



PAPANTONATOS

Pumps service & engineering

FLOWPAP®

Operating instructions for Papantonatos submersible pumps



Standard units

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0. General information

0.1. General description

Standard submersible pumps serve to transport cold clean water under normal operating conditions.

Other uses or operating purposes must be agreed upon with the manufacturer.

Submersible pumps are subjected to a thorough inspection before leaving the factory and equipped with operating instructions for fitting, starting, care etc., which conform to international safety regulations.

These instructions describe the procedures to be used for fitting, operation and maintenance of standard submersible pumps.



This documentation is to be kept by the user so that it is available to the operating personnel at any time.

0.2. Additional documentation

This documentation describes the fitting, operation and maintenance of standard submersible pumps. You will find further information

- in the instructions for filling standard submersible motors.
- in the data sheet
- in the order confirmation

Should the information in these operating instructions differ from that in the order confirmation or in the data sheet, follow the information in the order confirmation or the data sheet.

0.3. Symbols

The following symbols are used in this documentation in order to especially emphasize important information and call attention to dangers :



General information: Not heeding this can lead to damage.



Live components: Contact with these components can be deadly.



Caution: Not heeding this can lead to severe damage or to injury/health problems.



Warning: Not heeding this can lead to destruction of the unit or to severe injury/health problems.

Information placed directly on the machine and/or the unit, as for example

- Rotation arrow
- Labeling of connections
- Rating plate

must absolutely be heeded.

1. Safety instructions

The unit may only be operated by trained personnel, only in a completely assembled condition, and with a completely filled and immersed pump unit.



This documentation is to be kept by the user so that it is available to operating personnel at any time.

- Guards for movable parts (e.g. coupling) must not be removed from the machine while it is in operation.
- Danger from electric energy must be eliminated (for details see e.g. the regulations of the VDE and the local power supply companies).



Before maintenance and repair work, the motor of the pump unit must first be completely separated from the power supply.

The user must be certain that all maintenance, inspection and assembly work is completed by appropriately qualified technical personnel, sufficiently informed by thorough study of the operating instructions.

Work on the machine must only ever be performed when it is stopped. The procedures for stopping the machine in the operating instructions absolutely must be followed.

Pumps or units which convey health endangering substances must be decontaminated.

Immediately after finishing work, all safety and protective systems must be replaced and/or put back into operation.

Before restarting, the points listed in the section "First switching-on" must be heeded.



All work on the electrical system may only be performed by qualified electrician!



All work on the hydraulic connections may only be performed by qualified fitters.

1.1. *Unauthorized alteration and construction of replacement parts*

Alterations to the unit are only permitted after speaking with the manufacturer. Safe operation is only guaranteed with original replacement parts and accessories authorized by the manufacturer. The use of other parts releases liability.

1.2. *Prohibited modes of operation*

The operation safety of the delivered unit is only guaranteed for use according to the regulations in chapter 2 "Technical data" of the operating manual. The limits given in the data sheet may in no case be exceeded.

1.3. *Statement of nonliability*

By not heeding this documentation, product liability is rendered void.

2. Technical data

Each unit has been individually manufactured according to the special requirements of the customer. The specific technical data regarding head, delivery rate, current requirement, minimum permissible flow velocity on the external motor surfaces etc. can be found in the data sheet delivered with the unit or in the order confirmation.

2.1. Delivery contents

- pump unit
- these operating instructions
- technical data sheet
- instructions for filling submersible motors

2.2. General data

2.2.1. Normal operating conditions

- Pump-unit (pump+motor) must always be completely submerged
- Minimum cooling flow velocity along the motor surface as per motor data sheet
- Ambient temperature as per data sheet
- sand content : approx. 25mg/lit
- no impurities which could lead to deposits and blockages within the pump or to deposits on the motor surface
- no occurrence of water hammer
- no operation against closed slide valve
- operation within prescribed voltage tolerance
- permissible operational range : 50 to 120% of the optimal delivery rate
- correctly selected and adjusted motor protection
- observation of the max. permissible starting frequency



At higher surrounding temperatures and/or lower flow velocities on the external motor surfaces, or if there is risk of clogging, special measures for heat dissipation are required. This must be checked with the manufacturer by indicating the surrounding conditions. In this case, the suitability of the unit for its planned application must be confirmed by the manufacturer.

For units installed according to the instructions given in this documentation, noise level produced by the motor (working in his valid range), shouldn't exceed 70 db (A).

2.2.2. Fitting position

The following criteria must be taken into account in determining the fitting position and depth:

- Vertical fitting in a well above the filter line, so that a perfect flow is guaranteed along the motor
- Sufficient water cover
- A static water level at least 2m above the pump exit
- A dynamic water level above the suction housing, taking into account the required NPSH value (see pump characteristic) for the pump
- Flow rate (see pump characteristic)
- Supply conditions of the pumping medium (dependent upon the fitting conditions)



Regardless of the above mentioned criteria, the pump unit must definitely be installed above the well filter. If this must be changed, direct suction within the filter line must be prevented by suitable measures (e.g. blind tube in the filter, outer pump mantle, pump with sand protection jacket).

Other use and operating conditions must be checked with the manufacturer.

2.2.3. Starting frequency

The amount of regularly distributed starts per hour must be taken from the data sheet. Higher starting frequencies are only permissible upon agreement with the manufacturer.

Amount of maximum permissible starts in sequence:

Cold motor / Warm motor : 3 starts / 2 starts
Rest interval after each cycle..... : 5 minutes

3. Hydraulic connection

Exemplary construction of a water supply system is depicted in Fig. 3.1. Since this shows a basic arrangement, the actual layout must be suited to local and technical conditions.

The additional listed components are recommendations which serve the purpose of operational safety and the protection of the pump unit.



All work on the hydraulic connection may only be done by qualified fitters.

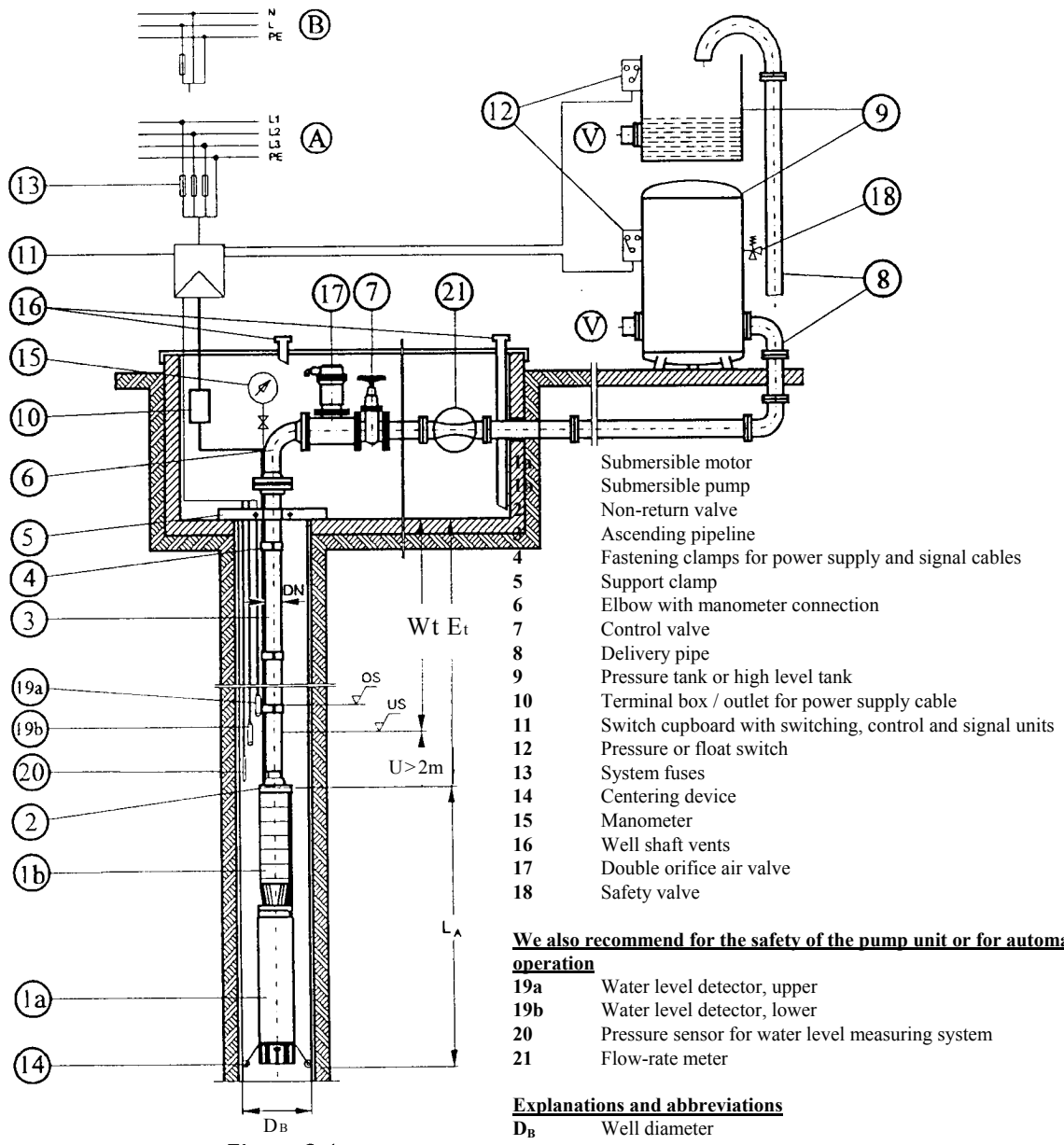


Figure 3.1
Water supply system diagram

4. Installation



Every pump unit must only be operated with a completely filled motor and completely immersed! The liquid level must be checked in every case before fitting, and if necessary adjusted according to the "FILLING INSTRUCTIONS FOR SUBMERSIBLE MOTORS"!

4.1. Procedures upon receipt of delivery

The unit must be taken out of its packaging immediately upon receipt and checked for possible damage, completeness and correctness. If damage has been determined, notify the carrier immediately. Should the pump unit be stored or transported further, please refer to the section on "Transport" or "Storage".

The data on the rating plate must agree with that contained in the shipping documents.

4.2. General remarks

Units which are delivered or stored in several subassemblies due to the extreme length must be assembled during the fitting in the well. Special fitting instructions must be requested from the manufacturer for this.



Due to the danger of sagging, pump units which exceed the permissible length given in Table 4.1, must be supported by an auxiliary U or H carrier when mounting in the vertical fitting position. The auxiliary carrier may only be removed after the pump unit is hanging vertically from the crane/lifting block (See Fig.4.1)

When assessing the diameter of the unit, use the smaller one from the pump and motor. It can be taken from the rating plate or the data sheet.

If a unit was shipped on a transport rail due to its extreme length, it must be lifted into the vertical position on this transport rail (= auxiliary carrier) before fitting into the well.

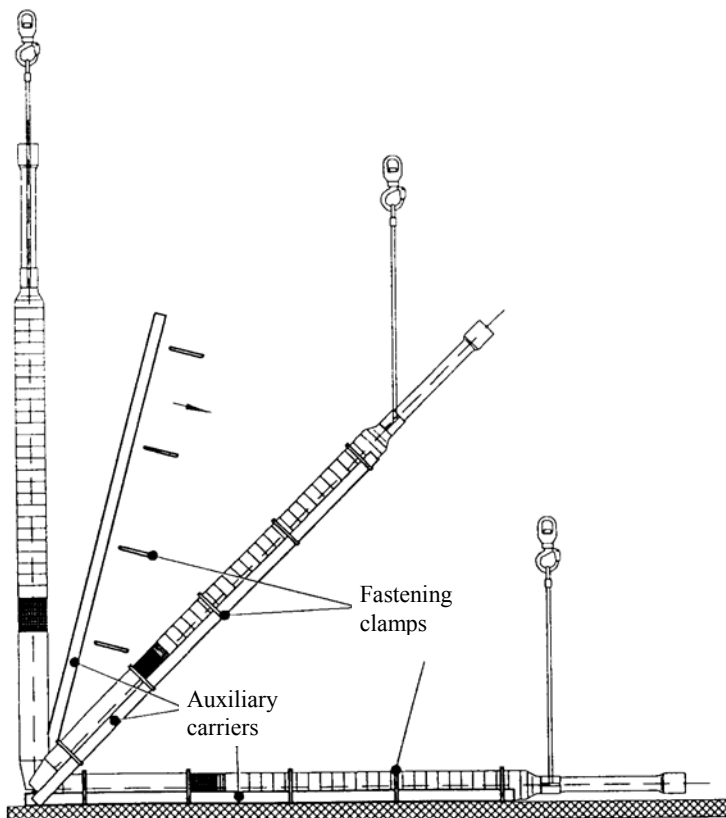


Figure 4.1 Using an auxiliary carrier

Rated diameter	Permissible total length
6''	3,3 m
8''	3,5 m
10''	4,4 m
12''	4,7 m

Table 4.1



4.3. *Work and checks before installation*



Before beginning installation, check the dependability of auxiliary equipment, particularly of hoists, as well as comparing the information on the data sheet with that on the rating plate on the motor.

Ensure that the line voltage (measured between two phases) is equal to the motor voltage according to the rating plate.

The maximum permissible voltage fluctuation can be seen in the data sheet. Greater voltage and frequency fluctuations must be given in the order and confirmed by the factory. In case of doubt, we recommend asking the manufacturer or the nearest factory representative before starting up the unit.

Before fitting, the insulating resistance of the motor must be measured according to chapter 5.10.

It must be ensured that the well diameter (DB) is large enough down to the fitting depth, so that the pump unit can be fitted without difficulties.



If the ascending pipeline is made of flanged pipes, the flanges must have recesses for the cable if the well diameter is narrowly proportioned.

4.4. *Installation of pre-assembled pump unit*

Mount the first length of the ascending pipe, which should not be longer than 0.5 m onto the assembled pump unit.

Fasten the power supply cables and, if necessary, the control lines and /or instruments leads with clamps onto the ascending pipe.

Attach a "fitting bracket" beneath the ascending pipe flange or sleeve, and hang the complete unit from a suitable hoist.

Lower the pump unit into the well until the fitting bracket is resting on the well pipe or well head.

Attach the next length of the ascending pipeline (3). Secure the power supply cables and, if necessary, the control lines and/or instrument lead approx 0.5 m above the flange or the sleeve with a cable grip (4).

Connect a second fitting bracket (5) beneath the upper flange, or beneath the sleeve with screwed pipes. Hang the unit onto the hoist with the upper fitting bracket, rise a bit, release the lower fitting bracket and sink the unit slowly into the well.



Do not let the pump slip through the bracket !

When lowering the unit, proceed so that the power supply cable is neither squeezed nor scraped.

In order to protect the power supply cables, we recommend lining the well head at the entry point of the power supply cable into the well pipe with a rubber sheet and feed it into the well shaft using a cable roller (see Fig. 4.2).

During the lowering, the unit must always hang freely and must not become wedged in the well casing-tube. One control possibility: the pump can be rotated freely.

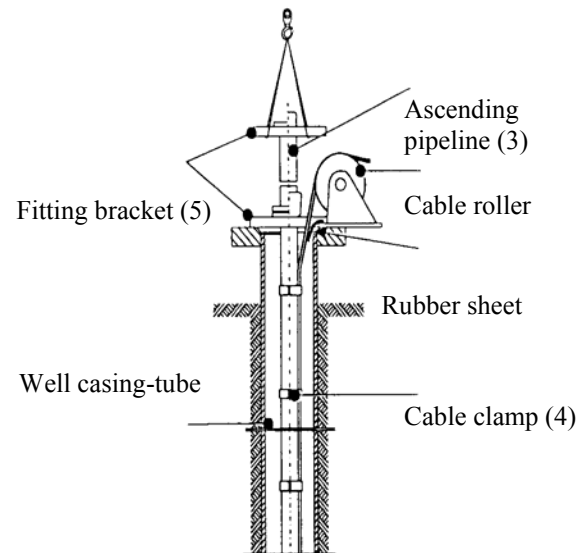


Figure 4.2 Fitting elements

Attach a second cable clamp about 0.5 m beneath the upper flange/sleeve. Lower the unit far enough for the fitting bracket to sit on the well head and then screw on the next piece of the ascending pipeline. If needed, attach a cable clamp every 3 m of pipe length.



For especially narrow and deep wells, the insulating measurements according to chapter 5.10 should be repeated, during installation process, in order to be able to determine possible damage to the power supply cables in time.

4.5. *Assembly during installation*



Special fitting instructions from the manufacturer for assembling pump units during fitting, on request.

4.6. Installation tips to ensure long-life for the pump-unit

To allow proper motor cooling, a minimum cooling flow velocity along the motor surface has to be granted (for the minimum required flow, refer to motor data sheet and motor name-plate).



For best motor cooling, the flow velocity along the motor surface must be: 0,5 – 2 m/sec.

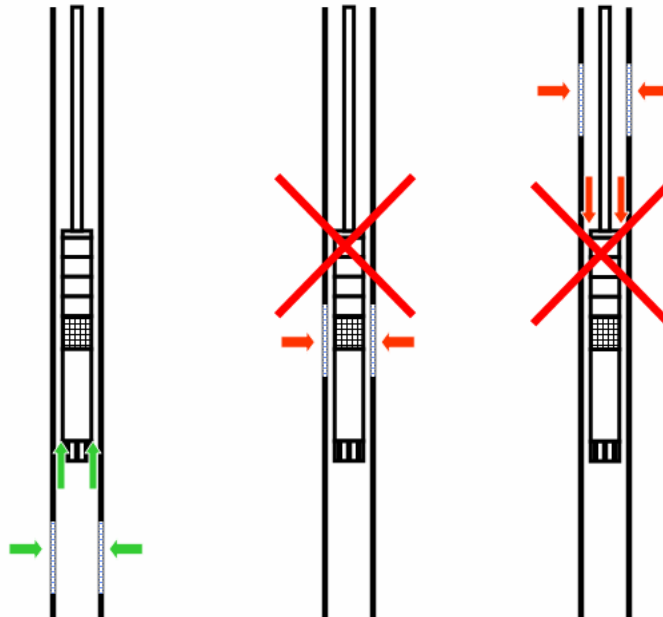


Figure 4.3 Installing a pump-unit in a well

The pump-unit must always be installed above the well filters, so that all the pumped capacity will flow along the motor surface, providing continuously the adequate cooling to the motor (see Fig. 4.3).

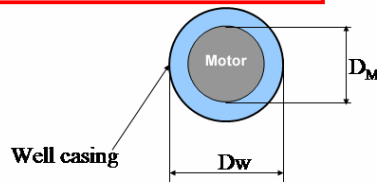


In all cases, the provided cooling flow velocity must be calculated.

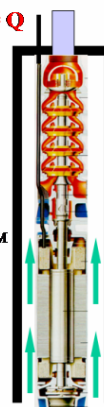
During operation, the actual cooling flow velocity along the motor surface is calculated by the following formula:

Motor cooling

$$\text{Cooling Flow} = \frac{\text{Quantity discharge}}{\text{Ringspace}}$$



Quantity = Q



Q [m³/h]: Pumped capacity

Dw [mm]: internal diameter of well casing (or cooling jacket)

Dm [mm]: external diameter of motor-stator

$$V \text{ m/sec.} = \frac{Q \text{ [m}^3\text{/h]} \times 353,68}{[D_w \text{ (mm)}]^2 - [D_M \text{ (mm)}]^2}$$

If the calculated cooling velocity is less than the minimum required, a cooling jacket must be fitted which will force all the pumped capacity to flow along the motor surface and thus cooling the motor. The internal diameter Dw of the cooling jacket must be chosen in order to give the adequate cooling flow to motor surface.

5. Electrical connection

5.1. Connection of motor



All work on the electrical system may only be performed by qualified electricians!

The connection diagrams Fig.5.1 to 5.6 shows the basic structure of the connection possibilities and the line arrangement of the mains cable and motor power supply cable.

Detailed information about the connection of motors and, if necessary, of control and monitoring devices can be taken from the appropriate circuit diagrams from the switch cupboard manufacturer.

So that a perfect connection with the least possible contact resistance can be established when connecting the power supply lines, the conductor ends should not be tin-plated.

Should the conductor ends be tin-plated, the tin-plated ends must be removed. The individual exposed fine-strand wires must be connected to the electrical system by suitable terminal screws or with crimping or soldering cable lugs.

5.2. Labeling of conductor ends and rotation direction of motor

The conductor ends of the power supply cables are labeled according to Fig. 5.1-5.5.

Counterclockwise rotation occurs if two phases of the main connection are transposed.

5.2.1. Single-phase motors

The rotation direction of single-phase motors is preset by the manufacturer and cannot be changed. The rotation direction preset by the manufacturer can be seen in the data sheet. Connection can only be made using the switching device accompanying the motor, for which the labeling of the leads can be seen in Fig.5.6

5.3. Motors with one power supply cable

If the current load values of the lines allow it, a three or four lead power supply cable is connected to the motor for direct switching and switching via e.g. a starting autotransformer.

5.4. Motors with two power supply cables, parallel connection

Motors whose rated current can no longer be conducted by one cable are equipped with two parallel cables. The connection of a motor with two power supply cables, with parallel connection, as well as the color and letter labeling of the conductor ends follows Fig. 5.2

5.5. Motors with two power supply cables (open delta connection)

For motors with star-delta switching (Fig.5.3), motors whose star connection (Fig. 5.4) and /or delta connection (Fig.5.5) is in the switch-board, as well as for motors provided with two different voltages, two three-lead or one three and one four-lead power supply cables are connected to the motor.

For motors with star-delta starting method, the maximum switching time from "star" to "delta" connection ($Y \rightarrow \Delta$) $t = 3$ sec.

5.6. Motor connection diagrams

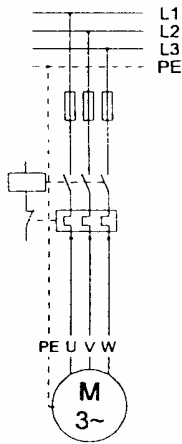


Fig 5.1

Motor for direct starting (DOL)
with one power supply cable

U
V
W
PE

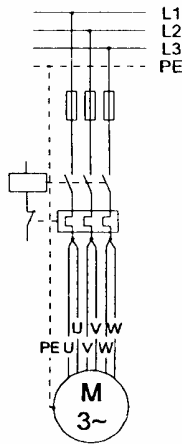


Fig 5.2

Motor for direct starting (DOL)
with two power supply cables
connected in parallel

U
V
W
PE

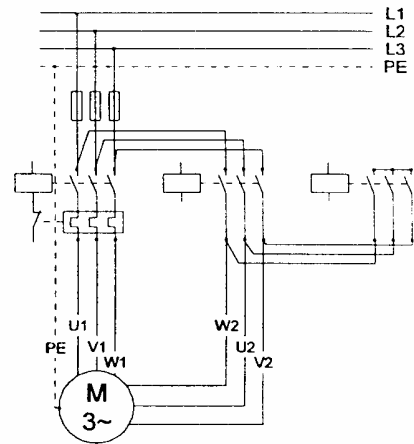


Fig 5.3

Motor for star-delta starting (Y-Δ)

U1/U2
V1/V2
W1/W2
PE

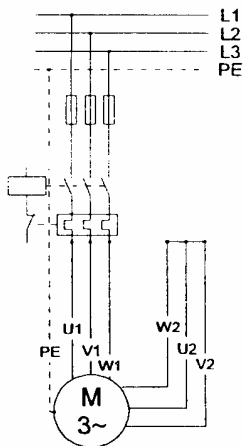


Fig 5.4

Motor for direct starting in Star
(Y connection in switch-board)

U1/U2
V1/V2
W1/W2
PE

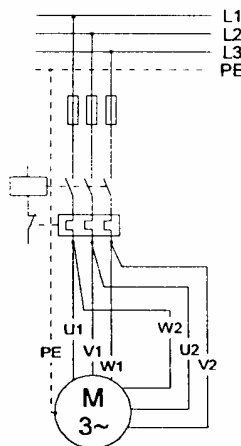


Fig 5.5

Motor for direct starting in Delta
(Δ connection in switch-board)

U1/U2
V1/V2
W1/W2
PE

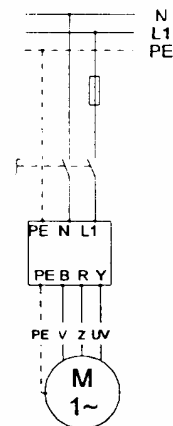


Fig 5.6

Single-phase motor

V
UV
Z
PE

5.7. Protective measures against shock-hazard voltages

Protective measures against shock-hazard voltages must be taken according to VDE regulations and the local electric supply company ordinances. According to VDE 0100, the protective conductor must be connected directly to the motor on new systems. This also applies when the unit is installed in an inaccessible well.

If there is no protective conductor leading from the motor, a separate protective conductor must be attached to the motor using the provided and labeled protective conductor screw. This is labeled with an earth symbol (\perp).

5.8. Motor protection

To protect the motor against power overload, an inverse time-lag overload relay must be provided, sensitive to phase failure and which compensates for temperature.

The overcurrent release for the switchgear and the safety fuses can be adjusted or selected according to the accompanying data sheet. If the selection of the thermally delayed overcurrent release has not already been made by the supplier of the pump unit, it must be chosen according to the data given in the table 5.1. For star-delta contactors, it is very important that the release is as a rule in the motor line (see Fig. 5.3). The adjusted current level is then only 58% of the operational current.

I_A		t	L
4"	from 6"		
$1.05 \times I_E$		> 2 hours	cold
$1.20 \times I_E$		< 2 hours	warm
$5.00 \times I_E$	$6.00 \times I_E$	≤ 10 seconds	cold

I_A = Release current

I_E = Operational current (rated current)

t = Delay time until release

L = Operational temperature before overload

Table 5.1 : Release ratings for submersible motors

The adjustment of the motor protection switch (thermally delayed overcurrent release) must be done according to the value given in the data sheet. The value given in the data sheet is a standard value for the operating point. If the actual operational current in the operating point of the pump lies under this given value, the switch must be adjusted lower so that there is effective protection and malfunctions can be indicated in time.



The motor protection adjustment must in no case be set higher than the highest permissible value given in the data sheet!



Testing the perfect functioning of a motor protection switch by intentional single-phasing is not permitted!

PT100 Temperature sensor into the motor (optional)

A PT100 temperature sensor (3-wire) is recommended, in order to allow monitoring of the internal motor temperature. It can be used to detect insufficient motor cooling and thus contribute to motor protection. Possible reasons for insufficient motor cooling are:

- not sufficient cooling flow velocity along the motor surface
- deposits-sedimentations on the motor surface that strangle heat-transfer to ambient water
- high ambient water temperatures

PT100 sensor has to be connected, via a 3-wire cable, to a "PT100 control-unit", on the control panel.



PT100 sensor can only detect long-term temperature reactions and thus does not replace the required electrical overload (overcurrent) protection!

Surge voltage protection

Consider the installation of sufficient surge voltage protection (lightning protection) in the line side (power supply) according to IEC 60099.

5.9. Short circuit protection

To prevent short circuiting of the power supply cable and the motor, safety measures must be taken according to local ordinances. Guide values for the safety fuse sizes can be taken from the data sheet.

5.10. Insulation test

Before initial starting, as well as after longer storage or idle time, the insulation resistance of the drive must be measured.



During and after the measurement, the connector ends of the motor line and/or the connection terminals partly carry dangerous voltage and may not be touched.



Before the measurement, ensure that there is no line voltage.

To measure the insulation, disconnect all leads of the power supply cable of the motor.

All leads must carefully be cleaned of all dirt. Heed the operating instructions of the insulation measuring device.

Insulation measurement is always performed with a measuring-circuit voltage of 500 Volts DC output. The measured value must be read after a minute of measurement duration. Readings may vary using a lower voltage ohmmeter.



The motor windings or power supply cable, charged up to the measuring circuit voltage, must be discharged after measurement by means of the insulation measuring device.

The limits for minimum insulation resistance and critical insulation resistance for measurements at 20°C winding temperature are as follows :

- New motor with its own power supply cable leads :200 MΩ (or more)
- New motor with power supply drop cable, installed in the well :5,0 MΩ (or more)
- Critical value after long operational time, for a motor installed in the well : 0,5 MΩ

Motor-winding temperature higher than 20°C, can substantially reduce the insulation resistance.

If the insulation value is near the minimum value, possible causes could be increased air humidity or dirty and moist conductor ends.



A relatively low insulation resistance does not definitely show that the pump unit will break down due to insulation problems. If however after regular measurements over a longer period of time, an extreme drop in the insulation resistance occurs within a short time, these must then be inspected.

If the insulation resistance falls below minimum value, the cause or the malfunctioning part (power supply cable, line connection or windings) must be determined and the insulation weakness removed.

5.10.1. Motors with one main feed line

Only one lead must be measured to chassis. The remaining leads must be insulated from chassis during the measurement.

5.10.2. Motors with two or more main feed lines

Each lead from one powers supply cable must be measured to chassis, while the remaining leads must be insulated from chassis.

6. Starting

6.1. General instructions



Due to the slender design of the submersible motors, different current values can be measured in the individual phases. This is especially true for two-pole motors. These differences can be reinforced by unsymmetrical voltage between the phases from the line side (power supply).

This effect can be reduced, by transposing-rotating all the 3 line-side phases (or all motor cable leads) in the same direction. For best motor performance, current unbalance should not exceed 5%.



An unsymmetrical voltage between phases from the line side (power supply) may cause overcurrent in one motor phase and must be regulated.

On an unsymmetrical power supply network, the motor current will be greatly unbalanced in the order 6 -10 times the voltage unbalance!

As an example, 6 Volts asymmetry on a 380/400V network (1,5%), will cause 9 to 15 Ampere asymmetry on a 100A nominal motor current (9%-15%). According to IEC, maximum permissible unsymmetrical voltage between phases is 1%, which is still very high (max. 4 Volts for 400V network).

Details which concern the electrical switchgear must be taken from the operating instructions from the switch cupboard manufacturer. For practical reasons, the pressure pipe downstream of the slide valve (7) is first closed when the transported water is free of sand and/or impurities.

6.2. First switching - on

After the pump unit has finally been installed and all pipelines have been connected as far as the slide valve (7), the slide valve (7) is closed except for a small gap for venting the ascending pipeline. The unit can be switched on after this.



Type series "S..." pump units (pumps with axial impellers) must never be started against a closed slide valve! Overloading with consequent destruction of the motor could then occur.

After switching on, the pressure at the manometer must be greater than the head given in the data sheet minus the water depth (w).

If this is not the case, the drive is rotating in the wrong direction. When the rotating direction is incorrect, the pump has no or extremely reduced performance. If incorrect rotation should occur, exchange 2 phases for one another on the line side input in the switch-board. Do not transpose anything on the star-delta contactor combination!



The unit must not be driven longer than 3 minutes in the wrong direction!



Single-phase motors are wired in such a way within the motor that they have the correct rotation on every supply system, with the prescribed voltage connected. The rotation direction on these motors cannot be changed.

During the time that the still empty ascending pipeline (3) is being filled, the ammeter may show a higher current than in the data sheet even after the switching-on current has decayed during the initial switching-on. After this the operational current must be lower than the highest permissible current given in the data sheet.

Open the slide valve (7) slowly, so that the well is not overloaded by too great a flow and sand is also swept up. Watch the current consumption of the motor on the ammeter during the opening. Slowly open the slide valve (7) until the ammeter shows the operational current according to the data sheet.

When the operating point has been reached for which the pump unit was designed, current consumption must approx. coincide with that given in the data sheet.

If this is not the case, the fitting conditions and electrical connections must once again be checked.

If there are no abnormalities during and after the test run, the pressure pipe can be connected if this has not yet been accomplished.

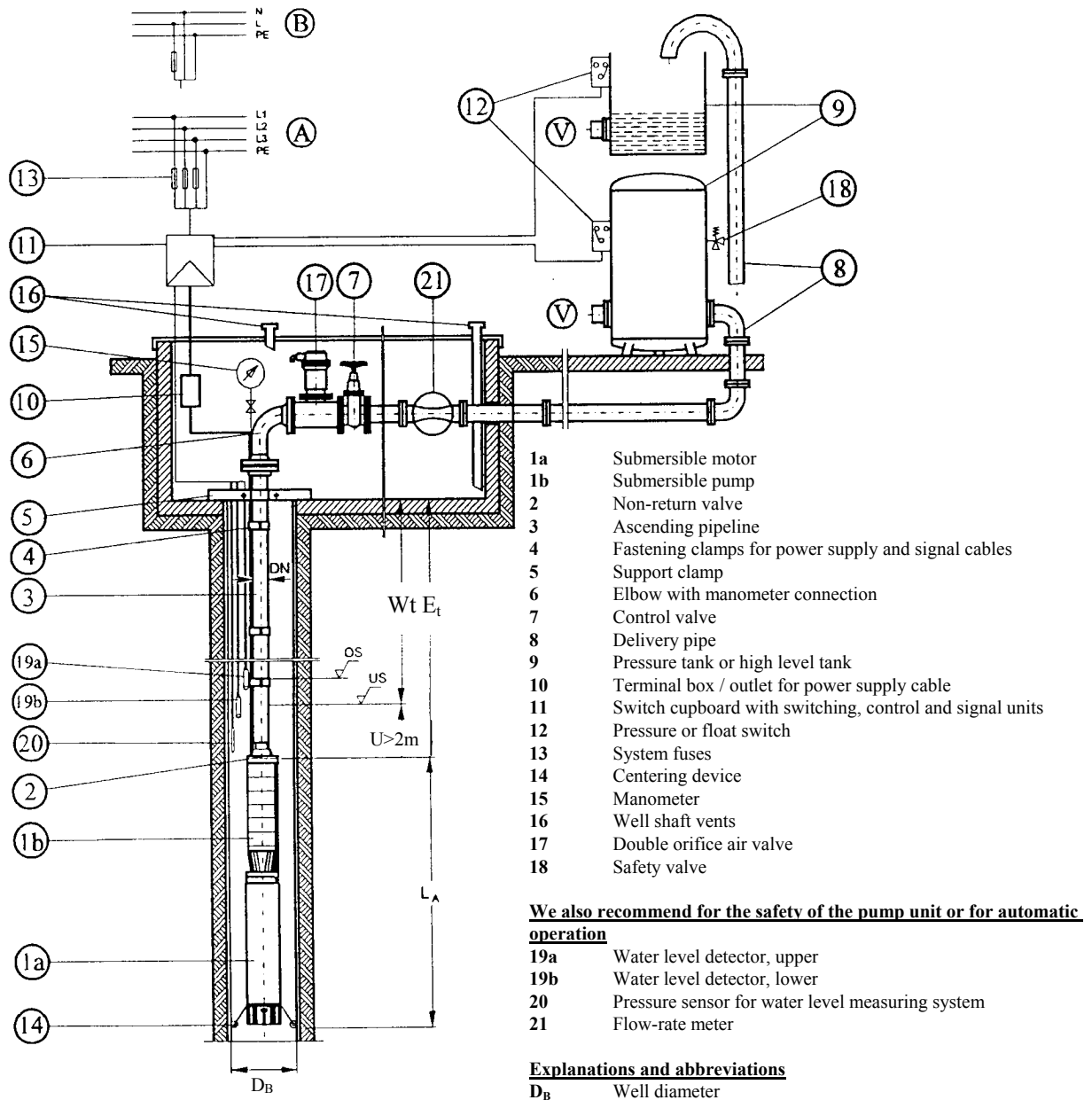


Figure 6.1
Water supply system diagram

7. Operation

After the unit has operated for a longer period of time, it is possible that a minimal readjustment of the motor circuit breaker be required, due to changed operating conditions e.g. by the sinking of the water level.



In no case select a motor protection adjustment setting which is greater than the highest permissible value given in the data sheet!

For monitoring the water level in the well and in the high-level tank, we recommend water level detectors or water level measuring units.

7.1. Starting frequency

The amount of regularly spaced starts per hour can be found in the data sheet. Higher starting frequency levels are only permissible upon agreement with the manufacturer.

Amount of maximum permissible starts in sequence:

Cold motor.....: 3 starts

Warm motor.....: 2 starts

Resting time after each cycle.....: 5 minutes

It is suggested that the motor be protected against non-permitted reconnection by a time-delay relay.

8. Maintenance

Submersible pump units normally run without maintenance.

If a pump unit should stand idle for a longer period of time, perform a 10 minute test run every 2-3 months, so that malfunctions can be recognized in time.



The pump unit must be completely submersed in pumping medium for this test run.

8.1. General information

Since the units are normally used at very great depths, we recommend performing and recording the following listed checks at regular intervals, in order to recognize malfunctions in time:



- Current consumption
- Head
- Flow
- System voltage
- Operating hours
- Insulation test

Current consumption of the motor is the most important value for monitoring the unit.

For finding problems, their cause and elimination, see the chapter **Operating problems and their elimination**.

8.2. Pump unit

The pump unit can be operated without maintenance measures, insofar as no irregularities in operation or pumping, caused by sand or a corrosive pumping medium, make premature removal necessary.

Fluctuating and/or rapidly increasing current consumption points to mechanical problems in the pump or motor.

Strong oscillation of the pressure and at the same time of the ammeter can be caused by irregular water inflow.

8.3. Electrical system



All the work on the electrical system may only be performed by qualified electricians!

8.4. Removal



If the pump unit is equipped with a non-return valve without load relieving holes, the unit weight with ascending pipeline and the water column contained within it must be lifted during removal!

If the non-return valve of the submersible pump is provided with load relieving holes, the weight of the water column does not apply.

8.5. Overhaul of the pump

The structural design of a submersible pump unit makes assembly and disassembly possible with simple tools.

In case of removal, installation instructions specific to that unit can be requested from the manufacturer.

We recommend, however, that the unit be examined by our technicians or that it be overhauled at one of our branch offices.

When taking the unit out of service and before starting removal work, we recommend studying these operating instructions once again.

For special advice regarding additional information or the acquisition of replacement parts, we need the following information:

- 1) Type description of the unit according to the rating plate
- 2) Machine number according to the rating plate
- 3) For questions regarding replacement parts :
 - a. Item-No. according to the sectional drawing
 - b. Part description and part-No. according to parts list
 - c. Number of needed parts
- 4) For problems:
 - α) Short description of the problem and/or the effects
 - β) Description of the faulty parts according to the parts list

Please refer all questions directly to the main factory or to a factory representative.

9. Storage

The pump unit must be stored vertically in a dry, well ventilated room.

If upon receiving the unit it can not be foreseen at what time it will be put into service, the following instructions should be heeded.

9.1. General remarks

Submersible pump units need special arrangements during storage, because some inner parts (e.g. stator and rotor plates) for functional reasons cannot be produced from corrosion-resistant material and are therefore sensitive to any type of air humidity.

All units may basically be stored either in filled or unfilled condition, however these two types of storage require different treatment of the unit.



All units should always be stored vertically. Units must be secured by appropriate means in this storage position to prevent tipping over.

The leads of the power supply cables must be protected from moisture. Also be careful that the power supply cables are not bent during storage.

9.2. Requirements for the storage area

- The storage area should be well ventilated
- Air humidity should lie within a range of 40 - 60%.
- Temperatures: +50°C to -15°C for units with motors originally filled by the manufacturer

For temperatures down to -25°C, heed the guidelines in the accompanying **instructions for filling submersible pump motors** under the section "Antifreezing compound".

9.3. Storage up to four weeks

No special arrangements are required for storage up to four weeks.

9.4. Storage between 1 and 24 months

For storage between 1 and 24 months, we recommend turning the shaft of the unit approx. every 6 to 8 weeks. For this it may also be necessary to remove an already mounted pressure housing, if needed including non-return valve.

On pump units where this is not possible, pump and motor must be separated from one another.

If needed, separate instructions must be requested from the manufacturer.

9.5. Storage for over 24 months

After storage of more than 24 months, we recommend a complete visual inspection at our main factory or at your nearest factory representative.

10. Transport



For transport, take care that the hoist has an adequate carrying force. It is expressly indicated that units less than 1000 kg carry no weight information.

Take special care when handling the pump unit. Make certain that it is not hit against walls, steel structures, floors or the like.

Overlong pump units must be prepared for transport according to the section "General remarks".



The motor must in no case be raised or moved by the power supply cables!



Check the motor filling before starting!



11. Operating problems and their elimination

<u>Failure effect</u>	<u>Cause</u>	<u>Possible fault</u>	<u>Possibility of damage repair</u>
Motor protection triggered	Motor circuit breaker adjusted too low	Motor circuit breaker incorrectly adjusted	Readjust motor circuit breaker according to data sheet or rating plate
	Current consumption of motor too high	Undervoltage or wrong frequency	Check system voltage and frequency (does the information on the type plate agree with the system voltage and frequency?)
		Phase failure	Check fuses Examine power supply cables for damage
		Pump or motor sluggish	Check the smooth running of the pump/motor
Pump does not start	Voltage failure	Blown fuse(s)	Replace fuse(s)
		Defective power supply cable(s)	Replace power supply cable(s)
		Motor protection triggered	Find cause for triggering, rectify, and reset motor circuit breaker
	Blocked pump	Impurities in the pump	Disassemble pump section and clean
Flow inadequate	Incorrect rotating direction	Rotating direction was not checked	Change rotating direction
	Reduction of area in the pressure pipe	Isolator valves not completely open	Completely open isolator valves
		Pressure pipe clogged	Clean pressure pipe
		Foreign body in the pipe	Clean pipework
		Wall filter stopped up	Remove unit and regenerate well
	Pressure pipe leak	Pipework defective	Check pipework

<u>Failure effect</u>	<u>Cause</u>	<u>Possible fault</u>	<u>Possibility of damage repair</u>
Flow inadequate (cont.)	Impellers worn out	High sand content of the pumping medium	Remove pump and repair (check material selection in coordination with a water analysis)
		Corrosive pumping medium	
		Cavitation	Check operating conditions
	Rotating speed too low	Undervoltage or wrong frequency	Check system voltage and frequency
		Motor running with one phase	Check fuses
		Bearing damage	Remove unit and repair
Units run, but does not pump	Head too great	Total system head does not correspond to pump characteristic	Reduce head
	Unit not suspended in pumping medium	Fitting depth inadequate	Check well level and/or suspend unit deeper
	Pressure pipe not free	Main slide valve closed	Check blockage and control units
	Motor runs but pump does not turn	Coupling between pump and motor defective	Remove unit and repair
	Suction sieve stopped up	Foreign body in well	Remove unit and clean suction sieve



Declaration of Conformity

complying with the Machinery Directive 98/37/EC, Appendix IIA

We herewith declare that the following submersible pump models:

R, BF, NE6, PN6, QN6, NB8, PN8, QN8, PN10, QN10, QN12

as completed with submersible electric motors

comply with the provisions of the Machinery Directive 98/37/EC, Appendix I

The following harmonized standards are applicable:

EN 809

EN 292 Part 1

EN 292 Part 2

The User's Manual, includes important safety recommendations for transportation, storage, installation, operation and maintenance of PAPANTONATOS SA pumps.

Athens 15 / 3 / 2005

Papantonatos SA

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Quality Assurance Manager

