

Operating Instructions

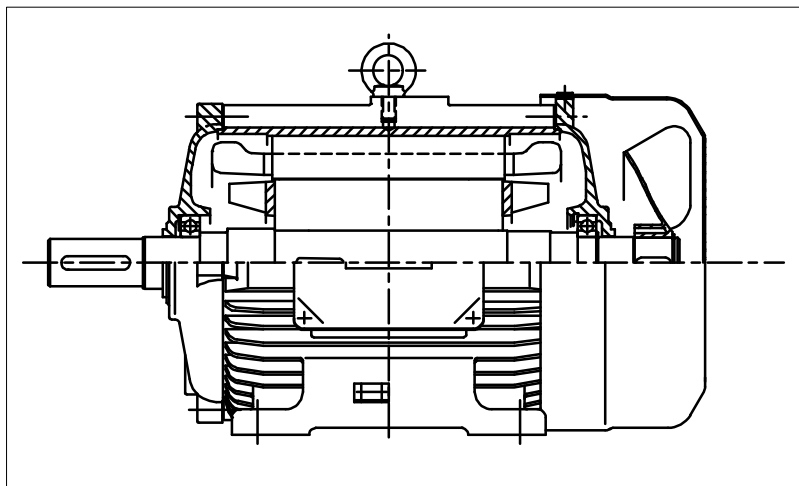
N – R 435 en 02.11

for totally enclosed fan-cooled (TEFC) and internally cooled (ODP)
three-phase motors with squirrel cage
for low voltage, with antifriction bearings

BN.A-071 to BN.A -315

A..A-071..-.. to 800..-..

J..A-160..-.. to 800.. -..



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Safety and commissioning instructions



1. Safety and commissioning instructions

1.1 Warning symbols in these instructions

The symbols are used in these operating instructions to point out to particular dangers.



This symbol refers to a dangerous situation which can cause fatal or serious injuries or considerable damage to property.



This symbol refers to a possibly dangerous situation which can cause injuries and damage to property if it is not avoided.

1.2 General

Low voltage motors have dangerous, **live** and **rotating** parts, and probably **hot** surfaces. All work for transport, connection, commissioning and maintenance is to be made by **qualified, responsible** specialists (EN 50110–1/VDE 0105 Part 1, IEC 60364 must be observed). An inadequate behaviour can cause severe **damages to persons and property**.

1.3 Specified use

These low voltage motors are meant for use in **industrial** plants. They are in accordance with the standards of the series **EN 60034 (VDE 0530)**.

Air-cooled types are suitable for ambient temperatures from **–20 °C (–4 °F) to +40 °C (+104 °F)** as well as altitudes \leq **1000 m** above sea level. It is **imperative** to observe differing data on the rating plate. The conditions at the site of application must comply with **all** indicated data on the rating plate.

Low voltage motors are **components** to be installed into machines in accordance with Directive 89/392/EEC.

Commissioning is not allowed as long as the conformity of the end product with this directive is not established (EN 60204–1 has also to be observed).

1.4 Transport, storage

The carrier is **immediately** to be informed on **damages** found upon delivery; **commissioning must not be admitted**, if required. Screwed-in eye bolts are to be tightened. They are suitable for the weight of the low voltage motor, **no** additional loads are allowed to be attached. If required, sufficiently dimensioned means of transport (e.g. rope guides) are to be used. Prior to commissioning the **transport locking devices** are to be **removed**. Reuse for further transports. For storage of low voltage motors, take care of a **dry, dustfree** and **low-vibration** ($v_{\text{eff}} \leq 0.2$ mm/s) ambience (bearing damages with motor at standstill).

Before commissioning the insulation resistance is to be measured. In case of values $\leq 1\text{k}\Omega$ per Volt of the rated voltage the winding must be dried. Observe the "Storage instructions".

Safety and commissioning instructions

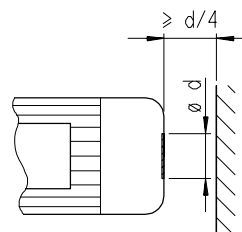
1.5 Installation

Take care of an even ground, suitable fastening of feet or flange and an exact alignment for direct coupling. Avoid that structure-dependent natural frequencies occur within the rotary frequency and the double mains frequency. Turn rotor **by hand**, listen to abnormal frictioning noises. **Check direction of rotation** before coupling (Observe section "Electrical connection").

Pulleys and couplings are **only** allowed to be installed or removed with suitable devices (Heating!) and to be covered with **protection against accidental contact**. Avoid inadmissible belt tensions (Tech. List). The **balance** of the low voltage motor is indicated on the shaft end face or on the rating plate (H = half key, F = full key). In case of a half key (H), the coupling must also be balanced with a half key. In case of any protruding and visible part of the key take care of the mass balancing.

If required, make the necessary pipe connections. Mounting types with the shaft end facing upwards are to be provided with a cover by **the customer**, avoiding that foreign bodies fall into the fan.

Ventilation must **not be hindered** and the outgoing air – also from adjacent units – must not be directly sucked in again.



1.6 Electrical connection

All work is only allowed to be done by **qualified** personnel with the low voltage motor and driven machine at **standstill, electrically dead** and **locked against restart**.

This is also applicable to auxiliary circuits (e.g. space heater).

Check de-energizing!

A non-observance of the tolerances indicated in EN 60034-1/VDE 0530, part 1 – voltage " 5%, frequency " 2%, curvature, symmetry – will result in an excessive heating and is influencing the electromagnetic compatibility. Observe data on the rating plate as well as wiring diagram in the terminal box.

Observe connection and differing data on the rating plate as well as the wiring data in the terminal box.

Connection is to be made in such a way that a **durably safe**, electrical connection is maintained (no uncovered wire ends); especially provided cable end equipment is to be used. A safe **earthing** is to be made.

The minimum air gaps between uninsulated and live parts themselves and to earth must not be lower than the following values: 8 mm at $U_N \leq 550$ V, 10 mm at $U_N \leq 750$ V, 14 mm at $U_N \leq 1100$ V.

The terminal box must be **free of** foreign bodies, dirt as well as humidity. Unused cable entries and the box itself are to be sealed against **dust** and **water**. For trial operation without driving elements the **key** is to be **secured**. For low voltage motors with brake it is to be **checked** before putting into operation, if the **brake** is perfectly functioning.

Safety and commissioning instructions

1.7 Operation

Vibration severities $v_{\text{eff}} \leq 3.5 \text{ mm/s}$ ($P_N \leq 15 \text{ kW}$) and 4.5 mm/s ($P_N > 15 \text{ kW}$) are not critical in coupled operation. In case of changes compared with normal operation – e.g. **higher temperatures, noises, vibrations** – the cause is to be found, if required, consult the manufacturer. Even for trial operation the safety devices are not allowed to be put out of function. In **case of doubt** switch off the low voltage motor.

In case of heavy dirt accumulation, the air ducts must be cleaned at regular intervals.

Bearings with regreasing devices are to be regreased with low voltage motor **running**. Risk of accidents! Pay attention to rotating parts. Observe saponification class! If grease drainholes are sealed with a plug, **remove these plugs** before putting into operation. Boreholes have to be sealed with grease. Replacement of bearings in case of permanent lubrication see Appendix 1 or motor documentation.

1.8 Warranty

The **Warranty** is only applicable if all of these instructions for safety and putting into operation as well as the following paragraphs of the operating instructions and the directions for possible additional units are strictly observed.

Safety and commissioning instructions

1.9 ESD Protective measures



Electrostatic discharge

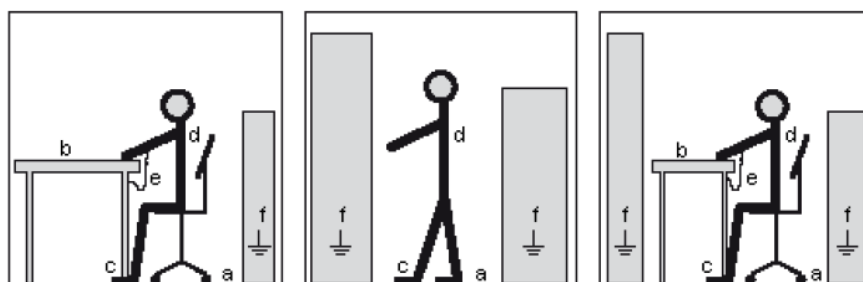
Electronic modules contain electro-statically sensitive components.

In case of inadequate handling these components can be destroyed easily.

Please observe below instructions to avoid damage to property.

- Touch electronic modules only when absolutely necessary work has to be done on these modules.
- If electronic modules have to be touched, the body of the person concerned must be electrically discharged immediately before and has to be grounded.
- Electronic modules may not come into contact with electrically insulating material such as plastic foil, plastic parts, insulating table tops or clothing of man-made fibers.
- Place the modules only onto conductive surfaces.
- Packing, storage and transporting of electronic modules and components only in conductive packing material such as metallized plastic containers, metal containers, conductive foam material or household aluminium foil.

The necessary ESD protective measures for electro-statically sensitive components are demonstrated once again in below drawings:



(1) Sitting workplace

a=conductive floor

d=ESD work coat

(2) Standing workplace

b=ESD table

e=ESD wristband

(3) Standing/sitting workplace

c=ESD shoes

f=Ground connection of cabinets

Description

2. Description

2.1 Overall construction and design

Mounting arrangement acc. to EN 60034-7:

see dimension drawing or rating plate

Mounting dimensions for surface cooling (TEFC) up to frame size 315 M acc. to

DIN 42673 (foot mounted)

DIN 42677 (flange mounted)

from frame size 315 L acc. to dimension drawing,

all frame sizes acc. to IEC 60072-1 or IEC 60072-2:

see dimension drawing

Mounting dimensions for internal cooling (ODP) up to frame size 315 M acc. to

DIN 42672 (foot mounted)

DIN 42676 (flange mounted)

from frame size 315 L acc. to dimension drawing,

all frame sizes acc. to IEC 60072-1 or IEC 60072-2:

see dimension drawing

Connection designations acc. to

DIN VDE 530 part 8

IEC 60034-8:

see wiring diagram

Enclosure acc. to EN 60034-5:

see rating plate

Cooling acc. to EN 60034-6:

IC 411 surface cooling or hollow-fin cooling

IC 511 tube cooling

IC 01 internal cooling

IC 611 internal cooling with mounted-on air-to-air heat exchanger

IC 81 W internal cooling with air-to-water heat exchanger

IC 71 W water jacket cooling

Details of the motor design are indicated in the valid technical catalogues.

2.2 Bearings

The motors are equipped with grease-lubricated antifriction bearings. The standard version of the bearings in surface-cooled motors up to frame size 280 and in internally cooled motors up to frame size 225 is permanently lubricated.

The bearings of totally enclosed fan-cooled (TEFC) motors from frame size 315 and the internally cooled open-drip proof (ODP) motors from frame size 250 are equipped with regreasing devices and automatic grease quantity control.

Description

2.3 Cooling

- 2.3.1 Surface cooling (TEFC) for the Type A..A-...-.. except A.WA-132..-.. to A.WA-560..-..**
Design for fin-, hollow-fin- or tube cooling, where an external fan takes in the cooling air through the openings in the fan cover and presses the air over the surface or through the cooling tubes of the stator housing. In case of hollow-fin or tube cooling the heat dissipation is supported by a closed cooling air circuit inside the motor.
- 2.3.2 Internal cooling for the Type J..A-... except JNWA-... and JNRA-...**
In case of motors with enclosure IP 23 the cooling air (ambient air) is taken in by internal fans through air inlet openings, is led over the heat-generating elements in the motor and is blown out through air outlets.
- 2.3.3 Internal cooling with mounted-on air-to-water heat exchanger for the Type JNWA-...**
The motors are equipped with air-water circuit coolers. The cooling air led through the heat exchanger and motor is recooled in the heat exchanger and the heat loss is dissipated through the cooling water. The heat exchangers are provided with special ribbed tubes.
- 2.3.4 Internal cooling with mounted-on air-to-air heat exchanger for the Type JNRA-...**
The motors are equipped with air-to-air heat exchanger. The cooling air led through the heat exchanger and motor is recooled in the heat exchanger and the heat loss is dissipated through the cooling medium air.
- 2.3.5 Water jacket cooling for the Type A.WA.-132..-.. to A.WA.-560..-..**
The stator housing has a double casing. For water channelling it is sub-divided by spirals where the cooling water passes through. This results in good heat dissipation. Additionally, this reduces the danger that suspended matters carried along in the water can deposit.

2.4 Motor frame

- 2.4.1 Construction for surface cooling (TEFC), hollow-fin cooling or tube cooling (Type A..A-...-.. except A.WA-132..-.. to A.WA-560..-..)**
Depending on the frame size the stator frame and end shields are made of grey cast iron or steel. The fan cover is made of sheet steel. The stator frame surface is provided with cooling fins, hollow fins or tubes and attached terminal box.
- 2.4.2 Construction for internal cooling (ODP) for the Type J..A-... except JNWA-...and JNRA-...**
Depending on the frame size the stator frame and end shields are made of cast iron or steel. The stator frame has an even surface with attached terminal box. There are distance fins between stator jacket and stator pack allowing the internal cooling.
- 2.4.3 Construction for internal cooling with air-to-water heat exchanger for the Type JNWA-...**
The stator frame and end shields are of steel. The stator frame surface is plain with mounted-on terminal box. Between the stator jacket and the stator core there are spacing ribs making possible the internal cooling. An air-water circuit cooler is mounted onto the ventilation openings.
- 2.4.4 Construction for internal cooling with air-to-air heat exchanger for the Type JNRA-...**
Like for the internal cooling with air-water heat exchanger, however, an air-to-air heat exchanger is mounted onto the ventilation openings.
- 2.4.5 Construction for water jacket cooling (Type A.WA.-132..-.. to A.WA.-560..-..)**
Stator frame and end shields are made of grey cast iron or steel. The stator housing is designed as double casing, through which the cooling water is led. The housing is provided with inlet and outlet for the cooling water.

Description

2.5 Stator winding

The stator winding is executed in insulation class (see rating plate) acc. to EN 60034–1.

High-quality enamelled wires, suitable surface insulating materials and the type of insulation provide a high level of mechanical and electrical stability with a high utilization factor and a long service life.

If required, the winding heads are sealed with a silicon–rubber compound. Such sealing offers special advantages in combination with the insulation classes F and H, when the motors are operated under severe starting– and braking conditions. Furthermore, the sealing provides an increased mechanical short circuit resistance and the motor inside (in case of surface cooling) is protected against condensed water.

2.6 Rotor

The rotor in motors of small frame sizes is equipped with a squirrel cage made of aluminium die cast, in case of larger frame sizes and for special starting– and braking conditions a brazed rotor version is also available. The rotor is dynamically balanced.

The balance is indicated on the shaft end or the rating plate, see Paragraph 4.1 "Installation".

The motors in standard design meet the requirements of vibration level N acc. to DIN EN 60034–14 / IEC 60034–14, in special cases level R (reduced) or S (special).

2.7 Terminal boxes

If required, additional terminals for the monitoring devices are available inside the terminal box. On special order an additional terminal box will be installed for larger motors (see dimension drawing).

The number of available terminals is indicated in the wiring diagrams.

2.8 Monitoring devices

Monitoring devices are only available on special request. See wiring diagram.

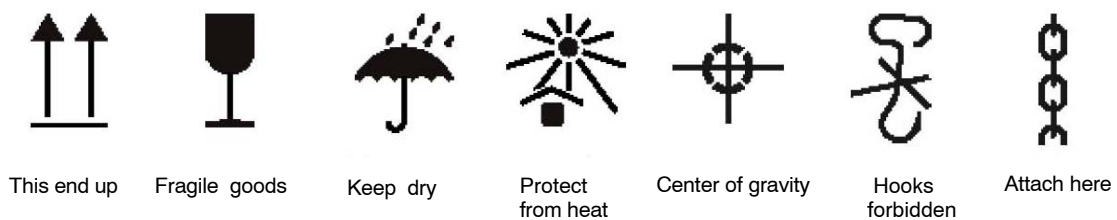
Transport

3. Transport

3.1 Transport markings

Depending on transport route and size the machine is packed differently. Unless otherwise expressly agreed the packing will be in compliance with the packing guidelines according to the International Standard for Phytosanitary Measures (ISPM).

Please observe the symbols on the packing. They have the following meaning:



For handling during transport the stator construction of the motor is equipped with lifting eyes, where the lifting hooks can be fixed.

Check whether screwed lifting eyes are securely tightened.

Lift motors only by using these lifting eyes. Several lifting eyes must always be used together.



Lifting of the motors on other parts (e.g. shaft ends) is not permitted, since this might result in considerable damages.

The lifting eyes are only suitable for the motor weight. Additional loads attached to the motor must never be lifted using these eyes.

3.2 Check before installation

Check whether the motor has been damaged during transport. If the packing is damaged to such an extent that a motor damage is to be assumed, the packing should be removed in the presence of a representative agent of the carrier.

Transport

3.3

Bearing lock

(for motors with cylindrical roller bearings only.)



The rotor of the motor is locked in order to avoid damages to bearings caused by vibrations at standstill:

- by red marked locking screws in the bearing cap
- or by a transport locking mechanism fixed to the shaft end.

Before the motor is mounted, the locking screws must be loosened by 10 mm and the transport locking device must be removed (see instruction plate on the motor).

After this, it must be possible to turn the shaft by hand.

We recommend loosening of the bearing lock only after the drive element has been fitted.

The transport locking mechanism **has to be** reused for further transports.

Prevent failures and thus avoid damages to persons and property.



The person responsible for the installation has to make sure, that

- safety– and operating instructions are available and observed
- operating conditions and technical data acc. to the order are observed
- protective equipment is used
- specified maintenance work is carried out.

Installation and commissioning

4. Installation and commissioning

A most careful mounting and alignment of the motors on an absolutely even surface is imperative to avoid distortions when the screws are being tightened. For machines which are to be coupled it must be paid attention to a careful alignment. See Appendix 2 for alignment check. As elastic as possible couplings should be used.

Motors with surface cooling (TEFC), hollow-fin cooling or tube cooling , internal cooling or internal cooling with air-to-air heat exchanger (for all indicated types except Type A.WA.—... and JNWA—...)



Maximum permissible coolant temperature (ambient temperature on site) acc. to EN 60034-1/IEC 60034-1 is 40 °C (104 °F) and a permissible altitude up to 1000 m above mean sea level (other values see rating plate).

Care must be taken that the cooling air can flow without hindrance into the air inlet openings and freely pass through the air outlet openings and cannot be directly sucked in again. Suction and outlet openings must be protected from obstructions and coarse dust.



Motors with water jacket cooling (Type A.WA.-132.-.. to A.WA-560.-..)

Before commissioning of water-cooled motors, the troublefree function of the cooling-water circuit must be guaranteed. It must be ensured that the motor will only be switched on when the cooling-water circuit is in operation. It must be kept functioning until the motor comes to standstill after switching-off. Inlet and outlet openings are found on the motor housing.

The cooling water circuit is to be monitored. Normally, the motor is equipped with PTC thermistor sensors, which switch off the motor if the cooling-water circuit fails. If the housing is provided with vent plugs for the water chamber, venting is to be made for the first filling and thereafter at regular intervals.

Only clean, non-aggressive cooling water is to be used. Admissible content of suspended solids is max. 10mg/l

A most careful mounting and alignment of the motors on an absolutely even surface is imperative to avoid distortions when the screws are being tightened. For machines which are to be coupled it must be paid attention to a careful alignment. See Appendix 2 for alignment check. As elastic as possible couplings should be used.



The inlet temperature of the cooling water should be at least 20 °C (68 °F). Temperatures below 20 °C (68 °F) result in higher formation of condensation water and motor failure. Admissible inlet and outlet temperature, maximum pressure and the required amount of cooling water are indicated on the motor plates.

When the motors are operated at a cooling water temperature below 0 °C (32 °F), an anti-freeze must be added due to reduced cooling effect. Consultation with the motor manufacturer is required.

Installation and commissioning



Motors with mounted-on air-water heat exchanger for the Type JNWA--..

Before commissioning of the motors, the troublefree function of the cooling-water circuit must be guaranteed. It must be ensured that the motor will only be switched on when the cooling-water circuit is in operation. It must be kept functioning until the motor comes to standstill after switching-off.

Admissible inlet and outlet temperature, maximum pressure and the required amount of cooling water are indicated on the motor plates.

4.1

Mounting

Fitting of pulleys or couplings.

First the shaft end should be cleaned (not with emery cloth) and then greased. Pulley or coupling should be fitted only with the aid of a fitting device. For this purpose the threaded centering hole in the shaft end can be used. Insert a threaded bolt into the threaded hole. Then place the steel washer, the diameter of which is large enough to cover the hub borehole of the pulley or coupling. The pulley and coupling is to be fitted onto the shaft end by means of a nut or a suitable hydraulic device.

The fitting of the drive elements by means of hammer blows is not permitted because of the risk of bearing damages.



When replacing the bearings those must only be removed and reinstalled by means of suitable devices using the shaft centering. Only original spare parts must be used.

The rotor of the motor is dynamically balanced. **Balance** is indicated on the shaft end face or the rating plate (**H** = half key, **F** = full key). Take care of the balance for installation of the driving element!

The balancing of the transmission elements to be fitted must be adapted to the rotor balancing. In case of half key balancing any **protruding and visible** part of the key has to be removed.

The motor must only be mounted and operated according to the specified mounting arrangement (see rating plate).

Installation and commissioning

4.2 Connection, insulation resistance

Connection must only be made by an expert and in accordance with the valid safety regulations. The relevant installation– and operating instructions as well as national and international rules have to be observed.

Observe data on the rating plate!

Compare type of current, mains voltage and frequency!

Check wiring diagram!

Observe rated current for setting of the protective switch!

Connect motor in accordance with the wiring diagram provided in the terminal box!

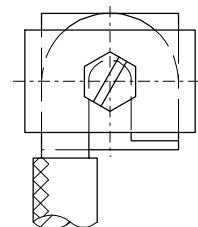
The motor must be protected against excessive heating, e.g. by means of a motor protective switch.

For earthing the motor is provided with an earthing terminal, which depending on the mounting arrangement is either located on the frame resp. on the flange end shield. In addition all motors have a protective conductor terminal inside the terminal box.

As protection against dust and humidity unused cable entries in the terminal box must have a torsionproof seal. All terminal screws and nuts have to be securely tightened to avoid excessive transition resistances (see Paragraph 4.6).

Protective measures are to be taken.

In case of terminal boards with U-shaped terminal washers the conductors to be connected have to be bent in U-shape and placed underneath the terminal washers. See sketch!



In case of motors with terminal boxes which have ground surfaces between cover and base, a thin grease film is to be applied for sealing and against corrosion.

After longer storage periods or standstill (see page 18) the insulation resistance of the winding must be measured phase against phase and phase against ground before putting into operation.

Humid windings might cause creeping currents, arcing and ruptures. In case of values $\leq 1 \text{ k}\Omega$ per Volt of rated voltage measured at a winding temperature of $20 \text{ }^\circ\text{C}$ ($68 \text{ }^\circ\text{F}$) the winding must be dried.



Cable-, lead entries and connecting cables must be suitable for ambient temperatures occurring.

4.3 Rotational direction and designation of the terminals acc. to DIN VDE 0530–8/IEC 60034–8

4.3.1

In standard design surface cooled (TEFC) motors up to frame size 355 and internally cooled (ODP) motors up to frame size 315 are suitable for both directions of rotation. Motors suitable for one rotational direction only are identified by an arrow on the motor for the correct direction. Terminals U1, V1, W1 connected to phase L1, L2, L3 (in alphabetical sequence or natural sequence) always result in clockwise rotation. This rule applies to all motors, even if they are not suitable for clockwise direction.

Installation and commissioning

4.3.2

Change of rotational direction:

For DOL (direct on–line) starting and in pole–changing motors with separate windings the direction of rotation can be reversed by exchanging two mains conductors on the terminal board of the motor.

For motors with star/delta starting and pole–changing motors with Dahlander winding, 2 (two) mains conductors at the input to the motor switch have to be exchanged.

For a machine with one shaft end only or with two shaft ends of different diameters, that rotational direction of the rotor is considered as the direction of rotation, being noticed by anybody when looking at the front end or thicker shaft end.

4.3.3

With forced ventilation the direction of rotation is separately marked by an arrow on the forced ventilation itself.

4.4

Air–to–water heat exchanger

(motors with air–to–water heat exchanger of the type JNWA–...)

For connection and commissioning the instructions for air–water heat exchangers must be considered.

Admissible inlet and outlet temperature, maximum pressure and the required amount of cooling water are indicated on the motor plates.

4.5

Check before commissioning



- Check whether the bearing lock has been removed!
See Paragraph 3.2 "Bearing lock"!
- Observe data on the rating plate!
- Check whether voltage and frequency of the motor comply with the mains data!
- Check whether the rotational direction is correct and for inverter operation, that the limit speed is not exceeded!
- Check whether the motor is protected as specified in the regulations!
- Check and make sure that in case of star/delta–starting, because of the risk of inadmissible operational loads, the switching from star to delta can only be executed after fading of starting current of the star step!
- Check whether the electrical connections are securely tightened and whether the monitoring devices are correctly connected and adjusted!
- Check coolant temperature!
- Check whether the additional equipment – if any – is functioning.
- In case of water–cooled motors, check whether the cooling water circuit is in operation!
- Check whether the cooling air inlet openings and cooling surfaces are clean!
- Check whether protective measures have been taken: earthing!
- Check whether the motor is securely fixed!
- In case of a belt drive, check the belt tension!
- Check whether the cover of the terminal box is closed and whether the cable entries are properly sealed.
- For forced–ventilated motors it is to be checked, whether the forced ventilation is functioning and in operation when the main motor is in operation.

Installation and commissioning

4.6 Tightening torques for screwed joints

4.6.1

General

If no other data are indicated the following torque limits (screw and nut) are applicable.

Note: Screws which become unusable have to be replaced by new ones of the same strength class and type.

4.6.2

Screwed joints for electrical connections

Thread	Tightening torque [Nm]	Thread	Tightening torque [Nm]
M 4	1.2	M 12	15.5
M 5	2	M 16	30
M 6	3	M 20	52
M 8	6	M 24	80
M10	10	M 30	150

4.6.3

Screwed joints strength class 8.8 and A4–70

Tightening torques for screws of the strength class 8.8 and A4–70 (A4–80) only in components with higher strength (e.g. grey cast iron, steel).

Thread	Tightening torque [Nm]	Thread	Tightening torque [Nm]
M 4	2.3	M 14	105
M 5	4.6	M 16	160
M 6	7.9	M 20	330
M 8	19	M 24	560
M10	38	M 30	1100
M 12	66	M 36	1900

4.6.4

Screwed joints strength class 5.6

Tightening torques for screws of the strength class 5.6, 4.6, A2 or for screws in components with lower strength (e.g. aluminium).

Thread	Tightening torque [Nm]	Thread	Tightening torque [Nm]
M 4	1.1	M 14	49
M 5	2.1	M 16	75
M 6	3.7	M 20	150
M 8	8.9	M 24	260
M10	18	M 30	520
M 12	30	M 36	920

Maintenance

5. Maintenance

The responsible for the facility must ensure that the specified maintenance work is made adequately.

5.1 Bearings and greasing

- 5.1.1** The bearings in totally enclosed fan-cooled (TEFC) motors up to frame size 280 and of internally cooled open drip-proof (ODP) motors up to frame size 225 are permanently lubricated. In case of differences this is marked by indication plates on the motor. For normal coolant temperatures (see EN 60034-1 or page 2 of these instructions) motors are greased in our plant, which under normal operating conditions must only be replaced after several years (see Appendix 1).
- 5.1.2** Bearings of totally enclosed fan-cooled (TEFC) motors from frame size 315 (upon customer request also for the range from frame size 160 to 280) and of internally cooled open drip-proof (ODP) motors from frame size 250 as well as the water-cooled motor with air-water circuit cooler are equipped with regreasing devices and automatic grease quantity control. The regreasing of the bearings is done by means of a grease gun through the nipples provided on the end shields. Overfilling of the bearing chambers is not possible since in case of an extended regreasing the used grease will be thrown off by a rotating disk in the outer grease chamber through an aperture in the end shield (or into a grease collecting chamber).



Regreasing during operation only!

Regreasing intervals, grease quantity and grease quality are indicated on the instruction plates at the motor. Regreasing, however, is to be made at least once a year.

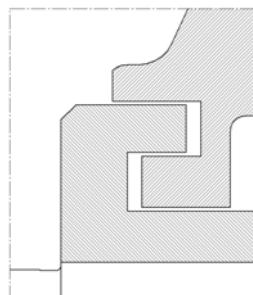
If the motor is equipped with **grease removal rams**, the used grease must be removed after regreasing by pulling the ram at the bearing several times to the stop, with the motor in operation.

If the motor is equipped with **grease collecting chambers**, these chambers are to be dismantled at motor standstill acc. to the intervals on the instruction plate and the used bearing grease is to be removed. If this is not done, the grease piles up and the bearings are overheated.

Bearings with external labyrinth seal.

For operation the labyrinths have to be filled with bearing grease.

After a disassembly the labyrinth gaps have to be cleaned and refilled with the specified bearing grease.



Maintenance



Extending the regreasing intervals endangers the bearing and might risk a deterioration of the sealing provided by the grease and thus the ingress of dust into the bearing. If the motors have not been operated for a longer period we recommend even for new motors to regrease the bearings before putting into operation, especially if due to congealing grease in the bearing there are noises which are caused by vibrations of the bearing cage. In the course of running—in increased bearing noises might occur for a short period. The bearing noise is not critical as long as the operating temperature of the bearing is not yet reached and the noise is caused by the dynamic viscosity of the bearing grease.

The temperature of the bearings is continuously to be checked. Up to an ambient temperature of 40 °C/104 °F a heating-up of 80 K is acceptable if the recommended grease quality is used.

We would like to point out that the grease quantity regulation can only work properly if the grease types specified by us are used. Decisive is the plate fixed on the motor!

Only use antifriction bearing grease as specified for regreasing on the motor plate, i.e. for the ambient temperature range from –25 °C (–13 ° F) to +70 °C (+158 °F) lithium based grease (e.g. Shell Alvania RL3), for the ambient temperature range from –60 °C (–76 °F) to +80 °C (+176 °F) special grease (e.g. Aeroshell Grease 7). Admissible ambient temperature for the motors: See Paragraph 1.3.

Motors for special operating conditions are supplied with a separate greasing plate stating the grease quality to be used as well as the regreasing intervals.



Relubrication with grease of a different saponification basis. e.g. sodium saponified grease, might cause a deterioration and elimination of the grease effect and thus a total damage of the bearings.

In case of 2 and 4 pole motors it might happen that by the use of unsuitable grease the grease quantity regulation fails and when pressing new grease into the bearings they get abnormally hot due to overfilling. In such cases the bearings have to be cleaned thoroughly by using cold-degreasing agent, and be refilled with suitable grease.

Maintenance

5.1.3



Avoidance of mechanical damages (bearing damages)

All machines have to be checked at regular intervals for mechanical damages.

Special attention must be paid that the intervals for bearing replacement and regreasing intervals or grease change intervals as well as oil change intervals to be specified by the user are observed.

When the rated service life is reached the bearings should either be replaced or it is to be proven by an inspection that there are no mechanical damages.

- For bearings which are not regreasable it is ensured that the rated service life will only be reached clearly after achieving the grease service life of the bearings.
- The calculated rated service life of the bearings can be seen in the data sheet of the machine, if it was specified particularly or for structural reasons specified for an individual case.
- For machines which are exposed to forces applied externally (e.g. belt force or axial load from the driven machine) the bearing service life is a minimum of 20.000 hours for the full load indicated in the technical list.
- All of the other machines have a rated bearing service life of at least 40.000 hours.
- For bearings with separate oil supply the user is to watch suitably that the lubrication is maintained.

5.2



Terminal locations, terminals, ventilating passages

Depending on the operating conditions, the following should be done at certain intervals checking the cleanliness of terminal locations and terminals

- checking of the electrical connections to be fixedly tightened
- cleaning of the ventilating passages.
 - Both the cooling air inlets and the cooling surfaces must be protected against obstruction and contamination.
- If required, the water chambers are to be flushed and cleaned from deposits.

Never use sharp-edged tools for cleaning.

5.3

Air-to-water heat exchanger

(Motors with air-water heat exchanger of the Type JNWA-...)

For maintenance please consider the instructions for the air-water heat exchangers.

Additional equipment

6. Additional equipment

On special order only.

6.1 Temperature monitoring *)

The temperature sensors for monitoring e.g. of the stator winding temperature, the bearings, the coolant must be connected to the additional terminals in the main terminal box or by one or several terminal boxes.

The temperature sensors have to be connected according to the relevant connection diagram. For connection the specifications and instructions acc. to Paragraph 4.2 "Connection" are applicable.

6.2 Electronic speed monitoring *)

This one is essentially consisting of the slot-type initiator and the control segment. The electronic speed monitoring is maintenance-free.

6.3 Space heater *)

Heating capacity and connection voltage: See special plate on the motor. The space heater has to be connected to the terminals provided in the main terminal box or by an additional terminal box acc. to the relevant connection diagram.

For connection the specifications and instructions acc. to Paragraph 4.2 "Connection" are applicable. An operation of the space heater is only allowed when the motor is switched off. The space heater must never be switched on during motor operation.

6.4 Forced ventilation *)

Observe direction of rotation! (see arrow for directional rotation.)

Forced ventilation is to be connected acc. to the wiring diagram inside the terminal box.

During operation of the main motor the forced ventilation must be switched on!

The forced ventilation is dissipating the heat loss during operation of the main motor. When switching off the main motor a temperature-dependant follow-up run of the forced ventilation is required.

6.4.1

To be checked when commissioning the main motor:

Check whether the forced ventilation works and is in operation when the main motor is switched on!

*) On special order only

Three-phase motors as centrifugal drive for heavy starting

7. Three-phase motors as centrifugal drive for heavy starting Special requirements for a safe application (Type AW.A-...-..)

For mounting and removal of the motor the corresponding operating instructions of the centrifuge must be observed.

Starting- and braking conditions of the motor in accordance with the corresponding operating instructions must be observed.

Even for trial operation the control and safety devices as well as the motor monitoring (thermal motor protection, speed monitoring and others) are not allowed to be put out of function.

The motor must only be mounted and operated according to the specified mounting arrangement. Any other application is prohibited.

It has to be secured that the servicing personnel is informed at once or the electrical machine is immediately stopped to find the causes, if contrary to the rated operation higher temperatures, noises, vibrations etc. occur.

Direction of rotation:

The centrifuge is only suitable for one direction of rotation. The relating arrow on the centrifuge must be observed.

Bearing and greasing:

For permanently lubricated motors (also see bearing and greasing data sheet on request) the grease life, grease quantities and grease qualities as indicated in Appendix 1 of these operating instructions are applicable. Motors with regreasing device are equipped with an automatic grease quantity control. Regreasing intervals, grease quantity, grease quality and the exact bearing type are indicated on the motor plate or in the bearing- and greasing data sheet to be requested.

A lack of regreasing, an extension of the regreasing intervals or the use of a wrong grease quality might endanger the bearing. This can result in a deterioration of the bearing and the motor shaft, also entailing consequential damages on the centrifuge.

For this reason it is recommendable to maintain an inspection- and maintenance plan where regreasing and possible bearing replacements are documented.

Replacement of bearing:

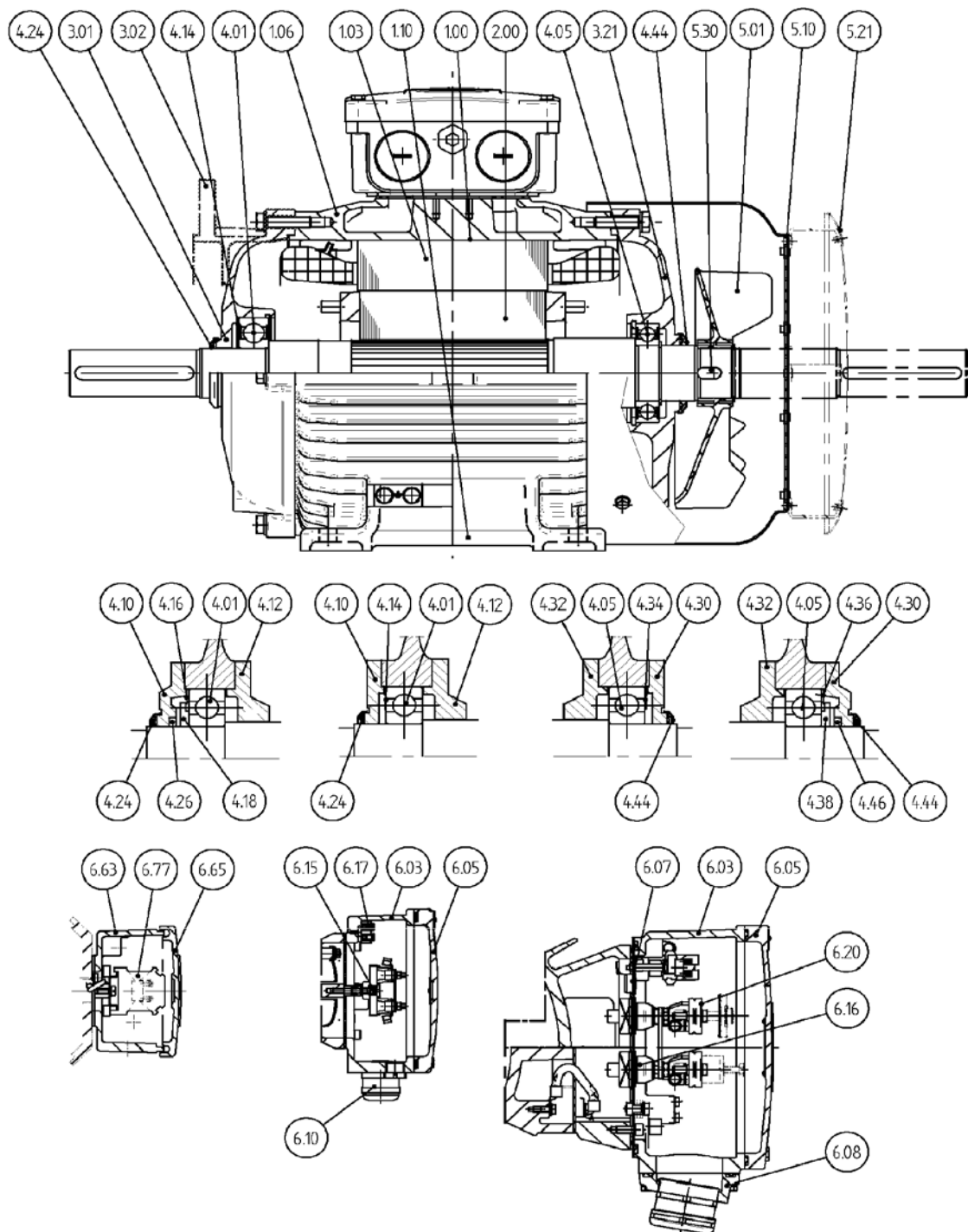
See safety instructions, section "Operation".

The service life of the bearings depends on many influences. Therefore, the operation of the low-voltage motor has continuously to be checked and the intervals for bearing replacement to be determined accordingly.

Spare parts

8. Spare parts and components

When ordering spare parts or components, please state the type and serial number of the motor.
Both data can be taken from the rating plate.



Spare parts

1.00	Stator, complete	5.01	External fan, complete
1.03	Stator core with winding	5.10	Fan cover, complete
1.06	Stator housing	5.21	Protective cover, complete
1.10	Mounting feet, unmachined (1 pair)	5.30	Spring fastener
2.00	Rotor, complete (balanced)	6.03	Base of terminal box
3.01	End shield, DE	6.05	Terminal box cover
3.02	Flange shield, DE	6.07	Bushing plate
3.21	End shield, NDE	6.08	Cable gland
4.01	Bearing, DE	6.10	Cable entry
4.05	Bearing, NDE	6.15	Terminal board, complete
4.10	Outside bearing cap, DE	6.16	Bushing terminal
4.12	Inner bearing cap, DE	6.17	Accessory terminal
4.14	Resilient preloading ring, DE	6.20	Clamping
4.16	Grease guide disk, DE	6.63	Base of terminal box
4.18	Centrifugal disk, DE	6.65	Terminal box cover
4.24	Outside gasket, DE	6.77	Accessory terminal
4.26	Inner gasket, DE		
4.30	Outside bearing cap, NDE		
4.32	Outside bearing cap, NDE		
4.34	Inner bearing cap, NDE		
4.36	Resilient preloading ring, NDE		
4.38	Grease guide disk, NDE		
4.44	Outside gasket, NDE		
4.46	Inner gasket, NDE		

The parts shown are available in different sets depending on type, size, mounting and enclosure. They are available from our works. All other parts such as bolts, spring washers etc. are available anywhere.

When ordering spare parts, please state:

Spare part designation

Motor type

Serial number

Example:

3.01 End shield, DE

ANLA-200LB-08

8 386 388

Storage instructions

9. Storage specifications

9.1 For motors which have to be stored for a period of up to 2 years, the following is to be observed:

9.1.1 Storage

9.1.1.1 The motors are to be stored dry, dustfree and at room temperature. In this case no special packing is required. Otherwise the motors must be packed into plastic foil with humidity-absorbing substances (e.g. Branogel) or into an air-sealed foil. Protective cover against sun and rain is to be provided.

9.1.1.2 In order to avoid secondary failures at the bearings caused by vibrations at standstill, for example by adjacent running machines, the motors are only allowed to be stored in vibrationless rooms.



9.1.1.3 For transport the TEFC, ODP and water-cooled motors with roller bearings have to be equipped with a bearing lock at the driving end. It is to remain locked until commissioning resp. to be reinstalled after an inspection or a trial operation. A locking device is not necessary and not available, if the bearing is axially preloaded.



9.1.1.4 On motors with sealed condensation water drain holes it might be necessary to have the condensation water flow out. Afterwards the boreholes are to be sealed again.

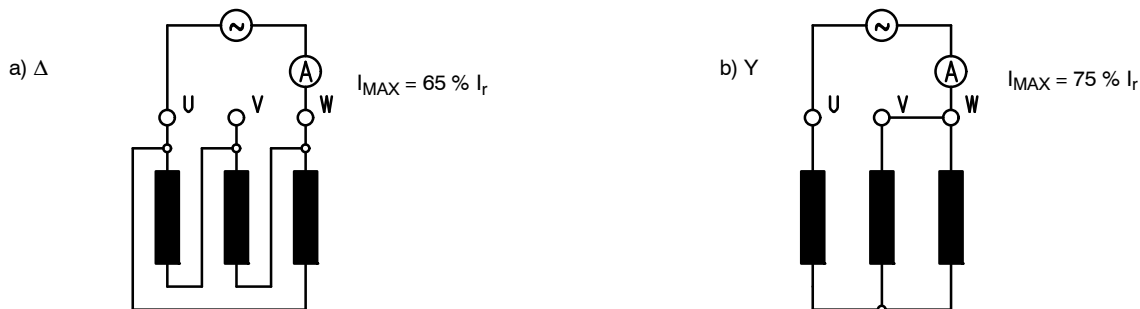


9.1.2 Commissioning

9.1.2.1 Before commissioning the insulation resistance of the winding must be measured by qualified personnel phase against phase and phase against mass. Damp windings may cause leakage currents, arcing and ruptures. In case of values $\leq 1 \text{ k}\Omega$ per Volt of rated voltage measured at a winding temperature of $20 \text{ }^\circ\text{C}$ ($68 \text{ }^\circ\text{F}$) the winding must be dried. Drying is possible by feeding of the winding with single phase a.c. current. The voltage has to be adjusted in a way that the recommended values of the heating current in accordance with Illustrations a) and b) are not exceeded.
The temperature should reach approx. $80 \text{ }^\circ\text{C}$ ($176 \text{ }^\circ\text{F}$) and be active for several hours. Drying is also possible in a drying kiln.

Storage instructions

Recommended heating circuits and maximum heating currents



9.1.2.2 On motors with bearing lock this one has to be removed before commissioning.



9.1.2.3 Antifriction bearings, lubrication

If adequately stored for a longer time it can be assumed that within 2 years the lubricating grease in the bearings is not affected. Motors with permanent lubrication can be put into operation after having checked the insulation resistance of the winding and a short trial run. For motors with insulation class F a lithium-saponified antifriction bearing grease with a dripping point of at least 180 °C (356 °F) is used for normal ambient temperatures. For the motors with insulation class H and certain special motors, the used special lubricating grease is indicated on an instruction plate attached to the motor.

9.1.2.4 For motors with a regreasing device it is advisable to regrease both bearings shortly after commissioning at running motor. Grease type, grease quantity and regreasing intervals are marked on an additional plate attached to the motor.

The data for grease service life with regreasing intervals can surely be expected for motors in enclosure IP 55. The bearing is protected against the ingress of fine dust and of water in all directions, e.g. for outdoor installation without additional protection. For motors with enclosure IP 44 and IP 54 these data apply with the restriction that the environmental load by dust and water is not exceeding the limits of DIN EN 60034-5 with tests according to DIN EN 60034-5.

9.1.3 **For motors which are transported and stored in assembled condition with the machine to be driven the following must be observed:**

9.1.3.1 Storage



a) The free shaft ends must be greased before installation of the motors as well as all of the other blank metal parts, e.g. foot- and flange surfaces or supporting faces of terminal boxes and covers.

As protection against dust and humidity, grease seals with antifriction bearing grease are to be installed at the shaft opening.

b) A humidity-absorbing substance (e.g. Branogel) is to be filled into the terminal boxes of the motors.

c) The machines are to be stored dry, dustfree and at room temperature.

d) For further measures the specifications according to the items 9.1.1.2 – 9.1.1.4 are applicable.

A bearing lock is not necessary, if the bearings are preloaded by means of belt drive (9.1.1.3).

Storage instructions

9.1.3.2 **Commissioning**
Before commissioning the humidity-absorbing substance (e.g. Branogel) is to be removed from the terminal boxes and the measures according to 9.1.2 are to be performed.

9.1.3.3 For outdoor storage it is additionally to be observed:
Protective cover against the influence of sun and rain is to be provided, exchange of air must be possible to avoid condensation water.



After 2 months it must always be checked if the protective measures acc. to 9.1.3.1a are still given and functioning.

9.2 For motors which are stored for more than 2 up to 4 years before commissioning additionally applies:

9.2.1 Storage

9.2.1.1 The manufacturer must be informed on the storage time in the purchase order.

9.2.1.2 Shaft opening and terminal box cover are to be provided with grease seals of antifriction bearing grease. The motor shafts are not allowed to be rotated, as otherwise the protective grease coating is destroyed. If a movement of rotating parts is unavoidable, the protective grease coating has to be renewed.

9.2.1.3 A humidity-absorbing substance (e.g. Branogel) must be in the terminal boxes.

9.2.1.4 In case of permanent lubrication the antifriction bearings can be greased with the adequate standard grease.

9.2.2 Commissioning

9.2.2.1 Before commissioning the humidity-absorbing substance (e.g. Branogel) is to be removed from the terminal boxes and the measures according to 9.1.2 are to be performed.

9.2.2.2 **Antifriction bearings, lubrication**
Motors with regreasing device must be relubricated immediately after commissioning with about the double grease quantity, until the used grease has been thrown out. Further greasing can then be made with the bearing grease indicated on the lubrication plate. During the running-in period increased bearing noises may occur, which are not dangerous, when the operating temperature of the bearing has not been reached and is caused due to the dynamic viscosity of the bearing grease.

Storage instructions

9.3 If motors (not Type A.WA–... and JNWA–...) are stored at temperatures till –50 °C (–58 °F) the following must be observed in addition to the instructions according to point 9.1. and 9.2:

9.3.1



The standard antifriction bearing grease for the motors as per catalogue is suitable for operating temperatures between –30 °C (–22 °F) and +130 °C (+266 °F). Temperatures till –50 °C (–58 °F) are harmless for the antifriction bearing grease, when the motors are at standstill or stored. (For an operation at –50 °C (–58 °F) a special grease, e.g. Klüber Isoflex Alltime SL2, is available for the bearings).

9.3.2

Motors with regreasing device are to be relubricated with the double grease quantity when put into operation.

9.4 If motors with direct water jacket cooling or with air–water cooler (Type A.WA–... or JNWA–...) are stored at temperatures up to –20 °C (–4 °F) the following must be observed in addition to the instructions of point 9.1 and 9.2:

The water has to be removed completely from the air–water coolers.

In any case the coolers have to be dried completely with hot air of max. 60 °C (140 °F) and then to be sealed.

Motors with coolers have to be stored in a dry and dustfree room.

At commissioning the motors with regreasing device have to be relubricated with the double grease quantity.

9.5 Further to these storage instructions all data of these operating instructions are to be considered. The manufacturer's warranty is only applicable if all of the above mentioned items are strictly observed.

Faults and remedies

10. Faults and remedies

Fault			Possible causes	Remedy
Bearing is too hot	Bearing noise*)	Motor runs unevenly		
			Too much grease in bearing	Remove excess grease
			Bearing dirty	Replace bearing
			Belt tension too high	Reduce belt tension
			Coupling forces are pulling or pushing	Realign motor, correct coupling
			Coolant temperature above 40 °C (104 °F)	Adjust temperature of cooling air
			Not enough grease in the bearing	Grease according to specifications
			Motor incorrectly mounted	Check mounting type of motor
			Bearing grease dark coloured	Check bearing currents
			Scoring at bearing inner race, e.g. caused by motor start with locked bearing	Replace bearing, avoid vibrations at standstill
			Unbalance caused by coupling	Exact balancing
			Motor fastening unstable	Check fastening

*) If remedies described are insufficient, we recommend to replace the bearings.

Fault				Possible causes	Remedy
Motor does not start	Motor is too hot	High decrease in speed	Protective device triggered		
				Countertorque too high	Check motor- and load torque
				Mains voltage too low	Check mains conditions
				Phase interruption	Check mains supply
				Wrong winding connection	Observe wiring diagram and rating plate
				Overload	Compare data on rating plate
				Too many starts per hour	Observe rated duty type
				Insufficient ventilation	Check ventilation passages, check direction of rotation
				Insufficient cooling	Check cooling water inlet and outlet temperature
				Ventilation passages or water chambers dirty	Clean
				Short-circuit of winding or terminal board	Measure insulation resistance
				Starting time exceeded	Check starting conditions

Operating instructions for brake motors with spring-loaded single-disk brake

11. Operating instructions for brake motors with spring-loaded single-disk brake (Type AB.A-...-..)

Description

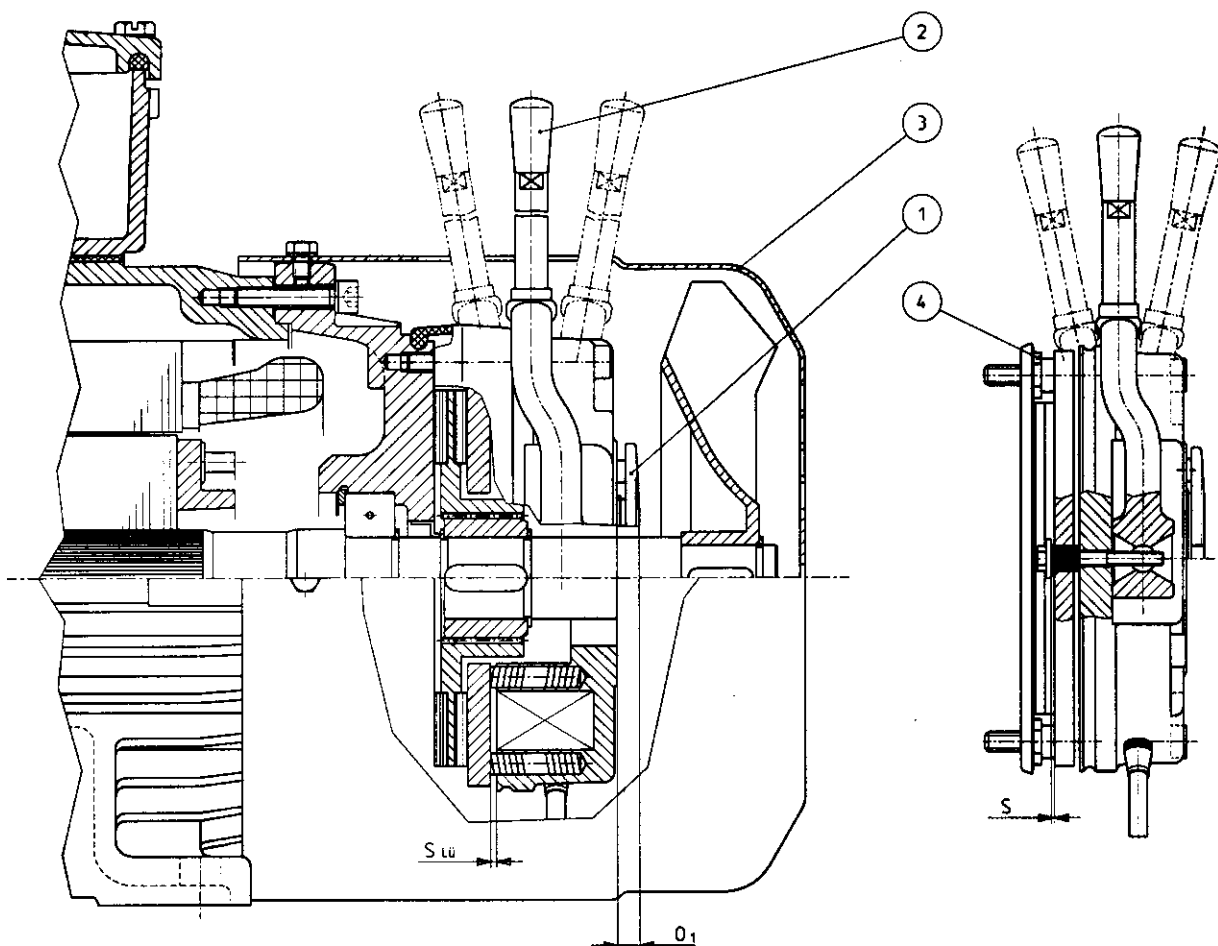
The maintenance-free brake is rest current-operated and in released condition it is operable in any fitted position as long as required and is suitable for both directions of rotation. The asbestos-free brake linings are highly wear-resistant.

Attention! The friction surfaces must not get into contact with oil or grease.

Air gap adjustment

Air gap " $S_{LÜ}$ " is adjusted according to Table 1. If a readjustment should be required, the correct air gap " $S_{LÜ}$ " is restorable by turning the readjusting bushes (4).

If the motor is designed with a manual release, it must be observed that dimension "S" between the self-locking nuts and the armature disk is equally adjusted on both sides. If the air gap " $S_{LÜ}$ " is required to be readjusted, however, nothing may be changed on the manual release.



Operating instructions for brake motors with spring-loaded single-disk brake

Braking torque adjustment

As delivered the brake is adjusted to the rated braking torque. A reduction of the braking torque is possible by unscrewing the adjusting ring (1) up to Dimension "O₁".

For braking torque adjustment it is required to remove the fan cowl (3). In case of the design with manual release part (2) must be unscrewed before.

Reduction of braking torque per detent according to Table 1

Table 1: Lenze brakes Type BFK 458

Brake size		06	08	10	12	14	16	18	20	25
Rated braking torque	[Nm]	4	8	16	32	60	80	150	260	400
S _{Lü}	[mm]	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5
S	[mm]	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.5
Reduction per detent	[Nm]	0.2	0.35	0.8	1.3	1.7	1.6	3.6	5.6	6.2
O _{1 max}	[mm]	4.7	4.7	7.6	9.6	11	10	14.9	16.4	18.3

Please request the operating and maintenance instructions for spring-loaded single-disk brakes, if required.

EC Declaration of Conformity

12. EC Declaration of Conformity

LOHER GMBH

LOHER

EG Konformitätserklärung EC Declaration of Conformity

Hersteller: Loher GmbH
Manufacturer: Hans-Loher-Straße 32
94099 Ruhstorf/Rott, Germany

Produktbezeichnung: **Drehstrom-Asynchronmaschinen**
Product name: **Three phase asynchronous machines**
AN.. AM.. AV.. AG.. AS.. AF.. AB.. BN.. DN.. EM..
EN.. JN.. JB.. JG.. JS.. L... ZT..

**Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein:
The indicated product is in conformity with the requirements of the following European Directives:**

2006/95/EG Richtlinie des Europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen – „**Niederspannungsrichtlinie**“
2006/95/EC Directive of the European Parliament and the council of the approximation of the Laws of the Member States relating to electrical equipment designed for use within certain voltage limits-
“**Low voltage directive**”.


**Die Übereinstimmung mit den Vorschriften dieser Richtlinien wird nachgewiesen durch die vollständige Einhaltung folgender Normen:
Conformity with the requirements of these directives is testified by complete adherence to the following standards:**


EN 60034 IEC 60034 VDE 0530

Das bezeichnete Produkt ist zum Einbau in eine Maschine bestimmt. Die Inbetriebnahme ist solange untersagt, bis die Konformität des Endproduktes mit der Richtlinie 2006/42/EG festgestellt ist. Die Sicherheitshinweise der Produktdokumentation und die einschlägigen Errichtungsbestimmungen, (z.B. EN 60204-1) sind zu beachten.

The indicated product is intended for fitting into a machine. Commissioning is prohibited until the conformity of the end product with Directive 2006/42/EG has been established. The safety notes in the product documentation and the relevant erection rules (e.g. EN 60204-1) must be observed.

Ruhstorf/Rott, 2009-12-18


Hofbauer
Leiter Qualitätssicherung
Manager Quality assurance


Dr. Neupert
Leiter Technik
Manager Engineering

Diese Erklärung ist keine Zusicherung von Eigenschaften im Sinne der Produkthaftung.
This declaration is not a warranty of attributes within the meaning of the Law concerning product liability.

Rev. G /2009-12-18

Appendix 1

Grease life and grease quantities

for antifriction bearings of three-phase motors with squirrel cage for low voltage and permanent lubrication.

Frame size	Grease life for permanent lubrication 1) operation hours at rated speed 1/min:						Grease quantities in g per bearing for permanent lubrication
	Horizontal mounting (IM B)						
	3600	3000	1800	1500	1200	≤ 1000	
63	33000	33000	40000	40000	40000	40000	4
71							5
80							9
90							11
100							15
112							25
132	24000	24000	40000	40000	40000	40000	50
160							70
180							80
200							60
225							70
250							90
280							120
	Vertical mounting (IM V)						
	3600	3000	1800	1500	1200	≤ 1000	
63	24000	24000	33000	33000	40000	40000	4
71							5
80							9
90							11
100							15
112							25
132	16000	16000	26000	26000	40000	40000	50
160							70
180							80
200							60
225							70
250							90
280							120

The indicated grease life is applicable for an ambient temperature of max. 40 °C (104 °F).

For a temperature rise of 10 °C (50 °F) each the grease life is to be reduced by factor 0.7 of the chart value (max. 20 °C/68 °F = factor 0.5).

At an ambient temperature of 25 °C (77 °F) the double grease life can be expected, however, 40000 operating hours at a maximum.

¹⁾ Independently of the operation hours the antifriction bearing grease resp. the bearing (2Z bearings) have to be replaced after 3–4 years at the latest.

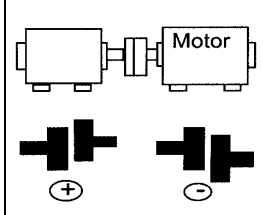
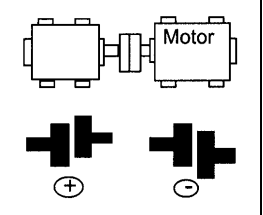
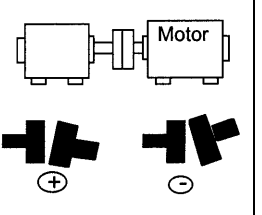
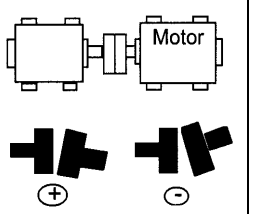
Appendix 2

LOHER	Servicebericht / Servicereport Ausrichtprotokoll / Alignment Protocol	Seite / Page ...
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Service Nr. / Service No.:	Bestellnr. / Order No.:
Type / Type:	Seriennr. / Serial No.:

Kupplungstyp / Type of coupling:	Durchmesser / Diameter:
----------------------------------	-------------------------

Empfohlene Ausrichtgenauigkeit / Tolerances for shaft alignment*		
Drehzahl / Speed (rpm)	Parallelversatz / Offset mm	Winkelversatz / Angularity offset mm / 100 mm coupling diameter
750	0,09	0,09
1500	0,06	0,05
3000	0,03	0,025

Gemessene Werte an der Kupplung / Measured values at the coupling				
	Parallelversatz / Offset		Winkelversatz / Angularity	
Messung / Measurement				

Bemerkungen / Comments:

* Falls keine Werte vom Kupplungshersteller vorgeschrieben sind / If no values were given from the coupling manufacturer

LOHER

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