6" and 8" Encapsulated Submersible Motors
6" und 8" Gekapselte Unterwassermotoren
Moteurs immergés 6" et 8" Encapsulés
Motori sommersi incapsulati da 6" e 8"
Motores sumergibles encapsulados de 6" y 8"
Motores encapsulados de instalação subaquática, de 6" e 8"
Καλυμμένοι υποβρήχιοι κινητήρες 6 και 8 ιντσών
--- Assembly and operating instructions ---

1. Strictly observe! ........................................ 4
   Intended use, typical use, permitted / prohibited media,
   requirements of the EC-regulation “machines”

2. Technical information ............................... 5
   Technical data, differences between the model variations, options

3. Storage and unpacking .............................. 5
   Storage conditions, unpacking, inspection

4. Assembling the motor ................................ 5
   Required tools, inspection before assembly, checking and topping
   off the motor fluid, assembly of motor and pump, connecting and
   extending the motor cable, measuring the insulation resistance

5. Electric connection .................................. 7
   Requirements for power supply, fuses and motor protection,
   grounding, surge voltage protection, connection of different
   models, connector pinout, determining rotation, connection of
   frequency converters and soft starters

6. Operation ............................................... 9
   Checks before powering up, switching sequence in case of
   generator operation, starting the motor

7. Trouble shooting ..................................... 10
   Safety during maintenance work, what to do in case of electrical,
   mechanical or hydraulic problems

Attention: The motors may only be used under strict observation
of these instructions. Keep this manual close at hand, so that you
have it available whenever questions arise!
1. Strictly observe!

1.1. Intended use
Electric submersible motors made by Franklin may be used to drive pump loads under water only.

1.1.1. Typical application:
Typical applications for loads (e.g. pumps) driven by submersible motors are:
- drinking water supply in cities and villages, even pumping out of rivers,
- wells in waterworks, private households and agriculture,
- stirring machines in water treatment plants,
- water supply for dairies, breweries and mineral water bottling plants as well as in industrial cooling circuits,
- ground water heat pump systems
- irrigation sprinkling systems in gardening, agriculture and forestry as well as for fish ponds,
- dewatering in civil engineering and mining,
- pressure boosting systems in industrial applications,
- fountains, also for horizontal installation. Note: In such a case you must strictly observe the regulations concerning the safety of electric installations for fountains.

1.1.2. Permitted media:
Submersible motors may only be used in clean and low viscosity fluids, such as
- drinking water and water for industrial use.

1.1.3. Non-permitted media:
Submersible motors must not be used under any circumstances in any other media:
- especially not for the pumping of air, explosive media or waste water.
- For the use in aggressive media there are motors available, which are made of V4A-steel (AISI 316). The person ordering the motor is solely responsible for choosing the material.

1.1.4. Temperature of medium
The temperature of the medium may be between 0 ... +30 °C. Temperatures down to -3 °C are only permitted with the original filling solution of the motor.
A coolant flow speed of 0.16 m/sec. (minimum) along the motor must be assured. Otherwise the motor will overheat.

1.1.5. Cooling tube or flow sleeve
The coolant flow speed results from the diameter of the well and the displacement of the pump.
If the required minimum speed of the coolant flow cannot be achieved, e.g. if the inlet opening of the well is above the motor or if the well has a very large diameter, a cooling tube or flow sleeve is required.
This should enclose the motor completely and the water inlet opening of the pump in such a way, that the motor is positively cooled (see illustration).
The tube may be made of a corrosion resistant steel or plastic.

1.1.6. With higher temperatures of the medium
operation is only permitted if you reduce the load in accordance
- with table 1
- with table 2

<table>
<thead>
<tr>
<th>Water temperature [°C]</th>
<th>Maximum Motor load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Motor rating 5,5 ... 22 kW</td>
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<tr>
<td>35</td>
<td>100%</td>
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<tr>
<td>40</td>
<td>88%</td>
</tr>
<tr>
<td>45</td>
<td>76%</td>
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<tr>
<td>50</td>
<td>62%</td>
</tr>
</tbody>
</table>

Table 1.1: Maximum loading capacity in % of the nominal power at a coolant flow speed of 0,16m/sec.

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</tr>
<tr>
<td>45</td>
<td>100%</td>
</tr>
<tr>
<td>50</td>
<td>88%</td>
</tr>
</tbody>
</table>

Table 1.2: Maximum loading capacity in % of the nominal power at a coolant flow speed of 1m/sec.

1.2. Requirements during use
- The maximum submersion depth below the water level must not exceed 350 m.
- If a deeper submersion depth is required, you may order specially tested motors with pre-assembled cables from the manufacturer.
- The frequency of starting must be limited to 20 starts per hour - with an On/Off time of minimum at least 90 seconds.
- You should generally plan the installation of a check valve in the riser pipe or drop pipe, if the pump is not already fitted with one. Spring loaded check valves are recommended to minimize water hammering at shut off.
- The distance between check valve and pump must not exceed 7 m.
- In wells with variable water supply we recommend the installation of a level control, to avoid dry running of motor and pump.

1.3. Duties of the personnel
Before unpacking, installing or operating the submersible motor:
Please strictly observe the information in this manual!
The non-observance of this manual may lead to errors during operation,
- threats to health and life may be caused by electrical or mechanical influences,
- damage to motor or surrounding installations and
- functional faults during operation.
For the operating steps described in this manual expert knowledge equivalent to a professional education of a skilled electrician or a technician for electric machinery is required.
- Electrical installation work must only be carried out by professional personnel.

Attention!
Under no circumstances may the motor be heated to more than +60 °C - neither during operation, nor during storage! Otherwise motor fluid may be lost due to expansion - the motor would be damaged after a short period of use!
1.4. Demands of the EC Directive

Submersible motors are components, which are in accordance with the EC Directive „Machines“. You may only start to operate the motor, if...

- you have manufactured a complete machine, e.g. in connection with the aggregate to be driven.
- the protection requirements demanded by the applicable EC- and local regulations are met.
- you have confirmed the protection requirements by issuing the EC declaration of conformity
- and you have made it clearly visible by attaching the CE-sign from outside!

2. Technical Information

2.1. For all models:

Design principle: Enclosed 2-pole asynchronous motor with water lubricated bearings.

Model - No.:

- 6": 236...
- 8": 239...

Voltage range:

- 220V ... 690V;
- 3~ 50Hz / 60Hz

Starting variants:

- Direct starting
- Y1-starting

Rotary speed:

- ~ 2860 rpm at 50 Hz

Weight:

See Product Info

Power:

- 6": 3... 45kW
- 8": 30 ... 150kW

Connection:

- 6"/8" NEMA flange

Type of protection:

- IP 68

Insulation class:

- F

Ambient temperature: nominal +30 °C

Coolant speed: nominal 16 cm/sec.

Frequency of starts: max. 20 switching operations per hour with a minimum On/Off time of 90 seconds

Installation position: vertical (shaft always upwards, never downwards) and slightly vertical in case of horizontal installation. (Just permissible when pump and motor in the same size)

Temperature monitoring: see section 5.3.7

Voltage tolerance: ±10% / +6%Un (Standard: 415 +6% = 440V, 380 -10% = 342V)

Cable: KTW and VDE tested cables

- 6": motor cable not in scope of delivery.
- 8": motor cable (8 m) part of scope of delivery.

Ground lead not in scope of delivery.

Noise level:

- < 70 dB(A)

Maximum axial thrust: depending on model towards motor:

- 6": 15.500N, 27.500N
- 8": 45.000N

from motor:

- 6": 1.400N
- 8": up to 75 kW 1.400N
- 8": 93 to 150 kW 3.400N

*Note: These data apply for a load time of max. 3 minutes. This time is sufficient to start the pump.

Motor filling: The composition of the fluid is in accordance with the food protection legislation. The filling may be replaced by drinking water just immediately before installation. Observe frost protection!

For all models:

The 6" and 8" motors are three-phase motors with hermetically enclosed stator. The specification 6" or 8" refers to the smallest possible well tube inside diameter into which the motor can be inserted. For correct dimensions please refer to the drawings 2.1 and 2.2 on page 59 and the technical data sheets for the respective motor model.

2.2. Options

6" motors:

- PTC temperature sensor 4kW ... 30kW,
- SubMonitor temperature sensor 4kW ... 30kW and PT100

Special materials: AISI 316 SS (with SIC mechanical seal for 4kW ... 45kW)

- Motors with SIC mechanical seal, special voltages, motor cable 4m and special lengths

8" motors:

- Special materials: AISI 316 SS
- Motors with SIC mechanical seal
- special voltages
- ground lead

3. Storage and unpacking

3.1. Storing the motor

Correct storage of the motor is a prerequisite for trouble free operation at a later date.

- Leave the motor in its original packaging until the day of installation.
- When standing the motor upright make sure that it cannot fall over (shaft always upwards).
- Do not subject the motor to direct sunlight or other heat sources. Under no circumstances may the motor be heated up higher than 60°C. Otherwise motor fluid may escape because of expansion, the motor would be damaged during later use.
- Make sure that the storage temperature with original filling does not drop below -15°C.

3.2. Unpacking the motor

⚠️ Risk of injury! ⚠️

Mind the weight of the motor.
Use only permitted lifting gear.
Do not step under loads being lifted.
Take the motor carefully out of its packaging in order to avoid damage.

3.3. Check

after unpacking for apparent external damage, for example:
- on the membrane cover
- on the housing
- on the bearing plate
- on the connection or motor cable

If you find any damage you must not assemble or operate the motor, as otherwise the motor or even the complete unit will not be safe enough because of the damage. A damaged motor causes a danger of injury and a threat to life.

4. Assembling the motor

4.1. Required tools

For the necessary inspections and correct assembly the following tools are required:

- Filling Kit (308 726 102)
- Insulation measuring unit 500V test, display up to min. 200 M Ohm

4.2. Inspection before assembly

If a leakage is visible or the motor is older than one year (e.g. in case of reuse or after longer storage), the motor filling must be checked before installation.

4.2.1. Determine the age of the motor

The age of the motor can be taken from the DATE CODE, which is engraved above the Motor nameplate:

98 B 62

Fig.4.1. manufacturing code
4.2.2. Check the motor fluid

Fig.4.2. Checking the motor fluid

1. Place the motor horizontally.
2. Insert the test gauge (2) through the bore in the diaphragm cover (1), until a resistance can be felt.

The filling level is sufficient, when the diaphragm is adjusted to the following distance:

Diaphragm distance:
- 6" standard motor 59mm +/- 2mm
- 6" AISI 316 SS 19mm +/- 2mm
- 8" type 1: 93kW ... 150kW 38mm +/- 2mm
- 8" type 2: 30 kW ... 75 kW 35mm +/- 3mm

4.2.3. Topping off the motor fluid

If the inspection has revealed that the motor fluid level is too low (distance between diaphragm and housing bigger than stated above), you may top off with clean tap water - do not use distilled water!

Filling quantities:
- 6" approx. 1.5 litres
- 8" approx. 2.8 litres

However, more suitable is the original filling fluid from Franklin Electric, because only this fluid ensures sufficient frost protection.

6" and 8" motors:
- 5 l (308 353 921)
- 10 l (308 353 922)
- 20 l (308 353 923)

4.3. Assembly of motor and pump (aggregate)

Fig.4.4. Assembly of motor and pump

Attention! With some devices the power supply plug is no longer accessible after assembly. In such a case you should first connect the motor cable as described below.

This manual can only describe the work steps related to the motor. Please observe also the installation instructions for the load device when assembling motor and aggregate.

Caution! For your safety!

Do not use the motor with damaged devices or parts. The high drive forces may otherwise cause accidents with considerable risk of injury and danger to life!

4.3.1. Preparatory tests

1. If necessary remove the shaft guard.
2. Before assembly turn the motor shaft by hand - it must rotate freely after overcoming the static friction.
3. Make sure that the surfaces of the parts to be connected are free of dirt and dust.

4.3.2. Assembly

1. Cover the inner part of the coupling on the load with a water resistant, acid-free grease (e.g. Mobil FM 102, Texaco Cygnus 2661, Gleitmo 746).

The grease minimizes the friction and provides additional protection against sand entry. During assembly of motor and pump unit make sure that the splined section is provided with an O-ring. This O-ring prevents sand and dirt from entering into the splined section of the shaft. The appropriate couplings are available from Franklin Electric.

2. Align the shafts of pump and motor to each other and join pump and motor together.

Attention! The shafts of pump and motor must not have a rigid connection (coupling) in axial direction.

The coupling should be fixed on the pump shaft and free to slide on the motor shaft.

Use fastening screws of appropriate quality, class and dimensions, as specified by the manufacturer of the load device. Observe the tightening torques specified by the manufacturer of the load device.

Note: Mounting bolts for load device assembly
- 6" motors: Screw thread 1/2-20 UNC
- 8" motors: Bore ∅ 17,5 mm
3. Bolt motor and pump together and tighten the fastening screws crosswise as specified.

4.3.3. Final tests

If the coupling is freely accessible during operation, it is absolutely necessary to install a guard against touching!

4.4. Connecting the motor cable

Fig.4.5. Preparing the motor cable and coupling

Attention! The cable must under no circumstances touch sharp edges.

Route the cable along the pump and protect it with a cable guard against damage. Please observe also the specifications of the pump manufacturer.

This step requires strict cleanliness. Dampness and dirt or grease on plug and socket contacts can be the cause for malfunctions and failures.

- You should always use genuine cables from Franklin Electric - these are suitable for drinking water and VDE-tested. Other cables may not be sufficiently safe and suitable!

4.4.1. Connect the cable to the motor

On the 8" model the motor cable is already connected ex-factory. In this case you may jump the following paragraph. For all other models:

1. Remove the plastic plug (1), Fig. 4.5.
2. Check both plug (2) and socket (3) for dirt and dampness.
3. Slide the jam nut of plug (2) so far back, that the thread in the socket (3) is visible again and slide the jam nut over the plug (4).

4. Cover the outer circumference of the rubber part on the plug slightly with silicon or Vaseline. Make sure that the contacts remain free of grease. Otherwise there may be a short circuit. Use some acid free (see 4.3.2) grease also for the thread of the jam nut.
5. Then insert the plug as deep into the socket (3) as possible, until the thread in the socket is visible again and slide the jam nut over the plug (4).
6. Turn the jam nut first in anti-clockwise direction to find the beginning of the thread. Then tighten the nut by hand in clockwise direction.

7. Tighten the jam nut with an open end spanner (30 mm), until an initial compression of the plug rubber can be felt.

8. Now tighten jam nut (4) approx. 1/2 turn. The plug connection is now leak tight.

Attention! Do not tighten more than 68 - 91 Nm, otherwise the plug seal will be damaged.

Note: Steps 2 to 8 describe also the assembly of a spare cable for an 8" motor.

Note: 8" DOL motors (110kW - 150kW) are fitted with 3 individual plugs. Insert the plugs and fasten them with the pressure plate and the 4 screws. The tightening torque is 9 - 10Nm. Tighten the screws crosswise.

4.4.2. Connecting the ground conductor

Attention! 8" motors are supplied without ground conductor. The customer is responsible for the correct connection of a ground conductor. For this purpose the motor is fitted with the respective PE-terminal.

4.4.3. Extending the motor cable

The customer can extend the cable supplied with the motor.

Attention! During operation the cable supplied with the motor must always be covered by the pumped fluid for cooling.

Use only extension leads which are
- made of suitable material for the application
- of sufficient insulation for the temperatures in the medium.

5. Electrical connection

5.1. In this chapter it is assumed that
- the motor is correctly assembled, as described in chapter 4,
- the insulation resistance of the motor cable has been measured and found in good condition, as described in chapter 4,
- the completely assembled aggregate has been correctly installed at the place of use, as described in the instructions of the manufacturer.

Caution! For your safety! Before making any connections you must assure:
that the complete system is electrically dead and
that nobody is able to accidentally switch the power on, while work on the system is in progress.
Do not work on electric installations if there is the risk of a thunderstorm or during a thunderstorm. Lightning may cause dangerous surge voltage. There is an acute threat to life by electric shock if you do not observe these notes.

5.2. The power supply must at least meet the following demands, to avoid damage to motor and undesired feedback effects to the supply network:

5.2.1. Power supply by mains connection

The following tolerances must not be exceeded, as otherwise the motor may be damaged:
- The total voltage tolerance must be within the range from -10% to +6% (measured on the motor terminals).
- The deviation of the motor current from the average value of all three currents must not exceed max. ± 5%.
5.2.2. Power supply by generator

Attention!
The applicable tolerances for supply apply by power mains also for the power supply by generators!

When choosing a generator consider the starting performance of the motor, i.e. starting current with a mean $\cos \phi$ of 0.5.

Also make sure that a generator of sufficient power is continuously available and that the voltage during start-up must be at least 65% of the nominal voltage.

Attention!
We highly recommend coordinating the dimensioning of the system with the generator manufacturer.

Note:
Strict compliance with the switching sequence is mandatory. Always switch the generator on and off without load! This means:
- for starting: always switch the generator on first and then the motor!
- for shut down: always switch the motor off first and then the generator!

5.3. Connecting the motor

Observe the specifications of the motor type plate and dimension the electric installation accordingly.

The following connection examples refer solely to the motor - they are no recommendations for any preceding control elements!

The person performing the installation is solely responsible for the correct planning and installation.

5.3.1. Fusing and motor protection

Consider the installation of an external power main switch (1), to be able to disconnect the voltage supply at any time - e.g. in case of danger or when working on the installation.

Plan fuses (2) for each individual phase at the customers site.

Plan the installation of a motor starting and protection switch (3), as explained in the following description for the individual models.

You should also plan the installation of an emergency shut-off, as far as this is specified or found necessary for your application!

5.3.2. Grounding

Fig.5.2. Grounding

The motor must be grounded.

During the dimensioning of the grounding connection particularly consider the motor power.

Expert rules can be found in EN 60034-1 and IEC 364-5-54 and in the European standards.

5.3.3. Surge voltage protection

Fig.5.3. Surge voltage protection

Provide a sufficient surge voltage protection (lightning protection) (5) in the voltage supply.

5.3.4. 6" and 8" 3-phase model

Franklin Electric motors are suitable for both clockwise and counter-clockwise rotation depending on the connection:

The motor rotates in anti-clockwise direction (looking onto the motor shaft), if:
- the conductor sequence L1 - L2 - L3 provides a left-hand field (can be checked with a rotating field tester)
- and you connect the motor as shown (L1-U,L2-V,L3-W).

The motor rotates in clockwise direction, (looking onto the motor shaft), if:
- the conductor sequence L1 - L2 - L3 provides a right-hand field when connecting the motor as shown,
- or if you exchange any two conductors (e.g. L3 - U, L1- W) in a left-hand field.

Connect the motor that the sense of rotation matches the load requirements. The connection examples show the common connection for a right-hand field and an ccw rotation..

5.3.5. Operation with frequency converter

- At all operating points of the control range the motor current must be lower than the nominal motor current specified on the nameplate.
- Adjust the frequency converter so that the limits of min. 30Hz and max. 60Hz are not exceeded.
- The surge voltages occurring during operation with a frequency converter must be limited to the values described in EN 60034-17 and a maximum voltage increase of 500V/µs and a maximum surge voltage of 1000V.
- The maximum acceleration time from 0Hz to 30Hz as well as the deceleration time from 30Hz to 0Hz is 1 second.
- The additional installation of a filter between frequency converter and motor is necessary if:
  - voltage ≤ 380 V and
  - the switching time < 2 µs and
  - cable length > 15 m.
For dimensioning of the cable, an additional voltage drop, depending on the apparent resistance of the filter, must be taken into consideration.
- Make sure that the necessary coolant speed at 50 Hz along the motor is also complied with during operation with a frequency converter.
- When connecting and starting the motor for the first time you must strictly observe the instructions in the operating manual for the frequency converter.

5.3.6. Connection of soft starting units (soft starters)
If you want to operate the motor with a soft starter, you must observe the following points:
- Set the starting voltage of the soft starter to 55 % of the nominal voltage.
- and the acceleration time as well as the deceleration time to maximum 3 seconds.
- After acceleration the soft starter should be bypassed by means of a contactor, as otherwise the resulting losses in the motor would be too high. This can lead to an overheating of the motor at nominal power.
In this respect consult the manufacturer of the soft starter.
When connecting and commissioning the motor observe strictly the instructions for the respective soft starter!

5.3.7. Thermal monitoring

<table>
<thead>
<tr>
<th>Encapsulated motor</th>
<th>Temperature monitoring system</th>
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<tbody>
<tr>
<td>6&quot; 4kW - 30kW</td>
<td>PTC / SubMonitor / PT100</td>
</tr>
<tr>
<td>6&quot; 37kW - 45kW</td>
<td>SubMonitor / PT100</td>
</tr>
<tr>
<td>8&quot; 30 kW - 110kW</td>
<td>SubMonitor / PT100</td>
</tr>
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</table>

PTC - temperature monitoring 6": 4kW-30kW
The PTC - sensor is located inside the stator windings.
The PTC is a sensor with a low resistance at permissible temperatures and a high resistance when the permissible temperature is exceeded.

Motors with a PTC - sensor are provided with an additional plug connector for an additional two-conductor sensor cable (Franklin).
Connecting cable 2x0.75 mm² (model 310 364 004), lengths 4m.
The two-conductor cable of the PTC - sensor in the motor must be connected to a PTC - motor protection system.
This protection device (PTC - receiver) is commercially available in good electrical controls shops or from your pump supplier.

SubMonitor temperature control
The SubMonitor sensor is installed inside the stator and sends a high frequency signal via the motor connection cables to the SubMonitor-receiver, when the temperature exceeds the permissible limit.
An additional cable for the signal transmission is therefore not required.
The SubMonitor - receiver evaluates the signal and protects the motor against:
- excessive temperature
- overloads
- under load (like dry-running)
- frequent start-stop cycles
The SubMonitor protection system is available at Franklin Electric.

6. Operation

6.1. This chapter assumes that
- the motor is correctly assembled with the aggregate, as described in chapter 4,
- the motor is correctly connected and fused, as described in chapter 5,
- the insulation resistance in the motor cable has been measured and found o.k., as described in chapter 4.4.4,
- the completely assembled aggregate has been correctly installed at the place of use, as described in the instructions of the manufacturer.

6.2. Before starting to operate the motor
make sure that
- the motor is fully submerged. The motor must only be operated under water.
- the riser pipe or drop has been bled, to avoid water hammering during starting. Otherwise both aggregate and pumping pipes may be damaged.
- the conditions for commissioning specified by the manufacturer of the pump are met.
- all electric connections and protective installations have been checked and fuses and circuit breakers are correctly adjusted.
- access to dangerous points has been eliminated, particularly to rotating parts, suction ports or pressure outlets and electrical connections.
- for motors with original filling the temperature of the medium does not drop below -3 °C and for motors with water filling not below 0 °C.
If not, you must not start to operate the motor, because there is a risk of accident and the motor may be damaged.

6.3. Starting the motor
Once you have checked all above mentioned points and all adjustments are correct, you may start the motor:
- Immediately after starting the motor please check
  - the operating current of the motor for each phase,
  - the main voltage while the motor is running,
  - the level of the medium to be pumped.
- Immediately stop the motor, if
  - the nominal current according to the specification on the name plate is exceeded,
  - voltage tolerances of more than +6%/- 10% of the nominal voltage are measured. For weak supply networks we recommend the installation of a voltage monitor!
- dry-running can be expected. In case of nonuniform supply it is necessary to install a level sensor, as a measure to avoid dry-running.
- the deviation of a motor current from the average value of all three currents exceeds 5%.

6.4. During test operation:
Each start applies heat to the motor. Particularly a high frequency of starts contributes to the reduction of the motor lifetime!
You should make sure that the values specified in the technical data concerning the frequency of starts are not exceeded, even during test operation!
7. Trouble shooting

7.1. General

Warning!
For your safety!
Please observe the safety regulations mentioned hereunder. Otherwise there is a risk of accident and a thread to life.

- Do not perform any other work to the motor than the tasks described in this manual. Otherwise the motor may be damaged, whereby the operating safety of the system can no longer be assured. Due to the partly quite high driving and pumping forces considerable risks for accidents may arise, even danger to life caused by electric shock.
- For trouble shooting and fault rectification on the complete system you must strictly observe the respective notes in the instruction manual of the pump manufacturer.
- Do not open the motor! Without the use of special tools the motor cannot be closed again correctly. This would destroy the motor.
- Do not carry out any changes or modifications to the motor or the electric connections. Otherwise the safety of the motor cannot be assured.
- Work must only be performed when the motor stopped! No work or inspections are required while the motor is running.
- For repairs use only genuine spare parts from Franklin Electric.
- The aggregate may be contaminated when taking it out of a medium, in which health impairing effects cannot be ruled out. Rests of medium may accumulate in the bore at the bottom of the diaphragm cover, which may drain unexpected.
- Mark contaminated motors or aggregates, before handing them over to third persons (e.g. before returning for repair).
- Disconnect the voltage supply before starting the work described hereunder.
- Make sure that nobody can switch the voltage supply back on by accident while work on the system is still in progress!
- Do not work on electric installations if there is the risk of a thunderstorm or during a thunderstorm.
- Make sure that all guards and safety installations have been completely reinstalled and are fully functional immediately after completing work.

7.2. What to do!
The motor is maintenance free. No preventive or regular service work is required.

7.2.1. In case of electric problems
e.g. in case of repetitive switching off you should check the insulation resistance by a specialist, as described before.
- Disconnect the motor connection cable from the system and measure motor and cable. If the ground to phase insulation resistance is less than 0,5 MOhm measure the motor and the cable solely.
- Is the cable faulty? Connect a new cable, as described before.
- Is the motor faulty? Have the motor checked in a specialist FAM's workshop - or install a new motor.
- Is it neither motor, nor cable? Have the electric system checked by a specialist.

7.2.2. In case of mechanical or hydraulic problems
e.g. unusual noises, concentricity faults of the pump or frequent on and off switching of the motor, you must perform trouble shooting for the aggregate.
- For this purpose refer to the instructions of the pump manufacturer.
Fig. 2.1. Measurements 6” motors

Abmessungen der 6” Motoren
Dimensions moteurs 6”
Dimensioni dei motori da 6”
Dimensiones de los motores de 6”
Medidas dos motores de 6”
Διαστάσεις των κινητήρων 6 ιντσών

Fig. 2.2. Measurements 8” motors

Abmessungen der 8” Motoren
Dimensions moteurs 8”
Dimensioni dei motori da 8”
Dimensiones de los motores de 8”
Medidas dos motores de 8”
Διαστάσεις των κινητήρων 8 ιντσών
### Jacketed Cable Ampacity, IEC Publication 364-5-523 (1983 edition), Table 52-B1, Installation Methods C & G

#### Direct start/Direktanlauf/Démarrage direct/Avviamento diretto/Arranque directo/Arranque directo/

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<thead>
<tr>
<th>rating kW</th>
<th>mm² - Cu - max. 70°C</th>
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<tbody>
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<td>4</td>
<td>180</td>
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<td>135</td>
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<td>7.5</td>
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<td>9.3</td>
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<td>11</td>
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<td>13</td>
<td>95</td>
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<td>15</td>
<td>130</td>
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<td>18.5</td>
<td>170</td>
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<td>140</td>
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<td>170</td>
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<td>37</td>
<td>195</td>
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<td>45</td>
<td>175</td>
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<tr>
<td>52 - 56</td>
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<td>60</td>
<td>180</td>
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<tr>
<td>67</td>
<td>220</td>
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<tr>
<td>83 - 85</td>
<td>220</td>
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<tr>
<td>93</td>
<td>265</td>
</tr>
<tr>
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<td>235</td>
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<td>185</td>
<td>230</td>
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#### wye-delta start/Stern-Dreieck Anlauf/Démarrage étoile-triangle/Avviamento stella-triangolo/Arranque estrella triángulo/Arranque estrela triângulo/

<table>
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<th>mm² - Cu - max. 70°C</th>
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<tr>
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<td>275</td>
</tr>
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<td>5.5</td>
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<td>150</td>
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<td>9.3</td>
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<td>160</td>
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<td>150</td>
<td>200</td>
</tr>
<tr>
<td>185</td>
<td>195</td>
</tr>
</tbody>
</table>

**Maximum cable lengths in meters for 400V / 50Hz and 5% voltage drop**

- **Maximale Kabellängen in Meter für 400V / 50Hz und 5% Spannungsabfall**
- **Longueurs de câble maximales en mètres pour 400V / 50Hz et une chute de tension de 5%**
- **Lunghezze max. cavi in metri per 400V / 50Hz e caduta di tensione del 5%**
- **Largos máximos de los cables, en metros, para 400V / 50Hz y 5% de caída de tension**
- **Comprimentos máximos dos cabos (em metros) para 400V / 50Hz e 5% de queda de tensão**

μέγιστα μήκη αγωγών για κινητήρες σε απευθείας έναρξη λειτουργίας, τάση των 400 V/50 Hz και πτώση τάσης των 5%
# Motor Test Report

## 1. CUSTOMER / USER

**Company**: ..................................  
**Country**: ..................................  
**Town**: ....................................  
**Mr./Mrs.**: ..................................  
**Tel. No.**: ..................................

## 2. MOTOR

<table>
<thead>
<tr>
<th>Modell:</th>
<th>Performance:</th>
<th>Voltage:</th>
<th>Frequency:</th>
<th>Material:</th>
</tr>
</thead>
<tbody>
<tr>
<td>..........</td>
<td>............[kW]</td>
<td>........[V]</td>
<td>........[Hz]</td>
<td>o 304</td>
</tr>
<tr>
<td>Date Code:</td>
<td>Sequenz-No:</td>
<td>Stator Nr:</td>
<td>Assembler:</td>
<td>o 316</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Built in:</th>
<th>Equipped for:</th>
<th>Worked with:</th>
</tr>
</thead>
<tbody>
<tr>
<td>o USA</td>
<td>o Subtrol</td>
<td>o Subtrol</td>
</tr>
<tr>
<td>o PT 100</td>
<td>o PTC</td>
<td>o PTC</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Worked:</th>
<th>Days:</th>
<th>Hours:</th>
</tr>
</thead>
</table>

## 3. INSTALLATION

<table>
<thead>
<tr>
<th>Pump Make:</th>
<th>Type:</th>
<th>Well Depth:</th>
<th>Well Diameter:</th>
</tr>
</thead>
<tbody>
<tr>
<td>...........</td>
<td>.......</td>
<td>...........</td>
<td>...............</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Protection Make:</th>
<th>Type:</th>
<th>pH-Value:</th>
</tr>
</thead>
</table>
| .................. | ...

<table>
<thead>
<tr>
<th>Water:</th>
<th>normal</th>
<th>aggressive</th>
<th>sandy</th>
<th>muddy</th>
</tr>
</thead>
<tbody>
<tr>
<td>o</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## 4. EXTERNAL

<table>
<thead>
<tr>
<th>Shaft:</th>
<th>Upper End:</th>
<th>Bell:</th>
<th>Deposits:</th>
<th>Valves:</th>
<th>Temperature:</th>
</tr>
</thead>
<tbody>
<tr>
<td>O.K.</td>
<td>O.K.</td>
<td>damaged</td>
<td>none</td>
<td>O.K.</td>
<td>.......[°C]</td>
</tr>
<tr>
<td>O.K.</td>
<td>damaged</td>
<td>.......</td>
<td>..........</td>
<td>..........</td>
<td>.......</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Diaphragm:</th>
<th>Lower End:</th>
<th>Bell:</th>
<th>Deposits:</th>
</tr>
</thead>
<tbody>
<tr>
<td>O.K.</td>
<td>damaged</td>
<td>.......</td>
<td>..........</td>
</tr>
<tr>
<td>O.K.</td>
<td>damaged</td>
<td>..........</td>
<td>..........</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Position:</th>
<th>Deposits:</th>
<th>Valves:</th>
<th>Temperature:</th>
</tr>
</thead>
</table>
| too high  | .......... | .......... | .....

<table>
<thead>
<tr>
<th>Splines:</th>
<th>Nameplate:</th>
<th>Cable / Lead:</th>
<th>Insulation:</th>
<th>Plug:</th>
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<tbody>
<tr>
<td>O.K.</td>
<td>O.K.</td>
<td>O.K.</td>
<td>wrong</td>
<td>O.K.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Height:</th>
<th>Upper Radial:</th>
<th>Lower Radial:</th>
<th>Lower Shaft:</th>
<th>Diaphragm:</th>
</tr>
</thead>
<tbody>
<tr>
<td>too high</td>
<td>o grooves</td>
<td>o grooves</td>
<td>o K.</td>
<td>o.K.</td>
</tr>
<tr>
<td>too low</td>
<td>o damaged</td>
<td>o K.</td>
<td>o K.</td>
<td>o.K.</td>
</tr>
<tr>
<td>too low</td>
<td>o destroyed</td>
<td>o grooves</td>
<td>o grooves</td>
<td>o.K.</td>
</tr>
<tr>
<td></td>
<td>o worn</td>
<td>o K.</td>
<td>o K.</td>
<td>o.K.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Segments:</th>
<th>Upper Radial:</th>
<th>Upper Shaft:</th>
<th>Liner:</th>
</tr>
</thead>
<tbody>
<tr>
<td>o O.K.</td>
<td>o K.</td>
<td>o K.</td>
<td>O.K.</td>
</tr>
<tr>
<td>o K.</td>
<td>o K.</td>
<td>o K.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shaft seal:</th>
<th>Upthurst:</th>
<th>Liquid:</th>
</tr>
</thead>
<tbody>
<tr>
<td>o O.K.</td>
<td>o K.</td>
<td>o K.</td>
</tr>
<tr>
<td>o K.</td>
<td>o K.</td>
<td>o K.</td>
</tr>
<tr>
<td>o destroyed</td>
<td>o K.</td>
<td>o K.</td>
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## 5. ELECTRICAL MEASUREMENTS

<table>
<thead>
<tr>
<th>Phase:</th>
<th>Normal Value:</th>
<th>Main Phase:</th>
<th>Start Phase:</th>
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<tbody>
<tr>
<td>1</td>
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<td>..........[Ohm]</td>
<td>..........[Ohm]</td>
</tr>
<tr>
<td>2</td>
<td>..........[Ohm]</td>
<td>..........[Ohm]</td>
<td>..........[Ohm]</td>
</tr>
<tr>
<td>3</td>
<td>..........[Ohm]</td>
<td>..........[Ohm]</td>
<td>..........[Ohm]</td>
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</table>

<table>
<thead>
<tr>
<th>Insulation Resistance:</th>
<th>Minimum:</th>
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</thead>
<tbody>
<tr>
<td>..........[M-Ohm]</td>
<td>.......[M-Ohm]</td>
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## 6. TEAR DOWN

<table>
<thead>
<tr>
<th>Thrust Disc:</th>
<th>Lower Radial:</th>
<th>Lower Shaft:</th>
<th>Diaphragm:</th>
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<tbody>
<tr>
<td>o O.K.</td>
<td>o K.</td>
<td>o K.</td>
<td>o K.</td>
</tr>
<tr>
<td>o grooves</td>
<td>o K.</td>
<td>o K.</td>
<td>o.K.</td>
</tr>
<tr>
<td>o destroyed</td>
<td>o K.</td>
<td>o K.</td>
<td>o.K.</td>
</tr>
<tr>
<td>o grooves</td>
<td>o K.</td>
<td>o K.</td>
<td>o.K.</td>
</tr>
<tr>
<td>o damaged</td>
<td>o K.</td>
<td>o K.</td>
<td>o.K.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Segments:</th>
<th>Upper Radial:</th>
<th>Upper Shaft:</th>
<th>Liner:</th>
</tr>
</thead>
<tbody>
<tr>
<td>o O.K.</td>
<td>o K.</td>
<td>o K.</td>
<td>O.K.</td>
</tr>
<tr>
<td>o K.</td>
<td>o K.</td>
<td>o K.</td>
<td></td>
</tr>
<tr>
<td>o grooves</td>
<td>o K.</td>
<td>o K.</td>
<td></td>
</tr>
<tr>
<td>o grooves</td>
<td>o K.</td>
<td>o K.</td>
<td></td>
</tr>
<tr>
<td>o damaged</td>
<td>o K.</td>
<td>o K.</td>
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<table>
<thead>
<tr>
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<th>Filling:</th>
<th>Liquid:</th>
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<tbody>
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<td>o K.</td>
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</tr>
<tr>
<td>o K.</td>
<td>o K.</td>
<td>o K.</td>
</tr>
<tr>
<td>o destroyed</td>
<td>o K.</td>
<td>o K.</td>
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</tbody>
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## 7. CONTROL BOX

<table>
<thead>
<tr>
<th>Type:</th>
<th>Relay:</th>
<th>Capacitor:</th>
<th>Wiring:</th>
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<tbody>
<tr>
<td>...........</td>
<td>O.K.</td>
<td>o defective</td>
<td>o.K.</td>
</tr>
</tbody>
</table>

## 8. REMARKS / COMMENTS

**Technical Warranty**:  
**Commercial Warranty**:  
**Repair**:  
**Scrap**:  
**Defect**:  
**Cause**:  

**Signature**:  
**Date**:  
**Entered into EDP**:  
**Date**:  

---
I. Declaration by the Manufacturer

as defined by Machinery Directive 98/37/EC Annex II

Hereby we declare that 6 inch and 8 inch Submersible motors with model numbers of the following series:

226...
236...
239...

are intended to be incorporated into machinery covered by this Directive but must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the actual provisions of the Directive.

II. Declaration of Conformity

We additionally declare that the above mentioned 6 inch and 8 inch Submersible motors conform with the provisions of the EMC Directive 89/336/EEC and the Low Voltage Directive 73/23/EEC.

Applicable harmonized standards:

- 73/23/EEC (Low Voltage Directive)
  - EN 60034-1
  - EN 50081-1
  - EN 50082-1

- 89/336/EEC (EMC Directive)
  - EN 55011

- 89/336/EEC (EN 55011)
  - EN 55022

T.P. Croucher
Technical Services Manager
Submarina Motor Engineering
12.05.03