COMBIVERT

GB INSTRUCTION MANUAL

Encoder Interface

Channel 1

HTL without inverted signals

Channel 2

variable

Mat.No.	Rev.
DLF5ZEM-K070	1B

KEB

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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

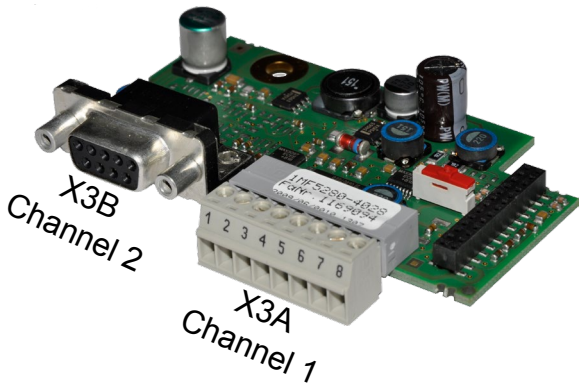
All operations serving transport, installation and commissioning as well as maintenance are to be carried out by skilled technical personnel (observe IEC 364 or CENELEC HD 384 or DIN VDE 0100 and national accident prevention rules!). According to this manual qualified staff means those who are able to 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 2: Incremental encoder HTL without inverted signals on channel 1

For housing size D and E



X3B	X3A
Channel 2	Channel 1
see material number	without inverse signals

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	K81	X	X	X	X

Term of delivery	0	installed		Z	Option, spare part	
Interface	S	TTL-output	4029	T	TTL-input	4028
	F5	Series				
applicable for housing size	1M	D, E (circuit board 1MF5280-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
- Attach plastic cover

3. Description of the Interface

3.1 Setting the voltage supply

Figure 3.1.a: Setting the encoder voltage by the DIL switch S1

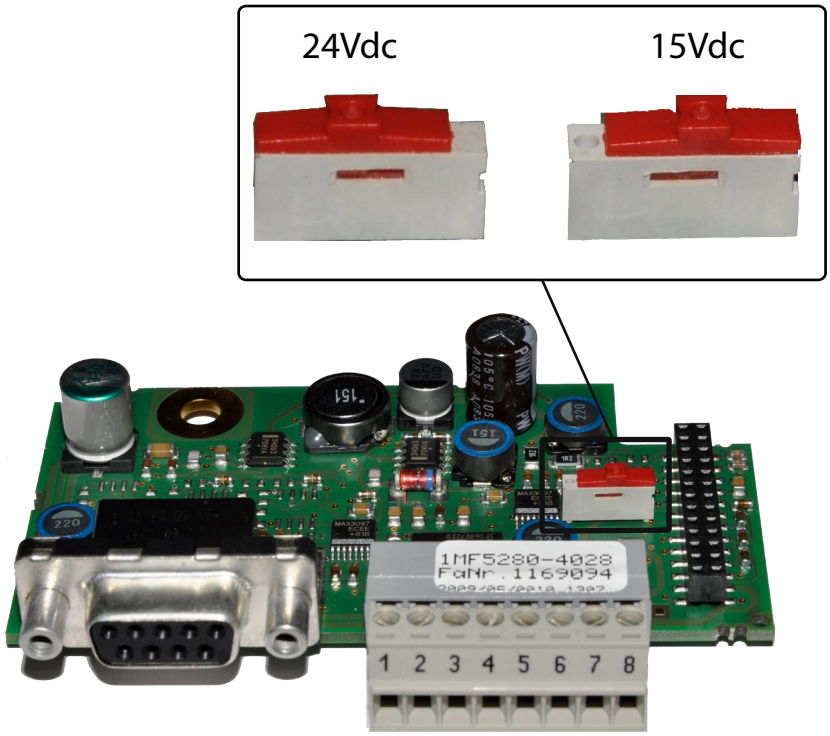
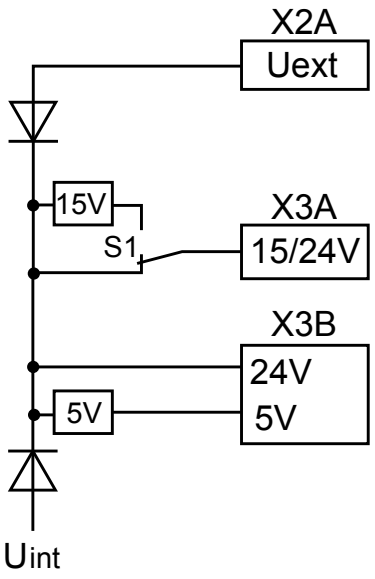


Figure 3.1.b Voltage supply of encoder interfaces

U_{int}	24 VDC	Internal voltage supply of the COMBIVERT (I_{max} 120 mA).
I_{int}	Current I_{int} reduces itself by draw current at the 5 V-output, as well as at the 15V-output in accordance with the following formula: $I_{24V} = I_{int} - \frac{5V \times I_{5V}}{U_{int}}$ $I_{24V} = I_{int} - \frac{5V \times I_{5V}}{U_{int}}$	
U_{ext}	Control terminal strip (X2A) of the COMBIVERT with external voltage supply 24…30 Vdc. / max. 1 A	
15/24 V	Voltage output of encoder interfaces X3A for encoder supply.	
5 V	Voltage output for encoder supply (I_{max} 300 mA). 5 V are obtained from the 24 V voltage.	
24 V	Voltage supply of encoder interfaces X3B for encoder supply.	



3.2 Description of channel 1

3.2.1 Specifications of channel 1

Interface type	Incremental Encoder Input
Input signals	HTL 15…30 V without inverse signals
Inputs / tracks	A+, B+, N+
Output	Voltage output 15/24 V for encoder supply
Particularities	Encoder breakage recognition for all signals
Limiting frequency	100 kHz
Increments per revolution	1…16383 inc (recommendation 2500 inc for speed upto 2400 rpm
Input resistance	3.9 kΩ at 24 V input voltage
Max. line length	50 m, the value is additionally limited by the signal frequency, cable capacity and supply voltage (see chapter „encoder line length").

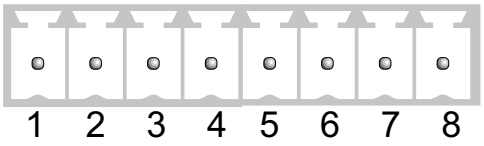
3.2.2 Description of X3A

Version	plug in terminal block
Terminals	8
Tightening torque	0.22…0.25 Nm
permissible cable cross-section	0.14…1.5mm²
Stripping length	7 mm

	Terminal assignment changed	The pin assignment has changed in relation to the previous version.

3.2.3 Assignment of X3A

Figure 3.2.3 Description of terminal strip X3A



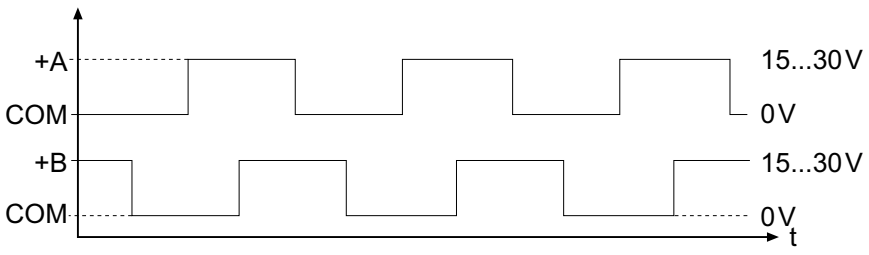
PIN	Name	Description
1	A+	Encoder track A HTL signal+
2	–	n.c.
3	B+	Encoder track B HTL signal+
4	–	n.c.
5	N+	Zero track HTL signal+
6	–	n.c.
7	15/24V	switchable voltage supply for encoder
8	COM	Reference potential for signals and voltage supply

3.2.4 Input signals

3.2.4.1 Signal tracks A and B

In case of HTL-encoder interface the signals A+ and B+ are rectangular signals with a phase-angle displacement by 90 degrees. The inverted signals will be generated internally and does not need to be provided by the encoder.

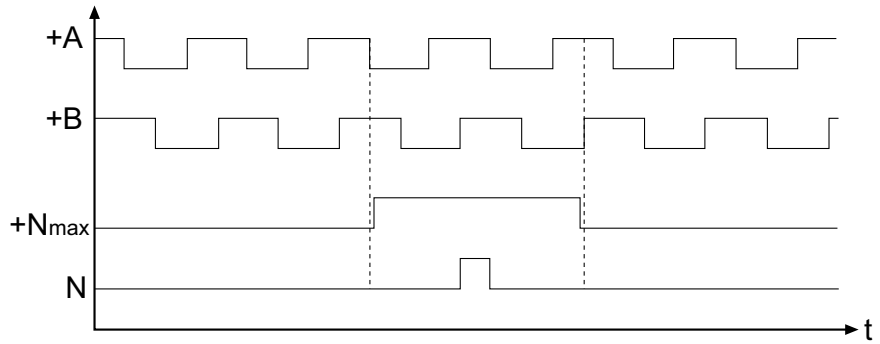
Signal tracks A+ and B+



3.2.4.2 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.

Evaluation of the Zero Signal



3.2.5 Encoder breakage recognition

For a monitoring of the encoder and the encoder cable the signal tracks and the zero track are monitored. Input N+ must be connected with input 15/24 V if the connected encoder should not have a zero track. The monitoring for channel 1 will be switched on/off with parameter Ec.42 (in the past Ec.20). The recognition of encoder breakage triggers an „error"! encoder 1“ (value 32), if the voltage at the signal input is smaller than 6 V.

Parameter		r/w	Enter	prog.
Ec.42	Encoder alarm mode	yes	no	no

Dependent on Ec.42 „Error! Encoder 1“ (value 32) or a warning is triggered, if the permissible signal levels are fallen below.

Setting range	Setting	Meaning
0	1	Encoder monitoring off
1		Encoder monitoring on
2		Encoder monitoring on (open-loop off)
3		Warning

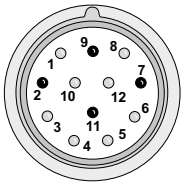
3.2.6 Connection of the encoder

3.2.6.1 Encoder cable at terminal strip X3A

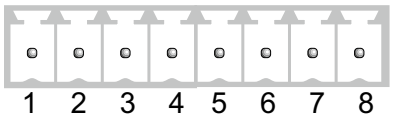
- Encoder cable double-shielded and twisted in pairs
- Connect exterior shielding at both ends to PE/GND
- Connect interior shieldings at one side to COM
- Do not connect exterior and interior shielding
- N+ is only required for posi function

Figure 3.2.6.1 Connection of the encoder

Motor encoder plug



Socket X3A



Name	PIN		PIN	Name	Core color
A+	5		1	A+	green
COM	10		8	COM	yellow
B+	8		3	B+	blue
COM	10		8	COM	red
N+	3		5	N+	gray
COM	10		8	COM	pink
Uin	12		7	15/24 V	brown
COM	10		8	COM	white
Housing	-		–	PE inverter	shielding

3.2.7 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

3.2.8 Encoder line length

The maximum line length of the encoder cable is 50 m. It results from the voltage drop of the supply line. The value is calculated as follows:

Encoder cable length =	$\frac{U - U_{min}}{I_{max} \cdot 2 \cdot R}$
max. encoder current I_{max}:	see encoder description
Supply voltage U:	15 V or 24 V
minimum input voltage U_{min}:	see encoder description
KEB encoder cable resistance R:	0,036 Ω/m at 0,5 mm²

3.2.9 Tested encoders

The following encoder can be used dependent on the interface and the control:

Manufacturer	Type	Encoder type
Heidenhain	• ROD 436	HTL-Incremental Encoder

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

3.3 Description of channel 2

The description of input X3B 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.00 and control whether value „27“ is entered. The displayed value has to be confirmed by „ENTER“ in any case.
- Select Ec.01 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.

5. Error Messages

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

	Error „E.hYb“ can be reset by a Power-On-Reset. Error „E.EncC“ can by writing on parameter Ec.00 and additional also be reset by a Hardware-Reset or Bus-Reset (control word) since software version 4.1.

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