

COMBIVERT



F5/F6

GB Instruction Manual

Power Unit Housing H

11...18,5 kW 230 V

11...37 kW 400 V

Translation of original manual	
Mat.No.	Rev.
00F50EB-KH00	1I

KEB

Table of Contents

1.	Preface.....	5
1.1	Information on special measures.....	5
1.2	Documentation.....	5
1.3	Validity and liability	6
1.4	Copyright.....	7
1.5	Specified application.....	7
1.6	Product description.....	7
1.7	Part code	8
1.8	Installation instructions	9
1.8.1	Cooling systems	9
1.8.2	Control cabinet installation.....	10
1.9	Safety and application notes	11
2.	Technical Data	12
2.1	Operating conditions.....	12
2.2	Technical data of the 230V class.....	13
2.3	Technical data of the 400V class	14
2.4	DC supply.....	15
2.4.1	Calculation of the DC input current.....	15
2.4.2	Internal input circuit.....	15
2.5	Dimensions and Weights	16
2.6	Terminal strips of the power circuit.....	21
2.6.1	Permissible cable cross-sections and tightening torques of the terminals	21
2.7	Accessories.....	22
2.7.1	Filter and chokes	22
2.7.2	Technical data filter	22
2.8	Connection Power Unit	24
2.8.1	Mains and motor connection.....	24
2.8.2	Selection of the motor cable	25
2.8.3	Connection of the motor	25
2.8.4	Temperature detection T1, T2.....	26
2.8.4.1	Use of the temperature input in KTY mode	27
2.8.4.2	Use of the temperature input in PTC mode	27
2.8.5	Connection of a braking resistor	28
2.8.5.1	Braking resistor without temperature monitoring	28
2.8.5.2	Braking resistor with over-heat protection and GTR7 monitoring (water-cooled inverters)	29
2.8.5.3	Braking resistor with over-heat protection and GTR7 monitoring (air-cooled inverters).....	30
A.	Annex A	31
A.1	Overload characteristic.....	31
A.2	Overload protection in the lower speed range	31
A.3	Calculation of the motor voltage.....	32
A.4	Maintenance	32
A.5	Storage	32
A.5.1	Cooling circuit	33

Table of Contents

B.	Annex B	34
B.1	Certification	34
B.1.1	CE Marking.....	34
B.1.2	UL Marking.....	34
C.	Annex C	36
C.1	Installation of water-cooled units	36
C.1.1	Heat sink and operating pressure.....	36
C.1.2	Materials in the cooling circuit.....	36
C.1.3	Requirements on the coolant.....	37
C.1.4	Connection to the cooling system.....	38
C.1.5	Coolant temperature and moisture condensation.....	38
C.1.6	Coolant heating depending on power loss and flow rate with water.....	40
C.1.7	Typically fall of pressure depending on the rate of flow.....	40
D.	Annex D	41
D.1	Changing the response threshold of the braking transistor	41

List of Figures


Figure 1:	Control cabinet installation.....	10
Figure 2:	Internal input circuit.....	15
Figure 3:	Dimensions mounted version air-cooled.....	16
Figure 4:	Dimensions through-mount version air-cooled.....	17
Figure 5:	Dimensions mounted version water-cooled.....	18
Figure 6:	Dimensions through-mount version water-cooled.....	19
Figure 7:	Dimensions through-mount version water-cooled with sub-mounted braking resistor ..	20
Figure 8:	Terminal strips of the power circuit.....	21
Figure 9:	Technical data filter.....	23
Figure 10:	Mains and motor connection.....	24
Figure 11:	Connection of the motor.....	25
Figure 12:	Connection of a KTY sensor.....	27
Figure 13:	Wiring example in PTC mode.....	27
Figure 14:	Intrinsically safe braking resistor without temperature monitoring.....	28
Figure 15:	Braking resistor with over-heat protection and GTR7 monitoring.....	29
Figure 16:	Braking resistor with over-heat protection without GTR7 monitoring.....	30
Figure 17:	Overload characteristic.....	31
Figure 18:	Overload protection in the lower speed range.....	31
Figure 19:	Coolant heating.....	40
Figure 20:	Typically fall of pressure depending on the rate of flow.....	40
Figure 21:	Changing the response threshold of the braking transistor.....	41

1. Preface

The described hard- and software are developments of the Karl E. Brinkmann GmbH. The enclosed documents correspond to conditions valid at printing. Misprint, mistakes and technical changes reserved.


1.1 Information on special measures


The used pictograms have following significance:

Danger  Is used, when death or serious bodily injury may be the consequence of non-observance of the measure.

Warning  Is used, when bodily injury and/or substantial property damage may be the consequence of non-observance of the measure.



Caution  Is used, when property damage may be the consequence of non-observance of the measure.


Attention  Is used, when noise sensitive or unrequested operation may be the consequence of non-observance of the measure.

Info  Is used, when a better or simpler result can be the consequence of the measure.

For a special case the instructions can be supplemented by additional pictograms and text.

1.2 Documentation

<p>Attention  Documentation via www.keb.de</p>	
	<p>Prior to performing any work on the unit, it is absolutely necessary to download and read the documentation, especially the safety precautions and instructions for use. Follow these steps to get the documentation:</p>
Step 1	<p>Read the material number (Mat.No.) from nameplate</p>
Step 2	<p>Input the material number at "www.keb.de => Service => Downloads" and click "search".</p> <p>Downloads</p> <div style="background-color: #f0f0f0; padding: 10px; border: 1px solid #ccc;"> <p>Search for specific material numbers</p> <p>Please enter a complete (11-digit) material number.</p> <p>Search for: <input type="text" value="XXXXXXXX-XXXX"/> <input type="button" value="search"/></p> </div>
<p>further on next side</p>	

Step 3	The entire documentation associated with the device will be displayed, including the instruction manuals in German and English. If available, other translations are also indicated. Make sure that the user understands the provided language.
	Should you be unable to read or understand the documentation, do not take any further steps. Please inform our support network for further assistance.

Non-observance of the safety instructions leads to the loss of any liability claims. The safety and warning instructions specified in this manual do not lay claim on completeness. This list is not exhaustive.



1.3 Validity and liability

The use of our units in the target products is beyond of our control and therefore exclusively the responsibility of the machine manufacturer, system integrator or customer.

The information contained in the technical documentation, as well as any user-specific advice in spoken and written and through tests, are made to best of our knowledge and information about the application. However, they are considered for information only without responsibility. This also applies to any violation of industrial property rights of a third-party.

Selection of our units in view of their suitability for the intended use must be done generally by the user.

Tests can only be done within the application by the machine manufacturer. They must be repeated, even if only parts of hardware, software or the unit adjustment are modified.

Danger  by tamper from unauthorized personnel	
	Unauthorised opening and tampering may lead to death, bodily injury, property damage and malfunctions. Modification or repair is permitted only by KEB authorized personnel. Infringement will annul the liability for resulting consequences.

The suspension of liability is especially valid also for operation interruption loss, loss of profit, data loss or other damages. The disclaimer will void the warranty. This is also valid, if we referred first to the possibility of such damages.

If single regulations should be or become void, invalid or impracticable, the effectivity of all other regulations or agreements is not affected.

Through multitude applications not each possible case of installation, operation or maintenance can be considered. If you require further information or if special problems arise which are not treated in detail in the documentation, you can request the required information from the local agency of the company Karl E.Brinkmann GmbH.

1.7 Part code

18 | F5 | C | 1 | R-9 | 7 | 0 | A

Cooling	
0, 5, A, F	heat sink (standard)
1, B, G	Flat rear
2, C, H	Water cooling
3, D, I	convection

Encoder interface	
0: none	

Switching frequency; short time current limit; overcurrent limit									
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%		

Input identification									
0	1ph 230 VAC/DC	5	400 V class DC	A	6ph 400 VAC				
1	3ph 230 VAC/DC	6	1ph 230 VAC	B	3ph 600 VAC				
2	1/3ph 230 VAC/DC	7	3ph 230 VAC	C	6ph 600 VAC				
3	3ph 400 VAC/DC	8	1/3ph 230 VAC	D	600 VDC				
4	230 V class DC	9	3ph 400 VAC						

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

Accessories (A...D with safety relay)	
0, A	none
1, B	Braking transistor
2, C	integrated filter
3, D	Braking transistor and integrated filter

Control type			
A	APPLICATION	K	like A with safety technology
B	BASIC (controlled frequency inverter)		
C	COMPACT (controlled frequency inverter)		
E	SCL	P	like E with safety technology
G	GENERAL (controlled frequency inverter)		
H	ASCL	L	like H with safety technology
M	MULTI (regulated, field-oriented frequency inverter for three-phase asynchronous motors)		
S	SERVO (regulated frequency inverter for synchronous motors)		

Series F5/F6

Inverter size

1.8 Installation instructions

1.8.1 Cooling systems

The KEB COMBIVERT is available for different cooling systems:

Heat sink with cooling fan (mounted version)

The standard version is delivered with heat sink and cooling fan.

Special versions

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

Flat rear



There is no heat sink at this version. The unit must be mounted on an appropriate ground for heat dissipation.

Water cooling

This version is dimensioned for the connection to an available cooling system. The dissipation of the power loss must be ensured by the machine builder. In order to avoid moisture condensation, the minimum inlet temperature may not decrease the ambient temperature. The max. inlet temperature may not exceed 40°C. No aggressive coolant shall be used. Measures against contamination and calcination must be done externally. We recommend a pressure of 4 bar on the cooling system.

Convection (trough-mount version)

In this version the heat sink is placed externally with a cutout in the control cabinet.

Warning  Hot surface	
 CAUTION DO NOT TOUCH! Hot Surfaces <small>In case of burn, cool inflicted area immediately and seek medical attention.</small>	Heat sinks can reach temperatures, which can cause burns when touching. If in case of structural measures a direct contact cannot be avoided, a warning notice "hot surface" must be mounted at the machine.

1.8.2 Control cabinet installation

Mounting distances	Dimension	Distance in mm	Distance in inch
	A	150	6
	B	100	4
	C	30	1,2
	D	0	0
	X ¹⁾	50	2
	1) Distance to preceding elements in the cabinet door.		

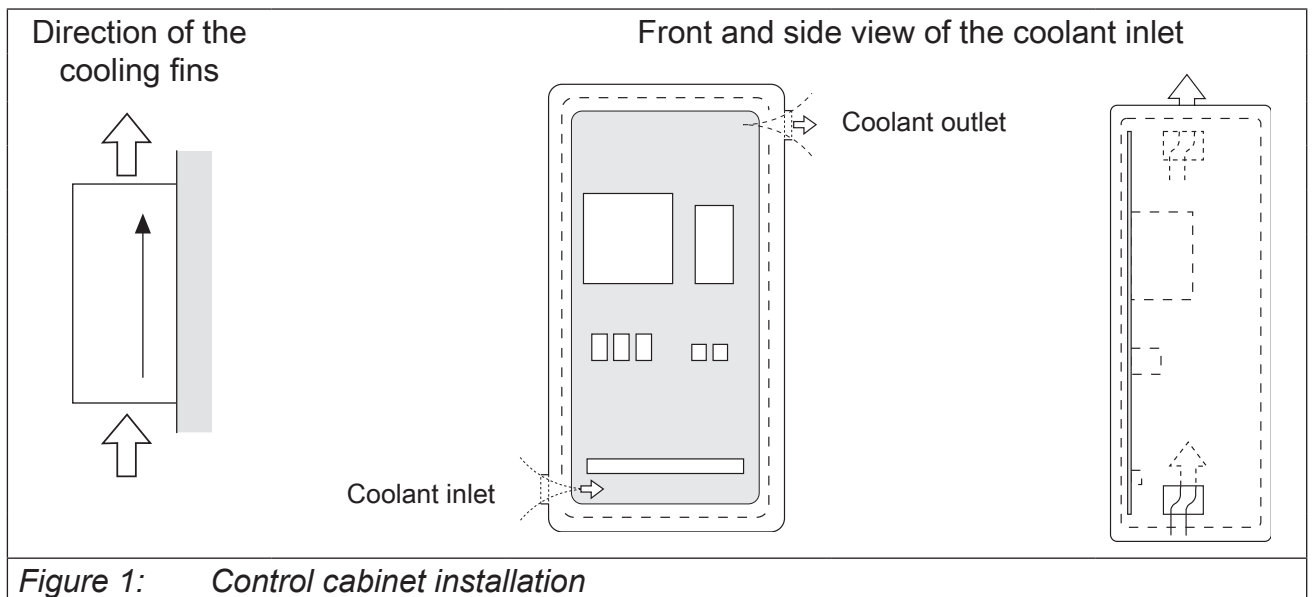


Figure 1: Control cabinet installation

See annex C for instructions of water-cooled units.

1.9 Safety and application notes



Safety and application notes for drive converter (in accordance with: Low-Voltage Directive 2006/95/EC)

1. General

In operation, drive converter depending on their degree of protection, may have live, uninsulated and possibly also moving or rotating parts, as well as hot surfaces.

In case of inadmissible removal of the required covers, of improper use, wrong installation or maloperation, there is the danger of serious personal injury and damage to property.

For further information, see documentation.

All operations serving transport, installation and commissioning as well as maintenance are to be carried out by skilled technical personnel (Observe IEC 364 or CENELEC HD 384 or DIN VDE 0100 and IEC 664 or DIN/VDE 0110 and national accident prevention rules!).

For the purposes of these basic safety instructions, „skilled technical personnel“ means persons who are familiar with the installation, mounting, commissioning and operation of the product and have the qualifications needed for the performance of their functions.

2. Specified application

Drive converter are components which are intended for the installation in electric systems or machines.

In case of installation in machinery, commissioning of the drive converter (i.e. the starting of normal operation) is prohibited until the machinery has been proved to conform to the provisions of the directive 2006/42/EC (Machinery Directive). Account is to be taken of EN 60204.

Start-up (i.e. the starting of normal operation) is only permitted in compliance with the EMC directive (2004/108/EC).

The drive converter meet the requirements of the Low-Voltage directive 2006/95/EC. The harmonized standards of the series EN 50178/DIN VDE 0160 in connection with EN 60439-1/DIN VDE 0660 part 500 and EN 60146/DIN VDE 0558 were used for drive converter.

The technical data as well as information concerning the supply conditions shall be taken from the rating plate and from the documentation and shall be strictly observed.

3. Transport, storage

The instructions for transport, storage and proper use shall be complied with.

The climatic conditions shall be in conformity with prEN 50178.

4. Installation

The installation and cooling of the appliances shall be in accordance with the specifications in the pertinent documentation.

The drive converter shall be protected against excessive strains. In particular, no components must be bent or isolating distances altered in the course of transportation or handling. No contact shall be made with electronic components and contacts.

Drive converter contain electrostatic sensitive components which are liable to damage through improper use. Electric components must not be mechanically damaged or destroyed (potential health risks).

5. Electrical connection

When working on live drive converter, the applicable national accident prevention rules (e.g. VBG 4) must be complied with.

The electrical installation shall be carried out in accordance with the relevant requirements (e.g. cross-sectional areas of conductors, fusing, PE connection). For further information, see documentation.

Instructions for the installation in accordance with EMC requirements, like screening, earthing, location of filters and wiring, are contained in the drive converter documentation. They must always be complied with, also for drive converter bearing a CE marking. Observance of the limit values required by EMC law is the responsibility of the manufacturer of the installation or machine.

6. Operation

Installations which include drive converter shall be equipped with additional control and protective devices in accordance with the relevant applicable safety requirements, e.g. act respecting technical equipment, accident prevention rules etc.. Changes to the drive converter by means of the operating software are admissible.

After disconnection of the drive converter from the voltage supply, live appliance parts and power terminals must not be touched immediately because of possibly energized capacitors. In this respect, the corresponding signs and markings on the drive converter must be observed.

During operation, all covers and doors shall be kept closed.

7. Maintenance and servicing

The manufacturer's documentation shall be followed.

KEEP SAFETY INSTRUCTIONS IN A SAFE PLACE!

Technical Data

2. Technical Data

2.1 Operating conditions

		Standard	Standard/ class	Instructions
Definition acc.		EN 61800-2		Inverter product standard: rated specifications
		EN 61800-5-1		Inverter product standard: general safety
Site altitude				max. 2000 m above sea level ³⁾ (with site altitudes over 1000 m a derating of 1 % per 100 m must be taken into consideration.)
Ambient conditions during operation				
Climate	Temperature	EN 60721-3-3	3K3	extended to -10...45 °C (use frost protection for water cooling systems and temperatures below zero) 5...85 % (without condensation)
	Humidity		3K3	
Mechanical	Vibration		3M1	
Contamination	Gas		3C2	
	Solids	3S2		
Ambient conditions during transport				
Climate	Temperature	EN 60721-3-2	2K3	Drain heat sink completely (without condensation)
	Humidity		2K3	
Mechanical	Vibration		2M1	max. 100 m/s ² ; 11 ms
	Surge		2M1	
Contamination	Gas	2C2		
	Solids	2S2		
Ambient conditions for the storage				
Climate	Temperature	EN 60721-3-1	1K4	Drain heat sink completely (without condensation)
	Humidity		1K3	
Mechanical	Vibration		1M1	max. 100 m/s ² ; 11 ms
	Surge		1M1	
Contamination	Gas	1C2		
	Solids	1S2		
Type of protection		EN 60529	IP20	
Environment		IEC 664-1		Pollution degree 2
Definition acc.		EN 61800-3		Inverter product standard: EMC
EMC emitted interference				
Cable-based interferences		–	C2 ¹⁾²⁾	Earlier limit value A (B optional) according to EN55011
Radiated interferences		–	C2 ²⁾	Earlier limit value according to EN55011
Interference immunity				
Static discharges		EN 61000-4-2	8 kV	AD (air discharge) and CD (contact discharge)
Burst - control lines + bus		EN 61000-4-4	2 kV	
Burst - mains supply		EN 61000-4-4	4 kV	
Surge - mains supply		EN 61000-4-5	1 / 2 kV	Phase-phase / phase-ground
Electromagnetic fields		EN 61000-4-3	10 V/m	
Cable-fed disturbances, induced by high frequency fields		EN 61000-4-6	10 V	0.15-80 MHz
Voltage variation / voltage drop		EN 61000-2-1	3	+10 % -15 % 90 %
Voltage unsymmetries / Frequency changes		EN 61000-2-4	3	3 % 2 %

Attention Deviations

¹⁾ This product can cause high frequency disturbances in residential areas (category C1) which require noise suppression measures.

²⁾ The specified value is only met in connection with a corresponding filter.

³⁾ Above 2000 m there is no "safe isolation" of the control.

2.2 Technical data of the 230V class

Inverter size			15	16	17
Housing size			H	H	H
Phases			3	3	3
Output rated power		[kVA]	19	26	33
Max. rated motor power		[kW]	11	15	18,5
Output rated current		[A]	48	66	84
Max. short time current	1)	[A]	86	118	151
OC-tripping current		[A]	103	142	181
Input rated current		[A]	63	73	92
Max. permissible main fuse gG	5)	[A]	80	80	100
Rated switching frequency		[kHz]	16	16	4
Max. switching frequency		[kHz]	16	16	16
Power loss at nominal operating		[W]	430	550	800
Power loss at DC supply		[W]	345	435	–
Standstill current at 4 kHz	2)	[A]	53	72,5	92
Standstill current at 8 kHz	2)	[A]	53	72,5	92
Standstill current at 16 kHz	2)	[A]	53	72,5	92
Min. frequency at continuous full load		[Hz]	3	3	3
Max. heat sink temperature			90 °C (194 °F)		
Motor cable cross-section	3)	[mm ²]	25	25	35
Min. braking resistor	4)	[Ω]	5,6	5,6	5,6
Max. braking current	4)	[A]	70	70	70
Overload characteristic (see annex A)			1		
Input rated voltage		[V]	230 (UL: 240)		
Input voltage range U _{in}		[V]	180...260 ±0		
Input voltage at DC operation		[V]	250...370 ±0		
Mains frequency		[Hz]	50 / 60 ±2		
permitted mains forms			TN, TT, IT ⁶⁾ , Δ mains ⁷⁾		
Output voltage	8)	[V]	3 x 0...U _{in}		
Output frequency	9)	[Hz]	0 - max. 599		
Max. motor line length shielded		[m]	100		
Cooling mode (L=air; W=water)			L	L	L

- 1) With the regulated operating modes MULTI and SERVO 5% are to be subtracted as control reserve
- 2) Max. current before the OL2 function triggers (in operating mode MULTI and SERVO)
- 3) Recommended minimum cross section of the motor line for rated power and a cable length of upto 100m (CU)
- 4) This data is only valid for units with internal braking transistor (see "unit identification")
- 5) Protection in accordance with UL see annex B
- 6) IT system optional
- 7) Phase conductor grounded mains are only permissible without HF filters
- 8) The voltage at the motor is dependent on the series-connected units and on the control method (see A.3)
- 9) The output frequency is to be limited in such way that 1/10 of the switching frequency is not exceeded Units with higher max. output frequency are subject to export restrictions and are only available on request.

The technical data are 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.

Info



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

2.3 Technical data of the 400V class

Inverter size		15	16	17	18	19	20
Housing size		H	H	H	H	H	H
Phases		3	3	3	3	3	3
Output rated power	[kVA]	17	23	29	35	42	52
Max. rated motor power	[kW]	11	15	18,5	22	30	37
Output rated current	[A]	24	33	42	50	60	75
Max. short time current	1) [A]	36	49,5	63	75	90	112
OC-tripping current	[A]	43	59	75	90	108	135
Input rated current	[A]	31	43	55	65	66	83
Max. permissible main fuse gG	7) [A]	35	50	63	80	80	100
Rated switching frequency	[kHz]	16	16	8	8	4	2
Max. switching frequency	[kHz]	16	16	16	16	16	8
Power loss at nominal operating	[W]	360	490	470	610	540	640
Power loss at DC supply	[W]	320	430	400	525	425	500
Standstill current at 4 kHz	2) [A]	24	33	42	50	60	67,5
Standstill current at 8 kHz	2) [A]	24	33	42	50	54	52,5
Standstill current at 16 kHz	2) [A]	24	33	25	30	36	–
Min. frequency at continuous full load	[Hz]	3	3	3	3	3	3
Max. heat sink temperature		90 °C (194 °F)					
Motor cable cross-section	3) [mm ²]	6	10	16	25	25	35
Min. braking resistor	4) [Ω]	22	22	22	13	13	9
Max. braking current	4) [A]	37	37	37	63	63	88
Overload characteristic		(see annex A)					
Input rated voltage	5) [V]	400 (UL: 480)					
Input voltage range	[V]	305...528 ±0					
Input voltage at DC operation	[V]	420...746 ±0					
Mains frequency	[Hz]	50 / 60 ±2					
permitted mains forms		TN, TT, IT ⁸⁾ , Δ mains ⁹⁾					
Output voltage	10) [V]	3 x 0...U _{in}					
Output frequency	11) [Hz]	0 - max. 599					
Max. motor line length shielded	[m]	100					50
Cooling mode (L=air; W=water)		L	W	L	W	L	W
Cooling water content		350 ml					

- 1) With the regulated operating modes MULTI and SERVO 5% are to be subtracted as control reserve
- 2) Max. current before the OL2 function triggers (in operating mode MULTI and SERVO)
- 3) Recommended minimum cross section of the motor line for rated power and a cable length of upto 100m (CU)
- 4) This data is only valid for units with internal brake transistor GTR 7 (see "unit identification")
- 5) At rated voltages ≥ 460V multiply the rated current with factor 0.86
- 6) At control board BASIC only 2kHz, with COMPACT 8 kHz 7) Protection in accordance with UL see annex B
- 8) Restrictions when using HF filters 9) Phase conductor grounded mains are only permissible without HF filters
- 10) The voltage at the motor is dependent on the series-connected units and on the control method (see A.3)
- 11) The output frequency is to be limited in such way that 1/10 of the switching frequency is not exceeded Units with higher max. output frequency are subject to export restrictions and are only available on request.

The technical data are 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.

Info



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

Caution  **Control type „Basic“**

No braking resistor may be connected for control type "Basic" at an input rated voltage of 480 Vac. The response threshold of the braking transistor (Pn.69) for all other controls without safety technology (A, E, G, H, M) must be adjusted at least to 770 Vdc (see annex D).

2.4 DC supply

2.4.1 Calculation of the DC input current

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 :

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

400V class :

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

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

- If you accelerate on the hardware current limit, the short-time current limit 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.

2.4.2 Internal input circuit

The COMBIVERT F5/F6 in H housing corresponds to the inverter type A1. Pay attention to the inverter type in DC interconnection and in operation at regenerative units.

Inverter type for COMBIVERT F5 F6 in H housing: A1

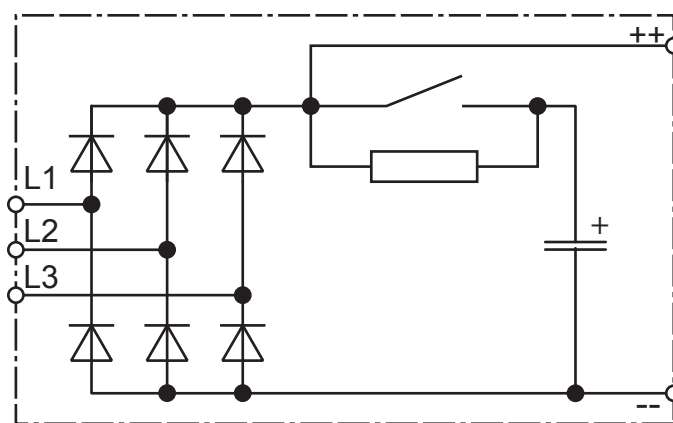
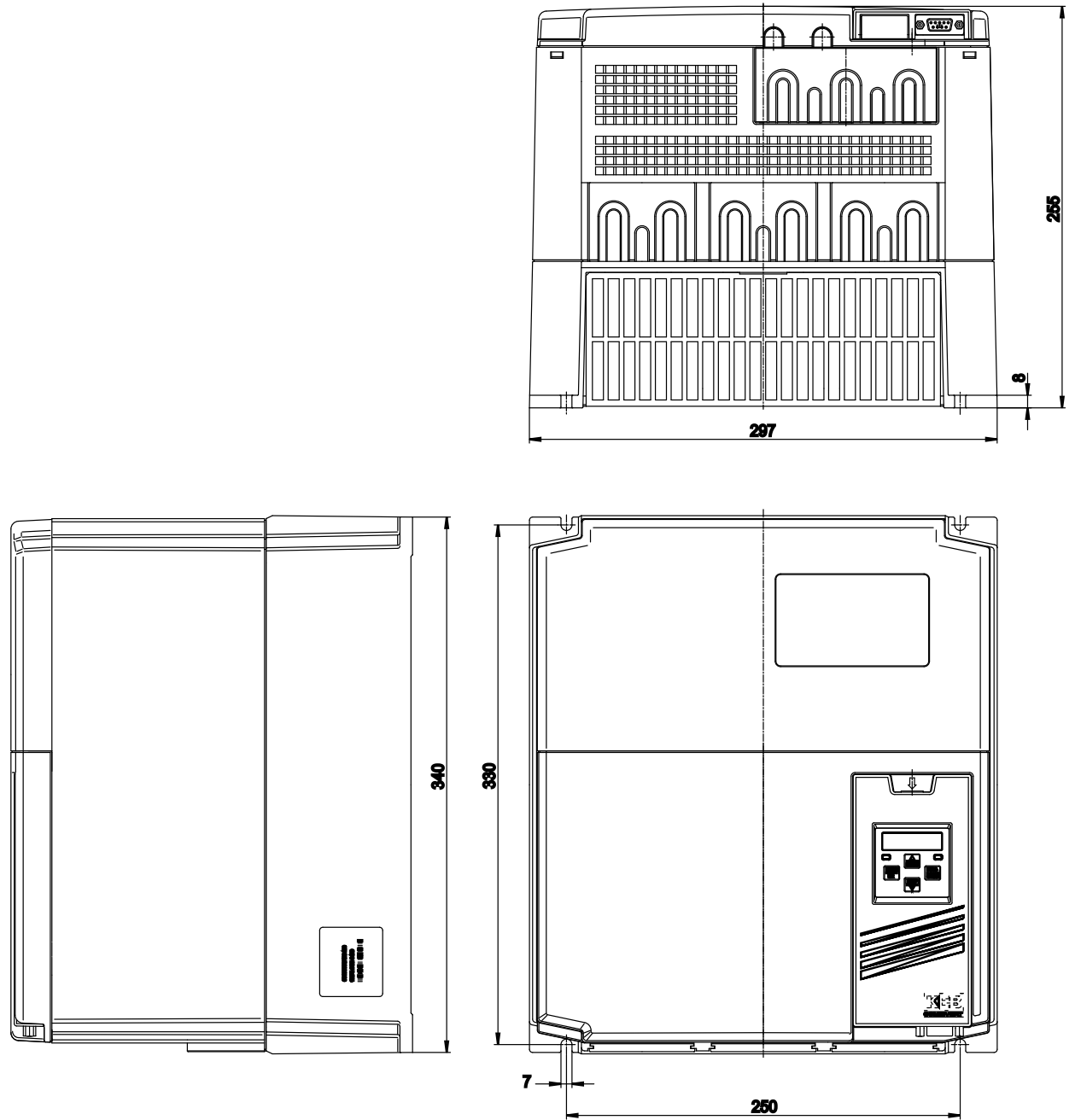


Figure 2: Internal input circuit

2.5 Dimensions and Weights

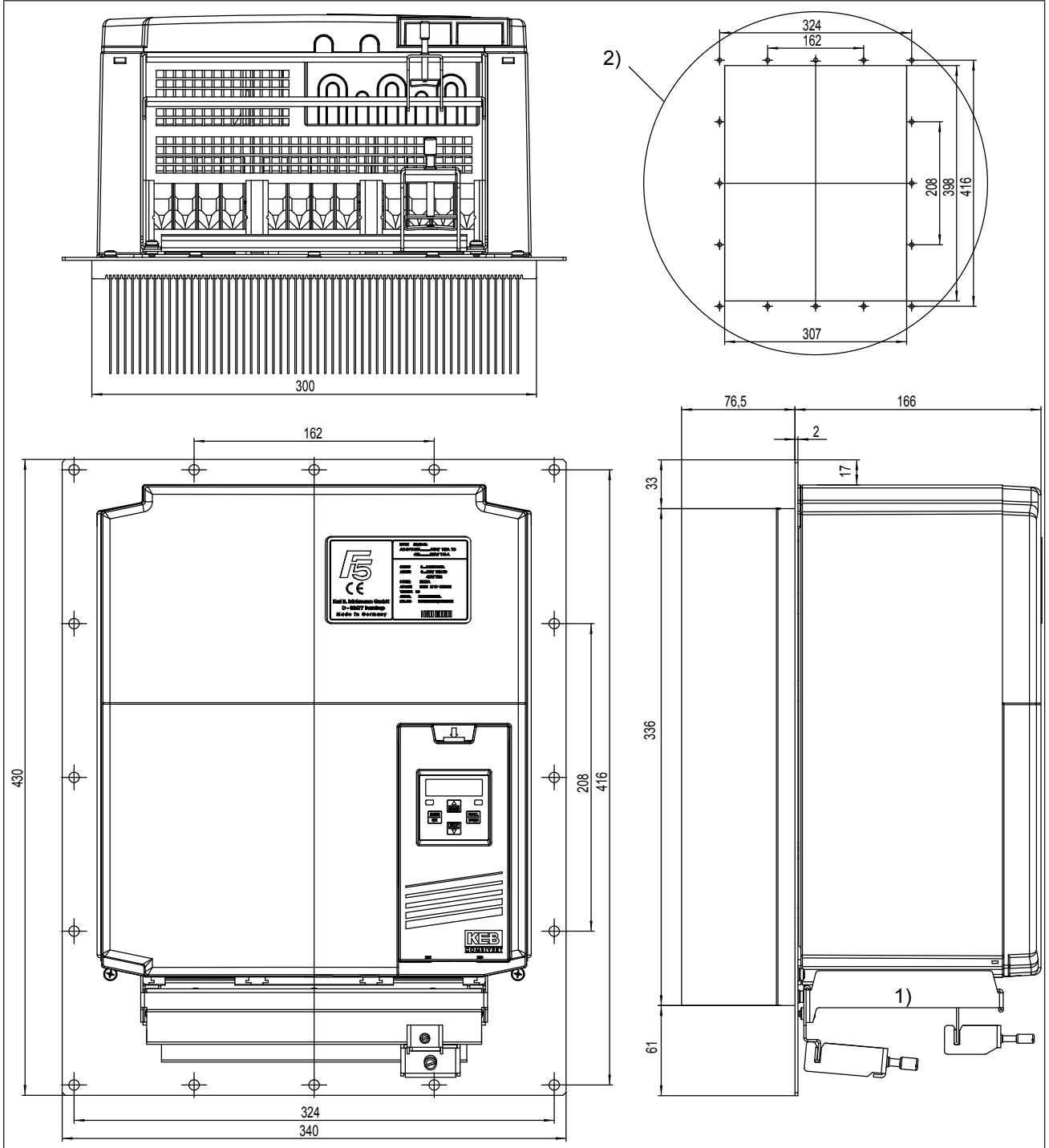
Dimensions mounted version air-cooled



Weight	14 kg
--------	-------

Figure 3: Dimensions mounted version air-cooled

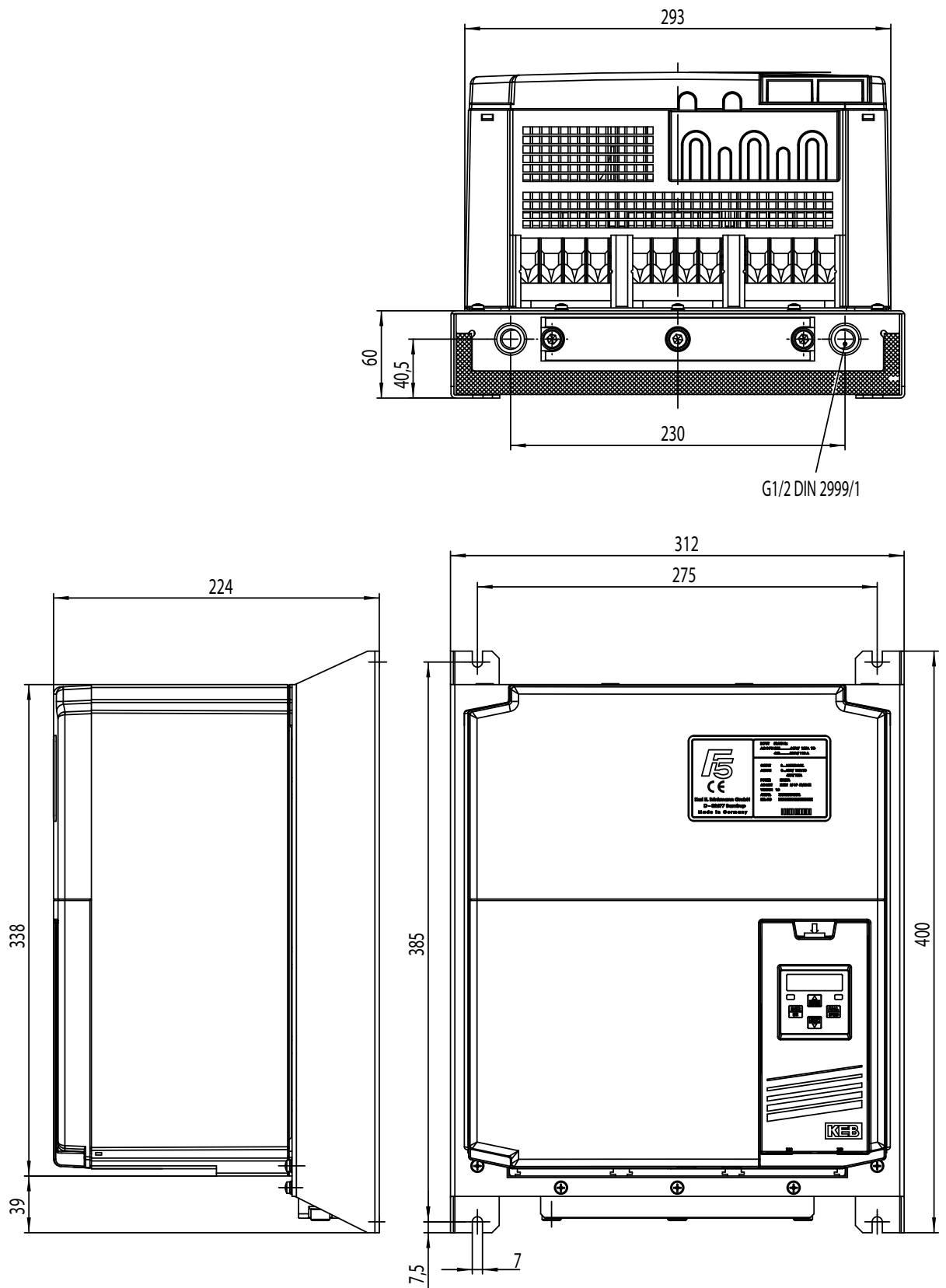
Dimensions through-mount version air-cooled



1)	Metal holder with shielding clamp optional
2)	Cabinet cutout
Weight	22 kg

Figure 4: Dimensions through-mount version air-cooled

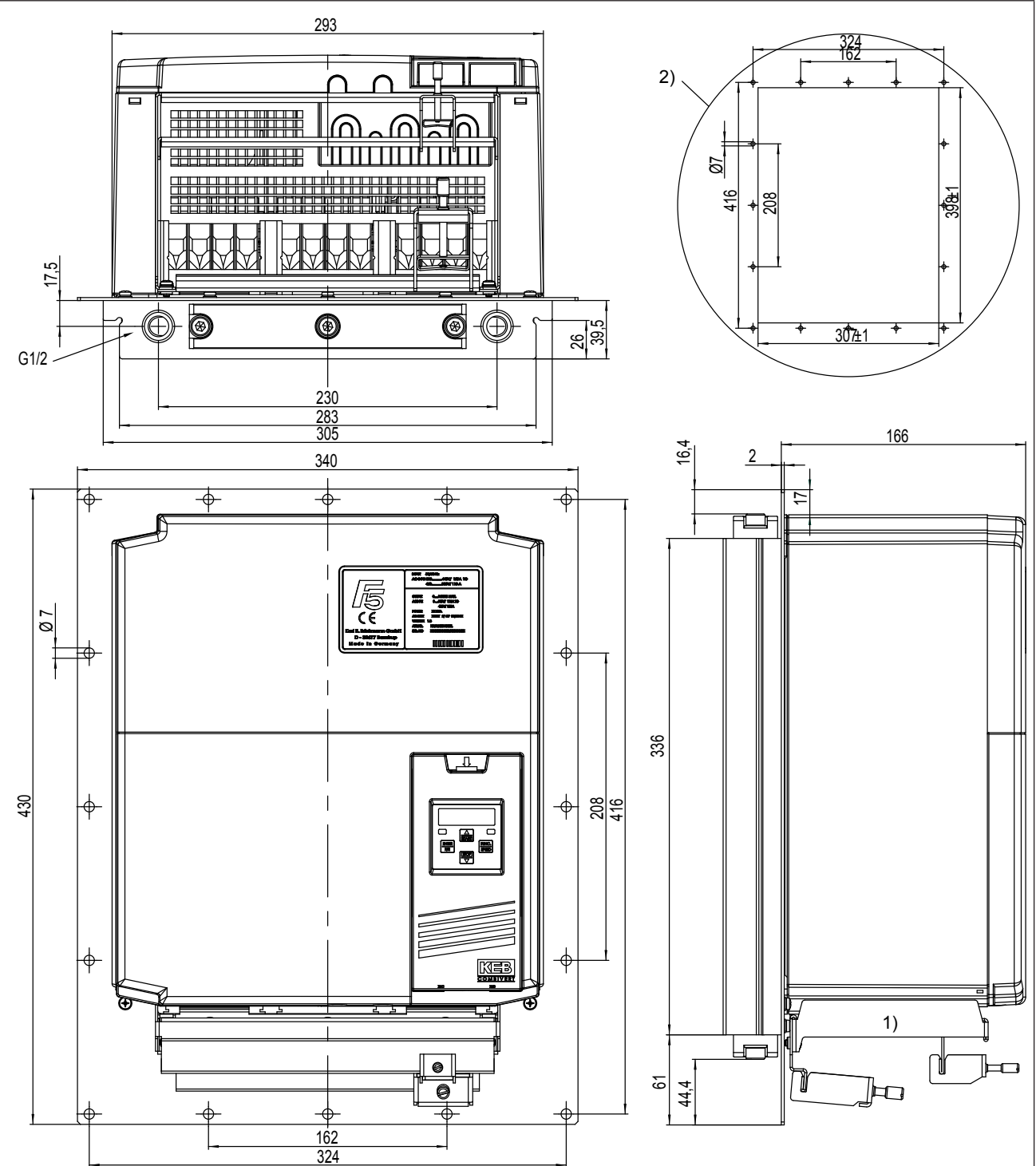
Dimensions mounted version water-cooled



Weight 32 kg

Figure 5: Dimensions mounted version water-cooled

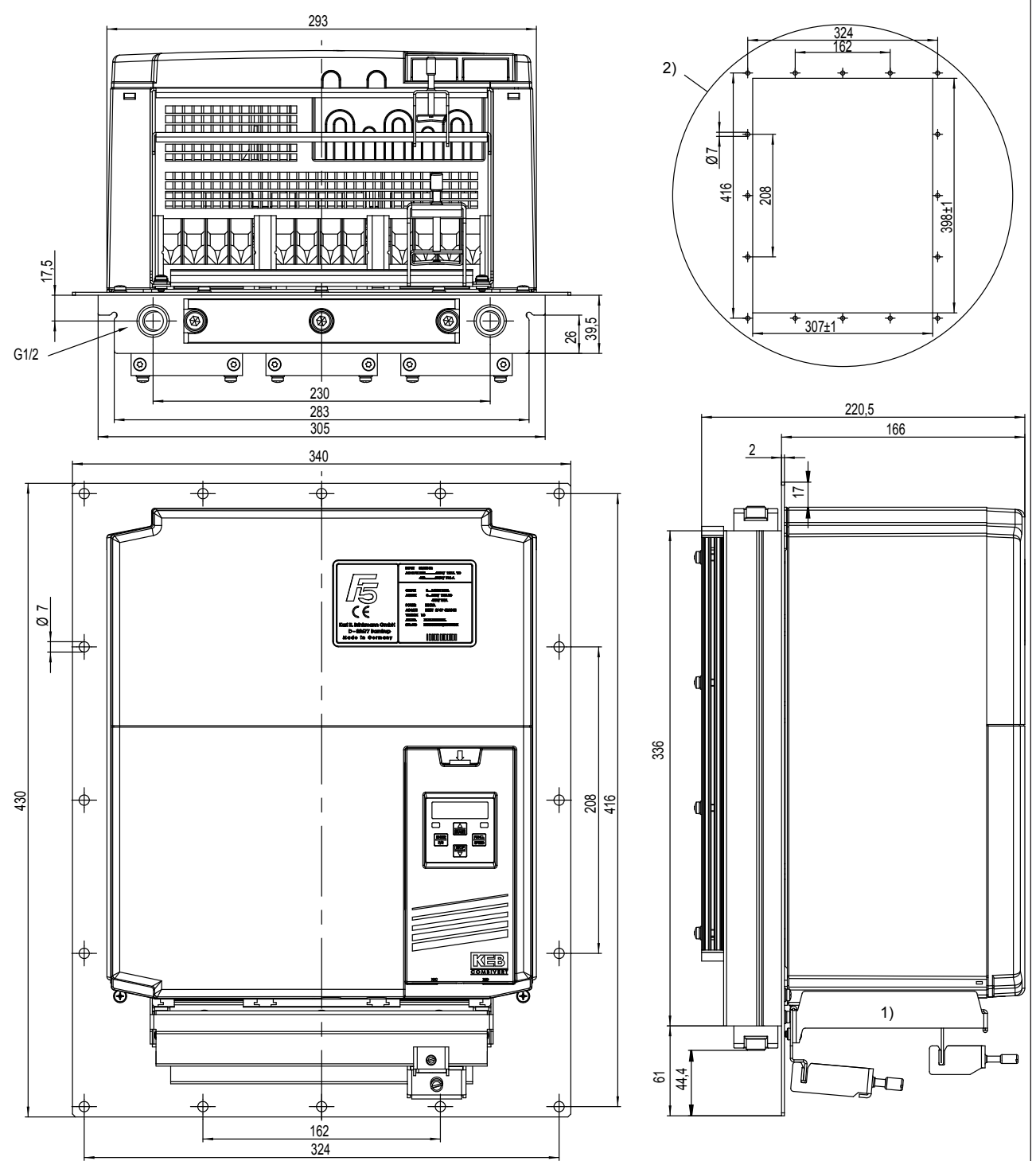
Dimensions through-mount version water-cooled



	1) Metal holder with shielding clamp optional
	2) Cabinet cutout
Weight	31 kg

Figure 6: Dimensions through-mount version water-cooled

Dimensions through-mount version water-cooled with sub-mounted braking resistor



1)	Metal holder with shielding clamp optional
2)	Cabinet outlet
Weight	33 kg

Figure 7: Dimensions through-mount version water-cooled with sub-mounted braking resistor

2.6 Terminal strips of the power circuit

Caution



Observe input voltage, since 230 V and 400 V class possible

Info



All terminal strips following the requirements of the EN 60947-7-1 (IEC 60947-7-1)

Housing size H	Name	Function	Terminal (2.6.1)
	L1, L2, L3	3-phase mains connection	1
	U, V, W	Motor connection	
	++, PB	Connection for braking resistor	
	++, --	Regenerative- and supply unit or as DC voltage input 250...370 VDC (230 V class) 420...720 VDC (400 V class)	
	T1, T2	Connection for temperature sensor	2
	K1, K2	Connection for GTR7 monitoring	2
	PE, ⊕	Connection for shielding /earthing	1

Figure 8: Terminal strips of the power circuit

2.6.1 Permissible cable cross-sections and tightening torques of the terminals

No.	Permissible cross-section flexible with wire-end ferrule				Tightening torque	
	mm ²		AWG		Nm	lb inch
	min	max	min	max		
1	2,5	35	12	2	4,5	40
2	0,5	2,5	21	12	0,6	6

2.7 Accessories

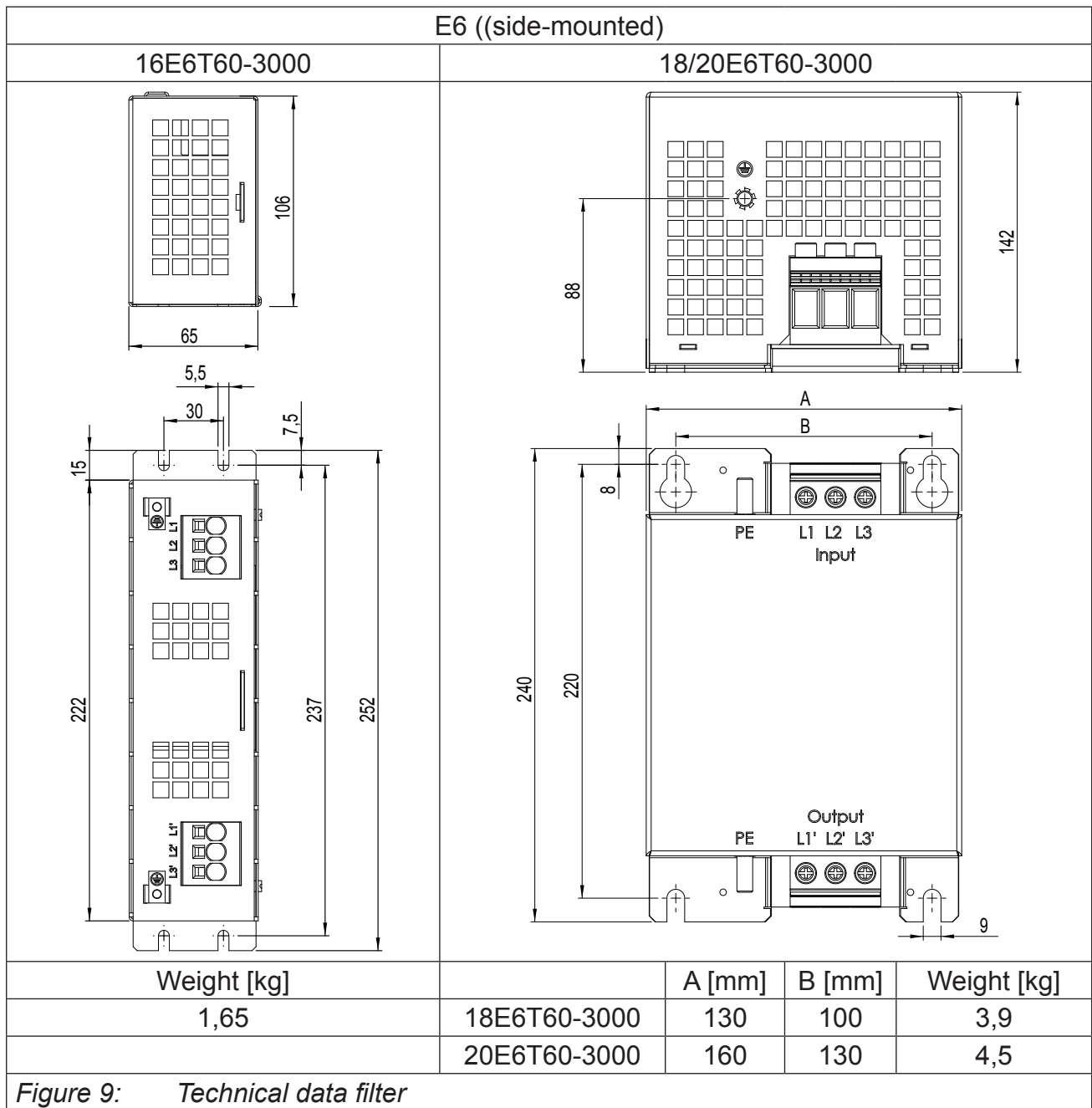
2.7.1 Filter and chokes

Voltage class	Inverter size	Filter	Mains choke 50 Hz (4 % Uk)	Motor choke 100 Hz (4 % Uk)
230 V	15	18E5T60-1002	15Z1B03-1000	15Z1F04-1010
		18E6T60-3000		
	16	19E5T60-1002	16Z1B03-1000	16Z1F04-1010
		20E6T60-3000		
	17	20E5T60-1002	16Z1B03-1000	17Z1F04-1010
		20E6T60-3000		

Voltage class	Inverter size	Filter	Mains choke 50 Hz (4 % Uk)	Motor choke 100 Hz (4 % Uk)
400 V	15	18E5T60-1002	15Z1B04-1000	15Z1F04-1010
		16E6T60-3000		
	16	18E5T60-1002	16Z1B04-1000	16Z1F04-1010
		16E6T60-3000		
	17	18E5T60-1002	17Z1B04-1000	17Z1F04-1010
		16E6T60-3000		
	18	18E5T60-1002	18Z1B04-1000	18Z1F04-1010
		18E6T60-3000		
	19	19E5T60-1002	19Z1B04-1000	19Z1F04-1010
		20E6T60-3000		
	20	20E5T60-1002	20Z1B04-1000	20Z1F04-1010
		20E6T60-3000		

2.7.2 Technical data filter

E5 (sub-mounted)		18E5:	5,1 kg
		19E5:	6,0 kg
		20E5:	5,5 kg

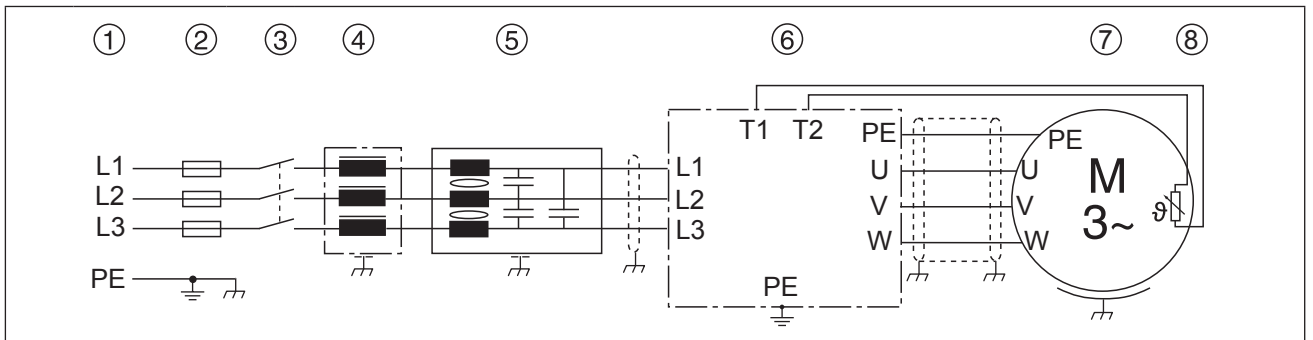


2.8 Connection Power Unit

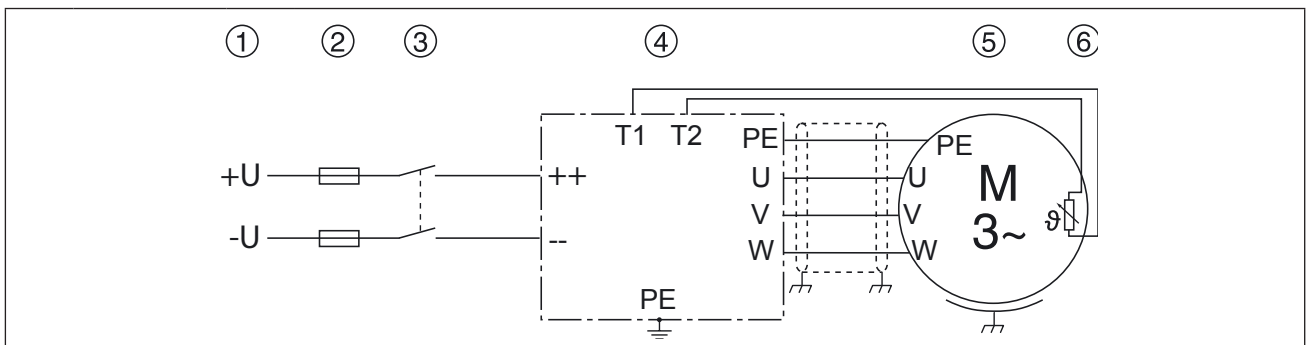
2.8.1 Mains and motor connection

Caution  **Mains and motor connection**

- Absolutely pay attention to the supply voltage of the KEB COMBIVERT. A 230V unit at 400V mains is destroyed immediately.
- Exchanging mains and motor connection leads to immediate destruction of the unit.
- Pay attention to the supply voltage and the correct polarity of the motor!



Legend	1	Mains supply
	2	Mains fuse
	3	Mains contactor
	4	Mains choke
	5	HF filter
	6	KEB COMBIVERT
	7	Motor (see also 2.8.3)
	8	Motor protection temperature sensor (also see 2.8.4)



Legend	1	DC supply
	2	DC fuses
	3	Mains contactor
	4	KEB COMBIVERT with DC input
	5	Motor (see also 2.8.3)
	6	Motor protection temperature sensor (also see 2.8.4)

Figure 10: Mains and motor connection

2.8.2 Selection of the motor cable

Correct selection and wiring of the motor cable is very important:

- lower abrasion of the motor bearings by leakage currents
- improved EMC characteristics
- lower symmetrical operating capacities
- less losses by transient currents

2.8.3 Connection of the motor

As a standard the connection of the motor must be carried out in accordance with the following table:

230/400 V motor		400/690 V motor	
230 V	400 V	400 V	690 V
Delta	Star	Delta	Star

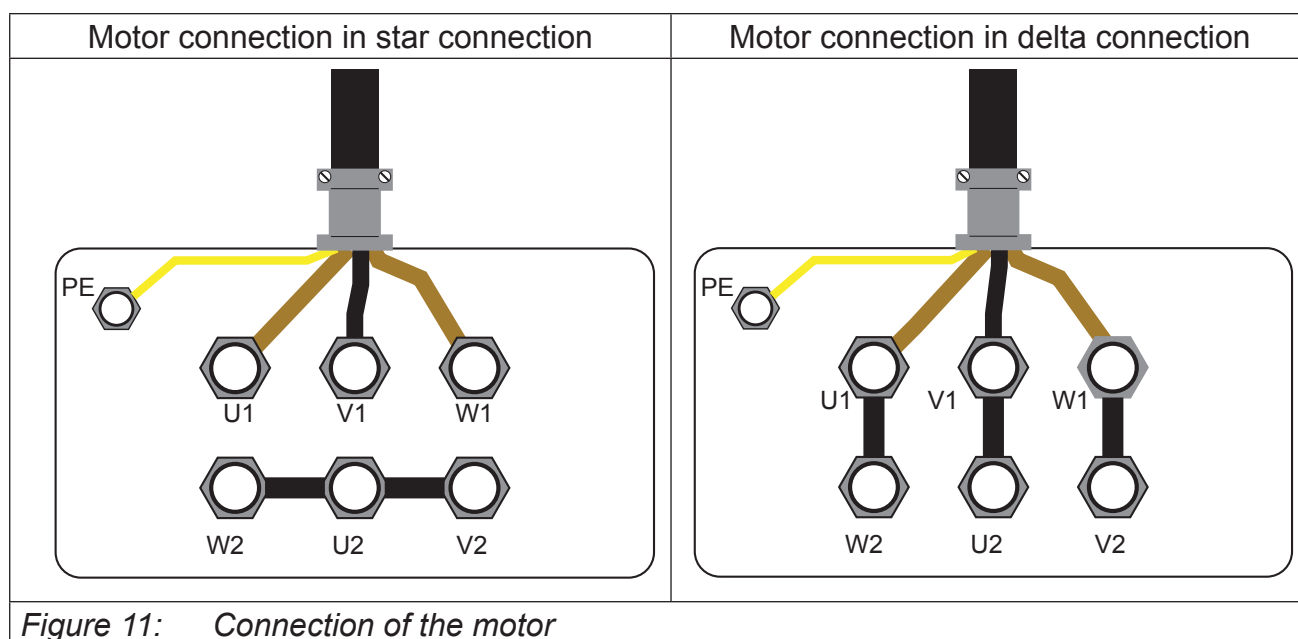


Figure 11: Connection of the motor

Attention



The connecting-up instructions of the motor manufacturer are generally valid!

Caution



Protect motor against voltage peaks!

Inverters switch at the output with a du/dt of approx. $5kV/\mu s$. Especially in case of long motor lines ($> 15\text{ m}$) voltage peaks at the motor can occur which endanger the isolation system.

A motor choke, a du/dt filter or sine-wave filter can be used to protect the motor.

2.8.4 Temperature detection T1, T2

Parameter In.17 displays in high byte the installed temperature input of the inverter. The KEB COMBIVERT F5/F6 is delivered as standard with switchable PTC/KTY evaluation. The desired function is adjusted with Pn.72 (dr33 at F6) and operates in accordance with the following table:

In.17	Function of T1, T2	Pn.72 (dr33)	Resistance	Display ru.46 (F6 => ru28)	Error/Warning ¹⁾
5xh	KTY84	0	< 215 Ω	Detection error 253	x
			498 Ω	1°C	– ²⁾
			1 kΩ	100°C	x ²⁾
			1,722 kΩ	200°C	x ²⁾
			> 1811 Ω	Detection error 254	x
	PTC (in accordance with DIN EN 60947-8)	1	< 750 Ω	T1-T2 closed	–
			0.75...1.65 kΩ (reset resistance)	T1-T2 closed	–
			1.65...4 kΩ (tripping resistance)	T1-T2 open	x
			> 4 kΩ	T1-T2 open	x
	6xh	PT100	–	upon request	
1)	The column is valid at factory setting. The function must be programmed accordingly with parameters Pn.12, Pn.13, Pn.62 and Pn.72 for F5 in operating mode GENERAL.				
2)	Disconnection is depending on the adjusted temperature in Pn.62 (F6 => pn11/14).				

Info



The behaviour of the inverter in case of error/warning is defined with parameters Pn.12 (CP.28), Pn.13 (F6 => pn12/13).

Dependent on the application the temperature input can be used for the following functions:

Function	Mode (F5 => Pn.72; F6 => dr33)
Motor temperature display and monitoring	KTY84
Motor temperature monitoring	PTC
Temperature control for water-cooled motors ¹⁾	KTY84
General fault sensing	PTC
1) If the temperature input is used for other functions, the motor temperature control at water-cooled inverters can be done indirectly via the water cooling circuit of the inverter.	

Caution



KTY or PTC cable

- Do not lay KTY or PTC cable of the motor (also shielded) together with control cable!
- KTY or PTC cable only permissible with double shielding within the motor cable!

2.8.4.1 Use of the temperature input in KTY mode

Connection of a KTY sensor	
	<p>KTY sensors are poled semiconductors and must be operated in forward direction! Connect anode to T1! Non-observance leads incorrect measurement in the upper temperature range. Protection of the motor winding is no longer guaranteed.</p>

Figure 12: Connection of a KTY sensor

Attention		KTY sensors may not be combined with other devices. Otherwise wrong measurements would be the consequence.
Info		KTY Sensor
<ul style="list-style-type: none"> Examples for the construction and programming of a temperature control with KTY84 evaluation can be taken from the application manual. Control Type COMPACT does not support the KTY sensor. 		

2.8.4.2 Use of the temperature input in PTC mode

If the temperature input is operated in PTC mode, all possibilities are available for the user within the specified resistance range. This can be:

Wiring example in PTC mode	
Thermal contact (NC contact)	
Temperature sensor (PTC)	
Mixed sensor chain	

Figure 13: Wiring example in PTC mode

The function can be switched off with Pn.12="7" (CP.28) if no evaluation of the input is desired (standard in operating mode GENERAL). Alternatively a bridge can be installed between T1 and T2.


2.8.5 Connection of a braking resistor

Warning  **Braking resistors**

- Braking resistors dissipate the produced energy of the motor into heat during generat-
• toric operation. Thus braking resistors can cause very high surface temperatures. Dur-
ing assembly pay attention to appropriate protection against contact and fire.
- The mains voltage must always be switched off in order to guarantee fire protection in
case of a defective braking transistor.
- No braking resistor may be connected for control type "Basic" at an input rated voltage
of 480 Vac. The response threshold of the braking transistor (Pn.69) for all other con-
trolls without safety technology (A, E, G, H, M) must be adjusted at least to 770 Vdc (see
annex D).

Attention  **Regenerative operation**

The frequency inverter remains in operation in spite of switched off power supply in genera-
toric operation. An error must be released by external wiring which switches the modulation
off in the inverter. This can occur e.g. at terminals T1/T2 or via digital input. The frequency
inverter must be programmed accordingly in each case.

Info  The use of a regenerative unit is reasonable for applications which
produce a lot of regenerative energy. Regeneration of excess energy
into the mains.

2.8.5.1 Braking resistor without temperature monitoring

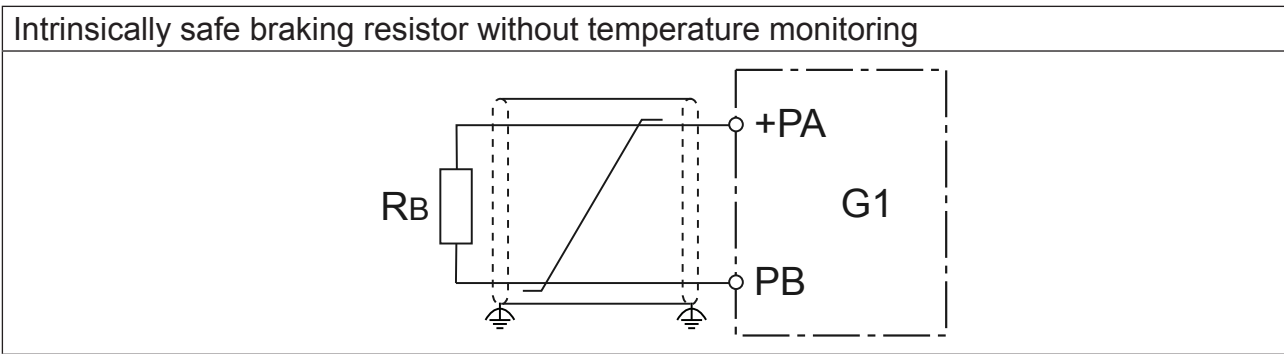



Figure 14: Intrinsically safe braking resistor without temperature monitoring

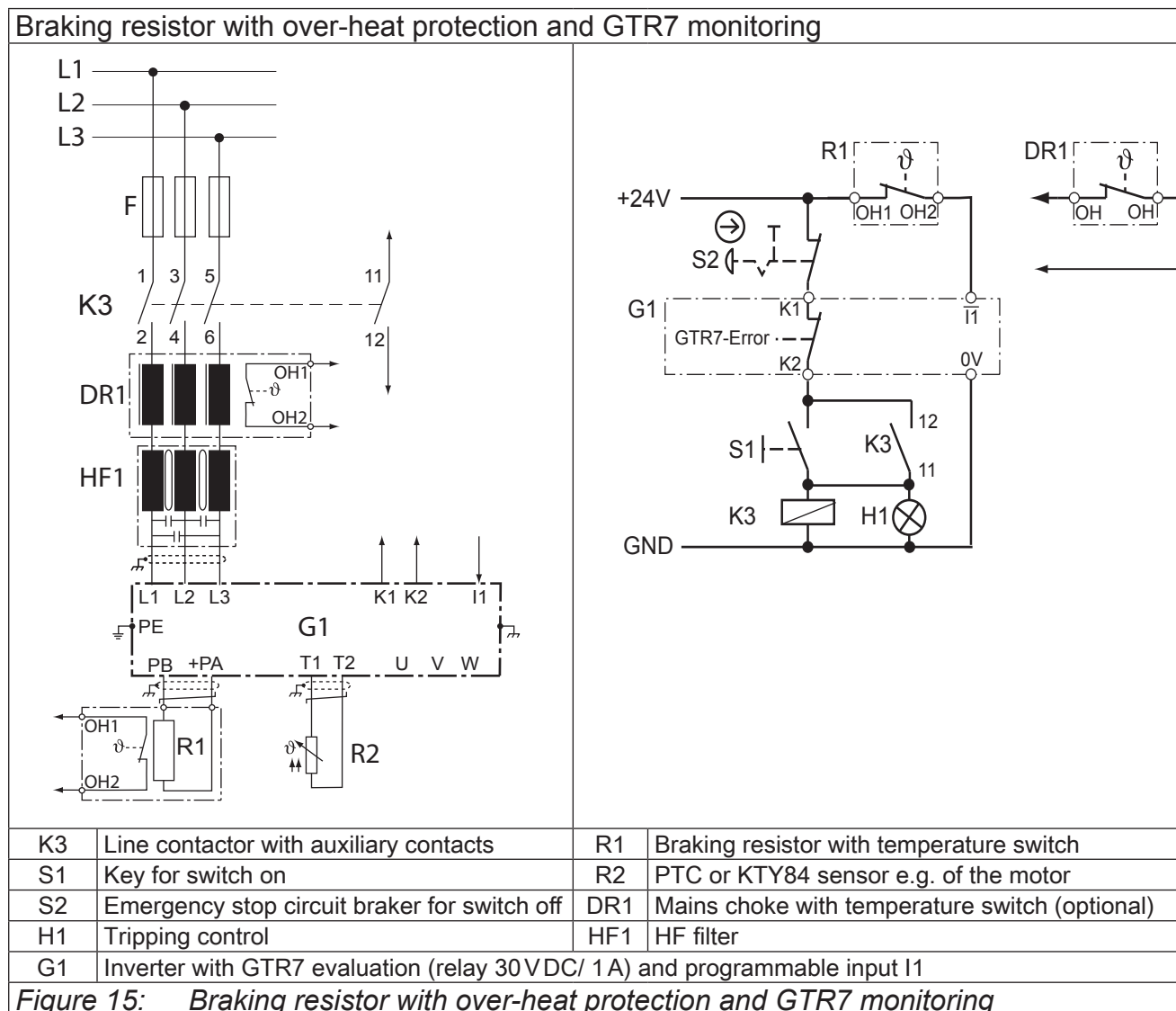
Caution  Only "intrinsically safe" braking resistors are permissible for operation
without temperature monitoring.

2.8.5.2 Braking resistor with over-heat protection and GTR7 monitoring (water-cooled inverters)

This circuit offers a direct protection with defective GTR7 (braking transistor). At defective braking transistor an integrated relay opens the terminals K1/K2 and error „E.Pu“ is released. Terminals K1/K2 are integrated into the holding circuit of the input contactor, so the input voltage is switched off in error case. Regenerative operation is also secured by the internal fault disconnection. All other errors of the braking resistor and the input choke are intercepted via a digital input. The input must be programmed to "external error".

Info **Terminals T1/T2**

If the PTC/KTY evaluation of the motor at terminals T1/T2 is not used, these terminals can be used instead of the programmable input. The temperature input must be operated in PTC mode.

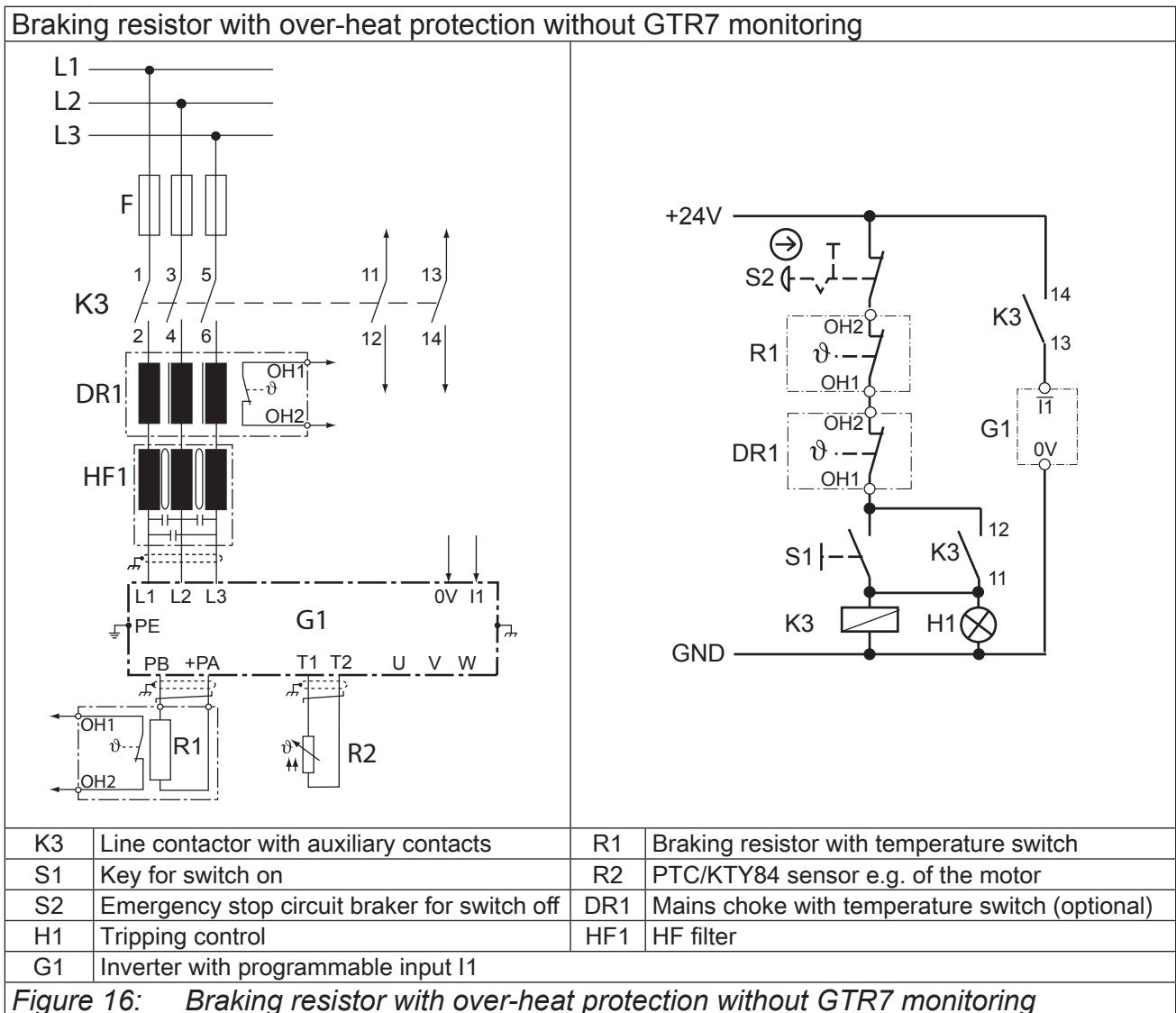


2.8.5.3 Braking resistor with over-heat protection and GTR7 monitoring (air-cooled inverters)

This circuit offers a direct protection with defective GTR7 (braking transistor). The braking resistor overheats and opens the OH terminals with defective GTR7. The OH terminals open the holding circuit of the input contactor, so that the input voltage is switched off in error case. An error in inverter is released by opening the auxiliary contacts of K3. Regenerative operation is also secured by the internal fault disconnection. The input must be programmed and inverted to "external error". Automatic restarting after cooling of the braking resistor is prevented by the self-holding circuit of K3.

Info **Terminals T1/T2**

If the PTC/KTY evaluation of the motor at terminals T1/T2 is not used, these terminals can be used instead of the programmable input. The temperature input must be operated in PTC mode.



A. Annex A

A.1 Overload characteristic

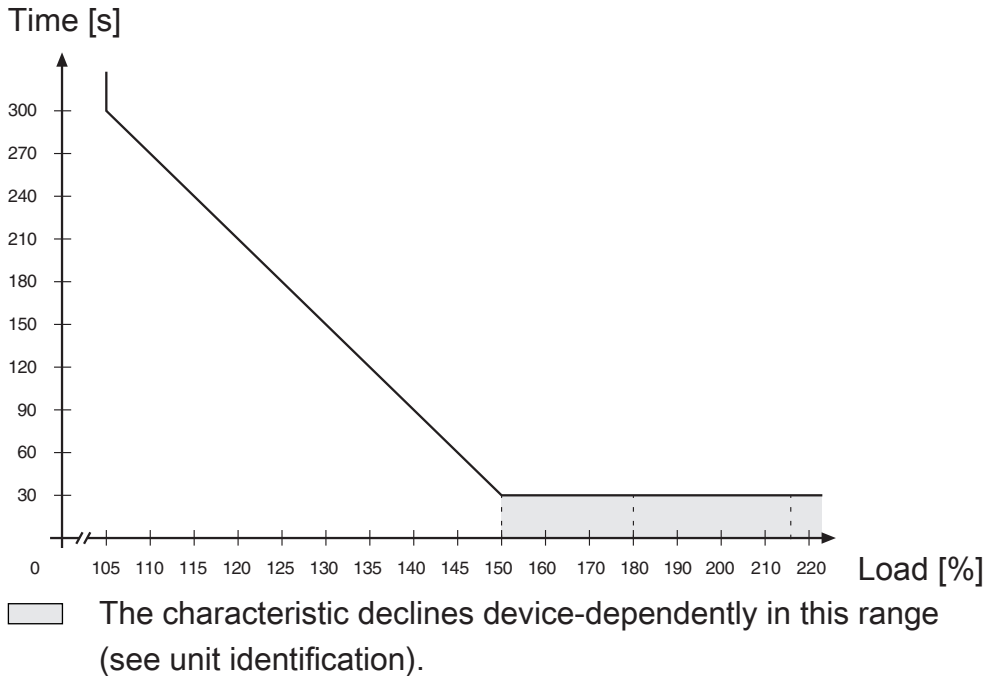


Figure 17: Overload characteristic

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.

A.2 Overload protection in the lower speed range

(only operating mode MULTI and SERVO)

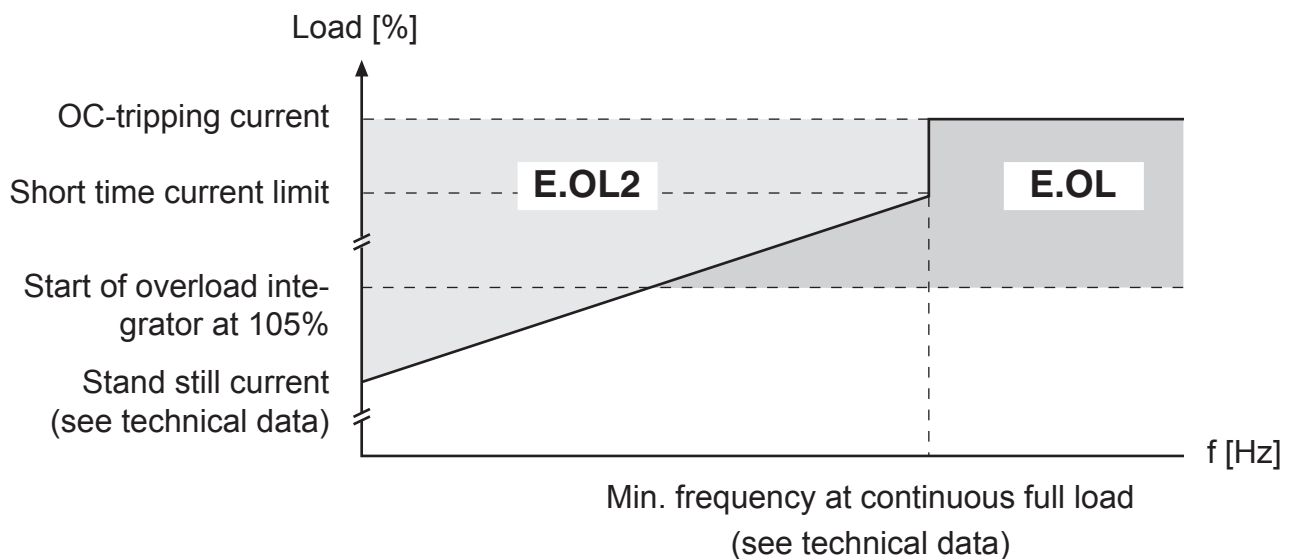


Figure 18: Overload protection in the lower speed range

A PT1-element ($\tau = 280 \text{ ms}$) starts if the permissible current is exceeded. After its sequence of operation the error E.OL2 is triggered.

A.3 Calculation of the motor voltage

The motor voltage for dimensioning of the drive is depending on the used components. The mains voltage reduces according to the following table:

Mains choke Uk	4 %	Example: Closed loop inverter with mains- and motor choke at non-rigid supply system: 400V mains voltage - 15 % = 340V motor voltage
Inverter open loop	4 %	
Inverter closed loop	8 %	
Motor choke Uk	1 %	
Non-rigid supply system	2 %	

A.4 Maintenance

All work may only be done by qualified personnel. The security must be ensured as follows:

- Disconnect power supply at MCCB
- Secure against restarting
- Await discharge time of capacitors (if necessary controlling by measurement at „+PA“ and „-“, respectively „++“ and „--“)
and „--“)
- Ensure loss of voltage by measurement

In order to avoid premature ageing and avoidable malfunctions, the measures mentioned below must be carried out in the appropriate cycle.

Cycle	Function
Constant	Pay attention to unusual noises of the motor (e.g. vibrations) as well as of the frequency inverter (e.g. fan).
	Pay attention to unusual smells of the motor or frequency inverter (e.g. evaporation of capacitor electrolyte, braise of the motor winding)
Monthly	Check unit for loose screws and plugs and if necessary tighten up.
	Clean frequency inverter from dirt and dust deposits. Pay attention especially to cooling fins and protective grid of the fans.
	Examine and clean extracted air filter and cooling air filter of the control cabinet.
	Examine function of the fans of the KEB COMBIVERT. The fans must be replaced in case of audible vibrations or squeak.
Annual	Check the connecting ducts for corrosion and change it if necessary for units with water cooling.

A.5 Storage

The DC link of the KEB COMBIVERT is equipped with electrolytic capacitors. If the electrolytic aluminium capacitors are stored de-energized, the internal oxide layer is removed slowly. Due to the leakage current the oxide layer is unrenewed. If the capacitor starts running with rated voltage there is a high leakage current which can destroy the capacitor.

In order to avoid defectives, the KEB COMBIVERT must be started up depending on the storage period in accordance with the following specification:

Storage period < 1 year			
• Start-up without special measures			
Storage period 1...2 years			
• Operate frequency inverter one hour without modulation			
Storage period 2...3 years			
• Remove all cables from the power circuit; especially of braking resistor or module			
• Open control release			
• Connect variable transformer to inverter input			
• Increase variable transformer slowly to indicated input voltage (>1 min) and remain at least on the specified time.			
	Voltage class	Input voltage	Residence time
	230 V	0...160 V	15 min
		160...220 V	15 min
		220...260 V	1 h
	400 V	0...280 V	15 min
		280...400 V	15 min
		400...500 V	1 h
Storage period > 3 years			
• Input voltages as before, however double the times per year. Eventually change capacitors.			

After expiration of this start-up the KEB COMBIVERT can be operated on nominal rating conditions or delivered to a new storage.

A.5.1 Cooling circuit

The cooling circuit must be completely empty if a unit shall be switched off for a longer period. At temperatures below 0°C the cooling circuit must be blown out additionally with compressed air.

B. Annex B

B.1 Certification

B.1.1 CE Marking

CE marked frequency inverter and servo drives were developed and manufactured to comply with the regulations of the Low-Voltage Directive 2006/95/EC.

The inverter or servo drive must not be started until it is determined that the installation complies with the Machine directive (2006/42/EC) as well as the EMC-directive (2004/108/EC) (note EN 60204).

The frequency inverters and servo drives meet the requirements of the Low-Voltage Directive 2006/95/EC. They are subject to the harmonized standards of the series EN61800-5-1.

This is a product of limited availability in accordance with IEC61800-3. This product may cause radio interference in residential areas. In this case the operator may need to take corresponding measures.

B.1.2 UL Marking



Acceptance according to UL is marked at KEB inverters with the adjacent logo on the type plate.

To be conform according to UL for use on the North American and Canadian Market the following additionally instructions must be observed (original text of the UL-File):

- For control cabinet mounting as „Open Type“
- Control Board Rating (max. 30Vdc, 1A)
- Maximum Surrounding Air Temperature 45°C (113°F)
- Overload protection at 130% of inverter output rated current (see type plate)
- “Cooling medium max. Pressure rating of 10 bar (145 PSI)”
- For KEB Control boards type „Basic (B)“ or „Compact (C)“ motor overload protection has to be added by using the internal motor thermal sensor.

For KEB Control boards type „Application (A, E, H)“, „General (G, M)“ or „Application Safety (K, L, P)“ motor protection has to set by parameters Pn14 and Pn15. See manual for details.

- „Use 60/75°C copper conductors only“ for equipment rated 100 Amperes or less and “Use 75°C copper conductors only” for equipment rated greater than 100 Amperes.
- Terminals - Torque Value for Field Wiring Terminals, the value to be according to the R/C Terminal Block used.
- Use in a pollution degree 2 environment
- “Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Manufacturer Instructions, National Electrical Code and any additional local codes”, or the equivalent”.

Short Circuit rating F5/F6 housing H:

240V Models:

“Suitable For Use On A Circuit Capable Of Delivering Not More Than 18000 rms Symmetrical Amperes, 240 Volts Maximum When Protected by Class RK5 Fuses.

See instructional manual for maximum fuse sizes”

480V Models:

“Suitable For Use On A Circuit Capable Of Delivering Not More Than 18000 rms Symmetrical Amperes, 480 Volts Maximum When Protected by Class RK5 Fuses.

See instructional manual for maximum fuse sizes”

Branch Circuit Protection of inverters F5/F6 housing H:

UL 248 Fuses; Class RK5 as specified below

Inverter	Input Voltage [V]	UL 248 Fuse class RK5 or J [A], maximum rating
15F5/F6	240 / 3ph	70
16F5/F6	240 / 3ph	90
17F5/F6	240 / 3ph	110
15F5/F6	480 / 3ph	40
16F5/F6	480 / 3ph	50
17F5/F6	480 / 3ph	60
18F5/F6	480 / 3ph	70
19F5/F6	480 / 3ph	90
20F5/F6	480 / 3ph	100

The voltage rating of the fuses must at least equal to the input voltage of the inverter (or similar wording).

C. Annex C

C.1 Installation of water-cooled units

In continuous operation water-cooled inverters are operated with lower temperature than air-cooled inverters. This has positive effects on lifetime-relevant components such as fan and DC link circuit capacitors and power modules (IGBT). Also the temperature dependent switching losses are positively effected. The use of water-cooled KEB COMBIVERT frequency inverters is offered in the drive technology, because there are process-caused coolants available with some applications. The following instructions must be observed absolutely when this units are used.

C.1.1 Heat sink and operating pressure

Design system	Material (voltages)	Max. operating pressure	Connecting duct
Extrusion casting heat sink	Aluminium (-1.67V)	10 bar	0000650-G140

The heat sinks are sealed with sealing rings and posses a surface protection (anodized) even in the ducts.

Caution



Max. operating pressure

In order to avoid a deformation of the heat sink and the damages involved, the indicated max. operating pressure may not be exceeded briefly also by pressure peaks.

Pay attention to the guidelines 97/23/EG of pressure units.

C.1.2 Materials in the cooling cicuit

For the screw connections and also for the metallic articles in the cooling circuit which are in contact with the coolant (electrolyte) a material is to be selected, which forms a small voltage difference to the heat sink in order to avoid contact corrosion and/or pitting corrosion (electro-chemical voltage series, see table 1.5.2). An aluminum screw connection or ZnNi coated steel screw connection is recommended. Other materials must be examined in each case before employment. The specific case of application must be checked by the customer in tuning of the complete cooling circuit and must be classified according to the used materials. With hoses and seals take care that halogen-free materials are used.

A liability for occuring damages by wrongly used materials and from this resulting corrosion cannot be taken over!

Material	generated Ion	Standard potential	Material	generated Ion	Standard potential
Lithium	Li ⁺	-3.04V	Cobald	Co ²⁺	-0.28V
Potassium	K ⁺	-2.93V	Nickel	Ni ²⁺	-0.25V
Calcium	Ca ²⁺	-2.87V	Tin	Sn ²⁺	-0.14V

Material	generated Ion	Standard potential	Material	generated Ion	Standard potential
Sodium	Na ⁺	-2.71 V	Lead	Pb ³⁺	-0.13 V
Magnesium	Mg ²⁺	-2.38 V	Iron	Fe ³⁺	-0.037 V
Titan	Ti ²⁺	-1.75 V	Hydrogen	2H ⁺	0.00 V
Aluminium	Al ³⁺	-1.67 V	Copper	Cu ²⁺	0.34 V
Manganese	Mn ²⁺	-1.05 V	Carbon	C ²⁺	0.74 V
Zinc	Zn ²⁺	-0.76 V	Silver	Ag ⁺	0.80 V
Chrome	Cr ³⁺	-0.71 V	Platinum	Pt ²⁺	1.20 V
Iron	Fe ²⁺	-0.44 V	Gold	Au ³⁺	1.42 V
Cadmium	Cd ²⁺	-0.40 V	Gold	Au ⁺	1.69 V

C.1.3 Requirements on the coolant

The requirements on the coolant are depending on the ambient conditions, as well as from the used cooling system. General requirements on the coolant:

Standards	TrinkwV 2001, DIN EN 12502 part 1-5, DIN 50930 part 6, DVGW work sheet W216
VGB Cooling water directive	The VGB cooling water directive (VGB-R 455 P) contains instructions about common process technology of the cooling. Particularly the interactions between cooling water and components of the cooling system are described.
pH-value	Aluminum is particularly corroded by lixiviums and salts. The optimal pH value for aluminum should be in the range of 7.5... 8.0.
Abrasive substances	Abrasive substances as used in abrasive (quartz sand), clogging the cooling circuit.
Copper cuttings	Copper cuttings can attach the aluminum and this leads to a galvanic corrosion. Copper should not be used together with aluminum due to electro-chemical voltage difference.
Hard water	Cooling water may not cause scale deposits or loose excretions. It shall have a low total hardness (<20°d) especially carbon hardness.
Soft water	Soft water (<7°dH) corrodes the material.
Frost protection	An appropriate antifreeze must be used for applications when the heat sink or the coolant is exposed temperatures below zero. Use only products of one manufacturer for a better compatibility with other additives.
Corrosion protection	Additives can be used as corrosion protection. In connection with frost protection the antifreeze must have a concentration of 20...25 Vol %, in order to avoid a change of the additives.

Special requirements for open and half-open cooling systems:

Impurities	Mechanical impurities in half-open cooling systems can be counteracted when appropriate water filters are used.
Salt concentration	The salt content can increase through evaporation at half-open systems. Thus the water is more corrosive. Adding of fresh water and removing of process water works against.
Algae and myxobacteria	Algae and myxobacteria can arise caused by increased water temperature and contact with atmospheric oxygen. The algae and myxobacteria clog the filters and obstruct the water-flow. Biocide containing additives can avoid this. Especially at longer OFF periods of the cooling circuit preventive maintenance is necessary.
Organic materials	The contamination with organic materials must be kept as small as possible, because separate slime can be caused by this

Caution



Damages at the unit which are caused by clogged, corroded heat sinks or other obvious operating errors, leads to the loss of the warranty claims.

C.1.4 Connection to the cooling system

- Screw in connecting duct in accordance with the manual
- The connection to the coolant must be carried out with flexible, pressure-resistant hoses and secured with clamps.
- Pay attention to flux direction and check tightness!
- The cooling flow must always be started before starting the KEB COMBIVERT.

The connection to the cooling system can occur as closed or open cooling circuit. The connection to a closed cycle cooling circuit is recommended, because the danger of contamination of coolant is very small. Preferably also a monitoring of the pH value of the coolant should be installed.

Pay attention to a corresponding cable cross section at required equipotential bonding in order to avoid electro-chemical procedures.

C.1.5 Coolant temperature and moisture condensation

The inlet temperature may not exceed 40°C. The maximum heat sink temperature is 90°C depending on the power unit and overload capacity (see „Technical data“). To ensure a safe operation the coolant output temperature must be 10K below this temperature.

Due to high air humidity and high temperatures it can lead to moisture condensation. Moisture condensation is dangerous for the inverter, because the inverter can be destroyed through eventual occurring short-circuits.

The user must guarantee that any moisture condensation is avoided!

In order to avoid a moisture condensation the following possibilities can be done. The application of both methods is recommended.

Supply of temper coolant

This is possible by using heatings in the cooling circuit for the control of the coolant temperature. The following dew point table is available for this:

Coolant inlet temperature [°C] is depending on ambient temperature and air humidity

Air humidity [%] \ Surrounding temperature [°C]	10	20	30	40	50	60	70	80	90	100
-25	-45	-40	-36	-34	-32	-30	-29	-27	-26	-25
-20	-42	-36	-32	-29	-27	-25	-24	-22	-21	-20
-15	-37	-31	-27	-24	-22	-20	-18	-16	-15	-15
-10	-34	-26	-22	-19	-17	-15	-13	-11	-11	-10
-5	-29	-22	-18	-15	-13	-11	-8	-7	-6	-5
0	-26	-19	-14	-11	-8	-6	-4	-3	-2	0
5	-23	-15	-11	-7	-5	-2	0	2	3	5
10	-19	-11	-7	-3	0	1	4	6	8	9
15	-18	-7	-3	1	4	7	9	11	13	15
20	-12	-4	1	5	9	12	14	16	18	20
25	-8	0	5	10	13	16	19	21	23	25
30	-6	3	10	14	18	21	24	26	28	30
35	-2	8	14	18	22	25	28	31	33	35
40	1	11	18	22	27	31	33	36	38	40
45	4	15	22	27	32	36	38	41	43	45
50	8	19	28	32	36	40	43	45	48	50

Temperature Control

The cooling system can be connected by means of pneumatic or magnetic valves. A relay is frontend. In order to avoid pressure surges, the valves for the temperature control must be inserted in the flow line of the cooling circuit. All usual valves can be used. Pay attention that the valves are faultless and do not clamp.

C.1.6 Coolant heating depending on power loss and flow rate with water

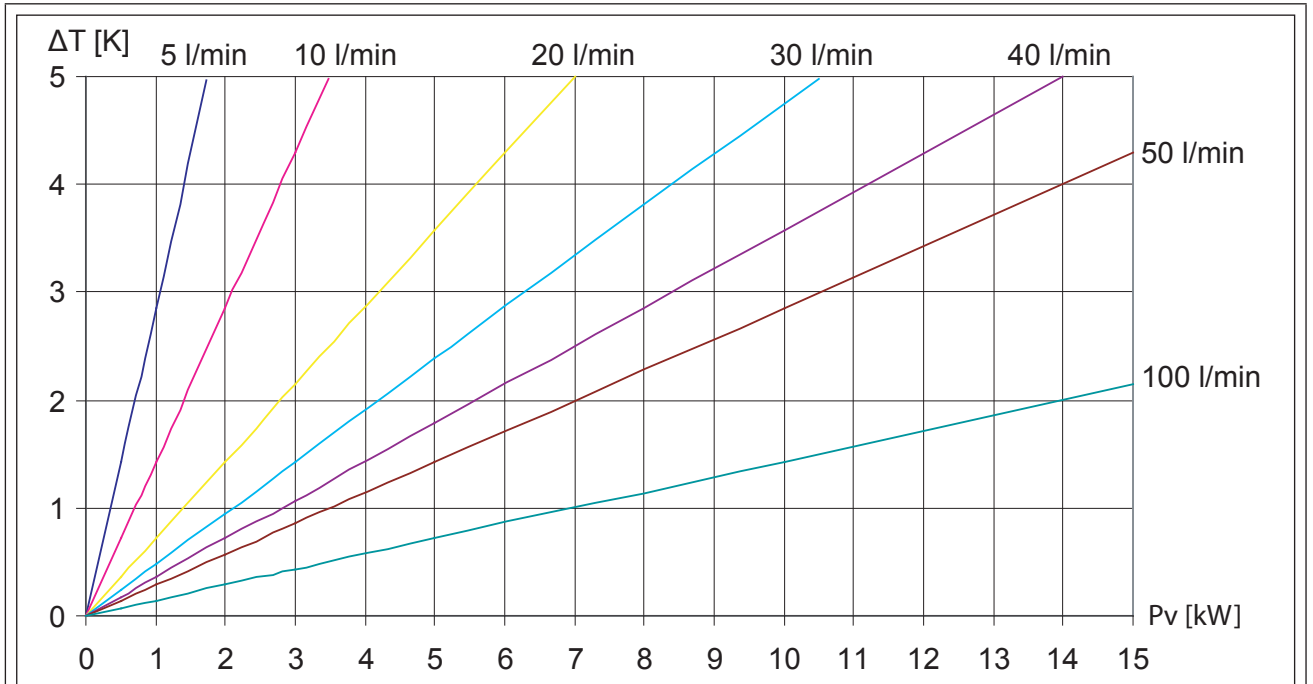


Figure 19: Coolant heating

C.1.7 Typically fall of pressure depending on the rate of flow

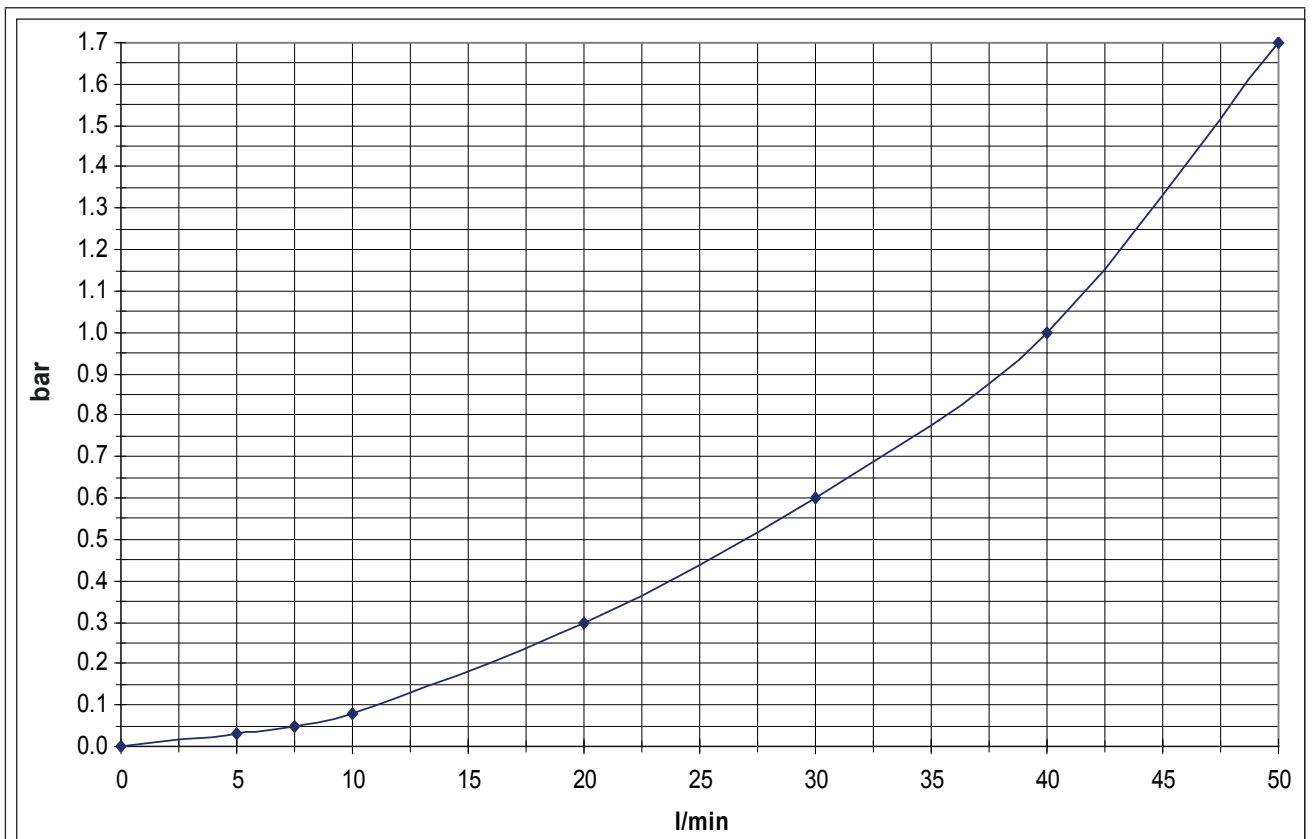


Figure 20: Typically fall of pressure depending on the rate of flow

D. Annex D

D.1 Changing the response threshold of the braking transistor

(not valid for control type „BASIC“)

To avoid a premature switching of the brake transistor at an input rated voltage of 480 Vac, the response threshold must be controlled or adjusted according to the following graphic.

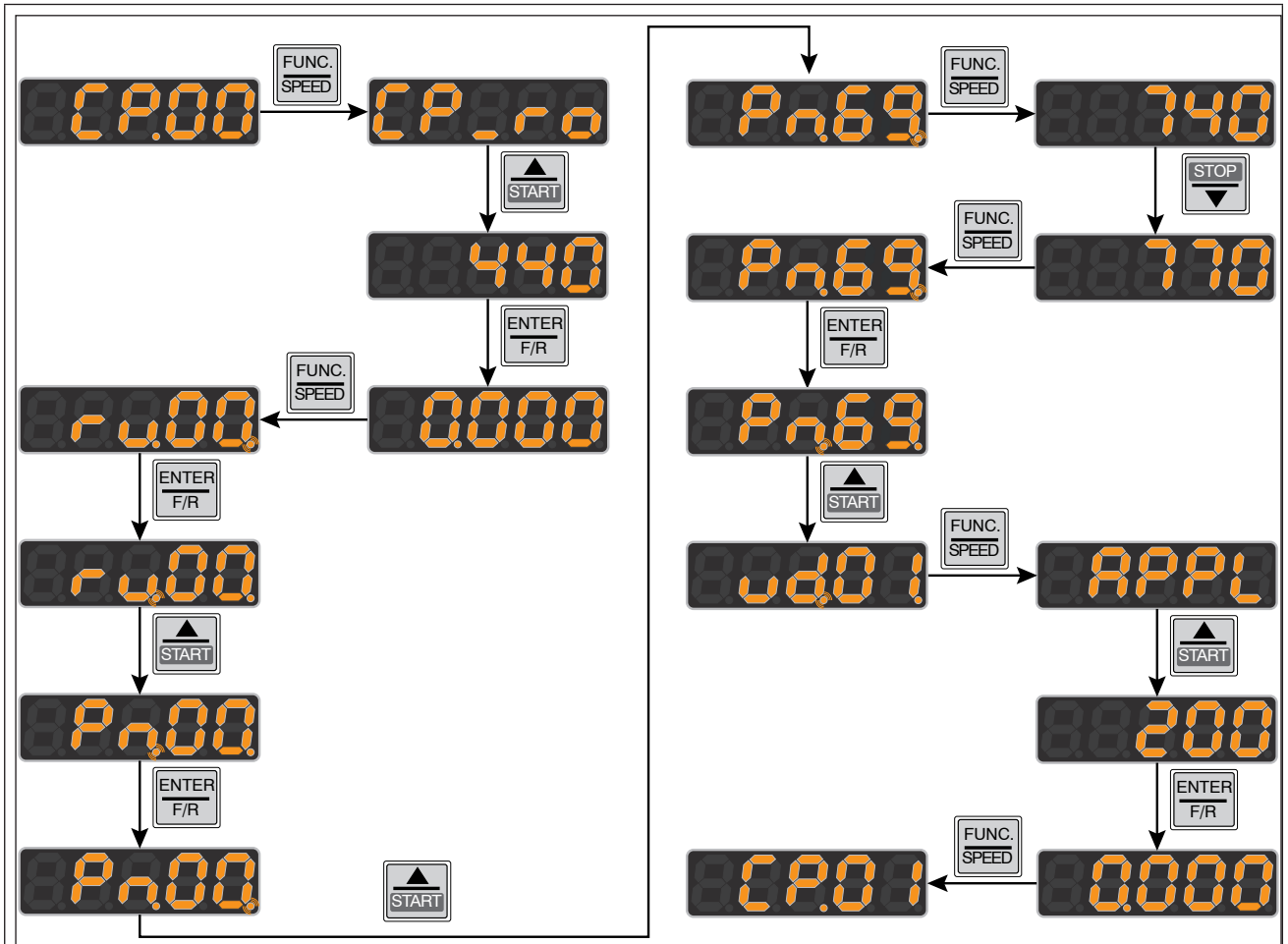


Figure 21: Changing the response threshold of the braking transistor





KEB Automation KG

Südstraße 38 • D-32683 Barntrup
fon: +49 5263 401-0 • fax: +49 5263 401-116
net: www.keb.de • mail: info@keb.de

KEB worldwide...

KEB Antriebstechnik Austria GmbH

Ritzstraße 8 • A-4614 Marchtrenk
fon: +43 7243 53586-0 • fax: +43 7243 53586-21
net: www.keb.at • mail: info@keb.at

KEB Antriebstechnik

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

KEB Power Transmission Technology (Shanghai) Co.,Ltd.

No. 435 Qianpu Road, Chedun Town, Songjiang District,
CHN-Shanghai 201611, P.R. China
fon: +86 21 37746688 • fax: +86 21 37746600
net: www.keb.de • mail: info@keb.cn

KEB Antriebstechnik Austria GmbH

Organizační složka
K. Weise 1675/5 • CZ-370 04 České Budějovice
fon: +420 387 699 111 • fax: +420 387 699 119
mail: info.keb@seznam.cz

KEB Antriebstechnik GmbH

Wildbacher Str. 5 • D-08289 Schneeberg
fon: +49 3772 67-0 • fax: +49 3772 67-281
mail: info@keb-drive.de

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.

Morris Close, Park Farm Industrial Estate
GB-Wellingborough, NN8 6 XF
fon: +44 1933 402220 • fax: +44 1933 400724
net: www.keb.co.uk • mail: info@keb.co.uk

KEB Italia S.r.l.

Via Newton, 2 • I-20019 Settimo Milanese (Milano)
fon: +39 02 3353531 • fax: +39 02 33500790
net: www.keb.de • mail: kebitalia@keb.it

KEB Japan Ltd.

15-16, 2-Chome, Takanawa Minato-ku
J-Tokyo 108-0074
fon: +81 33 445-8515 • fax: +81 33 445-8215
mail: info@keb.jp

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 RUS Ltd.

Lesnaya Str. House 30, Dzerzhinsky (MO)
RUS-140091 Moscow region
fon: +7 495 632 0217 • fax: +7 495 632 0217
net: www.keb.ru • mail: info@keb.ru

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

More and latest addresses at <http://www.keb.de>

© KEB	
Mat.No.	00F50EB-KH00
Rev.	11
Date	10/2016