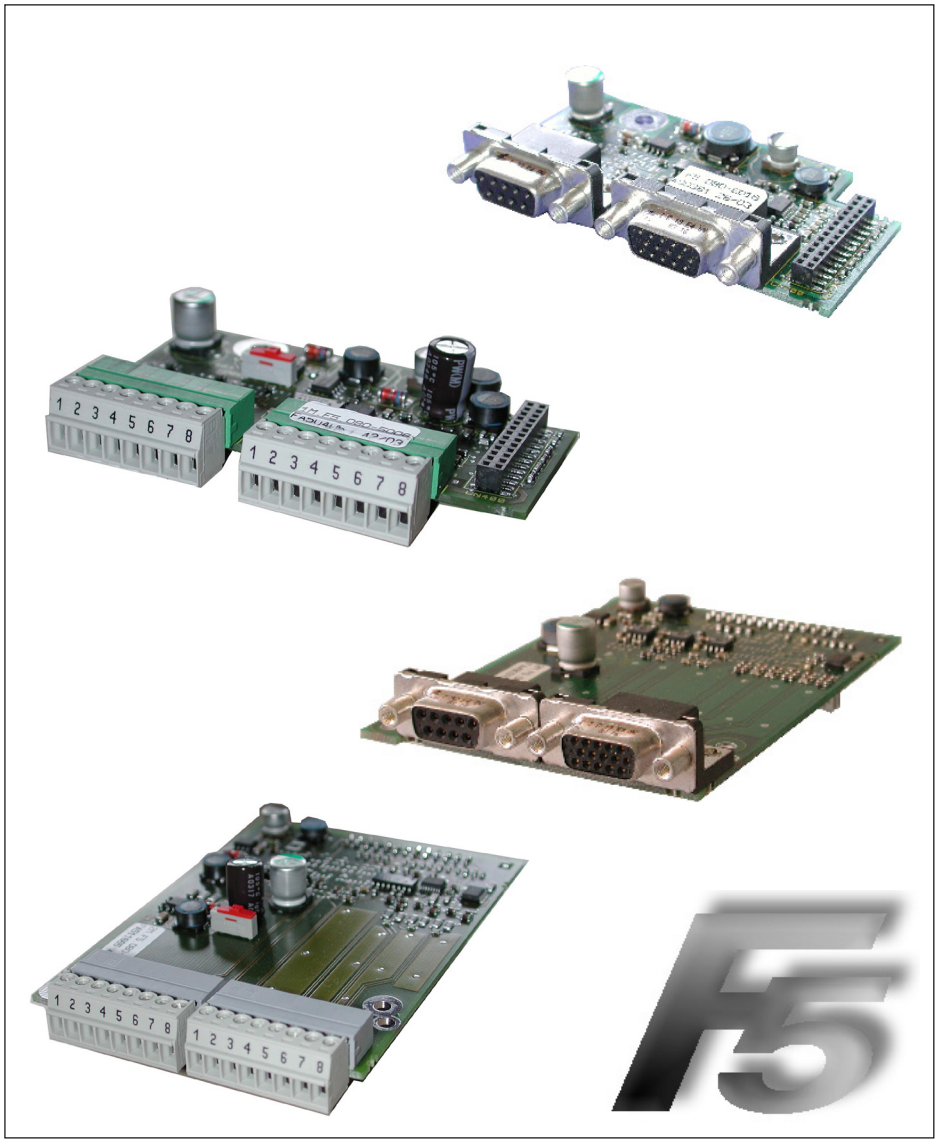
COMBIVERT



GB INSTRUCTION MANUAL — Encoder interface

Channel 1 — Incremental Encoder TTL input

Channel 2 — variable

Mat.No.	Rev.
DKF5ZEM-K001	1B

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 particularly 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.

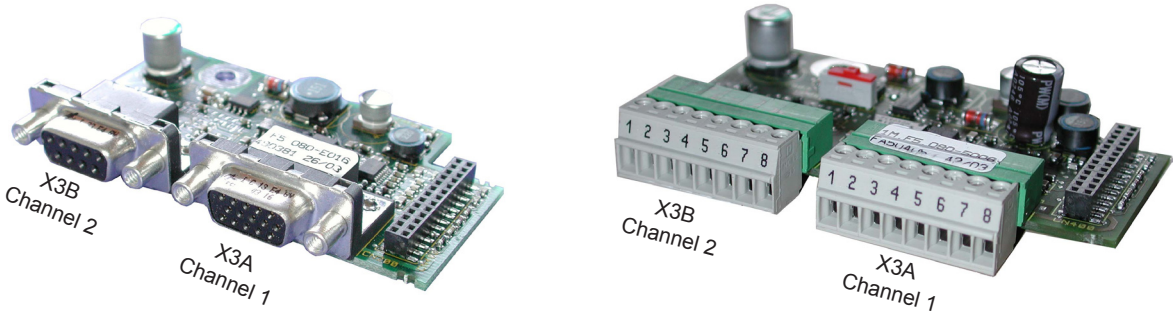
1.2 Qualification

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 and those with knowledge of the relevant standards and who are familiar with the field of power transmission (VDE 0100, VDE 0160 (EN 50178), VDE 0113 (EN 60204) as well as the appropriate 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 Input TTL at Channel 1



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

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 X3B	3	±10 V	3008	A	Initiator	3007
	4	SSI	1015	GB	TTL-output	1019
	7	Tacho	3009	G	TTL-input	1018
	8	HTL Output	8008	B	TTL-input terminal	5002
	F5	Series				
applicable for housing size	1M	D, E (circuit board 1M.F5.280-xxxx see above)				
	2M	G…U (circuit board 2M.F5.280-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.

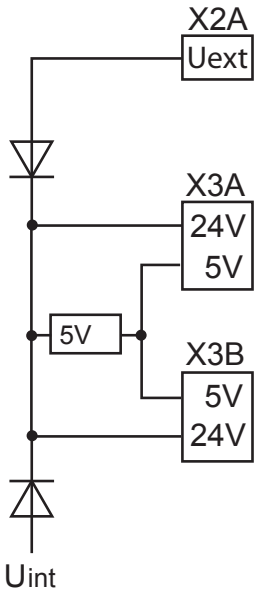
- Switch inverter de-energized and await capacitor discharge time
- Pull off operator
- Remove plastic cover
- Remove fixing bolt
- Fix interface board beginning from the socket connector straightly
- Screw in fixing bolt
- Adjust desired supply voltage with DIL switch
- Attach plastic cover

3. Description of the Interface

3.1 Voltage supply

Figure 3.1 Voltage supply of control and encoder interfaces

U_{int}	24 VDC	Internal voltage supply of the COMBIVERT (I_{max} 120 mA).
U_{ext}		Control terminal strip (X2A) of the COMBIVERT with external voltage supply 24…30 Vdc.
24 V		Voltage output of encoder interfaces X3A und X3B for encoder supply (max. 1 A at external supply). Current I_{int} reduces itself by draw current to the 5 V output in accordance with the following formula: $I_{24V} = I_{int} - \frac{5\,V \times I_{5V}}{U_{int}}$
5 V		Voltage output for encoder supply (I_{max} 300 mA). 5 V are obtained from the 24 V voltage.



3.2 Channel 1

3.2.1 Specifications

X3A	Terminal strip 8-pole or socket SUB-D15
Interface type	Incremental Encoder Input
Input signals	5 V TTL according to RS485
Inputs / tracks	A, B and N with the respective inverted signals
Limiting frequency	300 kHz
Increments per revolution	1…16383 inc (recommendation 2500 inc for speed upto 4500 rpm
Input resistance	150 Ω
Max. line length	50 m, the value is additionally limited by the signal frequency, cable capacity and supply voltage.

3.2.2 Description of X3A

Figure 3.3.2 X3A as socket or terminal strip

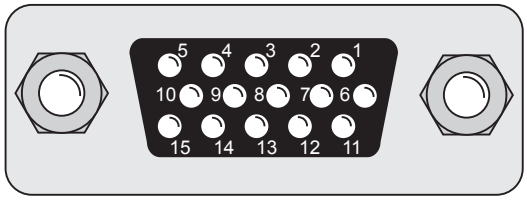


Figure 1

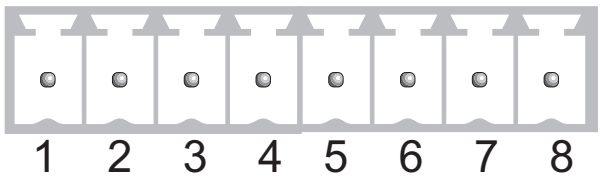


Figure 2

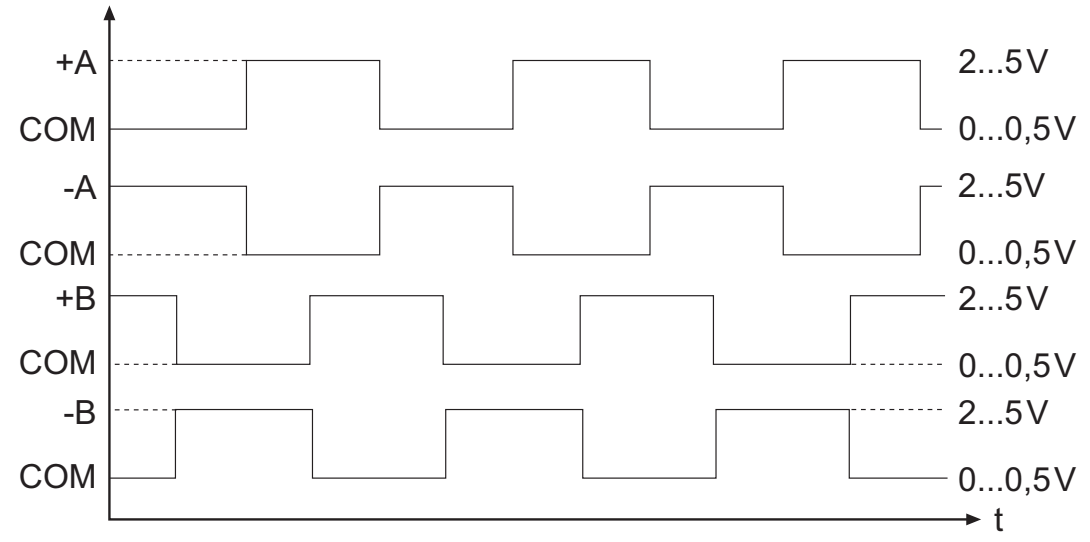
PIN		Name	Description
Figure 1	Figure 2		
8	1	A+	Incremental encoder input track A
9	3	B+	Incremental encoder input track B
15	5	N+	Input zero track
12	7	5 V	Voltage output 5 V
11	–	24 V	Voltage output 20…30 V
3	2	A-	Differential signal to A+
4	4	B-	Differential signal to B+
14	6	N-	Differential signal to N+
13	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.

3.2.3 Input signals channel 1

3.2.3.1 Signal tracks

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

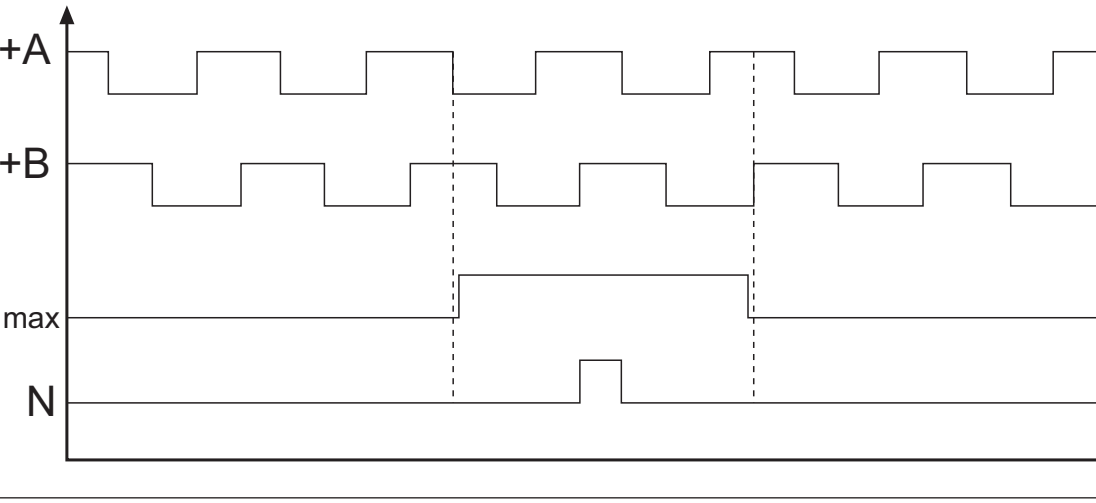
Figure 3.3.3.1 Signal tracks A+ and B+



3.2.3.2 Evaluation of the Zero Signal

The zero impulse is required to determine valid position points. In case of pure speed controls the signal does not need to be connected. In the following signal sequence the maximum permissible length of the zero impulse of the encoder is visible. The zero signal will be acquired if A+ ,B+ and N+ are at high level. By that there is only one valid position point which is independent from the travel direction.

Figure 3.3.3.2 Evaluation of the Zero Signal



3.2.3.3 Encoder breakage recognition

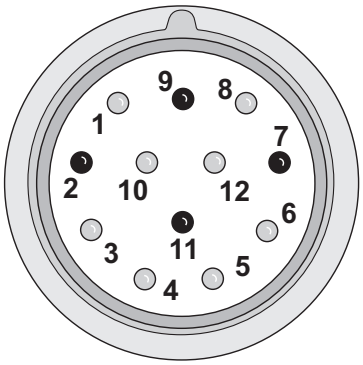
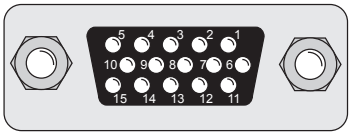
For a monitoring of the encoder and the encoder cable to channel 1 the signal tracks and the zero track are monitored. If the connected encoder has no zero track, then the the 5V-supply must be assigned to track N+ and COM to N- at the encoder plug. The monitoring is switched on/off with parameter Ec.42 (Ec.20 up to V2.8). The recognition of encoder breakage triggers an „error"! Encoder 1“ (value 32), if the voltage between two signal pairs is smaller than 625 mV .

3.2.4 Connection of the encoder

3.2.4.1 Encoder cabel at SUB-D15

- 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
- Do not connect exterior and interior shielding

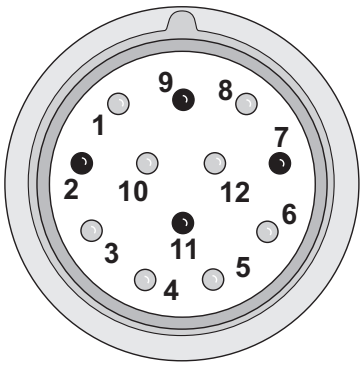
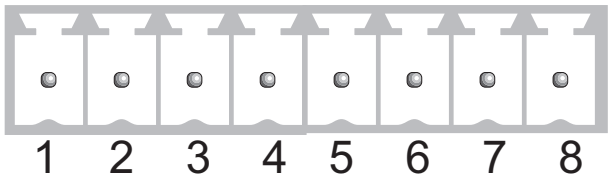
Figure 3.3.4.1 Connection of the encoder

Motor encoder plug		Socket X3A
		

Name	PIN		PIN	Core color
GND	–		–	exterior shielding
A+	5		8	green
A-	6		3	yellow
B+	8		9	blue
B-	1		4	red
N+	3		15	gray
N-	4		14	pink
COM	10		13	white
5 V	12		12	brown

3.2.4.2 Encoder cable at terminal strip X3A

Figure 3.3.4.2 Connection of the encoder

Motor encoder plug		Socket X3A
		

Name	PIN		PIN	Core color
GND	–		–	exterior shielding
A+	5		1	green
A-	6		2	yellow
B+	8		3	blue
B-	1		4	red
N+	3		5	gray
N-	4		6	pink
COM	10		8	white
5 V	12		7	brown

3.2.5 Encoder cable

KEB encoder cables are corresponding to the following specification:

Signal lines	3 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

3.2.6 Encoder line length

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

Encoder cable length =	$\frac{U - U_{min}}{I_{max} \cdot 2 \cdot R}$
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

3.2.7 Tested encoders

The following TTL incremental encoders have been tested by KEB on it application:

- Heidenhain ROD 426

However, this does not restrict the use of rotary encoder with same specifications of other manufacturers.

3.3 Channel 2

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

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.0 and check whether value „1: Incremental In“ is displayed. The displayed value has to be confirmed by „ENTER“ in any case.
- Select Ec.1 and adjust increments per revolution.
- Select Ec.42 (Ec.20 upto V2.8) and adjust the encoder breakage recognition dependent on the case of operation.
- If several slaves are connected, deactivate the terminating resistor with Ec.20 Bit 1 (do not switch off at last slave).

5. Error Messages

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

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