



ELECTRIC DRIVES

FOR EVERY DEMAND



Installation, operating and maintenance instructions

Three-phase asynchronous motors for low voltage with cage rotor

Three-phase asynchronous motors for low voltage with slip ring rotor
(translation)

Standard design

Type designation:

KP./KPE./K1../K2../KU../KV../K4../K8..
BP./BPE./B1../B2../BU../BV../BE../BR..
WE../W2../W4../WU../G1../G2../GS1..
YP./YPE./Y1../Y2../YE../YU..
S(R)../SG../SP./SPE./S1../S8..
CP./CPE./C1../R1../R2../RE..
AR./A1../A2../AU../AV../AE..

Motors that comply with the Directive 2005/32/EC and the regulation No. 640/2009 receive the marking IEx before the type designation, whereas x = 1, 2, 3, 4 (acc. to EN 60034-30). (Example IE3-W41R 132 S4).

1. General

The supplementary installation, operating and maintenance instructions must be observed for the following motor series:

- Explosion-protected three-phase asynchronous motors (ignition protection types "eb", "ec", "tb", "tc")
- Brake motors
- Smoke extraction motors
- Three-phase asynchronous motors with squirrel-cage rotor for low voltage, type of protection IP 57S
- Water-cooled three-phase asynchronous motors with squirrel-cage rotor for low voltage
- Single-phase asynchronous motors with squirrel-cage rotor
- Permanently excited synchronous motors for converter operation
- Reluctance motors
- Forced ventilation units, forced air-cooled motors

To prevent damage to the motors and the driven equipment, the provisions of the operating and maintenance instructions and if appropriate the applicable supplements must be complied with.. Especially to avoid risk of injury, the separately enclosed Safety Regulations must be strictly followed. As for reasons of clarity the

Operating and Maintenance Instructions cannot contain specific information with regard to all conceivable special applications and areas with special requirements, the user himself has to make appropriate protection arrangements during the installation process.

1.2. Qualified personnel

Installation work, commissioning and operation of motors must only be done by qualified personnel. Installation work shall only be done by qualified personnel who are skilled because of a technical education, expertise and schooling of knowledge about



- safety regulations,
- accident prevention regulations,
- standard engineering practice (for example VDE regulations, standards).

The qualified personnel must have the ability to assess the assigned job, identify possible dangers and avoid them. The qualified personnel must be authorised by the person in charge for security of the plant to carry out the necessary work and tasks.

1.3. Intended use

This motor is only approved for the intended use given by the manufacturer in his catalogue and the corresponding technical documentation. Other or additional use is not intended. This includes consideration of all corresponding product documents. Changes or reconstruction of the motor are not allowed. External products and components that shall be used together with the motor must be approved or recommended by the manufacturer.

1.4. Disclaimer

Observance of this manual and the conditions and methods used for installation, operation, use and maintenance of the electric motor cannot be monitored by the manufacturer. An improper installation can result in property damage and thus result in personal injuries. We therefore do not accept responsibility and liability for losses, damages or costs resulting from improper installation, improper or wrong use and maintenance or connected with this in any kind. We strive to improve our products continuously. Consequently technical data and illustrations remain subject to change without prior notice. Specifications may only be considered binding after written confirmation by the supplier.

1.5 EU Motors Commission Regulation No. 640/2009/EC

The European Commission Regulation No. 640/2009/EC for electric motors has been in force since June 2011. This regulation regulates the ecodesign requirements for 2, 4 and 6-pole low-voltage three-phase asynchronous motors in the power range 0.75 kW to 375 kW.

The individual ecodesign requirements take effect according to the following timetable:

- since **June 16, 2011** motors must achieve at least the efficiency level **IE2** defined in Appendix I Number 1 of the Regulation.
- since **January 1, 2015** motors with rated power output of **7.5 – 375 kW** must either achieve the efficiency level **IE3** defined in Appendix I Number 1 of the Regulation or the efficiency level **IE2** defined in appendix I Number 1 of the Regulation and **be equipped with speed regulation**.
- **Seit 1. Januar 2017** all motors with rated power output of **0.75 – 375 kW** must either achieve the efficiency level **IE3** defined in Appendix I Number 1 of the Regulation or the efficiency level **IE2** defined in appendix I Number 1 of the Regulation and be equipped with speed regulation.

The Regulation thus authorises the user to use either an IE3 motor (for fixed or variable speed) or an IE2 motor in combination with a speed controller. **The user is responsible for compliance with the requirements of the EU Regulation. Appropriate marking on the product shall be made by the motor manufacturer.** Refer to the Regulations No. 640/2009/EC and No. 4/2014/EC for the detailed scope of application and exceptions for special designs.

2. Description

The motors have been manufactured in accordance with IEC 34-1, EN 60034-1 and other appropriate European standards. Motors can also be supplied complying with special regulations (e.g. classification regulations,

regulations for explosion protection).

The details on the relevant order confirmation constitute the scope of supply.

3. Efficiency

The efficiency is determined according to the specifications of EN 60034-2-1. For motors < 1kW the direct measurement method is used. The measurement uncertainty of this method is rated „low“.

For motors ≥ 1kW the individual loss method is used. The additional losses of this method are determined from the residual losses. The measurement uncertainty of this method is also rated as „low“. Efficiency and Efficiency class complying with EN 60034-30 are listed on the rating plate of energy saving motors.

4. Degree of Protection

The degree of protection of the motors is indicated on their rating plate. The degree of protection of additional devices fitted to the motor can be different than the degree of protection of the motor. This needs to be taken into consideration during the installation of the motors. If motors are installed outdoors (degree of protection ≥ IP 44), they should be protected against direct effects of the climate (freezing of the fan due to direct fall of rain, snow and formation of ice).

5. Type of Construction

The type of construction of the motors is indicated on the rating plate. The motors can be used in different types of construction only with permission of the manufacturer and if necessary after modification carried out in accordance with the manufacturer's instructions.

Especially with types of construction with vertical shaft the user has to ensure that foreign bodies cannot fall into the fan cowl.

6. Transport & Storage

If possible the motors should only be stored in closed and dry rooms. Outdoor storage under cover is only permitted for a short time and requires adequate protection against all harmful effects of the climate. The motors also have to be protected against mechanical damage. Never transport or store the motors resting on their fan cowls. The eye bolts/attachment eyes of the motors together with appropriate lifting tackle must be used for transport. The eye bolts/attachment eyes are only intended for the lifting of the motors, without any additional parts such as bed plates, gears etc. If eye bolts/attachment eyes are removed after installation, the tapped holes must be blanked off permanently according to the Protection Standard. For longer periods of storage a low vibration environment shall be provided so that bearing damage due to downtime can be avoided. After a storage period of more than 12 months the condition of the grease must be checked before putting the motor into operation.

7. Removal of the Transport Safety Device

On motors with transport safety device (roller bearing), the hexagon head screw provided for the fastening of the transport safety device is to be loosened and taken off together with the transport safety device. Subsequently the bearing cover bolt packed in a bag inside the terminal box is to be screwed into the bearing cover. If it is necessary for the motor type the bag will also contain a lock washer that is to be placed onto the bearing end

shield bolt before screwing it into the bearing cover. After removal of the transport safety device micro movements of the rotor must be prevented by suitable measures (risk of downtime damage).



The transport lock is only intended for transportation. It must not be used for lifting weights!

8. Installation and Fitting



As during normal operation of electric motors, temperatures in excess of 100 °C can occur on their surface, any contact with them must be prevented if the motors are installed in accessible areas. Because of this temperature sensitive parts must never be fitted to them or have contact with them.

In types of construction IM B14 and IM B34 it must be ensured that the maximum usable screw depth specified in the table below is not exceeded, otherwise the winding will be damaged. Vent holes must be kept free and the minimum distances stated in the dimensional drawings must be maintained so that the flow of cooling air is not obstructed. Care must be taken that the discharged warmed up cooling medium is not sucked drawn in again. For constructions with shaft end upwards the user must prevent liquid entry from the shaft!



The key in the shaft end is secured by the shaft protective sleeve for transport and storage only. Because of the danger that the key may be thrown aside, a start-up or a trial run with the key protected by the shaft sleeve only is strictly forbidden.

Transmission components (such as couplings, pinions or belt pulleys) should be drawn onto the shaft by means of pull-on devices or by heating-up the part to be drawn onto the shaft. For the purpose of drawing the transmission components onto the shaft, the shaft ends are provided with tapped centering holes according to DIN 332 Part 2. Transmission components must never be driven onto the shaft using hammer blows because the shaft, the bearings and other components of the motor could be damaged.

All components that are to be fitted to the shaft end must be balanced dynamically according to the balancing system of the motor (full or half key). The rotors of the motor are balanced with half key; this is indicated by letter H after the serial number on the rating plate. Motors with letter F after the serial number are balanced with full key. If possible the motors are to be installed in such a way that they are free from vibrations. With precision balanced motors special instructions are to be followed. When the installation is completed the user must ensure protection of movable parts and safety of operation. Direct coupling to the driven machine requires a particularly accurate alignment. The shafts of both machines must be in alignment. The shaft height is to be adjusted to that of the driven machine using appropriate shims.

Belt drives put a lot of stress on the motor because of relatively high radial forces. When dimensioning belt drives, apart from the instructions and calculation

programs issued by the manufacturers of the belts, it must be ensured that the radial force permissible at the shaft end of the motor as stated in our data is never exceeded by the pull and pre-tensioning of the belt. When pre-tensioning the belt during installation the instructions of the belt manufacturers must be strictly adhered to.

Relatively large radial forces or masses can be taken up at the end of the motor shaft by the use of cylindrical roller bearings ("heavy bearing arrangement" VL). The minimum radial force at the shaft end must be a quarter of the permissible radial force. The permissible shaft end load is to be taken into account. The information can be taken from the tables and diagrams in the design selection data.



If the radial force falls below the minimum value, damage to the bearings can be caused within a few hours. Test runs in no-load state only permissible for a short period.

The threaded holes of the flange types listed in the table are through holes (type IM B14, IM B34). To avoid damage to the winding overhang of the motor winding, observe the **maximum permissible tap depths in conformity with the following table.**

Flange type (EN 50347)	Old flange type (DIN 42948)	Tap depth (mm)
FT65	C80	6.5
FT75	C90	8
FT85	C105	8.5
FT100	C120	8
FT115	C140	10
FT130	C160	10
FT165	C200	12
FT215	C250	12

If a motor of type IM B34 without flanged attachments is used, the user has to take appropriate **measures** at the through holes **to maintain the specified degree of protection.**

9. Insulation Check & Replacement of Grease/Bearings

When the motor is first commissioned and especially after extended storage, the insulation resistance of the winding is to be measured to earth and between phases. The check must take place using the rated voltage, but at least 500 V.



During and immediately after the measurements dangerous voltages are present at the terminals. Therefore never touch the terminals and follow the operating instructions of the insulation resistance meter closely!

Depending on the rated voltage U_N , the following minimum values must be maintained with a winding temperature of 25 °C:

Rated Power P_N in kW	Insulation Resistance referred to Rated Voltage in kΩ/V
$1 < P_N \leq 10$	6.3
$10 < P_N \leq 100$	4
$100 < P_N$	2.5

If the minimum values are lower, the winding must be dried properly until the insulation resistance corresponds to the required value. When the motor is commissioned after a prolonged period of storage inspect the bearing grease visually and replace it if hardening and other irregularities occur. If

the motors are to be commissioned by the manufacturer after more than three years following their delivery then the bearing grease must always be replaced. With motors fitted with covered or sealed bearings the bearings must always be replaced with new bearings of the same type after a storage period of four years.

10. Motor connection



The connection has to be done by qualified personnel according to the valid safety regulations. Outside of Germany the required national standards must be applied. Name plate designations have to be observed under all circumstances!

Take extra care when connecting the supply cables in the terminal box of the motor. The nuts of the connection screws have to be fastened without force. Before connecting the power line, the existing motor connections must eventually be retightened.

Terminal box overview

Terminal box type	Terminal board	Rated current [A]	Connecting thread	Tightening torque [Nm]
KA 05	K1M4	30	thread	1.8 ± 0.2
KA 05-13	K1M4	30	M4	1.8 ± 0.2
KA 05-13	K1M5	30	M5	2.4 ± 0.2
KA 25 A	SB 5	25	M5	2.5 ± 0.5
KA 25 A SS	SB 5	25	M5	2.5 ± 0.5
K 63/25 A	SB 5	25	M5	2.5 ± 0.5
KK 63 A	SB 6	63	M6	4 ± 1
KK 100 A	SB 8	100	M8	7.5 ± 1.5
KK 200/100 A	SB 8	100	M8	7.5 ± 1.5
KK 200 A	SB 10	200	M10	12.5 ± 2.5
KK 400 A	SB 12	400	M12	20 ± 4
KK 400 B	KM 12	400	M12	20 ± 4
KK 400 B	KM 16	630	M16	30 ± 4
KK 630 A	KLP 630-16	630	M16	30 ± 4
KK 630 A	KLP 630-20	630	M20	30 ± 4
KK 1000 A	KLSO 1000	1000	current bar	-

11. Commissioning

Please follow the Safety Regulations closely. All work is to be carried out only when there is no voltage on the motor. The installation must be carried out according to the valid regulations by qualified skilled personnel. Initially the mains conditions (voltage and frequency) must be compared with the data on the rating plate of the motor. The dimensions of the connecting cables must be adjusted in line with the rated currents of the motor. The connection points of the motor are marked in accordance with EN 60034-8 (VDE 0530 Part 8). Under point 24. "Connection diagrams for the connection of

three-phase" motors printed in these instructions are the most common connection diagrams for three-phase motors in basic design, according to which the connection is made. For all other versions, the special circuit diagrams are glued to the inside of the terminal box cover or placed in the terminal box. An additional terminal box can be provided for the connection of auxiliaries and protection devices (e.g. anti-condensation heaters); the same regulations apply as for the main terminal box. Always start the motors with an overcurrent protection device that is set in accordance with the relevant nominal values of the motor ($\approx 1.05 I_{nom}$).

Otherwise warranty claims with respect to damaged windings become void. Before the motor is connected for the first time it is recommended to check the insulation resistances between winding and earth and between phases (see Section 9). After prolonged storage it is absolutely essential that the insulation resistance is measured. Before coupling the motor to the driven machine, check the direction of rotation of the motor to prevent possible damage being caused to the driven machine. If the power lines are connected

with the phase sequence L1, L2, L3 to U, V, W, the direction of rotation is clockwise (view to shaft end on drive side DS). If two terminals are changed, the direction of rotation is counterclockwise (i.e. L1, L2, L3 to V, U, W). For machines with only one direction of rotation the required sense of rotation is marked by an arrow on the machine.

For the permissible tightening torques for the terminal board bolts refer to the table below:

Tightening torques for bolts (terminal box, end shield, bearing cover)

Series W.. and K.. 56 to 132T

Type		Type of construction	End shield		Fixed bearing cover		Terminal box or adapter cover	
W.2. and KPE. and K21.	W.1. and KP. and K20.		DS	NS	DS	NS	or adapter	cover
Bolts/tightening torque for bolts M_A								
63...	56...	all	M 4 2.0 Nm	M 4 2.0 Nm	M 4 1.5 Nm (for W.. and K.. 100 L M 5 2.0 Nm)	M 4 1.5 Nm	M 4 2.5 Nm	M 5 1.0 Nm
71...	63...		M 5 4.0 Nm	M 5 4.0 Nm				
80...	71...		M 6 7.0 Nm	M 6 7.0 Nm				
90...	80...							
100 L	90...							
100 LX.112...	100...	B3	M 8 10.0 Nm	M 8 10.0 Nm	M 5 2.0 Nm	M 5 2.0 Nm	M 4 2.5 Nm	M 4 2.0 Nm
		B5. B14	M 8 15.0 Nm					
132 S...T	-	B3. B14 FT130	M 8 10.0 Nm					
		B5. B14	M 8 15.0 Nm					

Tightening torques for bolts (terminal box, end shield, bearing cover)

Series W.. and K.. 112 to 355

Thread Ø	M5	M6	M8	M10	M12	M16	M20
End shield	-	-	25	45	75	170	275
Bearing cover	5	8	15	20	20	-	-
Terminal box	-	4	7.5	12.5	-	20	-

Before closing the terminal box make absolutely sure that:

- the connection has been made in accordance with the wiring diagram
- all terminal box connections are tightened
- all minimum values of air paths are maintained (larger than 8 mm up to 500 V, larger than 10 mm up to 750 V, larger than 14 mm up to 1000 V)
- the interior of the terminal box is clean and free from foreign bodies
- unused cable entries are blanked off and the threaded plugs with seals are tightened
- the seal in the terminal box cover is clean and tightly glued and all sealing surfaces are in the correct state to

ensure that the relevant degree of protection is maintained.

Before starting up the motor check that all safety regulations are strictly adhered to, that the machine is correctly installed and aligned, that all fixing parts and earthing connections are tightened, that the auxiliary and additional devices are functionally and correctly connected and if a second shaft end is fitted that the key is secured against being thrown aside.

If possible the motor is to be connected without load.

If the motor is running smoothly and without any abnormal noises, the load of the driven machine is to be applied to

the motor. When the motor is started up it is recommended to monitor the current consumption if the motor is loaded with its driven machine so that any possible overloads and asymmetries occurring in the mains can be recognised immediately.

The starter must always be in the starting position during starting. With slip ring motors the correct running of the brushes must be monitored. They must be absolutely spark-free.

For mountings like encoders, brakes and others please observe the corresponding operating and maintenance instructions of the manufacturer.

12.1 Maintenance

You are once again referred to the Safety Regulations, in particular to insulation, to securing against reconnection, to checking whether all components connected to a voltage

source are in dead state. If it is necessary to disconnect the motor from the mains for maintenance work particular care must be taken to ensure that any possibly existing auxiliary circuits (e.g. anti-condensation heaters, forced ventilators, brakes) are also anti-condensation from the mains.

If the motor is to be dismantled during maintenance work, the sealing compound on the centering shoulders is to be removed. When reassembling the motor these need to be resealed using a suitable motor sealing compound. Existing copper sealing washers must always be refitted. Careful and regular maintenance, inspections and revisions are necessary to detect and clear faults in time, before consequential damages will happen. As individual operating conditions cannot be defined for all applications the listed items represent a general advice for undisturbed operation. Individual local conditions (degree of soiling, load, etc.) must be taken into account when adjusting these terms.

What to do?	Time period	Terms
First inspection	After about 500 operating hours	½ year at the latest
Control of air circulation and surface of motor	Depending on local environmental pollution	
Relubrication (as option)	See rating plate or relubrication sign	
Main inspection	After about 10,000 operating hours	Once a year
Remove condensation water	Depending on the local environmental conditions	

12.2 Inspections

12.2.1 Initial inspection

According to the requirements an initial inspection of the motor must be organised after approximately 500 hours of operation, but not later than half a year after start of operation. The following examinations will be done at standstill of the motor:

- a) Check of the foundations. There must be no cracks or other damages like depressions.

The following examinations will be done when the motor is running:

- a) Check of the electrical characteristics.
- b) Check of the bearing temperatures. It is examined if the permissible bearing temperatures will be exceeded during operation of the motor.
- c) Check of the running noises. When the motor is running, it is checked if the quiet running has changed for the worse.

If the examination results in differences from the values specified in the maintenance manual or if there are other faults or damages detected, than these must be corrected immediately.

12.2.2 Main inspection

According to the requirements a main inspection of the motor must be organised annually after approximately 10,000 hours of operation.

The following examinations will be done at standstill of the motor:

- a) Check of the foundations. There must be no cracks or other damages like depressions.
- b) Check of the motor alignment. The motor alignment must be within the given tolerances.

- c) Check of the fastening bolts. All bolts used for fixing mechanical and electrical connections must be tight (see also the table for tightening torques for bolts in chapter 11. Commissioning).
- d) Check of the cables and the insulation material. The examination must check if the cables and used insulation materials are in good conditions. They must not be discoloured or even burnt and they must not be broken, cracked or faulty in any other way.
- e) Check of the insulation resistance. The insulation resistance of the winding must be measured. The requirements in the maintenance manual (chapter 9) must be kept.
- f) According to the grease quality and bearing type of the motor it can be necessary to change the grease after 10,000 working hours (see chapter 13 Bearings and Lubrication). Apart from that the necessary relubrication periods for friction bearings must be observed, because they differ from the inspection periods.

The following examinations will be done when the motor is running:

- a) Check of the electrical characteristics.
- b) Check of the bearing temperatures. It is examined if the permissible bearing temperatures will be exceeded during operation of the motor.
- c) Check of the running noises. When the motor is running, it is checked if the quiet running has changed for the worse.

If the examination results in differences from the values specified in the maintenance manual or if there are other faults or damages detected, than these must be corrected immediately.

13. Bearings and Lubrication

The roller bearings of the motors in standard design are filled with anti-friction bearing grease in the factory

(or with sealed bearings by the bearing manufacturer) according to DIN 51825 in compliance with the table below:

VEM motors GmbH:

Motor type	Designation of grease	Design. acc. to DIN 51825	Temperature range in °C
Thermal class F Thermal class H rise F Standard, TII, AS, NS, VL, LL Marine design (SS) Smoke exhaust design	Asonic GHY 72	KE2R-40	-40 up to +180
For low temperatures	Asonic GLY 32	KPE2N-50	-50 to +140
For high temperatures, Thermal class H rise H Roller table motors ARB, ARC Smoke exhaust design	Berutox FH 28 KN	KHC1R-30	-30 to +180
Power plant design Motors complying with VIK with relubrication device	High-LUB LM 3 EP	KP3N-30	-30 to +140
For very high ambient temperatures	Barrierta L55/3	-	-25 to +260
Customer request	Only after consultation with design department of VEM		

VEM motors Thurm GmbH:

Design of the motor	Grease designation	Designation acc. to DIN 51825	Temperature range in °C
Thermal class F Thermal class H according to F used Standard Marine design	Asonic GLY 32	KEHC2N-50	-50 to +140
for low temperatures	Isoflex PDL 300 A	KE1/2G-70	-70 to +110
for high temperatures Thermal class H according to H used, smoke exhaust designs Railway designs	Klüberquiet BHQ 72-102	KE2/3R-40	-40 to +180
for very high ambient temperatures	Barrierta L55/3	-	-25 to +260
Customer request	After consultation with the Design department of VEM		

Under normal load and climatic conditions, the quality of grease guarantees an operation of the motor for approx. 10,000 service hours with two pole design and 20,000 service hours with multipole design. If not otherwise agreed the grease of anti-friction bearing must never be refilled during this period. However, the condition of the grease should be checked occasionally even before this time limit. Irrespective of the operating hours, the bearings themselves or the grease of permanently lubricated bearings should be replaced at the latest after 4 years due to the reduction of the lubricity of the grease. The indicated number of service hours is only valid for operation at rated speed. When using inverter feeding the indicated relubrication periods

are reduced by 25% because of the higher temperature increase. If during operation of the motor via an inverter the nominal speed is exceeded then the regreasing period reduces approximately in the opposite ratio to the increase in the motor speed.

Regrease the bearings only after a thorough cleaning using suitable solvents. The same type of grease must be used. When replacing the grease only the equivalent types specified by the motor manufacturer can be used.

Please bear in mind that the bearings should only be filled up to about 2/3 of their free space. A complete filling of the bearings and bearing covers with grease leads to increased bearing temperature and therefore to increased wear.

The regreasing of bearings with regreasing facility is carried out at the grease nipple when the motor is running using the grease quantity required for the respective motor. For the regreasing intervals please refer to the table below:

Frame size		2-pole design	Design with 4-poles and more
Series IEC/DIN	Series Transnorm		
132 to 280	100 to 250	2,000 h	4,000 h
315	280 to 315	2,000 h	4,000 h
355	-	2,000 h	3,000 h

The quantities of grease required for the regreasing are stated in the below table (Please note that for the first regreasing approx. twice the amount of grease is required because the grease lubrication pipes are still empty). The used grease is collected in the grease chamber of the external bearing cap. After approx. 5 regreasings this old grease should be removed, e.g. as part of inspection work.

The necessary relubrication periods for roller bearings differ from the inspection periods and must be observed separately!

Series Transnorm Size	Overall length pole number	Quantity of grease in cm ³		Series IEC/DIN Size	Overall length pole number	Quantity of grease in cm ³	
		D-end	N-end			D-end	N-end
112	all	10	10	132	M4, MX6	17	17
132	all	17	17	160	L2, MX2, L4, 6, 8	23	20
160	all	23	20	180	M2, L4	23	23
180	2	23	23		M4, L6, 8	23	20
	≥ 4	31	31	200	L2, L4, 6, 8, LX6	31	23
200	2	31	31		LX2	31	31
	225	≥ 4	35	31	225	M2	31
2		35	35	M4, 6, 8, S4, 8		35	31
250	≥ 4	41	35	250	M2	35	35
	2	41	41		M4, 6, 8	41	35
280	≥ 4	52	41	280	2	41	41
	2	52	52		≥ 4	52	41
315	≥ 4	57	52	315	S, M2	52	52
	S2	57	52		S, M ≥ 4, MX2	57	52
	M, L, LX2	57	57		MY, L, LX2	57	57
	S4, 6, 8	64	52		MX4, 6, 8	64	52
	M, L, LX4, 6, 8	78	57		MY, L, LX4, 6, 8	78	57
355	2	57	57	355	2	57	57
	4	90	57		4, 6, 8	90	57
	6, 8	90	57				

The motors up to size 315 M are equipped as standard with roller bearings with life-time lubrication. From size 315 MX upwards they are equipped with relubrication devices which can be ordered for smaller motors as option. Information about bearings and relubrication can be found in the general installation, maintenance and operating manual or on the rating plate or relubrication sign.



Maintenance work (without relubrication) has to be done at standstill of the motor. It has to be assured that the machine is secured against reconnection and labelled with an appropriate sign.

In addition the security advices and accident prevention regulations of the manufacturers for the use of oils, lubricants and detergents must be observed!



Adjacent live parts have to be covered or secured!

It has to be assured that the auxiliary circuits like anti-condensation heating are dead (zero potential). For design versions with condensate drain hole please observe that the drain plug screw has to be lubricated with a suitable sealant (for example Epple 28) before relocking.

14. Long term storage (more than 12 months)

Long term storage must be done indoors in vibration-free, dry rooms with temperatures not below $-20\text{ }^{\circ}\text{C}$ and not above $+40\text{ }^{\circ}\text{C}$. The storage environment must not contain aggressive gas, vapours, dusts and salts. Preferably motors shall be moved and stored only in original packing. Storage and transport with motors standing on their fan covers is not allowed. Additionally unprotected metal surfaces like shaft ends and flanges must be protected with a medium for long-time corrosion protection in addition to the existing factory-provided temporary corrosion protection. If there is a risk of motors being covered by moisture from condensation, please provide precautionary measures against humidity. Then a special packing in airtight sealed plastic foil is necessary or as alternative packing in plastic foil with desiccants. Please put desiccant bags in the terminal box as well. For the transport please use the eye bolts/attachment eyes of the motors together with suitable lifting accessories. The eye bolts/attachment eyes must only be used for lifting the motors without additional mountings like foundation plates, gears and others. Motors with reinforced bearings are supplied with a transportation safety device. The transportation safety device at the shaft end must only be removed during installation of the motor and before switching on.

15. Slipring Contact System

The slip ring contact system must be inspected at regular intervals. It is advisable to check the slip rings 2 – 3 times immediately after commissioning, at intervals of approx. 50 operating hours. Subsequently regular maintenance is to be carried out at intervals that depend on the relevant operating conditions.

A thin layer of patina should be formed on the surface of the slip rings. Generally such patina layer is formed after an operation of between 100 to 500 hours. If intensive scoring or burnt spots on the slip ring surface occur they must be removed immediately either by cleaning or if necessary by re-machining. If slight scoring appears it is not necessary to re-machine. The pressure of the carbon brushes must be checked. It should be between 18.5 kPa and 24 kPa. When replacing the brushes the same type of brush must always be used. New carbon brushes must be bedded-in. With box type brush holders care must be taken to ensure that the carbon brushes do not jam due to contamination. The carbon brushes wear naturally and the abrasion can amount to 3 – 5 mm per 1,000 hours of operation.

16. Draining of condensation water

On installation sites where formation of dew and thus occurrence of condensation water can be expected inside the motor, the accumulated condensation water has to be drained at regular intervals through the opening at the lowest point of the end shield. Subsequently the opening must be closed up again.

17. Cleaning

So that the effects of cooling air are not interfered with, all parts of the motor must be cleaned at regular intervals. In the majority of cases it is sufficient to clean the machine with compressed air that is free from water and oil. Especially the vent holes and the spaces between the ribs must be kept clean. The dust generated by natural wear and deposited in the interior of the motor or in the slip ring space must be removed at regular intervals. It is recommended to include the electric motors in the regular routine inspections of the driven machine.

18. Auxiliary devices

As option the motors can be equipped with auxiliary devices.

18.1 Motors with Thermal Winding Protection

For monitoring the stator winding temperature it is possible to have thermocouples installed in the motor (PTC thermistors, KTY or PT 100). For their connection suitable auxiliary clamps for auxiliary circuits are available in the main terminal box or in additional terminal boxes. The connection is done according to the attached connection diagram.

A continuity test of the thermistor sensor circuit using a test lamp, a hand generator and such like is strictly prohibited because this would destroy the sensors immediately. If it becomes necessary to verify the cold resistance of the sensor circuit (at approx. $20\text{ }^{\circ}\text{C}$) then the measuring voltage must never exceed 2.5 V DC. It is recommended to carry out the measurement using a Wheatstone bridge with a 4.5 V DC supply voltage. The cold resistance of the sensor circuit must never exceed 810 Ohms; a measurement of the hot resistance is not necessary.



With motors that are fitted with thermal winding protection, care must be taken that when the thermal winding protection responds and after the cooling down of the motor, no hazards can occur due to spurious automatic reconnection.

18.2 Anti-condensation heating

The input supply voltage is indicated on the name plate of the motor. For their connection either in the main terminal box or in the auxiliary terminal boxes suitable clamps for auxiliary circuits are provided. The connection is done according to the attached connection diagram. The anti-condensation heating has to be switched on only after disconnection of the motor. It shall not be switched on while the motor is in operation.

18.3 Forced ventilation unit

The forced ventilation unit dissipates the lost heat at operation of the main motor. During operation of the main motor the motor of the forced ventilation unit has to be switched on. After disconnection of the main motor the forced ventilation has to continue depending on the temperature. For motors with forced ventilation units that are dependent on the direction of rotation, the sense of rotation has to be observed unconditionally (see rotation mark). Only manufacturer approved forced ventilation units shall be used. The forced ventilation unit has to be connected according to the connection diagram that is supplied inside of the terminal box.

19. Warranty, Repair, Spare Parts

Unless expressly agreed otherwise only our contractual workshops are permitted to carry out repairs during the warranty period. Other repairs that may potentially be required can also be carried out by skilled personnel in these workshops. Details about Customer Service network can be obtained from the manufacturer on request. The spare parts are listed in Section 25 "Design of the motors" of these operating and maintenance instructions. Maintenance carried out appropriately (provided it is as described in Section "Maintenance") does not constitute a breach of warranty provisions. The contractual warranty liability on the part of the manufacturer is not prejudiced by this.

20. Electromagnetic Compatibility

The motors, as non-independently working unit, have been checked with regard to their conformity with the EMC standards. It is the responsibility of the equipment operator to ensure by suitable measures that the apparatus or plant in their entirety comply with the relevant electromagnetic compatibility standards.

21. Troubleshooting

General mechanical and electrical faults can be rectified according to the Schedule in Section 26 "Fault clearance". All safety regulations must be strictly observed when rectifying faults.

22. Terminal board circuits

For a machine with only one shaft end or with two shaft ends that have different diameters, the sense of rotation is that rotational direction which is seen, if a person looks at the front end of the only or thicker shaft end.

For each motor the correct connection diagram is attached. The connection must be done accordingly. For the connection of auxiliary circuits please see the additional connection diagram, which is also attached.

23. Disposal

When disposing of the motors please observe applicable national law. In addition please take care that all oil and grease are disposed of according to the ordinance of waste oils (Altölverordnung). They must not be contaminated with solvents, cold cleaners and paint residues.

Before recycling the individual materials must be separated. Most important components are grey cast iron (housing), steel (shaft, stator and rotor sheets, and consumables), aluminium (rotor), copper (windings) and plastics (insulation materials like for example polyamide, polypropylene and others). Electronic components like printed circuit boards (inverter, encoder, etc.) must be recycled separately.

24. Schaltbilder zum Anschluss von Drehstrommotoren, Connection diagrams for the connection of three-phase motors, Schémas de connexion des moteurs triphasés, Schakelschema's voor de aansluiting van draaistroommotoren, Kredsløbsdiagrammer til tilslutningen af trefasede motorer

Käfigläufer mit einer Drehzahl:

Δ niedrige Spannung

single speed squirrel cage motors:

Δ low voltage

Rotor à cage à une vitesse de rotation:

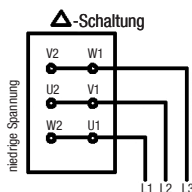
Δ tension basse

Kortsluitanker met één toerental:

Δ lage spanning

Kortslutningsmotor med eet

omdrejningstal: Δ lav spænding



Käfigläufer mit einer Drehzahl:

Y hohe Spannung

single speed squirrel cage motors:

Y high voltage

Rotor à cage à une vitesse de rotation:

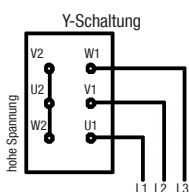
Y tension élevée

Kortsluitanker met één toerental:

Y hoge spanning

Kortslutningsmotor med eet omdrejningstal:

Y høj spænding



Sterndreieckschalteranschluss:

bei Sterndreieckschalter ohne Brückenanschluss nach Schema des Schalters

Star-delta switch connection:

For star-delta switch without bridges, connection as per to the switch scheme

Connexion du commutateur étoile-triangle:

Dans le cas des commutateurs étoile- triangle sans ponts, connexion suivant le schéma du commutateur

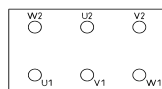
Sterndriehoek-aansluiting:

Bij sterdriehoekschakelaars zonder brug volgt aansluiting

overeenkomstig het schema van de schakelaar

Stjernetrekantkobleingstilslutning:

ved tilslutning af Y/ Δ omskifter foretages tilslutning i henhold til omskifterens diagram



Schleifringläufermotor

Δ niedrige Spannung

Slip ring motor

Δ low voltage

Moteur avec rotor à bagues

Δ tension basse

Sleepringankermotor

Δ lage spanning

Slæberingsmotor

Δ lav spænding

Y hohe Spannung

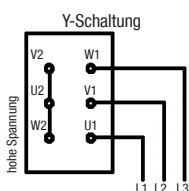
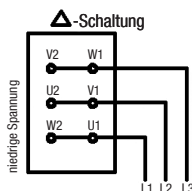
Y high voltage

Y tension élevée

Y hoge spanning

Y høj spænding

Ständer, Stand, Stator, Stander, Stator



Motor mit thermischem Wicklungsschutz

Klemmenplattenschaltung wie oben

Der Anschluss erfolgt nach dem Anschlussschema des Auslösegerätes

Motor with thermal winding protection

Terminal board connection as above

The connection will be implemented as per the connecting diagram of the tripping device

Moteur avec protection thermique de

l'enroulement Connexion de la plaque à

bornes comme ci-dessus

La connexion se fait suivant le schéma de connexion du déclencheur

Motor mit thermische wikkingsbeveiliging

Klemmenbord aansluiting zoals boven

Aansluiting vindt plaats overeenkomstig het aansluitschema van de uitschakel apparatuur

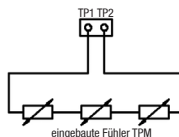
Motor med termisk viklingsbeskyttelse

Forbindelsesdiagram som ovenstående

Aanslutning van uitschakel apparatuur

tilslutning af relæ tilslutningen foretages i

henhold til relæts diagram



Läufer, Rotor, Anker, Løber, Rotor

Läuferanschluss je nach Typ an Läuferklemmen oder Bürstenhalter zum Anlasser

Rotor connection according to type either via terminals or via brush holder to starter

Connexion du rotor suivant le type aux borne du rotor ou au porte-balais vers le démarreur

Rotoraansluiting afhankelijk van type aan rotorlem of borstelhouder naar aanloopinrichting

Rotortilslutning foretages afhængig af type, enten til

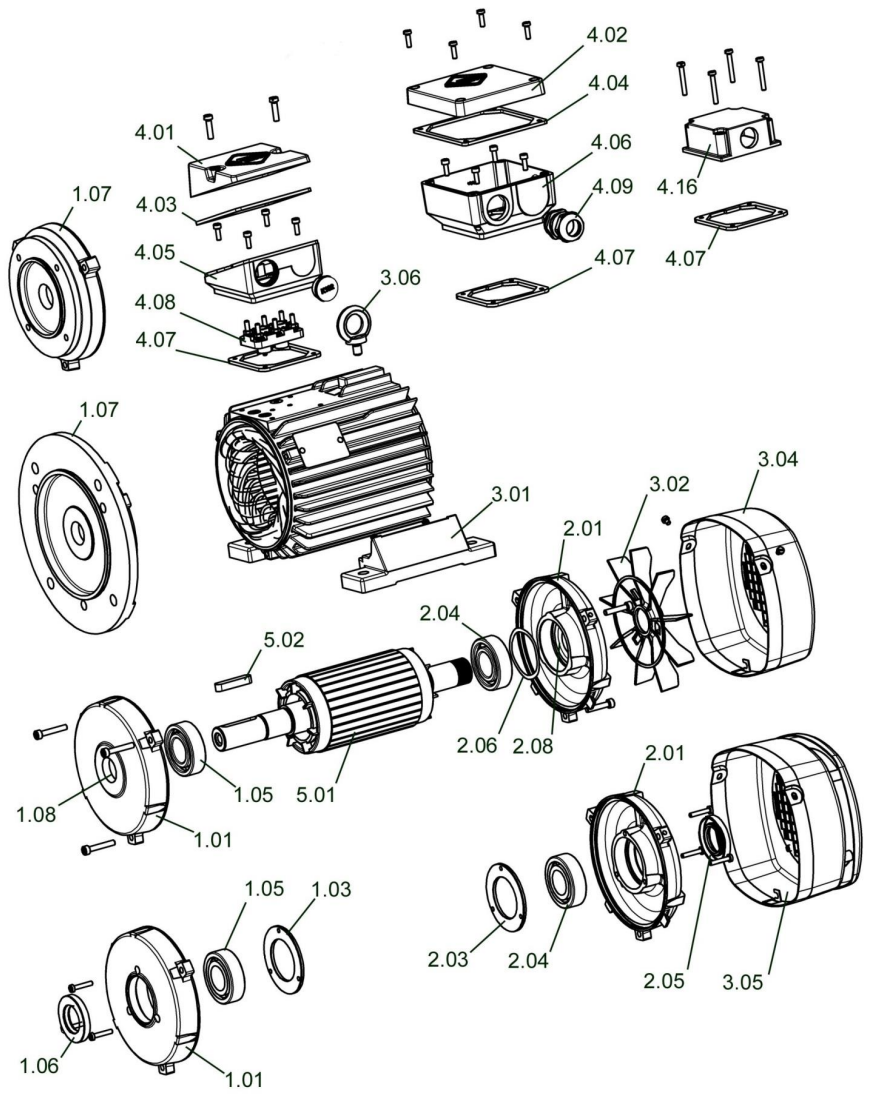
rotorklemmer eller børsteholder til starteren



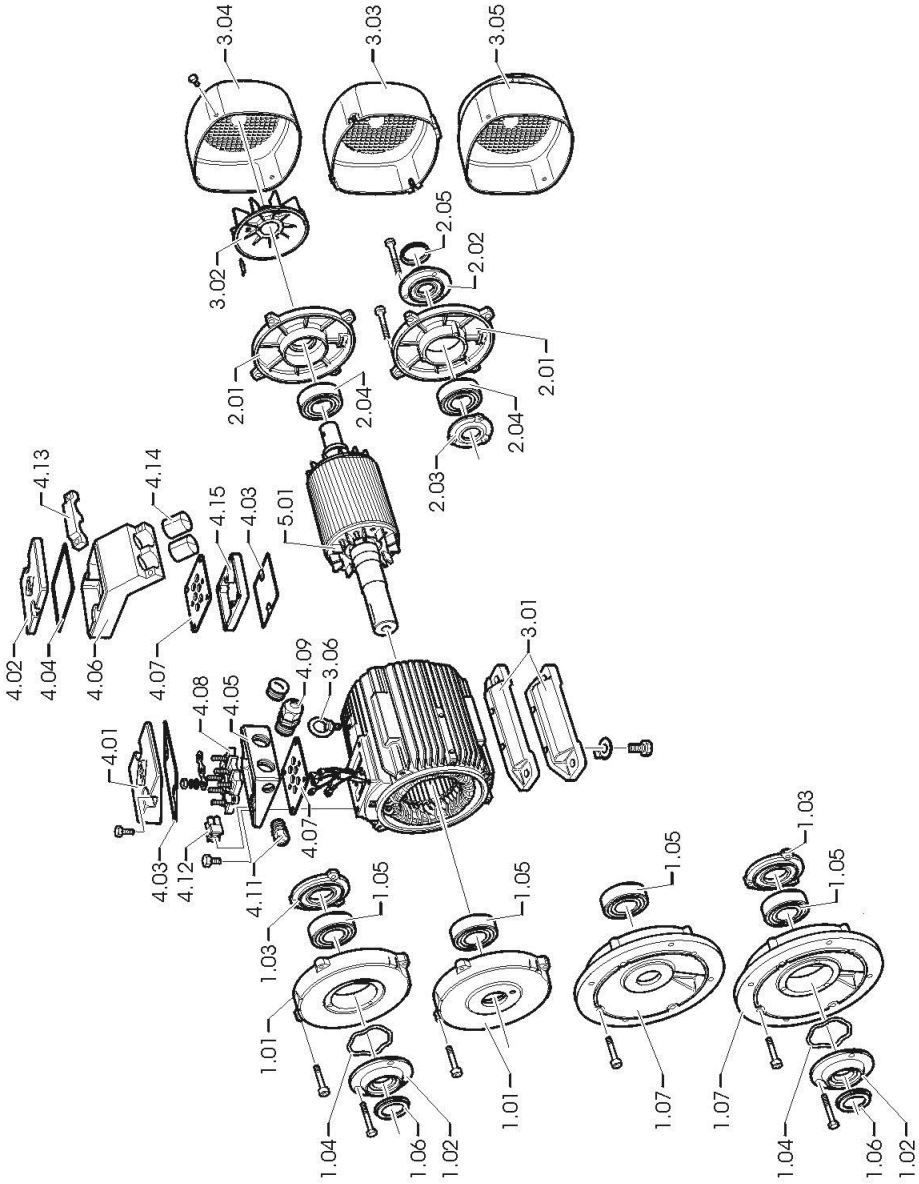
25. Construction of the motor

Kennzahl	Designation
1.01	End shield Drive-end
1.02	Bearing cover, Drive-end, external
1.03	Bearing cover, Drive-end, internal
1.04	Disc spring / wave washer, Drive-end, not for roller bearings
1.05	Antifriction bearing, Drive-end
1.06	V-type rotary seal, Drive-end
1.07	Flange end shield
1.08	Felt ring, Drive-end
2.01	End shield Non-drive end
2.02	Bearing cover, Non-drive end, external
2.03	Bearing cover, Non-drive end, internal
2.04	Antifriction bearing, Non-drive end
2.05	V-type rotary seal, Non-drive end
2.06	Wave washer, Non-drive end (or Drive-end)
2.08	Felt ring, Non-drive end
3.01	1 pair of motor feet
3.02	Fan
3.03	Fan cowl, plastic
3.04	Fan cowl, sheet steel
3.05	Fan cowl with canopy
3.06	Lifting eye bolt
4.01/4.02	Terminal box cover
4.03/4.04	Terminal box cover gasket
4.05/4.06	Terminal box base
4.07	Terminal box base gasket
4.08	Terminal plate
4.09	Cable gland
4.10	Screw plug for gland opening
4.11	Cable gland for thermal winding protection
4.12	Terminal for thermal winding protection
4.13	Clamp
4.14	Sealing components
4.15	Adapter plate
4.16	Flat terminal box
4.17	Standard parts bag
5.01	Rotor, complete
6.01	Grease thrower ring, Drive-end
6.02	Grease thrower ring, Non-drive end
6.03	Labyrinth gland, Drive- and Non-drive end
6.04	Guide disc, Drive-end
6.05	Guide disc, Non-drive end
7.01	Slip ring rotor with slip rings
8.01	Brush holder
8.02	Brush carrier plate with brush rod
8.03	Protective cover slip ring compartment
8.04	Gasket for protective cover
8.05	Cover for fan cowl
9.01	Terminal box cover for rotor terminal box
9.02	Gasket for terminal box cover for rotor terminal box
9.03	Terminal board for rotor connection
9.04	Terminal box base for rotor connection
9.05	Cable gland for rotor connection
9.06	Adapter flange for rotor terminal box
9.07	Screw plug for rotor connection

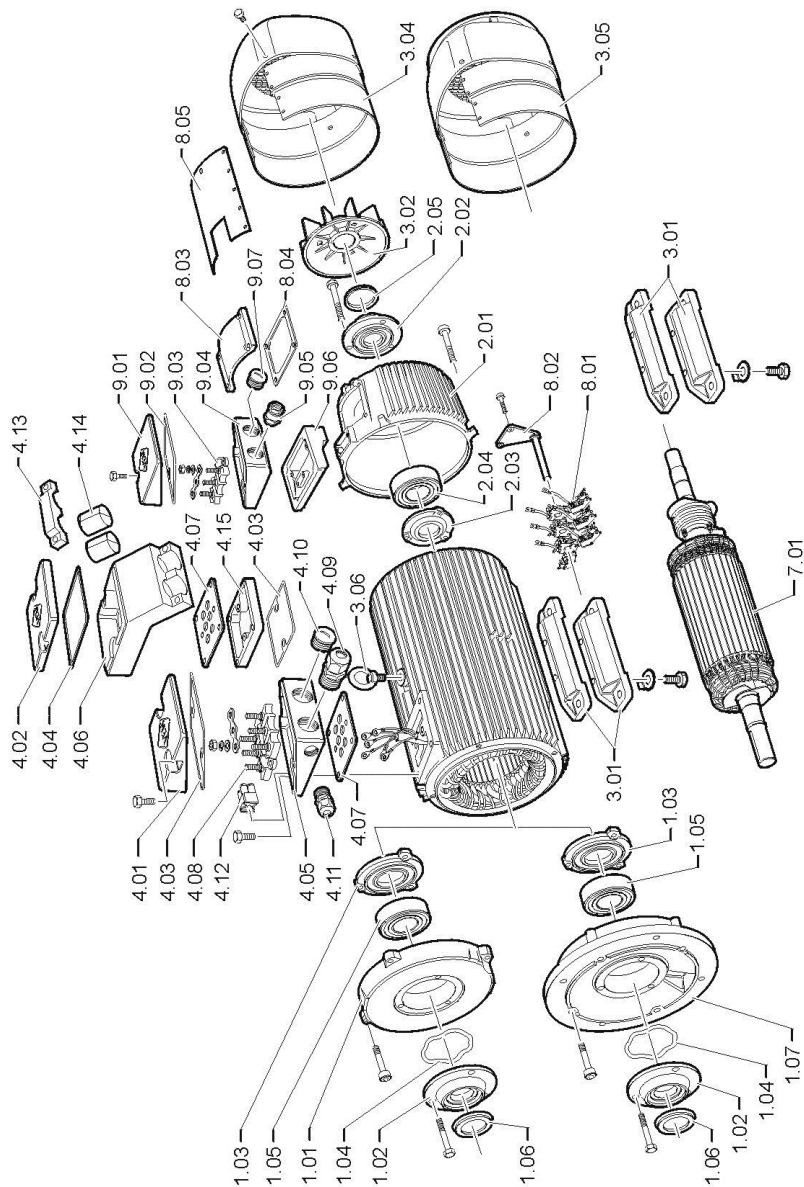
Three phase asynchronous motor with squirrel cage rotor/basic version K2.R 56 – 132T
(example, delivered version may differ in details)



Three phase asynchronous motor/basic version K1.R/K2.R 132 – 355 132 – 355
 (example, delivered version may differ in details)



Three-phase asynchronous motor with slip ring rotor/basic version S11R/SPER, S11H /SPEH
 (example, delivered version may differ in details)



26. Trouble shooting

26.1 Electrical Faults

	Motor doesn't start	
	Motor runs up heavily	
	Humming noise during start	
	Humming noise during operation	
	Hum in time of the double slip frequency	
	Excessive warming up at no-load operation	
	Excessive warming up at rated output	
	Excessive warming up of individual winding sections	
	Possible cause of fault	Remedial measure
● ● ●	Overload	Decrease the load
●	Interruption of a phase in the supply conductor	check the switch and the supply conductor
● ● ●	Interruption of a phase in the supply conductor after switching-on	check the switch and the supply conductor
●	Mains voltage too low, frequency too high	check the mains conditions
●	Mains voltage too high, frequency too low	check the mains conditions
● ● ● ●	Stator winding misconnected	check the winding connections
● ● ●	Turn-to-turn fault	check the winding and the insulation resistance, repair in authorized service workshop
● ● ●	Phase-to-phase short circuit	check the winding and the insulation resistance, repair in authorized service workshop
●	Interruption in the squirrel cage winding	repair in authorized service workshop

26.2 Mechanical Faults

	Dragging noise	
	Excessive warming up	
	Strong vibrations	
	Bearing warming up excessively	
	Bearing noises	
	Possible cause of fault	Remedial measure
● ● ●	Rotary parts are dragging	Determine the cause, re-align parts
●	Air supply reduced	Check the ventilation passages
●	Unbalance of the rotor	Take rotor off, re-balance it
●	Rotor not circular, shaft deformed	Take rotor off, co-ordinate further measures with the manufacturer
●	Imperfect alignment	Align motor & driven machine, check the coupling
●	Unbalance of the coupled machine	Re-balance coupled machine
●	Shocks from the coupled machine	Check the coupled machine
●	Irregularities from the gear	Check and repair the gear
●	Resonance with the foundation	Stiffen the foundation after consultation
●	Changes in the foundation	Determine the cause, eliminate it and re-align the machine
●	Too much grease in the bearing	Remove excess grease
●	Coolant temperature higher than 40 °C	Regrease bearing with suitable grease
●	V-type rotary seal or gamma ring are dragging	Replace V-type rotary seal or gamma ring, maintain the prescribed installation clearance
● ●	Lubrication insufficient	Lubricate according to instructions
● ●	Bearing is corroded	Replace bearing
● ●	Bearing clearance too small	Use bearing with larger bearing clearance
●	Bearing clearance too large	Use bearing with smaller bearing clearance
●	Chatter marks in the bearing track	Replace bearing
●	Standstill marks	Replace bearing
●	Cylindrical roller bearing operated at low load	Change the bearing according to manufacturer's instructions
●	Coupling pushes or pulls	Re-align motor & driven machine
●	Belt tension too high	Adjust the belt tension according to instructions
● ●	Bearing not aligned or stressed	Check the bearing bore, consult the manufacturer

EU Declaration of Conformity



Manufacturer: VEM motors GmbH
Address: Carl-Friedrich-Gauß-Str. 1
D-38855 Wernigerode

VEM motors Thurm GmbH
Äußere Dresdner Str. 35
D-08066 Zwickau

Product name: The electrical apparatus
**Low Voltage asynchronous motors / generators with cage and
Slipring machines of the series:**

A...¹⁾
B...¹⁾
C...
G...
K...¹⁾
S...
W...¹⁾
Y...¹⁾
Gear motors SG.../SP.../KIXB...¹⁾ and
Single-phase-motors EA.../EB.../ED... for
industrial applications

¹⁾ Motors that comply with the Guideline 2009/125/EC and the regulation No. 4/2014 receive the marking IEx before the type designation, whereas x= 1,2,3,4 (acc. to EN 60034-30-1) is.

are in conformity with the instructions of the following EU Directives :
2014/35/EU

Directive of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits
Official Journal of the European Union L96, 29.03.2014, S. 357-374

2014/30/EU

Directive of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility
Official Journal of the European Union L96, 29.03.2014, S. 79-106

2009/125/EC

Directive of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products
Official Journal of the European Union L285, 31.10.2009, S. 10-35

The sole responsibility for issuing this Declaration of Conformity lies with the manufacturers.

Compliance with the provisions of these Directives is demonstrated by compliance with the following standards:

Reference number and issue date

EN 61000-6-2:2005, EN 61000-6-4:2007+A1:2011
EN 60038:2011, EN 60204-1:2006+A1:2009
EN 60034-1 :2010+Cor.:2010
and all other relevant parts and additions EN 60034- ...

The specified product is exclusively intended for fitting into another machine/installation. Start of operation is permitted until conformity of the end product with the directive 2006/42/EC is established.

Date of first application of CE-mark: 01.1996

Wernigerode, 15.03.2019 Zwickau, 15.03.2019

 
Stürtzbecher Dr. Koch
Managing Director Managing Director

This certificate attests the conformity with the named Directives; however, it is not a promise of properties in the meaning of product liability. In case of electronic communication, the signature does not appear.



ELECTRIC DRIVES

FOR EVERY DEMAND

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