



Installation, Operating and Maintenance Instructions for Converter-Fed Synchronous Motors with Permanent-Magnet Rotor

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1. General

To prevent damage to motors and the driven equipment the procedures laid down in the Operating and Maintenance Instructions must be followed. Especially to avoid risk of injury, the Safety Regulations must be adhered to strictly.

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

2. Description

The motors have been manufactured in accordance with IEC 34-1, DIN EN 60034-1, DIN VDE 0530 and other appropriate DIN standards. Motors can also be supplied to comply with special regulations (e.g. Classification Regulations, Regulations for Explosion Protection).

The details on the relevant Order Confirmation constitute the scope of supply.

3. Degree of Protection

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

4. Type of Construction

The type of construction of the motors is indicated on the rating plate. The motors can be used in different types of construction only with permission of the manufacturer and if necessary after modification carried out in accordance with the manufacturer's instructions. Especially with types of construction with vertical shaft the user has to ensure that foreign particles cannot fall into the fan cowl.

5. Transport & Storage

If possible the motors should only be stored in closed and dry rooms. Outdoor storage under cover is permitted for a short time only and requires adequate protection against all harmful effects of the climate. The motors also have to be protected against mechanical damage. Never transport or store the motors resting on their fan cowls. The eye bolts of the motors together with appropriate lifting tackle must be used for transport. The eye bolts are intended for the lifting of the motors only, without any additional parts such as bed plates, gears etc. Before using the eye bolts, their intactness must be checked. If eye bolts are removed after installation, the tapped holes must be blanked off permanently according to the Protection Standard.

6. Installation and Fitting

Since during normal operation of electric motors, temperatures in excess of 100 °C can occur on their surface, any contact with them must be prevented if the motors are installed in accessible areas. Because of this temperature sensitive parts must never be fitted to them or have contact with them. Vent holes must be kept free and the minimum distances stated in the dimensional drawings must be maintained so that the flow of cooling air is not obstructed. Care must be taken that the discharged warmed up cooling medium is not sucked up again.

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

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

All components that are to be fitted to the shaft end must be balanced dynamically according to the balancing system of the motor (full or half key). The rotors of the motor are balanced with half key; this is indicated by letter H after the serial number on the rating plate. Motors with letter F after the serial number are balanced with full key. If possible the motors are to be installed in such a way that they are free from vibrations.

Direct coupling to the driven machine requires a particularly accurate alignment. The shafts of both machines must be in alignment. The shaft height is to be adjusted to that of the driven machine using appropriate shims.

Belt drives put a lot of stress on the motor because of relatively high radial forces. When dimensioning belt drives, apart from the instructions and calculation programmes issued by the manufacturers of the belts, it must be ensured that the radial force permissible at the shaft end of the motor as stated in our data is never exceeded by the pull and pre-tensioning of the belt. When pre-tensioning the belt during installation the instructions of the belt manufacturers must be strictly adhered to.

7. Commissioning



Synchronous motors with permanent-magnet rotor are not suitable for direct on-line starting. For converter feeding, before commissioning must be exactly checked that the converter is suitable for feeding the synchronous motor. If there are any doubts, please contact the manufacturers of both components.



During their mounting and dismantling, synchronous motors with permanent-magnet rotor emit magnetic stray fields, particularly the rotors of these motors can disturb or damage other electrical or electronic apparatus and devices. This is especially important for cardiac pacemakers, mobile electronic devices and credit cards.



For synchronous motors, as they are fed by converters, particular safety regulations must be observed. This means, that these motors, also after complete shut-off of the electrical connections and at standstill, can have dangerous voltages at their terminals. Furthermore, with open terminal box, it must be always observed that the motor shaft is block against rotation.

During working at the cabling, reverse voltages can occur. Converter feeding of the motor can result in voltages being present at the motor terminals, also if the motor is in standstill. If the synchronous motor with permanent-magnet rotor is overloaded, this can cause, due to demagnetisation, winding damages.

The maximum allowed speed of the motor is limited to 1,2 times of the nominal speed, given on the nameplate, higher speed can result in damages of the drive system.



This dismantling of the rotor must always be done with special tools, designed for this particular purpose, ignoring this fact results in serious personal injuries and material damages. During assembling of the permanent-magnet rotor, it must be strictly observed, that no waste or metallic parts remain on the rotor surface or the stator bore hole.

Please follow the Safety Regulations closely. All work is to be carried out only when there is no voltage on the motor. The installation must be carried out according to the valid regulations by qualified skilled personnel. Initially the mains conditions (voltage and frequency) must be compared with the data on the rating plate of the motor. The dimensions of the connecting cables must be adjusted in line with the rated currents of the motor.

The connection points of the motor are marked in accordance with DIN VDE 0530 Part 8 (DIN EN 60034-8). In Section 17 of these instructions the most common circuit diagrams for three phase motors in basic design are provided, according to which the connection will be implemented. For all other versions, the special circuit diagrams are glued to the inside of the terminal box cover or

placed in the terminal box. An additional terminal box can be provided for the connection of auxiliary and protection devices (e.g. anti-condensation heaters); the same regulations apply as for the main terminal box.

Always start the motors with an over-current protection device that is set in accordance with the relevant nominal values of the motor ($\approx 1,05 I_{nom}$). Otherwise warranty claims with respect to damaged windings become void. Before the motor is connected for the first time it is recommended to check the insulation resistances between winding and earth and between phases (see Section 8). After prolonged storage it is absolutely essential that the insulation resistance is measured. Before coupling the motor to the driven machine, check the direction of rotation of the motor to prevent possible damage being caused to the driven machine. If the mains supply with the phase sequence L1, L2 and L3 is to be wired to the connection points U, V, W, the motor is rotating clockwise looking at the shaft end. The direction of rotation can be changed by swapping the connections between 2 phases. For the permissible tightening torques for the terminal board bolts refer to the table below:

Terminal board	Connecting Bolt Thread	Permissible Tightening Torque in Nm
16 A	M4	1.2 + 0.5
25 A	M5	2.5 \checkmark 0.5
63 A	M6	4 \checkmark 1
100 A	M8	7.5 \checkmark 1.5
200 A	M10	12.5 \checkmark 2.5
400 A	M12	20 \checkmark 4
630 A	M16 / M20	30 \checkmark 4 / 52 \checkmark 4

Before closing the terminal box make absolutely sure that:

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

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

If possible the motor is to be connected without load. If the motor is running smoothly and without any abnormal noises, the load of the driven machine is to be applied onto the motor. When the motor is started up it is recommended to monitor the current consumption if the motor is loaded with its driven machine so that any possible overloads and asymmetries occurring in the mains can be recognised immediately. The starter must always be in the starting position during starting. With slip ring motors the correct running of the brushes must be monitored. They must be absolutely spark-free. Please always observe the Safety Regulations during operation of the motor and when switching it off.

8. Insulation Check & Replacement of Grease / Bearings



When the motor is first commissioned and especially after extended storage, the insulation resistance of the winding is to be measured to earth and between phases. The check must take place using the rated voltage, but at least 500 V, **and by appropriate safe measures, the rotation of shaft must be prevented, as otherwise dangerous voltage could be induced. During and immediately after the measurements dangerous voltages are present at the terminals. Therefore never touch the terminals and follow the operating instructions of the insulation resistance meter closely! After the test, the windings must be discharged immediately.**

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

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

If the minimum values are lower, the winding must be dried properly until the insulation resistance corresponds to the required value.

When the motor is commissioned after a prolonged period of storage inspect the bearing grease visually and replace it if hardening and other irregularities occur. If the motors are to be commissioned by the manufacturer after more than three years following their delivery then the bearing grease must always be replaced. With motors fitted with covered or sealed bearings the bearings must always be replaced with new bearings of the same type after a storage period of four years.

9. Maintenance



You are once again referred to the Safety Regulations, in particular to isolation, to securing against reconnection, to checking whether all components connected to a voltage source are in dead state. If it is necessary to disconnect the motor from the mains for maintenance work particular care must be taken to ensure that any possibly existing auxiliary circuits (e.g. anti-condensation heaters, forced ventilators, brakes) are also disconnected from the mains.

If the motor is to be dismantled during maintenance work, the sealing compound on the centering shoulders is to be removed. When re-assembling the motor these need to be re-sealed using a suitable motor sealing compound. Existing copper sealing washers must always be refitted.



If bearings are changed, this must be done without removing the rotor from the stator.

10. Bearings and Lubrication

The anti-friction bearings of the motors are filled with anti-friction bearing grease in the factory (or with sealed bearings by the bearing manufacturer) according to DIN 51825 in compliance with the table below:

Type series	Lubricating grease according to DIN 51825	Lubricating Grease Base
All Squirrel Cage motors IEC/DIN 132 – 355 and Progressive standard 112 – 315	KE2R-40 K2N-30	Polyurethane base
Forced Ventilated motors		
Brake motors		
Marine Motors for on board ship		

Under normal load and climatic conditions, the quality of grease guarantees an operation of the motor for approx. 10,000 service hours with two pole design and 20,000 service hours with multipole design. If not otherwise agreed the grease of anti-friction bearing must never be refilled during this period. However, the condition of the grease should be checked occasionally even before this time limit. The indicated number of service hours is only valid for operation at rated speed. If during operation of the motor via an inverter the nominal speed is exceeded then the regreasing period reduces approximately in the opposite ratio to the increase in the motor speed. Regrease the bearings only after a thorough cleaning using suitable solvents. The same type of grease must be used. When replacing the grease only the equivalent types specified by the motor manufacturer can be used. Please bear in mind that the bearings should only be filled up to about 2/3 of their free space. A complete filling of the bearings and bearing covers with grease leads to increased bearing temperature and therefore to increased wear.

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

Frame Size	Two pole design	Four and multipole design
112 to 280	2,000 hrs.	4,000 hrs.
315	2,000 hrs.	4,000 hrs.
355	2,000 hrs.	3,000 hrs.

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

Series Progressive standard	Overall length Number of poles	Quantity of grease in cm ³		Series IEC/DIN	Overall length Number of poles	Quantity of grease in cm ³	
		D-end	ND-end			D-end	ND-end
Frame Size				Frame Size			
112	all	10	10	160	LX2, M2	23	20
132	all	17	17		L4, 6, 8	23	20
160	all	23	20	180	M2	23	23
180	2	23	23		M4, L6, 8	23	20
	≥4	31	31	L4	23	23	
200	2	31	31	200	L2	-	-
	≥4	35	31		LX2	31	31
225	2	35	35	L4, 6, 8	31	23	
	≥4	41	35	LX 6			
250	2	41	41	225	M2	31	31
	≥4	52	41		M4, 6, 8	35	31
280	2	52	52	250	S4, 8		
	≥4	57	52		M2	35	35
315 VL	S2	57	52	280	M4, 6, 8	41	35
	M2	57	57		2	41	41
	S4, 6, 8	64	52	≥4	52	41	
	M4, 6, 8	78	57	2	52	52	
355	2	57	57	315	≥4	57	52
	4	90	57		MX2 VL	57	52
	6,8	90	57		MY2 VL	57	57
			MX4, 6, 8 VL		64	52	
			MY4, 6, 8 VL		78	57	

11. Draining of condensation water

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

12. Cleaning

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

13. Motors with Thermal Winding Protection

A continuity test of the thermistor sensor circuit using a test lamp, a hand generator and such like is strictly prohibited because this would destroy the sensors immediately. If it becomes necessary to verify the cold resistance of the sensor circuit (at approx. 20°C) then the measuring voltage must never exceed 2.5 V DC. It is recommended to carry out the measurement using a Wheatstone

bridge with a 4.5 V DC supply voltage. The cold resistance of the sensor circuit must never exceed 810 Ohms; a measurement of the hot resistance is not necessary. With motors that are fitted with thermal winding protection, care must be taken that when the thermal winding protection responds and after the cooling down of the motor, no hazards can occur due to spurious automatic reconnection.

14. Warranty, Repair, Spare Parts

Unless expressly agreed otherwise only our contractual workshops are permitted to carry out repairs during the warranty period. Other repairs that may potentially be required can also be carried out by skilled personnel in these workshops. Details about Customer Service network can be obtained from the manufacturer on request. The spare parts are listed in Section 20 of these Operating & Maintenance Instructions. Maintenance carried out appropriately (provided it is as described in Section "Maintenance") does not constitute a breach of warranty provisions. The contractual warranty liability on the part of the manufacturer is not prejudiced by this.

15. Electromagnetic Compatibility

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

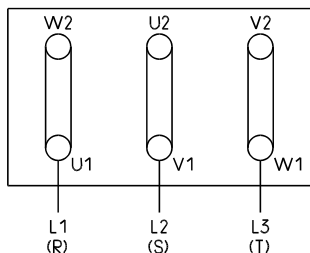
16. Trouble Shooting

General mechanical and electrical faults are to be rectified according to the Schedule in Section 19. All Safety Regulations must be strictly observed when rectifying faults.

17. Terminal board circuits

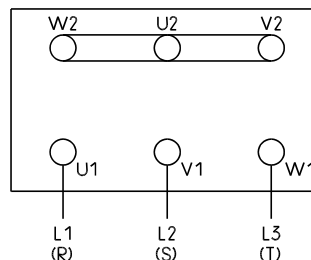
Single Speed Squirrel Cage Motor :

Δ low voltage



Single Speed Squirrel Cage Motor:

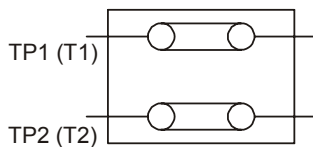
Y high voltage



Motor with thermal winding protection

Terminal board connection as above

from
the motor



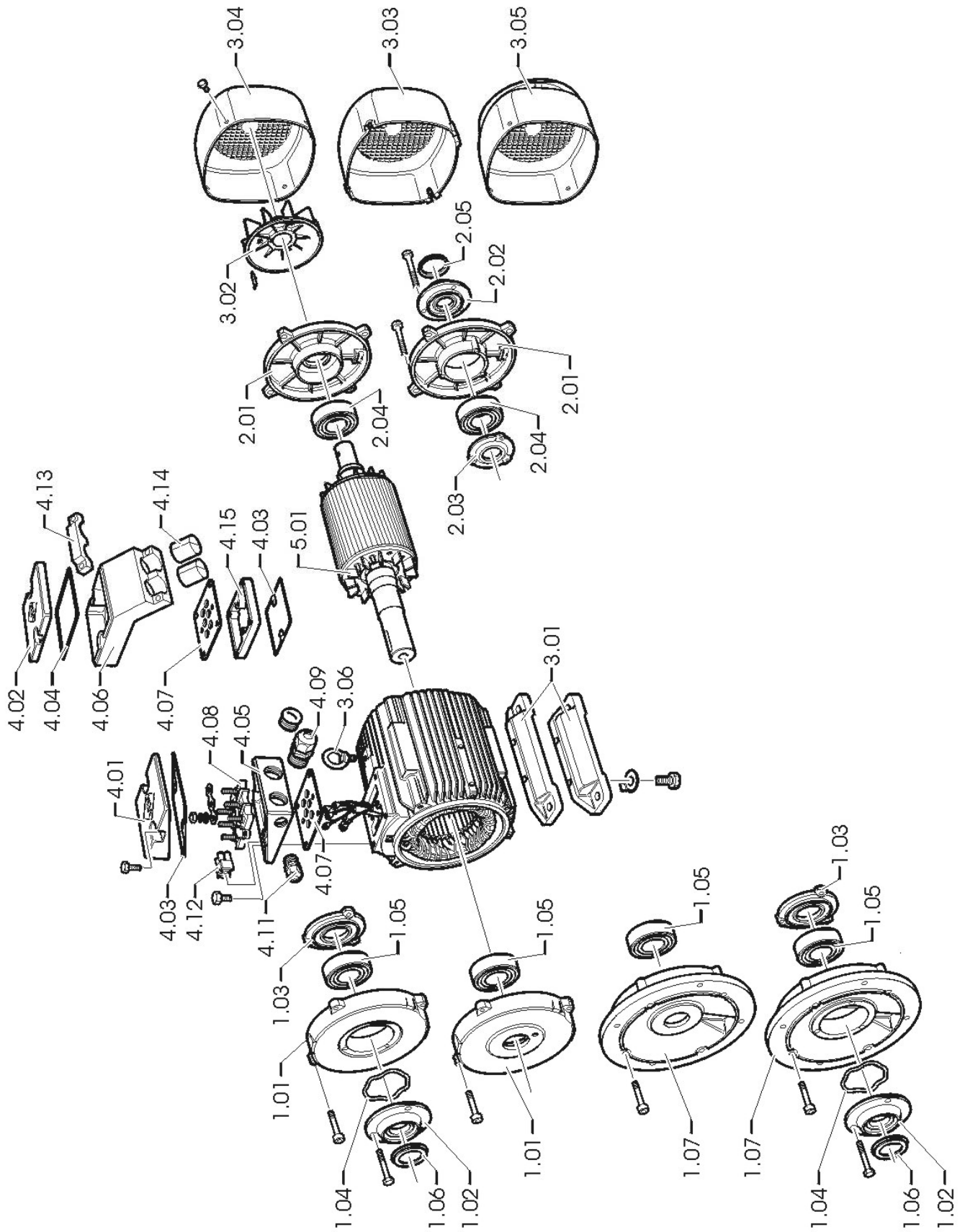
connection of the tripping device

The connection will be implemented as per the connection diagramme of the tripping device

18. Construction of the motor

Item No.	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 / Wellfeder, D-Seite, nicht bei Rollenlagern	Disc spring / wave washer, Drive end, not for roller bearings
1.05	Wälzlager D-Seite	Antifriction bearing, Drive end
1.06	V-Ring D-Seite	V-type rotary seal, Drive end
1.07	Flanschlagerschild	Flange end shield
1.08	Filzring D-Seite	Felt ring, Drive end
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	V-Ring N-Seite	V-type rotary seal, Non-drive end
2.06	Wellfeder	Wave washer
2.08	Filzring N-Seite	Felt ring, Non-drive end
3.01	1 Paar Motorfüße	1 pair of motor feet
3.02	Lüfter	Fan
3.03	Lüfterhaube, Kunststoff	Fan cowl, plastic
3.04	Lüfterhaube, Stahlblech	Fan cowl, sheet steel
3.05	Lüfterhaube mit Schutzdach	Fan cowl with canopy
3.06	Ringschraube	Lifting eye bolt
4.01/4.02	Klemmenkastendeckel	Terminal box cover
4.03/4.04	Dichtung Klemmenkastendeckel	Terminal box cover gasket
4.05/4.06	Klemmenkastenunterteil	Terminal box base
4.07	Dichtung Klemmenkastenunterteil	Terminal box base gasket
4.08	Klemmenplatte	Terminal plate
4.09	Kabeleinführung	Cable gland
4.10	Verschlussschraube	Screw plug for gland opening
4.11	Kabeleinführung für thermischen Wicklungsschutz	Cable gland for thermal winding protection
4.12	Anschluß für thermischen Wicklungsschutz	Terminal for thermal winding protection
4.13	Schelle	Clamp
4.14	Verschlussstücken	Sealing Components
4.15	Zwischenplatte	Adapter plate
4.16	Flacher Anschlußkasten	Flat terminal box
4.17	Normalienbeutel	Standard parts bag
5.01	Läufer, komplett mit Permanentmagneten	Rotor, complete with permanent magnets
6.01	Schleuderscheibe, D-Seite	Grease thrower ring, Drive end
6.02	Schleuderscheibe, N-Seite	Grease thrower ring, Non-drive end
6.03	Labyrinthbuchse, D- u. N-Seite	Labyrinth gland, Drive and Non-drive end
6.04	Leitscheibe, D-Seite	Guide disc, Drive end
6.05	Leitscheibe, N-Seite	Guide disc, Non-drive end

Three phase asynchronous motor / basic version P2.R 112 - 355
(example, delivered version may differ in details)



19. Trouble shooting

19.1 Electrical Faults

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

19. 2 Mechanical Faults

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

FREMDLÜFTERAGGREGATE, Baureihe FBW
FORCED VENTILATION UNITS, Serie FBW



VEM motors GmbH



FREMDLÜFTERAGGREGATE BAUREIHE FBW

Allgemein

Zur Vermeidung von Schäden an den Motoren und den anzutreibenden Ausrüstungen sind die Bestimmungen der Bedienungs- und Wartungsanleitung einzuhalten. Insbesondere müssen zur Vermeidung von Gefahren die Sicherheitshinweise, die dem Hauptmotor gesondert beiliegen, streng beachtet werden. Da die Bedienungs- und Wartungsanleitung zur besseren Übersichtlichkeit keine einzelnen Informationen für alle denkbaren Sondereinsatzgebiete und Bereiche mit speziellen Anforderungen enthalten kann, sind bei der Montage durch den Betreiber entsprechende Schutzvorkehrungen zu treffen.

Transport und Lagerung

Die Motoren sollen möglichst nur in geschlossenen, trockenen Räumen gelagert werden. Eine Lagerung in Freiluftbereichen mit Überdachung ist nur kurzzeitig zulässig, dabei müssen sie gegen alle schädlichen Umwelteinflüsse geschützt werden. Ebenso sind sie gegen mechanische Schädigungen zu sichern.

Montage

Die Montage ist im spannungslosen Zustand des Fremdlüfters und des zu belüftenden Hauptmotors vorzunehmen.

Vor dem Einbau ist darauf zu achten, dass das Lüfterrad leicht durchläuft und die Schaufeln des Lüfterrades nicht deformiert oder verbogen werden. Hierdurch können Unwuchten erzeugt werden, die sich negativ auf die Lebensdauer auswirken und den vorzeitigen Ausfall des Axialventilators zur Folge haben können.

Der elektrische Anschluss erfolgt grundsätzlich dreiphasig entsprechend dem Anschlussplan des Axialventilators.

Das Anschlussschema ist zusätzlich auch im Klemmenkastendeckel eingeprägt bzw. eingeklebt. Die Lüfter können im Bedarfsfall über eine externe Sicherheitseinrichtung (z.B. Motorschutzschalter) geschützt werden.

Konstruktiver Aufbau

Das Fremdlüfteraggregat FBW ist eine montagefertige Einheit. Sie besteht aus der Fremdlüfterhaube, dem Anströmgerüst, dem Lüftermotor mit Lüfterflügeln und dem Anschlusskasten.

Die Schutzart im angebauten Zustand entspricht IP55 nach DIN EN 60034-5.

Inbetriebnahme

Auf die genaue Beachtung der Sicherheitshinweise wird nochmals ausdrücklich hingewiesen. Alle Arbeiten sind nur im spannungslosen Zustand des Motors vorzunehmen. Die Installation muss unter Beachtung der gültigen Vorschriften von entsprechend geschultem Fachpersonal erfolgen. Zuerst ist ein Vergleich der Netzverhältnisse (Spannung und Frequenz) mit den Leistungsschildangaben des Motors vorzunehmen. Die Abmessungen der Anschlusskabel sind den Nennströmen des Motors anzupassen. Die Bezeichnung der Anschlussstellen des Motors entspricht der DIN VDE 0530 Teil 8. Unter dem Punkt „Elektrischer Anschluss“ dieser Anleitung sind die häufigsten Schaltbilder für Drehstrommotoren in Grundausführung abgedruckt, nach denen der Anschluss vorgenommen wird. Für andere Ausführungen werden besondere Schaltbilder mitgeliefert, die im Klemmenkastendeckel eingeklebt sind bzw. im Klemmenkasten beiliegen. Nach dem Einbau ist ein Probelauf durchzuführen. Dabei ist darauf zu achten, dass der Luftstrom durch das Lüftungsgitter angesaugt und über den zu kühlenden Motor geblasen wird (siehe auch Drehrichtungspfeil auf der Innenfläche des Lüftungsgitters).

Achtung, im Falle der falschen Drehrichtung ist die Kühlleistung erheblich geringer.

Die Axialventilatoren können in jeder Einbaulage eingesetzt werden. Die Sicherheitsvorschrift bezüglich des Berührungsschutzes beweglicher Teile (DIN EN 294) ist erfüllt.

Wartung

Es wird ausdrücklich nochmals auf die Sicherheitshinweise verwiesen, insbesondere auf das Freischalten, Sichern gegen Wiedereinschaltung, Prüfen auf Spannungsfreiheit aller mit einer Spannungsquelle verbundenen Teile.

Die Lager der Axialventilatoren sind wartungsfrei für die Lebensdauer ausgelegt. Im Betrieb muss darauf geachtet werden, dass speziell in leicht staubhaltiger Atmosphäre die Lüfterflügel nicht überdurchschnittlich Staubansatz aufbauen, da auch hierdurch Unwuchten erzeugt werden.

Achtung, bei Ersatzteilbestellungen ist immer die Angabe der Motor-Ident.-Nummer erforderlich, da die Aggregatlänge im Einzelfall bei Spezialmotoren von der anliegenden Tabelle abweichen kann.

FORCED VENTILATION UNIT DESIGN SERIES FBW

General

To prevent damage on motors and the driven equipment the procedures laid down in the Operating and Maintenance Instructions must be followed. Especially the separately enclosed Safety Regulations must be observed strictly to avoid risk of injury.

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

Transport & Storage

Preferably the motors should only be stored in closed and dry rooms. Outdoor storage under cover is permitted only for a short time and requires adequate protection against all harmful effects of the climate. The motors also have to be protected against mechanical damage.

Assembly

Assembly should be carried out under de-energized conditions of the forced ventilation unit as well as the main motor.

Before installation it has to be observed that the fan is running smoothly and the wings of the fan are not deformed or damaged, as through this unbalances can be produced, that will have a negative effect on the life time and that can result in an untimely breakdown of the axial fan.

The electric connection has to be done basically three-phase according to the connection diagram of the axial fan.

In addition the connection diagram is fixed or printed inside of the terminal box cover.

The ventilator units can be protected in case of need with an external security device (for example motor protection switch)

Engineering Design

The separately driven fan unit FBW is ready for assembly. It consists of a separate fan cover, air flow grid, fan motor with wings and terminal box.

The type of protection in attached condition is IP 55 according to DIN EN 60034-5.

Commissioning

Please follow the Safety Regulations closely. All work is to be carried out only when there is no voltage on the motor. The installation must be

carried out according to the valid regulations by specially qualified personnel. Initially the mains conditions (voltage and frequency) must be compared with the data on the rating plate of the motor. The dimensions of the connecting cables must be adjusted in line with the rated currents of the motor.

The connection points of the motor are marked in accordance with DIN VDE 0530 Part 8.

In section "Electrical connection" of these instructions the most common circuit diagrams for three phase motors in basic design are provided. The connection has to be implemented accordingly. For all other versions, the special circuit diagrams are glued to the inside of the terminal box cover or placed in the terminal box.

After installation a test run has to be done. When doing it, it has to be observed that the air flow is drawn in through the ventilation grid and blown over the motor, which has to be cooled (see also the arrow for rotation direction on the inside of the ventilation grid).

Attention! In case of wrong rotation direction the amount of cooling air is significantly lower.

The axial fans can be used for operation in all kinds of mounting positions. The security regulations for protection against contact of movable parts (DIN EN 294) is fulfilled.

Maintenance

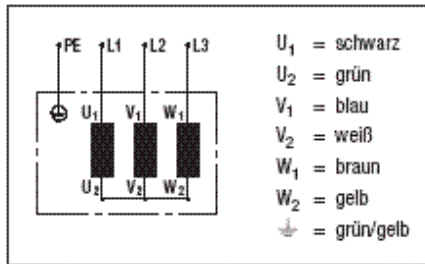
You are once again referred to the Safety Regulations, in particular to isolation, to securing against reconnection, to checking whether all components connected to a voltage source are in dead state.

The bearings of the axial fans are maintenance free for the whole life time. During operation it has to be observed that especially in dusty atmospheres no piling of dust at the base of the fan wings is generated, because that can result in unbalances and life time reduction as well.

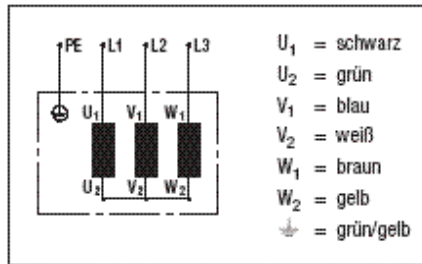
Attention! For spare parts orders the indication of the identification number of the motor is necessary, because the length of the aggregate for special motors can be different from the values of the attached table.

Ergänzende Montage-, Bedienungs- und Wartungsanleitung
 Additional Installation, Operating and Maintenance Instructions

Elektrischer Anschluss, Baureihe FBE

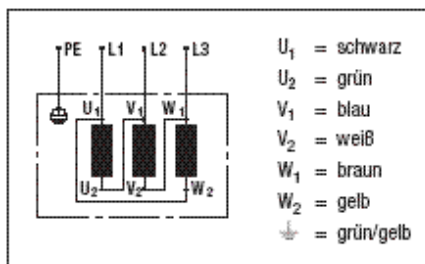


Electrical connection, series FBE

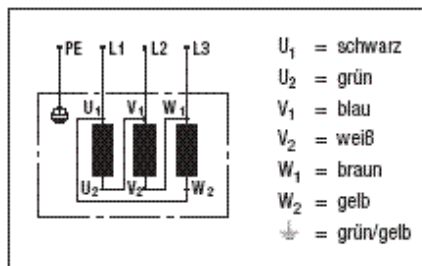


U₁ = black
 U₂ = green
 V₁ = blue
 V₂ = white
 W₁ = brown
 W₂ = yellow

**Drehstrommotor
 Sternschaltung**



**Three-phase asynchronous motor
 Star connection**



U₁ = black
 U₂ = green
 V₁ = blue
 V₂ = white
 W₁ = brown
 W₂ = yellow

**Drehstrommotor
 Dreieckschaltung**

**Three-phase asynchronous motor
 Delta connection**