Water-cooled three-phase asynchronous motors

Type series K21B / K23B

we get things moving

Contents

Note:
We make all efforts to better our products. Versions, technical data and figures could be changed therefore.They are always not binding before written confirmation by the supply factory.

Introduction

The demands for high-power motors for compact installation spaces have increased significantly over the past years. They are required above all in mechanical engineering by the manufacturers of die-casting machines, extruders, printing presses and paper machines, wire drawing machines and mining equipment. Water-cooled motors from VEM are ideally suited for all such applications. One key distinction from the welded steel constructions used to date is the fact that VEM offers water-cooled three-phase motors in grey cast iron housings.

- Raised machine output with no extra installation space requirements
- No additional outlay to comply with noise and vibration limits
- No additional cooling or ventilation measures, as only a minimal amount of heat is dissipated to the surroundings
- Simple integration into existing liquid cooling systems

Juni 2000

VEM motors GmbH Elektromotorenwerk Wernigerode	Werknorm **EG-Konformitätserklärung**	**EW-N 1200** Blatt 1 Seite 1

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

ab: 1. 12. 1998
verbindlich
bis:

Die elektrischen Betriebsmittel
asynchrone Drehstrommotoren mit Käfigläufer,
Kompaktantriebe,
asynchrone Drehstrommotoren mit Schleifringläufer
der Reihen

KP./KPE./K10./K11./K12./K20./K21./K25.
BP./BPE./B10./B11./B20./B21.
AR., BR.
A10./A11./A20./A21.
SP./SPE./S10./S11.
WE1./W20./W21.
R10./R11./R20./R21.
K22. 355 / B22. 355
G10./G11./G20./G21./GS10./GS1.
CP./CPE./C10./C11.
YP./YPE./Y10./Y11./Y20./Y21.
K81R/K82R/B82R/K85./K86.
S81.
M21. 132 bis 180 (MMGE..., EDU...)
KU./BU./YU..
Getriebemotoren S(R)I14.., S(R)P4, S(R)K4...
mit Angabe des Motortyps

stimmen mit den Vorschriften folgender Europäischer Richtlinien überein:
73/23/EWG
Richtlinie des Rates zur Rechtsangleichung der Rechtsvorschriften der Mitgliedstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen.
geändert durch RL 93/68 /EWG
89/336/EWG
Richtlinie des Rates zur Rechtsangleichung der Rechtsvorschriften der Mitgliedstaaten über die elektromagnetische Verträglichkeit
geändert durch RL 91/263/EWG, 92/31/EWG und 93/68/EWG
Die Übereinstimmung mit den Vorschriften dieser Richtlinien wird durch die Einhaltung nachstehender Normen nachgewiesen:

Europäische Norm / Deutsche Norm
EN 61000-6-1, EN 61000-6-2, EN 61000-6-3, EN 61000-6-4
EN 55014-1, EN 55014-2
EN 61000-3-2, EN 61000-3-3
EN 60034-1, DIN EN 60034-2, EN 60034-5, EN 60034-6, EN 60034-9, DIN IEC 60038
EN 61800-3 + A11
EN 60204-1

Wernigerode, d. 20. 6. 2003

Sander
Geschäftsführer

Beutner
Werkleiter

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Zusicherung von Eigenschaften im Sinne der Produkthaftung.
Bei elektronischer Übermittlung des Dokumentes erscheint keine Unterschrift.

Fortsetzung Blatt 1, Seite 2

Erarb.	Gepr.	Genehm.	Änderungszustand
			o) 06 / 06

Standards and regulations

The motors comply with the relevant standards and regulations, particularly with the following:

Title	DIN EN / DIN VDE	IEC
Rotating electrical machines, rating and performance	DIN EN 60034-1	IEC 60 034-1 EC 60 085
Rotating electrical machines, Methods for determining losses and efficiency	DIN EN 60034-2	IEC 60 034-2
Three-phase asynchronous motors for general use, with standardised dimensions and outputs, frame sizes 56 - 315	DIN EN 50347	IEC 60 072
Terminal markings and direction of rotation for rotating electrical machines	DIN EN 60034-8	IEC 60 034-8
Rotating electrical machines, symbols for types of construction	DIN EN 60034-7	IEC 60 034-7
Built-in thermal protection -		IEC 60 034-11
Rotating electrical machines, methods of cooling	DIN EN 60034-6	IEC 60 034-6
Rotating electrical machines, degrees of protection	DIN EN 60034-5	IEC 60 034-5
Rotating electrical machines, Mechanical vibrations	DIN EN 60034-14	IEC 60 034-14
Rotating electrical machines, Noise limits	DIN EN 60034-9	IEC 60 034-9
Rotating electrical machines, starting performance of induction cage motors up to 660 V, 50 Hz	DIN EN 60034-12	IEC 60 034-12
IEC standard voltages	DIN IEC 60 038	IEC 60 038

VEM-Motors conform furthermore to various foreign regulations which are aligned to IEC 60034-1.

Design version

Shaft height	Series	Housing	Material for End shields	Feet	Foot mounting
225 bis 280	K21B / K23B	Grey cast iron with cast-in cooling pipes	Grey cast iron	Grey cast iron	Bolted on
315					Cast on

The motor housing has cast-in cooling tubes. The cooling water passes a guiding ring, that ring is fully assembled in the factory. On this guiding ring, the N-side end shield is mounted. The design allows an optimised distribution of the cooling water, with high water velocities and uniform cooling. Terminal boxes, end shields, winding insulation, degree of protection and painting systems correspond to the standard version.

The advantage of water cooling lies in the reduction of noise emissions compared to surface cooled three-phase motors of the same power rating and size. The waste heat of the motors is dissipated without interference with the environment and the cooling principle allows a better power rating and optimal vibration damping with a more compact design version.

Water cooling

For motors of series K21B / K23B, the waste heat arising from the motor operation is dissipated by the cooling water. The inlet and outlet for the cooling water is implemented at the non-driving end (N-end).
The motors are intended for operation in closed cycle systems. Starting from size 315, the operation in open cycle systems is practicable as a special version..
The cooling water must have the quality of potable water. If used or stored at temperatures lower than the freezing point, an anti-freeze agent must be used.

Configuration of the cooling tubes for motors in sizes 225 up to 280.

Degree of protection

The normal version of the motors complies with degree of protection IP 55, which can be raised to IP 56, according to the order. IP 65 and higher degrees of protection are possible on request. The motors are equipped with drain holes in the end shields, which are closed with plastic stoppers.

The penetration of water along the shaft must be prevented by the user in all motors with the shaft end upwards (IM V3/IM V36).

In the case of flange motors in types of construction IM V3/ IM V36, the collection of water in the flange end shield is prevented by a standard outlet hole.
In normal cases, no special protective measures against the effects of weather are necessary for positioning outside. However, the motors must be protected against intensive solar radiation, e.g. by a protective roof.

Drain holes

All motors have drain holes for draining the condensed water, both at the driving and the non-driving end, that have to be closed by a stopper in accordance with the degree of protection. The drain holes have to show to the ground, otherwise it could happen that condensed water will accumulate.

Vibration behaviour

The permissible vibration intensities of electrical motors are specified in DIN EN 60034-14. The vibration intensity level N (normal) is achieved or bettered by VEM motors in the basic version. The vibration intensity R (reduced) and S (special) can be supplied at extra cost dependent on type on request.

All rotors are dynamically balanced with inserted half key. This balance status is documented on the rating plate by the letter H behind the motor number; the rotor can also be balanced with a full key if the customer prefers. In that case, the code letter behind the motor number will be F.

Type designation of VEM low voltage motors

Example: K21B 225 S4 TWS

K	2	1	B	225	S	4	TWS	....

Version
K ... Squirrel-cage rotor

Design version
2 ... Basic design K21R

Standard mark
1 ... power rating and fixing dimensions according to DIN EN 50347
3 … version with higher power rating, dimensions IEC 60072

Degree of protection/cooling
B ... water cooling, cooling type IC 31W, degree of protection IP 55

Shaft height
in mm

Foot length
S ... short
M ... middle
L ... long

Symbol for different output
X, Y, Z ...

Pol number
2, 4, 6, ... pole-changing separated by dashes

Special symbols
TWS – thermal motor protection, 3 thermistors

Bearings/bearing lubrication

VEM-Motors are equipped with anti-friction bearings from respected manufacturers. The rated bearing lifetime is at least 20.000 h with the exploitation of the maximum permissible load. The rated bearing lifetime for motors installed in a horizontal position without additional axial loading is 40.000 h in the case of coupling service.
The bearings must be relubricated in due times in accordance with the usable grease life, so that the scheduled bearing lifetime can be achieved. Under normal operating conditions, the lubrication filling will allow 10.000 operating hours for the 2-pole version and 20.000 operating hours for the 4-pole version without relubrication.
Under normal service conditions, for versions with relubrication device, 2.000 or 4.000 operational hours will apply. A grease of type KE2R-40 as specified in DIN 51825 will be used as a standard grease. The used grease is to be removed from the lubrication chamber in the external bearing cover after five relubrications. Information about bearing sizes, types and quantities of lubrication and times for relubrication is to be taken from an additional plate attached to the motor.

Use of cylindrical roller bearings

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

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

If the minimum radial force specified is not reached, we recommend the use of grooved ball bearings (easy bearing arrangement). The bearings can be changed on request.

Loading of the bearing and the shaft end

The design of the bearing and shaft is according to standard version K21R.

Paint finish

Normal finish

- Suitable for „moderate“ climatic group as specified in IEC 60721-2-1
  Weather protected and non-weather protected locations, up to 100 % relative air humidity at temperatures up to + 30 °C, for a short time up to 85 % relative air humidity at temperatures up to + 25 °C continuously

Paint systems
- primer coat synthetic resin/zinc phosphate, layer thickness 30 µm
- finish layer dual component polyurethane paint, layer thickness 30 µm

Special finish

- Suitable for the „world wide“ climatic group as specified in IEC 60721-2-1
  Open air positioning in atmospheres tending to be heavily polluted, up to 100 % relative air humidity at temperatures up to +35 °C for a short time, up to 98 % relative air humidity at temperatures up to +30 °C continuously

Paint systems
- primer coat synthetic resin/zinc phosphate, layer thickness 30 µm
- second coat an dual component basis, layer thickness 30 µm
- finish layer dual component paint, layer thickness 30 µm

special paint finish on customer’s request
standard colour RAL 7031 blue-grey

Shaft ends

The definition of the motor ends is made in accordance to IEC 60034-8:

D-end (DS):	Drive end of the motor (Driving side)
N-end (NS):	End opposite to the drive (the side positio ned opposite the DS) (Non-driving side)

Centre holes as specified in DIN 332, sheets 1 and 2, Form DS.

The key and key ways are executed as specified in DIN 6885 sheet 1, Form At. The key lengths comply with DIN EN 50347.

Threads for press-on and dismantling devices:

Shaft end diameters	thread
from 50 up to 85 mm	M20
from 85 up to 130 mm	M24

The motors are always supplied with key fitted.

The second shaft end is able to transfer the full nominal output in the case of coupling drive. The output transmission capability of the second shaft end is, in the case of belt, chain or pinion drive available on request.
The drive elements with key ways, such as belt pulleys or couplings, are to be balanced with a half key inserted with a balance quality grade of at least G 6.3 as specified in DIN ISO 1940 part 1.

Design voltage and frequency

In the basic version, motors are supplied for the following design voltages and frequencies:

230/400 V	/Y	50 Hz
400/690 V	/Y	50 Hz
690 V		50 Hz
480 V		60 Hz

The motors can be operated in networks in which the voltage at the design frequency deviates from the rated value (design voltage area A) by up to ± 5 % without changing the design output. The frequency in these networks can deviate by ± 2 % from the rated value in the case of the design voltage.
The above-given standard voltages, specified as in DIN IEC 60038 will be taken as design points.
Special voltages and frequencies on customer request.

Design voltage range, design frequency range

Motors that are to be used for mains voltage with a general tolerance of + 10 % as specified DIN IEC 60038 are to be selected according to the corresponding design voltage listed in the technical tables. The design voltage range restricted by UU and UO is also given there.
If the motors are connected to voltages between 95 % and 105 % of the design voltage range - this will correspond to the relevant mains voltage value as specified in DIN IEC 60038 with + 10 % - it will already be permissible to exceed the permissible temperature rise of the stator winding at the frequency limits of the measuring range by approximately 10 K as specified in DIN EN 60034-1, without taking the permissible tolerances into account.

Design output

The rated output applies to continuous operation as specified in DIN EN 60034-1, related to a coolant temperature of 30 °C and an altitude of 1000 m above sea level, operating frequency 50 Hz and design voltage.

Motor torque

The design torque in Nm given at the motor shaft will be

$$M = 9550 \cdot \frac{P}{n}$$

with P = design output in kW
n = speed in r.p.m.

The starting torque, pull-up torque and pull-out torque are given as multiples of the design torques in the motor selection data tables. If the voltage deviates from your design data, the torques will change approximately quadratically.

Ambient temperature

All standard versions of VEM motors are suitable for use under ambient temperatures from –20 °C up to +40 °C (depending on anti-freeze agent). Different temperatures on request. If frequent moisture condensation is to be expected at the place of installation of a motor, we recommend the use of anti-condensation heating devices or other appropriate precautions.

Overload capacity

All motors can be subject to the following overload conditions as specified in DIN EN 60034-1:
- 1.5-fold rated current for 2 min.
- 1.6-fold rated torque for 15 s

Both conditions apply to rated voltage and rated frequency.

Nominal efficiency and power factor

Efficiency η and the power factor $\cos \varphi$ are given in the lists of the motor selection.

Restarting in the case of residual field and phase opposition

It is possible to restart all motors after a network failure with 100 % residual field.

Motor protection

The following variations of motor protection are possible, if ordered:
- Motor protection with thermistor temperature sensors in the stator winding
- Bimetal temperature sensor as opener or closer in the stator winding
- Silicium diodes
- Resistance thermometer to monitor winding or bearing temperature
- Bearing vibration diagnosis

Tolerances – Electrical parameters

The following tolerances are permitted as specified in DIN EN 60034-1:

Efficiency (when determined indirectly)	-0.15 (1-η) at P_N 50 kW -0.1 (1-η) at P_N > 50 kW
Power factor	$\frac{1-\cos\varphi}{6}$ at least 0.02 at most 0.07
Slip (at standard load in warmed-up state)	± 20 % at P_N 1kW ± 30 % at P_N < 1kW
Starting current (in the planned starting connection)	+ 20 % without lower limit
Starting torque	- 15 % and + 25 %
Pull-up torque	- 15 %
Pull-out torque	- 10 % (after application of this tolerance M_k/M still at least 1.6)
Moment of inertia	± 10 %
Noise level (measurement-area related sound intensity level)	+ 3 dB (A)

Taking necessary manufacturing tolerances and deviations in materials in the case of the raw materials used into account, these tolerances are permitted for three-phase asynchronous motors. The following remarks are given in the standard:

1. A guarantee of all or any of the values as specified in the table is not mandatory. Guaranteed values to which the permissible deviations should apply must be specified expressly in tenders. The permissible deviations must comply with the table.
2. Attention is drawn to the differences in the interpretation of the concept of a “guarantee“. In some countries, there is a differentiation between typical and declared values.
3. If a permissible deviation only applies in one direction, the value will not be limited in the other direction.

Tolerances – Mechanical parameters

Letter codes according to DIN EN 50 347	Meaning of the dimension	Fit or tolerance
B	Spacing of feet fixing holes in axial direction	± 1 mm
P	Diameter or width across corners of the flange	- 1 mm
b	Spacing of feet fixing holes across axial direction	± 1 mm
N	Diameter of the flange spigot	up to diameter 230 mm j6 from diameter 250 mm h6
D, DA	Diameter of the cylindrical shaft end	up to diameter 48 mm k6 from diameter 55 mm m6
M	Pitch circle diameter of the mounting flange	± 0.8 mm
AB, AC	Largest width of the motor (without terminal boxes)	+ 2 %
H	Shaft height (lowest edge of foot to centre of shaft end)	up 250 mm -0.5 above 250 mm -1
L, LC	Total length of the motor	+ 1 %
HD	Total height of the motor (lowest edge of foot, housing or flange up to the highest point of the motor)	+ 2 %
K, S	Diameter of the mounting holes of the foot or flange	+ 3 %
GA, GC	Lowest edge of shaft end to the upper edge of the key	+ 0.2 mm
F, FA	Width of the key	h9
C, CA	Distance from the centre of the first foot mounting hole to the shaft shoulder or flange face	± 3.0 mm
	Distance from the shaft shoulder to the flange face in the case of fixed bearing on D-end	± 0.5 mm
	Distance from the shaft shoulder to the flange face	± 3.0 mm
	Motor mass	-5 up to +10 %

Three-phase motors with squirrel-cage rotor
Type K21B

Cooling method IC 31W, duty type S1, continuous duty
Insulation class F, degree of protection IP 55

Motor selection data
power rating according to DIN EN 50 347

Design point 400 V, 50 Hz
Insulation class F, thermal reserve up to B

Type	P_B	n_B	EFF-	$\eta_{4/4B}$	$\eta_{3/4B}$	cos φ_B	I_B 400 V	I_A/I_B	M_A/M_B	M_K/M_B	J	m
	kW	min-1	-	%	%	-	A	-	-	-	kgm2	kg
synchronous speed 3000 min^{-1} – 2pole version												
K21B 225 S2	37	2940	2	93.0	92.0	0.90	64	7.0	1.8	2.4	0.193	320
K21B 225 M2	45	2945	1	94.0	94.0	0.90	76.5	6.7	1.7	2.5	0.220	350
K21B 250 M2	55	2960	1	94.7	94.6	0.89	94	7.4	2.0	2.7	0.375	440
K21B 280 S2	75	2970	1	94.6	93.5	0.92	124	7.5	2.0	2.6	0.650	600
K21B 280 M2	90	2970	2	94.7	94.2	0.91	151	8.5	2.2	2.8	0.675	605
K21B 315 S2	110	2975		95.4	94.5	0.91	183	8.5	1.5	2.5	1.21	965
K21B 315 M2	132	2975		95.4	94.5	0.91	219	8.5	2.0	2.7	1.44	1025
K21B 315 MX2	160	2975		96.0	95.0	0.93	259	8.5	2.0	2.6	1.76	1155
K21B 315 MY2	200	2970		96.0	95.2	0.92	327	8.2	2.6	2.6	2.82	1450
K21B 315 L2	250	2973		96.1	95.2	0.93	404	7.3	2.1	2.0	3.66	1700
K21B 315 LX2	315	2975		96.7	95.5	0.92	511	7.4	2.4	2.0	4.43	1870
synchronous speed 1500 min^{-1} – 4pole version												
K21B 225 S4	37	1470	2	93.0	93	0.84	68.5	6.0	1.7	2.4	0.2750	340
K21B 225 M4	45	1465	2	92.0	92.4	0.85	84	5.8	1.4	2.2	0.3130	355
K21B 250 M4	55	1475	2	94.0	94	0.84	100	6.6	2.0	2.1	0.5250	450
K21B 280 S4	75	1480	2	94.1	93.5	0.86	134	7.0	2.0	2.2	0.9500	630
K21B 280 M4	90	1480	2	94.6	93.5	0.86	160	7.0	2.1	2.2	1.10	675
K21B 315 S4	110	1485		95.1	94.5	0.86	194	7.5	1.8	2.2	1.96	985
K21B 315 M4	132	1485		95.1	94.5	0.86	233	7.0	1.8	2.2	2.27	1065
K21B 315 MX4	160	1480		95.0	94.8	0.87	279	7.0	1.8	2.0	2.73	1175
K21B 315 MY4	200	1485		96.0	95	0.88	342	7.5	2.0	2.4	4.82	1485
K21B 315 L4	250	1485		96.1	95	0.90	417	8.0	2.0	2.3	5.93	1750
K21B 315 LX4	315	1490		96.5	95.5	0.88	535	8.6	1.9	2.5	6.82	1870
synchronous speed 1000 min^{-1} – 6pole version												
K21B 225 M6	30	972		90.0	90	0.88	54.5	5.9	1.9	2.5	0.4430	335
K21B 250 M6	37	980		91.5	91.5	0.87	67	6.0	2.0	2.3	0.8250	430
K21B 280 S6	45	980		92.0	92	0.87	81	6.0	2.0	2.0	1.28	575
K21B 280 M6	55	980		92.5	92	0.88	97.5	6.5	2.3	2.4	1.48	615
K21B 315 S6	75	985		93.7	93	0.87	133	7.0	2.0	2.4	2.63	935
K21B 315 M6	90	990		94.4	93.5	0.88	156	7.0	2.0	2.4	3.33	1025
K21B 315 MX6	110	990		94.0	93.8	0.88	192	7.5	2.2	2.6	3.60	1055
K21B 315 MY6	132	990		95.0	94.7	0.88	228	7.5	2.0	2.4	6.00	1335
K21B 315 L6	160	985		95.3	95	0.89	272	7.5	2.3	2.4	6.67	1490
K21B 315 LX6	200	990		95.0	94.7	0.87	349	8.3	2.2	2.7	8.6	1700

Three-phase motors with squirrel-cage rotor
Type K21B

Cooling method IC 31W, duty type S1, continuous duty
Insulation class F, degree of protection IP 55

Motor selection data
increased power rating, fixing dimensions according to IEC 60 072

Design point 400 V, 50 Hz
Insulation class F

Type	PB	nB	ηB	cos φ_B	IB 400 V	IA/IB	MA/MB	MK/MB	J	m
	kW	min-1	%	-	A	-	-	-	-kgm²	kg
synchronous speed 3000 min⁻¹ – 2pole version										
K23B 225 S2	45	2945	91.5	0.87	81.5	7.8	1.9	2.4	0.193	320
K23B 225 M2	52	2937	93.5	0.89	90	7.0	1.7	2.7	0.220	350
K23B 250 M2	65	2950	94.2	0.88	113	7.5	2.0	2.7	0.375	440
K23B 280 S2	90	2957	93.5	0.92	151	7.0	1.6	2.0	0.650	600
K23B 280 M2	110	2967	93.5	0.91	187	8.0	1.8	2.5	0.675	605
K23B 315 S2	132	2970	94.5	0.92	219	8.5	1.2	2.4	1.21	965
K23B 315 M2	160	2970	94.6	0.92	265	8.5	1.5	2.4	1.44	1025
K23B 315 MX2	200	2975	96.0	0.92	327	9.0	1.6	2.8	1.76	1155
K23B 315 MY2	250	2977	96.0	0.90	418	9.0	2.0	3.0	2.82	1450
K23B 315 L2	315	2977	96.5	0.93	507	8.5	2.4	2.5	3.66	1700
K23B 315 LX	355	2985	97.0	0.92	574	9.0	2.8	3.2	4.43	1870
synchronous speed 1500 min⁻¹ – 4pole version										
K23B 225 S4	45	1467	92.0	0.82	86	5.8	1.7	2.3	0.2750	340
K23B 225 M4	55	1473	91.0	0.75	116	7.0	2.3	2.5	0.3130	355
K23B 250 M4	75	1485	94.0	0.81	142	7.4	1.7	2.3	0.5250	450
K23B 280 S4	90	1476	93.6	0.83	167	7.5	1.8	2.4	0.9500	630
K23B 280 M4	110	1483	91.0	0.81	215	7.0	2.8	3.0	1.10	675
K23B 315 S4	132	1486	94.5	0.85	237	9.0	2.5	3.0	1.96	985
K23B 315 M4	160	1487	95.1	0.82	296	9.0	2.0	3.0	2.27	1065
K23B 315 MX4	190	1486	95.3	0.82	351	9.0	2.0	3.0	2.73	1175
K23B 315 MY4	250	1487	95.4	0.88	430	8.5	2.4	2.6	4.82	1485
K23B 315 L4	290	1487	96.2	0.89	489	8.5	2.4	2.7	5.93	1750
K23B 315 LX4	355	1489	96.0	0.85	628	8.5	2.0	2.5	6.82	1870
synchronous speed 1000 min⁻¹ – 6pole version										
K23B 225 M6	37	971	89.0	0.87	69	5.6	1.9	2.4	0.4430	335
K23B 250 M6	45	977	91.0	0.86	83	5.9	2.0	2.3	0.8250	430
K23B 280 S6	55	985	91.0	0.85	103	7.2	2.3	2.8	1.28	575
K23B 280 M6	75	983	91.5	0.86	138	7.0	2.3	2.5	1.48	615
K23B 315 S6	90	986	92.7	0.88	159	7.0	2.0	2.3	2.63	935
K23B 315 M6	110	985	93.1	0.88	194	7.5	2.3	2.5	3.33	1025
K23B 315 MX6	132	986	93.2	0.86	238	7.5	2.3	2.5	3.60	1055
K23B 315 MY6	160	988	94.1	0.86	285	8.2	2.5	2.8	6.00	1335
K23B 315 L6	200	898	94.5	0.80	382	8.5	2.5	3.0	6.67	1490
K23B 315 LX6	240	989	93.5	0.75	494	7.5	2.5	2.8	8.6	1700

Dimensions
Water-cooled three-phase motors with squirrel-cage rotor

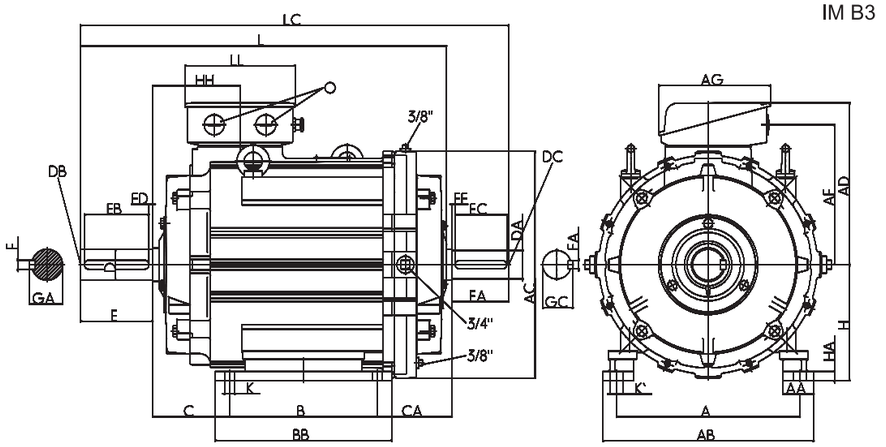
																				Terminal box		
Type	A	AA	AB	AC	AD	AD	AD'	AF	B	BB	C	CA	H	HA	HH	K	K'	L	LC	LL	AG	O
K2.B	b	n	f	g		KL/KR	g_1		a	e	w_1	w_2	h	c	A	s	s'	k	k1	z	x	-
225S2	356	75	413	440	300	217	300	240	286	343	149	196	225	25	168	19	25	680	800	207	212	2xM50x1.5
225S4.8	356	75	413	440	300	217	300	240	286	343	149	196	225	25	168	19	25	710	830	207	212	2xM50x1.5
225M2	356	75	413	440	300	217	300	240	311	368	149	211	225	25	168	19	25	680	800	207	212	2xM50x1.5
225M4	356	75	413	440	300	217	300	240	311	368	149	211	225	25	168	19	25	710	830	207	212	2xM50x1.5
225M6.8	356	75	413	440	300	217	300	240	311	368	149	171	225	25	168	19	25	710	830	207	212	2xM50x1.5
250M2	406	84	471	490	358	234	358	282	349	412	168	210	250	28	177	24	30	737	857	242	282	2xM63x1.5
250M4.6.8	406	84	471	490	358	234	358	282	349	412	168	210	250	28	177	24	30	737	857	242	282	2xM63x1.5
280S2	457	94	522	550	386	266	386	310	368	431	190	234	280	32	206	24	30	875	1028	242	282	2xM63x1.5
280M2	457	94	522	550	386	266	386	310	419	482	190	229	280	32	206	24	30	875	1028	242	282	2xM63x1.5
280S4.6.8	457	94	522	550	386	266	386	310	368	431	190	234	280	32	206	24	30	875	1028	242	282	2xM63x1.5
280M4.6.8	457	94	522	550	386	266	386	310	419	482	190	229	280	32	206	24	30	875	1028	242	282	2xM63x1.5
315S2	508	126	590	600	416	280	416	340	406	503	216	316	315	44	296	28	35	1090	1243	242	282	2xM63x1.5
315S4.6.8	508	126	590	600	416	280	416	340	406	503	216	316	315	44	296	28	35	1120	1273	242	282	2xM63x1.5
315M2	508	126	590	600	416	280	416	340	457	554	216	320	315	44	296	28	35	1090	1243	242	282	2xM63x1.5
315M4.6.8	508	126	590	600	416	280	416	340	457	554	216	320	315	44	296	28	35	1120	1273	242	282	2xM63x1.5
315MX2	508	126	590	600	416	280	416	340	457	554	216	400	315	44	296	28	35	1090	1243	242	282	2xM63x1.5
315MX4	508	126	590	600	416	280	416	340	457	554	216	400	315	44	296	28	35	1120	1273	242	282	2xM63x1.5
315MX6.8	508	126	590	600	416	280	416	340	457	554	216	320	315	44	296	28	35	1120	1273	242	282	2xM63x1.5
315MX10.12	508	126	590	600	416	280	416	340	457	554	216	320	315	44	296	28	35	1120	1273	242	282	2xM63x1.5
315MY2	508	110	590	610	481	313	481	400	457	573	216	495	315	44	310	28	35	1436	1589	340	415	2xM63x1.5
315MY4.6.8	508	110	590	610	481	313	481	400	457	573	216	495	315	44	310	28	35	1466	1649	340	415	2xM63x1.5
315L2	508	110	590	610	481	313	481	400	508	624	216	539	315	44	310	28	35	1436	1589	340	415	2xM63x1.5
315L4.6.8	508	110	590	610	481	313	481	400	508	624	216	564	315	44	310	28	35	1466	1649	340	415	2xM63x1.5
315LX2	508	110	590	610	481	313	481	400	508	624	216	684	315	44	310	28	35	1436	1589	340	415	2xM63x1.5
315LX4	508	110	590	610	481	313	481	400	508	624	216	689	315	44	310	28	35	1466	1649	340	415	2xM63x1.5
315LX6.8	508	110	590	610	481	313	481	400	508	624	216	564	315	44	310	28	35	1466	1649	340	415	2xM63x1.5

Dimensions
Water-cooled three-phase motors with squirrel-cage rotor

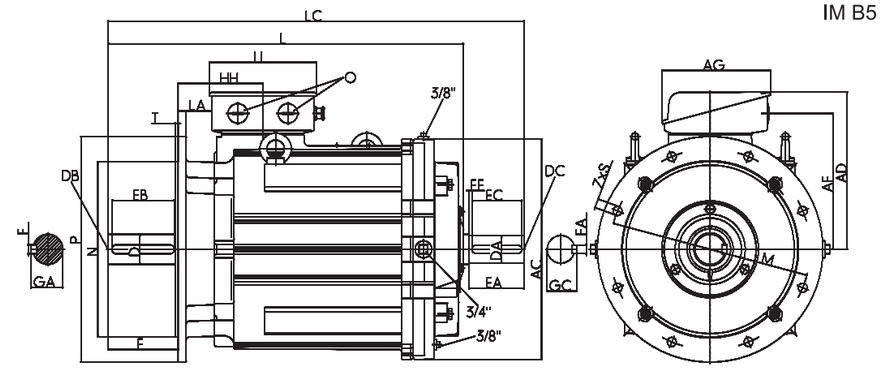
Terminal box	Flange dimensions						Shaft end D-side							Shaft end N-side							Tolerances				
Type	Type	LA	M	N	S	T	D	DB	E	EB	ED	F	GA	DA	DC	EA	EC	EE	FA	GC	-	-	-	-	-
	-	c1	e1	b1	s1	f1	d	-	l			u	t	d_1		l1			u_1	t_1	H	N	D	DA	
225S2	FF 400	16	400	350	18	5	55	M20	110	100	5	16	59	55	M16	110	100	5	16	59	-0.5	h6	m6	m6	H7
225S4.8	FF 400	16	400	350	18	5	60	M20	140	125	7.5	18	64	55	M16	110	100	5	16	59	-0.5	h6	m6	m6	H7
225M2	FF 400	16	400	350	18	5	55	M20	110	100	5	16	59	55	M16	110	100	5	16	59	-0.5	h6	m6	m6	H7
225M4	FF 400	16	400	350	18	5	60	M20	140	125	7.5	18	64	55	M16	110	100	5	16	59	-0.5	h6	m6	m6	H7
225M6.8	FF 400	16	400	350	18	5	60	M20	140	125	7.5	18	64	55	M16	110	100	5	16	59	-0.5	h6	m6	m6	H7
250M2	FF 500	18	500	450	18	5	60	M20	140	125	7.5	18	64	55	M16	110	100	5	16	59	-0.5	h6	m6	m6	H7
250M4.6.8	FF 500	18	500	450	18	5	65	M20	140	125	7.5	18	69	55	M16	110	100	5	16	59	-0.5	h6	m6	m6	H7
280S2	FF 500	18	500	450	18	5	65	M20	140	125	7.5	18	69	65	M20	140	125	7.5	18	69	-1	h6	m6	m6	H7
280M2	FF 500	18	500	450	18	5	65	M20	140	125	7.5	18	69	65	M20	140	125	7.5	18	69	-1	h6	m6	m6	H7
280S4.6.8	FF 500	18	500	450	18	5	75	M20	140	125	7.5	20	79.5	65	M20	140	125	7.5	18	69	-1	h6	m6	m6	H7
280M4.6.8	FF 500	18	500	450	18	5	75	M20	140	125	7.5	20	79.5	65	M20	140	125	7.5	18	69	-1	h6	m6	m6	H7
315S2	FF 600	22	600	550	22	6	65	M20	140	125	7.5	18	69	65	M20	140	125	7.5	18	69	-1	h6	m6	m6	H7
315S4.6.8	FF 600	22	600	550	22	6	80	M20	170	140	15	22	85	70	M20	140	125	7.5	20	74.5	-1	h6	m6	m6	H7
315M2	FF 600	22	600	550	22	6	65	M20	140	125	7.5	18	69	65	M20	140	125	7.5	18	69	-1	h6	m6	m6	H7
315M4.6.8	FF 600	22	600	550	22	6	80	M20	170	140	15	22	85	70	M20	140	125	7.5	20	74.5	-1	h6	m6	m6	H7
315MX2	FF 600	22	600	550	22	6	65	M20	140	125	7.5	18	69	65	M20	140	125	7.5	18	69	-1	h6	m6	m6	H7
315MX4	FF 600	22	600	550	22	6	80	M20	170	140	15	22	85	70	M20	140	125	7.5	20	74.5	-1	h6	m6	m6	H7
315MX6.8	FF 600	22	600	550	22	6	80	M20	170	140	15	22	85	70	M20	140	125	7.5	20	74.5	-1	h6	m6	m6	H7
315MX10.12	FF 600	22	600	550	22	6	80	M20	170	140	15	22	85	70	M20	140	125	7.5	20	74.5	-1	h6	m6	m6	H7
315MY2	FF 600	22	600	550	22	6	65	M20	140	125	7.5	18	69	65	M20	140	125	7.5	18	69	-1	h6	m6	m6	H7
315MY4.6.8	FF 600	22	600	550	22	6	80	M20	170	140	15	22	85	70	M20	140	125	7.5	20	74.5	-1	h6	m6	m6	H7
315L2	FF 600	22	600	550	22	6	65	M20	140	125	7.5	18	69	65	M20	140	125	7.5	18	69	-1	h6	m6	m6	H7
315L4.6.8	FF 600	22	600	550	22	6	80	M20	170	140	15	22	85	70	M20	140	125	7.5	20	74.5	-1	h6	m6	m6	H7
315LX2	FF 600	22	600	550	22	6	65	M20	140	125	7.5	18	69	65	M20	140	125	7.5	18	69	-1	h6	m6	m6	H7
315LX4	FF 600	22	600	550	22	6	80	M20	170	140	15	22	85	70	M20	140	125	7.5	20	74.5	-1	h6	m6	m6	H7
315LX6.8	FF 600	22	600	550	22	6	80	M20	170	140	15	22	85	70	M20	140	125	7.5	20	74.5	-1	h6	m6	m6	H7

Water-cooled three-phase motors with squirrel-cage rotor
Cooling method IC 31W, degree of protection IP 55

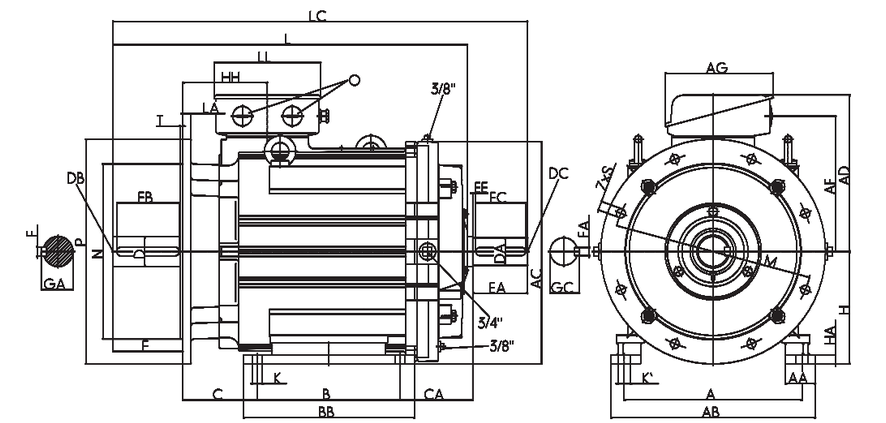
IM B3



IM B5



IM B35

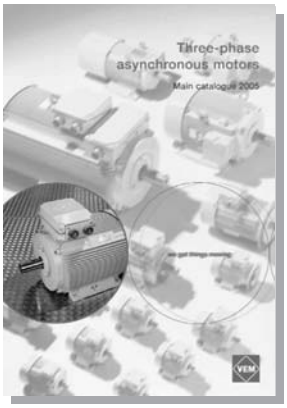


Additional information about products from VEM-group can be found in the electronic catalogue. The catalogue can help to choose and configure VEM-products and contains full-scale and dimensioned technical drawings of all products, that can be copied in DXF-format.
In addition to general information about the VEM-group, catalogues, spare part lists and operating and maintenance instructions of the different design versions are available as well.

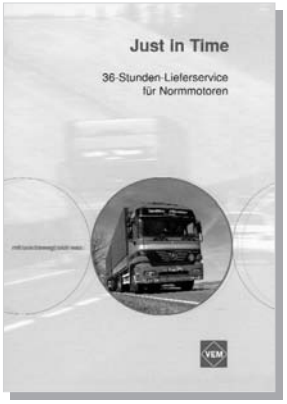
Current version 4.5

Additional catalogues low voltage motors

Main catalogue 2005
EMW/04-102 E / 0305



36-hours-delivery service
VEM / 14-601 E / 0402



Compact drives
VEM 06-001 E/0302

Notice:
It is our objective to improve our products continuously. Specifications, technical data and illustrations can change. These are not binding as long as a written confirmation by the manufacturer confirms the validity.

VEM motors GmbH
Carl-Friedrich-Gauss-Strasse 1
38855 Wernigerode
Phone: +49 (0)3943/68 0
Fax: +49 (0)3943/68 2440
E-mail: motors@vem-group.com
www.vem-group.com

we get things moving

EMW / 04-053 E / 0406 Printed in the Federal Republic of Germany. Changes are reserved.