

Additional Installation, Operating and Maintenance Instructions



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

Type of protection „Increased safety e”

Type of protection „n”

Motors for use in areas with occurrence of combustible dust  II 2D,  II 3D

VEM motors GmbH
VEM motors Thurm GmbH



General



Attention! Read installation, operation and maintenance instructions, connection diagram, additional connection diagram and safety regulations before transportation, installation, start-up, maintenance and repair. Mind the information!

The existing additional operation and maintenance manual is valid together with the already mentioned documents and the operation and maintenance manual for standard motors, where the basic specifications for connection, installation, operation and maintenance as well as the spare parts lists are included. This manual shall help the user to ease the secure and proper transportation, installation, start-up and maintenance of the explosion-protected electric machine.

Technical changes of the electric machines that are included in this manual are subject to alterations by us. Technical drawings and pictures are simplified illustrations. Due to improvements and changes it might happen that they do not correspond in detail with the supplied electric machine. The technical data and the dimensions are non-binding. No claims can be derived from it.

Symbols

In this manual three symbols will be used, that indicate important passages:



Security and warranty advices, possible damage to persons included.



Warning against electric voltage, danger of life. Advice that damages to the electrical machine and/or the auxiliary devices can happen.



Additional advice for electrical Ex-motors of Group II of category 2 (zone 1, 21) or Group II of category 3 (zone 2, 22).

Security regulations

The security regulations, accident prevention regulations, standards and approved rules of technique must be observed unconditionally!

The non-observance of the security advices can result in endangering people and/or damaging of the machine.

Operation according to regulations

This manual is valid for explosion-protected, surface-cooled, low voltage electric machines. The type of protection according to EN 60035, part 5 is at least IP 54 for motors for operation in zones 1 and 2, at least IP 55 for operation in zone 22 and IP 65 for operation in zones 21 and 22 with conducting dust.

For combinations always the highest required type of protection has to be used. The type of protection is always declared on the name plate of the motor.

In areas with risk of explosion only electric motors with the permitted type of protection may be used.



Electric machines of Group II, category 2 (assigned to zones 1, 21) or Group II, category 3 (assigned to zones: 2, 22)

Other or different operations are not classified in accordance to the regulations.

For damages and operational disturbances that result from faults at installation, ignorance of this manual or improper repair no warranty can be claimed.

Areas with risk of explosions

Which areas outdoors or indoors have to be considered at risk of explosion according to the relevant rules and regulations must be left at the responsibility of the operator or the supervisory authority if there is any doubt about the localisation of areas with risk of explosion.

The responsibilities for the operator of such plants are described in the regulation 99/92/EG – ATEX 137 (former ATEX 118a), occupational health and safety regulation. The directive 94/9/EG – ATEX 95 (former ATEX 100a) contains the fundamentals for explosion-protected products.

The requirements for products for operation in areas with risk of explosion are determined in this directive. They will be supported by corresponding regulations (see below).

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Explosion-protected electrical machines, that will be covered by this manual, have been designed according to the regulations of series EN 60034 (VDE 0530), EN 60079-0, EN 61241-0 and the regulation for the corresponding type of protection EN 60079-7, EN 60079-15, EN 50281 or EN 61241-1.

They shall only be put into operation according to the measures of the appropriate supervisory authority. The supervisory authority is responsible for acknowledgement of the risk of explosion.



Type of protection, temperature class and characteristics have to be taken from the name plate of the motor.

- Group II, category 2 (assigned zones: 1, 21)

In this category electrical machines of type of protection „increased safety“ „e“ and „flame-proof enclosure“ „d“ can be found. In addition electrical machines for operation in areas with combustible dusts and type of protection „protection by enclosure“ are included in this group.

- Group II, category 3 (assigned zones: 2, 22)

In this category electrical machines with type of protection „n“ and electrical machines for operation in areas with combustible dusts and type of protection „protection by enclosure“ can be found.



If the certification number includes the letter X, special requirements have to be observed that are listed in the corresponding type examination certificate.

Characterisation of explosion-protected motors

| | Nr. NB | RL 94/9/EG | New name EN 60079 ff., 61241 ff. | Old name (EN 50014 ff., EN 50281) |
|----|--------|----------------------|---|---|
| CE | 0637 | Ex II 2G | EN/IEC 60079-0 / EN/IEC 60079-7 Ex e II T2, T3 or T4 | EN 50014 / EN 50019 EEx e II T2, T3 or T4 |
| CE | 0637 | Ex II 3G | EN/IEC 60079-0 / EN/IEC 60079-15 Ex nA II T2, T3 or T4 | DIN EN 50014 / 50021, IEC 79-15 EEx nA II T2, T3 or T4 |
| CE | 0637 | Ex II 2D | EN/IEC 61241-0 / EN/IEC 61241-1 Ex tD A21 T 125°C IP65 | EN 50014 / EN 50281-1-1 IP65 T 125°C |
| CE | 0637 | Ex II 3D | EN/IEC 61241-0 / EN/IEC 61241-1 Ex tD A22 T 125°C IP55 (IP 65 for combustible dust) | EN 50014 / EN 50281-1-1 IP55 T 125°C (IP 65 for combustible dust) |
| | | | combination gas or dust | |
| CE | 0637 | Ex II 2D Ex II 2G | Ex tD A21 T 125°C IP65 Ex e II T2, T3 or T4 | IP65 T 125°C EEx e II T2, T3 or T4 |
| CE | 0637 | Ex II 3D Ex II 2G | Ex tD A22 T 125°C IP55 (IP 65 for combustible dust) Ex e II T2, T3 or T4 | IP55 T 125°C (IP 65 for combustible dust) EEx e II T2, T3 or T4 |
| CE | 0637 | Ex II 2D Ex II 3G | Ex tD A21 T 125°C IP55 Ex nA II T2, T3 or T4 | IP65 T 125°C EEx nA II T2, T3 or T4 |
| CE | 0637 | Ex II 3D Ex II 3G | Ex tD A22 T 125°C IP55 (IP 65 for combustible dust) Ex nA II T2, T3 or T4 | IP55 T 125°C (IP 65 for combustible dust) EEx nA II T2, T3 or T4 |

QS certification from NB 0637 ... IBExU Freiberg

[When indicating a maximum surface temperature: for zone 2 (gas): total surface including rotor and windings; for zone 21,22 (dust): outer surface (enclosure, shaft)!]

General advice for inverter operation

Inverter operation of explosion-protected three-phase motors is only permissible if the motors are manufactured, tested, certified and especially marked for this kind of operation. The special manufacturer's instruction must be observed unconditionally. For the type of protection „increased safety“ „e“ and for motors for operation in zone 21 special EC-type examination certificates are required, in which inverter operation is explicitly allowed and in which the required conditions and parameters of the system motor-inverter-security device are listed.

For protection type „n“ the motors, that will be fed by inverter with a variable frequency and/or voltage, have to be tested with the predefined inverter or with an inverter, that is comparable according to the specification for output voltage and current.

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The necessary parameters and conditions have to be taken from the name plate or the documentation of the motor.

The motors must always be equipped with thermal winding protection to avoid unacceptable temperatures. The data from the thermal winding protection device must be analysed by suitable equipment. Motors shall not be operated as multimotor drive.

For installation and start of operation of the frequency inverter please observe the instructions and the manual of the manufacturer unconditionally.

Frequency inverter operation in zone 2 (Ex II 3G) or zone 22 (Ex II 3D)

Operation with frequency inverter is permissible only within the operational data given on the name plate. It is permissible to exceed the rated motor current for a very short time (max. 1 min within a period of 10 min) up to 1,5 times of the rated current. The given maximum torque and frequency shall not be exceeded under all circumstances. By selecting an appropriate inverter and/or using filters it must be ensured that the maximum permissible puls voltage at the motor terminals is not exceeded.

For the individual series/options the following values for max. puls voltage are defined:

Series K21./K20.

| | |
|---|--------------------------------|
| size 56-132T ¹⁾ | $\hat{U} \leq 1,000 \text{ V}$ |
| size 56-132T ¹⁾ (acc. to Sp. 2945) | $\hat{U} \leq 1,350 \text{ V}$ |
| size 132 [K20. 112] to 355 | $\hat{U} \leq 1,350 \text{ V}$ |

Series KU1./KU0.

| | |
|--|--------------------------------|
| size 56-132T ¹⁾ (acc. to Sp 9382) | $\hat{U} \leq 1,560 \text{ V}$ |
| size 132 [KU0. 112] to 355 | $\hat{U} \leq 1,800 \text{ V}$ |

Series KV1./KV4./KV0.

| | |
|----------------------------|--------------------------------|
| size 132 [KV0. 112] to 355 | $\hat{U} \leq 2,500 \text{ V}$ |
|----------------------------|--------------------------------|

1) 132T shaft height 132 delivered by production site VEM motors GmbH Thurm

It must be ensured that the operating voltage at the motor terminals complies under all circumstances with the rating on the name plate. The data from the thermal winding protection device has to be analysed either by a separate relay or by the inverter.

Frequency inverter operation in zone 21 (Ex II 2D)

Motors for operation in zone 21 must always be certified by a notified body before using frequency operation. The limit values that are determined in the EC type examination certificate and printed on the name plate must be kept under all circumstances. This means especially a control of the motor current in relation to the frequency. Only use frequency inverters that fulfil the requirements of the EC type examination certificate.

Frequency inverter operation in zone 1 (Ex II 2G)

Motors of protection type "increased safety" "e" for use in zone 1 must always be certified by a notified body before using frequency operation. The limit values that are determined in the EC type examination certificate and printed on the name plate must be kept under all circumstances. This means in particular monitoring of the continuous current as a function of the frequency. Only use frequency inverters that fulfil the requirements of the EC type examination certificate. Analysis of thermal winding protection data must be done by using a trip unit with Ex-mark II (2) G that fulfils the requirements of the directive 94/9/EC. The given values for maximum torque and frequency must not be exceeded under all circumstances. The maximum allowable puls voltage of 1560 V for sizes 56 to 132T and 1800 V for sizes 132 [K10. 112] to 355 at the motor terminals have to be limited by choosing a suitable inverter and/or using filters. It has to be secured that the operating voltage at the motor terminals always complies with the data indicated on the name plate (please observe voltage drop in connection with filters!). If the terminal voltage of the motor is lower as the rated voltage indicated on the name plate due to voltage drops at the frequency inverter, the cables and possible chokes or filters, the edge frequency must be adjusted to a smaller value according to the linear voltage/frequency relation. This results in a smaller possible speed control range.

Installation and electrical connection

At installation and start of operation the security advices that are enclosed with the motor have to be observed. Installation work shall only be done by qualified personnel who is skilled because of a technical education, expertise and schooling of knowledge about

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- security regulations,
- accident prevention regulations,
- standards and approved rules of technique (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 authorized by the person in charge for security of the plant to carry out the necessary work and tasks.

In Germany the construction of electrical systems in areas with risk of explosion is liable to the following regulations:

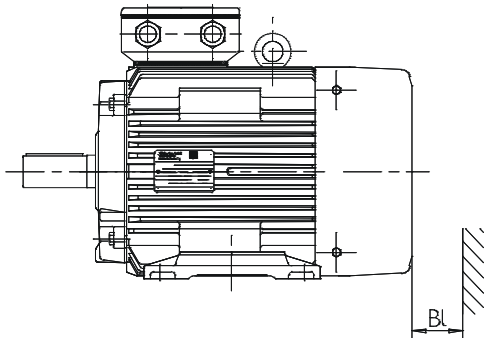


- BetrSichV "Operational Safety Act",
- TRBS "Technical rules for industrial safety"
- GefStoffV "Hazardous Goods Regulations"
- (DIN EN 60079-14 "Electrical systems for hazardous areas")

Outside of Germany the correct national regulations have to be observed.

The permissible coolant temperature (room temperature at place of installation) according to EN 60034-1/IEC 60034-1 is max. 40°C/min. -20°C without labelling and the permissible altitude of site is up to 1000 m above sea level (other than the given values have to be specified on the name plate of the motor and must be certified separately if necessary).

Please make sure that the cooling air can enter and leave the air in/outlet without hindrance and without getting sucked in again. Inlet and outlet openings have to be protected against pollution and dirt particles.



The minimum distance of air inlet of the fan cover against any obstacles (dimension Bl) has to be observed under all circumstances.

For type of constructions with shaft end upwards the operator has to ensure that no foreign substances can fall inside from above.

During installation of surface cooled motors it has to be observed that the condensate drain holes are located at the lowest possible place. If the condensate drain holes are closed, the screws must be reinserted with a sealant after drainage of condensation water. If the condensate drain holes are open, the direct contact with a jet or gush of water must be avoided. A careful installation of the motors on an exactly level support has to be ensured to avoid strain when tightening the machine. Machines that shall be coupled must be adjusted exactly. If possible elastic couplings shall be used.

Motor connection

The connection has to be done by qualified personnel according to the valid security regulations.

Outside of Germany the required national standards must be applied.

Name plate designations have to be observed under all circumstances!



- Compare current type, mains voltage and frequency!
- Mind connection type!
- Mind rated current for motor protection switch setting!
- For motors with type of protection „increased safety“ „e“ the t_E - time has to be observed!
- Connect the motor according to the connection diagram inside of the terminal box!

Earthing shall be done with the earthing clip that can be found at the enclosure or at the end shield depending on the type of construction. In addition all motors are equipped with a ground conductor clamp inside of the terminal box. Unused cable glands of the terminal box have to be closed for protection against dust and humidity. For electrical connection the standard security and starting instructions are valid. The cable glands

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or screwed sealing plugs must be admitted for use in Ex-applications. The installation torques, sealing areas and clamp ranges of the cable clamps given by the manufacturer have to be observed unconditionally.

Supply cables have to be selected according to DIN VDE 0100 taking into account rated current and operational conditions (i.e. ambient temperature, method of cable installation etc. complying with DIN VDE 0298 and IEC / EN 60204-1).



For room temperatures of more than 40°C cables have to be used, that are allowed for an operation of at least 90°C. This is also valid for motors that are marked with X on the supplemental sheet of the EC-type examination certificate which indicates special requirements for the cable design.

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.

Terminal box overview

| Terminal box type | Terminal board | $I_{B \max}$ | $Q_{B \max}$ | Terminal type | Connecting thread | a [mm] | M_{Anzug} [Nm] |
|-------------------|------------------|--------------|--------------------|------------------|-------------------|-----------|----------------------------|
| | | [A] | [mm ²] | | | | |
| 25 A | KB 3Ex (KS 10A) | 53 | 10 | slot terminal | S10 x 1 | 4,3 ± 0,1 | 6 |
| 63 A | KB 4Ex (KS 14A) | 72 | 16 | slot terminal | S14 x 1,25 | 6,3 ± 0,2 | 10 |
| 100 A | KB 4Ex (KS 14A) | 72 | 16 | slot terminal | S14 x 1,25 | 6,3 ± 0,2 | 10 |
| 200 A | KB 5Ex (KS 18A) | 118 | 35 | slot terminal | S18 x 1,5 | 9,2 ± 0,2 | 20 |
| KA 05-13 | KB 5580 Ex/d 4.3 | 30 | 2,5 | U-clamp terminal | M4 | - | 1,2 |
| 25 AV | KL 155 | 30 | 4 | U-clamp terminal | M5 | - | 2 |
| 25 AV | KB 5591Ex/d 5,2 | 37 | 4 | U-clamp terminal | M5 | - | 2 |
| 63 AV | KB 5121Ex-3 | 64 | 10 | U-clamp terminal | M5 | - | 2 |
| 100 AV | KB 5121Ex-3 | 64 | 10 | U-clamp terminal | M5 | - | 2 |
| 100 AV | KB 5130Ex | 118 | 35 | U-clamp terminal | M6 | - | 3 |
| 200 AV | KB 5130Ex | 118 | 35 | U-clamp terminal | M6 | - | 3 |
| 100/63 AV | KM 8/6 | 63 | 10 | U-clamp terminal | M6 | - | 3 |
| 200 A-SB | KM 10/8 | 100 | 70 | saddle terminal | M8 | - | 6 |
| 200 A-SB | KB 5130 Ex | 118 | 35 | U-clamp terminal | M6 | - | 3 |
| 400 A | KM 10/8 | 100 | 70 | saddle terminal | M8 | - | 6 |
| 400 A | KM 16/12 | 250 | 120 | saddle terminal | M12 | - | 15,5 |
| 400 AV | KM 10/8 | 100 | 70 | saddle terminal | M8 | - | 6 |
| 630 A | KLP M20 | 315 | 240 | screw terminal | M12/M8 | - | 15,5/6 |
| K1X 200 A | KM 10/8 | 100 | 70 | saddle terminal | M8 | - | 6 |
| K2X 200 A | KM 10/8 | 100 | 70 | saddle terminal | M8 | - | 6 |
| K1X 400 A | KM 16/12 | 250 | 120 | saddle terminal | M12 | - | 15,5 |
| K2X 400 A | KM 16/12 | 250 | 120 | saddle terminal | M12 | - | 15,5 |
| 1000 A | KLSO 1000 | 1000 | 2x 240 | current bar | M10 | - | 10 |

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

$Q_{B \max}$ max. rated cross-section

a slot width of the slotted bolt (terminal board according to DIN 22412)

M_{Anzug} max. tightening torque for connecting thread

For motors with a terminal board fitted with slotted bolts according to directive 94/9/EC only cable lugs complying with DIN 46295 shall be used. The cable lugs are fixed with pressure nuts with integrated spring washer. Alternatively a solid round wire can be used. The diameter of the wire must be suitable for the slot width of the slotted bolt.

When inserting the feed line in the terminal box it has to be secured that no tensile loading acts on the cables. The inside of the terminal box must be kept clean. The seals must be undamaged and have to be fitting. The terminal box must always be closed when the motor is in operation.



Attention, do not open terminal boxes in atmospheres with risk of dust explosions when they are still hot from operation!

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Tightening torques for bolts (terminal box, end shield, bearing cover)
Series KPER/O 63 to 132T, KPR/O 56 to 100

| Type | | Type of construction | End shield | | Fixed bearing cover | | Terminal box | |
|------------------|--------|--|----------------|----------------|---|------------------|---------------|---------------|
| KPER/O | KPR/O | | 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 KPER/O 100 L M 5 2,0 Nm) | M 4 1,5 Nm | M 4 2,5 Nm | M 4 2,0 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 K1.R 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 | - |

Motors with type of protection „increased safety“ “e” and with outgoing cable (including the design version with flat terminal box with separate certificate according to directive 94/9EC)

The outgoing cable is led through with 4 or 7 conductors according to the demands of the customer.

If the entire terminal box is delivered and the connection is done in an Exe-protected surrounding, than the following instructions have to be observed:

1. When mounting the terminal box at least the requirements for type of protection IP54 must be fulfilled.
2. For compliance with the required clearances the terminal socket has to be fastened according to the indicated drawing of holes.
3. The inner earth conductor from the motor (green/yellow) with crimped lug has to be placed under the clamping yoke of the earth connection.
4. The outgoing cables of the motor have to be soldered into the angled lugs of the terminal socket. The correct connection U1, V1, W1 (U2, V2, W2) has to be observed.

When mounting the aggregate please take note that the motor number on the name plate agrees completely with the number on the riveted plate inside of the terminal box cover.

Protective measures against unacceptable warming

If there is no other information on the test certificate or on the name plate concerning duty type and tolerances, electrical machines are designed for continuous duty and normal, not frequently recurring starts, at which no significant warming occur. The motors shall only be operated in the duty type indicated on the name plate.

The range A of the voltage and frequency limits of DIN EN 60034-1 (DIN VDE 0530, part 1) – voltage $\pm 5\%$, frequency $\pm 2\%$, shape of curve, mains symmetry – has to be observed, so that the warming is kept within the permissible limits. Bigger deviations from design values can result in excess warming of the electrical machine to unacceptable temperatures. These deviations have to be indicated on the name plate. The motor has to be protected against unacceptable warming at starting for example with a motor protection switch. That means a current-dependent delayed protection switch according to DIN VDE 0660 or a similar device for all phases has to be installed, so that unacceptable warming is prevented. The protective device must be adjusted to the rated current. Windings in delta-connection have to be protected by connecting the release or relay in series with the phase windings. Selection and adjustment of the releases must be based on the rated value of the phase current ($\times 0,58$ rated current of the motor). If such a connection is not possible, suit-

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able protection switches must be used, for example with phase failure control. For pole-changing motors current-dependent delayed releases or relays have to be provided for each rotational speed level that can be locked against each other.



For type of protection „increased safety“ “e” the starting will be controlled as well. Therefore the protection device must switch off within the time period t_E that is given for the corresponding temperature class when the rotor is blocked. The requirement is fulfilled if the release time (it can be taken from the release characteristics (starting temperature 20°C) for the ratio I_A/I_N) is not higher than the indicated t_E time.

Electrical machines of type of protection „increased safety“ “e” for heavy starting (start-up time $> 1,7 \times t_E$ time) must be protected by a starting control according to the information of the certificate of conformity. They have to be certified accordingly.



Thermal motor protection by means of direct temperature monitoring of the winding is permissible if this is certified and indicated on the name plate. The protection consists of thermo couples according to DIN 44081 / 44082 that ensures explosion protection together with a tripping device with type of protection marking . For pole-changing motors it is necessary to have separate protection devices for each rotation speed level, that can be locked against each other.


Auxiliary devices

Explosion-protected motors can be equipped with different auxiliary devices as option:

Additional thermal motor protection

For monitoring the stator winding temperature it is possible to have thermo couples installed in the motor (PTC thermistors, KTY or PT100). 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.

Thermal motor protection as inherent protection

The use of thermal winding protection as inherent motor protection is only permissible if the operation is tested separately and certified by a notified body. On the name plate instead of the t_E time a t_A time is marked. In addition the following text will be printed on the name plate: “operation only with tested PTC tripping device and marking ”.

Anti-condensation heating

The heating tapes must comply with the directive 94/9/EC. The heating power and the input supply voltage are 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.

Forced ventilation unit

The fans must comply with the directive 94/9/EC. The forced ventilation unit is dissipating 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 of the sense 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.

External heat and cooling sources

No extra measures will be necessary for existing external heat and cooling sources, if the temperatures at the installation site are not exceeded. If the temperatures are exceeded or impacts on operational temperatures or maximum surface temperatures can be expected provisions will have to be made to maintain and confirm explosion protection. If in doubt please contact the manufacturer.

Maintenance and repair

In Germany maintenance, repair and changes of explosion-protected machines have to be done taking the workplace safety ordinance (BetrSichV), the explosion protection ordinance (ExVO, 11.GSGV), the security advices and the description of the general maintenance manual into account.

Outside of Germany the required national standards must be applied.

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More information about testing and maintenance of electrical systems or repair and reconditioning of electric equipment can be found in EN 60079-17 and IEC 60079-19. Activities that will influence the explosion protection such as:

- repair of the stator winding and of the terminals,
 - repair of the ventilation system
 - repair of the bearings and of the sealing of dust explosion protected motors (Ex 2D, 3D)
- must only be done by VEM service personnel or by authorized workshops with trained personnel which is qualified for such tasks by industrial training, experience and special schooling.

For dust explosion-protected motors the dust explosion protection is depending very much on the local environmental conditions. For that reason the motors have to be checked and maintained regularly.



Thick layers of dust will result in a temperature rise on the surface of the motor due to thermal insulation. Layers of dust on the motors or even the total coverage should be avoided as far as possible by suitable installation and constant maintenance.

The indicated surface temperature of the motor is only valid, if the dust layer on the motor is max. 5 mm. The securing of these conditions (dust type, maximum layer thickness and other) has to be assured. The motor shall not be opened before a suitable time has passed to reduce the inner temperatures to values that are not ignitable. If the motors have to be opened for maintenance or repair, the work has to be done in a dust-free room if possible. If this is not possible suitable measures have to be taken to prohibit that dust can collect inside of the enclosure.

At disassembly take extra care that the sealing parts like sealing, end faces and other are not damaged.

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 can not be defined for all applications the listed terms represent a general advice for undisturbed operation. Individual local conditions (degree of pollution, 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 name plate or relubrication sign | |
| Main inspection | After about 10,000 operating hours | Once a year |
| Remove condensate water | Depending on the local environmental conditions | |

The necessary relubrication intervals for anti-friction bearings are different to these inspection intervals. They have to be observed as well!

The motors up to size 315M are equipped as standard with anti-friction bearings with life-time lubrication. From size 315MX 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 operation manual or on the name plate or relubrication sign.



Maintenance works (without relubrication) has to be done at standstill of the motor. It has to be assured that the machine is secured against re-connection 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 has to 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.

The work has to be marked with an additional repair sign including the following information:

- date,
- executive company,
- if necessary type of repair,
- if necessary sign of the expert.

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If the work is not done by the manufacturer it has to be accepted by an officially approved expert. He has to issue a written confirmation or mark the machine with his test mark. Outside of Germany the relevant state regulations have to be observed.

Spare parts



Except for standard, commercially available and equivalent parts (like anti-friction bearings) only original spare parts (see spare parts list) shall be used; this applies especially for sealings and connection parts.

For spare parts orders the following information is necessary:

Spare parts name
Motor type
Motor number

Terminal board connections



In standard design surface cooled motors are adapted for both rotational directions. The types K12R 355/2-pole are an exception. They are equipped with a fan dependent on the direction of rotation. If such fans or return stops (zone 22) are used a sign for sense of rotation has to be fixed on the fan cover.

The connections U1, V1, W1 at phases L1, L2, L3 (in alphabetical or natural order) result always in clockwise rotation. The sense of rotation can be reversed at direct starting if two main connections at the terminal board are changed.

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.

Additional Installation, Operating and Maintenance Instructions

Hints for screwed cable glands that are admitted for explosion protection

The terminal boxes are designed as standard with metric threaded holes according to EN 50262 or on request with NPT-threaded holes according to ANSI B1.20.1-1983. At delivery the holes are closed with plugs or ATEX-certified cable glands.

For connection of the motor only use cable entries and plugs that are designed according to directive 94/9/EC (ATEX) and have at least IP 55 type of protection.

For motors in type of protection "flameproof enclosure" "tD" (IP 6X necessary!) the cable entries and plugs must be designed according to directive 94/9/EC (ATEX) and have at least IP 65 type of protection.

All unused cable entry points must be closed with plugs according to the minimum type of protection listed in directive 94/9/EC (ATEX). Existing plugs must be checked accordingly and if necessary they have to be changed.



The specification of thread type is given on the equipment (name plate or terminal box). Alternatively the instruction about cable entry thread, number and position of cable entries can be given in the dimensional drawing of the motor.

For explosion protected VEM-motors cable glands of the company Jacob are used, if not ordered otherwise. The following specifications must be observed for these special cable glands:

Ex-brass screw connection, metric thread,
EC declaration of conformity DMT 99 ATEX E 016

| thread | Part-No. | For cable diameter mm | Width across flats mm | Installation torque Nm |
|--------------|-------------------------|--------------------------|--------------------------|---------------------------|
| M 12,x1,5 | 50.612 M/EX | 3...6 | 14 | 5 |
| M 12x1,5 | 50.612 M1/EX | 3...6,5 | 14 | 5 |
| M 16x1,5 | 50.616 M/EX | 5...9 | 17 | 5 |
| M 20x1,5 | 50.620 M1/EX | 6...12 | 22 | 7,5 |
| M 20x1,5 | 50.620 M/EX | 9...13 | 22 | 7,5 |
| M 25x1,5 | 50.625 M/EX | 11...16 | 27 | 10 |
| M 32x1,5 | 50.632 M/EX | 14...21 | 34 | 15 |
| M 40x1,5 | 50.640 M/EX | 19...27 | 43 | 20 |
| M 50x1,5 | 50.650 M/EX | 24...35 | 55 | 20 |
| M 63x1,5 | 50.663 M/EX | 32...42 | 65 | 20 |
| M 63x1,5 | 50.663 M1/EX | 40...48 | 65 | 20 |
| M 75x1,5 *) | Fa. HAWKE International | 54,5...65,3 | 95 | 20 |
| M 80x1,5 **) | Fa. HAWKE International | 67...73 | 106,4 | 20 |

*) BAS 01 ATEX 2070X, **) BAS 01 ATEX 2294X

Ex-EMC-brass screw connection, metric thread 016
EC declaration of conformity DMT 99 ATEX E 016

| thread | Part-No. | For cable diameter mm | Width across flats mm | Installation torque Nm |
|-----------|------------------|--------------------------|--------------------------|---------------------------|
| M 12,x1,5 | 50.612 M/EMV/EX | 3...6 | 14 | 5 |
| M 12x1,5 | 50.612 M1/EMV/EX | 3...6,5 | 14 | 5 |
| M 16x1,5 | 50.616 M/EMV/EX | 5...9 | 17 | 5 |
| M 20x1,5 | 50.620 M1/EMV/EX | 6...12 | 22 | 7,5 |
| M 20x1,5 | 50.620 M/EMVEX | 9...13 | 22 | 7,5 |
| M 25x1,5 | 50.625 M/EMV/EX | 11...16 | 27 | 10 |
| M 32x1,5 | 50.632 M/EMV/EX | 14...21 | 34 | 15 |
| M 40x1,5 | 50.640 M/EMV/EX | 19...27 | 43 | 20 |
| M 50x1,5 | 50.650 M/EMV/EX | 24...35 | 55 | 20 |
| M 63x1,5 | 50.663 M/EMV/EX | 32...42 | 65 | 20 |
| M 63x1,5 | 50.663 M1/EMV/EX | 40...48 | 65 | 20 |

If screwed cable glands or plugs according to directive 94/9/EC (ATEX) from other manufacturers are used please observe the corresponding manufacturers information.

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