Options for ABB drives

User's manual
FSE-31 pulse encoder interface module

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List of related manuals and guides

Drive hardware manuals	Code (EN)
ACS880-01 hardware manual	*3AUA0000078093*
ACS880-04 hardware manual	*3AUA0000128301*
ACS880-04 single drive module packages hardware manual	*3AUA0000138495*
ACS880-14 and -34 single drive module packages hardware manual	*3AXD50000022021*
ACS880-04XT drive modules (500 to 1200 kW) hardware manual	*3AXD50000025169*
ACS880-07 (45 to 630 kW) hardware manual	*3AUA0000105718*
ACS880-07 (560 to 2800 kW) hardware manual	*3AUA0000143261*
ACS880-17 (160 to 3200 kW) hardware manual	*3AXD50000020436*
ACS880-37 (160 to 3200 kW) hardware manual	*3AXD50000020437*
ACS880-17 (132 to 355 kW) hardware manual	*3AXD50000035158*
ACS880-37 (132 to 355 kW) hardware manual	*3AXD50000035159*
ACS880-104 hardware manual	*3AUA0000104271*
ACS880-107 hardware manual	*3AUA0000102519*

Drive firmware manuals	
ACS880 primary control program firmware manual	*3AUA0000102519*

Option manuals and guides	
ACX-AP-x assistant control panels user's manual	*3AUA0000085685*
FSE-31 pulse encoder interface module user's manual	*3AXD50000016597*
FSO-21 safety functions module user's manual	*3AXD50000015614*

Drive PC tool manuals	
Drive composer start-up and maintenance PC tool user's manual	*3AUA0000094606*
Functional safety design tool user's manual	*3AXD10000102417*

General safety guides	
Functional safety; Technical guide No. 10	*3AUA0000048753*
Safety and functional safety; A general guide	*1SFC001008B0201*
ABB Safety information and solutions	www.abb.com/safety

You can find manuals and other product documents in PDF format on the Internet. See section *Document library on the Internet* on the inside of the back cover. For manuals not available in the Document library, contact your local ABB representative.

User’s manual

FSE-31 pulse encoder interface module

3AXD50000016597 Rev B
EN
EFFECTIVE: 2017-06-19

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Further information

1

Safety

Contents of this chapter

The chapter contains the warning symbols used in this manual and the safety instructions which you must obey when you install or connect an option module to a drive. If you ignore the safety instructions, injury, death or damage can occur. Read this chapter before you start the installation.

Use of warnings

Warnings tell you about conditions which can cause injury or death, or damage to the equipment. They also tell you how to prevent the danger. The manual uses these warning symbols:

Electricity warning tells you about hazards from electricity which can cause injury or death, or damage to the equipment.

General warning tells you about conditions, other than those caused by electricity, which can cause injury or death, or damage to the equipment.

Safety in installation and maintenance

These instructions are for all who install or connect an option module to a drive and need to open its front cover or door to do the work.

WARNING! Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur.

- If you are not a qualified electrician, do not do installation or maintenance work.
- Disconnect the drive from all possible power sources. After you have disconnected the drive, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you continue.
- Disconnect all dangerous voltages connected to other connectors or parts in reach. For example, it is possible that 230 V AC is connected from outside to a relay output of the drive.
- Always use a multimeter to make sure that there are no parts under voltage in reach. The impedance of the multimeter must be at least 1 Mohm.

Note: For the maintenance instructions of the FSE-31 module, see *FSO-21 safety functions module user's manual* (3AXD50000015614 [English]).

2

Introduction to the manual

Contents of this chapter

This chapter introduces this manual.

Applicability

This manual applies to the FSE-31 pulse encoder interface module, revision F.

Compatibility

The FSE-31 pulse encoder interface module is compatible with:

- ACS880 primary control program version 2.21 or later
- FSO-21 safety functions module, revision B or later
- Drive composer pro PC tool, version 1.8 or later.

The supported safety encoder type is:

- differential push-pull HTL encoder.

Target audience

This manual is intended for people who plan the installation, install, start up, use and service the module. Before you do work on the module, read this manual and the applicable drive manual that contains the information for the product in question.

You are expected to know the fundamentals of safety technology, electricity, wiring, electrical components and electrical schematic symbols. The manual is written for readers worldwide. Both SI and imperial units are shown.

General safety system considerations

The FSE-31 module is a part of a safety system. The system builder is responsible for making sure that the system is fully functional. For general safety considerations and information to be taken into account when building a safety system, see *FSO-21 safety functions module user's manual* (3AXD50000015614 [English]).

Contents

The manual consists of these chapters:

- *Safety* contains the safety instructions which you must obey when you install the module.
- *Hardware description* gives a short description of the module.
- *Mechanical installation* contains a delivery checklist and instructions on installing the module.
- *Electrical installation* contains instructions on wiring the module.
- *Start-up and validation* contains instructions on starting up the module.
- *Diagnostics* shows how to trace faults with the status LED on the module.
- *Technical data* contains the technical data of the module.

Terms and abbreviations

Term/abbreviation	Description
Fail-safe mode	The FSO module has activated the drive STO function as a result of an error. To exit this mode and continue normal operation, reboot the FSO module.
FEA-03	F-series extension adapter module
FSO-21	Safety functions module which supports safety encoders
hi-Z state	In digital outputs, the signal is neither driven to a logical high nor low level. It is “floating”.
HTF	Hardware fault tolerance. (EN/IEC 62061)
HTL	High-threshold logic
Safety system	Whole safety system including for example human interface, safety encoder, FSE-31 module, FSO module, drive and sensors.
SIL	Safety integrity level (levels are: 1, 2, 3, and 4). Corresponds to PL. (EN 62061)
SILCL	Maximum SIL that can be claimed for a safety function or subsystem. (EN/IEC 62061)
STO	Safe torque off
PL	Performance level (levels are: a, b, c, d and e). Corresponds to SIL. (EN ISO 13849-1)

Exclusion of liability

ABB is not responsible for the implementation, verification and validation of the overall safety system. It is the responsibility of the system integrator (or other party) who is responsible for the overall system and system safety.

The system integrator (or other responsible party) must make sure that the entire implementation complies with all relevant standards, directives and local electrical code, and that the system is tested, verified and validated correctly.

3

Hardware description

Contents of this chapter

This chapter gives a short description of the module.

Product overview

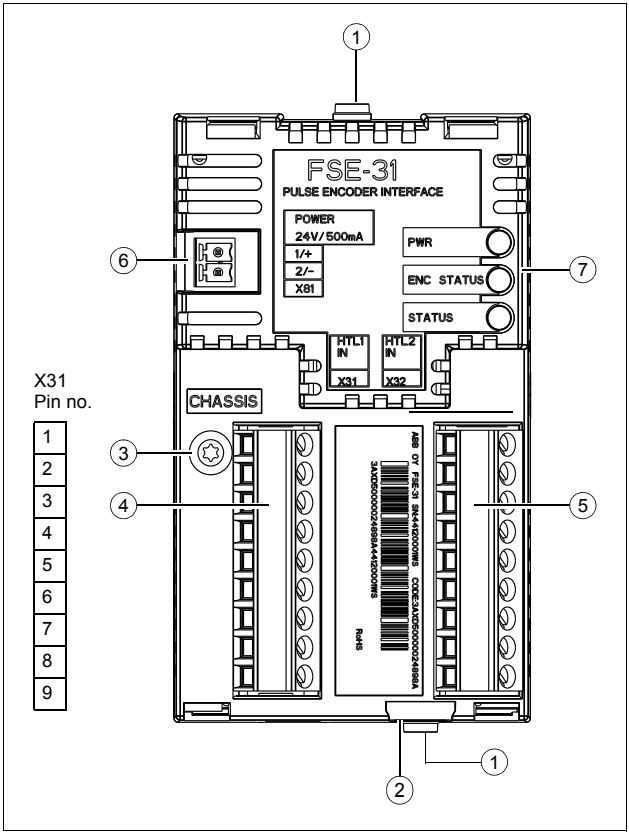
The FSE-31 pulse encoder interface module is used in safety systems together with the FSO-21 safety functions module.

The safety pulse encoder delivers pulses to the FSE-31 module which delivers safe speed, direction and position information to the FSO-21 module. The FSE-31 module also monitors the operation of the safety encoder and indicates faults to the FSO-21 module.

The FSE-31 module has two encoder interfaces. ACS880 primary control program version 2.21 supports one encoder interface (connector X31). It can function as an HTL encoder interface.

The FSE-31 module has an external power supply interface, which supplies power to the FSE-31 module and the safety pulse encoder.

Layout



X31
Pin no.

1
2
3
4
5
6
7
8
9

Item	Description
1	Retaining clips
2	Lock
3	Mounting screw
4	Encoder interface connector X31
5	Encoder interface connector X32 (reserved for future use)
6	External power supply X81
7	Diagnostic LEDs

Type designation label

The type designation label is attached on the top of the FSE module. An example label and description of the label contents are shown below.

Item	Description
1	Type
2	Serial number of format RYWWSSSSWS, where R component revision; A, B, … Y: Last digit of the manufacturing year: 4, 5, … for 2014, 2015 WW: Manufacturing week: 01, 02, … for week 1, week 2, … SSSS: Integer starting every week from 0001 WS: Manufacturing location
3	ABB MRP code of the FSE module
4	Combined ABB MRP code, component revision, serial number and manufacturing location
5	RoHS mark

4

Mechanical installation

Contents of this chapter

This chapter contains a delivery checklist and instructions on installing the module.

Necessary tools and instructions

- Torx screwdriver (T10)

For a complete list of tools, see the applicable drive hardware manual.

Unpacking and examining the delivery

1. Open the option package.
2. Make sure that the package contains:
   - FSE-31 pulse encoder interface module
   - this manual (not included if the module is installed into the drive at the factory).
3. Make sure that there are no signs of damage.

Installing the module

WARNING! Obey the safety instructions. See chapter *Safety*. If you ignore the safety instructions, injury or death can occur.

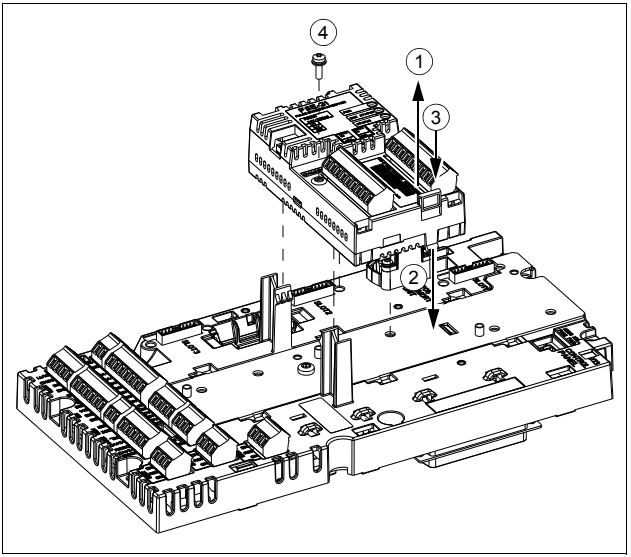
1. Pull out the lock.
2. Put the module carefully into its position on the drive until the retaining clips lock it into position.
3. Push in the lock.
4. Tighten the screw.

   Note: The screw tightens the connections and grounds the module. It is necessary for fulfilling the EMC requirements and for proper operation of the module.

WARNING! Do not tighten the screw tighter than 0.8 N·m. Too big a torque value breaks the thread.

See the applicable drive manual for further instructions on how to install the module to the drive.

Note: Do not install the FSE-31 module on an FEA-03 F-series extension adapter.


4
1
3
2

5

Electrical installation

Contents of this chapter

This chapter contains instructions on wiring the module.

Warnings

WARNING! Obey the safety instructions. See chapter *Safety*. If you ignore the safety instructions, injury or death can occur. If you are not a qualified electrician, do not do electrical work.

Necessary tools and instructions

- Slot-head screwdriver
- Torx screwdriver
- Cabling tools

For a complete list of tools, see the applicable drive hardware manual.

Terminal designations

Pin allocation of the encoder interface connector 1 (X31)

X31	HTL		
No.	**Name**	**Specification**	**Description**
1	VCC_ENC_1	15 V DC	Encoder channel 1 power supply output
2	COM_ENC_1	0 V	Encoder channel 1 supply/signal common (ground)
3	A+_1	0…15 V DC	Encoder channel 1 signal A+ input
4	A-_1	0…15 V DC	Encoder channel 1 signal A- input
5	B+_1	0…15 V DC	Encoder channel 1 signal B+ input
6	B-_1	0…15 V DC	Encoder channel 1 signal B- input
7	Z+_1	0…15 V DC	Encoder channel 1 signal Z+ input
8	Z-_1	0…15 V DC	Encoder channel 1 signal Z- input
9	SHIELD_1	N/A	Encoder channel 1 cable shield

Pin allocation of the power supply connector (X81)

X81	Description
1/+	Supply voltage
2/-	Supply ground

Wiring

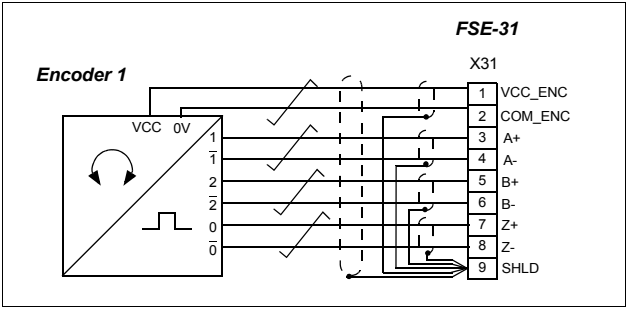
Connect the external control cables to the applicable module terminals.

Do not route signal cables parallel to power cables.

You have to use the same power supply for the FSE-31 and FSO-21 modules.

If an internal safety encoder failure occurs, the safety encoder goes into the Safe state. To recover from these situations, you have to be able to reboot the safety encoder (for example, by switching the power off and on).

We recommend that you use the same power supply for the safety encoder and the FSE-31 and FSO-21 modules.



Note: This figure applies to the FSE-31 module revision F or later. Make sure you connect the safety encoder according to this figure. You can see the revision of the module in the type designation label (see page *15*).

6

Start-up and validation

Contents of this chapter

This chapter refers to the instructions for starting up the module.

Before you start

Make sure that you have completed the drive start-up procedure.

Required tools

Drive composer pro PC tool, version 1.8 or later

Setting the parameters

You start up the FSE-31 module through the drive and FSO-21 module parameters.

See the start-up instructions in *FSO-21 safety functions module user's manual* (3AXD50000015614 [English]).

Validation

See the validation instructions in *FSO-21 safety functions module user's manual* (3AXD50000015614 [English]).

7

Diagnostics

Contents of this chapter

This chapter shows how to trace faults with the status LEDs on the module.

Faults and warning messages

For the fault and warning messages concerning the module, see the drive firmware manual.

LEDs

The FSE-31 module has three diagnostic LEDs.

Name	Color	Description
PWR	Green	The module is powered up.
ENC STATUS	Green	The encoder is in normal operation.
	Off	An encoder fault is active.
STATUS	Green	The module is in normal operation.
	Green flashing	The module is initializing.
	Off	A module fault is active.

Safety encoder fault reaction

The FSE-31 module indicates the internal faults of the safety encoder as cabling faults.

The fault reaction depends on the FSO parameter settings. For more information, see *FSO-21 extended safety functions module user's manual* (3AXD50000015614 [English]).

8

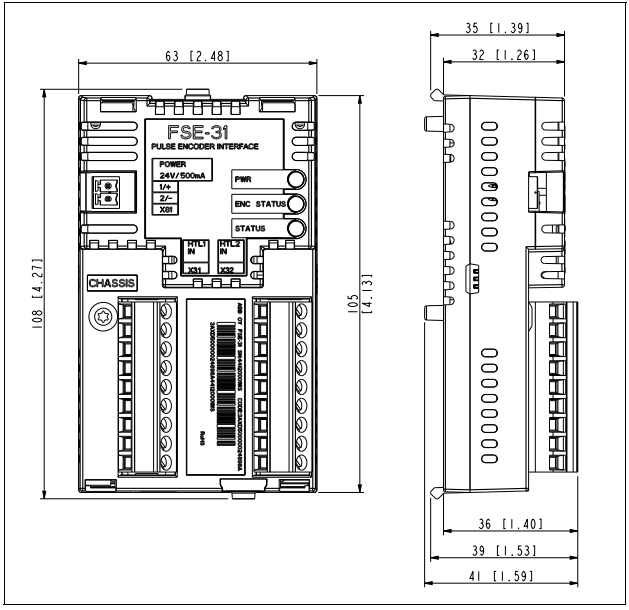
Technical data

Contents of this chapter

This chapter contains the technical data of the module.

Dimension drawing

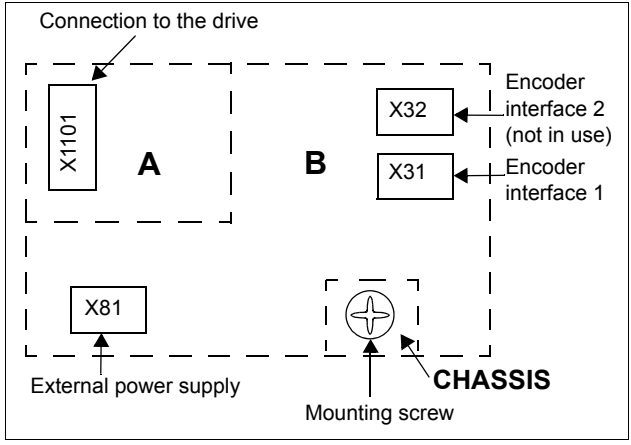
The dimensions are in millimeters and [inches].



Isolation areas

The following figure describes the different isolation areas of the module.

The shield pins of connectors X31 and X32 are connected to chassis. The mounting screw connects the chassis to ground.



Encoder interface connector 1 (X31)

Connector pitch: 5.0 mm, wire size: max. 2.5 mm^2

External power supply (X81)

- Connector pitch: 3.5 mm, wire size: max. 1.5 mm^2
- 24 V DC
- Maximum power consumption: 500 mA

Supported safety encoders

- Differential push-pull HTL encoders
- Supply voltage: 15 V DC
- Maximum pulse frequency: 200 kHz

The safety encoder must indicate its internal faults either by
- setting its outputs to the hi-Z state (“floating” the outputs) or
- setting its complement outputs to identical states.

Note: The FSE-31 module does not support the use of a separate error indication signal from the safety encoder.

Supported encoder cables

- Draka JAMAK 4 x (2 + 1) x 0.5 mm^2 or similar
- Maximum cable length: 300 m (980 ft)

Safety performance

When the FSE-31 module and a safety encoder are used in a safety function with a SIL/PL requirement, the safety encoder must be SIL/PL classified. The user must make sure that the SIL/PL capability of the safety encoder and the complete safety function meets the required SIL/PL.

Examples of the SIL/PL capability of the safe speed measurement:

Safety performance with an HTL encoder classified to SIL 3, SILCL 3 (HFT=1), PL e (Category 3) and the FSE-31 and FSO-21 modules:

- SIL 3, SILCL 3 (HFT=1), PL e (Category 3)

Safety performance with a single HTL encoder classified to SIL 2, SILCL 2 (HFT=0), PL d (Category 2) and the FSE-31 and FSO-21 modules:

- SIL 2, SILCL 2 (HFT=1), PL d (Category 2)

Safety data

The safety data of the FSE-31 module is given in *FSO-21 safety functions module user's manual* (3AXD50000015614 [English]).

General data

- Degree of protection: IP20
- Ambient conditions: See the FSO-21 module user's manual.
- Package: Cardboard. Plastic wrapping: Antistatic air bubble sheet (PE).
- Printed circuit board conformal coated

Standards

The FSE-31 and FSO-21 module combination complies with:

- IEC 61508 ed. 2.0: 2010
- EN/IEC 62061:2005 + A1:2013
- EN ISO 13849-1:2008 + AC:2009
- EN/IEC 61800-5-2:2007

All components are RoHS compliant.

Further information

Product and service inquiries

Address any inquiries about the product to your local ABB representative, quoting the type designation and serial number of the unit in question. A listing of ABB sales, support and service contacts can be found by navigating to www.abb.com/searchchannels.

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