



ELECTRIC DRIVES

FOR EVERY DEMAND



Ergänzende Montage-, Bedienungs- und Wartungsanleitung

Explosiongeschützte Drehstrom-Asynchronmotoren
mit Käfigläufer für Niederspannung

Supplementary installation, operating and maintenance instructions

Explosion-proof three-phase asynchronous motors
with squirrel-cage rotor for low voltage



ATEX





English	
Supplementary installation, operating and maintenance instructions. Explosion-proof three-phase asynchronous motors with squirrel-cage rotor for low voltage	



The series designation is supplemented for energy-efficient versions with the identifier IE*-, where * = 1, 2, 3, 4 according to EN/IEC 60034-30-1 is equivalent to the efficiency class (example IE3-K11R 132S 4 Ex e IIC T3).

Ignition protection type enhanced safety "eb" ("e"),

Ignition protection type "ec" (enhanced safety "n"),

Ignition protection type, protection by enclosure "t", series (IE*-)K... and (IE*-) "W..."

General



Attention: Read the installation, operating and maintenance instructions (O&M), terminal diagram, supplementary terminal diagram and safety data sheet prior to transportation, installation, commissioning, maintenance and repair and follow the instructions!

These supplementary operating and maintenance instructions apply together with the operating and maintenance instructions for standard motors, which contain the basic specifications for connection, assembly, operation and maintenance, as well as the spare parts lists and the documents already mentioned.

These instructions (O&M) are intended to enable the operator to transport, install, commission and maintain the explosion-protected electrical machine safely and properly. Neither compliance with these instructions nor the conditions and methods used during installation, operation, use and maintenance of the electric motor can be supervised by the manufacturer. Improper execution of the installation may lead to damage to property and consequently endanger human beings. Hence, we do not assume any responsibility or liability for any losses, damages or expenses resulting from or in any way connected with incorrect installation, improper operation and incorrect use and maintenance. Drawings and Figures are simplified illustrations. Due to improvements and modifications, it is possible that they do not match in detail with the electrical machine supplied. We endeavour to constantly improve our products. Hence, we reserve the right to undertake modifications to the product, the technical specifications or the installation, operating and maintenance instructions without prior notice. Designs, technical specifications and figures are binding only after certification in writing by the factory delivering the product.

Symbols

Three symbols are used in these operating instructions to indicate particularly important passages:



Safety and warranty information, potential personal injury included.



Warns of electrical voltage, danger to life. Indicates that damage to the electrical machine and/or auxiliary equipment may occur.



Ex supplementary note for electrical machines of equipment group II for category 2 (zone 1, 21) or of equipment group II for category 3 (zone 2, 22).

Safety regulations

The safety regulations, accident prevention regulations, directives and good engineering practices stated in these operating instructions must be observed without fail!

Failure to observe the safety instructions may result in danger to human beings and/or damage to the machine.

Intended use

These operating instructions apply to explosion-proof, low-voltage electric motors. The protection class according to IEC/EN 60034-5 is at least IP 54 for motors for use in zones 1 and 2, at least IP 55 for use in zone 22 and IP 65 for use in zones 21 and 22 with electrically conductive dust. For combinations, the highest required protection class always applies. The protection class is always indicated on the nameplate of the motor.

Only electrical machines with the approved ignition protection type should be used in potentially explosive atmospheres.



Electrical machines of equipment group II, category 2 (assigned zones: 1, 21) or equipment group II, category 3 (assigned zones: 2, 22)

Any other use or use beyond this is considered improper.

No liability is assumed for damage and operational faults resulting from installation errors, ignoring these instructions or improper repairs.

Motors according to IECEx (meaning of the references to Directive 2014/34/EU)

For all references (even for supplementary equipment, cable glands, add-on components, etc.) to Directive 2014/34/EU, the components must instead be approved according to the ignition protection type of protection IECEx or, if selected by the operator, they must be approved according to IECEx.

The motors are marked as being IECEx-compliant. For IECEx-approved motors, references to categories/zones must be understood as references to the relevant equipment protection level (e.g., category 3, assigned zone 2 equivalent to EPL Gc). References to the BMPB must be understood as references to the chain of custody (CoC).

Potentially explosive areas

The decision as to which areas outdoors or in enclosed spaces must be regarded as potentially explosive in line with relevant regulations or provisions must be left exclusively to the operator or, if there is any doubt about the definition of potentially explosive areas, to the competent supervisory authority. Directive 99/92/EC defines the responsibilities for the operator of such installations. The basis for explosion-proof products is the Directive 2014/34/EU (Directive 94/9/EC). This defines the requirements for products for use in potentially explosive atmospheres. These are supported by relevant standards (see below).

Explosion-protected electrical machines, to which these instructions are applicable, are designed in accordance with the standards of the series IEC/EN 60034 (VDE 0530), EN IEC 60079-0 and the standards applicable to the relevant ignition protection type IEC/EN 60079-7, IEC 60079-15 and/or IEC/EN 60079-31. They should be put into operation in potentially explosive atmospheres only in accordance with the responsible supervisory authority.



Refer to the nameplate of the motor for the ignition protection type, temperature class, as well as characteristics.

- **Equipment group II, category 2 (assigned zones: 1, 21)**
This category includes electrical machines of ignition protection type enhanced safety "eb" ("e") and flameproof enclosure "db" or "db eb" ("d"/"de"). Moreover, electrical machines for use in areas with combustible dusts in the ignition protection type protection by enclosure "tb" are classified in this group.
- **Equipment group II, category 3 (assigned zones: 2, 22)**
This category includes electrical machines of ignition protection type enhanced safety "ec" ("n") and electrical machines for use in areas with combustible dusts of ignition protection type protection by enclosure "tc".



If the certificate number is supplemented with an X, special requirements in the enclosed type test certificate must be observed.

The machine design basically complies with the following standards:

General standards applied

Feature	Standard	
Rating and operating behaviour	IEC 60034-1	DIN EN 60034-1
Method for determining losses and efficiency of rotating electrical machines and tests	IEC 60034-2-1	DIN EN 60034-2-1
	IEC 60034-2-2	DIN EN 60034-2-2
	DIN IEC 60034-2-3	EN 50598
Protection class	IEC 60034-5	DIN EN 60034-5
Cooling	IEC 60034-6	DIN EN 60034-6
Design	IEC 60034-7	DIN EN 60034-7
Connection designations and direction of rotation	IEC 60034-8	DIN EN 60034-8
Noise emission	IEC 60034-9	DIN EN 60034-9
Starting behaviour, rotating electrical machines	IEC 60034-12	DIN EN 60034-12
Vibration size sages	IEC 60034-14	DIN EN IEC 60034-14
Efficiency classification of three-phase motors with squirrel-cage rotors	IEC 60034-30	DIN EN 60034-30-1
IEC standard voltages	IEC 60038	DIN EN 60038



Supplementary standards for explosion-proof machines

































Feature	Standard	
Electrical equipment for areas at risk of explosive gas atmosphere Part 0: General requirements	IEC 60079-0	DIN EN IEC 60079-0
Electrical equipment for areas at risk of explosive gas atmosphere Part 1: Flame-proof enclosure “d”	IEC 60079-1	DIN EN 60079-1
Electrical equipment for areas at risk of explosive gas atmosphere Part 7: Enhanced safety “e”	IEC 60079-7	DIN EN 60079-7
Electrical equipment for areas at risk of explosive gas atmosphere Part 14: Electrical installations for hazardous areas (excluding mines)	IEC 60079-14	DIN EN 60079-14
Electrical equipment for areas at risk of explosive gas atmosphere Part 15: Ignition protection type “n”	IEC 60079-15	DIN EN IEC 60079-15
Electrical equipment for use in areas with combustible dust Part 17: Testing and maintenance of electrical systems in potentially explosive atmospheres (excluding mines)	IEC 60079-17	DIN EN IEC 60079-17
Electrical equipment for areas at risk of explosive gas atmosphere Part 19: Repair and overhaul	IEC 60079-19	DIN EN 60079-19
Explosive atmospheres Part 31: Equipment dust explosion protection by housing “t”	IEC 60079-31	DIN EN 60079-31

Standards Customs Union Eurasia

Feature	Standard	
Rating and operating behaviour	EN / IEC 60034-1	GOST R IEC 60034-1
Method for determining losses and efficiency of rotating electrical machines and tests	EN / IEC 60034-2-1	GOST R IEC 60034-2-1
	EN / IEC 60034-2-2	GOST R IEC 60034-2-2
	EN / IEC 60034-2-3	GOST R IEC 60034-2-3
Protection class	EN / IEC 60034-5	GOST R IEC 60034-5
Cooling	EN / IEC 60034-6	GOST R IEC 60034-6
Design	EN / IEC 60034-7	GOST R IEC 60034-7
Connection designations and direction of rotation	EN / IEC 60034-8	GOST R IEC 60034-8
Noise emission	EN / IEC 60034-9	GOST R IEC 60034-9
Starting behaviour, rotating electrical machines	EN / IEC 60034-12	GOST R IEC 60034-12
Vibration size sages	EN / IEC 60034-14	GOST R IEC 60034-14
Efficiency classification of three-phase motors with squirrel-cage rotors	EN / IEC 60034-30	GOST R IEC 60034-30
IEC standard voltages	IEC 60038	GOST R IEC 60038

Marking of explosion-proof motors

QA certification by the notified body 0637 ... IBExU Freiberg

Marking according to Directive 2014/34/EU (Directive 94/9/EC) or ТП TC 012/2011		Designation according to		Designation according to	
EU EAC	No. NB	Group/ Category/ G (Gas) or D (Dust)		IEC 60079-0:2004/ EN 60079-0:2006, IEC 60079-7:2006/ EN 60079-7:2007, IEC 60079-15:2010/ EN 60079-15:2010	IEC 60079-0:2017 / EN IEC 60079-0:2018, EN 60079-7:2015 or EN 60079-31:2014
	0637	 II 2G		Ex e II T1/T2, T3 or T4	Ex eb IIC T1/T2, T3 or T4 Gb
	ГБ08	 1			
		 II 3G		Ex nA II T2, T3 or T4	Ex ec IIC T2, T3 or T4 Gc
	ГБ08	 2			
	0637	 II 2D		Ex tD A21 IP65 T125°C	Ex tb IIIC Tx°C Db
	ГБ08				
		 II 3D		Ex tD A22 IP55 Tx°C (IP 65 conductive dust)	Ex tc IIIB Tx°C Dc (Ex tc IIIC Tx°C Dc, conductive dust)
					
	0637	 II 2G II 2D		Ex e II T2, T3 or T4 Ex tD A21 IP65 Tx°C	Ex eb IIC T1/T2, T3 or T4 Gb Ex tb IIIC Tx°C Db
	ГБ08	 1 -			
	0637	 II 2G II 3D		Ex e II T2, T3 or T4 Ex tD A22 IP55 Tx°C (IP 65 conductive dust)	Ex eb IIC T1/T2, T3 or T4 Gb Ex tc IIIB Tx°C Dc (Ex tc IIIC Tx°C Dc, conductive dust)
	ГБ08	 1 -			
	0637	 II 3G II 2D		Ex nA II T2, T3 or T4 Ex tD A21 IP65 Tx°C	Ex ec IIC T2, T3 or T4 Gc Ex tb IIIC Tx°C Db
	ГБ08	 2 -			
		 II 3G II 3D		Ex nA II T2, T3 or T4 Ex tD A22 IP55 Tx°C (IP 65 conductive dust)	Ex ec IIC T2, T3 or T4 Gc Ex tc IIIB Tx°C Dc (Ex tc IIIC Tx°C Dc, conductive dust)
	ГБ08				

[When maximum surface temperature is specified: Zone 1 and Zone 2 (gas): Entire surface including rotor and windings; for zone 21, 22 (dust): Outer surface (housing, shaft).]











Motors with double marking are meant only for use in areas where there is a risk of gas or dust explosion. Deployment with hybrid mixtures must be tested and approved separately.

Nameplate




The motor nameplate is designed in German/English language. Other languages are possible, with a surcharge for non-EU languages.

The nameplate contains the most important rating data such as type designation and motor number, power, rated voltage and frequency, rated current, design, protection class, power factor, speed, thermal class, the IE class with efficiency, and information on explosion protection. The information may vary depending on the type. For motors with a re-lubrication device, the grease quantity/lubrication and intervals between lubrication are also noted on the nameplate or on a separate plate.

The nameplates must be fixed to the housing with notched nails so that it cannot be detached. They may be made of aluminium or stainless steel (surcharge). Consultation is required for supplementary plates.

	VEM motors GmbH D 38855 Wernigerode 0637 Made in Germany			 II 2G	 Ex eb IIC T2/T3 Gb
3-Mot.Nr./N°/M.		123456/0001 H	IE3-K11R 180 M4 Ex eb IIC T2/T3 2D TPM HW		
V	Hz	cos φ	A	min ⁻¹ /r.p.m./rev/m	
400/690 Δ/Y	50	0.86	32.5/19.8	1473	17.0
Beschein./Certif. 2G: IBExU99ATEX1138/52		I _L /I _N	6.7	t _c 35 s	IE 3 - 92.4%
 400/690 Δ/Y	50	0.84	29.5/17.1	 1478	15.0
Beschein./Certif. 2G: IBExU99ATEX1138/51		I _L /I _N	7.3	t _c 12 s	IE 3 - 92.2%
Beschein./Certif. 2D: IBExU09ATEX1065		Th.KI/Th.d./Cl.th.155(F/B)			
Prüfung/Test/Essai 29.04.2020				215	kg
IM B3				04.2020	IEC/EN 60034-1
Fett/Grease/Graisse					
 DE	6310 RS C3 DIN625	-	cm ³		
NE	6310 RS C3 DIN625	-	cm ³	-	h 

Example of nameplate: Motor in ignition protection type enhanced safety "eb" or protection by housing "tb"

 <div>VEM motors GmbH Werk Zwickau Made in Germany</div>			<div>Äußere Dresden Straße 35 D-08066 Zwickau</div>	
05/2020		EN 60034		
IE3-KPR 90 L 2 H TPM130				
12345670012005		Th.KI. 155	3-Mot	IP 55
2.2	kW	cosφ 0.89	2905	min ⁻¹ IM B3
40 °C	50	Hz	230/400	V D/Y
IE3 85.9 %		7.05/4.05	A	29.0 kg
5Hz	37/64V	8.1/4.7A	7.2Nm	0.19kW
20Hz	92/160V	7.1/4.1A	7.2Nm	0.83kW
50Hz	230/400V	7.05/4.05A	7.2Nm	2.2kW
 <div>Ex ec IIC T3 Gc max. Temp. 150 °C</div>			<div>Ü ≤ 1350V dU/dt ≤ 1000V/µs</div>	
II 3G				

Sample nameplate: Motor in ignition protection type enhanced safety "ec" for FC (Frequency Converter) operation

General information on operation with frequency converter

The operation of explosion-proof three-phase motors with frequency converter is permitted only if the motors have been manufactured, tested, approved and marked separately for this operation. The separate manufacturer's instructions must always be observed.

By selecting the appropriate converter and/or using filters, you must ensure that the maximum permissible pulse voltage at the motor terminals is not exceeded.

If the motor design requires special converter assignment, the relevant supplementary information is provided on the nameplate. Configure the converter parameters correctly. The parameter settings are provided on the nameplate of the machine. Ensure that the specified maximum limit speed is not exceeded. Information for this purpose is given either on the rating plate or on the supplementary plate for operation with the converter.

VEM uses an insulation system for motors operated with a converter that meets the requirements of IVIC class C according to IEC 60034-18-41. Depending on the level of the converter input voltage, various insulation systems are available from VEM for different loads on the insulation system. These meet the requirements of IVIC class C according to IEC 60034-18-41.

If the motor is operated off the converter, currents may occur in the bearing, which may cause damage to them and lead to premature failure of the bearing and, thus, of the motor.

Damage can be avoided by adopting appropriate measures, e.g., large-area contact surface, potential equalization, use of filters at the output of the converter, reduction of the bearing load or the use of insulated bearings.

The following values for the max. pulse voltage are obtained for the individual series/options:

Series KP./ KPE./ K11./ K10./ K12./ K21./ K20./ K4.R/ W.1R/ W.2R
size 56-132T¹⁾ $\dot{U} \leq 1,000 V$

size 56-132T¹⁾ according to Sp.2945 $\hat{U} \leq 1,350 \text{ V}$
 size 132[K20. 112] up to 450 $\hat{U} \leq 1,350 \text{ V}$

Series KP./ KPE./ KU1./ KU0./ KU2./ WU1R/ WU2R ²⁾

size 56-132T¹⁾ according to Sp.9382 $\hat{U} \leq 1,560 \text{ V}$
 size 132 [KU0. 112] up to 450 $\hat{U} \leq 1,800 \text{ V}$

KV1./ series KV4./ KV0./ KV2./ WV1R/ WV2R ²⁾

size 132 [KV0., KV4. 112] up to 450 $\hat{U} \leq 2,500 \text{ V}$

- 1) 132T.... Axle height 132 supplied by VEM motors GmbH - Zwickau factory
- 2) Marking of the K... / W... series with a trailing TU or TV is possible for certain designs.

It must be ensured that the operating voltage applied to the motor terminals matches in every case that of the specification on the nameplate (pay attention to the voltage drop across the filter!). If, due to the voltage drops across the frequency converter, the cables and any chokes or filters, the terminal voltage at the motor is lower than the rated voltage specified on the nameplate, the base frequency must be set to a lower value in accordance with a linear voltage/frequency ratio. This results in the possible speed control range being smaller.

Operation on the frequency converter is permitted only within the operating points specified on the nameplate. Temporary overshoot of the rated machine current up to 1.5 times the rated current is permissible for a maximum of 1 min. within a time interval of 10 min only for motors with axial height 132 or more, as supplied by VEM motors GmbH - Wernigerode factory. The limit characteristic indicated on the rating plate applies to all motors from the VEM motors GmbH – Zwickau factory product range. The specified maximum speed or frequency may not be exceeded under any circumstances. The evaluation of the built-in thermal winding protection must be carried out via a tripping unit with Ex marking II (2) G that meets the requirements of Directive 2014/34/EU. The motors should not be operated as a group drive.

For installation and commissioning of the frequency converter, it is essential to observe the manufacturer's information and operating instructions. The switching frequency may not fall below the minimum frequency specified on the nameplate.

Category 2 devices on the frequency converter

For the ignition protection types enhanced safety “eb” (EPL Gb), as well as protection by enclosure “tb” (EPL Db), EU type test certificates are required in which operation off the converter is explicitly approved. The conditions and parameter configurations of the motor, converter and protective device system to be complied with are listed in the respective EU type test certificate (or the CoC in the case of IECEx), the associated EU Declaration of Conformity, the nameplate or in the data sheets.

Category 3 devices on the frequency converter

For design in the ignition protection types enhanced safety “ec” (EPL Gc), as well as protection by enclosure “tc” (EPL Dc) (EPL Dc), motors supplied by variable frequency and/or voltage converters must also be tested with the specified converter or an equivalent converter regarding the specification for output voltage and current. Alternatively, the temperature class can be determined by calculation. The necessary parameters and conditions are provided on the nameplate and in the motor documentation. A CoC is required for IECEx.

Electromagnetic compatibility

When operating the motors on the frequency converter, especially with built-in PTC thermistors and other sensors, interference emissions may occur depending on the type of converter. Exceeding the limit values according to IEC/EN 61000-6-3 must be avoided for the drive system consisting of motor and converter. The EMC instructions of the converter manufacturer must be observed.

Efficiency classes

For explosion-proof motors, information about the efficiency class (IE- class) according to IEC/EN 60034-30-1 is permissible on the nameplate and mandatory in the scope of regulation (EU) 2019/1781 dated 01/10/2019. The IE class and the rated efficiency are specified. The motor efficiency is determined in accordance with IEC/EN 60034-2-1: 2014 for 1-phase AC motors via direct measurement and for 3-phase AC motors by means of summation of the individual losses and determination of the residual losses (Section 6.1.1, Table 2). The type designation is extended by the efficiency class as a prefix (example IE3-K11R 132 S4...).

Installation and electrical connection

During installation and commissioning, the safety instructions enclosed with the motor must be observed. Installation work should be carried out only by qualified personnel who, on the basis of professional education, experience and instruction, have adequate knowledge of



- Safety regulations,
- Accident prevention regulations,
- Directives and good engineering practices (e.g., VDE regulations, standards).

Qualified personnel must be able to assess the work assigned to them and identify and avoid potential hazards. They must be authorised by the person responsible for the safety of the installation to carry out the necessary work and activities.

In Germany, installation of electrical systems in potentially explosive atmospheres requires, among other things, compliance with the following regulations:



- BetrSichV "Industrial Safety Regulations"
- TRBS "Technical rules for operational safety"
- GefStoffV "Ordinance on Hazardous Substances"
- IEC/EN 60079-14 "Explosive atmospheres - Part 14: Project planning, selection and installation of electrical systems"

Outside Germany, the relevant national regulations must be observed!

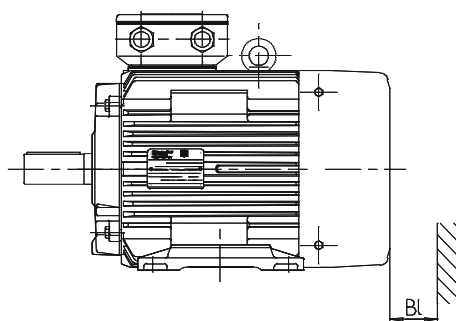
Unventilated motors without a fan of their own are cooled by means of free convection through finned cooling on the motor housing. Sufficient safety against impermissible heating is ensured by power reduction/winding adjustment and verified by means of type testing/submission. Free convection must be ensured to maintain the temperature class and the permissible operating temperature. The motor should not be enclosed.

Environmental influences

The permissible coolant temperature (room temperature at the installation site) in accordance with IEC/EN 60034-1 is max. 40 °C and min. -20 °C without marking and the permissible installation altitude is up to 1,000 m above sea level (other values are specified on the motor nameplate and, if necessary, certified separately).

It must be ensured that the cooling air can flow in freely through the air inlet openings and flow out freely through the air outlet openings and cannot be drawn in again directly. Intake and discharge openings must be protected from contamination and coarse dust. The direct intake of exhaust air from neighbouring units must be prevented with the help of suitable measures.

The minimum distance between the air inlet of the fan guard and an obstacle (dimension BI) must always be observed.



Size	BI [mm]
63, 71	14
80, 90	16
100, 112	20
132, 160, 180, 200	40
225, 250	90
280 ... 315	100
355...450	110

Vertical falling of foreign bodies and liquid into the fan of motors with vertical shaft position must be prevented as follows:

Shaft end down:

The fan guard is provided with a protective roof (at the time of delivery), which is larger than the circumscribed circle of the air inlet openings. Alternatively, protection against foreign bodies and liquids falling in can be implemented by the operator. In this case, this must be specified by the purchaser in the order.

Shaft end up:

In the case of designs with the shaft end pointing upwards, the operator himself must prevent foreign bodies and water from falling in vertically. The ingress of water or liquid along the shaft must also be prevented by the operator.

When installing surface-cooled motors, it must also be ensured that the condensation drain holes are located at the lowest point. If the condensation drain holes are plugged, replace the screws after draining the condensed water and after applying sealant to them. In the case of open condensed water holes, prevent direct exposure to jet water or gushing water. Install the motors carefully on an exactly even surface to avoid distortion when tightening the screws. Where machines are to be coupled, ensure exact alignment. Flexible couplings should be used as far as possible.

The key in the shaft end is secured by the shaft sleeve only for transportation and storage, whereas commissioning or a test run with the key secured only by the shaft sleeve is strictly prohibited due to the risk of the key being thrown out.

When mounting the transmission element (such as coupling, pinion or belt pulley), use mounting devices or heat the part to be mounted. For mounting, the shaft ends have centrings with threads according to DIN 332 Part 2. It is not permissible to knock transmission elements onto the shaft, as the shaft, bearings and other parts of the motor may be damaged.

All elements to be mounted on the shaft end must be dynamically balanced carefully according to the balancing system of the motor (full or half key). The rotors of the motors are balanced with half key. This is marked on the rating plate with the letter H behind the motor number. Motors with the letter F behind the motor number are balanced with full key. The motors must be installed as vibration-free as possible. Special instructions must be followed for motors in low-vibration design. The operator must ensure protection of moving parts and establish operational safety after completing the installation.

Insulation testing

At the time of initial start-up and especially after a longer period of storage, the insulation resistance of the winding to earth and between the phases must be measured. Dangerous voltages occur at the terminals during and directly after the measurement. Therefore, do not touch the terminals under any circumstances, and carefully follow the operating instructions of the megger.

Danger! Establish safety against it being switched on inadvertently. Connect the windings to earth for at least 10 sec. before and after the insulation measurement to dissipate static charge.

The following table is used to assess the insulation resistance. The insulation value R_{is} of the cold motor, i.e., at room temperature of approx. 25°C, must always be assessed, as warm values are not clearly reproducible. For a brand-new motor or after rewinding, the minimum value of the insulation resistance at room temperature must match the values according to point 1. of the table. Transportation and storage under unfavourable conditions may reduce this value without damaging the insulation. Motors that have been stationary for a longer period of time under extreme climatic conditions, and which have no standstill heating (dew formation in the winding) may therefore still be put into operation if the insulation resistance of the cold motor has dropped to values according to point 2. of the table. If the insulation resistance value is below those according to point 2., the windings must be dried or, in special operating cases, they must be cleaned and then dried.

The recovery of the insulation resistance value must be checked after a brief period of operation. Under normal storage conditions and breaks in operation, the insulation resistance value should not drop below values according to point 2. when the motor is cold.

Voltage	Rated voltage < 1.5 kV	Rated voltage > 1.5 kV
Measurement voltage	> 100 V up to max. 500 V	1,000 V
Measurement time	1 min.	
1st winding new or repaired dry 25 °C	$R_{is} > 50 \text{ M}\Omega$	$R_{is} > 100 \text{ M}\Omega$
2nd winding after longer operating time, dry condition unknown, 25 °C	$R_{is} > 1 \text{ M}\Omega$	$R_{is} > 5 \text{ M}\Omega / \text{kV}$

Tab. Insulation resistances

If the values fall below the minimum, the winding must be dried properly until the insulation resistance equals the required value.

Motor connection

The connection must be carried out by a specialist in accordance with the applicable safety provisions. Outside Germany, the relevant national regulations must be applied.

It is absolutely essential to observe the nameplate information.

Compare the type of power input, mains voltage and frequency.

Pay attention to the connection.



Observe the rated current for circuit breaker setting.

For motors with ignition type protection enhanced safety "eb", the t_E time and the relative starting current I_A/I_N must be observed.

Connect the motor according to the terminal diagram provided in the junction box!

Depending on the design, there is an earthing terminal on the housing or on the flanged bearing shield for connecting to earth. All motors also have a protective conductor terminal inside the junction box. Unused cable glands in the junction box must be sealed to protect them against dust and moisture. The general safety and commissioning instructions are applicable to the electrical connection. The cable glands or screw plugs must be approved for the explosive zone. The installation torque values, sealing ranges and clamping ranges of the strain relief specified by the gland manufacturer must always be observed. Connection cables must be selected in accordance with DIN VDE 0100, taking the rated current and the system-dependent conditions (e.g., ambient temperature, type of laying, etc., in accordance with DIN VDE 0298 or IEC / EN 60204-1) into account.



At room temperatures exceeding 40°C, cables with a permissible operating temperature of at least 90°C must be used. This also applies to motors in which special requirements for the cable design are referred to in the data sheet/supplement to the EU type test certificate.

When connecting the motors, particular care must be taken to ensure that the connections in the junction box are established carefully. The nuts of the connecting screws must be tightened firmly without using brute force.

For motors with a terminal board with slotted bolts according to Directive 2014/34/EU (Directive 94/9/EC), only cable lugs according to DIN 46295 should be used for connecting the motor. The cable lugs are fastened using compression nuts with integrated spring washers. Alternatively, a solid round wire with a diameter equivalent to the slot width of the connecting bolt is permissible for the connection. When inserting the supply cables into the junction box, ensure that the cables are strain-relieved. The inside of the junction boxes must be kept clean. The seals must be intact and seated properly. The junction box must always be closed during operation.



Caution! – do not open junction boxes at operating temperature in atmospheres at risk of dust explosion.

On order, the type AK16/5 can be supplied as a separate terminal box for the motors (IE-) KPR/KPER 56 - 132S..T. In this case, the technician undertaking installation work must be authorised to set up installations in potentially explosive atmospheres and must implement the motor connection diagrams. The creep distances and air gaps are complied with by pre-assembling the terminal base (connecting plate) and the rail for PTC resistor or heating tape connection. Protection class IP55 (66) is ensured by

means of a closed base plate with 4 x M4 threads in the arrangement/dimension 56 x 56 and by using the seals and standard parts supplied along with the motors.

Special design of terminal box N-side

In this special design, the junction box is located in front of the fan guard on the N-side of the motor. For this purpose, the stator housing was turned by the manufacturer.

Special marking in the type designation:

KNS ... for sizes 56 to 132.T
 (VEM motors GmbH, Zwickau factory)

KN ... for sizes 112 to 450
 (VEM motors GmbH, Wernigerode)

A separate submission may be required for category 2 motors.

The junction boxes are designed by default with metric threaded holes according to EN 50262 as standard or with NPT threaded holes according to ANSI B1.20.1-1983 as a special design. The tolerance of the threads is 6H according to ISO 965-1.



Caution! – do not open junction boxes at operating temperature in atmospheres at risk of dust explosion.

Terminal box		Terminal board										
Type	Supplementary information	Type	I _B max [A]	Customer connection						Connection type provided by the customer	Connection thread on customer side	a [mm]
				Q _B min [mm²]			Q _B max [mm²]					
				f	m	e	f	m	e			
		KL 155	30	-	2.5		-		4	Bolt/Clamp	M5	-
KA 05-13		KB 5580Ex/d 4.3	34.7	-	4		4		6		M4	
25 A		KB 5590Ex/d 5.2	34.7	-	4		4		6	Bolt/Clamp	M4	-
		KB 5581 Ex	27.5	-			2.5		4		M4	
63 A		KB 4Ex (KS 14A)	72	-	10		-	16		Slotted bolt	S14 x 1.25	6.3 ± 0.2
100/63 A		KB 4Ex (KS 14A)	72	-	10		-	16		Slotted bolt	S14 x 1.25	6.3 ± 0.2
		KB 5121 Ex-3	56.8	-			-	10	16	Bolt/Clamp	M5	-
		VEM 8/6	63	6	6	6	25	25	25		M6/M5	-
		KB5130 Ex	114	-			35			Bolt/U-clamp	M6	-
	With ZW	KB5130 Ex	107.5	-			35			Bolt/U-clamp	M6	-
				-			35			Bolt/U-clamp	M6	-
100 A		KB 4Ex (KS 14A)	72	-	10		-	16		Slotted bolt	S14 x 1.25	6.3 ± 0.2
		KB 5121 Ex-3	56.8	-			-	10	16	Bolt/Clamp	M5	-
		KB5130 Ex	107.5	-			35			Bolt/U-clamp	M6	-
100 AV		KB5130 Ex	107.5	-			35			Bolt/U-clamp	M6	-
200/100 A-SB		KB 4Ex (KS 14A)	72	-	10		-	16		Slotted bolt	S14 x 1.25	6.3 ± 0.2
		KB 5121 Ex-3	56.8	-			-	10	16	Bolt/Clamp	M5	-
		KB 5Ex (KS 18A)	118	-	25		25	35	25	Slotted bolt	S18 x 1.5	9.2 ± 0.2
		KB 5130 Ex	107.5	-			35			Bolt/U-clamp	M6	-
200 A		KB 5Ex (KS 18A)	118	-	25		25	35	25	Slotted bolt	S18 x 1.5	9.2 ± 0.2
	with ZW	KB5130 Ex	107.5	-			35			Bolt/U-clamp	M6	-
		KB5130 Ex	107.5	-			35			Bolt/U-clamp	M6	-
400 A		VEM 10/8	100	8			70			Bolt/Lug clamp	M8/2x M6	-
		KB 5Ex (KS 18A)	118	-			25	35	25	Bolt/U-clamp	M6	
63 AV		KB 5121 Ex-3	56.8	-			-	10	16	Bolt/Clamp	M5	-
	with ZW	KB 5590Ex/d 5.2	34.7	-	4		4	6			M4	

		KB 5590Ex/d 5.2	34.7	-	4		4		6		M4		
63/25 AV		KB 5581 Ex	25.9	-			2.5		4	Bolt/Clamp	M4	-	
		KB 5590Ex/d 5.2	34.7	-	4		-	4			M4		
100/ 63 AV		VEM 8/6	63	6	6	6	25	25	25	Bolt/Clamp	M6/M5	-	
		KB 5121 Ex-3	56.3	-			-	10	16		M5		
		KB 5130 Ex	107.5	-			35				M6		
200 A-SB		VEM 10/8	100	8			70			Bolt/Lug clamp	M8/2x M6	-	
		KB 5130 Ex	107.5	-			35			Bolt/Clamp	M6		
400 A-SB		VEM 10/8	100	8			70			Bolt/Lug clamp	M8/2x M6		
		VEM 16/12	250	12			120			Bolt/Lug clamp	M12/ 2 x M10		
630 A	straight, M75	VEM KLP 630-16p	450	16	25	-	185	240	-	SK type 230/12-p-16	M12 / M8	-	
		VEM KLP 630-16h		95	120	-	240	300	-	SK type 230/12-h-16			
		VEM KLP 630		70		-	300		-	without	M12		
	straight, M63	VEM KLP 630		see above									
	oblique, M75	VEM KLP 630-16p		16	25	-	185	240	-	SK type 230/12-p-16	M12 / M8		-
		VEM KLP 630-16h		95	120	-	240	300	-	SK type 230/12-h-16			
		VEM KLP 630		70		-	300		-	without	M12		
	oblique, M63	VEM KLP 630		see above									
1,000 A	straight, M80	VEM KLP 1000	1 000	70			2 x 240			Busbars	M10	-	
	straight, M75												
	oblique, M80												
	oblique, M75												

$I_{B \max}$ max. rated current

Q_{Bmin} / Q_{Bmax} min./max. Rated cross section

a Slot widths of the connecting bolt (terminal boards according to DIN 22412)

$M_{Tightening}$ Max. tightening torque for connection thread

*) with single-core connection conductor bent into an eyelet

ZW Intermediate plate

Terminal box gasket

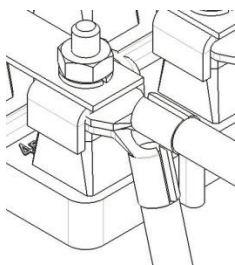
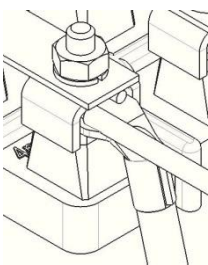
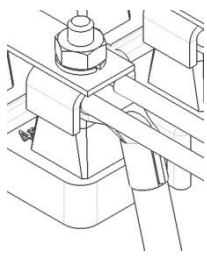
Gasket	Permissible min. coolant temperature
Surface seal, silicone red, 3 mm thick	-40°C
Silicone foam dia. 5 or 8 mm white	
EPDM E 9566, 3 mm thick *)	
EPDM, black, 3 mm thick	-30°C
Foam seal Fermapor, 3 mm **)	-40°C

*) only terminal box KA 05-13

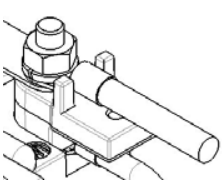
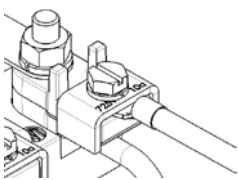
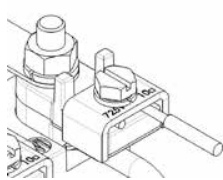
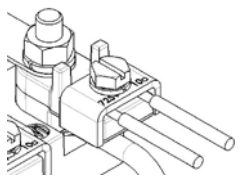
**) only terminal box 25 A and 63 A

Connection options and handling

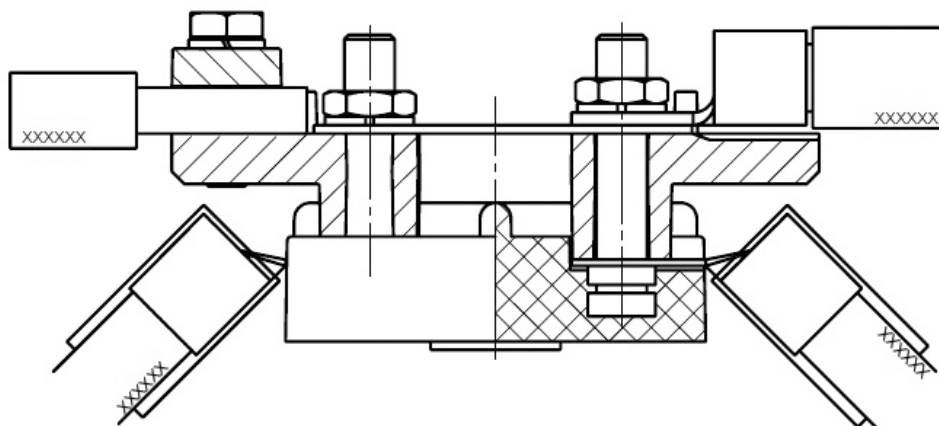
Terminal boards: KL 155; KB 5581Ex; KB 5580Ex/d 4.3; KB 5590Ex/d 5.2; KB 5121Ex-3; KB 5130Ex

		
Connection with cable lug according to DIN 46234	Connection with single conductor and clamp	Connection of two conductors of approximately same thickness with clamp

Terminal board: VEM 8/6

			
Connection with cable lug directly	Connection with cable lug and clamp	Connection with bent single conductor and clamp	Connection of two conductors of approximately same thickness with clamp


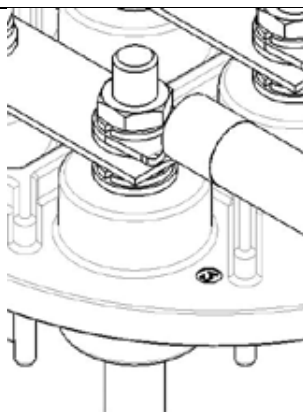
Terminal board: VEM 10/8; VEM 16/12



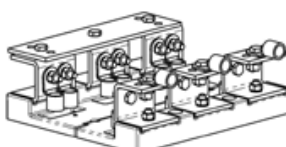
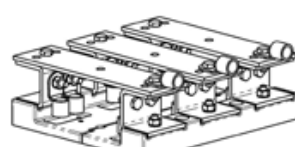
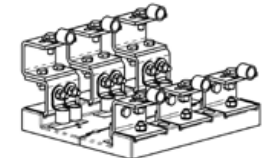
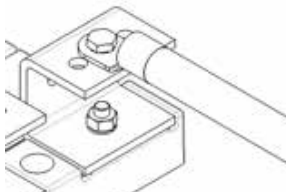
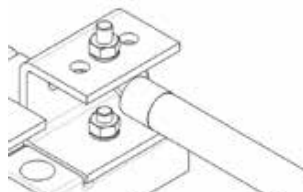
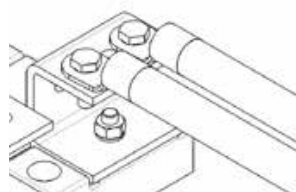
Connection with single conductor

Connection with cable lug

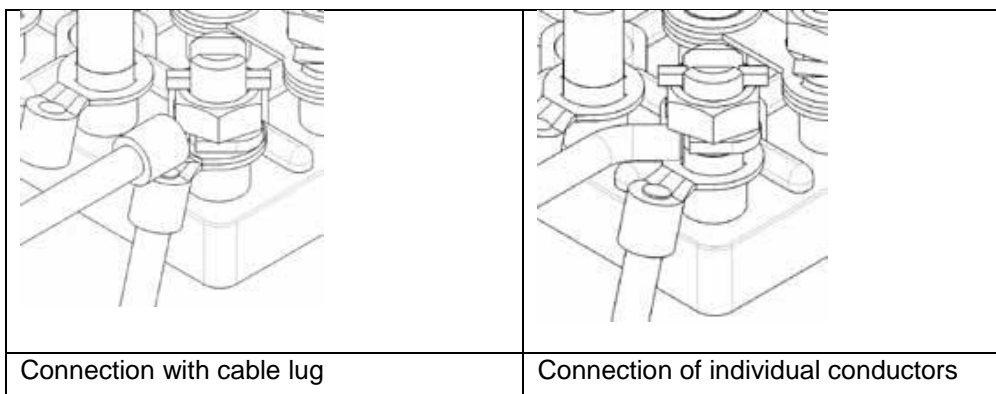
Terminal board: **VEM 10/8; VEM 16/12**

	
<p>Connection without cable lug with clamping piece</p>	<p>Connection with cable lug, possible with connection cross-section from 70 mm²</p>

Terminal board: VEM KLP 1000

Star connection	Delta connection	Star/Delta connection
		
 <p>Connection with cable lug from above</p>	 <p>Connection with cable lug from below</p>	 <p>Connection of multiple cable lugs (also possible from below)</p>

Terminal boards with slotted bolts: KS 14A; KS 18A



Tightening torques connection system (DIN 46200) – values in Nm

Thread dia.	S10x1	S14x1.25	S18x1.5	M4	M5	M6	M8	M10	M12	M16	M20
Terminal base (terminal board/motor)	-	-	-	1.5	2.5	4	7.5	12.5	-	15	-
Clamping bolt	6	10	20	1.2	1.2	3	6	10	15.5	30	52
Screw terminal							7.5		20		
Bracket clamp/Lug clamp	-	-	-	1.2	1.2	3	-	10	-	-	-

VEMoCONTACT

Alternative main connection system via terminal blocks

Area of application: explosion-proof VEM asynchronous motors

The manufacturer's specifications for the main terminal blocks must be observed.

Terminal blocks with lever handle (TopJob®S)

Clamping range: 1 mm² (1.5 mm²)* to 16 mm² (25 mm²)*

Max. rated voltage (UB_{max}): 500 V

When using fine-stranded and flexible single conductors, the next larger down-conductor cross-section can be clamped. The clamping point is opened by pressing the orange lever handle with a freely selectable tool.

High current terminal block (Series 285)

Clamping range: up to 35 mm² max. rated voltage (UB_{max}): 800 V

The clamping point is opened by turning the operating tool anticlockwise (blade 5.5 mm). With the conductor entry open, press the orange button (locking function).

The connection point remains open and can be clamped. (See handling high-current terminal 35 mm²)

Versions with terminal blocks, variant with spring-loaded terminal block (Series 22xx) or high-current terminal block (Series 285)

Terminal box	Terminal board								
Type	Type	I _B max [A]	Q _B min [mm²]			Q _B max [mm²]			Connection type provided by the customer
			f	m	e	f	m	e	
63/25 AV	2204-1201 (-1207)**	30	-			4			Push-in cage clamp
100/ 63 A-SB	2210-1201 (-1207)**	50				10			
100 A-SB	2216-1201 (-1207)**	65				16			
200/ 100 A-SB	285-935 (-137/999-950)	75	6		6	35		35	Power cage clamp

**) max. rated voltage U_Bmax 500 V

Axial shaft seal (AWD)

Series (IE.-)KPER/O 63 to 132T, (IE.-)KPR/O 56 to 100, (IE.-)K1.R 112 to 315, (IE.-)K4.R 355 to 400, (IE.-)W... 112 to 355, (IE.-)W...355 to 450

Sealing material AWD	Permissible min. coolant temperature
FKM	-20°C
FPM 80, FKM	-25°C
Silicone	-30°C

Tightening torques for screws on the junction box, bearing shields and bearing covers

Series (IE.-)KPER/O 63 to 132T, (IE.-)KPR/O 56 to 100

Type		Design	Bearing shield		Fixed bearing cover		Terminal box	
(IE.-) KPER/ O	(IE.-) KPR/O		DS	NS	DS	NS	respecti vely Adapter	Cover
			Screws/Screw tightening torque MA					
63...	56...	all	M 4 2.0 Nm	M 4 2.0 Nm	M 4 1.5 Nm (for (IE.-) KPR/O 100 L M 5 2.0 Nm)	M 4 1.5 Nm	M 4 2.5 Nm	M 5 1.0 Nm
71...	63...							
80...	71...		M 5 4.0 Nm	M 5 4.0 Nm				
90...	80...		M 6 7.0 Nm	M 6 7.0 Nm				
100L...	90...							
100LX, 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 5 1.0 Nm
		B5, B14	M 8 15.0 Nm					
132S...	-	B3, B14- FT130	M 8 10.0 Nm					
T		B5, B14	M 8 15.0 Nm					
								M 4 2.0 Nm

Series (IE.-)K1.R 112 to 315, (IE.-)K4.R 355 to 400, (IE.-)W... 112 to 355, (IE.-)W... 355 to 450

Thread dia.	M5	M6	M8	M10	M12	M16	M20	M24
Load stands	-	-	-	-	-	150 Nm	250 Nm	400 Nm
Bearing shields	-	-	25 Nm	45 Nm	75 Nm	170 Nm	275 Nm	-
Bearing cover	5 Nm	8 Nm	15 Nm	20 Nm	20 Nm	-	-	-
Terminal box	-	4 Nm	7.5 Nm	12.5 Nm	-	20 Nm	-	-

Motors of ignition protection type enhanced safety “eb” with cable brought out (including the version with flat junction box certified separately according to Directive 2014/34/EU (Directive 94/9/EC))

The outgoing cable is designed with 4 or 7 conductors according to the customer's requirement. If a terminal box is supplied complete and the connection is made in an Ex eb-protected room, the following instructions must be observed:

1. The terminal box must be mounted in such a way that it meets at least the IP54 degree of protection.
2. In order to comply with the required air gaps, the terminal base must be fixed in accordance with the specified drilling pattern.
3. The inner earth conductor from the motor (green/yellow) with crimped cable lug must be placed under the clamp of the earth connection.
4. The motor leads (cables) are to be soldered softly into the angled cable lugs of the terminal base. Ensure correct connection U1, V1, W1 (U2, V2, W2).

When mounting the unit, make sure that the motor number on the motor nameplate and the riveted plate in the terminal box cover match.

Protective measures against impermissible heating

Unless otherwise specified in the type test certificate or on the nameplate regarding the mode of operation and tolerances, electrical machines are designed for continuous operation and normal, non-frequent start-ups in which no significant start-up heating occurs. The motors should be deployed only for the operating mode specified on the rating plate. If the rating plate does not specify any operating mode, the motors should be operated only in continuous mode S1.

The range A of the voltage and frequency limits in IEC/EN 60034-1 (DIN VDE 0530, Part 1) - voltage $\pm 5\%$, frequency $\pm 2\%$, waveform, mains symmetry - must be observed to ensure that the heating remains within the permissible limits. Motors for range B of the voltage limits are marked separately on the nameplate.

Larger deviations from the rated values may increase the heating of the electrical machine beyond permissible limits. This must be prevented in every operating condition by current-dependent, time-delayed protective devices. Motor circuit breakers with bimetallic tripping devices or electronic motor circuit breakers complying with the following standards must be used:

- DIN EN IEC 60947-4-1 (VDE 0660-102),
- DIN EN 60947-4-2 (VDE 0660-117),
- DIN EN 60947-2 (VDE 0660-101)

In addition, these protective devices must pass the functional safety test in accordance with DIN EN 50495. Windings in delta connection must be protected in such a way that the tripping devices or relays are connected in series with the phase winding. The nominal value of the phase current, i.e., 0.58 times the rated motor current, must be used as the basis for selecting and adjusting the tripping devices. If such a circuit is not possible, suitable circuit breakers, e.g., with phase failure monitoring, must be used. In the case of pole-changing motors, current-dependent delayed tripping devices or relays must be provided for each speed stage, which must be interlocked against each other.




With ignition protection type enhanced safety “eb”, even the start-up is monitored. Hence, the protective must shut down within the t_E time specified for the respective temperature class in the case of a blocked rotor. The requirement is met if the tripping time – to be taken from the tripping characteristic (initial temperature 20 °C) for the ratio I_A/I_N – is not greater than the specified t_E time.

Electrical machines of ignition protection type enhanced safety “eb” for heavy-duty start-up (ramp-up time $> 1.7 \times t_E$ time) must be protected by a start-up monitor in accordance with the information in the certificate of conformity and must be explicitly certified for this use.



Thermal machine protection by direct temperature monitoring of the winding is permissible if this is certified and specified on the rating plate. It consists of temperature sensors according to DIN 44081 / 44082, which in conjunction with tripping devices with the protection class identification

 II (2) G ensure explosion protection. In the case of pole-changing motors, separate, mutually interlocked protective devices are required for each speed stage.

Supplementary equipment

Explosion-proof motors may be equipped with supplementary devices as an option:

Supplementary thermal motor protection

Temperature sensors (PTC thermistors, KTY or PT100) may be installed in the motor to monitor the stator winding temperature. For their connection, appropriate auxiliary terminals for auxiliary circuits are provided either in the main junction box or in supplementary junction boxes. They are connected according to the enclosed terminal diagram.

Thermal motor protection as full protection

The use of the thermal winding protection as full motor protection is permissible only if this operation has been tested separately and certified by a notified body. In this case, the identification on the nameplate is made by the indication of the t_A time instead of the t_E time and the text information:

“Operation only with functionally tested PTC tripping device with protection type designation  II (2) G”.



Standstill heating

The heating tapes must meet the requirements of Directive 2014/34/EU (Directive 94/9/EC). The heating power and supply voltage are indicated on the motor nameplate. For their connection, appropriate terminals for auxiliary circuits are provided either in the main junction box or in supplementary junction terminal boxes. They are connected according to the enclosed terminal diagram. The standstill heater is to be switched on only after the motor has been shut down. It should not be switched on while the motor is running.

Forced ventilation unit

The forced cooling fans must meet the requirements of Directive 2014/34/EU (Directive 94/9/EC). The forced ventilation unit ensures that heat loss is dissipated when the main motor is in operation. During operation of the main motor, the forced ventilation motor must be switched on. After switching off the main motor, the forced ventilation must continue to operate for some time depending on the temperature.

For motors with forced cooling fan units dependent on the direction of rotation, it is essential to observe the direction of rotation (see direction of rotation arrow). Only those forced cooling fan units supplied by the manufacturer should be used. The forced ventilation unit must be connected in accordance with the valid terminal diagram supplied in the junction box.

Fitting with RFID transponder (memory motor), NFC chip and QR code

As an option, you may fit the equipment with RFID transponder (short: TAG) or QR code as memory motor, special marking MM according to EW-N 1002, sheet 13 or according to Sp....

Alternatively, the version with NFC chip and/or QR code is possible.



In areas with potentially explosive atmospheres, the data should be read out only with a reader approved in accordance with Directive 2014/34/EU (Directive 94/9/EC).

External sources of heat and cold

If external sources of heat or cold are present, no additional measures are necessary if the temperatures at the attachment point do not exceed the maximum permissible coolant temperature. If this is exceeded or if effects on the operating temperatures or maximum surface temperatures are expected, suitable measures must be adopted to maintain and verify explosion protection. In case of doubt, consult the manufacturer.

Maintenance and Repair

Maintenance, repair and modifications to explosion-protected machines must be carried out in Germany in compliance with the Industrial Safety Regulations (BetrSichV), Explosion Protection Regulations (ExVO, 11th GSGV), the safety instructions and the descriptions in the general maintenance instructions.

Outside Germany, the relevant national regulations must be observed!

Other instructions and information on testing and maintenance of electrical systems or repair and overhaul of electrical equipment are given in IEC/EN 60079-17 and IEC/EN 60079-19. Work affecting explosion protection includes e.g.,

- Repairs to the stator winding and terminals,
- Repairs to the ventilation system,
- Repairs to the bearing and sealing on dust explosion-proof motors (Ex 2D, 3D).

These should be carried out only by VEM service personnel or by/in authorised workshops by qualified personnel who have the necessary knowledge based on their professional education, experience and instruction. Repairs must be documented in accordance with DIN EN IEC 60079-0. Measures for securing mechanical parts against unintentional restart or for electrical disconnection must be implemented and followed.

With dust explosion-proof motors, the dust explosion protection depends considerably on the local conditions. For this reason, the motors in these areas must be checked and serviced regularly.



Thick layers of dust lead to an increase in temperature on the surface of the motor due to thermal insulation. Hence, dust deposits on motors or even their complete burial must be avoided as far as possible by appropriate installation and ongoing maintenance.

The specified surface temperature of the motor is valid only if the dust deposits on the motor do not exceed a thickness of 5 mm. These initial conditions (type of dust, maximum layer thickness, etc.) must be ensured. The motor should not be opened until sufficient time has elapsed to allow the internal temperatures to drop to non-ignitable levels. If the motors have to be opened for maintenance or repair, this work should be carried out in a dust-free room as far as possible. If this is not possible, suitable measures must be adopted to prevent dust from entering the housing. During disassembly, particular care must be taken not to damage the parts necessary for the tightness of the construction, such as seals, flat surfaces, etc.

Careful and regular maintenance, inspections and reviews are necessary to detect and rectify potential faults in time before consequential damage may occur. Since the operating conditions cannot be defined exactly, only general deadlines can be specified, assuming trouble-free operation. They must always be adapted to the local conditions (pollution, load, etc.). The instructions given in the standards EN 60079-17 and EN 60079-19 must always be observed.



Unacceptable deviations identified during inspections must be rectified immediately.

What is to be done?	Time interval	Deadlines
Initial inspection	After approx. 500 hours of operation	After 6 months at the latest
Checking the air paths and surface of the motor	depending on the local degree of pollution	
Applying grease/lubricant (option)	See nameplate or lubrication plate	
Main inspection	Approx. 8,000 hours of operation	Once a year
Drain condensed water	depending on climatic conditions	

Initial inspection

Carry out the initial inspection after approx. 500 hours of operation, but after a maximum of half a year at the latest. Carry out the following checks:

Measure	When the motor is running	At standstill
Checking compliance with electrical parameters	X	
Check whether the running smoothness and running noise have deteriorated	X	
Check that the permissible temperatures at the bearings are not exceeded	X	
Check that the cooling air flow is not impaired	X	X
Check that no cracks or subsidence have occurred in the foundation	X	X
Check that all fixing screws for electrical and mechanical connections are firmly tightened		X

Main inspection

Carry out the main inspection after approx. 8,000 hours of operation or after one year at the latest. Carry out the following checks:

Measure	When the motor is running	At standstill
Checking compliance with electrical parameters	X	
Check whether the running smoothness and running noise have deteriorated	X	
Check that the permissible temperatures at the bearings are not exceeded	X	
Check that the cooling air flow is not impaired	X	X
Check that no cracks or subsidence have occurred in the foundation	X	X
Check that the alignment of the motor is within the permissible tolerances		X
Check that all fixing screws for electrical and mechanical connections are firmly tightened		X
Check that the insulation resistances of the winding are sufficiently large		X
Check that all potential and earth connections, as well as shield connections, are correctly connected and proper contact made		X
Check the cleanliness of the machine surface and check that there are no dust deposits present > 5mm		X

Inspection in the event of faults

Exceptional operating conditions, such as overload or short circuit, are faults that excessively stress the machine electrically and mechanically. Natural disasters may also trigger exceptional operating conditions. Perform main inspection immediately after such faults.



The necessary lubrication intervals for rolling bearings differ from the inspection intervals and must be observed separately

Up to size 315M, the machines have rolling bearings with lifelong grease lubrication as standard. From size 315 MX, they are equipped with a re-lubrication device, which is also available as an option for the lower size range. Refer to the general installation, operating or maintenance instructions, and/or the nameplate or lubrication plate for information on bearings and lubrication.



Maintenance work (except re-lubrication work) may be carried out only when the machine is at a standstill. It must be ensured that the machine is secured against being switched on and that it is marked with an appropriate sign.

Moreover, safety instructions and accident prevention regulations must be observed when using oils, lubricants and cleaning agents from the relevant manufacturers! Adjacent live parts must be covered! It must be ensured that the auxiliary circuits, e.g., standstill heater, are disconnected from the power supply. For the version with condensate drain hole, the drain plug must be coated with suitable sealant (e.g., Eppele 28) before resealing it!

The work must be identified by an additional repair tag with the following information:

- Date,
- Company executing the work,
- type of repair, if necessary,
- if applicable, the badge of the officially approved person qualified to carry out the inspection in line with the industrial safety regulations (BetrSichV).



If the work is not carried out by the manufacturer, it must be accepted by a competent person approved officially for testing in line with the industrial safety regulations (BetrSichV). This person must issue written certification to this effect or affix their mark of conformity to the machine. Abroad, the relevant national regulations must be observed.

Varnishing and impregnation after repair or maintenance work



When repainting explosion-proof motors or impregnating a complete stator after rewinding, thicker layers of varnish or resin may appear on the machine surface. These may lead to electrostatic charge, so that there is a risk of explosion in the event of discharge. Charging processes nearby may also lead to electrostatic charging of the surface or parts of the surface, and there may be a risk of explosion due to discharge. The requirements according to IEC/EN 60079-0: "Equipment – General requirements", section 7.4 and TRBS 2153 must always be complied with, among other things, by:

Restricting the overall varnish or resin layer thickness according to the explosion group to

- IIA, IIB: Total layer thickness ≤ 2 mm
- IIC: Total layer thickness ≤ 0.2 mm

Restricting the surface resistance of the varnish or resin used to

- IIA, IIB, IIC, III surface resistance $\leq 1\text{G}\Omega$ for motors of groups II and III

Breakdown voltage ≤ 4 kV for explosion group III (dust only, measured by the thickness of the insulating material according to the method described in IEC 60243-1). Furthermore, the specifications of E DIN EN 60079-32: "Electrostatic Hazards," especially Annex A: "Fundamentals of Static Electricity," Annex B: "Electrostatic Discharges in Special Situations" and Annex C: "Flammability of substances" should be taken into account.

Spare parts



With the exception of standardised, commercially available and equivalent parts (e.g., rolling bearings), only original spare parts (see spare parts list) should be used. This applies in particular to seals and connection parts. The following information is required when ordering spare parts:

- Spare part designation
- Motor type

- Motor number

Storage

For outdoor storage or use, a superstructure or appropriate cover is recommended. Avoid long-term exposure to direct intense sunlight, rain, snow, ice or dust.

Long-term storage (beyond 12 months)

Long-term storage must be made in a vibration-free environment in closed, dry rooms within a temperature range of -20 to +40°C and in an atmosphere free from corrosive gases, vapours, dusts or salts. The motors should preferably be transported and stored in their original packaging. Storage and transportation on the fan guards is not permissible. Unprotected metallic surfaces, such as shaft ends and flanges, must also be provided with long-term corrosion protection in addition to the temporary corrosion protection provided at the factory. If the motors accumulate dew under ambient conditions, precautions must be taken to protect them from moisture. In this case, special packaging with airtight sealed film or packaging in plastic film with moisture-absorbing materials is required. Packings of a moisture-absorbing substance must be inserted in the terminal boxes of the motors.

For transportation, the eye-bolts/load stands of the motors must be used with suitable slings. The eye-bolts/load stands are meant only for lifting the motors without additional attachments such as base plates, gearboxes, etc.

Motors with reinforced bearings are supplied with a transportation lock. The transportation lock at the end of the shaft should be removed only when the motor is installed and before switching it on.

Rotate the shafts at least once a year to avoid permanent standstill marks. Longer storage periods reduce the grease service life of the bearings (ageing). With open bearings, inspection of the grease condition is recommended once a year. If de-oiling or contamination of the grease is evident, the grease must be replaced. Closed bearings (ZZ 2RS) must be replaced after a storage period > 48 months.

Disposal

When disposing of the machines, the national regulations applicable must be observed. Moreover, it must be noted that oils and greases are disposed of in accordance with the waste oil regulations. They may not be contaminated with solvents, cold cleaners and paint residues.

Before recycling, the individual materials should be separated. The most important components are grey cast iron (housing), steel (shaft, stator and rotor laminations, small parts), aluminium (rotor), copper (windings) and plastics (insulation materials such as polyamide, polypropylene, etc.). Electronic components such as printed circuit boards (converters, encoders, etc.) are prepared separately.

Terminal board circuits



In standard design, the surface-cooled motors are suitable for both directions of rotation. Exceptions are the 2-pole motors from size 355 onwards and low-noise motors, which are identified by a "G" behind the pole number. By default, they are designed for fans that are dependent on the direction of rotation. When using fans depending on the direction of rotation or provided with reverse locks, a direction of rotation arrow is affixed to the fan guard.

The terminals U1, V1, W1 on phases L1, L2, L3 (in alphabetical or natural order) always result in clockwise rotation. However, if the machine is marked with "DL" in the type designation, the motor is already wired up for anticlockwise rotation.

The direction of rotation can be reversed at the time of switching on the motor by interchanging two mains conductors on the terminal board of the motor.



Changing the direction of rotation is not permissible for the version with reverse locks and/or a fan dependent on the direction of rotation.

For a machine with only one shaft end or two shaft ends of different thickness, the direction of rotation is the direction of rotation of the rotor that an observer sees when looking at the front side of the only or thicker shaft end.



Each motor is supplied with a binding terminal diagram according to which the connection must be made. The auxiliary circuits must be connected in accordance with the supplementary terminal diagrams that are also enclosed.

Information on cable glands approved for explosion protection

The junction boxes are designed by default with metric threaded holes according to EN 50262 as standard or with NPT threaded holes according to ANSI B1.20.1-1983 as a special design. The tolerance of the threads is 6H according to ISO 965-1. At the time of delivery, these are sealed with ATEX-certified screw plugs, ATEX-certified cable glands or a non-certified sealing plug.

For connection of the machine, only those cable glands that are designed according to the Directive 2014/34/EU (Directive 94/9/EC) and have a minimum protection class of IP 55 or according to the protection class of the motor must be used.

For motors with the ignition protection type protection provided by enclosure "t", which require protection class IP 6X, the cable entries and sealing plugs must be designed according to Directive 2014/34/EU (Directive 94/9/EC) and they must have minimum protection class of IP 65.



It is pointed out that the sealing plug(s) must be replaced with a certified insert or screw plugs before putting the motor into service. All unused cable entry openings must be sealed with sealing plugs of the appropriate minimum protection class approved in accordance with Directive 2014/34/EU (Directive 94/9/EC). Plugs already existing must be checked for compliance with this specification and replaced, if necessary.

The thread type is specified on the equipment (nameplate or junction box). Alternatively, information about the insertion threads, their number and position is specified in the dimensional drawing of the motor. Certified cable glands are used.

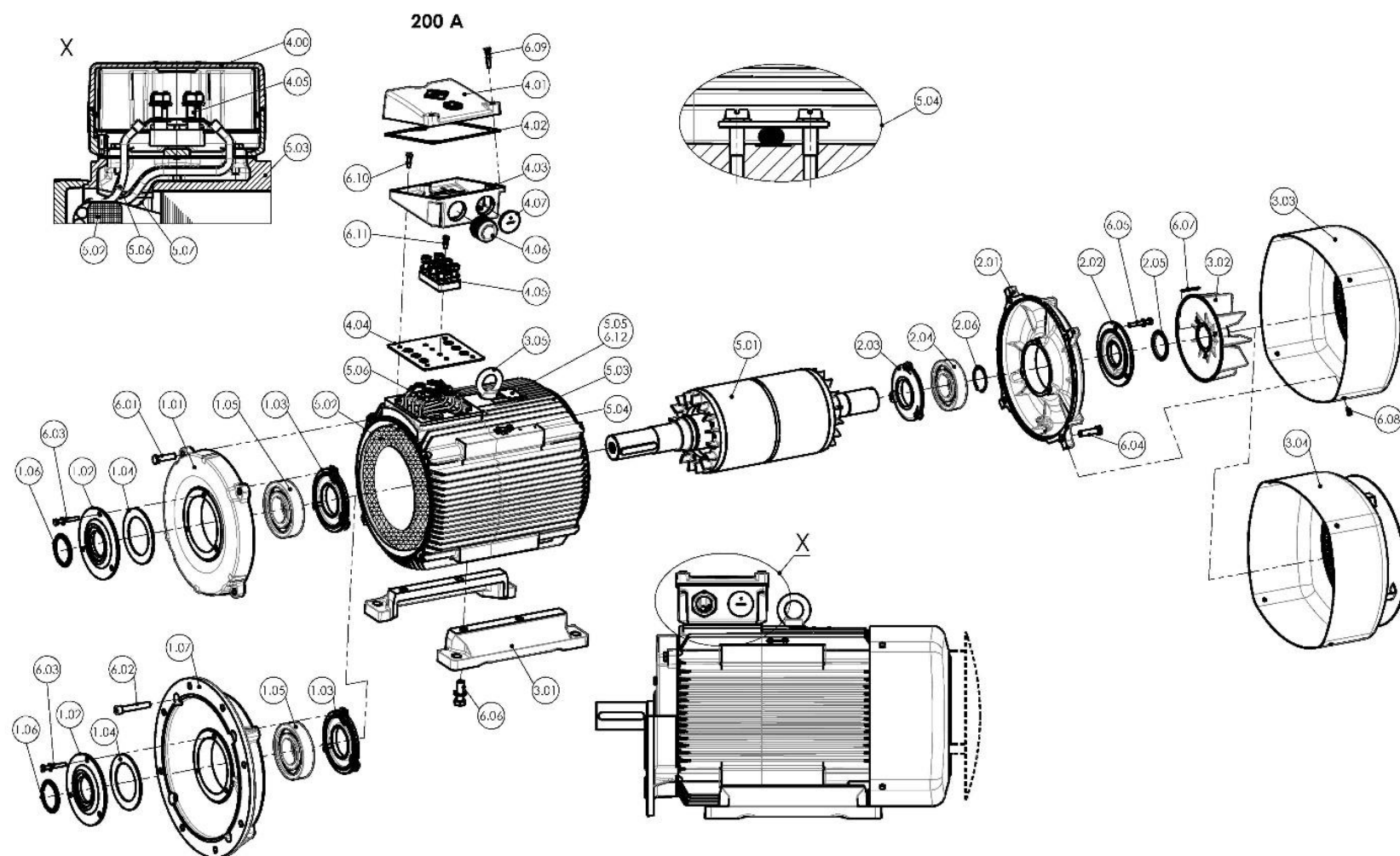
For the range (IE.-)KPER/O 63 to 132(T) and (IE.-)KPR/O 56 to 112 a sealing ring made of NBR material is required for assembly of the ATEX-certified screw plugs and ATEX-certified cable glands.

If cable glands or screw plugs certified according to Directive 2014/34/EU (Directive 94/9/EC) (ATEX) from other manufacturers are used, attention must be paid to their manufacturer's specifications.

Aufbau der Motoren bis Baugröße 315 / 355 ohne Innenkühlkreislauf

Construction of motors to size 315 / 355 without internal cooling circuit

Bauteil (Part)	Bezeichnung (Designation)
1.01	Lagerschild, D-Seite (End shield, Drive-end)
1.02	Lagerdeckel D-Seite, außen (Bearing cover, Drive-end, external)
1.03	Lagerdeckel D-Seite, innen (Bearing cover, Drive-end, internal)
1.04	Tellerfeder, D-Seite (Disc spring, Drive-end)
1.05	Wälzlager, D-Seite (Antifriction bearing, Drive-end)
1.06	Gammaring, D-Seite (Gamma-ring, Drive-end)
1.07	Flanschlagerschild (Flange end shield)
2.01	Lagerschild, N-Seite (End shield, Non-drive-end)
2.02	Lagerdeckel N-Seite, außen (Bearing cover, Non-drive-end, external)
2.03	Lagerdeckel N-Seite, innen (Bearing cover, Non-drive-end, internal)
2.04	Wälzlager, N-Seite (Antifriction bearing, Non-drive-end)
2.05	Gammaring, N-Seite (Gamma-ring, Non-drive-end)
2.06	Sicherungsring, N-Seite (Lock ring, Non-drive-end)
3.01	1 Paar Motorfüße (1 pair of motor feet)
3.02	Lüfter (Fan)
3.03	Lüfterhaube (Fan cover)
3.04	Lüfterhaube mit Schutzdach (Fan cover with canopy)
3.05	Ringschraube (Lifting eye bolt)
4.00	Klemmenkasten, komplett (Terminal box, complete)
4.01	Klemmenkastendeckel (Terminal box cover)
4.02	Dichtung Klemmenkastendeckel (Terminal box cover gasket)
4.03	Klemmenkastenunterteil ((Terminal box base)
4.04	Dichtung Klemmenkastenunterteil (Terminal box base gasket)
4.05	Klemmenplatte (Terminal plate)
4.06	Kabeleinführung (Cable gland)
4.07	Verschlussschraube (Screw plug for gland opening)
5.01	Läufer, komplett (Rotor, complete)
5.02	Ständerblechpaket (Stator core, whited)
5.03	Gehäuse (Motor housing)
5.04	Erdungsanschluss (Protective earth conductor)
5.05	Leistungsschild (Rating plate)
5.06	Wicklungsableitung (Lead from winding)
5.07	Kabelschutz (Mechanical cable protection)

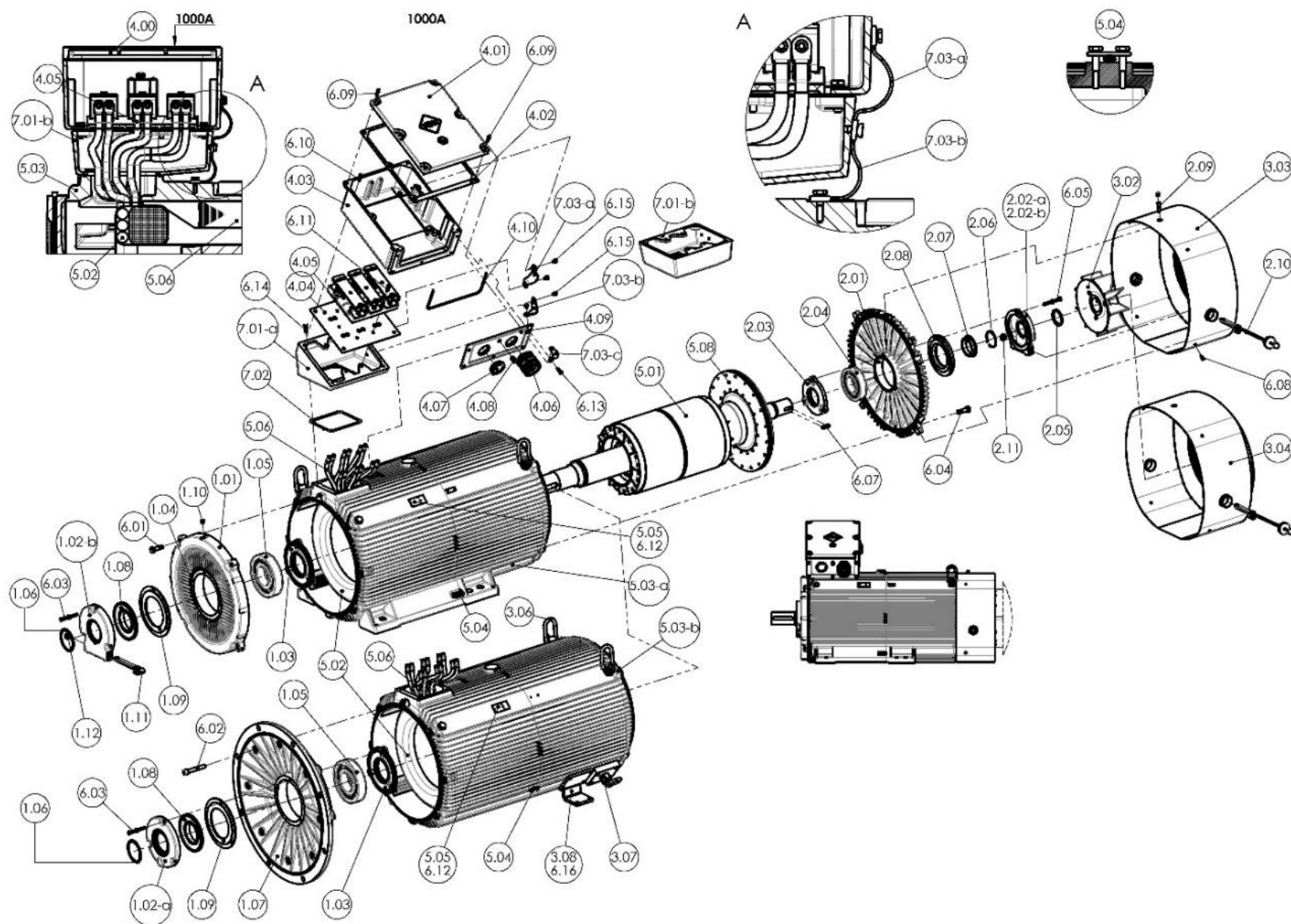


Aufbau der Motoren ab Baugröße 355 (bis 450) mit Innenkühlkreislauf

Construction of motors from size 355 (to 450) with internal cooling circuit

Bauteil (Part)	Bezeichnung (Designation)
1.01	Lagerschild, D-Seite (End shield, Drive-end)
1.02-a	Lagerdeckel D-Seite, außen (Bearing cover, Drive-end, external)
1.02-b	Lagerdeckel D-Seite, außen, für Fettentnahmeeinrichtung (Bearing cover, Drive-end, external, for grease removal device)
1.03	Lagerdeckel D-Seite, innen (Bearing cover, Drive-end, internal)
1.04	Tellerfeder, D-Seite (Disc spring, Drive-end)
1.05	Wälzlager, D-Seite (Antifriction bearing, Drive-end)
1.06	Gammaring, D-Seite (Gamma-ring, Drive-end)
1.07	Flanschlagerschild (Flange end shield)
1.08	Schleuderscheibe D-Seite (Centrifugal disc Drive-end)
1.09	Leitscheibe D-Seite (Guide disk Drive-end)
1.10	Schmiernippel, D-Seite (Grease nipple Drive-end)
1.11	Fett-Entnahmeeinrichtung D-Seite (Fat removal device Drive-end)
1.12	Verschlussschraube Lagerdeckel, D-Seite, (Bearing cap screw plug Drive-end)
2.01	Lagerschild, N-Seite (End shield, Non-drive-end)
2.02-a	Lagerdeckel N-Seite, außen (Bearing cover, Non-drive-end, external)
2.02-b	Lagerdeckel N-Seite, außen, für Fettentnahmeeinrichtung (Bearing cover, Non-Drive-end, external, for grease removal device)
2.03	Lagerdeckel N-Seite, innen (Bearing cover, Non-drive-end, internal)
2.04	Wälzlager, N-Seite (Antifriction bearing, Non-drive-end)
2.05	Gammaring, N-Seite (Gamma-ring, Non-drive-end)
2.06	Sicherungsring, N-Seite (Lock ring, Non-drive-end)
2.07	Schleuderscheibe, N-Seite (Sling disc, Non-Drive-end)
2.08	Leitscheibe, N-Seite (Guide disc, Non-drive-end)
2.09	Schmiernippel, N-Seite (Grease nipple Non-drive-end)
2.10	Fett-Entnahmeeinrichtung N-Seite (Fat removal device Non-drive-end)
2.11	Verschlussschraube Lagerdeckel, N-Seite, (Bearing cap screw plug Non-drive-end)
3.00	Lüfter (Fan)
3.03	Lüfterhaube (Fan cover)
3.04	Lüfterhaube mit Schutzdach (Fan cover with canopy)
3.05	Ringschraube (Lifting eye bolt)
3.06	Lastbock (Attached eyes)
3.07	Wirbelbock (eddy Bock)
3.08	Befestigungswinkel (mounting brackets^)
4.00	Klemmenkasten, komplett 1.000 A(Terminal box, complete 1.000 A)
4.01	Klemmenkastendeckel (Terminal box cover)
4.02	Dichtung Klemmenkastendeckel (Terminal box cover gasket)
4.03	Klemmenkastenunterteil ((Terminal box base)
4.04	Dichtung Klemmenkastenunterteil (Terminal box base gasket)

4.05	Klemmenplatte (Terminal plate)
4.06	Kabeleinführung (Cable gland)
4.07	Verschlussschraube (Bearing cap screw plug)
4.08	Kabeleinführung für Hilfsanschluss (Cable entry for auxiliary connection)
4.09	Abschlussstück (End piece)
4.10	Dichtung für Abschlussstück (Seal for end piece)
5.01	Läufer, komplett (Rotor, complete)
5.02	Ständerblechpaket (Stator core, whited)
5.03	Gehäuse (Motor housing)
5.03-a	Gehäuse mit Motorfüßen IM B3 IM B35 (Housing with motor feet IM B3 IM B35)
5.03-b	Gehäuse ohne Motorfüße IM V1 (Gehäuse ohne Motorfüße IM V1)
5.04	Erdungsanschluss (earth connection)
5.05	Leistungsschild (Rating plate)
5.06	Wicklungsableitung (Lead from winding)
5.07	Kabelschutz (Mechanical cable protection)
7.00	Zwischenflansch (intermediate flange)
7.01-a	Zwischenflansch schräg 1.000 A, (intermediate flange inclined 1.000 A)
7.01-b	Zwischenflansch gerade 1.000 A, (intermediate flange straight 1.000 A)
7.02	Dichtung Zwischenflansch, (Gasket intermediate flange)
7.03-a	Masseband, (Earth strap)
7.03-b	Masseband, (Earth strap)
7.03-c	Masseband, (Earth strap)



EU Declaration of Conformity (according to Annex VII of EC Directive 2014/34/EU)



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

VEM motors GmbH
Werk Zwickau
Äußere Dresdner Straße 35
D-08066 Zwickau

Product name: **Explosion-protected three-phase asynchronous motors with squirrel-cage rotor of the series (IE*-)K... / (IE*-)K8.. (Y2, Y3) / (IE*-)W... / (IE*-)B...**
The additional mark in front of the series with IE * * = 1, 2, 3, 4 or as suffix Y2, Y3 indicates the energy efficiency class of the motors according to EN / IEC 60034-30-1

The object of the declaration described above is in conformity with the relevant Union harmonization legislation:
2014/34/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 equipment and protective systems intended for use in potentially explosive atmospheres (recast),

Official Journal of the European Union L96/309-356 of 29.03.2014

2006/42/EG

Directive of the European Parliament and of the Council of 17. May 2006 on machinery, and amending Directive 95/16/EC (recast), Official Journal of the European Union L157/24-86 of 09.06.2006

2011/65/EU

Directive of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment Official Journal of the European Union L174/88-110 of 01.07.2011

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 L96/79-106 of 29.3.2014

This declaration of conformity is issued under the sole responsibility of the manufacturer.

We confirm conformity of the product indicated above with the standards:

Reference number and date of issue

EN 60079-0:2018	[IEC 60079-0:2017]
EN 60079-1:2014/AC:2018	[IEC 60079-1:2014/COR1:2018]
EN IEC 60079-7:2015/A1:2018	[IEC 60079-7:2015/AMD1:2017]
EN 60079-15:2010	[IEC 60079-15:2010]
EN 60079-31:2014	[IEC 60079-31:2013]
EN 60034-1:2010+Cor.:2010	[IEC 60034-1:2010, modified]

with all relevant parts and supplements of EN 60034-.. [IEC 60034-..]

The motors for which an EC type examination certificate from a notified body or a type examination certificate of an independent test laboratory is available, but it is related to some older standard editions, than these motors also fulfil the basic requirements for security and health protection from directive 2014/34/EU (ATEX). The designated product is intended for incorporation into a machinery, and it must not be put into operation until the relevant machinery into which the product has been incorporated has been declared being in conformity with the provisions of Directive 2006/42/EC.

The quality assurance systems of the manufacturers are certified by IBExU Institut für Sicherheitstechnik GmbH, notified body No. 0637 with approval no. IBExU20ATEXQ011 and IBExU20ATEXQ012.

Wernigerode, 2019-09-16

























Dr. Koch
Managing Director
VEM motors GmbH

Perplies
Explosion Protection Representative
Wernigerode

Blankenhagen
Explosion Protection Representative
Zwickau

This declaration confirms compliance with the above-mentioned directives but is not a guarantee of product liability.

Series (IE*-)K... / (IE*-)K8.. (Y2, Y3) / (IE*-)W... / (IE*-)B...

Equipment type IEC-size	EU	NB	Group/ category/ G (Gas) or D (Dust)	Type of protection, temperature class, equipment protection level ¹⁾
(IE*-)K... 56 up to 450 (IE*-)W... 63 up to 450 (IE*-)B... 80 up to 450 (IE*-)K8.. 63 up to 450... (Y2, Y3)	CE	0637	 II 2G	Ex db IIC T3...T6 or Ex db IIC T3...T6 Gb or Ex d IIC T3...T6 or Ex d IIC T3...T6 Gb
	CE	0637	 II 2G	Ex db eb IIC T3...T6 or Ex db eb IIC T3...T6 Gb or Ex de IIC T3...T6 or Ex de IIC T3...T6 Gb
	CE	0637	 II 2G	Ex db IIB+H2 T3...T6 or Ex db IIB+H2 T3...T6 Gb or Ex d IIB+H2 T3...T6 or Ex d IIB+H2 T3...T6 Gb
	CE	0637	 II 2G	Ex db eb IIB+H2 T3...T6 or Ex db eb IIB+H2 T3...T6 Gb or Ex de IIB+H2 T3...T6 or Ex de IIB+H2 T3...T6 Gb
	CE		 II 3G	Ex ec IIC T2, T3 or T4 Gc (Ex nA IIC T2, T3 or T4 Gc)
	CE	0637	 II 2G	Ex eb IIC T1/T2, T3 or T4 Gb (Ex e IIC T1/T2, T3 or T4 Gb)
	CE		 II 3D	Ex tc IIIB TX°C Dc or Ex tc IIIC TX°C Dc ²⁾
	CE	0637	 II 2D	Ex tb IIIC TX°C Db
	CE	0637	 II 2G  II 2D	Ex db IIC T3...T6 or Ex db IIC T3...T6 Gb or Ex d IIC T3...T6 or Ex d IIC T3...T6 Gb or optionally Ex tb IIIC T200 °C - T85°C Db
	CE	0637	 II 2G  II 2D	Ex db eb IIC T3...T6 or Ex db eb IIC T3...T6 Gb or Ex de IIC T3...T6 or Ex de IIC T3...T6 Gb or optionally Ex tb IIIC T200 °C - T85°C Db
	CE	0637	 II 2G  II 2D	Ex db IIB+H2 T3...T6 or Ex db IIB+H2 T3...T6 Gb or Ex d IIB+H2 T3...T6 or Ex d IIB+H2 T3...T6 Gb or optionally Ex tb IIIC TX°C Db
	CE	0637	 II 2G  II 2D	Ex db eb IIB+H2 T3...T6 or Ex db eb IIB+H2 T3...T6 Gb or Ex de IIB+H2 T3...T6 or Ex de IIB+H2 T3...T6 Gb or optionally Ex tb IIIC TX°C Db
	CE	0637	 II 2G  II 2D	Ex eb IIC T1/T2, T3 or T4 Gb (Ex e IIC T1/T2, T3 or T4) or optionally Ex tb IIIC TX°C Db
	CE	0637	 II 2G  II 3D	Ex eb IIC T1/T2, T3 or T4 Gb (Ex e IIC T1/T2, T3 or T4 Gc) or optionally Ex tc IIIB TX°C Dc or Ex tc IIIC TX°C Dc ²⁾
	CE	0637	 II 2D  II 3G	Ex tb IIIC TX°C Db or optionally Ex ec IIC T2, T3 or T4 Gc (Ex nA IIC T2, T3 or T4 Gc)
	CE		 II 3G  II 3D	Ex ec IIC T2, T3 or T4 Gc (Ex nA IIC T2, T3 or T4 Gc) or optionally Ex tc IIIB TX°C Dc or Ex tc IIIC TX°C Dc ²⁾

¹⁾

- ²⁾ conductive dust

- NB 0637 ... IBExU Inst. für Sicherheitstechnik GmbH, Fuchsmühlenweg 7,
09599 Freiberg (Germany)