C O M B I V E R T

G6

Original manual	
Mat.No.	Rev.
00G6NES-E000	1D

KEB

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1. Preface

1.1 General

First we would like to welcome you as a customer of the company Karl E. Brinkmann GmbH and congratulation to the purchase of this product. You have decided for a product on highest technical level.

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.

The instruction manual must be made available to the user. Before working with the unit the user must become familiar with it. This especially applies to the knowledge and observance of the following safety and warning indications. The used pictograms have following significance:

	Danger Warning Caution	Is used, if life or health of the user are endangered or substantial damage to property can occur.
	Attention observe at all costs	Is used, if a measure is necessary for safe and trouble-free operation.
	Information Aide Tip	Is used, if a measure simplifies the handling or operation of the unit.

1.2 Safety instructions

	Observe safety and operating instructions	Precondition for all further steps is the knowledge and observance of the safety and operating instructions (instruction manual part 1). This is provided accompanied by the device or by the download site of www.keb.de.

Non-observance of the safety and operating instructions leads to the loss of any liability claims. The warnings and safety instructions in this manual work only supplementary. This list is not exhaustive.

1.3 Validity and liability

The use of our units in the target products is outside of our control and therefore lies exclusively in the area of responsibility of the machine manufacturer.

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.

Unauthorised opening and tampering may lead to bodily injury and property damage and may entail the loss of warranty rights. Original spare parts and authorized accessories by the manufacturer serve as security. The use of other parts excludes liability for the consequences arising out of.

The suspension of liability is especially valid also for operation interruption loss, loss of profit, data loss or other damages. 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.

1.4   Copyright

The customer may use the instruction manual as well as further documents or parts from it for internal purposes. Copyrights are with KEB and remain valid in its entirety. All rights reserved.

KEB®, COMBIVERT®, COMBICONTROL® and COMBIVIS® are registered trademarks of Karl E. Brinkmann GmbH.

Other wordmarks or/and logos are trademarks (™) or registered trademarks (®) of their respective owners and are listed in the footnote on the first occurrence.

When creating our documents we pay attention with the utmost care to the rights of third parties. Should we have not marked a trademark or breach a copyright, please inform us in order to have the possibility of remedy.

1.5   Specified application

The COMBIVERT G6 serves exclusively for the control and regulation of three-phase motors. The operation of other electric consumers is prohibited and can lead to the destruction of the unit. Frequency inverters are components which are intended for the installation in electric systems or machines.

The used semiconductors and components of KEB are developed and dimensioned for the use in industrial products. If the KEB COMBIVERT F5 is used in machines, which work under exceptional conditions or if essential functions, life-supporting measures or an extraordinary safety step must be fulfilled, the necessary reliability and security must be ensured by the machine builder. The operation of our products outside the indicated limit values of the technical data leads to the loss of any liability claims.

1.6   Product description

The product family COMBIVERT G6 has been developed for the universal use at open-loop three-phase drives. The COMBIVERT G6 can be operated open-loop or encoderless speed or torque-controlled. The units are equipped with an integrated EMC filter.

This accompanying instruction manual contains only information for the installation and connection of the IO-Link control of the KEB COMBIVERT G6.

Further parts of the installation manual are required depending on the ordered type:

• Connection and adjustments of the power unit

• Safety function STO

• Safe digital output for f=0Hz

A manual with general safety requirements and EMC conform installation is available under www.keb.de.

1.7 Part code

| xx | G6 | x | x | x | - | x | x | x | x |

Cooling (not valid for customer-/special version)

0	Air-cooling (housing C, D, E); air-cooling/flat rear (housing A, B)
1	Flat rear

Control/keyboard/display (not valid for customer-/special version)

0	Open-loop without keyboard/display	A	like 0 on ASCL hardware
1	Open-loop with keyboard/display	B	like 1 on ASCL hardware
2	SCL without keyboard/display		
3	SCL with keyboard/display		
4	ASCL without keyboard/display		
5	ASCL with keyboard/display		

Switching frequency; short time current limit; overcurrent cut-off
(not valid at customer/special version)

0	2 kHz	125 %	150 %		1	4 kHz	125 %	150 %
2	8 kHz	125 %	150 %		3	16 kHz	125 %	150 %
4	2 kHz	150 %	180 %		5	4 kHz	150 %	180 %
6	8 kHz	150 %	180 %		7	16 kHz	150 %	180 %
8	2 kHz	180 %	216 %		9	4 kHz	180 %	216 %
A	8 kHz	180 %	216 %		B	2 kHz	180 %	216 %

Voltage, connection

0	1-phase	230 V	AC/DC	3	3-phase	400 V	AC/DC
1	3-phase	230 V	AC/DC	5		400 V	DC
2	1/3-phase	230 V	AC/DC	6	1-phase	230 V	AC
A-Z	Customer-/special version (firmware and download)						

Housing type A, B, C, D, E

Variants

Preface

| | xx | G6 | x | x | x | - | x | x | x | x | | | | | | | | |

0	without filter, without braking transistor, without safety function STO	A	like 0 with STO	H	like A with f=0Hz
1	without filter, with braking transistor, without safety function STO	B	like 1 with STO	I	like B with f=0Hz
2	internal filter; without braking transistor, without safety function STO	C	like 2 with STO	K	like C with f=0Hz
3	internal filter, with braking transistor, without safety function STO	D	like 3 with STO	L	like D with f=0Hz

Control type	
C	Analog/digital (standard)
GB	CAN® [1]
E	IO-Link® [2]
F	EtherCAT® [3]
G	PROFINET® [4]

G6 unit type

Inverter size

[1] CANopen® is registered trademark of CAN in AUTOMATION - International Users and Manufacturers Group e.V.

[2] IO-LINK® is registered trademark of PROFIBUS user organisation e.V.

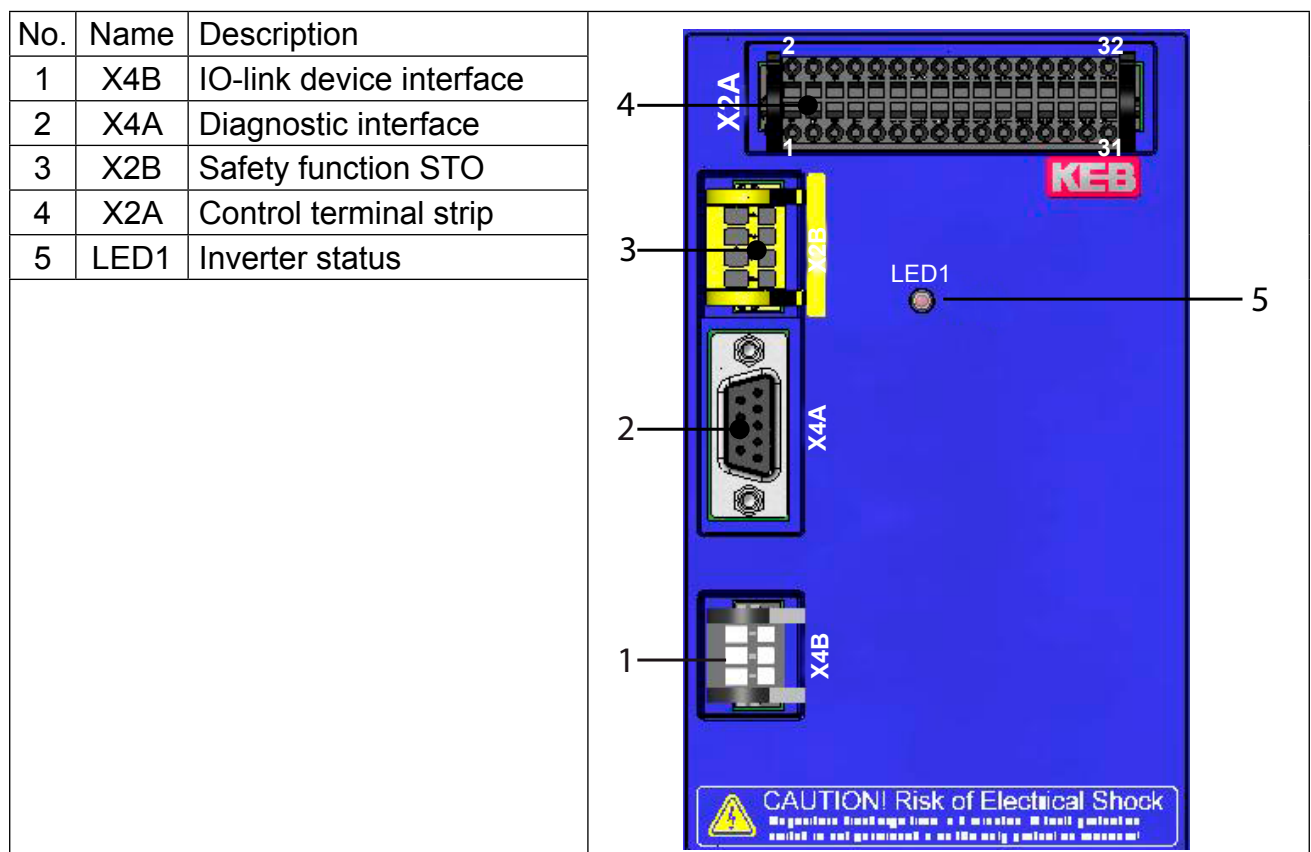[3] EtherCAT® is registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany

[4] PROFINET® is registered trademark by Siemens AG

2. Control circuit IO-Link

The control provides the following functions:

- IO-link device interface
- Hardware allocation of digital inputs and outputs
- Diagnostic interface (parameter display, scope mode)
- Hardware of the control circuit „safely separated" according to EN 61800-5-1 (base TN-C/-S mains)
- LED for inverter state
- Provide allocation of power module parameters for the parameterization for not voltage supplied power module.
- optional with safety function STO (separate manual)
- optional f=0 Hz functionality (separate manual)

2.1 Overview

No.	Name	Description
1	X4B	IO-link device interface
2	X4A	Diagnostic interface
3	X2B	Safety function STO
4	X2A	Control terminal strip
5	LED1	Inverter status

2.1.1 Inverter status LED1

Pattern	Function
off	Unit switched off
on	Unit ready for operation
flashing	Unit in malfunction

2.1.2 IO-link device interface

X4B	PIN	Name	Function
	1	L+	Voltage input 18…30 Vdc / 500 mA
	2	C/Q	Transmission signal Input: 18…30 Vdc Ri:10…40 kΩ Output: 18…30 Vdc I: 220…480 mA
	3	L-	0V
	Baud rate: 38.4 kBd Accuracy of the transmission speed: ±0,16 % Bus and operator supply voltage are not isolated.		

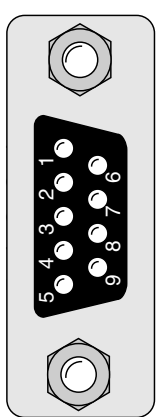| Mechanical specification of the terminal block X4B		
Connection cross-section	0.2…1.5 mm²	26-16 AWG
Stripping length	10 mm	0.4 inch
Screwdriver blade	0.4 x 2.5	
Other	Use wire-end ferrules as round, square or hexagon pressing.	

2.1.3 Diagnosis/visualisation

The integrated RS232/485 interface serves for the connection of service tools (e.g. COMBIVIS) and displays. Telegram DIN66019II is used as communication protocol.

> ℹ️ The correct configuration and language file must be loaded for the operation with COMBIVIS. The download can be done via the KEB homepage.

Interface	Standard	Connecting cable
RS485	TIA/EIA-485 and ISO 8482	
RS232	ANSI TIA/EIA-232	0058025-001D
RS232/USB		0058060-0020

2.1.3.1 Assignment of the interface X4A

reserved	1		6	reserved
TxD (RS232)	2		7	DGND (reference potential)
RxD (RS232)	3		8	TxD-A (RS485)
RxD-A (RS485)	4		9	TxD-B (RS485)
RxD-B (RS485)	5			

2.1.3.2 Connection of the RS232 interface

A RS232 cable is required to connect the control board with a PC. Transmission rate of 1.2…100 kBaud is possible.

Serial cable to connect the control board with a PC
0058025-001D
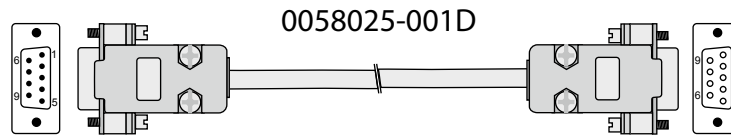
### 2.1.3.3 Connection of the RS485 interface

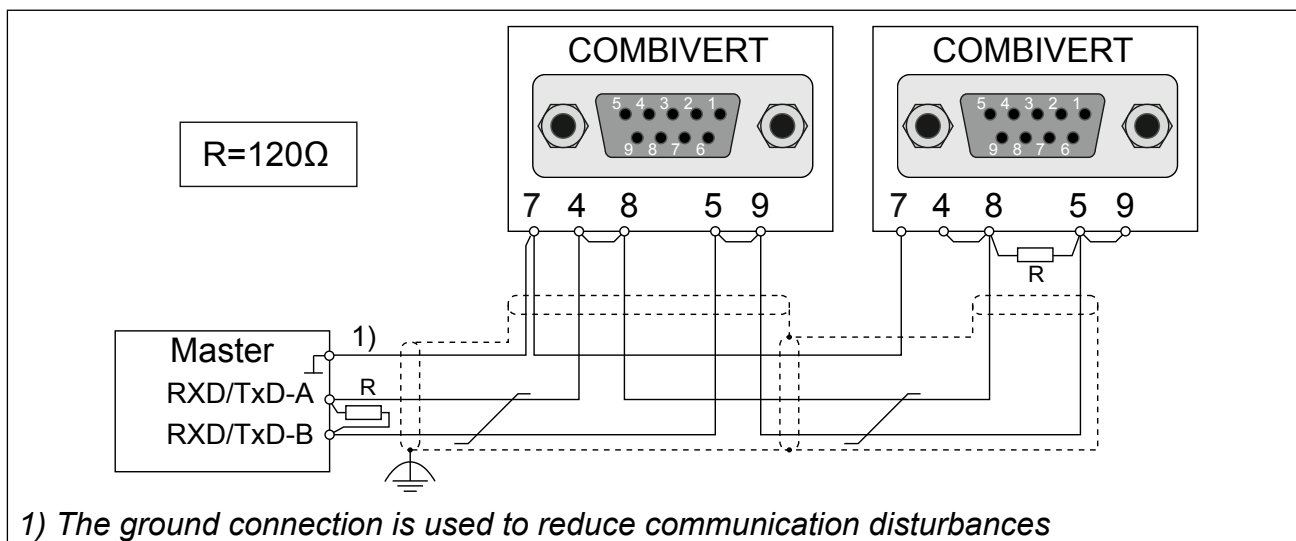| ⚠	The following instructions must be observed in order to prevent interferences at the RS485 interface: • use in pairs, twisted and shielded cable • Ground outer shield at one side (prior at interference-free side) • Connect terminating resistors (120 Ω) at both ends on pair of wires of the communication bus • if available, the internal shielding must be laid at the transmitter to ground • Lay earth cable between the bus nodes

ℹ	A biasing can be used if there are still interferences. However, this should be done only once at the communication bus (preferably at the master).

2.1.3.4 Wiring RS485 full duplex

1) The ground connection is used to reduce communication disturbances

Control circuit
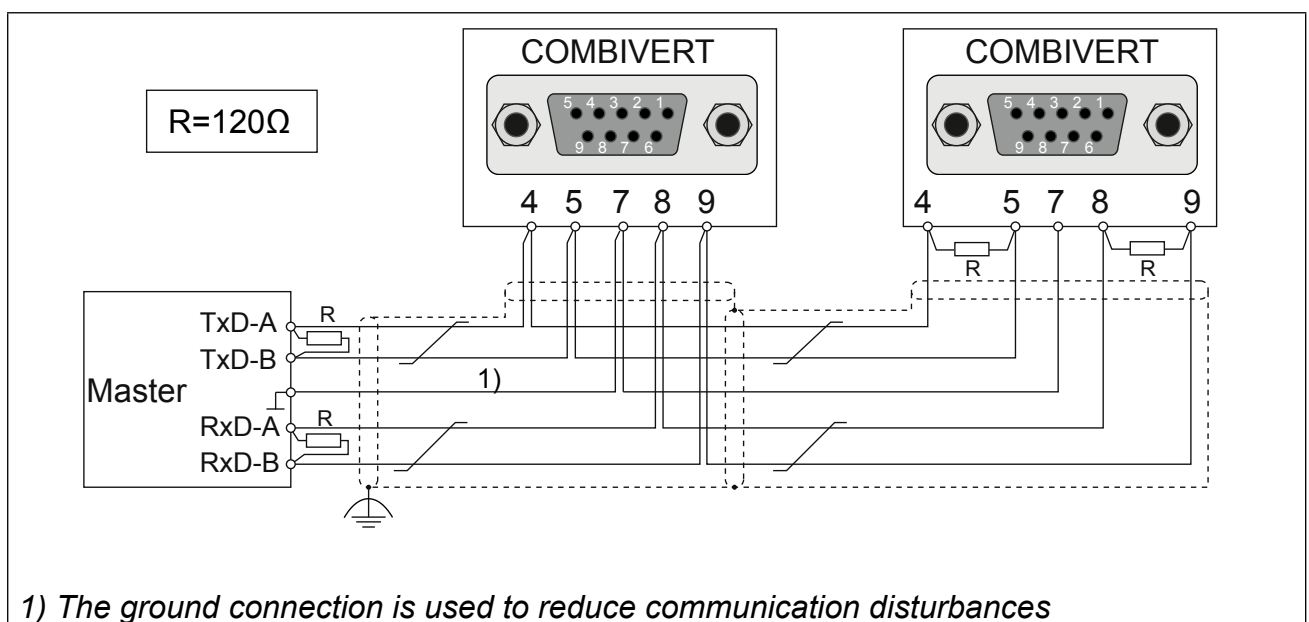
2.1.3.5 Wiring RS485 half duplex

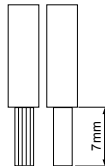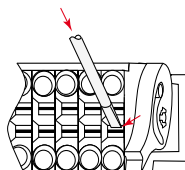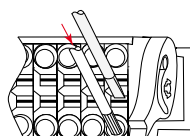1) The ground connection is used to reduce communication disturbances
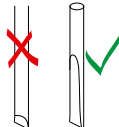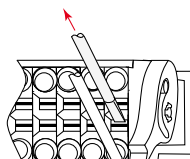
Although the functional earth is connected correctly potential differences between the bus nodes can occur at long lines which disturb the communication. To avoid the interface from destruction by high circulating current based on this, potential differences can be reduced by connection of an additionally ground line between the controls (0V terminal). To avoid interference coupling into the signal line, lay these additionally ground cable outside of the bus line!

2.1.4 Control terminal strip X2A

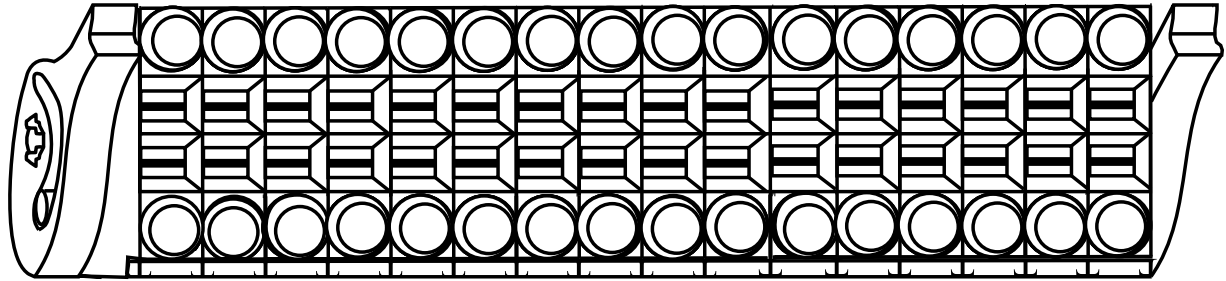The control terminal strip is designed as a double, plug-in terminal strip with spring cage connection. It contains 32 pole. The following instructions must be observed at connection:
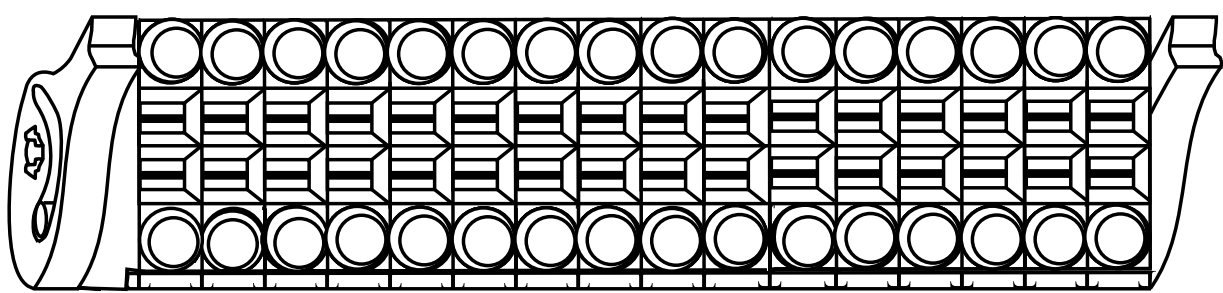
Attention	Prevent EMC malfunctions
	• Use shielded / drilled cables • Lay shield on one side of the inverter onto earth potential • Lay control and power cable separately (about 10...20 cm apart); Lay crossings in a right angle (in case it cannot be prevented)

2.1.4.1 Assembly of the wires

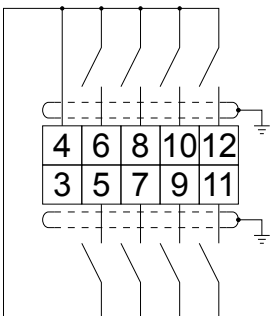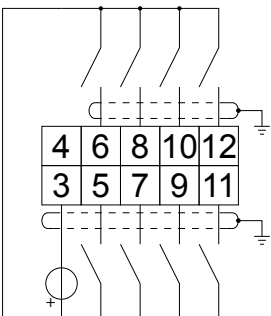|			
	Required tools: Screw driver SD 0.4 x 2.5 (DIN 5264)		
1.	Strip cable 	Cable	permissible cross-section
---	---
rigid and flexible	0.13…1 mm^2 (AWG28…18) | Use wire-end ferrules as round, square or hexagon pressing.		
2.	Plug screw driver mid into the square slot		
3.	Plug cable into the round slot, that no wires can be seen from the outside.		
4.	Remove screw driver and check if cables are fixed.		

2.1.4.2 Assignment of the terminal strip X2A

	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	

PIN	Name	Description	Specifications
1	0V	Digital mass; Reference potential for digital inputs/outputs and U_{in}	
2	U_{in}	Input external voltage supply	U=24 VDC +20 %/-15 % I_{max}=400 mA
3	0V	like pin 1	
4	U_{out}	Voltage output for the control of the digital inputs	U=24 VDC ±25 % I_{max}=100 mA
5	RST	reset	8 digital inputs according to IEC61131-2 type 1 „0" = -3…5 VDC „1" = 15…30 VDC Scan time ≤ 2 ms
6	ST [1]	Control release	
7	R	Direction of rotation reverse	
8	F	Direction of rotation forward	
9	I2	Digital input 2	
10	I1	Digital input 1	
11	I4	Digital input 4	
12	I3	Digital input 3	
13	O2	Digital output 2	2 digital transistor outputs PNP U=24 VDC ±25 % I_{max}=50 mA ohmic load for O1+O2 max switching frequency=250 Hz
14	O1	Digital output 1	
15	0V	like pin 1	
16	CRF	Reference voltage for setpoint potentiometer	10 VDC +5 %; I_{max} = 4 mA
17	AN1-	-Analog input 1	adjustable: 0…±10 V (R_i=55 kΩ) 0…±20 mA (R_i=250 Ω) 4…20 mA (R_i=250 Ω) Resolution: 10 Bit + sign Scan time ≤ 2 ms
18	AN1+	+Analog input 1	
19	AN2-	-Analog input 2	
20	AN2+	+Analog input 2	
			further on next side

	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	

	1	3	5	7	9	11	13	15	17	19	21	23	25	27	29	31	

PIN	Name	Description			Specifications
21	COM	Analog mass; Reference potential for analog inputs and outputs			
22	ANOUT1	Analog output 1		U=0…±10 VDC (max. 11.5 VDC) I_{max}=10 mA Ri = 100 Ω Resolution= 11Bit + sign	
23	COM	like Pin 21			
24	ANOUT2	Analog output 2		like Pin 22	
25	R2-C	Relay 2	Switching contact		U_{max} = 30 VDC I = 0.01…1 A Ohmic load
26	R1-C	Relay 1	Switching contact		
27	R2-B	Relay 2	NC contact		
28	R1-B	Relay 1	NC contact		
29	R2-A	Relay 2	NO contact		
30	R1A	Relay 1	NO contact		
31	R3-C [2]	Relay 3	switching contact f=0 Hz		is described in a separate manual
32	R3-A [2]	Relay 3	no contact f = 0 Hz		

1) The control release (terminal ST) is without function for units with safety function STO.
2) Relay 3 is only equipped at the version with 0Hz functionality. The function is described in a separate manual.
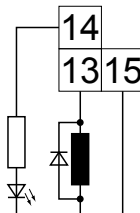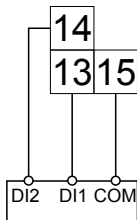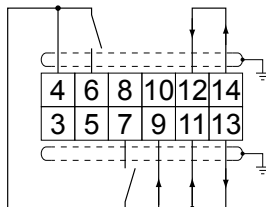
2.1.4.3 Connection of the digital inputs

Connection of the digital inputs	
with internal voltage supply	with external voltage supply

Control circuit

Input		Factory setting of the digital inputs			
Name	PIN	open-loop operation		closed-loop operation	
RST	5	reset			
ST	6	Control release			
R	7	Direction of rotation reverse			
F	8	Direction of rotation forward			
I1	10	Fixed frequency 1	Fixed frequency 3	Fixed value 1	Fixed value 3
I2	9	Fixed frequency 2		Fixed value 2	
I3	12	External error input (E.EF)			
I4	11	Activates the DC braking		–	

2.1.4.4 Connection of the digital outputs

Examples for the connection of the digital outputs	
Connection appliance	Connection to an external control
Example for the control of digital inputs and outputs	

Output		Factory setting of the digital outputs
Name	PIN	
O1	14	Switches at actual value=setpoint
O2	13	Ready signal

2.1.4.5 Connection of the analog inputs

Examples for the connection of the analog setpoint input

⚠	*) Connect potential equalizing line only if a potential difference of >30 V exists between the controls. The internal resistance is reduced to 30 kΩ.
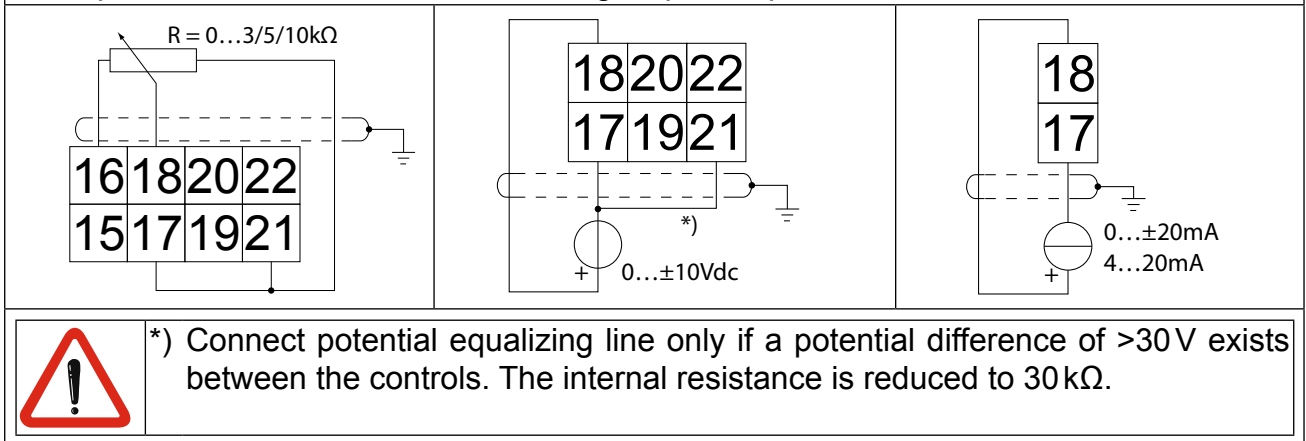
Input		Factory setting of the setpoint inputs
Name	PIN	
AN1	17/18	analog setpoint setting 0…±10 Vdc
AN2	19/20	–
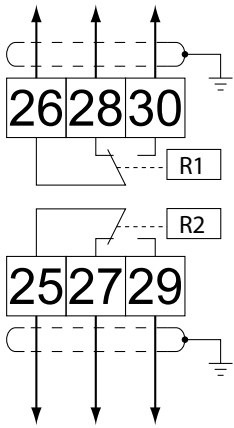
2.1.4.6 Connection of the analog outputs

Connection of the analog outputs

0…10Vdc
Imax=10mA

0…10Vdc
Imax=10mA
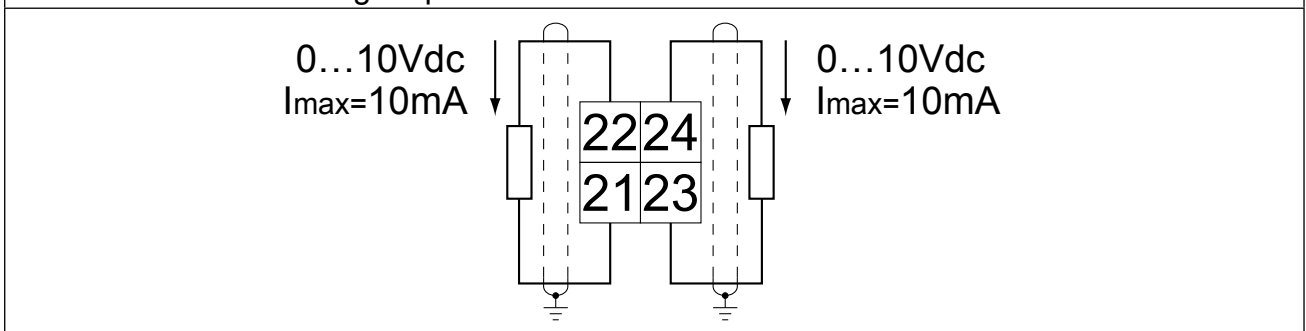
Output		Factory setting of the analog outputs	
Name	PIN	open-loop operation	closed-loop operation
AO1	22	Actual value display (CP01) 0…±400 Hz	Actual value display (CP01) 0…±4000 rpm
AO2	24	Apparent current 0…2•$Iout_N$	

Control circuit

2.1.4.7 Connection of the relay outputs

Connection of the relay outputs	
	Specification: U = max. 30 Vdc I = 0.01…1 A Ohmic load

Output		Factory setting of the relay outputs	
Name	PIN	open-loop operation	closed-loop operation
R1	26/28/30	Fault relay	
R2	25/27/29	Frequency-dependent switch	Run signal

3. Parameter Description

On delivery the KEB COMBIVERT G6 is assigned with an user menu, the customer parameters (CP-Parameters). These represent a selection of important parameters for the operation.

Up to a maximum of 48 customer parameters can be defined from over 500 parameters. Only parameter CP00 password input is predefined and can not be modified or deleted.

Depending on the unit, there are three different customer parameter menus:

•	for open-loop operation	00G6N1B-C000
•	for ASCL operation	00G6N1B-H000
•	for SCL operation	00G6N1B-J000

The menu to be used can be determined from parameter CP48 (see below).

CP48   **Software version**

Co-domain	Setting	Description
0.0.0.0 … F.F.F.F	–	Display of the software version
		The first two digits display the major and minor version number (e.g. 1.2.x.x => V1.2)
		The third digit displays the power unit software
	x.x.0.x	Power unit open-loop 1st version
	x.x.1.x	Power unit open-loop 2nd version
	x.x.2.x	Power unit ASCL
	x.x.3.x	Power unit SCL
		The fourth digit displays a serial number for the date code.

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