COMBIVERT

2

D	BETRIEBSANLEITUNG	**Leistungsteil**
GB	INSTRUCTION MANUAL	**Power Circuit**
F	MANUEL D'INSTRUCTIONS	**Circuit de Puissance**
I	MANUALE D'ISTRUZIONE	**Circuito di potenza**
RU	Руководство по эксплуатации	**Силовая часть**
E	MANUAL DE INSTRUCCIONES	**Circuito de Potencia**

STOP

Erst Betriebsanleitung Teil 1 lesen !
Read Instruction manual part 1 first !
Lisez d'abord le manuel d'instructions partie 1 !
Prima leggere le manuale di istruzione 1 parte !
Сначала прочти инструкцию 1 част !
Leer manual de instrucciones parte 1 antes !

KEB

00.F5.00B-K003

12/2004

D

Seite
D - 3 ..... D - 20

Diese Betriebsanleitung beschreibt die Leistungsteile der KEB COMBIVERT F5 - Serie. Sie ist nur gültig in Verbindung mit der Betriebsanleitung Teil 1 und Teil 3. Alle Anleitungen müssen jedem Anwender zugänglich gemacht werden. Vor jeglichen Arbeiten muß sich der Anwender mit dem Gerät vertraut machen. Darunter fällt insbesondere die Kenntnis und Beachtung der **Sicherheits- und Warnhinweise aus Teil1**. Die in dieser Betriebsanleitung verwendeten Piktogramme entsprechen folgender Bedeutung:

Gefahr
Warnung
Vorsicht

Achtung,
unbedingt
beachten

Information
Hilfe
Tip

GB

Page
GB - 3 .... GB - 20

This Instruction Manual describes the power circuit of the KEB COMBIVERT F5 series. It is only valid together with the Instruction Manuals Part 1 and Part 3. Both Instruction Manuals must be made available to the user. Prior to performing any work on the unit the user must familiarize himself with the unit. This includes especially the knowledge and observance of the **safety and warning directions of Part 1**. The pictographs used in this Instruction Manual have following meaning:

Danger
Warning
Caution

Attention,
observe at
all costs

Information
Help
Tip

F

Page
F - 3 ..... F - 20

Ce manuel d'instruction décrit le circuit de puissance des KEB COMBIVERT de la serie F5. Il est à utiliser avec les manuels d'instruction Partie 1 et Partie 3. L'ensemble des manuels d'instruction doit être fournit à l'utilisateur. Avant d'intervenir sur l'appareil, l'utilisateur doit se familiarisé lui-même avec l'appareil. Ceci inclu de respecter les remarques de sécurité et de mise en garde de la partie 1. Les pictogrammes utilisés dans ce manuel ont la signification suivante:

Danger
Avertissement
Précaution

Attention,
à respecter
obligatoirement

Information
Aide
Astuces

I

Pagina
I - 3 ..... I - 20

Questo manuale d'istruzione descrive il circuito di potenza delle serie KEB COMBIVERT F5. E' valido solo unitamente ai manuali parte 1 e parte 3. Entrambi i manuali d'istruzione devono essere resi disponibili all'utente. Prima di procedere a qualsiasi lavoro sull'apparecchiatura l'utente deve familiarizzare con la stessa. Questo include in special modo la conoscenza e l'osservanza delle direttive di sicurezza e delle avvertenze della parte 1. I simboli utilizzati in questo manuale hanno il seguente significato:

Avvertimento
Pericolo
Cautela

Attenzione,
osservare
assolutamente

Informzione
Aiuto
Suggerimento

RU

Страницы
RU - 3 ..... RU - 20

Эта инструкция описывает силовую часть преобразователя частоты KEB COMBIVERT F5. Она действительна только совместно с инструкциями часть 1и часть 3. Все инструции должны быть доступны для каждого пользователя. Прежде чем приступить к работе, каждый пользователь должен тчательно ознакомиться с прибором. Особено это касается изучения и соблюдения требований к **Безопасности и Предупреждениям из части 1**. Ниже приведённые пиктограммы означают следующее.

Опастность
Предупреждение
Осторожно

Внимание
обязательно
соблюдать

Информация
Указание
Совет

E

Páginas
E - 3 ..... E - 20

Este manual de instrucciones describe las series estándar del KEB COMBIVERT F5. Este manual de instrucciones debe estar a disposición de cualquier usuario. Antes de manipular el convertidor el usuario debe familiarizarse con él. Esto debe aplicarse especialmente al conocimiento de las indicaciones de advertencia y seguridad. El significado de los pictogramas usados en este manual son:

Peligro
Advertencia
Precaución

Atención,
Cuidado

Consejo
Comentario
Información

1. General

1.1 Product Description

In selecting the KEB COMBIVERT you have acquired a frequency inverter with the highest demands on quality and dynamic.

It serves exclusively for a stepless speed regulation of a three-phase a.c. motor.

The operation of other electrical consumers is prohibited and can lead to the destruction of the unit.

This manual describes the power circuits for **KEB COMBIVERT F5-B, F5-C, F5-G, F5-M** and **F5-S** frequency inverters in the range of

- **0.37...45 kW / 230V class**
- **0.37...160 kW / 400V class**

GB

Additional manuals:

• **200...355 kW / 400V class / W-housing**	00.F5.01Z-KW01
• **200...630 kW / 400V class / P-housing**	00.F5.01Z-KP00
• **7,5...355 kW / water-cooled**	00.F5.01W-K000
• **Servo A-housing**	00.F5.S1M-KA01

Not only is this unit small in size and price, it also has the following features:

- only slight switching losses due to IGBT
- low noise development due to high switching frequency
- extensive safety device for current, voltage and temperature
- voltage and current monitoring in static and dynamic operation
- conditionally short circuit proof and earth-fault proof
- noise immunity in accordance with IEC1000
- hardware current regulation
- integrated cooling fan
- uniform mounting grid
- mountable side by side through rack design

1.2 Rating Plate

10.F5.G1B–3200

at FI: Cooling
0: Standard
1: Flat rear
2: Water-cooled
3: Convection

at Servos: Motor cooling
0: Self-cooling
1: External cooling

Encoder interface type see control part

0: no interface	5: Resolver a. SSI	A: Inc.-Input a. Initiator	F: Hiperface a. Inc.-Outp.
1: Inc.-Input a. Inc.-I/O	6: Hiperface a. SSI	B: Resolver a. Initiator	G: Inc.-Input a. Inc.-Inp.
2: Resolver a. Inc.-I/O	7: Inc.-Input a. Tacho	C: Hiperface a. Initiator	H: Resolver a. Inc.-Inp.
3: Hiperface a. Inc.-I/O	8: Resolver a. Tacho	D: Inc.-Input a. Inc.-Outp.	I: Hiperface a. Inc.-Inp.
4: Inc.-Input a. SSI	9: Hiperface a. Tacho	E: Resolver a. Inc.-Outp.	

at FI: Switching frequency / max. short time current / OC-tripping current

0: 2 kHz/125%/150%	5: 4 kHz/150%/180%	A: 8 kHz/180%/216%	F: 16 kHz/200%/240%
1: 4 kHz/125%/150%	6: 8 kHz/150%/180%	B: 16 kHz/180%/216%	G: 2 kHz/400%/480%
2: 8 kHz/125%/150%	7: 16 kHz/150%/180%	C: 2 kHz/200%/240%	H: 4 kHz/400%/480%
3: 16 kHz/125%/150%	8: 2 kHz/180%/216%	D: 4 kHz/200%/240%	I: 8 kHz/400%/480%
4: 2 kHz/150%/180%	9: 4 kHz/180%/216%	E: 8 kHz/200%/240%	K: 16 kHz/400%/480%

at Servos: Motor speed
1: 1500 rpm 2: 2000 rpm 3: 3000 rpm 4: 4000 rpm 6: 6000 rpm

Input identification

0: 1ph 230V AC/DC	5: 400V DC class	A: 6ph 400V AC	
1: 3ph 230V AC/DC	6: 1ph 230V AC	Z: 230V AC oder AC/DC	
2: 1/3ph 230V AC/DC	7: 3ph 230V AC	Y: 400V AC oder AC/DC	
3: 3ph 400V AC/DC	8: 1/3ph 230V AC	W: 230V DC	
4: 230V DC class	9: 3ph 400V AC	V: 400V DC	

Housing type A, B, D, E, G, H, R, U, W

Accessory
0: without
1: braking transistor
2: integrated filter
3: braking transistor, integrated filter

Control type
B: BASIC
C: COMPACT
G: GENERAL (controlled frequency inverter)
M: MULTI (regulated, field-oriented frequency inverter for three-phase asynchronous motors)
S: SERVO (regulated frequency inverter for synchronous motors)

Series F5

at FI: Unit size

at Servos: Motor identification / motor dimension wide

GB

1.3 Installation Instructions

1.3.1 Cooling Systems

The KEB COMBIVERT F5 is available for different cooling systems:

Standard

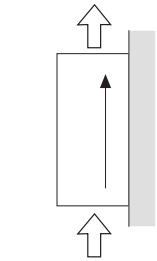
- **Standard**
  Standard design with heat sink and fan (below described).

Special versions

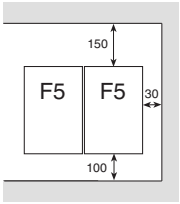
The dissipation of the power loss must be guaranteed by the machine builder.

- **Flat rear**
  The heat sink is omitted at this design. The unit must be mounted onto an appropriate base to ensure the heat dissipation.
- **Water-cooling**
  This design is laid out for the connection to an existing cooling system. The dissipation of the power loss must be guaranteed by the machine builder. To avoid moisture condensation the minimum inlet temperature may not fall below the room temperature. The maximum inlet temperature shall not exceed 40°C. Measurements against contamination and calcifying must be taken externally. The maximum pressure on the cooling system shall not exceed 4 bar (special version with higher pressures on request).
- **Convection (through-mount version)**
  At this design the heat sink is moved through a section of the control cabinet to the outside.

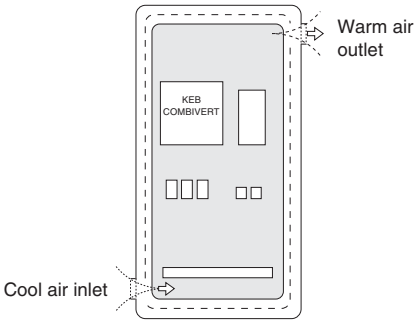
1.3.2 Control Cabinet Installation

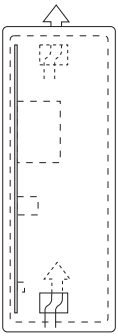


Direction of cooling fins



Minimum distances





GB

1.4 DC-Supply

The **DC input current** of the inverter is basically determined by the used motor. The data can be taken from the motor name plate.

230V Class:

$$I_{DC} = \frac{\sqrt{3} \text{ x rated motor voltage x rated motor current x motor cos } \varphi}{\text{DC voltage (310V)}}$$

400V Class:

$$I_{DC} = \frac{\sqrt{3} \text{ x rated motor voltage x rated motor current x motor cos } \varphi}{\text{DC voltage (540V)}}$$

The **DC input peak current** is determined by the operating range:

- if you accelerate on the hardware current limit, the short-time limit current of the inverter must be used in the formula above (instead of the rated motor current).
- if the motor in normal operation is never stressed with rated torque, it can be calculated with the real motor current.
- a good practice value corresponds approx. to 1,5-times of the rated motor current (from 90kW 1,25-times)

2. Technical Data

2.1 Technical Data 230V Class

Inverter Size			**05**			**07**			**09**				**10**				**12**	**13**
Housing size			**A**	**B**		**A**	**B**		**B**		**D**		**B**		**D**		**D**	**E**
Phases			1	1	3	1	1	3	1	3	1	3	1	3	1	3	3	3
Output nominal power		[kVA]	0,9			1,6			2,8				4,0				6,6	9,5
Max. rated motor power		[kW]	0,37			0,75			1,5				2,2				4,0	5,5
Output nominal current		[A]	2,3			4			7				10				16,5	24
Max. short time current	1)	[A]	4,1			7,2			12,6				18				29,7	36
OC-tripping current		[A]	5,0			8,6			15,1				21,6				35,6	43
Nominal input current		[A]	4,6	4,6	3,2	8,0	8,0	5,6	14	9,8	14	9,8	20	14	20	14	23	31
Max. permissible mains fuse (inert)		[A]	16			16	20	16	20	16	20	16	25	20	25	20	25	35
Rated switching frequency		[kHz]	4	16		8	16		16				8		16		8	8
Max. switching frequency		[kHz]	8	16		8	16		16				16				16	16
Power loss at nominal operating		[W]	30	50		55	65		90		130		105		170		210	290
Power loss at DC power supply		[W]	28	48		51	60		80		120		90		155		185	265
Stall current at 4kHz	2)	[A]	2,3			4			7				10				16,5	24
Stall current at 8kHz	2)	[A]	2,3			4			7				10				16,5	24
Stall current at 16kHz	2)	[A]	–	2,3		–	4		7				8,5		10		10	16,8
Max. heat sink temperature TOH			100	90		95	90		90 °C (194 °F)									
Motor line cross section	3)	[mm²]	1,5			1,5	2,5	1,5	2,5	1,5	2,5	1,5	4	2,5	4	2,5	4	6
Min. braking resistor	4)	[Ohm]	100	56		100	56		47				33				27	16
Typ. braking resistor	4)	[Ohm]	180			180			100				68				33	27
Max. braking current	4)	[A]	4,5	7,5		4,5	7,5		9,5				12				15	25
Overload curve (page appendex)			1															
Tightening torque for terminals		[Nm]	0,5															1,2
Mains voltage		[V]	180...260 ±0 (230 V Nominal voltage)															
Mains frequency		[Hz]	50 / 60 +/- 2															
Output voltage		[V]	3 x 0...U Mains															
Output frequency		[Hz]	see Control board															
Max.shielded motor line length at 4 kHz	5)	[m]	10	30		10	100		100		100		100				100	100
Max.shielded motor line length at 8 kHz	5)	[m]	10	20		10	50		100		100		100				100	100
Max.shielded motor line length at 16 kHz	5)	[m]	-	10		-	20		40		100		100				100	100
Storage temperature			-25...70 °C (-13...158 °F)															
Operating temperature			-10...45 °C (14...113 °F)															
Model / protective system (EN 60529)			IP20															
Environment (IEC 664-1)			Pollution degree 2															
EMC tested according to			EN 61800-3															
Vibration/Jolt according to			Germanischer Lloyd; EN 50155															
Climatic category (EN 60721-3-3)			3K3															

1) With the regulated systems F5-M as well as F5-S 5% are to be subtracted as control reserve
2) Max. current before the responding of the OL2-function (only F5-M; F5-S; F5-A)
3) Recommended minimum cross section of the motor wire for rated power and a cable length of upto 100m (copper)
4) This data is only valid for units with internal brake transistor GTR 7 (see "unit identification")
5) At units with integrated filter (see "unit identification"):
   up to max. 5m line length and 4kHz operating frequency = Limit Value B (EN 55011)
   up to max. 10m line length and 16kHz operating frequency = Limit Value A (EN 55022)

The technical data is for 2/4-pole standard motors. With other pole numbers the inverter must be dimensioned onto the motor rated current. Contact KEB for special or medium frequency motors.

Site altitude max. 2000m. With site altitudes over 1000m a power reduction of 1% per 100m must be taken into consideration.

GB

Inverter Size			14		15		16	17	18	19	20	21
Housing size			E	G	G	H	H	R	R	R	R	R
Phases			3		3		3	3	3	3	3	3
Output nominal power		[kVA]	13		19		26	33	40	46	59	71
Max. rated motor power		[kW]	7,5		11		15	18,5	22	30	37	45
Output nominal current		[A]	33		48		66	84	100	115	145	180
Max. short time current	1)	[A]	49,5		72		99	126	150	172	217	270
OC-tripping current		[A]	59		86		119	151	180	206	261	324
Nominal input current		[A]	43		63		86	92	116	126	165	198
Max. permissible mains fuse (inert)		[A]	50		80		80	100	160	160	200	315
Rated switching frequency		[kHz]	4	16	8	16	16	8	8	8	8	8
Max. switching frequency		[kHz]	16		16	16	16	16	8	8	8	8
Power loss at nominal operating		[W]	350	410	460	430	550	850	1020	1200	1350	1620
Power loss at DC power supply		[W]	300	355	375	345	435	790	950	1100	1230	1470
Stall current at 4kHz	2)	[A]	33	36	36	53	72,5	92	110	126	159	198
Stall current at 8kHz	2)	[A]	24	33	-	53	72,5	84	100	115	145	180
Stall current at 16kHz	2)	[A]	16,8	26	-	53	66	50	-	-	-	-
Max. heat sink temperature TOH			90 °C (194 °F)									
Motor line cross section	3)	[mm²]	10		25		25	35	50	50	95	95
Min. braking resistor	4)	[Ohm]	16	8	8	5,6	5,6	4,7	4,7	3,9	2	2
Typ. braking resistor	4)	[Ohm]	20		13		10	7	5,6	4,7	3,9	3,0
Max. braking current	4)	[A]	25	50	50	70	70	85	85	102	160	160
Overload curve (page appendex)			1									
Tightening torque for terminals		[Nm]	1,2	2,5	4			6				
Mains voltage		[V]	180...260 ±0 (230 V Nominal voltage)									
Mains frequency		[Hz]	50 / 60 +/- 2									
Output voltage		[V]	3 x 0...U Mains									
Output frequency		[Hz]	see Control board									
Max.shielded motor line length at 4 kHz	5)	[m]	100					50				
Max.shielded motor line length at 8 kHz	5)	[m]	100					50				
Max.shielded motor line length at 16 kHz	5)	[m]	100					50				
Storage temperature			-25...70 °C (-13...158 °F)									
Operating temperature			-10...45 °C (14...113 °F)									
Model / protective system (EN 60529)			IP20									
Environment (IEC 664-1)			Pollution degree 2									
EMC tested according to			EN 61800-3									
Vibration/Jolt according to			Germanischer Lloyd; EN 50155					-				
Climatic category (EN 60721-3-3)			3K3									

1) With the regulated systems F5-M as well as F5-S 5% are to be subtracted as control reserve
2) Max. current before the responding of the OL2-function (only F5-M; F5-S; F5-A)
3) Recommended minimum cross section of the motor wire for rated power and a cable length of upto 100m (copper)
4) This data is only valid for units with internal brake transistor GTR 7 (see "unit identification")
5) At units with integrated filter (see "unit identification"):
   up to max. 5m line length and 4kHz operating frequency = Limit Value B (EN 55011)
   up to max. 10m line length and 16kHz operating frequency = Limit Value A (EN 55022)

The technical data is for 2/4-pole standard motors. With other pole numbers the inverter must be dimensioned onto the motor rated current. Contact KEB for special or medium frequency motors.

Site altitude max. 2000m. With site altitudes over 1000m a power reduction of 1% per 100m must be taken into consideration.

2.2 Technical Data 400V Class

Inverter Size		05		07			09			10			12			13		14		
Housing size		A	B	A	B	D	A	B	D	B	D	D	B	D	E	D	E	D	E	G
Phases		3		3			3			3			3			3		3		
Output nominal power	[kVA]	0,9		1,8			2,8			4,0			6,6			8,3		11		
Max. rated motor power	[kW]	0,37		0,75			1,5			2,2			4,0			5,5		7,5		
Output nominal current	[A]	1,3		2,6			4,1			5,8			9,5			12		16,5		
Max. short time current 1)	[A]	2,3		4,7			7,4			10,4			17			21,6		29,7		24,8
OC-tripping current	[A]	2,8		5,6			8,9			12,5			21			25,9		35,6		29,7
Nominal input current	[A]	1,8		3,6			6			8			13			17		23		
Max. permissible mains fuse (inert)	[A]	10	16	10	16		10	16		16			20			25		25		
Rated switching frequency	[kHz]	4	16	4	16		4	8		8	4	16	4	8	16	4	16	2	8	16
Max. switching frequency	[kHz]	4	16	4	16		4	16		16			4	16		16		16 6)		16
Power loss at nominal operating	[W]	45	60	50	90		60	80	105	120	140	170	150	185	300	185	250	185	320	380
Power loss at DC power supply	[W]	44	58	48	87		75		100	110	130	160	135	170	285	165	230	160	295	350
Stall current at 4kHz 2)	[A]	-	1,3	-	2,6		-	4,1		5,8			9,5			12		14,5		16,5
Stall current at 8kHz 2)	[A]	-	1,3	-	2,6		-	4,1		5,8	5,2	5,8	-	9,5		9,5	12	7,4		16,5
Stall current at 16kHz 2)	[A]	-	1,3	-	2,6		-	3,5		4,9	3,5	5,8	-	5,8	9,5	5,8	12	5,7	10	12
Max. heat sink temperature TOH		90 °C (194 °F)																		
Motor line cross section 3)	[mm²]	1,5		1,5			1,5			1,5			2,5			4		4		
Min. braking resistor 4)	[Ohm]	390		180	120		110	120		82			82		39	56	39	56	39	
Typ. braking resistor 4)	[Ohm]	620		300	620		150	390		270			150			110		85		
Max. braking current 4)	[A]	2,2		4,5	7,5		7	7,5		10			10		21	15	21	15	21	
Overload curve (page appendex)		1																		
Tightening torque for terminals	[Nm]	-	0,5	-	0,5		-	0,5		0,5			0,5			0,5		0,5		1,2
Mains voltage 5)	[V]	305...500 ±0 (400 V Nominal voltage)																		
Mains frequency	[Hz]	50 / 60 +/- 2																		
Output voltage	[V]	3 x 0...U Mains																		
Output frequency	[Hz]	see Control board																		
Max.shielded motor line length at 4 kHz	[m]	10		10		30	10	100		100			50	100		100		100		
Max.shielded motor line length at 8 kHz	[m]	-	8	-	8	20	-	30		50	100		-	100		100		-	100	
Max.shielded motor line length at 16 kHz	[m]	-	4	-	5	10	-	10		10	20		-	100		100		-	100	
Storage temperature		-25...70 °C (-13...158 °F)																		
Operating temperature		-10...45 °C (14...113 °F)																		
Model / protective system (EN 60529)		IP20																		
Environment (IEC 664-1)		Pollution degree 2																		
EMC tested according to		EN 61800-3																		
Vibration/Jolt according to		Germanischer Lloyd; EN 50155																		
Climatic category (EN 60721-3-3)		3K3																		

1) With the regulated systems F5-M as well as F5-S 5% are to be subtracted as control reserve.
2) Max. current before the responding of the OL2-function (only F5-M; F5-S; F5-A)
3) Recommended minimum cross section of the motor wire for rated power and a cable length of upto 100m (copper)
4) This data is only valid for units with internal brake transistor GTR 7 (see "unit identification")
5) At mains voltage ≥460V multiply the nominal current with factor 0,86.
6) F5-Basic: 2 kHz

The technical data is for 2/4-pole standard motors. With other pole numbers the inverter must be dimensioned onto the motor rated current. Contact KEB for special or medium frequency motors.

Site altitude max. 2000m. With site altitudes over 1000m a power reduction of 1% per 100m must be taken into consideration.

GB

Inverter Size			15			16			17		18			19	
Housing size			E	G	H	E	G	H	G	H	G	H	R	H	R
Phases			3			3			3		3			3	
Output nominal power		[kVA]	17			23			29		35			42	
Max. rated motor power		[kW]	11			15			18,5		22			30	
Output nominal current		[A]	24			33			42		50			60	
Max. short time current	1)	[A]	36			49,5			63		75			90	
OC-tripping current		[A]	43			59			75		90			108	
Nominal input current		[A]	31			43			55		65			66	
Max. permissible mains fuse (inert)		[A]	35			50			63		80			80	
Rated switching frequency		[kHz]	4	8	16	2	8	16	4	8	2	8	16	4	8
Max. switching frequency		[kHz]	16			16 [6]	16		16		16			16	
Power loss at nominal operating		[W]	350	380	360	330	500	490	500	470	430	610	850	540	750
Power loss at DC power supply		[W]	310	340	320	275	445	430	430	400	345	525	810	425	695
Stall current at 4kHz	2)	[A]	24			27	33		42		45	50		60	
Stall current at 8kHz	2)	[A]	16	19	24	-	21,5	33	21,4	30	30	45	50	39	60
Stall current at 16kHz	2)	[A]	10	8,4	15	-	9,5	20	-	13,5	20	20	40	18	27
Max. heat sink temperature TOH			90 °C (194 °F)												
Motor line cross section	3)	[mm²]	6			10			16		25			25	
Min. braking resistor	4)	[Ohm]	39		22	25		22	25	22	13		9	13	9
Typ. braking resistor	4)	[Ohm]	56			42			30		22			15	
Max. braking current	4)	[A]	21		37	32	30	37	30	37	63		88	63	88
Overload curve (page appendex)			1												
Tightening torque for terminals		[Nm]	1,2		4	1,2		4	1,2	4	4	4	6	4	6
Mains voltage	5)	[V]	305...500 ±0 (400 V Nominal voltage)												
Mains frequency		[Hz]	50 / 60 +/- 2												
Output voltage		[V]	3 x 0...U Mains												
Output frequency		[Hz]	see Control board												
Max.shielded motor line length at 4 kHz		[m]	100												
Max.shielded motor line length at 8 kHz		[m]	100												
Max.shielded motor line length at 16 kHz		[m]	100												
Storage temperature			-25...70 °C (-13...158 °F)												
Operating temperature			-10...45 °C (14...113 °F)												
Model / protective system (EN 60529)			IP20												
Environment (IEC 664-1)			Pollution degree 2												
EMC tested according to			EN 61800-3												
Vibration/Jolt according to			Germanischer Lloyd; EN 50155									-		s.l.	-
Climatic category (EN 60721-3-3)			3K3												

1) With the regulated systems F5-M as well as F5-S 5% are to be subtracted as control reserve.
2) Max. current before the responding of the OL2-function (only F5-M; F5-S; F5-A)
3) Recommended minimum cross section of the motor wire for rated power and a cable length of upto 100m (copper)
4) This data is only valid for units with internal brake transistor GTR 7 (see "unit identification")
5) At mains voltage ≥460V multiply the nominal current with factor 0,86.
6) F5-Basic: 2 kHz

The technical data is for 2/4-pole standard motors. With other pole numbers the inverter must be dimensioned onto the motor rated current. Contact KEB for special or medium frequency motors.

Site altitude max. 2000m. With site altitudes over 1000m a power reduction of 1% per 100m must be taken into consideration.

Inverter Size			**20**		**21**		**22**		**23**	
Housing size			**H**	**R**	**R**		**R**		**R**	**U**
Phases			3		3		3		3	
Output nominal power		[kVA]	52		62		80		104	
Max. rated motor power		[kW]	37		45		55		75	
Output nominal current		[A]	75		90		115		150	
Max. short time current	1)	[A]	112		135		172		225	
OC-tripping current		[A]	135		162		207		270	
Nominal input current		[A]	83		100		127		165	
Max. permissible mains fuse (inert)		[A]	100		160		160		200	
Rated switching frequency		[kHz]	2	8	4	8	4	8	2	8
Max. switching frequency		[kHz]	8	16	16		16		12	8
Power loss at nominal operating		[W]	640	900	1000	1100	1200	1500	1300	1900
Power loss at DC power supply		[W]	500	830	915	1015	1100	1400	1160	1760
Stall current at 4kHz	2)	[A]	67,5	75	90		115	115	127,5	150
Stall current at 8kHz	2)	[A]	52,5	75	63	90	80	115	90	150
Stall current at 16kHz	2)	[A]	-	34	45	54	46	51	-	-
Max. heat sink temperature TOH			90 °C (194 °F)							
Motor line cross section	3)	[mm²]	35		50		50		95	
Min. braking resistor	4)	[Ohm]	9		9		8		6	5
Typ. braking resistor	4)	[Ohm]	12		10		8,6		6,7	
Max. braking current	4)	[A]	88		88		100		133	160
Overload curve (page appendex)			1							
Tightening torque for terminals		[Nm]	4	6	6		6		15	
Mains voltage	5)	[V]	305...500 ±0 (400 V Nominal voltage)							
Mains frequency		[Hz]	50 / 60 +/- 2							
Output voltage		[V]	3 x 0...U Mains							
Output frequency		[Hz]	see Control board							
Max.shielded motor line length at 4 kHz		[m]	50							
Max.shielded motor line length at 8 kHz		[m]	50							
Max.shielded motor line length at 16 kHz		[m]	50							
Storage temperature			-25...70 °C (-13...158 °F)							
Operating temperature			-10...45 °C (14...113 °F)							
Model / protective system (EN 60529)			IP20							
Environment (IEC 664-1)			Pollution degree 2							
EMC tested according to			EN 61800-3							
Vibration/Jolt according to			-							
Climatic category (EN 60721-3-3)			3K3							

1) With the regulated systems F5-M as well as F5-S 5% are to be subtracted as control reserve.
2) Max. current before the responding of the OL2-function (only F5-M; F5-S; F5-A)
3) Recommended minimum cross section of the motor wire for rated power and a cable length of upto 100m (copper)
4) This data is only valid for units with internal brake transistor GTR 7 (see "unit identification")
5) At mains voltage ≥460V multiply the nominal current with factor 0,86.
6) F5-Basic: 2 kHz

The technical data is for 2/4-pole standard motors. With other pole numbers the inverter must be dimensioned onto the motor rated current. Contact KEB for special or medium frequency motors.

Site altitude max. 2000m. With site altitudes over 1000m a power reduction of 1% per 100m must be taken into consideration.

An input choke is necessary from size 23!

Inverter Size			24			25	26	27
Housing size			R	U		U	U	U
Phases			3			3	3	3
Output nominal power		[kVA]	125			145	173	208
Max. rated motor power		[kW]	90			110	132	160
Output nominal current		[A]	180			210	250	300
Max. short time current	1)	[A]	270			263	313	375
OC-tripping current		[A]	324			315	375	450
Nominal input current		[A]	198			231	275	330
Max. permissible mains fuse (inert)		[A]	315			315	400	450
Rated switching frequency		[kHz]	2	4	8	4	4	2
Max. switching frequency		[kHz]	8			8	8	8
Power loss at nominal operating		[W]	1700	2000	2400	2300	2800	3100
Power loss at DC power supply		[W]	1530	1830	2230	2100	2550	2800
Stall current at 4kHz	2)	[A]	144	180		210	250	240
Stall current at 8kHz	2)	[A]	108	180		168	162,5	180
Stall current at 16kHz	2)	[A]	-	-		-		
Max. heat sink temperature TOH			90 °C (194 °F)					
Motor line cross section	3)	[mm²]	95			95	120	150
Min. braking resistor	4)	[Ohm]	5			4	4	4
Typ. braking resistor	4)	[Ohm]	5			4,3	4,3	4,3
Max. braking current	4)	[A]	200			200	200	200
Overload curve (page appendex)			1			2		
Tightening torque for terminals		[Nm]	15			25		
Mains voltage	5)	[V]	305…500 ±0 (400 V Nominal voltage)					
Mains frequency		[Hz]	50 / 60 +/- 2					
Output voltage		[V]	3 x 0…U Mains					
Output frequency		[Hz]	see Control board					
Max.shielded motor line length at 4 kHz		[m]	50					
Max.shielded motor line length at 8 kHz		[m]	50					
Max.shielded motor line length at 16 kHz		[m]	50					
Storage temperature			-25…70 °C (-13…158 °F)					
Operating temperature			-10…40 °C (14…104 °F)					
Model / protective system (EN 60529)			IP20					
Environment (IEC 664-1)			Pollution degree 2					
EMC tested according to			EN 61800-3					
Vibration/Jolt according to			-					
Climatic category (EN 60721-3-3)			3K3					

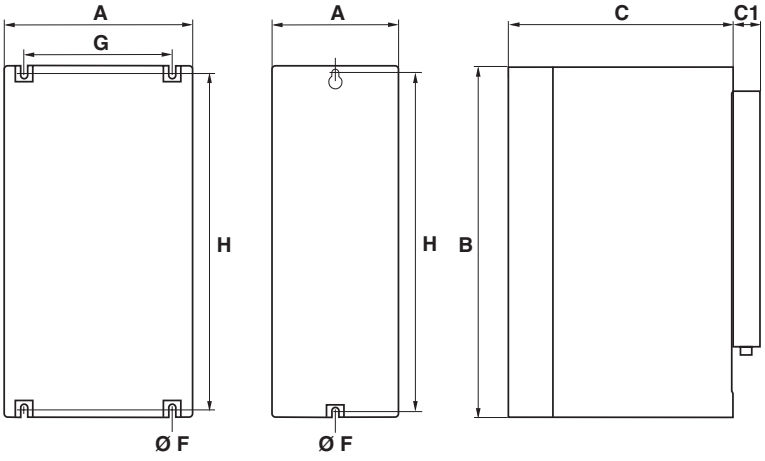
1) With the regulated systems F5-M as well as F5-S 5% are to be subtracted as control reserve.
2) Max. current before the responding of the OL2-function (only F5-M; F5-S; F5-A)
3) Recommended minimum cross section of the motor wire for rated power and a cable length of upto 100m (copper)
4) This data is only valid for units with internal brake transistor GTR 7 (see "unit identification")
5) At mains voltage ≥460V multiply the nominal current with factor 0,86.
6) F5-Basic: 2 kHz

The technical data is for 2/4-pole standard motors. With other pole numbers the inverter must be dimensioned onto the motor rated current. Contact KEB for special or medium frequency motors.

Site altitude max. 2000m. With site altitudes over 1000m a power reduction of 1% per 100m must be taken into consideration.

An input choke is necessary from size 23!

2.3 Dimensions and Weight



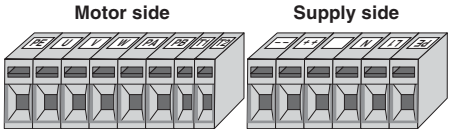
Housing	A	A*	B	B*	C	C*	C1	F	G	G*	H	H*	Weight [kg]	with filter
A	76	76	191	216	144	184	14	5	–	–	175	175	0,9	1,8
B	90	90	220	249	160	200	14	5	–	–	210	240	2	3,3
D	90	90	250	285	181	221	14	5	–	–	240	275	3	4,3
E	130	132	290	352	208	258	14	7	–	100	275	335	5	5,5
G	170	181	340	415	255	311	–	7	150	150	330	400	10	13,2
H	297	300	340	445	255	321	–	7	250	250	330	420	14	19,1
R	340	–	520	–	355	–	–	10	300	–	495	–	25	32
U	340	–	800	–	355	–	–	11	300	–	775	–	75	–

* with submounted filter; C1 Operator

2.4 Survey of Power Circuit Terminals

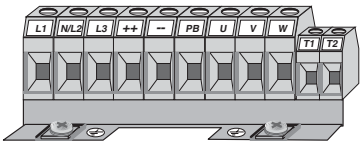
Note input voltage, since 230V and 400V class (3-phase) are possible.

Housing size A

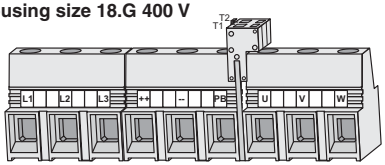


U, V, W	Motor connection
PA, PB	Connection for braking resistor
T1, T2	Connection for temperature sensor
L1, N	1-phase mains connection
++, --	Connection for braking module, feedback and supply unit DC input 250...370 VDC (230V class)
PE	Connection for shielding/earthing

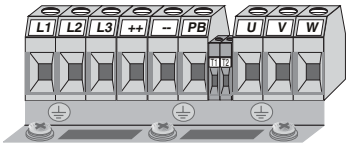
Housing size B, D and E



Housing size 18.G 400 V

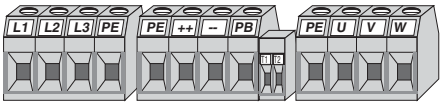


Housing size G

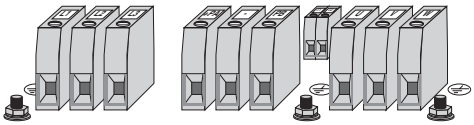


L1, N	1-phase mains connection
L1, L2, L3	3-phase mains connection
U, V, W	Motor connection
++, PB	Connection for braking resistor,
++, --	Connection for braking module, feedback and supply unit DC input 250...370 VDC (230V class) DC input 420...720 VDC (400V class)
T1, T2	Connection for temperature sensor
PE, ⏚	Connection for shielding/earthing

Housing size H



Housing size R and U



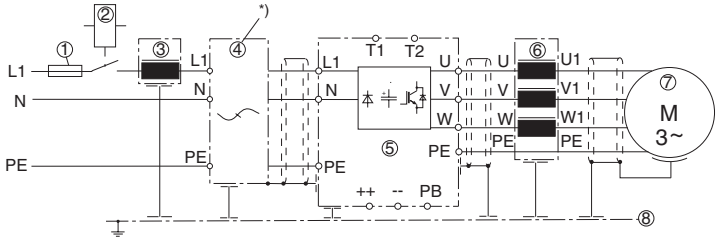
L1, L2, L3	3-phase mains connection
U, V, W	Motor connection
+PA, PB	Connection for braking resistor
+PA, -	Connection for feedback unit (Intermediate circuit voltage output)
T1, T2	Connection for temperature sensor
⏚	Connection for shielding/earthing

2.5 Connection of Power Circuit

Exchanging the mains and motor connection leads to immediate destruction of the unit.

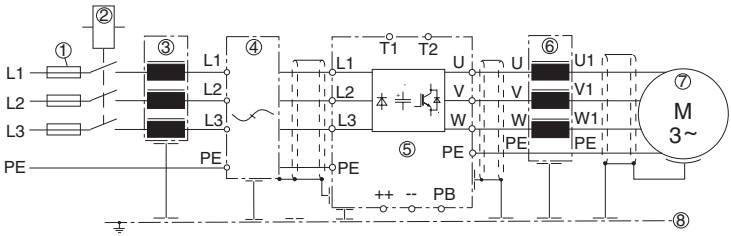
Pay attention to the supply voltage and the correct polarity of the motor!

1-phase connection



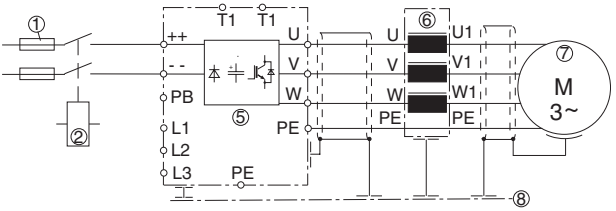
* For units with integrated radio interference suppression (see „unit identification“) the external radio interference suppression filter is omitted.

3-phase connection



DC power supply

250...370 VDC (230V-class) +
420...720V DC (400V-class) -



① **Mains fuse**	⑤ **KEB COMBIVERT**
② **Main contactor**	⑥ **Motor choke or output filter (not for F5-M or F5-S)**
③ **Input choke**	⑦ **Motor**
④ **Interference suppression filter**	⑧ **Mounting plate**

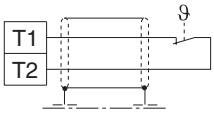
GB

External temperature monitoring

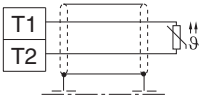
To carry out an evaluation activate the function by way of the software (F5-B/G) of the control card (CP.28 / see control part).

Do not lay connecting cable (also shielded) together with control cable! Permissible in the motor cable only with double shielding!

F5-M/S:
Bridge, when no monitoring occurs



Thermojunction (NC-contact)



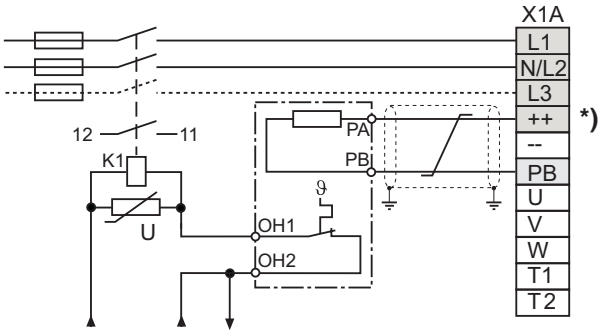
Temperature sensor (PTC)
1650Ω...4kΩ tripping resistance
750Ω...1650Ω reset resistance
(according to IEC 60947-8)

Braking resistor

Observe safety instructions of part 1!

GB

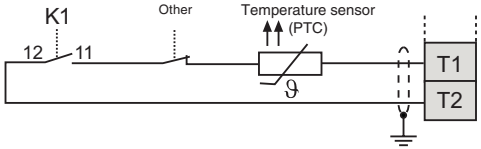
Braking resistors can develop a very high surface temperature, therefore install as safe-to-touch as possible!



230 or 24 V AC/DC supply

at 24 V AC/DC check tripping

*) depending on the housing size the terminal ++, +PA or PA can be used

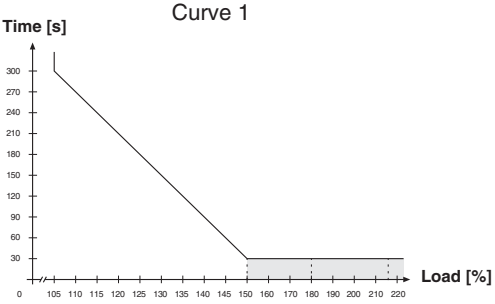


During clearing of the temperature monitoring the input voltage is switched off. For additional protection in regenerative operation connect the auxiliary contacts 11 and 12 of the line contactor K1.

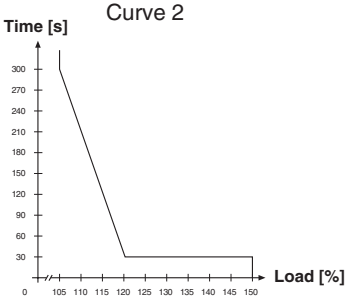
3. Annex

3.1 Overload Characteristic

Curve 1



Curve 2

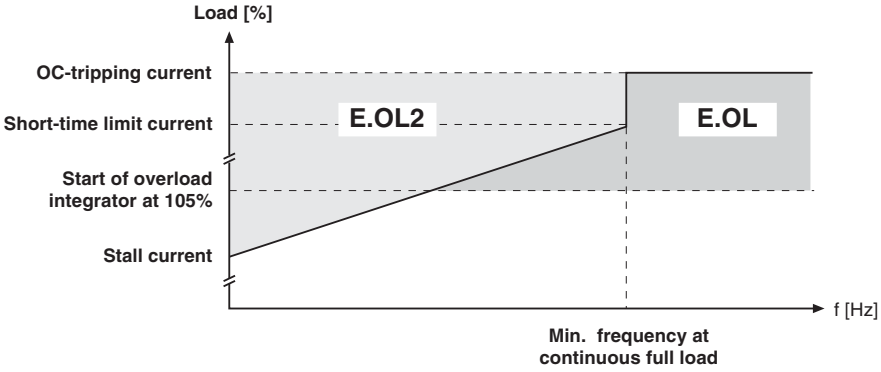


The characteristic declines device-dependently in this range (see rating plate)

On exceeding a load of 105% the overload integrator starts. When falling below the integrator counts backwards. If the integrator achieves the overload characteristic that corresponds to the inverter, the error E.OL is triggered.

3.2 Overload protection in the lower speed range

(only valid for F5-M and F5-S, stall current see technical data)



If the permissible current is exceeded a PT1-element (τ=280ms) starts, after its sequence of operation the error E.OL2 is triggered.

D

Vor Auslieferung durchlaufen alle Produkte mehrfach eine Qualitäts- und Funktionskontrolle, so daß Fehler auszuschließen sind. Bei Beachtung unserer Betriebsanleitung sind keine Störungen zu erwarten. Sollte sich trotzdem ein Grund zur Reklamation ergeben, so ist das Gerät mit Angabe der Rechnungsnummer, des Lieferdatums, der Fehlerursache und der Einsatzbedingungen an uns zurückzusenden. Für Fehler, die aufgrund falscher Behandlung, falscher Lagerung oder sonstigen allgemeinen Irrtümern auftreten, übernehmen wir keine Verantwortung. Prospekte, Kataloge und Angebote enthalten nur Richtwerte. Technische Änderungen jeder Art behalten wir uns vor. Alle Rechte vorbehalten. Nachdruck, Vervielfältigung und fotomechanische Wiedergabe sind ohne schriftliche Genehmigung durch KEB auch auszugsweise verboten.

GB

Prior to delivery all products pass several quality and performance inspections so that malfunctions can be ruled out. When used in accordance with the operating instructions failure is most unlikely. However, if you have cause for complaint the unit should be returned stating invoice number, delivery date, cause of failure and field conditions. We do not accept the responsibility for failures due to misuse, wrong storage or similar causes. Leaflets, catalogues and quotations contain only standard values. We reserve the right to make technical changes without obligation. All rights reserved. Any piratic printing, mimeograhing or photomechanical reproduction, even in extracts, is strictly prohibited.

F

Avant la livraison tous les produits passent par différents contrôles fonctionnels et qualitatifs de manière à éliminer les mauvais fonctionnements. L'apparition de défauts sur ces produits est très improbable s'ils sont raccordés et utilisés selon les recommandations des manuels d'instructions. Néanmoins, si un défaut apparaissait, le matériel doit être retourné en indiquant le numéro du bon de livraison, la date d'expédition et les détails apparents du défaut ainsi que le type d'application. Un mauvais emploi, de mauvaises conditions de stockage ou d'autres causes de ce type excluent notre responsabilité en cas de défectuosité. Les documents techniques et commerciaux, les offres de prix ne contiennent que des valeurs standards. Nous nous réservons le droit de procéder à des modifications techniques sans préavis. Tout droit réservé. Toutes contrefaçons imprimées, ou reproductions photomécaniques; même partielles, sont strictement interdites.

I

Prima di essere spediti, tutti i nostri prodotti sono soggetti a severi controlli di qualità e funzionamento, questo al fine di evitare malfunzionamenti. Se utilizzati seguendo il manuale di istruzione si evita qualsiasi malfunzionamento. Comunque, qualora dovesse verificarsi un guasto, l'unità dovrà essere rispedita specificando il numero di bolla, la data di spedizione, i dettagli del guasto ed il tipo di applicazione. Non si assumono responsabilità per errori dovuti a manomissioni, cattivo stoccaggio o simili. Ci riserviamo di effettuare qualsiasi modifica senza preavviso alcuno. Tutti i diritti sono riservati. Qualsiasi riproduzione non autorizzata, anche parziale, è rigorosamente proibita.

RU

Перед отгрузкой все изделия неоднократно проходят проверку на предмет качества и работоспособность, так что брак исключается. При соблюдении нашего руководства по эксплуатации появление неисправностей не ожидается. Если вопреки этому, всё таки появятся основания для рекламации, изделие необходимо отправить на наш адрес с указанием номеров товарной накладной и счёта, датой поставки, причиной приведшей к выходу изделия из строя и условий эксплуатации.
Фирма KEB не несёт ответственность за выход изделий из строя по причинам не правильного храненя, транспортировки, неправильного обращения и других ошибочных действий. Проспекты, каталоги и коммерческие предложения содержат только ориентировочные значения. Мы оставляем, за собой право вносить технические изменения любого рода. Все права принадлежат нам. Размножение, перепечатывание, фотомеханическое воспроизведение, даже частичное, без письменного разрешения на то фирмы KEB запрещено.

E

Antes de ser enviados todos los productos pasan severos controles de calidad por lo que pueden descartarse defectos. Cuando sea utilizado de acuerdo con las instrucciones de operación una avería no es nada probable. Sin embargo, si tiene motivo de reclamación la unidad podría devolverse indicando número de factura, fecha de entrega, causa del fallo y condiciones de instalación. Nosotros no aceptamos la responsabilidad por fallos debidos a mal uso, almacenaje incorrecto o causa similar. Los folletos, catalogues y ofertas contienen sólo valores estándar. Nos reservamos el derecho de modificar el equipo sin ninguna obligación. Todos los derechos reservados. Cualquier impresión pirata, reproducción mimeógrafia o fotomecanica, incluso en parte, está estrictamente prohibida.

Karl E. Brinkmann GmbH
Försterweg 36-38 • **D**-32683 Barntrup
fon: +49 5263 401-0 • fax: +49 5263 401-116
net: www.keb.de • mail: info@keb.de

KEB Antriebstechnik GmbH & Co. KG
Wildbacher Str. 5 • **D**–08289 Schneeberg
fon: +49 3772 67-0 • fax: +49 3772 67-281
mail: info@keb-combidrive.de

KEB Antriebstechnik Austria GmbH
Ritzstraße 8 • **A**-4614 Marchtrenk
fon: +43 7243 53586-0 • fax: +43 7243 53586-21
Kostelni 32/1226 • **CZ**-370 04 Ceské Budejovice
fon: +420 38 7319223 • fax: +420 38 7330697
net: www. keb.at • mail: info@keb.at

KEB Antriebstechnik
Herenveld 2 • **B**-9500 Geraadsbergen
fon: +32 5443 7860 • fax: +32 5443 7898
mail: vb.belgien@keb.de

KEB CHINA Karl E. Brinkmann GmH
(Xinmao Building, Caohejing Development Zone)
No. 99 Tianzhou Road (No.9 building, Room 708)
CHN-200233 Shanghai, PR. China
fon: +86 21 54503230-3232 • fax: +86 21 54450115
net: www.keb.cn • mail: info@keb.cn

KEB CHINA Karl E. Brinkmann GmH
No. 36 Xiaoyun Road • Chaoyang District
CHN-10027 Beijing, PR. China
fon: +86 10 84475815 + 819 • fax: +86 10 84475868
net: www.keb.cn • mail: hotline@keb.cn

KEB Antriebstechnik Austria GmbH
Organizacni slozka
Kostelni 32/1226
CZ-370 04 Ceske Budejovice
fon: +420 38 7699111 • fax: +420 38 7699119
mail: info.keb@seznam.cz

KEB España
C/ Mitjer, Nave 8 - Pol. Ind. LA MASIA
E-08798 Sant Cugat Sesgarrigues (Barcelona)
fon: +34 93 897 0268 • fax: +34 93 899 2035
mail: vb.espana@keb.de

Société Française KEB
Z.I. de la Croix St. Nicolas • 14, rue Gustave Eiffel
F-94510 LA QUEUE EN BRIE
fon: +33 1 49620101 • fax: +33 1 45767495
net: www.keb.fr • mail: info@keb.fr

KEB (UK) Ltd.
6 Chieftain Buisiness Park, Morris Close
Park Farm, Wellingborough **GB**-Northants, NN8 6 XF
fon: +44 1933 402220 • fax: +44 1933 400724
net: www.keb-uk.co.uk • mail: info@keb-uk.co.uk

KEB Italia S.r.l.
Via Newton, 2 • **I**-20019 Settimo Milanese (Milano)
fon: +39 02 33500782 • fax: +39 02 33500790
net: www.keb.it • mail: kebitalia@keb.it

KEB - YAMAKYU Ltd.
15–16, 2–Chome, Takanawa Minato-ku
J–Tokyo 108-0074
fon: +81 33 445-8515 • fax: +81 33 445-8215
mail: ky-sales@f4.dion.ne.jp

KEB - YAMAKYU Ltd.
711, Fukudayama, Fukuda
J–Shinjo-Shi, Yamagata 996 - 0053
fon: +81 233 29-2800 • fax: +81 233 29-2802
mail: ky-sales@f4.dion.ne.jp

KEB Nederland
Leidsevaart 126 • **NL**–2013 HD Haarlem
fon: +31 23 5320049 • fax: +31 23 5322260
mail: vb.nederland@keb.de

KEB Polska
ul. Budapesztańska 3/16 • **PL**–80-288 Gdańsk
fon: +48 58 524 0518 • fax: +48 58 524 0519
mail: vb.polska@keb.de

KEB Portugal
Avenida da Igreja – Pavilão A n. º 261 Mouquim
P-4770 - 360 MOUQUIM V.N.F.
fon: +351 252 371318 + 19 • fax: +351 252 371320
mail: keb.portugal@netc.pt

KEB Taiwan Ltd.
No.8, Lane 89, Sec.3; Taichung Kang Rd.
R.O.C.-Taichung City / Taiwan
fon: +886 4 23506488 • fax: +886 4 23501403
mail: info@keb.com.tw

KEB Korea Seoul
Room 1709, 415 Missy 2000
725 Su Seo Dong, Gang Nam Gu
ROK-135-757 Seoul/South Korea
fon: +82 2 6253 6771 • fax: +82 2 6253 6770
mail: vb.korea@keb.de

KEB Sverige
Box 265 (Bergavägen 19)
S-4393 Hälsö
fon: +46 31 961520 • fax: +46 31 961124
mail: vb.schweden@keb.de

KEB America, Inc.
5100 Valley Industrial Blvd. South
USA-Shakopee, MN 55379
fon: +1 952 224-1400 • fax: +1 952 224-1499
net: www.kebamerica.com • mail: info@kebamerica.com