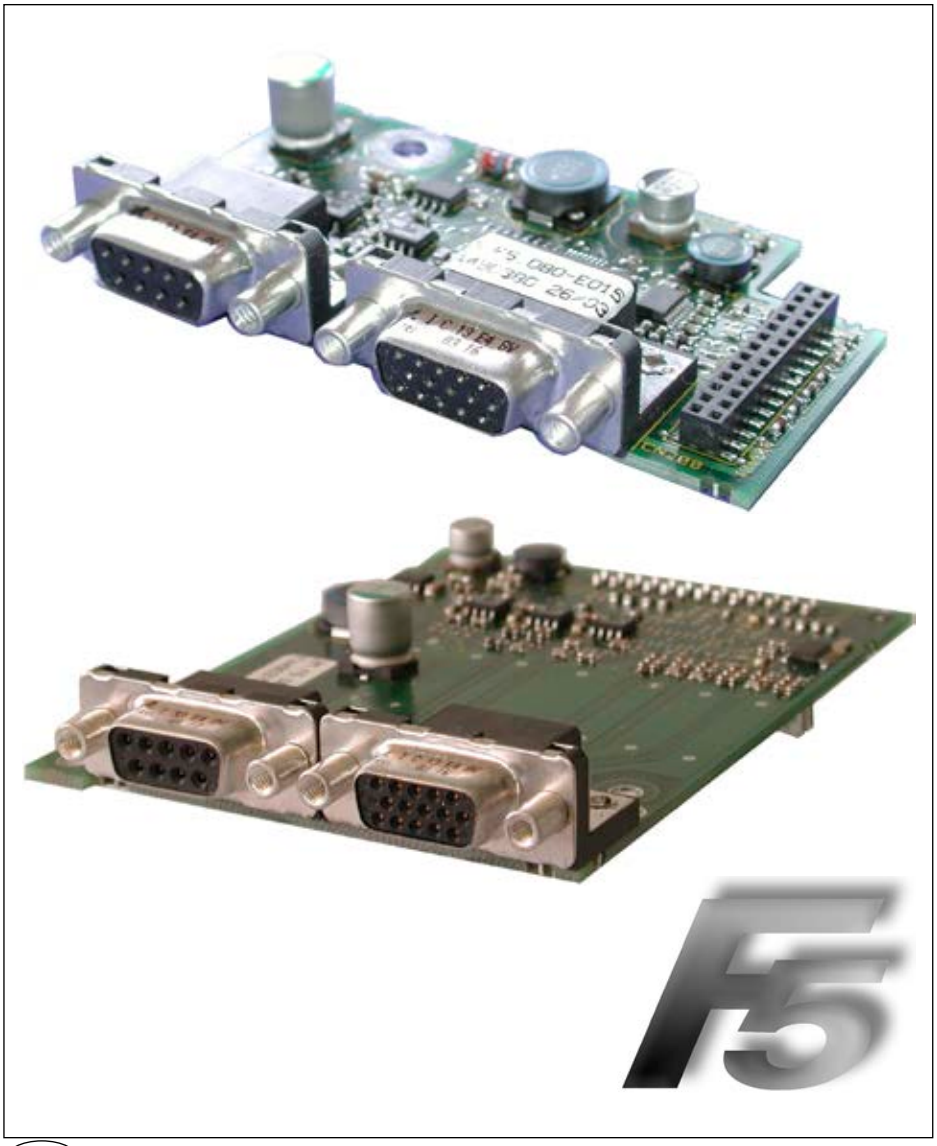
COMBIVERT

CE



GB **INSTRUCTION MANUAL**

Encoder interface

Channel 1 variable

Channel 2 SSI

Mat.No.	Rev.
DSF5ZEM-K002	1A

KEB

Inhaltsverzeichnis

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1. Preface

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.

1.1 Information on special measures

The used pictograms have following significance:

Danger	Is used, when death or serious bodily injury may be the consequence of non-observance of the measure.
Warning	Is used, when bodily injury and/or substantial property damage may be the consequence of non-observance of the measure.
Caution	Is used, when property damage may be the consequence of non-observance of the measure.
Attention	Is used, when noise sensitive or unrequested operation may be the consequence of non-observance of the measure.
Info	Is used, when a better or simpler result can be the consequence of the measure.

For a special case the instructions can be supplemented by additional pictograms and text.

1.2 Documentation

Attention	**Documentation via www.keb.de**
	Prior to performing any work on the unit, it is absolutely necessary to download and read the documentation, especially the safety precautions and instructions for use. Follow these steps to get the documentation:
Step 1	Read the material number (Mat.No.) from nameplate
Step 2	Input the material number at "www.keb.de => Service => Downloads" and click "search". **Downloads** **Search for specific material numbers** **Please enter a comlete (11-digit) material number.** **Search for:** 15G6DCD-3510 search

further on next side

Step 3	The entire documentation associated with the device will be displayed, including the instruction manuals in German and English. If available, other translations are also indicated. Make sure that the user understands the provided language.
	**Should you be unable to read or understand the documentation, do not take any further steps. Please inform our support network for further assistance.**

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 beyond of our control and therefore exclusively the responsibility of the machine manufacturer, system integrator or customer.

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.

Danger  **by tamper from unauthorized personnel**	
	Unauthorised opening and tampering may lead to death, bodily injury, property damage and malfunctions. Modification or repair is permitted only by KEB authorized personnel. Infringement will annul the liability for resulting consequences.

The suspension of liability is also valid especially for operation interruption damages, loss of profit, data loss or other damages. The disclaimer will void the warranty. This is also valid, if we referred first to the possibility of such damages.

If individual regulations should be futile, not effective or impracticable, then the effectivity of all other regulations or agreements is not affected by this.

Through multitude applications not each possible case of installation, operation or maintenance can be considered. If you require further information or if special problems arise which are not treated in detail in the documentation, you can request the required information from the local agency of the company Karl E.Brinkmann GmbH.

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.

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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 used semiconductors and components of the Karl E.Brinkmann GmbH 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.

The safety function is limited to a service life of 20 years. After this time the unit must be replaced.

2. Product description

X3B	X3A
Channel 2	Channel 1
SSI	variable
Synchronous Serial Interface	see material number

Figure 1: SSI - Encoder interface at channel 2

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	K8x	x	x	x	x

Term of delivery	0	installed	Z	Option, spare part
	1	SIN/COS	5	Resolver
	3	Endat	L	HTL input without inverse signal
	4	TTL input		
	F5	Series		
applicable for housing size	1M	D, E (PCB 1M.F5.280-1015/ -0025/ -4017/ -2020/ -2021)		
	2M	G…U (PCB 2M.F5.280-1015/ -2020/ -2021)		

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 Voltage supply

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: $I_{24V} = I_{int} - \frac{5{,}2\,V \times I_{5V}}{U_{int}}$	
5 V	Voltage output for encoder supply. 5.2 V are obtained from the 24 V voltage.	
I5V	300 mA	at Hiperface, Sin/Cos, EnDat and SSI-Sin/Cos.
	500 mA	at all other encoder interfaces.
	1 A	at external supply (dependent on the voltage source)

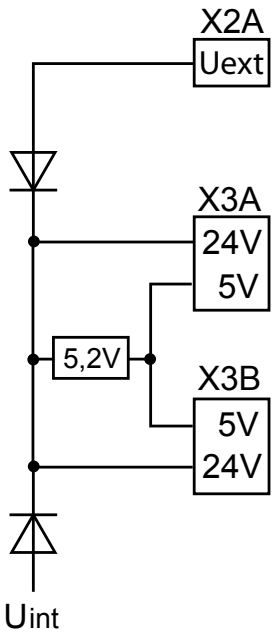


Figure 2: Voltage supply of control and encoder interfaces

3.2 Channel 1

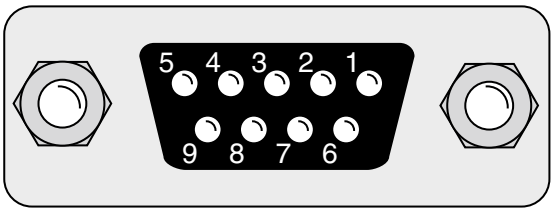
The description of input X3A is depending on the used encoder interface. It is described in a separate manual.

3.3 Channel 2

3.4 Specification channel 2

Socket X3B	SUB-D9
Interface type	SSI (synchronous serial interface)
Input signals	5 V TTL according to RS485
Outputs and inputs	Clock+, Clock-, Data+, Data-
Code	Binary coded, Gray Code
Resolution	12 Bit Singleturn, 12 Bit Multiturn
Limiting frequency	220 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.

3.4.1 Description of socket X3B



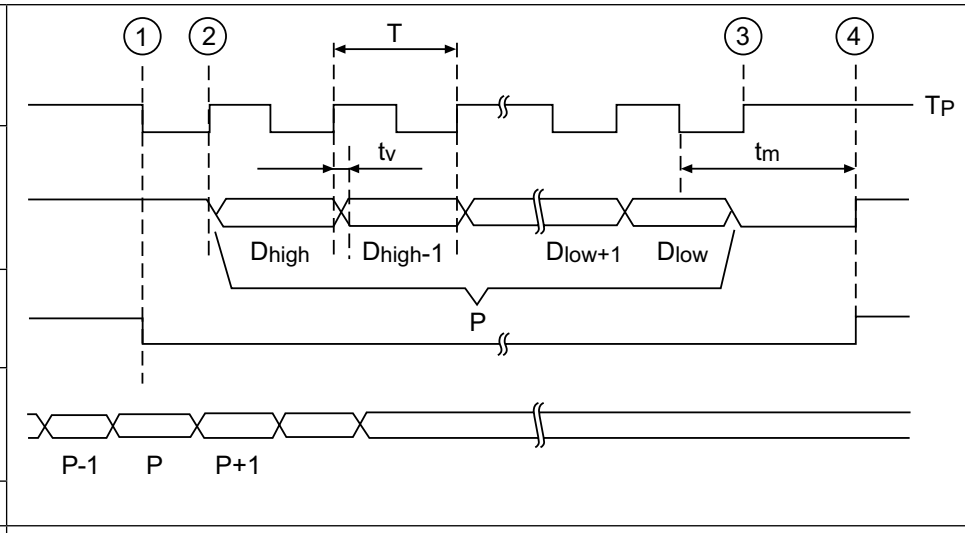
PIN	Name	Description
1	CL+	Output of the clock signal
2	DAT+	Input data track
3	–	–
4	5 V	Voltage output 5 V
5	24 V	Voltage output 20…30 V
6	CL-	Difference signal to clock signal C+
7	DAT-	Difference signal to data track DAT+
8	–	–
9	COM	Reference potential for voltage supply
–	GND	Connection for shield at connector housing - is directly connected with the inverter earth.

Figure 3: Socket X3B

3.4.2 Input signals channel 2

3.4.2.1 Serial data transmission

Singleturn absolute encoder divide one revolution of the shaft into a defined number of measuring steps. This are 4096 positions at a SSI protocol, corresponding to a resolution of 12 Bit. Multiturn absolute encoder do not only detect angle positions within one revolution but also the number of revolutions. With a resolution of the multiturn part of 12 Bit this corresponds to 4096 revolutions. The position measuring area of $0…2^{24}$-1 should not be left, since an overflow and/or underflow is not evaluated as error. A system offset can be defined by writing on Ec.34 or approaching to reference point.



P:	Parallel position data
T:	Period
Tp:	Clock interruption up to the next request
tm:	Pulse duration of the monoflop
tv:	Deceleration time
D_{high}:	Most significant position bit
D_{low}:	Least significant position bit

Figure 4: Serial data transmission with SSI encoder

3.4.2.2 Encoder breakage recognition

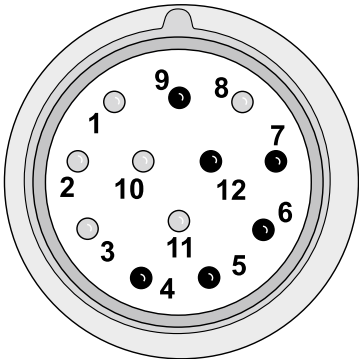
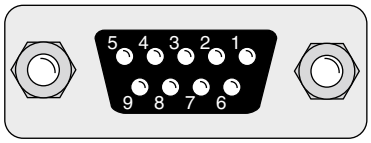
An error bit is evaluated for monitoring of the encoder at channel 2. The monitoring is switched on/off with parameter Ec.42 (Ec.20 up to V2.8). The encoder breakage recognition triggers an „error! encoder 2“ (value 34).

For encoder breakage detection the encoder needs to send a so-called Power failure bit and the evaluation with Ec24 "SSI power failure bit" has to be enabled.

3.4.3 Connection of the encoder

- Encoder cable double-shielded and twisted in pairs
- Connect exterior shielding at both ends to PE/GND
- Connect interior shielding at one side to COM
- Do not connect exterior and interior shielding

Two connection examples of SSI encoders are following. The assignment of the motor encoder interface is different according to the manufacturer. The examples must be adopted accordingly.

Encoder plug	Socket X3B
	

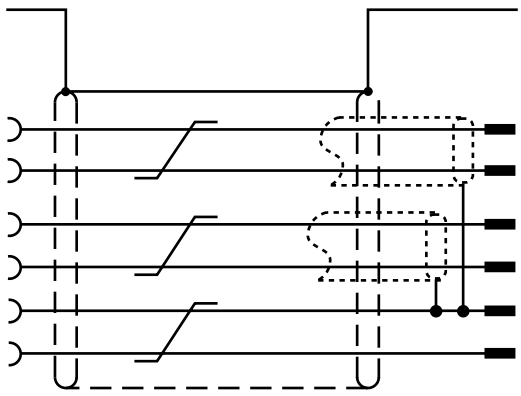
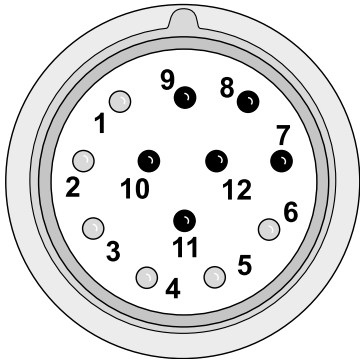
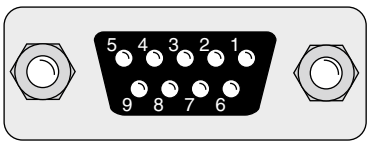
Name	PIN	Material number: 00F4609-xxxx	PIN	Core color
GND	–		–	exterior shielding
CL+	3		1	green
CL-	11		6	yellow
Data+	2		2	blue
Data-	10		7	red
COM	1		9	white + internal shielding
24 V	8		5	brown

Figure 5: Connection example: Encoder with 18V supply (e.g. Sick-Stegmann AG615)

Encoder plug	Socket X3B
	

Name	PIN	Material number: 00F4909-xxxx	PIN	Core color
GND	–		–	Solder external shielding to metal housing
CL+	3		1	green
CL-	4		6	yellow
Data+	5		2	blue
Data-	6		7	red
COM	1		9	white + internal shielding
5 V	2		4	brown

Figure 6: Connection example: Encoder with 5V supply (e.g. Kübler 9081)

3.4.4 Encoder cable

KEB delivers ready-made encoder cable in accordance with the following number code:

For Stegmann encoder:

00F4609-xPxx	x,xx m	z.B. 00F4609-0P60	corresponds to 0,60 m
00F4609-0xxx	xxx m	z.B. 00F4609-0040	corresponds to 40 m

For Kübler encoder:

00F4909-xPxx	x,xx m	z.B. 00F4909-0P60	corresponds to 0,60 m
00F4909-0xxx	xxx m	z.B. 00F4909-0040	corresponds to 40 m

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

3.4.5 Encoder line length

The maximum line length for the connection line is limited by the signal frequency, cable capacity and the line resistance.

Encoder line length =	$\frac{U - U_{min}}{I_{max} \cdot 2 \cdot R}$
max. encoder current I_{max}:	see encoder description
Supply voltage U:	Voltage output
min. supply voltage U_{min}:	see encoder description
KEB encoder cable resistance R:	0.036 Ω/m at 0.5 mm²

3.5 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 „6: SSI“ is entered. The displayed value has to be confirmed by „ENTER“ in any case.
- Select parameter Ec.11 and adjust the increments per revolution to 1024.
- Select parameter Ec.17 and adjust 4-fold evaluation (1024 inc x 4 = 4096 inc)
- Ec.42 and Ec.24 (Ec.20 upto V2.8) and adjust the encoder breakage recognition dependent on the case of operation.
- Select parameter Ec.21 and adjust multiturn resolution (standard 12 Bit); adjust „0“ for singleturn encoders.
- Select parameter Ec.22 and adjust clock frequency for SSI encoder.
- Select parameter Ec.23 and adjust data format (standard Gray-Code).
- Ec.30 displays the read out position of the SSI encoder.
- A system offset can be defined by writing on parameter Ec.34 or approaching to reference point.

3.6 Error messages

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

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