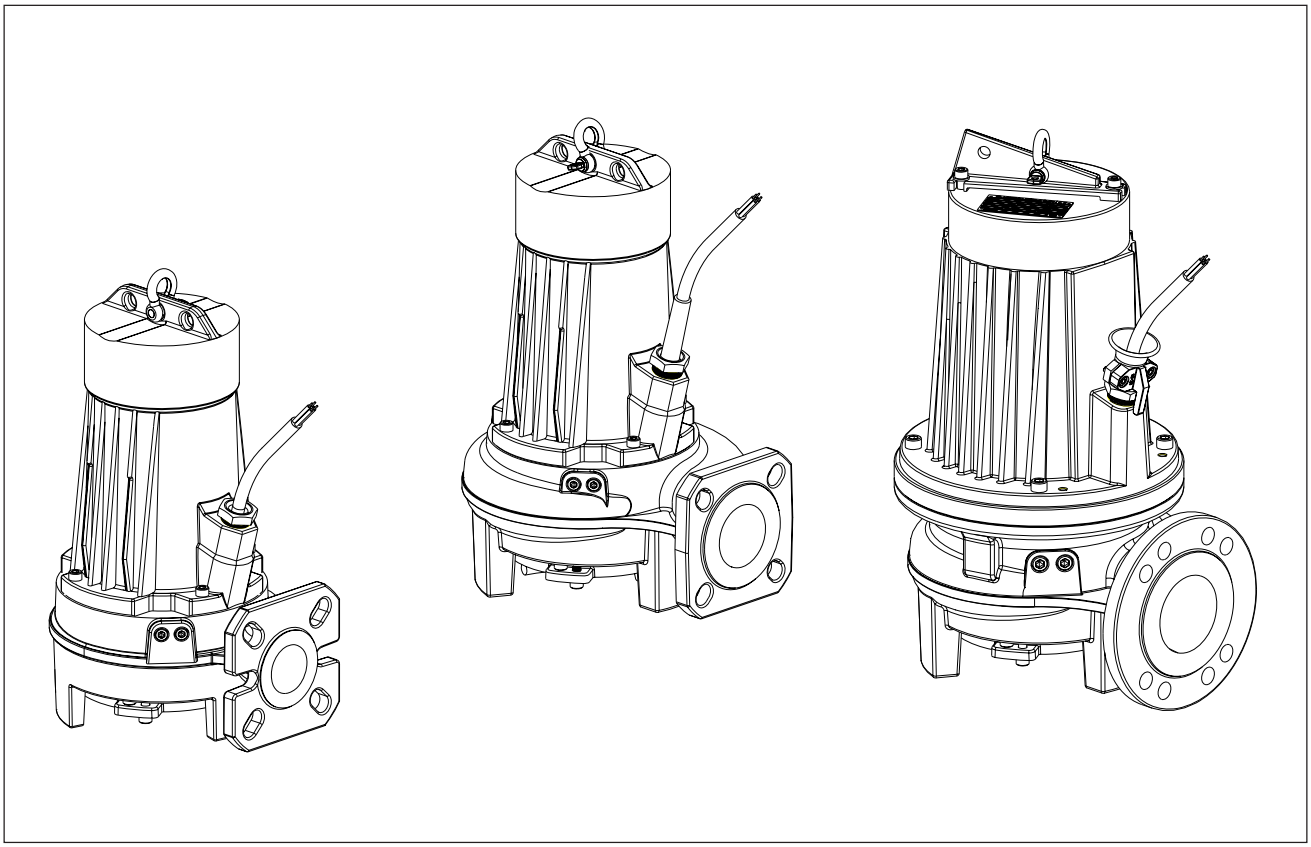
ROBOT PUMPS

OPERATION
&
MAINTENANCE MANUAL

RC-SERIES



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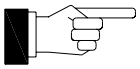
3. SAFETY AND ENVIRONMENT

3.1 Symbols

* In this manual

General warning
Danger !

Electrical hazard !



Attention !

* On the pump

Danger of physical injury
Rotating parts !

Electrical hazard !

EC-conformity symbol

3.2 General safety instructions

* Only trained and authorized personnel may install and maintain the pump after carefully reading this manual.

* Only use the pump for its intended purpose and under the regulated circumstances.

* Don't go near rotating parts.

* Clean the pump before maintenance and inspection.

* Observe the local regulations when working with agressive, corrossive, toxic, flammable and explosive chemicals.

* Never remove safety signs, keep them clean.

* Always connect to a grounded circuit.

* Before maintenance and inspection always disconnect the pump from the mains.

* Use a proper hoist for lifting and handling the pump.

* Do not leave a large loop of cable in the sump, as the pump may eventually damage it.

* Never drop the loose cable end in water.

3.3 Environment

Parts which are replaced during repair, maintenance or renewal, could contain materials which could be harmful to the environment.
Please take care in the disposal of these parts.
Do this in accordance with the local environmental regulations.

4. TECHNICAL DATA

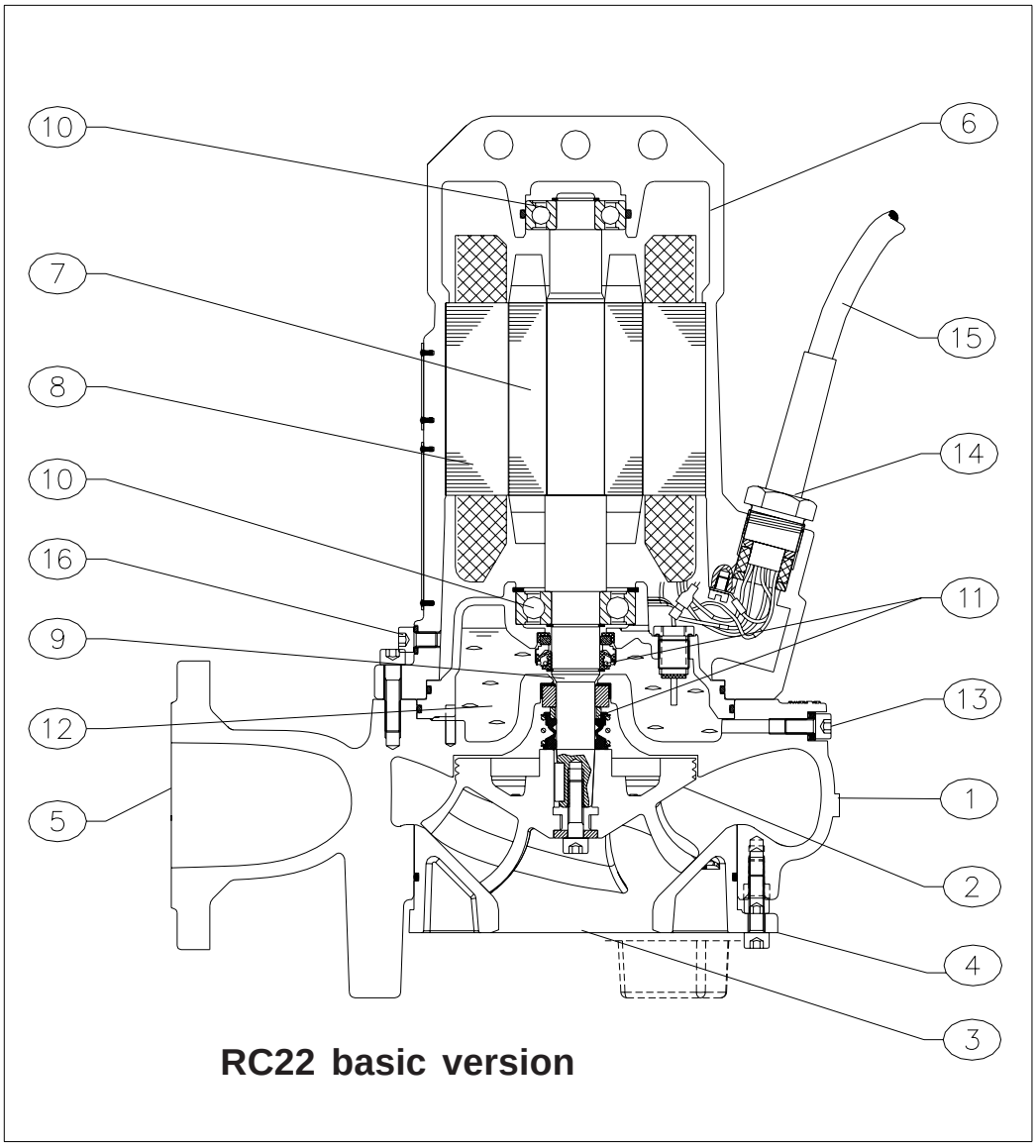
4.1 General

The RC-pump is a cast iron channel impeller pump designed with a large free passage and a high head. The pump is suitable for efficient transport of lightly contaminated water.

Construction:

- High efficiency motor, standard class F insulation (up to 155 °C).
- Two independent mechanical seals, running in oil, form an effective barrier between pump and motor.
- Heavy duty bearings, greased for life.
- Open channel impeller with a large free passage.

4.2 Main parts



RC22 basic version

1 Pumpcasing
2 Impeller
3 Suction
4 Suction cover
5 Delivery
6 Motorcasing
7 Rotor
8 Stator
9 Shaft
10 Bearings
11 Mechanical seal (2x)
12 Oil reservoir
13 Oil plug
14 Cable entry
15 Cable
16 Inspection plug

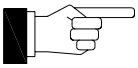
Fig. 4.1

5. FIRST PUMSTART

After unpacking the pump, carry out the following check points:

5.1 Delivery-check

Check for possible transport damage and especially check that the cable has not been nicked or damaged.



Check for complete delivery.

When the delivery is incomplete or damaged, please contact your dealer immediately.

5.2 Oil level

Check the oil level. (see 7.5)

5.3 Power supply

Before making the electrical connections, check if the line voltage and frequency are the same as on the pump dataplate.
If thermostats are supplied make sure that they are correctly connected.
For examples of electrical diagrams and pump cable coding, see appendix 2, 3 and 4.

5.4 Thermoswitches

Check if the pump is equipped with thermoswitches (optional).
Contact rating: max. 250V-1.6A
The contacts are normally closed.

5.5 Cable entry

Especially when the pump has been in store for a long time, the cable gland should be checked and if necessary tightened (see 7.4).

5.6 Motor protection

The pump should always be connected to the line by means of a suitable motor protection circuitbreaker.
If the pump is started direct on line (DOL), the protection breaker should be set to the current, as given on the dataplate.
For star delta start (YD), it is good practice to install the overcurrent relay directly after the main contactor. In this case, the pump is also adequately protected in star-connection. The maximum setting of the overcurrent relay is 0.6x the current as given on the dataplate.
It is good practice to set the protection breaker at a 10% lower current, because all breakers require at least 110% of the adjusted current before tripping.

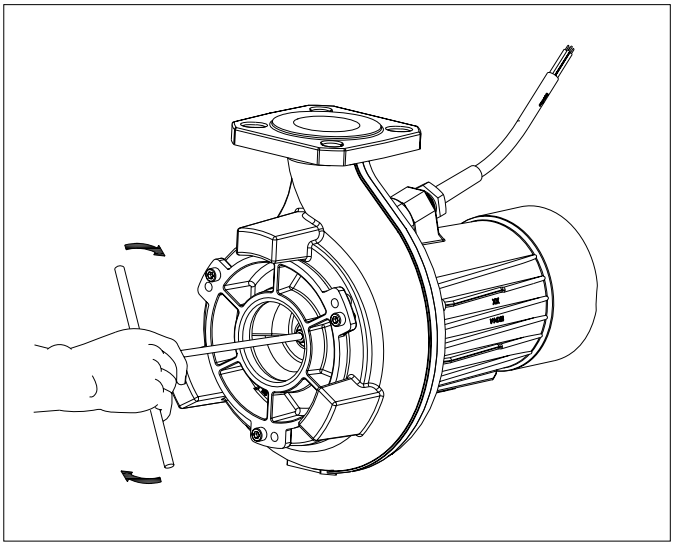


Fig. 5.1

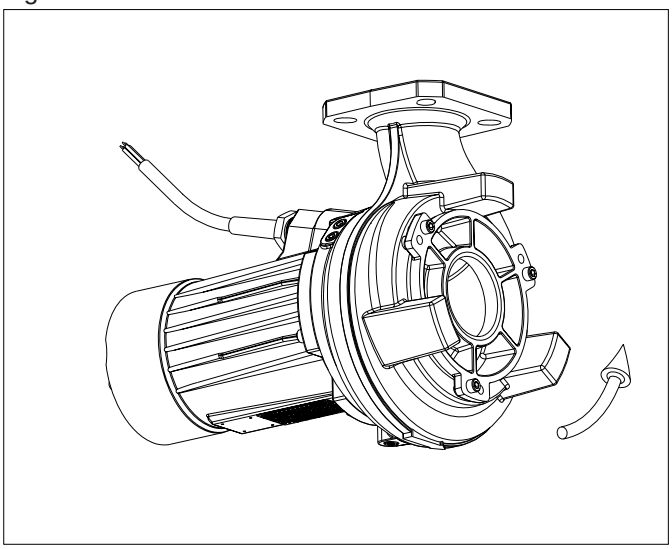


Fig. 5.2

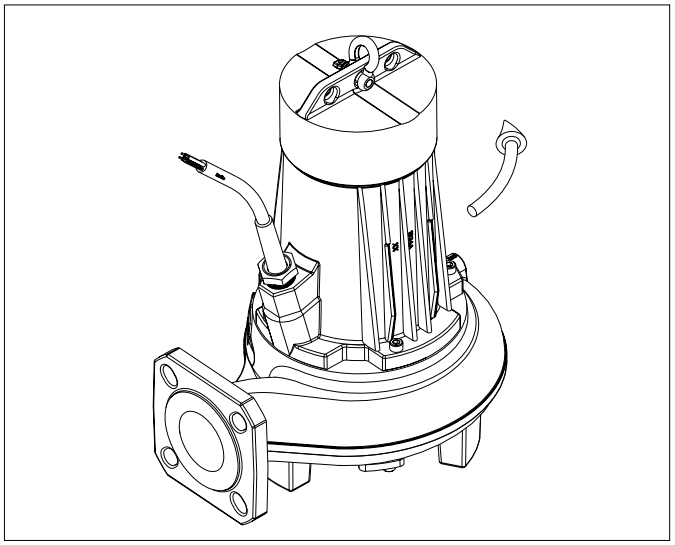


Fig. 5.3

5.7 Motor check

If in doubt about the condition of the motor or cable, Megger test motorwindings against grounding wire. The phase resistance against grounding wire should be at least 1 MOhm.

Turn the impeller clockwise by hand, using a proper socket wrench (see fig.5.1)
This should be possible without much force.
With this procedure sticking mechanical seal surfaces will be loosened smoothly.

5.8 Installation parts

Check if all components for your installation are delivered. See also chapter 6.

5.9 Direction of rotation

A correct direction of rotation is essential for proper operation. This can be checked as follows:

- Put the pump in horizontal position and start the pump.
  Looking on the impeller through the suction opening, the correct direction of rotation is counter-clockwise
  (See arrow on pumpcasing, Fig. 5.2).

or:

- Starting the pump will give a recoil on the pump frame.
  Looking at the motor (in vertical position see Fig. 5.3), the recoil is counter-clockwise.

Take care !
The recoil can be very powerful !
Don't go near rotating parts !

5.10 Current-check

Note the max. current from the dataplate.
Apply an ammeter to one of the phase wires during normal operation. Check that the current is not higher than the value on the dataplate. (see appendix 1). If so check for:

- voltage (too low ?)
- specific gravity or viscosity of the fluid (too high ?)
- blocked impeller ?
- direction of rotation correct ?

If the problem cannot be solved contact your dealer.

5.11 Medium temp. / max.motorload

When the medium temperature is higher than 40°C, the maximum motorload must be reduced.
The relationship between medium temperature and maximum absorbed motor current is shown below.
Check the reading of the dataplate against the reading of an Ammeter.
If the motor current exceeds the max. motorcurrent from the table below the pump is not suitable or the motorcurrent must be reduced.
The motorcurrent can be reduced by installing a smaller impeller. Contact your dealer.

Temperature		Max.motorcurrent
°C	°F	%
40	104	100
50	122	95
60	144	90
70	158	80
80	176	70

5.12 Start frequency

When the pump is controlled by level regulators, the on and off levels should be adjusted in such a way, that the pump does not do more than 20 starts an hour.

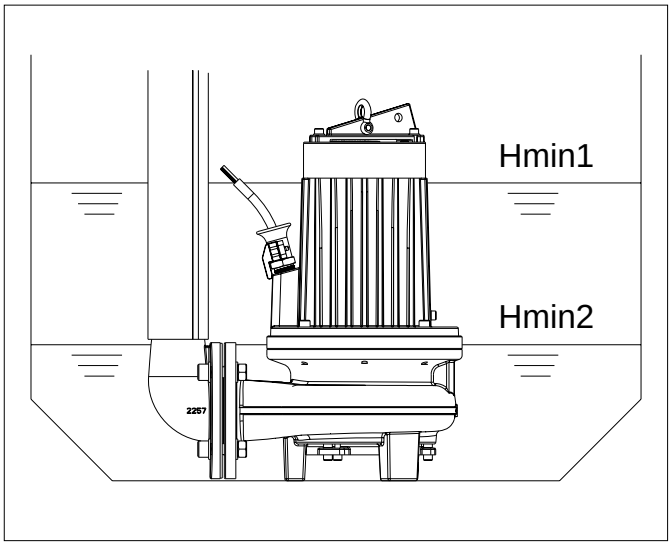


Fig. 5.4

5.13 Min. and max. submersion depth

The motorhousing should be at least 2/3 submerged for continuous operation at full load (see Hmin.1 Fig. 5.4).
It is good practice, whenever possible to keep the motorhousing completely under water.

For interrupted level controlled operation, less cooling is required.
We recommend not to run the pump with the water level below the top of the volute in order to avoid air being drawn in (see Hmin.2 Fig. 5.4).
Air in the discharge pipes might impair performance.

The maximum submersion depth is 20m / 60ft.

6. INSTALLATION OPTIONS

For the submersible pump the following installations are possible:

-H Stationary wet installation with a header coupling type HK.
-V Stationary wet installation with a guide bar quick release coupling type V.
-F Freestanding wet installation.
-T Transportable wet installation.

6.1 INSTALLATION - H

Stationary wet installation with a ROBOT quick-release header coupling type HK.
A flexible hose connects pump and coupling.

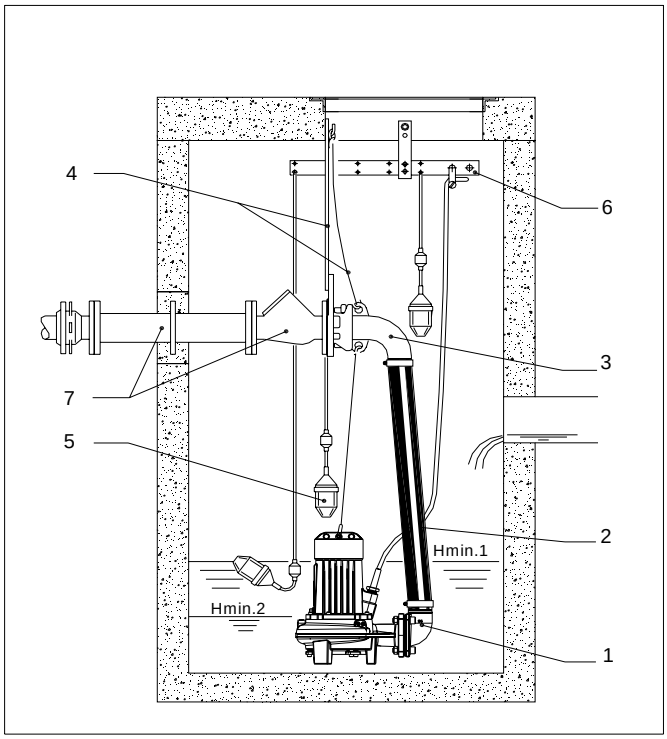


Fig. 6.1

Except for the pump the following components are necessary:

1. Hose connection, which is fastened to the pump;
2. Flexible hose, between pump and coupling;
3. Header coupling, consisting of coupling bend, rubber joint and a fixed coupling part;
4. Suspension bracket and chain, for lifting the pump;
5. Level regulators for start-, stop- and alarm-signals;
6. Suspension for level regulators and power supply cable;
7. Piping, non return valve, bends etc.

Checkpoints before operating:

- Ensure a good free passage beneath the suction opening of the pump (at least the same as the suction diameter).
- Adjust the start- and stop levels in such a way that the motor does not make more than 20 starts per hour.
- Check that the motor is adequately cooled. The motorhousing should be at least 2/3 submerged for continuous operation at full load (see Hmin.1 Fig. 6.1).

It is good practice, whenever possible to keep the motorhousing completely under water.

For interrupted level controlled operation, less cooling is required. We recommend not to run the pump with the water level below the top of the volute in order to avoid air being drawn in (see Hmin.2 Fig. 6.1).
Air in the discharge pipes might impair performance.

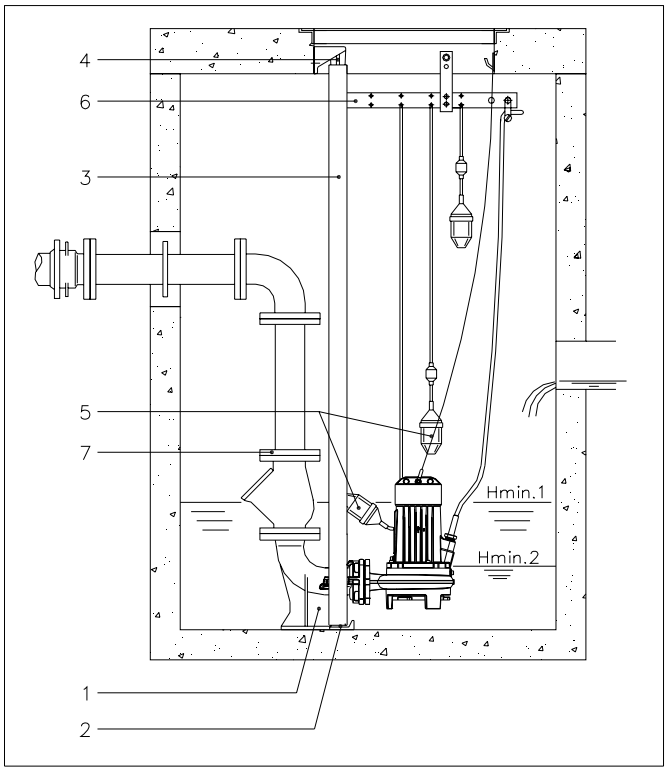


Fig. 6.2

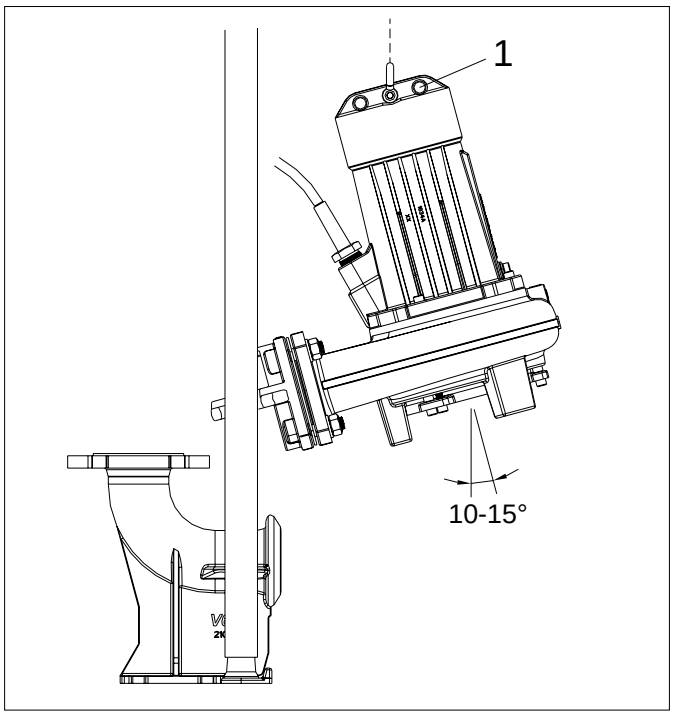


Fig. 6.3

6.2 INSTALLATION -V

Stationary wet installation with a ROBOT quick-release guide bar coupling type -V. The pump is automatically coupled to the discharge.

Except for the pump the following components are necessary:

1. Bottom elbow, rubber joint and coupling adapter;
2. Guide bar foundation plate;
3. Two guide bars;
4. Top bracket, mounted within the well cover clearance;
5. Level regulators for start-, stop- and alarm signals;
6. Suspension for level regulators and power supply cables;
7. Piping, non return valve, discharge bends etc.

Checkpoints before operating:

- The guide bars must stand vertical (maximum tolerance 3°).
- The installation angle should be : 10-15° (see Fig. 6.3). If necessary, this angle can be changed by alteration of the position of the lifting hook on the suspension bracket on top of the motor (pos. 1).
- Adjust the start and stoplevels in such a way that the motor does not make more than 20 starts per hour.
- Check that the motor is adequately cooled. The motorhousing should be at least 2/3 submerged for continuous operation at full load (see Hmin.1 Fig. 6.2).

It is good practice, whenever possible to keep the motorhousing completely under water.
For interrupted level controlled operation, less cooling is required. We recommend not to run the pump with the water level below the top of the volute in order to avoid air being drawn in (see Hmin.2 Fig. 6.3).
Air in the discharge pipes might impair performance.

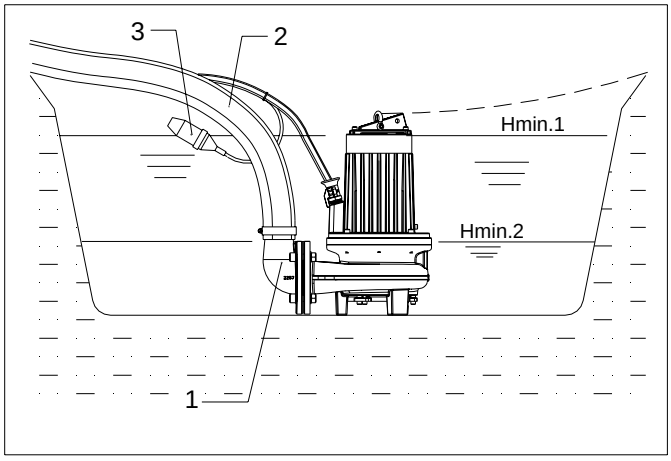


Fig. 6.4

6.3 INSTALLATION - F

Freestanding: semi-permanent fixed wet installation.

Except for the pump the following components are necessary:

1. Hose or threaded connection, which is fastened to the pump;
2. Flexible hose or pipe;
3. Pump support;
4. Level regulators.

Checkpoints before operating:

- Adjust the start- and stoplevels in such a way that the motor does not make more than 20 starts per hour.
- Check that the motor is adequately cooled. The motorhousing should be at least 2/3 submerged for continuous operation at full load (see Hmin.1 Fig. 6.4).

It is good practice, whenever possible to keep the motorhousing completely under water.

For interrupted level controlled operation, less cooling is required. We recommend not to run the pump with the water level below the top of the volute in order to avoid air being drawn in (see Hmin.2 Fig. 6.4).
Air in the discharge pipes might impair performance.

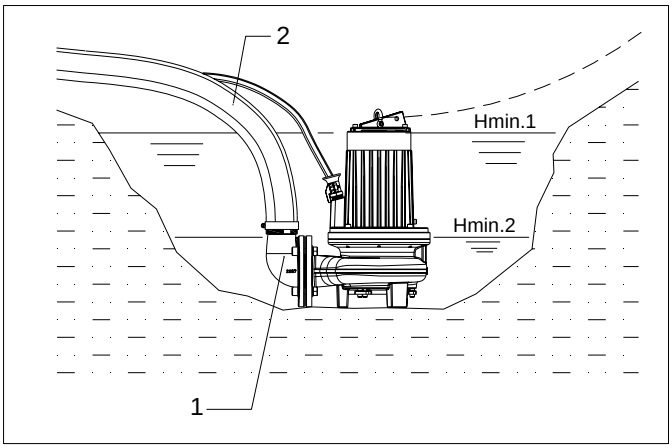


Fig. 6.5

6.4 INSTALLATION - T

Transportable wet installation.

Except for the pump the following components are necessary:

1. Hose connection, which is fastened to the pump;
2. Flexible hose;
3. Pump support.

Checkpoints before operating:

- Do not let the pump bury itself in the mud.
- Do not leave a large loop of the cable in the sump, as the pump may eventually damage it.
- Check that the motor is adequately cooled. The motorhousing should be at least 2/3 submerged for continuous operation at full load (see Hmin.1 Fig. 6.5).

It is good practice, whenever possible to keep the motorhousing completely under water.

For interrupted level controlled operation, less cooling is required. We recommend not to run the pump with the water level below the top of the volute in order to avoid air being drawn in (see Hmin.2 Fig. 6.5).
Air in the discharge pipes might impair performance.

7. MAINTENANCE

7.1 General

Always disconnect the pump from the mains before inspection or disassembly.

Clean the pump thoroughly.

The motor housing can be hot when the pump is just switched off.

7.2 Maintenance schedule

* After the first 100 running hours:
- Check the oil level (see chapter 7.5). If there is more than a few drops of water in it, contact your dealer.

* Every year or 1000 running hours:
- Check the oil and oil level (see chapter 7.5). If there is more than a few cm3 water in it, contact your dealer.

- Refresh the oil every year or when it is no longer transparent. (see chapter 7.6)

7.3 Lubricants

* The bearings are greased for life and need no refill.

* The oil reservoir is filled with ExxonMobil Marcol 152
Viscosity: 32 cSt.
When another kind of oil is used this is marked on a label on the pump.

Oil quantities:

RC 22: 0.5 L.
RC 41: 1.6 L.

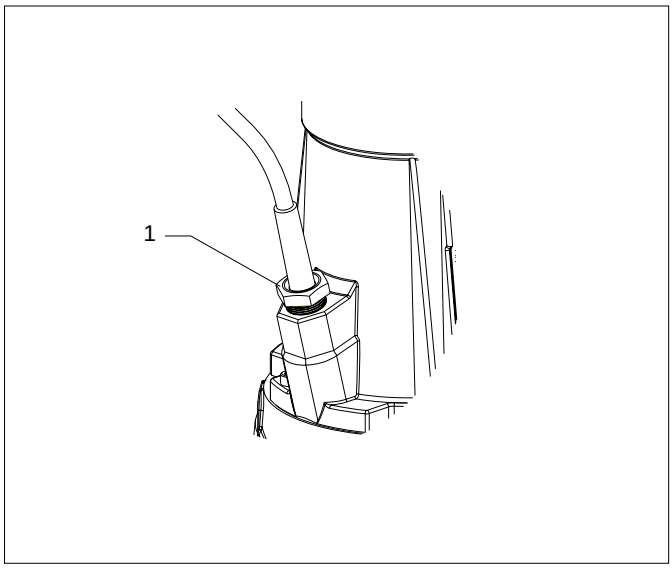


Fig. 7.1

7.4 Cable entry

Especially when the pump has been in use for a long time, the compression of the rubber cable seal might be deminished, which can cause leakage. By screwing-in the cable entry the seal will be retentioned.

7.4.1 Cable entry without cable clamp

See fig. 7.1

Turn the hexagon head of the entry (1) for 1/6 of a turn clockwise using the right tool.

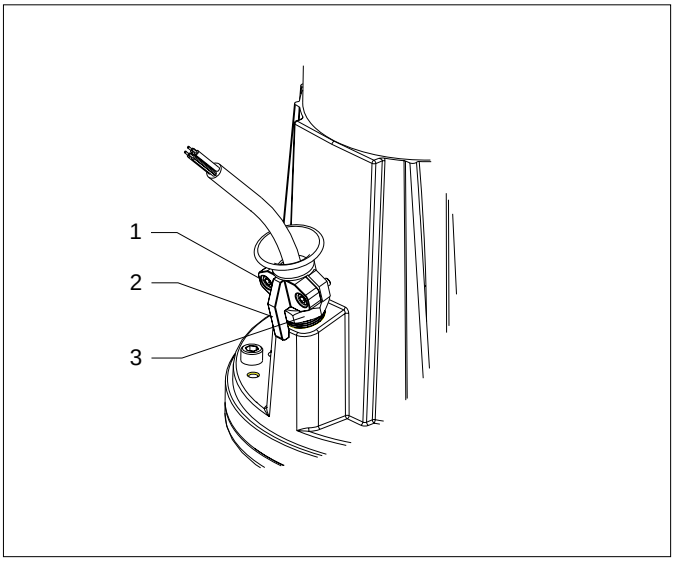


Fig. 7.2

7.4.2 Cable entry with cable clamp

See fig. 7.2

Unscrew the 2 hexagon socket screws (1).
Remove the cable clamp (2).
Turn the hexagon head of the entry (3) clockwise, using the right tool, so far that it is possible to replace the cable clamp again.
Screw-in the 2 hexagon socket screws (1).

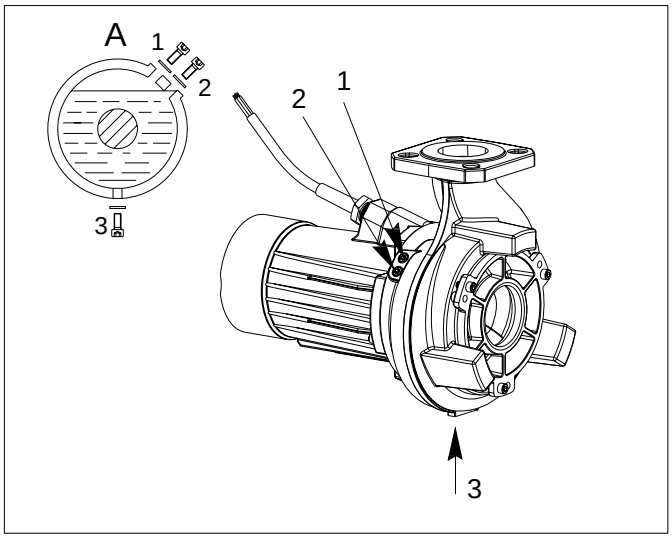


Fig. 7.3

7.5 Oil level

Put the pump in a horizontal position so that the 2 hexagonal socket screws are on top (see fig.7.3).
Unscrew the level plug (1) and the vent plug (2).

The oil level should be at the lower side of the openings (see drawing).
By turning the pump a bit this should be visible.
If not so fill up to the right level.

Always use the right kind of oil !

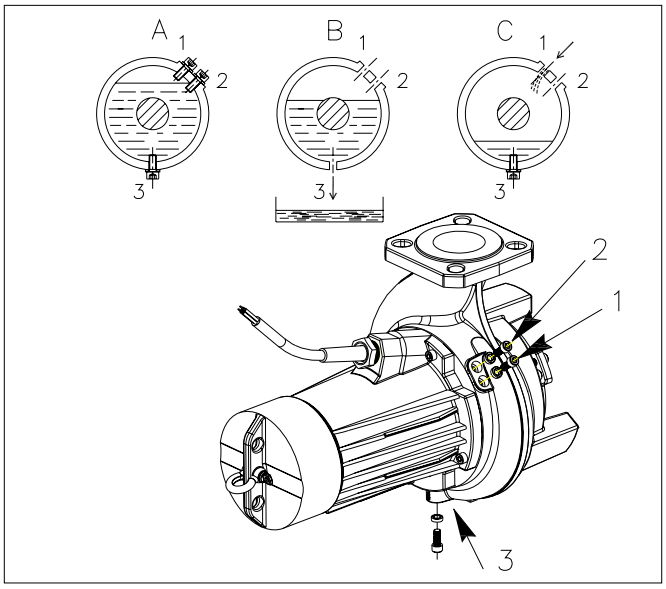


Fig. 7.4

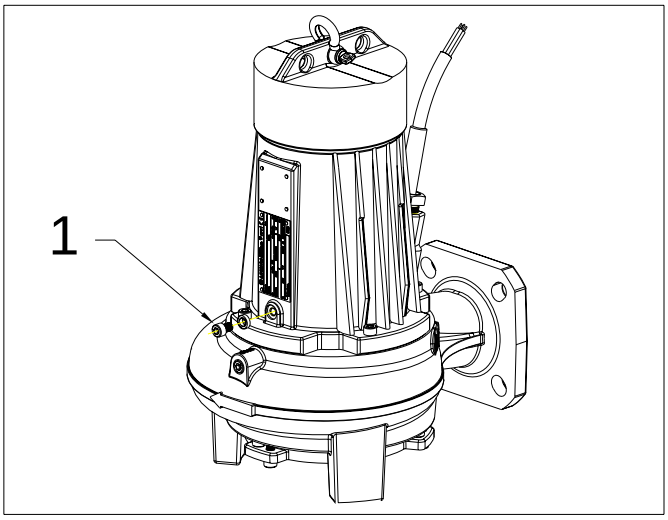


Fig. 7.5

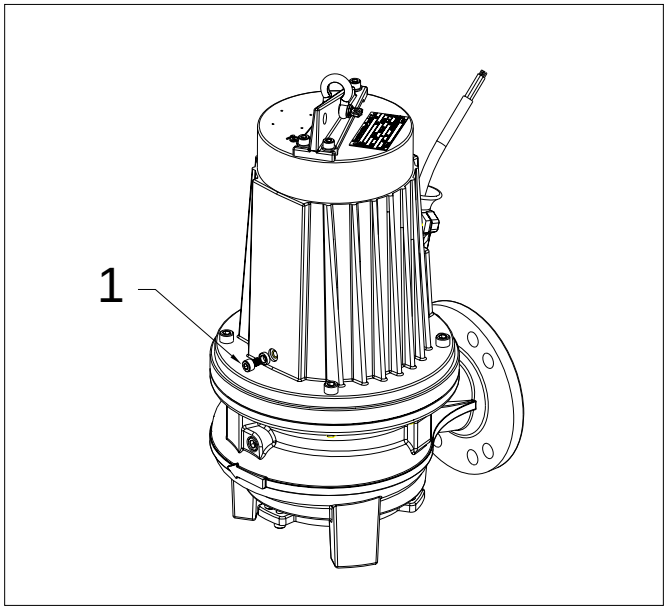


Fig. 7.6

7.6 Oil change

Collection, storage and removal of the oil should be done according to the regulations of the local authorities.

When necessary replace the sealing rings.

Always use the right kind of oil ! (see chapter 7.3).

Put the pump in a horizontal position so that plug (3) is at the bottom (fig.7.4 position A).
Remove the vent plug (2) and the filling plug (1).
Put a receiving bin underneath the drain plug (3).
Remove the plug and drain the oil (fig.7.4 position B).
Replace the drain plug and refill the oilhousing (Fig.7.4 position C).
The oil level should be at the lower side of opening (2). (fig.7.4 position A).
Replace the plugs.

7.7 Motor housing

Unscrew the inspection plug of the motorhousing
(For RC22 see Fig. 7.5 pos 1).
(For RC41 see Fig. 7.6 pos 1)
Put the pump in horizontal position with the inspection opening downwards.
If water is present this will come out this way.
A small amount of water, due to condensation, is permissable.

More water is an indication of leakage of the construction. Oil is an indication of seal failure between motorhousing and oil chamber. If so, contact your dealer.

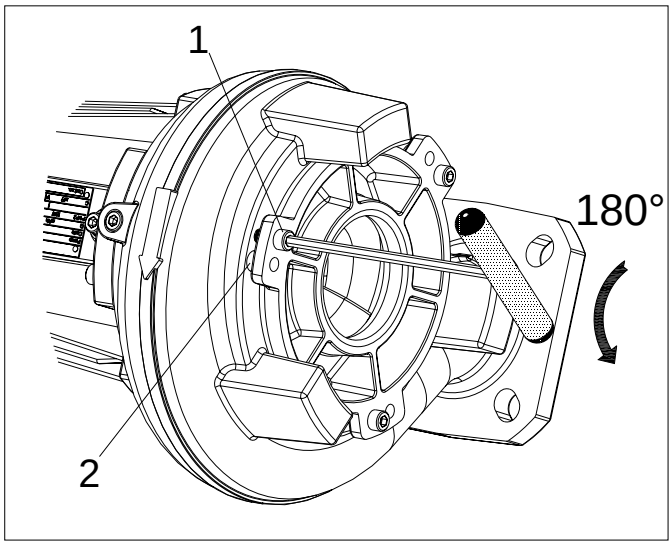


Fig. 7.7

7.8 Adjustment of the suction cover

If, for inspection, the suction cover has been removed, or if the impeller clearance has increased , adjustment should take place in the next sequence.

1. Turn-in the 3 adjusting bolts (2) until they are completely screwed-in in the pumpcasing.
2. Place the cover in the suction opening of the pumpcasing and push it evenly against the impeller.
3. Fasten the 3 connecting bolts (1) by hand.
4. Unscrew the 3 connecting bolts (1) 180º.
5. Unscrew the 3 adjusting bolts (2) until they firmly touch the suction cover.
6. Rotate the impeller, using a T-shaped Allen key and see if the impeller touches the cover evenly.

Rotate the impeller only clockwise, otherwise the fixing bolt may come loose.

7. If the impeller cannot rotate freely, unscrew the 3 connecting bolts (1) about 90º.
8. Unscrew the 3 adjusting bolts until they touch the cover again.

If necessary repeat step 7 and 8.
The clearance between impeller and cover should be about 0.6mm.

Now the pump is operational again.

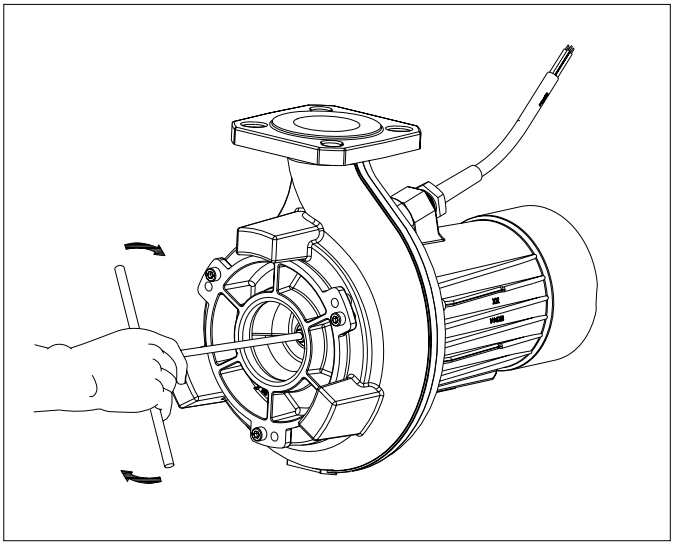


Fig. 8.1

8. TRANSPORT AND STORAGE

The pump can be transported and stored in both horizontal and vertical position.

Never lift the pump by the motorcable or discharge hose.
Always use the suspension bracket !

In case of long storage, the pump must be protected against moisture and heat.

Before storing the pump clean it with a waterjet and check the motor housing for water ingress (see chapter 7.7) .

On a regular base (every three months), turn the impeller by hand, this is necessary to prevent sticking of the mechanical seal surfaces (see Fig. 8.1).

After 6 months of storage, a general inspection is advised, before installing the pump.
Follow the instructions of chapter 5.

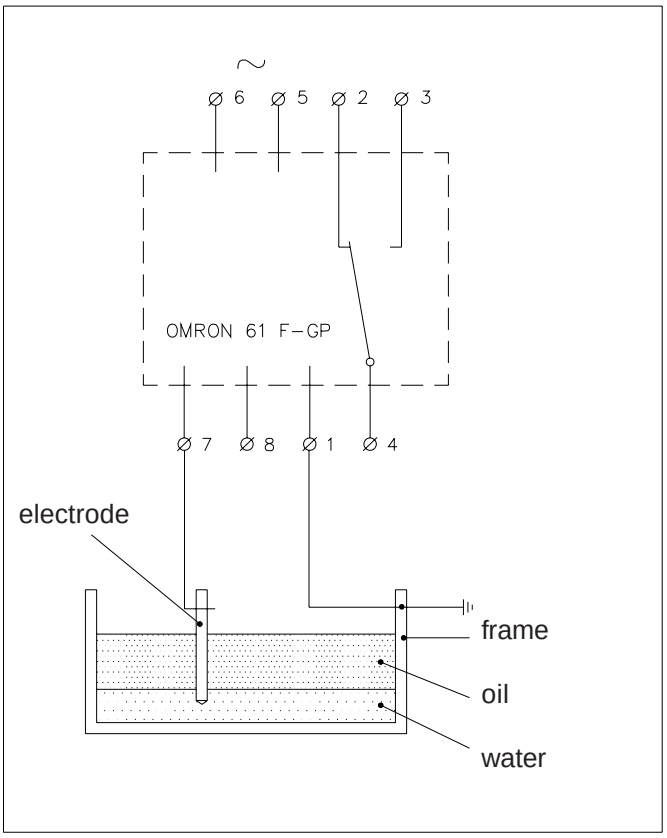


Fig. 9.1

9. OPTIONS

9.1 Waterdetector

As a safeguard against water ingress into the motor, the pump can be equipped with a waterdetector.
When your pump is equipped with a waterdetector, this can be found on the dataplate.
See appendix 1: at position (1) a “W” is stamped at the fore-last character.
The waterdetector detects water which might have entered the oilhousing or motorhousing due to seal failure or cable damage.
The waterdetector causes the pump to switch off, before damage to the motor is done.

The probe itself is a non-active electrode, placed in oil and motorhousing. It is used in conjunction with a relay in the control circuit that measures the resistance between probe and frame.
If only air or oil is present, the resistance is over 5000 Ohm. If water enters, the resistance will decrease to as low as 300 to 500 Ohm.

We advise to use OMRON relay 61 F-GP or E&H type EMR4-N500-2B or Telemecanique type RM4-LG01 or an equivalent.
These relays switch at about 5000 Ohms.

No water present:
- high resistance between terminals 1and 7 (>5000 Ohm)
- terminals 2 and 4 closed
- terminals 3 and 4 open

Water present:
- low resistance between terminals 1 and 7 (300-500 Ohm)
- terminals 2 and 4 open
- terminals 3 and 4 closed

9.2 Thermoswitches

Thermoswitches are optional.
When your pump is equipped with thermoswitches, a “T” is stamped at the fore-last character at position (1) of the dataplate. (See appendix 1). A copy of your dataplate is on page 2.
For connection values see par. 5.4.

9.3 Thermistors

Instead of thermoswitches, the pump can be equipped with thermistors (on special request).
This will be marked with a “U” on the dataplate.
Normally the resistance is about 200-500 Ohm.
When the switch-off temperature is reached the resistance will be between 1650-4000 Ohm.
The maximum voltage is 7.5V.

A thermistor is not a circuit breaker but a resistance!

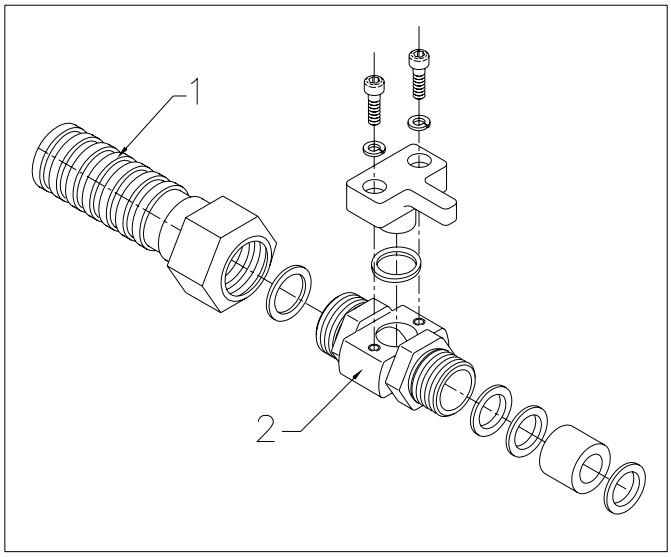


Fig. 9.2

9.4 Cable protection

When chemical or mechanical protection for the cable is needed a tube can be fitted around the cable (Fig. 9.2 pos 1).
This is a flexible stainless steel tube (1) connected to a special cable entry (Fig.9.2 pos 2).

9.5 Special oil

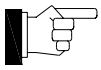
Upon request the oil housing can be filled with a special oil. If so, a label on the pump shows which kind of oil is used.

10. TROUBLE SHOOTING

10.1 Safety

When working on the motor, make sure that the power is switched off.

When working on the pump make sure it cannot start unexpectedly!



Only qualified electricians may do the electrical work.

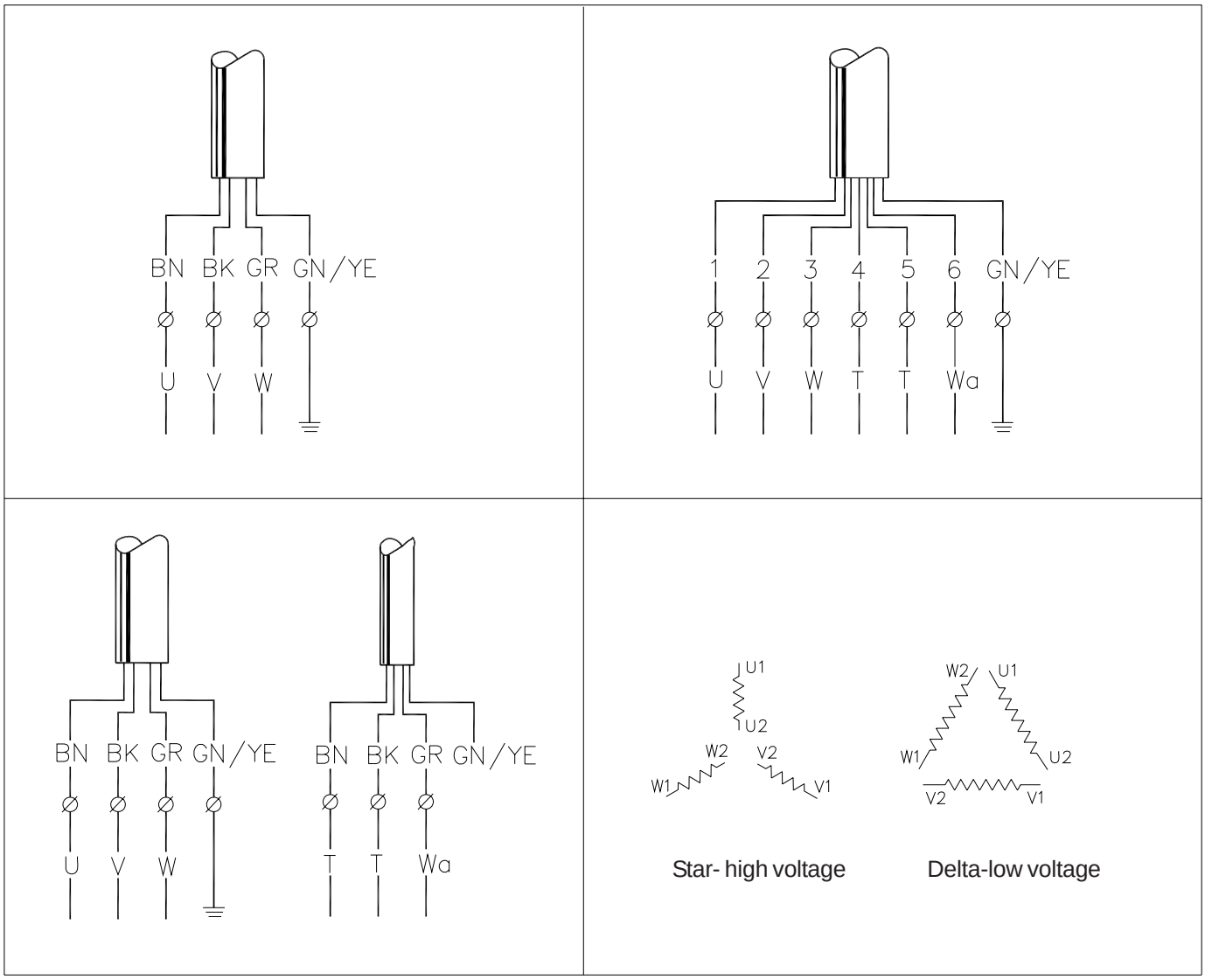
When starting the pump ensure nobody goes near rotating parts.

Observe local electrical and safety regulations!

PROBLEM	POSSIBLE CAUSE	REQUIRED ACTION	CHECKPOINTS
Pump does not start	No voltage on motor terminals	Check power supply	* No power * Main isolator switch * Fuses
		Check motor protection	* Earth leakage relay * Motor protection relay * Motor temperature * Water detector
		Check start-and stop signals	* Too low waterlevel * Obstructed level switches * Switches interchanged * Control panel
	Motor failure	Check motor wiring	* Continuity and isolation * Phase resistance
Pump does not stop	No stop signal	Check level regulation	* Float switches * Control panel
	Wrong start- and stop level	Check level regulation	* Obstructed level switches * Adjust start- and stop level * Power supply not stable
Pump starts and stops repeatedly	Fault in power supply	Check power supply	* Low voltage * Not all 3 phases available * Setting of motor protection
	Motor overloaded	Check pump	* Wrong direction of rotation * Impeller blocked * Protection in automatic reset mode
	Motor overheated	Check cooling Check motor	* Continuity and isolation * Fuses
Current too high	Fault in power supply	Check power supply	* Low voltage
	Pump failure	Check pump	* Impeller blocked * Viscosity or spec. gravity too high * Wrong direction of rotation
Pump runs but no flow or too low flow	Clogging or air lock	Check discharge and coupling	* Discharge obstructed * Valve fully or partly closed * Air pocket in pump or discharge * Coupling leaks
	Pump failure	Check pump	* Impeller or volute blocked * Pump is sucking too much air * Worn or broken impeller
	Fault in power supply	Check power supply	* Control panel * Fuses * Low voltage
	Too low capacity	Check discharge	* Discharge obstructed * Valve fully or partly closed * Air pocket
High level alarm	Pump failure	Check pump	* Impeller or volute blocked * Pump is sucking too much air * Worn or broken impeller * Worn or broken bearings
	Fault in power supply	Check power supply	* Fuses * Control panel
	Motor failure	Check motor	* Continuity and isolation

APPENDIX 2; Direct-on-line start motor (DOL)

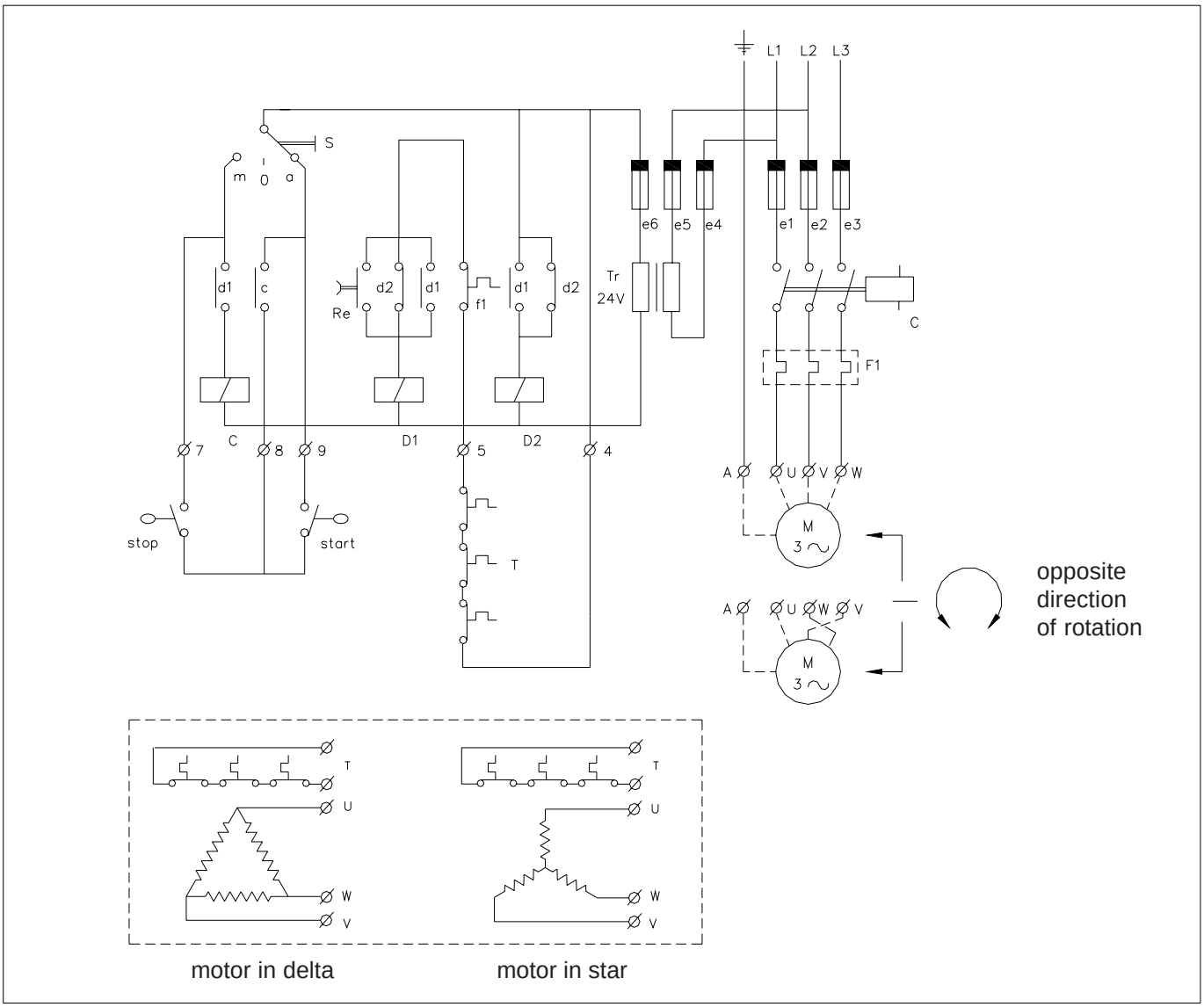
PUMP CABLE CONNECTIONS



PUMP CABLE	CONTROL PANEL
BN =brown GR =gray BK =black GN/Y =green/yellow	U,V,W =line T =thermostats Wa =water detector ⏚ =earth connection

In some situations where a longer pump cable is used an extra 10 mm2 earth cable is fitted to the motorhousing to fulfill the demands of the Low Voltage Directive.
Always connect this cable also to the earth connection!

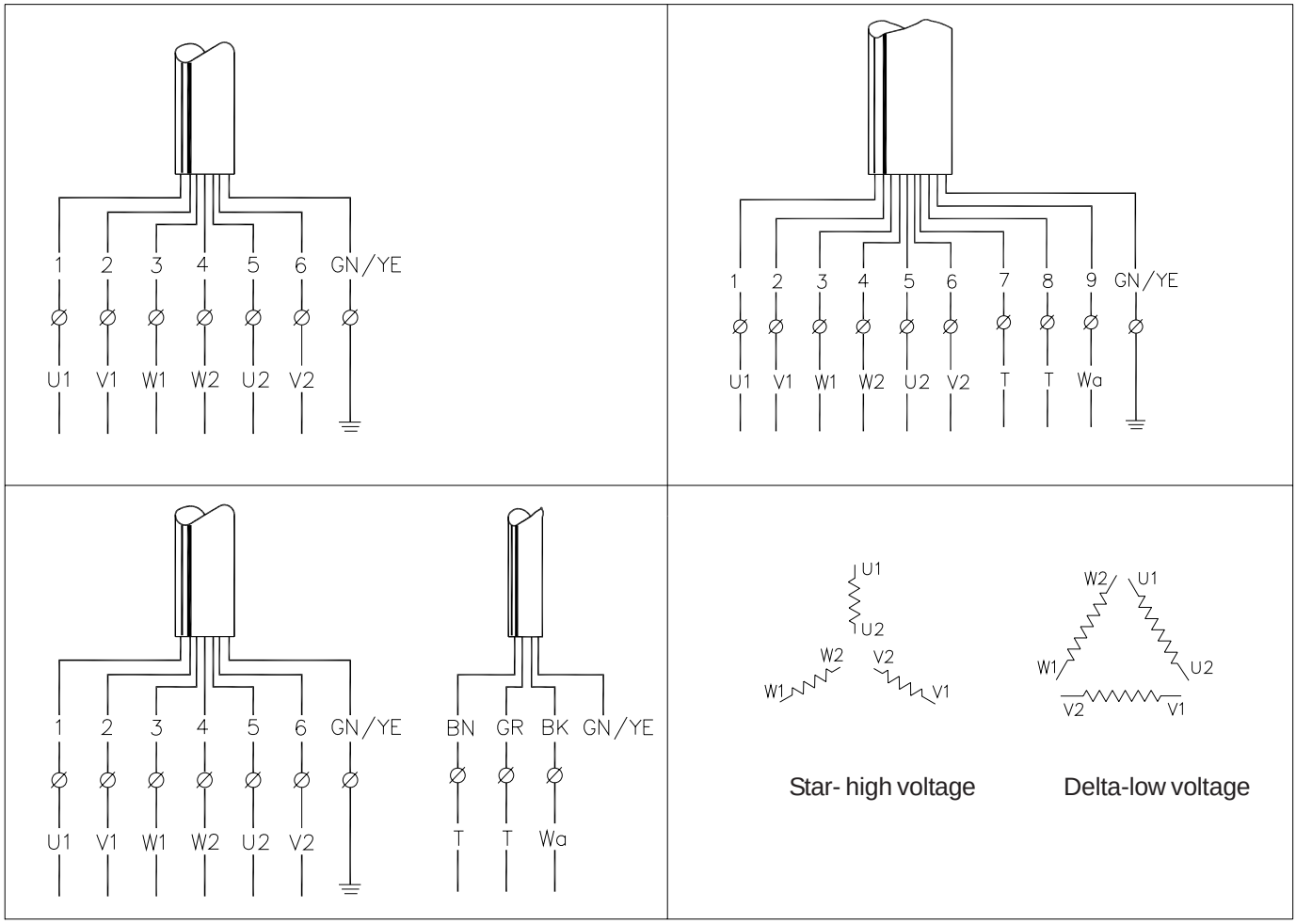
EXAMPLE OF A DIRECT-ON-LINE CONNECTION DIAGRAM



CODING	
e1, e2, e3	Line fuses
e4, e5	Fuses, primary control-circuit
e6	Fuses, secondary control-circuit
C	Maincontactor
F1	Motor protection circuit breaker with manual reset
D1	Auxiliary relay for motor protection
D2	Auxiliary relay for power failure
Tr	Transformer
S	Manual-off -auto selector switch
Start	Level switch pump start
Stop	Level switch pump stop
Re	Reset push button
M	Pump motor
T	Thermostats (if fitted)

APPENDIX 3; Star-delta start motor (YD)

PUMP CABLE CONNECTIONS



PUMP CABLE

BN	= brown
GR	= gray
BK	= black
GN/YE	= green/yellow

CONTROL PANEL

U,V,W	= line
T	= thermostats
Wa	= water detector
⏚	= earth connection

In some situations where a longer pump cable is used an extra 10 mm2 earth cable is fitted to the motorhousing to fulfill the demands of the Low Voltage Directive.
Always connect this cable also to the earth connection!

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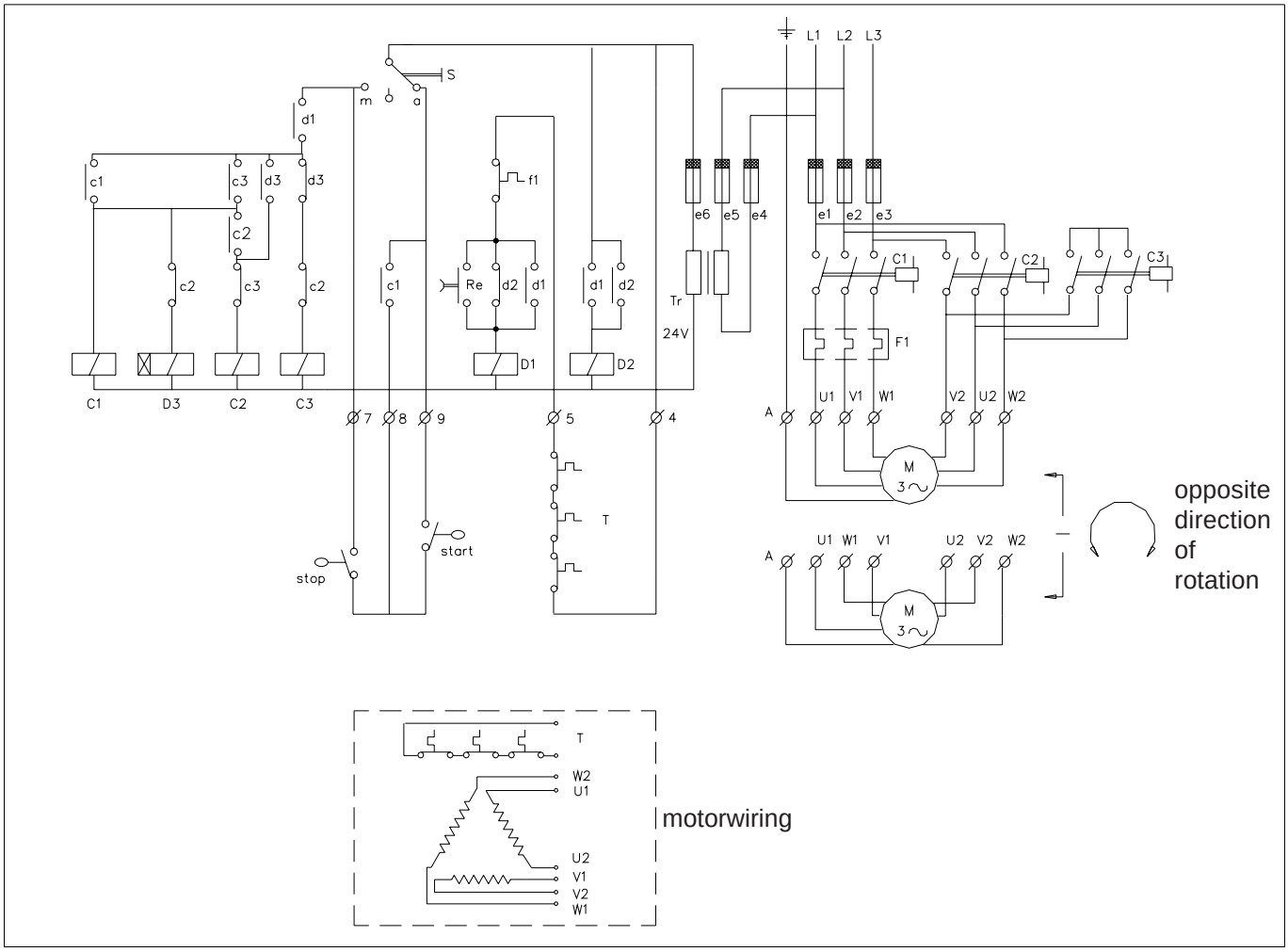
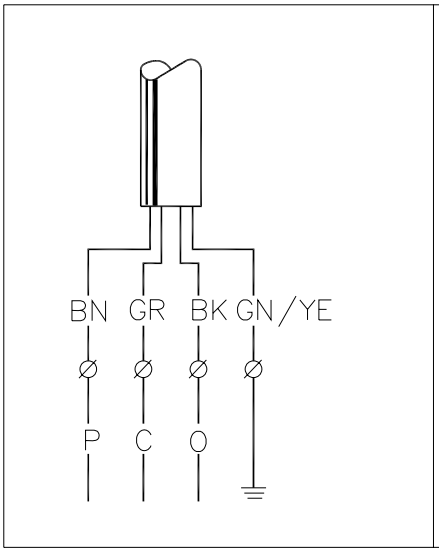
EXAMPLE OF A STAR-DELTA CONNECTION DIAGRAM

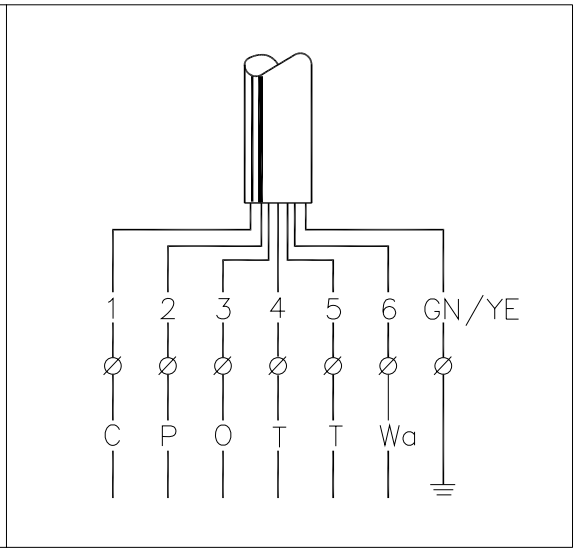


CODING	
e1, e2, e3	Line fuses
e4, e5	Fuses, primary control-circuit
e6	Fuses, secondary control-circuit
F1	Motor protection circuit breaker with manual reset
C1	Maincontactor
C2	Relay delta connection
C3	Relay star connection
D1	Auxiliary relay for motor protection
D2	Auxiliary relay for power failure
D3	Timer relay star-delta start
Tr	Transformer
S	Manual-off-auto selector switch
Start	Level switch pump start
Stop	Level switch pump stop
Re	Reset push button
M	Pump motor
T	Thermostats (if fitted)

APPENDIX 4; Single phase motor

PUMP CABLE CONNECTIONS





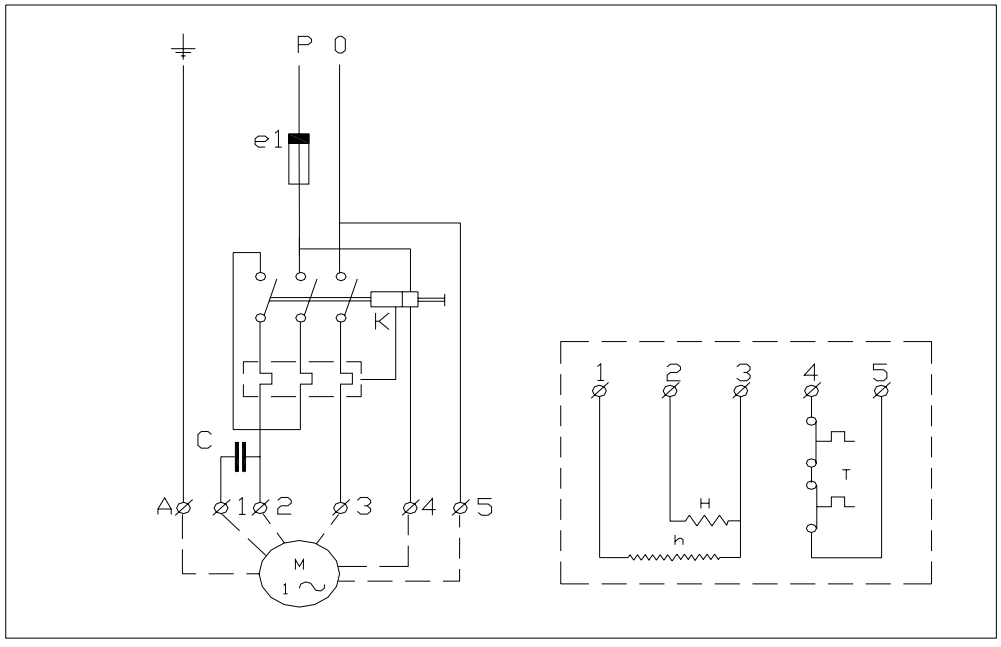
PUMP CABLE

BN	=brown
GR	=gray
BK	=black
GN/YE	=green/yellow

CONTROL PANEL

P, O	=line
C	=capacitor
T	=thermostats
Wa	=water detector (if fitted)
⏚	=earth

EXAMPLE OF A SINGLE PHASE CONNECTION DIAGRAM



P	line (phase)
O	line (neutral)
e	fuse
K	motor protection
C	capacitor
H	main coil
h	starter coil
T	thermostats (250V-1,6A max.)
⏚	earth

MOTOR WIRING	COLOR
* 1	blue / white
* 2	red / white
* 3	red / white (thick)
* 4+5	red

In some situations where a longer pump cable is used an extra 10 mm2 earth cable is fitted to the motorhousing to fulfill the demands of the Low Voltage Directive.
Always connect this cable also to the earth connection!

APPENDIX 5; Notes:

Name	Date	Remarks

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