ENGINEERING
TOMORROW

Danfoss

Operating Guide

iC7-Hybrid PROFINET

PROFINET RT

Contents

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 electrical shock, and referring to the instructions.

⚠	ISO warning symbol for hot surfaces and burn hazard
⚡	ISO warning symbol for high voltage and electrical 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, start-up, and maintenance by qualified personnel can result in death or serious injury. • Only qualified personnel are allowed to perform installation, start-up, 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 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.

NOTICE

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 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

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.

Table 5: Communication Profiles and Supported Applications for iC7-Hybrid

Profile	Grid Converter	DC/DC Converter
PROFIdrive Application Class 0	X	X
PROFIenergy version 1.3	X	X
PROFIdrive standard PNUs	X	X
iC Hybrid Profile	X	X

2.3 iC7 Hybrid Profile

2.3.1 Overview

The iC Hybrid profile is used in the iC7 series with the Grid Converter and DC/DC Converter applications.

2.3.2 Control Word

Table 6: 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 is opened[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 precharging[2], closing the main circuit breaker[2], and start running), or keep the unit running.
4	Pre-charge	0: Stop the DC-link precharging, if ongoing. 1: Start or continue the DC-link precharging.
5	–	Reserved
6	–	Reserved
7	Warning/Fault 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.

Table 6: Control Word Bits in iC Hybrid Profile *(continued)*

Bit	Name	Description
11	Watchdog	Incoming watchdog bit.
12	Vendor Specific Bit 1	0: Deactivate vendor specific function using digital input/ output virtual slot 6412. 1: Activate vendor specific function using digital input/ output virtual slot 6412.
13	Vendor Specific Bit 2	0: Deactivate vendor specific function using digital input/ output virtual slot 6413. 1: Activate vendor specific function using digital input/ output virtual slot 6413.
14	Vendor Specific Bit 3	0: Deactivate vendor specific function using digital input/ output virtual slot 6414. 1: Activate vendor specific function using digital input/ output virtual slot 6414.
15	Vendor Specific Bit 4	0: Deactivate vendor specific function using digital input/ output virtual slot 6415. 1: Activate vendor specific function using digital input/ output virtual slot 6415.

1) If controlled by the grid converter unit.

2) If applicable.

2.3.3 Status Word

Table 7: 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: Converter is not ready to start modulation. Check *Grid Control Ready Status* or *DC/DC Control Ready Status* and *Application Ready Status Word*. 1: Converter is ready to start modulating.
2	Running	0: Converter is not modulating. 1: 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

Table 7: Status Word Bits in iC Hybrid Profile *(continued)*

Bit	Name	Description
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
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	Outgoing fieldbus watchdog bit.

2.4 **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 4.3 GSDML File (Device Description File)) for further information).

Table 8: Input and Output Submodule Sizes

Application	Submodules	
	Cyclic input data	Cyclic output data
iC Hybrid Profile	[STW] [MAV]	[CTW] [REF]
Application	**Signal modules**	
Grid Converter	4 signals (16 bytes) 8 signals (32 bytes) 12 signals (48 bytes) 16 signals (64 bytes) 20 signals (80 bytes)	4 signals (16 bytes) 8 signals (32 bytes) 12 signals (48 bytes) 16 signals (64 bytes) 20 signals (80 bytes)
DC/DC Converter	4 signals (16 bytes) 8 signals (32 bytes) 12 signals (48 bytes) 16 signals (64 bytes) 20 signals (80 bytes)	4 signals (16 bytes) 8 signals (32 bytes) 12 signals (48 bytes) 16 signals (64 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 chosen signals. If a Boolean type is mapped, only bit 0 is used in the chosen 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.

2.5 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.
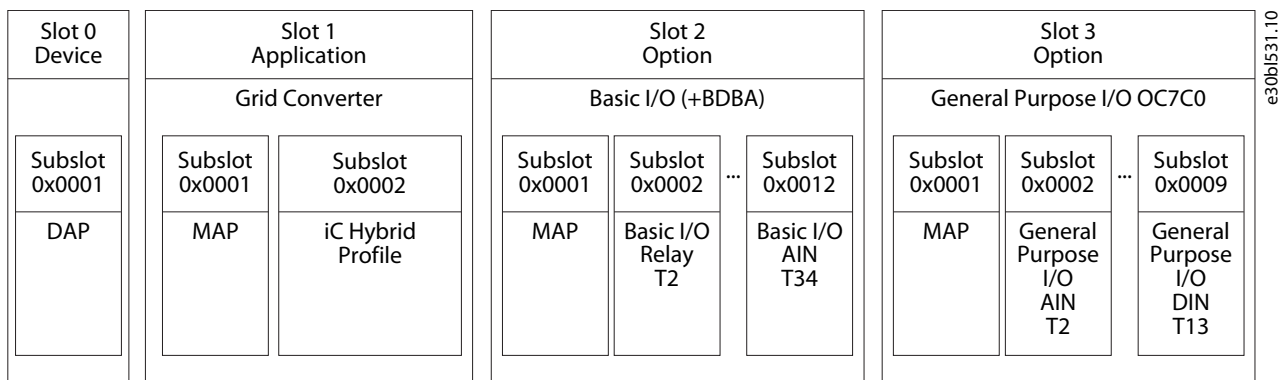

Figure 1: Example of a PROFINET Device Model with Functional Extension Options Installed in an iC7-Hybrid Power Converter

2.6 Network Topologies

2.6.1 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

2.6.2 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>
</table>

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

NOTE: Using tools such as MyDrive® Insight may influence system performance in a line topology.
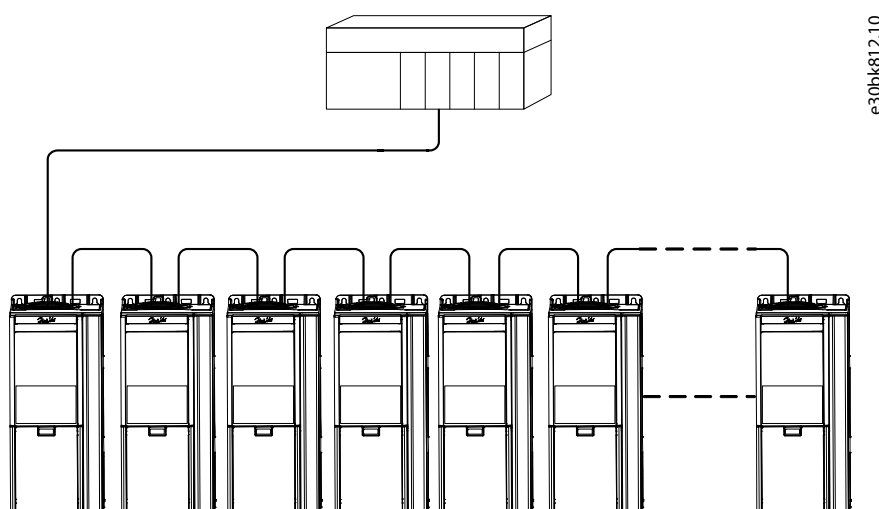
Figure 2: Example of Line Topology

<table>
<tr><td colspan="2" align="center">NOTICE</td></tr>
</table>

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.

2.6.3 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.

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Figure 3: Example of Star Topology
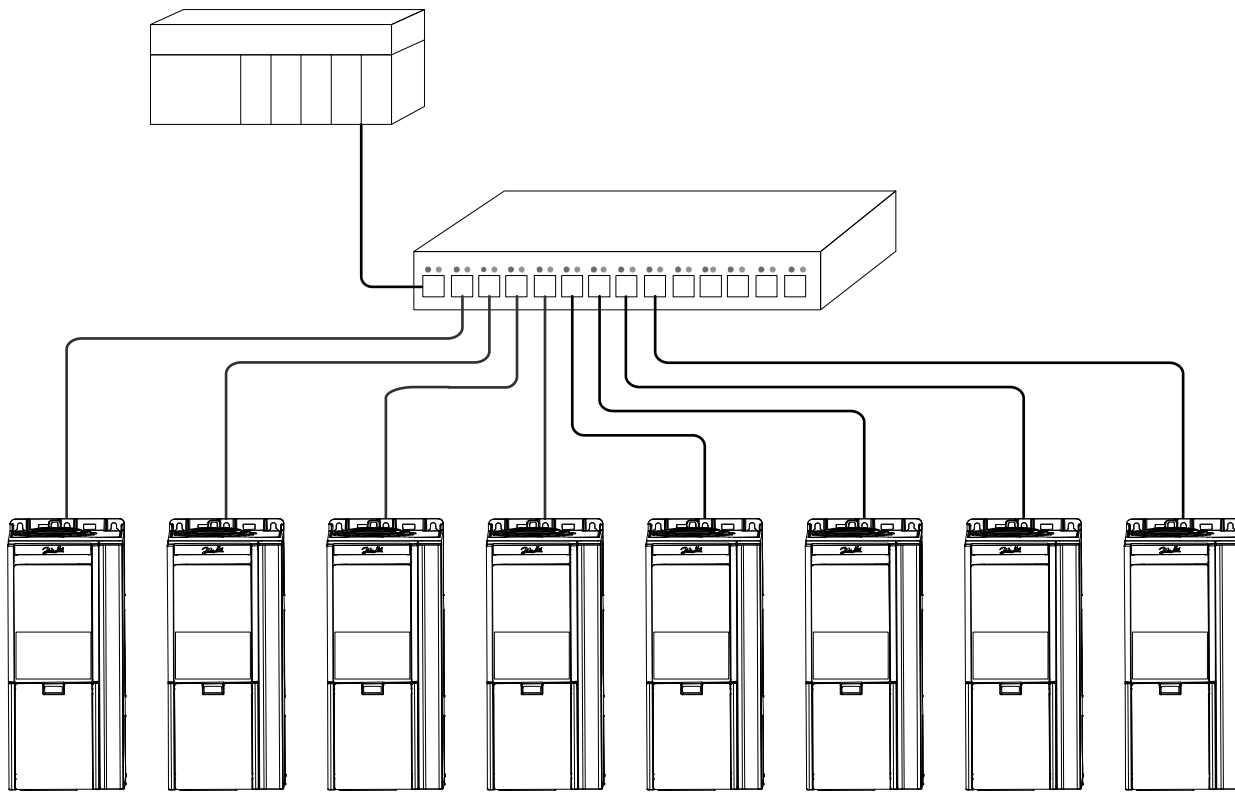
2.6.4 **Ring Topology**

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.
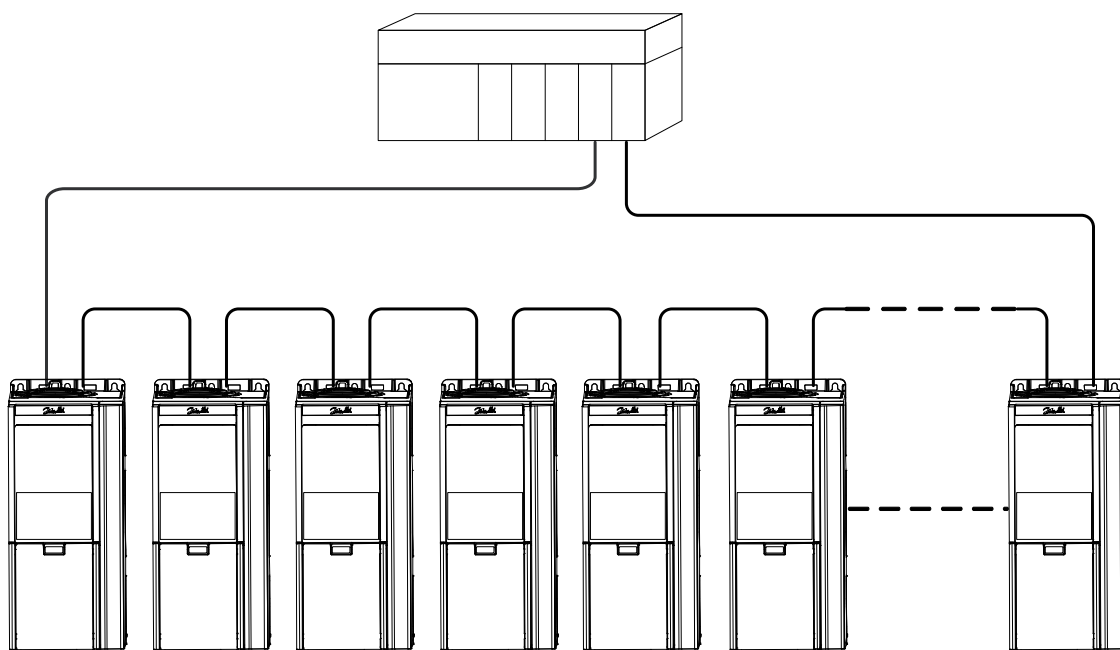
Figure 4: Example of Ring Topology

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   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.
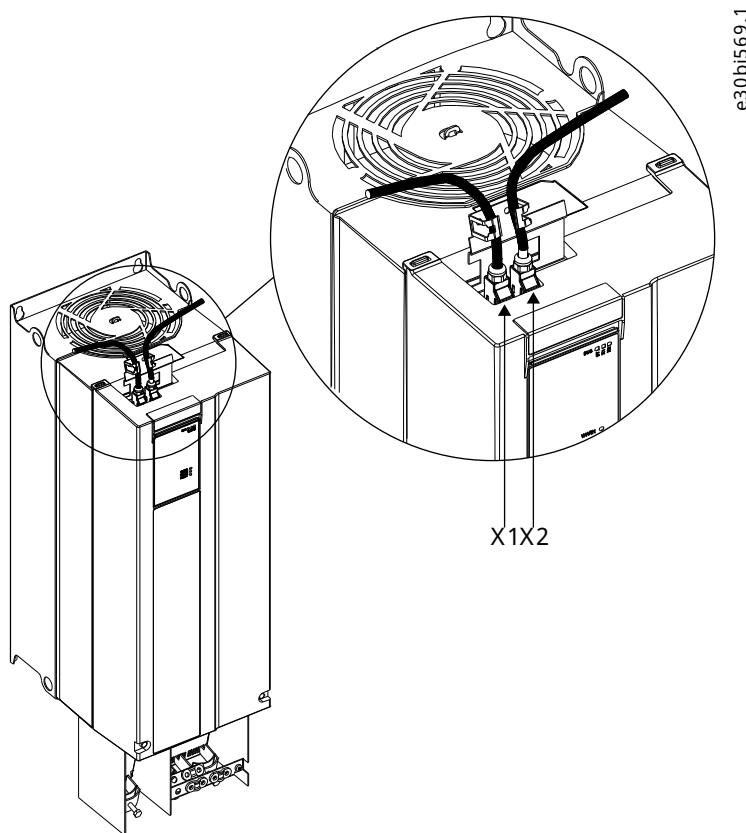
Figure 5: Location of the Communication Interface, X1/X2 in FA02-FA12 Frames (with the Optional EMC Plate)

3.3   Communication Interface X1/X2 in Frames 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.
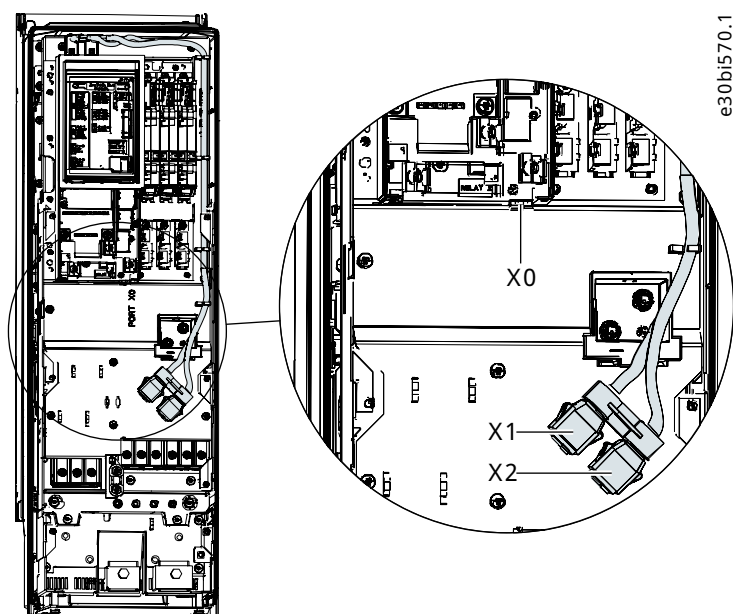
Figure 6: Communication Port X0, X1, and X2 Locations in FK06–FK08 Frames
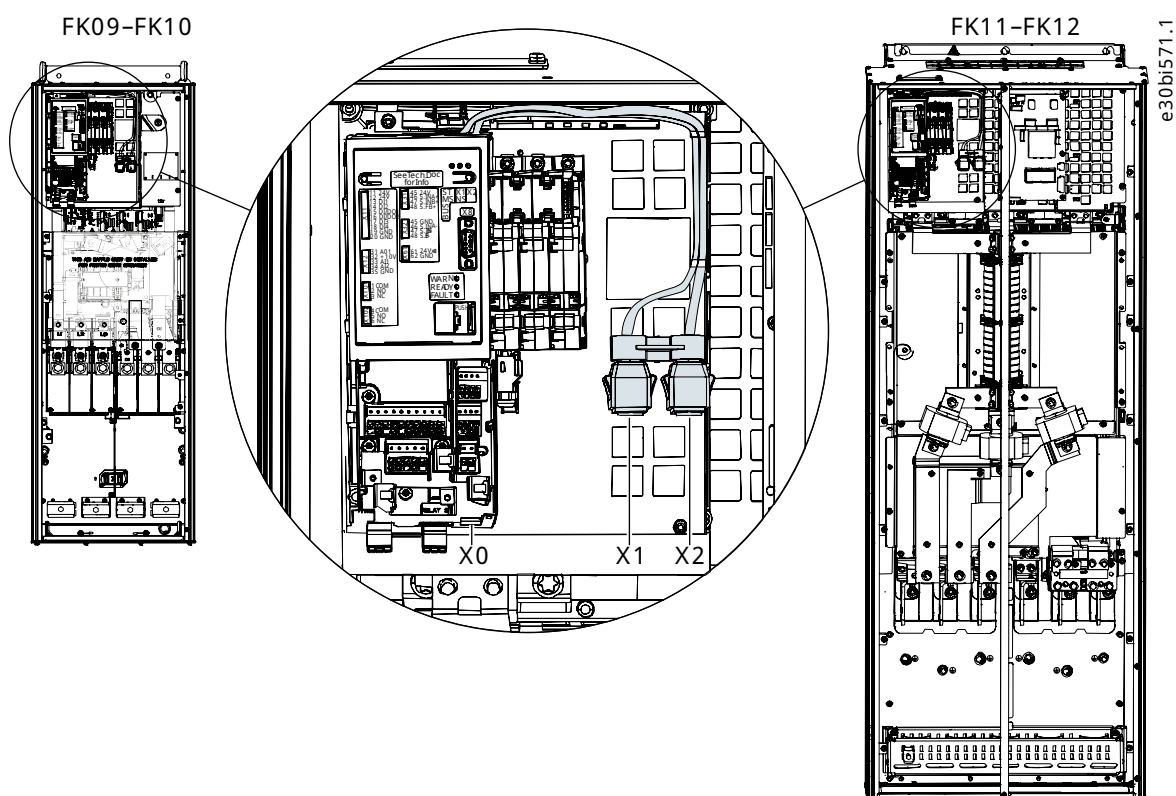
Figure 7: Communication Port X0, X1, and X2 Locations in FK09–FK12 Frames

3.4 **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.
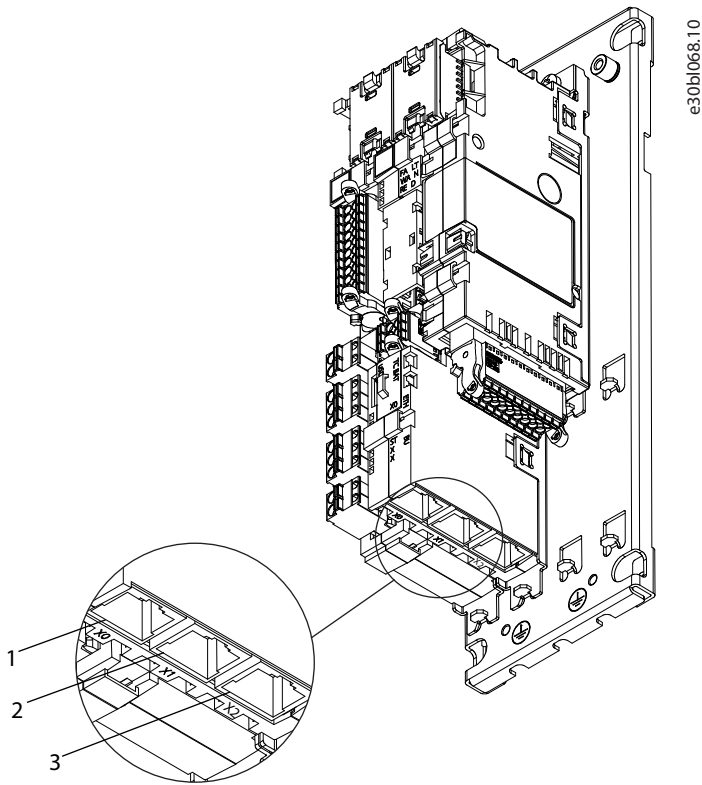
Figure 8: Communication Port X0, X1, and X2 Locations in the Modular Control Unit

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

3.5 EMC-compliant Installation

3.5.1 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.

3.5.2 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.

3.5.3 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°.

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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))		

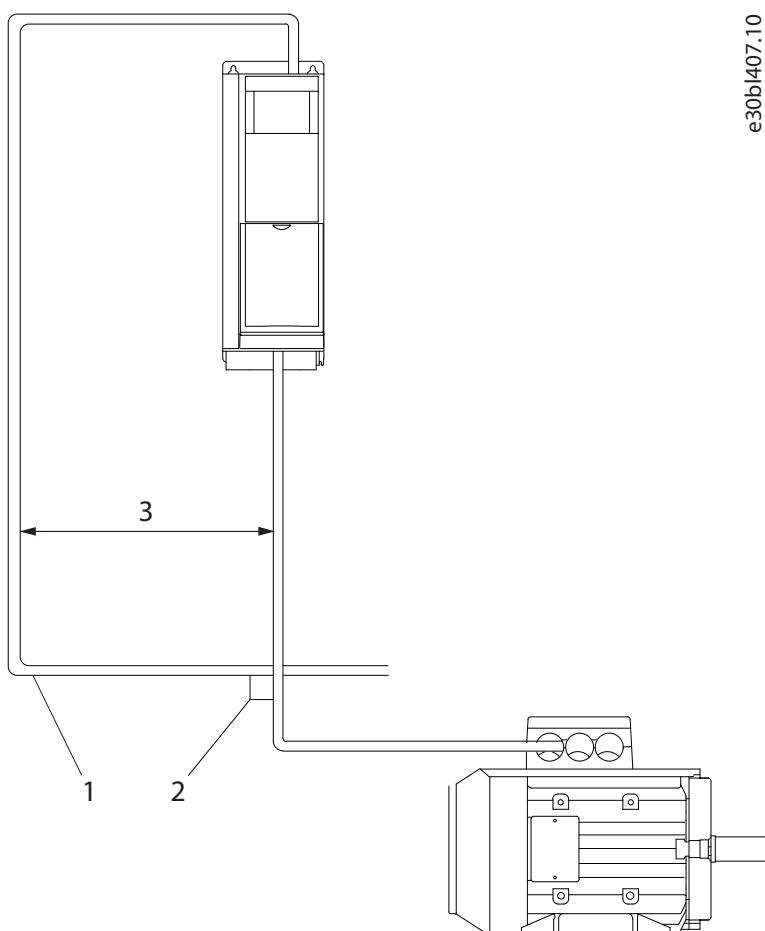# 4 Configuration

4.1 Configuring 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 **10.2 Communication Interfaces**.

Table 9: 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).

4.2 Configuring Name of Station

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

Menu index	Parameter name	Parameter number	Value	Additional information
10.3.2.2.1	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.

4.3 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.

4.4 Reference and Main Actual Handling

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** (parameter number **2834**).

4.5 Connectivity Settings

Table 10: General Connectivity Settings for Grid Converter and DC/DC Converter

Menu index	Parameter	Parameter number	Value	Description
2.9.8.1	*Fieldbus Fault Response*	1304	• Info (default) • Warning • Fault • Fault, open MCB See Table 11 for descriptions of the events.	Select the behavior when a fieldbus fault, for example loss of I/O connection occurs.
2.9.8.2	*No Fieldbus Connection Response*	1305	• Info (default) • Warning • Fault • Fault, open MCB See Table 11 for descriptions of the events.	Select the behavior if an active fieldbus connection has not been established.

Table 10: General Connectivity Settings for Grid Converter and DC/DC Converter *(continued)*

Menu index	Parameter	Parameter number	Value	Description
2.9.8.3	*Process Data Timeout Response*	1306	• Info (default) • Warning • Fault • Fault, open MCB See Table 11 for descriptions of the events.	Select the response if there is no fieldbus connection.
2.9.8.4	*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.
2.9.8.5	*Fieldbus Watchdog Response*	5244	• No response (default) • Warning • Fault • Fault, open MCB See Table 11 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.
2.9.8.6	*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.
2.9.8.7	*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 11: Event Descriptions for Grid Converter and DC/DC Converter

Value	Description
Info	The event is logged in the event log.
Warning	The converter issues a warning.
Fault	A fault is issued, and the modulation is stopped.
Fault, open MCB	A fault is issued, the modulation is stopped and the MCB is opened, if controlled by the converter.

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 12. 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 12: 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 13: Diagnostics Parameters

Menu index	Parameter name	Parameter number	Value	Description
10.3.2.3.1	*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.
10.3.2.3.2	*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, in parameter *10.3.2.1.1*. The report shows the current status of:

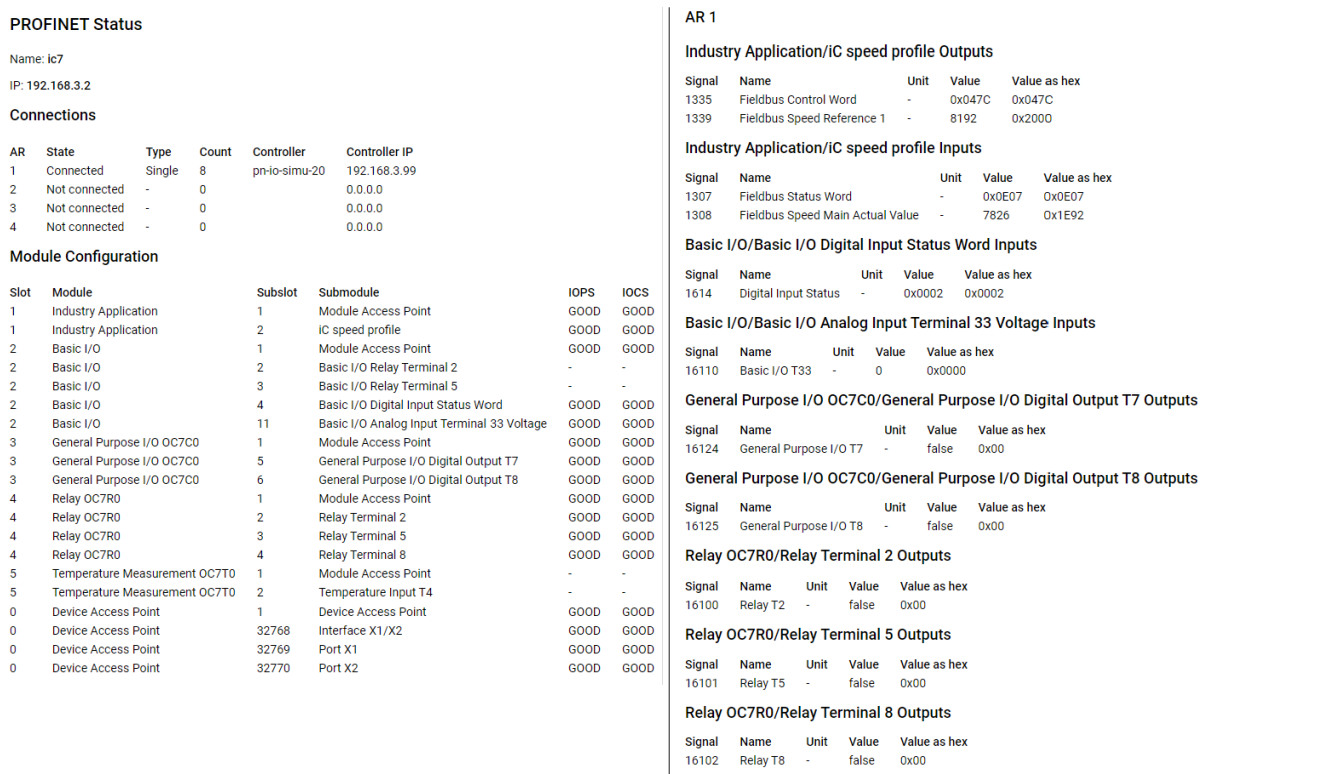- Connections
- Configuration
- Mapped signals and their values

PROFINET Status

Name: ic7

IP: 192.168.3.2

Connections

AR	State	Type	Count	Controller	Controller IP
1	Connected	Single	8	pn-io-simu-20	192.168.3.99
2	Not connected	-	0		0.0.0.0
3	Not connected	-	0		0.0.0.0
4	Not connected	-	0		0.0.0.0

Module Configuration

Slot	Module	Subslot	Submodule	IOPS	IOCS
1	Industry Application	1	Module Access Point	GOOD	GOOD
1	Industry Application	2	iC speed profile	GOOD	GOOD
2	Basic I/O	1	Module Access Point	GOOD	GOOD
2	Basic I/O	2	Basic I/O Relay Terminal 2	-	-
2	Basic I/O	3	Basic I/O Relay Terminal 5	-	-
2	Basic I/O	4	Basic I/O Digital Input Status Word	GOOD	GOOD
2	Basic I/O	11	Basic I/O Analog Input Terminal 33 Voltage	GOOD	GOOD
3	General Purpose I/O OC7C0	1	Module Access Point	GOOD	GOOD
3	General Purpose I/O OC7C0	5	General Purpose I/O Digital Output T7	GOOD	GOOD
3	General Purpose I/O OC7C0	6	General Purpose I/O Digital Output T8	GOOD	GOOD
4	Relay OC7R0	1	Module Access Point	GOOD	GOOD
4	Relay OC7R0	2	Relay Terminal 2	GOOD	GOOD
4	Relay OC7R0	3	Relay Terminal 5	GOOD	GOOD
4	Relay OC7R0	4	Relay Terminal 8	GOOD	GOOD
5	Temperature Measurement OC7T0	1	Module Access Point	-	-
5	Temperature Measurement OC7T0	2	Temperature Input T4	-	-
0	Device Access Point	1	Device Access Point	GOOD	GOOD
0	Device Access Point	32768	Interface X1/X2	GOOD	GOOD
0	Device Access Point	32769	Port X1	GOOD	GOOD
0	Device Access Point	32770	Port X2	GOOD	GOOD

AR 1

Industry Application/iC speed profile Outputs

Signal	Name	Unit	Value	Value as hex
1335	Fieldbus Control Word	-	0x047C	0x047C
1339	Fieldbus Speed Reference 1	-	8192	0x2000

Industry Application/iC speed profile Inputs

Signal	Name	Unit	Value	Value as hex
1307	Fieldbus Status Word	-	0x0E07	0x0E07
1308	Fieldbus Speed Main Actual Value	-	7826	0x1E92

Basic I/O/Basic I/O Digital Input Status Word Inputs

Signal	Name	Unit	Value	Value as hex
1614	Digital Input Status	-	0x0002	0x0002

Basic I/O/Basic I/O Analog Input Terminal 33 Voltage Inputs

Signal	Name	Unit	Value	Value as hex
16110	Basic I/O T33	-	0	0x0000

General Purpose I/O OC7C0/General Purpose I/O Digital Output T7 Outputs

Signal	Name	Unit	Value	Value as hex
16124	General Purpose I/O T7	-	false	0x00

General Purpose I/O OC7C0/General Purpose I/O Digital Output T8 Outputs

Signal	Name	Unit	Value	Value as hex
16125	General Purpose I/O T8	-	false	0x00

Relay OC7R0/Relay Terminal 2 Outputs

Signal	Name	Unit	Value	Value as hex
16100	Relay T2	-	false	0x00

Relay OC7R0/Relay Terminal 5 Outputs

Signal	Name	Unit	Value	Value as hex
16101	Relay T5	-	false	0x00

Relay OC7R0/Relay Terminal 8 Outputs

Signal	Name	Unit	Value	Value as hex
16102	Relay T8	-	false	0x00

e30bk437.10

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 14: 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*.

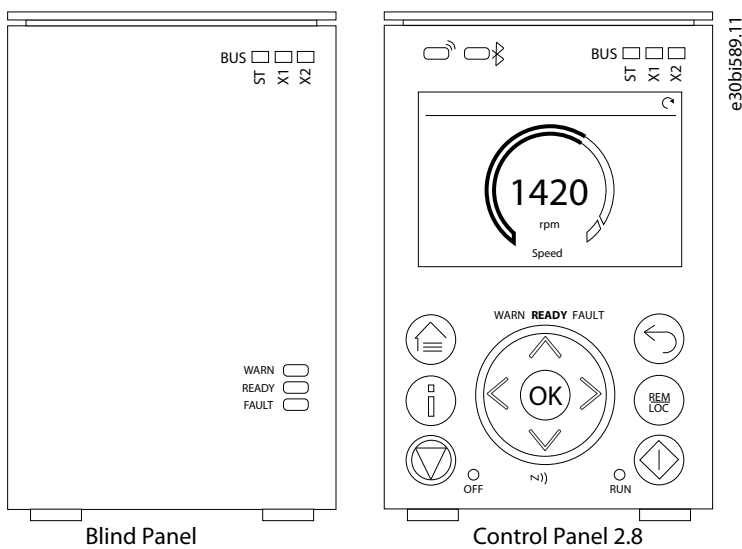**3.** To activate or deactivate the feature, click the toggle switch.
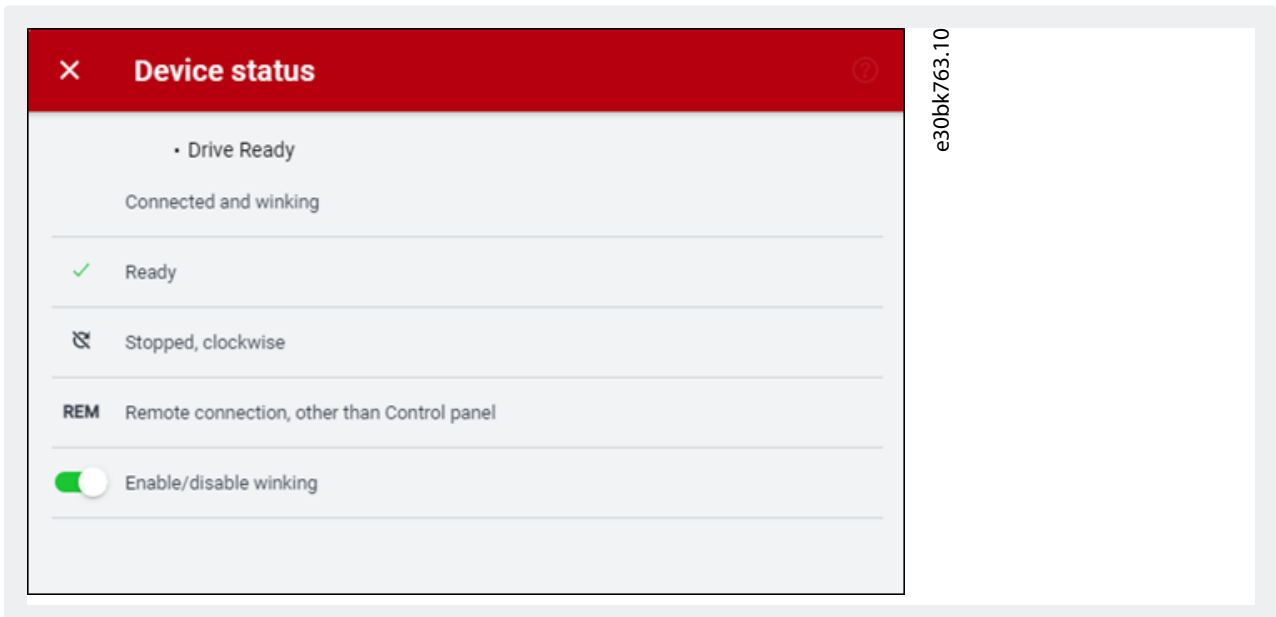
See 6.5 Fieldbus Indicator LEDs for more information on interpreting the LED signals and where the LEDs are located.
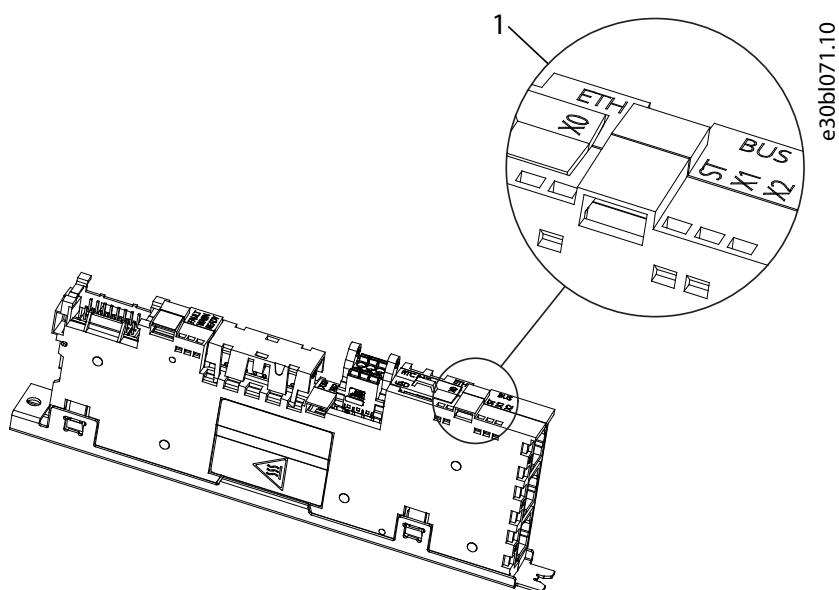
6.5 Fieldbus Indicator LEDs

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 15: 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.

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