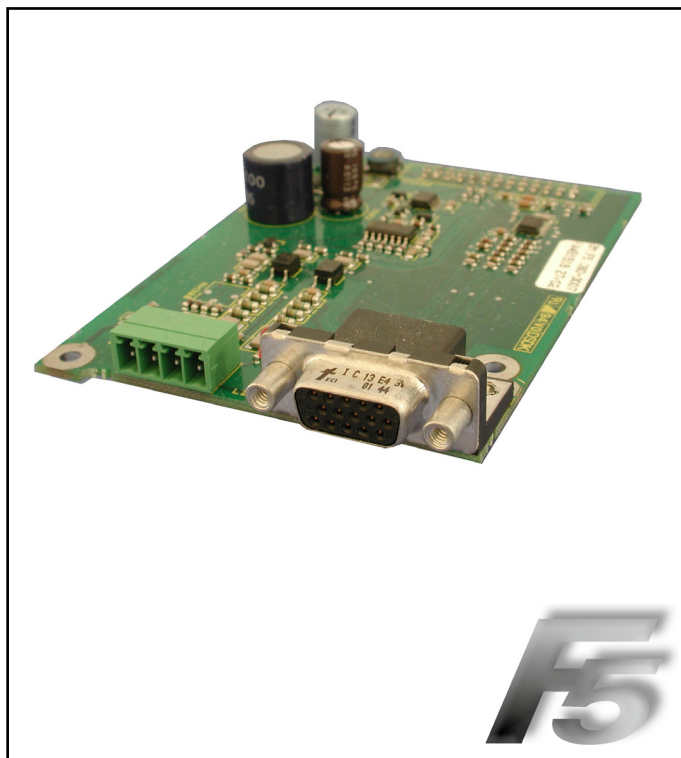


COMBIVERT



GB INSTRUCTION MANUAL

Channel 1

Channel 2

Encoder Interface

Variable Input

Initiator

Mat.No.	Rev.
DI.F5.ZEM-K000	1B



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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.

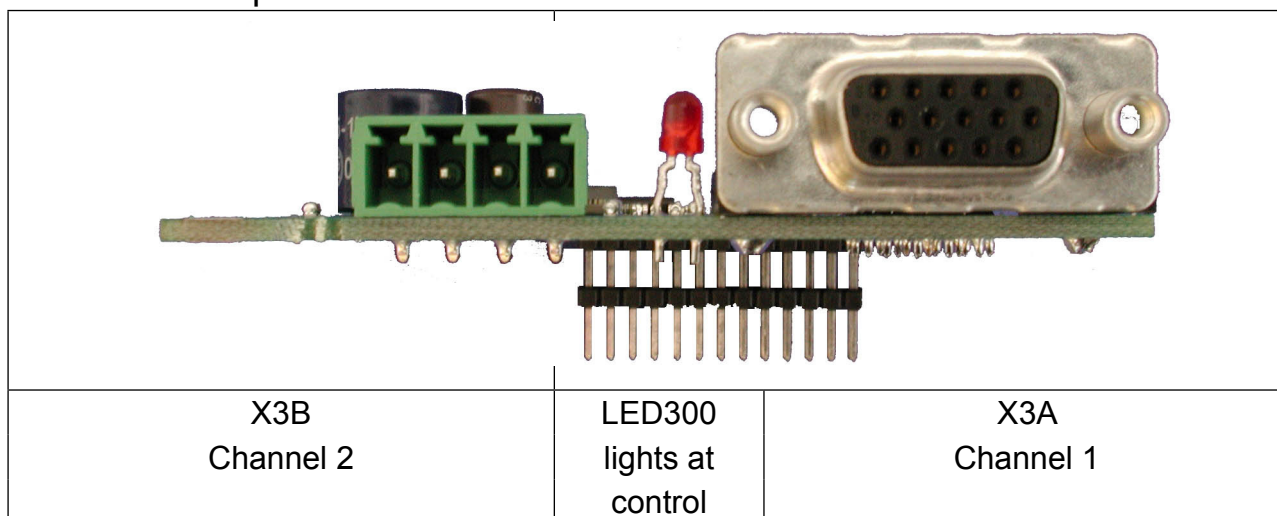


Danger by high voltage

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



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 comprises 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	A	X	X	7	
applicable for housing size			Term of delivery	0	installed	Z	Option, spare part
				A	TTL input		3007
			K81 varnished for corrosive environments				
			F5	Series			
		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
- Attach plastic cover

3. Description of the Encoder Interface

3.1 Channel 1

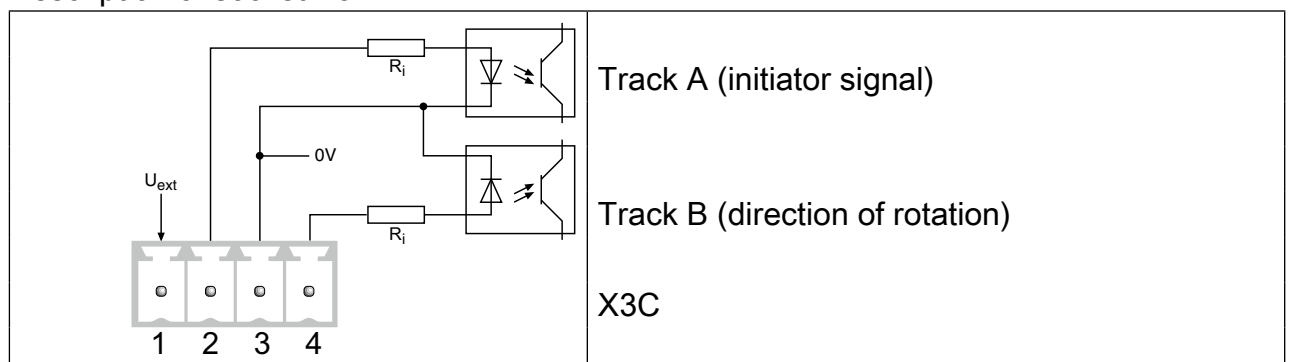
The description of input X3B is depending on the used encoder interface. It is described in a separate manual.

3.2 Channel 2

3.2.1 Specifications

Slot	X3B
Interface type	Initiator input
Input resistance	1.9 kOhm
Voltage level	24 V $\pm$ 25 %
min. pulse duration	25 μ s
Limiting frequency	20 kHz
Max. line length	50 m
max. encoder cable length	50 m

3.2.2 Description of socket X3B



PIN	Description
1	Voltage output 20...30V, voltage supply for initiator
2	Initiator input
3	0V reference potential
4	Rotation change (0V clockwise rotation; 24 V counter clockwise rotation)

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

5. Start-up

After 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 „5: Initiator“ is entered.
The displayed value has to be confirmed by „ENTER“ in any case.

6. Parameter Adjustment

6.1 Rotation selection encoder 2 (Ec.16 Bit 0...2)

No direction of rotation can be detected at initiator evaluation. Therefore a positive speed (clockwise rotation) is always expected. This setting can be redefined dependent on Ec.16:

Ec.16	Rotation selection encoder 2
Bit 0...2	Encoder direction of rotation
0	not inverted - clockwise rotation (default)
1	inverted - counter clockwise rotation
2	the sign of the determined speed corresponds to the sign of the output frequency
3	dependent on track B (terminal X3C.4) 0 → clockwise rotation 24 V → counter clockwise rotation
Bit 3	System inversion
0	not inverted
1	inverted

6.1.1 Encoder increments per revolution 2

The number of cam of the encoder shaft or disk is adjusted with this parameter. Generally it can be said:

The more cams are available, the

- more proper the speed resolution
- more faster the detection (important for short clock cycles)
- merrier the control characteristics

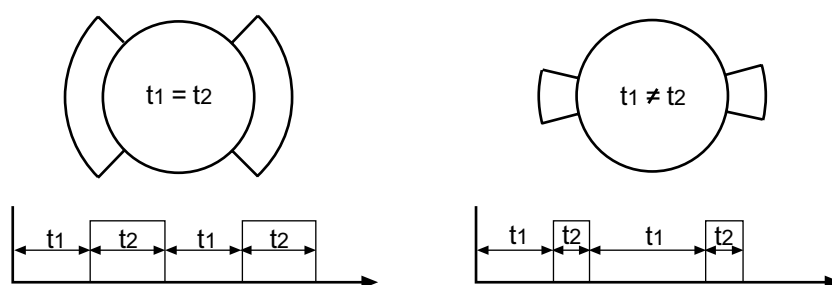
6.1.2 Encoder 2 trigger (Ec.17)

The type of evaluation is adjusted with this parameter. There are two possibilities for the initiator interface:

- Single evaluation; only the rising edge is evaluated per cam; is adjusted if there is no symmetrical pulse-/stop ratio available.
- Double evaluation; the rising and falling edge is evaluated per cam. If a symmetrical pulse-/stop ratio is available, a higher resolution is reached with the double evaluation, that benefits the control.

Ec.17	Encoder 2 trigger
0	1-fold
1	2-fold
2...13	reserved

Symmetrical and unsymmetrical cam arrangement



If double evaluation is adjusted in spite of unsymmetrical pulse/stop ratio, this leads inevitably to speed fluctuations.

6.1.3 Time 2 for speed calc. (Ec.13)

The speed scan time for the initiator input is determined with Ec.13. The initiator signals are detected and used for the calculation of speed control within the adjusted time.

Ec.13	Value dec.	0	1	2	3	4	5	6	7	8	9
	Time [ms]	05	1	2	4	8	16	32	64	128	256

The adjustment of this time is heavily dependent on the application. Generally it can be said:

- the longer the speed scan time is adjusted, the more pulses are evaluated and so more accurate the speed control
- the shorter the speed scan time is adjusted, the faster the speed control but however more inaccurate (especially important at short cycle times of the machine)

6.2 Evaluation of the initiator signals

The following formula serves the evaluation of initiators:

$$\Delta n \text{ [rpm]} = \frac{60000}{\text{Ec.17} \times \text{Ec.11} \times \text{Ec.13}}$$

$\Delta n \text{ [rpm]}$: Speed resolution in revolutions per minute (accuracy)

60000: Conversion factor of 1/ms in rpm

Ec.17: insert 1 for single evaluation; 2 for double evaluation

Ec.11: Number of cams

Ec.13: Time for speed calc. in ms

6.2.1 Example

A speed accuracy of 20 rpm is required. A cam number of 50 with symmetrical arrangement is preset at the initiator.

$$Dn = 20 \text{ rpm} \quad \text{Ec.17} = 2 \quad \text{Ec.11} = 50$$

$$\Delta n \text{ [rpm]} = \frac{60000}{\text{Ec.17} \cdot \text{Ec.11} \cdot \Delta n} = \frac{6000}{2 \cdot 50 \cdot 20} = 30 \text{ ms}$$

Adjustment Ec.13 to „6“ = 32 ms

6.2.2 Additional requirement

The drive shall reach the maximum speed $n_{\max}$ with an acceleration time t_{ACC} of 200 ms!



A satisfactory control is reached if the actual value change is 10 times faster than the setpoint change.

This means for the example above:

$32 \text{ ms} \cdot 10 < t_{\text{ACC}}$, from this it follows that this application with the specified additional requirement will have no good control characteristics.

New calculation:

We could meet the additional requirement with a scan time of 16 ms.

$$\text{Ec.11} = \frac{60000}{\text{Ec.17} \cdot \text{Ec.13} \cdot \Delta n} = \frac{6000}{2 \cdot 16 \cdot 20} = 93.75 \text{ increments}$$

Thus another cam disk with minimum 94 cams should be used for the sample.

7. Error messages

Error messages and their meaning are described in the inverter documentation.



For safety reasons a power-on-reset must always be executed after error „E.EnC“.



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