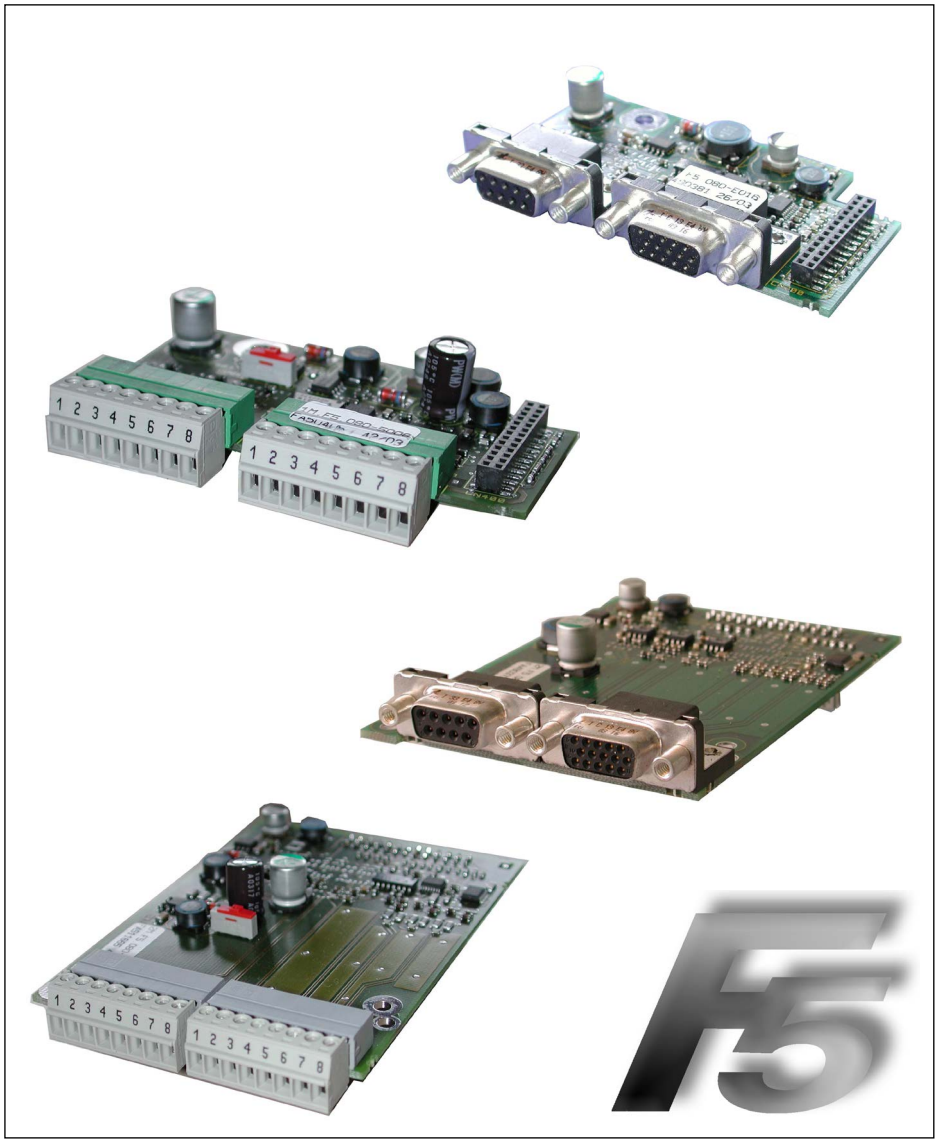
COMBIVERT



GB INSTRUCTION MANUAL

Encoder Interface

Channel 1
Channel 2

variable
Incremental Encoder
TTL-Output

Mat.No.	Rev.
DKF5ZEM-K021	1F

KEB

1. Safety Instructions

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. The pictographs used in this Instruction Manual have following meaning:

	Danger	Refers to danger of life by electric current.

	Warning	Refers to possible danger of injury or life.

	Note	Refers to tips and additional information.

1.1 Validity

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.

Inspection of our units in view of their suitability for the intended use must be done generally by the user. Inspections are particulary necessary, if changes are executed, which serve for the further development or adaption of our products to the applications (hardware, software or download lists). Inspections must be repeated completely, even if only parts of hardware, software or download lists are modified.

	Controlling by the user	Application and use of our units in the target products is outside of our control and therefore lies exclusively in the area of responsibility of the user.

	Use under special conditions	The used semiconductors and components of KEB are developed and dimensioned for the use in industrial products. If the KEB COMBIVERT 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.

1.2 Qualification

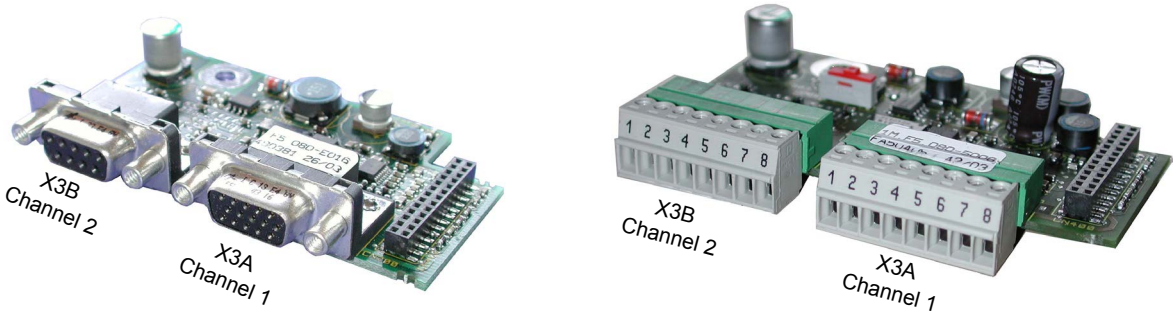
All operations serving transport, installation and commissioning as well as maintenance are to be carried out by skilled technical personnel (observe IEC 364 or CENELEC HD 384 or DIN VDE 0100 and national accident prevention rules!). According to this manual qualified staff means:

- those who are able to recognise and judge the possible dangers based on their technical training and experience
- those with knowledge of the relevant standards and who are familiar with the field of power trasmission (VDE 0100, VDE 0160 (EN 50178), VDE 0113 (EN 60204) as well as the approporiate regulations for your area.

	Danger by high voltage	KEB electronics components contain dangerous voltages which can cause death or serious injury. In operation, drive converters, depending on their degree of protection, may have live, uninsulated, and possibly also moving and 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.

2. Product Description

Figure 1: Incremental encoder output TTL on channel 2



X3B	X3A
Channel 2	Channel 1
Incremental encoder output TTL	see material number

2.1 General

Each of the interface cards delivered by KEB include two interfaces. As there are numerous different combinations available each interface will be described by means of separate instructions. The instruction covers the installation of the interface card, the connection as well as the start-up of a suitable encoder. Further information and the parameter adjustments are described in the application manual for the inverter/servo.

2.2 Material number

xM	F5	K8x	X	X	X	X

Term of delivery	0	installed		Z	Option, spare part	
Interface X3A	D	TTL-input	1019	P	EnDat	2023
	E	Resolver	0029	B	TTL input 15/24 V	5005
	F	Hiperface	2029	V	SSI-SIN/COS	2027
	J	HTL input	1017	X	HTL input 15 V	5009
	M	SIN/COS	2026 2036	9	UVW	7007
	S	HTL input without inverse signals				4019
	F5	Series				
applicable for housing size	1M	D, E (circuit board 1MF5280-xxxx see above)				
	2M	G…U (circuit board 2MF5280-xxxx see above)				

2.3 Scope of delivery (option or replacement delivery)

- Encoder interface
- Two instruction manuals
- Fixing bolt
- Packing material

2.4 Mechanical installation

All kind of works on the inverter may be carried out by authorized personnel in accordance with the EMC and safety rules only.

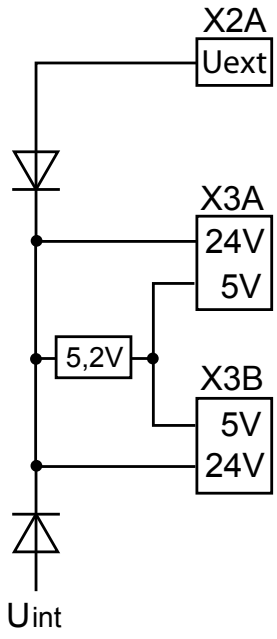
- Switch inverter de-energized and await capacitor discharge time
- Pull off operator
- Remove plastic cover
- Remove fixing bolt
- Fix interface board beginning from the socket connector straightly
- Screw in fixing bolt
- Adjust desired supply voltage with DIL switch
- Attach plastic cover

3. Description of the Interface

3.1 Voltage supply

Figure 2: Voltage supply of control and encoder interfaces

U_{int}	24 VDC	Internal voltage supply of COMBIVERT.
I_{int}	120 mA	at Hiperface, Sin/Cos, EnDat and SSI-Sin/Cos.
	170 mA	at all other encoder interfaces.
U_{ext}	Control terminal strip (X2A) of the COMBIVERT with external voltage supply 24…30 DCV.	
24 V	Voltage output of encoder interfaces X3A and X3B for encoder supply.	
I_{24V}	Current I_{int} reduces itself by draw current to the 5 V output in accordance with the following formula: $I_{24V} = I_{int} - \frac{5{,}2_{V} \times I5V}{U_{int}}$	
5 V	Voltage output for encoder supply. 5,2 V are obtained from the 24 V voltage.	
I_{5V}	300 mA	at Hiperface, Sin/Cos, EnDat and SSI-Sin/Cos.
	1 A	at external supply (dependent on the voltage source)



3.2 Channel 1

The description of input X3A is depending on the used encoder interface. It is described in a separate manual.

3.3 Channel 2

3.3.1 Specifications

X3B	Terminal strip 8-pole or socket SUB-D9
Interface type	Incremental encoder output
Output signals	5 V TTL according to RS485
Outputs / tracks	A, B and N with the respective inverted signals
Limiting frequency	300 kHz

3.3.2 Description of X3B

Figure 3: X3B as socket or terminal strip

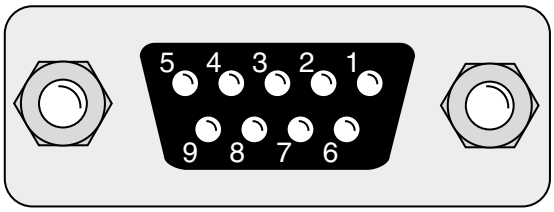


Figure 1

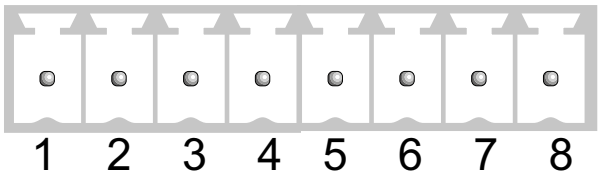


Figure 2

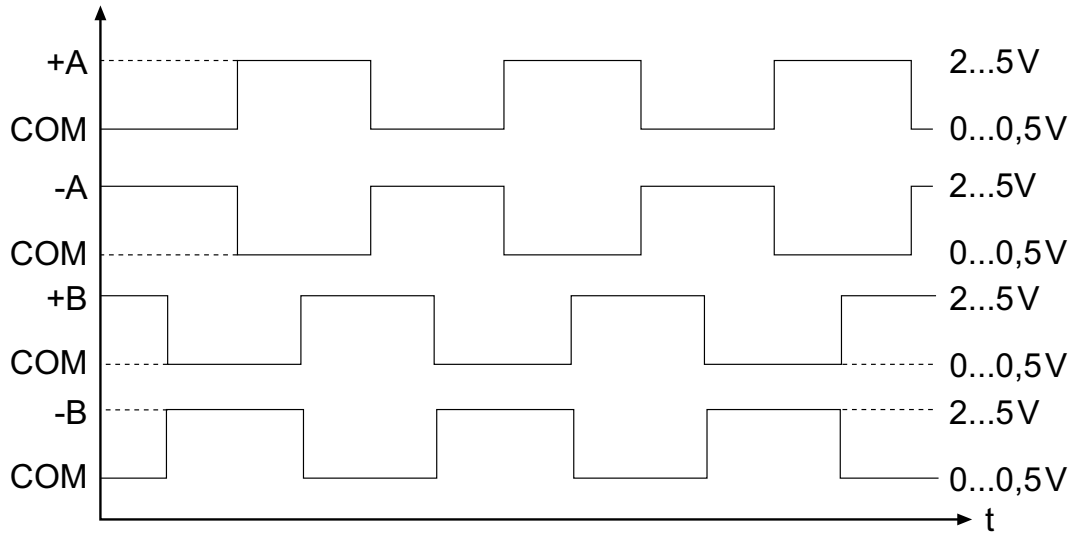
PIN		Name	Description
Figure 1	Figure 2		
1	1	A+	Incremental encoder output track A
2	3	B+	Incremental encoder output track B
3	5	N+	Output zero track
4	7	5 V	Voltage output 5 V
5	–	24 V	Voltage output 20…30 V
6	2	A-	Differential signal to A+
7	4	B-	Differential signal to B+
8	6	N-	Differential signal to N+
9	8	COM	Reference potential for voltage supply
–	–	GND	Connection for shield at connector housing - is directly connected with the inverter earth. Connect-up external shield at the respective connector housing.

3.3.3 Output signals channel 2

3.3.3.1 Signal tracks

At this TTL output encoder interface the signals A+ and B+ are electrically phase-shifted by 90° rectangular signals with the respective inverted tracks A- and B-.

Figure 4: Signal tracks A and B with inverse signals



3.3.3.2 Parameterization

3.3.3.3 Output of the zero signal

The zero signal is generally output once per revolution with TTL level. At division of the input signals by parameter Ec.27 bit 4… 6, the zero signal is output as direct output. Thus it is shorter than the divided tracks A and B.

3.3.4 Connection of the incremental encoder simulation

3.3.4.1 Encoder cable

KEB encoder cables are corresponding to the following specification:

Signal lines	4 x (2 x 0,14 mm²)
Supply lines	2 x (0,5 mm²)
Particularities	trailing capable, oil resistant
Temperature range	constant up to 80 °C
Color	green RAL 6018
Material number	00F50C1-4xxx

3.3.4.2 Encoder line length

The maximum line length of the connecting cable is 50 m. It is limited by the signal frequency, cable capacity and the line resistance.

Encoder cable length =	$\frac{U - Umin}{I_{max} \bullet 2 \bullet R}$
max. encoder current I_{max}:	see encoder description
Supply voltage U:	5,2 V
min. supply voltage U_{min}:	see encoder description
KEB encoder cable resistance R:	0,036 Ω/m at 0,5 mm²

3.3.4.3 Encoder cable at X3B

- Encoder cable double-shielded and twisted in pairs
- Connect exterior shielding at both ends to PE/GND
- Connect interior shieldings at one side to COM
- Don´t interconnect exterior and interior shielding

Figure 5: Connection of the encoder

Figure A: X3B as SUB-D9

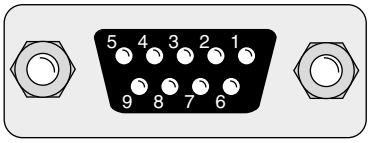


Figure B: X3B as terminal strip

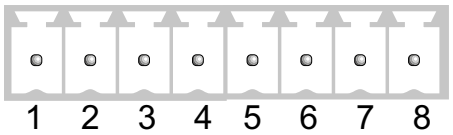


	Figure A	Figure B			
Name	PIN	PIN		Name	Core color
GND	–	–		GND	exterior shielding
A+	1	1		A+	green
A-	6	2		A-	yellow
B+	2	3		B+	blue
B-	7	4		B-	red
N+	3	5		N+	gray
N-	8	6		N-	pink
COM	9	8		COM	white

3.4 Parameter adjustments

3.4.1 Ec.27 Operation mode output

Ec.27 Operation mode output			
Bit	**Meaning**	**Value**	**Explanation**
0…1	source	0: Channel 1	The increments of the encoder at channel 1 (programmable and/or readable by Ec.01) are output via the encoder operation mode at channel 2.
		1: Channel 2	- reserved -
		2: Actual value	The displayed speed in ru.07 „actual value“ is output via the encoder emulation. If this speed is a measured or calculated value is without meaning. The increments per revolution of the encoder emulation must be selected with bit 2.3 „actual value“. Attention: No zero signal is output!
		3: reserved	–
2…3	actual value	0: 256 Ink	Number of increments per revolution which are output with the adjustment „source = 2: actual value“ via encoder emulation mode.
		4: 512 inc	
		8: 1024 inc	
		12: 2048 inc	
4…6	Division	0: direct	The increments of encoder channel 1 are output direct via the encoder emulation. Use this adjustment always if „source = 2: actual value“ is parameterized.
		16: 2	The increments of the encoder channel 1 are divided by the selected factor (2, 4, 8,…). Attention: The zero signal is not divided. The zero signal is output once per revolution. Also the pulse width of the zero signal is not changed compared with the direct output.
		32: 4	
		48: 8	
		64: 16	
		80: 32	
		96: 64	
		112: 128	

4. Start-up

After the installation or exchange of an encoder interface some adjustments of the inverter/ servo software have to be done before operation:

•	Switch on inverter
•	Select application mode
•	Select parameter Ec.10 and control whether value „2: incremental encoder output“ is entered (occurs automatically if the interface was recognized correctly). Error „35: Error! encoder change“ (E.EnCC) is released by changing and/or plug on the interface.In order to reset this error the value of Ec.00 or Ec.10 must be confirmed with „ENTER“ (keyboard operation) or written with the same value (bus operation).
•	Adjust channel 2 with Ec.20 to output.  Only for encoder interface "xMF5K8G-9Z09".Choose Ec.11 and select one of the following values: 12, 1024, 2048, 4096 und 8192 Inc/rev
•	 For all other encoder interfaces the following section applies. Select parameter Ec.27 and configure the encoder emulation: • The emulation increments must be adjusted in Ec.27 if „2: actual value“ is selected as source. Attention! No zero pulse is generated with this adjustment. • If channel 1 is selected as source, the increments per revolution of the encoder at channel 1 (parameter Ec.01) determines the increments per revolution of the emulation. • The increments per revolution of the emulation can be reduced with the adjustment of a division in Ec.27.

5. Error Messages

Error messages and their meaning are described in Chapter 9 of the application manual.

KEB Automation KG
Südstraße 38 • 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 • 4614 Marchtrenk
fon: +43 7243 53586-0 • fax: +43 7243 53586-21
net: www.keb.at • mail: info@keb.at

KEB Antriebstechnik
Herenveld 2 • 9500 Geraadsbergen
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,
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
Suchovrbenske nam. 2724/4 • 370 06 České Budějovice
fon: +420 387 699 111 • fax: +420 387 699 119
mail: info@keb.cz

KEB Antriebstechnik GmbH
Wildbacher Str. 5 • 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
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
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
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 • 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
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
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)
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
Shakopee, MN 55379
fon: +1 952 224-1400 • fax: +1 952 224-1499
net: www.kebamerica.com • mail: info@kebamerica.com

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Mat.No.	DKF5ZEM-K021
Rev.	1F
Date	11/2017