Application manual

PROFINET Controller/Device

Application manual

PROFINET Controller/Device

RobotWare 7.18

Document ID: 3HAC066558-001

Revision: R

Table of contents

Table of contents

Overview of this manual

About this manual

This manual describes the following options and contains instructions on how to configure them in an OmniCore system.

- *PROFINET Controller*, option number 3020-1
- *PROFINET Device*, option number 3020-2
- *PROFIsafe Controller*, option number 3023-1
- *PROFIsafe Device*, option number 3023-2

> **Note**
>
> It is the responsibility of the integrator to provide safety and user guides for the robot system.

Usage

This manual should be used during installation and configuration of the PROFINET options.

> **Note**
>
> Before any work on or with the robot is performed, the safety information in the product manual for the controller and manipulator shall be read.

Who should read this manual?

This manual is intended for:

- Personnel that are responsible for installations and configurations of industrial network hardware/software.
- Personnel that make the configurations of the I/O system.
- System integrators.

Prerequisites

The reader should have the required knowledge of:

- PROFINET network
- I/O system configuration
- OmniCore controller
- RobotStudio

References

ABB documents

Reference	Document ID
Application manual - I/O Engineering	*3HAC082346-001*
Technical reference manual - System parameters	*3HAC065041-001*
Product manual - OmniCore E10	*3HAC079399-001*

7

Overview of this manual

Reference	Document ID
Product manual - OmniCore C30	3HAC060860-001
Product manual - OmniCore C90XT	3HAC073706-001
Product manual - OmniCore V250XT Type B	3HAC087112-001
Product manual - OmniCore V400XT	3HAC081697-001
Operating manual - Integrator's guide OmniCore	3HAC065037-001
Operating manual - OmniCore	3HAC065036-001
Operating manual - RobotStudio	3HAC032104-001

Other references

Reference	Description
International standard IEC 61158 Type 3 International standard IEC 61784	The PROFINET industrial network standard is described in the international standards.
International standard IEC 62443	Industrial communication networks – Network and system security
PROFINET Cabling and Interconnection Technology	Installation Guideline for PROFINET
Commissioning PC Stations - Manual and Quick Start	Release 12/2006 C79000-G8976-C156-08
ET200SP Distributed I/O System	Manual from Siemens
www.profinet.com	The web site of PROFINET International

Revisions

Revision	Description
A	Released with RobotWare 7.0.
B	Released with RobotWare 7.0.1. • Cfg name removed from entire manual.
C	Released with RobotWare 7.0.2. • LLDP overview image corrected in section *PROFINET for OmniCore on page 14*. Image now shows that LAN3 is a private network port.
D	Released with RobotWare 7.1. • Information regarding group signals added in section "Signal Editor" and "Editing signals". • Configuration of internal device added in chapter *Configuring the internal device on page 51*. • The following sections have been updated regarding PROFIsafe: *PROFINET for OmniCore on page 14*, *I/O devices on page 20*, *Information about the internal device on page 21*, "The I/O Engineering Tool user interface" and *Configuring the internal device on page 51*. • New chapter: *Setting up your PROFINET system on page 25*. • Information about a new flash pattern for PC-STAT added in section "Unidentified devices", in chapter *Troubleshooting scenarios on page 67*. • Appendix regarding TIA portal removed. • PROFINET parameters are described in the instructions instead of in a separate chapter. The section System Parameters is therefore removed.

Application manual - PROFINET Controller/Device
3HAC066558-001 Revision: R

Revision	Description
E	Released with RobotWare 7.2. • Minor corrections in section "Network connections on the OmniCore". • New section: *Creating safety integers on page 57*. • Minor corrections in section "Connections on the main computer".
F	Released with RobotWare 7.3. • Limitations for selection of LLDP mode added in sections *Specification overview, internal controller on page 14* and *Configuring the PROFINET network properties on page 29*. • Information regarding the Parameterization Speedup parameter added in section *Poor performance using fast startup on page 68*. • Information about MDI settings added in section *Using Fast Device Startup on page 45*.
G	Released with RobotWare 7.4. • Information about certification added in section *PROFINET for Omni-Core on page 14*. • Section "Network connections on OmniCore" replaced by "Ethernet networks on OmniCore". • Updated sections due to removed connection between IOE and VSM: "The ribbon", "Symbols", *Configuration prerequisites on page 51* and *Saving the configuration on page 58*.
H	Released with RobotWare 7.5. • Information about Media Redundancy Protocol (MRP) added in section *Manually adding devices to your network on page 38*. • Information about temporary IP addresses added in section *Troubleshooting scenarios on page 67*.
J	Released with RobotWare 7.6. • Minor corrections in section *PROFINET for OmniCore on page 14* and *Adding I/O modules on page 41*. • Information about I/O-Network added in entire manual. • Section "Ethernet networks on OmniCore" removed. • Section *Configuring the network settings on page 27* updated and section "Configuring the IP settings for internal controller has been removed".
K	Released with RobotWare 7.7. • Minor corrections in *PROFINET for OmniCore on page 14*. • Reference to AM I/O Engineering added, and section "I/O Engineering user interface" removed. • New section: *Scan Editor options on page 35* • Update button for GSD files added in *Importing the GSD files on page 34*.
L	Released with RobotWare 7.10. • Information about 3023-1 *PROFIsafe Controller* added in *What is PROFINET? on page 13*, *PROFINET for OmniCore on page 14*, *Information about the internal device on page 21*, *Information about the internal controller on page 23*, *Logging in with configuration grant on page 25*. • New section: *Add safety I/O modules to internal controller (for option 3023-1 PROFIsafe Controller) on page 41*. • GSD version for internal controller updated in section *PROFINET for OmniCore on page 14*. • Information about calculation of **Faulty Telegrams** added in *Manually adding devices to your network on page 38*. • Minor updates in *PROFINET for OmniCore on page 14*.

Revision	Description
	• Minor updates regarding submodules in *Configuring the internal controller and external devices on page 33*. • New section: *Deleting an internal device on page 54*. • Device SD-IO 8 bytes 4-bytes crc added in section *Input and output size on page 21*. • Description of identification and maintenance fields added in *Configuring the internal device on page 51*. • Information about **I/O Network** added in *Configure IP settings on page 27*.
M	Released with RobotWare 7.13. • Information about support for PROFINET Device for E10 added. • Information about naming standards for GSD files added in *Troubleshooting scenarios on page 67*. • Information about muted event log messages added in *Muting I/O event messages for external devices on page 49*. • Minor updates in *References on page 7*.
N	Released with RobotWare 7.15. • Information about PROFINET support for OmniCore V line controllers added in *Interface ports on page 15*. • Information about PROFIenergy added in *What is PROFINET? on page 13*, *PROFINET for OmniCore on page 14* and *PROFIenergy on page 59*. • Overview of network connections for PROFINET added in *PROFINET for OmniCore on page 14*. • Information about supported address types for PROFIsafe updated in *PROFINET for OmniCore on page 14*.
P	Released with RobotWare 7.16. • Minor corrections due to new interface.
Q	Released with RobotWare 7.17. • Sections *PROFIenergy for OmniCore on page 60* and *PROFIenergy commands on page 65* updated.
R	Released with RobotWare 7.18. • Updated the section *Energy saving modes on page 61*.

Network security

Network security

> This product is designed to be connected to and to communicate information and data via a network interface. It is your sole responsibility to provide, and continuously ensure, a secure connection between the product and to your network or any other network (as the case may be).
>
> You shall establish and maintain any appropriate measures (such as, but not limited to, the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information. ABB Ltd and its entities are not liable for damage and/or loss related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.

This page is intentionally left blank

1 Introduction

1.1 What is PROFINET?

General

PROFINET is an open standard for Industrial Ethernet. PROFINET satisfies requirements for automation technology. PROFINET solutions can be implemented for factory and process automation, for safety applications, and for the entire range of drive technology right up to clock-synchronized motion control.

Standardization

The use of open standards, simple operation, and the integration of existing system segments have driven the definition of PROFINET from the beginning. PROFINET is standardized in IEC 61158 and IEC 61784. The continual further development of PROFINET offers users a long term perspective for the implementation of their automation tasks.

Communication profiles

PROFINET has a modular design and different PROFINET communication profiles are all combinations of modular elements from the groups transmission technology, communication protocol, and application profiles.

The following are examples of PROFINET communication profiles:

- PROFIsafe - Defines how safety-oriented devices (emergency shutoff switches, light grids, overfill protection systems, etc.) can communicate safety control information over a network securely enough that they can be used in safety-oriented automation tasks up to EN954's KAT4, AK6, or SIL3 (Safety Integrity Level).

- PROFIdrive - The PROFIdrive profile covers application scenarios from simple frequency converters to highly dynamic servo drivers.

- PROFIenergy - A profile of the PROFINET communications protocol that allows the power consumption of automation equipment in manufacturing (such as robot assembly cells, laser cutters and sub-systems such as paint lines) to be managed over a PROFINET network. It offers an open and standardized means of controlling energy usage during planned and unplanned breaks in production.

1.2 PROFINET for OmniCore

General

The PROFINET network is running on the OmniCore main computer and does not require any additional hardware.

Options

There are two options available for PROFINET:

- 3020-1 *PROFINET Controller*
- 3020-2 *PROFINET Device*

ℹ️ **Note**

In this manual, the 3020-2 *PROFINET Device* and the 3023-2*PROFIsafe Device* are referred to as *internal device*.

The following options are available for PROFIsafe:

- 3023-1 *PROFIsafe Controller*
- 3023-2 *PROFIsafe Device*

ℹ️ **Note**

With option *3023-2 PROFIsafe Device*, it is possible to configure safe modules for the internal device.

The following options are available for PROFIenergy:

- 3021-1 *PROFIenergy*

Compatibility

PROFINET

The PROFINET controller and device is certified by PROFINET International (PI) with conformance class B/ NetLoad Class II.

The PROFINET controller and device is certified for the PROFINET version 2.35.

PROFIsafe

The PROFIsafe controller and device were executed in accordance with the following documents:

PROFIsafe - Test Specification for F-Slaves, F-Devices, and F-Hosts, Version 2.3.

Specification overview, internal controller

Item	Specification
PROFINET version	2.35
PROFIsafe version	2.6.1
GSD file versions supported	2.20–2.42
Number of I/O devices connected to controller	In total 50 I/O devices of which maximum 8 safe devices.

Item	Specification
LLDP mode	Legacy and Standard mode supported: • *Legacy mode* supports communication to I/O devices according to PROFINET I/O specification up to version 2.2. • *Standard mode* supports communication to I/O Devices according to PROFINET I/O specification after version 2.2. **Note** If one device in the configuration only supports legacy mode, all devices must run in legacy mode.
Startup mode	Legacy and Advanced mode supported.

Specification overview, internal device

Item	Specification
PROFINET version	2.44
PROFIsafe version	2.6.1
GSD version	2.43
Slot configuration	Slot 1-2: Digital input or output modules of variable size Slot 3-4: Safe digital input or output modules of fixed 8 bytes size
Connection size	Maximum 256 input bytes and 256 output bytes, and maximum 8 safe input bytes and 8 safe output bytes.

Application protocols

For information about application protocols and port numbers, see section "OmniCore application protocols" in *Operating manual - Integrator's guide OmniCore*.

Default gateway

There is one default gateway for the entire system. The default gateway must hence be configured so that it matches both the requirements for PROFINET traffic and non-PROFINET traffic.

Interface ports

The PROFINET controller and device can be configured on both the **Public Network** (WAN/WAN1) and the **I/O Network** (LAN). See .

> ℹ️ **Note**
>
> For OmniCore V line controllers, PROFINET shall not be connected to the WAN2 port.
>
> See *Operating manual - Integrator's guide OmniCore* for an overview of network segments and ports for all OmniCore controllers.

Network connections

PROFINET on public network

When the public network is used for connecting to an industrial network, the traffic shares the same media as the factory network and will share bandwidth with other non industrial network traffic.
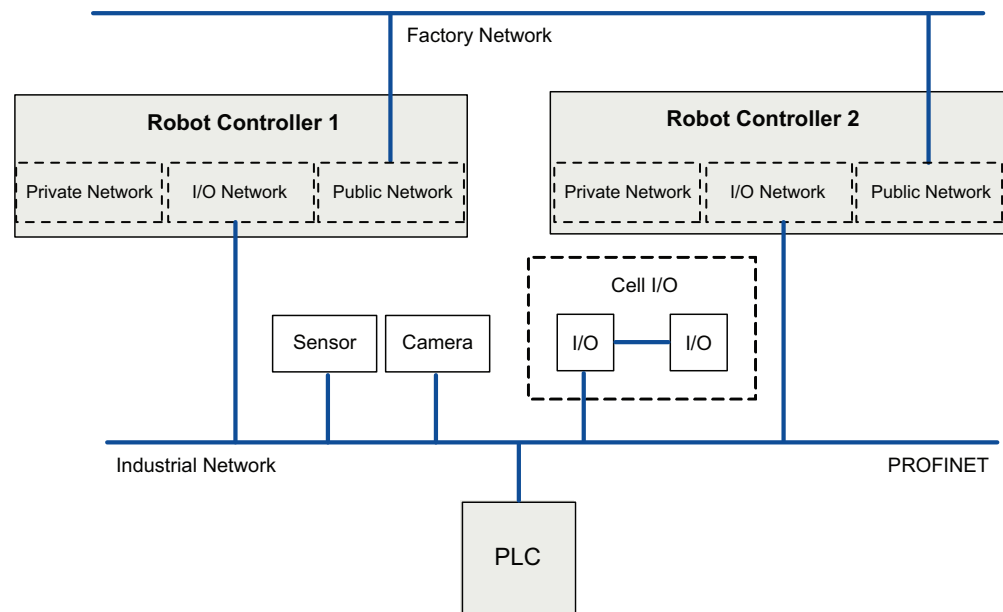
The following figure illustrates the network when connecting a controller and a device to the public network:
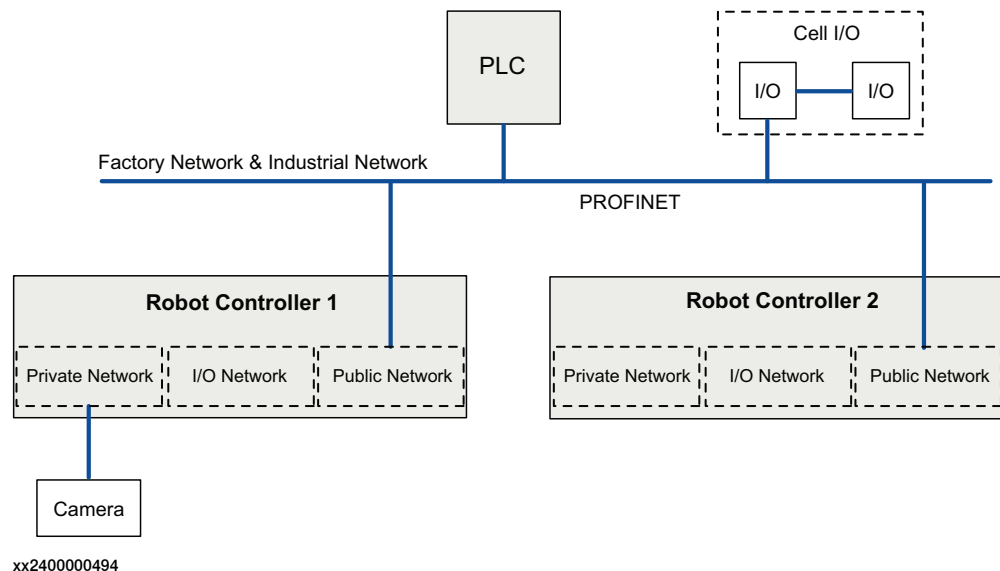
xx2400000494

PROFINET on I/O network

By connecting to the I/O network it is possible to connect several robot controllers to a dedicated industrial network.
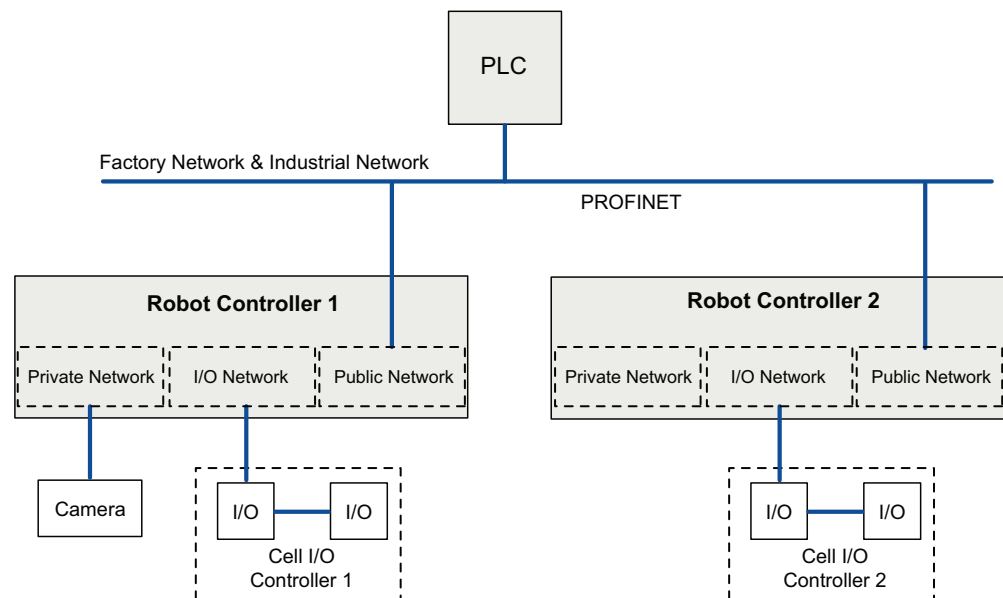
xx2400000495

> **ℹ Note**
>
> The I/O Network is not available for OmniCore E10.

PROFINET on different networks

The PROFINET controller and internal device can be on different network interfaces. In this example, the PROFINET controller acts on the public network and the internal device acts on the I/O network.

xx2400000603

Continues on next page

Link Layer Discovery Protocol (LLDP)

The OmniCore controller supports LLDP, but only on one port at a time. Any network connected to another port must have LLDP disabled (or use equipment not supporting LLDP).

Device replacement

PROFINET controller supports the device replacement mechanism. When a device fails, a new, identical device can replace the failed one if plugged in the same topology location. And this does not need any engineering tool. The new device is automatically assigned the same parameters and name as the previous one.

The conditions for device replacement to work are:

- You must replace a previously connected device by an identical device with an empty station name at the same topology location. For example, the new device is plugged in the same port as previously in a switch.
- This feature requires all switches and devices to support Link Layer Discovery Protocol (LLDP). The easiest way to achieve this is to only use Conformance Class B devices and switches in the PROFINET network.
- The device cannot be configured with FSU (Fast Startup Unit). In that case Device replacement will not work.

Requirements for PROFIsafe address types

Address Type 2 is supported for both PROFIsafe Device and Controller. However, the user must configure external devices, using either DIP-switches or vendor-specific configuration tools.

> **Note**
>
> It is not possible to assign F-Addresses to external devices via I/O Engineering.

2 Hardware overview

2.1 Ethernet switches

Prerequisites

It is recommended to use PROFINET certified switches.

2.2 I/O devices

Limitations

It is possible to connect most types of PROFINET-IO compliant I/O device on the PROFINET controller network. All I/O devices should comply with the PROFINET standard and be conformance tested by PROFINET international. I/O devices may be mounted inside the controller.

Safety I/O devices

PROFINET supports safety modules. It is possible to configure safety I/O devices and create safety signals to the I/O devices. For more information, see *Application manual - Functional safety and SafeMove*.

3 Software overview

3.1 Information about the internal device

General

To use the PROFINET internal device, the OmniCore controller must be installed with the option 3020-2 *PROFINET Device*. If safe modules shall be added, the option 3023-2 *PROFIsafe Device* must also be installed.

The PROFINET internal device can be used to:

- connect an OmniCore controller to a PLC.
- connect an OmniCore controller to another OmniCore controller which acts as a PROFINET controller.

Predefined network

When the robot system is installed with the *PROFINET* option, a predefined network with the name *PROFINET* is created at system startup.

Use I/O Engineering to configure the PROFINET network for initial use. For example, by setting the correct network name and IP settings. The DCP protocol can also be used to set station name and IP-address when running as a device.

Input and output size

PROFINET has an internal device with maximum 2048 digital input signals and maximum 2048 digital output signals. Apart from this, if PROFIsafe is used, 64 safety digital input signals and 64 safety digital output signals can also be added.

The following table shows the possible modules that can be configured for the internal device:

Slot	Possible modules	Comment
01	DO 8 bytes DO 16 bytes DO 32 bytes DO 64 bytes DO 128 bytes DO 256 bytes	
02	DI 8 bytes DI 16 bytes DI 32 bytes DI 64 bytes DI 128 bytes DI 256 bytes	

3 Software overview

3.1 Information about the internal device
Continued

Slot	Possible modules	Comment
03	SDO 8 bytes SD-IO 8 bytes SDO 8 bytes/4-bytes crc SD-IO 8 bytes/4-bytes crc	ℹ️ **Note** The *SDO 8 bytes* and *SD-IO 8 bytes* modules are compatible with PROFINET version 2.4. The *SDO 8 bytes/4-bytes crc* and *SD-IO 8 bytes/4-bytes crc* modules are compatible with PROFIsafe version 2.6.1. ℹ️ **Note** If the *SD-IO module* (both input and output) is selected, slot 04 will not be available for configuration.
04	SDI 8 bytes SDI 8 bytes/4-bytes crc	ℹ️ **Note** The *SDI 8 bytes* module is compatible with PROFINET version 2.4. The *SDI 8 bytes/4-bytes crc* module is compatible with PROFIsafe version 2.6.1.

💡 **Tip**

If a configuration mismatch between the connecting PLC and the internal device occurs, an event message is generated on the FlexPendant or the RobotStudio. This event message informs the user of the present slot configuration of the internal device.

ℹ️ **Note**

The *Input Size* sets the size on digital outputs and *Output Size* sets the size on digital inputs, seen from the PLC's point of view.

3.2 Information about the internal controller

General

To use the PROFINET internal controller, the OmniCore controller must be installed with the option 3020-1 *PROFINET Controller*. If third-party safe devices shall be used, the option 3023-1 *PROFIsafe Controller* must also be installed.

The PROFINET internal controller can be used to:

- connect PROFINET devices to the OmniCore controller.
- connect the OmniCore controller to another OmniCore controller which acts as a PROFINET device.

GSD files

In order to configure a PROFINET network with I/O Engineering, GSD files need to be imported into the tool. These files contains vital information about the PROFINET I/O devices and they are supplied by the vendor/manufacturer of the specific PROFINET module.

For information regarding how to import a GSD file, see *Importing the GSD files on page 34*.

3.3 Software for configuring a device

General

The PROFINET internal device needs to be configured in I/O Engineering before it can be connected to a PLC/PROFINET controller. Furthermore, the connecting PLC/PROFINET controller might need a PC software tool to configure all connection parameters used to connect to the OmniCore system.

GSD file for configuring the internal device for a PROFINET controller

The provided GSD file for the OmniCore PROFINET device is used to inform the connecting PLC / PROFINET controller of supported connection parameters.

The GSD file, *GSDML-V2.xx-ABB-Robotics-OmniCore-YYYYMMDD.xml*, for the internal device can be obtained from the RobotStudio or the OmniCore controller.

- **In the RobotWare installation folder in RobotStudio:**
  ...\DistributionPackages\ABB.RobotWare-x.x.x-xxx\RobotPackages\RobotControl_x.x.xxx\utility\service\GSDML

- **On the OmniCore Controller:**
  ...\products\RobotControl_x.x.x\utility\service\GSDML

> **ℹ️ Note**
>
> Navigate to the RobotWare installation folder from the RobotStudio **Add-Ins** tab, by right-clicking on the installed RobotWare version in the **Add-Ins** browser and selecting **Open Package Folder**.

4 Setting up your PROFINET system

4.1 Logging in with configuration grant

Log in with configuration grant

For configuration in I/O Engineering, the user grant **Modify configuration** is required. See *Operating manual - RobotStudio*, section *Managing user rights and write access on a controller*.

Log in as safety user

If working with options 3023-1 *PROFIsafe Controller* or 3023-2 *PROFIsafe Device*, and a configuration is to be written to a robot controller, log in as a safety user (a user with access to **Safety Services**). See *Operating manual - RobotStudio*, section *Managing the user authorization system*.

4.2 Starting I/O Engineering

Start I/O Engineering

1 Start RobotStudio and connect to the robot system to configure.

2 In the ribbon of the **Controller** tab, select **I/O Engineering.**

See *Application manual - I/O Engineering* for more information.

Application manual - PROFINET Controller/Device
3HAC066558-001 Revision: R

4.3 Configuring the network settings

Configure IP settings

IP settings for the PROFINET network used on the **Public Network** or **I/O Network** are defined in **Network Settings** in RobotStudio or on the FlexPendant. See *Operating manual - RobotStudio* and *Operating manual - Integrator's guide OmniCore*.

ℹ	**Note**

When using PROFINET on the **I/O Network**, make sure that DHCP server is not active on the **Public Network** (WAN/WAN1). To disable DHCP for the **Public Network**, assign a static IP address.

Configure firewall settings

The Firewall Management function is used to configure the network firewall on the controller. Configuration is done in RobotStudio under **Configuration\Communication\Firewall Manager** where pre-configured Network Services can be enabled or disabled. See *Operating manual - RobotStudio* and *Operating manual - Integrator's guide OmniCore*.

4.4 Setting the station name

Set station name

The station name is used to identify the controller and/or the device on the respective network interfaces (**Public Network** and **I/O Network**).
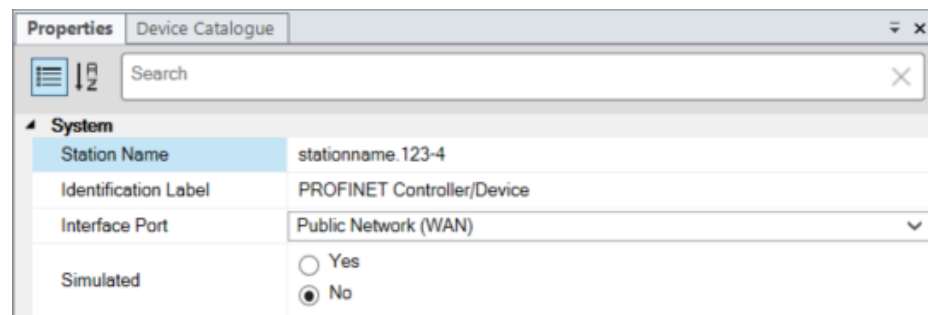
1 In the **Configuration** browser, expand **PROFINET** and select **Controller**.

2 In the **Properties** browser, specify **Station name**.

> **Note**
>
> This is the name of the internal device as it appears on the Public or I/O network. For example, detectable by a PLC.

PROFINET station name follows the PROFINET naming convention. It uses lower case alphabets for naming station name.
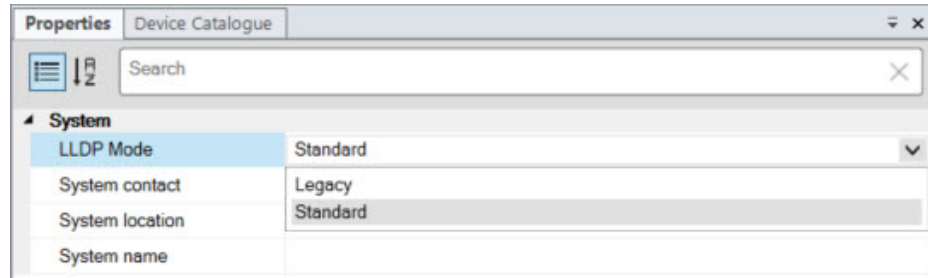
Properties	Device Catalogue		
Search			×
System			
Station Name	stationname.123-4		
Identification Label	PROFINET Controller/Device		
Interface Port	Public Network (WAN)		∨
Simulated	○ Yes ◉ No		

xx1900000883

4.5 Configuring the PROFINET network properties

Configure the PROFINET network properties

1 In the **Configuration** browser, select **PROFINET** (under I/O system).

2 In the **Properties** browser, you can configure the following network properties:

xx2200000268

| Parameter	Description
LLDP Mode	Select **Standard** or **Legacy**, indicating what Link Layer Discovery Protocol mode should be supported.
	ℹ **Note**
	The controller supports LLDP, but only on one port at a time. Any network connected to another port must have LLDP disabled (or use equipment not supporting LLDP).
	ℹ **Note**
	If one device in the configuration only supports legacy mode, all devices must run in legacy mode.

4.6 Selecting an interface port

Select an interface port

The PROFINET controller and device can be configured on both the **Public Network (WAN/WAN1)** and the **I/O Network** (LAN):

1 In the **Configuration** browser, expand **PROFINET** and select the controller or the internal device.

2 In the **Properties** browser, select the **Interface Port** to be used for the controller:
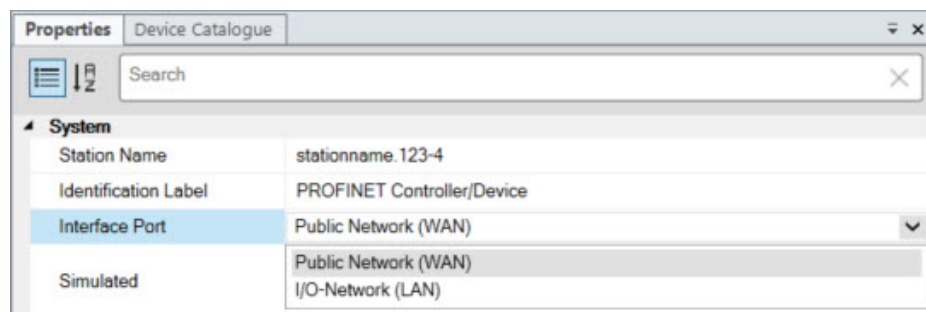
xx2200000266

Select between **Public Network (WAN)** and **I/O Network (LAN)**.

4.7 Working with functional safety (PROFIsafe)

Log in as safety user

If working with safe I/O signals (option 3023-2 PROFIsafe Device), log in as a safety user (the user grant **Safety Services** is required). See *Operating manual - RobotStudio*, section *Managing user rights and write access on a controller*.

Requirements for PROFIsafe address types

The following applies for the PROFIsafe address types:

- For PROFIsafe Device, **Address type 2** is supported.

Communication error handling

When communication errors occur, signals that are mapped to PROFIsafe devices are set to fail-safe values (0) and one or more error log messages are generated.

In order to prevent unintentional restart of the communication, the operator is required to activate the **F-Host Operator Acknowledge** button on the FlexPendant (Settings\Safety Controller\Configuration).

This page is intentionally left blank

5 Configuring the internal controller and external devices

5.1 Configuration prerequisites

Prerequisites

Before configuring the internal controller and external device, make sure to set up your system according to *Setting up your PROFINET system on page 25*.

5.2 Importing the GSD files

Import GSD files

A GSD file contains data about a device. It is necessary to add GSD files for all devices that should be added. It is also possible to add GSD files for any devices that may be added later.

1 In the **I/O Engineering** tab, select **Import Device Files > GSD Files**, or right-click on **PROFINET** (under I/O system) and select **Manage GSD files**.

2 The **GSD Files** window is displayed. Click **Import** and browse for a GSD file, or **Import, Folder** to import a complete folder with GSD files.
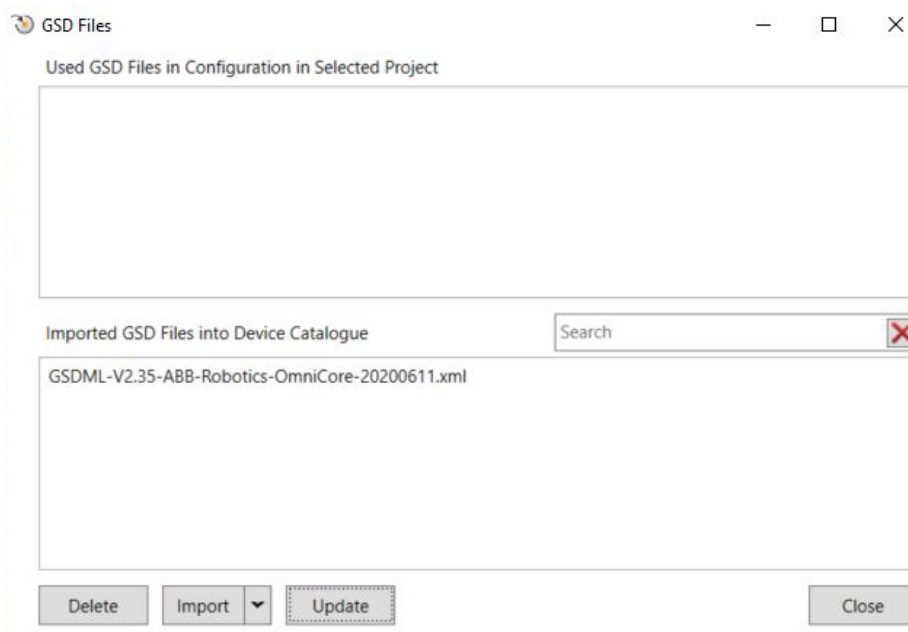
xx2200000941

> **ℹ Note**
>
> The **Used GSD Files...** window shows all GSD files that are used in the current I/O project.
>
> The **Imported GSD Files...** window shows all GSD files that are imported into the I/O project but are not used in the configuration.

> **ℹ Note**
>
> When a new I/O project is opened, only the used GSD files will be shown in the **Imported GSD Files...** window. Click **Update** to display all previously imported, but not used, GSD files.

5.3 Scanning the network

Scan Editor options

Within the **Scan Editor**, you can right-click the device row to show a menu of options:

Option	Description
Add as	Select a device and add it to the configuration tree.
Blink	Blink with the device status LEDs in order to identify it.
Factory Reset	Reset the IP settings of the device to factory reset.

The following buttons are available in the **Scan Editor**:

| Option	Description
Refresh	Lists all the devices that are reachable on this network.
Export	Exports a .csv file with all devices and the columns with data for each device.
Send Changes	To change a device's parameters, double-click on that device and enter the values that needs to be changed. Clicking **Send Changes** will save these changes in the device.

Scan the network

If the controller is connected to a physical PROFINET network with the I/O devices already in place, this describes how to scan the network to find available devices.

This scanning is performed on the network connected to the port selected in the network properties. See *Configuring the network settings on page 27*.

If you want to configure the network before the physical network is in place, follow the instruction *Manually adding devices to your network on page 38*.

1 In the **Configuration** browser, right-click on **PROFINET** (under I/O System) and select **Scan Network**.
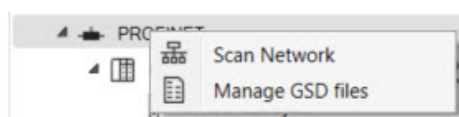
xx1900000885

> 💡 **Tip**
>
> Use the **Blink** functionality to detect the correct unit when multiple devices are connected.
>
> When a device is identified, the PC-STAT LED on the device will flash green with a frequency of 1Hz.

2 Add the detected device by right-clicking the device and selecting **Add as**. Select the configuration that corresponds to the physical device. The device is now displayed in the **Configuration** browser under the **PROFINET** / **Controller** node.

Continues on next page
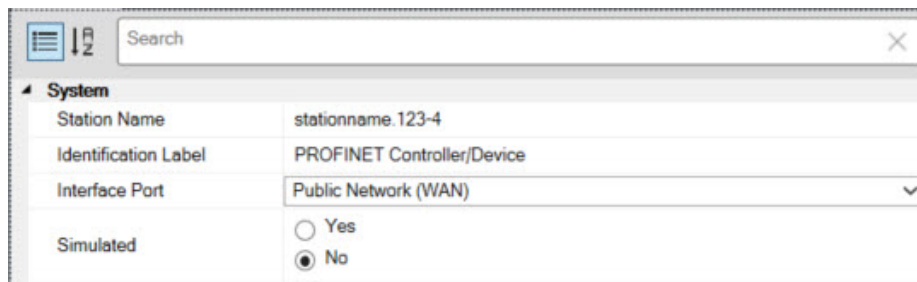
3 The properties for the device are added automatically in the **Properties** browser. Make sure these are correct.

5.4 Configuring the controller properties

Configure the controller properties

1 In the **Configuration** browser, expand **PROFINET** and select **Controller**.

2 In the **Properties** browser, you can configure the following properties:

xx2200000411

Parameter	Description
Station name	Define a station name to be used to identify the controller on the respective network interfaces (**Public Network** and **I/O-Network**).
Identification Label	Define a label to help the operator to identify the controller.
Interface Port	Select between **Public Network (WAN)** and **I/O-Network (LAN)** indicating the interface port to be used for the controller.
Simulated	Select **Yes** or **No**, indicating if the industrial network and all its connected I/O devices should be treated as simulated.

5.5 Manually adding devices to your network

Manually add devices to your network

1 In the **Configuration** browser, expand **PROFINET** and select **Controller**.

2 Select the **Device Catalogue** tab to show a list of available devices.

3 Double-click on a device in the list to add it to the controller.

   The added device is automatically selected. If the device contains an internal I/O module (physically included on the device), it is added as the first I/O module under the device.

4 In the **Properties** tab, specify the properties for the device:

xx1900000888

 ℹ Note

A red frame around a property field means that the property is not specified, or causes a validation error.

Parameter	Description	Allowed values
Station name	This parameter is used to identify a PROFINET device on the network. The name must be unique on the network.	
Reduction Ratio	This parameter indicates how frequently the cyclic I/O messages should be exchanged. For example, a **Reduction Ratio** of 4 means that I/O data is sent every 4 ms.	Valid range is 1 to 512. Default value is 8.

Continues on next page

Application manual - PROFINET Controller/Device
3HAC066558-001 Revision: R

Parameter	Description	Allowed values
Faulty Tele-grams	The number of missed frames that lead to device time-out, for example the value 3 leads to a time-out for three missed frames in a row.	Valid range is 3 to 255. **Note** The maximum allowed value is defined by the **Data Hold Time** and the **Reduction Ratio** (**Data Hold Time = Faulty Telegrams** x **Reduction Ratio**), and the **Data Hold Time** can maximum be 1920 ms. Therefore the max number of **Faulty Telegrams** is calculated as, 1920 / **Reduction Ratio**.
IP Address	Defines the IP address for the external device on the PROFINET network.	
Subnet	Defines the subnet mask for the external device.	
Gateway	Defines the gateway for the external device. **Note** If no IP address is defined for the gateway, the address defined in **IP Address** will be used as default.	
Name	The name of the external device is used as a reference to the specific external device when configuring the I/O signals and device commands.	A string with maximum 32 characters. The string must follow the RAPID rules described in *Technical reference manual - RAPID Overview*. The name must be unique among all named objects in the I/O system configuration. **Note** Names differing only in upper and lower case are considered to be equal.
State when System Startup	Defines the logical state that the robot system shall try to set for the external device at system startup. The available options are: • Establish communication (Activated) • Don't establish communication (Deactivated) • Restore the previously stored logical state for the external device at system shutdown (Last State)	

Continues on next page

Parameter	Description	Allowed values
Trust Level	Defines the behavior for external devices at different execution situations in the robot controller. The **Trust Level** only affects physical devices controlled by an industrial network master in the robot controller. An internal slave device is not controlled by an industrial network master in the robot controller and is therefore not affected by this setting.	A string corresponding to the name of a defined Device Trust Level type. A string with maximum 32 characters. The string must follow the RAPID rules described in *Technical reference manual - RAPID Overview*. ℹ️ **Note** Names differing only in upper and lower case are considered to be equal.
Simulated	Select **Yes** or **No**, specifying if the industrial network and all its connected external devices should be treated as simulated.	
Identification Label	This parameter is an optional way to provide a label that will help the operator to identify the external device.	A string with maximum 80 characters.
Media Redundency Protocol	Media Redundancy Protocol (MRP) is a data network protocol standardized by IEC 62439-2. It is a redundancy protocol supported by all PROFINET capable devices that will allow a network to be configured in a ring topology to overcome any single failure on the network.	Select **Enabled** or **Disabled**, specifying if the MRP should be enabled or not. ℹ️ **Note** The robot controller has no support for MRP.

5.6 Adding I/O modules

Add I/O modules

1 To add I/O modules, select the device and double-click on the I/O modules in the **Device Catalogue**.

2 Select the module in the **Configuration** browser and configure the module settings in the **Properties** browser. These properties are extracted from the GSD file for the I/O module.
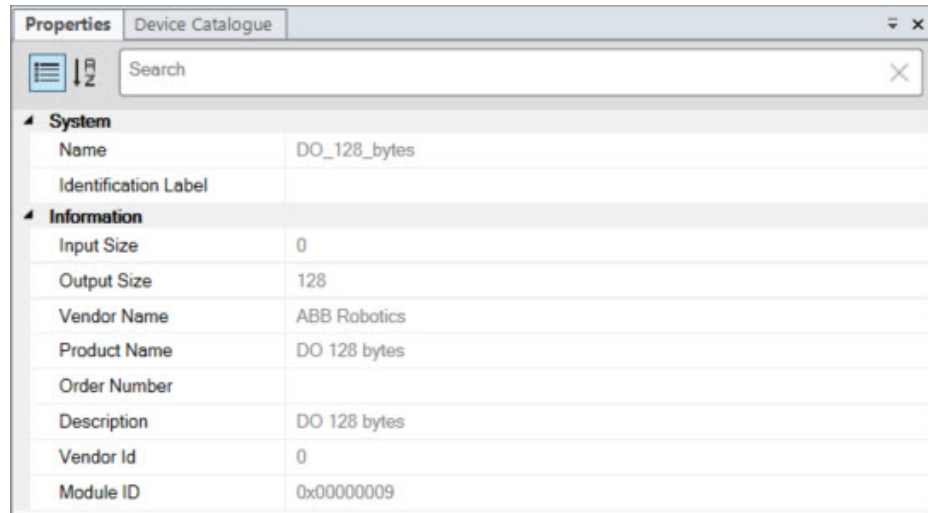
xx1900000890

Add safety I/O modules to internal controller (for option 3023-1 *PROFIsafe Controller*)

1 In the **Configuration** browser, expand **Controller** and select the device for which safe I/O modules should be added.

2 Select **Device Catalogue** to view a list of available safe I/O modules.

3 Double-click the safe I/O modules (output and/or input) in the list to be added to the internal controller.

> **Note**
>
> There are a set of rules for which type of I/O modules that are allowed for each slot. Only the the modules presented in the **Device Catalogue** are allowed to select for that slot.

> **Note**
>
> All unconfigured slots are configured in numerical order. For example, if the modules are deleted from slot 1 and 2, you may have to select a DO in slot 1 before being able to select a DI in slot 2.

> **Note**
>
> A yellow marking beside the module symbol indicates a safe I/O module. If any safe module is included in the internal device, a yellow marker is shown by the internal device as well.

4 Select the safe I/O submodule in the **Configuration** browser and configure the **PROFIsafe F-Parameters**:

xx2200001025

PROFIsafe F-Parameter	Description
Source address	The PROFIsafe **Source address** combined with the **Destination address** uniquely identifies the module. Both addresses are decimal values.
Destination address	The PROFIsafe **Destination address** combined with the **Source address** uniquely identifies the module. Both addresses are decimal values.
Timeout	The monitoring time (WD_Timeout), in milli seconds, within which a valid current safety message frame must arrive.
SIL	The Safety Integrity Level (SIL) of a submodule.
Version	Indicates the version number of the F-parameter. Always 1.
CRC Length	Indicates the length of the CRC2 signature. Can be 3-Byte-CRC or 4-Byte-CRC.
Block Id	Indicates the parameter block type: • 0: No I-parameters defined. • 1: Field **I Par CRC (hex)** must be completed.

PROFIsafe F-Parameter	Description
Passivation	Indicates the level of passivation that is supported. Can be Device/Module or Channel. ℹ️ **Note** Mandatory if **CRC Seed** is defined.
CRC Seed	Only displayed if **CRC Seed** is set to CRC-Seed32. Indicates how the MonitoringNumber for CRC2 is generated. ℹ️ **Note** If **CRC Seed** is defined, **Passivation** must also be completed. ℹ️ **Note** For PROFIsafe version 2.6, **CRC Seed** must be set to CRC-Seed32.
I Par CRC (hex)	Only displayed if **Block Id** is set to 1. Enter the IParCrc value for the safe module, calculated using a **Vendor Tool**.

5   For each safe submodule, click **Vendor Tool** to open the iParCrc checksum tool and calculate the IParCrc value for the module. Copy the <u>hexadecimal</u> value into the **I/O Engineering**.

> ℹ️ **Note**
>
> Note that the IParCrc checksum must be recalculated if the module configuration is changed, that is, for example, channel configuration and delay filter.

> ℹ️ **Note**
>
> The **Vendor Tool** is provided by the device manufacturer.

5.7 Working with signals

5.7.1 Creating I/O signals

Overview

I/O signals can be added to I/O devices in a project, either on module level or submodule level.

For detailed descriptions of all signal parameters, see *Technical reference manual - System parameters*.

Create I/O signals

1 In the ribbon of the **I/O Engineering** tab, select **Signal Editor**.

2 In the **Configuration** browser, select the I/O device (module or sub-module) for which signals are to be created and complete the fields.
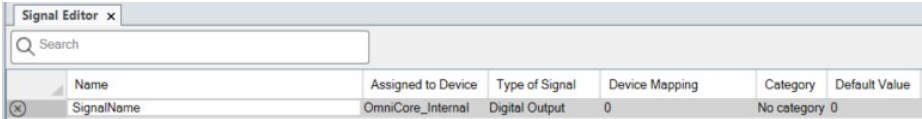
xx1900000891

For detailed descriptions of all signal parameters, see *Technical reference manual - System parameters*.

3 Select **I/O Project**/**Save Project** to save the changes.

5.8 Using Fast Device Startup

About Fast Device Startup

The Fast Device Startup functionality is used in tool changing applications to shorten the connection time between the PROFINET controller and an I/O device. To be able to use this functionality, the I/O device needs to support this functionality. All devices must support fast startup in the communication chain; devices such as switches or other intermediate hardware that could affect the PROFINET communication. For more information, see *Poor performance using fast startup on page 68*.

Some manufacturers also call this functionality Fast Start Up (FSU) or Prioritized Startup.

To activate Fast Device Startup against an I/O device, activate the system parameter *Fast Device Startup* and select the corresponding port(s) to be configured. See *Activating Fast Device Startup for external devices on page 47* and *Configuring port speed for external devices on page 48*.
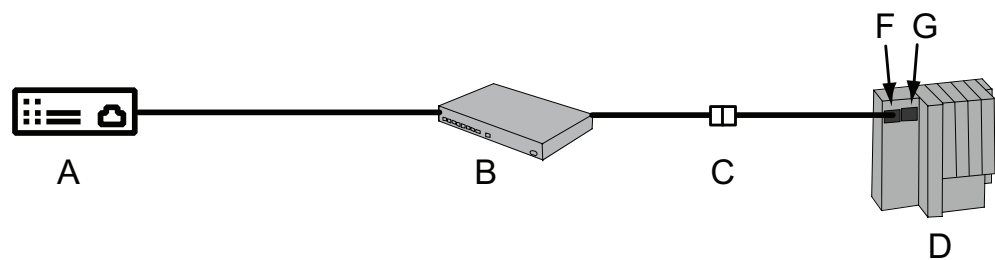

> ![i] **Note**
>
> The I/O device with FSU functionality is connected with the OmniCore controller. When the power of the I/O device is switched off and switched on again, the OmniCore controller establishes contact with the I/O device using the fast startup sequence.

Three alternative connections

I/O device connected via a switch

xx1100000093

A	OmniCore controller acting as PROFINET controller
B	Switch
C	Connection point
D	I/O device
F	Port 1 on the device
G	Port 2 on the device

In this alternative the PROFINET controller connects to the I/O device via a switch. Enable fast device startup and select 100 MBit (full duplex) on port 1. The port number is usually displayed upon the I/O device itself.
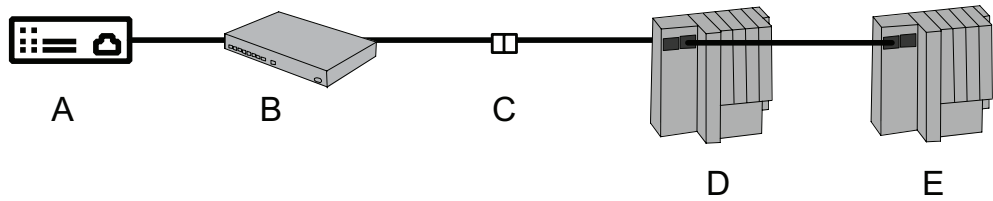
Continues on next page

Two I/O devices connected in serial via a switch

xx1100000094

A	OmniCore controller acting as PROFINET controller
B	Switch
C	Connection point
D	I/O device
E	I/O device

In this alternative, both I/O devices are disconnected at the connection point. Both port 1 and port 2 on the first device (D) and port 1 on the second device (E) needs to be configured to support Fast Device Startup.

I/O device connected without a switch

xx1100000095

A	OmniCore controller acting as PROFINET controller
C	Connection point
D	I/O device

In this alternative there is a direct cable between the PROFINET controller and the I/O device. Enable fast device startup and select 100 MBit (full duplex) on the port. A crossed Ethernet cable needs to be used.

MDI settings for fixed port speed

When fixed port speed is used, the interface WAN on the robot controller has the Medium-dependent interface set as **MDI**.

Thus, Auto MDI-X functionality is disabled, and the user must be aware of the link-partners setting and what type of cable to use in order to achieve a link.

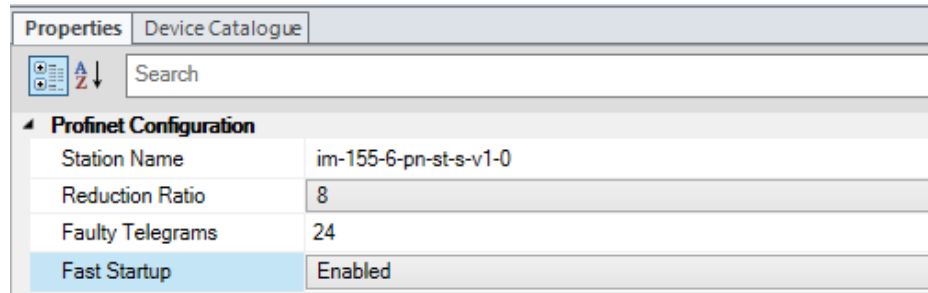The following table displays the cable requirements for the Ethernet link:

	MDI	MDI-X	Auto MDI-X
MDI	crossover	straight	any
MDI-X	straight	crossover	any
Auto MDI-X	any	any	any

Continues on next page

5.8.1 Activating Fast Device Startup for external devices

The following steps describe how to activate Fast Device Startup for an external device:

1 In the **Configuration** browser, select the external device for which Fast Device Startup should be activated.

2 In the **Properties** browser, set **Fast Startup** to **Enabled**.

xx1800003277

5.8.2 Configuring port speed for external devices

The following steps describe how to configure port speed for an external device:

1   In the **Configuration** browser, select the external device. Select the port for which port speed should be configured.

2   In the **Properties** browser, select one of the available speed options in **PortSpeed**.
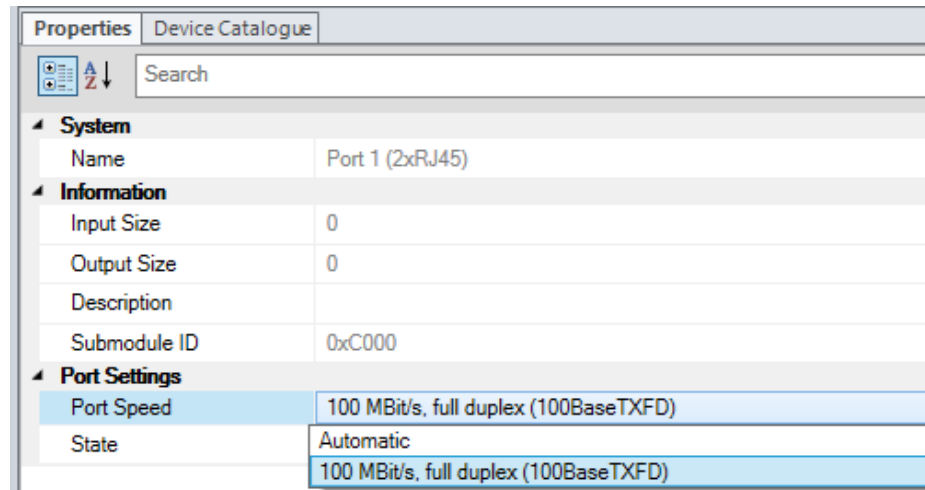
xx1900000905

ℹ️	**Note**	

The GSD file defines what port speeds are allowed for the external device.

5.8.3 Muting I/O event messages for external devices

I/O Event Messages from an external device can be muted using the RAPID instruction `IODeviceMute`.

Devices are unmuted by default, but using this instruction all event log messages from a specified device can be muted. The device will remain muted until the setting is changed or until the controller is restarted.

For information about how to use the instruction `IODeviceMute`, see *Technical reference manual - RAPID Instructions, Functions and Data types*.

This page is intentionally left blank

6 Configuring the internal device

6.1 Configuration prerequisites

Prerequisites

Before configuring the internal device, make sure to set up your system according to *Setting up your PROFINET system on page 25*.
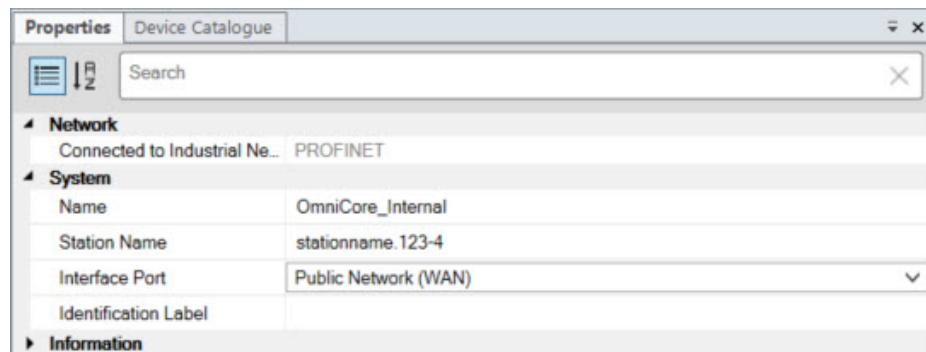
6.2 Adding an internal device

Add internal device

1 In the **Configuration** browser, select **PROFINET**.

2 Select **Device Catalogue** to view a list of available devices.

3 Double-click a device in the list to add it to the configuration.

4 Select the internal device in the **Configuration** browser and configure the **Properties**:

xx2000001985

Parameter	Description	Allowed values
Name	The name of the internal device is used as a reference to the specific internal device when configuring the I/O signals.	
Station Name	This parameter is used to identify a PROFINET device on the network. The name must be unique on the network.	
Interface Port	The interface port to be used for the controller.	Public Network (WAN) or I/O-Network (LAN)
Identification Label	This parameter is an optional way to provide a label that will help the operator to identify the internal device.	A string with maximum 80 characters.
IM1 Function (Identification and maintenance)	Information that describes the function of the internal device. Used to help the operator to identify the internal device.	A string with maximum 32 characters.
IM1 Location (Identification and maintenance)	The location of the internal device.	A string with maximum 22 characters.
IM2 Installation Date (Identification and maintenance)	Information about when the internal device was installed.	Format YYYY-MM-DD
IM3 Description (Identification and maintenance)	Additional information for the internal device. Used to help the operator to identify the internal device.	A string with maximum 54 characters.

Continues on next page

5   Continue by adding I/O modules to the internal device. See *Adding I/O modules to the internal device on page 55*.

6.3 Deleting an internal device

Delete internal device

> ℹ️ **Note**
>
> When an internal device is deleted, all associated signals are also removed.

1 In the **Configuration** browser, right-click on the internal device and select **Delete**.

2 The selected internal device is now removed from the configuration.

6.4 Adding I/O modules to the internal device

Add I/O modules to internal device

1 In the **Configuration** browser, expand **PROFINET** and select the internal device for which I/O modules should be added.

2 Select **Device Catalogue** to view a list of available I/O modules.

3 Double-click the I/O modules (output and input) in the list to be added to the internal device.

> ℹ **Note**
>
> There are a set of rules for which type of I/O modules that are allowed for each slot. Only the the modules presented in the **Device Catalogue** are allowed to select for that slot.

> ℹ **Note**
>
> All unconfigured slots are configured in numerical order. For example, if the modules are deleted from slot 1 and 2, you may have to select a DO in slot 1 before being able to select a DI in slot 2.

Add safety I/O modules to internal device (for option *3023-2 PROFIsafe Device*)

1 In the **Configuration** browser, expand **PROFINET** and select the internal device for which safe I/O modules should be added.

2 Select **Device Catalogue** to view a list of available safe I/O modules.

3 Double-click the safe I/O modules (output and input) in the list to be added to the internal device.

> ℹ **Note**
>
> There are a set of rules for which type of I/O modules that are allowed for each slot. Only the the modules presented in the **Device Catalogue** are allowed to select for that slot.

> ℹ **Note**
>
> All unconfigured slots are configured in numerical order. For example, if the modules are deleted from slot 1 and 2, you may have to select a DO in slot 1 before being able to select a DI in slot 2.

> ℹ **Note**
>
> A yellow marking beside the module symbol indicates a safe I/O module. If any safe module is included in the internal device, a yellow marker is shown by the internal device as well.

4   Select the safe I/O module in the **Configuration** browser and configure the **PROFIsafe F-Parameters**:

xx2000001934

Parameter	Description	Allowed values
Source address	The PROFIsafe address **Source address** combined with the **Destination address** uniquely identifies the module. Both addresses are decimal values. **Note** Both address values must match the information sent from the controller.	Valid range is 0 to 65535.
Destination address	The PROFIsafe address **Destination address** combined with the **Source address** uniquely identifies the module. Both addresses are decimal values. **Note** Both address values must match the information sent from the controller.	Valid range is 0 to 65535.
Timeout	A valid current safety message frame must arrive within the monitoring time, defined in milli seconds.	

6.5 Creating safety integers

Create safety integers

When creating safety integers, the signal should be 32-bit long and the device mapping should have the most significant byte first.

1. In the ribbon, select **Signal Editor**.

2. In the **Configuration** browser, select the I/O module for which the signal is to be created.

3. In the column **Name**, type the name of the signal.

xx2100000038

4. In the column **Type of Signal**, select **Group Output** or **Group Input**.

5. In the column **Device Mapping**, enter the device mapping values. If the offset is 64, type the mapping using the format: 88-95,80-87,72-79,64-71. This will create a safety integer mapped 0-31.

6. Press **Enter** to create the signal.

6.6 Saving the configuration

Save configuration

See *Application manual - I/O Engineering* for more information.

7 PROFIenergy

7.1 What is PROFIenergy?

General

PROFIenergy is a profile of the PROFINET communications protocol that allows the power consumption of automation equipment in manufacturing (such as robot assembly cells, laser cutters and sub-systems such as paint lines) to be managed over a PROFINET network. It offers an open and standardized means of controlling energy usage during planned and unplanned breaks in production. PROFINET is an open standard for Industrial Ethernet. PROFINET satisfies requirements for automation technology. PROFINET solutions can be implemented for factory and process automation, for safety applications, and for the entire range of drive technology right up to clock-synchronized motion control.

Standardization

The use of open standards, simple operation, and the integration of existing system segments have driven the definition of PROFINET from the beginning. PROFINET is standardized in IEC 61158 and IEC 61784. The continual further development of PROFINET offers users a long term perspective for the implementation of their automation tasks.

7.2 PROFIenergy for OmniCore

General

PROFIenergy is an application profile that specifies methods and techniques to implement energy-saving functions within a PROFINET I/O enabled device. The PROFIenergy profile is based on PROFINET in order to have a manufacturer independent basis, for an effective energy management. The profile defines a set of commands, which allow the customer to switch on and switch off energy saving modes for unused consumers during breaks in a common way. It is possible to retrieve any energy saving mode information from the controller using PROFIenergy while the controller is active.

The PROFINET network is running on the OmniCore main computer and does not require any additional hardware.
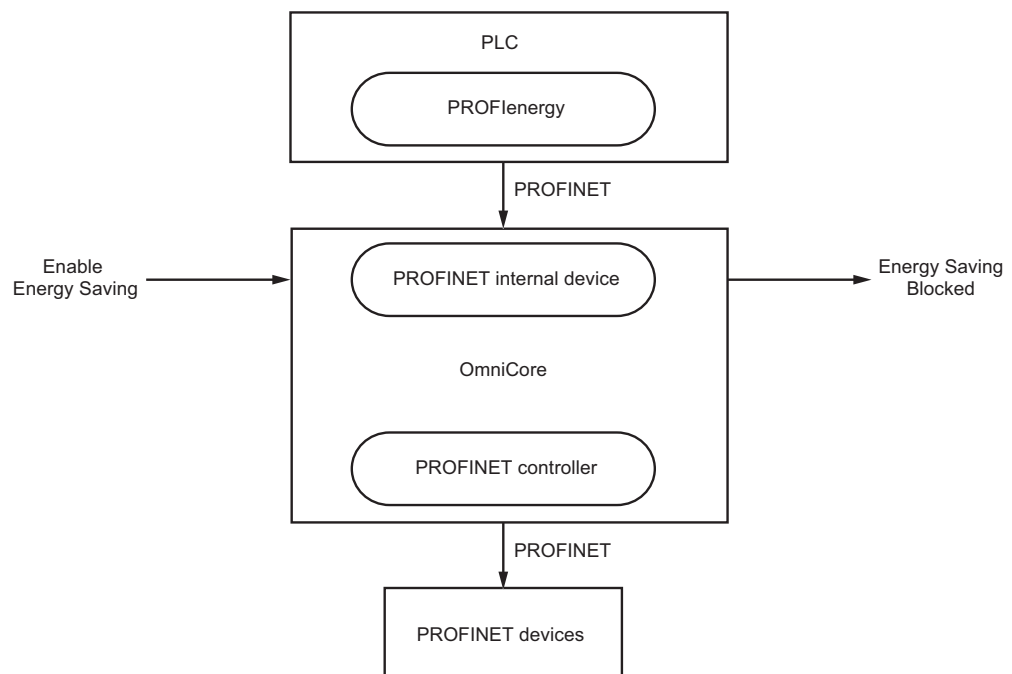
xx2400001692

Options

The RobotWare option *3021-1 PROFIenergy* allows the OmniCore controller to act as a PROFIenergy device on the PROFINET network.

> **Note**
>
> PROFIenergy also requires option 3020-2 *PROFINET Device*.

The option supports the Class 1 (Standby Management) Device Profile. The robot controller can act and respond to incoming PROFIenergy commands. The option complies with the *PROFIenergy Profile Specification, Version V1.3 – Date: October 2021*.

7.3 Functional description

Energy saving modes

The following energy saving modes are available:

- *BRAKES ON*
- *MOTORS OFF*
- *IO OFF*
- *SLEEP WOL*

PE_MODE[i]	Mode	Description	Selection	Power consumption[ii]
0xF0	OPERATE	The robot controller is operating. It is not possible to enter an energy saving modes from operate.	This is achieved by setting the robot controller in manual mode or if the system input signal is set to not allow energy saving.	400-15000 W
0xFF	READY TO OPERATE	The robot controller is operating. It is possible to enter an energy saving mode.	This is achieved by setting the robot controller in automatic mode and the system input signal is set to allow energy saving.	400-15000 W
0x3	BRAKES ON	Energy saving mode where the mechanical brakes are applied and do not consume any power.	20 seconds ≤ pause time < 2 minutes	190 W
0x2	MOTORS OFF[iii]	Energy saving mode where the controller is in motors off state. The internal power rail for the motor will be discharged, which will reduce power loss.	2 minutes ≤ pause time < 10 minutes	170 W
0x1	IO OFF[iv]	Energy saving mode where any energy enabled device managed by the PROFINET controller are paused. The robot controller is in motors off state.	10 minutes ≤ pause time	Lower value than MOTORS OFF, but depends on PROFINET I/O units used in the system.
0xFE	SLEEP WOL	The robot controller is set to sleep and waits to receive a wake up request using a magic packet (method 1). All energy enabled devices that are managed by the internal PROFINET controller, are set to IO OFF during this sleep. **Note** Requires the hardware option 3071-2 Wake-on-LAN3# V-line.	On the Go Sleep Mode WOL request. Possible selection: 15 minutes ≤ pause time	<2 W

[i] PROFIenergy mode. An energy mode with lower mode number has lower energy consumption.

[ii] Values may differ depending on combination of controller and manipulator. The following values reflect the power consumption for a system consisting of OmniCore V250XT Type B with one ADU, and IRB6720-215/2.65 LID, but no device managed by the PROFINET controller.

[iii] The MOTORS OFF mode also have brakes applied.

[iv] The IO OFF mode also have the motors off and brakes applied.

Continues on next page

> **ℹ Note**
>
> PROFIenergy is supported for OmniCore E line, C line and V line, but with the following restrictions:
> - V line supports all energy modes
> - C line does not support the energy mode SLEEP WOL
> - E line does not support the energy modes SLEEP WOL and IO OFF

Energy saving mode icon

The FlexPendant indicates when an energy saving mode has been enabled:

Icon	Description
⬛	Energy saving mode enabled.

Prerequisites

All energy consumption levels are assumed to be 0.

Enable energy saving

At the startup of a robot system, it does not permit energy saving since the *Enable Energy Saving* system input signal is set to zero as default. To permit any energy saving mode, the *Enable Energy Saving* system input signal must be set to one and the robot controller needs to be in automatic operator mode.

Selecting devices for the IO OFF mode

This section describes the procedure to define devices with *EnergySavingActive* attribute. The important aspects of enabling *EnergySavingActive* in devices are:

- The devices that are connected to the internal PROFINET controller should be defined in the configuration of network devices. This helps the devices to be paused during IO OFF mode for energy saving.
- The *EnergySavingActive* attribute should be set for each device.
- It is possible to set the *EnergySavingActive* attribute through the *Device Trust Level*. For more information, see *Application manual - I/O Engineering* and *Technical reference manual - System parameters*.
- Since the robot controller is not in any energy saving mode at startup, all devices that are selected are set to continue or activate.
- When the controller is paused for 10 minutes or longer, any selected device that is not in operate state and supports energy saving, will be paused. Also, a connected and deactivated device will be directed to pause.

Changing mode

To enter an energy saving mode, the robot controller must be in the state READY TO OPERATE. In the READY TO OPERATE state, the robot controller is in automatic mode and the motors may be on or off. Then the PROFIenergy can be paused for a certain amount of time.

Application manual - PROFINET Controller/Device
3HAC066558-001 Revision: R

> ⚠️ **WARNING**
>
> When entering an energy saving mode, the robot stops immediately, regardless of its position, speed, or connected process equipment.

The PROFIenergy device should receive signal to end the pause to leave an energy saving mode. The robot controller resumes to its previous state, that is the same state as it had when it was paused. For example, if a RAPID program was executing when the pause was started then when leaving the energy saving mode, the program will resume and carry on from where it was paused.

> ⚠️ **WARNING**
>
> When the robot controller is in automatic mode, motors on can be enabled and the robot or other equipment can start to move without warning.
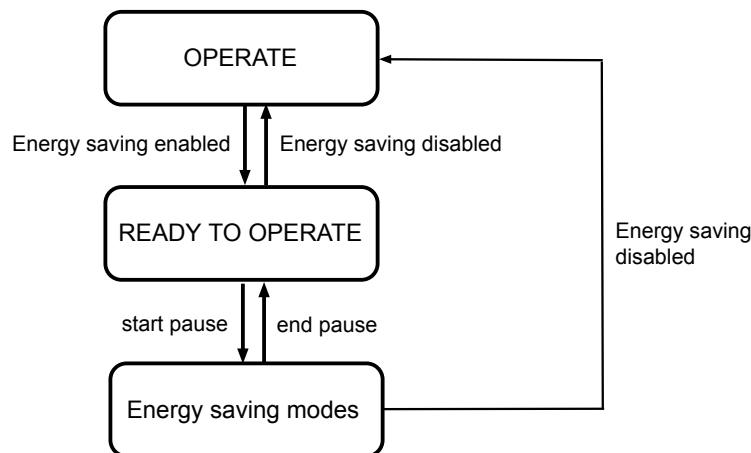
en1300000009

Scenarios at system failure or emergency stop

The following are some of the scenarios that occur when the robot controller has a system failure or emergency stop:

- When the robot controller is in system failure state, it is not possible to carry out any energy saving requests.
- It is possible to start and stop energy saving at emergency stop. However, sometimes the robot controller is not able to resume to same condition it had when energy saving was started.
- The end pause will succeed but motors and program condition might not be possible to resume. It is the responsibility of the energy controller to manage, when it is not possible to resume to the original conditions.
- Turning on the power switch will set the robot controller not to save any energy.

Prohibit energy saving at critical processes

When it is necessary to protect certain process or equipment, the energy saving can be prohibited.

- Block energy saving by setting system input signal *Enable Energy Saving* to zero.
- Begin the uninterruptable process.
- Finish the process.
- Allow energy saving by setting system input signal *Enable Energy Saving* to one.

The current energy saving status is visible through the system output signal *Energy Saving Blocked*. For more information, see *Technical reference manual - System parameters*, parameter *Energy Saving Blocked*.

Ending the energy saving mode

To override an active energy saving, switch to manual mode or restart the robot controller.

> **ℹ Note**
>
> The SLEEP WoL mode can only be overridden by a power cycle.

7.4 PROFIenergy commands

Supported commands

The following PROFIenergy commands are supported by the PROFINET internal device.

PE command	Service request ID	Modifier
Start_Pause	0x01	0x00
Start_Pause_with_time_response	0x01	0x01
End_Pause	0x02	0x00
List_Energy_Saving_Modes	0x03	0x01
Get_Mode	0x03	0x02
PEM_Status	0x04	0x00
PEM_Status_with CTTO	0x04	0x01
PE_Identify	0x05	0x00
Query_Version	0x06	0x00
Info_Sleep_Mode_WOL[i]	0x20	0x00
Go_Sleep_Mode_WOL[ii]	0x21	0x00

[i] Only applicable for option 3071-2 Wake-on-LAN 3 Vline.
[ii] Only applicable for option 3071-2 Wake-on-LAN 3 Vline.

For additional information, see *PROFIenergy Profile Specification, Version V1.3 – Date: October 2021*.

This page is intentionally left blank

8 Troubleshooting

8.1 Troubleshooting scenarios

Problem assigning IP address or station name

If an external PROFINET configuration tool is used to set IP address or station name for a controller or device, it may not be possible to perform that operation. In such a case, make sure that the device or PLC is not involved in any I/O data exchange. If, for example, a device or PLC is exchanging data with another device or PLC, it is not possible to change the IP address or station name of those devices.

Unidentified devices

Devices can be identified using RobotStudio, or other PROFINET tools. To identify the internal device in the robot controller, the PC-STAT LED will flash green with a frequency of 1 Hz.

- For RobotStudio, use the **Blink** functionality in the **Scan Editor**, see *Scanning the network on page 35*.

- For other tools, see the respective supplier user manuals.

Unable to connect to a device

If all parameters are correct, but it is still not possible to connect to an device using the PROFINET controller, make sure that the device does not already have an active connection with another controller. Most I/O devices do not accept that two controllers are connected against the same I/O device at the same time. That is, if the device does not allow shared device functionality.

Connections are lost randomly

Lost connections can occur for a number of reasons.

- Bad network

- Overloaded Ethernet switches

- Ethernet cable problems

Another possible reason is that the OmniCore PROFINET is not able to process all the PROFINET requests within the specified time frame. If, for example, 20 I/O devices are used with 1 ms reduction ratio (poll rate), the slightest variation of CPU load on the main computer might cause a protocol disturbance which can lead to a connection timeout. The maximum possible devices that can be used depends on the reduction ratios used, CPU load and data lengths transferred at every data cycle.

There can be connection loss while configuring PROFINET Controller on the same logical subnet as other applications, on the WAN port. It might cause sporadic loss of communication for the applications as well as for the PROFINET communication.

8 Troubleshooting

Poor performance using fast startup

In general the startup time for one I/O device using fast startup is less than a second, together with the robot controller. This is highly dependent upon the device itself. Check with the device vendor for detailed description about I/O devices that support fast startup with corresponding performance figures.

- If there are other intermediate hardware on the connection link, that might interfere with the PROFINET connection.
- If there is a chained setup containing multiple devices, there is an increased latency before all devices are running. Depending upon the number of chained devices the total connection time can be more than a second.
- Make sure that the port/ports used for fast startup is selected in the I/O configuration.
- Check with the device vendor for optimal settings when using the I/O device with fast startup. Sometimes device behavior is configurable with a vendor specific tool or through the network configuration tool. According to the GSD file.
- If the device does not support parameterization speedup, the connection time may be longer. If supported by the device, it is included in the GSD file.
- Check that the switch settings are correct according to below:
  - 100 Mbit speed rate with full duplex.
  - Auto negotiation shall be switched off.
  - Disable "switch intelligent features" such as flow control and MDIX (medium dependent interface crossover) that might cause delays during startup.
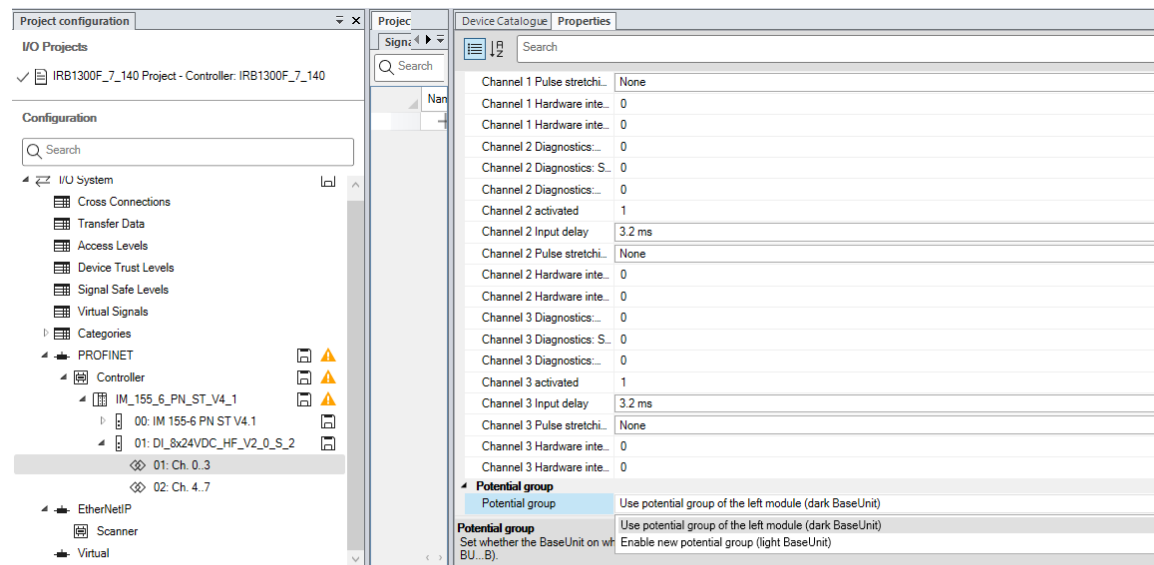
Configuring Siemens™ ET200SP I/O device

For Siemens™ ET200SP I/O devices, it is important to select the correct **Potential group**.

If the back plane of the device is dark, select **Use potential group of the left module (dark BaseUnit)**.

If the back plane of the device is light colored, select **Enable new potential group (light BaseUnit)**.

xx1800000146

Duplicated module id in GSD file

If the error message "Exception: GSD file includes dap's with the same module id for device ...", then duplicates of the module id exist in the GSD file and you must select which one to use.

Right-click on the device, select **Identify as** and select the definition to use.

Missing GSD definition

If the warning message "... could not be matched to any loaded GSD definition" is shown, there can be two reasons:

- If the message "Exception: GSD file includes dap's with the same moduleId for device ..." is also shown, see *Duplicated module id in GSD file on page 69*.

- If the message "Exception: GSD file includes dap's with the same moduleId for device ..." is not shown, load the GSD definitions. See *Importing the GSD files on page 34*.

IP address goes to 0.0.0.0 after restart of robot controller

If a PROFINET controller, for example a PLC, sets a temporary IP address for the internal PROFINET device in the robot controller, then the IP address will go to 0.0.0.0 after a restart.

GSD file is not loaded

The GSD file is not loaded if the file name does not follow the PROFINET standard.

This page is intentionally left blank

Index

ABB AB
Robotics & Discrete Automation
S-721 68 VÄSTERÅS, Sweden
Telephone +46 10-732 50 00

ABB AS
Robotics & Discrete Automation
Nordlysvegen 7, N-4340 BRYNE, Norway
Box 265, N-4349 BRYNE, Norway
Telephone: +47 22 87 2000

ABB Engineering (Shanghai) Ltd.
Robotics & Discrete Automation
No. 4528 Kangxin Highway
PuDong New District
SHANGHAI 201315, China
Telephone: +86 21 6105 6666

ABB Inc.
Robotics & Discrete Automation
1250 Brown Road
Auburn Hills, MI 48326
USA
Telephone: +1 248 391 9000

abb.com/robotics