

X4, Encoder 1

Technical description of connector

Illustration:

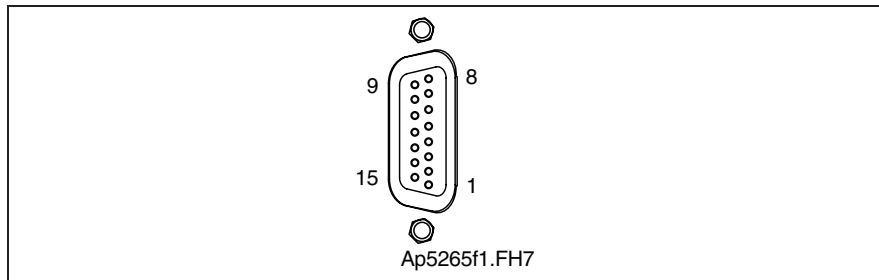


Fig. 4-81: Connector X4

Design:

Type	No. of pins	Design
D-SUB	15	bushing on unit

Fig. 4-82: Design

Connection cross section:

Cross section single wire [mm ²]	Cross section multi core wire [mm ²]	Cross section in AWG gauge no.:
--	0.25-0.5	--

Fig. 4-83: Connection cross section

Encoder 1

Connection
Encoder 1:

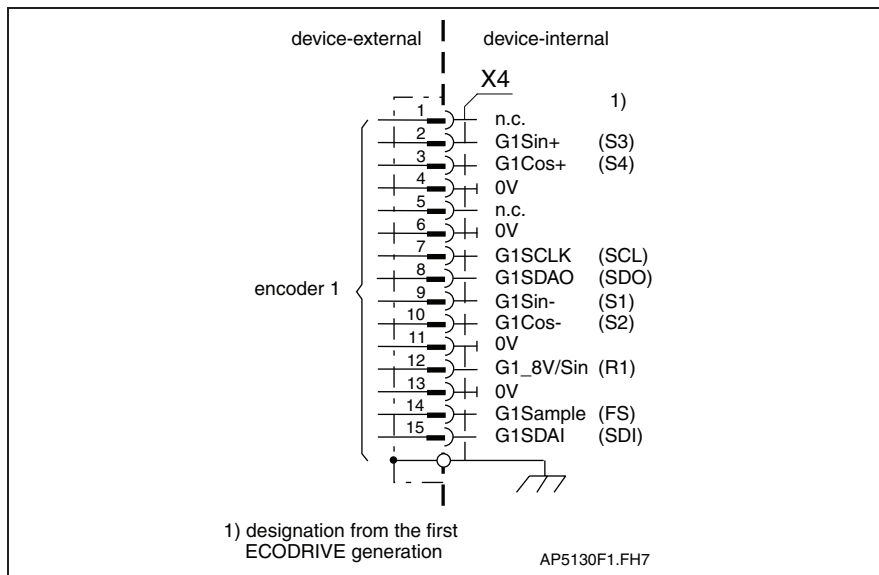


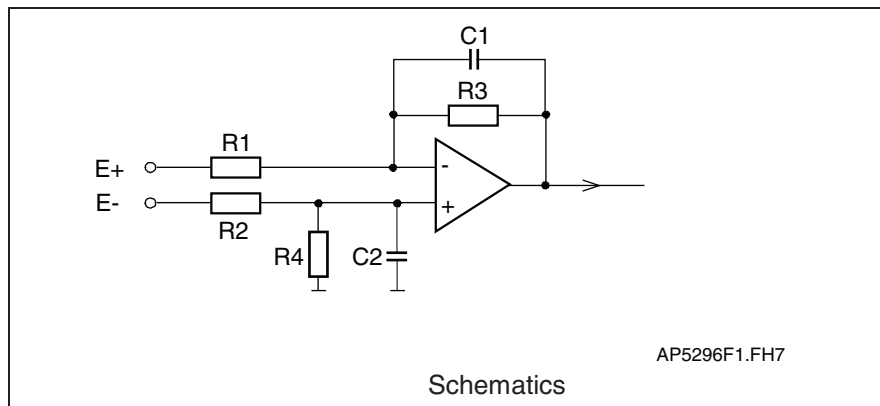
Fig. 4-84: Encoder 1

Shield connection: Via D-subminiature mounting screws and metal connector housing.

G1SCLK: Clock lead for I²C interface

G1SDAO, G1SDAI: Data lead for I²C interface

G1Sample: Control signal for encoder initialization

G1Sin+ (S3), G1Sin- (S1): Input circuit G1Sin+ (S3), G1Sin- (S1):

R1: 10k
 R2: 10k
 R3: 20k
 R4: 20k
 C1: no data
 C2: no data

Fig. 4-85: Input circuit

Features of the differential input circuit G1Sin+ (S3), G1Sin- (S1):

	Digital servo feedback	Resolver
max. allowed amplitude encoder signal	(1,0 + 0,1) Vss	9,0 Vss
Evaluation AD converter	12 Bit	12 Bit
Limit frequency	75 kHz	--
Input resistance	20k ± 5%	

Fig. 4-86: Features of the differential input circuit

G1Cos+ (S4), G1Cos- (S2): See G1Sin+ (S3), G1Sin- (S1)

G1_8V/Sin: Features of the encoder output amplifier stage G1_8V/Sin:

	Digital servo feedback	Resolver
Output voltage	8 V _{DC} ± 0,2V	18,2 Vss (sine with 4 kHz)
max. output current	DC 250 mA	AC 70 mA eff.
min. DC resistance of the load	--	35 R

Fig. 4-87: Features of the encoder output amplifier stage

Signal allocation to the actual position value

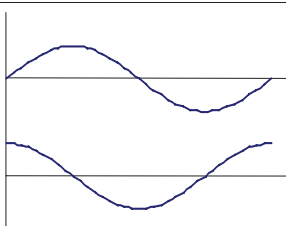
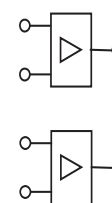
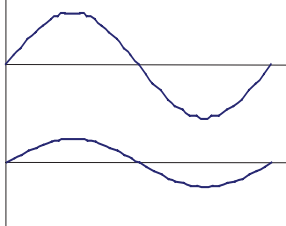
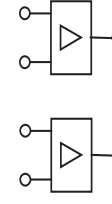
Signal allocation (X4)	signal designation	signal form	actual position value (with default setting)
	G1Sin+(S3) G1Sin- (S1) G1Cos+(S4) G1Cos- (S2)	 DSF (sine 1 Vss without 120 Ohm matching resistor, I²C-Bus)	increasing
 amplitude-modulated signal	G1Sin+(S3) G1Sin- (S1) G1Cos+(S4) G1Cos- (S2)	 Resolver	increasing

Fig. 4-88: Signal allocation to the actual position value

Note: default setting:
 => see firmware functional description: "Motor Encoder"
 (Encoder 1).

Connecting the Measuring System

See page 1-4: "An Overview of Measuring Systems Supported".

X8, Encoder 2

Technical description of connector

Illustration:

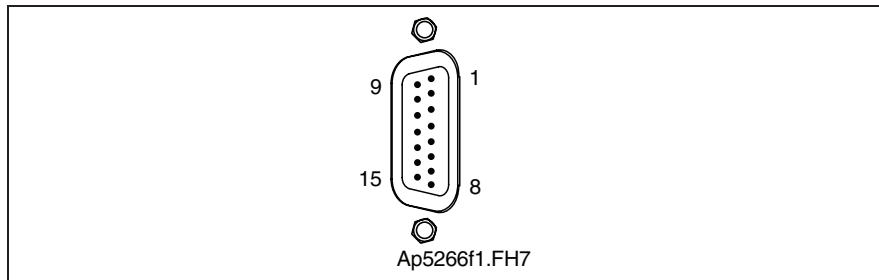


Fig. 4-110: Connector X5

Design:

Type	No. of pins	Design
D-SUB	15	Pins on unit

Fig. 4-111: Design

Connection cross section:

Cross section single wire [mm ²]	Cross section multi core wire [mm ²]	Cross section in AWG gauge no.:
--	0.25-0.5	--

Fig. 4-112: Connection cross section

Encoder 2

Connection
Encoder 2:

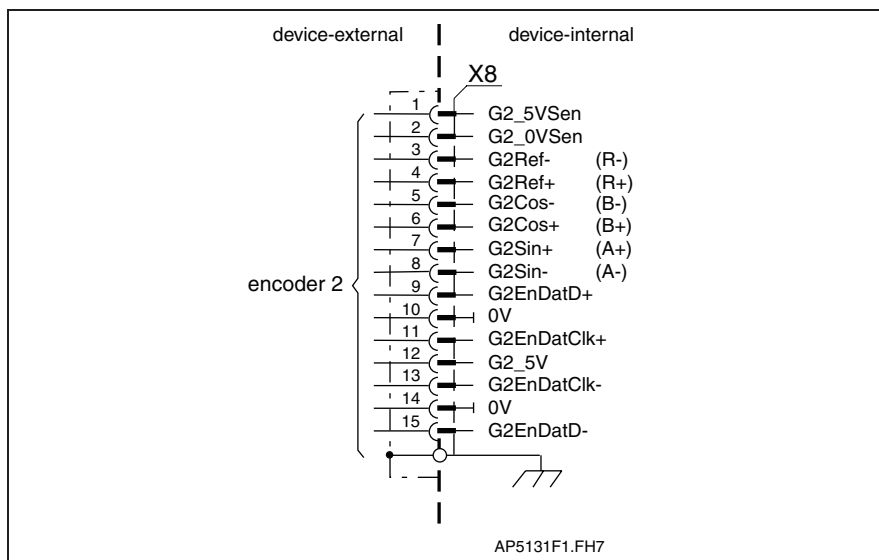
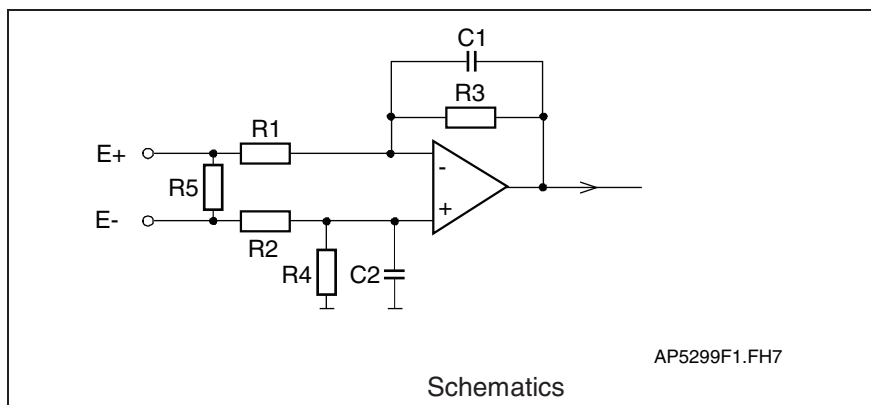


Fig. 4-113: Encoder 2

Shield connection: Via D-subminiature mounting screws and metal connector housing.

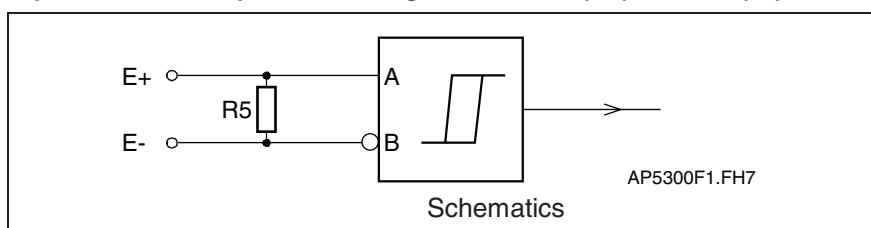
G2EnDat+, G2EnDat-: Differential signal of the EnDat Data lead.

G2EnDatClk+, G2EnDatClk-: Differential signal of the EnDat Pulse lead.

G2Sin+ (A+), G2Sin- (A-): Input circuit for sine signals G2Sin+ (A+), G2Sin- (A-):

R1: no data
 R2: no data
 R3: no data
 R4: no data
 R5: 120R
 C1: no data
 C2: no data

Fig. 4-114: Input circuit for sine signals

Input circuit for square-wave signals G2Sin+ (A+), G2Sin- (A-):

R5: 120R

Fig. 4-115: Input circuit for square-wave signals

Features of the differential input G2Sin+ (A+), G2Sin- (A-):

Sine encoder:

	Input voltage
max. allowed amplitude encoder signal ($U_{\text{SEncoder signal}}$)	(1,0 + 0,2) V _{SS}
Evaluation AD converter	12 Bit
Limit frequency	200 kHz
Input resistance	120 R
Resolution over a encoder cycle	See the following note

Fig. 4-116: Features of the differential input (Sine encoder)

Note: Resolution over a period under the assumption of the following conditions:

- Differential signal $1.0V_{\text{SS}}$
- Reference voltage for the differential signal 2.7 V
- $$\frac{\text{Position resolution}}{\text{Encoder cycle}} = \frac{2^{12}}{1,2V_{\text{SS}}} \cdot U_{\text{SEncodersignal}}$$

Example: If $U_{\text{SEncoder signal}} = 1\text{ V}_{\text{SS}}$

$$\frac{\text{Position resolution}}{\text{Encoder cycle}} = \frac{2^{12}}{1,2V_{\text{SS}}} \cdot 1V_{\text{SS}} = 6826$$

=> see also firmware functional description "Optional encoder" (Encoder 2)

Square-wave encoder

	Input voltage	
Signal amplitude nominal: (referencing unit ground)	min.	max.
High	> 2.4 V	5 V
Low	0 V	< 0,8 V
Limit frequency	200 kHz	
Input resistance	120 R	

Fig. 4-117: Features of the differential input (Square-wave encoder)

G2Ref+ (R+), G2Ref- (R-): See "G2Sin+ (A+), G2Sin- (A-):"

G2Cos+ (B+), G2Cos- (B-): See "G2Sin+ (A+), G2Sin- (A-):"

G2_5VSen, G2_0VSen: Returning encoder supply to amplifier so that encoder cable can be regulated and 5V are pending at the encoder independent of cable length.

G2_5V: Features of the encoder output amplifier stage G2_5V:

Output voltage:	5 V _{DC}
max. output current:	300 mA

Fig. 4-118: Features of the encoder output amplifier stage

Signal allocation to the actual position value

Signal allocation (X8)	signal designation	signal form	actual position value (with default setting)
	G2Sin+(A+) G2Sin- (A-) G2Cos+(B+) G2Cos- (B-) G2Ref+(R+) G2Ref- (R-)	sine (1V_{ss}) without absolute value (e.g. gearwheel encoder)	reducing
	G2Sin+(A+) G2Sin- (A-) G2Cos+(B+) G2Cos- (B-) G2Ref+(R+) G2Ref- (R-)	square (TTL) without absolute value	reducing
	G2Sin+(A+) G2Sin- (A-) G2Cos+(B+) G2Cos- (B-)	sine (1 V_{ss}) with absolute value (e.g. EnDat)	increasing

Fig. 4-119: Signal allocation to the actual position value

Note:

Default setting:
=> see firmware functional description "Optional encoder" (Encoder 2)

Allowed encoder cable lengths

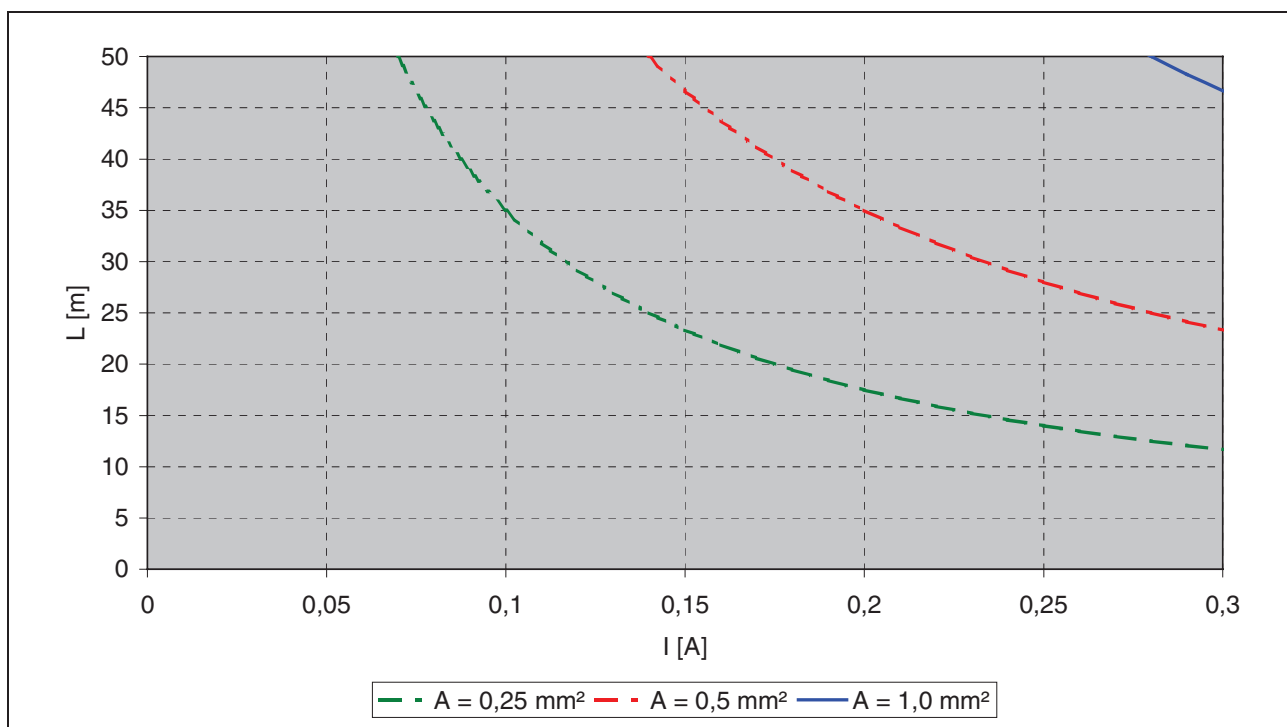
Selecting wire cross sections

Note: The current consumption of the connected encoder systems generates a voltage drop due to the resistivity (dependent upon the wire cross sections and lengths) of the wire. This reduces the signal at the encoder input.

To compensate the voltage drop, the DKC can influence the encoder power source. Using a voltage sensor, the available voltage at the encoder is known.

⇒ For a given wire length and encoder current consumption, a minimum cross section becomes necessary. This relationship is illustrated below.

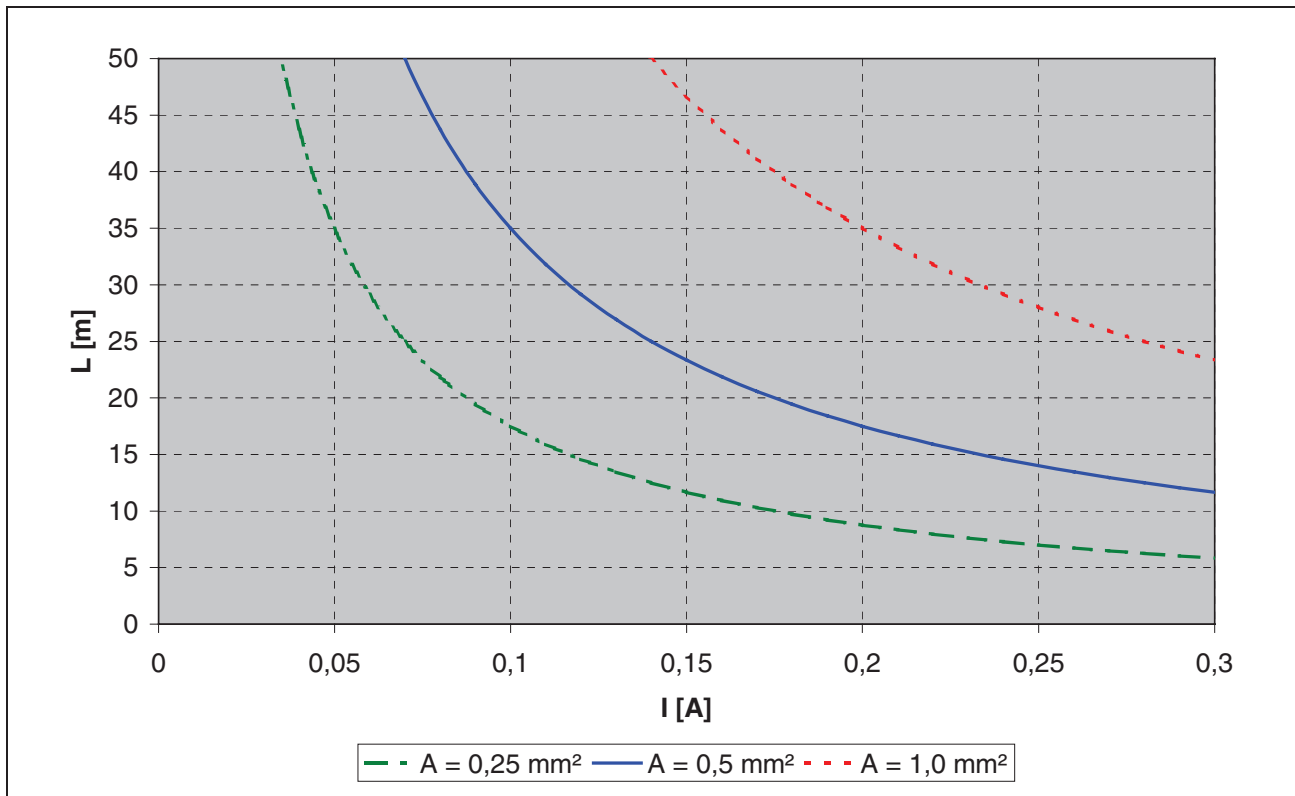
1. With sensor connection in the encoder lead



L: cable length
I: current
A: wire cross sections

Fig. 4-120: With sensor connection

2. Without sensor connection in the encoder lead



L: cable length
 I: current
 A: wire cross sections

Fig. 4-121: Without sensor connection

Measuring Systems Connections

See page 1-4: "An Overview of Measuring Systems Supported".