the bearing with the new grease. The outlet of grease drainage should be opened to allow the proper venting of old grease.

Use a grease gun to pump grease through grease nipple into the bearings. After re-greasing, operate the motor for 10-30 minutes to allow any excess grease to vent out.

TABLE 1.

Bearing Number		600 RPM	720 RPM	750 RPM	900 RPM	1000 RPM	1200 RPM	1500 RPM	1800 RPM	3000 RPM	3600 RPM
62XX 63XX 72XX 73XX	6210										
	12									2000 Hrs.	
	13										
	14									1000 Hrs.	
	15										
	16									720 Hrs.	
	17							2000 Hrs.			
	18	3000 Hrs.									
	20										
	22										
	24							1500 Hrs.			
	26										
	28							2000 Hrs.		1000 Hrs.	
	30										
	32							500 Hrs.			
34							1500 Hrs.				
36											
38							2000 Hrs.		1000 Hrs.		

Bearing Number		600 RPM	720 RPM	750 RPM	900 RPM	1000 RPM	1200 RPM	1500 RPM	1800 RPM	
NU2XX NU3XX	NU214									
	15								2000 Hrs.	
	16									
	17									
	18	3000 Hrs.							1500 Hrs.	
	20									
	22								1000 Hrs.	
	24									
	26					2000 Hrs.				
	28								500 Hrs.	
	30									
	32									
	34				2000 Hrs.		1000 Hrs.			
	36									
	38	2000 Hrs.								
	40									
	44				1000 Hrs.					
	48	1000 Hrs.								

Bearing Number		600 RPM	720 RPM	750 RPM	900 RPM	1000 RPM	1200 RPM	1500 RPM	1800 RPM
222XX 223XX	22220							300 Hrs.	
	22								
	24	1000 Hrs.				500 Hrs.			
	26								
	28								
	30					300 Hrs.			
	32	500 Hrs.							
	34								
	36								
	38	500 Hrs.							
	40	300 Hrs.							
	44								
	48	300 Hrs.							

TABLE 2.

Bearing No.	Amount of replenishment
62XX 72XX NU2XX 2222XX	6210 30 g
	6212 40
	6213 50
	6214 50
	6215 60
	6216 60
	6217 80
	6218 80
	6220 100
	6222 120
	6224 120
	6226 140
	6228 160
	6230 180
	6232 200
	6234 250
	6236 300
	6238 350
	6240 400
	6244 450
	6248 500

Bearing No.	Amount of replenishment
63XX 73XX NU223XX 223XX	6310 40 g
	6312 60
	6313 80
	6314 80
	6315 100
	6316 100
	6317 120
	6318 120
	6320 160
	6322 220
	6324 270
	6326 300
	6328 400
	6330 450
	6332 500
	6334 600
	6336 700
	6338 800
	6340 900
	6344 900
	6348 900

*Fill new grease until it overflows and the old grease is entirely replaced.

5.5.4 Oil re-lubrication (For oil lubrication types only)

Maintain proper lubrication by checking the oil level periodically and adding oil when necessary. Because of the initial clearing action of the bearing and the expansion of the oil as it comes up to operating temperature, the oil level will be higher after the motor has been in operation for a while than it is with the motor at standstill.

Overfilling should be avoided not only because of the possibility that expansion may force the oil over the oil sleeve and on to the rotor, but also because too high an operating oil level prevents the bearing from clearing itself of excess oil. The resultant churning can cause extra loss, high temperatures, and oxidized oil. If, during operation, the oil level goes above the maximum shown on the sight gauge, drain enough oil to bring the level back within the recommended operating range. **Do not permit the operating level to fall below the minimum shown on the gauge.**

ATTENTION!

Should it ever become necessary to add excessive amount of make-up oil, investigate immediately for oil leaks.

Change the oil at regular intervals. The time between oil changes depends upon the severity of operating conditions and, hence, must be determined by the motor user. Two or three changes a year is typical, but special conditions, such as high ambient temperature, may require more frequent changes. Avoid operating the motor with oxidized oil.

Use only good grade, oxidation-corrosion-inhibited turbine oils produced by reputable oil companies.

The viscosity of the oil to be used depends upon the type and size of the bearings, its load and speed, the ambient temperature, and the amount and temperature of the cooling water (if used)). The lubrication nameplate or instructions with each motor specifies the viscosity range of oil suitable for average conditions. The usual oil viscosity range of oil suitable for average conditions. The usual oil viscosity recommendations are summarized in Table 3. Operation in ambient temperatures that are near or below freezing may require preheating the oil or the use of special oil. Whenever the motor is disassembled for general cleaning and reconditioning, the bearing housing may be washed out with a suitable cleaning solvent. Be sure that the oil-metering hole is clear, and then dry the housing thoroughly before re-assembly, and ensure all traces of cleaning solvent have been removed.

TABLE 3 Oil Viscosity**

Bearing function and location	Bearing Type	Oil Viscosity - SSU	
		@ 100°F	@ 200°F
Thrust Bearing	72XX, 73XX Angular contact ball And/or (62XX, 63XX)	150	45
	Spherical roller	300	53
	Plate (Kingsbury Type)	300	53

**Remark: When a lubrication nameplate attached to the motor, use lubrication oil it stipulates.

5.5.5 Cleaning and installation of bearings

- (a) Apply the proper amount of grease to the disassembled parts of the bearing after they have been thoroughly cleaned with high quality cleaning oil. Then protect them from contamination before and during assembly.
- (b) Bearing installation

ATTENTION!

Before installing the bearings, make sure that the shaft mounted parts inside the bearings are in place before installation.

Since the bearing is a high precision component, it is important to avoid ingress of dust and foreign matter, and hammering during cleaning and installation. Use extreme care and insure clean conditions during installation and assembly.

ATTENTION!

The best way for bearing installation is heat shrinking. Knocking and hammering during installation should be avoided absolutely.

The bearing should be heated in a bath of clean oil at a temperature of approximately 80°C. After warming, slide the bearings in place quickly and nimbly so that it has not shrunk before being fully in position.

Grease the bearing after the temperature returns to normal, and then reassemble the motor.

5.6 Maintenance of sleeve bearings

5.6.1 Daily inspections

- (a) Ensure the volume and quality of lubrication oil are in compliance with specifications.

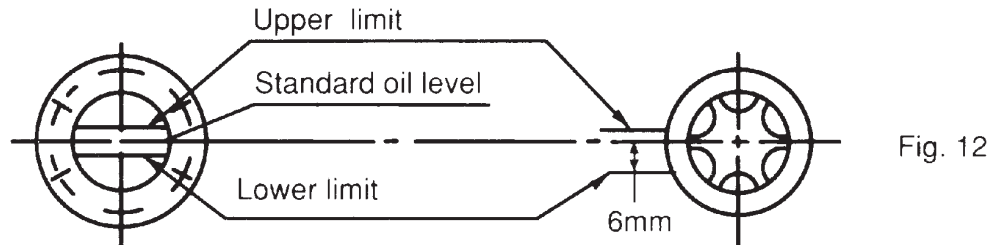


Fig. 12

- (b) Ensure there is motion of the oil ring and it is not clamped.
(c) The indicator of the shaft endplay should be restricted within the specified range of the red groove of the shaft or the $\pm 3\text{mm}$ (.118 in.) range of the drive-end shaft shoulder, or the bearing may be damaged.

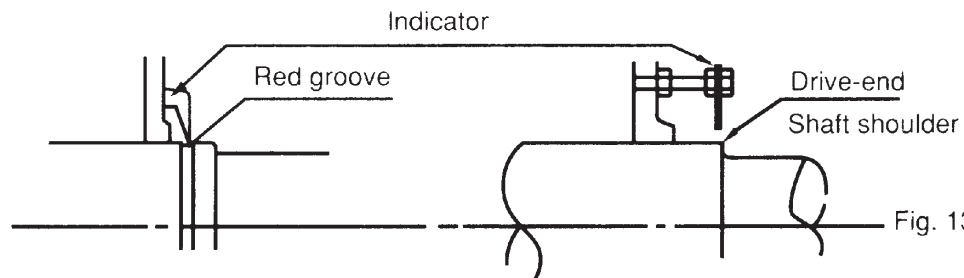


Fig. 13

5.6.2 Regular examination

- (a) Periodical change of oil

The oil reservoirs of self (not flood) lubricated bearings should be drained and refilled about every six (6) months. More frequent changes may be needed on high speed (3600 rpm) motors or if severe oil discoloration or contamination occurs. In conditions where contamination does occur, it may be advisable to flush the reservoir with kerosene to remove any sediment before new oil is added. Proper care must be taken to thoroughly drain the reservoir of the flushing material before refilling with the new oil.

Refill the reservoir to the center of oil sight glass with a rust and oxidation inhibited turbine grade oil. Refer to the outline and lubrication nameplate for the correct viscosity.

- (b) Quantity of lubrication oil

Please refer to the lubrication nameplate for oil quantity.

- (c) Oil viscosity

- (d)

ISO	Equivalents	Viscosity (SUS/100°F)
VG32	Esso Teresso 32	150
VG46	Esso Teresso 46	200
VG68	Esso Teresso 68	300

5.6.3 Disassembly



Prior to disassembling, ensure the power supplies are disconnected and there are no moving parts.

The bearing sleeve is of the spherically seated, self-aligning type. The opposite drive end bearing is normally insulated for larger motors (or when specified). On some motors, the insulation is bonded to the spherical seat of the bearing housing.

ATTENTION!

Extreme care must be exercised in removing the bearing sleeve from the insulated support to avoid damaging this insulation.

The following is the recommended procedure for removing the bearing sleeve:

- (a) Remove the oil drain plug in the housing bottom and drain the oil sump.
- (b) Remove all instrumentation sensors that are in contact with the bearing sleeve. These would include resistance temperature detectors, thermocouples, thermometers, etc..
- (c) Remove the socket head bolts holding the bearing cap and the inner air seal. The end cover plate must also be removed if the non-drive end bearing is being disassembled. Remove the bearing cap and top half of the inner air seal. Place them on a clean, dry surface to avoid damage to the parting surfaces.
- (d) Remove the top half of the bearing sleeve using suitable eyebolts in the tapped holes provided. Lift the bearing top straight up and avoid any contact with the shoulders of the shaft journals that might damage the thrust faces of the bearing. Place on a clean, dry surface taking care to prevent damage to either the parting surfaces or the locating pins that are captive in the top bearing half.
- (e) Remove the screws at the partings in the oil ring and dismantle the ring by gently tapping the dowel pin ends with a soft face mallet. Remove the ring halves and immediately reassemble them to avoid any mix up of parts or damage to the surfaces at the partings.
- (f) Pull up on the garter spring surrounding the floating labyrinth seal and carefully slip out the top half. Rotate the garter spring until the lock is visible. Twist counter-clockwise to disengage the lock, remove the garter spring then rotate the lower half of the seal out of the groove in the bearing housing. Note the condition of these floating labyrinth seals. If they are cracked or chipped, they must be replaced. Do not attempt to reuse a damaged seal.
- (g) To remove the bottom bearing half, the shaft must be raised a slight amount to relieve pressure on the bearing. On the drive end, this can be done by jacking or lifting on the shaft extension. Protect the shaft. On the non-drive, jacking or lifting can be done using bolts threaded into the tapped holes provided in the shaft end.

- (h) Roll the bottom bearing half to the top of the shaft journal and then lift it using suitable eyebolts threaded into the holes provided. Again avoid any contact with the shaft shoulders that could damage the bearing thrust faces. Place the lower bearing half on a clean, dry surface to protect the parting surfaces.



Use extreme care when rolling out the lower bearing half. Keep the hands and fingers well clear of any position where they might be caught by the bearing half if it were accidentally released and rotated back to its bottom position. Serious personal injury could result.

- (i) Protect the shaft journal by wrapping it with clean, heavy paper or cardboard.

5.6.4 Re-assembly

Bearing re-assembly is basically a reverse of the disassembly procedures outlined above, with the following suggestions:

- (a) The interior of the bearing housing should be cleaned and then flushed with clean oil or kerosene.
- (b) The bearing halves and the shaft journal should be wiped clean using lint-free cloth soaked with clean oil.
- (c) All parts should be carefully inspected for nicks, scratches, etc., in any contact surfaces. Such imperfections should be removed by an appropriate method such as stoning, scraping, filling, etc., followed by thorough cleaning.
- (d) Before installing the floating labyrinth seal halves, observe their condition. Do not attempt to use a cracked or chipped seal. The bottom half seal has a set of drilled holes in its side face. These must be placed at the bottom toward the inside of the bearing so that accumulating oil may drain back into the housing.
- (e) Put a bead of Curil-T around the seal half O.D.'s on both sides adjacent to the garter spring groove. This will prevent oil by-passing the seal around its outside.
- (f) Place the bottom seal half on top of the shaft and roll it into position. Install the top half and insert the garter spring pulling up on both ends to permit engaging the lock. Run a bead of Curil-T around the O.D's on both sides adjacent to the garter spring groove on this half also.
- (g) Carefully reassemble the two oil ring halves. Inspect the dowel pins for burrs and straightness and make any corrections required. Do not force the ring halves together. Excessive force may alter the roundness or flatness of the oil ring which can change its oil delivery performance.
- (h) Some of the pipe plugs in the housing are metric thread type. These are identified as those, which have a copper, lead, or similar material washer. If these plugs are removed,

be careful not to lose the washers. Before re-assembly, inspect the washers and replace them as required.

- (i) Before installing the bearing cap, observe the position of the floating labyrinth seal. The “tab” must be on top to engage the pocket. Failure to position the seal properly will result in damage when the cap is assembled.

ATTENTION!

- (1) Curil-T is the only approved compound for use in the assembly of the bearings on this motor. Other products may harden and impede the operation.**
- (2) During the re-assembly of the bearing parts, a thin layer of Curil-T should be applied to all gaskets and machined interface surfaces. This suggestion does not apply to the machined surfaces of the bearing liner halves.**
- (3) When seating the bearing shell, apply a thin layer of lube oil at the spherical surface of the liner. Slowly roll the lower bearing liner into the bearing housing making sure that the splined surface of the liner and the housing are flush. Gradually lower the shaft onto the bearing. The weight of the shaft will help rotate the bearing liner so that the babbitt surface of the liner will match the slope of the journal. Sometimes it is required to use a rubber mallet to tap lightly on the bearing housing while slowly rolling the shaft to help this seating operation.**

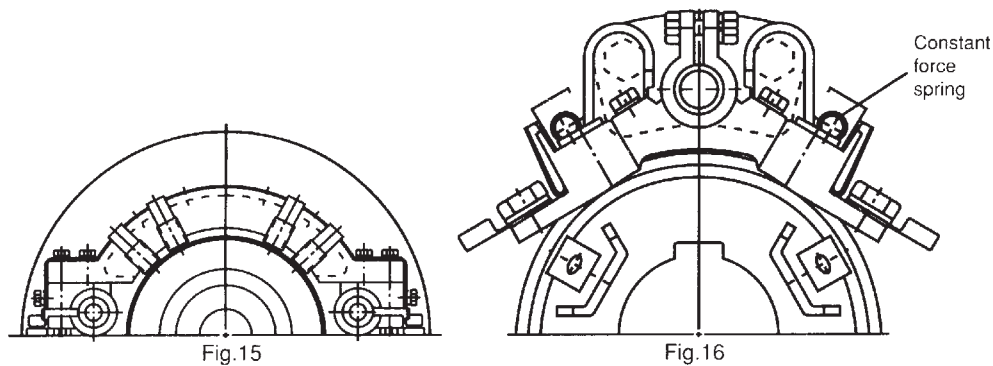
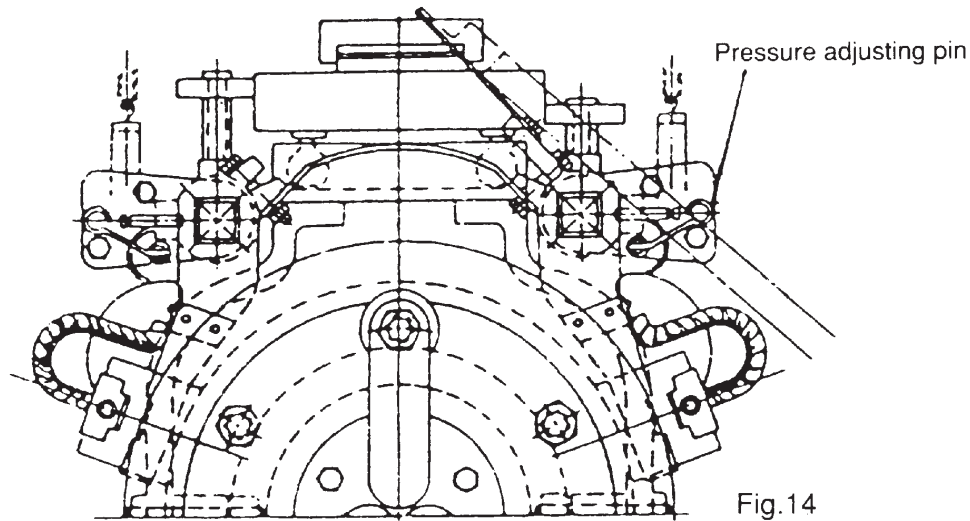
5.7 Maintenance of slip ring (For Wound Rotor Motors only)



Ensure motor is disconnected from power supplies and there are no accessible moving parts before maintenance operation.

5.7.1 Adjustment of carbon brush

- (a) Brush pressure for normal operation:
 - Electro-graphite brush.....0.2~0.25 kg/cm²
When frequent vibrations are evident or the brush is small (area below 0.5 cm²), the pressure should be greater than as shown.
- (b) Adjustment of brush pressure:
The brush pressure should be adjusted to keep normal operation as it wears.
 - The brush pressure may be reduced after use, so it is necessary to re-adjust. For adjustment, please turn adjusting screw, pressure adjusting pin or pressure adjusting plate as shown in Fig. 14 to obtain the correct tension ($=0.23 \times \text{brush cross sectional area in cm}^2$) $\pm 10\%$ kg.
- (c) Brush pressure need not be adjusted if constant force spring is used as shown in Fig. 15 and Fig. 16.



5.7.2 Brush replacement

The carbon brush is a part of the equipment which is easily worn away, replace it after it is worn to $\frac{1}{2} \sim \frac{3}{4}$ of original size.

(a) Brush material

The brush material is important to the performance of the motor. Only the most appropriate materials are chosen by TWMC, and are listed on the nameplate of the motor. It is important to know this when you replace the brush, so a recommended type is used.

(b) Dimensions

Brush, holder and gap between them, please refer to CNS 2322 C4051 or JIS C2802.

ATTENTION!

The gap between a brush and it holder is important for good performance and safety of the motor.

(c) Adjustment of new brushes (Shown in Fig. 17)

- (1) Polish the new brush with a file until it assumes the appropriate contour of the slip ring which it touches.

- (2) Place sand-paper (JIS R6252 No. 40...50) on the slip ring with the abrasive face of the paper against the brush to induce a closer contact by rubbing against each other.
- (3) Repeat item 2 with fine sand –paper (JIS R6252 No. 100 to 200) until the contact surface between brush and slip ring exceeds 80%.
- (4) Finally, clean the contaminated slip ring and brush with clean cloth or compressed air.

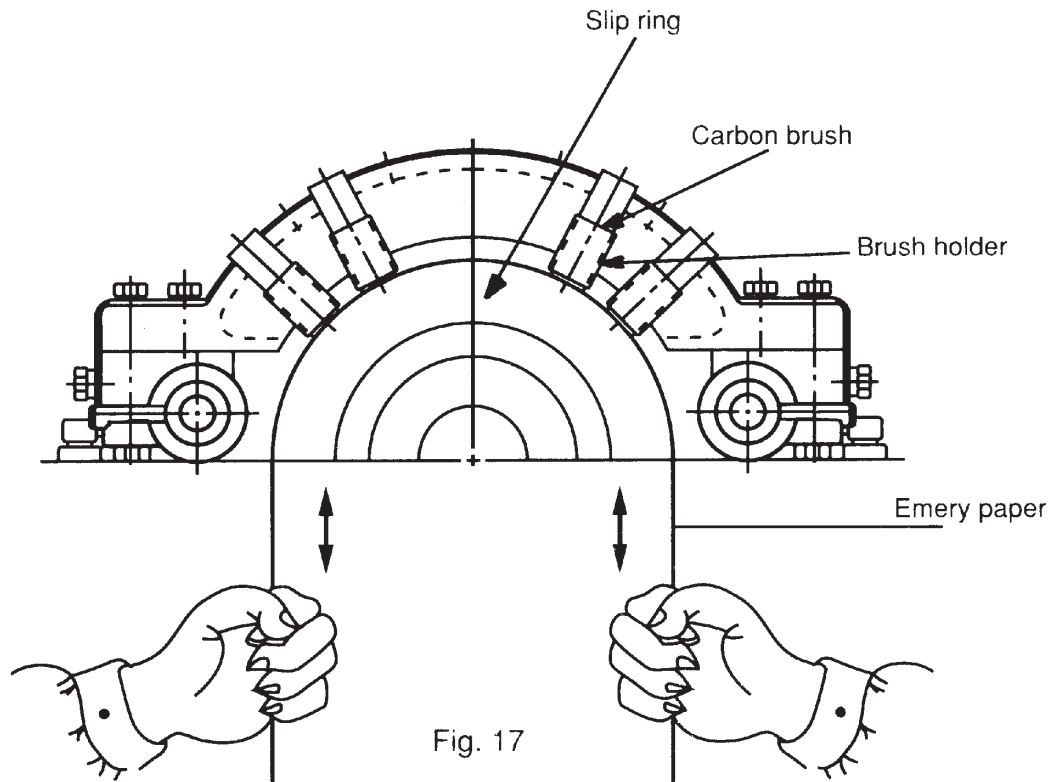


Fig. 17

5.8 Maintenance of non-reverse ratchet mechanism (For Vertical high Thrust Motor only)

5.8.1

In the pump piping system, a check valve and a stop valve should be installed in the discharge line. The check valve, placed between the pump and the stop valve, is to protect the pump from reverse flow and excessive backpressure. The stop valve is used in priming, starting and when shutting down the pump. It is advisable to close the stop valve before stopping the pump. This is especially important when the pump is operated against a high static head.

TWMC vertical high thrust motors are equipped with non-reverse ratchet (N.R.R.) mechanism only when requested by the pump manufacturer. Typical construction of the N.R.R. mechanism is shown as Fig 18 below.

The N.R.R. mechanism keeps the pump and motor from rotating in the reverse direction. Thus prevents damage from over-speeding and damage to water-lubricated pump shaft bearings

when, on shutdown, the falling water column tends to drive the pump in the reverse direction. In normal operation, the ratchet pins are lifted by the ratchet teeth and are held clear by centrifugal force and friction as the motor comes up to speed. When power is removed, the speed decreases and the pins fall. At the instant of reversal, a pin will catch in a ratchet tooth and prevent backward rotation.

5.8.2

The service life of ratchet pins depends not only on the reverse shock load between the pin and ratchet tooth when pump stopped but also the frequency of pump starting and stopping while in service. Provided that the pins are deformed due to this reverse shock load, then the up and down motion of the ratchet pins could be sluggish or jammed and that unusual noises shall arise.

The recommended replacement period for these ratchet pins is every three (3) years. If the reverse shock load is greater than 30% of motor rated torque or the starting frequency is more than twice per day, then the replacement period should be halved.

ATTENTION!
The check valve and stop valve in the discharge line should be regularly inspected and maintained to assure the normal function of these valves. This is important to protect the pump and motor from damage and increase the service life of the N.R.R. mechanism.

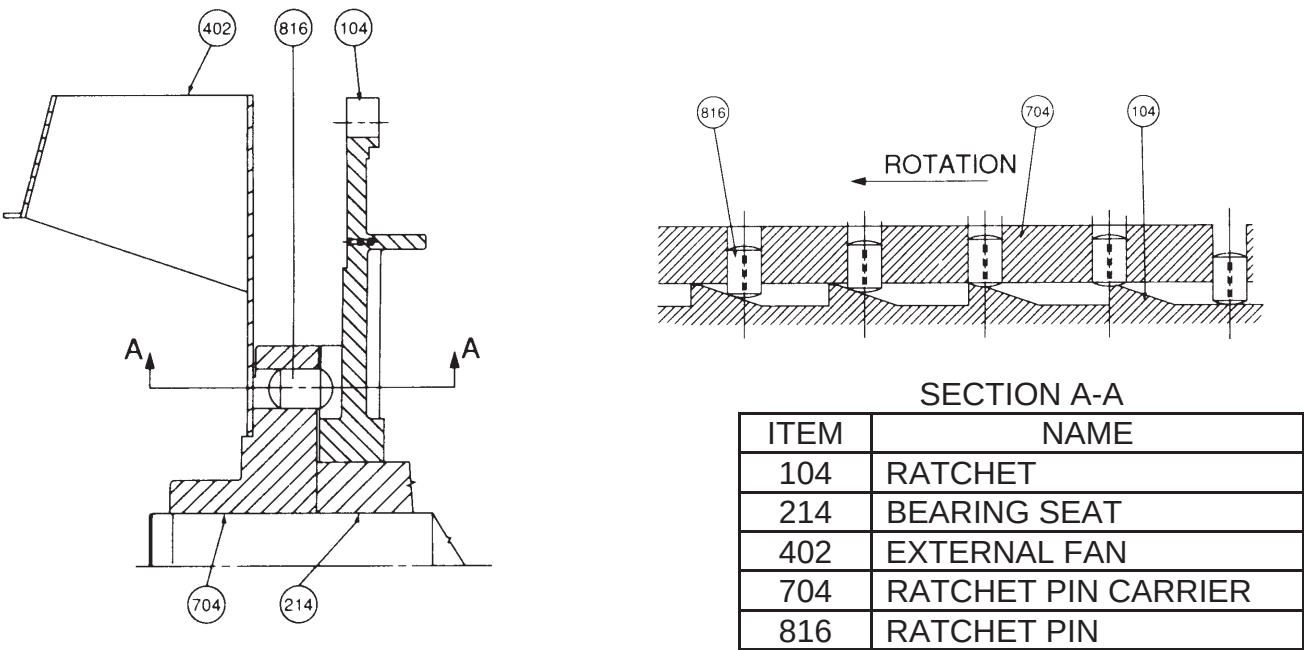


Fig. 18

6. FAULT FINDING AND RECOGNITION

Kinds of Breakdown	Symptoms	Possible Causes	Remedies
Fail to start without load	Motionless and soundless	Power-off	Consult power company
		Switch-off	Switch-on
		No fuse	Install fuse
		Broken wiring	Check wiring and repair
		Broken lead	Check wiring and repair
		Broken windings	Check windings and repair
	Fuse blowing. (Automatic switch trips off, slow start with electromagnetic noise)	Short circuit of circuit switches	Check circuit switches and replace
		Incorrect wiring	Check wiring according to nameplate
		Poor contact at terminal	Lock tightly
		Windings grounded	Factory repair
		Broken windings	Factory repair
		Poor contact of circuit switches	Check and repair
		Broken wiring	Check and repair
		Poor contact of starting switches	Check and repair
		Short circuit of starting switches	Check and repair
		Incorrect connections of starting switches	Connect according to nameplate
Loading after start	Fuse blowing. Fail to restart due to trip-off of automatic switch	Insufficient capacity of fuse	Replace fuse if wiring permits
		Overload	Lighten load
		High load at low voltage	Check circuit capacity and reduce load
	Overheating motor	Overload or intermittent overload	Lighten load
		Under-voltage	Check circuit capacity and power source
		Over-voltage	Check power source
		Ventilation duct clogged	Remove the foreign matter in the duct
		Ambient temperature exceeds 40°C	Correct insulation class to B or F, or lower ambient temperature
		Friction between rotor and stator	Factory repair
		Fuse blown (Single-phase rotating)	Install the specified fuse
		Poor contact of circuit switches	Check and repair
		Poor contact of circuit starting switches	Check and repair
		Unbalance three-phase voltage	Check circuit or consult power company

Kinds of Breakdown	Symptoms	Possible Causes	Remedies
Loading after start	Speed falls sharply	Voltage drop	Check circuit and powers source
		Sudden overload	Check machine
		Single-phase rotating	Check circuit and repair
	Switch overheat	Insufficient capacity of switch	Replace switch
		High load	Lighten load
	Bearing over-heating	High belt tension	Adjust belt tension
		Slack belt tension	Adjust belt tension
		Misalignment between motor and machine shafts	Re-align
		Over speed of bearing outer-ring	Adjust bracket
		High bearing noise	Replace the damaged bearing
Noise	Electromagnetic noise induced by electricity	Occurrence from its first operation	May be normal
		Sudden sharp noise and smoking	Short circuit of windings should be repaired at the factory
	Bearing noise	Noise of low shishi or Thru-Thru	May be normal
		Kala-Kala as a result of poor lubrication	Grease
		Kulo-Kulo as a result of poor lubrication	Clean bearing and grease
		Sa-Sa or larger noise	Replace the damaged bearing
	Mechanical noise caused by machinery	Loose belt sheave	Adjust key and lock the screw
		Loose coupling or skip	Adjust the position of couplings, lock key and screw
		Loose screw on fan cover	Lock fan cover screw tightly
		Fan rubbing	Adjust fan position
		Rubbing as a result of ingression of foreign matter	Clean motor interior and ventilation ducts
		Wind noise	Noise induced by air flowing through ventilation ducts
	Induced by conveyance machine	Repair machine	
Vibration	Electromagnetic vibration	Short circuit of winding	Factory repair
		Open circuit of rotor	Factory repair
	Mechanical vibration	Unbalanced rotor	Factory repair
		Unbalanced fan	Factory repair
		Broken fan blade	Replace fan
		Unsymmetric centers between belt sheaves	Align central points
		Central points of couplings do not lie on the same level	Adjust the central points of couplings to the same level
		Improper mounting installation	Lock the mounting screws
		Motor mounting bed is not strong enough	Reinforce mounting bed
Remarks:			
(1) Circuit switches: These include knife switches, electromagnetic switches, fuse and other connection switches etc.			
(2) Starting switches: These include Delta-Star starters, compensate starters, reactance starters, resistor starters, starting controller’s etc.			



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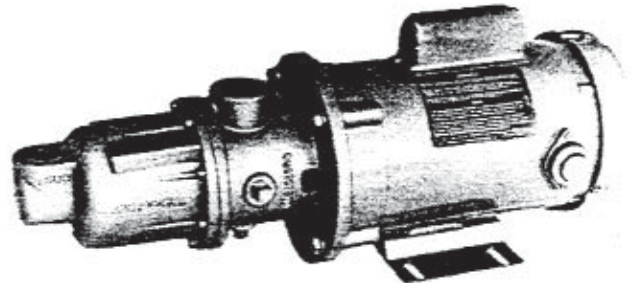
SERVICE MANUAL

MOYNO® 500 PUMPS

300 SERIES MOTORIZED 331, 332, 333, AND 344 MODELS

DESIGN FEATURES

Housing: Cast iron/316 SS
 Pump Rotor: Chrome plated AISI 416 stainless steel/Chrome plated 316 stainless steel
 Pump Stator: NBR (Nitrile)
 Seal: Mechanical (carbon/ceramic)
 Motor Shaft: AISI 416 stainless steel/ANSI 316 stainless steel
 Motor: 1/2 HP, 60 Hertz, 1725 rpm, totally enclosed, fan cooled (TEFC) C-Faced, 1 phase 115/230V or 3 phase 230/460V (other motor options available; consult sales representative)



Note: Alternate elastomers available. Refer to Repair/Conversion kit numbers pages 3 and 4.

INSTALLATION

Mounting Position. Pump may be mounted in any position. When mounting vertically, it is necessary to keep bearings above seals to prevent possible seal leakage into bearings.

Pre-Wetting. Prior to connecting pump, wet pump elements and mechanical seal by adding fluid to be pumped into suction and discharge ports. Turn pump over several times in a clockwise direction to work fluid into pump elements.

Piping. Piping to pump should be self-supporting to avoid excessive strain on pump housings. See Table 1 for suction and discharge port sizes of each pump model. Use pipe "dope" or tape to facilitate disassembly and to provide seal on pipe connections.

Electrical. Follow the wiring diagram on the motor nameplate or inside the terminal box for the proper connections. The wiring should be direct and conform to local electrical codes. Check power connections for proper voltage. Voltage variations must not exceed $\pm 10\%$ of nameplate voltage. Motor is provided with internal automatic overload protection.

To prevent damage to pump, pump rotation must be clockwise when facing pump from motor end.

OPERATION

Self-Priming. With wetted pumping elements, the pump is capable of 25 feet of suction lift with pipe size equal to port size. Be sure suction lines are air tight or pump will not self prime. Self-priming capabilities will vary due to fluid viscosity.

DO NOT RUN DRY. Unit depends on liquid pumped for lubrication. For proper lubrication, flow rate should be at least 10% of rated capacity.

Pressure and Temperature Limits. See Table 1 for maximum discharge pressure of each model. Unit is suitable for service at temperatures shown in Table 2.

Storage. Always drain pump for extended storage periods by removing bottom drain plug in pump body.

Caution: Suction pressure should never be greater than discharge pressure.

Table 1. Pump Data

Pump Model	Suction Port (NPT)	Discharge Port (NPT)	Voltage Rating (VAC)	Discharge Pressure (psig)
331	3/4	3/4	See Motor Name Plate For Voltage Ratings	150
332	3/4	3/4	See Motor Name Plate For Voltage Ratings	100
333	3/4	3/4	See Motor Name Plate For Voltage Ratings	50
344	3/4	3/4	See Motor Name Plate For Voltage Ratings	†30

†With 3/4 HP motor, pressure is 40 psig.

Table 2. Temperature Limits

Elastomer	Temperature Limits
*NBR	10°-160°F
*EPDM	10°-210°F
*FPM	10°-240°F

*NBR = Nitrile

EPDM = Ethylene-Propylene-Diene Terpolymer

FPM = Fluoroelastomer

TROUBLESHOOTING

WARNING: Before making adjustments, disconnect power source and thoroughly bleed pressure from system prior to disassembly. Failure to do so could lead to electric shock or serious bodily harm.

Failure To Pump.

1. Motor will not start: Check power supply. Voltage must be $\pm 10\%$ of nameplate rating when motor is in locked rotor condition. Check for faulty capacitor on 1 phase Models.
2. Motor runs and thermally kicks out: Check for excessive discharge pressure. Check for defective centrifugal switch on 1 phase Models. Increase ventilation to motor. Do not use less than #14 wire size.
3. Stator torn; possible excessive pressure: Replace stator, check pressure at discharge port.
4. Flexible joint broken; possible excessive pressure: Replace joint, check pressure at discharge port.
5. Wrong rotation (3 phase only): Rotation must be clockwise when facing pump from motor end. Reverse the connections of any two line leads to the motor.
6. Excessive suction lift or vacuum.

Pump Overloads.

1. Excessive discharge pressure: Check pressure at discharge port for maximum ratings given in Table 1.
2. Fluid viscosity too high: Limit fluid viscosity to 100 CP or 500 SSU.

Noisy Operation.

1. Excessive suction lift or vacuum: Maximum suction lift is 25 feet for water.
2. Suction line too small: Check pipe size. Be sure lines are free from obstructions.
3. Pump Cavitates: Pump speed is 1725 rpm. Viscosity of fluid should not exceed 100 CP or 500 SSU.
4. Flexible joint worn: Replace joint. Check pressure at discharge port.
5. Insufficient mounting: Mount to be secure to a firm base. Vibration induced noise can be reduced by using mount pads and short sections of hose on suction and discharge ports.

Seal Leakage.

1. Leakage at startup: If leakage is slight, allow pump to run several hours to let faces run in.
2. Persistent seal leakage: Faces may be cracked from freezing or thermal shock. Replace seal.

Pump Will Not Prime.

1. Air leak on suction side: Check pipe connections.

PUMP DISASSEMBLY

WARNING: Before disassembling pump, disconnect power source and thoroughly bleed pressure from system. Failure to do so could result in electric shock or serious bodily harm.

1. Remove suction and discharge piping. Drain pump body by removing drain plug (261B).

2. Remove screws (112) holding suction housing (2) to discharge housing (1). Remove suction housing (2) and stator (21).
3. Remove rotor (22) from flexible joint (24) by turning counterclockwise (RH thread). On pinned, 3 phase models, remove rotor pin (45) with suitable punch.
4. Flexible joint (24) can be removed from motor shaft by using a 3/16 allen wrench in end of joint and turning counterclockwise. On 3 phase motors, remove motor pin (46) with suitable punch, then remove joint:
5. Slide mechanical seal (69) off motor shaft.
6. Remove discharge housing (1) from adaptor flange (12) by removing screws (1 12B).
7. Carefully pry seal seat out of discharge housing (1). If any parts of mechanical seal are worn or broken, the complete seal assembly should be replaced. Seal components are matched parts and are not interchangeable.
8. Remove adapter flange (12) from motor (70) by removing screws (112A).
9. Remove slinger ring (77).

PUMP ASSEMBLY

1. Install slinger ring (77).
2. Attach adaptor flange (12) to motor housing using screws (112A).
3. Attach discharge housing (1) to adaptor flange (12) using screws (112B). Be sure to center seal bore on shaft.
4. Install mechanical seal (69) in discharge housing (1) using the following procedure:
 - a. Clean and oil sealing faces using clean oil (not grease).

Caution: Do not use oil on EPDM parts. Substitute glycerin or soap and water.

- b. Oil outer surfaces of the seal seat, and push assembly over the motor shaft and into the discharge housing (1) seating it firmly and squarely.
 - c. After cleaning and oiling the shaft, slide the seal body along the motor shaft until it meets the seal seat.
 - d. Install seal spring and spring retainer on shaft.
5. Thread flexible joint (24) into motor shaft in a clockwise direction (RH thread). Tighten with 3/16 allen wrench. On 3 phase models, install motor pin (46).
 6. Thread rotor (22) onto flexible joint (24) in a clockwise direction (RH thread). On 3 phase models, install rotor pin (45).
 7. Slide stator (21) on rotor (22). On 331 & 332 models, insert rounded end of stator ring (135) into end of stator prior to installing stator on rotor.
 8. Secure stator (21) and suction housing (2) to discharge housing (1) using screws (112).
 9. Lubricate rotor and stator by filling Suction housing and discharge housing with fluid to be pumped.
 10. Connect Suction and discharge piping and power source.

PARTS LIST

To determine part numbers for all parts except standard motors, enter table with item number from pump illustration. Then locate part number under applicable model number (first three digits). Parts listed down the center are applicable to all pump models. To determine part numbers for standard motor (item 70), enter table at item 70 with the last two digits of model number: motor description and part number are on that line.

Item No.	Description	Pump Model Numbers			
		331	332	333	344
1	Discharge Housing	Cast Iron 350-1016-000/Stainless Steel 350-1016-007			
2	Suction Housing	Cast Iron 330-1064-002/Stainless Steel 330-1911-002			
*21	Stator	340-3501-120	340-3502-120	340-3503-120	340-3504-120
*22	Rotor (Threaded) 416 S5	320-2729-000	330-0906-000	320-1394-000	320-1841-000
*22	Rotor (Pinned) 416 SS	320-2729-004	320-4559-004	320-1584-002	320-1569-002
24	Flexible Joint (Threaded)	Carbon Steel 320-1511-000/Stainless Steel 320-3759-000			
240	Flexible Joint (Pinned)	Carbon Steel 320-1612-000/Stainless Steel 320-4415-000			
*45	Shaft Pin (2 req.)	320-4069-002			
*69	Mechanical Seal	320-2424-000			
70	Standard Motor				
	-59 1PH TEFC 1750 RPM	330-4529-000			
	-60 3PH TEFC 1750 RPM, Pin	330-4528-100			
	-52 1PH TEFC 1750 RPM	330-4529-1 00			
	-50 3PH TEFC 1750 RPM	330-4528-003			
77	Slinger Ring	320-6382-000			
112	Screw, Cap (8 req.)	Carbon Steel 619-1430-103 (10-24 x 5/8)/Stainless Steel 619-1432-120 (10-24 x 3/4)			
112A	Screw, Hex Hd (4 req.)	Carbon Steel 619-1530-161 (3/8-16 x 1)/Stainless Steel 320-6715-005 (3/8-16 x 1)			
135	Stator Ring	Carbon Steel 320-7812-000 /Stainless Steel 362-1774-000			
215	Lock Washer (8 req.)	320-6464-000			
215A	Lock Washer (4 req.)	Carbon Steel 623-0010-411/Stainless Steel 320-6717-002			
261	Pipe Plug, 1/4 NPT	Carbon Steel 610-0120-021/Stainless Steel 610-0420-020			
	Rotor (Threaded) 316 SS	320-2933-000	320-2942-000	320-2936-000	320-2934-000
	Rotor (Pinned) 316 SS	320-2933-002			

*Recommended spare parts.

Used on 3 phase models.

REPAIR/CONVERSION KIT NUMBERS

Item No.	Description	All 331 Models (Threaded Only)			All 332 Models (Threaded Only)		
		NBR	EPDM	FPM	NBR	EPDM	FPM
—	Kit No.	311-9026-000	311-9025-000	311-9054-000	311-9027-000	311-9038-000	311-9055-000
21	• Stator	340-3501-120	340-3501-320	340-3501-520	340-3502-120	340-3502-320	340-3502-520
24	• Joint	*320-1511-000	320-6367-000	320-4670-000	*320-1511-000	320-6367-000	320-4670-000
69	• Seal	320-2424-000	320-6379-000	320-6501-000	320-2424-000	320-6379-000	320-6501-000
Item No.	Description	All 333 Models (Threaded Only)			All 344 Models (Threaded Only)		
		NBR	EPDM	FPM	NBR	EPDM	FPM
—	Kit No.	311-9029-000	311-9028-000	311-9056-000	311-9031-000	311-9030-000	311-9057-000
21	• Stator	340-3503-120	340-3503-320	340-3503-520	340-3504-120	340-3504-320	340-3504-520
24	• Joint	*320-1511-000	320-6367-000	320-4670-000	*320-1511-000	320-6367-000	320-4670-000
69	• Seal	320-2424-000	320-6379-000	320-6501-000	320-2424-000	320-6379-000	320-6501-000

NBR = Nitrile

EPDM = Ethylene-Propylene-Diene Terpolymer

FPM = Fluoroelastomer

*Carbon steel joint, for 316 SS joint use 320-3759-000.

REPAIR/CONVERSION KIT NUMBERS (CONT.)

		All 331 Models (Pinned Only)			All 332 Models (Pinned Only)		
Item No.	Description	NBR	EPDM	FPM	NBR	EPDM	FPM
—	• Kit No.	311-9104-000	311-9108-000	311-9112-000	311-9105-000	311-9109-000	311-9113-000
21	• Stator	340-3501-120	340-3501-320	340-3501-520	340-3502-120	340-3502-320	340-3502-520
24	• Joint	*320-1612-000	320-6973-000	320-6984-000	*320-1612-000	320-6973-000	320-6984-000
69	• Seal	320-2424-000	320-6379-000	320-6501-000	320-2424-000	320-6379-000	320-6501-000
45	• Pin (2 req.)	320-4069-002			320-4069-002		
		All 333 Models (Pinned Only)			All 344 Models (Pinned Only)		
Item No.	Description	NBR	EPDM	FPM	NBR	EPDM	FPM
—	• Kit No.	311-9106-000	311-9110-000	311-9114-000	311-9107-000	311-9111-000	311-9115-000
21	• Stator	340-3503-120	340-3503-320	340-3503-520	340-3504-120	340-3504-320	340-3504-520
24	• Joint	*320-1612-000	320-6973-000	320-6984-000	*320-1612-000	320-6973-000	320-6984-000
69	• Seal	320-2424-000	320-6379-000	320-6501-000	320-2424-000	320-6379-000	320-6501-000
45	Pin (2 req.)	320-4069-002			320-4069-002		

ABRASION RESISTANT SEALS

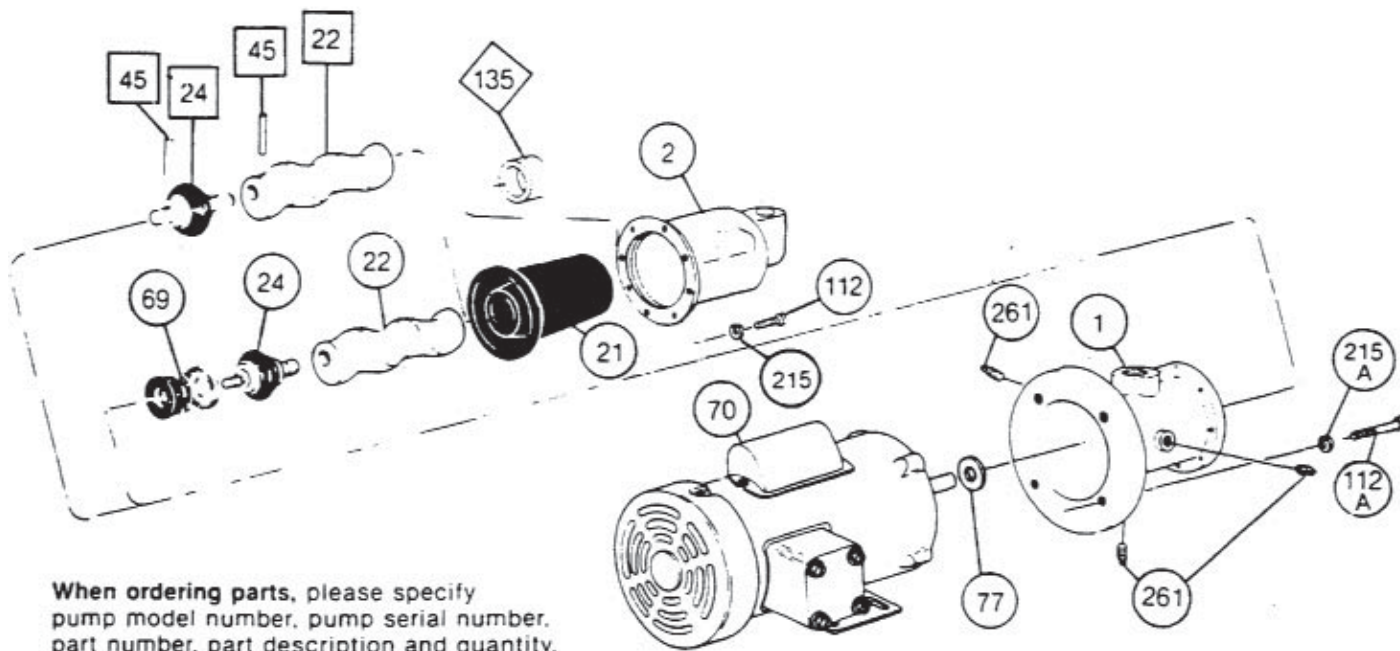
Elastomer	All 331 – 334 Models
NBR	320-6460-000
EPDM	320-6502-000
FPM	320-6503-000

NBR = Nitrile

EPDM = Ethylene-Propylene-Diene Terpolymer

FPM = Fluoroelastomer

*Carbon steel joint, for 316 SS joint use 320-4415-000.



Used only on 331 & 332 Models.



Used on 3 Phase Models

Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.


PUMP COMPANY
Zoeller Family of Water Solutions™

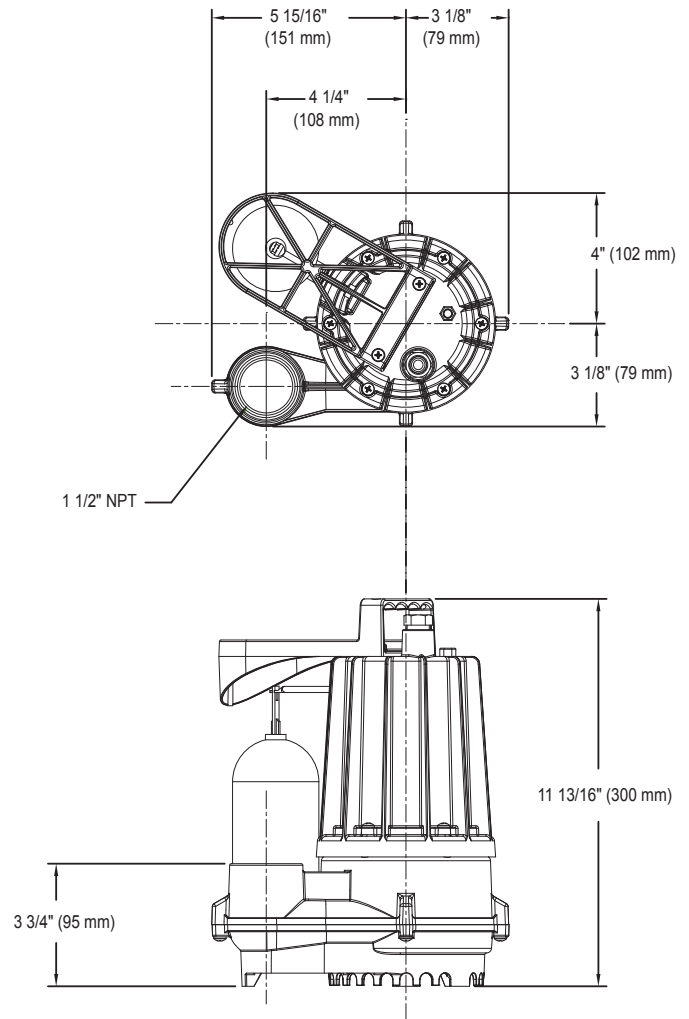
TECHNICAL DATA SHEET

AQUA-MATE SERIES

Model 72 Submersible Dewatering Pump

PRODUCT SPECIFICATIONS

MOTOR	Horse Power	3/10
	Voltage	115
	Phase	1 Ph
	Hertz	60 Hz
	RPM	3400
	Type	Permanent split capacitor
	Insulation	Class B
	Amps	3.1
PUMP	Operation	Automatic or nonautomatic
	Auto On/Off Points	7-3/8" (18.7 cm) / 3-5/8" (9.2 cm)
	Discharge Size	1-1/2" NPT
	Solids Handling	3/8" (9 mm) spherical solids
	Cord Length	9' (3 m) standard
	Cord Type	UL listed, 3-wire, grounded plug
	Max. Head	18' (5.5 m)
	Max. Flow Rate	38 GPM (144 LPM)
	Max. Operating Temp.	110° F (43° C)
	Cooling	Oil free
	Motor Protection	Auto reset thermal overload
MATERIALS	Motor Housing	Engineered plastic
	Pump Housing	Engineered plastic
	Base	Engineered plastic
	Upper Bearing	Ball bearing
	Lower Bearing	Ball bearing
	Mechanical Seals	Carbon and ceramic
	Impeller Type	Non-clogging vortex
	Impeller	Engineered plastic
	Hardware	Stainless steel
	Motor Shaft	410 stainless steel
	Gasket	Buna-N o-ring



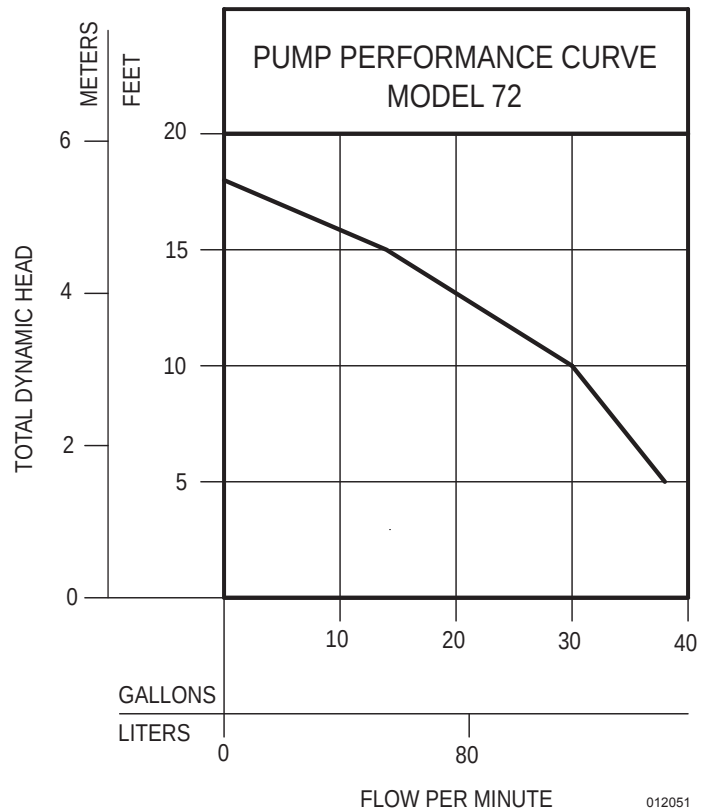
SK1924

NOTE: See model comparison chart for specific details.



TOTAL DYNAMIC HEAD FLOW PER MINUTE

MODEL		72	
Feet	Meters	Gal.	Liters
5	1.5	38	144
10	3.0	30	114
15	4.6	14	53
Shut-off Head:		18 ft. (5.5 m)	



Model	MODEL COMPARISON										
	Seal	Mode	Volts	Ph	Amps	HP	Hz	Lbs	Kg	Simplex	Duplex
M72	Single	Auto	115	1	3.1	3/10	60	9.5	4.3	1	3
N72	Single	Non	115	1	3.1	3/10	60	9.5	4.3	2	2 & 3
BN72	Single	Non	115	1	3.1	3/10	60	9.5	4.3	*	---

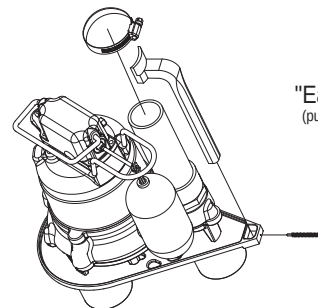
* Single piggyback switch included.

SELECTION GUIDE

1. Integral float-operated mechanical switch, no external control required.
2. Single piggyback variable level float switch or double piggyback variable level float switch. Refer to FM0477.
3. See FM0477 for a residential alternator system.

OPTIONAL PUMP STAND P/N 10-2421

- Reduces potential clogging by debris
 - Replaces rocks or bricks under the pump
 - Made of durable, noncorrosive ABS
 - Raises pump 2" (5 cm) off bottom of basin
 - Provides the ability to raise intake by adding sections of 1½" or 2" (DN40 or DN50) PVC piping
 - Attaches securely to pump
 - Accommodates sump, dewatering and effluent applications
- NOTE: Make sure float is free from obstruction.



"Easy assembly"
(pump & discharge pipe
not included.)



All installation of controls, protection devices and wiring should be done by a qualified licensed electrician. All electrical and safety codes should be followed including the most recent National Electrical Code (NEC) and the Occupational Safety and Health Act (OSHA).

Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.



Zoeller Family of Water Solutions™

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visit our web site:
www.zoeller.com

NOTICE: VENT HOLE FOR
CHECK VALVE
SEE #3 IN CAUTION SECTION
BELOW AND #4 ON PAGE 3

INSTALLATION INSTRUCTIONS RECOMMENDED MODELS

DATE INSTALLED:
MODEL NUMBER:

EFFLUENT*/SUMP/DEWATERING	SEWAGE
49 / 53 / 57 Series, 98 Series	264 Series
137 Series, 151 / 152 / 153 Series	266 / 267 / 268 Series

PN 151797

PREINSTALLATION CHECKLIST - ALL INSTALLATIONS

1. Inspect your pump. Occasionally, products are damaged during shipment. If the unit is damaged, contact your dealer before using. DO NOT remove the test plugs in the cover nor the motor housing.
2. Carefully read the literature provided to familiarize yourself with specific details regarding installation and use. These materials should be retained for future reference.

 WARNING	 CAUTION
SEE BELOW FOR LIST OF WARNINGS 1. Make certain that the receptacle is within the reach of the pump's power supply cord. DO NOT USE AN EXTENSION CORD. Extension cords that are too long or too light do not deliver sufficient voltage to the pump motor. But, more important, they could present a safety hazard if the insulation were to become damaged or the connection end were to fall into the sump. 2. Make sure the pump electrical supply circuit is equipped with fuses or circuit breakers of proper capacity. A separate branch circuit is recommended, sized according to the "National Electrical Code" for the current shown on the pump nameplate. 3. Testing for ground. As a safety measure, each electrical outlet should be checked for ground using an Underwriters Laboratory Listed circuit analyzer which will indicate if the power, neutral and ground wires are correctly connected to your outlet. If they are not, call a qualified licensed electrician. 4. For Added Safety. Pumping and other equipment with a 3-prong grounded plug must be connected to a 3-prong grounded receptacle. For added safety the receptacle may be protected with a ground-fault circuit interrupter. When a pump needs to be connected in a watertight junction box, the plug can be removed and spliced to the supply cable with proper grounding. For added safety this circuit may be protected by a ground-fault circuit interrupter. The complete installation must comply with the National Electrical Code and all applicable local codes and ordinances. 5. FOR YOUR PROTECTION, ALWAYS DISCONNECT PUMP FROM ITS POWER SOURCE BEFORE HANDLING. Single phase pumps are supplied with a 3-prong grounded plug to help protect you against the possibility of electrical shock. DO NOT UNDER ANY CIRCUMSTANCES REMOVE THE GROUND PIN. The 3-prong plug must be inserted into a mating 3-prong grounded receptacle. If the installation does not have such a receptacle, it must be changed to the proper type, wired and grounded in accordance with the National Electrical Code and all applicable local codes and ordinances. Three phase pumps require motor starting devices with motor overload protection. See FM0486 for duplex installations. 6. The tank is to be vented in accordance with local plumbing code. Pumps must be installed in accordance with the National Electrical Code and all applicable local codes and ordinances. Pumps are not to be installed in locations classified as hazardous in accordance with National Electrical Code, ANSI/NFPA 70. 7. "Risk of electrical shock" Do not remove power supply cord and strain relief or connect conduit directly to the pump. 8. Installation and servicing of electrical circuits and hardware should be performed by a qualified licensed electrician. 9. Pump installation and servicing should be performed by a qualified person. 10. Risk of electric shock - These pumps have not been investigated for use in swimming pool and marine areas. 11. According to the state of California (Prop 65), this product contains chemicals known to the state of California to cause cancer and birth defects or other reproductive harm.	SEE BELOW FOR LIST OF CAUTIONS 1. Check to be sure your power source is capable of handling the voltage requirements of the motor, as indicated on the pump name plate. 2. The installation of automatic pumps with variable level float switches or nonautomatic pumps using auxiliary variable level float switches is the responsibility of the installing party and care should be taken that the tethered float switch will not hang up on the pump apparatus or pit peculiarities and is secured so that the pump will shut off. It is recommended to use rigid piping and fittings and the pit be 18" or larger in diameter. 3. Information - vent hole purpose. It is necessary that all submersible sump, effluent, and sewage pumps capable of handling various sizes of solid waste be of the bottom intake design to reduce clogging and seal failures. If a check valve is incorporated in the installation, a vent hole (approx. 3/16") must be drilled in the discharge pipe below the check valve and pit cover to purge the unit of trapped air. Trapped air is caused by agitation and/or a dry basin. Vent hole should be checked periodically for clogging. The 53 / 57, and 98 Series pumps have a vent located in the pump housing opposite the float, adjacent to a housing lug, but an additional vent hole is recommended. The vent hole on a High Head application may cause too much turbulence. You may not want to drill one. If you choose not to drill a vent hole, be sure the pump case and impeller is covered with liquid before connecting the pipe to the check valve and no inlet carries air to the pump intake. NOTE: THE HOLE MUST ALSO BE BELOW THE BASIN COVER AND CLEANED PERIODICALLY. Water stream will be visible from this hole during pump run periods. 4. Pump should be checked frequently for debris and/or build up which may interfere with the float "on" or "off" position. Repair and service should be performed by Zoeller Pump Company Authorized Service Station only. 5. Dewatering and effluent sump pumps are not designed for use in pits handling raw sewage. 6. Maximum operating temperature for standard model pumps must not exceed 130°F (54°C). 7. Pump models 266, 267, 268, and 137 must be operated in an upright position. Do not attempt to start pump when tilted or laying on its side. 8. Do not operate a pump in an application where the Total Dynamic Head is less than the minimum Total Dynamic Head listed on the Pump Performance Curves. NOTE: Pumps with the "UL" mark and pumps with the "US" mark are tested to UL Standard UL778. CSA Certified pumps are certified to CSA Standard C22.2 No. 108. REFER TO WARRANTY ON PAGE 2.

Limited Warranty

Manufacturer warrants, to the purchaser and subsequent owner during the warranty period, every new product to be free from defects in material and workmanship under normal use and service, when properly used and maintained, for a period of three years from the date of original manufacture. Parts that fail within the warranty period, that inspections determine to be defective in material or workmanship, will be repaired, replaced or remanufactured at Manufacturer's option, provided however, that by so doing we will not be obligated to replace an entire assembly, the entire mechanism or the complete unit. No allowance will be made for shipping charges, damages, labor or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to and there shall be no warranty for any material or product that has been disassembled without prior approval of Manufacturer, subjected to misuse, misapplication, neglect, alteration, accident or act of God; that has not been installed, operated or maintained in accordance with Manufacturer's installation instructions; that has been exposed to outside substances including but not limited to the following: sand, gravel, cement, mud, tar, hydrocarbons, hydrocarbon derivatives (oil, gasoline, solvents, etc.), or other abrasive or corrosive substances, wash towels or feminine sanitary products, etc. in all pumping applications. The warranty set out in the paragraph above is in lieu of all other warranties expressed or implied; and

we do not authorize any representative or other person to assume for us any other liability in connection with our products.

Contact Manufacturer at, 3649 Cane Run Road, Louisville, Kentucky 40211, Attention: Customer Service Department to obtain any needed repair or replacement of part(s) or additional information pertaining to our warranty.

MANUFACTURER EXPRESSLY DISCLAIMS LIABILITY FOR SPECIAL, CONSEQUENTIAL OR INCIDENTAL DAMAGES OR BREACH OF EXPRESSED OR IMPLIED WARRANTY; AND ANY IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE AND OF MERCHANTABILITY SHALL BE LIMITED TO THE DURATION OF THE EXPRESSED WARRANTY.

Some states do not allow limitations on the duration of an implied warranty, so the above limitation may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

EASY DO'S & DON'T'S FOR INSTALLING A SUMP PUMP

1. DO read thoroughly all installation material provided with the pump.
2. DO inspect pump for any visible damage caused by shipping. Contact dealer if pump appears to be damaged.
3. DO clean all debris from the sump. Be sure that the pump will have a hard, flat surface beneath it. DO NOT install on sand, gravel or dirt.
4. DO be sure that the sump is large enough to allow proper clearance for the level control switch(es) to operate properly.
5. DO Always Disconnect Pump From Power Source Before Handling. DO always connect to a separately protected and properly grounded circuit.
DO NOT ever cut, splice, or damage power cord (Only splice in a watertight junction box).
DO NOT carry or lift pump by its power cord.
DO NOT use an extension cord with a sump pump.
6. DO install a check valve and a union in the discharge line.
DO NOT use a discharge pipe smaller than the pump discharge.
7. DO NOT use a sump pump as a trench or excavation pump, or for pumping sewage, gasoline, or other hazardous liquids.
8. DO test pump immediately after installation to be sure that the system is working properly.
9. DO cover sump with an adequate sump cover.
10. DO review all applicable local and national codes and verify that the installation conforms to each of them.
11. DO consult manufacturer for clarifications or questions.
12. DO consider a two pump system with an alarm where an installation may become overloaded or primary pump failure would result in property damages.
13. DO consider a D.C. Backup System where a sump or dewatering pump is necessary for the prevention of property damages from flooding due to A.C. power disruptions, mechanical or electrical problems or system overloading.
14. DO inspect and test system for proper operations at least every three months.

SERVICE CHECKLIST



▲ WARNING ELECTRICAL PRECAUTIONS- Before servicing a pump, always shut off the main power breaker and then unplug the pump - making sure you are wearing insulated protective sole shoes and not standing in water. Under flooded conditions, contact your local electric company or a qualified licensed electrician for disconnecting electrical service prior to pump removal.

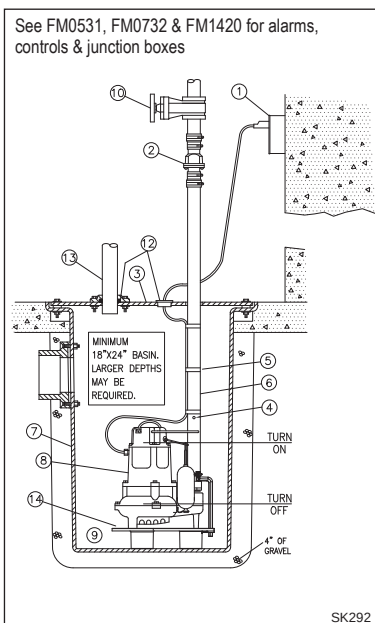
▲ WARNING Submersible pumps contain oils which becomes pressurized and hot under operating conditions - allow 2½ hours after disconnecting before attempting service.

CONDITION	COMMON CAUSES
A. Pump will not start or run.	Check fuse, low voltage, overload open, open or incorrect wiring, open switch, impeller or seal bound mechanically, defective capacitor or relay when used, motor or wiring shorted. Float assembly held down. Switch defective, damaged, or out of adjustment.
B. Motor overheats and trips overload or blows fuse.	Incorrect voltage, negative head (discharge open lower than normal) impeller or seal bound mechanically, defective capacitor or relay, motor shorted.
C. Pump starts and stops too often.	Float tight on rod, check valve stuck or none installed in long distance line, overload open, level switch(s) defective, sump pit too small.
D. Pump will not shut off.	Debris under float assembly, float or float rod bound by pit sides or other, switch defective, damaged or out of adjustment.
E. Pump operates but delivers little or no water.	Check strainer housing, discharge pipe, or if check valve is used vent hole must be clear. Discharge head exceeds pump capacity. Low or incorrect voltage. Incorrect motor rotation. Capacitor defective. Incoming water containing air or causing air to enter pumping chamber.
F. Drop in head and/or capacity after a period of use.	Increased pipe friction, clogged line or check valve. Abrasive material and adverse chemicals could possibly deteriorate impeller and pump housing. Check line. Remove base and inspect.

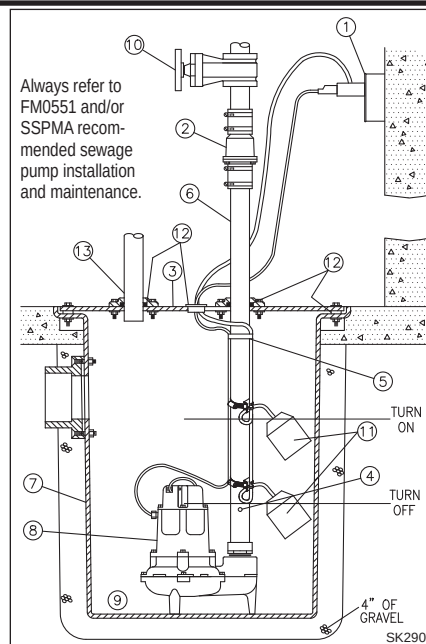
If the above checklist does not uncover the problem, consult the factory - Do not attempt to service or otherwise disassemble pump. Service must be performed by Zoeller Authorized Service Stations. Go to www.zoellerpumps.com/servicestations to find the Authorized Service Station in your area.

RECOMMENDED INSTALLATION FOR ALL APPLICATIONS

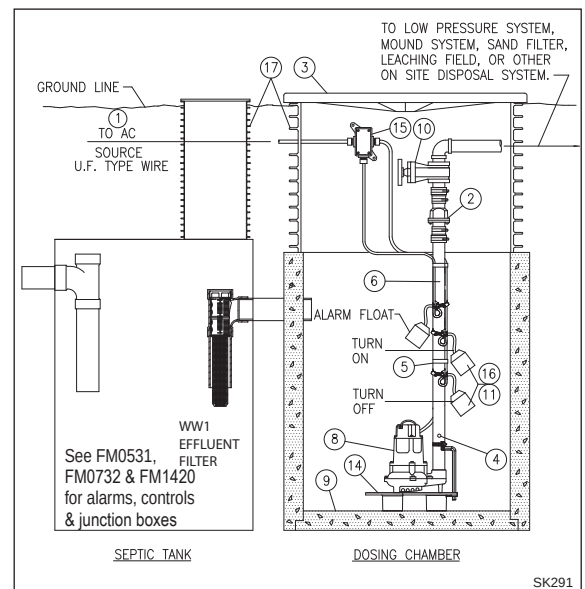
- (1) Electrical wiring and protection must be in accordance with National Electrical Code and any other applicable state and local electrical requirements.
 - (2) Install proper Zoeller unichek (combination union and check valve), preferably just above the basin to allow easy removal of the pump for cleaning or repair. On sewage, effluent or dewatering, if high head or below cover installation is required use 30-0164 on 1½" pipe, 30-0152 on 2" pipe and 30-0160 on 3" pipe. See (4) below.
 - (3) All installations require a basin cover to prevent debris from falling into the basin and to prevent accidental injury.
 - (4) When a Unichek is installed, drill a 3/16" dia. hole in the discharge pipe even with the top of the pump. **NOTE: THE HOLE MUST ALSO BE BELOW THE BASIN COVER AND CLEANED PERIODICALLY.** (High Head unit see #3 under "Caution" on front page). Water stream will be visible from this hole during pump run periods.
 - (5) Securely tape or clamp power cord to discharge pipe, clear of the float mechanism(s).
 - (6) Use full-size discharge pipe.
 - (7) Basin must be in accordance with applicable codes and specifications.
 - (8) Pump must be level and float mechanism(s) clear of sides of basin before starting pump.
 - (9) Basin must be clean and free of debris after installation.
 - (10) Gate Valve or Ball Valve to be supplied by installer and installed according to any and all codes.
 - (11) Locate float switches as shown in sketches. The best place for the "off" point is above the motor housing and positioned 180° from the inlet. Never put "off" point below discharge on pump (Sewage & Effluent only). **NOTE: FOR AUTOMATIC PUMPS, USE DEWATERING INSTALLATION SKETCH.**
 - (12) Gas tight seals required to contain gases and odors.
 - (13) Vent gases and odors to the atmosphere through vent pipe (Sewage & Dewatering only).
 - (14) Install Zoeller Pump Stand (Model 10-2421) under pump to provide a settling basin. (Effluent & Dewatering only.)
- For Effluent Only:**
- (15) Wire pump to power through a Zoeller watertight junction box or watertight splice. **NOTE: Watertight enclosure is a must in damp areas. See No. 8 on front page of FM0732.**
 - (16) Refer to SSPMA Effluent Sizing Manual for determining "on" - "off" switches.
 - (17) Septic tank risers must be used for easy pump and filter access.
- NOTE: Double seal pumps offer extra protection from damage caused by seal failure.**



TYPICAL DEWATERING INSTALLATION



TYPICAL SEWAGE INSTALLATION

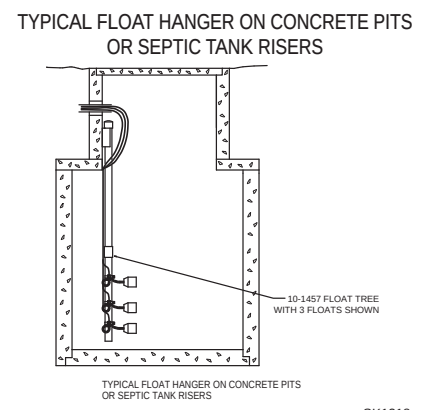
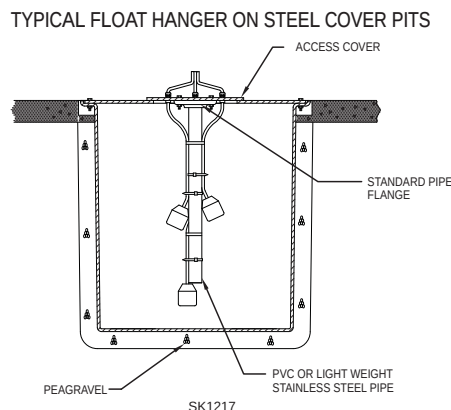


TYPICAL EFFLUENT INSTALLATION

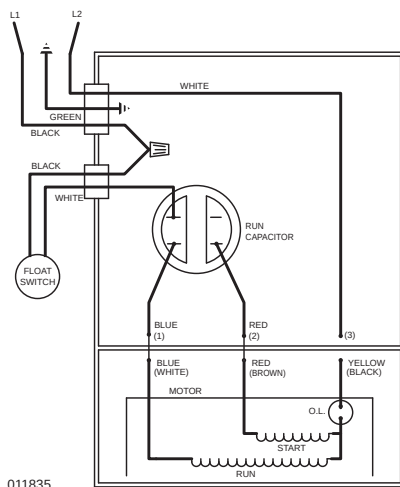
All installations must comply with all applicable electrical and plumbing codes, including, but not limited to, National Electrical Code, local, regional, and/or state plumbing codes, etc. Not intended for use in hazardous locations.

SUGGESTED METHODS OF FLOAT INSTALLATION

On some installations it may be desirable to install an independent hanger for the level control switches to avoid possible hang ups on the pumps, piping, valves, etc. Float hangers are available from Zoeller Company on Catalog Sheet FM0526 or can be fabricated from standard pipe and fittings.



WD & WH MODEL INSTALLATION



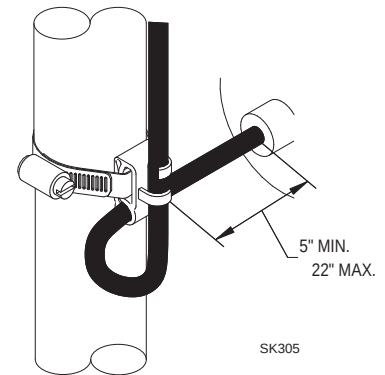
011835
WIRING DIAGRAM FOR MODELS
WD - 230V, 1 Ph, 60 Hz.
WH - 200/208V, 1 Ph, 60 Hz.

Determining Pumping Range
in Inches (1 inch - 2.5 cm)

Tether Length	5	10	15	20	22
	min.				max.
Pumping Range	9	13.5	18	22	24

Use only as a guide. Due to weight of cable, pumping range above horizontal is not equal to pumping range below horizontal. Ranges are based on testing in nonturbulent conditions. Range may vary due to water temperature and cord shape. As tether length increases, so does the variance of the pumping range.

Models WD & WH are fully automatic. A float switch is included and factory wired in the pump circuit to provide automatic operation once the float switch is secured properly to the outlet pipe. Use the diagram above to secure the float switch properly and obtain the proper tether to customize the on-off cycle to each application.



20 AMP SWITCH (WD & WH MODELS)

Note: Failure to keep within proper tether limits may prevent reliable switch operation.

Note: Cable must be mounted in horizontal position.

SINGLE PHASE WIRING INSTRUCTIONS



▲ WARNING FOR YOUR PROTECTION, ALWAYS DISCONNECT PUMP FROM ITS POWER SOURCE BEFORE HANDLING. Single phase pumps are supplied with a 3-prong grounded plug to help protect you against the possibility of electrical shock. DO NOT UNDER ANY CIRCUMSTANCES REMOVE THE GROUND PIN. The 3-prong plug must be inserted into a mating 3-prong grounded receptacle. If the installation does not have such a receptacle, it must be changed to the proper type, wired and grounded in accordance with the National Electrical Code and all applicable local codes and ordinances.



▲ WARNING "Risk of electrical shock" Do not remove power supply cord and strain relief or connect conduit directly to the pump.

▲ WARNING Installation and checking of electrical circuits and hardware should be performed by a qualified licensed electrician.

▲ WARNING Units supplied without a plug (single and three phase) and single phase nonautomatic units with a 20 amp plug must have a motor control and liquid level control provided at time of installation. The control device should have suitable voltage, ampere, frequency, grounding and horsepower rating for the pump to which it is connected.

THREE PHASE WIRING INSTRUCTIONS



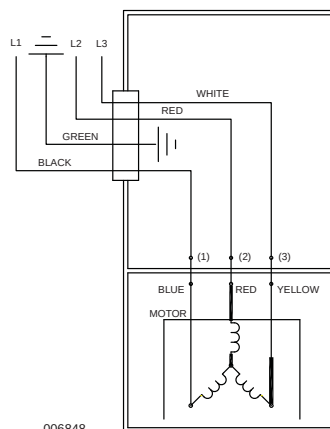
▲ WARNING FOR YOUR PROTECTION, ALWAYS DISCONNECT PUMP FROM ITS POWER SOURCE BEFORE HANDLING.

To automatically operate a nonautomatic three phase pump, a control panel is required. Follow the instructions provided with the panel to wire the system. For automatic three phase pumps see automatic 3 phase wiring diagram located to the far right.

Before installing a pump, check the pump rotation to ensure that wiring has been connected properly to power source, and that the green lead of power cord (See wiring diagram), is connected to a valid ground. Momentarily energize the pump, observing the directions of kick back due to starting torque. Rotation is correct if kick back is in the opposite direction of rotation arrow on the pump casing. If rotation is not correct, switching of any two power leads other than ground, should provide the proper rotation.

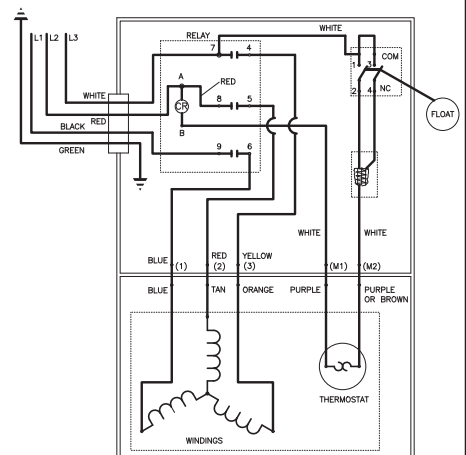
All three phase pumps require motor starting devices with motor overload protection. See FM0486 for duplex installations. Pumps must be installed in accordance with the National Electrical Code and all applicable local codes and ordinances. Pumps are not to be installed in locations classified as hazardous in accordance with National Electrical Code, ANSI/NFPA 70.

NONAUTOMATIC 3 PHASE



006848

AUTOMATIC 3 PHASE



013071

IMPORTANT NOTICE: Some insurance policies, both commercial and residential, extend coverage for damages incurred by product failure. You will need to have possession of the product to support your claim in most cases. Zoeller Pump Co. will exchange the unit or refund the original purchase price once the claim is settled with the insurer in the case where you need to retain possession of the product to support a damage claim you submit to your insurance company.

Su Tranquilidad es Nuestra Prioridad®



La siguiente información sobre este producto refleja las condiciones existentes en la fecha de publicación. Se debe consultar a la fábrica cualquier discrepancia o inconsistencia que existiera.

Zoeller Family of Water Solutions™

ENVIAR CORRESPONDENCIA A: P. O. Box 16347 • Louisville, KY 40256-0347 USA
ENVIAR A: 3649 Cane Run Road • Louisville KY, 40211-1961 USA
+1 (502) 778-2731 • Fax: +1 (502) 774-3624

Visite nuestro sitio web:
www.zoeller.com

INSTRUCCIONES DE INSTALACIÓN

MODELOS RECOMENDADOS

FECHA DE INSTALACIÓN:

NÚMERO DE MODELO:

AVISO: AGUJERO DE VENTILACIÓN PARA LA VÁLVULA DE RETENCIÓN, VEA EL NRO. 3 EN LA SECCIÓN DE PRECAUCIONES A CONTINUACIÓN Y EL NRO. 4 EN LA PÁGINA 3.

EFLUENTES*/SUMIDERO/ACHIQUE	AGUAS CLOACALES
49 / 53 / 57 Series, 98 Series	264 Series
137 Series, 151 / 152 / 153 Series	266 / 267 / 268 Series

LISTA DE VERIFICACIÓN DE PRE-INSTALACIÓN - TODAS LAS INSTALACIONES

- Inspeccione su bomba. Ocasionalmente, los productos se dañan durante el envío. Si la unidad está dañada, comuníquese con su vendedor antes de usarla. NO quite los tapones de prueba de la cubierta ni del cárter del motor.
- Lea cuidadosamente toda la literatura provista para familiarizarse con los detalles específicos relacionados con la instalación y uso. Estos materiales deberán guardarse para referencia futura.



▲ ADVERTENCIA

VER ABAJO LA LISTA DE ADVERTENCIAS

- Asegúrese de que el tomacorriente esté al alcance del cable de alimentación eléctrica de la bomba. NO USE UN CABLE DE EXTENSIÓN. Los cables de extensión que son demasiado largos o livianos no suministran voltaje suficiente al motor de la bomba. Más importante aún, presentan un peligro a la seguridad si el aislante se daña o el extremo de conexión cae dentro del sumidero.
- Asegúrese de que el circuito de alimentación eléctrica de la bomba esté equipado con fusibles o interruptores de circuito de capacidad adecuada. Se recomienda un circuito auxiliar, del tamaño de acuerdo al "Código Eléctrico Nacional" para la corriente que se muestra en la etiqueta de nombre de la bomba.
- Prueba de puesta a tierra. Como medida de seguridad, cada tomacorriente debe verificarse para puesta a tierra usando un analizador de circuitos aprobado por el Underwriters Laboratory, el cual indicará si los alambres de energía, neutrales y de puesta a tierra están conectados correctamente a su tomacorriente. Si no lo están, llame a un técnico electricista calificado.
- Para mayor seguridad. El equipo de bombeo y otro equipo eléctrico con enchufes de 3 patillas deben conectarse a un tomacorriente para 3 patillas con puesta a tierra. Para mayor seguridad, el tomacorriente puede estar protegido con un interruptor de circuito de falla a tierra. Cuando una bomba necesita ser conectada a una caja de conexión hermética, el enchufe puede ser retirado y empalmado al cable de alimentación eléctrica propiamente conectado a tierra. Para mayor seguridad, este circuito puede ser protegido mediante un interruptor de circuito de falla a tierra. La instalación completa deberá cumplir con el Código Eléctrico Nacional y todas las ordenanzas y códigos locales aplicables.
- PARA SU PROTECCIÓN, SIEMPRE DESCONECTE LA BOMBA DE LA FUENTE DE ALIMENTACIÓN ELÉCTRICA ANTES DE MANIPULARLA. Las bombas monofásicas se suministran con enchufes de 3 patillas con puesta a tierra para ayudar a protegerle contra la posibilidad de choque eléctrico. NO RETIRE BAJO NINGUNA CIRCUNSTANCIA LA CLAVIJA DE PUESTA A TIERRA. Los enchufes de 3 patillas se deben introducir en un tomacorriente para 3 patillas apropiado. Si la instalación no posee un tomacorriente de este tipo, se debe cambiar por uno apropiado, cableado y con puesta a tierra de acuerdo al Código Eléctrico Nacional y a todas las ordenanzas y códigos locales aplicables. Las bombas trifásicas requieren dispositivos de arranque del motor con protección contra sobrecarga. Vea FM0486 para instalaciones duplex.
- El tanque se debe ventilar conforme a los códigos de plomería locales. Las bombas se deben instalar conforme al Código Eléctrico Nacional y a todos los códigos y ordenanzas locales que correspondan. Las bombas no se deben instalar en sitios peligrosos conforme a la clasificación del Código Eléctrico Nacional, ANSI/NFPA 70.
- "Riesgo de choque eléctrico". No quite el cable de alimentación eléctrica ni el dispositivo de alivio de tensión y no conecte un conductor directamente a la bomba.
- La instalación y verificación de los circuitos eléctricos y del equipo deberán llevarse a cabo por un técnico electricista calificado.
- La instalación y verificación de la bomba deberá llevarse a cabo por una persona calificada.
- Riesgo de choque eléctrico – No se ha investigado el uso de estas bombas en áreas marinas y en piscinas.
- Este producto contiene sustancias químicas que de acuerdo al estado de California pueden causar cáncer y defectos congénitos u otros daños a la salud reproductiva.

REFÍERASE A LA GARANTÍA EN LA PÁGINA 2.

▲ PRECAUCIÓN

VER ABAJO LA LISTA DE PRECAUCIONES

- Asegúrese de que la fuente de energía eléctrica sea capaz de manejar los requisitos de voltaje del motor, según se indica en la etiqueta de nombre de la bomba.
- La instalación de bombas automáticas con interruptores de flotador de nivel variable o las bombas no automáticas que usan interruptores de flotador de nivel variable auxiliares es responsabilidad del instalador y deberá verificarse que el interruptor de flotador atado no se enganchará en el aparato de la bomba ni en las peculiaridades del foso y que está fijado de manera que permita la parada de la bomba. Se recomienda usar tubería y empalmes rígidos y que el foso tenga 45 cm (18 pulg.) o más de diámetro.
- Información - Objetivo del agujero de ventilación. Es necesario que todas las bombas sumergibles de sumidero, efluentes y de aguas cloacales capaces de manejar residuos sólidos de varios tamaños tengan la entrada en la parte inferior para reducir el atascamiento y las fallas del sello. Si se incorpora a la instalación una válvula de retención, deberá perforarse un agujero de ventilación [de aprox. 5 mm (3/16 pulg.)] en la tubería de descarga debajo de la válvula de retención y de la tapa del foso a fin de purgar la unidad del aire atrapado. La causa de aire atrapado puede ser agitación y/o un estanque seco. Deberá revisarse periódicamente el agujero de ventilación para verificar que no esté atascado. Las bombas de las series 53, 57 ó 98 poseen una ventilación ubicada en la caja de la bomba del lado opuesto al flotador, junto a una aleta de la caja. Sin embargo, se recomienda un agujero de ventilación adicional. Un agujero de ventilación en una aplicación de carga elevada podría causar demasiada turbulencia. Es posible que usted prefiera no perforar uno. Si decide no perforar un agujero de ventilación, asegúrese de que la caja de la bomba y el impulsor estén cubiertos de líquido antes de conectar la tubería a la válvula de retención y que no haya ningún tipo de entrada de aire en la vía de entrada de la bomba. **NOTA: EL AGUJERO TAMBIÉN DEBERÁ ESTAR POR DEBAJO DE LA TAPA DEL SUMIDERO Y SE DEBERÁ LIMPIARLO PERIÓDICAMENTE.** Se verá un chorro de agua saliendo del agujero durante los períodos de bombeo.
- Se debe revisar la bomba frecuentemente para asegurarse de que no hay escombros y/o acumulación que pueda interferir con la posición "on" (encendido) o "off" (apagado) del flotador. La reparación y servicio deberá hacerse solamente por personal de una Estación de servicio autorizada por Zoeller Pump Company.
- Las bombas de achique y de efluentes no se diseñan para uso en fosos con aguas cloacales crudas.
- La temperatura de funcionamiento máxima para bombas de modelo estándar no debe superar 54°C (130°F).
- Las bombas modelos 266, 267, 268, y 137 se deben operar en posición vertical. No intente encender la bomba cuando esté inclinada o apoyada sobre uno de sus lados.
- No opere la bomba en una aplicación donde la carga dinámica total sea menor que la carga dinámica total mínima que se indica en la Curva de rendimiento de la bomba.

AVISO: Las bombas con la marca "UL" y "US" han sido probadas de acuerdo al estándar UL778. Las bombas "aprobadas por CSA" están certificadas de acuerdo al estándar CSA C22.2 No. 108.

GARANTÍA LIMITADA

El Fabricante garantiza, al comprador y el propietario subsiguiente durante el período de garantía, que cada producto nuevo está libre de defectos en materiales y mano de obra bajo condiciones de uso y servicio normales, cuando se usa y mantiene correctamente, durante un período de tres años a partir de la fecha de fabricación original del producto. Las partes que fallen durante el período de garantía, un año a partir de la fecha de compra por parte del usuario final, lo que ocurra primero, cuyas inspecciones determinen que presentan defectos en materiales o mano de obra, serán reparadas, reemplazadas o remanufacturadas a opción del Fabricante, con la condición sin embargo de que por hacerlo no estemos en la obligación de reemplazar un ensamblaje completo, el mecanismo entero o la unidad completa. No se dará concesión alguna por costos de envío, daños, mano de obra u otros cargos que pudieran surgir por falla, reparación o reemplazo del producto.

Esta garantía no aplica a y no se ofrecerá garantía alguna por ningún material o producto que haya sido desarmado sin aprobación previa del Fabricante, o que haya sido sometido a uso indebido, aplicación indebida, negligencia, alteración, accidente o acto fortuito; que no haya sido instalado, usado o mantenido según las instrucciones de instalación del Fabricante; que haya sido expuesto a sustancias foráneas que incluyen pero no se limitan a lo siguiente: arena, grava, cemento, lodo, alquitrán, hidrocarburos, derivados de hidrocarburos (aceite, gasolina, solventes, etc.), u otras sustancias abrasivas o corrosivas, toallas para lavar o productos sanitarios femeninos, etc. en todas las aplicaciones de

bombeo. La garantía presentada en el párrafo anterior deja sin efecto cualquier otra garantía expresa o implícita; y no autorizamos a ningún representante u otra persona para que asuma por nosotros ninguna otra responsabilidad con respecto a nuestros productos.

Comuníquese con el Fabricante en 3649 Cane Run Road, Louisville, KY 40211 EE.UU., Attention: Customer Service Department, para obtener cualquier reparación necesaria o reemplazo de partes o información adicional sobre nuestra garantía.

EL FABRICANTE EXPRESAMENTE RECHAZA RESPONSABILIDAD POR DAÑOS ESPECIALES, EMERGENTES O INCIDENTALES O POR INCUMPLIMIENTO DE LA GARANTÍA EXPRESA O IMPLÍCITA; Y CUALQUIER GARANTÍA IMPLÍCITA DE IDONEIDAD PARA UN FIN PARTICULAR Y DE COMERCIALIZACIÓN SE LIMITARÁ A LA DURACIÓN DE LA GARANTÍA EXPRESA.

Algunos estados no permiten limitaciones en la duración de una garantía implícita, de forma que la limitación anterior podría no aplicar a usted. Algunos estados no permiten la exclusión o limitación de daños incidentales o emergentes, de forma que la limitación o exclusión anterior podría no aplicar a usted.

Esta garantía le otorga a usted derechos legales específicos y podría tener otros derechos que varían de un estado a otro.

LO QUE DEBE Y NO DEBE HACER PARA INSTALAR UNA BOMBA DE SUMIDERO

1. LEA completamente todo el material sobre la instalación provisto con la bomba.
2. INSPECCIONE la bomba para ver si hay cualquier daño visible causado durante el envío. Comuníquese con el vendedor si la bomba está dañada.
3. RETIRE todos los escombros del sumidero. Asegúrese de que la bomba se apoyará sobre una superficie dura, plana y estable. **NO LA INSTALE** sobre arena, grava o tierra.
4. ASEGÚRESE de que el sumidero sea suficientemente grande para permitir el funcionamiento correcto de los interruptores de control de nivel.
5. SIEMPRE desconecte la bomba de la fuente de alimentación eléctrica antes de manipularla.
SIEMPRE conecte la bomba a un circuito protegido separadamente y con puesta a tierra adecuado.
JAMÁS corte, empalme o dañe el cable de alimentación eléctrica. (Empalme únicamente cuando hay una caja de conexión hermética.)
JAMÁS transporte o levante la bomba por su cable de alimentación eléctrica.
JAMÁS use un cable de extensión con una bomba de sumidero.
6. INSTALE una válvula de retención y una unión en la tubería de descarga.
JAMÁS use una tubería de descarga de menor tamaño que la descarga de la bomba.

7. JAMÁS use una bomba de sumidero como una bomba excavadora o para zanjas, ni para bombear aguas cloacales, gasolina u otros líquidos peligrosos.
8. PRUEBE la bomba inmediatamente después de su instalación para asegurarse de que el sistema funciona correctamente.
9. CUBRA el foso con una tapa adecuada para sumidero.
10. EXAMINE todos los códigos nacionales y locales aplicables y verifique que la instalación esté de acuerdo a cada uno de ellos.
11. CONSULTE con el fabricante si necesita aclaraciones o tiene preguntas.
12. CONSIDERE un sistema de dos bombas con alarma en donde la instalación puede sobrecargarse o la falla de una bomba primaria causaría daños a la propiedad.
13. CONSIDERE un sistema de apoyo de CD en donde una bomba de achique o sumidero es necesaria para prevenir daños a la propiedad debido a inundación causada por interrupciones en el suministro de energía eléctrica, problemas mecánicos o eléctricos, o sobrecarga del sistema.
14. INSPECCIONE y pruebe el funcionamiento del sistema por lo menos cada 3 meses.

LISTA DE VERIFICACIÓN DE SERVICIO



▲ ADVERTENCIA PRECAUCIONES ELÉCTRICAS - Antes de proporcionar algún servicio a la bomba, desactive siempre el interruptor principal de suministro de energía eléctrica y desenchufe la bomba. Asegúrese de usar zapatos protectores con suelas aislantes y de no estar parado en el agua. Bajo condiciones de inundación, llame a su compañía eléctrica local o a un técnico electricista calificado para desconectar el servicio eléctrico antes de quitar la bomba.



▲ ADVERTENCIA Las bombas sumergibles contienen aceites que se presurizan y calientan bajo condiciones operativas. Deje que pasen 2½ horas después de apagarla antes de proceder con el servicio.

CONDICIÓN	CAUSAS COMUNES
A. La bomba no arranca o no funciona.	Verifique el fusible, voltaje bajo, protección contra sobrecarga abierta, cableado abierto o incorrecto, interruptor abierto, impulsor o sello trabado mecánicamente, capacitor o relé defectuoso, motor o cableado eléctrico en corto circuito. Conjunto del flotador enganchado. Interruptor defectuoso, dañado o fuera de punto.
B. El motor se sobrecalienta y activa la protección contra sobrecarga o desconecta el fusible.	Voltaje incorrecto, carga negativa (descarga abierta menos de lo normal), impulsor o sello trabado mecánicamente, capacitor o relé defectuoso, motor en corto circuito.
C. La bomba se enciende y se apaga muy a menudo.	El flotador está apretado en la varilla, la válvula de retención está atascada o no hay una instalada en una línea de larga distancia, protección contra sobrecarga abierta, interruptores defectuosos, foso del sumidero demasiado pequeño.
D. La bomba no se apaga.	Hay escombros debajo del conjunto del flotador, el flotador o la varilla del flotador están trabados por los lados del foso u otros, interruptor defectuoso, dañado o fuera de punto.
E. La bomba funciona pero sin o con poca agua.	Verifique la caja del filtro y la tubería de descarga, o si se usa una válvula de retención, el agujero de ventilación debe estar abierto. La carga de descarga excede la capacidad de la bomba. Voltaje bajo o incorrecto. Rotación incorrecta del motor. Capacitor defectuoso. El agua de entrada contiene aire o hace que el aire entre en la bomba.
F. Caída en la carga y/o capacidad después de un período de uso.	Aumento de fricción en la tubería, línea o válvula de retención atascada. Material abrasivo o productos químicos adversos podrían haber deteriorado el impulsor o el cárter de la bomba. Revise la línea. Quite la base e inspeccione.

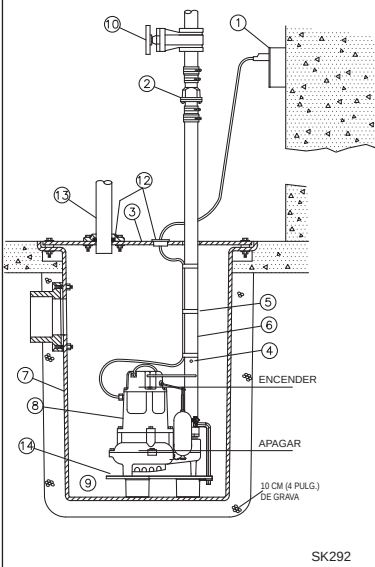
Si la lista de verificación arriba mencionada no revela el problema, consulte con la fábrica. No intente proporcionar algún servicio o desarmar la bomba. Las Estaciones de servicio autorizadas por Zoeller deberán proporcionar dicho servicio.

Visite el sitio www.zoellerpumps.com/servicestations para encontrar la estación de servicio autorizada para su zona.

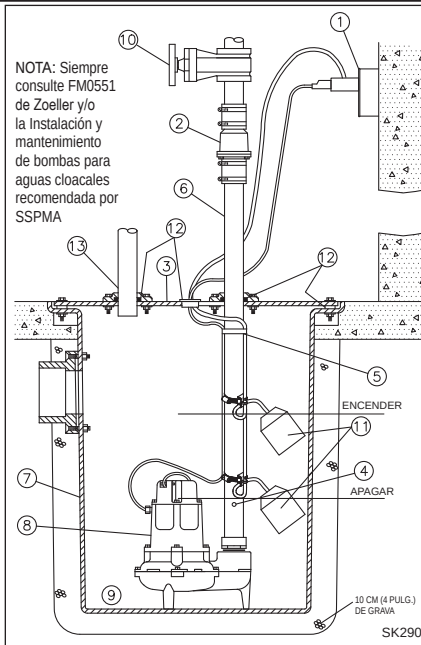
- El cableado y la protección eléctrica deben estar de acuerdo con el Código Eléctrico Nacional y todos los otros requisitos eléctricos locales y estatales aplicables.
- Instale el "Unicheck" (combinación de unión y válvula de retención) apropiado de Zoeller, luego arriba del estanque para que se pueda quitar fácilmente la bomba para su limpieza o reparación. Si los sistemas para aguas cloacales, efluentes o achique requieren instalación de carga elevada o por debajo de la tapa, use 30-0164 en tubería de 38 mm (1½ pulg.), 30-0152 en tubería de 51 mm (2 pulg.) y 30-0160 en tubería de 76 mm (3 pulg.). Vea el número 4 más abajo.
- Todas las instalaciones requieren una tapa para prevenir que escombros caigan dentro del estanque y prevenir lesiones accidentales.
- Cuando instale un "Unicheck", perforo un agujero de 5 mm (3/16 pulg.) de diámetro en la tubería de descarga al mismo nivel de la parte superior de la bomba. **NOTA: EL AGUJERO TAMBIÉN DEBERÁ ESTAR POR DEBAJO DE LA TAPA DEL ESTANQUE Y SE DEBE LIMPIARLO PERIÓDICAMENTE.** (Para unidades de carga elevada, ver el número 3 de la lista de "Precauciones" en la página 1.) Se verá un chorro de agua saliendo del agujero durante los períodos de bombeo.
- Fije firmemente el cable de alimentación eléctrica al tubo de descarga con cinta o abrazadera.
- Use tubería de descarga de tamaño completo.
- El estanque debe estar de acuerdo con los códigos y las especificaciones aplicables.
- La bomba debe estar nivelada y el mecanismo del flotador libre de los lados del estanque antes de encender la bomba.
- El estanque debe estar limpio y libre de escombros después de la instalación.
- El instalador deberá suministrar una válvula de paso directo o una válvula de bola y instalarla de acuerdo con cualesquiera y todos los códigos.
- La ubicación de los interruptores de flotador es como se muestra en el esquema a la izquierda. El punto "off" (apagado) debe estar por encima del cárter del motor y a 180° de la entrada. **NOTA: PARA BOMBAS AUTOMÁTICAS, UTILICE EL ESQUEMA PARA LA INSTALACION PARA ACHIQUE MÁS ABAJO.**
- Los sellos herméticos contra gases son necesarios en todas las instalaciones de aguas cloacales a fin de contener los gases y olores.
- Ventile los gases y olores a la atmósfera a través del tubo de ventilación. (sólo para cloaca y achique).
- Instale el soporte para bomba Zoeller (Modelo 10-2421) debajo de la bomba para proporcionar un sumidero de decantación (sólo para efluente y achique).

- La conexión del cableado de la bomba a la fuente de alimentación eléctrica debe hacerse a través de una caja de conexión hermética Zoeller o un empalme hermético. **NOTA: La caja hermética es obligatoria en áreas húmedas.** Vea FM0732. Vea el número 8 en la página 1.
 - Consulte el Manual sobre tamaños de efluentes del SSPMA para determinar la posición de los interruptores "on-off" (encendido-apagado).
 - Se debe usar tubos verticales en el tanque séptico para tener fácil acceso a la bomba y al filtro.
- NOTA:** Las bombas de sello doble ofrecen protección adicional contra los daños causados por falla del sello.

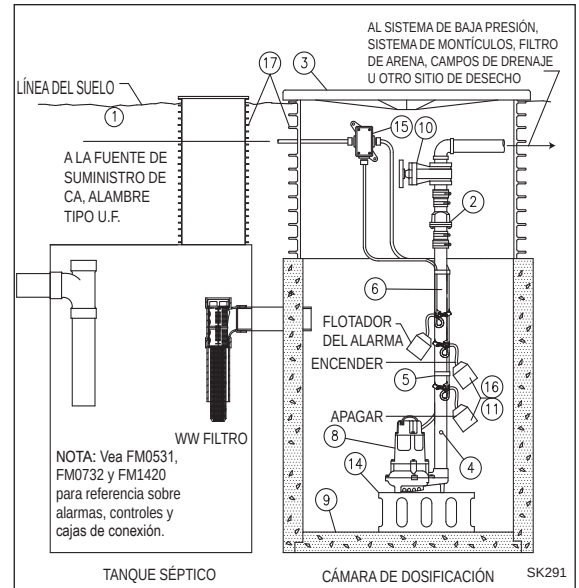
NOTA: Vea FM0531, FM0732 y FM1420 para referencia sobre alarmas, controles y cajas de conexión.



INSTALACIÓN TÍPICA PARA ACHIQUE



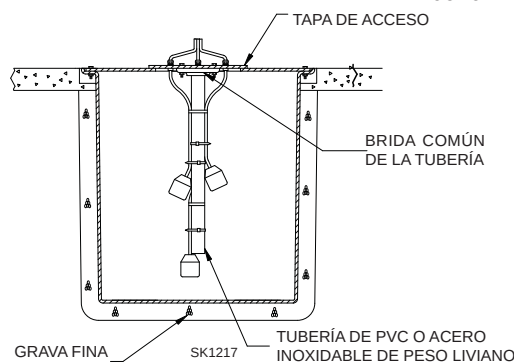
INSTALACIÓN TÍPICA PARA AGUAS CLOACALES

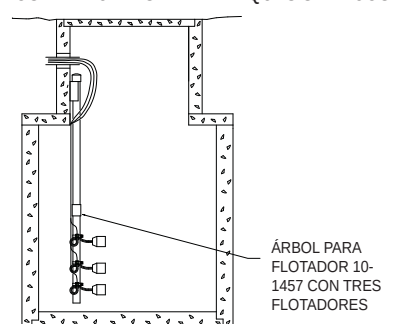


INSTALACIÓN TÍPICA PARA EFLUENTES

Todas las instalaciones deben cumplir con todos los códigos eléctricos y de instalación sanitaria aplicables, incluyendo, pero sin limitarse al Código Eléctrico Nacional, los códigos locales, regionales y/o los códigos estatales de instalación sanitaria, etc. No se debe usar las instalaciones en lugares peligrosos.

En algunas instalaciones es deseable instalar un soporte colgante independiente para los interruptores de control de nivel para evitar posibles enganches en las bombas, tubería, válvulas, etc. Los soportes colgantes del flotador se pueden comprar de Zoeller Company según la Hoja de catálogo FM0526, o fabricarse de tubería y empalmes comunes.





INSTRUCCIONES PARA LA INSTALACIÓN DE LOS MODELOS WD Y WH

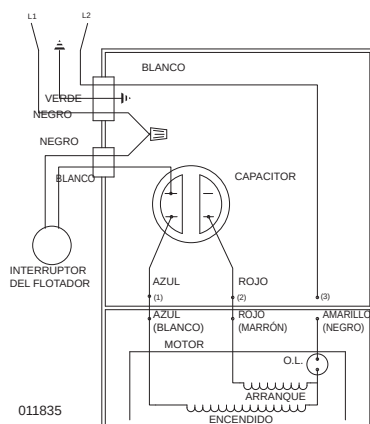


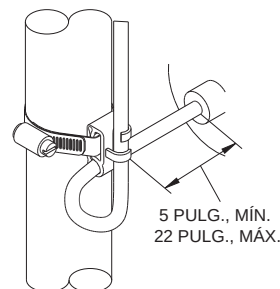
DIAGRAMA DE CABLEADO PARA LOS MODELOS:
WD-230V, 1 FASE, 60 CICLOS
WH-200/208V, 1 FASE, 60 CICLOS

Determinación del rango de bombeo en pulgadas
(1 pulg. = 2,5 cm)

Longitud de la atadura	5	10	15	20	22
	min.				máx.
Rango de bombeo	9	13.5	18	22	24

Usar solamente como guía. Debido al peso del cable, el rango de bombeo sobre la horizontal no es igual al rango de bombeo debajo de la horizontal. Los rangos se basan en pruebas en condiciones no turbulentas. El rango puede variar debido a la temperatura del agua y a la forma del cable. A medida que aumenta la longitud de la atadura, también aumenta la variación en el rango de bombeo.

Los modelos WD y WH son completamente automáticos. Se incluye un interruptor de flotador con cableado de fábrica en el circuito de la bomba para proveer una operación automática una vez que el interruptor de flotador se haya atado correctamente a la tubería de salida. Use el diagrama de arriba para asegurar correctamente el interruptor de flotador y obtener la atadura apropiada para adecuar el ciclo de encendido-apagado a cada aplicación.



SK305

INTERRUPTOR DE 20 AMPERIOS
(MODELOS WD Y WH)

Nota: No tener en cuenta los límites adecuados de la atadura podría alterar el funcionamiento seguro del interruptor.

Nota: El cable debe ser instalado en posición horizontal.

INSTRUCCIONES PARA EL CABLEADO MONOFÁSICO



▲ ADVERTENCIA PARA SU PROTECCIÓN, SIEMPRE DESCONECTE LA BOMBA DE LA FUENTE DE ALIMENTACIÓN ELÉCTRICA ANTES DE MANIPULARLA. Las bombas monofásicas se suministran con enchufes de 3 patillas con puesta a tierra para ayudar a protegerle contra la posibilidad de choque eléctrico. NO RETIRE BAJO NINGUNA CIRCUNSTANCIA LA CLAVIJA DE PUESTA A TIERRA. Los enchufes de 3 patillas se deben introducir en un tomacorriente para 3 patillas apropiado. Si la instalación no posee un tomacorriente de este tipo, se debe cambiar por uno apropiado, cableado y con puesta a tierra de acuerdo al Código Eléctrico Nacional y a todas las ordenanzas y códigos locales aplicables.

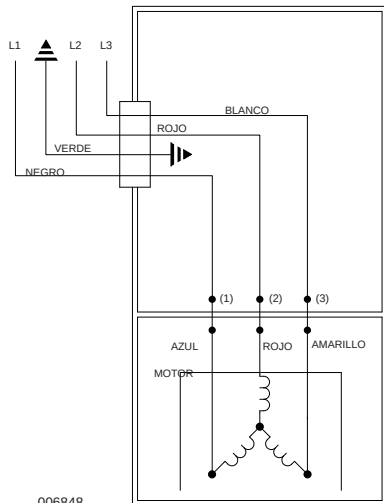


▲ ADVERTENCIA "Riesgo de choque eléctrico". No quite el cable de alimentación eléctrica ni el dispositivo de alivio de tensión y no conecte un conductor directamente a la bomba.

▲ ADVERTENCIA La instalación y verificación de los circuitos eléctricos y del equipo deberán llevarse a cabo por un técnico electricista calificado.

▲ ADVERTENCIA A las unidades que se suministran sin enchufe (monofásico y trifásico) y a las unidades monofásicas no automáticas que poseen un enchufe de 20 amperios se les debe conectar un control de motor y un control de nivel de líquidos durante la instalación. Los niveles de voltaje, amperaje, frecuencia, puesta a tierra y potencia del dispositivo de control deben ser apropiados para la bomba a la cual se conecta.

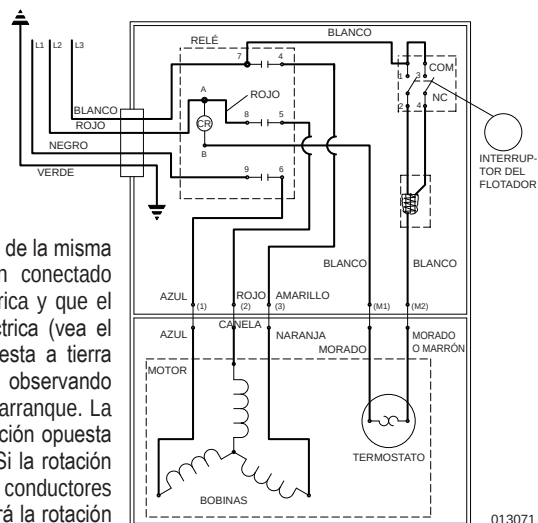
INSTRUCCIONES PARA EL CABLEADO TRIFÁSICO



006848

Las bombas trifásicas no son automáticas. Para operarlas automáticamente se requiere un panel de control. Siga las instrucciones provistas con el panel para completar el cableado del sistema. Para bombas trifásicas automáticas, ver el diagrama de cableado para bombas trifásicas automáticas a la derecha.

Antes de instalar una bomba, verifique la rotación de la misma para asegurarse de que los cables se hayan conectado correctamente a la fuente de alimentación eléctrica y que el conductor verde del cable de alimentación eléctrica (vea el diagrama de cableado) está conectado con puesta a tierra adecuada. Active momentáneamente la bomba, observando la dirección del retroceso debido a la torsión de arranque. La rotación es correcta si el retroceso está en dirección opuesta a la flecha de rotación en la caja de la bomba. Si la rotación no es correcta, cambiar dos de cualquiera de los conductores eléctricos, excepto el con puesta a tierra, proveerá la rotación apropiada.



013071



▲ ADVERTENCIA PARA SU PROTECCIÓN, SIEMPRE DESCONECTE LA BOMBA DE LA FUENTE DE ALIMENTACIÓN ELÉCTRICA ANTES DE MANIPULARLA.

Todas las bombas trifásicas requieren dispositivos de arranque del motor con protección contra sobrecarga. Vea FM0514 para instalaciones simplex o FM0486 para instalaciones duplex. Las bombas se deben instalar de acuerdo al Código Eléctrico Nacional y a todas las ordenanzas y códigos locales aplicables. Las bombas no se deben instalar en sitios clasificados como peligrosos según el Código Eléctrico Nacional ANSI/NFPA 70.

AVISO IMPORTANTE: Ciertas pólizas de seguro, tanto comerciales como residenciales, extienden la cobertura a los daños causados por la falla del producto. En la mayoría de los casos, usted deberá conservar el producto para respaldar su reclamo. Zoeller Pump Co. reemplazará la unidad o reembolsará el precio de compra original una vez que la compañía de seguros liquide el reclamo, en el caso de que usted necesite conservar el producto para respaldar un reclamo por daños que le haya presentado a su compañía de seguros.

Que vous dormiez en paix est notre priorité®

Les renseignements présentés ici reflètent les conditions au moment de la publication. Consulter l'usine en cas de contradiction ou d'inconsistance.



Zoeller Family of Water Solutions™

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ADRESSE PHYSIQUE : 3649 Cane Run Road • Louisville, KY 40211-1961 USA
TÉL : +1 (502) 778-2731 • FAX +1 (502) 774-3624

www.zoeller.com

AVIS : TROU D'ÉVENT POUR
LE CLAPET DE SÉCURITÉ
VOIR N° 3 CI-DESSOUS ET
N° 4 PAGE 3.

INSTRUCTIONS D'INSTALLATION MODÈLES RECOMMANDÉS

DATE D'INSTALLATION :

NUMÉRO DE MODÈLE :

EFFLUENTS* / PUISARD / ASSÈCHEMENT	ÉGOUT
Série 49 / 53 / 57	Série 264
Série 137, Série 151 / 152 / 153	Série 266 / 267 / 268

LISTE DE VÉRIFICATIONS AVANT L'INSTALLATION - TOUTES LES INSTALLATIONS

1. Inspecter la pompe. De temps en temps, la pompe est endommagée en cours d'expédition. Si la pompe est endommagée, contacter le distributeur avant de l'utiliser. NE PAS enlever les bouchons test du couvercle ni du compartiment moteur.
2. Il faut lire attentivement tous les documents fournis pour se familiariser avec les détails spécifiques de l'installation et de l'utilisation. Il faut conserver ces documents pour pouvoir les consulter ultérieurement.



AVERTISSEMENT

VOIR PLUS BAS POUR LA
LISTE DES AVERTISSEMENTS

1. Il faut vérifier que la prise est à portée du cordon d'alimentation de la pompe. NE PAS UTILISER DE RALLONGE. Les rallonges trop longues ou de trop faible capacité ne fournissent pas la tension nécessaire au moteur de la pompe, mais, encore plus important, elles peuvent être dangereuses si l'isolant est endommagé ou si l'extrémité avec le branchement tombe dans un endroit humide ou mouillé.
2. **Vérifier que le circuit d'alimentation de la pompe est équipé de fusibles ou de disjoncteurs de capacité appropriée.** Il est recommandé d'installer un circuit indépendant de capacité suffisante, conforme aux codes électriques nationaux pour la capacité indiquée sur la plaque d'identification de la pompe.
3. **Vérification de la mise à la terre.** Pour des raisons de sécurité, il faut vérifier la terre de chaque prise électrique en utilisant un analyseur de circuit sur la liste d'Underwriters Laboratory qui indique si les fils de phase, de neutre et de terre de la prise sont branchés correctement. S'ils ne sont pas branchés correctement, appeler un électricien agréé qualifié.
4. Pour des raisons de sécurité, les pompes et autre équipement équipés d'un fil à trois broches, avec mise à la terre, doivent être branchés sur une prise à trois broches. Pour des raisons de sécurité, la prise doit être protégée par un disjoncteur différentiel. Quand la pompe est branchée dans un boîtier de branchement étanche, il est possible d'enlever la fiche et de faire le branchement directement sur l'alimentation avec mise à la terre appropriée. Pour des raisons de sécurité, ce circuit peut être protégé par un disjoncteur différentiel. L'installation doit être conforme au code national d'électricité et tous les règlements locaux.
5. **POUR DES RAISONS DE SÉCURITÉ, IL FAUT TOUJOURS DÉBRANCHER L'ALIMENTATION DE LA POMPE AVANT DE LA MANIPULER.** Les pompes monophasées sont équipées d'un cordon avec fiche à trois broches de mise à terre pour protéger contre les électrocutions. IL NE FAUT JAMAIS ENLEVER LA BROCHE DE MISE À TERRE. Il faut brancher la fiche à trois broches dans une prise à trois broches de mise à terre. Si le circuit n'est pas équipé d'une telle prise, il faut en installer une en respectant le code national d'électricité et toute la législation et réglementation locales en vigueur. Les pompes triphasées doivent être équipées d'un dispositif de mise en marche avec protection thermique du moteur. Consulter la norme FM0486 pour les installations duplex.
6. La ventilation du réservoir doit être conforme au code de plomberie local. Les pompes doivent être installées conformément au code national d'électricité et à toute la législation et réglementation locales en vigueur. Les pompes ne doivent pas être installées dans des endroits classifiés à risque, conformément à la norme ANSI/NFPA 70 du Code national américain de l'électricité.
7. **Risque d'électrocution.** Ne pas enlever le cordon d'alimentation ni le distributeur de tension mécanique, ni brancher le conduit directement à la pompe.
8. L'installation et la vérification de l'équipement électrique doivent être faites par un électricien qualifié.
9. L'installation et la vérification de la pompe doivent être faites par une personne qualifiée.
10. **Risque d'électrocution.** L'usage de ce type de pompe dans une piscine de natation et des zones marines n'a pas été étudié.
11. Ce produit contient des produits chimiques dont l'état de la Californie a déterminé comme étant la cause de cancer et de déficiences à la naissance ou autres dommages reproductifs.



MISE EN GARDE

VOIR PLUS BAS POUR LA
LISTE DES MISES EN GARDE

1. Vérifier que le circuit d'alimentation a une capacité suffisante pour alimenter le moteur, comme indiqué sur la pompe ou sur la plaque d'identification de l'appareil.
2. L'installateur est responsable de l'installation des pompes automatiques avec des interrupteurs à niveau variable ou des pompes non-automatiques utilisant des interrupteurs auxiliaires à niveau variable et il doit s'assurer que l'interrupteur à flotteur est installé fermement pour qu'il n'accroche pas à la pompe ni au puits pour permettre l'arrêt de la pompe. Il est recommandé d'utiliser du tuyau et des raccords rigides et le puits doit avoir un diamètre supérieur à 45 cm (18").
3. **Renseignements sur le trou d'évent.** Il est nécessaire que la pompe submersible, les pompes à effluents et d'égout capables de passer des solides de différentes tailles aient leur alimentation à la base pour réduire le colmatage et la défaillance des joints. Si l'installation comprend un clapet de sécurité, il faut percer un trou d'évent d'environ 5 mm (3/16") dans le tuyau de refoulement au-dessous du clapet de sécurité et le couvercle pour purger l'air de l'appareil. L'air emprisonné est causé par l'agitation et / ou un puits sec. Il faut vérifier périodiquement que le trou d'évent n'est pas colmaté. Les carters de pompe de la série 53 / 57 et 98 sont équipés d'un trou d'évent à l'opposé du flotteur, près du goujon du carter, du goujon du carter, mais un trou d'évent est recommandé. Le trou d'évent de l'application à une hauteur de refoulement dynamique élevée peut causer une turbulence trop élevée. Il peut être désirable de ne pas le percer. S'il est décidé de ne pas percer de trou d'évent, il faut s'assurer que le carter et le rotor de la pompe sont couverts de liquide avant de brancher le tuyau sur le clapet anti-retour et qu'aucune conduite d'aspiration n'amène de l'air à l'admission de la pompe. **REMARQUE - LE TROU DOIT AUSSI ÊTRE AU-DESSOUS DU COUVERCLE DU PUIS ET IL FAUT LE NETTOYER RÉGULIÈREMENT.** Un jet d'eau sera visible de cette orifice durant les périodes de fonctionnement de la pompe.
4. Il faut vérifier fréquemment qu'il n'y a pas de débris ni d'accumulation pouvant interférer avec le déplacement du flotteur de marche / arrêt. Les réparations ne doivent être faites que par un centre de réparation agréé par Zoeller Pump Company.
5. Les pompes d'assèchement mécanique et d'effluents sont conçues pour pompage d'eau usée non traitée dans un puits.
6. La température de fonctionnement maximale d'une pompe standard ne peut pas être plus de 54°C (130°F).
7. Il faut utiliser les pompes modèles 266, 267, et 137 en position verticale. Il ne faut pas essayer de mettre la pompe en marche quand elle est inclinée ou couchée sur le côté.
8. Il ne faut pas faire fonctionner la pompe dans une application où la hauteur de refoulement dynamique est inférieure à la hauteur de refoulement dynamique minimale donnée dans les courbes de refoulement et de capacité.

REMARQUE - Les pompes avec annotations "UL" et "US" sont vérifiées d'après la norme UL778. Les pompes certifiées CSA sont vérifiées d'après la norme C22.2 no 108.

SE RÉFÉRER À LA GARANTIE EN PAGE 2.

GARANTIE LIMITÉE

Le fabricant garantit à l'acheteur et au propriétaire ultérieur pendant la période de garantie, tout produit neuf contre tout vice de matériel et de main-d'œuvre, en utilisation normale et quand utilisé et entretenu correctement, pendant une période de 3 ans de la date de fabrication initiale. Les pièces devenant défectueuses pendant la période de garantie, et que des inspections prouvent contenir des vices de fabrication ou de main-d'œuvre, seront réparées, remplacées ou renouvelées au choix du Fabricant, à condition qu'en faisant cela nous ne soyons pas obligés de remplacer l'ensemble, le mécanisme complet ou l'appareil complet. Aucune provision n'est faite pour les frais d'expédition, les dégâts, la main-d'œuvre ni d'autres frais causés par la défaillance, la réparation ou le remplacement du produit.

Cette garantie ne s'applique pas et ne couvre aucun matériel ou produit qui a été démonté sans l'autorisation préalable du Fabricant, soumis à un usage abusif, des applications incorrectes, de la négligence, des modifications, des accidents ou un cas de force majeure ; qui n'a pas été installé, utilisé ou entretenu selon les instructions d'installation du Fabricant; qui a été exposé, y compris, mais non de façon limitative, à du sable, des gravillons, du ciment, de la boue, du goudron, des hydrocarbures ou des dérivés d'hydrocarbures (huile, essence, solvants, etc.) ou à d'autres produits abrasifs ou corrosifs, serviettes ou produits d'hygiène féminine etc., dans toutes les applications de pompage. La garantie mentionnée ci-dessus remplace toutes les autres garanties

expresses ou implicites et nous n'autorisons aucun représentant ou autre personne à accepter la responsabilité en notre nom pour nos produits. Prendre contact avec le Fabricant, 3649 Cane Run Road, Louisville, KY 40211, à l'attention du Service à la Clientèle, pour obtenir des réparations, des pièces de remplacement ou des renseignements supplémentaires concernant la garantie.

LE FABRICANT REFUSE EXPRESSÉMENT TOUTE RESPONSABILITÉ POUR LES DÉGÂTS SPÉCIAUX, INDIRECTS OU SECONDAIRES OU POUR LES RUPTURES DE GARANTIE EXPRESSES OU IMPLICITES; ET TOUTE GARANTIE IMPLICITE D'APPLICABILITÉ À UNE UTILISATION SPÉCIFIQUE OU DE COMMERCIALITÉ EST LIMITÉE À LA DURÉE DE LA GARANTIE EXPRESSE.

Certaines provinces ne permettent pas les limitations de la durée de la garantie implicite et il est possible que cette limitation ne s'applique pas. Certaines provinces ne permettent pas l'exclusion ou la limitation des dégâts secondaires ou indirects, et il est possible que cette limitation ou exclusion ne s'applique pas.

Cette garantie vous donne des droits spécifiques reconnus par la loi et vous pouvez également avoir d'autres droits qui varient d'une province à l'autre.

CONSEILS POUR L'INSTALLATION D'UNE POMPE DE PUISARD

1. IL FAUT lire toutes les instructions d'installation fournies avec la pompe.
2. IL FAUT vérifier que les appareils n'ont pas été endommagés en cours d'expédition. Contacter le distributeur si la pompe a été endommagée.
3. IL FAUT nettoyer tous les débris dans le puisard. Vérifier qu'il y a une surface dure et plate à l'emplacement désiré pour la pompe. NE PAS installer la pompe sur du sable, du gravier ou de la terre.
4. IL FAUT vérifier que le puisard est assez large pour avoir de l'espace suffisant pour le bon fonctionnement des interrupteurs de commande de niveau.
5. IL FAUT toujours débrancher l'alimentation de la pompe avant de la manipuler.
IL FAUT toujours brancher la pompe sur un circuit séparé mis à la terre.
IL NE FAUT JAMAIS couper, faire une épissure ou endommager un cordon d'alimentation. (Pour faire une raccordement, il faut utiliser un boîtier de raccordement étanche.
IL NE FAUT PAS utiliser le cordon d'alimentation pour transporter ou soulever la pompe.
IL NE FAUT PAS utiliser de rallonge pour une pompe de puisard.
6. IL FAUT installer un clapet de sécurité et un raccord sur la conduite de refoulement.
IL NE FAUT PAS utiliser une conduite de refoulement de diamètre inférieur à celui du refoulement de la pompe.
7. IL NE FAUT PAS utiliser une pompe de puisard comme pompe de tranchée ou d'excavation, ou pour pomper des égouts, de l'essence ou tout autre liquide dangereux.
8. IL FAUT essayer la pompe immédiatement après l'installation pour être certain que le système fonctionne correctement.
9. IL FAUT recouvrir la pompe de puisard d'un couvercle de puisard approprié.
10. IL FAUT étudier tous les codes locaux et nationaux applicables et vérifier que l'installation est conforme.
11. IL FAUT consulter le fabricant pour obtenir des clarifications ou des réponses aux questions.
12. IL FAUT considérer un système à deux pompes avec une alarme quand l'installation peut être surchargée ou si une défaillance de la pompe primaire causait des dégâts importants.
13. IL FAUT considérer un système de secours en courant alternatif quand une pompe de puisard ou d'échage mécanique est nécessaire pour éviter des dégâts matériels en cas d'inondation à la suite d'une panne d'alimentation secteur, de problème mécanique ou électrique ou de surcharge du système.
14. IL FAUT inspecter le système et vérifier son fonctionnement au moins tous les trois mois.

LISTE DE VÉRIFICATIONS POUR L'ENTRETIEN



⚠️ AVERTISSEMENT

PRÉCAUTIONS AVEC LE SYSTÈME ÉLECTRIQUE – Avant de réparer la pompe, il faut toujours ouvrir le circuit et débrancher la pompe, en prenant soin de porter des chaussures à semelle isolante et de ne pas se tenir dans l'eau. En cas d'inondation, contacter la compagnie d'électricité ou un électricien agréé pour couper l'alimentation avant de déposer la pompe.

⚠️ AVERTISSEMENT

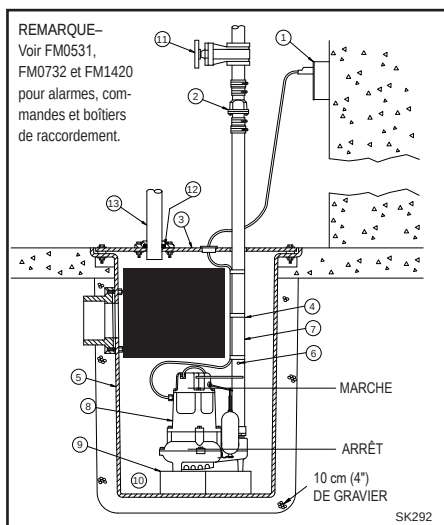
Les pompes submersibles contiennent de l'huile qui peut être sous pression ou devenir chaude en cours de fonctionnement. **Attendre 2 heures et demi après l'avoir débranchée avant de travailler sur la pompe.**

CONDITION	CAUSES FRÉQUENTES
A. La pompe ne démarre pas ou ne fonctionne pas.	Vérifier que le fusible est en bon état, que la tension est normale, que le circuit n'est pas surchargé et que le câblage est correct, que l'interrupteur n'est pas ouvert, que le rotor ou le joint n'est pas bloqué, que le condensateur ou le relais n'est pas défectueux, si installé, qu'il n'y a pas de court-circuit dans le moteur ou le bobinage. Flotteur bloqué en position basse. Interrupteur défectueux, endommagé ou mal réglé.
B. Le moteur surchauffe et déclenche le disjoncteur ou la sécurité thermique.	Mauvaise tension, hauteur de refoulement négative (refoulement ouvert au-dessous de la normale), blocage mécanique du rotor ou du joint, moteur court-circuité.
C. La pompe se met en marche et s'arrête trop fréquemment.	Flotteur grippé sur la tige, clapet de sécurité coincé ou pas de clapet installé sur une conduite longue, clapet de sécurité ouvert, interrupteurs de niveau défectueux, puits trop petit.
D. La pompe ne s'arrête pas.	Débris sous le flotteur, flotteur ou tige du flotteur coincé contre la paroi du puits, interrupteur défectueux, endommagé ou mal réglé.
E. La pompe fonctionne mais son débit est faible ou non existant.	Vérifier le carter de crépine, le tuyau de refoulement ou, si un clapet de sécurité est installé, le trou d'évent. La hauteur de refoulement est supérieure à la capacité de la pompe. Mauvaise tension. Mauvaise direction de rotation de la pompe. Condensateur défectueux. L'eau d'alimentation contient de l'air ou provoque l'entrée d'air dans la chambre de la pompe.
F. Baisse de capacité ou de hauteur de refoulement après une période d'utilisation.	Augmentation de la friction dans le tuyau de refoulement, tuyau ou clapet de sécurité colmaté. Des produits abrasifs ou des produits chimiques peuvent détériorer le rotor et le carter de pompe. Inspecter la conduite. Déposer la base et inspecter.

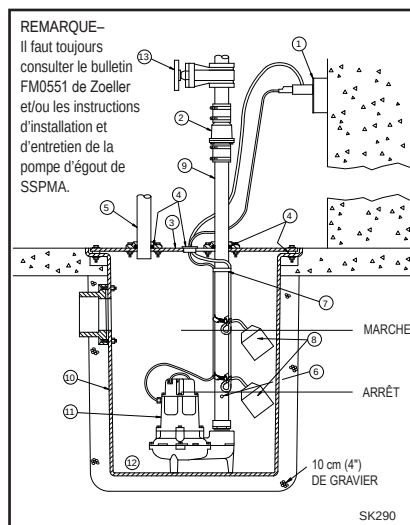
Si les vérifications ci-dessus ne résolvent le problème, consulter l'usine. Ne pas essayer de réparer ou de démonter la pompe. Toutes les réparations doivent être faites par un centre de réparation agréé par Zoeller. Visitez le site Web www.zoellerpumps.com/servicestations pour trouver le centre de service agréé le plus proche.

INSTALLATION RECOMMANDÉE POUR TOUTES APPLICATIONS

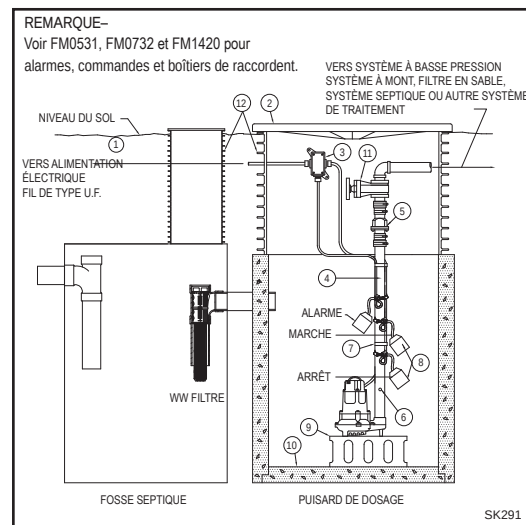
- (1) Les circuits et les protections électriques doivent être conformes aux normes des codes électriques nationaux, provinciaux et locaux.
 - (2) Installer un Unicheck (raccord / clapet de sécurité combiné) de Zoeller approprié, de préférence juste au-dessus du puits pour permettre la dépose de la pompe pour le nettoyage ou les réparations. Pour les égouts, les effluents ou les eaux d'assèchement mécanique, utiliser le modèle 30-0164 avec des tuyaux de 1-1/2" (38 mm), modèle 30-0152 avec des tuyaux de 2" (51 mm) et le modèle 30-0160 avec des tuyaux de 3" (76 mm) s'il faut une grande hauteur de refoulement ou en cas d'installation sous un couvercle. Voir (4) ci-dessous.
 - (3) Tous les puits doivent avoir un couvercle pour empêcher les débris d'y tomber et éviter les chutes accidentelles.
 - (4) Quand un Unicheck est installé, percer un trou de 5 mm (3/16") dans le tuyau de refoulement, de niveau avec le dessus de la pompe. Les pompes de la série 50 et 90 ont un trou d'évent intégré. **REMARQUE – LE TROU DOIT AUSSI ÊTRE AU-DESSOUS DU COUVERCLE DU PUITS ET IL FAUT LE NETTOYER RÉGULIÈREMENT** (pompes à hauteur de refoulement élevée, voir n° 3 de la première page « MISE EN GARDE »). Un jet d'eau sera visible de cette orifice durant les périodes de fonctionnement de la pompe.
 - (5) Attacher fermement le cordon d'alimentation électrique sur le tuyau de refoulement en utilisant du chatterton ou des colliers.
 - (6) Utiliser un tuyau de refoulement de pleines dimensions.
 - (7) Le puits doit être conforme à tous les règlements applicables.
 - (8) Avant la mise en service, la pompe doit être de niveau et le mécanisme du flotteur ne doit pas toucher les bords du puits.
 - (9) Après l'installation, le puits doit être propre et ne doit pas contenir de débris.
 - (10) L'installateur doit fournir la vanne d'arrêt et l'installer en respectant tous les codes.
 - (11) Identifier les interrupteurs à flotteur indiqués dans les illustrations. Le point d'arrêt doit être au-dessus du carter du moteur et à 180° de l'admission. Le point d'arrêt ne se doit trouver jamais au-dessous du refoulement de la pompe (uniquement pour les systèmes d'eaux usées et d'effluent). **REMARQUE - pour les pompes automatiques, utiliser le schéma d'installation pour l'assèchement ci-dessous.**
 - (12) Pour éviter la propagation des gaz et des odeurs, toutes les installations doivent avoir des joints étanches.
 - (13) Les gaz et les odeurs sont évacués à l'atmosphère au moyen d'un tuyau d'évent. (uniquement pour les systèmes d'eaux usées et d'assèchement).
 - (14) Installer la base de pompe Zoeller (modèle 10-2421) sous la pompe pour former un bassin de décantation (uniquement pour les systèmes d'effluent et d'assèchement).
- Uniquement pour les systèmes d'effluent :**
- (15) Brancher l'alimentation de la pompe par l'intermédiaire d'un boîtier étanche Zoeller ou d'une épissure étanche. **REMARQUE – Le boîtier étanche est une nécessité absolue dans un milieu humide. Voir le n° 8 à la première page de FM0732.**
 - (16) Consulter le manuel de dimensions pour les égouts de SSPMA afin de déterminer le modèle d'interrupteur de marche / arrêt à utiliser.
 - (17) Un accès à la fosse septique doit être prévu pour l'entretien du filtre et de la pompe.
- REMARQUE – Les pompes à joint double offrent une protection supplémentaire contre les dommages causés par la défaillance du joint.**



INSTALLATION TYPIQUE
POUR L'ASSÈCHEMENT MÉCANIQUE



INSTALLATION TYPIQUE
POUR ÉGOUT

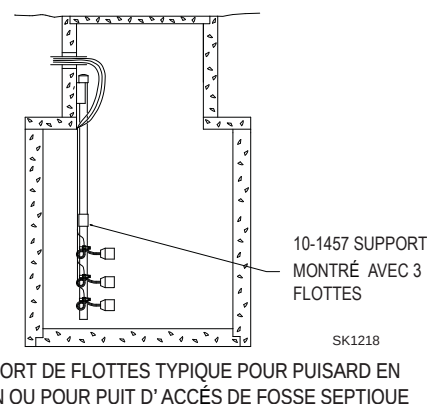
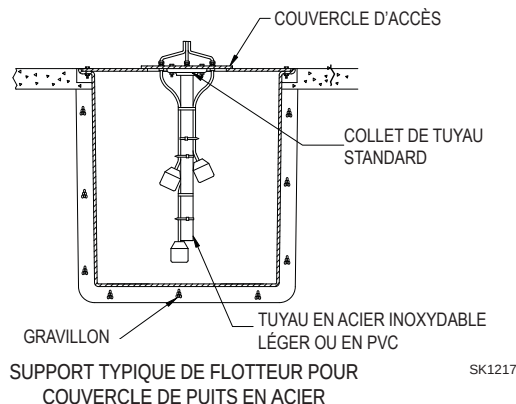


INSTALLATION TYPIQUE
POUR LES EFFLUENTS

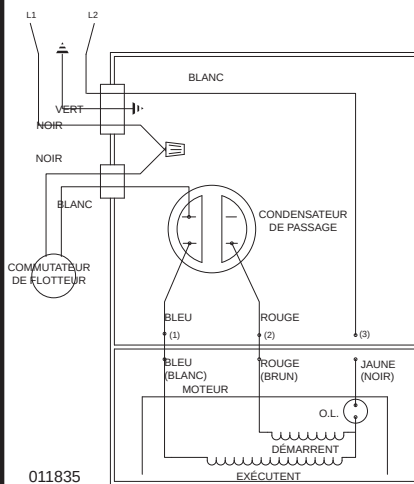
Toutes les installations doivent être conformes aux codes électriques et de plomberie applicables, y compris, mais pas limité aux codes électriques nationaux, locaux, régionaux et aux codes de plomberie provinciaux. Pas conçu pour utilisation dans les endroits dangereux.

MÉTHODES SUGGÉRÉES POUR L'INSTALLATION DU FLOTTEUR

Pour certaines installations, il peut être nécessaire d'installer un support indépendant pour les interrupteurs de commande de niveau pour éviter des accrochages possibles sur la pompe, la tuyauterie, les vannes, etc. Il est possible de fabriquer les supports de flotteurs en utilisant des tuyaux et des raccords standard pour faciliter la dépose en cas de réparation. Les supports de flotteurs sont disponibles chez Zoeller tel que décrit au feuillet FM0526 ou peuvent être fabriqués avec de la tuyauterie et des raccords standard.



Installation des modèles WD et WH



011835

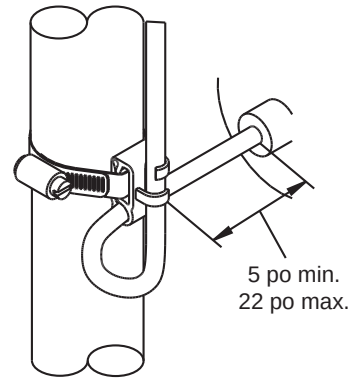
SCHEMA ÉLECTRIQUE POUR LES MODÈLES
WD - 230 V, monophasé, 60 Hz
WH - 200/208, monophasé, 60 Hz

Définition de la plage de pompage en pouces (1 pouce = 2,5 cm)

Longueur du bras d'attache	5 min.	10	15	20	22 max.
Plage de pompage	9	13.5	18	22	24

Ce tableau ne doit être utilisé que comme guide. À cause du poids du câble, la plage de pompage au-dessus de l'horizontale n'est pas égale à la plage de pompage au-dessous de l'horizontale. Les plages sont basées sur des essais sans turbulence. La plage peut varier en fonction de la température de l'eau et de la forme du cordon. Plus le bras est long, plus les variations de plage de pompage sont importantes.

Les modèles WD et WH sont entièrement automatiques. Un interrupteur à flotteur est inclus et branché dans le circuit de la pompe pour permettre le fonctionnement automatique après avoir installé l'interrupteur à flotteur correctement sur le tuyau de refoulement. Il faut utiliser le schéma ci-dessus pour attacher correctement l'interrupteur à flotteur et obtenir un bras approprié pour modifier le cycle de marche-arrêt pour chaque application.



SK305

Interrupteur 20 amps (modèles WD et WH)

Remarque – L'interrupteur risque de mal fonctionner si le câble d'attache n'est pas maintenu dans les limites appropriées.
Remarque – Le câble doit être installé horizontalement.

Instructions de branchement monophasé



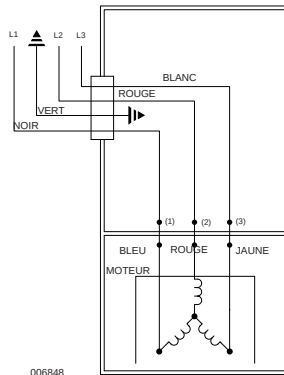
▲ AVERTISSEMENT POUR DES RAISONS DE SÉCURITÉ, IL FAUT TOUJOURS DÉBRANCHER L'ALIMENTATION ÉLECTRIQUE DE LA POMPE AVANT L'INTERVENTION. Les pompes monophasées sont fournies avec une fiche à trois broches pour aider à protéger contre les risques d'électrocution. IL NE FAUT JAMAIS ENLEVER LA BROCHE DE TERRE. La fiche à trois broches doit être branchée dans une prise à trois alvéoles correspondantes. Si le circuit d'alimentation n'a pas une telle prise, il faut installer une prise du type approprié, branchée et mise à la terre selon le code national de l'électricité et tous les codes et règlements locaux appropriés.



▲ AVERTISSEMENT « Risque d'électrocution ». Il ne faut pas enlever le cordon d'alimentation et le serre-câble ni brancher directement la pompe.
▲ AVERTISSEMENT L'installation et la vérification des circuits électriques et de la quincaillerie doivent être faites par un électricien qualifié.
▲ AVERTISSEMENT Les unités non équipées d'une fiche (monophasée et triphasée) et les unités non automatiques monophasées à fiche de 20 ampères doivent être dotées d'une commande de moteur et d'un régulateur de niveau de liquide lors de l'installation. La tension, l'intensité, la fréquence, la mise à la terre et la puissance du dispositif de commande doivent s'accorder à la pompe sur lequel il est branché.

Instructions de branchement triphasé

Pompe non-automatique triphasée



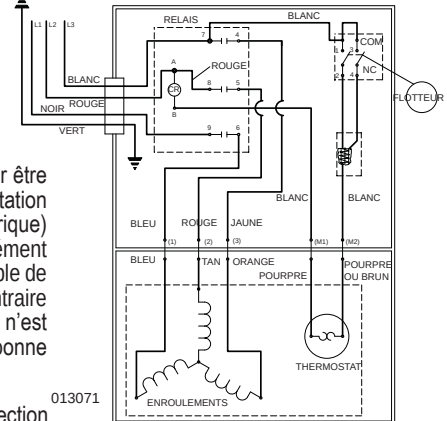
006848

Les pompes triphasées ne sont pas automatiques. Pour qu'elles fonctionnent automatiquement, il faut installer un panneau de commande. Pour brancher le système, suivre les instructions fournies avec le panneau de commande. Pour trois phases automatique les pompes voient le diagramme de câblage automatique de 3 phases situé vers le droit.

Avant d'installer la pompe, vérifier la rotation de la pompe pour être certain que les fils ont été branchés correctement sur l'alimentation et que le fil vert du cordon d'alimentation (voir schéma électrique) est branché sur une bonne terre. Mettre la pompe momentanément sous tension et observer la direction du retour causé par le couple de démarrage. La rotation est correcte si le retour est en sens contraire à la flèche de rotation dans le carter de la pompe. Si la rotation n'est pas correcte, inverser deux des fils de phase pour obtenir la bonne direction de rotation.

Toutes les pompes triphasées doivent être équipées d'un dispositif de démarrage, avec dispositif de protection contre la surcharge. Voir FM0486 pour les installations duplex. La pompe doit être branchée conformément au code national de l'électricité et tous les codes et règlements locaux appropriés. Il ne faut pas installer les pompes dans un endroit classé dangereux conformément au code national de l'électricité, ANSI/NFPA 70.

Pompe automatique triphasée



013071



▲ AVERTISSEMENT POUR DES RAISONS DE SÉCURITÉ, IL FAUT TOUJOURS DÉBRANCHER L'ALIMENTATION ÉLECTRIQUE DE LA POMPE AVANT L'INTERVENTION.

REMARQUE IMPORTANTE. – Certaines polices d'assurance commerciales et résidentielles couvrent les dommages résultant d'une défaillance du produit. Dans la plupart des cas, vous devez être en possession du produit pour déposer une réclamation. Zoeller Pump Co. s'engage à remplacer l'appareil ou à rembourser le prix d'achat original après que l'assureur aura réglé la réclamation dans un cas où vous êtes tenu d'être en possession du produit pour documenter une réclamation soumise à votre assureur.

Product information presented here reflects conditions at time of publication. Consult factory regarding discrepancies or inconsistencies.



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REPLACEMENT PARTS LIST FOR MODELS:

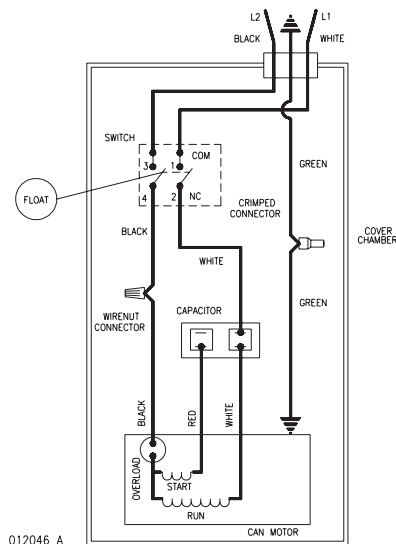
M72 AUTOMATIC 115V
N72 NONAUTOMATIC 115V
M76 AUTOMATIC 115V
N76 NONAUTOMATIC 115V

Consult factory for all other models

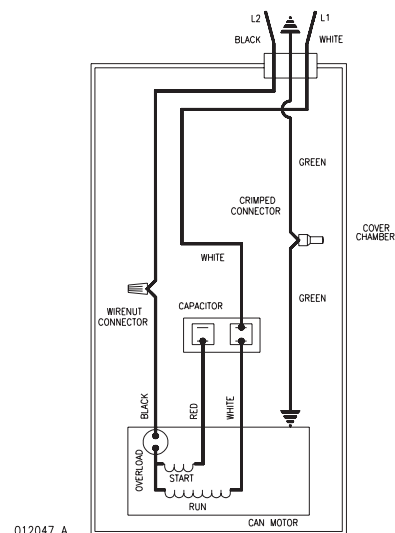
TO ORDER REPLACEMENT PARTS:

PLEASE FURNISH THE FOLLOWING INFORMATION:

- Model Number.
- Part Number of Pump.
- Part Number and Description of part.



WIRING DIAGRAM FOR MODEL
M72
7/99 THRU CURRENT

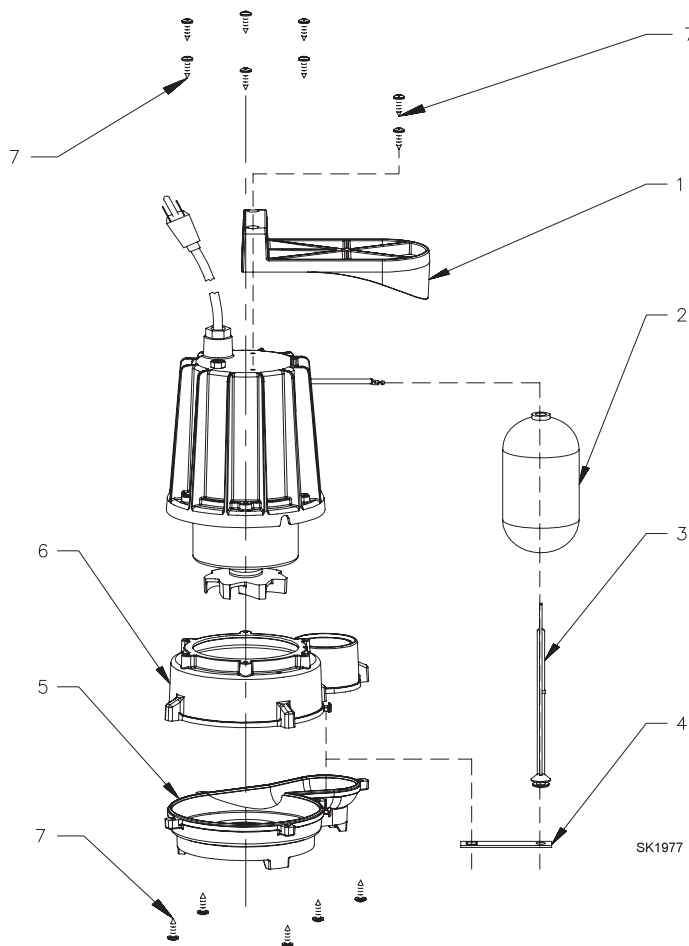


WIRING DIAGRAM FOR MODEL
N72
7/99 THRU CURRENT

REPLACEMENT PARTS LIST FOR MODELS: **“M72”, “N72”, “M76” and “N76”.**

MODEL: M72			Rev. A
REF. NO.	DESCRIPTION	QTY	7/99 thru Current
1	Guard/Handle	1	012029
2	Float-Polypropylene	1	034019
3	Float-Rod	1	054062
4	Guide	1	012043
5	Base	1	012028
6	Pump Housing	1	012027
7	Screw	13	012042

MODEL: N72			Rev. A
REF. NO.	DESCRIPTION	QTY	7/99 thru Current
1	Handle	1	012030
2	N/A	N/A	N/A
3	N/A	N/A	N/A
4	N/A	N/A	N/A
5	Base	1	012028
6	Pump Housing	1	012027
7	Screw	13	012042



MODEL: M76			Rev. A
REF. NO.	DESCRIPTION	QTY	02/00 thru Current
1	Guard/Handle	1	012029
2	Float-Polypropylene	1	034019
3	Float-Rod	1	002524
4	Guide	1	012043
5	Base	1	012028
6	Pump Housing	1	012048
7	Screw	13	012042

MODEL: N76			Rev. A
REF. NO.	DESCRIPTION	QTY	02/00 thru Current
1	Handle	1	012030
2	N/A	N/A	N/A
3	N/A	N/A	N/A
4	N/A	N/A	N/A
5	Base	1	012028
6	Pump Housing	1	012048
7	Screw	13	012042



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Your Peace of Mind is Our Top Priority®

Assembly and operating instructions

DULCOMETER®, Compact Controller
Measured variable: pH / ORP

ProMinent®

PH-501 - Transmitter, pH, Prominent Dulcometer pH or ORP4-20mA output, 7781499

EN



Please carefully read these operating instructions before use. · Do not discard.
The operator shall be liable for any damage caused by installation or operating errors.
The latest version of the operating instructions are available on our homepage.

Supplemental instructions

General non-discriminatory approach

In order to make it easier to read, this document uses the male form in grammatical structures but with an implied neutral sense. It is aimed equally at both men and women. We kindly ask female readers for their understanding in this simplification of the text.

Supplementary information

Please read the supplementary information in its entirety.

Information



This provides important information relating to the correct operation of the unit or is intended to make your work easier.

Safety Information

The safety information includes detailed descriptions of the hazardous situation, see
🔗 *Chapter 2.1 'Explanation of the safety information' on page 8*

The following symbols are used to highlight instructions, links, lists, results and other elements in this document:

More symbols

Symbol	Description
1. ➡	Action, step by step
⇒	Outcome of an action
🔗	Links to elements or sections of these instructions or other applicable documents
■	List without set order
[Button]	Display element (e.g. indicators) Operating element (e.g. button, switch)
'Display /GUI'	Screen elements (e.g. buttons, assignment of function keys)
CODE	Presentation of software elements and/or texts

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Identity code

1 Identity code

DCCa	DULCOMETER® Compact,									
	Mounting type									
	E	Spare part units								
	W	Wall/pipe mounting IP 67								
	S	With fitting kit for control panel mounting IP 54								
	Design									
	00	With ProMinent® logo								
	E1	Spare part unit, controller housing lower part (processor/PCB), fully assembled								
	E2	Spare part unit, controller housing top part (processor/PCB), fully assembled								
	Operating voltage									
	6	90 ... 253 V, 48/63 Hz								
	Measured variable									
	C0	Free chlorine								
	NG	pH/ORP (switchable)								
	L3	Conductive conductivity (designation: COND_C)								
	L6	Inductive conductivity (designation: COND_I)								
	Hardware extension									
	0	None								
	Approvals									
	01	CE (Standard)								
	Certificates									
	0	None								
	Operating instructions language									
	EN	German	KR	Korean						

	Identity code
--	---------------

DCCa	DULCOMETER® Compact,									
							EN	English	LT	Lithuanian
							ES	Spanish	LV	Latvian
							IT	Italian	NL	Dutch
							FR	French	PL	Polish
							FI	Finish	PT	Portuguese
							BG	Bulgarian	RO	Romanian
							ZH	Chinese	SV	Swedish
							CZ	Czech	SK	Slovakian
							EL	Greek	SL	Slovenian
							HU	Hungarian	RU	Russian
							YES	Japanese	TH	Thai

2 Introduction

Data and functions

These operating instructions describe the technical data and functions of the DULCOMETER® Compact Controller, measured variable pH / ORP.

2.1 Explanation of the safety information

Introduction

These operating instructions provide information on the technical data and functions of the product. These operating instructions provide detailed safety information and are provided as clear step-by-step instructions.

The safety information and notes are categorised according to the following scheme. A number of different symbols are used to denote different situations. The symbols shown here serve only as examples.

DANGER!

Nature and source of the danger

Consequence: Fatal or very serious injuries.

Measure to be taken to avoid this danger

Danger!

- Denotes an immediate threatening danger. If this is disregarded, it will result in fatal or very serious injuries.

WARNING!

Nature and source of the danger

Possible consequence: Fatal or very serious injuries.

Measure to be taken to avoid this danger

Warning!

- Denotes a possibly hazardous situation. If this is disregarded, it could result in fatal or very serious injuries.

CAUTION!

Nature and source of the danger

Possible consequence: Slight or minor injuries, material damage.

Measure to be taken to avoid this danger

Caution!

- Denotes a possibly hazardous situation. If this is disregarded, it could result in slight or minor injuries. May also be used as a warning about material damage.

! NOTICE!

Nature and source of the danger

Damage to the product or its surroundings

Measure to be taken to avoid this danger

Note!

- Denotes a possibly damaging situation. If this is disregarded, the product or an object in its vicinity could be damaged.



Type of information

Hints on use and additional information

Source of the information, additional measures

Information!

- *Denotes hints on use and other useful information. It does not indicate a hazardous or damaging situation.*

2.2 Users' qualifications



WARNING!

Danger of injury with inadequately qualified personnel!

The operator of the plant / device is responsible for ensuring that the qualifications are fulfilled.

If inadequately qualified personnel work on the unit or loiter in the hazard zone of the unit, this could result in dangers that could cause serious injuries and material damage.

- All work on the unit should therefore only be conducted by qualified personnel.
- Unqualified personnel should be kept away from the hazard zone

Training	Definition
Instructed personnel	An instructed person is deemed to be a person who has been instructed and, if required, trained in the tasks assigned to him/her and possible dangers that could result from improper behaviour, as well as having been instructed in the required protective equipment and protective measures.
Trained user	A trained user is a person who fulfils the requirements made of an instructed person and who has also received additional training specific to the system from ProMinent or another authorised distribution partner.
Trained qualified personnel	A qualified employee is deemed to be a person who is able to assess the tasks assigned to him and recognize possible hazards based on his/her training, knowledge and experience, as well as knowledge of pertinent regulations. The assessment of a person's technical training can also be based on several years of work in the relevant field.

Training	Definition
Electrician	Electricians are deemed to be people, who are able to complete work on electrical systems and recognize and avoid possible hazards independently based on his/her technical training and experience, as well as knowledge of pertinent standards and regulations. Electricians should be specifically trained for the working environment in which they are employed and know the relevant standards and regulations. Electricians must comply with the provisions of the applicable statutory directives on accident prevention.
Customer Service department	Customer Service department refers to service technicians, who have received proven training and have been authorised by ProMinent to work on the system.


Note for the system operator

The pertinent accident prevention regulations, as well as all other generally acknowledged safety regulations, must be adhered to!

3 Safety and responsibility

3.1 General Safety Information



WARNING!

Live parts!

Possible consequence: Fatal or very serious injuries

- Measure: Disconnect the mains power supply prior to opening the housing
- De-energise damaged, defective or manipulated units by disconnecting the mains plug



WARNING!

Unauthorised access!

Possible consequence: Fatal or very serious injuries

- Measure: Ensure that there can be no unauthorised access to the unit



WARNING!

Operating errors!

Possible consequence: Fatal or very serious injuries

- The unit should only be operated by adequately qualified and technically expert personnel
- Please also observe the operating instructions for controllers and fittings and any other component groups, such as sensors, measuring water pumps ...
- The operator is responsible for ensuring that personnel are qualified



CAUTION!

Electronic malfunctions

Possible consequence: Material damage to destruction of the unit

- The mains connection cable and data cable should not be laid together with cables that are prone to interference
- Measure: Take appropriate interference suppression measures

! NOTICE!

Correct and proper use

Damage to the product or its surroundings

- The unit is not intended to measure or regulate gaseous or solid media
- The unit may only be used in accordance with the technical details and specifications provided in these operating instructions and in the operating instructions for the individual components

! NOTICE!

Correct sensor operation

Damage to the product or its surroundings

- Correct measuring and dosing is only possible if the sensor is working perfectly
- Check and calibrate the sensor regularly

! NOTICE!

Compensation of control deviations

Damage to the product or its surroundings

- This controller cannot be used in control circuits which require rapid compensation (< 30 s)

! NOTICE!

Correct sensor operation / Run-in time

Damage to the product or its surroundings

- Correct measuring and dosing is only possible if the sensor is working perfectly
- It is imperative that the run-in times of the sensors are adhered to
- The run-in times should be allowed for when planning initial operation
- It may take a whole working day to run-in the sensor
- Please read the operating instructions for the sensor

3.2 Correct and proper use

! NOTICE!

Compensation for control deviations

Damage to the product or its surroundings

- The controller can be used in processes, which require compensation of > 30 seconds

! NOTICE!

Correct and proper use

The unit is intended to measure and regulate liquid media. The marking of the measured variables is located on the controller and is absolutely binding.

The unit may only be used in accordance with the technical details and specifications provided in this operating manual and in the operating manuals for the individual components (such as, for example, sensors, fittings, calibration devices, metering pumps etc.).

Any other uses or modifications are prohibited.

4 Functional description

Brief functional description

The DULCOMETER® Compact Controller for pH and redox measured variables provides basic functions for water treatment applications. It has a fixed configuration with the following features:

- Measured variables pH and redox (can be switched over on the DULCOMETER® Compact Controller)
- Language independent operation (use of abbreviations, such as *[INPUT]*, *[OUTPUT]*, *[CONTROL]*, *[ERROR]*)
- Illuminated display
- 3 LEDs indicate the operating states (*[f-REL]* active, *[P-REL]* active, error)
- Sensor monitoring of pH
- P or PID control characteristics
- Selectable control direction (raise or lower measured value)
- Impulse frequency relay *[f-REL]* for metering pump control
- Power relay *[P-REL]*, configurable as alarm, limit value or pulse width modulated (PWM) control output for metering pumps
- Analogue output 0/4...20 mA, can be configured as a measured value or correction variable
- Suction function for all actuators
- Digital input to switch off the DULCOMETER® Compact Controller or to process a sample water limit contact by remote control
- Temperature sensor input (Pt 1000) for temperature compensation of the pH value
- Protection class IP67 (wall/pipe mounting), protection class IP54 (control panel mounting)

Applications:

- Waste water treatment
- Treatment of drinking water
- Swimming pool water treatment

4.2 Overview of the first level menu

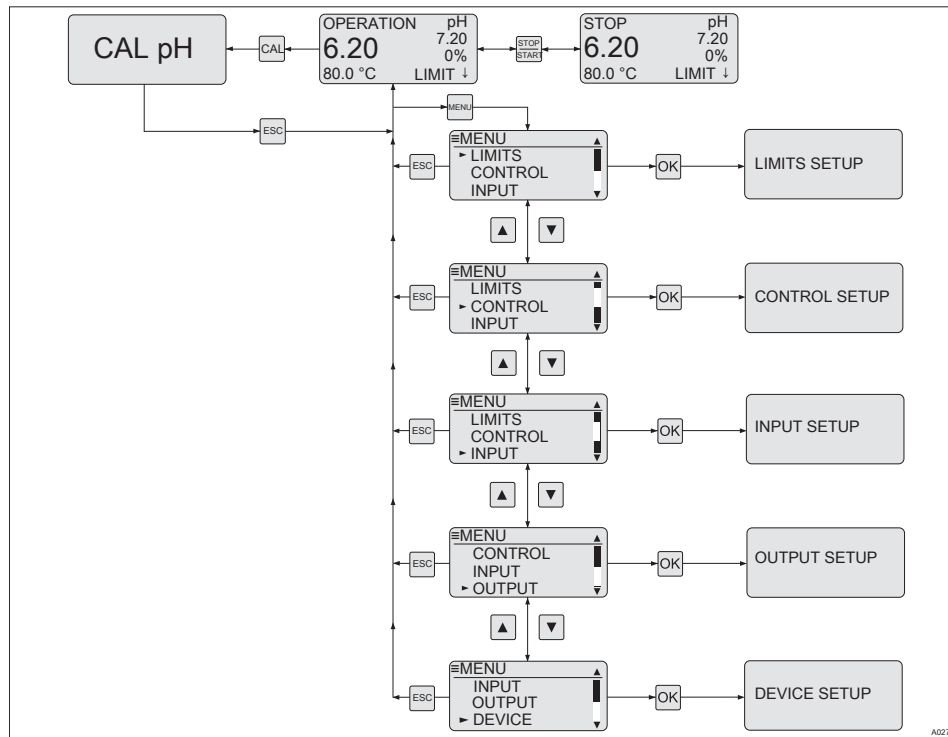
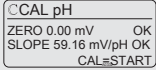
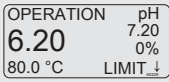
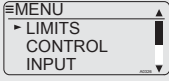
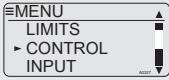


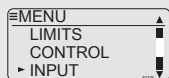
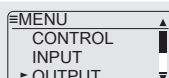
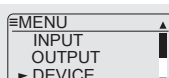
Fig. 2: Overview of the first level menu; shown for pH

Display view	Selection with:	Reference	Function
OPERATION pH 6.20 7.20 80.0 °C 0% LIMIT ↓		Chapter 7 'Operating diagram' on page 43	
CAL			Changes to the calibration menu.

Functional description

Display view	Selection with:	Reference	Function
		Chapter 8.1 'pH sensor calibration (CAL)' on page 48	The calibration menu enables calibration of controller and sensor.
			
			Stop/Start the control and metering function.
		Chapter 9.2 'STOP/START key' on page 73	By pressing the STOP key, the control is stopped. The STOP key can be pressed independently of the currently displayed menu. However the STOP state is only shown in the continuous display.
		Chapter 7.3 'Continuous display' on page 45	Changes from the continuous display to the setting menu.
		Chapter 8.3 'Setting limit values [LIMITS]' on page 58	Enables the setting of the limit value for limit value monitoring.
			
		Chapter 8.4 'Setting the control [CONTROL]' on page 60	Enables parameter setting for the control.
			

Functional description

Display view	Selection with:	Reference	Function
		Chapter 8.5 <i>'Input setting (INPUT)'</i> on page 63	Enables setting of the measured value input parameter.
			
		Chapter 8.6 ' <i>Output setting (OUTPUT)'</i> on page 66	Enables setting of the mA output parameter.
			
		Chapter 8.7 <i>'DEVICE setting'</i> on page 70	Enables adjustment of the password and the controller <i>[RESTART]</i> function.

5 Assembly and installation

- **User qualification, mechanical installation:** trained qualified personnel, see *Chapter 2.2 'Users' qualifications' on page 10*
- **User qualification, electrical installation:** Electrical technician, see *Chapter 2.2 'Users' qualifications' on page 10*



CAUTION!

Possible consequence: Material damage.

The hinge between the front and rear part of the housing cannot absorb high levels of mechanical loading. When working on the DULCOMETER® Compact Controller, firmly hold the top section of the controller housing.



CAUTION!

Check band for strain relief

Possible consequence: Material damage.

The ribbon cable and its socket cannot be mechanically loaded. Hence it is essential that when mounting the controller in the control panel mounting, the check strap (part number 1035918) is fitted for strain relief and mechanical securing. Without the check strap, the ribbon cable or its socket could be damaged if they were to fall out of the controller upper housing.



NOTICE!

Mounting position and conditions

- The controller conforms to IP 67 degree of protection (wall/pipe mounting) or IP 54 (control panel mounting) requirements. This degree of protection is only achieved if all seals and cable glands are correctly fitted.
- The (electrical) installation should only take place after (mechanical) installation
- Ensure that there is unimpeded access for operation
- Ensure safe and low-vibration fastening
- Avoid direct sunlight
- Permissible ambient temperature of the controller at the installation location: -10 ... +60 °C at max. 95% relative air humidity (non-condensing)
- Take into consideration the permissible ambient temperature of the sensors and other components connected
- The controller is only suitable for operation in closed rooms. If operated outside, the controller must be protected against the environment by a suitable protective enclosure



Read-off and operating position

- *Install the device in a favourable position for reading and operating (preferably at eye level)*



Mounting position

- *Leave sufficient free space for the cables*



Packaging material

Dispose of packaging material in an environmentally responsible way. All packaging components carry the corresponding recycling code ♻.

Assembly and installation

5.1 Scope of delivery

The following parts belong to the standard scope of delivery of a DULCOMETER® Compact Controller.

Description	Quantity
Assembled device	1
Cable connection set DMTa/DXMa (metr.)	1
Operating instructions	1

5.2 Mounting (mechanical)

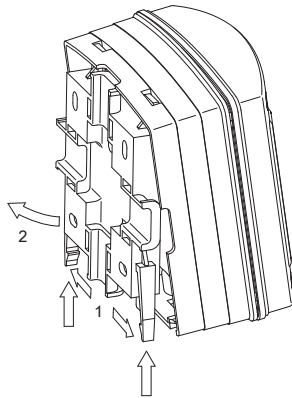
The DULCOMETER® Compact Controller is suitable for mounting on a wall, pipe or control panel.

Mounting materials (contained in the scope of supply):

Description	Quantity
Wall/tube retaining bracket	1
Round head screws 5x45 mm	2
Washer 5.3	2
Rawlplug Ø 8 mm, plastic	2

5.2.1 Wall mounting

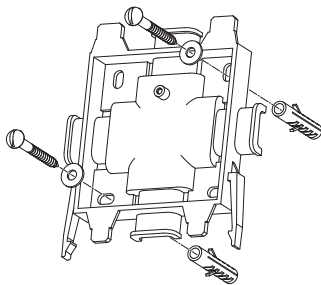
Mounting (mechanical)



AG273

Fig. 3: Removing the wall/pipe bracket

1. ➤ Remove the wall/pipe bracket. Pull the two snap-hooks (1) outwards and push upwards
2. ➤ Fold out the wall/pipe bracket (2) and pull out in a downwards direction
3. ➤ Mark two drill holes diagonal to each other by using the wall/pipe bracket as a drilling template
4. ➤ Drill holes: Ø 8 mm, d = 50 mm



AG274

Fig. 4: Screwing on the wall/pipe bracket using washers

5. ➤ Screw on the wall/pipe bracket using the washers

6. ➤ Suspend the DULCOMETER® Compact Controller at the top in the wall/pipe bracket and push using light pressure at the bottom against the wall/pipe bracket. Then press upwards until the DULCOMETER® Compact Controller audibly snaps into position.

Assembly and installation

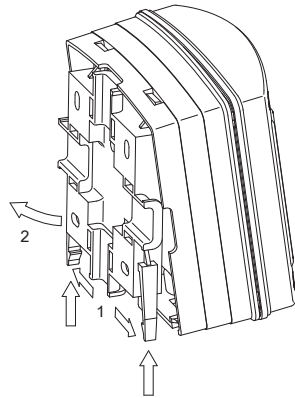
5.2.2 Pipe mounting

Mounting (mechanical)



Pipe diameter

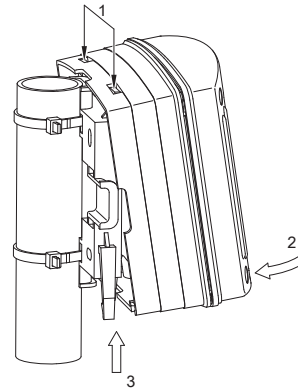
Pipe diameter: 25 mm to 60 mm.



A0273

Fig. 5: Removing the wall/pipe bracket

1. ➔ Remove the wall/pipe bracket. Pull the two snap-hooks (1) outwards and push upwards
2. ➔ Fold out the wall/pipe bracket (2) and pull out in a downwards direction
3. ➔ Secure the wall/pipe bracket using cable ties (or pipe clips) to the pipe



A0275

Fig. 6: Suspend and secure the DULCOMETER® Compact Controller

4. ➔ Suspend the DULCOMETER® Compact Controller at the top (1) in the wall/pipe bracket and push using light pressure at the bottom (2) against the wall/pipe bracket. Then press upwards (3) until the DULCOMETER® Compact Controller audibly snaps into position

5.2.3 Control panel mounting

Mounting kit for control panel installation of the DULCOMETER® Compact Controller:
Order number 1037273

Description	Quantity
Drilling template sheet 3872-4	1
PT screw (3.5 x 22)	3
Profile seals	2
Strain relief strip DF3/DF4	1
PT screw (3.5 x 10)	2
Individual parts packed in transparent cover / Mounting kit is not contained in the standard scope of supply	



CAUTION!

Material thickness of control panel

Possible consequence: material damage

- The thickness of the material of the control panel should be at least 2 mm to ensure secure fixing



In the mounted state, the DULCOMETER® Compact Controller extends approx. 30 mm from the control panel.

Assembly and installation

Preparing the control panel

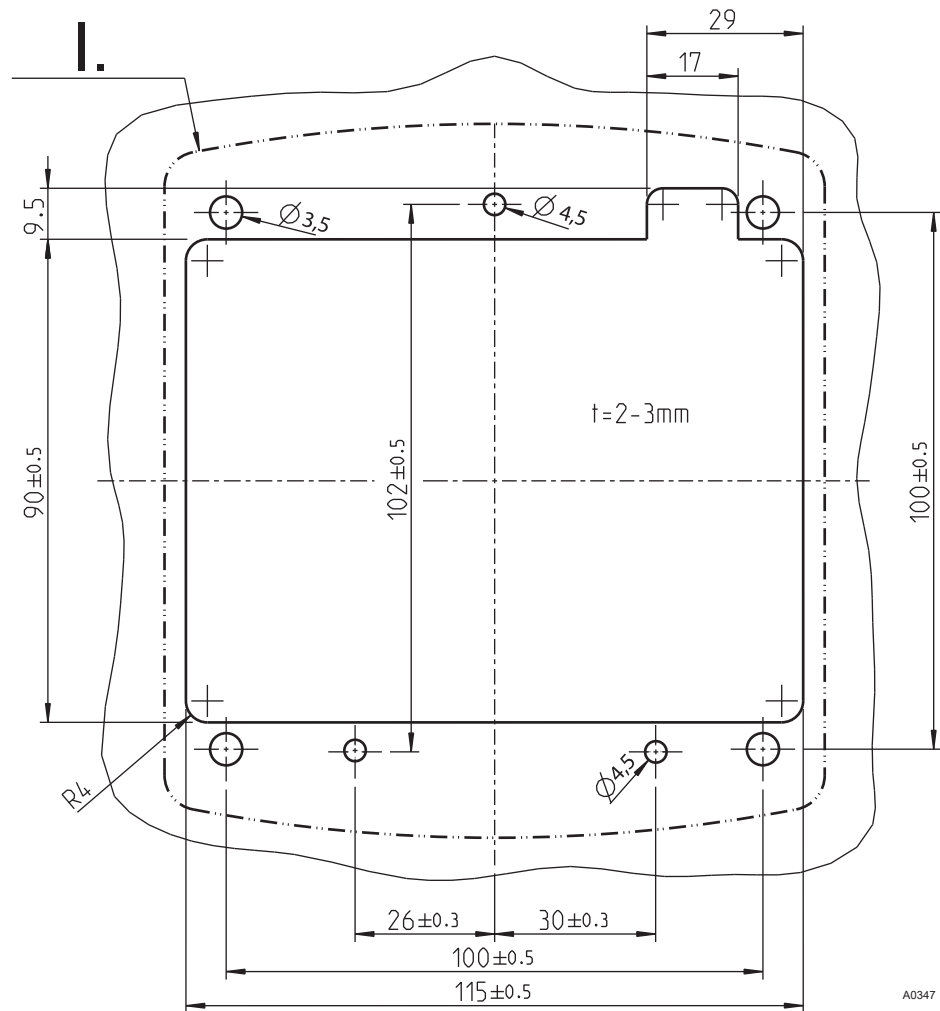


Fig. 7: The drawing is not to scale and is intended for information purposes only.

I. Outline contour of the DULCOMETER® Compact Controller housing

1. ➡ Mark the exact position of the DULCOMETER® Compact Controller on the control panel using the drilling template

2. 



Core hole

Adhere to the 3.5 mm Ø as the core hole diameter for screwing in the fixing bolts.

Drill four holes for the bolts for the top section of the controller housing using a 3.5 mm Ø drill bit

3. 

Drill three holes for the bolts for the bottom section of the controller housing using a 4.5 mm Ø drill bit

4. 

Drill four holes using an 8 mm Ø drill bit and use a jigsaw to cut the cut-out

⇒ Deburr all the edges.

Assembly and installation

Fitting the DULCOMETER® Compact Controller into the cut-out in the control panel

! NOTICE!

Ribbon cable base

The base for the ribbon cable is firmly soldered onto the PCB. The base cannot be removed. Open the base lock (3) to loosen the ribbon cable, see Fig. 8

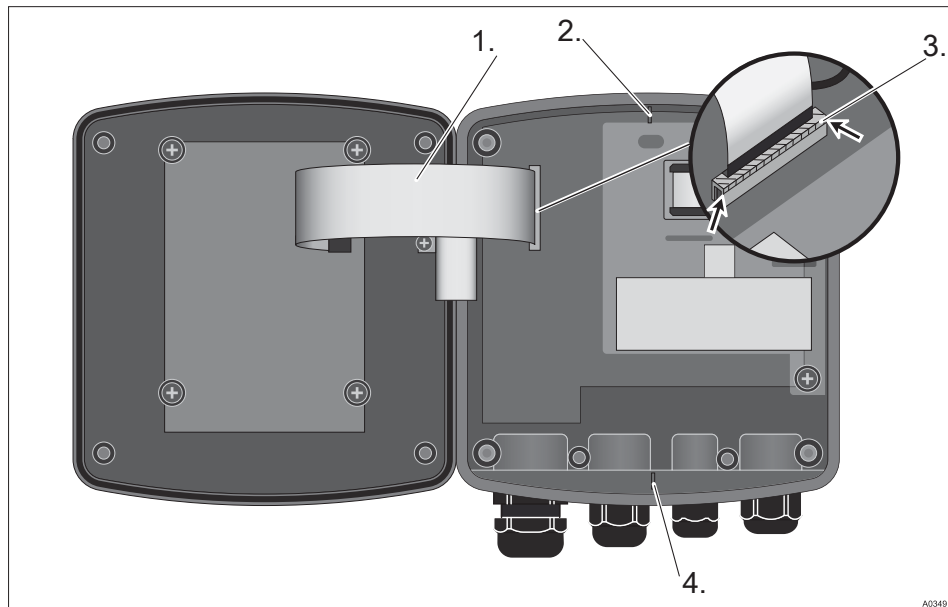


Fig. 8: Loosening the ribbon cable

1. ➡ Undo four screws and open the DULCOMETER® Compact Controller
2. ➡ Open the right and left lock (3) (arrows) on the base and pull the ribbon cable (1) out of the socket
3. ➡ Use pliers to break off the catches (2 and 4). These are not needed for control panel installation

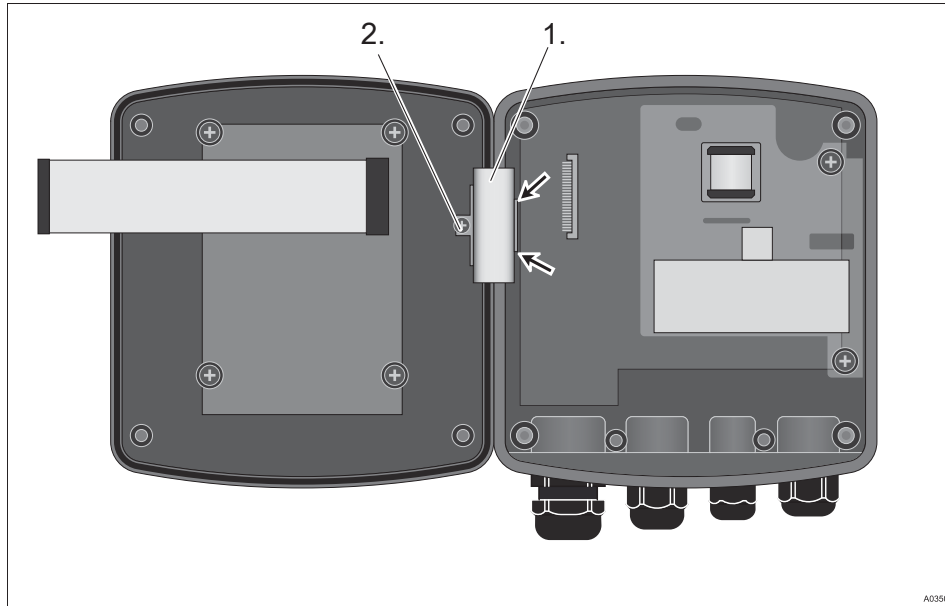


Fig. 9: Dismantle the hinge

4.  Remove the screw (2), unclip the hinge (1) on the bottom section of the controller housing (arrows) and remove the hinge

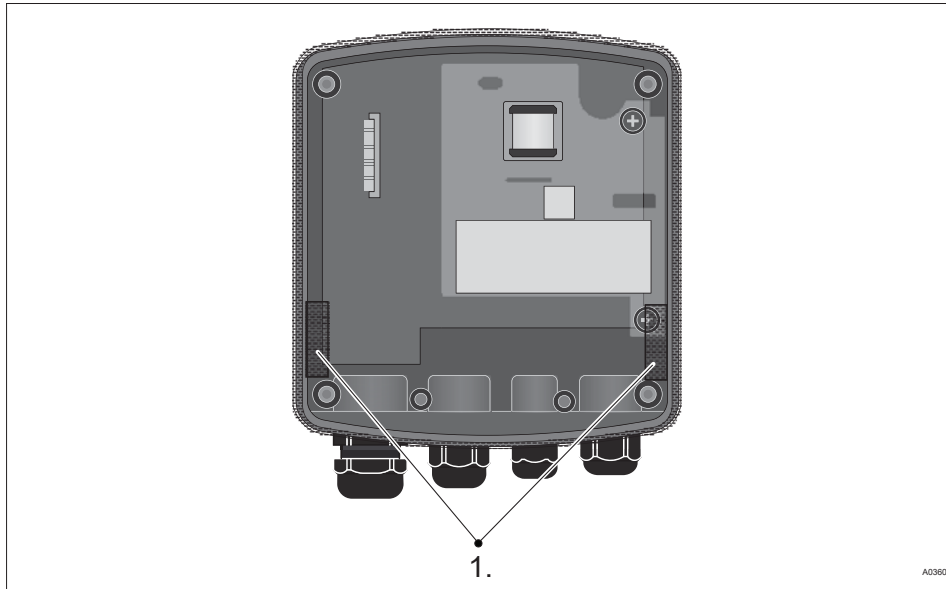


Fig. 10: Fitting the profile seal on the bottom section of the controller housing

5. ➤ Position the profile seal evenly around the upper edge of bottom section of the DULCOMETER® Compact Controller housing. Arrange the clips (1) as shown in the figure
⇒ Ensure that the profile seal evenly surrounds the upper edge of the housing.
6. ➤ Insert the bottom section of the DULCOMETER® Compact Controller housing with the profile seal from behind into the cut-out and use three screws to secure it in place

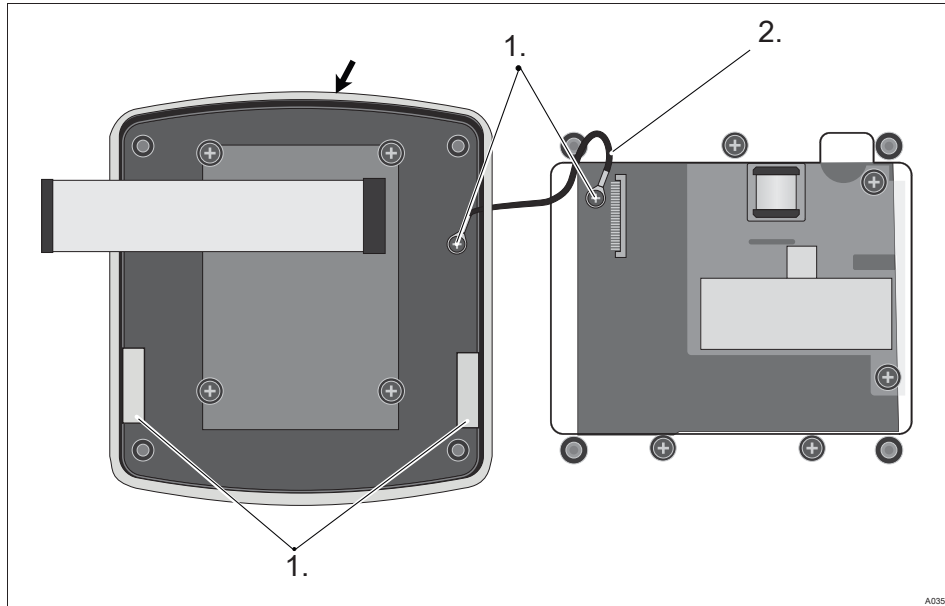


Fig. 11: Fitting the profile seal onto the top section of the controller housing

- 7.** ➤ Position the profile seal (arrow) evenly into the groove in the top section of the DULCOMETER® Compact Controller housing. Arrange the clips (3) as shown in the figure
- 8.** ➤ Secure the strain relief (2) using two screws (1)

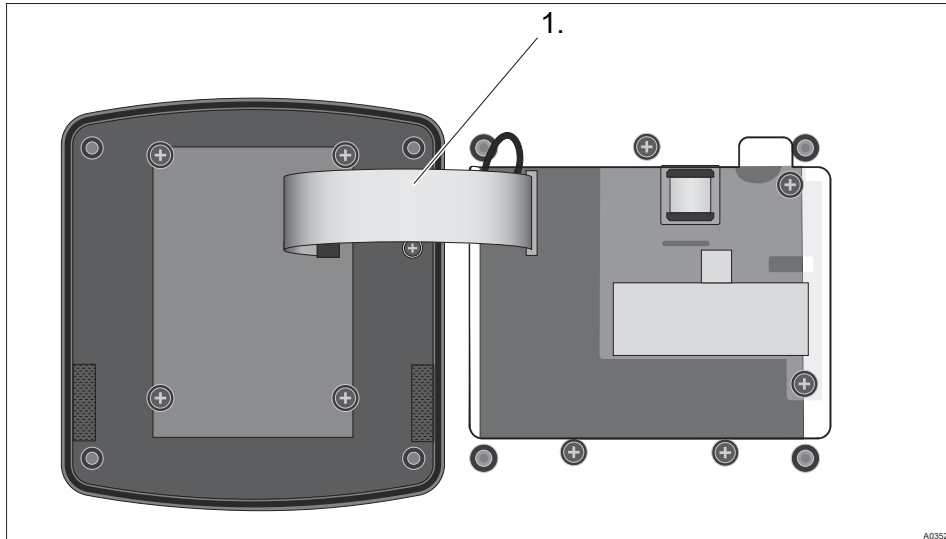


Fig. 12: Push and lock the ribbon cable in its base

- 9.** ➤ Push and lock the ribbon cable (1) in its base
- 10.** ➤ Screw the top section of the controller housing onto the bottom section of the DULCOMETER® Compact Controller housing
- 11.** ➤ Once again check that the profile seals are fitted properly
 - ⇒ IP 54 degree of protection can only be provided if the control panel is mounted correctly

5.3 Installation (electrical)



WARNING!

Live parts!

Possible consequence: Fatal or very serious injuries

- Measure: Disconnect the electrical power supply to the device before opening the housing and secure to prevent unintentional reconnection
- Disconnect damaged or defective devices or devices that have been tampered with and prevent unintended reconnection
- The provision of a suitable isolating device (emergency-off switch, etc.) is the responsibility of the plant operator



The signal leads of the DULCOMETER® Compact Controller must not be routed alongside interference-prone cabling. Faults could lead to malfunctions of the DULCOMETER® Compact Controller.

Assembly and installation

5.3.1 Cable Cross-Sections and Cable End Sleeves

	Minimum cross-section	Maximum cross-section	Stripped insulation length
Without cable end sleeve	0.25 mm ²	1.5 mm ²	
Cable end sleeve without insulation	0.20 mm ²	1.0 mm ²	8 - 9 mm
Cable end sleeve with insulation	0.20 mm ²	1.0 mm ²	10 - 11 mm

5.3.2 Installation of coaxial cable to guard terminal XE1



CAUTION!

Maximum length of the coaxial cable 10 m

Incorrect measured value due to too long a coaxial cable

Possible consequence: Slight or minor injuries, material damage.

The maximum length of the coaxial cable may not exceed 10 m when using redox or pH sensors. The measurement signal can otherwise be falsified by the effects of interference.

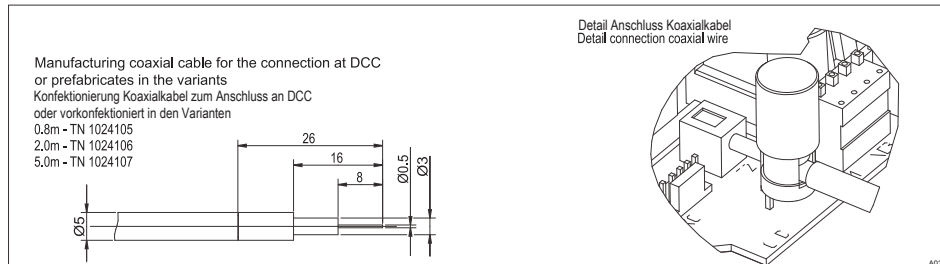


Fig. 13: Installation of Coaxial Cable to Guard Terminal XE1

When installing the coaxial cable for the guard terminal XE 1, the lengths of insulation to be removed from the coaxial cable must be adhered to. The guard terminal *'is tightened'* by hand.

5.3.2.1 Terminal diagram / wiring

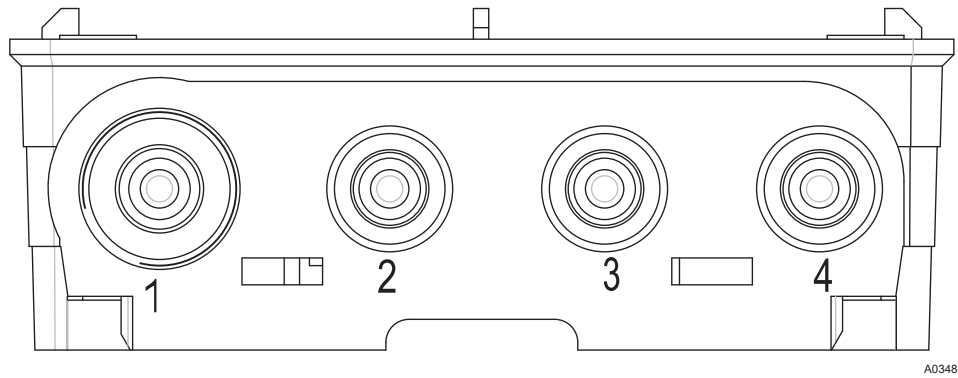


Fig. 14: Threaded connector number

Wiring

Threaded connector no. Size	Description	Terminal Description	Terminal number	Pol	Function	Recommended cable ø	Remarks
1 / M20	ph/redox		XE 1	Ref. El.	pH/ redox sensor	ø 5	Guide cable through multiple M20 / 2x5 mm seal inserts
	Input 1		XE 2	meas. sig			
	Temp. input Pt 1000	XE 4	1	+	Temp. sensor	ø 5	
			2	-			
2 / M16	Wire jumper	XE 3			]	ø 4,5 *	Guide 4- core cable through multiple M 16 / 2x4,5 mm seal inserts
	or				Short circuit		
	potential equaliser	XE 3	1	free	Potential equal- iser***		

Assembly and installation

Threaded connector no. Size	Description	Terminal Description	Terminal number	Pol	Function	Recommended cable ø	Remarks
	Standard signal output	XA 1	2	Ref. volt.		ø 4,5 *	Guide 4-core cable through multiple M 16 / 2x4,5 mm seal inserts
			1	+ 15 V	e.g. recorder / actuator		
	Contact input	XK 1	2	-			
			1	+	Pause		
	Relay output (f-relay)	XR 2	2	-			
			1		Frequency controlled metering pump		
			2				

* To achieve protection class IP 67 please use original Prominent cable, part number 1036759

*** When using as a potential equaliser, the short circuit bridge] must be removed!

3 / M16	Relay output	XR1	1	COM	Solenoid valve / metering pump ** raise / lower	ø 5	Guide cable through single M16 seal insert
	or		2	NO			
	Relay output						
	or	XR1	1	COM	Limit relay		
	Relay output		2	NO			
	(P-relay)						
		XR1	1	COM	Alarm relay		
	3		NC				

Threaded connector no. Size	Description	Terminal Description	Terminal number	Pol	Function	Recommended cable ø	Remarks
** An RC suppressor must be connected (not part of the scope of delivery)							
4 M16	Mains connection	XP 1	1	N	85 ... 253 V eff.	ø 6,5	Guide cable through single M16 seal insert
			2	L			

Legend to the "Wiring" table

Abbreviation	Meaning
Pol.	Polarity
Ref. El.	Reference electrode
meas sig.	Measurement signal (glass electrode)
Ref. pot.	Internal reference potential
f-relay	Pump frequency relay
P-relay	Power relay
COM	Common relay contact (root)
NO	Contact 'normally opened'
NC	Contact 'normally closed'

Assembly and installation

Terminal diagram

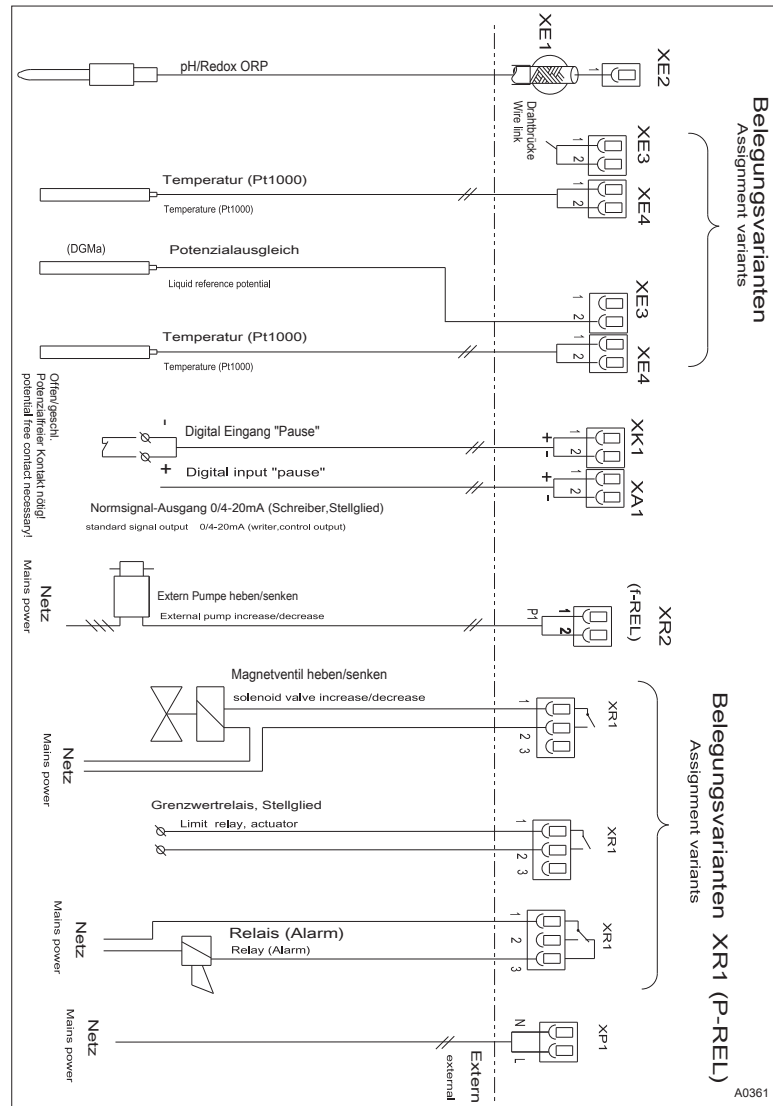


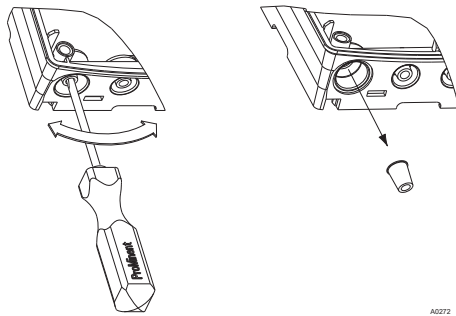
Fig. 15: Terminal diagram

5.3.3 Installation (electrical)



The cable must be routed in a site-provided cable duct to ensure strain relief

1. Undo the four housing screws
2. Slightly lift the controller housing top section forwards and fold it to the left



A0272

Fig. 16: Punch out threaded holes

- 3.



Large threaded connection (M 20 x 1.5)

Small threaded connection (M 16 x 1.5)

Punch out as many threaded connections on the bottom side of the controller housing bottom section as required

4. Guide the cable into the respective reducing inserts.

5. Insert the reducing inserts into the threaded connectors
6. Guide the cable into the controller.
7. Connect the cable as indicated in the terminal diagram
8. Screw the required threaded connections in and tighten
9. Tighten the clamping nuts of the threaded connections so that they are properly sealed
10. Click the controller housing top section on to the controller housing bottom section
11. Manually tighten the housing screws
12. Once again check the seating of the seal. Only if the mounting is correct, is protection class IP 67 (wall/pipe mounting) or IP 54 (control panel mounting) achieved

5.4 Switching of inductive loads



If you connect an inductive load, i.e. a consumer which uses a coil (e.g. an alpha motorised pump), then you must protect your controller with a protective circuit. If in doubt, consult an electrical technician for advice.

The RC member protective circuit is a simple, but nevertheless very effective, circuit. This circuit is also referred to as a snubber or Boucherot member. It is primarily used to protect switching contacts.

Assembly and installation

When switching off, the connection in series of a resistor and capacitor means that the current can be dissipated in a damped oscillation.

Also when switching on, the resistor acts as a current limiter for the capacitor charging process. The RC member protective circuit is highly suitable for AC voltage supplies.

The magnitude of the resistance R of the RC member is determined according to the following equation:

$$R = U / I_L$$

(Where U = Voltage across the load and I_L = current through the load)

The magnitude of the capacitor is determined using the following equation:

$$C = k * I_L$$

$k = 0, 1 \dots 2$ (dependent on the application).

Only use capacitors of class X2.

Units: R = Ohm; U = Volt; I_L = Ampere;
C = μF



If consumers are connected which have a high starting current (e.g. plug-in, switched mains power supplies), then a means of limiting the starting current must be provided.

The switching-off process can be investigated and documented using an oscilloscope. The voltage peak at the switch contact depends on the selected RC combination.

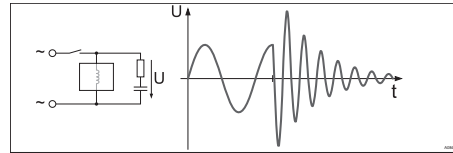


Fig. 17: Switching-off process shown on the oscillogram.

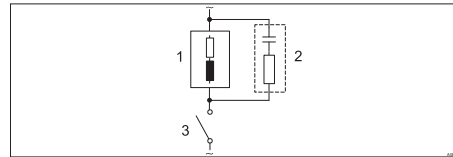


Fig. 18: RC protective circuit for the relay contacts

Typical AC current application with an inductive load:

- 1) Load (e.g. alpha motor-driven pump)
- 2) RC-protective circuit
 - Typical RC protective circuit at 230 V AC:
 - Capacitor [0.22 μF /X2]
 - Resistance [100 Ohm / 1 W] (metal oxide (pulse resistant))
- 3) Relay contact (XR1, XR2, XR3)

6 Commissioning

- **Users' qualification:** trained user, see
 *Chapter 2.2 'Users' qualifications' on page 10*



WARNING!

Sensor run-in periods

This can result in hazardous incorrect metering

- Correct measuring and metering is only possible if the sensor is working perfectly
- Please read the operating manual for the sensor
- The sensor must be calibrated after commissioning

Following completion of mechanical and electrical assembly, the DULCOMETER® Compact Controller should be integrated into the measuring point.

6.1 Initial commissioning

When first switching on the DULCOMETER® Compact Controller the DULCOMETER® Compact Controller is in a STOP state.

Selection of the measurement variable, controller setting and setting of the various, process-dependent, parameters takes place next.  *Chapter 8 'Operating menus for the measured variables pH and ORP' on page 48.*

6.2 Selection of the measured variable

The pH and redox measurement variables are set in the *'INPUT'* menu.



NOTICE!

Reset to factory settings

If you set or switch the measurement variable, all parameters in the controller are reset to the factory settings for the selected measurement variable.

You must then reset all the controller functions.

6.3 Setting the controller during commissioning



NOTICE!

Reset to factory settings

When switching over the metering direction, all actuators in the DULCOMETER® Compact Controller are reset to the factory settings for the selected metering direction.

For safety reasons, all actuators are deactivated. The base load is reset to 0 %. All parameters relating to the actuator, are reset to the factory setting.

Consequently all parameters relating to the actuator, must be reset.

Commissioning

The DULCOMETER® Compact Controller only controls *'one-way'*. Only one position or one negative control variable can be calculated. The direction of the control variable is set in the *'PUMP'* menu. There is no dead zone. In this sense, control cannot be *'switched off'* (except with *'STOP'* or *'PAUSE'*).

The value of the P-proportion of the control (X_p) is specified with the DULCOMETER® Compact Controller in the units of the corresponding measurement variable (e.g. 1.5 pH).

For pure P-control and a separation between the set and actual values, which corresponds to the X_p value, the calculated control variable is +100 % (with the setting *'raise'*) or -100 % (with the setting *'lower'*).

7 Operating diagram

7.1 Overview of equipment/Control elements

- **User qualification:** instructed user, see [Chapter 2.2 'Users' qualifications'](#) on page 10

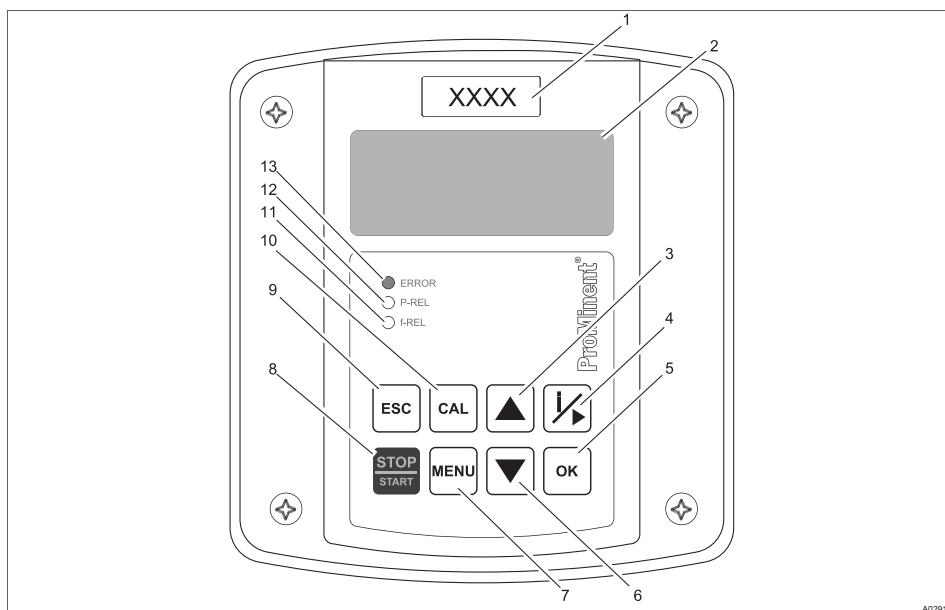


Fig. 19: Overview of equipment/Control elements

Function	Description
1st respective measured variable	Affix the measured variable label here
2. LCD display	
3. UP key	Too increase a displayed number value and to jump upwards in the operating menu
4. INFO/RIGHT key	Opens the info menu or moves the cursor one place to the right

Operating diagram

Function	Description
5. OK key	To apply, confirm or save a displayed value or status or to acknowledge an alarm
6. DOWN key	To decrease a displayed number value and to jump down in the operating menu
7. MENU key	Accesses the controller operating menu
8. STOP/START key	Starts and stops control and metering function
9. ESC key	Jumps a level back in the operating menu, without storage or changing entries or values
10. CAL key	For accessing the calibration menu and navigating within the calibration menu.
11. f-REL LED	Shows the activated state of the f-relay
12. P-REL LED	Shows the activated state of the P-relay
13. ERROR LED	Indicates a controller error state. A text message is displayed simultaneously in the LCD continuous display

7.2 Adjusting display contrast

If the DULCOMETER® Compact Controller is set to '*continuous display*', you can set the contrast of the LCD-display. By pressing the ▲ key you can adjust the LCD display contrast so it is darker. By pressing the ▼ key you can adjust the LCD display contrast so it is lighter. Here each key press represents a contrast level. I.e. the key must be pressed once for each contrast level.

7.3 Continuous display

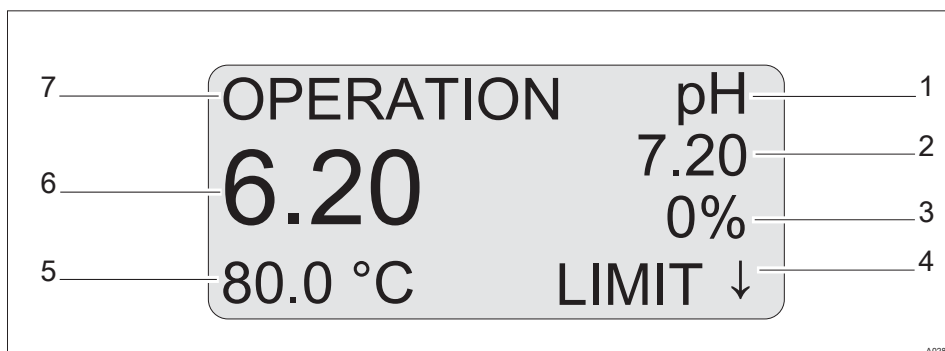


Fig. 20: Continuous display

- | | | | |
|---|--|---|-----------------------------------|
| 1 | Measured variable | 5 | Temperature (Correction variable) |
| 2 | Setpoint | 6 | Measured value (actual value) |
| 3 | Control variable | 7 | Mode |
| 4 | Possible error text: e.g. "Limit ↓"
(Direction of the limit value transgression, e.g. here lower limit value transgression) | | |

7.4 Info display

In the info display, the most important parameters for each menu item of the first menu level are displayed.

Access to the info display from the continuous display is by pressing the  key. Pressing the  key again calls the next info display. Pressing the  key recalls the continuous display again.

Operating diagram

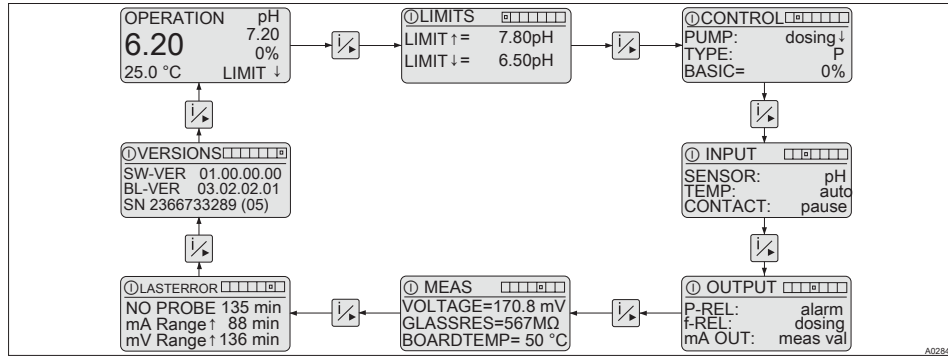


Fig. 21: Info display

Using the **OK** key you can jump from the currently displayed info display directly to the selection menu of this info display.

Using the **ESC** key you can jump back to the info display.

i Info display "MEAS"

The "MEAS" info display shows the following measured values:

- [VOLTAGE]: currently measured sensor mV value
- [GLASSRES]: measured glass resistance of connected pH sensors for media temperatures of 15 °C to 80 °C. The displayed value is only valid when used with ProMinent pH sensors
- [BOARDTEMP]: Current housing interior temperature

7.5 Password

Access to the setting menu can be limited using a password. The DULCOMETER® Compact Controller is supplied with the password '5000'. Using the preset password '5000' the DULCOMETER® Compact Controller is setup so that all menus can be accessed without any limitations.

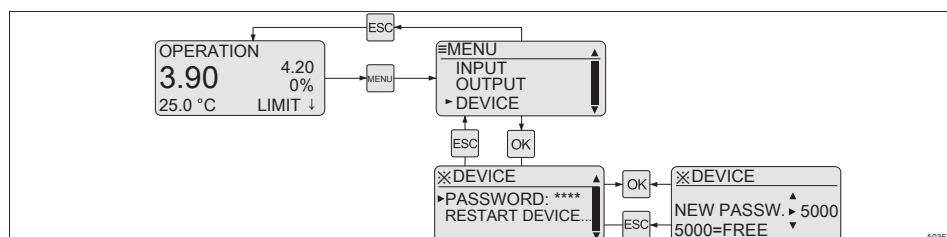


Fig. 22: Password setting

Password	Possible values			
Factory setting	Increment	Lower value	Upper value	Remarks
5000	1	0000	9999	5000 = [FREE]

8 Operating menus for the measured variables pH and ORP

- **User qualification:** instructed user, see ↗ Chapter 2.2 'Users' qualifications' on page 10

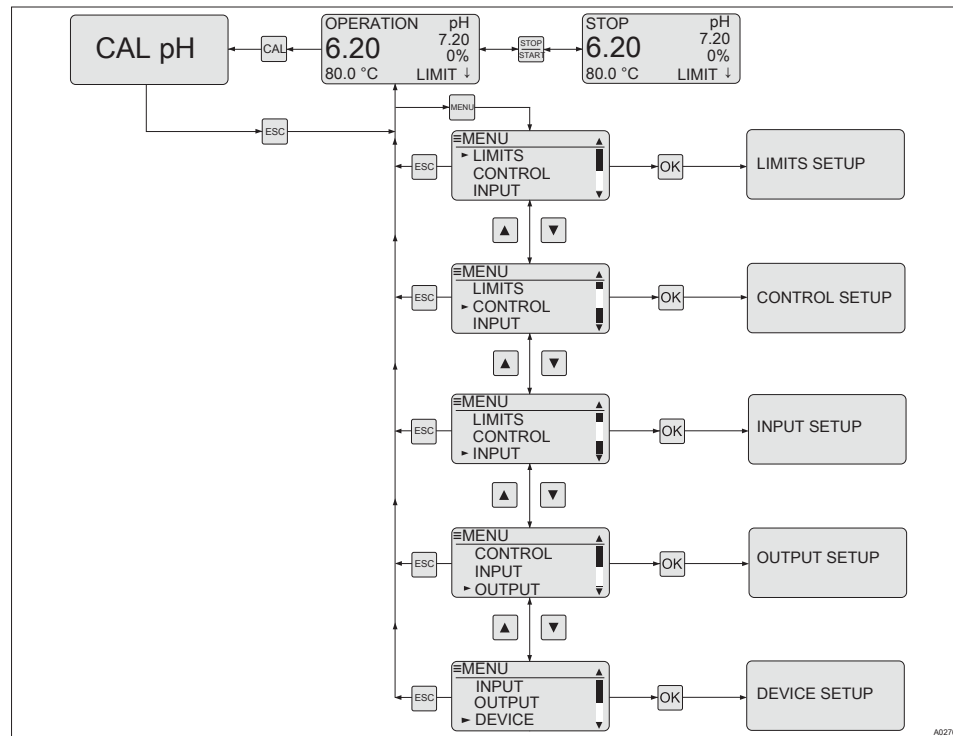


Fig. 23: Operating menu overview

8.1 pH sensor calibration (CAL)

Correct sensor operation

- Correct measuring and metering is only possible if the sensor is working perfectly
- Observe the sensor operating instructions
- The carrying out of a 2-point calibration is strongly recommended and is to be preferred to a single point calibration

Operating menus for the measured variables pH and ORP

During calibration, the DULCOMETER® Compact Controller sets the control outputs to '0'. Exception to this: a basic load or a manual control variable has been set. This remains active. The mA standard signal output is frozen.

When calibration/testing has been completed successfully, all of the error checks relating to the reading are restarted. The DULCOMETER® Compact Controller saves all the determined data for zero point and slope when the calibration is successful.



Used buffer

Dispose of the used buffer solution. Related info: see buffer solution safety data sheet.

Setting	Possible values				Remarks
	Starting value	Increment	Lower value	Upper value	
Buffer temperature	Measured value	0.1 °C	0 °C	120 °C	The temperature can only be adjusted under <i>'TEMP'</i> <i>'auto'</i> or <i>'manual'</i>
Buffer values	Start value = 7.00 pH (ZERO) 4.00 pH (SLOPE)	0.01 pH	0.00 pH	14.00 pH	Limit value ZERO = 6..8 pH Limit value SLOPE = < 6 pH; > 8 pH

Operating menus for the measured variables pH and ORP

2-Point Calibration

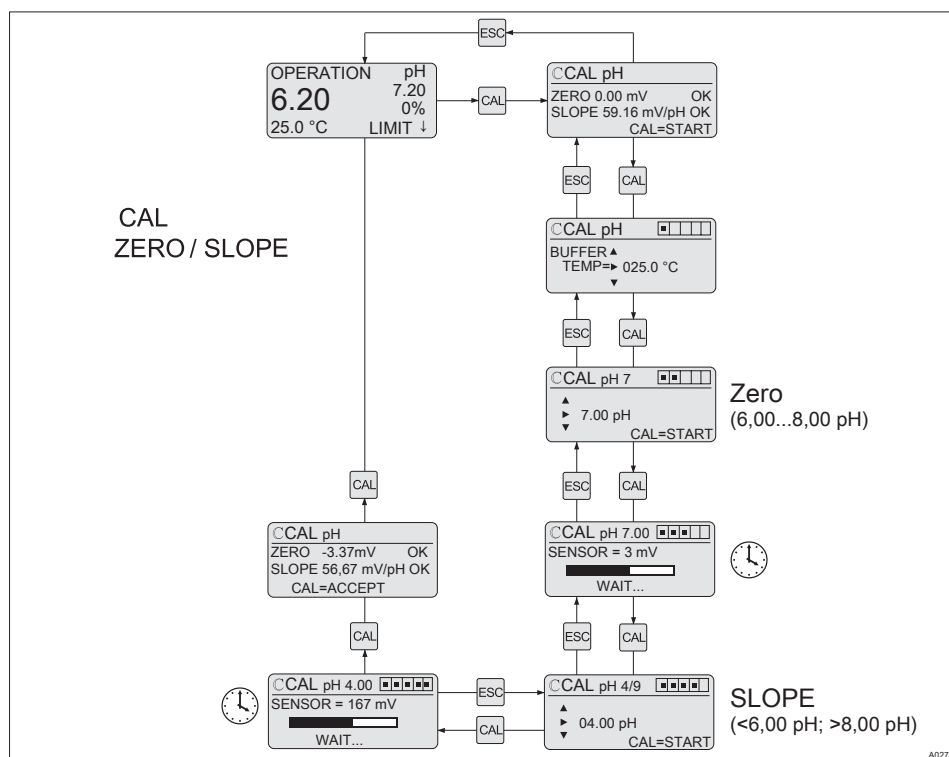


Fig. 24: 2-Point calibration pH sensor



Valid calibration values

Valid calibration:

- Zero point $-60\text{ mV} \dots +60\text{ mV}$
- Slope $40\text{ mV/pH} \dots 65\text{ mV/pH}$

Two test containers with a buffer solution are required for calibration. The pH value of the buffer solutions should be at least 1.5 pH units apart. Thoroughly rinse the sensor with water when changing the buffer solution.

1. Select the calibration menu
2. Start the calibration
3. If temperature has been selected (only if 'TEMP' is set to 'auto' or 'manual'), then set the buffer temperature with the keys , and
4. Confirm the entry by pressing the key
5. Set the pH-value of the buffer 'ZERO' using the keys , and
6. Immerse sensor in the buffer solution containing test container 1 (e.g. pH 7). In so doing, slightly move the sensor
7. Then press
 - ⇒ Calibration is running .
8. Then press to accept the value
 - ⇒ if CAL=ACCEPT is shown in the display and the displayed mV value is stable.
9. Remove the sensor from the buffer solution, rinse thoroughly in water and then dry with a cloth (pad dry, don't rub!)
10. Set the pH-value of the buffer 'SLOPE' using the keys , and
11. Immerse sensor in the buffer solution containing test container 2 (e.g. pH 4). In so doing, slightly move the sensor
12. Then press
 - ⇒ Calibration is running .
13. Then press to accept the value
 - ⇒ if CAL=ACCEPT is shown in the display and the displayed mV value is stable.
14. The determined values for the zero point and slope are displayed

Operating menus for the measured variables pH and ORP

- ⇒ The calibration is now saved as successful if the values for 'ZERO' and 'SLOPE' are both 'OK'.



Incorrect calibration

Should the result of the calibration lie outside the specified tolerance limits, an error message appears 'ERR'. In this case the current calibration will not be applied.

Check the prerequisites for the calibration and clear the error. Then repeat the calibration

- 15.** ➤ Then press  to confirm the result or to terminate the calibration (if necessary, as unsuccessful)

1-Point slope calibration

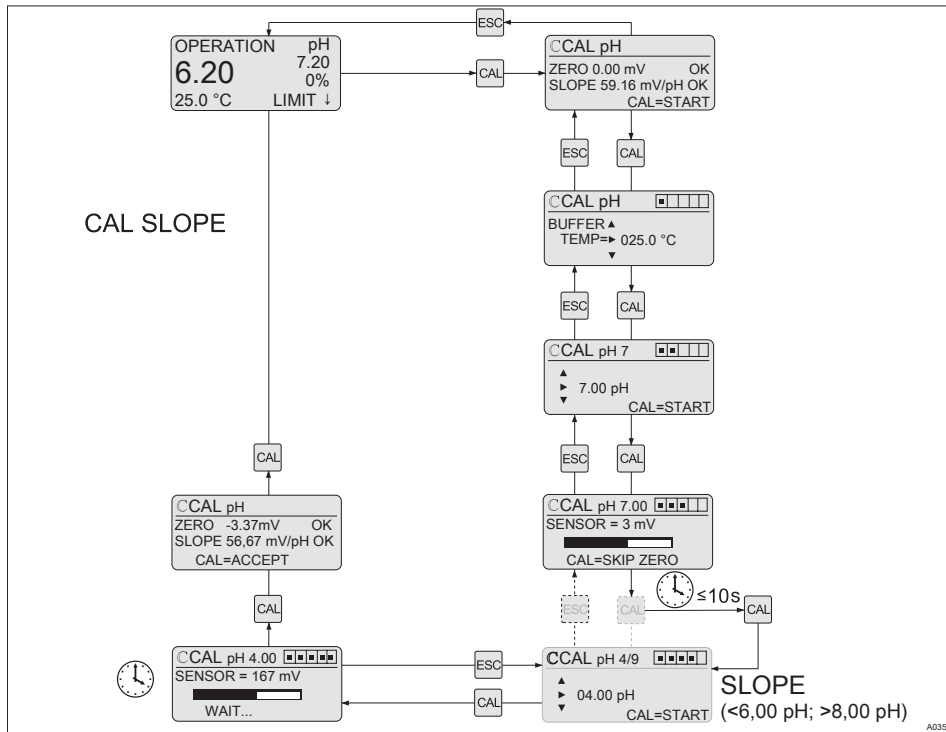


Fig. 25: Single point slope calibration

i *Valid calibration values*

Valid calibration:

- *Slope 40 mV/pH...65 mV/pH*

Valid calibration:

- Slope 40 mV/pH...65 mV/pH

One test container with a buffer solution is required for calibration. Again with the single point calibration the buffer values for 'ZERO' and 'SLOPE' must be at least 1.5 pH units apart. If these buffer values are not recognised, then you must carry out a 2-point calibration.

1.  Select the calibration menu 
2. Start the calibration

Operating menus for the measured variables pH and ORP

3. ➤ If temperature has been selected (only if 'TEMP' is set to 'auto' or 'manual'), then set the buffer temperature with the keys ▲, ▼ and ↵.
4. ➤ Confirm the entry by pressing the OK key or CAL key
5. ➤ Do not set the pH-value of the buffer 'ZERO'. Press the CAL key to confirm and if 'CAL=SKIP ZERO' appears (within no more than 10 s), press the CAL key again
 - ⇒ You have skipped the zero point calibration and are now in the slope calibration screen
6. ➤ Set the pH-value of the buffer 'SLOPE' using the keys ▲, ▼ and ↵.
7. ➤ Immerse sensor in the buffer solution containing test container (e.g. pH 4). In so doing, slightly move the sensor
8. ➤ Then press CAL
 - ⇒ Calibration is running ⌚.
9. ➤ Then press CAL to accept the value
10. ➤ The determined values for the zero point and slope are displayed
 - ⇒ The calibration is now saved as successful if the values for 'ZERO' and 'SLOPE' are both 'OK'.



Incorrect calibration

Should the result of the calibration lie outside the specified tolerance limits, an error message appears 'ERR'. In this case the current calibration will not be applied.

Check the prerequisites for the calibration and clear the error. Then repeat the calibration

11. ➤ Then press CAL to confirm the result or to terminate the calibration (if necessary, as unsuccessful)

Single point zero point calibration

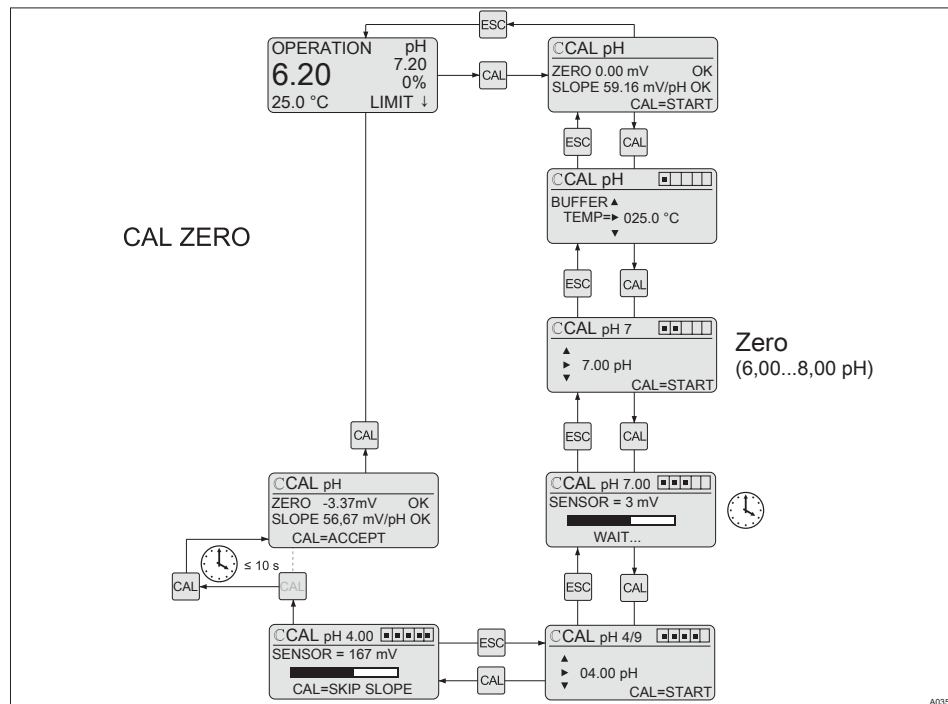


Fig. 26: Single point zero point calibration



Valid calibration values

Valid calibration:

- Zero point -60 mV... +60 mV

One test container with a buffer solution is required for calibration. Again with the single point calibration the buffer values for 'ZERO' and 'SLOPE' must be at least 1.5 pH units apart. If these buffer values are not recognised, then you must carry out a 2-point calibration.

1. Select the calibration menu **CAL**
2. Start the calibration **CAL**

Operating menus for the measured variables pH and ORP

3. ➤ If temperature has been selected (only if 'TEMP' is set to 'auto' or 'manual'), then set the buffer temperature with the keys ,  and .
4. ➤ Confirm the entry by pressing the  key again
5. ➤ Set the pH-value of the buffer 'ZERO' using the keys ,  and .
6. ➤ Immerse sensor in the buffer solution containing test container (e.g. pH 7). In so doing, slightly move the sensor
7. ➤ Then press 
 - ⇒ Calibration is running .
8. ➤ Then press  to accept the value
9. ➤ Do not set the pH-value of the buffer 'SLOPE'. Press the  key to confirm and if 'CAL=SKIP SLOPE' appears (within no more than 10 s), press the  key again
 - ⇒ The calibration is now saved as successful if the values for 'ZERO' and 'SLOPE' are both 'OK'.



Incorrect calibration

Should the result of the calibration lie outside the specified tolerance limits, an error message appears 'ERR'. In this case the current calibration will not be applied.

Check the prerequisites for the calibration and clear the error. Then repeat the calibration

10. ➤ Then press  to confirm the result or to terminate the calibration (if necessary, as unsuccessful)

8.2 Redox sensor calibration (CAL)



Redox sensor calibration

The redox sensor cannot be calibrated. It is only possible to set an 'OFFSET' of the order of ± 40 mV and then make a comparison using this value. Should the redox sensor differ by more than ± 40 mV from the reference value, then it must be checked in accordance with the requirements of the sensor operating instructions.

Operating menus for the measured variables pH and ORP



Correct sensor operation

- Correct measuring and metering is only possible if the sensor is working perfectly
- Observe the sensor operating instructions

During the calibration: the DULCOMETER® Compact Controller sets the control outputs to '0'. Exception to this: a basic load or a manual control variable has been set. This remains active. The mA standard signal output is frozen.



Used buffer

Dispose of the used buffer solution. Related info: see buffer solution safety data sheet.

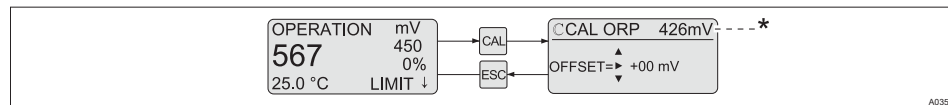


Fig. 27: Redox sensor calibration (CAL) * corrected value

A container with a redox buffer solution (e.g. 465 mV) is needed for testing.

1. Select the Test menu
2. Immerse redox sensor in the redox buffer solution containing test container (e.g. 465 mV)
3. Wait until the mV value has stabilised
4. Adjust the displayed mV values using the keys , and to the mV value of the redox buffer solution in the test container. Confirm the value by pressing . The OFFSET value is transferred into the measuring parameters
 - ⇒ quits the test menu without transferring the OFFSET value into the measuring parameters.
5. If the redox sensor is unclean or defective, it must be cleaned as described in the redox sensor operating instructions, or alternatively replaced

8.3 Setting limit values [LIMITS]

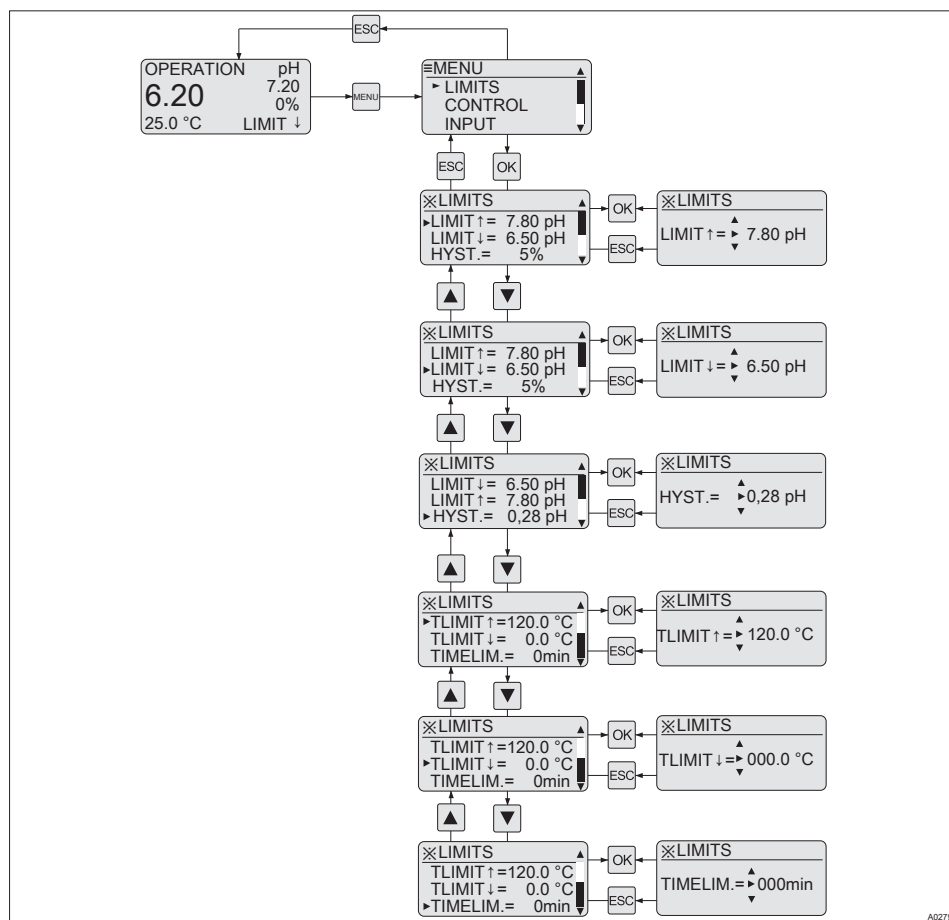


Fig. 28: Setting limit values [LIMITS]

Operating menus for the measured variables pH and ORP

Setting		Possible values			
Display	Starting value	Increment	Lower value	Upper value	Remark
[LIMIT ↑ pH]	8.50 pH	0.01 pH	0.00	14.00	upper pH limit value
[LIMIT ↓ pH]	6.50 pH	0.01 pH	0.00	14.00	lower pH limit value
[LIMIT ↑ ORP]	800	1 mV	-1000 mV	1000 mV	upper ORP limit value
[LIMIT ↓ ORP]	600	1 mV	-1000 mV	1000 mV	lower ORP limit value
[HYST.]	0.28 pH	0.01 pH	0.00	14.00	hysteresis for pH
	20 mV	1 mV	-1000 mV	1000 mV	hysteresis for ORP
[TLIMIT ↑ °C]	120.0 °C	0.1 °C	0.0 °C	120.0 °C	upper limit correction value °C
[TLIMIT ↓ °C]	0.0 °C	0.1 °C	0.0 °C	120.0 °C	lower limit correction value °C
[TLIMIT ↑ °F]	248.0 °F	0.1 °F	32.0 °F	248.0 °F	upper limit correction value °F
[TLIMIT ↓ °F]	32.0 °F	0.1 °F	32.0 °F	248.0 °F	lower limit correction value °F
[TIMELIM.]	0 min = OFF	1 minute	0	999	Checktime after a limit value has been exceeded or undershot pH / ORP

Hysteresis = [HYST.]

If the value has fallen below a limit value, then the limit value criteria are reset when the measured value has reached the value of the limit value plus hysteresis.

If the value has fallen below a limit value, then the limit value criteria are reset when the measured value has reached the value of the limit value minus hysteresis.

If the limit value criteria no longer exist on expiry of [TIMELIM], then the control is automatically reactivated.

8.4 Setting the control [CONTROL]

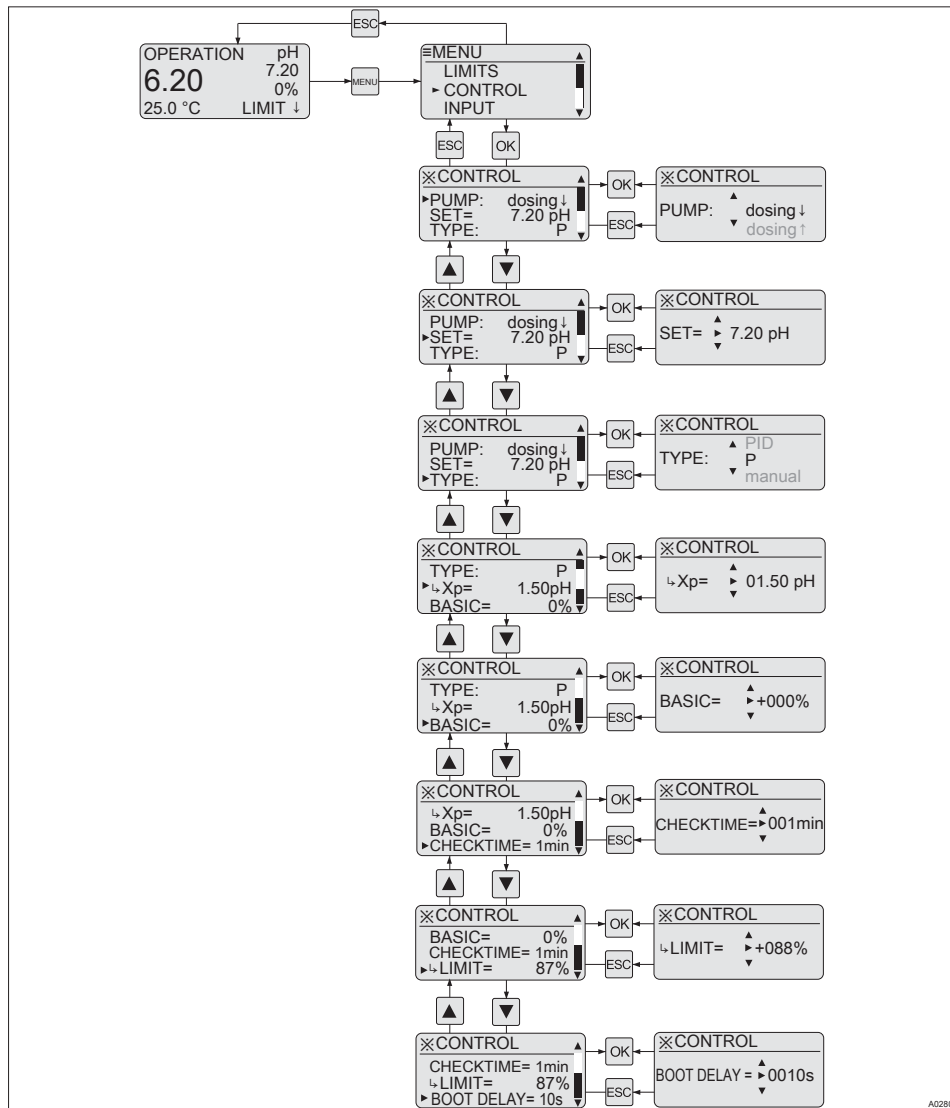


Fig. 29: Setting the control [CONTROL]

Operating menus for the measured variables pH and ORP

Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remark
[PUMP]	dosing ↓	dosing ↓ dosing ↑			Mono-directional control direction ²
[SET]	7.20 pH	0.01 pH	0.00 pH	14.00 pH	pH setpoint
[SET]	750 mV	1 mV	-1000 mV	1000 mV	ORP voltage setpoint
[TYPE]	P	P Manual PID			Controller type
[↪Xp]	1.50 pH	0.01 pH	0.01 pH	70.00 pH	P-proportion of the pH control variable
[↪Xp]	100 mV	1 mV	1 mV	3000 mV	P-proportion of the ORP control variable
[↪Ti]	0 s	1 s	0 s	9999 s	PID control integral action time (0 seconds = no I-proportion)
[↪Td]	0 s	1 s	0 s	2500 s	PID control derivative action time (0 seconds = no D-proportion)
[BASIC] ¹	0%	1%	- 100%	100%	Basic load
[↪MANUAL] ¹	0%	1%	- 100%	100%	Manual control value
[CHECK-TIME]	0 min	1 min	0 min	999 min	Control checktime 0 minutes = off

Operating menus for the measured variables pH and ORP

Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remark
[↗LIMIT] ¹	0%	1%	- 100%	100%	Checktime limit. No basic load, only PID control value
[BOOT DELAY]	0 s	1 s	0 s	9999 s	Control delay period after the start of the measuring point. After it is switched on, the unit only measures but does not control during this period.

1 = in an upwards direction with mono-directional control: 0 .. +100% (setting with PUMP: dosing ↑), in a downwards direction: -100..0% (setting with PUMP: dosing ↓).

2 = When switching over the metering direction, all actuators in the DULCOMETER® Compact Controller are reset to the factory settings for the selected metering direction.

8.5 Input setting (INPUT)

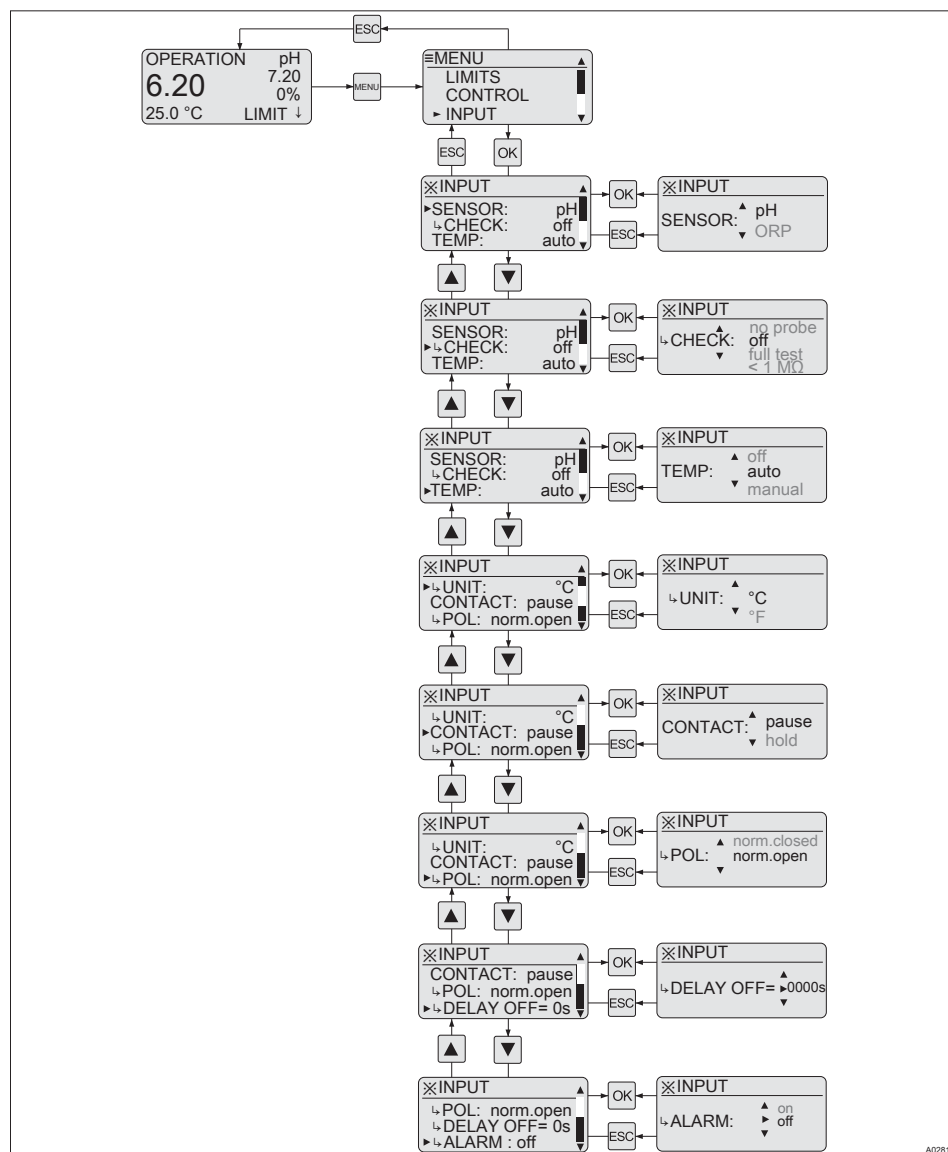


Fig. 30: Input setting (INPUT)

Operating menus for the measured variables pH and ORP

Setting		Possible values			
Display	Starting value	Increment	Lower value	Upper value	Remarks
Sensor	pH	pH			Process variables switchover pH <--> redox ¹ .
		ORP			
↳CHECK	off	off			Sensor monitoring 'off'
		< 1 MΩ			Sensor break check (glass break)
		no probe			Check for presence
		full test			Check for sensor break and presence
TEMP	off	auto			Pt 1000
		manual			manual
		off			Correction off
↳UNIT	°C	°C			Correction variable unit
		°F			
↳VALUE	25.0 °C	0.1 °C	0.0 °C	120.0 °C	Manual correction variable °C
↳VALUE	77.0 °F	0.1 °F	32 °F	248 °F	Manual correction variable °F
CONTACT	pause	pause			Configuration digital contact input
		hold			
↳POL	norm.open	norm.open			Polarity of the contact input
		norm.close d			
1. Attention: If this setting is changed, all parameters are reset to the corresponding factory settings					

Operating menus for the measured variables pH and ORP

Setting		Possible values			
Display	Starting value	Increment	Lower value	Upper value	Remarks
↳ DELAY OFF	0 s	1 s	0 s	1000 s	Contact input switch-off delay. Switching off of the contact input is delayed by this period.
↳ ALARM	OFF	ON			Switch on and off use of the alarm relay 'PAUSE/HOLD'
		OFF			
1. Attention: If this setting is changed, all parameters are reset to the corresponding factory settings					

↳ **CHECK** = With configured pH measured variables, it is possible to monitor a sensor connected to the potentiometric input for fault states. This check is disabled as standard.

Monitoring for sensor breakage: The sensor breakage check (glass breakage) identifies a defective sensor due to its low internal resistance. Correctly functioning pH sensors have very high resistances with internal resistances in the high MΩ range. The DULCOMETER® Compact Controller is capable of recognising broken sensors from their internal resistance. This function should be deactivated if very low resistance sensors are used.

Check for presence: The "Presence check" identifies a disconnected sensor or a broken cable. This function should be disabled if pH sensors are used which have a high internal resistance across their entire operating range.

8.6 Output setting (OUTPUT)

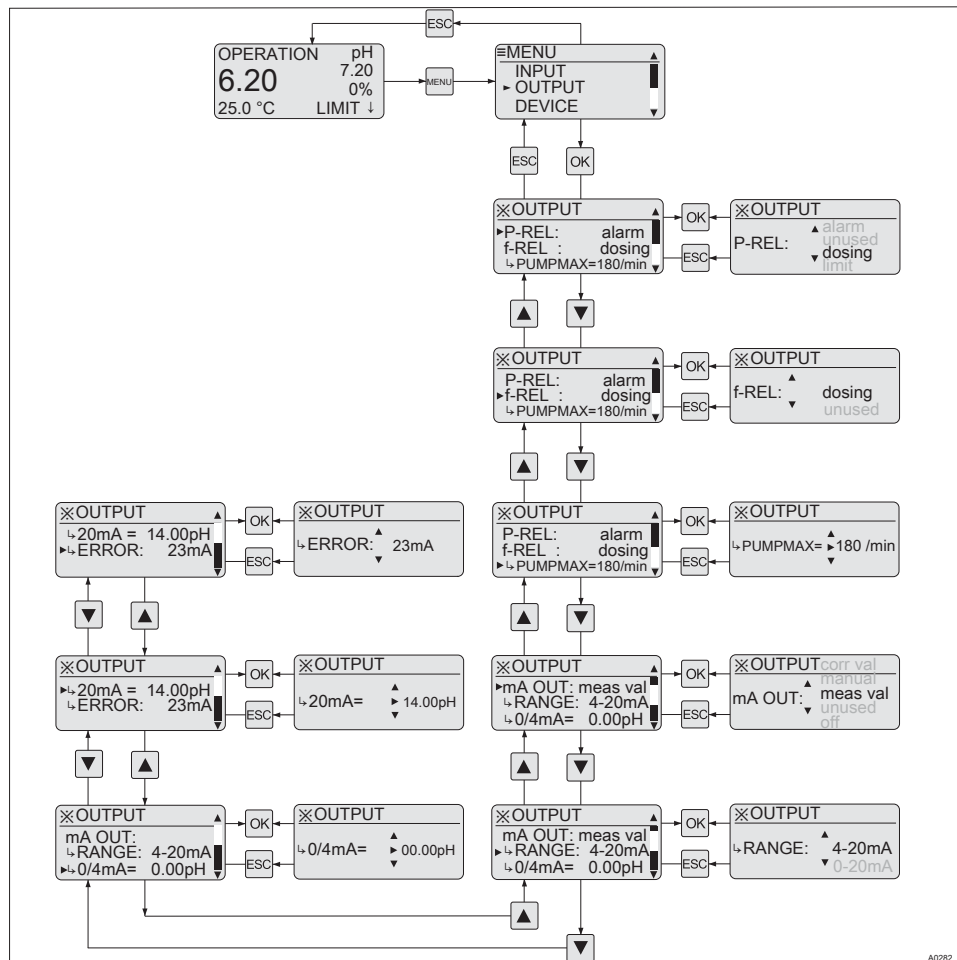


Fig. 31: Output setting (OUTPUT)

Operating menus for the measured variables pH and ORP

Setting		Possible values			
	Starting value	Increment	Lower value	Upper value	Remarks
P-REL (Power relay)	alarm	alarm			Alarm relay
		unused			off
		dosing			PWM relay
		limit			Limit relay
↳PERIOD	60 s	1 s	30 s	6000 s	Cycle time of the PWM control (P-REL = dosing)
↳MIN ON ¹	10 s	1 s	5 s	PERIOD/4 or 999	Minimum switch on period using PWM control (P-REL = dosing)
↳DELAY ON	0 s	1 s	0 s	9999 s	Switch-on delay limit value relay (P-REL = limit)
↳DELAY OFF	0 s	1 s	0 s	9999 s	Switch-off delay limit value relay (P-REL = limit)
f-REL	dosing	dosing			Activation of the low power relay (frequency relay)
		unused			