

Encapsulated Submersible Motors, 6" and 8"

GB

Assembly and operating instructions



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EC Declaration of Conformity

Manufacturer: Franklin Electric Europa GmbH
Rudolf-Diesel-Strasse 20
D-54516 Wittlich/Germany

Product: 6-Inch and 8-Inch Encapsulated Submersible Motors

Type Designations: 226..., 236..., 239..., 276...

The above products are in conformity with the following European Directives:

2006/95/EC (Low Voltage Directive)

and

2004/108/EC (EMC Directive)

Applied harmonized standards: **EN 60034-1: 2010**

Applied national standards: **NEMA MG 1-2009: 18.170, 18.181**



J. A. Weber
Manager, Engineering Services

3 December 2013

1 With this document

These assembly and operating instructions form an integral part of the submersible motor and describe its safe, intended use in all operating phases.

Storage and handing over

- ⇒ Keep the assembly and operating instructions in the immediate vicinity of the motor.
- ⇒ Hand the assembly and operating instructions over to every subsequent user of the motor.

Application

These assembly and operating instructions only apply to the motors described here.

1.1 Warning notices and warning symbols

Warning notices point out special dangers and indicate the measures that can be taken to avoid the danger. Warning notices come in three levels:

Warning word	Meaning
DANGER	Immediate danger to life and health
WARNING	Possible danger to life and health
CAUTION	Possible danger of slight injury or material damage

Warning notices are built up as follows:



Warning word

Type and source of danger as well as the possible consequences of measures not being observed!

- ⊙ *Forbidden actions.*
 - ⇒ *Measures to avoid the danger.*
-

1.2 Instructions and highlights

In these assembly and operating instructions we use the following symbols and, for improved legibility and uniform identification, highlights:

- Insulation measuring unit (this indicates a listing)
- ☑ Instructions ... observed (this indicates a condition)
- ⇒ Switch off the motor. (this indicates an instruction to take action)
- Motor has stopped. (this indicates the result of the action)
- Immediately switch off** the motor... (you can see a highlight in bold here)



Note

Specifically important information is given here. You should observe this information to ensure correct and safe operation of the motor.

2 Safety

This section describes the safety rules which you have to observe for the safe use of submersible motors. Possible sources of danger and the relevant safety measures are listed here.

2.1 Intended use

Franklin Electric submersible motors are only intended for integration with a machine in order to drive the relevant machine under water. They must only be put into use if the machine fulfils the provisions of the applicable directives and statutory provisions.

Installation location: Vertical (Mandatory mounting position: vertical, shaft up. Only one diameter step allowed, i.e. 6" motor on 8" pump). Horizontal (only allowed if the pump size is identical to the motor size, e.g. 6" motor with 6" pump). The pump has to sufficient "Down Thrust" transmit to the motor.

The submersible motors must only be used in clean, highly fluid media, such as drinking or process water.

The following media are not allowed: air, highly flammable, explosive media and wastewater.

Loss of guarantee and exclusion of liability

Franklin Electric shall not be liable for the damage resulting from any further, non-intended use. The risk of such use rests solely with the user.

2.2 Target group

The electrical system must only be installed by professional staff (qualified electrical engineers or electrical machine technicians).

2.3 General safety instructions

The following safety measures must be observed prior to putting the motor into use:

- Do not carry out any other work on the motor than described in these instructions.
- Only use the motor under water (the motor and the short motor cable must be fully submersed).
- Do not implement any changes or conversions to the motor or its electrical connections.
- Never open the motor.
- Never use the motor in combination with damaged pump units or parts.
- Only work on the motor when it is switched off. No work or checks require the motor to be running.
- Switch off the power supply to the motor before carrying out any work on it.
- Make sure that nobody can switch on the voltage unexpectedly while work is being carried out on the motor.
- Never work on electrical systems during a thunderstorm.
- Make sure immediately after ending the work that all protective and safety devices have been fitted again and are operational.
- Before switching on the motor, make sure that all electrical connections and safety devices have been checked and that all fuses and safeties have been set correctly.
- Make sure that no danger zones are freely accessible (e.g. rotating parts, suction locations, pressure output locations, electrical connections).
- Observe the pump manufacturer's commissioning instructions.
- If motors or pump units have been used in contaminated media they must be marked as such before handing them over to a third party (e.g. when submitting them for repair). Pay attention to possible residues in "Dead spaces" (diaphragm cover).
- Contaminated motors or pump units must be marked as such before handing them over to a third party (e.g. when submitting them for repair).
- Repairs must only be carried out by authorized professional workshops. Use only original Franklin Electric spare parts.

3 Storage, transport, disposal

- Storage**
- ⇒ Store the motor in its original packaging until the time of installing it.
 - ⇒ If the motor is stored standing up, make sure that it cannot topple over (shaft always pointing up!).
 - ⇒ Do not store the motor in direct sunlight or within the reach of other heat sources.
 - ⇒ Observe the storage temperature (–15 - +60 °C, see Technical specifications).

Transport



Falling loads may cause lethal injuries or may crush parts of the body!

- ⊙ Nobody is allowed to be located under suspended loads.
 - ⇒ Only use approved hoisting gear.
 - ⇒ Select the hoisting gear on the basis of the total weight to be transported.
-

Unpacking

- ⇒ After unpacking the motor check it for possible damage, e.g. damage to the diaphragm cover, housing, endbell, connection and motor cable.
- ⇒ Immediately inform the supplier of any damage found.



Danger to life due to electrocution if the motor cable is damaged!

- ⊙ Do **not** install the motor and do **not** put it into operation.
-

Disposal

- In order to avoid environmental damage:
- Avoid contamination by lubricants, detergents etc.
 - Dispose of the motor and the packaging material in a proper, environmentally sound manner.
 - Observe local regulations.

4 Technical specifications

Description	Value
Performance/model number	6": 4 - 45 kW (HighTemp90 up to 30 kW) models 236 ... (276 ...) 8": 30 - 150 kW (HighTemp75 up to 110 kW) models 239 ... (279 ...)
Voltage range	220 V ... 690 V, 3~ 50/60 Hz
Frequency tolerance	± 2%
Voltage tolerance (on the motor terminals)	50Hz : –10 / +6 % of U _N , i.e. at a nominal voltage of 380-415 V: 380V –10 % = 342V / 415V + 6 % = 440 V 60Hz : +/- 10% of U _N
Speed	approx. 2900 rpm at 50 Hz
Start alternatives	Direct starting, wye-delta-starting
Switching frequency	Max. 20 switching actions per hour with a minimum off time of 90 s
Protection	IP 68 according to IEC 60529
Insulation class	F (155°C)
Submersion depth	max. 350 m

Description	Value
Installation location	Vertical (Mandatory mounting position: vertical, shaft up. Only one diameter step allowed, i.e. 6" motor on 8" pump). Horizontal (only allowed if the pump size is identical to the motor size, e.g. 6" motor with 6" pump). The pump has to sufficient "Down Thrust" transmit to the motor. No general warranty when built-in in booster systems.
Operating temperature	≥ -3 °C
Sound pressure level	≤ 70 dB(A)
Maximum axial thrust towards the motor	6": 4 - 22 kW 15.5 kN (optional High Thrust Version: 45kN) 30 kW 27.5 kN (optional High Thrust Version: 45kN) (HighTemp90 – 18,5kW) 37 / 45 kW 45 kN (HighTemp90 – 22 / 30kW) 8": all motors 45.0 kN
Maximum axial thrust away from the motor (only for a short-time load of max. 3 minutes; independent of performance rating)	6": 1400 N 8" 30 - 75 kW 1400 N 93 - 150 kW 3400 N
Material	The person placing the order is responsible for selecting the correct material, specifically as regards its resistance in the medium to be transported. 304SS/Cast Iron Version: Stator 304, powder-coated castings 304SS: Stator and castings in 316SS 316SS: Stator and castings in 316SS
Motor fluid	FES 91 (approved, water-based emulsion) (FES92 for HighTemp 75/90)
Weight	Technical data sheets (see appendix)
Storage temperature	-15 °C to $+60$ °C
Short motor cable	KTW and VDE- tested (HighTemp Motors with cable without KTW approval) 6": Motor cable 4.0 m length 8": Motor cable 8.0 m length
Connection flange	6", 8": NEMA flange (see appendix)
Temperature monitoring	PT100 temperature sensor for retrofitting Subtrol temperature sensor + SubMonitor tripping device PTC temperature sensor (only for 6" 4 - 30 kW, sensor with cable)
Medium temperature	6" Standard: 4-30kW Nominal 30°C; 37/45kW Nominal 50°C 6" HighTemp90: Nominal 90°C 8" Standard: Nominal 30°C 8" HighTemp75: Nominal 75°C
Coolant flow speed (is the speed of the medium flowing along the motor casing during normal operation)	Nominal 0.16 m/sec In the event of higher media temperatures operation is only allowed if you <ul style="list-style-type: none"> • reduce the performance (De-Rating) • increase the coolant flow speed

5 Putting the motor into use

5.1 Checking the motor prior to installing it

If a leak is visible or if the motor is more than one year old (e.g. in the event of re-use or after long storage):

⇒ Check the fluid level in the motor prior to installing it.

Tools You need the following tools for assembly and inspection work:

- Insulation measuring unit: 500 VDC testing
 - Filling Kit 308 726 103
- ⇒ Determine the age of the motor by checking the type plate (see Figure 5-1).

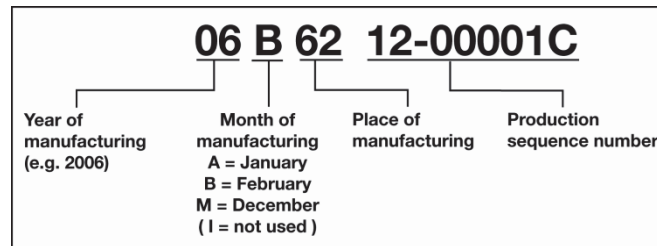


Figure 5-1: Type plate with date of manufacture

5.1.1 Checking the motor fluid



CAUTION

Motor damage due to being insufficiently filled!

- ⇒ Fill the motor with sufficient motor fluid
- ⇒ Wear safety goggles and gloves when filling and draining the motor.

⇒ Top up using original motor fluid from Franklin Electric (5 litres concentrate Id. no. 308 353 941)
Never use distilled water!

Filling volumes

- 6": max. 1.5 liter
- 8": max. 3.5 liter

Venting the motor

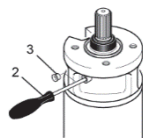
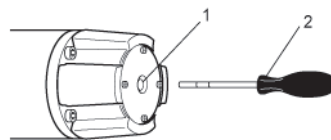


Figure 5-2: Venting the motor

- ⇒ Place the motor horizontally so that the filling valve is located at the highest position.
- ⇒ Remove the plug (3) from the filling valve.

Carefully push the test pin (2) into the filling valve until air and some fluid escape from it.

Checking the motor



- ⇒ Feed the test pin (2) through the opening (1) in the diaphragm housing until you can feel resistance.
- ⇒ Measure the actual diaphragm distance to the side of the opening in the diaphragm cover.
If the measured result is not identical to the target value:
59 mm ± 2 mm (6"- motor-Cast iron/304SS / 4-30kW)
25 mm ± 2 mm (6"- motor-304SS and 316SS / 4-30kW)
47 mm ± 2 mm (6"- motor-304SS/316SS - 37/45kW)
47 mm ± 2 mm (6"- HighTemp90)
44 mm ± 2 mm (6"- 45kN Version)
37 mm ± 2 mm (8"- motors all)

Figure 5-3: Checking the motor fluid

Topping up the motor

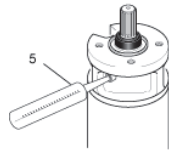


Figure 5-4: Topping up the motor fluid

- ⇒ Top up or drain motor fluid.
- ⇒ Apply the filling syringe (5) to the filling valve.
- ⇒ Top up the motor filling fluid until the value of the diaphragm position is lower than the target value.

- Adjusting the motor**
- ⇒ Adjust the diaphragm position by draining (see Venting) or topping up motor fluid until the target value is reached.
 - ⇒ Fit the plug (3) again.

5.2 Motor and pump assembly



Note

These assembly and operating instructions only describe action steps related to the motor. You should also observe the pump unit manufacturer's instructions in all events.

- Preparation**
- Short motor cable fitted (see 5.3.1)
 - Shaft protector removed
 - Motor shaft rotated manually before assembly – runs freely after overcoming static friction
 - Surfaces of parts to be connected are free from dust and dirt
 - Coupling attached to the pump shaft, slides on the motor shaft

Assembly

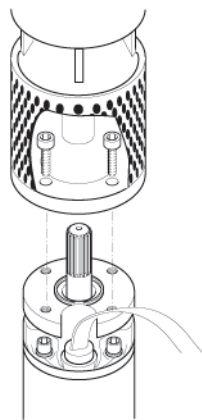


Figure 5-5: Pump assembly

- ⇒ Apply water-resistant, acid-free grease (e.g. Mobil FM 102, Texaco, Cygnus 2661, Gleitmo 746) to the inner part of the coupling to the pump unit.
- ⇒ Make sure that the splined section is encased by an O-ring when the motor and the pump unit are assembled together.
- ⇒ Align the pump unit and motor shaft to each other, connect the pump unit and the motor.
- ⇒ Screw the motor to the pump unit, tighten the fixing screws crosswise as instructed.
 - 6": ½"-20 UNF-2B
 - 8": Bore Ø 17.5 mm
- ⇒ Protect the coupling location against contact.

5.3 Motor cable



CAUTION

Motor damage due to damaged motor cable!

- ⇒ Make sure that the motor cable is not in contact with any sharp edges.
- ⇒ Protect the cable against damage using the cable guard.

5.3.1 Connecting the short motor cable



Note

⇒ Always a **new** cable must be used

Tools and Torques

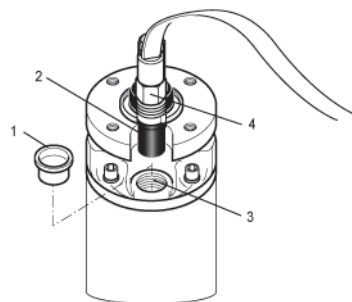
You need to use the following tools and torques for assembly and inspection work:

- 6" Motors (all Ratings) 60 N/m ±6 N/m; Wrench 1 3/16" (30,2 mm)
- 8" Motors (30 – 93kW) 74 N/m ±7 N/m; Wrench 1 3/16" (30,2,) oder 1 5/8" (42mm)
- 8" Motors (110 – 150kW) 9,0 N/m ±1 N/m, Allen Key 3/16" (4,7mm)

Preparation

- Remove the sealing plug (1)
- Clean and dry the surfaces of the plug (2) and the socket (3)

Assembly



- ⇒ Pull back the jam nut (4) until the plug (2) is free
- ⇒ Apply silicone paste or vaseline to the rubber casing surfaces
- ⇒ Apply acid-free grease to the thread of the union nut
- ⇒ Insert the plug (4) in the socket (3)

Figure 5-5: Connection of the short motor cable

5.3.2 Extending the motor cable

- The unit manufacturer's instructions regarding the cable connection have been observed
- Only extension cable and insulating material used which are suitable for the specific use (specifically drinking water) and which are approved for the temperatures occurring in the relevant medium
- Cable cross-sections: The tables in the appendix only serve as recommended suggestions. The fitter is responsible for the correct selection and dimensioning of the cable
- ⇒ Lay the cable along the pump.
- ⇒ Connect the ground conductor correctly (motors or integrated ground conductors are prepared for external grounding).
- ⇒ Protect the cable connection location against water penetration (shrink hoses, compounds or ready cable sets).
- ⇒ Make sure that the short motor cable is always fully surrounded by transport medium for proper cooling during operation.

5.4 Measuring the insulation resistance

This measurement is to be carried out using an insulation measuring unit (500 VDC) before and while submersing the fully assembled unit at the place of use.

- ⇒ Before submersing the unit, connect a measuring cable to the ground conductor.
- ⇒ Make sure that the contact points are clean.
- ⇒ Connect the other measuring cable to every core of the connected motor cable in succession. The insulation resistance is shown on the insulation measuring unit.

For your information Minimum insulation resistance (500 VDC; 1 min.; 20°C) **with extension cable:**

- for a new motor > 4 MΩ
- for a used motor > 1 MΩ

Minimum insulation resistance (500 VDC; 1 min.; 20°C) **without extension cable:**

- for a new motor > 400 MΩ
- for a used motor > 20 MΩ

5.5 Making the electrical motor connection



Danger to life due to electrocution!

⇒ Prior to making the electrical motor connection make sure that there is no more voltage on the entire plant and that nobody can accidentally switch on the voltage again while the work is being carried out.

Observe the instructions on the motor type plate and dimension the electrical system accordingly. The connection examples in this chapter concern the actual motor and do not serve as recommendation for the upstream control elements.

All action steps of the previous chapter have been carried out properly

Energy supply by generator



Note

We urgently recommend that you discuss the plant dimensions with the generator manufacturer.

The voltage tolerance -10 % to +6 % -50Hz and +/-10% - 60Hz motors (on the motor terminals) and the deviation of a motor current from the mean value of all three currents must not be more than 5 %.

- Generator selected on the basis of the motor start behaviour, i.e. starting current with a mean $\cos \phi$ of 0.5
- Sufficient continuous generator power available
- Voltage at start at least 55 % of the nominal voltage
- ⇒ You must follow the following switch-on sequences unconditionally:
 - first switch on the generator and then the motor.
 - first switch off the motor and then the generator.

Fusing and motor protection

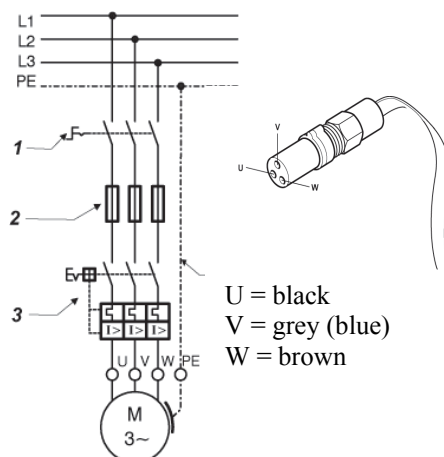


Figure 5-10: Fusing and motor protection

- ⇒ Provide an external mains switch (1) enabling the voltage to be removed from the system.
- ⇒ Provide fuses (2) for every single phase on site.
- ⇒ Provide a motor starting and protection switch (3) (see connection alternatives)
- ⇒ Provide an emergency stop system, if required for your specific application.
- ⇒ Ground the motor (4) (exterior grounding possible with all motors)

Surge voltage protection

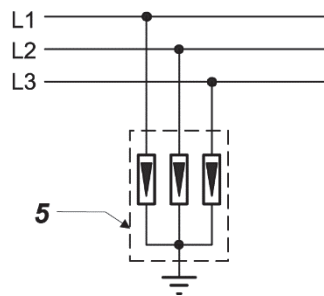


Figure 5-12: Surge voltage protection

⇒ Integrate an overload protector in accordance with IEC 60099 in the power supply (lightning safety (5)).

Connection alternatives

The motors can be used for clockwise and anti-clockwise rotation. The connection example shows the usual circuit with a right-hand field and an anti-clockwise direction of rotation:

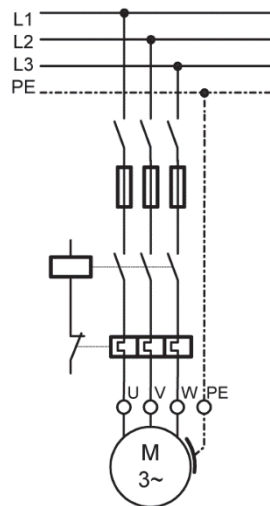


Figure 5-13: Direct starting

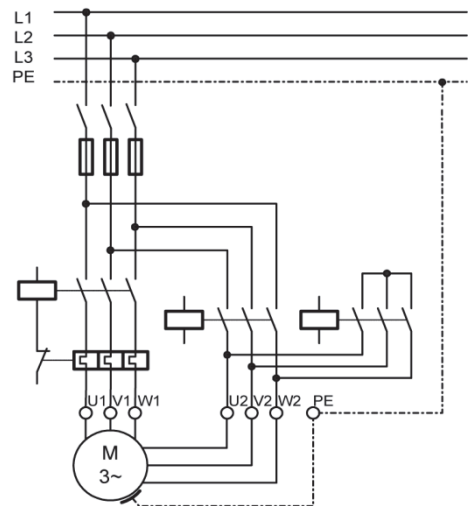


Figure 5-14: Wye-delta-starting

Motor safety switch

A motor safety switch (overload relay) is absolutely necessary!

Only use thermal trips of tripping categories 10A or 10, with

- ⇒ tripping time < 10 s at 500 % I_N (nominal current),
- ⇒ phase sensitivity,
- ⇒ temperature compensation from 20 to 40 °C.
- ⇒ Set the motor protection unit to the value of the operating current measured without exceeding the rated motor current I_N (as indicated on the type plate).

6 Motor operation

6.1 Making sure that the motor is cooled sufficiently



Caution

Damage to the motor and the motor cable due to overheating

- ⇒ Make sure that the coolant flow speed along the motor is sufficient.
- ⇒ Make sure that the short motor cable is always fully surrounded by transport medium for proper cooling.

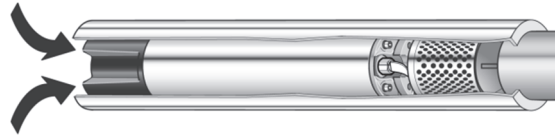


Figure 6-1: Cooling tube

If the required minimum coolant flow speed cannot be reached (e.g. if the inlet opening of the well is located above the motor or if using large-diameter wells):

- ⇒ Fit a cooling tube (see figure 6-1).
- ⇒ Make sure that the cooling tube encases the entire motor and the pump water inlet opening.
The motor is force-cooled.

6.2 Providing a check valve and a level sensor

- ⇒ Provide one spring-loaded check valve in the production tube in case no such check valve has been fitted in the pump.
- ⇒ Ensure that the first check valve is no further than 7 m (metres) away from the pump.
- ⇒ Install a level sensor for wells with a highly varying water inflow.

6.3 Switching on the motor

- ☑ All action steps of the previous chapter have been carried out properly
- ⇒ Switch on the motor using the mains switch in the control cabinet.
- ⇒ Measure the following values after switching on:
 - Motor operating current in every phase
 - Mains voltage when motor is running
 - Level of the medium to be transported
- ⇒ **Immediately switch off the motor if:**
 - the nominal current as specified on the type plate is exceeded,
 - voltage tolerances of more than -10 % / +6 % to 50Hz and +/- 10% to 60Hz, relative to the nominal voltage are measured on the motor,
 - there is a risk of the motor running dry,
 - a motor current deviates from the mean value of all three currents by more than 5 %.

6.4 Operating a motor with a frequency converter



Note

When operating a motor with a frequency converter, the relevant operating manual must be observed!

- ⇒ Make sure that the motor current in all operating levels of the regulating range does not exceed the nominal motor current indicated on the type plate.
- ⇒ Adjust the frequency converter so that the limit values for the nominal motor frequency of min. 30 Hz and max. the value of the nominal motor frequency (50 or 60 Hz) are observed.
- ⇒ Limit any voltage peaks on the motor when using a frequency converter to the following values: max. voltage rise 500 V/μs, max. voltage peak 1000V.
- ⇒ Make sure that the running up time from 0 to 30 Hz and the deceleration time from 30 to 0 Hz is maximum one second.
- ⇒ Dimension the cable such that power loss due to additional filters is taken into consideration.

- ⇒ Make sure that the required coolant flow speed along the motor is also observed with frequency converter operation.

6.5 Operating a motor with a soft starter



Note

When operating a motor with a soft starter, the relevant operating manual must be observed!

- ⇒ Set the starting voltage of the soft starter to 55 % of the nominal voltage and set the running up and delay times to max. three seconds.
- ⇒ Bridge the soft starter after running up, using a contactor.

7 Maintenance and service

The motor is maintenance-free, no maintenance or service activities are necessary.

8 Troubleshooting

Fault	Remedy
Unusual noises, problems with the true running of the pump or the pump switching on and off too frequently.	⇒ Try to find the cause of the fault on the pump unit.
The pump repeatedly switches off	<ul style="list-style-type: none"> ⇒ Have the insulation resistance checked by a professional (see chapter 5.4). ⇒ If no cause can be found in the motor or the motor cable: Have the electrical system checked.

9 Service

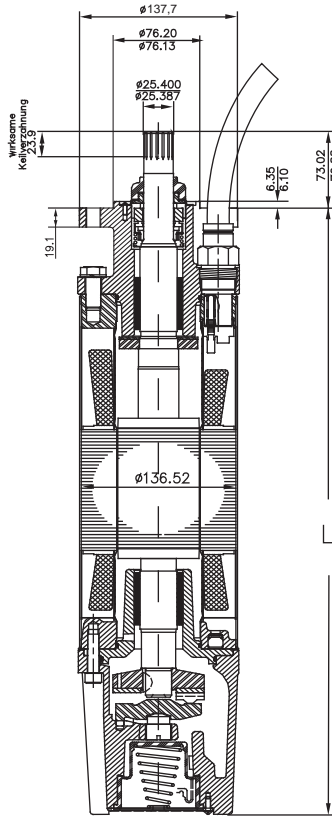
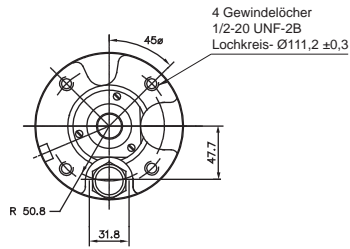
Repairs must only be carried out by authorised professional workshops (only use original Franklin Electric spare parts).

If you have any questions or problems, please contact your dealer or contact Franklin Electric via Internet or mail to field-service@franklin-electric.de.

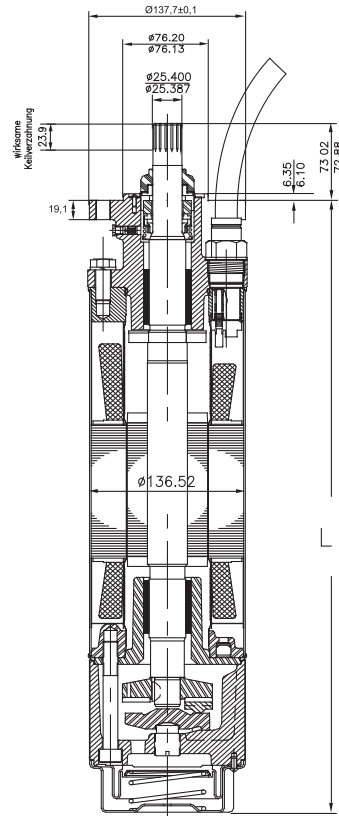
10 Appendix

Page	Explanation
Page A	Outline drawings 6" / 8" Standard Motors
Page B	Outline drawings HiTemp 75/90 Motors
Page C	Motor Test Report (MTR)
Page D	Cable cross-sections DOL and YD

6" Encapsulated

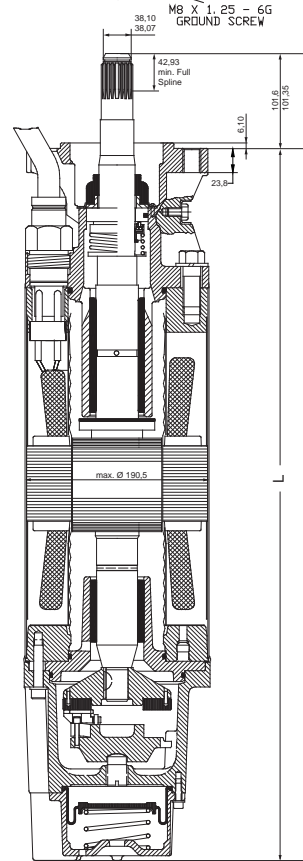
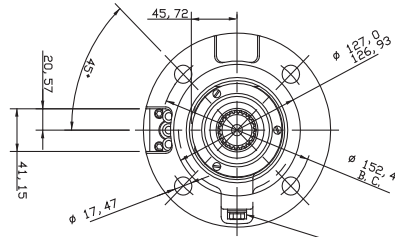


Cast Iron - 304SS



304SS / 316SS

8" Encapsulated



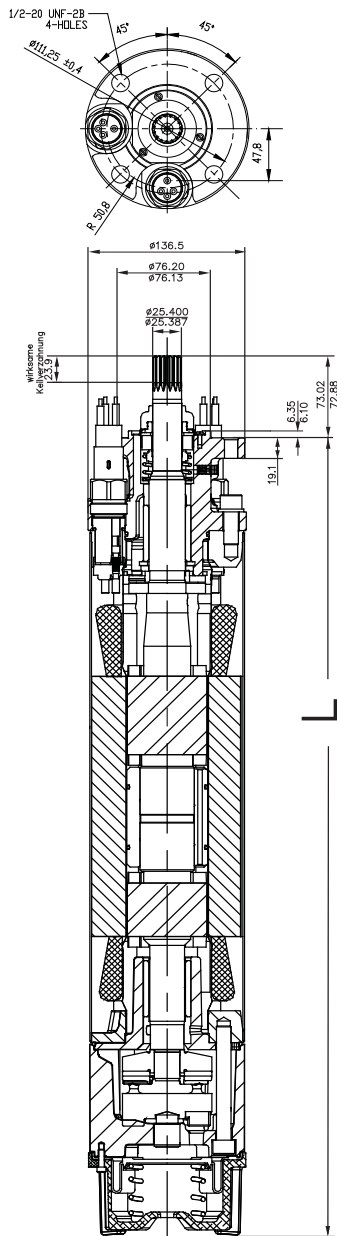
P _N [kW]	Cast Iron - 304SS L [mm]	304SS* L [mm]	316SS** L [mm]	Motor Package Size [mm]	Shipping Weight [kg]**	
					DOL	YΔ
4	581,2	570,7	570,7	155 x 212 x 800	41,3	40,3
5,5	614,4	604,0	604,0	155 x 212 x 800	44,9	43,9
7,5	646,2	635,8	635,8	155 x 212 x 800	49,0	48,0
9,3	678,7	668,3	668,3	155 x 212 x 1070	51,3	50,3
11	711,2	700,8	700,8	155 x 212 x 1070	54,7	53,7
15	776,2	765,8	765,8	155 x 212 x 1070	60,5	59,5
18,5	841,5	831,1	831,1	155 x 212 x 1070	67,1	66,1
22	906,5	896,1	896,1	155 x 212 x 1070	73,1	72,1
30	1036,6	1026,2	1026,2	155 x 212 x 1200	87,7	87,7
37		1476,7	1476,7	223 x 267 x 1823	136	
45		1629,2	1629,2	223 x 267 x 1823	156	

* HighThrust Version + ~60mm
 ** HighThrust Version + ~70mm
 *** HighThrust Version + ~4Kg

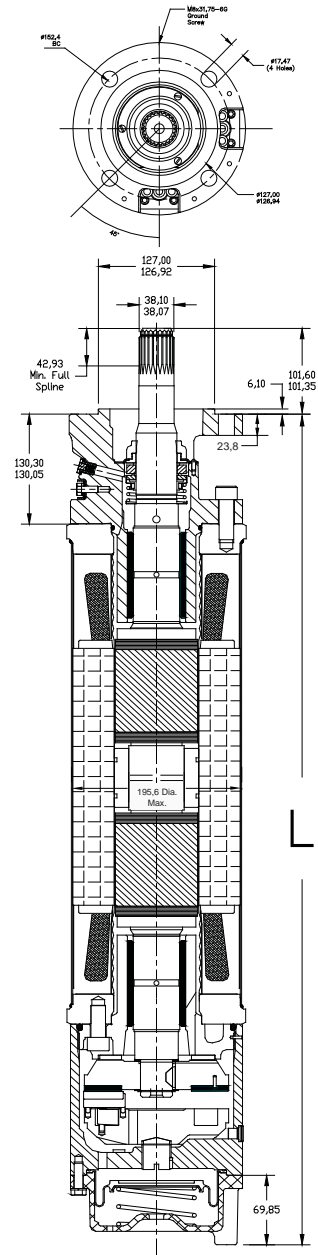
P _N [kW]	304/316 L [mm]	Motor Package Size [mm]	Shipping Weight [kg]
30	920,5	432 x 235 x 1295	145
37	1000,0	432 x 235 x 1295	157
45	1070,7	432 x 235 x 1295	172
55	1390,4	432 x 235 x 1626	202
75	1490,6	432 x 235 x 1626	240
93	1740,8	432 x 235 x 2007	318
110	1970,6	432 x 235 x 2438	381
130	2170,9	432 x 235 x 2438	420
150	2400,8	432 x 235 x 2743	494



6" Encapsulated HighTemp 90°C



8" Encapsulated HighTemp 75°C



P _N [kW]	L [mm]	Motor Package Size [mm]	Shipping Weight [kg]
3.7	716	190,5 x 273,5 x 876,3	55
5.5	752	190,5 x 273,5 x 876,3	61
7.5	780	190,5 x 273,5 x 939,8	68
11	846	190,5 x 273,5 x 1073,2	73
15	909	190,5 x 273,5 x 1073,2	81
18.5	1041	190,5 x 273,5 x 1200,2	94
22	1410	222,2 x 273,5 x 1822,4	138
30	1562	222,2 x 273,5 x 1822,4	152

P _N [kW]	L [mm]	Motor Package Size [mm]	Shipping Weight [kg]
30	1138	432 x 245 x 1295	182
37	1265	432 x 245 x 1626	207
45	1455	432 x 245 x 1626	252
55	1747	432 x 245 x 2007	318
75	1976	432 x 245 x 2438	382
93	2179	432 x 245 x 2438	421
110	2408	432 x 245 x 2743	473



FEE – NO: _____

VISIT DATE: _____

Motor Test Report

Additional comments under „Remarks“

1. CUSTOMER / USER			
Company: _____	Country: _____	Town: _____	
Talked To: _____	Tel.: _____		
2. MOTOR			
Type: _____	Modell: _____	KW: _____	Volts: _____ Hz: _____
Date Code: _____	Sequenz-Nr: _____	Stator Nr: _____	Assembler: _____ Material: _____
Built in: _____	Equipped for: _____	Worked with: _____	
Worked for: <input type="checkbox"/> Months _____	<input type="checkbox"/> Days _____	<input type="checkbox"/> Hours _____	Date Inst.: _____ Date Failed: _____
3. INSTALLATION			
<input type="checkbox"/> Vertical _____	<input type="checkbox"/> Horizontal _____	Pump Make: _____	Type: _____
Well depth /[m]: _____	Well diameter /[cm]: _____	Pump at /[m]: _____	Water inlet at /[m]: _____
Cable length /[m]: _____	Cable square /[mm ²]: _____	Protection Make: _____	Type: _____
Water: _____ [^]	Temperature: _____	PH-Value: _____	Setting /[A]: _____
4. EXTERNAL			
Shaft Height: _____	Upper End Bell: _____	Shaft Rotation: _____	Slinger: _____
Stator Shell: _____	Lower End Bell: _____	Deposits: _____	Valve: _____
Splines: _____	Diaphragm Pos.: _____	Cable / Lead Insu.: _____	Connector: _____
Nameplate: _____	Leakage: _____	Snap Ring: _____	
5. ELECTRICAL MEASUREMENTS			
Phase 1: _____ Ω	Normal Value: _____ Ω	Main Phase: _____ Ω	
Phase 2: _____ Ω	Normal Value: _____ Ω	Start Phase: _____ Ω	
Phase 3: _____ Ω	Normal Value: _____ Ω	Insulation Resistance: _____ MΩ	
6. TEARDOWN			
Thrust Bearing: _____	Lower Radial Bearing: _____	Diaphragm: _____	
Segments: _____	Upper Radial Bearing: _____	Liner: _____	
Filling Liquid: _____	Sleeve Upper Shaft End: _____	Shaft Seal: _____	
Water Entry: _____ cm ³	Sleeve Lower Shaft End: _____	Windings: _____	
Up-thrust Washer: _____		Prong: _____	
7. CONTROL BOX			
Relay: _____	Type: _____	Capacitor: _____	Wiring: _____
Subtrol: _____		CP-Water: _____	
8. REMARKS			

Tech. Warranty: _____ Com. Warranty: _____ Repair Scrap Defect: _____ Cause: _____

Signature: _____ Date: _____ Entered into EDP: _____ Date: _____



maximum lengths in meters for 400V / 50Hz and 5% voltage drop at 30°C ambient
Jacketed Cable Ampacity, IEC Publication 364-5-523 (1983 edition), Table 52-B1, Installation Methods C & G

rating		cable size mm ² , copper wire - 70°C rated insulation															
KW	HP	2,5	4	6	10	16	25	35	50	70	95	120	150	185	240	300	400
4	5,5	180	290	430	710												
5,5	7,5	130	210	320	530	830											
7,5	10	90	150	230	390	610	940										
9,3	12,5	80	130	190	320	510	770										
11	15	60	100	160	270	430	650	890									
13	17,5		90	140	230	370	560	770									
15	20		80	120	200	320	490	680	920								
18,5	25			100	160	260	400	540	740	980							
22	30				140	220	340	470	630	840							
26	35				120	190	290	390	540	720	920						
30	40					160	250	340	470	620	790	940					
37	50					130*	200	280	380	500	640	760	890	1020			
45	60						170	240	330	440	570	690	810	940			
52	70						150*	210	290	390	500	600	710	820	980		
55	75						140*	190	270	360	470	560	660	770	910		
60	80							180	250	340	440	530	630	730	870	1010	
67	90							160*	220	300	390	460	550	630	750	860	1000
75	100								200*	270	350	420	490	570	680	780	910
83	111								180*	250	320	390	450	530	630	730	850
85	114									230	290	350	410	480	570	650	750
93	125									220*	280	340	390	460	550	620	720
110	150										220	270	310	360	420	480	550
130	175										200*	240	280	330	390	440	520
150	200											200*	240	280	330	380	440
185	250													210*	250	280	330

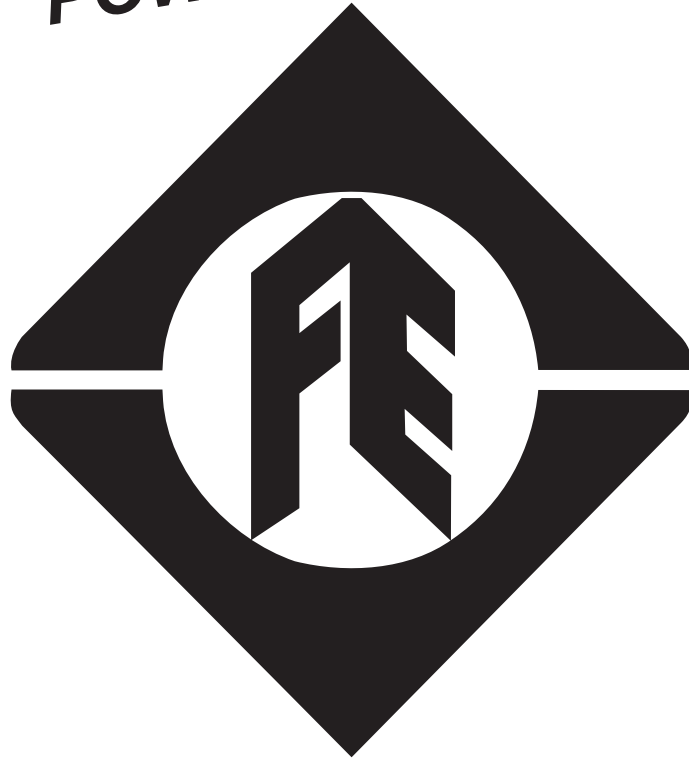
rating		cable size mm ² , copper wire - 70°C rated insulation															
KW	HP	2,5	4	6	10	16	25	35	50	70	95	120	150	185	240	300	400
4	5,5	270	430	640													
5,5	7,5	190	310	480	790												
7,5	10	130	220	340	580	910											
9,3	12,5	120	190	280	480	760											
11	15	90	150	240	400	640	970										
13	17,5	70	130	210	340	550	840										
15	20	70	120	180	300	480	730	1020									
18,5	25	60	90	150	240	390	600	810									
22	30		70	120	210	330	510	700	940								
26	35		60*	100	180	280	430	580	810								
30	40			90	150	240	370	510	700	930							
37	50				120	190	300	420	570	750	960						
45	60				100	160	250	360	490	660	850						
52	70				90*	150	220	310	430	580	750	900					
55	75					130	210	280	400	540	700	840	990				
60	80					120	190	270	370	510	660	790	940				
67	90					100	180	240	330	450	580	690	820	940			
75	100					90*	150	210	300	400	520	630	730	850	1020		
83	111						130	190	270	370	480	580	670	790	940		
85	114						130*	180	250	340	430	520	610	720	850	970	
93	125						120*	160	240	330	420	510	580	690	820	930	
110	150							130*	190	250	330	400	460	540	630	720	820
130	175								160*	220	300	360	420	490	580	660	780
150	200								150*	190	250	300	360	420	490	570	660
185	250										190*	240	270	310	370	420	490

* only for individual conductor cable



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QUALITY IN THE WELL