# Instructions & Safety Regulations for Low Voltage Motors

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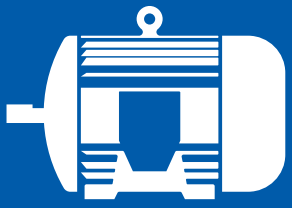

VALIADIS
Hellenic Motors

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# VALIADIS S.A.
## HELLENIC MOTORS

# Instructions and Safety Regulations for Low voltage motors

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**Three-Phase Asynchronous Motor Technical Instructions for Operation and Maintenance Technical Instructions for Operation and Maintenance of Three-Phase Asynchronous Motor**

## 1. Safety instructions

**Warning! Precautions before installation and use**

1.1 Always confirm that parameters shown on nameplate of motor meet your requirement.

1.2 Always confirm that the motor does not suffer from any damage.

1.3 Remove shaft clip on shaft extension (if any), but always remount it before re-transportation of motor.

1.4 Always use slinger or bolt on pedestal of motor body, small slinger of other auxiliary equipment is not suitable for hoisting the whole motor. Always check whether eye bolt and slinger are in good condition before using motor slinger and other hoisting device, screw down eye bolt; adjust the position of eye bolt by adding appropriate shim, if necessary, and it should be used only for hoisting motor itself. If the motor has more than one slingers, they must be used together to share the weight. If output power, auxiliary equipment and installation form of motor are different, center of gravity of motors with different specifications in the same pedestal might not be the same. To handle motor with packing box, always fix the lifting rope to chassis directly, or use eye bolt of motor body.

1.5 After the installation is confirmed, installation form of motor should be consistent with that shown on nameplate of motor. If drain hole is provided, its position should be suitable for service condition. Drain hole should be kept on the lowest position. If the above-mentioned requirements cannot be satisfied after the motor is installed, please contact with Valiadis S.A. Company.

1.6 Rotate motor shaft extension slowly, confirm that motor could run freely.

## 2. Precautions

**Warning! Please observe the following safety precautions**

2.1 Persons who are responsible for installation, testing, operation, maintenance and repair of motor must undergo complete technical training, realize the danger to themselves and other people and hazard to equipment. Because if the motor is not installed, tested, operated and maintained correctly, serious or fatal injury might occur.

**Warning! Please refer to relevant national regulations for specific safety instructions.**

2.2 Before maintenance and repair of motor, always cut off all power supplies connected to motor and its auxiliaries. When shutting off power, at the same time, confirm that motor is in standstill.

2.3 Motor must be grounded reliably, corresponding associated protective device must also be grounded to prevent danger during running of motor, or failure of motor.

2.4 Safety protection and other protective devices of motor should not be open circuited or out of use. Correct usage of various protections may guarantee extended operational of the motor.

2.5 Motor must be provided with appropriate protection, to prevent working personnel approaching rotating parts; while motor is running. It is strictly prohibited to contact rotating parts.

2.6 It is strictly prohibited to contact motor wiring etc living parts. When automatic start, automatic shutdown or remote start is available, and start mode is not cut off, always set up a warning plate around the motor, reminding that the motor might start at any moment.

2.7 Before startup of motor, always confirm that all shaft keys are mounted securely.

2.8 In order to prevent overload operation of motor, it is advisable to install winding temperature monitoring device. Valiadis S.A. Company may install temperature protective device on motor winding. Its terminals may be connected directly to a controller for automatic powershut off.

2.9 Out of phase operation is strictly prohibited in motors. In order to prevent such an event, out of phase protective device must be installed.

2.10 When to installing coupling or belt pulley, do not use a hammer to hit, avoiding so the damaging of motor bearing. The best method is by shrinkage fitting.

2.11 To approach high noise equipment, always wear ear protector, for noise level of motor, consult Valiadis S.A. Company or refer to Valiadis S.A. Company's relevant product standards.

2.12 Pay attention to avoid water or other liquids entering the motor.

2.13 When motor is used for variable speed machine, always confirm that it does not exceed maximum safety speed. At the same time, confirm that the motor does not run with overloaded (At low speed, heat dissipation capacity of motor with self-cooling fan decreases,so independent fan for auxiliary cooling must be added, otherwise, motor might fail). If you have any question, please contact Valiadis S.A. Company.

2.14 Confirm that proper safety protection measures have been provided to avoid hazardous event when brake fails.

2.15 Some Valiadis S.A. motors are provided with non-shutdown oil filler. If grease is needed during operation of motor, please impose to be done by properly trained person, and that live parts and rotating parts have complete protection.

**Note: Incomplete execution of precautions might cause electrical injury to human body. Incomplete execution of precautions might cause personal injury. Incomplete execution of precautions might cause mechanical damage.**

## 3. Operating environment and working conditions

### 3.1 Operating environment

3.1.1 Ambient temperature -15˚C - 40˚C.

3.1.2 Altitude should not exceed 1000m.

3.1.3 Relative humidity should not exceed 95%.

**Note: when a deviation with the above-mentioned environment exists, for example, ambient temperature is lower than -20˚C or higher than +45˚C, relative humidity of air exceeds 95%, altitude exceeds 1000 m, or a high vibration condition. Please consult applicability of motor's specifications. If you have any question, please contact Valiadis S.A. Company.**

### 3.2 Working conditions

3.2.1 Deviation of power supply frequency from the value indicated on nameplate should not exceed 1%, voltage deviation should not exceed 5% (unless agreed between both parties for a special design).

3.2.2 Open motor (IP23, IP21) is applicable to clean, dry, well ventilated and non-corrosive indoor environment. If an open motor runs outdoors, suffers from weather, corrosive media generated by other equipment, preventing so the motor to work normally.

3.2.3 Enclosed motor (IP44, IP54, IP55) is applicable to relatively dirty environment with moisture or dust.

3.2.4 Outdoor anti-corrosion motor is applicable to outdoor environment or environment with corrosive gas, and to environment with high humidity as well.

3.2.5 For water cooled motor and motor using water cooling bearing, ambient temperature should not be lower than 0˚C, avoiding so motor is damage due to cooling with frozen water.

3.2.6 The foundation on which the motor is mounted must have sufficient rigidity, eliminating any resonance generation or breaking.

3.2.7 Sufficient space must be left around the place where motor is mounted in order to facilitate equipment installation and repair.

**Note: Normal ventilation of motor should not be impeded by any cause. When there is an additional ventilating device around the motor, always check that it does not influence effective ventilation of motor. If there is an influence, always adjust ventilation volume of the ventilating device, or change ventilation passage of motor to ensure its effective ventilation**.

## 4. Transportation and storage

### 4.1 Transportation of motor

4.1.1 Before the delivery of any motor, different protections should be provided accordingly, if the user wants to move a motor for whichever reason, always has to take the same protection measures.

4.1.2 For some large and medium size motors, motors using roller bearing, rolling bearing and sleeve bearing, in order to protect bearings against damage during transportation, locking device (shaft clip) is installed to protect bearing during transportation. Bearing locking device (shaft clip) must be used whenever a motor is being moved.

4.1.3 Upon motor arrives at destination, always check the motor and the package immediately. If package is damaged during transportation, notify transportation agent to the site to check at your presence. If an insurance is stipulated for transportation, take photos of the damage occurred during transportation and report it immediately (report within the period specified by the insurance company, this is very important). Therefore, check goods arrived immediately, and report evidence of motor problems due to whatever reason to transportation company and supplier, this is very important. It will ensure the customer to obtain satisfactory product and service.

4.1.4 After motor arrives at destination, if it is not installed and used immediately, always take necessary protective measures, allocate persons for management. The practice of no protection or arbitrary storage is inadvisable.

4.1.5 If motor is packed, always unpack to check whether motor is in good condition or not, whether accessories are complete immediately after arrival. If you have any doubt or find any missing accessories, please take photos and notify the supplier.

4.1.6 For packed motor, always lift the motor itself directly or use fork-lift truck to scoop up from bottom of pallet.

4.1.7 Do not use fork-lift truck to scoop up from the bottom of motor or from any other part of the motor.

### 4.2 Short-term storage of motor

4.2.1 Motor should be stored in clean, dry environment without corrosive gas.

4.2.2 Motor must be placed on flat ground, and should not influence handling of other materials.

4.2.3 Storage location should avoid any environment subject to drastic changes. For example, keep away from boiler or refrigerated warehouse etc.

4.2.4 Temperature of storage location is advisable to be between 5 ˚C and 50 ˚C , if space heater is used, when ambient temperature exceeds 50˚C, always ensure the motor not to be overheated.

4.2.5 Humidity in storage location is advisable to be below 75%. Temperature of motor should be kept above dew point, so as to prevent condensation of moisture in motor. For motor with space heater must be powered on during storage of motor, so as to prevent motor from damping during storage. Operation of heating device should be checked periodically.

If no space heater is available, other alternative method must be used to heat motor, so as to prevent motor from damping due to condensation of moisture during storage. If incandescent bulb is used to heat inside the motor, always ensure the bulb not to be in contact with any component of the motor, so as to prevent motor damage due to focussed heating point.

4.2.6 If the motor is stored outdoors, do not store the package of motor in original state outdoors, always remove plastic package around the motor, put cover on the motor, so as to ensure that rain water will not flow inside the motor. However, covering should not influence ventilation of motor. Rigid support of 10cm must be added under the motor to prevent moisture and other contaminants from entering the motor.

4.2.7 Prevent harmful insects from entering inside the motor.

4.2.8 If the motor is stored in its original package, always open a large enough vent on the package to keep effective ventilation of motor, but vent hole should not influence rainproof function.

4.2.9 Always confirm that cooling water in cooling water pipe of a water cooling motor or of a water cooling bearing has been removed, so as to prevent corrosion due to long time storage ,or freezing of water pipe when weather changes.

Alternatively, mixture of water and ethylene glycol may be filled in water pipe, but proportion of ethylene glycol should be no less than 50%, so as to ensure that this mixture will not freeze during storage of motor. After filling the mixture, always plug inlet/outlet of cooling pipe to prevent running off of the mixture.

**4.3 Long -term storage of motor (more than 3 months)**

Beside requirement for short-term storage, attention should be paid to the following requirements.

4.3.1 Time should not be too long, do not stack too high, so as to avoid damaging motor.

4.3.2 Measure insulation resistance once per two months, and keep record.

4.3.3 Measure humidity once per two months, and keep record. if humidity exceeds storage requirement, adjust storage location.

4.3.4 Check paint on motor surface once per three months, if corrosion exists, remove rust and paint again.

4.3.5 Check antirust situation on motor shaft extension surface and flange surface once per three months. if any rust is found out, use metallographical sand paper to grind off corrosion on surface very carefully, then perform anti-corrosive treatment again.

4.3.6 For motor using rolling bearing, appropriate lubricating grease has been filled according to requirement before delivery. Regreasing makeup is not required during motor storage. In order to ensure that bearing will not be damaged during motor storage, motor should be rotated regularly, generally, motor should be rotated once per month, not less than 10 turns per time.

4.3.7 For motor using sleeve bearing, lubricating oil has been discharged before delivery, if it is stored for a long time, new lubricating oil must be filled into sleeve bearing to prevent bearing from rusting. Motor should be rotated once per month, no less than 10 turns per time, both forward and reverse rotation should be performed to ensure that each part of bearing obtains effective antirust protection.

4.3.8 If storage period of motor with sleeve bearing exceeds one year, sleeve bearing must be removed for anti-corrosive treatment storage again.

4.3.9 After the motor has been stored for a long time, check whether rust occurs on bearing, if rust occurs, replace with new bearing and fill new grease.

4.3.10 After motor has been stored in damp environment for a long time, before use, always confirm that insulation resistance of motor is larger than 1MΩ, if it is lower than 1MΩ, perform drying treatment. If after drying treatment the insulation is still low, then the motor must be sent for repair.

Note: Motor drying method Method 1: dismantle the motor, place stator winding in drying oven, for motor with wound rotor, place the rotor also in drying oven to the temperature of drying oven should not exceed 100˚C. Note that inside and outside of drying oven should be well ventilated. Generally, when insulation resistance exceeds 1MΩ and generally remains unaltered, means that drying is finished.

Method 2: plug up motor rotor, apply low voltage to motor winding, generally, the current applied onto motor winding is required be about 1/3-1/2 of rated current on nameplate. Pay attention to ensure that temperature of motor winding should not exceed 100˚C, when insulation resistance exceeds 1MΩ and insulation resistance stops changing, it means that drying is finished.

**4.4 Storage of motor after installation**

After a motor is installed, or will not be used for a long time after being used for some time, in addition to protection as per the requirement of Article 4.3 Long -term storage of motor (more than 3 months), motor should also run periodically, generally, it is required to run once per two months.

**5. Installation and correction of motor**

**5.1 Inspection before installation**

5.1.1 Check whether values indicated on nameplate of motor are consistent with service requirement, whether motor wiring is consistent with wiring diagram.

5.1.2 Whether motor is affected with damp, use megohmmeter to measure insulation resistance of motor, when insulation resistance of motor is lower than 1MΩ, stator coil must be dried. Drying temperature should not exceed 100℃.

5.1.3 Check whether motor is damaged, distorted, whether fasteners are loose or fall off. Rotate rotor slowly with hands, friction and abnormal phenomenon should not occur.

5.1.4 Check whether installation type of motor is consistent with requirement, IM B3 motor might not be suitable for IM V5 (vertical shaft installed) without retrofit. Additional support might be required for fixing or different bearings should be replaced to bear axial thrust.

5.1.5 Eliminate dust, foreign bodies etc on motor.

5.1.6 If motor is stored for a long time (generally more than one year),check grease for motor bearing, replace with new grease for bearing if required.

**5.2 Installation foundation of motor**

**Foundation design for motor and relevant equipment is reliable guarantee for safe operation and convenient maintenance of equipment, therefore, sufficient space must be left around equipment to facilitate maintenance and monitoring. Ensure cooling air of motor could flow through motor surface and positions that need cooling without any obstruction, also ensure that other equipment or heat source does not influence cooling effect of motor. Note that motor foundation should not be influenced by**

**external vibration source, if there is other equipment in vicinity, possible resonance between them must be verified.**

**Note: CAUTION: Electric welding equipment must be solidly earth grounded. Do not use motor, coupling, pulley or motor base as a current path. Serious bearing and insulation damage may result.**

5.2.1 The foundation on which motor is installed should have certain rigidity. If not installed together with other machines, both parties should use concrete of reliable quality to construct the foundation. Installation surface should be flat. For motor that needs to be moved frequently, appropriate installation structure should be used.

5.2.2 In order to ensure axiality of motor during operation, motor installation surface should be lower than of the machine foundation plane when designing the foundation. This is for leaving an adjustment margin for installation later. Generally 2mm should be left. Since an error might occur in the process of both motor manufacturer and equipment manufacturer, generally, this error is compensated by the 2mm left for the foundation.

5.2.3 Contact surface of motor installation foundation and motor foot plane must be suitable. Stress surface of foundation is generally required to be larger than foot installation plane of motor.

5.2.4 If the difference between motor's and driven machine's center height needs adjustment, area of shim must be larger than the area of motor foot plane. When several shims are needed for height adjustment, the number should not exceed 3 pieces.

5.2.5 If motor and equipment use a common pedestal, motor operation will be more reliable, so it is suggested to use common pedestal as far as possible.

**Note: if installation foundation lacks sufficient rigidity or structure is unreliable, critical speed of motor might change during operation, abnormal vibration and noise will thus occur, leading to the damage of bearing and in worse case, personal injury or equipment accident might occur.**

**5.3 Installation of motor**

5.3.1 Preparation before installation

5.3.1.1 Prepare certain quantity of shim, which is made of steel plate, thickness should be 0.1mm, 0.2mm, 0.5mm, 1.0mm respectively.

5.3.1.2 Prepare some simple tools, for example, lever for rotating rotor, jack for adjusting axial and horizontal position of motor and adjustable bolt.

5.3.1.3 Prepare corresponding test tools, such as dial gauge, for adjusting installation accuracy of coupling.

5.3.1.4 Surface of installation foundation must be cleaned up.

5.3.1.5 Check whether position and height of mounting hole is consistent with outline drawing of motor.

5.3.1.6 Remove shaft clip on motor, keep it well for use later.

5.3.2 Precautions before installation

5.3.2.1. Surface of grouting hole for installation of motor must be rough, so as to facilitate secure bonding with grout.

5.3.2.2. In order to ensure secure bonding of bolt and cement for installation of motor and equipment, anti-rust coating, contaminated and stained dust on bolt must be cleaned up, and then antirust coated.

5.3.2.3. If concrete surface is contaminated or there is lubricating oil, surface must be cleaned up, a layer on the surface must be chiseled away for cleaning.

5.3.2.4. Use gasoline to remove anti-rust coating on motor shaft extension excircle and foot plane.

5.3.2.5. During installation, please confirm that mounting holes are locked securely using steel bolt, nut. In case where corrosion tends to occur, use stainless steel bolt. In high vibration condition, add absorbing pad.

5.3.2.6. For motor with drain hole, pay attention to its correct position. After the motor is installed, ensure drain hole is in the lowest position of the motor. When drain hole is open, ensure necessary protection is provided to prevent any object from entering into the motor.

5.3.2.7. For motor that has been stored for a long time or has been repaired recently, before starting, check insulation resistance of motor. Such inspection includes insulation resistance of stator winding, rotor winding of a wound rotor, and other auxiliary devices.

5.3.2.8. Motor slinger could only bear the weight of motor itself. It should not be lifted together with other equipment. Also note that the slinger of the motor body apart of the slinger for accessories, such as cooler, cooler ventilation box, collector ring protection box, fan housing, external cover of sleeve bearing etc, should be used to lift the whole motor. Slinger of as above components could only be used to lift the components themselves.

5.3.2.9 When lifting the motor, all slingers should be used simultaneously in order that the weight of the motor to be distributed evenly on all slingers.

5.3.2.10 If several wire ropes are used to lift one slinger, the length of the wire ropes must be sorted out to ensure resistant before lifting. Wire ropes should also be orderly and should not be twisted together.

**Note: it is strictly prohibited to use both ends of only one wire rope to lift a motor using all slingers. If there are two and more slingers on the motor, two or more separate wire ropes should be used to lift the motor.**

5.3.3 Installation of motor

5.3.3.1 Installation of coupling (1). Dynamic balance test must be conducted for the coupling. Motor has generally been half-key balanced. If full key balance is required, please contact with Valiadis S.A. Company. (2). Before installing coupling, fill with machine oil the holes of motor shaft and coupling, in order to facilitate the installation of coupling. (3). To install coupling, always heat coupling to a certain temperature, then push coupling into motor shaft. It is strictly prohibited to install coupling by knocking, otherwise motor bearing might be damaged. (4). It is most appropriate to use flexible coupling between driven equipment and motor, no matter if a rolling bearing or a sleeve bearing is used. Rigid coupling connection is not appropriate for load. (5). Certain gap must be left for installation of coupling of motor carrying roller bearing and the coupling of equipment, in order a blocking of the equipment to be avoided. (6). For motor with sleeve bearing, the coupling used should be able to restrict axial play distance, preventing axial thrust of driven equipment from damaging motor's bearing. (7). If length of coupling is less than the length of shaft extension, the key protruding of coupling must be cut off. This is to ensure balance accuracy of motor, reducing vibration. (8). After the fitting of coupling a protective cover must be installed around the coupling to prevent accident. (9). When installing a motor with sleeve bearing, ensure that play pointer on shaft extension end is in the shaft groove, ensure that magnetic center of stator and rotor is correct during operation of motor.

**Special attention: when coupling is used for drive, sufficient gap must be left between coupling of motor and coupling of load, in order to axial force to be prevented during operation , causing thermal expansion, which in consequence damages the bearing and finally the whole motor.**

5.3.3.2 Installation of belt pulley. Belt pulley connection is not suitable for most motors. If it has to be used, contact the manufacturer. It may be used only after special design.

(1). Flat belt drive should not be used for 2P motor above 4kW, and 4P motor above 30kW.

(2). When belt pulley is used for drive, the length of belt pulley should not exceed the length of shaft extension, otherwise shaft end might be distorted and broken.

(3). Only coupling connection may be used for double shaft ends use.

(4). When belt pulley is used for drive, centerline of motor shaft must be parallel to centerline of load shaft. Belt center must be perpendicular to centerline of shaft.

(5). Dynamic balance test should be conducted before installation of belt pulley.

(6). Before the fitting of belt pulley, apply anti-rust oil on motor shaft, in order to facilitate the fitting.

(7). Compact shaft is installed for all motors suitable for belt drive. Radial force specified not be exceeded. Therefore, it is very important to confirm whether motor is suitable for your requirement before use.

(8). Diameter of belt pulley must be appropriate, diameter ratio of the two pulleys for flat belt should not exceed 5:1, diameter ratio of two pulleys of V belt should not exceed 8:1. Linear velocity of belt should also be controlled within certain scope, generally, linear velocity should be 32m/min.

(9). Belt pulley must be installed close to the start of motor shaft extension as close as possible. This could reduce bending moment caused by belt drive, avoiding fracture of shaft.

5.3.3.3 Gear drive

5.3.3.4 (1) Diameter, installation position of gear must be appropriate with load of motor shaft and bearing, and must be confirmed before installation or use. If you have any doubt, please contact Valiadis S.A. Company.

(2) Special attention should be paid to parallelism between two shafts.

（3）Gear engagement must be correct, center line of drive power must be on the same straight line.

（4）Runout, vibration, friction etc should not occur during operation of equipment.

5.3.3.4 Thermal effect during operation of motor and load Heat could be generated during normal operation of equipment driven by the motor. Attention should be paid to the following while aligning centerline of motor and equipment:

(1). Increment of shaft center height of totally enclosed motor (TEFC) may be calculated using calculation formula. Increment of shaft center height=0.00045 × shaft center height of motor (mm)

**At the same time, thermal expansion and contraction of the equipment driven by motor should also be considered.**

(2). For connection using coupling, gap must be left between two couplings, generally subject to load. It may be calculated using the following relation. Increment of shaft extension=0.0005 × length of motor bed plate (mm).

**Note: ensure couplings other than rigid coupling could move freely and continuously in axial direction, so that shaft of motor and equipment could perform axial thermal expansion and contraction.**

5.3.3.5 Installation of rigid foundation

(1). Check whether installation surface of rigid foundation is clean up.

(2). Foundation must be flat. Its flatness error should not exceed 0.1mm.

(3). Sharing of one base plate between motor and equipment is favorable for stability. If a shared base plate is embedded into concrete together, it will function better.

(4). Place the motor on the foundation carefully, avoid damage of foundation and motor due to collision.

(5). Check installation surface, that is to say, each part of installation foot must have the same rigidity, so as to avoid inclination of motor during operation.

5.3.3.6 Installation of vertical type motor

(1). Sometimes, vertical type motor share foundation with some equipments (such as water pump), so foundation must have sufficient rigidity and weight. Calculation not solid enough might cause vibration of motor and equipment during use.

(2). Check whether installation surface is clean or not.

(3). Four points (center height below H180) and eight points (center height above H180) must be corrected for installation surface. Plane runout must be ensured to be within 0.04mm.

(4). Motor may be installed after the comfirmation that the above-mentioned inspection meets requirement.

5.3.3.8 Adjustment of motor installation is vital ensuring that motor and equipment could reach the service life satisfactory to you, motor and equipment must be correctly aligned. That is to say, axial deviation and angle deviation between two shafts of motor and equipment should be minimized. If required accuracy cannot be reached, bearing and even motor might be damaged.

(1). Before equipment adjustment, coupling of motor and equipment must be installed, and should be connected together easily, so as to facilitate free movement during adjustment.

(2). In order to facilitate adjustment of large motor, equipped with adjusting bolt hole, adjusting bolt must be mounted on motor foot before adjustment.

(3). If accurate installation is required, adjusting bolts may also be mounted around the equipment.

(4). It is very necessary to use relatively accurate instrument for measuring during accurate adjustment.

(5). All measured data must be recorded for reference in the future.

**6. Connection of motor parts**

**6.1 Connection of motor cooler**

6.1.1 Connection of air-air cooler . Air-air cooler is generally installed together with motor. Separate connection is not required. However, air intake and discharge should not be hindered. If air-air cooler is delivered to the user separately, manufacturer's instructions must be observed and kept strictly during installation.

6.1.2 Connection of duct ventilation. Motor using duct ventilation is equipped with joint flange made according to the dimension specified in outline drawing. Before connecting ventilation duct, check whether there is anything in the duct hindering ventilation. Duct should be cleaned up thoroughly. Effective seal must be used at flange joint. After connection is finished, draft test should be conducted to check whether there is any air leakage.

6.1.3 Connection of air-water cooler. Motor using air-water cooler is equipped with joint flange made according to the dimension specified in outline drawing. Effective seal must be used at flange joint. Water supply must be opened before starting motor.

6.1.4 Connection of water-cooled motor. In some special environments, water-cooled motor is required. Connection of water-cooling pipe adopted flange. It may also be made according to user's requirement. Generally, it is indicated on the outline drawing provided. Cooling water circulates in a specially designed motor enclosure. Since enclosure and cooling pipe generally forms carbon steel, this material tends to be corroded by water and generate fouling. Waste and fouling caused by corrosion could block up pipe, hindering the flowing of cooling water, influencing finally the cooling of motor. So cooling water must meet relevant requirements. In most cases, common urban tap water could meet these requirements. But in some places, water from local water supply network formed by ground water cannot meet the requirements. When there is a doubt, the quality of water supply should be tested. If it cannot meet the requirements, change the water source, or carry out water treatment in order, so that water quality could meet the requirements as follows:

PH value 8 ± 1 Alkalinity ≥ 1mmol/kg Sulfate <100 mg/kg Chloride <20 mg/kg Concentrated aluminum solution < 0.25 mg/kg

**6.2 Installation of the sleeve bearing**

6.2.1 Sleeve bearing using forced cooling is provided with oil pipe flange, pressure gauge, and with flow indicator could be provided, if required. Install necessary oil pipe and fittings, connect circulation system.

6.2.2 Thin oil station for the supply of cooling oil should be installed beside the motor with equal distance to two bearings.

6.2.3 Install oil feed pipe, connect to bearing.

6.2.4 Install oil discharge pipe, ensure the angle downward along bearing is larger than 10°C. If the angle is too small, oil level in the bearing will increase, speed of oil flowing to thin oil station will be reduced, leading to oil leakage or ineffective oil way.

6.2.5 Fill in correct quantity of lubricating oil at thin oil station. Correct type and viscosity of lubricating oil is indicated on outline drawing. If the oil looks dirty, filter the oil.

6.2.6 Before starting motor, open thin oil station first, check whether there is any leakage in the oil network. When oil reaches the half of bearing through inspection hole,then normal oil level is reached.

**Note that there is no lubricating oil in sleeve bearing upon delivery of motor. Starting the motor without filling in lubricating oil will damage bearing directly.**

**6.3 Wiring of main motor power supply**

6.3.1 Safety instructions for wiring of power supply

(1). All electrical wiring must be carried out strictly in accordance with national electrical standards and local regional regulations.

(2). Electrical wiring must be carried out by technically skilled and trained personnel.

(3). Power supply of all equipments including auxiliary equipment. Make sure that power supply is cut off from all components. Evident mark should be provided at the place of power supply control, so as to prevent power on again.

(4). Provide protective grounding for all components.

(5). Use guardrail to isolate from other live equipments in periphery.

6.3.2 Requirement for power supply Rated operating conditions are indicated on nameplate of motor. It may run continuously in the following range, however, performance and rated conditions of motor will change:

(1) Voltage change ± 10%

(2) Frequency change ± 5%

(3) Simultaneous change of voltage and frequency ± 10%,

should not exceed ± 5%.

Exceeding the abovementioned rates, operating characteristics of motor cannot meet the requirements and motor might fail and even be damaged .

6.3.3 Wiring of main motor power supply

(1). Generally, main junction box of motor could rotate by 4 × 90 °. The user may make adjustment according to requirement, however, after the adjustment, sealing of junction box must be ensured.

(2). Wiring diagram is provided inside the junction box or directly on the nameplate of the motor. Please connect wire correctly according to the wiring diagram. There are 6 binding posts (U1, V1, W1, U2, V2, W2) or 3 binding posts (U, V, W) on terminal block of the motor. 6 binding posts could be connected into Δ or Y according to the wiring diagram. In case of 3 binding posts, it means that the other 3 binding posts have been joined inside the motor, just connect outside 3 binding posts as per A-U, B-V, C-W.

**Note: after connecting wires according to the above-mentioned phase sequence, the direction of rotation of motor is clockwise when viewed from shaft extension end of motor. Note: in special order, sometimes rotation direction of motor is anticlockwise. Please refer to this requirement when ordering.**

(3). After correct wiring, confirm whether power supply is correct or not, according to the voltage and frequency as indicated on nameplate of motor. Motor could be started only after the confirmation of no error existence.

(4). Wiring of multi-speed motor should be made according to attached wiring diagram. Its rotation direction at different speeds should be confirmed during testing. If you have any question, please contact Valiadis S.A. Company.

(5). Wiring of main power supply. Creepage distance with junction boxes and minimum voltage drop have been fully taken into consideration during design of motor. In order to ensure trouble-free continuous operation of motor, sufficient insulation and creepage distance must be ensured. This is very important, as exposed parts after wiring connections must be properly insulated as per safety instructions.

**Note: it is very important to insulate the exposed parts after wiring, it could overcome problems due to wiring.**

(6). Bolt must be used for connection between motor's outgoing line part and feeder cable, and should be insulated. Surplus terminal box glands must be closed for sealing.

(7). Inside of main junction box must be clean and dry without foreign bodies. Sealing must be done according to delivery requirement when fixing again after wiring.

### 6.4 Wiring of auxiliary terminal box

6.4.1 According to product and user's requirement, various protections are installed in the auxiliary terminal box of motor. Auxiliary terminal box is fitted on the enclosure of motor. It may be mounted in different positions according to the user's requirements. See outline drawing of motor for details.

6.4.2 Various overload protection wirings of motor must follow relevant wiring standards and safety standards.

6.4.3 Line bank and fixed head are provided in auxiliary terminal box for connecting thermistor, PT100 and heater etc. Its maximum voltage is 750V to ground.

6.4.4 Power supply of motor heater is usually 1~220 V. When the motor is not in use, heater powers on for heating automatically. Please pay special attention to avoid danger.

6.4.5 Various protection wirings in auxiliary terminal box should be connected properly according to wiring diagram in auxiliary junction box.

6.4.6 Inside , the auxiliary box must be clean and dry without foreign bodies. Sealing must be done according to delivery requirement after the wiring connections.

### 6.5 Connection of rotor power supply for slip ring motor

6.5.1 Outgoing cables from the rotor of a slip ring motor are located in a terminal box on the cover of non-drive end . Feeder cables may be also connected from appropriate side. Feeder cables may be also connected directly on the brush holder or connected to the rotor terminal block.

6.5.2 Check up wiring diagram attached with motor carefully before making connection.

### 6.6 Connection of independent fan

6.6.1 Motor driven by an inverter is generally equipped with independent fan to ensure normal cooling during operation of motor at different speeds.

6.6.2 Motor with independent fan is generally three-phase asynchronous motor. Its terminal box is usually located on the fan cover.

6.6.3 Wiring of independent fan should be treated in the same way as in wiring of main power supply.

6.6.4 Before independent fan is powered on, ground it according to regulations.

6.6.5 If independent fan is not grounded according to requirement, or bearing of main motor is damaged due to improper installation, the supplier will not assume loss.

**Note: independent fan should be grounded in strict accordance with requirements.**

### 6.7 Grounding of motor

6.7.1 Motor must be grounded effectively according to safety regulations before use.

6.7.2 Ground terminals are provided in the terminal box of motor, on frame foot of large motor as well , as on flange of vertical type motor. These ground terminals must be grounded simultaneously.

6.7.3 Grounding of motor must be connected with user's grounding system.

### 6.8 Grounding of a motor driver by an inverter

When a inverter is used for motor control, frame ground of motor must be connected with load equipment ground, so as to balance potential between them. For motor with center height above H280, 1 × 70mm flat copper wire or more than two pieces of 50mm$^2$ round copper wire should be used, distance between two wires must be more than 150mm. if motor and equipment use the same steel plate foundation, the above-mentioned measures are not needed.

## 7. Testing of motor

### 7.1 Inspection before start

After installation of motor is finished and before testing, check connection of motor and equipment strictly. Check whether wires are connected correctly according to wiring diagram. Strict and careful inspection is helpful for safe operation of motor.

7.1.1 Check whether the motor is installed correctly, check whether foundation is defective, for example, whether there is any crack or not.

7.1.2 Check whether fixing bolts are screwed down.

7.1.3 Check whether all connections are made correctly, including connection of all auxiliary equipment.

7.1.4 Check whether diameter of leads is correct or not, whether joint is loose or whether there is any other defect.

7.1.5 Check whether temperature class and voltage, withstand class of leads and they meet requirements of motor or not.

7.1.6 Check whether insulation wrapping is made in cable ends except wire connection terminals.

7.1.7 Reconfirm that terminal box and frame of motor have been grounded.

7.1.8 Check whether capacity of contactor, fuse etc in control system are correct or not, whether contacts of contactors are in good condition.

7.1.9 Whether the set startup method meets requirement of motor.

7.1.10 Check whether cooling system is connected correctly or not.

7.1.11 Check lubricating oil pipe connection of sleeve bearing, pay attention to whether there is any leakage during operation. See 8.2 Lubrication of Motor Using Sleeve bearing. Follow the requirements in details.

7.1.12 For water-cooling motor, check connection of cooling water pipe, pay attention to whether there is any leakage during operation.

7.1.13 Check whether pressure and flow of lubricating oil for sleeve bearing and of cooling water of water cooler are meeting motors requirements or not.

7.1.14 Check whether connection of main wiring is correct and tight.

7.1.15 For motor with heater, should be ensured that is not energized during operation of motor, and energized when motor is not in use.

### 7.2 Measurement of insulation resistance

Before the first startup, or a restart up after being out of use for a long time, insulation resistance of motor should be measured. Measurements includes stator winding and rotor winding (slip ring motor). In the general maintenance process of a motor, insulation resistance should always be measured. For newly delivered motor, since winding is dry, its insulation resistance is relatively high. If transportation and storage conditions are not appropriate for the motor, and the motor is affected with damp, or motor is being used improperly,all these will cause reduction of insulation resistance.

Value of insulation resistance provides information related with humidity, and cleanness of insulating material. Correct state of motor insulation may be determined based on these information.

7.2.1 Precautions before measurement of insulation resistance

（1） If measured value of insulation resistance is relatively small, clean up windings of motor. If desired result still cannot be achieved, dry the windings. If these measures still cannot achieve desired result, please contact service personnel of Valiadis S.A. Company.

（2） If the motor is found affected with damp before measurement, whatever the measurement result is, the motor must be dried.

（3） With increase of winding temperature, insulation resistance of motor will decrease. Generally, when temperature is above ambient and the temperature increases by 10 ˚C, the insulation resistance will decrease by its half value.

（4） When winding insulation is very good upon delivery of motor, means that measured value of insulation resistance provided by the manufacturer was much higher than the value measured on site.

7.2.2 Permissible minimum value of insulation resistance Generally, it is unrealistic to judge permissible minimum value of insulation resistance very correctly, because value of insulation resistance depends on dryness of motor, variety of motor and actual condition on site. Insulation resistance of a dried motor is much higher than the permissible minimum values.

7.2.2.1 Calculation method of permissible minimum values of insulation resistance. Permissible minimum value of insulation resistance means that insulation resistance of a motor should be no lower than the value calculated using the following formula ,when motor is in hot state or after temperature rise test:

$$R = \frac{U1}{1000+P/100} \quad (M\Omega)$$

Where, R-insulation resistance of motor winding (MΩ); U1-rated voltage of motor winding (V); P-rated power of motor (kW).

7.2.2.2 Control value of insulation resistance in general condition. The value calculated according to calculation method of permissible minimum value of insulation resistance is the control value of motor in hot state. Generally, it is impossible to measure when motor is in hot state, so control value might change. Upon delivery of motor, because winding of

motor is very dry, its insulation resistance is very high. For example, it is typically above 500MΩ for low voltage motor,and above 1000 MΩ for a high voltage motor. However, if it is measured in an environment where temperature is very high, humidity is relatively large, the value of insulation resistance will decrease evidently. If the insulation resistance of a low voltage motor is above 10 MΩ, where on a high voltage motor is above 100 MΩ, the motor may still be used normally. If the insulation islower than this value, check the condition of the motor, whether there is moisture or too much dust, because even if the insulation is not damaged, low insulation might also occur.

For a used motor, the motor may still be used normally if its insulation resistance referring to a low voltage motor is above 10 MΩ, and of high voltage motor is above 100 MΩ. For insulation resistance of a wound rotor, the motor may be used if it is above 10 MΩ. Note that carbon dust on slip ring and exposed metal surface might reduce insulation resistance of rotor.

7.2.2.3 Measurement of insulation resistance of a motor stator. Measurement of insulation resistance is obtained through an insulation measurement meter (commonly called megohmmeter).Insulation measurement meter of different capacities will be used according to different voltage classes.

(1) 500VDC or 1000VDC megohmmeter is used for measurement when rated voltage is up to 1140V.

(2) 2500VDC megohmmeter is used for measurement when rated voltage is 1140V and above.

**Note: when insulation resistance is being measured or after measurement is finished, do not contact connecting terminal, of motor, just ground it for a while in order to prevent electric shock.**

**Before measurement of insulation resistance, always confirm that power supply is cut off and motor is at standstill.**

No matter megohmmeter of whichever capacity is used for measurement of insulation resistance, the measurement time must be at least 1 minute, then record the measurement result. Pay attention to the following operations before measurement.

(1) Confirm that connection of all power supplies is cut off.

(2) Confirm that motor frame and other windings not to be measured are grounded.

(3) Ground wiring of all auxiliary devices.

(4) Insulation resistance should be measured in the terminal box of the motor, and the megohmmeter should be connected between motor winding and frame.

(5) In respect to the measurement of insulation resistance, whole winding may be measured. Insulation resistance of each phase of winding separately may be measured if required. To measure insulation resistance of a certain winding, the windings of the other two phases must be connected together and grounded.

(6) Measurement of the temperature of the winding. If the motor has been stored for some time, temperature of motor enclosure may be measured instead of temperature of winding.

(7) After the measurement of insulation resistance is finished, ground the winding under test for immediate dischange.

7.2.2.4 Measurement of insulation resistance of a motor with wound rotor. Measurement of insulation resistance for motor with a wound rotor is the same as on a common motor, however, attention must be paid to the following:

（1） Confirm that connection of all power supplies is cut off.

（2） Confirm that power supply connected to slip ring is cut off.

（3） Confirm that rotor winding and frame, shaft are grounded.

（4） Check whether pressure of carbon brush is proper.

（5） Measure temperature of winding, if it has been stored for some time, temperature of motor enclosure may be measured instead of temperature of winding. If insulation resistance of rotor winding is measured, attention should also be paid to:

（1） Ground stator winding and frame.

（2） Ground shaft.

（3） Generally, windings may be connected into Y connection and measured together. If they are measured separately, windings not to be measured must be grounded alternately.

（4） After the measurement of insulation resistance is finished, the winding under test must be grounded for immediate discharge.

7.2.2.5 Measurement of insulation resistance of auxiliary components

（1） For motors with the heater, the insulation resistance of heater is measured by 500VDC megohmmeter.

（2） For PT100, Valiadis S.A. suggests not to measure insulation resistance. PT100 should all be grounded during the insulation measurement of the motor windings.

（3） For motor with insulated bearing. If insulated bearing or bearing separate insulation is mounted on both ends, the only thing to do is to disconnect shorted ground wire on shaft extension end. If insulated bearing is not mounted on shaft extension end, measurement may be carried out only after bearing and bearing housing or end cover are separated.

**7.3 Startup of motor**

7.3.1 First startup

**Note: For direct on line startup of the motor, starting current reaches 5-8 times the rated .For a voltage stepdown startup, the starting torque is proportional to the square of the voltage ratio. When capacity of the electric network is insufficient, stepdown startup may be used. However, the motor must be started on no load or on light load condition. Whereas when driven load is large, only direct on line voltage may be used for starting.**

7.3.1.1 First startup could be lasted only for a very short time, generally 1 second is enough. The main purpose is to check rotating direction of motor. Rotating direction of motor is expressly indicated on enclosure of motor. For motor without such indication, the motor may rotate on both direction.

7.3.1.2 For a motor driven by inverter, with an independent fan, check rotating direction of independent fan motor. Generally, independent fan motor could only rotate in one direction, rotating direction is indicated on the enclosure of the independent fan.

7.3.1.3 At the same time, check whether rotating parts are in contact with stationary parts. Eliminate if such phenomenon exists.

7.3.1.4 If, due to any reason, the required rotating direction is different from the rotating direction given for the motor, do not change its direction by yourself, ask the manufacturer to do it, since internal and external cooling fan of motor must be adjusted, and the marking for rotating direction of motor must be changed.

7.3.1.5 To change direction of rotation of a motor, change if any of two feeder cables.

7.3.1.6 To start a slip ring motor, it may work only when the rotor winding is connected with starting resistors in series.

7.3.1.7 It is advisable to start the motor for the first time when it is disconnected from the driven equipment.

7.3.1.8 In case there is no coupling between the motor and the driven equipment, axial movement is normal to a motor.

7.3.2 Operation of motor at no load

7.3.2.1 After first startup of motor and troubleshooting, no load operation of motor may be started.

7.3.2.2 No load run test of motor is usually carried out when the motor is uncoupled from any load. No load run test requires 1-2 hours. Observe whether there is any phenomenon, like abnormal noise or vibration, or whether bearing is overheated ,or oil leaks during this period. If the above-mentioned problems exist, solve them before operation with load.

7.3.2.3 Full voltage startup and voltage stepdown startup are permitted for the motor.

7.3.2.4 No matter what startup method is used, if the motor cannot start within 1-2 seconds, then cut off power supply immediately, check all possible causes, eliminate them. The motor and equipment might be damaged if motor is forced to start up before troubleshooting.

7.3.3 Operation of motor under load condition.

7.3.3.1 Since no load run test is normal, the coupling between motor and equipment may be performed and operation of motor with load may be started.

7.3.3.2 Start up the motor with load, note that if the motor fails to start up very quickly and run smoothly, cut off power supply immediately, check whether network power is insufficient or coupling is incorrect.

7.3.3.3 If abnormal vibration occurs, possibly coupling center is not aligned, fixing bolt is loose, rigidity of foundation is poor or the vibration may be transferred from other machines and so on. Abnormal vibration will cause damage of motor. Once abnormal vibration is detected, stop running immediately.

7.3.3.4 If abnormal noise exists, possibly voltage is too low, load is blocked, load driven by rotor is too heavy, electrical connection is not connected properly or the sum of the above-mentioned problems. Abnormal noise will also cause damage of motor. Once abnormal noise is detected, stop running immediately.

7.3.3.5 Please confirm that operating current is consistent with the rated current on nameplate, and the current of three phases is basically balanced. For motor with wound rotor (KΔ,KZR series), also confirm that operating current is consistent with the rated current on nameplate, and current of three phases is basically balanced.

7.3.3.6 Startup times of motor should be restricted according to technical requirements of the motor. Permissible startup times of motor mainly depends on load characteristics and motor type. Too many startup times will cause the motor to generate abnormal high temperature. This will speed up ageing of motor insulation, shorten the service life of motor or lead to an accident.

(1) Twice startup on cold state is permitted.

(2) When the motor runs for a long time or is in hot state, there should be a time interval between shutdown and restart. Two successive startups are not permitted. Generally, is permitted to restart after more than 30 minutes when the motor is unloaded; When the motor is on load, restart after 60 minutes.

(3) In typical operating conditions, startup times of motor should be about 800 times per year, subject to different powers.

7.3.3.7 For motor with thermosensitive element or PT100, during operation with load, the temperature of the corresponding parts of motor should be recorded. Note, that the temperature should not exceed the permissible limit value of the motor. Temperature must be measured continuously. When recording the temperature of the motor ,the temperature of the cooling system should be recorded simultaneously, for example, temperature of air intake and output (air-air cooler), water inlet temperature (water cooler).

Generally, the temperature of winding and bearing becomes stable when the motor has run with load for more than 4 hours. This shows that motor goes into stable operation. If the temperature of the winding still increases slowly, check whether the load of motor is on normal rate or not. If your equipment load does not reach the motor power, record the load and temperature just for reference and inspect later.

7.3.3.8 When the motor has run for some time, the temperature of the bearing becomes stable. General specifications for the bearing temperature is as follows:

（1） Temperature of rolling bearing should not exceed 95 ºC.

（2） Temperature of the sleeve bearing should not exceed 90 ºC. When the temperature of the bearing exceeds the above-mentioned limit value, stop the motor immediately, do not restart the motor before detecting and curing the fault of trouble.

If the motor is not equipped with temperature measuring element PT100, the temperature should be detected by measuring the temperature of the outer cover or end over of motor bearing (if permitted after installation of equipment). Generally, the external temperature is 10 ˚C lower than the actual temperature of the bearing. However, pay attention to safety during measurement when using a thermometer directly.

7.3.3.9 As far as bearing is concerned, its temperature rise speed could reflect whether motor works normally or not. If the bearing temperature is found to increase very fast during operation of the motor, or there is an abnormal vibration and noise, stop the motor immediately, and do not restart the motor before the fault of trouble has been detected and cure.

7.3.3.10 To start an equipment with large moment of inertia, the startup time of motor is relatively long. If startup time is found to be very long, or an abnormal noise is generated during the startup, please stop the starting and contact with service personnel of Valiadis S.A. Company.

| Foundation form | Motor center height | Vibration speed mm/s |
|---|---|---|
| Rigid foundation | Below H355 | 3.5 |
| Rigid foundation | 2P below H355 | 4.5 |
| Rigid foundation | Above H355 | 4.5 |
| Rigid foundation | 2P above H355 | 5.0 |
| Flexible foundation | Below H355 | 4.0 |
| Flexible foundation | 2P below H355 | 5.0 |
| Flexible foundation | Above H355 | 5.0 |
| Flexible foundation | 2P above H355 | 6.0 |

7.3.3.11 When several motors use the same transformer simultaneously and the capacity of the transformer is not large enough, do not start up all motors simultaneously, start them one by one from large to small.

7.3.3.12 During operation of the motor and equipment, with included the detection of any abnormality, all protective devices of equipment should not be disconnected.

7.3.3.13 Observe closely during the first days of equipment operation under load, note whether temperature and vibration are changing, or whether noise is abnormal.

7.3.3.14 For motor with vibration monitoring device SPM, after motor has run for some time, measure vibration and shock pulse value, and keep record. If SMP vibration monitoring device is not provided, vibration measuring instrument may be used for inspection. Measuring position cannot be the one specified in motor specification due to connection of motor and equipment. Measurement may be carried out on exposed part of motor, however, should not be performed on fan housing etc thin sheets. After the motor is installed and connected with equipment, vibration value will be larger than that upon delivery of the motor correspondingly, check it with reference to the value of as above table.

When this value is exceeded, or vibration is irregular, please find out cause. If this cannot be determined, please contact service department of Valiadis S.A. Company.

7.3.3.15 For slip ring motor, check whether spark is generated on slip ring during operation with load. If there is spark, it shows that contact is poor, motor should be shut down for contact pressure adjustment.

7.3.3.16 After equipment has run for some time with load, check heat exchange system, especially when motor is using water cooling. Check whether there is any leak or blockage. Eliminate if there is any.

7.3.3.17 When the motor is running with load, temperature on surface of some motors might be very high. All operating and maintenance persons should avoid contact with hot surface.

**Note: pay attention to operating condition of motor when the motor is running. Shut down if abnormal noise or vibration is generated. Check the cause of abnormal noise and vibration, do not start the motor before troubleshooting.**

**Possible cause of abnormal noise and vibration might be loose erection, bolt on motor and equipment loose, misalignment of coupling, defective stator coil, open circuit of power supply in one phase, unbalance due to failure of rotor component etc.**

7.3.4 Shutdown

7.3.4.1 Shutdown is different, it is a subject of load driven by the motor, however, main precautions are consistent.

7.3.4.2 Unload, reduce motor load to minimum.

7.3.4.3 Cut off power control switch.

7.3.4.4 For motor with heating device, if it is not interlocked with main power switch, power on the heating device.

7.3.4.5 For water cooling motor, cut off cooling water supply.

## 8. Lubrication of motor

Correct lubrication of motor will affect service life of bearing directly, and will also affect service life of motor. It is very important to fill lubricating grease (oil) to motor bearing properly and periodically.

**8.1 Lubrication of motor using rolling bearing**

8.1.1 We use double sealed bearing ("ZZ" is attached behind model of bearing) for small motor. This kind of bearing is pre-oiling type, re-filling is not required.

8.1.2 For larger motors (generally H160 and above) or motors with specific requirements, oil filling/draining device is fitted. These motors have been filled with oil or grease upon delivery, however, oil or grease should be replaced periodically.

8.1.3 For motor that has been stored or being out of use for more than two months, grease must also be added again after the motor is started. New grease must be added in while the motor is running. Fill grease until old grease is discharged from oil draining device. Refer to 8.1.5 for grease filling method in details.

At initial stage of grease filling, too much grease might cause increase of bearing temperature, this is normal. With discharge of old grease, temperature will be reduced to normal.

8.1.4 Normal cycle for grease replacement is a subject to the motor's size and service condition. However, the longest oiling greasing cycle should not exceed one year. Suggested oiling values for motor are given below (excessive or frequent oiling might also damage the motor)

**Note:**

**Normal condition: work at rated or lower than rated power in clean environment, running time per day is within 8 hours.**

| Rated power | Revolution of | Suggested oiling cycle | | |
|---|---|---|---|---|
| (kW) | motor (rpm) | Normal condition | Harsh condition | Severe condition |
| <18.5 | 1500 | 5 years | 3 years | 1 year |
| 18.5-90 | 1500 | 1 year | 6 moths | 3 months |
| 90-200 | 1500 | 3 months | 3 months | 1 month |
| 200-630 | 1500 | 3 months | 1 month | 15 days |
| <18.5 | 3000 | 5 years | 3 years | 1 year |
| 18.5-90 | 3000 | 1 year | 6 moths | 3 months |
| 90-200 | 3000 | 3 months | 1 month | 1 month |
| 200-630 | 3000 | 3 months | 1 month | 15 days |

**Harsh condition: work at rated or lower than rated power, 24 hours per day. Or in relatively dirty and dusty environment. Or motor undergoes vibration or light impact load.**

**Severe condition: in very dirty and dusty environment, or subject to heavy impact load and large vibration.**

8.1.5 Grease filling method

（1） Open dust cap on oil nipple and oil outlet, confirm that oil nipple is clean, use manual oil gun or pneumatic oil gun to fill grease into oil nipple, until new grease is discharged from oil outlet.

（2） Take off oil gun, let motor run 10 to 20 minutes, confirm that surplus grease has been discharged, put on dust cap of oil nipple and oil outlet, oiling is finished.

8.1.6 Type of lubricating grease Use correct lubricating grease. If the grease used is incompatible with original grease, this will reduce service life of bearing greatly. If you cannot determine the brand, please contact Valiadis S.A. Company. Valiadis S.A. Company specifies lubricating grease brand for bearing of motor that may be filled with oil, **IKV-PLEX 2/3 BLUE** (SHELL: SHELL GADUS S3 V220C 2, TOTAL: ALTIS EM-2, BP: ENERGREASE LC-2).

**Special attention: if oil is filled in motor during running, it should be done by a trained person . Live parts and rotating parts should be protected completely. Please**

**note the brand of bearing lubricating grease, filling time and quantity indicated on auxiliary nameplate of motor.**

### 8.2 Lubrication of motor using sleeve bearing

8.2.1 Sleeve bearings of motors are empty of oil upon delivery. Oil must be filled before the use of the motors.

8.2.2 Thin oil network that uses forced circulation cooling should be powered on before starting of the motor.

8.2.3 Observe rotation of oil ring during operation of motor. If the oil ring does not move, stop the motor immediately, because standstill of the oil ring will damage the bearing.

8.2.4 Check and confirm that no friction occurs between rotating parts and stationary parts in the bearing.

8.2.5 Check oil level in bearing through inspection hole. Oil level line is provided for all sleeve bearings, generally in the center of inspection window. When oil level is in the position of oil level line, it shows normal oil quantity. If oil level exceeds oil level line, but could still be seen in the inspection window, this is also OK.

8.2.6 For sleeve bearings using forced circulation cooling,the normal oil supply pressure is 120kPa ± 20kPa. Such a pressure could ensure that the bearing is working effectively. Higher pressure is unnecessary, on the contrary, too high pressure might cause oil leakage.

8.2.7 A very critical issue in the use of sleeve bearings is to measure the oil temperature regularly, especially on self-circulation sleeve bearings. If the temperature of a bearing increases suddenly, stop the motor immediately. Do not restart the motor before the cause has been detected. If the cause cannot be detected, please contact service personnel of Valiadis S.A. Company.

8.2.8 Generally, lubricating oil should be replaced immediately after the testing of the motor is finished or after the motor has run for several days, because foreign bodies might exist in bearing, pipeline etc, so it is very necessary to replace lubricating oil after the use for several days. Replaced lubricating oil may be reused after eliminating abrasion particles and foreign bodies using filtration method.

8.2.9 For self-circulation sleeve bearings, lubricating oil must be replaced after the running of about 6 months. For frequently started , or 2 pole motors (3000 rpm) the time interval for replacement of lubricating oil should be shortened.

### 8.3 Type of bearings

1.Bearing sizes for K series motors.

| Frame size | Drive End Bearing | | Non-Drive end Bearing | |
|---|---|---|---|---|
| | 2 p | 4,6,8 p | 2 p | 4,6,8 p |
| K80 | 6204ZZC3 | 6204ZZC3 | 6204ZZC3 | 6204ZZC3 |
| K90 | 6205ZZC3 | 6205ZZC3 | 6205ZZC3 | 6205ZZC3 |
| K100 | 6206ZZC3 | 6206ZZC3 | 6206ZZC3 | 6206ZZC3 |
| K112 | 6306ZZC3 | 6306ZZC3 | 6306ZZC3 | 6306ZZC3 |
| K132 | 6308ZZC3 | 6308ZZC3 | 6308ZZC3 | 6308ZZC3 |
| K160 | 6309C3 | 6309C3 | 6309C3 | 6309C3 |
| K180 | 6311C3 | 6311C3 | 6311C3 | 6311C3 |
| K200 | 6312C3 | 6312C3 | 6312C3 | 6312C3 |
| K225 | 6313C3 | 6313C3 | 6313C3 | 6313C3 |
| K250 | 6314C3 | 6314C3 | 6314C3 | 6314C3 |
| K280 | 6314C3 | 6317C3 | 6314C3 | 6317C3 |
| K315 | 6316C3 | 6319C3 or NU 319 | 6316C3 | 6319C3 |
| K355 | 6319C3 | 6322C3 or NU 322 | 6319C3 | 6322C3 |

2. Bearing sizes for AK series motors.

| Frame size | Drive End Bearing | | Non-Drive end Bearing | |
|---|---|---|---|---|
| | 2 p | 4,6,8 p | 2 p | 4,6,8 p |
| AK56 | 6201C3 | 6201C3 | 6201C3 | 6201C3 |
| AK63 | 6201C3 | 6201C3 | 6201C3 | 6201C3 |
| AK71 | 6202C3 | 6202C3 | 6202C3 | 6202C3 |
| AK80 | 6204C3 | 6204C3 | 6204C3 | 6204C3 |
| AK90 | 6205C3 | 6205C3 | 6205C3 | 6205C3 |
| AK100 | 6206C3 | 6206C3 | 6206C3 | 6206C3 |
| AK112 | 6306C3 | 6306C3 | 6306C3 | 6306C3 |
| AK132 | 6308C3 | 6308C3 | 6308C3 | 6308C3 |

3. Bearing sizes for AB series motors.

| Frame size | Drive End Bearing | | Non-Drive end Bearing | |
|---|---|---|---|---|
| | 2 p | 4,6,8 p | 2 p | 4,6,8 p |
| AB 160 | 6310C3 | 6310C3 | 6310C3 | 6310C3 |
| AB 180 | 6312C3 | 6312C3 | 6312C3 | 6312C3 |
| AB 200 | 6313C3 | 6313C3 | 6313C3 | 6313C3 |
| AB 225 | 6314C3 | 6314C3 | 6314C3 | 6314C3 |
| AB 250 | 6314C3 | 6317C3 | 6314C3 | 6317C3 |
| AB 280 | 6314C3 | 6318C3 | 6314C3 | 6318C3 |
| AB 315 | 6317C3 | 6319C3 OR NU319 | 6317C3 | 6319C3 |
| AB 355 | 6319C3 | 6322C3 OR NU322 | 6319C3 | 6322C3 |

4. Bearing sizes for KZR series motors.

| Frame size | Drive End Bearing | Non-Drive end Bearing |
|---|---|---|
| KZR112M-6 | 6308 | 6308 |
| KZR 132M-6 | 6309 | 6309 |
| KZR 160M-6 | 6311 | 6311 |
| KZR 160L-6-8 | 6311 | 6311 |
| KZR 180L-6-8 | 6313 | 6313 |
| KZR 200L-6-8 | NU 315 | 6315 |
| KZR 225M-6-8 | NU 315 | 6315 |
| KZR 250M-6-8 | NU 316 | 6316 |
| KZR 280S-6-8-10 | NU 320 | 6320 |
| KZR 280M-6-8-10 | NU 320 | 6320 |
| KZR 315S-8-10 | NU 322 | 6322 |
| KZR 315M-8-10 | NU 322 | 6322 |
| KZR 355M-10 | NU 326 | 6326 |
| KZR 355L-10 | NU 326 | 6326 |
| KZR 400L-10 | NU 330 | 6330 |

5. Bearing sizes for KΔ series motors.

| Frame size | Drive End Bearing | Non-Drive end Bearing |
|---|---|---|
| KΔ 160 | NU 309 | 6309 |
| KΔ 180 | NU 311 | 6311 |
| KΔ 200 | NU 312 | 6312 |
| KΔ 225 | NU 313 | 6313 |
| KΔ 250 | NU 314 | 6314 |
| KΔ 280 | NU 317 | 6317 |
| KΔ 315 | NU 319 | 6319 |
| KΔ 355 | NU 322 | 6322 |
| KΔ 400 | NU 326 | 6326 |

**9. Inspection and maintenance**

In order to ensure continuous, safe and reliable use of the motor, always check and maintain motor in time, detect any hidden troubles to prevent spreading of failure. Since the motor is the power for the whole equipment, especially large power motor is even the heart of the entire system. The in time and effective maintenance could ensure reliability and a normal service life of the motor.

**9.1 Purpose of inspection and maintenance**

9.1.1 Ensures reliable operation of the motor.

9.1.2 Minimizes down troubles of the motors.

9.1.3 Some initial failures may be detected and eliminated, avoiding so possible deterioration.

**9.2 Precautions for inspection and maintenance**

9.2.1 Before setting in operation a motor, get familiar with the general electrical safety regulations, avoid personnel injuries due to ignorance.

9.2.2 The operators must be provided with professional training, regarding technical inspection and maintenance procedures, and to understand simple measurement technologies required for the motor.

9.2.3 To follow relevant safety measures for inspection and maintenance in special environments.

9.2.4 If maintenance and upkeeping is planned in advance, read these operating and maintenance instructions carefully, it will be helpful for the reliability of the user's equipment.

9.2.5 An important part of a maintenance and upkeeping is that the user must prepare and posess appropriate spare parts.

**9.3 Level of maintenance and up keeping**

Please perform inspection and maintenance works in the following principles.

9.3.1 Routine inspection during operation of motor. The purpose of routine inspection during operation of motor is to determine whether the motor is running normally.

9.3.2 Periodic inspection of motor. The purpose of periodic inspection of motor is to prevent occurrence of failure, so as to ensure proper use of motor and extension of service life.

9.3.3 Maintenance of motor. No matter if the motor is in whichever service condition, after the use of some time, the motor must be maintained. Subject to operating environment and conditions, the maintenance cycle of motor cannot be established, however, periodic maintenance time of generally about one year is required. For a use in a very severe environment or outdoors, maintenance cycle must be shortened. While considering maintenance cycle, the following factors must be taken into consideration:

(1) Environmental condition influences the use of the motor directly. The motor must be maintained regularly when ambient humidity is high or operating in dusty place. Daily dust removal is very important.

(2) Frequent startup, when exceeds generally specified startup frequency.

(3) Service condition of wearing parts, such as bearing and slip ring.

(4) Frequent fluctuation of supply voltage.

(5) Shock on driven equipment.

(6) Function of motor on the whole system.

**9.4 Routine inspection during operation of motor.**

**Special attention: If any noise and vibration increases suddenly or is too high, stop the motor immediately and check quickly. Check temperature of bearing periodically during continuous operation, at least once per day**.

9.4.1 Clean the motor regularly, prevent oil, water etc from entering inside the motor.

9.4.2 Keep good ventilation of motor, keep air inlet/outlet clean. Fan screen housing should be cleaned up regularly to prevent blockage of air.

9.4.3 Motor should be monitored regularly during operation, if there is any abnormality, shut down immediately and check.The motor may continue working only after troubleshooting.

9.4.4 Check whether play pointer of sleeve bearing is in specified level. If it exceeds the specified level, this means that friction exists between shaft and bearing, shut down immediately and check it.

9.4.5 Shutdown inspection of motor. Shutdown inspection is required when any of the following conditions occurs:

When :

(1) Motor vibrates severely.

(2) Equipment driven by motor is damaged.

(3) Heating of motor bearing is serious.

(4) Shaft travel impact occurs on motor.

(5) Speed of motor decreases suddenly.

(6) Temperature of frame increases rapidly.

(7) Motor or starting device generates smoke.

(8) Unexpected personal accident occurs.

**9.5 Periodic inspection of motor**

9.5.1 Motor should be checked according to the service condition of motor.

(1) Check whether fixing bolt of motor is loose or not, or whether there is rust on fixing bolt, which influences fixing performance.

(2) Check whether electrical connection is secure, whether there is rust etc that might influence contact performance.

(3) Check whether critical connection of slip ring of motor with winding rotor (KΔ,KZR series) is secure, whether slip ring and brush are worn.

(4) Check whether grounding of motor is secure, whether there is any rust etc that might influence grounding performance.

(5) Check whether shaft seal of motor is aging. If aged or worn, proceed to replacement. If you are unfamiliar specifications, please contact user service personnel of Valiadis S.A. Company.

(6) Check whether coupling is fixed securely and aligned correctly.

(7) Check whether there is any liquid which is harmful for the performance of the motor. Eliminate it if there is any.

(8) Check the bearing of the motor, if it is worn, replace it immediately.

(9) Check the painting of the motor, repaint if required, in order to prevent too much corrosion.

**9.6 Maintenance of motor**

Motor should be maintained periodically. If there is any failure, fix it timely. Generally, carry out minor maintenance once per month, comprehensive maintenance once per year. Content of maintenance includes the following aspects.

9.6.1 Items of minor maintenance include:

(1) Remove dust on the surface of motor.

(2) Measure insulation resistance of motor.

(3) Fasten fixing bolt and grounding bolt, and various connecting bolts.

(4) Clean up starting device and insulated terminals.

(5) Remove dust, carbon etc on slip and brush part of motor with winding rotor (KΔ,KZR series).

(6) Clean up windscreen of motor fan housing, ensure air inlet and outlet to be clean.

9.6.2 Items of comprehensive maintenance includes:

(1) All items of minor maintenance.

(2) Internal cleaning of motor, so that motor stator winding is clean without oil stain, grease, dust etc.

(3) Whether the motor bearing is in good condition. If it is damaged, replace immediately. In normal service condition, it is suggested to replace the bearing once per year (yearly operating time is about 8000 hours).

(4) If it is unnecessary to replace bearing, clean the bearing and replace lubricating grease.

(5) Clean or replace other parts of motor.

**9.7 Up keeping method of motor**

9.7.1 External cleaning of motor External cleaning of motor is as important as internal cleaning, it influences operating performance of motor directly. Any negligence of external cleaning of the motor is unfavorable to a long-term stable operation of motor.

(1) Fully enclosed motor (degree of protection above IP44), including air-air cooler motor, must be cleaned up regularly, including air inlet/outlet duct and surface of motor. It is especially important to keep outer fan of motor clean regularly, because dust deposited on fan during operation will generate an unbalance which is unfavorable to motor operation, it might generate vibration in worse condition.

(2) If the motor works in location where long fiber exists, clean up fiber accumulated on motor surface and vent opening periodically.

(3) For open motor (ODP motor with degree of protection below IP23), air inlet should be cleaned up regularly to avoid dust and other foreign bodies blocking the air inlet and influencing normal circulation of air.

Note: when carrying out external cleaning of motor, remember not to clean while the **motor is running ,or either remove external parts, so as to avoid foreign bodies being sucked into motor**.

9.7.2 Internal cleaning of the motor. After the motor has run for a long time, dust, grease and carbon powder will inevitably exist in the motor (for slip ring motor, due to abrasion). Such particles tend to absorb moisture and lead to a decrease in insulation resistance of coils. Dust deposit reduces cooling effect and leads to temperature rise, in a worse case, accident might occur on the motor. So it is very important to clean up internally of the motor periodically. This is an important action which will ensure long-term safe operation of the motor. Internal cleaning methods of the motors are as follows:

(1) Use industrial suction cleaner to clean internally the motor. Dust and other broken particles in side the motor should be removed. Its main advantage is that dust and other broken particles will not fly away while cleaning internally the motor. It is very important

that the suction pipe of industrial suction cleaner must be nonmetal, in order insulation of the winding not to be damaged.

(2) Use compressed air to clean internally the motor, however, attention must be paid to dryness of air, compressed air containing moisture will influence insulation of motor. At the same time, note that pressure of the compressed air should not be too high, generally 4kg/cm$^2$. Too high pressure tends to damage insulation of coil, too low pressure could not achieve good cleaning effect, so pressure of compressed air must be checked correctly.

(3) Use soft cloth to clean internally the motor. Note that particles like cotton waste and chemical fiber should not be used for cleaning, because they will stick fiber in side the motor or the surface of the coils, influencing the cooling of the motor.

(4) If there are petroleum substances such as grease in side motor, use cloth with petroleum solvent (solvent will not drip) to wipe off.

(5) For motors used in hazardous environment. If petroleum solvent is used to clean internally the motor, pay attention to safety. When safety cannot be guaranteed, do not use this method. Use incombustible solvent to wipe off or move the motor out of the hazardous environment for maintenance.

(6) Pay attention to safety precautions when cleaning the motor. Especially when petroleum solvent is used, always keep ventilation around motor.

(7) For motor with radial ventilation structure, special attention should be paid to the cleaning of the ventilating duck.

Blockage of ventilating duct will enhance temperature rise of the motor.

(1) Judgment for cleanness of sleeve bearing

a) Color of lubricating oil, if color changes.

b) Deposit is generated, such as bonding sheet of oil.

c) Viscosity is too high or too low, it is generally controlled within ± 15% of standard requirement.

d) Determine whether oil deteriorates by snuffing at its smell, sour taste and other abnormal tastes show that oil deteriorates.

(2) Cleaning methods of roller bearing

9.7.3 Cleaning of roller bearing. Motor bearing must be cleaned after running for a long time.

(1) Clean petroleum solvent must be used for cleaning. Cleaning should be performed for generally three times, then use clean cloth to wipe the bearing.

(2) Provide anti-dust protection for bearing during cleaning and wiping, so as to prevent invasion of dust and other tiny particles.

(3) Cold pressing technique is the best way to assemble bearing, but common user has no such equipment, it may be heated by warming. Bearing may be heated in cleansing oil, temperature should be controlled at 90˚C. If heating method is used to the heat the bearing, note that after the heating, end cover may be mounted only after the bearing is completely cooled down.

(4) It is prohibited to use any tool to knock the bearing directly for fitting, similarly, do not fit end cover by knocking, because the result of knocking is a damaged bearing.

9.7.4 Cleaning of sleeve bearings.

When condition of Article (1) occurs on sleeve bearing of the motor, the oil must be replaced, and the bearing must be cleaned. Sleeve bearing must be cleaned using kerosene. Before refilling new oil, confirm that kerosene has been discharged completely.

(3) Precautions for cleaning of sleeve bearings. Since bush of sleeve bearing is made of Babbitt metal, be very careful in removal and cleaning process, any knocking might damage bush and insulation film of bearing.

## 10. Common troubles of motor and troubleshooting

| No. | Common troubles | Cause analysis | Remedies |
|---|---|---|---|
| 1 | Fail to start | 1.Power supply is not connected. | **1.** Check whether connecting wire etc are disconnected. Whether control switch is turned on. Whether fuse is mounted. Whether leads are broken. |
| | | **2.** Stator winding is defective. | **2.** Check whether short circuit or open circuit occurs on winding. |
| | | **3.** Load is too heavy or equipment is blocked. | **3.** Select motor of a size larger or reduce load; if drive equipment is blocked, eliminate failure. |
| | | **4.** Wiring is incorrect. | **4.** Correct wiring. |
| 2 | Slow start. | **1.** Supply voltage is too low. | **1.** Check voltage feeders. |
| | | **2.** Control switch is shorted or contact is poor. | **2.** Check control switch. |
| | | **3.** Power supply is out of phase. | **3.** Power supply and all connected switches and lines. |
| | | **4.** Contact of power cable connection is poor. | **4.** Check mounting and fastening of connecting wire, eliminate loosening. |
| | | **5.** Coil is grounded or shorted. | **5.** If coil of motor winding is found to be grounded or shorted, send it to factory for repair. |
| 3 | Normal in no load operation, trip or cannot start during operation with load. | **1.** Capacity of switch and fuse is insufficient, load is heavy. | 1. Replace with switch andfuse of large capacity. |
| | | **2.** Voltage is too low, load is heavy. | 2.Check line condition and supply voltage, solve problem or reduce load. |
| | | **3.** Load is heavy. | **3.** Select motor of a larger size or reduce load. |

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| **4** | Motor enclosure is electrified | **1.** Power cord and ground wire are confused. | **1.** Correct wrong wires. |
| | | **2.** Winding is aging or affected with damp. | **2.** Dry winding, if insulation is aging, replace winding. |
| | | **3.** Leads contact with enclosure. | **3.** Check whether leads contact with enclosure. If contact exists, add insulation for correction immediately. |
| **5** | Motor enclosure is hot | **1.** Load is too heavy. | **1.** Adjust loads, if heavy load is required, replace with a larger motor. |
| | | **2.** Ambient temperature exceeds 40 ℃. | **2.** Reduce ambient temperature or replace with motor with higher level of insulation. |
| | | **3.** Voltage is too low. | **3.** Check circuit, transformer capacity and voltage. |
| | | **4.** Voltage is too high. | **4.** Check whether supply voltage is consistent with the voltage required by motor. |
| | | **5.** Motor runs out of phase. | **5.** Check condition of switch, fuse and circuit. |
| | | **6.** Cooling fan is damaged, motor is not cooled. | **6.** Replace fan. |
| | | **7.** Stator rubs rotor. | **7.** Send to factory for repair or replace motor. |
| | | **8.** Voltage of three phases is unequal. | **8.** Check control circuit and supply voltage, eliminate unequal factors. |
| **6** | Operating speed decreases suddenly | **1.** Load increases suddenly. | **1.** Check load condition and mechanical connection. |
| | | **2.** Out of phase occurs suddenly on motor. | **2.** Check condition of switch, fuse and circuit, eliminate trouble. |
| | | **3.** Voltage decreases suddenly. | **3.** Check control circuit and supply voltage, whether there is any change. |

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| **7** | Electromagnetic noise is generated during operation | **1.** New product has electromagnetic noise. | **1.** Normal phenomenon, just use it at ease, it will not influence performance. |
| | | **2.** Electromagnetic noise is generated after use for some time. | **2.** Check whether load increases, check whether circuit is loose or not etc. |
| | | **3.** Motor runs out of phase. | **3.** Check electrical connection, eliminate out of phase failure. |
| | | **4.** Stator rubs rotor. | **4.** Check inside chamber of motor stator, whether there are paint knot etc foreign bodies, restore after inspection. |
| **8** | Mechanical noise is generated during operation | **1.** Sound of ventilation. | **1.** Sound is generated due to ventilation of motor. |
| | | **2.** Coupling or belt connection is loose. | **2.** Check coupling condition, check whether key or bolt is loose. |
| | | **3.** Fan housing bolt is loose. | **3.** Fasten bolt for fan housing. |
| | | **4.** Fan contacts with end cover, fan housing. | **4.** Adjust distance between fan and end cover, fan housing. |
| | | **5.** Foreign bodies are sucked in and attached on rotating parts. | **5.** Remove the foreign bodies attached on rotating parts. |
| | | **6.** Equipment driven by motor generates noise. | **6.** Check noise of equipment driven by motor, eliminate noise source. |
| **9** | Bearing sounds | **1.** Uniform hissing sound. | **1.** Generally, this sound is normal bearing friction sound. |
| | | **2.** Intermittent metal collision sound. Similar to click sound. | **2.** It is the sound of bearing carrier, and may be eliminated after oiling. |
| | | **3.** Obvious bearing rolling sound. | **3.** Bearing is severely lack of oil,or grease fill in grease or oil immediately. |
| | | **4.** Large hiss or accompanied with other sound. | **4.** Bearing is damaged, replace with new bearing immediately. |

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| **10** | Abnormal vibration | **1.** Motor or load is mounted improperly or becomes loose. | **1.** Check and fasten foundation bolt. |
| | | **2.** Strength of foundation for installation of motor and equipment is insufficient. | **2.** Reinforce foundation for installation of motor and equipment. |
| | | **3.** Balance of coupling or belt pulley is poor. | **3.** Balance again. |
| | | **4.** Coupling or belt pulley center is not aligned. | **4.** Align center. |
| | | **5.** Shaft extension is bent after collision. | **5.** Replace rotor or shaft. |
| | | **6.** Rotor balance is poor. | **6.** Balance again. |
| | | **7.** Fan balance is poor or fan is damaged. | **7.** Replace fan or balance again. |
| | | **8.** Coil of stator or rotor is shorted. | **8.** Send to factory for repair. |
| | | **9.** Influenced by vibration of equipment or adjacent equipment. | **9.** Eliminate vibration source. |
| **11** | Bearing overheats | **1.** Bearing is damaged. | **1.** Replace bearing. |
| | | **2.** Amount of lubricating grease filled in bearing is inappropriate or quality of lubricating grease is poor. | **2.** Replace lubricating grease, filling amount of lubricating grease is between 1/2 and 2/3. |
| | | **3.** Coupling is not aligned well or belt pulley is too tense. | **3.** Align coupling or adjust tension of belt pulley. |
| | | **4.** Abrasion of bearing chamber and shaft cause deflection of steel ring. | **4.** Replace the worn end cover, shaft or rotor. |
| | | **5.** Assembling of motor is not tight. | **5.** Reassemble the motor. |

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| **12** | Temperature rise is high or smoke is generated | **1.** Load is too heavy. | **1.** Select motor of a larger size or reduce load. |
| | | **2.** Ambient temperature is too high. | **2.** Reduce ambient temperature or reduce load. |
| | | **3.** Supply voltage is too high or too low. | **3.** Check the cause, confirm that voltage is too high or too low, reduce load or shut down. |
| | | **4.** Motor runs with two phases. | **4.**Check electrical connection, restore for any phase failure. |
| | | **5.** Ventilating duct of motor is blocked. | **5.**Remove dirt and foreign bodies at air inlet/outlet of motor. |

## 11. Disposal of discarded motor

According to national requirement for environmental protection, after service life of motor expires, it should be disposed according to motor materials respectively, so as to avoid influence on environment in disposal process. Main materials of motor are cast iron, steel, copper, aluminum and insulating materials. General metal may be recycled for use. Nonmetal material cannot be recycled,but may be disposed by burning etc methods, however, it must be ensured that burning process will not pollute the environment. Please dispose according to relevant national regulations.

# VALIADIS S.A.

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