



Danfoss iC7 Series Automation Frequency Converter User Guide

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TOMORROW
Operating Guide
Functional Extensions
iC7 Series



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Introduction

1.1 Purpose of the Operating Guide

This operating guide provides information for safe installation, commissioning, and operation of functional extensions used with iC7 drives.

This guide is intended for use by qualified personnel only. Read and follow the operating instructions to use the drive safely and professionally, and pay particular attention to the safety instructions and general warnings. Keep this operating guide available with the drive at all times.

1.2 Additional Resources

- Additional resources are available to help understand the features, and safely install and operate the iC7 products:
- Safety guides, which provide important safety information related to installing iC7 drives.
- Installation guides, which cover the mechanical and electrical installation of drives, or functional extension options.
- Design guides, which provide technical information to understand the capabilities of the iC7 drives for integration into motor control and monitoring systems.
- Application guides, which provide instructions on setting up the drive for a specific end use.
- Supplemental publications, drawings, and manuals are available at www.danfoss.com.

Latest versions of Danfoss product manuals are available for download at <http://drives.danfoss.com/downloads/portal/>.

1.3 Version History

This guide is regularly reviewed and updated. All suggestions for improvement are welcome. The original language of this guide is English.

Table 1: Version History

Version	Remarks
AQ390830267692, version 05 01	Information on configuring Relay Option OC7R0 added.
AQ390830267692, version 04 01	Information on support for SinCos encoders added.
AQ390830267692, version 03 01	Updates regarding electrical specifications, and the default value and available selections of parameter 9.6.6 BiSS/SSI Clock Rate.
AQ390830267692, version 02 01	Updates regarding Encoder/Resolver Option OC7M0 features.
AQ390830267692, version 01 01	First version. The information in this version is valid for Encoder/Resolver Option OC7M0 installed in iC7-Automation frequency converters.

Safety

2.1 Safety Symbols

The following symbols are used in this guide:



DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.



WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE

Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

2.2 Safety and Installation Awareness

Before starting installation, read all safety guidelines and precautions related to installing functional extensions. For more information on functional extension selection and functional extension slots in the drives, see the product-specific design guides. Supplemental information and other iC7 guides can be downloaded from www.danfoss.com/service-and-support.

Configuration

3.1 Configuration Overview

The parameters related to functional extensions are in parameter group 9, called I/O. Parameters are dependent on the mounting, and will appear in the parameter menu after the functional extension has been mounted and wired.

Installation

4.1 Checking the Shipment

Make sure that the items supplied and the information on the product label correspond to the order confirmation. The product label is placed on the front and right side of the option casing.

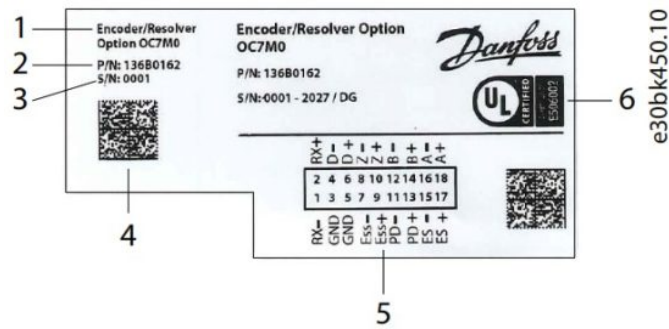


Illustration 1: Example of a Product Label

1. Product name of the functional extension
2. Code number
3. Serial number
4. A 2D code which contains the code number, serial number, production year and week, and the product name.
5. Identification of I/O connections on the option
6. Compliance and approval markings (if not covered by drive approvals).

4.2 Installing Functional Extensions in Frequency Converters

The instructions in this chapter apply to frequency converters with an integrated control board.



DANGER

SHOCK HAZARD FROM THE AC DRIVE

Touching electrical parts of the drive can cause death or serious injury even after the equipment has been disconnected from AC power.

Perform the following steps before touching any internal components:

Disconnect the mains power.

Disconnect the motor.

Disconnect external connections to the DC terminals of the drive.

Wait for the capacitors to discharge fully. Refer to the label on the drive for the correct discharge time.

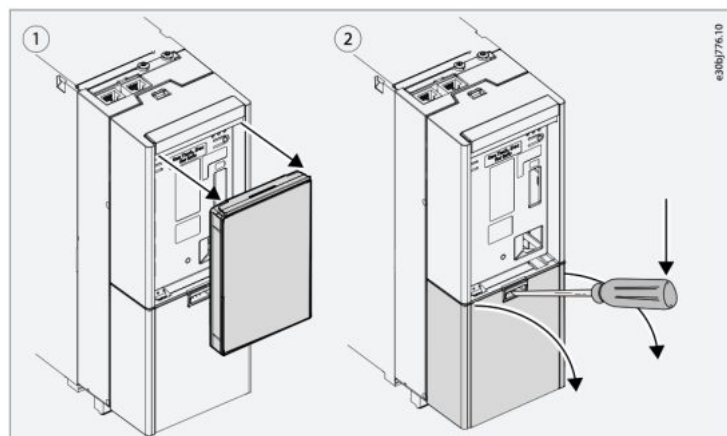
Ensure that the DC-link capacitors have discharged fully by measuring the DC link with a voltage meter.

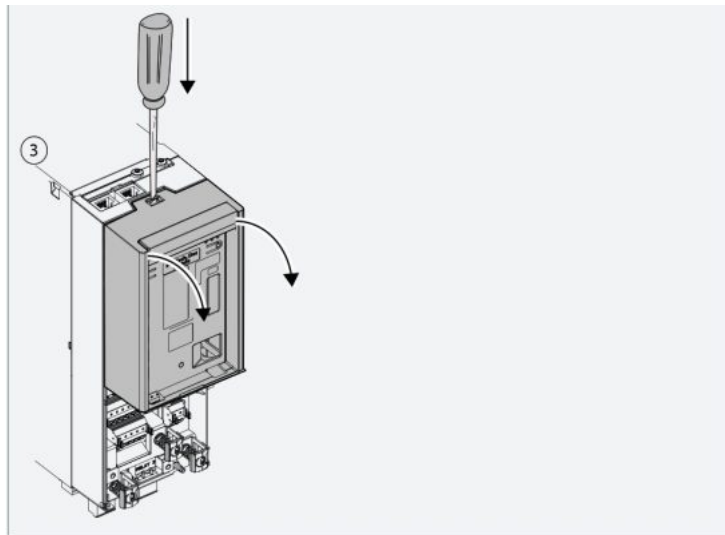
NOTICE

The Encoder/Resolver Option OC7M0 must be installed in option slot A.

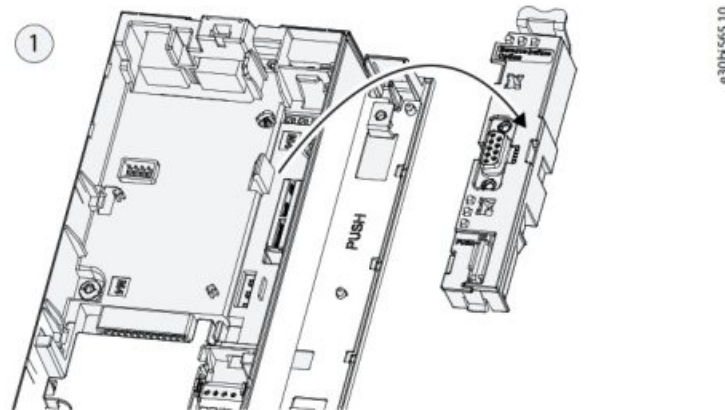
- For more information on option slot locations in frequency converters, refer to the design guide.
- For information on slot identification in software, refer to the application guide.

1. Remove the control panel, terminal cover, and control panel cradle.

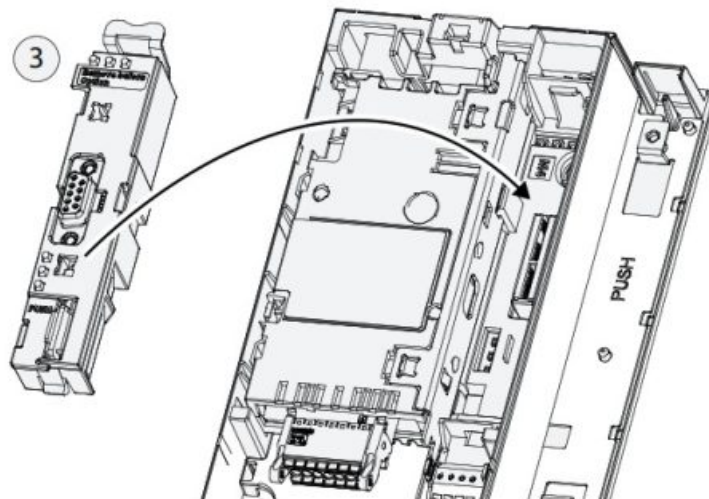
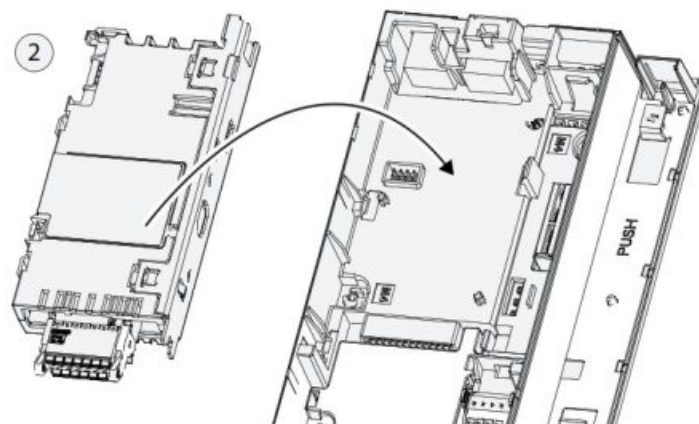




2. Remove the interface board, place the option board in the slot, and reinstall the interface board.



e30d565.10



4.3 Installing Boards to the Modular Control Unit

Use these instructions to install a board, for example an option board, to the mounting plate of the modular control unit.



DAMAGE TO OPTION BOARDS

Do not install, remove, or replace option boards on the drive when the power is on. Doing this can cause damage to the boards.

- Switch off the AC drive before installing, removing, or replacing option boards on the drive.

Procedure

1. Remove the screw that is pre-attached to the fixing point at the top of the mounting plate and keep it.
2. Slide the lower edge of the board to the mounting plate fixing point.

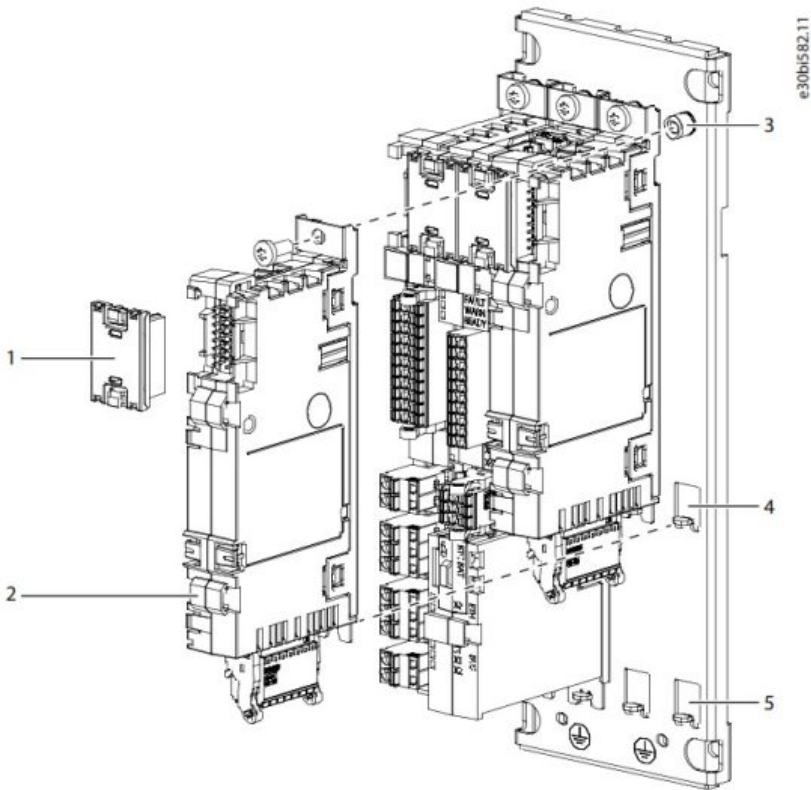


Illustration 2: Installing a Board to the Modular Control Unit Mounting Plate

1. Option connector	4. Fixing point at the middle
2. Option board	5. Fixing point at the bottom
3. Fixing point at the top	

3. Use the screw to attach the board to the fixing point at the top.
4. Attach an option connector to the newly installed board and the board next to it.

Encoder/Resolver Installation and Configuration

5.1 Encoder/Resolver Option OC7M0

The Encoder/Resolver option supports connecting various devices as speed/position feedback or reference. It also has a TTL encoder simulation output, which can be used to mirror the resolver input signal. There are 4 channels (A, B, Z, and D) which can be configured in different combinations according to Table 2.

Table 2: Encoder/Resolver Option Configurations

Device	Tracks
Incremental TTL/HTL	A and B
Incremental TTL/HTL with zero pulse	A, B, and Z
Resolver	A and B
Resolver with encoder mirror out	A and B + Z and D
SinCos	A and B
SSI	Z and D
EnDat	Z and D
BiSS	Z and D
HIPERFACE DSL	D

Adjustable encoder voltage supply is available 5–24 V with the possibility of feedback enabling monitoring and compensation for cable voltage drop. The voltage level is set with parameter 9.4.4 Encoder supply voltage.

NOTICE

Setting the voltage too high can damage the connected encoder.

Resolver supply/excitation is available with adjustable voltage and frequency by parameters 9.7.1 Excitation Voltage and 9.7.2 Excitation Frequency.

5.2 Required Tools

- Torx 20 screwdriver for mounting EMC plate Slot C-E.
- Slotted screwdriver (maximum 3 mm) for releasing the spring-loaded terminals of the plug connector.
- Wire crimpers may be needed for certain encoder cable types.

5.3 Items Supplied

The Encoder/Resolver OC7M0 option can be ordered as a preinstalled option by using the dedicated model code, or as a separate option for field mounting by using the code number.

When the option is not mounted at the factory, the following items are included in the shipment:

- Encoder/Resolver OC7M0.
- Option connector.
- Cable clamps.
- Screws.
- Operating guide.

5.4 Pin Assignment for Encoder/Resolver OC7M0

The Plug detect feature, which monitors that pins 11 and 13 are connected, detects the unintentional disconnection of the plug connector.

NOTICE

If the Plug detect connection is missing while the interface is activated (parameter 9.4.1 Interface configuration ≠ “Disabled”), the drive generates a fault.

- The fault is generated only when switching to closed-loop operation, not when selecting an encoder.
- The plug connector is delivered without a connection between pin 11 and 13.

Table 3: Pin Assignment and Function for Encoder/Resolver Option OC7M0

Numbering	Functions	Numbering	Functions
1	Resolver Excitation –	2	Resolver Excitation +
3	GND	4	Ch. D- (TTL, RS-485, HIPERFACE DSL®)
5	GND	6	Ch. D+ (TTL, RS-485, HIPERFACE DSL®)
7	Encoder Supply Sensor –	8	Ch. Z- (TTL, HTL, RS-485, R-)
9	Encoder Supply Sensor +	10	Ch. Z+ (TTL, HTL, RS-485, R+)
11	Plug Detect – (GND)	12	Ch. B- (TTL, HTL, RS-485, Analog B-)
13	Plug Detect +	14	Ch. B+ (TTL, HTL, RS-485, Analog B+)
15	Encoder Supply – (GND)	16	Ch. A- (TTL, HTL, RS-485, Analog A-)
17	Encoder Supply +	18	Ch. A+ (TTL, HTL, RS-485, Analog A+)

5.5 Encoder/Resolver Option OC7M0 Specifications

NOTICE

Voltage can be up to 24 V. Setting the voltage too high can damage the connected encoder.

The voltage is configured in parameter 9.4.4 Encoder Supply Voltage. For details, refer to 5.7.1 Configuration (Menu Index 9.4).

Table 4: Electrical Specifications for Encoder/Resolver Option OC7M0

Encoder supply voltage [V DC]	Maximum current [mA]
24	125
15	150
12	150
8	225
5	300

If the available power is insufficient, it is possible to use an external power supply for the encoder.

Table 5: Device Type Specifications

Device type	Specifications		Additional information 11
	Data	Value	
TTL (A, B, Z)	Signal level	0–5 V	
	Maximum resolution	65535	
	Maximum frequency	750 kHz	

	Maximum cable length	Depends on signal frequency	Differential signals are preferred, but single signals are also supported. The trigger threshold is 0.33–0.4 times the encoder supply voltage.
HTL (A, B, Z)	Signal level	0-24 V	
	Maximum resolution	65535	
	Maximum frequency	500 kHz	
SinCos	Signal level	1 V peak-peak	–
	Maximum resolution	65535	
	Maximum frequency	750 kHz	
SSI	Maximum resolution	31 bit	–
	Maximum data length	63 bit	
	Maximum clock frequency	2 MHz	
EnDat	Maximum resolution	31 bit	Both EnDat 2.1 and EnDat 2.2 are supported, but only with pure absolute channel, not with incremental channel.
	Maximum data length	63 bit	
	Maximum clock frequency	8.33 MHz	
HIPERFACE DSL	Maximum resolution	31 bit	Baud rate is fixed.
	Maximum data length	63 bit	
	Baud rate	10 Mbps	
BiSS	Maximum resolution	31 bit	–
	Maximum data length	63 bit	
	Maximum clock frequency	8.33 MHz	
Resolver	Excitation voltage	2–8 Vrms	
	Excitation frequency	2–20 kHz	
	Maximum number of poles	254	
	Maximum input voltage	8 Vrms	
	Maximum load	100 mArms	
Encoder simulation (TTL Output)	Voltage level	Minimum: 1.5 V Typical: 2 V differential	
	Maximum resolution	65535	
	Maximum frequency	750 kHz	

	Maximum load	60 mA	
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1 The limitations described in this guide apply to the current software version.

Table 6: Cable Specifications for Encoder/Resolver Option OC7M0

Cable type	Cross-section [mm ² (AWG)]	Minimum stripping length [mm (in)]
Flexible/rigid wire without cable end sleeves	0.2–1.5 (26–16)	10 (0.4)
Flexible wire with cable end sleeves with collar	0.2–0.75 (26–18)	

A standard RS485 interface supports cable lengths up to 1200 m (3940 ft) depending on signal frequency and cable type. Consult the documentation for the respective encoder or resolver for details on allowed cable length.

5.6 Setup and Connection Examples for Encoder/Resolver OC7M0

5.6.1 Incremental Encoder

With TTL and HTL incremental encoder, the actual position is 0 after power-up, and encoder pulses are counted to increment or decrement the actual position. For improved resolution with TTL and HTL encoders, both the positive and negative edge of A and B pulses are detected giving 4 quad counts per encoder pulse.

Table 7: Parameters for Incremental Encoder

Parameter	Setting
9.4.1 Interface configuration	Set according to the type of connected encoder. TTL/HTL with 2 tracks: Select [1] 2 track Incremental A, B. TTL/HTL with 3 tracks: Select [3] 3 track Incremental A, B, Z.
9.4.4 Encoder Supply Voltage	Set the appropriate supply voltage for the connected encoder. NOTICE Voltage can be up to 24 V. Setting the voltage too high can damage the connected encoder.
9.5.1 Resolution Device 1	Set the resolution of the encoder in pulses per revolution.

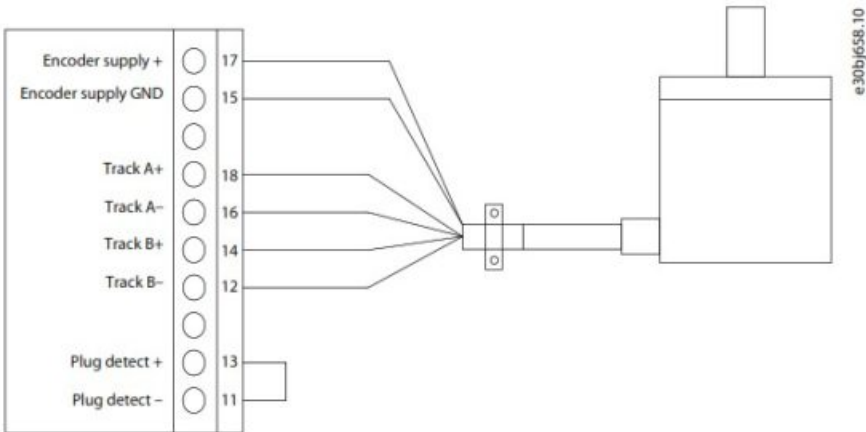


Illustration 3: Wiring Configuration for Incremental Encoder, 2 Differential Tracks (TTL, HTL)

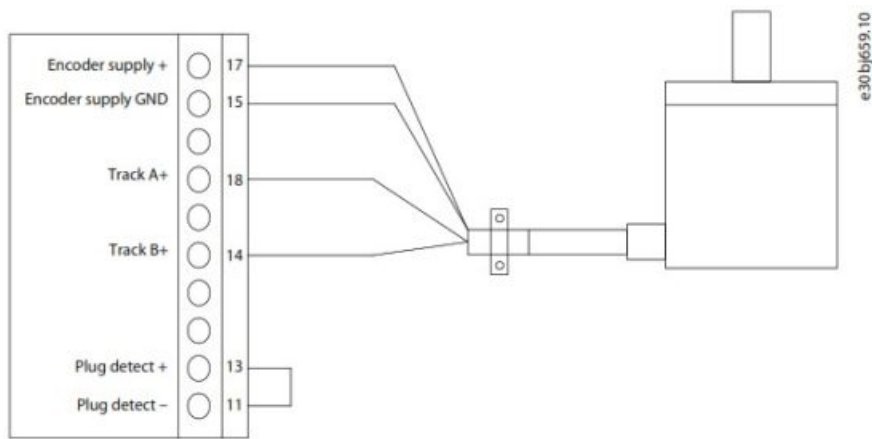


Illustration 4: Wiring Configuration for Incremental Encoder, 2 Single Tracks (TTL, HTL)

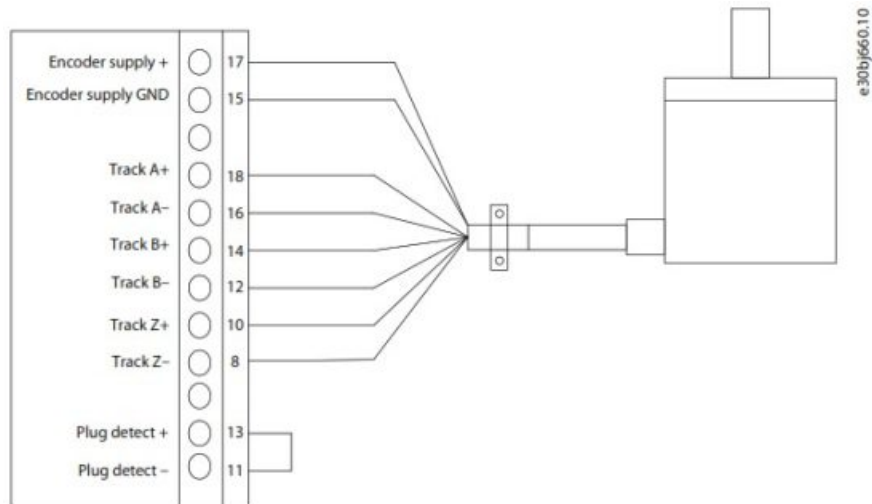


Illustration 5: Wiring Configuration for Incremental Encoder, 3 Differential Tracks (TTL, HTL)

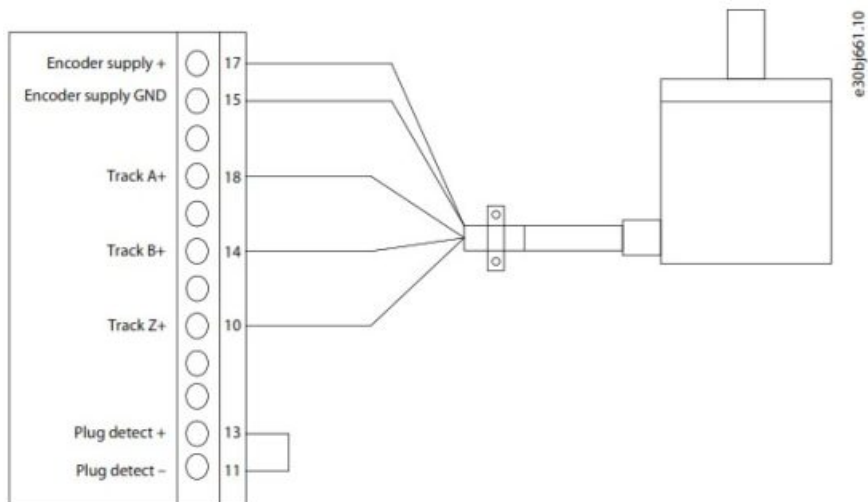


Illustration 6: Wiring Configuration for Incremental Encoder, 3 Single Tracks (TTL, HTL)

5.6.2 Two Incremental Encoders

It is possible to connect two 2-track incremental encoders where channel 1 (A, B) supports TTL and HTL, while channel 2 (Z, D) only supports TTL.

Table 8: Parameters for 2 Incremental Encoders

Parameter	Setting
9.4.1 Interface configuration	Select [5] 2 track Incremental A,B + 2 track incremental Z,D.
9.4.4 Encoder Supply Voltage	Set the appropriate supply voltage for the connected encoders. If the power requirement exceeds the maximum power of the internal supply, the 2 nd encoder may require external supply. NOTICE Voltage can be up to 24 V. Setting the voltage too high can damage the connected encoder.
9.5.1 Resolution Device 1	Set the resolution of the encoder connected to A and B in pulses per revolution.
9.5.2 Resolution Device 2	Set the resolution of the encoder connected to Z and D in pulses per revolution.

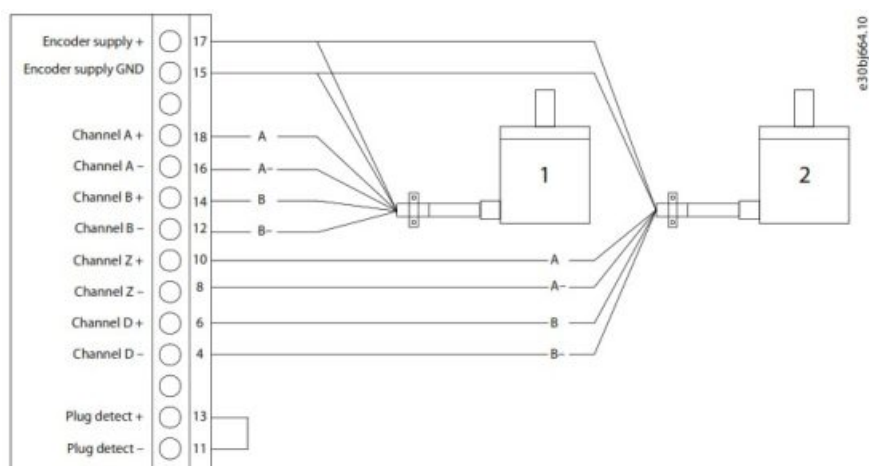


Illustration 7: Wiring Configuration for 2 Incremental Encoders

1. Incremental encoder, 2 differential tracks (TTL, HTL)
2. Incremental encoder, 2 differential tracks (only TTL on Z and D).

NOTICE

The incremental encoder connected to channels Z and D may require separate supply.

5.6.3 Resolver

With a resolver, the actual position is set to the absolute value within 1 resolver pole pair based on the analog value of the sine and cosine signals.

With a 2-pole resolver, this corresponds to the absolute position within 1 resolver revolution.

Table 9: Parameters for Resolver

Parameter	Setting
9.4.1 Interface configuration	Set to [7] Resolver A,B.
9.7.1 Excitation Voltage	Set the excitation voltage according to the specification of the connected resolver.
9.7.2 Excitation Frequency	Set the excitation frequency according to the specification of the connected resolver.
9.7.3 Number of Poles	Set the number of poles of the connected resolver.

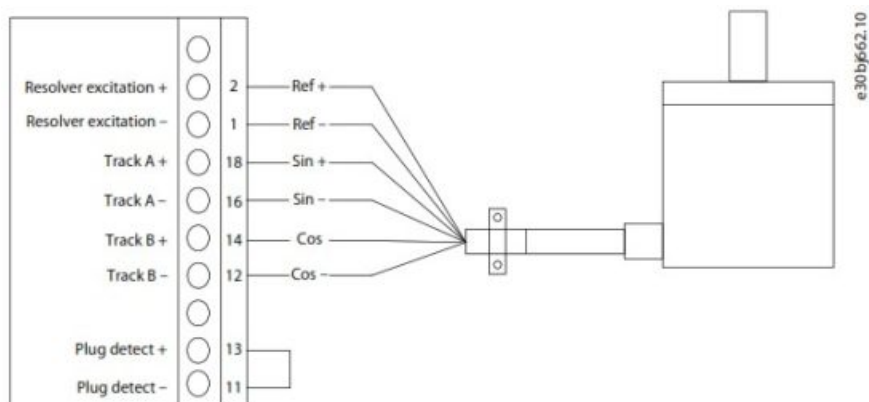


Illustration 8: Wiring Configuration for Resolver

5.6.4 Resolver with Mirror Out

When using a resolver, a TTL encoder signal can be generated to mirror the resolver signal. The mirroring enables transferring the shaft position to other devices for monitoring, or further control. The encoder output signal can be scaled by defining the number of pulses representing 1 rotation of the resolver.

Table 10: Parameters for Resolver with Mirror Out

Parameter	Setting
9.4.1 Interface Configuration	Set to [8] Resolver A,B + Mirror out Z,D.
9.5.2 Resolution Channel 2	Set the required number of pulses for the encoder output representing 1 rotation of the resolver.
9.7.1 Excitation Voltage	Set the excitation voltage according to the specification of the connected resolver.
9.7.2 Excitation Frequency	Set the excitation frequency according to the specification of the connected resolver.
9.7.3 Number of Poles	Set the number of poles of the connected resolver.

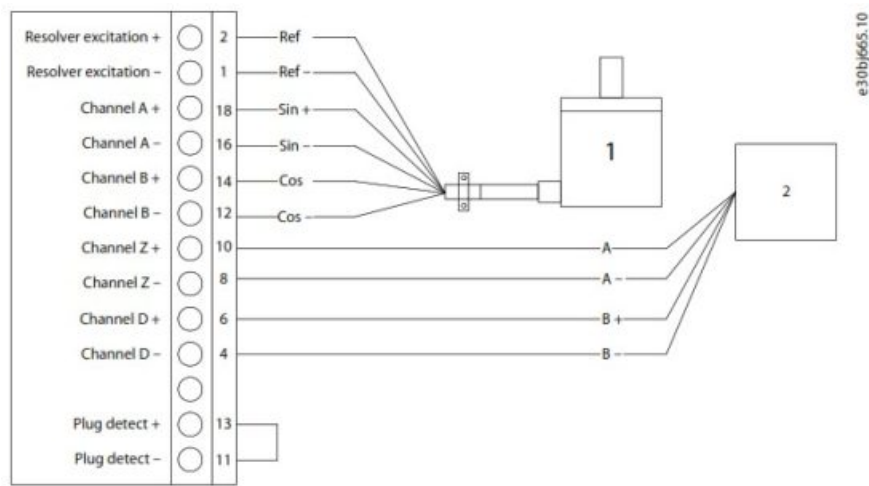


Illustration 9: Wiring Configuration for Resolver with Mirror Out

1. Resolver
2. Controller, or other device

5.6.5 SinCos Encoder

Table 11: Parameters for SinCos Encoder

Parameter	Setting
9.4.1 Interface configuration	Select [10] SinCos A,B.
9.4.4 Encoder Supply Voltage	Set the appropriate supply voltage for the connected encoder. NOTICE Voltage can be up to 24 V. Setting the voltage too high can damage the connected encoder.
9.5.1 Resolution Device 1	Set the resolution of the encoder in pulses per revolution.

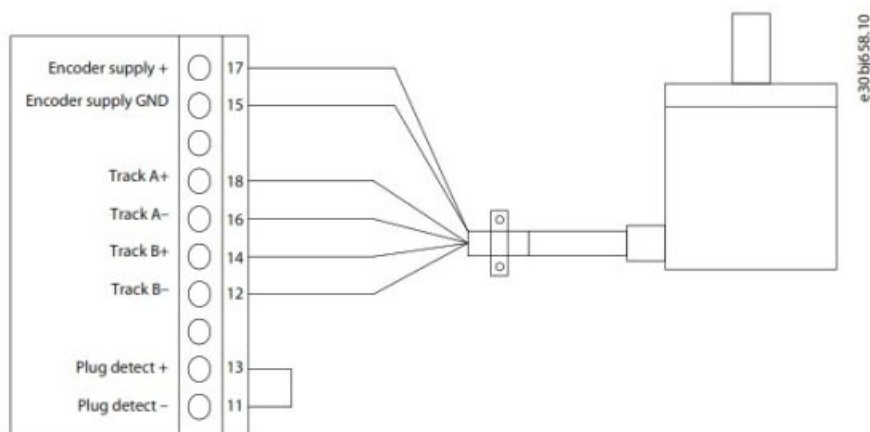


Illustration 10: Wiring Configuration for SinCos Encoder

5.6.6 SSI Encoder

Absolute position is read from the encoder and used to set the actual position after power-up.

Table 12: Parameters for SSI Encoder

Parameter	Setting
9.4.1 Interface Configuration	Select [17] SSI Z,D.
9.4.4 Encoder Supply Voltage	Set the appropriate supply voltage for the connected encoder. NOTICE Voltage can be up to 24 V. Setting the voltage too high can damage the connected encoder.
9.6.1 Singleturn Resolution	Set the number of bits used for 1 revolution.
9.6.2 Multiturn Resolution	Set the number of bits used for revolution count.
9.6.6 BiSS/SSI Clock Rate	Set the clock rate used for SSI or BiSS.

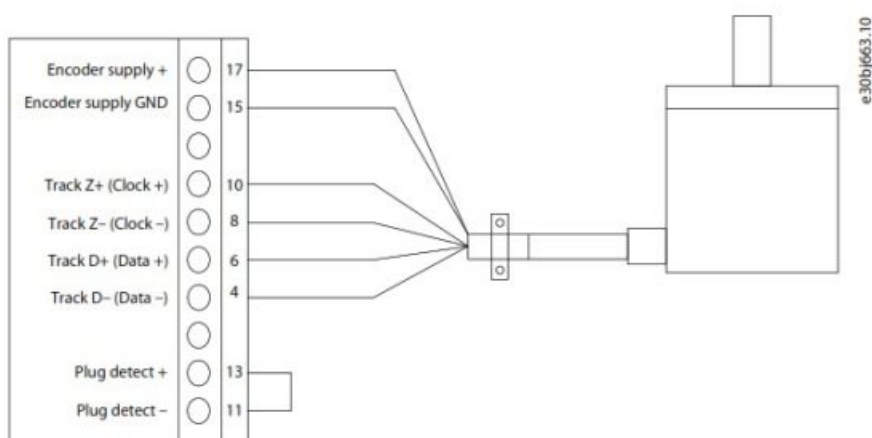


Illustration 11: Wiring Configuration for 2-Track SSI Encoder

5.6.7 EnDat Encoder

Absolute position is read from the encoder and used to set the actual position after power-up.

Table 13: Parameters for EnDat Encoder

Parameter	Setting
9.4.1 Interface configuration	Select [22] EnDat Z,D.
9.4.4 Encoder Supply Voltage	Set the appropriate supply voltage for the connected encoder. NOTICE Voltage can be up to 24 V. Setting the voltage too high can damage the connected encoder.
9.6.1 Singleturn Resolution	Set the number of bits used for 1 revolution.
9.6.2 Multiturn Resolution	Set the number of bits used for revolution count.
9.6.3 EnDat Clock Rate	Set the rate for the clock signal according to the encoder specifications.

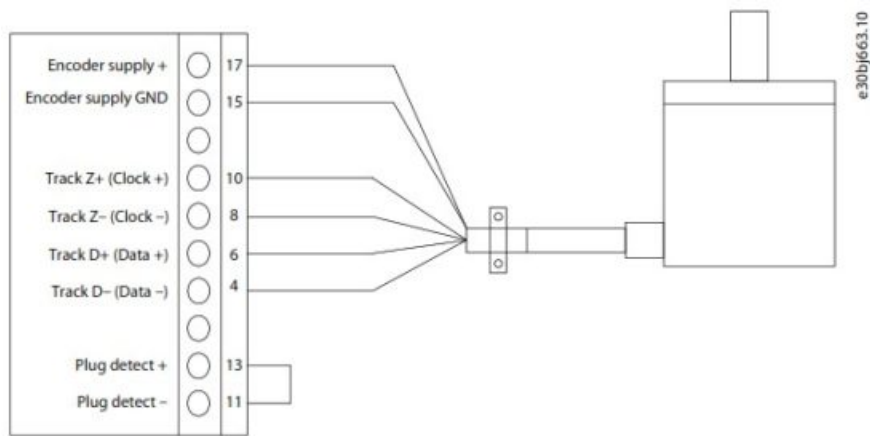


Illustration 12: Wiring Configuration for 2-Track EnDat Encoder

5.6.8 BiSS Encoder

Absolute position is read from the encoder and used to set the actual position after power-up.

Table 14: Parameters for BiSS Encoder

Parameter	Setting
9.4.1 Interface configuration	Select [29] BiSS Z,D.
9.4.4 Encoder Supply Voltage	Set the appropriate supply voltage for the connected encoder. NOTICE Voltage can be up to 24 V. Setting the voltage too high can damage the connected encoder.
9.6.1 Singleturn Resolution	Set the number of bits used for 1 revolution.
9.6.2 Multiturn Resolution	Set the number of bits used for revolution count.
9.6.6 BiSS/SSI Clock Rate	Set the rate for the clock signal according to the encoder specifications.

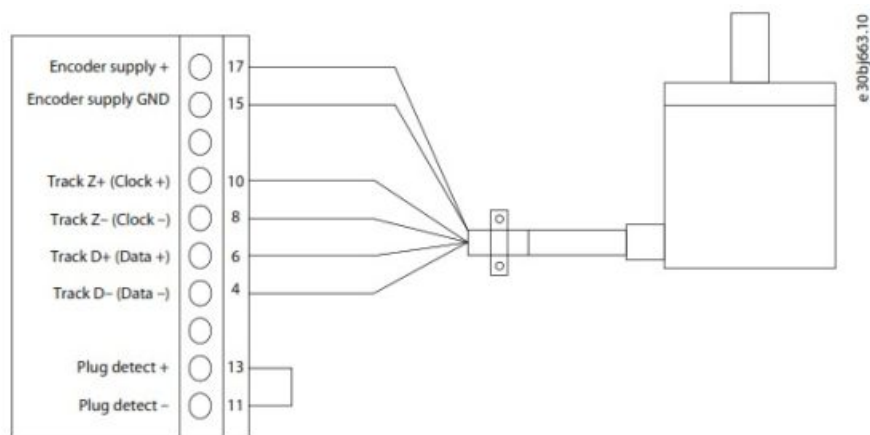


Illustration 13: Wiring Configuration for 2-Track BiSS Encoder

5.6.9 HIPERFACE DSL

Absolute position is read from the encoder and used to set the actual position after power-up.

Table 15: Parameters for HIPERFACE DSL

Parameter	Setting
9.4.1 Interface configuration	Select [26] Hiperface DSL D.
9.4.4 Encoder Supply Voltage	Set the appropriate supply voltage for the connected encoder. NOTICE Voltage can be up to 24 V. Setting the voltage too high can damage the connected encoder.
9.6.1 Singleturn Resolution	Set the number of bits used for 1 revolution.
9.6.2 Multiturn Resolution	Set the number of bits used for revolution count.

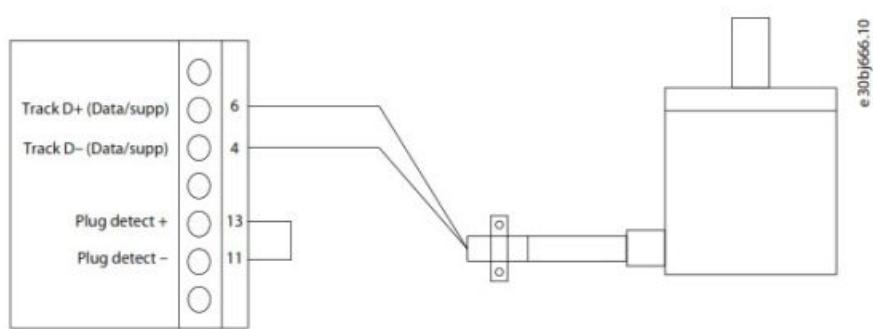


Illustration 14: Wiring Configuration for HIPERFACE DSL Encoder

5.7 Parameter Descriptions for Encoder/Resolver

5.7.1 Configuration (Menu Index 9.4)

P 9.4.1 Interface Configuration

Description: Select the required configuration of the interface consisting of 4 tracks A, B, Z, and D offering various combinations of 1 or 2 devices.

Default Value: 0 [Disabled]	Parameter Type: Selection	Parameter Number: 4000
Unit: –	Data Type: UINT	Access Type: Read/Write

The following are the selections for the parameter:

Selection number	Selection name
0	Disabled
1	2 track incremental A,B
3	3 track incremental A,B,Z
5	2 track incremental A,B + 2 track incremental Z,D
7	Resolver A,B
8	Resolver A,B + mirror out Z,D
9	Resolver A,B + 2 track incremental Z,D
10	SinCos A,B
17	SSI Z,D
19	SSI Z,D + 2 track incremental A,B
22	EnDat Z,D
23	EnDat Z,D + 2 track incremental A,B
26	Hiperface DSL D
27	Hiperface DSL D + 2 track incremental A,B
29	BiSS Z,D
30	BiSS Z,D + 2 track incremental A,B

P 9.4.4 Encoder Supply Voltage

Description: Set the supply voltage level according to the specification of the connected encoder.

Default Value: 5	Parameter Type: Range (3–24)	Parameter Number: 4002
Unit: V	Data Type: UINT	Access Type: Read/Write

P 9.4.5 Supply Sense

Description: Activate power supply cable drop compensation.

Default Value: 0	Parameter Type: Range (0–1)	Parameter Number: 4035
Unit: –	Data Type: BOOL	Access Type: Read/Write

5.7.2 Incremental Settings (Menu Index 9.5)

P 9.5.1 Resolution Channel 1

Description: Set the resolution of the incremental encoder connected to channel 1.

Default Value: 1024	Parameter Type: Range (1–65535)	Parameter Number: 4008
Unit: –	Data Type: UINT	Access Type: Read/Write

P 9.5.2 Resolution Channel 2

Description: Set the resolution of the incremental encoder connected to channel 2.

Default Value: 1024	Parameter Type: Range (1–65535)	Parameter Number: 4009
Unit: –	Data Type: UINT	Access Type: Read/Write

5.7.3 SSI/EnDat/BiSS/HIPERFACE Settings (Menu Index 9.6)

P 9.6.1 Singleturn Resolution

Description: Number of bits used for one revolution.

Default Value: 13	Parameter Type: Range (1–32)	Parameter Number: 4010
Unit: –	Data Type: UINT	Access Type: Read/Write

P 9.6.2 Multiturn Resolution

Description: Number of bits used for revolution count.

Default Value: 12	Parameter Type: Range (0–32)	Parameter Number: 4011
Unit: –	Data Type: UINT	Access Type: Read/Write

P 9.6.3 EnDat Clock Rate

Description: Set the Clock rate used for EnDat.

Default Value: 13 [1 MHz]	Parameter Type: Selection	Parameter Number: 4036
Unit: MHz	Data Type: UINT	Access Type: Read/Write

The following are the selections for the parameter:

Selection number	Selection name
0	8.33 MHz
6	4.16 MHz
12	2.08 MHz
13	1 MHz
14	0.2 MHz
15	0.1 MHz

P 9.6.5 SSI Data Format

Description: Select the SSI data coding according to the specifications of the connected SSI encoder.

Default Value: 1 [Gray]	Parameter Type: Selection	Parameter Number: 4034
Unit: –	Data Type: BOOL	Access Type: Read/Write

The following are the selections for the parameter:

Selection number	Selection name
0	Binary
1	Gray

P 9.6.6 BiSS/SSI Clock Rate

Description: Sets the clock rate used for SSI or BiSS.

Default Value: 18 [833 kHz]	Parameter Type: Selection	Parameter Number: 4037
Unit: –	Data Type: UINT	Access Type: Read/Write

The following are the selections for the parameter:

Selection number	Selection name
2	8.33 MHz
3	6.25 MHz
4	5.00 MHz
5	4.16 MHz
6	3.57 MHz
7	3.13 MHz
8	2.78 MHz
9	2.50 MHz
10	2.27 MHz
11	2.08 MHz
12	1.92 MHz
13	1.79 MHz
14	1.67 MHz
15	1.56 MHz
17	1.25 MHz
18	833 kHz
19	625 kHz
20	500 kHz
21	417 kHz
22	357 kHz
23	313 kHz
24	278 kHz
25	250 kHz
26	227 kHz
27	208 kHz
28	192 kHz
29	179 kHz
30	167 kHz
31	156 kHz

5.7.4 Resolver (Menu Index 9.7)

P 9.7.1 Excitation Voltage

Description: Set the Excitation voltage according to the specifications of the connected resolver (RMS).

Default Value: 5	Parameter Type: Range (2–8)	Parameter Number: 4005
Unit: V	Data Type: UINT	Access Type: Read/Write

P 9.7.2 Excitation Frequency

Description: Set the Resolver excitation frequency according to the specifications of the connected resolver.

Default Value: 5000	Parameter Type: Range (2000–20000)	Parameter Number: 4004
Unit: Hz	Data Type: UINT	Access Type: Read/Write

P 9.7.3 Number of Poles

Description: Set the number of poles of the connected resolver.

Default Value: 2	Parameter Type: Range (2–254)	Parameter Number: 4003
Unit: –	Data Type: USINT	Access Type: Read/Write

Relay Option Installation and Configuration

6.1 Relay Option OC7R0

The Relay Option OC7R0 makes it possible to extend relay functions with 3 relay outputs: 2 NO/NC and 1 NO rated for up to 250 V AC/2 A.

For detailed specifications, see 6.5 Relay Option OC7R0 Specifications.

6.2 Required Tools

- Torx 20 screwdriver for mounting the option and EMC plate.
- Slotted screwdriver (maximum 3 mm) for releasing the spring-loaded terminals of the plug connector.

6.3 Items Supplied

The Relay Option OC7R0 can be ordered as a preinstalled option by using the dedicated model code, or as a separate option for field mounting by using the code number.

- When the option is not mounted at the factory, the following items are included in the shipment:
- Relay Option OC7R0 (with connectors mounted)
- Option connector
- EMC plate and screws
- Operating guide

6.4 Pin Assignment for Relay Option OC7R0

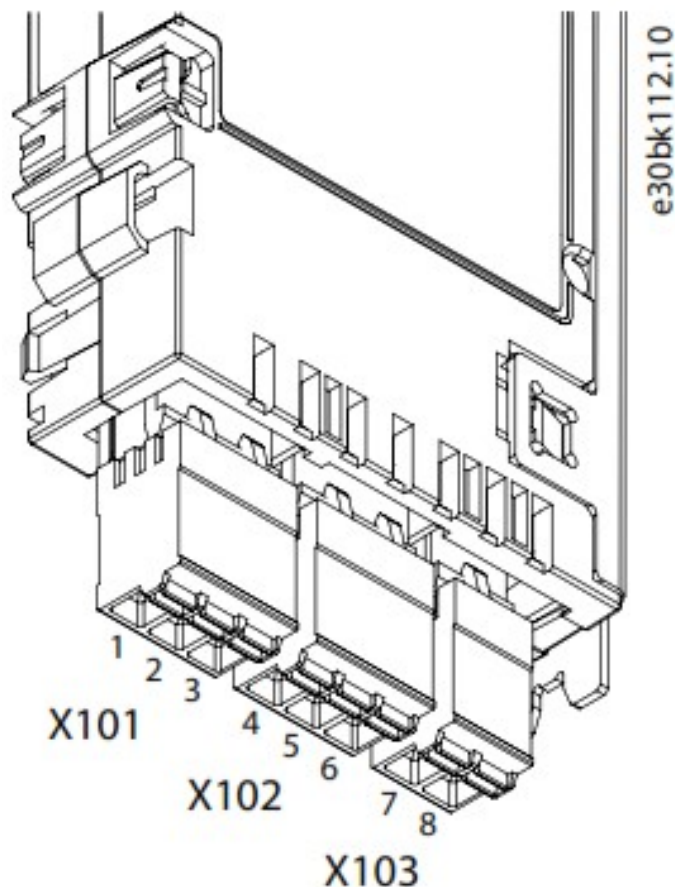


Illustration 15: Relay Option OC7R0 Terminals

Table 16: Functions for Relay Option OC7R0 Terminals

Terminal X101		Terminal X102		Terminal X103	
Numbering	Function	Number	Function	Number	Function
1	Common	4	Common	7	Common
2	Normally Open (NO)	5	Normally Open (NO)	8	Normally Open (NO)
3	Normally Closed (NC)	6	Normally Closed (NC)		

The connectors are coded and cannot be exchanged in the control board.

See 6.6 Setup and Connection Examples for Relay Option OC7R0 for more information on wiring the option.

6.5 Relay Option OC7R0 Specifications

Relays are PELV galvanic isolated from supply voltage and other high voltage terminals, unless otherwise specified.

Table 17: Technical Specifications for Relay Option OC7R0

Functions	Data
Number of relay outputs	3 (2 NO/NC, 1 NO)
Maximum terminal load (AC-1): Resistive load	250 V AC, 2 A
Maximum terminal load (AC-15): Inductive load @ $\cos \phi = 0.4$	250 V AC, 0.2 A
Maximum terminal load (DC-1): Resistive load	80 V DC, 2 A
Maximum terminal load (DC-13) : Inductive load	24 V DC, 0.1 A
Minimum load	24 V DC, 10 mA
	24 V AC, 20 mA
Rated number of cycles (@2 A resistive load)	400 000 switchings
Cable type	Cu, 75 °C (167 °F)
Cable size	Solid: 0.2–2.5 mm
	(24–14 AWG)
	Flexible: 0.2–2.5 mm
	(24–14 AWG)
	Flexible with ferrule, without plastic sleeve: 0.25–2.5 mm
	(24–14 AWG)
	Flexible without ferrule, with plastic sleeve: 0.25–2.5 mm
	(24–14 AWG)
Maximum cable length	300 m (984 ft)
Maximum altitude	4400 m (14400 ft) NOTICE – The operating altitude sets requirements on voltages. For the wiring diagrams for different operating altitudes, see 6.6.1 Wiring Diagrams for Different Operating Altitudes.
Ambient temperature	-30 °C...60 °C (-22 °F...140 °F)
Weight	0.12 kg (0.26 lb)
Environment	Overvoltage category III/pollution degree 2

6.6 Setup and Connection Examples for Relay Option OC7R0

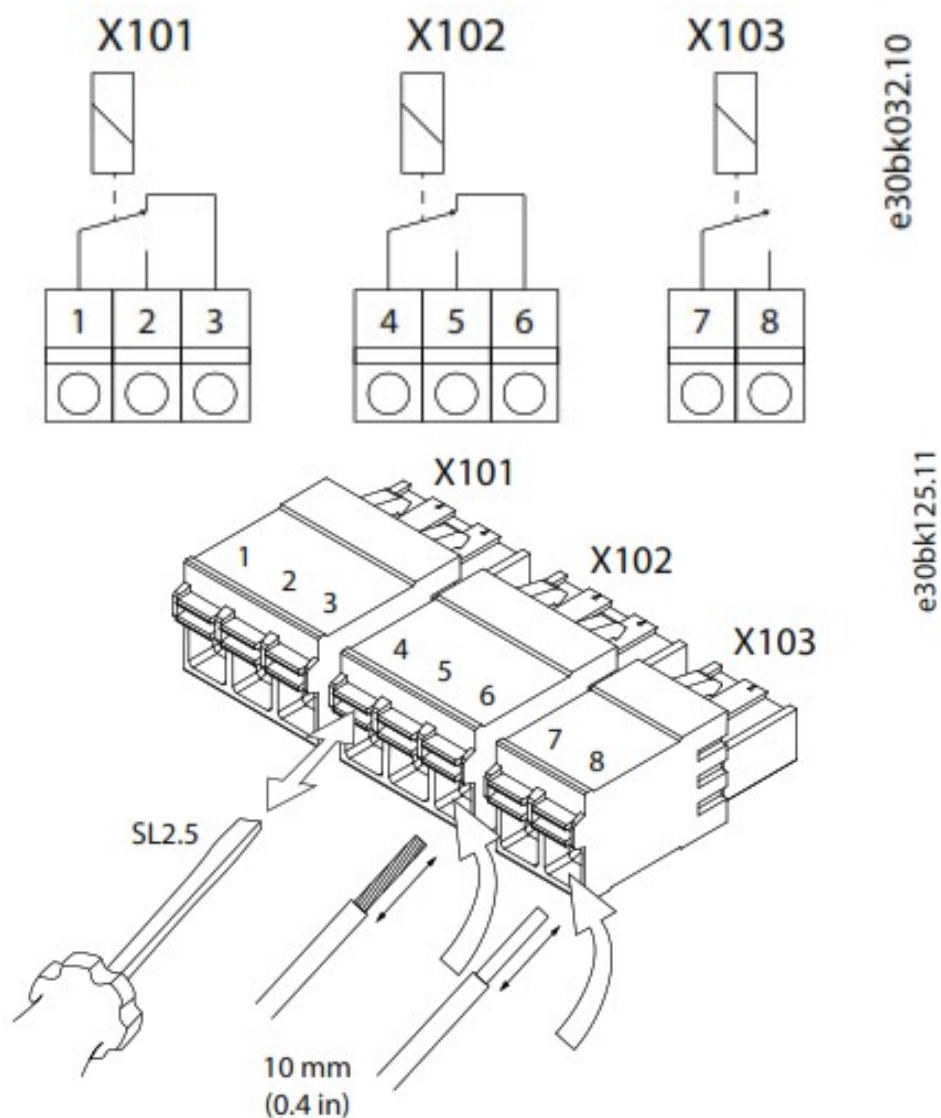


Illustration 17: Inserting Wires into the Relay Option OC7R0 Connectors

6.6.1 Wiring Diagrams for Different Operating Altitudes

- Operation up to 2000 m (6560 ft) altitude: Each relay can operate at different phase voltages. See Illustration 18.
- Operation above 2000 m (6560 ft) altitude: Operation with voltage above 50 V AC requires operation on the same phase voltage. See Illustration 19.
- Operation with mixed voltage (24 V) and high voltage is possible. High voltage must be on the same phase. See Illustration 20.

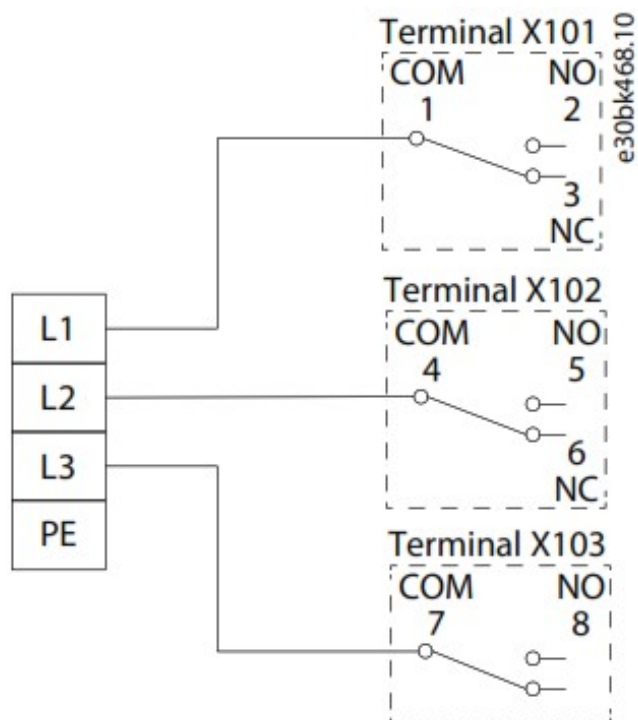


Illustration 18: Operation up to 2000 m (6560 ft) Altitude

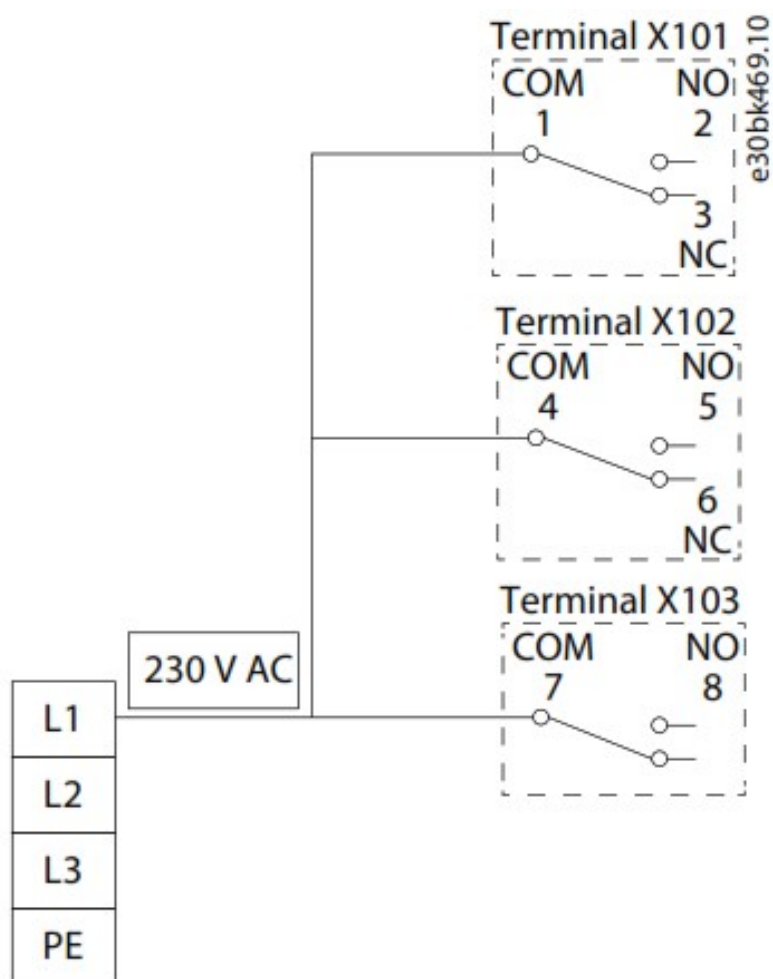


Illustration 19: Operation above 2000 m (6560 ft) Altitude with Voltage above 50 V AC

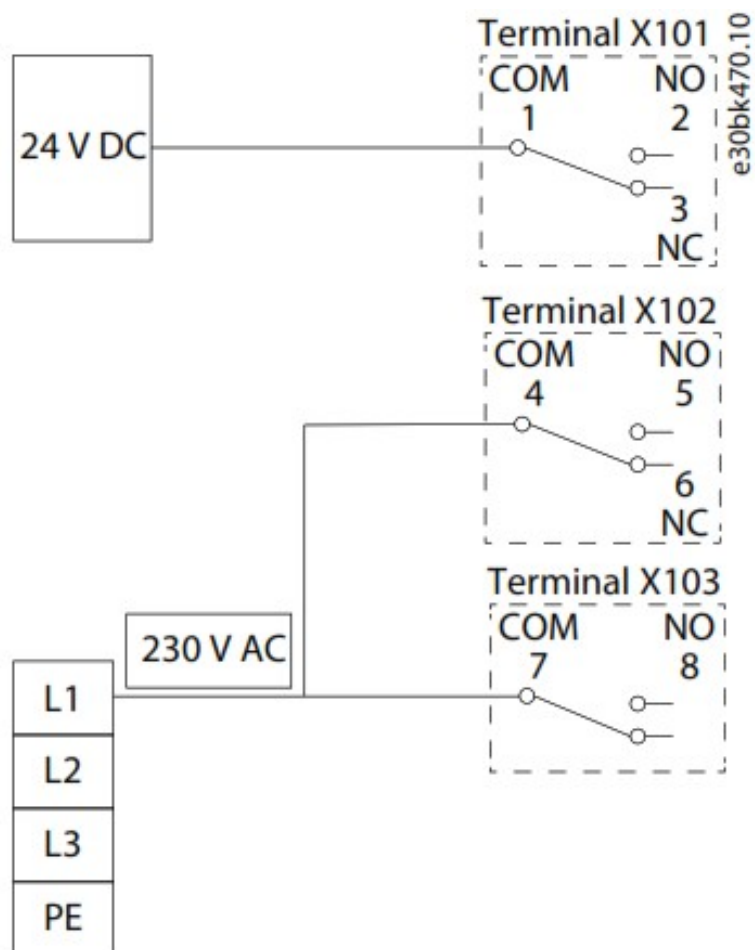


Illustration 20: Operation above 2000 m (6560 ft) Altitude with Mixed Voltages

6.7 Parameter Descriptions for Relay Option OC7R0

To set Relay output, see parameter group 5.26.1 General Digital Outputs.

Table 18: Digital Output Mapping for Relay Option OC7R0

Bit number	Value
15	—
14	Relay 8
13	Relay 5
12	Relay 2
11	—
10	—
9	—
8	—
7	—
6	—
5	—
4	—
3	—
2	—
1	—
0	—

6.7.1 Status (Menu Index 9.3)

P 9.3.1 Digital Relay Bit Word

Description: Shows the bitwise status of each relay output, bit 12 for relay 2, bit 13 for relay 5, bit 14 for relay 8

Default Value: NA	Parameter Type: Range (0 — 65535)	Parameter Number: 4909
Unit: —	Data Type: WORD	Access Type: Read Only

P 9.3.2 Relay X101

Description: Number of activations of Relay X101.

Default Value: 0	Parameter Type: Range (0 — 4294967295)	Parameter Number: 4910
Unit: —	Data Type: UDINT	Access Type: Read Only

P 9.3.3 Relay X102

Description: Number of activations of Relay X102.

Default Value: 0	Parameter Type: Range (0 — 4294967295)	Parameter Number: 4911
Unit: —	Data Type: UDINT	Access Type: Read Only

P 9.3.4 Relay X103

Description: Number of activations of Relay X103.




Default Value: 0	Parameter Type: Range (0 — 4294967 295)	Parameter Number: 4912
Unit: –	Data Type: UDINT	Access Type: Read Only

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