Danfoss

Operating Guide

iC7-Hybrid PROFINET

PROFINET RT OS7PR

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1 Introduction and Safety

1.1 Purpose of the Operating Guide

This operating guide provides information about configuring the system, controlling the drive or power converter, accessing parameters, programming, troubleshooting, and some typical application examples.

The operating guide is intended for use by qualified personnel, who are familiar with the iC7 drives and power converters, PROFINET technology, and the PC or PLC that is used as a master in the system.

Read the instructions before configuring PROFINET, and follow the procedures in this guide.

1.2 Additional Resources

Additional resources are available to help understand the features, and safely install and operate the iC7 series products:

- Safety guides, which provide important safety information related to installing iC7 series drives and power converters.

- Installation guides, which cover the mechanical and electrical installation of drives, power converters, or functional extension options.

- Design guides, which provide technical information to understand the capabilities of the iC7 series drives or power converters for integration into motor control and monitoring systems.

- Operating guides, which include instructions for control options, and other components for the drive.

- Application guides, which provide instructions on setting up the drive or power converter for a specific end use. Application guides for application software packages also provide an overview of the parameters and value ranges for operating the drives or power converters, configuration examples with recommended parameter settings, and troubleshooting steps.

- *Facts Worth Knowing about AC Drives*, available for download on www.danfoss.com.

- Other supplemental publications, drawings, and guides are available at www.danfoss.com.

Latest versions of Danfoss product guides are available for download at https://www.danfoss.com/en/service-and-support/documentation/.

1.3 Safety Symbols

The following symbols are used in Danfoss documentation.

⚠ 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).

The guide also includes ISO warning symbols related to hot surfaces and burn hazard, high voltage and electric shock, and referring to the instructions.

⚠️	ISO warning symbol for hot surfaces and burn hazard
⚠️	ISO warning symbol for high voltage and electric shock
📖	ISO action symbol for referring to the instructions

1.4 **Qualified Personnel**

Correct and reliable transport, storage, installation, operation, and maintenance are required for the trouble-free and safe operation of the product. Only qualified personnel are allowed to install and operate this equipment.

Qualified personnel are defined as trained staff, who are authorized to install, commission, and maintain equipment, systems, and circuits in accordance with pertinent laws and regulations. Also, the qualified personnel must be familiar with the instructions and safety measures described in this guide.

1.5 **Safety Precautions**

⚠️ **WARNING**
HIGH VOLTAGE Drives and power converters contain high voltage when connected to AC mains input, DC supply, or load sharing. Failure to perform installation, startup, and maintenance by qualified personnel can result in death or serious injury. • Only qualified personnel are allowed to perform installation, startup, and maintenance.

⚠️ **WARNING**
UNINTENDED START When the drive or power converter is connected to the AC mains or connected on the DC terminals, the motor may start at any time, causing risk of death, serious injury, and equipment or property damage. • Stop the drive or power converter before configuring parameters. • Make sure that the drive or power converter cannot be started by an external switch, a fieldbus command, an input reference signal from the control panel, or after a cleared fault condition. • Disconnect the drive or power converter from the mains whenever safety considerations make it necessary to avoid an unintended motor start. • Check that the drive or power converter and any driven equipment are in operational readiness.

⚠ **WARNING**

DISCHARGE TIME

The drive or power converter contains DC-link capacitors, which can remain charged even when the drive or power converter is not powered. High voltage can be present even when the warning indicator lights are off. Failure to wait the specified time after power has been removed before performing service or repair work can result in death or serious injury.

- Stop the motor.
- Disconnect all power sources, including permanent magnet type motors.
- Wait for capacitors to discharge fully. The discharge time is specified on the drive or power converter product label.
- Measure the voltage level to verify full discharge.

⚠ **WARNING**

LEAKAGE CURRENT HAZARD

Leakage currents exceed 3.5 mA. Failure to ground the drive or power converter properly can result in death or serious injury.

- Ensure that the minimum size of the ground conductor complies with the local safety regulations for high touch current equipment.

⚠ **WARNING**

EQUIPMENT HAZARD

Contact with rotating shafts and electrical equipment can result in death or serious injury.

- Ensure that only trained and qualified personnel perform installation, start-up, and maintenance.
- Ensure that electrical work conforms to national and local electrical codes.
- Follow the procedures in this guide.

⚠ **CAUTION**

INTERNAL FAILURE HAZARD

An internal failure in the drive or power converter can result in serious injury when the drive or power converter is not properly closed.

- Ensure that all safety covers are in place and securely fastened before applying power.

1.6 Abbreviations

Table 1: Abbreviations

Abbreviation	Definition
CTW	Control word
DAP	Device access point
DCP	Discovery and configuration protocol
DHCP	Dynamic host configuration protocol
DO	Drive object
DU	Drive unit
EMC	Electromagnetic compatibility

Table 1: Abbreviations (continued)

Abbreviation	Definition
I/O	Input/Output
IP	Internet protocol
IRT	Isochronous real time
LED	Light-emitting diode
LLDP	Link layer discovery protocol
LSB	Least significant bit
MAP	Module access point
MAV	Main actual value
MRC	Media redundancy client
MRM	Media redundancy manager
MRP	Media redundancy protocol
MRV	Main reference value
MSB	Most significant bit
PAP	Parameter access point
PC	Personal computer
PCD	Process channel data
PDEV	P-Device
PLC	Programmable logic controller
PNU	Parameter number
PPO	Process parameter object
REF	Reference
RFG	Ramp frequency generator
RT	Real time
STW	Status word

1.7 Trademarks

PROFIBUS® and PROFINET® are registered trademarks of PROFIBUS and PROFINET International (PI).

PROFIdrive® is a registered trademark licensed by PROFIBUS and PROFINET International (PI).

1.8 Version History

This guide is regularly reviewed and updated. All suggestions for improvement are welcome.

The original language of this guide is English.

Table 2: Version History

Version	Remarks
AQ481922002453, version 0201	Added instructions for configuring PROFINET RT with iC7 Series Generator application software.
AQ481922002453, version 0101	First release.

2 Product Overview

2.1 PROFINET Features and Technical Data

Fieldbus options for iC7 are integrated in the control board. Fieldbuses are enabled on communication interfaces X1 and X2 only. Modbus TCP is offered as standard, and other protocols such as PROFINET RT can be selected in the configurator when ordering a drive or power converter, or alternatively, they can be activated later by a proof-of-purchase token.

Table 3: PROFINET Model Codes

Model code	Description
+BAPR	PROFINET RT OS7PR

PROFINET is the Ethernet-based automation standard of PROFIBUS and PROFINET International (PI) for the implementation of an integrated and consistent automation solution based on Industrial Ethernet. PROFINET supports the integration of distributed field devices and time-critical applications in switched Ethernet networks. It also supports the integration of component-based distributed automation systems for vertical and horizontal integration of networks.

Table 4: PROFINET Features

Feature	Technical data
Cyclic response	1 ms update cycle
	PROFINET RT Conformance Class B (CC-B)
	Data consistency with submodule
Diagnostics	PROFINET Extended Diagnostics
	PROFINET Diagnostics (ALARM CR)
Connection	MRP (Media Redundancy Protocol)
	LLDP/SNMP
	Netload Class III, Advanced robustness against net load
	IPv4
	Addressing mode: DCP, STATIC, DHCP/BOOTP
System integration	Supported GSDML versions: • GSDML version 2.42: current version • GSDML version 2.35: compatible with legacy systems • GSDML version 2.31: compatible with legacy systems
PROFIenergy	Version 1.3

2.2 Communication Profiles and Objects

2.2.1 Overview

The iC7 series complies with PROFINET and PROFIdrive standards, mandatory PNU objects, PROFINET Extended Diagnostics, and a range of vendor-specific profiles for product-specific applications.

Each application in the iC7 series has a dedicated profile or profiles for fieldbus communication.

When using the Generator application software, a communication profile must be selected. Communication profiles are selected in parameter *Fieldbus Profile (1301)*. The parameter is applied only when the active control place is set to fieldbus control and when parameter *Converter Mode (162)* is set to *Motor Control*. The supported profiles for motor control operation are iC Generic, iC Speed, and PROFIdrive Application Class 1.

If parameter *Converter Mode (162)* is set to *Grid Control* when using any of the iC7-Hybrid application software, only the iC Hybrid profile is available.

Table 5: Communication Profiles and Supported Applications

Profile	Grid Converter	DC/DC Converter	Generator
iC Generic	–	–	X
iC Hybrid	X	X	X
iC Speed	–	–	X
PROFIdrive Application Class 0	X	X	–
PROFIdrive Application Class 1	–	–	X
PROFIenergy version 1.3	X	X	X
PROFIdrive standard PNUs	X	X	X

2.2.2 iC Generic

2.2.2.1 Overview

The iC Generic profile is used for motor control operation with the iC7 Series Generator application software.

2.2.2.2 Control Word

Table 6: iC Generic Profile Control Word Bits

Bit	Name	Description
0	Ramp Stop	0: The ramp stop request is inactive. The drive can be started. 1: The drive is ready to operate.
1	Coast Stop	0: A running drive coasts to a stop (modulation stops). 1: The coast request is inactive. The drive can be started.
2	Quick Stop	0: The drive stops with the Quick Stop function. 1: The Quick Stop request is inactive. The drive can be started.
3	Start	0: The drive stops operating with the method determined by the parameter *Missing Start Response (4717)*. 1: The drive starts to operate on the rising edge of this signal.
4	–	Reserved
5	–	Reserved
6	–	Reserved
7	Event Reset	0: Event Reset Inactive 1: Event Reset Active A rising edge of this signal resets events (warnings, faults, and so on), which do not have active triggering conditions. After a fault the drive goes to a Switching On Inhibited state, which must be acknowledged with bit 0.
8	Reference Reverse	0: The speed reference remains normal. 1: The speed reference is reversed. The reference can also be reversed with a negative setpoint. Double negatives result in a forward reference.

Table 6: iC Generic Profile Control Word Bits (continued)

Bit	Name	Description
9	–	Reserved
10	Data Valid	0: Ignores the current process data. Uses the previously processed data when the Data Valid bit was previously true. 1: Reads the current process data. For most of the control word commands to be acknowledged by the drive, fieldbus must be the commanding control place. See options in parameter group **Control Places** in parameter group **2 Parameters**.
11	Watchdog	0: Watchdog low 1: Watchdog high Continuous toggling 0–1 can be used as a sign of life between the drive and the fieldbus master. The value of this bit is also passed through the fieldbus status word as is.
12	Fieldbus Digital Input 1	0: Fieldbus Digital Input 1 inactive 1: Fieldbus Digital Input 1 active Select the value **CTW B12** for any input parameter to use this signal for the activation of a selected function.
13	Fieldbus Digital Input 2	0: Fieldbus Digital Input 2 inactive 1: Fieldbus Digital Input 2 active Select the value **CTW B13** for any input parameter to use this signal for the activation of a selected function.
14	Fieldbus Digital Input 3	0: Fieldbus Digital Input 3 inactive 1: Fieldbus Digital Input 3 active Select the value **CTW B14** for any input parameter to use this signal for the activation of a selected function.
15	Fieldbus Digital Input 4	0: Fieldbus Digital Input 4 inactive 1: Fieldbus Digital Input 4 active Select the value **CTW B15** for any input parameter to use this signal for the activation of a selected function

2.2.2.3 Status Word

Table 7: iC Generic Profile Status Word Bits

Bit	Name	Description
0	Ready To Switch On	0: The drive is not ready to receive a start command because of at least 1 of the following conditions is true: Fault Active, Ramp Stop Active, Coast Stop Active, or Quick Stop Active. 1: The drive is ready to accept a start command.
1	Power Unit Ready	0: The drive cannot be set running because the ready conditions of the power unit are not met. Check parameter **Motor Control Start Ready Status Word (6207)** for any conditions that are not met. 1: All power unit ready conditions are met.

Table 7: iC Generic Profile Status Word Bits (continued)

Bit	Name	Description
2	Drive Running	0: The drive is not running.
		1: The drive is running.
3	Fault Active	0: No active drive faults.
		1: One or more drive faults are active. Switching on is inhibited.
4	–	Reserved
5	Quick Stop Active	0: The quick stop command is inactive. A new start command is required.
		1: The quick stop command is active. This command can also be given from another control source than fieldbus.
6	–	Reserved
7	Warning Active	0: All drive warnings are inactive.
		1: One or more drive warnings are active.
8	–	Reserved
9	Fieldbus Control Active	0: Fieldbus is not the active control place.
		1: Fieldbus is the active control place.
10	–	Reserved
11	Run Enabled	0: The digital input signal *Run Enable Input (103)* is inactive, and modulation is disabled.
		1: The digital input signal *Run Enable Input (103)* is active, and modulation is enabled.
12	–	Reserved
13	–	Reserved
14	–	Reserved
15	Watchdog Feedback	0: The watchdog signal that the drive has received is low.
		1: The watchdog signal that the drive has received is high.

2.2.3 **iC Hybrid**

2.2.3.1 **Overview**

The iC Hybrid profile is used in the iC7 series with Grid Converter and DC/DC Converter applications, and with the Generator application in grid control mode.

2.2.3.2 **Control Word**

Table 8: Control Word Bits in iC Hybrid Profile

Bit	Name	Description
0	Switch On Enabled	0: Pre-charging[1], closing the main circuit breaker[1], and running are prevented or interrupted. If the main circuit breaker is closed, it opens[1]. 1: Pre-charging[1], closing the main circuit breaker[1], and running are not prevented or interrupted.
1	MCB Close Enabled	0: Closing the main circuit breaker is prevented[1] or the main circuit breaker is opened[1], and running is prevented or interrupted. 1: Closing the main circuit breaker is not prevented[1].
2	Quick Stop	0: Activate Quick Stop. 1: Do not activate Quick Stop.
3	Start	0: Stop the unit if it is running, or stop the startup sequence if it is not completed. 1: Initiate the startup sequence (DC-link pre-charging[2], closing the main circuit breaker[2], and start running), or keep the unit running.
4	Pre-charge	0: Stop the DC-link pre-charging, if ongoing. 1: Start or continue the DC-link pre-charging.
5	–	Reserved
6	–	Reserved
7	Event Reset	0: No action. 1: Reset active warnings/faults.
8	–	Reserved
9	–	Reserved
10	Data Valid	0: Ignore the current incoming process data values, instead use the last processed value when the Data Valid bit was true. 1: Use the current incoming process data values. For most of the control word commands to be acknowledged by the drive or power converter, the active control place must be set to fieldbus control in parameter group *Control Places* in parameter group *2 Parameters*.
11	Watchdog	Incoming watchdog bit. With continuous toggling between 0 and 1, this bit can be used as a sign-of-life between the drive or power converter and fieldbus controller. The value of this bit is passed through the fieldbus status word as is.
12	Fieldbus Digital Input 1	0: Fieldbus Digital Input 1 inactive. 1: Fieldbus Digital Input 1 active. Select the value *CTW B12* for any input parameter to use this signal to activate a function.

Table 8: Control Word Bits in iC Hybrid Profile (continued)

Bit	Name	Description
13	Fieldbus Digital Input 2	0: Fieldbus Digital Input 2 inactive. 1: Fieldbus Digital Input 2 active. Select the value *CTW B13* for any input parameter to use this signal to activate a function.
14	Fieldbus Digital Input 3	0: Fieldbus Digital Input 3 inactive. 1: Fieldbus Digital Input 3 active. Select the value *CTW B14* for any input parameter to use this signal to activate a function.
15	Fieldbus Digital Input 4	0: Fieldbus Digital Input 4 inactive. 1: Fieldbus Digital Input 4 active. Select the value *CTW B15* for any input parameter to use this signal to activate a function.

1) *If controlled by the grid converter unit.*

2) *If applicable.*

2.2.3.3 Status Word

Table 9: Status Word Bits in iC Hybrid Profile

Bit	Name	Description
0	Ready to Switch On	0: Not ready to switch on. 1: Ready to switch on.
1	Ready to Run	0: The converter is not ready to start modulation. Check *Grid Control Ready Status (5096)* or *DC/DC Control Ready Status (6520)* and *Application Ready Status Word (6525)*. 1: The converter is ready to start modulating.
2	Running	0: The converter is not modulating. 1: The converter is modulating.
3	Fault	0: No faults are active. 1: One or more faults are active.
4	–	Reserved
5	Quick Stop	0: Quick stop active. 1: Quick stop not active.
6	–	Reserved
7	Warning	0: No warnings active. 1: One or more warnings are active.
8	–	Reserved
9	Control by PLC	0: The active control place is not fieldbus. 1: The active control place is fieldbus.
10	–	Reserved

Table 9: Status Word Bits in iC Hybrid Profile (continued)

Bit	Name	Description
11	Run Enabled	0: Run enable from the dedicated input signal is missing. 1: Run enable from the dedicated input signal is present.
12	–	Reserved
13	–	Reserved
14	–	Reserved
15	Watchdog Feedback	0: The watchdog signal is low. 1: The watchdog signal is high.

2.2.4 iC Speed

2.2.4.1 Overview

The iC Speed profile is used with iC7 series Generator application software. The iC Speed profile differs from the PROFIdrive profile, because it does not have a state machine. It is only controlled by the actual state 1/0 of the control bits, not the sequence in which they are manipulated.

2.2.4.2 Control Word

Table 10: iC Speed Profile Control Word Bits

Bit number	Name	Description
0	Speed Preset Reference Selector 1	Use these bits to select between speed presets: 00: Preset reference 1 01: Preset reference 2 10: Preset reference 3 11: Preset reference 4
1	Speed Preset Reference selector 1	Use these bits to select between speed presets: 00: Preset reference 1 01: Preset reference 2 10: Preset reference 3 11: Preset reference 4
2	–	Reserved
3	Coast Stop	0: The drive coasts to a stop. 1: The coast request is inactive. The drive can be started.
4	Quick Stop	0: The drive stops with the Quick Stop function. 1: The Quick Stop request is inactive. The drive can be started.
5	Freeze Speed Reference	0: The speed reference (input of the ramp generator) is frozen to its latest value. 1: The speed reference can be changed freely.
6	Start	0: The drive stops operating with the method determined by parameter *Missing Start Response (4717)*. 1: The drive starts to operate on the rising edge of this signal.

Table 10: iC Speed Profile Control Word Bits (continued)

Bit number	Name	Description
7	Event Reset	The rising edge of this signal resets events (warnings, faults, and so on), which do not have active triggering conditions. 0: Event reset inactive. 1: Event reset active.
8	–	Reserved
9	Speed Ramp	0: Ramp 1 is active. Configure ramp in parameter group *2.4.1.2 Ramp 1*. 1: Ramp 2 is active. Configure ramp in parameter group *2.4.1.3 Ramp 2*.
10	Data Valid	0: Ignores the current process data. Uses the previously processed data when the Data Valid bit was previously true. 1: Reads the current process data (controlled by PLC). For most of the control word commands to be acknowledged by the drive, fieldbus must be the commanding control place. See options in parameter group *Control Places* in parameter group *2 Parameters*.
11	–	Reserved.
12	Fieldbus Digital Input 1	0: Fieldbus Digital Input 1 inactive 1: Fieldbus Digital Input 1 active Select the value *CTW B12* for any input parameter to use this signal for the activation of a selected function.
13	Fieldbus Digital Input 2	0: Fieldbus Digital Input 2 inactive 1: Fieldbus Digital Input 2 active Select the value *CTW B13* for any input parameter to use this signal for the activation of a selected function.
14	Fieldbus Digital Input 3	0: Fieldbus Digital Input 3 inactive 1: Fieldbus Digital Input 3 active Select the value *CTW B14* for any input parameter to use this signal for the activation of a selected function.
15	Fieldbus Digital Input 3	0: Fieldbus Digital Input 4 inactive 1: Fieldbus Digital Input 4 active Select the value *CTW B15* for any input parameter to use this signal for the activation of a selected function.

2.2.4.3 **Status Word**

Table 11: iC Speed Profile Status Word Bits

Bit number	Name	Description
0	Control Ready	0: The device controls are not ready and do not react to process data. 1: The device controls are ready and react to process data.
1	Drive Ready	0: The drive is not ready for operation. 1: The drive is ready for operation.

Table 11: iC Speed Profile Status Word Bits (continued)

Bit number	Name	Description
2	Coast	0: There is an active coast stop command and the drive is in a coast stop state.
		1: There are no active coast signals. The drive can be started.
3	Fault	0: There are no active faults.
		1: There is at least 1 active fault. The drive cannot be started before the fault condition is cleared and the fault is reset.
4	–	Reserved
5	–	Reserved
6	–	Reserved
7	Warning	0: There are no active warnings.
		1: There is at least 1 active warning. The cause of the warning should be investigated and mitigated.
8	Speed Reference	0: Speed not at reference. The motor speed differs from the given speed reference, for example, due to ramping.
		1: Speed at reference. The motor speed matches the given speed reference.
9	Fieldbus Control	0: Fieldbus control inactive. None of the basic command functions of the drive are affected by fieldbus commands.
		1: Fieldbus control active. Fieldbus is the active control place, or configured as part of the advanced control place.
10	Limiter	0: Limiter inactive. All limiters (regulators) are inactive.
		1: Limiter active. One or more limiters (regulator) are actively limiting the drive current, torque, and so on. See parameter *Motor Regulator Status Word (1715)* for further details.
11	Operation	0: The drive is not modulating (operating).
		1: The drive is modulating (operating).
12	–	Reserved
13	–	Reserved
14	–	Reserved
15	–	Reserved

2.2.5 PROFIdrive Application Class 1

2.2.5.1 Overview

Standard telegram 1 is implemented according to PROFIdrive Application Class 1 profile as defined in the PROFIdrive standard and state machine diagram. It can be used with iC7 series Generator application software.

2.2.5.2 **Control Word**

Table 12: Control Word Bits in PROFIdrive Standard Telegram 1

Bit number	Name	Description
0	On-Off	0: The drive cannot operate. A running drive is stopped with a ramp to zero speed. A resettable Switching On Inhibited state is reset. 1: The drive is ready to operate.
1	Coast Stop	0: The drive coasts to a stop. 1: The coast request is inactive. The drive can be started.
2	Quick Stop	0: The drive stops with the quick stop function. 1: The quick stop request is inactive. The drive is ready to operate.
3	Operation	0: The drive stops operating and coasts to a stop. 1: The drive starts to operate on the rising edge of this signal.
4	Ramp Generator	0: Reset ramp generator. The output of the RFG is set to 0. The drive decelerates along the current limit or along the voltage limit of the DC link. 1: Enable ramp generator (RFG).
5	Speed Reference	0: Freeze speed reference. The speed reference (input of the ramp generator) is frozen to its latest value. 1: Unfreeze speed reference. The speed reference can be changed freely.
6	Reference	0: Disable reference. The speed reference (ramp generator input) is forced to zero. 1: Enable reference. The speed reference can be changed freely.
7	Event Reset	0: Event reset inactive. 1: Event reset active. The rising edge of this signal resets events, which do not have active triggering conditions. After a fault, the drive goes to a Switching On Inhibited state, which must be acknowledged with bit 0.
8	–	Reserved
9	–	Reserved
10	Fieldbus Control	0: Ignores the current process data. Uses the previously processed data when the Data Valid bit was previously true. 1: Reads the current process data (controlled by PLC). For most of the control word commands to be acknowledged by the drive, fieldbus must be the commanding control place. See options in parameter group *Control Places* in parameter group *2 Parameters*.
11	–	Reserved
12	Fieldbus Digital Input 1	0: Fieldbus Digital Input 1 inactive. 1: Fieldbus Digital Input 1 active. Select the value *CTW B12* for any input parameter to use this signal for the activation of a selected function.

Table 12: Control Word Bits in PROFIdrive Standard Telegram 1 (continued)

Bit number	Name	Description
13	Fieldbus Digital Input 2	0: Fieldbus Digital Input 2 inactive. 1: Fieldbus Digital Input 2 active. Select the value *CTW B13* for any input parameter to use this signal for the activation of a selected function.
14	Fieldbus Digital Input 3	0: Fieldbus Digital Input 3 inactive. 1: Fieldbus Digital Input 3 active. Select the value *CTW B14* for any input parameter to use this signal for the activation of a selected function.
15	Fieldbus Digital Input 4	0: Fieldbus Digital Input 4 inactive. 1: Fieldbus Digital Input 4 active. Select the value *CTW B15* for any input parameter to use this signal for the activation of a selected function.

2.2.5.3 **Status Word**

Table 13: Status Word Bits in PROFIdrive Standard Telegram 1

Bit number	Name	Description
0	Ready to Switch On	0: Not ready to switch on 1: Ready to switch on. Motor control is ready, no active faults and switching on (control word bit 0) is allowed.
1	Ready to Operate	0: Not ready to be started. The drive cannot be set running with a start command. 1: Ready to be started. Control is switched on and a start command can be given.
2	Operation	0: The drive is not running. 1: The drive is running.
3	Faults	0: All drive faults are inactive. 1: One or more drive faults is active. Switching on is inhibited.
4	Coast Stop	0: The Coast Stop command is active. 1: The Coast Stop command is inactive.
5	Quick Stop	0: The Quick Stop command is active. Switching on is inhibited. The command can be given from fieldbus or IO. 1: The Quick Stop command is inactive. A new start command is required.
6	Switching On Inhibited	0: Switching on allowed. Nothing is inhibiting the drive from being switched on (control word bit 0 can be activated). 1: Switching on inhibited due to faults or quick stop. After faults have been acknowledged or the quick stop command is removed, the Off command must be given to reset the state.

Table 13: Status Word Bits in PROFIdrive Standard Telegram 1 (continued)

Bit number	Name	Description
7	Warning	0: All drive warnings are inactive. 1: One or more warnings are active.
8	Speed Error Within/Out of Tolerance Range	0: Speed error out of tolerance range. The actual speed differs from the speed reference more than 1% of motor nominal speed. 1: Speed error within the tolerance range. The actual speed differs from the speed reference less than 1% of motor nominal speed
9	Fieldbus Control Active/Inactive	0: Fieldbus control inactive. None of the basic command functions of the drive are affected by fieldbus commands. 1: Fieldbus control active. Fieldbus is the active control place or configured as part of the advanced control place.
10	Speed Reached/Speed not Reached	0: Speed not reached. The actual speed is below the comparison value set with parameter *Limit Supervision 1 Threshold (5253)*. 1: Speed reached. The actual speed is above the comparison value set with parameter *Limit Supervision 1 Threshold (5253)*.
11	–	Reserved.
12	–	Reserved.
13	–	Reserved.
14	–	Reserved.
15	–	Reserved.

2.3 Submodules

In iC7 series, the exchange of process data values is done through submodules:

- Profile signals
- Process data input and output signals. The available signal content can be browsed in the iC7-Hybrid device description files (see 4.4 GSDML File (Device Description File)) for further information.

Table 14: Submodule Sizes

Application	Cyclic input data	Cyclic output data
iC Hybrid Profile	[STW] [MAV]	[CTW] [REF]
iC Generic Profile	[STW] [MAV]	[CTW] [REF][1]
iC Speed Profile	[STW] [MAV]	[CTW] [REF][1]
PROFIdrive Standard Telegram 1	[STW] [MAV]	[CTW] [REF][1]

1) *Fieldbus Profile (1301)*

Table 15: Signal Module Sizes

Application	Cyclic input data	Cyclic output data
DC/DC Converter, Grid Converter, Generator	4 signals (16 bytes)	4 signals (16 bytes)
	8 signals (32 bytes)	8 signals (32 bytes)
	12 signals (48 bytes)	12 signals (48 bytes)
	16 signals (64 bytes)	16 signals (64 bytes)
	20 signals (80 bytes)	20 signals (80 bytes)

Each of the selections in a signal module can comprise the following data types:

- Boolean

- Unsigned 8/16/32

- Signed 8/16/32

- Float32

The buffer size adapts to the data type of the selected signals. If a Boolean type is mapped, only bit 0 is used in the selected signal address, and the remaining 7 bits are not used.

The actual interpretation of the value that is read or written depends on the data type and representation. For example, motor current is a real-type 32-bit value that is represented as float, and publishing the motor current as an actual value does not need any scaling and factoring.

2.4 Functional Extension Options

Each functional extension option is defined by its own PROFINET device model with a module and submodule(s).

Slot 1 contains the application and the subsequent slots contain the installed options. Each option supports a module access point (MAP), and other submodules contain the process data.
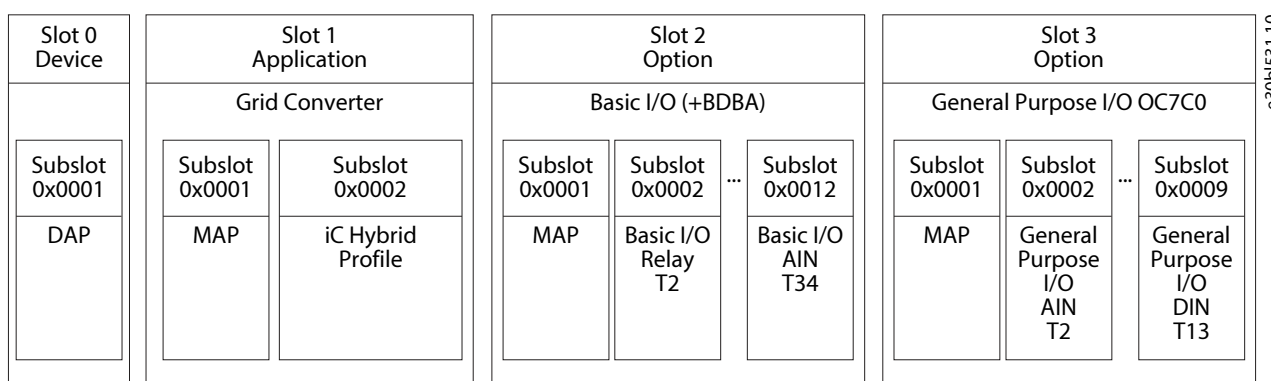
Figure 1: Example of a PROFINET Device Model with Functional Extension Options Installed in an iC7-Hybrid Power Converter

2.5 Network Topologies

2.5.1 Overview

Communication interface X1/X2 is used for fieldbus connection.

The communication interface in the iC7 drives and power converters has 2 Ethernet ports (X1 and X2) and an embedded switch with 2 Ethernet RJ45 connectors. It has 1 MAC and IP address, and is considered a single device in the network. The communication interface supports 3 network topologies:

- Line topology

- Star topology

- Ring topology

2.5.2 Line Topology

In many applications, line topology enables simpler cabling and the use of fewer Ethernet switches. Observe network performance and the number of devices in a line topology. Too many devices in a line may exceed network update time limits.

<table>
<tr><td colspan="2" align="center">**NOTICE**</td></tr>
<tr><td colspan="2">When line topology is used, take precautions to avoid timeout in the PLC when more than 8 drives or power converters are installed in series. Each drive or power converter in the network adds a small delay to the communication due to the built-in Ethernet switch. When the update time is too short, the delay can lead to a timeout in the PLC.

- Set the update time as shown in the table. The numbers given are typical values and can vary from installation to installation.

Number of units connected in series	Minimum update time [ms]
<8	2
8–16	4
16–32	8
33–50	16
>50	Not recommended
</td></tr>
</table>

> **NOTE:** Using tools such as MyDrive® Insight may influence system performance in a line topology.

e30bk812.10
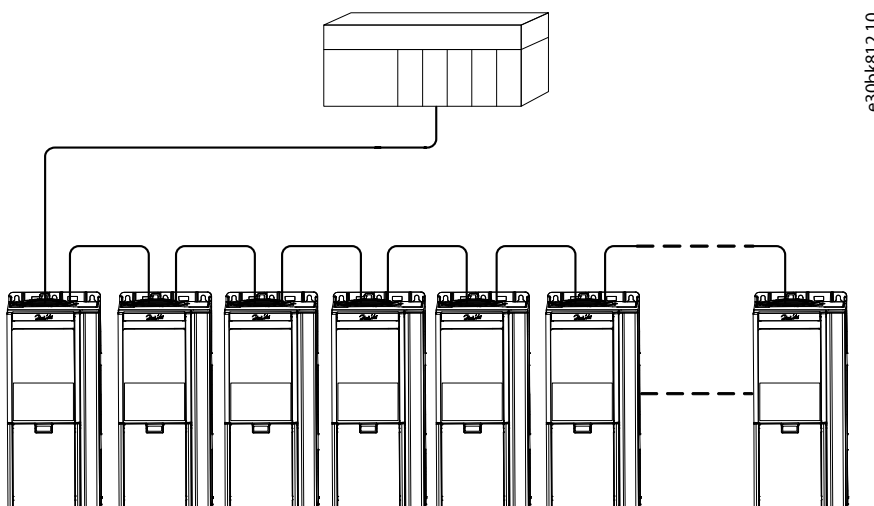
Figure 2: Example of Line Topology

<table>
<tr><td align="center">**NOTICE**</td></tr>
<tr><td>Installing drives or power converters of different current ratings in line topology may result in unwanted power-off behavior.

- Mount the drives or power converters with the longest discharge time first in the line topology. In normal operation, the drives or power converters with bigger current ratings have a longer discharge time.
</td></tr>
</table>

2.5.3 Star Topology

In a star network, all devices are connected to the same switch or switches. Star topology reduces the damage caused by a single cable failure. In a star topology, a single cable failure affects a single device instead of all devices in the network. In many applications, this topology enables simpler cabling depending on the location and distance of the device.
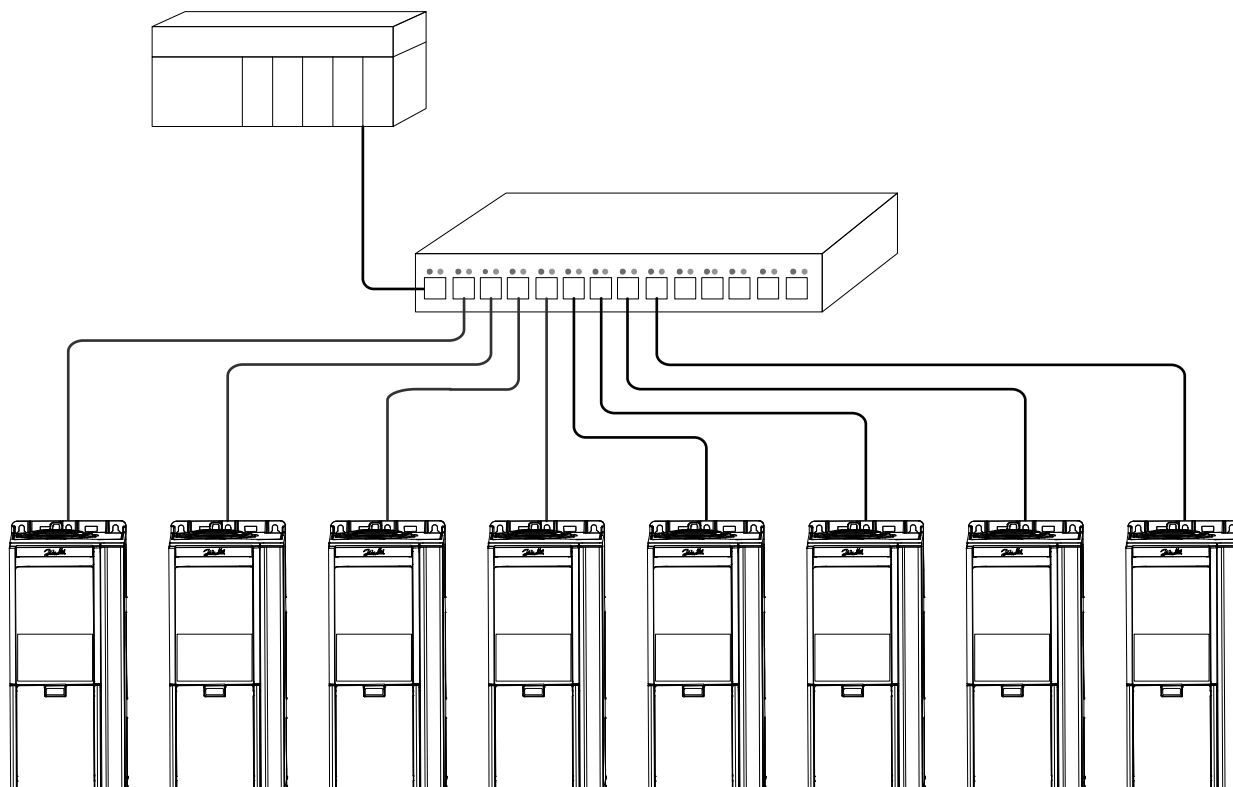
e30bk813.10

Figure 3: Example of Star Topology

2.5.4 Ring Topology

Ring topology enables the same simpler cabling and reduced cabling costs as line topology, but also reduces the damage caused by a single cable failure in a similar manner as star topology.

NOTICE
When ring topology is used, take precautions to avoid timeout in the PLC when more than 8 drives or power converters are installed in series. Each drive or power converter in the network adds a small delay to the communication due to the built-in Ethernet switch. When the update time is too short, the delay can lead to a timeout in the PLC. • Set the update time as shown in the table. The numbers given are typical values and can vary from installation to installation.

Number of units connected in series	Minimum update time [ms]
<8	2
8–16	4
16–32	8
33–50	16
>50	Not recommended

The ring topology protocol depends on the protocol in use.

For PROFINET, the Media Redundancy Protocol (MRP) is used. The MRP is designed to react deterministically on a cable failure. One of the nodes in the network has the role of Media Redundancy Manager (MRM), which observes and controls the ring topology to react to network faults. Usually this device is a PLC or network switch.
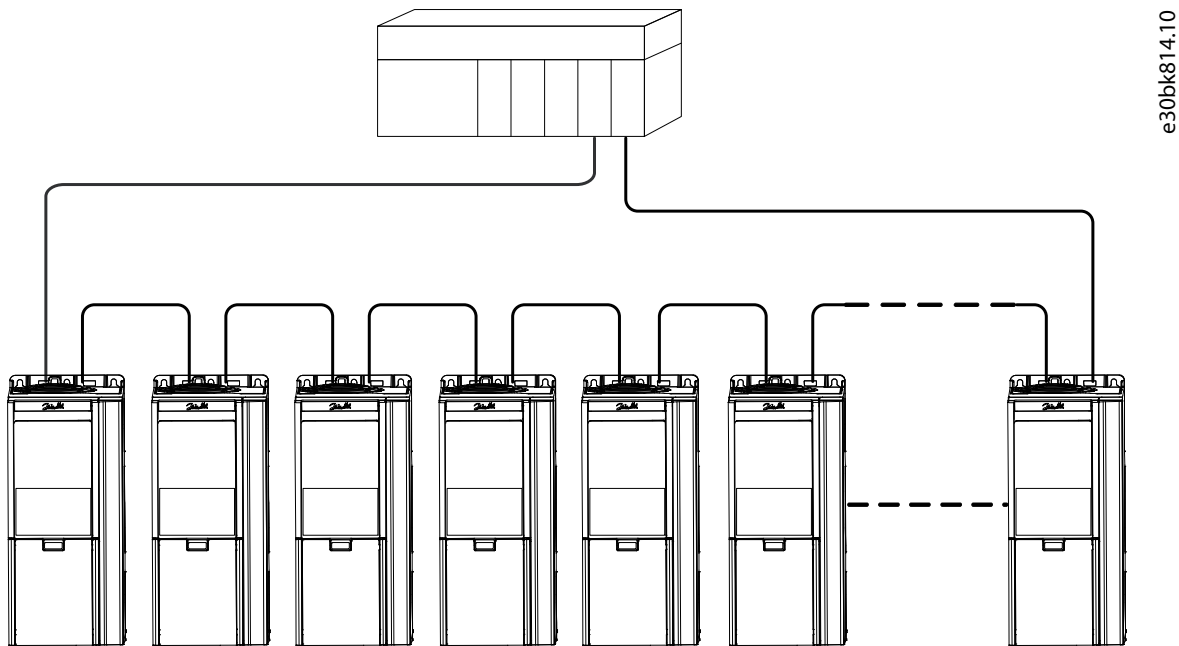
Figure 4: Example of Ring Topology

3 Fieldbus Cable Connections

3.1 Prerequisites for Installation

Communication interfaces are integrated in the control board in iC7 drives and power converters.

The position of the connections differs based on the control board concept and frame, for example. For more information on the location of the connections, cabling, and shielding, refer to the product-specific design guide.

3.2 Installation in Frequency Converters

3.2.1 Communication Interface X1/X2 in Frames FA02–FA12

The communication interface is on the top of the frequency converter as shown in Figure 5. Industrial-grade RJ45 connectors are recommended for optimal connection. A combined shield/fixing plate, the Fieldbus EMC plate, is available as an accessory to strengthen the mechanical fixation of the cables. For information on ordering the EMC plate, refer to the product-specific design guide.
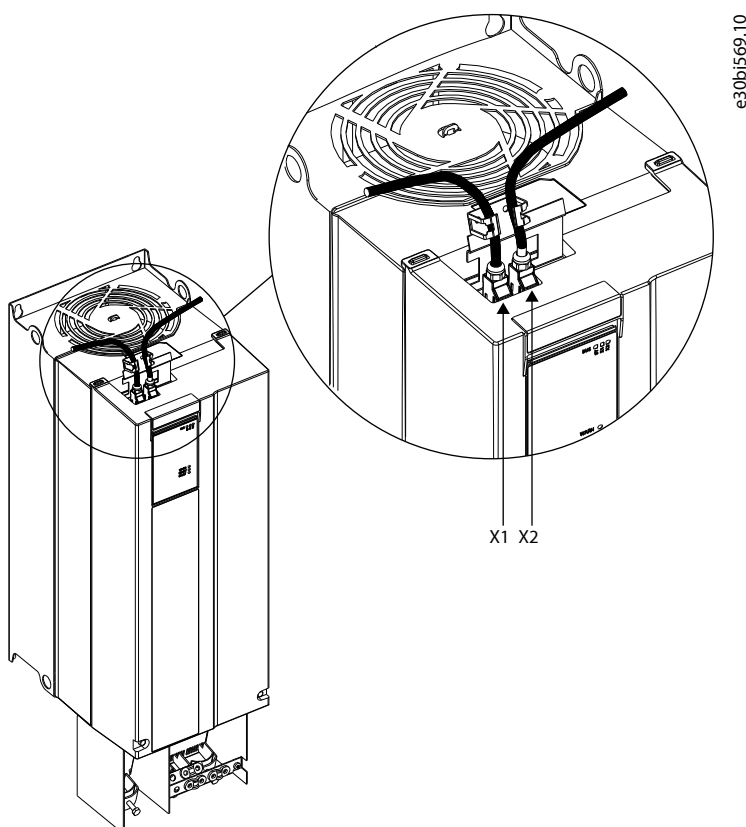
Figure 5: Location of the Communication Interface, X1/X2 in FA02-FA12 Frames (with the Optional EMC Plate)

3.2.2 Communication Interface X1/X2 in Frames FB09–FB12/FK06–FK12

The communication interface ports are located inside the frequency converter. The position of the ports and the recommended wiring path are shown in Figure 6 and Figure 7.
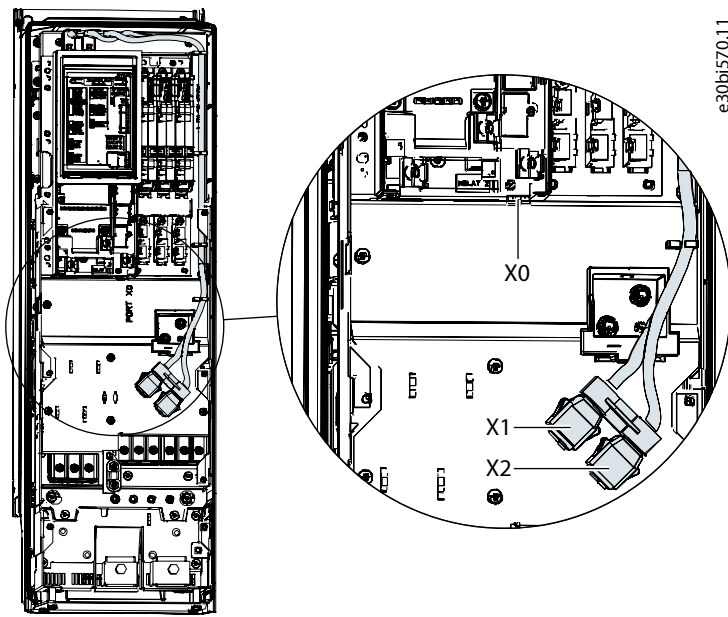
Figure 6: Communication Port X0, X1, and X2 Locations in FK06–FK08 Frames
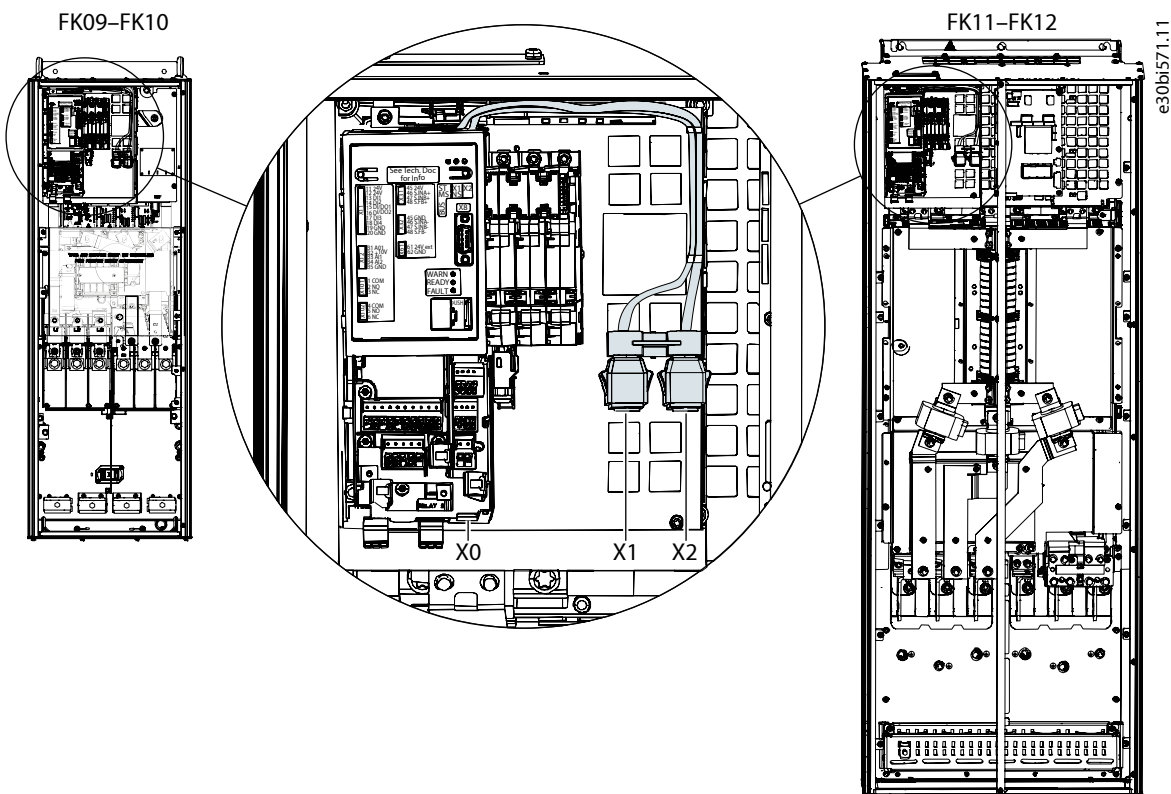
Figure 7: Communication Port X0, X1, and X2 Locations in FB09–FB12/FK09–FK12 Frames

3.3 Installation in System Modules

3.3.1 Communication Interface X1/X2 in System Modules

For systems that use system modules, the communication interface ports are located at the bottom facing side of the modular control unit as shown in Figure 8.
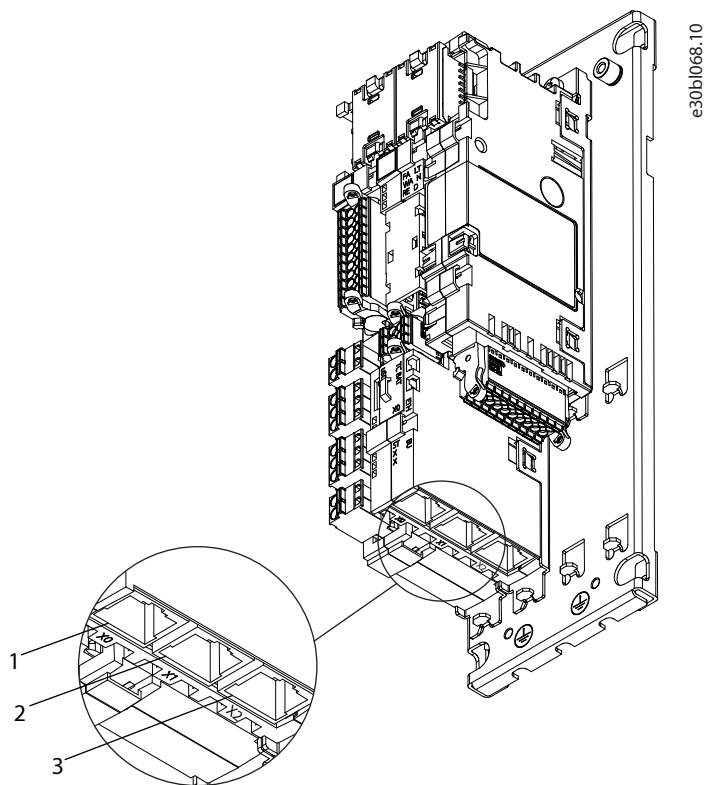
Figure 8: Communication Port X0, X1, and X2 Locations in the Modular Control Unit

1	Ethernet port (X0)	**2**	Ethernet port (X1)
3	Ethernet port (X2)		

3.4 EMC-compliant Installation

3.4.1 Overview

To obtain an EMC-compliant installation, follow the instructions provided in the product-specific design guide and the installation guide included in the shipment.

3.4.2 Grounding

- Ensure that all stations connected to the fieldbus network are connected to the same ground potential. When distances between the stations in a fieldbus network are long, connect the individual station to the same ground potential. Install equalizing cables between the system components.

- Establish a grounding connection with low HF impedance, for example, by mounting the unit on a conductive backplate.

- Keep the ground wire connections as short as possible.

3.4.3 **Cable Routing**

For more information on cabling, refer to the product-specific design guide and installation guide included in the shipment.

NOTICE
EMC INTERFERENCE
Failure to isolate fieldbus communication, motor, and brake resistor cables can result in unintended behavior or reduced performance.
• Use shielded cables for motor and control wiring, and separate cables for fieldbus communication, motor wiring, and brake resistor.
• A minimum of 200 mm (7.9 in) clearance between power, motor, and control cables is required. For power sizes above 315 kW (450 hp), increase the minimum distance to 500 mm (20 in).

NOTICE
CABLE ROUTING
• When the fieldbus cable intersects a motor cable or a brake resistor cable, ensure that the cables intersect at an angle of 90°.

e30bl407.10
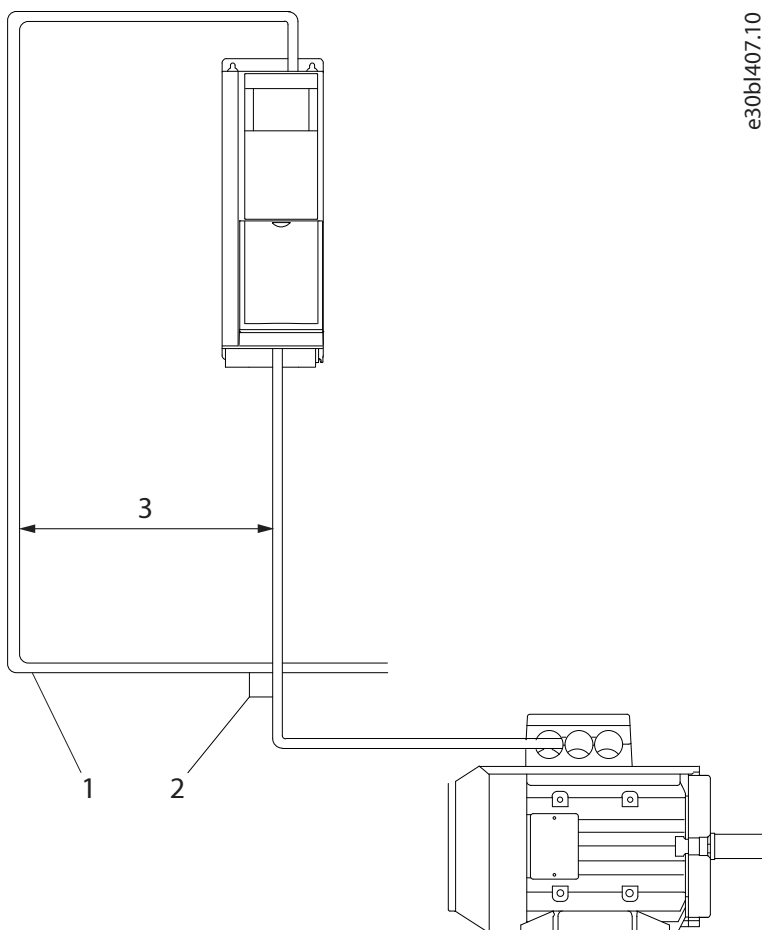
Figure 9: Cable Routing

1	Fieldbus cable	2	90° intersection
3	≥200 mm (7.9 in) (≥ 500 mm (20 in) for power sizes >315 kW (450 hp))		

4 Configuration

4.1 Configuring Fieldbus Protection Settings

4.1.1 Fieldbus Protection Settings for DC/DC Converter

The general fieldbus settings are in parameter group *Parameters* > *Protections and Responses* > *Fieldbus Protections*.

Table 16: Fieldbus Protection Setting Parameters for DC/DC Converter

Parameter	Parameter number	Value	Description
Fieldbus Fault Response	1304	• No response • Info • Warning • Warning, Current Lim. Ramp - Persistent • Fault (default) See Table 17 for descriptions of the events.	Select the behavior when a fieldbus fault, for example, loss of I/O connection occurs.
No Fieldbus Connection Response	1305	• No response (default) • Info • Warning • Warning, Current Lim. Ramp - Persistent • Fault See Table 17 for descriptions of the events.	Select the behavior if an active fieldbus connection has not been established.
Process Data Timeout Response	1306	• No response • Info (default) • Warning • Warning, Current Lim. Ramp - Persistent • Fault See Table 17 for descriptions of the events.	Select the response if there is no fieldbus connection.
Process Data Timeout Time	1340	0.05–18000 s (Default value: 1.00 s)	Set the timeout time. If process data is not received within the time set, a process data timeout is triggered.
Fieldbus Watchdog Response	5244	• No response • Info • Warning (default) • Warning, Current Lim. Ramp - Persistent • Fault See Table 17 for descriptions of the events.	Select the response in case the fieldbus watchdog bit (bit 11) has not changed its value within the specific watchdog delay time.

Table 16: Fieldbus Protection Setting Parameters for DC/DC Converter (continued)

Parameter	Parameter number	Value	Description
Fieldbus Watchdog Delay	5245	0.00–3000 s (Default: 5.00 s)	Set a delay time for after which the fieldbus watchdog event is triggered if the watchdog bit has not changed its value.
Fieldbus Watchdog Start Delay	5246	0.00–3000 s (Default: 30.00 s)	Set a delay time for after which the fieldbus watchdog event is triggered if the watchdog bit has not changed its value. This time applies only immediately after powering the control unit.

Table 17: Event Descriptions

Value	Description
No response	The event is ignored.
Info	The event is logged in the event log.
Warning	The converter issues a warning.
Warning, Current Lim. Ramp - Persistent	The drive or power converter issues a warning, and the positive/negative active current limits are ramped down to preset values. The current limit overrides stay active until the warning is acknowledged by a reset.
Fault	A fault is issued, and the modulation is stopped.

4.1.2 Fieldbus Protection Settings for Grid Converter

The general fieldbus settings are in parameter group *Parameters* > *Protections and Responses* > *Fieldbus Protections*.

Table 18: Fieldbus Protection Setting Parameters for Grid Converter

Parameter	Parameter number	Value	Description
Fieldbus Fault Response	1304	• No response • Info • Warning • Warning, Current Lim. Ramp - Persistent • Fault (default) • Fault, open MCB See Table 19 for descriptions of the events.	Select the behavior when a fieldbus fault, for example, loss of I/O connection occurs.
No Fieldbus Connection Response	1305	• No response (default) • Info • Warning • Warning, Current Lim. Ramp - Persistent • Fault • Fault, open MCB See Table 19 for descriptions of the events.	Select the behavior if an active fieldbus connection has not been established.

Table 18: Fieldbus Protection Setting Parameters for Grid Converter (continued)

Parameter	Parameter number	Value	Description
Process Data Timeout Response	1306	- No response - Info (default) - Warning - Warning, Current Lim. Ramp - Persistent - Fault - Fault, open MCB See Table 19 for descriptions of the events.	Select the response if there is no fieldbus connection.
Process Data Timeout Time	1340	0.05–18000 s (Default value: 1.00 s)	Set the timeout time. If process data is not received within the time set, a process data timeout is triggered.
Fieldbus Watchdog Response	5244	- No response - No response - Warning (default) - Warning, Current Lim. Ramp - Persistent - Fault - Fault, open MCB See Table 19 for descriptions of the events.	Select the response in case the fieldbus watchdog bit (bit 11) has not changed its value within the specific watchdog delay time.
Fieldbus Watchdog Delay	5245	0.00–3000 s (Default: 5.00 s)	Set a delay time for after which the fieldbus watchdog event is triggered if the watchdog bit has not changed its value.
Fieldbus Watchdog Start Delay	5246	0.00–3000 s (Default: 30.00 s)	Set a delay time for after which the fieldbus watchdog event is triggered if the watchdog bit has not changed its value. This time applies only immediately after powering the control unit.

Table 19: Event Descriptions

Value	Description
No response	The event is ignored.
Info	The event is logged in the event log.
Warning	The drive or power converter issues a warning.
Warning, Current Lim. Ramp - Persistent	The drive or power converter issues a warning, and the positive/negative active current limits are ramped down to preset values. The current limit overrides stay active until the warning is acknowledged by a reset.
Fault	The drive or power converter issues a fault, and the modulation is stopped.
Fault, open MCB	The drive or power converter issues a fault, the modulation is stopped and the MCB is opened, if controlled by the converter.

4.1.3 Fieldbus Protection Settings for Generator

The general fieldbus settings are in parameter group *Parameters* > *Protections and Responses* > *Fieldbus Protections*.

Table 20: Fieldbus Protection Setting Parameters for Generator

Parameter	Parameter number	Value	Description
Fieldbus Fault Response	1303	- No response - Info (default) - Warning - Fault, ramp to coast - Fault, coast See Table 21 for descriptions of the events.	Select the behavior when a fieldbus fault, for example, loss of I/O connection occurs.
Process Data Timeout Response	5291	- No response - Info (default) - Warning - Fault, ramp to coast - Fault, coast See Table 21 for descriptions of the events.	Select the response if there is no fieldbus connection.
Process Data Timeout Delay	1340	0.05–18000 s (Default value: 1.00 s)	Set the timeout time. If process data is not received within the time set, a process data timeout is triggered.
Fieldbus Watchdog Response	5244	- No response (default) - Info - Warning - Fault, ramp to coast - Fault, coast See Table 21 for descriptions of the events.	Select the response in case the fieldbus watchdog bit (bit 11) has not changed its value within the specific watchdog delay time.
Fieldbus Watchdog Delay	5245	0.00–3000 s (Default: 5.00 s)	Set a delay time for after which the fieldbus watchdog event is triggered if the watchdog bit has not changed its value.
Fieldbus Watchdog Start Delay	5246	0.00–3000 s (Default: 30.00 s)	Set a delay time for after which the fieldbus watchdog event is triggered if the watchdog bit has not changed its value. This time applies only immediately after powering the control unit.

Table 21: Event Descriptions

Value	Description
No response	The event is ignored.
Info	The event is logged in the event log.
Warning	The drive or power converter issues a warning.
Fault, ramp to coast	The drive or power converter issues a fault, and ramps the motor speed to 0 before stopping modulation.
Fault, coast	The drive or power converter issues a fault and modulation is stopped immediately.

4.2 **Configuring the Ethernet Interface**

The X1 and X2 interfaces are internally connected with an Ethernet switch and share the same physical MAC layer, and the same IP settings apply to both interfaces. IPv4 settings are configured in MyDrive® Insight or in the control panel.

1. Configure IPv4 settings.

– In MyDrive® Insight, go to *Setup and Service > Interface configuration > Interface X1/X2 > IPv4 settings*.

– In the control panel, navigate to parameter group *Communication Interfaces*.

Table 22: IPv4 Settings

Function	Value	Description
Interface X1/X2 MAC address	00:1B:08:xx:xx:xx	The MAC address of interface X1/X2. The value is read-only.
IPv4 addressing method	Disable	Only link-local IP address in the 169.254.xxx.xxx range is active.
	Static IP	A static IP address is entered manually.
	Automatic	IP address is assigned via a DHCP or BOOTP server.
	DCP (default)	DCP is used with PROFINET where a PLC assigns the IP address, subnet mask, and other relevant parameters.
Requested IPv4 address	xxx.xxx.xxx.xxx	If *Automatic* is selected as the IPv4 addressing method and no DHCP/BOOTP server is present, the X1/X2 interface automatically configures an IP address and subnet mask in the 169.254.xxx.xxx range.
Requested IPv4 subnet mask	xxx.xxx.xxx.xxx	The requested IPv4 subnet mask for the interface.
Requested IPv4 gateway address	xxx.xxx.xxx.xxx	Requested IPv4 gateway address for the interface.
Enable ACD	Enable	Request to enable or disable Address Conflict Detection for the interface.
	Disable (default)	The change does not take effect before a power cycle is performed. If no conflicts are detected, ACD activity shows 0. If an address conflict occurs, the ACD activity shows 1, and the IPv4 interface reverts to an automatically assigned IP address in the 169.254.xxx.xxx range. The recommended setting for PROFINET is *Disable*.
DNS server 1, 2	xxx.xxx.xxx.xxx	The user-requested Domain Name Server 1 for the interface (for manual IP addressing mode only).

4.3 **Configuring Name of Station**

1. Navigate to parameter *Name of Station (7080)*.

Parameter name	Parameter number	Value	Additional information
Name of Station	7080	Accepted characters: • Lower case letters (a–z) • Numbers (0–9) • Special characters: dash (–), full stop (.) The value can be up to 127 characters or digits in total. The maximum length for each component separated by a full stop or dash is 63 characters or digits. Spaces are not allowed.	Each PROFINET device has a unique Name of Station.

4.4 GSDML File (Device Description File)

To configure a PROFINET controller, the configuration tool needs a GSDML file for each type of device in the network. The GSDML file is a PROFINET xml file containing the necessary communication setup data for a device. Each product in the iC7 series has a unique GSDML file.

Download the GSDML files for the iC7 series from https://www.danfoss.com/en/service-and-support/downloads/dds/fieldbus-configuration-files/. Check that the GSDML file version is compatible with the firmware version.

4.5 Reference and Main Actual Value Handling

4.5.1 DC/DC Converter and Grid Converter

For the Grid Converter and DC/DC Converter applications, the Main Reference [REF] and Main Actual Value [MAV] are tied to the DC-link voltage of the converter. Both of these signals are interfaced as 32-bit floating point values. They are expressed in % of parameter *DC-link Nominal Voltage (2834)*.

4.5.2 Generator

In the Generator application software, the Main Reference [REF] and Main Actual Value [MAV] are tied to the motor electrical speed in Hz. Both of these signals are interfaced as 16-bit integer values. Parameters *Fieldbus Speed Scale Max (6310)*, *Fieldbus Speed Scale Min (6311)*, *Fieldbus Speed Signal Max (6312)*, and *Fieldbus Speed Signal Min (6313)* are used to scale the raw input signal for the motor speed reference [REF] to Hz, and to scale the motor electrical speed [MAV] in Hz to the raw output signal.

With the PROFIdrive profile, the scaling is automatically set for the input signal values +32767/-32768 to correspond to speed values of +199.99%/-200.00% of motor nominal speed.

Table 23: Reference and Main Actual Handling Parameters

Parameter name	Parameter number	Default value	
		iC Generic and iC Speed	PROFIdrive
Fieldbus Speed Signal Max	6312	10000	32767
Fieldbus Speed Signal Min	6313	-10000	-32768
Fieldbus Speed Scale Max	6310	100.00 Hz	2*Fnom
Fieldbus Speed Scale Min	6311	-100.00 Hz	-2*Fnom

5 Parameter Access

5.1 Overview

iC7 series supports access to parameters via Base Mode Parameter Access. The data mechanism transmits requests and replies acyclically. The requests and replies are transmitted by the Acyclic Data Exchange mechanism.

For detailed instructions on how to access parameters, refer to the documentation provided by the PLC manufacturer.

5.2 PROFIdrive Parameter Numbers

PROFIdrive specifies a list of standard PNUs and maps them to the areas defined in Table 24. For more details on PROFIdrive PNUs, refer to the latest version of the PROFIdrive standard.

The iC7 series supports all mandatory PNU objects and some optional and the device-specific parameter access range. The PROFIdrive parameters are not accessible via MyDrive® Insight or the control panel.

Table 24: Supported PNUs

PNU	Description
922	Telegram selection
923	List of all parameters for signals
944	Fault message counter
947	Fault number
950	Scaling of the fault buffer
964	Drive unit identification
965	Profile identification number
972	Drive reset
974	Base mode parameter access service identification
975	Drive object identification
976	Load device parameter set
977	Transfer in non-volatile memory (global)
980–989	Number list of defined parameters
60000	Velocity reference value
61000	NameOfStation (read only)
61001	IpOfStation (read only)
61002	MacOfStation (read only)
61003	DefaultGatewayOfStation (read only)
61004	SubnetMaskOfStation (read only)

6 Troubleshooting

6.1 Diagnostics

The iC7 series supports diagnostic event messaging for control systems by using faults and warnings. The faults and warnings are enabled by default. Whenever one occurs, it is indicated on the display of a control system. If diagnosis interrupt is used by the control system, it is possible to read out the fault or warning event within the PLC program and to react accordingly.

Table 25: Diagnostics Parameters

Parameter name	Parameter number	Value	Description
Diagnostics Fault	7081	• Enabled (default) • Disabled	Enables diagnostic fault. When disabled, the device does not send any PROFINET diagnosis message with severity *Fault* when a fault is present on the device.
Diagnostics Warning	7083	• Enabled (default) • Disabled	Enables diagnostic warning. When disabled, the device does not send any PROFINET diagnosis message with severity *Maintenance required* when a warning is present on the device.

6.2 PROFINET Report

The PROFINET report is available in MyDrive®Insight. The report shows the current status of:

• Connections

• Configuration

• Mapped signals and their values

Figure 10: Example of a PROFINET Report

6.3 **Configuring Port Mirroring Settings**

Enable or disable the port mirroring function for network troubleshooting with a network analyzer tool.

1. In MyDrive® Insight, go to *Setup and Service > Interface Configuration > Port Mirroring Settings*.

Table 26: Port Mirroring Settings

Function	Selections	Description
Source port	• X1 • X2	Frames are mirrored from this port.
Destination port	• X1 • X2	Frames are mirrored to this port.
Block RX from destination port	Enable/Disable	Device does not receive any frames from Destination Port when enabled.
Enable port mirroring	Enable/Disable	Enables the Port Mirroring feature.

6.4 **Identifying a Unit**

The winking function makes the fieldbus indicator LEDs ST, X1, and X2 flash yellow to make it easy to identify a unit. The function is enabled in MyDrive® Insight.

1. In MyDrive® Insight, click the device name in live mode.

2. Select *Device Status*.

3. To activate or deactivate the feature, click the toggle switch.
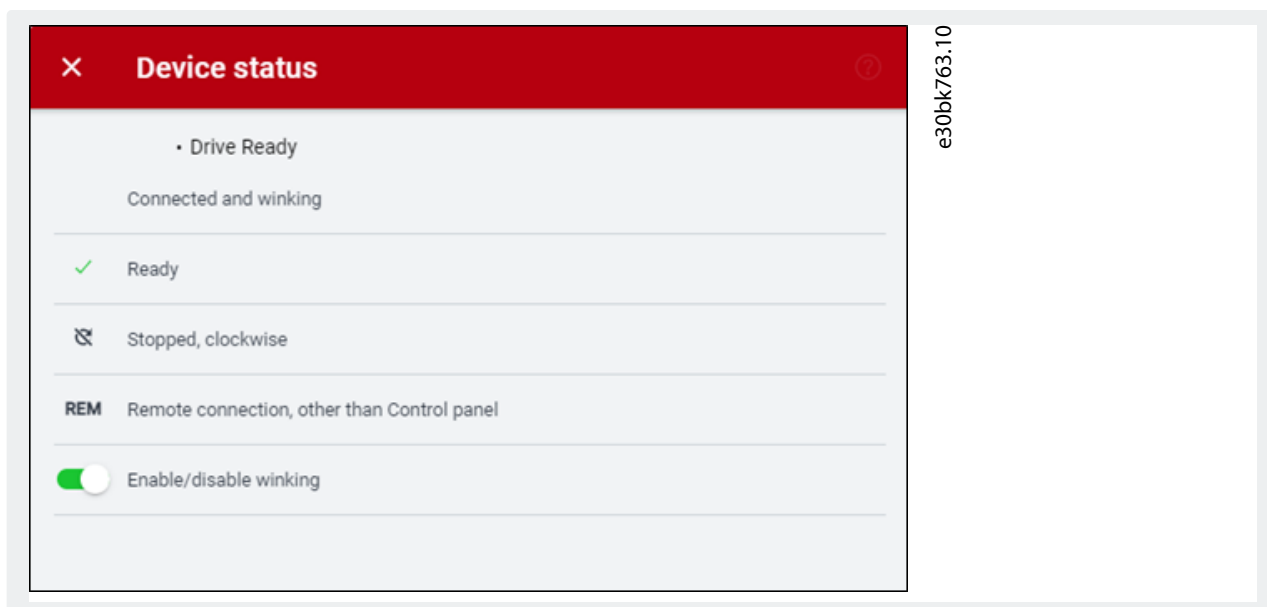
See 6.5 Fieldbus Indicator LEDs for more information on interpreting the LED signals and where the LEDs are located.

6.5 **Fieldbus Indicator LEDs**

The fieldbus indicator LEDs are in the top right corner of the control panel and the bottom part of the front-facing side of the modular control unit.
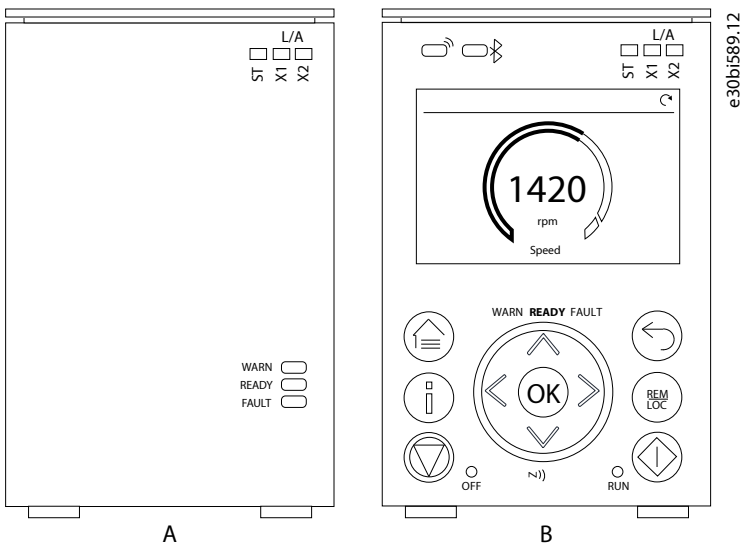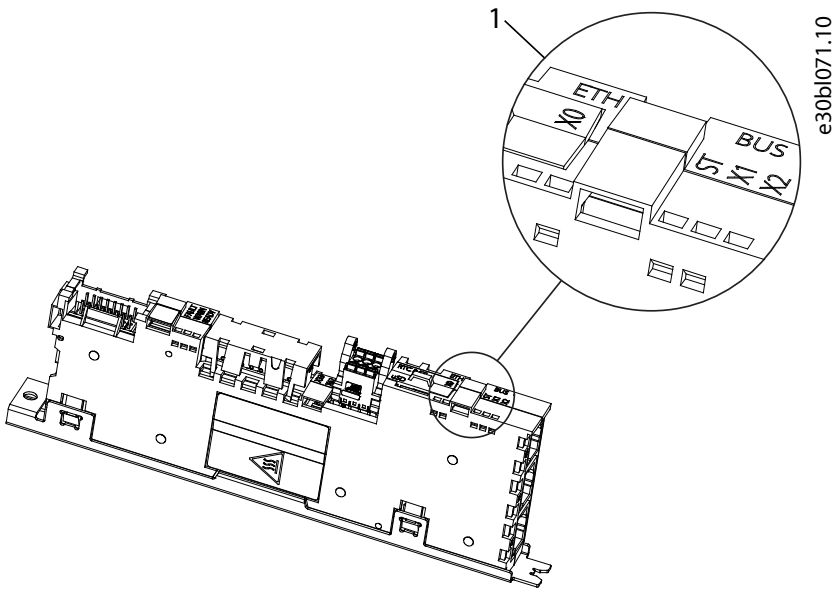
Figure 11: Fieldbus Indicator LEDs on Control Panel

| 1 | Fieldbus indicator LEDs (ST, X1, and X2) |

Figure 12: Fieldbus Indicator LEDs on Modular Control Board

- The LED labeled ST shows the module status.

- The LED labeled X1 shows the network status on Ethernet port X1.

- The LED labeled X2 shows the network status on Ethernet port X2.

Table 27: Fieldbus Indicator LED Functions

LED label	Status	LED pattern	Description
ST	DCP blink	Flashing yellow	PROFINET discovery protocol active, 3 s flashing.
	Not configured	Off	PROFINET not configured.
	IO connection faulted	Steady red	A PROFINET IO connection has faulted.
	Configuration mismatch	Flashing red	PROFINET configuration mismatch.
	Configured/No IO connection	Flashing green	Device is configured from PLC master but no IO connection has been established.
	All IO connections OK	Solid green	PROFINET IO connection to device established.
X1/X2	DCP blink	Flashing yellow	PROFINET discovery protocol active, 3 s flashing.
	Link down	Off	–
	Invalid configuration/Duplicated IP address	Solid red	IP configuration error
	Link up	Solid green	Ethernet link is active.

172K4283B

1 7 2 K 4 2 8 3 B