

Operating Instructions  
Stainless Steel Motors



# INSTALLATION AND MAINTENANCE INSTRUCTIONS FOR THREE-PHASE STAINLESS STEEL INDUCTION MOTORS

## 1. General safety instructions



**Caution:** DC, AC, and three-phase machines all have live and rotating parts which can reach temperatures of up to and above 50° C during operation. The electric motor must not be put into operation until the machine in which it is installed conforms with the Machinery Directive (Certificate of Incorporation, Directive 2006/42/EC Type 4.2 and Annex II B).

Incorrect installation, improper use, removal or disconnection of safety devices, inadequate preventive and corrective maintenance, or incorrect connection can result in various injuries or material damage. The motor may therefore only be moved, installed, commissioned, handled, controlled, maintained, and repaired **by qualified personnel** (definition to IEC 364).

It is recommended to observe the following instructions, the system-relevant notes, all safety regulations as well as the standards regarding correct installation. If you require more information about non-standard motors, please contact the manufacturer.

The motors described in this manual are suitable for installations in industrial environments. The individual responsible for installing the motor must ensure its effectiveness and take additional protective measures if they are required for other applications. When working on an electrical machine, it must be shut down and disconnected from the power supply (including auxiliary equipment, if any). If electric protection measures are in place, unexpected restarts of the machine must be prevented in the event of voltage recovery. It is important here to ensure that the specific recommendations for the usage of the equipment are followed carefully. In the case of a single-phase AC motor with an operating capacitor, the capacitor can remain temporarily charged even after the motor has stopped, allowing the terminals to remain live.

**Conformity with "Low Voltage Directive" 2006/95/EC and with "Directive RoHS" 2011/65/EC** on the restriction of the use of certain hazardous substances in electrical equipment: the motors are compliant with the provisions of the directives and are therefore supplied with the CE mark on the nameplate.

## 2. Operating Conditions

The motors are designed for use at ambient temperatures of -15 to 40 ° C at an altitude of max. 1000m above sea level according to IEC 60034-1.

If the ambient temperature and altitude (depending on the application) differ from these conditions, please contact the manufacturer.

**Use in aggressive and explosive environments (e.g., ATEX) is prohibited.**

### 3. Installation, general information

**When receiving the motor**, check that it corresponds with the order and that it has not been damaged in transit. Should this be the case, notify the transport company immediately. Do not operate a damaged motor. If the motor is equipped with eyebolts, these should be used to lift the motor only and no other machines connected to the motor.

When **storing** the motor, the environment must be clean, dry, vibration-free ( $v_{eff}=0.2\text{mm/s}$ ), and free of corrosive agents. Always protect the motor from humidity.

**Insulation resistance measurement:** Before commissioning and after long periods of standstill or storage, it is necessary to measure the insulation resistance between the outer conductors and the insulation resistance of each outer conductor to the ground using a suitable DC meter (500 V). **Do not touch the terminals during and directly after the measurement, as they are live.**

The insulation resistance, measured at the winding temperature of 25°C, must not be lower than 10 MΩ for new windings and not lower than 1 MΩ for windings that have been in use for a long time. Smaller values usually indicate moisture in the windings. If this is the case, let them dry.

When **installing** the motor, position it in a location that allows unobstructed airflow for cooling. Avoid any obstruction to the airflow and heat sources near the motor that could affect both the temperature of the cooling air and the temperature of the motor, as well as any other factor that could affect the steady exchange of heat. Also ensure sufficient air recirculation.

For outdoor installations, protect the motor against solar radiation and weather influences with suitable measures. The protection against weather influences becomes an essential factor if the motor is self-ventilated (IC411) and installed with a vertical shaft and fan pointing upwards.

The surface on which the motor is mounted must be correctly dimensioned and level so that the motor is securely fastened and aligned with the working machine, and to avoid vibration of the motor.

Shutdown devices, electronic torque limiters, or other similar devices should be mounted when the motor is operating at full load and for extended periods, or when the motor is blocked.

To protect the motor, it is advisable to use **thermal sensors** for load types that involve many starts under load. Magnetic overcurrent releases are not suitable because the rated current of the protection device must be set higher than the rated current of the motor.

When starting at no load (or reduced load) or when soft starting, starting with a low current or a reduced load are necessary, use reduced voltage starting (e.g., star-delta starting, autotransformer starting, inverter starting, etc.)

Before connecting to the power supply, ensure that the supply voltage complies with the data on the nameplate: motor, forced cooling fan (if any), etc. After ensuring that the supply voltage is in accordance with the data on the nameplate and other information in this manual, the motor, brake, and auxiliary devices can be connected. Select cables with sufficient cross-section to avoid thermal overload and/or excessive voltage drops at the motor connection terminals. The cable cross-section must also be selected to match the cable entry opening to ensure a secure installation and in any case conformity with protection class IP69K.

Metal parts of the motor which are not normally live must be firmly **connected to earth** with a cable of suitable cross-section, using the correct terminal provided for this purpose in the terminal box. To avoid changing the IP protection class, ensure that the seals are not crushed and that all fixing screws are tightened when closing the terminal box.

Three-phase motors should rotate clockwise (when looking at the output shaft face) if the connections match the wiring diagram on the nameplate.

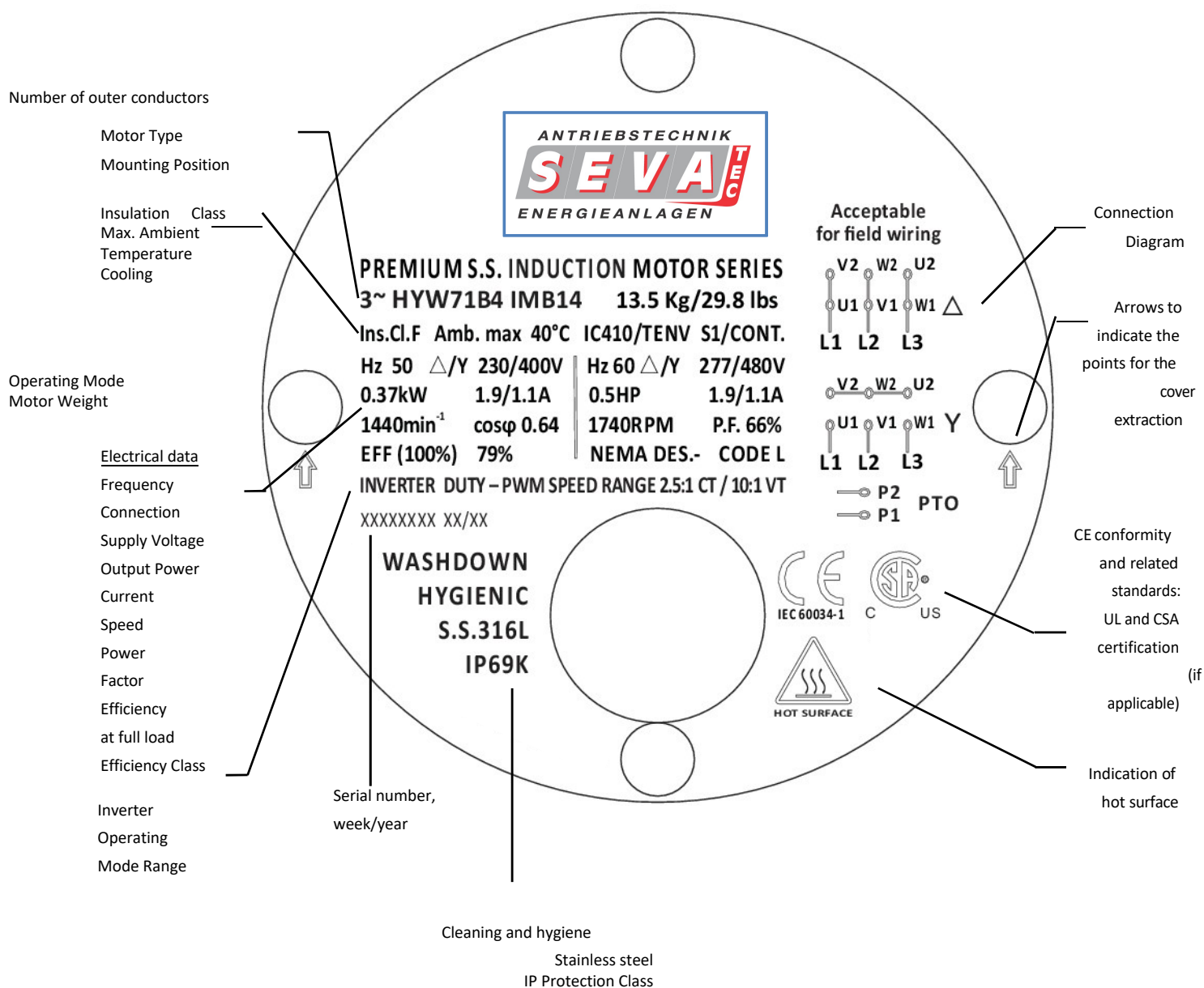
If the direction of rotation is not desired, reverse the two-phase conductor connections at the terminals. When connecting or disconnecting motor windings of drives with a high number of poles ( $\geq 6$  poles), dangerous voltage peaks can occur; **therefore, suitable protective devices (e.g., varistors or line filters) must be provided in the supply line.**

Three-phase asynchronous motors are by default suitable **for operation with frequency inverters.** The use of inverters, in any case, requires some precautions against voltage peaks ( $U_{max}$ ) and voltage gradients ( $dV/dt$ ) that are generated by this type of power supply. The values have increased steadily due to the increase of the line voltage ( $U_N$ ), the motor size, the length of the power cables between the inverter and the motor as well as the decreasing quality of the inverter. The use of appropriate filters between the inverter and motor is recommended for supply voltages  $> 400V$ , voltage peak values  $U_{max}$

**$> 1000V$ , voltage gradients  $dV/dt > 1kV$ , and power cable lengths between inverter and motor  $> 30m$ .**

#### 4. Marking

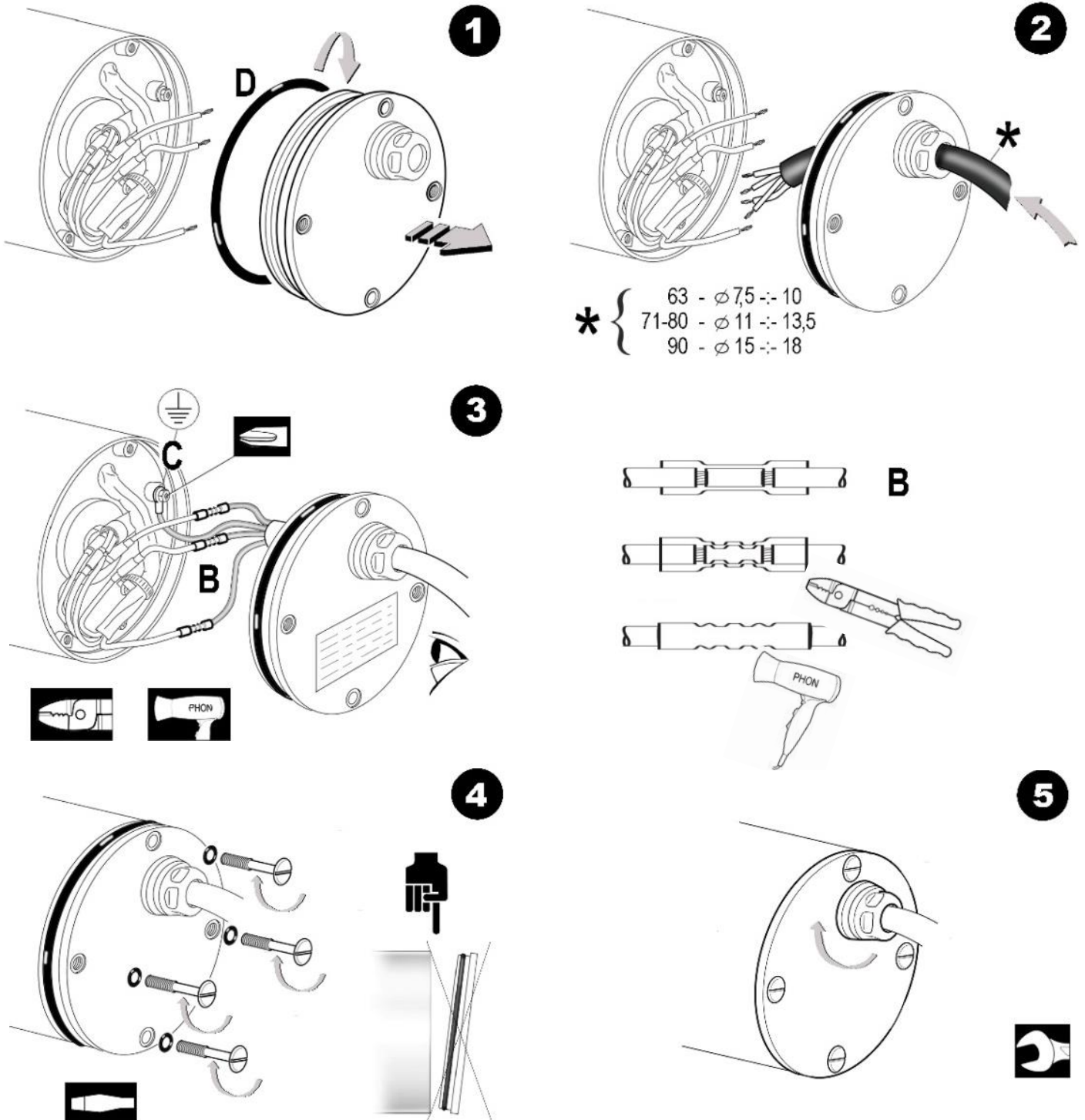
The motor is permanently marked by the nameplate (situated on the rear cover or housing) which contains the motor data and the connection diagram.

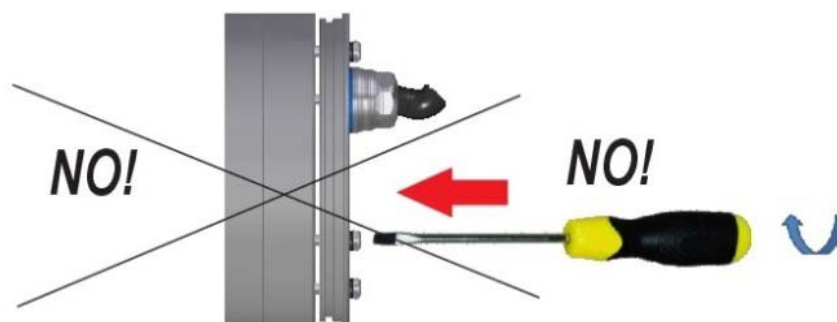
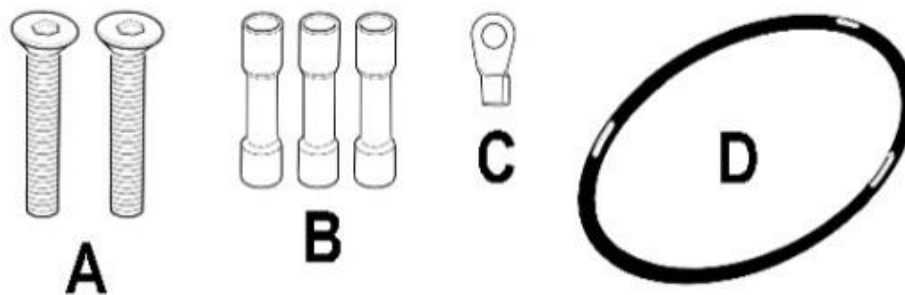


## 5. Terminal box opening, connections and cable gland tightening

The motor is supplied with the rear cover only partially screwed so as to allow an easy opening of the same during the wiring operations. After removing the cover, inside the inner instructions for wiring, heat-shrinkable wire-to-wire splicings for the cable connection, the extraction screw for properly removing the cover in case of maintenance.

**Carefully follow the instructions supplied**, taking care when closing the cover that all seals are present and undamaged and of the proper tightening of the cable of suitable size, in order to guarantee the IP rating indicated on the nameplate (see illustrations from 1 to 5 and recommendations in the next page).





# **DO NOT USE THE CLAMPING SCREWS TO POSITION THE COVER!**

TO AVOID ANY DAMAGE TO THE O-RING SEALS UNDER THE SCREWS (SO THAT THE WARRANTIES REGARDING THE CORRECT PROTECTION CLASS REMAIN VALID) THE FOLLOWING STEPS MUST BE FOLLOWED CAREFULLY WHEN ASSEMBLING THE COVER:



1. Slightly tighten the screws first (as delivered) before tightening them fully
2. Avoid tilting the cover when positioning it using a rubber hammer
3. Fully tighten the screws



## 6. Connection between the motor shaft and load

All parts mounted with a key on the shaft end should be machined with H7 tolerance. Before assembly, thoroughly clean and lubricate the mating surfaces to prevent seizure. The assembly and disassembly are performed using jacking screws and pullers. Shocks and impacts must be avoided as they can irreparably damage the bearings. For direct coupling, please ensure that the motor and the load are precisely aligned. Flexible coupling between motor and load may be necessary.

In the case of a vertical installation (V1...V9), the surface of the coupling flange should be sealed with a sealant to prevent any water from entering and remaining in the flanged end shield. Should any water flow through the shaft seal ring and enter the motor, the required IP protection class would no longer be ensured. For direct coupling without speed reduction and mounting variant "shaft end upwards", an "open" flange version is also available, which enables the water to drain. If required, please contact us directly.

For V-belt drives, please ensure that the belt protrusion is minimal and that the working shaft is parallel to the drive shaft. V-belts should not be over-tensioned to avoid excessive load on the bearings and motor shaft (see product catalog for max. shaft load and relative bearing life). The motor is dynamically balanced with a half key in the shaft end and designed for the rated speed only; to avoid vibration and imbalance, transmission shafts must also be pre-balanced with a half key. Before carrying out a possible test run without output elements, the key must be secured. Before commissioning, the terminals, fastening, and mounting elements must be checked – a tight fit and secure fastening are essential. Condensate drain holes must point downwards.

For operation at an ambient temperature greater than 40°C or lower than -15°C please consult us. When ordering spare parts, specify all available data (see section 9).

## 7. Installation instructions for compliance with EMC Directive 2004/108/EC

According to IEC60034, the provisions of the EMC Directive are not directly applicable because electric motors are components intended for installation and, in that sense are not machines that are supplied directly to the end-user. Asynchronous motors that are running in continuous operation and connected to a three-phase alternating voltage supply or to a single-phase alternating voltage supply, comply with standards EN50081 and EN50082. No special shielding will be required.

When operating in jog mode, any interference generated by a plug-in device must be limited by suitable wiring (please see manufactures specifications for the device).

If the motors are supplied by frequency inverters the connection instructions supplied by the inverter manufacturer must be observed.

The following instructions must be observed if a version with a rotary encoder is used: Install the electronic control card as closely as possible to the encoder (and as far away from the inverter as possible; if not possible, carefully shield the inverter). Encoder signal cables must be routed separately from the power cables (see manufacturer's instructions supplied with the motor).

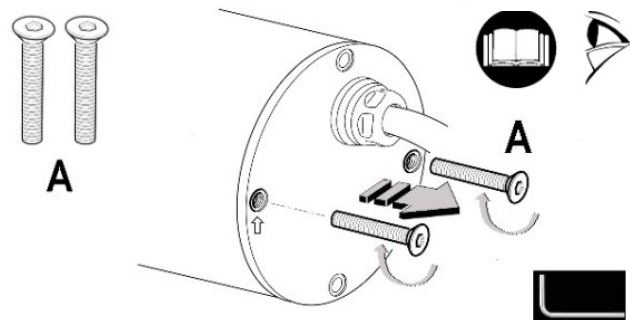
All the above-mentioned components are designed for installation in a machine or a complete system and should not be operated until the machine or system conforms with the EMC Directive 2004/108/EC.

## 8. Preventive maintenance

The following items should be checked and corrected as required (depending on the environment and operation) or periodically: cleanliness of the motor (no oil, dirt, or machining debris) and unobstructed airflow for cooling; proper fastening of electrical connections, terminal screws, and mechanical motor coupling; static seal condition, dynamic seal condition; vibration-free running of the motor ( $v_{eff} < 3,5 \text{ mm/s}$  and unusual noise).

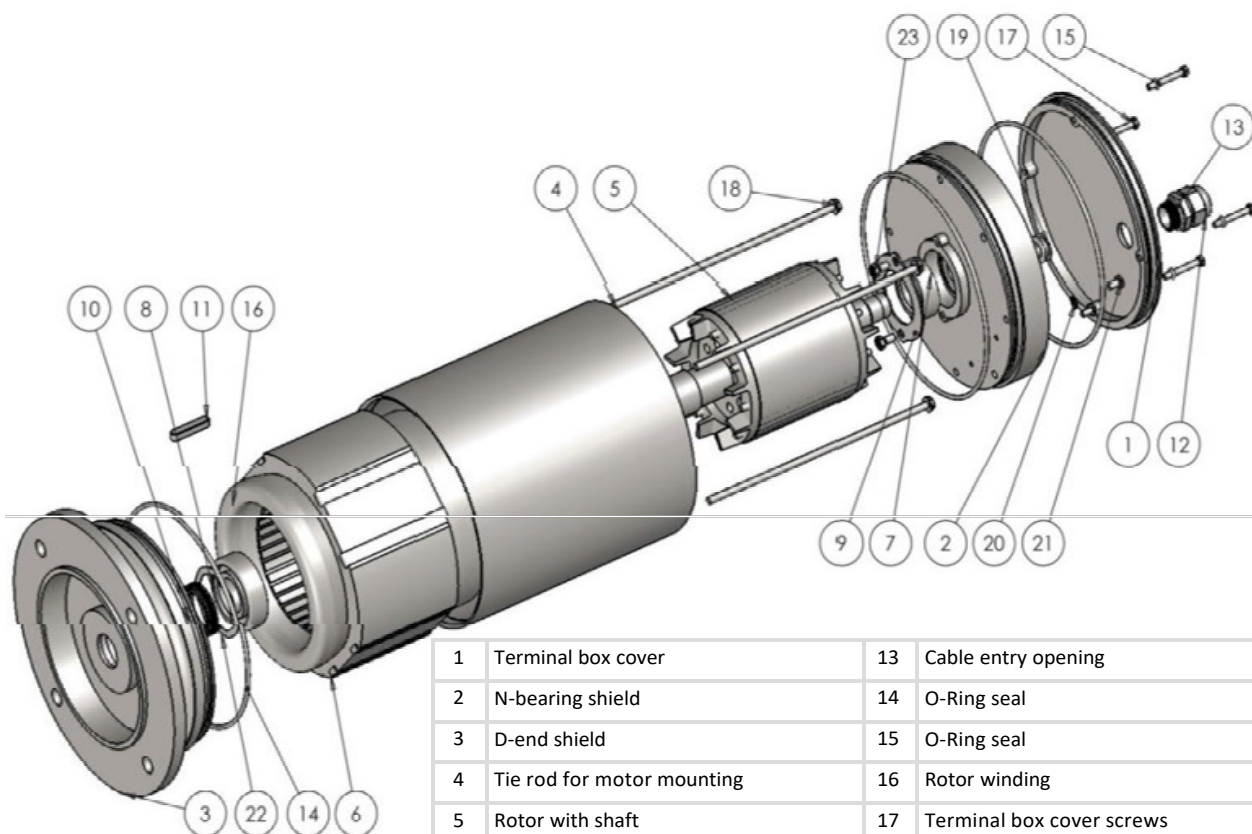
- In this case, check the fastening of the motor, the balancing of the coupled machine or a possible replacement of the bearings; small amounts of water inside the motor due to condensation.
- In this case, unscrew the drain plugs (if present) and reseal them to ensure that the required IP protection class is still applicable.

To remove the cover, use the screws on the threaded holes marked with arrows (see below). Do not lift the cover with a screwdriver or other tools to avoid damaging the cover and its O-ring seal.



## 9. Corrective maintenance, exploded view of the motor, spare parts

If necessary, please contact our customer service and specify the motor model and the parts that need replacing. Opening the engine without proper authorisation and instructions will void any warranty.



1	Terminal box cover	13	Cable entry opening
2	N-bearing shield	14	O-Ring seal
3	D-end shield	15	O-Ring seal
4	Tie rod for motor mounting	16	Rotor winding
5	Rotor with shaft	17	Terminal box cover screws
6	Stator pack, wound	18	Circlip (spring washer)
7	N-bearing	19	Cable entry grommet
8	D-bearing	20	Ground symbol
9	Bearing retaining ring	21	Ground screw and cable tie
10	Shaft seal ring	22	Crinkled spring washer
11	Key	23	Bearing locking screws
12	Closure of the cable entry opening		