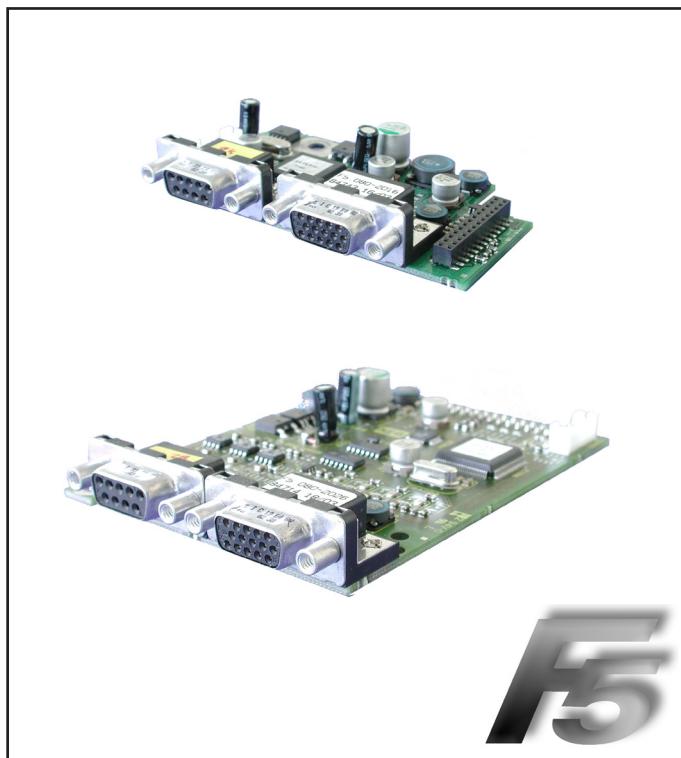


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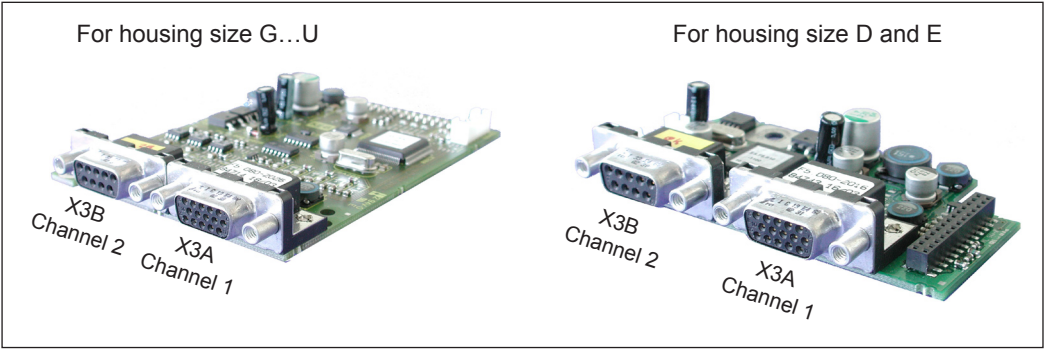
EnDat Encoder Interface

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1. Product description



1.1 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.

1.2 Description of encoder interface channel 1

Encoder type: EnDat Version 2.1

Voltage level: 1 Vss

Inputs/Tracks: A, B (process data channel)
Data (parameter channel)
Clock (clock signal)

Particularities: -

1.3 Part number

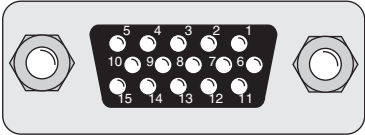
2M.F5.K8G-P Z 2 X

	Term of delivery	0: installed	Z: Option, spare part
	2. Encoder interface	P: TTL-output	Q: TTL-input
	applicable for housing size	1: D, E	2: G...U

1.4 Scope of delivery (option or replacement delivery)

- encoder interface
- two instruction manuals
- fixing bolt
- packing material

1.5 Description of socket X3A

Socket X3A (top view)		
SubD 15pole		
		
PIN	Name	Description
1	-	-
2	-	-
3	A-	Signal input A- (difference signal to A+)
4	B-	Signal input B- (difference signal to B+)
5	-	-
6	Clock+	Clock signal RS485
7	Clock-	Clock signal RS485
8	A+	Incremental signals A for counter and direction detection
9	B+	Incremental signals B for counter and direction detection
10	-	-
11	-	-
12	+5,25 V	Power supply for encoder
13	COM	Reference potential for supply voltage
14	-DATA	data channel RS485
15	+DATA	data channel RS485

1.6 Power supply

1.6.1 Max. load capacity in dependence of voltage supply

Max. load capacity at +5,25V: 300mA

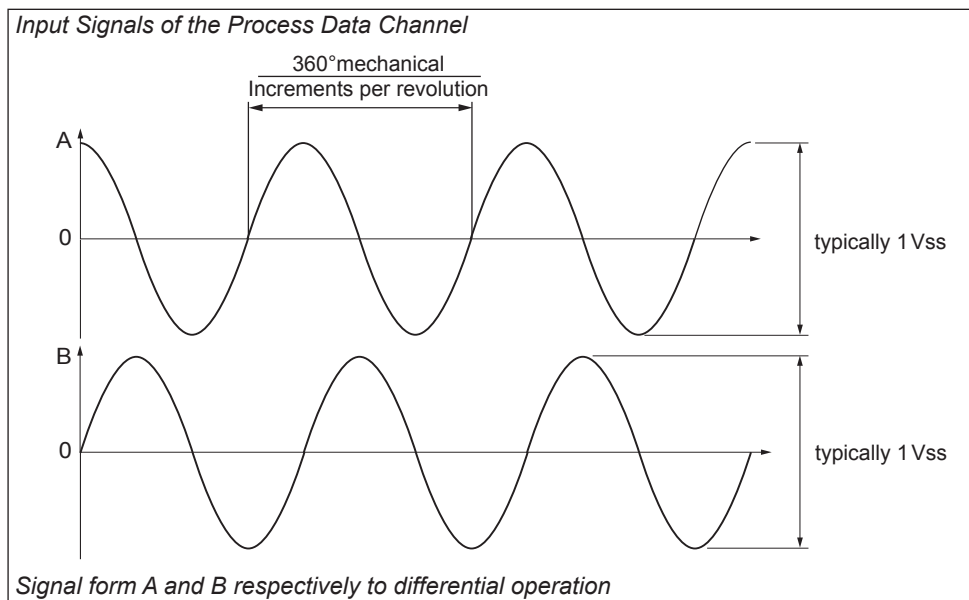
The specified current is reduced by the current taken from the second interface (see application manual Chapter 6.10).

1.7 Signal inputs and outputs

1.7.1 Technical data

Input resistance:	120 Ω
Process data channel:	1 Vss typical (0,6...1,2)
Parameter channel:	EIA RS485 half duplex, synchronous serial
Clock signal output:	EIA RS485
Limiting frequency:	200 kHz
Encoder line number:	1...2048 Inc (Recommendation: 1024 Inc at rotary speed < 4500 rpm)
Max. line length:	see annex

1.7.2 Input signals of encoder inputs



1.7.3 Description of encoder signals

During start-up and then all 30 ms an inquiry is transmitted to the encoder and the absolute position is serial read out. Thus a reference point search is not necessary.

As the increments per revolution are stored in the encoder, error Ec.37=70 is triggered immediately, if a deviating value is entered in Ec.1.

A position difference is tracked after filter with ramp time. If this difference increases too quickly, so that it cannot keep tracked or a max. value is exceeded (e.g. at encoder breakage), the interface state Ec.37 changes to „69“ and the inverter switches off.

The clock signal is used for synchronization.

Installation and Start-up

1.7.4 Encoder breakage recognition

The recognition of encoder breakage is a software function and dependent on the encoder type. It is possible to insert the encoder during operation. By writing on Ec.0 the initialization starts. After fault-free initialization the correct position will be send.

The incremental track is monitored approx. all 16 ms. An error is triggered, if the permissible signal levels are fallen below. Also the absolute track, i.e. the serial communication to the encoder is monitored. If the encoder gives not an answer, or a communication is not possible, the respective state message will be transmitted to the inverter. Dependent on the encoder type the response time can be 100 ms and more.

1.7.5 Adjustment of increments per revolution (Ec.1)

The inc/r of the inverter has to correspond with the inc/r of the encoder. In case of different adjustment, error message Ec.37=70 is generated immediately.

2. Installation and Start-up

2.1 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

2.2 Tested encoder

The following EnDat encoder have been tested by KEB on it application:

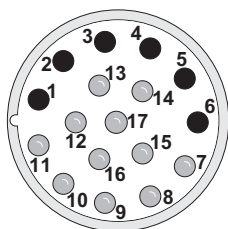
- Heidenhain ECN 1313 Singleturn; ECI 1317 Singleturn
- Heidenhain ROQ 425 Multiturn; EQI 1329 Multiturn

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

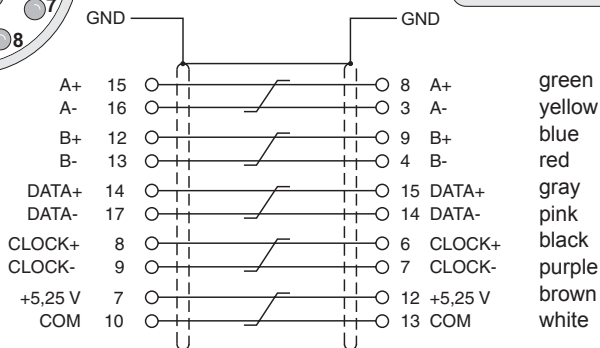
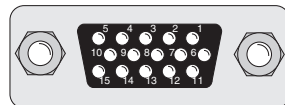
2.3 Electrical installation

Connection of the encoder cable

Encoder male connector servo motor



Encoder interface X3A



2.4 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
- when using synchronous motors set ud.2 to F5-S
- Select parameter Ec.0 and control whether „EnDat“ is entered. **The displayed value has to be confirmed by „ENTER“ in any case.**
- Select parameter Ec.10 and carry out the same for the 2. encoder interface
- Select parameter Ec.1 and control/adjust the increments per revolution
- Select parameter Ec.38; if automatic read in is not adjusted in Bit 2, read out encoder data with Bit 0.
- Select parameter Ec.37 and control encoder status.

2.5 EnDat® - parameter

The following parameters are stored in the EnDat-encoder and automatically read in e.g.manually read/write by Ec.38:

Synchronous motors: dr.23...dr.28, dr.30...32

Asynchronous motors: dr.0...dr.7

Encoder parameter: Ec.1...3, In.31...32

Controller parameter: cS.19

2.6 Encoder 1 status (Ec.37)

This parameter displays, by means of different status messages, the status of encoder and interface. Dependent on the encoder only special messages are possible. All errors are only set at control release, although they are already displayed in Ec.37.

The following value is displayed at correct operation:

16: position values are being transferred, encoder and interface are working

The following status messages triggers „**Error Encoder Change**“ (**E.EncC**) because the correct evaluation of the position is no longer guaranteed :

64: encoder is unknown and will not be supported

67: The signals of the incremental track are not correct, e.g. no encoder is connected or the encoder cable is defective.

68: The signals of the absolute track are not correct. The absolute track at Endat, Hiperface and SSI-Sin/Cos is digital. The absolute track at Sin/Cos is analog.

69: position deviation too high. The position determined by the incremental signals and the absolute position (of absolute track, zero signal or serial selected) does no longer correspond or cannot be corrected.

70: increments per revolution adjusted in the inverter does not correspond with encoder increments per revolution.

71: interface type is unknown: Interface has not been recognized.

75: encoder temperature too high (message from encoder)

76: rotary speed is too high (message from encoder)

77: encoder signals are outside the specification (message from encoder)

78: encoder has internal defect (message from encoder)

92: encoder will be formatted. When writing an encoder with memory structures different from the KEB-definition, their memories will be re-organized in such a manner that they can be written. This procedure can take some seconds, depending on the respective memory structure.

96: new value detected, because an another encoder is attached.

98: Interface is busy

Error E.EncC can only be reset via parameter Ec.0. Exception! An error due to wrong increments per revolution (value 70) is reset immediately, if the correct increments per revolution are adjusted (from software 2.7). Attention, the modulation is released, when the control release is still set!

The following status messages triggers „**Error Encoder 1**“ (**E.Enc1**), if encoder data is read:

97: KEB-reference is undefined. Memory structure of the encoder does not correspond to the KEB-definition and therefore data cannot be read. The encoder is defined by writing data. At F5-S the error is reset as follow:

- writing a position to Ec.2.
- perform a system position trimming

Following status messages trigger error „**Error Hybrid**“ (**E.HYb**):

0, 255: no communication between interface and control card

2.7 Read/write Encoder 1 (Ec.38)

With Ec.38 the parameter are read/write from/to the encoder.

Bit	Value	Function
0	1	Reading out of the parameters. Then the parameter is reset.
1	2	Storing of the parameters in the encoder (only with supervisor-password and in nOP status)
2	4	Automatic reading out of the parameters when connecting a new encoder (loading after acknowledgement with Ec.0 and default values)

At F5-S bit 2 is default-moderately set, not at F5-M and F5-G. Thus at F5-S encoder data are reading out after default loading.

3. Line length

The maximum line length 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 input I _{max} : see encoder description	
Supply voltage U: 5,25V	
min. supply voltage U _{min} : 4,75V	
KEB encoder cable resistance R: 0,036 Ω/m	



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