SEW EURODRIVE

Manual

MOVIDRIVE® Modular, MOVIDRIVE® System

CES11A Multi-Encoder Card

Edition 03/2016

22747850/EN

Table of contents

22747850/EN – 03/2016

22747850/EN – 03/2016

1 General information

1.1 About this documentation

This documentation is an integral part of the product. The documentation is intended for all employees who perform assembly, installation, startup, and service work on the product.

Make sure this documentation is accessible and legible. Ensure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it. If you are unclear about any of the information in this documentation or require further information, contact SEW-EURODRIVE.

1.2 Structure of the safety notes

1.2.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries.
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries.
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the drive system or its environment.
INFORMATION	Useful information or tip: Simplifies handling of the drive system.	

22747850/EN – 03/2016

1.2.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard
	Warning of dangerous electrical voltage
	Warning of hot surfaces
	Warning of risk of crushing
	Warning of suspended load
	Warning of automatic restart

1.2.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

⚠ **SIGNAL WORD** Type and source of hazard. Possible consequence(s) if disregarded. Measure(s) to prevent the hazard.

22747850/EN – 03/2016

1.3 Rights to claim under limited warranty

Read the information in this documentation. This is essential for fault-free operation and fulfillment of any rights to claim under limited warranty. Read the documentation before you start working with the unit!

1.4 Exclusion of liability

Read the information in this documentation, otherwise safe operation is impossible. You must comply with the information contained in this documentation to achieve the specified product characteristics and performance features. SEW-EURODRIVE assumes no liability for injury to persons or damage to equipment or property resulting from non-observance of these operating instructions. In such cases, SEW-EURODRIVE assumes no liability for defects.

1.5 Other applicable documentation

This documentation supplements the operating instructions of the application inverters MOVIDRIVE® modular and MOVIDRIVE® system.

This documentation may only be used in combination with the operating instructions of the application inverters MOVIDRIVE® modular and MOVIDRIVE® system.

1.6 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.7 Copyright notice

22747850/EN – 03/2016

2 Safety notes

2.1 Safety functions

The MOVIDRIVE® modular and MOVIDRIVE® system drive inverters may not perform safety functions without higher-level safety systems. Use higher-level safety systems to ensure protection of equipment and personnel.

2.2 Lifting applications

Do not use MOVIDRIVE® modular and MOVIDRIVE® system drive inverters for any safety functions in conjunction with lifting applications.

Use monitoring systems or mechanical protection devices as safety equipment to avoid possible damage to property or injury to people.

22747850/EN – 03/2016

3 System description

3.1 Fields of application

The CES11A multi-encoder card expands the MOVIDRIVE® modular and MOVIDRIVE® system application inverters by an additional encoder connection.

This offers the following possibilities:

- The encoder can be used as distance encoder or as motor encoder.
- When an absolute encoder is used, no reference travel is required at startup or in case of a power failure.
- Positioning is either performed directly with the external encoder or with the motor encoder.
- When an external encoder is used (even without motor encoder feedback), no positioning switches are required at the travel path.
- Free processing of the absolute position in a higher-level controller.
- The external encoder can be mounted either on the motor or along the track.
- Simple encoder integration with user-guided startup.
- Multi-motor operation for 2 motors that are not operational at the same time.

3.2 Supported encoder types

The following encoder types can be evaluated by the CES11A multi-encoder card:

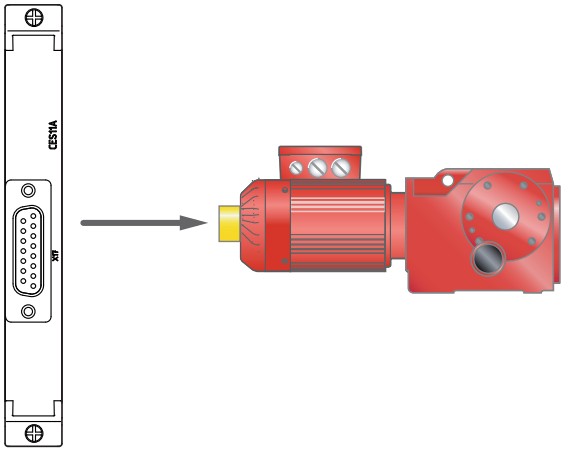
HTL 12/24 V (differential)
TTL/RS422 (differential)
SIN/COS 1 V_{SS} (differential)
HIPERFACE® with SIN/COS signals 1 V_{SS}
SEW encoder (RS485) with SIN/COS signals 1 V_{SS}, e.g. AS7W, AG7W
EnDat 2.1 with SIN/COS signals 1 V_{SS}
SSI encoder with/without SIN/COS signals 1 V_{SS}
CANopen encoder

22747850/EN – 03/2016

3.3 Application examples

3.3.1 Absolute positioning with combi encoders (HIPERFACE®, SSI, EnDat)

Apart from an incremental signal (SIN/COS, TTL, HTL) for speed control, combi encoders also have a signal for the absolute position. This absolute position is usually transmitted via a serial interface. There are combi encoders with different transmission protocols such as HIPERFACE®, SSI or EnDat.



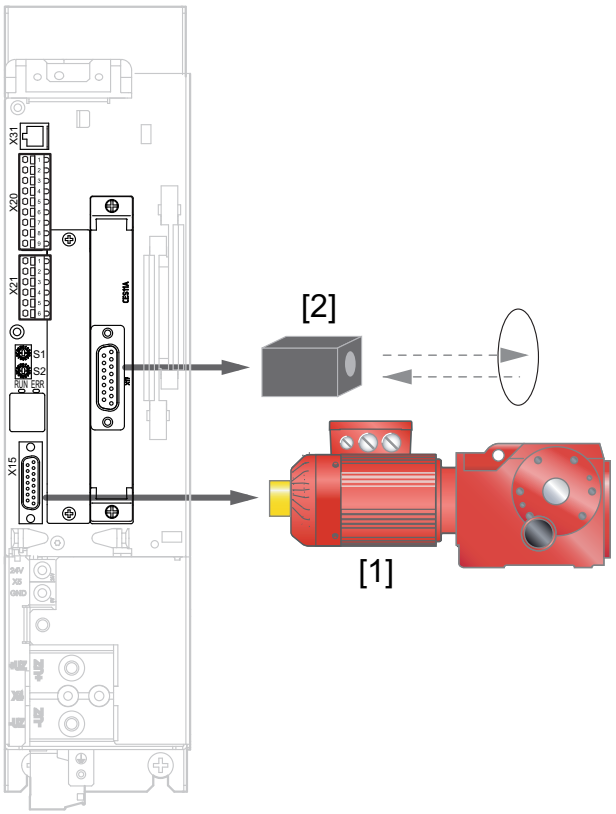
17071096715

This system is ideal for applications with rigid coupling to measure distances. The major advantage is that no additional encoder is required for the track.

22747850/EN – 03/2016

3.3.2 Absolute positioning with synchronous encoder

With systems subject to slip, it is not possible to detect the position via the motor encoder. This is why an additional measuring system is required for the track. Measuring systems can be laser distance encoders, barcode encoders, draw-wire encoders or length scales. One advantage of measuring the length directly at the track can for example be that temperature-related length changes are also detected.



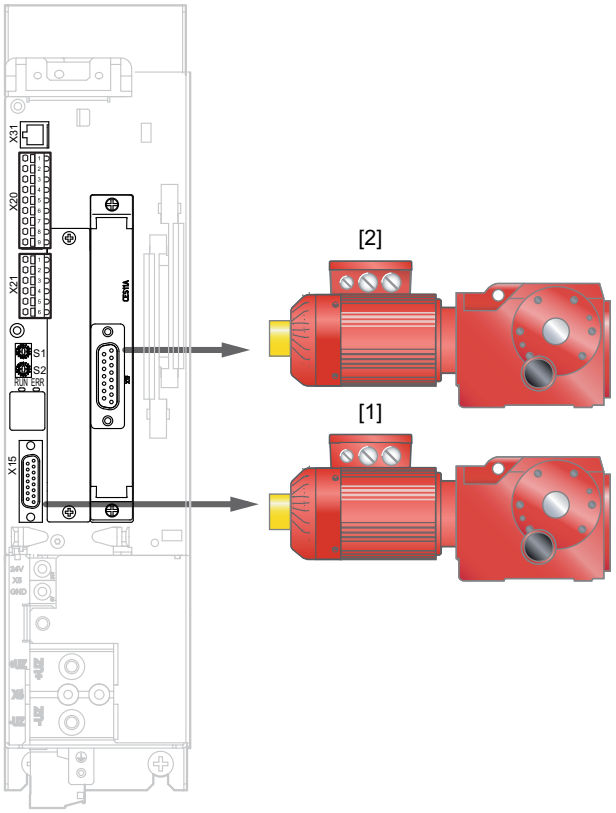
17071100043

[1] Motor encoder on X15 of the basic unit

[2] Distance encoder on X17 of the CES11A multi-encoder card

Ideally, for asynchronous motors a SIN/COS encoder is used as motor encoder in this case. For synchronous motors, you should use a resolver. The motor encoder is connected to the X15 of the basic unit. The distance encoder is connected to the X17 of the CES11A multi-encoder card.

3.3.3 Multi-motor operation with parameter set changeover



17426208395

[1] Motor encoder 1 on X15 of the basic unit

[2] Motor encoder 2 on X17 of the CES11A multi-encoder card

When an additional CES11A multi-encoder card is plugged in the axis module, 2 motor encoders can be connected to an MDA single-axis module.

The encoder assignment is performed via the MOVISUITE® engineering software.

Depending on the activated parameter set, power must be connected to the individual motor via power contactors.

22747850/EN – 03/2016

3.4 Suitable encoders

Manufacturer	Designation	Interface	Encoder type
Balluff	BTL5-S112	SSI	Linear
Balluff	BTL5-S112B	SSI	Linear
Dimetix	FLS-C 10	SSI	Linear
Elgo	LIMAX2	SSI	Linear
Heidenhain	ECN113	EnDat2.1	Rotational
Heidenhain	ECN1313	EnDat2.1	Rotational
Heidenhain	EQN1125	EnDat2.1	Rotational
Heidenhain	EQN1325	EnDat2.1	Rotational
Heidenhain	EQN425	EnDat2.1	Rotational
Heidenhain	ROQ425 ATEX EnDat	EnDat2.1	Rotational
Heidenhain	ROQ425 EnDat	EnDat2.1	Rotational
Heidenhain	ROQ424	SSI combi encoder	Rotational
Heidenhain	ROQ425 ATEX	SSI combi encoder	Rotational
Hübner	HMG161 S24 H2048	SSI	Rotational
Hübner	AMG73 S24 S2048	SSI combi encoder	Rotational
Hübner	AMG83 S24 S2048	SSI combi encoder	Rotational
IVO	GM 401	SSI	Rotational
Kuebler	Kueb 9081xxxx2003	SSI	Rotational
Kuebler	Kueb 9081xxxx2004	SSI	Rotational
Leuze	AMS 200-xxx-11-x	SSI	Linear
Leuze	AMS 304i-xxx (H)	SSI	Linear
Leuze	BPS 37	SSI	Linear
Leuze	OMS1 0.1 mm	SSI	Linear
Leuze	OMS1 1 mm	SSI	Linear
Leuze	OMS2 0.1 mm	SSI	Linear
MTS Sensors	RD4 0,005 mm	SSI	Linear
MTS Sensors	RF 0,005 mm	SSI	Linear
MTS Sensors	RH 0,005 mm	SSI	Linear
MTS Sensors	RP 0,005 mm	SSI	Linear
Pepperl+Fuchs	WCS3B LS410	CANopen	Linear
Pepperl+Fuchs	PCV80S-F200-SSI 0.1 mm	SSI	Linear
Pepperl+Fuchs	PCV80S-F200-SSI 1 mm	SSI	Linear
Pepperl+Fuchs	VDM100-150 0.1 mm	SSI	Linear
Pepperl+Fuchs	VDM100-150 1 mm	SSI	Linear
Pepperl+Fuchs	WCS2(A)-LS311	SSI	Linear
Pepperl+Fuchs	WCS3(A)-LS311	SSI	Linear
Pepperl+Fuchs	WCS3B-LS311	SSI	Linear
Pepperl+Fuchs	AVM58X-1212	SSI combi encoder	Rotational
SEW-EURODRIVE	AF1H	HIPERFACE	Rotational
SEW-EURODRIVE	AG7W	RS485	Rotational
SEW-EURODRIVE	AG7Y	SSI combi encoder	Rotational
SEW-EURODRIVE	AK0H	HIPERFACE	Rotational
SEW-EURODRIVE	AL1H	HIPERFACE	Linear
SEW-EURODRIVE	AS1H	HIPERFACE	Rotational
SEW-EURODRIVE	AS3H	HIPERFACE	Rotational
SEW-EURODRIVE	AS4H	HIPERFACE	Rotational
SEW-EURODRIVE	AS7H	HIPERFACE	Rotational
SEW-EURODRIVE	AK1H	HIPERFACE	Rotational
SEW-EURODRIVE	AV1H	HIPERFACE	Rotational
SEW-EURODRIVE	AV6H	HIPERFACE	Rotational
SEW-EURODRIVE	AS7W	RS485	Rotational
SEW-EURODRIVE	EF1H	HIPERFACE	Rotational

22747850/EN – 03/2016

Manufacturer	Designation	Interface	Encoder type
SEW-EURODRIVE	EK0H	HIPERFACE	Rotational
SEW-EURODRIVE	EK1H	HIPERFACE	Rotational
SEW-EURODRIVE	ES1H	HIPERFACE	Rotational
SEW-EURODRIVE	ES2H	HIPERFACE	Rotational
SEW-EURODRIVE	ES3H	HIPERFACE	Rotational
SEW-EURODRIVE	ES4H	HIPERFACE	Rotational
SEW-EURODRIVE	ES7H	HIPERFACE	Rotational
SEW-EURODRIVE	EV1H	HIPERFACE	Rotational
SEW-EURODRIVE	AS7Y	SSI combi encoder	Rotational
SEW-EURODRIVE	EH1S	SIN/COS	Rotational
SEW-EURODRIVE	EH7S	SIN/COS	Rotational
SEW-EURODRIVE	ES1S	SIN/COS	Rotational
SEW-EURODRIVE	ES2S	SIN/COS	Rotational
SEW-EURODRIVE	AV7W	RS485	Rotational
SEW-EURODRIVE	EV1S	SIN/COS	Rotational
SEW-EURODRIVE	EV2S	SIN/COS	Rotational
SEW-EURODRIVE	EV7S	SIN/COS	Rotational
SEW-EURODRIVE	AH7Y	SSI	Rotational
SEW-EURODRIVE	AV7Y	SSI combi encoder	Rotational
SEW-EURODRIVE	EG7S	SIN/COS	Rotational
SEW-EURODRIVE	AV1Y	SSI combi encoder	Rotational
SEW-EURODRIVE	AV2Y	SSI combi encoder	Rotational
SEW-EURODRIVE	ES7S	SIN/COS	Rotational
SEW-EURODRIVE	EG7C	HTL	Rotational
SEW-EURODRIVE	EG7R	TTL	Rotational
SEW-EURODRIVE	EG7T	TTL	Rotational
SEW-EURODRIVE	EH1C	HTL	Rotational
SEW-EURODRIVE	EH1R	TTL	Rotational
SEW-EURODRIVE	EH1T	TTL	Rotational
SEW-EURODRIVE	EH7C	HTL	Rotational
SEW-EURODRIVE	EH7R	TTL	Rotational
SEW-EURODRIVE	EH7T	TTL	Rotational
SEW-EURODRIVE	EI71	HTL	Rotational
SEW-EURODRIVE	EI72	HTL	Rotational
SEW-EURODRIVE	EI76	HTL	Rotational
SEW-EURODRIVE	EI7C	HTL	Rotational
SEW-EURODRIVE	EI7C-FS	HTL	Rotational
SEW-EURODRIVE	ES1C	HTL	Rotational
SEW-EURODRIVE	ES1R	TTL	Rotational
SEW-EURODRIVE	ES1T	TTL	Rotational
SEW-EURODRIVE	ES2C	HTL	Rotational
SEW-EURODRIVE	ES2R	TTL	Rotational
SEW-EURODRIVE	ES2T	TTL	Rotational
SEW-EURODRIVE	ES7C	HTL	Rotational
SEW-EURODRIVE	ES7R	TTL	Rotational
SEW-EURODRIVE	EV1C	HTL	Rotational
SEW-EURODRIVE	EV1R	TTL	Rotational
SEW-EURODRIVE	EV1T	TTL	Rotational
SEW-EURODRIVE	EV2C	HTL	Rotational
SEW-EURODRIVE	EV2R	TTL	Rotational
SEW-EURODRIVE	EV2T	TTL	Rotational
SEW-EURODRIVE	EV7C	HTL	Rotational
SEW-EURODRIVE	EV7R	TTL	Rotational
SIKO	MSA1000	SSI	Linear

22747850/EN – 03/2016

Manufacturer	Designation	Interface	Encoder type
Sick	DME4000-xx9 0.1 mm	CANopen	Linear
Sick	DME4000-xx9 1 mm	CANopen	Linear
Sick	DME4000-xx7 / DME5000-xx7	HIPERFACE	Linear
Sick	AFM60B	SSI	Rotational
Sick	AFM60E	SSI	Rotational
Sick	DME3000-111	SSI	Linear
Sick	DME5000-1x1 0.1 mm	SSI	Linear
Sick	DME5000-1x1 1 mm	SSI	Linear
Sick	OLM100-1001 0.1 mm	SSI	Linear
Sick/Stegmann	LinCoder L 230	HIPERFACE	Linear
Sick/Stegmann	SKM 36	HIPERFACE	Rotational
Sick/Stegmann	SKS 36	HIPERFACE	Rotational
Sick/Stegmann	SRM 50	HIPERFACE	Rotational
Sick/Stegmann	SRM 60	HIPERFACE	Rotational
Sick/Stegmann	SRM 64	HIPERFACE	Rotational
Sick/Stegmann	SRS 50	HIPERFACE	Rotational
Sick/Stegmann	SRS 60	HIPERFACE	Rotational
Sick/Stegmann	SRS 64	HIPERFACE	Rotational
Sick/Stegmann	AL2H (TTK70) (only after consultation with SEW-EURODRIVE)	HIPERFACE	Linear
Stegmann	AG 100 MSSI	SSI	Rotational
Stegmann	AG 626	SSI	Rotational
Stegmann	ARS60	SSI	Rotational
Stegmann	ATM60	SSI	Rotational
Stegmann	ATM90	SSI	Rotational
Stegmann	POMUX KH53	SSI	Linear
TR Electronic	CE 58M CANopen	CANopen	Rotational
TR Electronic	LE200 CAN 0.1 mm	CANopen	Linear
TR Electronic	LE200 CAN 1 mm	CANopen	Linear
TR Electronic	CE 58M	SSI	Rotational
TR Electronic	CE 65M	SSI	Rotational
TR Electronic	LA41K	SSI	Linear
TR Electronic	LE100 0.1 mm	SSI	Linear
TR Electronic	LE100 1 mm	SSI	Linear
TR Electronic	LE200 0.1 mm	SSI	Linear
Vahle	APOS	SSI	Linear
Visolux	EDM	SSI	Linear
Balluff	BML-S1G0	SSI	Linear
Sick	DL100	SSI	Linear
Sick	DL100Hi	SSI	Linear
Sick	DL50Hi	SSI	Linear
Sick	OLM100-1201 0.1 mm	SSI	Linear

22747850/EN – 03/2016

4 Assembly/Installation instructions

4.1 Before you start

Observe the following notes before installing or removing the CES11A multi-encoder card:

- Disconnect the inverter from the power. Disconnect the DC 24 V supply and the supply system voltage.
- Take appropriate measures to protect the option card from electrostatic charge (use discharge strap, conductive shoes, etc.) before touching it.
- **Before installing** the option card, remove the keypad and the front cover.
- **After installing** the option card, replace the front cover and the keypad.
- Keep the option card in its original packaging until immediately before you are ready to install it.
- Hold the option card by its edges only. Do not touch any of the components.

4.2 Installing the multi-encoder card

The multi-encoder card may be installed in the following inverters:

Inverters	Multi-encoder card CES11A
MOVIDRIVE® modular – Single-axis module	Yes
MOVIDRIVE® modular – Double-axis module	No
MOVIDRIVE® system	Yes

4.3 Installing the multi-encoder card – MOVIDRIVE® modular

Observe the notes in chapter "Electrical Installation" in the inverter operating instructions.

INFORMATION

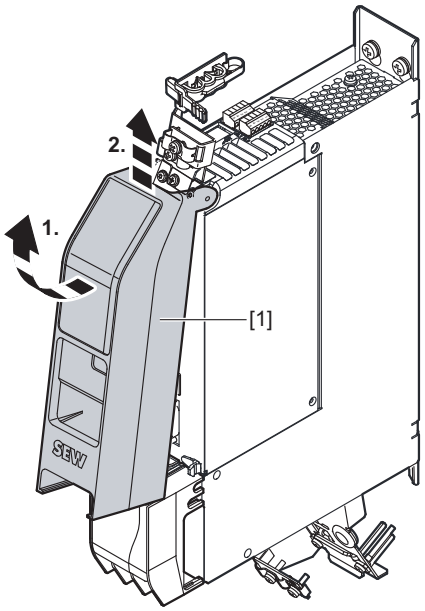
Requirements for installation.

Multi-encoder cards can only be installed in axis modules suitable for option cards.

1. Disconnect the application inverter from the power supply. Disconnect the DC 24 V supply and the line voltage.
2. Ensure electrostatic discharge with suitable measures before starting the work. Suitable measures for equipotential bonding are e.g. the use of a discharge strap or wearing conductive shoes.

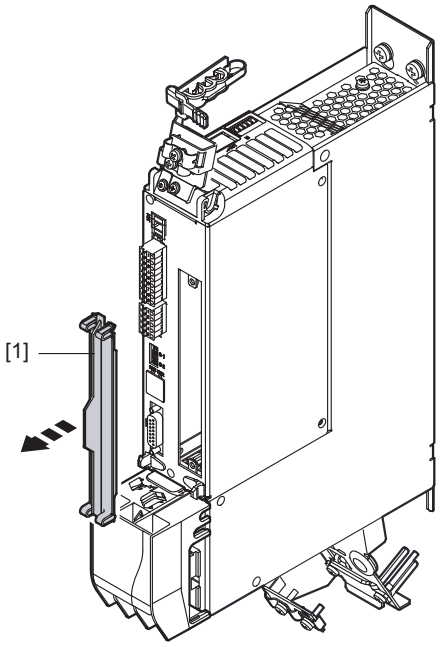
22747850/EN – 03/2016

3. Remove the cover [1] from the front of the application inverter.



18014412495194507

4. Remove the plastic cover [1] at the card slot.

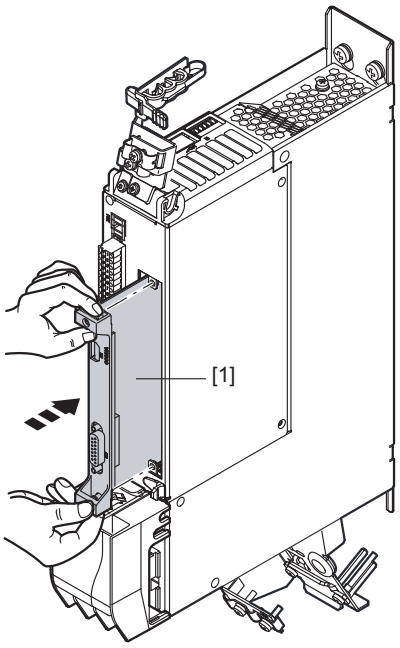


18014412495192075

INFORMATION

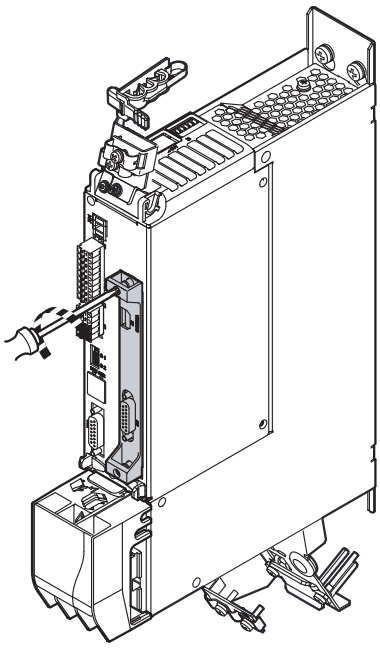
Hold the multi-encoder card by its edges only.

5. Take the multi-encoder card [1] and insert it in the slot with slight pressure.



18014412495196939

6. Screw in the card with the specified tightening torque .



18014412495199371

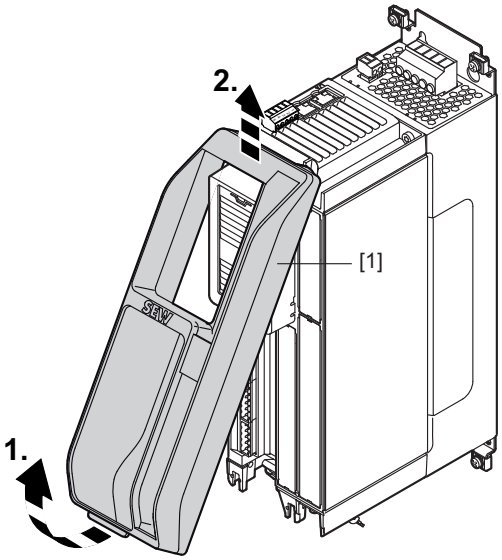
7. Install the cover at the front of the application inverter.

22747850/EN – 03/2016

4.4 Installing the multi-encoder card – MOVIDRIVE® system

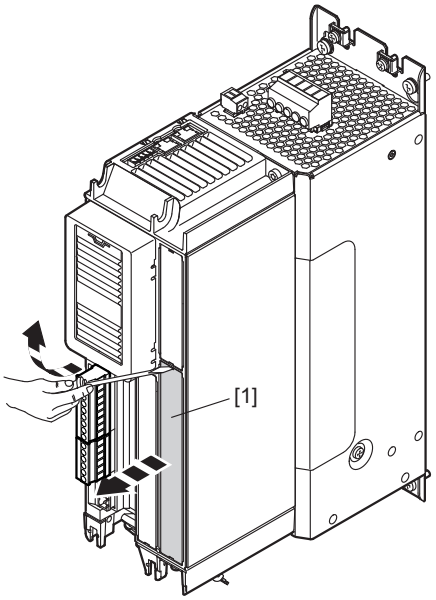
Observe the notes in chapter "Electrical Installation" in the inverter operating instructions.

1. Disconnect the application inverter from the power supply. Disconnect the DC 24 V supply and the line voltage.
2. Ensure electrostatic discharge with suitable measures before starting the work. Suitable measures for equipotential bonding are e.g. the use of a discharge strap or wearing conductive shoes.
3. Remove the cover [1] from the front of the application inverter.



14299394571

4. Remove the plastic cover [1] of the card slot using a screwdriver.

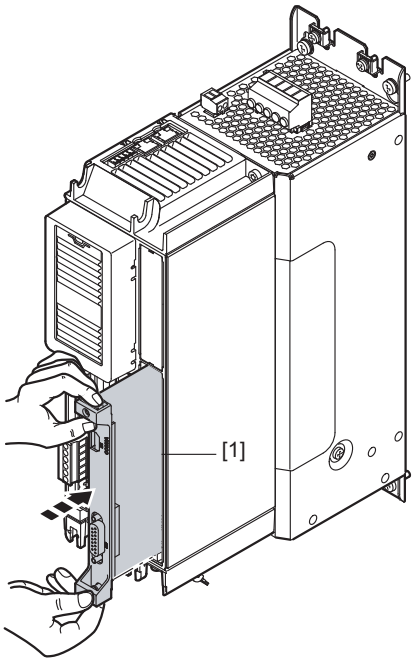


15160620811

INFORMATION

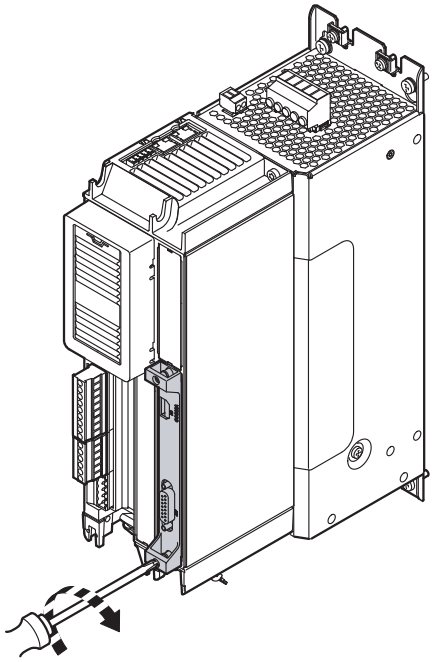
Hold the multi-encoder card by its edges only.

5. Take the multi-encoder card [1] and insert it in the slot with slight pressure.



15160623243

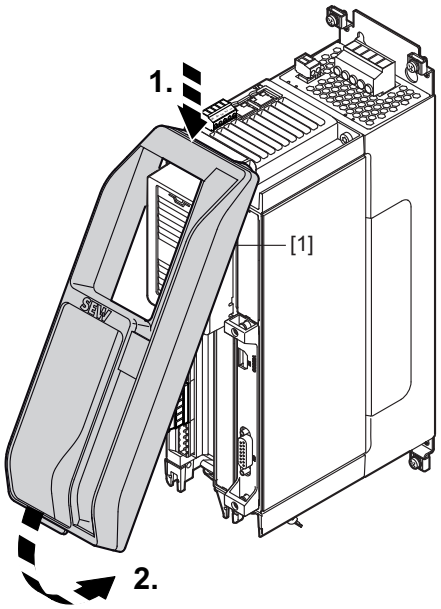
6. Screw in the card with the specified tightening torque .



15160625675

22747850/EN – 03/2016

7. Install the cover [1] at the front of the application inverter.



14578455307

4.5 Connection and terminal assignment

Part number Multi-encoder card type CES11A:

NOTICE

The connections on X17 must not be installed or removed during operation.

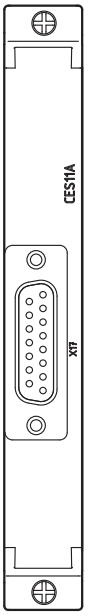
Electrical components in the encoder or on the encoder card could be destroyed.

De-energize the inverter before plugging or removing the encoder connections.

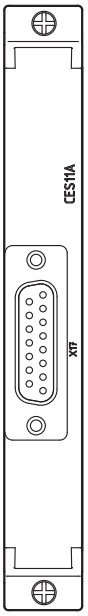
INFORMATION

- The 24 V encoders from SEW-EURODRIVE (except HTL and HIPERFACE®) have a wide voltage range (DC 10 V – 30 V) and can be supplied alternatively with DC 24 V (PIN13) or DC 12 V (PIN15).

4.5.1 Terminal assignment of TTL, HTL, SIN/COS encoder

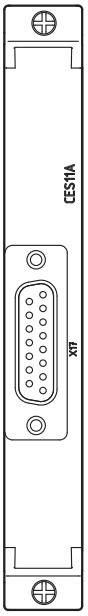
Card	Terminal		Connection	Brief description
		X17:1	A (COS+) (K1)	Signal track A (COS+) (K1)
		X17:2	B (SIN+) (K2)	Signal track B (SIN+) (K2)
		X17:3	C	Signal track C (K0)
		X17:4	Reserved	–
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	$\overline{A}$ (COS-) ($\overline{K1}$)	Negated signal track $\overline{A}$ (COS-) ($\overline{K1}$)
		X17:10	$\overline{B}$ (SIN-) ($\overline{K2}$)	Negated signal track $\overline{B}$ (SIN-) ($\overline{K2}$)
		X17:11	$\overline{C}$	Negated signal track $\overline{C}$ ($\overline{K0}$)
		X17:12	Reserved	–
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

4.5.2 Terminal assignment HIPERFACE® and SEW encoder (RS485)

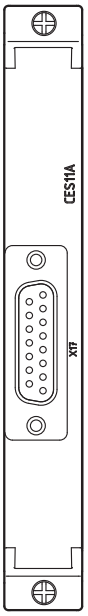
Card	Terminal		Connection	Brief description
		X17:1	A (COS+) (K1)	Signal track A (COS+) (K1)
		X17:2	B (SIN+) (K2)	Signal track B (SIN+) (K2)
		X17:3	Reserved	–
		X17:4	DATA+	Data line RS485
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	$\overline{A}$ (COS-) ($\overline{K1}$)	Negated signal track $\overline{A}$ (COS-) ($\overline{K1}$)
		X17:10	$\overline{B}$ (SIN-) ($\overline{K2}$)	Negated signal track $\overline{B}$ (SIN-) ($\overline{K2}$)
		X17:11	Reserved	–
		X17:12	DATA-	Data line
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

22747850/EN – 03/2016

4.5.3 Terminal assignment EnDat encoder

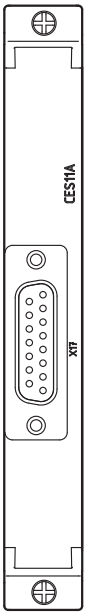
Card	Terminal		Connection	Brief description
		X17:1	A (COS+)	Signal track A (COS+)
		X17:2	B (SIN+)	Signal track B (SIN+)
		X17:3	PULSE+	Clock signal
		X17:4	DATA+	Data line
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	$\overline{A}$ (COS-)	Negated signal track $\overline{A}$ (COS-)
		X17:10	$\overline{B}$ (SIN-)	Negated signal track $\overline{B}$ (SIN-)
		X17:11	PULSE-	Clock signal
		X17:12	DATA-	Data line
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	–
		X17:15	V_{S12VG}	12 V encoder supply

4.5.4 Terminal assignment SSI encoder

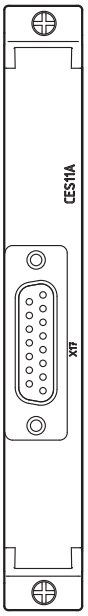
Card	Terminal		Connection	Brief description
		X17:1	Reserved	–
		X17:2	Reserved	–
		X17:3	PULSE+	Clock signal
		X17:4	DATA+	Data line RS485
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	Reserved	–
		X17:10	Reserved	–
		X17:11	PULSE-	Clock signal
		X17:12	DATA-	Data line
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

22747850/EN – 03/2016

4.5.5 Terminal assignment SSI and SIN/COS combination encoders

Card	Terminal		Connection	Brief description
		X17:1	A (COS+)	Signal track A (COS+)
		X17:2	B (SIN+)	Signal track B (SIN+)
		X17:3	PULSE+	Clock signal
		X17:4	DATA+	Data line
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	$\overline{A}$ (COS-)	Negated signal track $\overline{A}$ (COS-)
		X17:10	$\overline{B}$ (SIN-)	Negated signal track $\overline{B}$ (SIN-)
		X17:11	PULSE-	Clock signal
		X17:12	DATA-	Data line
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

4.5.6 Terminal assignment CANopen encoder

Card	Terminal		Connection	Brief description
		X17:1	Reserved	–
		X17:2	Reserved	–
		X17:3	Reserved	–
		X17:4	CAN_H	CAN high data cable
		X17:5	Reserved	–
		X17:6	-TEMP_M	Motor temperature evaluation
		X17:7	Reserved	–
		X17:8	GND	Reference potential
		X17:9	Reserved	–
		X17:10	Reserved	–
		X17:11	Reserved	–
		X17:12	CAN_L	CAN low data cable
		X17:13	V_{S24VG}	24 V encoder supply
		X17:14	+TEMP_M	Motor temperature evaluation
		X17:15	V_{S12VG}	12 V encoder supply

22747850/EN – 03/2016

4.6 Encoder connection

4.6.1 General installation notes

Encoder connection	Description
Connecting socket on the card	15-pole D-sub socket
Maximum encoder cable length	• HTL encoder ES7C and EG7C: 100 m • Standard HTL encoder: 100 m • Other encoders: 100 m, see note [1]
Core cross section	Min. 0.5 mm^2

- [1] The maximum cable length might be reduced depending on the technical data of the respective encoder. Observe the manufacturer specifications.
- Use shielded cables with twisted pair conductors and make sure they are grounded on both ends over a large surface area:
  - At the encoder in the cable gland or in the encoder connector.
  - At the inverter in the housing of the D-sub connector.
  - At the metal clamp on the bottom of the inverter,

    or
  - At the strain relief of MOVIDRIVE® system.
- Route the encoder cable separately from the power cables.

4.6.2 Prefabricated cables for connection at X17 of the multi-encoder card

- For information on how to connect a SEW-EURODRIVE distance encoder, refer to the technology manuals MOVIDRIVE® modular and MOVIDRIVE® system.
- A prefabricated cable with open cable end and conductor end sleeves is available for connecting external distance encoders.

  The cable part number is 18182240.

22747850/EN – 03/2016

5 Project planning

5.1 Absolute encoder selection

When selecting the absolute encoder, the following points should be considered to achieve optimum travel characteristics and good dynamic properties in the system:

- **Position measurement should be conducted without slip.**

  The rotary encoders should be driven with no slip. Avoid all friction wheel connections.

- **Position measurement must be rigid.**

  Avoid elasticity and clearance.

- **The resolution of the position measurement must be as high as possible.**

  The more increments the encoder counts per unit-distance traveled,

  – the more exactly it approaches the target position,

  – and the more rigid the control loop system can be set.

- **The "refresh time" should be less than 1 ms**.

  The "refresh time" is the duration that the absolute encoder needs to determine a new actual position.

  This value exerts a decisive influence on the dynamic characteristics of the drive.

- **The actual position issued by the absolute encoder should not be averaged or filtered.**

  Averaged or filtered values of the actual position lead to a significant reduction of the drive dynamics.

Absolut encoders which can be used with the CES11A multi-encoder card are divided into 3 categories:

- Multi-turn rotary encoders, e.g. TR CE58, CE 65, Sick ATM60
- Laser distance measuring devices, e.g. TR LE200, Sick DME5000
- Linear distance measuring devices, e.g. Leuze BPS37, Pepperl & Fuchs WCS2, Pepperl & Fuchs WCS3

5.1.1 Multi-turn rotary encoders

- Multi-turn rotary encoders are ideally suited in applications with positive power transmission from the motor shaft to the load.

  In this case, the absolute encoder can be mounted onto the motor shaft of the drive. This keeps the installation costs low while the position resolution is generally high due to the gear ratio.

- If the position measurement is performed using an externally mounted rotary encoder (distance encoder), it is essential to make sure the ratio between the motor encoder and the distance encoder is sufficient.

22747850/EN – 03/2016

5.1.2 Laser distance measuring instruments

Distance measurement with laser systems is based on a runtime measurement of pulsed infrared beams. Various measurement values have to be processed in the encoder to determine an accurate position value with this procedure. The result is a delay in position measurement with these systems of up to 50 ms. This delay has a negative effect on the dynamics and positioning accuracy of the drive.

Consider the following points when using and configuring laser distance measuring devices:

- Ensure a vibration-free design when mounting the measurement system, e.g. in case of travel drives for storage/retrieval systems. Install the measuring system on the bottom in this instance because the swinging motion of the tower will otherwise have an adverse effect on the measurement.
- The maximum acceleration of the drive is not to exceed 0.8 m/s^2.
- The encoder characteristics will usually result in a positioning accuracy of ±1 – 3 mm.
- The long delay
  - may demand a drastic velocity precontrol reduction (index 8404.6).
  - may limit the amplification of the position controller (index 8406.1) to small values (0.1 – 0.4). This means high dynamic properties cannot be achieved.
- There is a lag fault which is dependent on the speed, making it harder to monitor the drive (delayed shut-off in the event of a fault).

5.1.3 Material measure by metal rule

The working process of the linear position measuring system equals the process of the multi-turn rotary encoder. There is no averaging, so this system is not subject to a delay in position measurement.

A linear position measuring system offers the following advantages:

- No reduction in dynamic properties.
- Possible velocity precontrol (index 8404.6) of 100 %. No speed dependent lag errors occur.
- The monitoring functions are fully effective; a small lag fault window is possible.

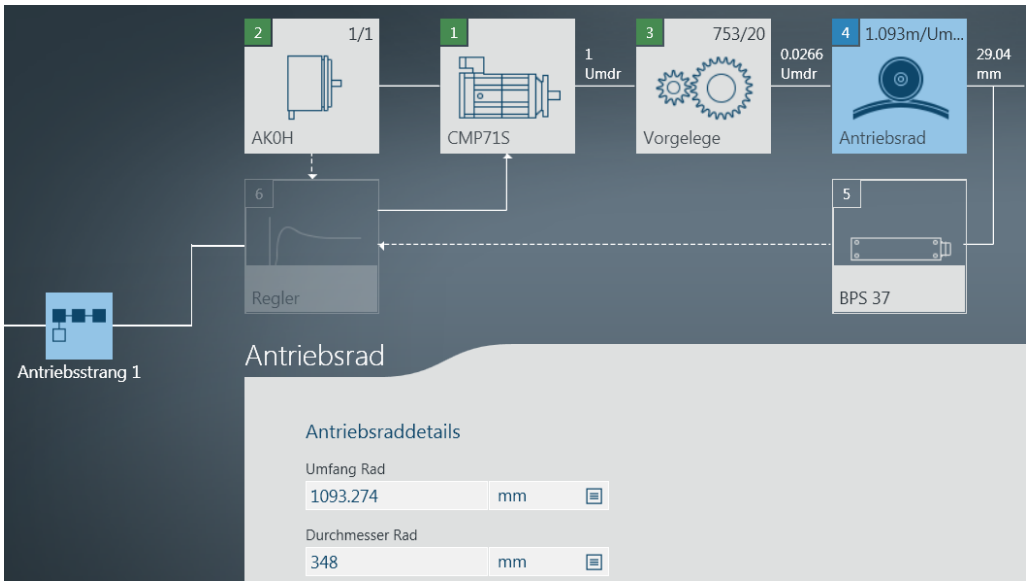
Disadvantages of a linear position measuring system:

- Position resolution of 0.8 mm. The required positioning accuracy should not be less than ± 2 mm.
- Rather complicated mechanical installation due to the need for routing the metal ruler.

22747850/EN – 03/2016

5.1.4 Example: Determining the number of encoder increments per motor revolution

The following example shows, how the amount of generated encoder increments of a distance encoder per motor revolution is determined.



17426501003

Startup via MOVISUITE® engineering software

Specifications:

- Gear ratio: i = 37.65 (753/20)
- Drive wheel diameter: d = 348 mm -> Circumference: U = 1093 mm
- Distance encoder resolution: z = 0.1 mm/increment

How many increments per motor revolution does the linear encoder deliver?

U/(z × i) = 1093 mm / (0.1 mm/incr. × 37.65) = 290 increments/motor revolution

The amount of determined encoder increments per motor revolution is sufficient for a correct application control behavior, when the following criteria are adhered:

- Rigidity setting of the closed loop system = 1.
- Mass inertia ratio $J_{ext}/J_{motor} \leq 20$.
- Dynamics = 0.5 m/s^2.

For an optimal drive control behavior, the amount of generated increments per motor revolution must be high.

If the amount of increments per motor revolution is too low, torque impulses may occur, that additionally stain the mechanics and drive technology, and worsen the control behavior.

Torque impulses of ≤ 10 % of the motor torque can still be accepted, as the control behavior is only minimally affected.

22747850/EN – 03/2016

5.2 Parameterization of the approved encoder

The following points must be observed in the design and construction of encoders and when setting their parameters:

5.2.1 SSI encoder

INFORMATION

The following applies for all parameterizable SSI encoders:

- The interface must be set to "SSI".
- You have to set "24 data bits + error bit" or "0 in bit 25".
- If the plausibility check is active, the plausibility must be set to "Normal = 0".
- If not specified otherwise, the keying must be set the "Gray".

- **HEIDENHAIN ROQ 424 (AV1Y)**

  The SSI version with 10 – 30 V is supported. The type designation specifies all additional conditions.
- **TR CE 58, CE 65, CE 100 MSSI, LE 100 SSI, LE 200, LA 66K-SSI, LA 41K-SSI, ZE 65**
  - Make a setting of 24 data bits and program signal bits to logical 0. Bit no. 25 may either contain 0 or an error or power fail bit. Other special bits following the position will not be evaluated. The 25-bit version is not supported.
  - The output mode must be "Direct".
  - The interface must be set to "SSI".
- **SICK STEGMANN AG100 MSSI, AG626, ATM90, ATM60**

  Only the 24-bit version is supported.
- **SICK STEGMANN ARS60**

  Only the 15-bit version is supported.
- **SICK DME-5000-x111, DME-4000-x111**
  - The interface must be set to "SSI".
  - You have to set "24 data bits + error bit".
  - The resolution must be set to 0.1 mm or 1 mm.
  - The plausibility must be set to "Normal".
- **SICK DL100, DL100Hi**
  - The interface must be set to "SSI".
  - The keying must be set to "Gray".
  - You have to set "24 data bits + error bit".
  - Set the resolution to 0.1 mm.
  - Set parameter "ErrRej" to "Off".
  - Set parameter "AvgDst" to "Medium".
- **SICK DL50Hi**
  - The interface must be set to "SSI".
  - You have to set "24 data bits + error bit".

22747850/EN – 03/2016

  - The resolution must be set to 0.1 mm or 1 mm.
  - Set parameter "AvgDst" to "Fast".
- **SICK OLM100**
  - You have to set "24 data bits + error bit".
  - Set the resolution to 0.1 mm.
- **Pepperl & Fuchs WCS2(A)-LS311, WCS3(A)-LS311**

  The type designation specifies all necessary conditions. The line length to the encoder must not exceed 10 m.
- **Pepperl & Fuchs EDM 30/120/140 - 2347/2440**
  - All modes are supported. Recommendation: Mode 0 (DIP switches 3 and 4 in ON position) or mode 3 (DIP switches 3 and 4 in OFF position) and measuring for triple reflector (DIP switch 2 in OFF position).
- **Pepperl & Fuchs VDM 100-150**
  - The operating mode must be set to mode 3 ([Menu] / [Parameters] / [operating modes] / [Mode 3]).
  - The keying must be set to "Gray".
  - The resolution must be set to 0.1 mm or 1 mm.
- **Pepperl & Fuchs PCV80S-F200 SSI**
  - The keying must be switched to "Binary".
  - The resolution (X and Y) must be set to 0.1 mm.
- **LEUZE AMS200, OMS1, OMS2, BPS37**
  - You have to set "24 data bits + error bit".
  - Set the resolution to 0.1 mm.
- **LEUZE BPS307i**
  - You have to set "24 data bits + error bit".
  - The resolution must be set to 1 mm or 0.1 mm.

22747850/EN – 03/2016

5.2.2 CANopen encoder

- **TR CE 58 CANopen**
  - The termination switch must be set to "ON".
  - The node ID must be set to 1 via the 6-fold DIP switch.
  - The number of increments per revolution must be set to the standard value 4096.
- **TR LE200 CANopen**
  - Terminating resistor for bus termination required.
  - The node ID must be set to 1 via the 8-fold DIP switch.
- **SICK DME-4000-x19**
  - The interface must be set to "CANopen".
  - The node ID must be set to "1".
  - The resolution must be set to 0.1 mm or 1 mm.
  - The plausibility must be set to "Normal".
- **SICK OLM100 CANopen**
  - You have to set "24 data bits + error bit".
  - Set the resolution to 0.1 mm.
- **Pepperl & Fuchs WCS3B-LS410**
  - The node ID must be set to 1 (switches 1 – 6 of the 8-fold DIP switch).
  - The baud rate must be set to 250 kBd (switches 6 – 7 of the 8-fold DIP switch).
  - The transmission mode must be set to "asynchronous 0 ms / 10 ms" (switches 1 – 3 of the 4-fold DIP switch).
  - The data protocol must be set to "data protocol 2" (switch 4 of the 4-fold DIP switch to "on").

5.2.3 HIPERFACE® encoders

- **SICK DME-5000-x17, DME-4000-x17**
  - The interface must be set to "Hiperface®".
  - Set the resolution to 1 mm.
  - The plausibility must be set to "Normal".

22747850/EN – 03/2016

6 Startup

6.1 General startup instructions

INFORMATION

You need the MOVISUITE® SEW-EURODRIVE engineering software for startup.

- The encoder startup must be performed connected to MOVIDRIVE® modular/ MOVIDRIVE® system. The mechanics coupled to the external encoder must be movable via a suitable setpoint and control signal source.

  Ensure that the following steps have been performed correctly:

  – Installation of CES11A multi-encoder card,
  – Wiring,
  – Terminal assignment,
  – Safe disconnection.

6.2 Startup procedure

The startup procedure is specified by the MOVISUITE® engineering software.

22747850/EN – 03/2016

7 Error messages

7.1 Fault 14 Encoder 2

Suberror: 14.1 **Description: Position comparison check**		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Comparison between raw position and track counter faulty with absolute encoders.	- Check the track signal wiring. - Check interference source (e.g. from EMC). - Replace encoder. - Replace card.

Suberror: 14.2 **Description: Unknown encoder type**		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Encoder type not known; not supported by inverter.	- Check encoder type. - Contact SEW-EURODRIVE Service.

Suberror: 14.3 **Description: Invalid data**		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Data on the encoder nameplate invalid (measuring steps / pulses per revolution / multi-turn).	- Check startup parameters. - Possibly, the EnDat encoder cannot be inserted correctly. - Replace encoder.

Suberror: 14.4 **Description: Track measurement**		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Faulty track measurement.	- Switch the unit off/on. - Check wiring. - Check interference source (e.g. from EMC). - Check/replace encoder.

Suberror: 14.5 **Description: Internal warning**		
	Response: Encoder warning	
	Cause	Measure
	- Encoder signals warning status.	- Check wiring. - Check interference source (light beam interrupted, reflector, data cable, etc.). - Clean sensor.

Suberror: 14.6 **Description: Signal level too low**		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Error while monitoring signal level; vector below permitted limit.	- Check wiring. - Check interference source (e.g. from EMC). - Check encoder.

Suberror: 14.7 **Description: Signal level too high**		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Error while monitoring signal level; vector exceeds permitted limit.	- Check the gear ratio of the inserted resolver.

22747850/EN – 03/2016

Suberror: 14.8 Description: Signal level monitoring		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Error while monitoring signal level; vector exceeds permitted limit.	- Check the resolver mounting position.

Suberror: 14.9 Description: Quadrant check		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Error while checking quadrants (sine encoder).	- Switch the unit off/on. - Check wiring. - Check interference source (e.g. from EMC). - Check/replace encoder.

Suberror: 14.10 Description: Position tolerance band monitoring		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Position outside tolerance band.	- Check startup parameters. - Check wiring. - Check interference source (light beam interrupted, reflector, data cable, etc.). - Replace encoder.

Suberror: 14.11 Description: Data timeout		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Timeout of encoder process data.	- Check interference source (e.g. from EMC). - Check startup parameters.

Suberror: 14.12 Description: Emergency		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Encoder sends emergency error message.	- Check interference source (e.g. from EMC). - Check startup parameters.

Suberror: 14.13 Description: Initialization		
	Response: Encoder 2 – latest error	
	Cause	Measure
	- Communication error during initialization.	- Check parameterization. - Check baud rate. - Check node ID. - Check wiring.

Suberror: 14.14 Description: Communication		
	Response: Encoder 2 – latest error	
	Cause	Measure
	Error in communication to the encoder.	- Check voltage supply. - Check interference source (e.g. from EMC). - Check wiring.

22747850/EN – 03/2016

Suberror: 14.15 Description: System error		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Encoder evaluation signals a system error.	- Multi-turn encoder left the configured range. - Check limits. - Check correct settings of encoder numerator/denominator factors. - Check interference source (e.g. from EMC). - Check startup parameters. - Switch the unit off/on. - If the error persists, contact SEW-EURODRIVE Service.

Suberror: 14.16 Description: Permanent high level in data line – critical		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Permanent high level of data signal.	- Check wiring. - Check encoder.

Suberror: 14.17 Description: Permanent high level in data line		
	Response: Encoder 2 – latest error	
	Cause	Measure
	- Permanent high level of data signal.	- Check wiring. - Check encoder.

Suberror: 14.18 Description: Permanent low level in data line – critical		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Permanent low level of data signal.	- Check wiring. - Check encoder.

Suberror: 14.19 Description: Permanent low level in data line		
	Response: Encoder 2 – latest error	
	Cause	Measure
	- Permanent low level of data signal.	- Check wiring. - Check encoder.

Suberror: 14.20 Description: SSI error bit – critical		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Error bit set in SSI protocol.	- Check startup parameters. - Check settings at SSI encoder (error bit). - Check wiring. - Check interference source (light beam interrupted, reflector, data cable, etc.). - Replace encoder.

Suberror: 14.21 Description: SSI error bit		
	Response: Encoder 2 – latest error	
	Cause	Measure
	- Error bit set in SSI protocol.	- Check startup parameters. - Check settings at SSI encoder (error bit). - Check wiring. - Check interference source (light beam interrupted, reflector, data cable, etc.). - Replace encoder.

22747850/EN – 03/2016

Suberror: 14.22 **Description: Internal fault – critical**		
	Response: Encoder 2 – latest critical error	
	Cause	Measure
	- Encoder signals internal fault status.	- Check wiring. - Check interference source (light beam interrupted, reflector, data cable, etc.). - Replace encoder.

Suberror: 14.23 **Description: Internal fault**		
	Response: Encoder 2 – latest error	
	Cause	Measure
	- Encoder signals internal fault status.	- Check wiring. - Check interference source (light beam interrupted, reflector, data cable, etc.). - Replace encoder.

Suberror: 14.24 **Description: Travel range exceeded**		
	Response: Encoder 2 – latest error	
	Cause	Measure
	- The present position mode (8382.10) does not permit a larger travel range.	- Check travel range.

Suberror: 14.25 **Description: Encoder startup**		
	Response: Inhibit output stage	
	Cause	Measure
	- Fatal error during startup.	- Switch the unit off/on.

22747850/EN – 03/2016

8 Technical data

8.1 CES11A multi-encoder card

8.1.1 Voltage supply

The multi-encoder card is supplied by the basic unit.

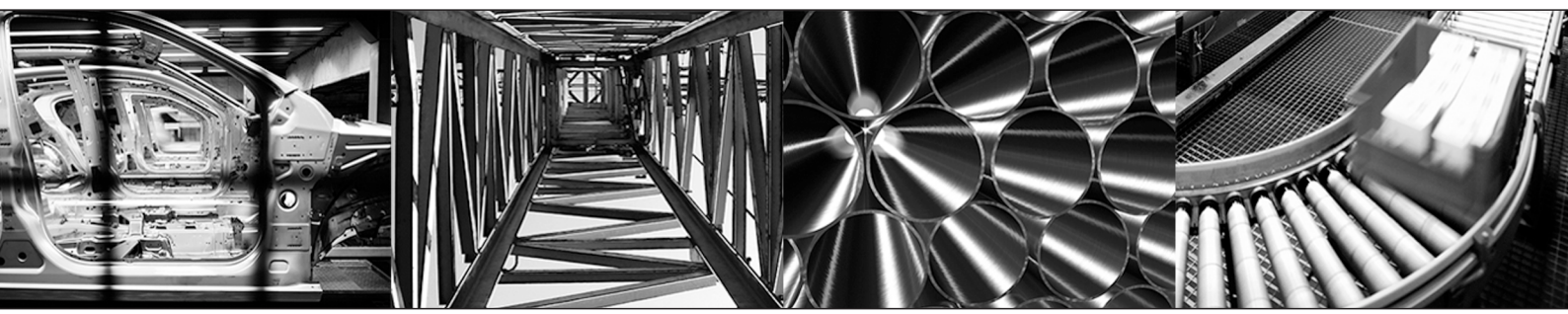
8.1.2 Encoder supply

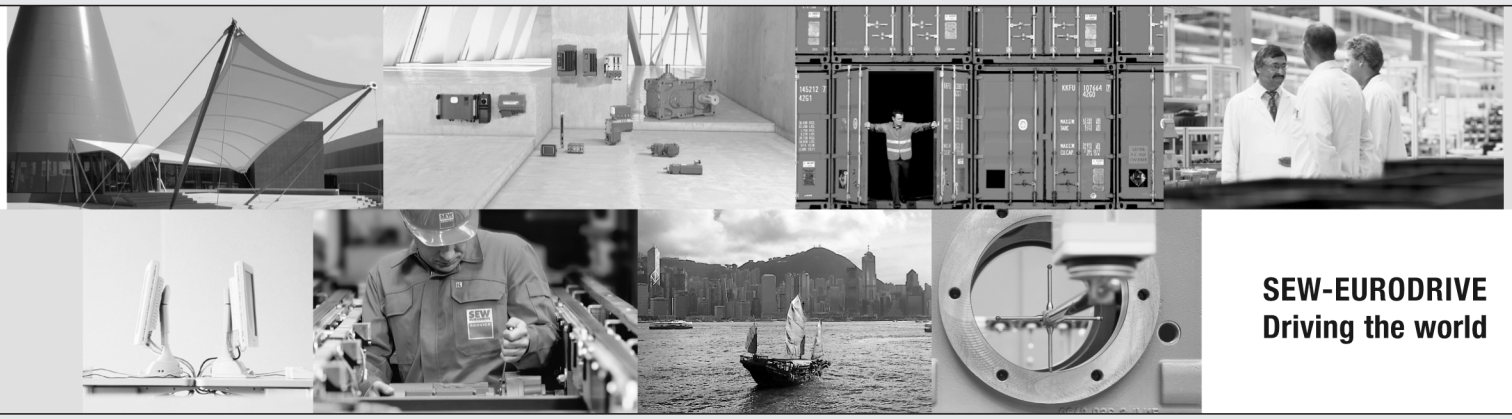
	Terminal designation	Specification
Power consumption		
Nominal power loss 24 V		< 3 W
Operating power		15 W
Encoder supply		
12 V	X17:15	DC 12 V ± 10 %
24 V	X17:13	DC 18 – 30 V
Nominal output current 12 V or 24 V		500 mA
Peak output current I_{max} for 150 µs		1000 mA
Capacitive load		< 220 µF
Inductive load		< 500 µH
Short-circuit protection of 12 V supply		Yes, but a permanent short circuit is not permitted.
Short-circuit protection of 24 V supply		Yes, but a permanent short circuit is not permitted.
Evaluable temperature sensor		TF / TH / KTY84-130 / PT1000

8.1.3 Encoder connection

Encoder connection	Specification
Connection on encoder card end	15-pole D-sub socket
Maximum encoder cable length	- HTL encoder ES7C and EG7C: 100 m - Standard HTL encoder: 100 m - Other encoders: 100 m

22747850/EN – 03/2016





SEW-EURODRIVE
Driving the world

SEW-EURODRIVE GmbH & Co KG
P.O. Box 3023
76642 BRUCHSAL
GERMANY
Phone +49 7251 75-0
Fax +49 7251 75-1970
sew@sew-eurodrive.com
➞ **www.sew-eurodrive.com**