Danfoss

Operating Guide

iC7 Series 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, 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, 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 products:

- The safety guide, which provides important safety information related to installing iC7 drives.

- The installation guides, which cover the mechanical and electrical installation of drives, functional extension options, or other extra components.

- The application guides, which provide instructions on setting up the drive for a specific end-use.

- 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 documentation are available for download at http://drives.danfoss.com/downloads/portal/.

1.3 Safety Symbols

The following symbols are used in this guide:

⚠ **D A N G E R** ⚠
Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ **W A R N I N G** ⚠
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

⚠ **C A U T I O N** ⚠
Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

N O T I C E
Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

1.4 Safety Precautions

⚠ **W A R N I N G** ⚠
HIGH VOLTAGE AC drives 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 must perform installation, start-up, and maintenance.

⚠ W A R N I N G ⚠

UNINTENDED START

When the drive 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.

– Press [Off] on the control panel - if present - before configuring parameters.

– Make sure that the drive cannnot be started by external switch, a fieldbus command, an input reference signal from the control panel, via remote operation using MyDrive® software tools, or after a cleared fault condition.

– Disconnect the drive from all power sources whenever personal safety considerations make it necessary to avoid unintended motor start.

– Check that the drive, motor, and any driven equipment are in operational readiness.

⚠ D A N G E R ⚠

DISCHARGE TIME

The drive contains DC-link capacitors, which can remain charged even when the drive 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 could result in death or serious injury.

– Stop the motor.

– Disconnect AC mains, permanent magnet type motors, and DC-link connections to other drives.

– Wait for the capacitors to discharge fully before performing any service or repair work. The exact discharge time is shown on the front cover of the drive.

– Use a measuring device to make sure that there is no voltage, before opening the drive or performing any work on the cables.

⚠ W A R N I N G ⚠

LEAKAGE CURRENT HAZARD

Leakage currents exceed 3.5 mA. Failure to ground the drive 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.

⚠ W A R N I N G ⚠

EQUIPMENT HAZARD

Contact with rotating shafts or 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 regulations.

– Follow the procedures in this guide.

⚠ C A U T I O N ⚠

INTERNAL FAILURE HAZARD

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

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

1.5 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
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

1.6 Version History

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

The original language of this guide is English.

Table 1: Version History

Version	Remarks
AQ408626183394, version 0101	The information in this version applies to PROFINET RT OS7PR (+BAPR).

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 alternatively, they can be activated later by a proof-of-purchase token.

Table 2: 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 3: 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	GSDML for iC7-Automation application software
	• GSDML version 2.42: current version
	• GSDML version 2.35: compatible with legacy systems
	• GSDML version 2.31: compatible with legacy systems

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.

Communication profiles are selected in parameter *10.3.1.2 Fieldbus profile*.

Table 4: Communication Profiles and Supported Applications for iC7-Automation

Profile	iC7-Automation application software		
	Industry	Active Front End	Motion
PROFIdrive Application Class 1	X	–	X
PROFIenergy version 1.3	X	–	X

Profile	iC7-Automation application software		
	Industry	**Active Front End**	**Motion**
PROFIdrive standard PNUs	X	X	X
iC Speed Profile	X	–	X
iC Active Front End Profile	–	X	–

2.3 iC Speed Profile

The iC Speed profile is used with the iC7 series. 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.

2.3.1 Control Word (CTW) in iC Speed Profile

Table 5: iC Speed Profile Control Word Bits

Bit number	Name	Description
0+1	Preset reference selector	00 = Preset reference 1 01 = Preset reference 2 10 = Preset reference 3 11 = Preset reference 4
2	Reserved	Reserved for future use. Any control words sent to the device should keep this bit at 0 to ensure compatibility with future extensions of the control word.
3	No coast/Coast	1 = No function. 0 = Causes the frequency converter immediately to coast the motor.
4	No quick stop/ Quick stop	1 = No function. 0 = Quick stops the frequency converter and ramps down the motor speed to stop as defined in the quick-stop ramp parameter.
5	No hold/Hold – output frequency	1 = No function. 0 = Holds the present output frequency (in Hz).
6	Start/No start	1 = If the other starting conditions are fulfilled, the selection allows the frequency converter to start the motor. 0 = Stops the frequency converter and ramps down the motor speed as defined in the ramp-down parameter.
7	Fault acknowledge	0→1 = Acknowledge faults. Acknowledge is edge-triggered, when logic is changed from 0 to 1. Faults can only be acknowledged if the trigger condition has been removed and any required acknowledgment has been done. 0 = No function.
8	Jog/No jog	1 = Sets the output frequency to the jog speed defined in the jog speed parameter. 0 = No function.
9	Ramp select	1 = Ramp 2 is active. 0 = Ramp 1 is active.
10	Data valid	1 = Uses the process data (control by PLC).

Bit number	Name	Description
		0 = Ignores the current process data. This is linked to the submodule where the CTW is present. If signals are to be covered, the CTW/STW profile (for example, the iC Speed Profile) must be part of the signals list. Uses the previously processed data when the data valid bit was true (no control by PLC).
11	Reserved	Reserved for future use.
12	User defined	These bits are reserved for application-specific advanced control. For more information, refer to the application guide.
13	User defined	
14	User defined	
15	User defined	

2.3.2 Status Word (STW) in iC Speed Profile

Table 6: iC Speed Profile Status Word Bits

Bit number	Name	Description
0	Control ready/Control not ready	1 = The device controls are ready and react to process data. 0 = The device controls are not ready do not react to process data.
1	Frequency converter ready/Frequency converter not ready	1 = The frequency converter is ready for operation. 0 = The frequency converter is not ready for operation. This does not involve faults and warnings as they are indicated in their respective bits elsewhere.
2	Coasting/No coast	1 = There are no active coast signals, and the motor can start when a start signal is given. 0 = The frequency converter has an active coast signal and has released the motor.
3	Fault/No fault	1 = A fault has occurred, and an acknowledge signal is required to re-establish operation. 0 = There are no faults.
4	Reserved	Reserved
5	Reserved	Reserved
6	Reserved	Reserved
7	Warning/No warning	1 = A warning has occurred. 0 = There are no warnings.
8	Speed=reference/ Speed<>reference	1 = The present motor speed matches the present speed reference within a given tolerance. The tolerance is product specific. 0 = The motor runs, but the present speed is different from the present speed reference, for example while the speed ramps up or down during start or stop.
9	Bus control/Local operation	1 = The device is controlled and reacting to I/O and process data. 0 = The device does not react on commands from fieldbus, for 1 of the following reasons: • CTW Bit 10 = 0. • HMI is in local mode. • MyDrive® Insight has taken control. • Control places do not include fieldbus.

Bit number	Name	Description
10	Frequency limit ok/Out of frequency limit	1 = The output frequency is within the defined motor limits. 0 = The output frequency has exceeded the motor limits defined in parameters. The speed limits are set by parameters: • *P 5.8.3.1 Positive Speed Limit* • *P 5.8.3.2 Negative Speed Limit* • *P 5.8.3.3 Minimum Speed Limit*
11	In operation/No operation	1 = The process is running, and the motor could be running or starting at any time. 0 = There are no active start requests, and the process does not run. The motor is in a coasted state and is not started.
12	Reserved	Reserved
13	Reserved	Reserved
14	User defined	These bits are reserved for application-specific advanced control. For more information, refer to the application guide.
15	User defined	

2.4 PROFIdrive – Standard Telegram 1

Standard telegram 1 is implemented according to PROFIdrive Application Class 1 profile as defined in the PROFIdrive standard and state machine diagram.

2.4.1 Control Word (CTW) in PROFIdrive Standard Telegram 1

Table 7: Control Word Bits in PROFIdrive Standard Telegram 1

Bit number	Name	Description
0	On-Off	1 = On. 0 = Off.
1	Coast stop	1 = No coast stop. 0 = Coast stop.
2	Quick stop	1 = No quick stop. 0 = Quick stop.
3	Operation	1 = Enable operation. 0 = Disable operation.
4	Ramp generator	1 = Enable Ramp generator (RFG). 0 = Reset Ramp generator. Output of the RFG is set to 0. The drive decelerates along the current limit or along the voltage limit of the DC link.
5	Freeze	1 = Unfreeze ramp generator. 0 = Freeze ramp generator. Freezes the present output frequency (in Hz).
6	Enable setpoint	1 = Enable setpoint. 0 = Disable setpoint.
7	Fault acknowledge	0 → 1 = Acknowledge faults. Acknowledge is edge triggered, when changing from logic 0 to logic 1.

Bit number	Name	Description
		0 = No function.
8	Jog 1	1 = Jog 1 on. 0 = Jog 1 off. Operation is enabled, drive is in standstill and STW1 bit 4, 5, 6 = 0. The drive runs up along the ramp to jogging setpoint 1.
9	Jog 2	1 = Jog 2 on. 0 = Jog 2 off. Operation is enabled, drive is in standstill and STW1 bit 4, 5, 6 = 0. The drive runs up along the ramp to jogging setpoint 1.
10	Control by PLC	1 = Uses the process data (control by PLC). 0 = Ignores the current process data. This is linked to the submodule where the CTW is present. If signals are to be covered, the CTW/STW profile (for example, the iC Speed Profile) must be part of the signals list.
11	Reserved	Reserved for future use.
12	User defined	These bits enable mapping application functionality of the drive to the control word. Mapping is done through parameters. For more information, refer to the application guide.
13	User defined	
14	User defined	
15	User defined	

2.4.2 Status Word (STW) in PROFIdrive Standard Telegram 1

Table 8: Status Word Bits in PROFIdrive Standard Telegram 1

Bit Number	Name	Description
0	Ready to switch on	1 = Ready to switch on. 0 = Not ready to switch on.
1	Ready to operate	1 = Ready to operate. 0 = Not ready to operate.
2	Operation enabled	1 = Operation enabled. 0 = Operation disabled.
3	Operation fault	1 = Fault present. 0 = No fault.
4	Coast stop	1 = Coast stop not activated (No OFF2). 0 = Coast stop activated (OFF2).
5	Quick stop	1 = Quick stop not activated (No OFF3). 0 = Quick stop activated (OFF3).
6	Switching on inhibited	1 = Switching on inhibited. 0 = Switching on not inhibited.
7	Warning	1 = A warning has occurred.

Bit Number	Name	Description
		0 = There are no warnings.
8	Speed=reference/ Speed<>reference	1 = The present motor speed matches the present speed reference within a given tolerance. The tolerance is product specific. 0 = The motor runs, but the present speed is different from the present speed reference. It could, for example, be the case while the speed ramps up/down during start/stop.
9	Bus control/Local operation	1 = The device is controlled and reacting to I/O and Process data 0 = The device does not react on commands from fieldbus, because of one of the following reasons: • CTW bit 10 = 0 • HMI is in local mode. • MyDrive® Insight has taken control. • Control places do not include fieldbus.
10	Frequency limit ok/Out of frequency limit	1 = The output frequency is within the defined motor limits. 0 = The output frequency has exceeded the defined motor limits given by parameters. The speed limits are set by parameters: • *P 5.8.3.4 High Speed Warning* • *P 5.8.3.9 Low Speed Monitor Limit*
11	User defined	These bits enable mapping application functionality of the drive to the status word. Mapping is done through parameters. For more information, refer to the application guide.
12	User defined	
13	User defined	
14	User defined	
15	User defined	

2.4.3 PROFIdrive State Machine

In the PROFIdrive control profile, the control bits perform different functions:

• 0–3 perform the basic start-up and power-down functions.

• 4–10 perform application-oriented control.

• 12–15 can be configured for different purposes.

See Illustration 1 for the basic state transition diagram, where control bits 0–3 control the transitions and the corresponding status bit indicates the actual state. The black dots indicate the priority of the control signals. Fewer dots indicate lower priority, and more dots indicate higher priority.

The general state diagram is defined in the PROFIdrive standard.
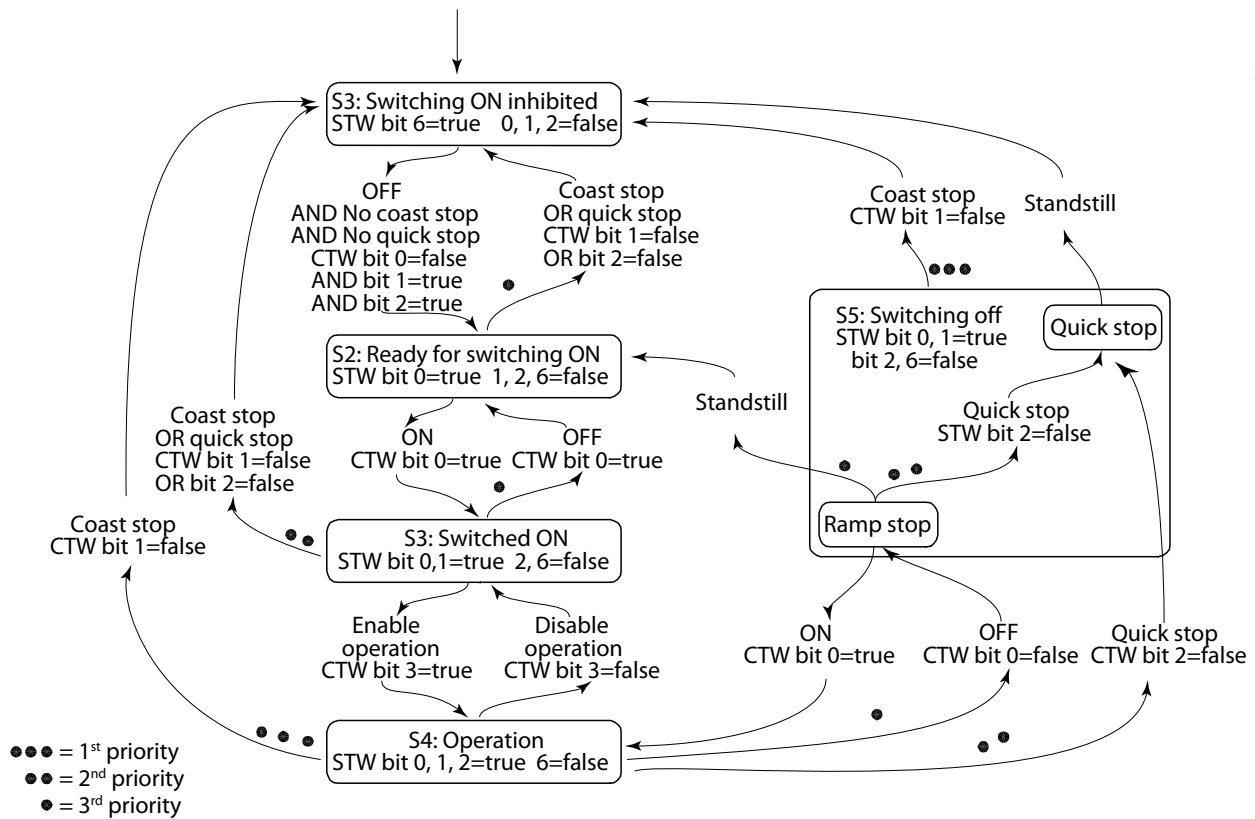
Illustration 1: General State Diagram

2.5 Submodules

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

- Profile signals
- Process data input and output signals.

Table 9: Input and Output Submodule Sizes

Application	Submodules	
	Cyclic input data	Cyclic output data
PROFIdrive Standard telegram 1	[STW] [MAV]	[CTW] [REF]
iC Speed Profile	[STW] [MAV]	[CTW] [REF]
CTW 2 / STW 2	[STW2]	[CTW2]
Application	**Signal modules**	
Industry	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)
Active Front End	4 signals (16 bytes) 8 signals (32 bytes) 12 signals (48 bytes) 16 signals (64 bytes)	N/A

Application	Submodules	
	Cyclic input data	Cyclic output data
	20 signals (80 bytes)	
Motion	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

- Float 32

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 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.

2.5.1 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.
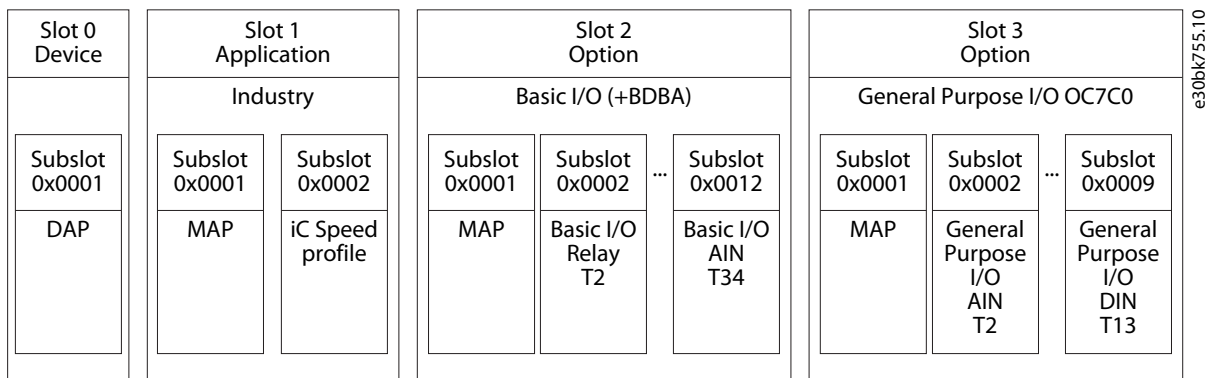
Illustration 2: Example of a PROFINET Device Model with Functional Extension Options Installed in an iC7-Automation Frequency Converter

2.6 Network Topologies

Communication interface X1/X2 is used for fieldbus connection.

The iC7 series communication interface 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

2.6.1 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.

N O T I C E

When line topology is used, take precautions to avoid timeout in the PLC when more than 8 drives are installed in series. Each drive 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 drives connected in series	Minimum update time [ms]
<8	2
8–16	4
16–32	8
33–50	16
>50	Not recommended

N O T I C E

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

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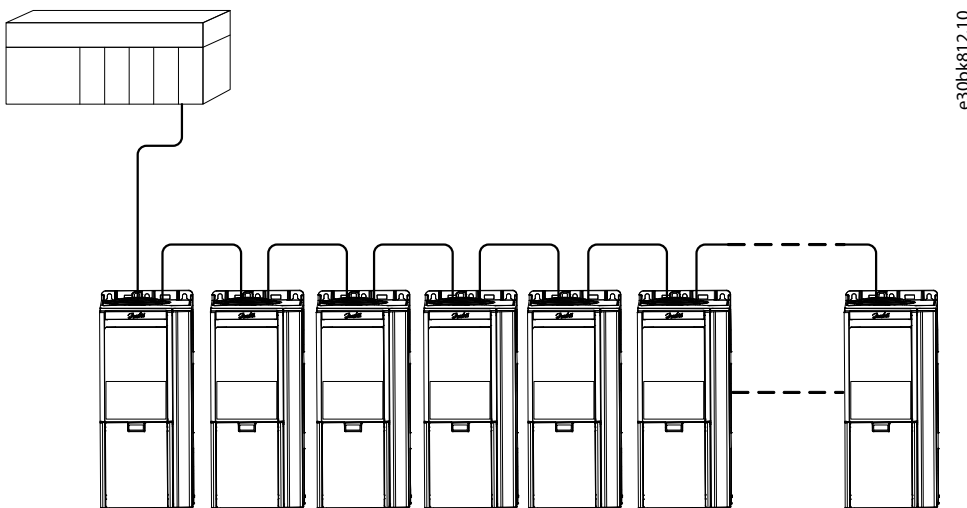
Illustration 3: Example of Line Topology

N O T I C E

Installing drives of different current ratings in line topology may result in unwanted power-off behavior.

- Mount the drives with the longest discharge time first in the line topology. In normal operation, the drives with bigger current ratings have a longer discharge time.

2.6.2 Star Topology

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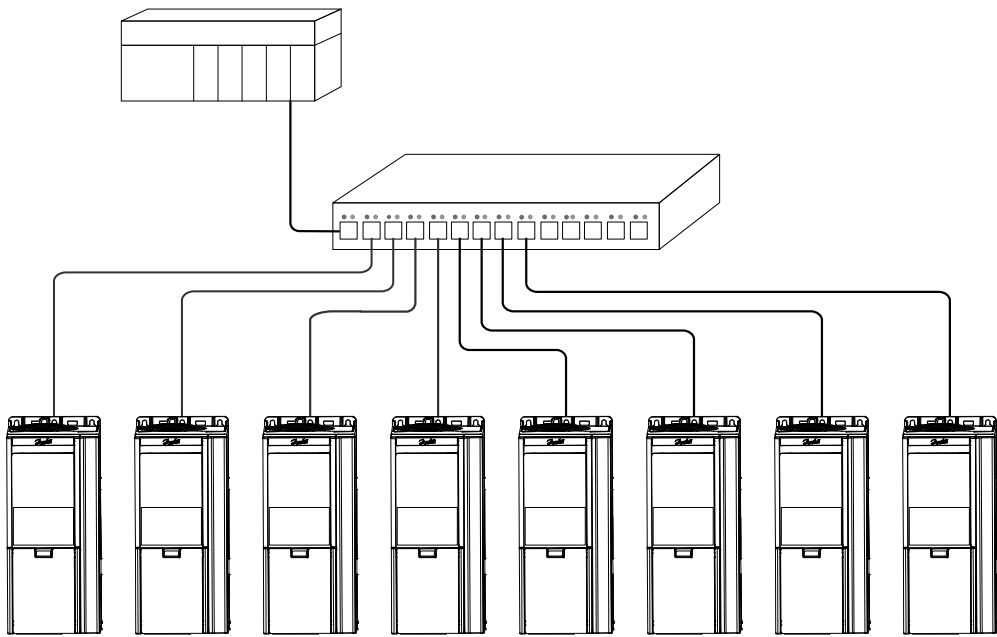
e30bk813.10

Illustration 4: Example of Star Topology

2.6.3 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.

N O T I C E

When line topology is used, take precautions to avoid timeout in the PLC when more than 8 drives are installed in series. Each drive 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 drives 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.

e30bk814.10
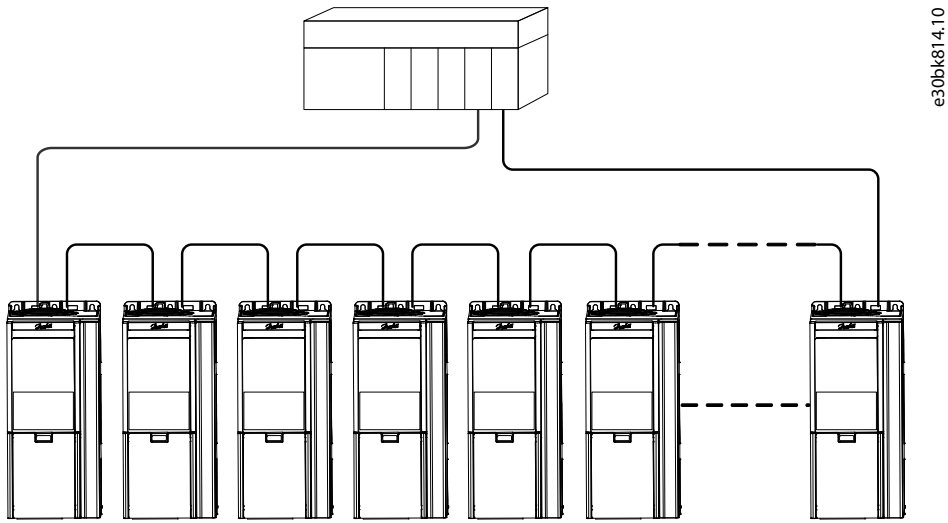
Illustration 5: Example of Ring Topology

3 Fieldbus Cable Connections

3.1 Prerequisites for Installation

Communication interfaces are integrated in the control board in iC7 drives.

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 drive design guide.

3.1.1 Communication Interface X1/X2 in Frames FA02–FA12

The communication interface is on the top of the frequency converter as shown in Illustration 6. 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.
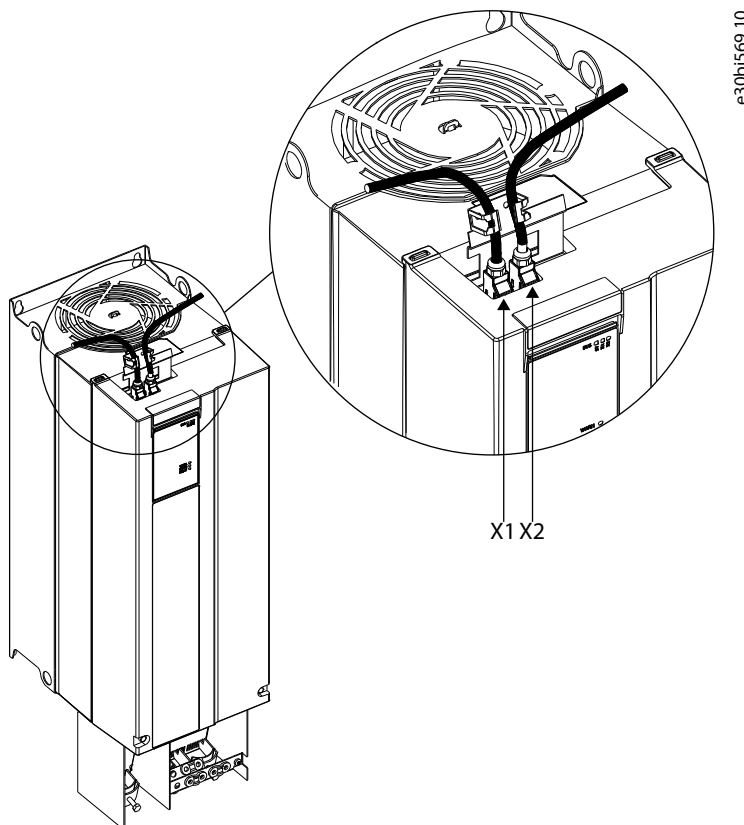
Illustration 6: Location of the Communication Interface, X1/X2 in FA02-FA12 Frames (with the Optional EMC Plate)

3.1.2 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 Illustration 7 and Illustration 8.
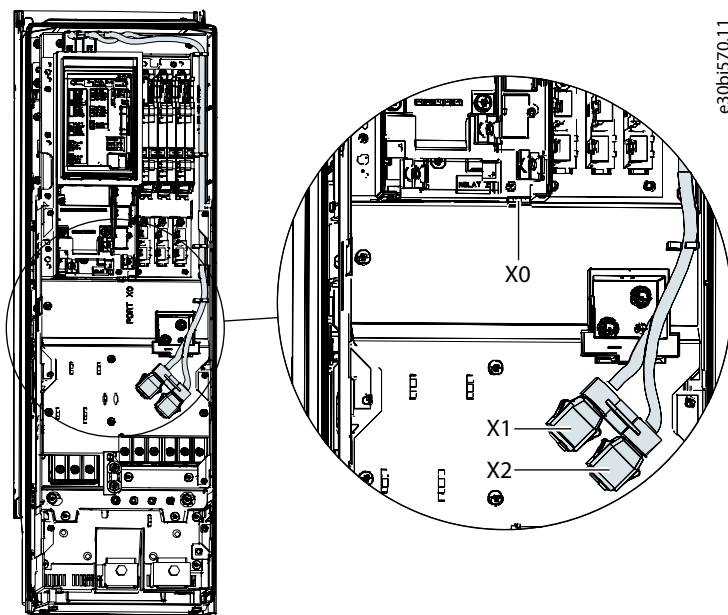
Illustration 7: Communication Port X0, X1, and X2 Locations in FK06–FK08 Frames
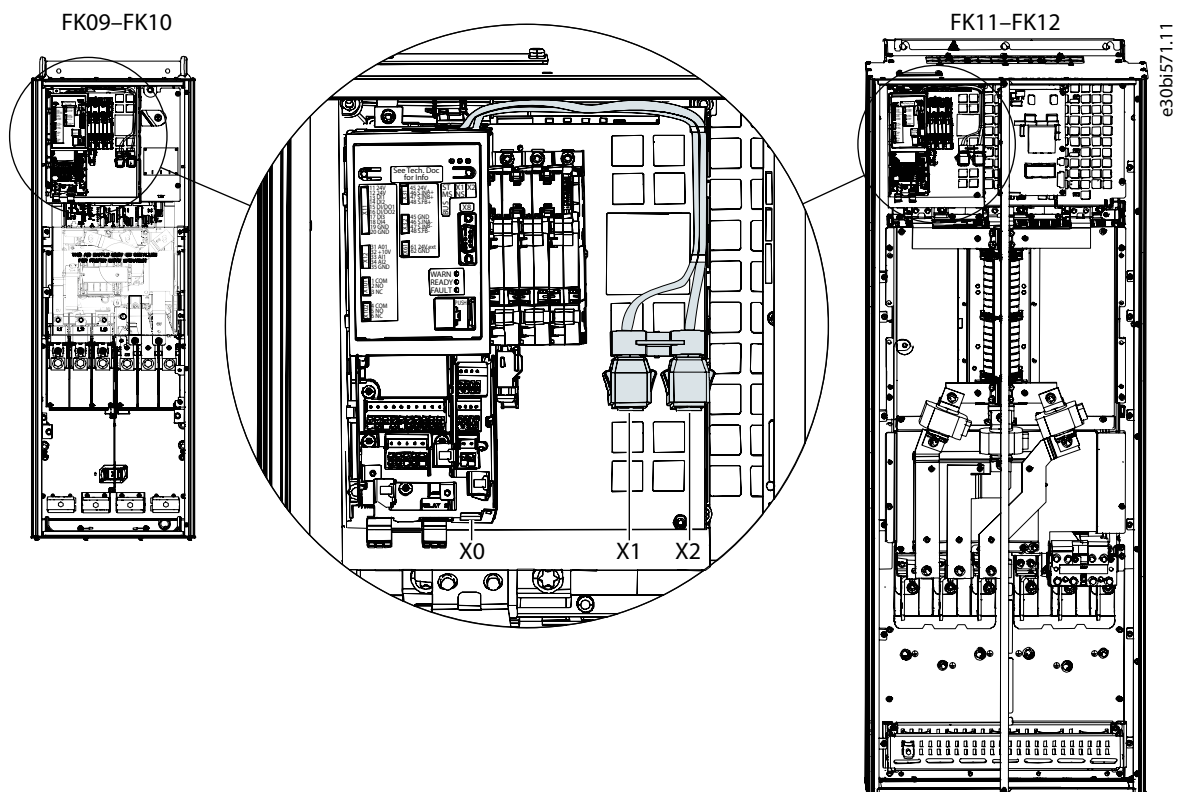
Illustration 8: Communication Port X0, X1, and X2 Locations in FK09–FK12 Frames

3.2 EMC-compliant Installation

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

3.2.1 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 drive on a conductive backplate.

- Keep the ground wire connections as short as possible.

3.2.2 Cable Routing

> **N O T I C E**
>
> **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.
>
> – Minimum 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).

> **N O T I C E**
>
> **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°.
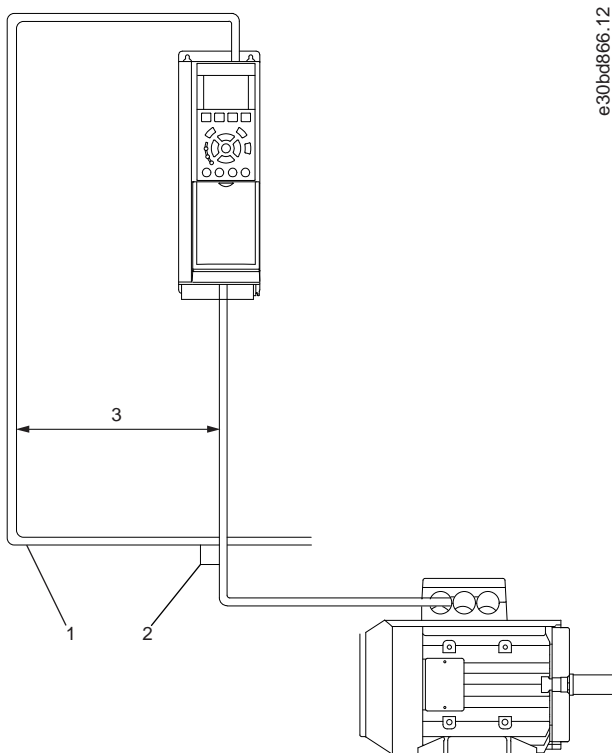
Illustration 9: Cable Routing

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

4 PROFINET 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 10: 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/disable (default)	Request to enable or disable Address Conflict Detection for the interface. The change will not take effect before a power cycle is performed. If no conflicts are detected, ACD activity displays 0. If an address conflict occurs, the ACD activity will display 1, and the IPv4 interface will revert to an automatically assigned IP address in the 169.254.xxx.xxx range. Recommended setting for PROFINET is disabled.
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 PROFINET Name of Station

1. Navigate to parameter *10.3.2.2.1 Name of Station*.

Table 11: PROFINET Configuration, Name of Station

Menu index	Parameter name	Parameter number	Value	Additional information
10.3.2.2.1	Name of Station	7080	Accepted characters:	Each PROFINET device is identified with a unique Name of Station.

Menu index	Parameter name	Parameter number	Value	Additional information
			- 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.	

4.3 GSDML (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 Handling

The speed reference is scaled as a normalized relative value in percent (N2). The value is transmitted in hexadecimal:

- 0% = 0 hex

- 100% = 4000 hex

- -100% = C000 hex

Table 12: Reference Handling Parameters

Menu index	Parameter	Parameter number	Unit	Range
4.2.2.3	Nominal Speed	402	[rpm]	0–100000
5.8.3.1	Positive Speed Limit	1729	[rpm]	0–35400
5.8.3.2	Negative Speed Limit	1728	[rpm]	-35400–0

Reversing may be unwanted for certain applications.
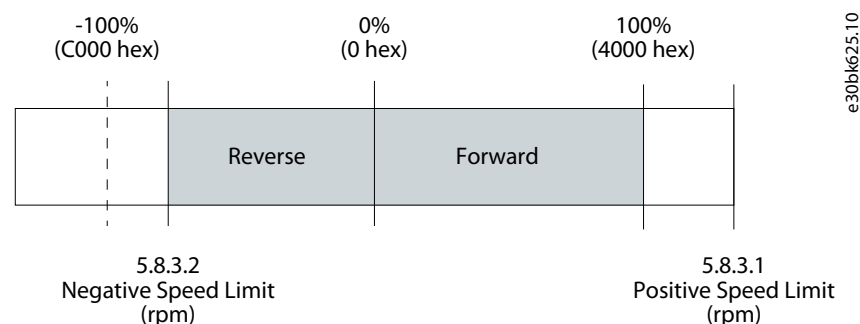
Illustration 10: Example of Fieldbus Speed Reference

4.5 General Connectivity Settings

General connectivity settings are in parameter group *10 Connectivity* ➔ *Integrated Communication* ➔ *Protocols* ➔ *General Settings*.

Table 13: General Connectivity Parameters

Menu index	Parameter	Parameter number	Value	Description
10.3.1.2	*Fieldbus profile*	1301	• iC Speed Profile (default) • PROFIdrive Standard telegram 1	Select the fieldbus profile. The selection affects the interpretation of the control word and status word.
10.3.1.3	*Fieldbus Fault Response*	1303	• Info (default) • Warning • Fault, Ramp to Coast • Fault, coast See Table 14 for descriptions of the events.	Select the behavior when a fieldbus fault, for example loss of I/O connection occurs.
10.3.1.4	*No Fieldbus Connection Response*	1327	• Info (default) • Warning • Fault, Ramp to Coast • Fault, coast See Table 14 for descriptions of the events.	Select the response in case there is no fieldbus connection.
10.3.1.6	*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.
10.3.1.12	*Process Data Timeout Response*	1341	• Info • Warning • Warning – Change Control Place • Warning – Change Control Place Persistent • Fault, Ramp to coast • Fault (default) See Table 14 for descriptions of the events.	Select the response in case there is no fieldbus connection.
10.3.1.13	*Process Data Timeout Control Place*	112	• Local control (default) • Fieldbus control • I/O control • Advanced control See Table 15 for descriptions of the control places.	Select the alternate control place to be used if there is a fieldbus timeout. This is only valid with a timeout warning or info.

Table 14: Event Descriptions

Value	Description
Info	The event is logged in the event log.
Warning	The drive issues a warning.
Fault, ramp to coast	The drive issues a fault, ramps down, and coasts.

Value	Description
Fault	The drive issues a fault, and coasts the motor.
Warning - Change Control Place	The drive issues a warning. The control place changes to the selected alternative while timeout warning is active. The control place changes back to the original control place when fieldbus process data returns.
Warning - Change Control Place – Persistent	The drive issues a warning. The control place changes to the selected alternative if timeout warning is active. The control place requires a reset command to change back to the original control place after fieldbus process data returns.

Table 15: Control Place Descriptions

Value	Description
Local control	The drive is controlled by a connected control panel.
Fieldbus control	The drive is controlled via a fieldbus.
I/O control	The drive is controlled via I/O.
Advanced control	The drive is controlled via a combination of I/O and fieldbus.

5 Parameter Access

5.1 Parameter Access 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 16. For more details on PROFIdrive PNUs, refer to the latest version of the PROFIdrive standard.

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

Table 16: 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 to 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 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 17: Diagnostics Parameters

Menu index	Parameter name (number)	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 will 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

Illustration 11: Example of a PROFINET Report

6.3 Configuring Port Mirroring Settings

Enable/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 18: 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	Enable the Port Mirroring feature.

6.4 Identifying a Drive

For easy identification of a drive, the winking function makes the fieldbus indicator LEDs ST, X1, and X2 flash yellow. The function is enabled in MyDrive® Insight under *Device Status*, by clicking the device name in live mode.
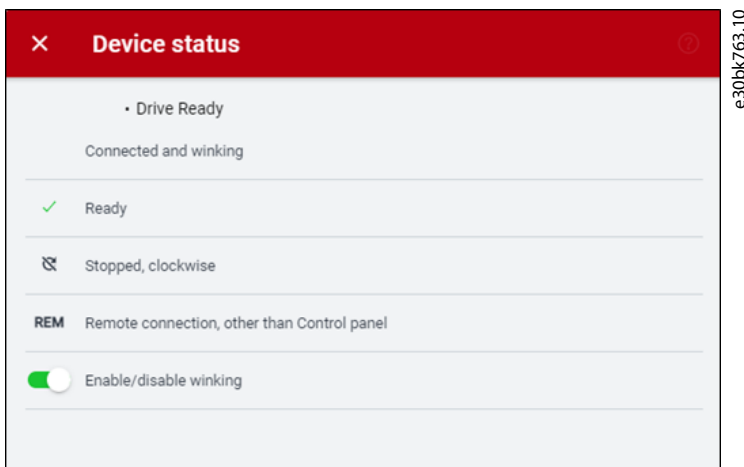

Illustration 12: Enabling Winking in MyDrive® Insight

See Table 19 for more information on interpreting the LED signals.

6.5 Fieldbus Indicator LEDs

The fieldbus indicator LEDs are in the top right corner of the control panel.

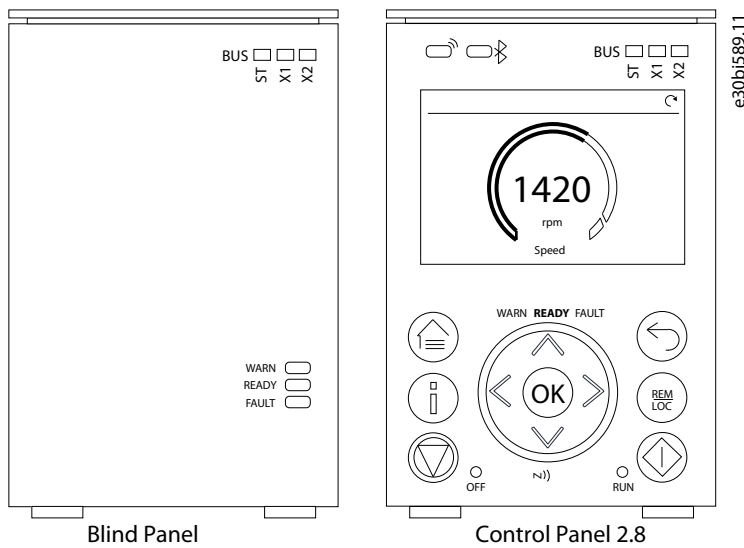Blind Panel   Control Panel 2.8

Illustration 13: Control Panel Options

For more information on control panels, refer to the application guides.

- 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 19: 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.