ROBOTICS

Application manual

Safe 24V Switching Device

Trace back information:
Workspace 25B version a8
Checked in 2025-07-03
Skribenta version 5.6.019

Application manual

Safe 24V Switching Device

RobotWare 7.19

Document ID: 3HAC093252-001

Revision: A

© Copyright 2024-2025 ABB. All rights reserved.
Specifications subject to change without notice.

The information in this manual is subject to change without notice and should not be construed as a commitment by ABB. ABB assumes no responsibility for any errors that may appear in this manual.

Except as may be expressly stated anywhere in this manual, nothing herein shall be construed as any kind of guarantee or warranty by ABB for losses, damage to persons or property, fitness for a specific purpose or the like.

In no event shall ABB be liable for incidental or consequential damages arising from use of this manual and products described herein.

This manual and parts thereof must not be reproduced or copied without ABB's written permission.

Keep for future reference.

Additional copies of this manual may be obtained from ABB.

Original instructions.

© Copyright 2024-2025 ABB. All rights reserved.
Specifications subject to change without notice.

Table of contents

Overview of this manual 7
Network security 9

1 Introduction 11

2 Hardware overview 15

2.1 ABB Safe 24V Switching Device, DSQC1092 15
2.2 Power board, DSQC1078 16
2.3 Energy buffer, DSQC1082 18
2.4 Control board, DSQC1080 19
2.5 Distribution board, DSQC1079 21
2.6 Relay board, DSQC1081 23
2.7 Fan unit board, DSQC1090 26
2.8 Technical data 28

3 Hardware installation 31

3.1 General installation information 31
3.2 Installing Safe 24V Switching Device 33

4 Software commissioning 35

4.1 Recommended work process 35
4.2 Offline configuration 37
4.3 Online configuration 44
4.4 Verifying parameters in the ABB Safety Configuration Report 54
4.5 Upgrading firmware 56

Index 57

© Copyright 2024-2025 ABB. All rights reserved.

This page is intentionally left blank

Overview of this manual

About this manual

This manual describes the Safe 24V Switching Device and contains instructions for the configuration.

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

Usage

This manual shall be used during installation and configuration of the Safe 24V Switching Device.

> **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.

> **Note**
>
> Service shall only be conducted by ABB personnel. This to reduce risk of injury or damage to equipment.

Who should read this manual?

This manual is intended for

- Personnel responsible for installations and configurations of industrial network hardware/software
- Personnel responsible for I/O system configuration
- System integrators

Prerequisites

The reader must have the required knowledge of

- Mechanical installation work
- Electrical installation work
- System parameters and how to configure them
- RobotStudio
- OmniCore V400XT

References

Document references

Reference	Document ID
Operating manual - RobotStudio	*3HAC032104-001*

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Continued

Reference	Document ID
Operating manual - OmniCore	*3HAC065036-001*
Operating manual - Integrator's guide OmniCore	*3HAC065037-001*
Product manual - OmniCore V400XT	*3HAC081697-001*
Technical reference manual - System parameters	*3HAC065041-001*
Technical reference manual - RAPID Instructions, Functions and Data types	*3HAC065038-001*
Application manual - Controller software OmniCore	*3HAC066554-001*
Product specification - OmniCore V line	*3HAC074671-001*
Application manual - EtherNet/IP Scanner/Adapter	*3HAC066565-001*
Application manual - I/O Engineering	*3HAC082346-001*
SISTEMA lib for Safe 24V switching unit, DSQC1092	9AKK108470A5021

Revisions

Revision	Description
A	First revision.

© Copyright 2024-2025 ABB. All rights reserved.

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.

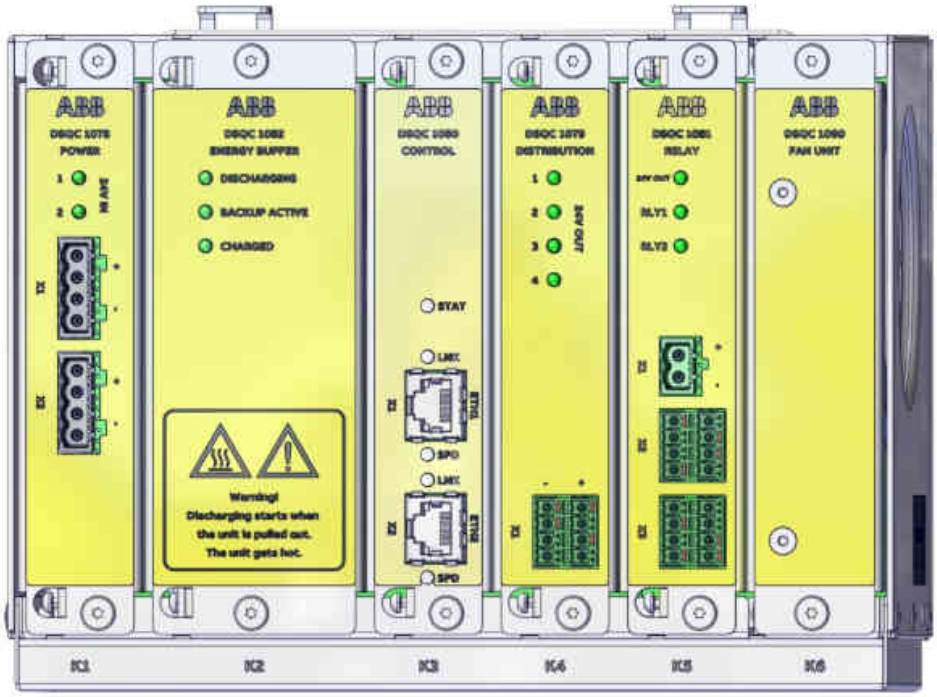
© Copyright 2024-2025 ABB. All rights reserved.

This page is intentionally left blank

1 Introduction

Safe 24V Switching Device

The Safe 24V Switching Device DSQC1092 is pre-installed in the robot controller at delivery.



xx2400001398

Options

The following options are available for the Safe 24V Switching Device DSQC1092:

- *Base switching device* [3084-1]
- *Energy buffer* [3085-1]
- *Distribution board* [3086-1]
- *Relay board* [3087-1]

Features

The Safe 24V Switching Device DSQC1092 provides the following features:

- Redundant 24VDC power input
- Energy buffer of 300 ms
- Safe communication based on Ethernet
- Safe 24VDC power outputs
- Safe relay outputs
- 17 LEDs to provide information about the device condition

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Continued

Safety

DSQC1092 is compliant with performance level d and structure category 3 as defined in ISO 13849-1:2015.

For further information about safety related data, see SISTEMA library for DSQC1092.

> **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.

> **Note**
>
> The Safe 24V Switching Device complies with ISO 13849-1 in accordance with certification from an accredited body. The ISO 13849-1 compliance of the Safe 24V Switching Device is not validated by UL. The Safe 24V Switching Device is currently approved by UL for employment in OmniCore V400XT.

VDC power output configuration

The Safe 24V Switching Device DSQC1092 has five safe VDC power outputs. Four VDC power outputs can provide up to 4A each. One VDC power output can provide up to 8A.

xx2400001399

The four VDC power outputs which provide 4A, can be connected in parallel. This to provide other combinations such as 2x8 A or 1x16 A configurations.

> **Note**
>
> The maximum available output current for all VDC power output configurations is 16 A.

Ethernet communication

DSQC1092 uses safe communication based on Ethernet (CIP safety). The device will automatically be assigned an IP address when the ETH1/ETH2 ports are connected to the *Private Network* on the main computer. The integrator is responsible for addressing the correct nodes during commissioning. See *Connecting the EtherNet/IP network on page 35*.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Note

For offline configuration of the device, the IP address can be defined manually. See *Offline configuration*.

Note

In case of communication loss, all VDC power outputs are de-energized and the relays are opened. This might lead to failure to perform the intended requested command. The communication timeout value is configured by the safety master.

Cybersecurity

The cybersecurity for DSQC1092 comprises several combined security features for the protection against threats such as viruses, malware, and other exploits. Examples of cyber security features are secure boot and firewall management.

For detailed information about OmniCore cybersecurity, see *Operating manual - Integrator's guide OmniCore*.

The following is applicable for DSQC1092:

- DSQC1092 shall be directly connected to the *Private Network* on the main computer of the robot controller using an Ethernet cable.
- The device communicates with the robot controller via 44818/TCP, 44818/UDP, 2222/UDP. See *Operating manual - Integrator's guide OmniCore*, section *Network architecture and communication*.

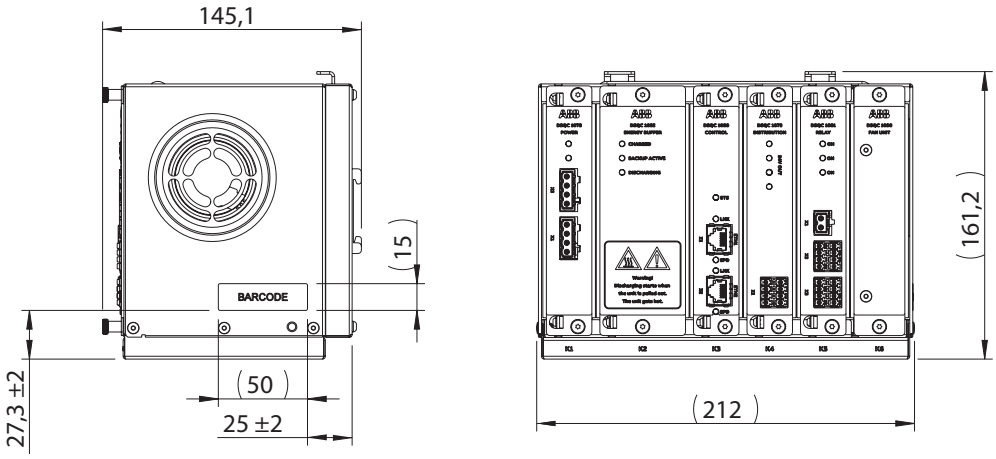
© Copyright 2024-2025 ABB. All rights reserved.

This page is intentionally left blank

2 Hardware overview

2.1 ABB Safe 24V Switching Device, DSQC1092

Description



xx2400001568

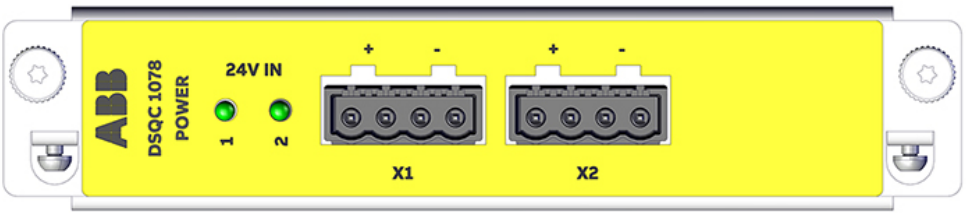
DSQC1092 consists of the following submodules:

Type	Description
DSQC1078	Power board
DSQC1082	Energy buffer
DSQC1080	Control board
DSQC1079	Distribution board
DSQC1081	Relay board
DSQC1090	Fan unit board

© Copyright 2024-2025 ABB. All rights reserved.

2.2 Power board, DSQC1078

Description



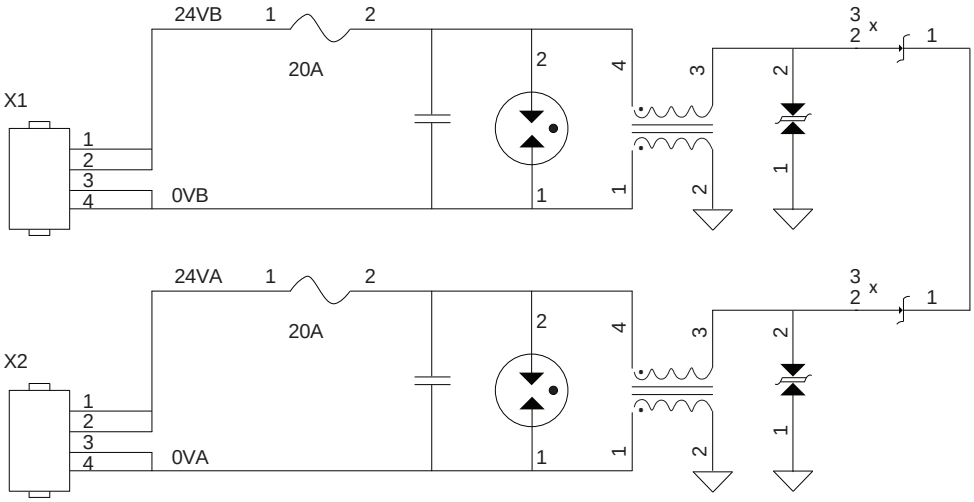
xx2400001527

The power board manages and distributes the internal power. The board has two redundant VDC power inputs (X1 and X2).

VDC power is connected to X1 when the device is installed in the robot controller. X2 can be used for external power supply to the device.

Note

0VA and 0VB are internally connected within the Safe 24V Switching Device, DSQC1092.



xx2500000150

CAUTION

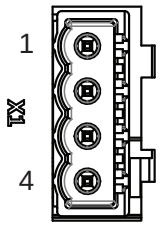
Service shall only be conducted by ABB personnel. The device must not be disassembled.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Connectors

Connector X1

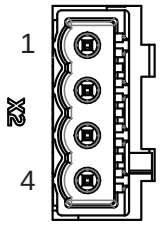


xx2400001678

	Description
Connection	Connector for VDC power input
Type	Phoenix CCA 2,5/4-G-5,08 P26THRR56, 1955057

Pin	Name	Description
1	24V IN B	
2	24V IN B	
3	0V IN B	
4	0V IN B	

Connector X2



xx2400001679

	Description
Connection	Connector for VDC power input
Type	Phoenix CCA 2,5/4-G-5,08 P26THRR56, 1955057

Pin	Name	Description
1	24V IN A	
2	24V IN A	
3	0V IN A	
4	0V IN A	

Status LEDs

The power board has the following status LEDs.

LED	LED color	Status
24V IN (1-2)	Green, steady	Power on (threshold at 21.6 V)

© Copyright 2024-2025 ABB. All rights reserved.

2.3 Energy buffer, DSQC1082

Description

xx2400001528

The energy buffer board handles energy backup in case of power loss. Upon loss of input power, all power rail outputs will maintain the current status for a minimum of 300 ms at max load. If input power is still missing after 300 ms the de-energize principle is followed, meaning that the device will immediately disable all power rail outputs and put the relays in open state.

Note

In case of loss of input power, > 300ms, the outputs of the DSQC1092 will follow the de-energized principle. This behavior must be addressed in a risk assessment.

CAUTION

Service shall only be conducted by ABB personnel. The device must not be disassembled.

Status LEDs

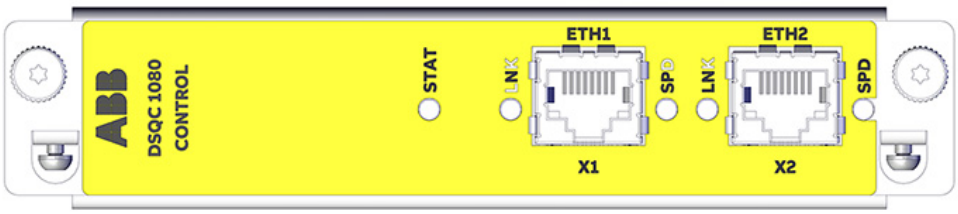
The energy buffer has the following status LEDs.

LED	LED color	Status
CHARGED	Green, steady	Indicates that the energy buffer is fully charged.
BACKUP ACTIVE	Yellow, steady	Indicates that energy buffer is connected and feeding the VDC outputs.
DISCHARGING	Red, steady	Indicates that the energy buffer is actively discharging and there is stored energy remaining.

© Copyright 2024-2025 ABB. All rights reserved.

2.4 Control board, DSQC1080

Description



xx2400001529

The control board has two Ethernet ports (ETH1 and ETH2) and manages the Ethernet communication and the control of the safe outputs. The Ethernet ports are daisy-chained and support DHCP.

CAUTION

Service shall only be conducted by ABB personnel. The device must not be disassembled.

Connectors

Connector X1 and X2

	Description
Connection	Connectors for ETH1 and ETH2
Type	RJ45, TE Connectivity
Article number	5406217-1

Pin	Name	Description
1	TXRX1P-A	Transmit Data+ or bidirectional
2	TXRX1M-A	Transmit Data- or bidirectional
3	TXRX2P-B	Receive Data+ or bidirectional
4	TXRX3P-C	NC or bidirectional
5	TXRX3M-C	NC or bidirectional
6	TXRX2M-B	Receive Data- or bidirectional
7	TXRX4P-D	NC or bidirectional
8	TXRX4M-D	NC or bidirectional

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Status LEDs

The control board has the following status LEDs.

LED	LED color	Status
STAT (Module status)	Red/Green	Shows the device status: • Off: Power to module is missing • Green (steady): Device is operating in a normal condition • Green (flashing): Device is in idle or standby state • Red (flashing ~1Hz): Device is booting • Red (flashing 2 times, 1s off): Fallback after FW upgrade failed • Red (flashing 4 times, 1s off): Boot error • Red (steady): Device has an unrecoverable fault and may need replacing • Red/Green (flashing): Device is in self-test or the device needs commissioning due to incomplete or incorrect configuration.
LINK (Link/activity) **Note** One LED for ETH1 and one for ETH2.	Yellow	• Flashing: The Ethernet is active on link. • Solid: A LAN link is established. • Off: A LAN link is *not* established.
SPD (Speed) **Note** One LED for ETH1 and one for ETH2.	Green/Yellow	• Off: 10 Mbps data rate is selected. • On (GREEN): 100 Mbps data rate is selected. • On (YELLOW): 1000 Mbps data rate is selected.

CAUTION

LEDs are not reliable indicators and cannot be guaranteed to provide accurate information. They should only be used for general diagnostics during commissioning or troubleshooting. Do not attempt to use LEDs as operational indicators.

© Copyright 2024-2025 ABB. All rights reserved.

2.5 Distribution board, DSQC1079

Description

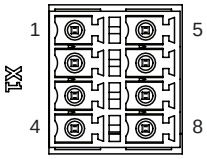
xx2400001530

The distribution board manages four safe VDC power outputs. The outputs are independent and parallel and are capable of supplying 4A each.

> **CAUTION**
>
> Service shall only be conducted by ABB personnel. The device must not be disassembled.

Connectors

Connector X1



xx2400001669

	Description
Connection	Connector for 4A VDC power output
Type	Phoenix MCDN 1,5/4-G1-3,81 P26THR, 1749544

Pin	Name	Description	Device Mapping[i]
1	OUT1-	VDC power 1 reference ground	0
2	OUT2-	VDC power 2 reference ground	1
3	OUT3-	VDC power 3 reference ground	2
4	OUT4-	VDC power 4 reference ground	3
5	OUT1+	VDC power 1 output	0
6	OUT2+	VDC power 2 output	1
7	OUT3+	VDC power 3 output	2
8	OUT4+	VDC power 4 output	3

i See **Signal editor** in I/O Engineering.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Status LEDs

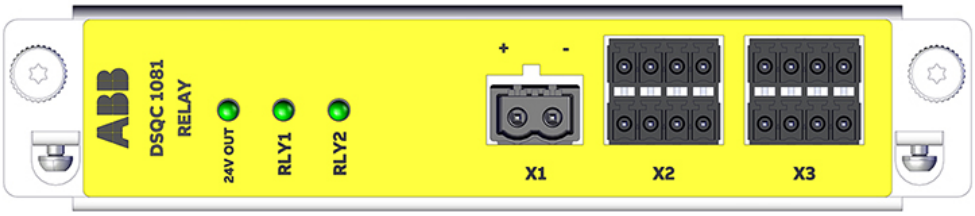
The distribution board has the following status LEDs.

LED	LED color	Status
24V OUT (1-4)	Green	Indicates that there is power available on the corresponding VDC power output.

© Copyright 2024-2025 ABB. All rights reserved.

2.6 Relay board, DSQC1081

Description



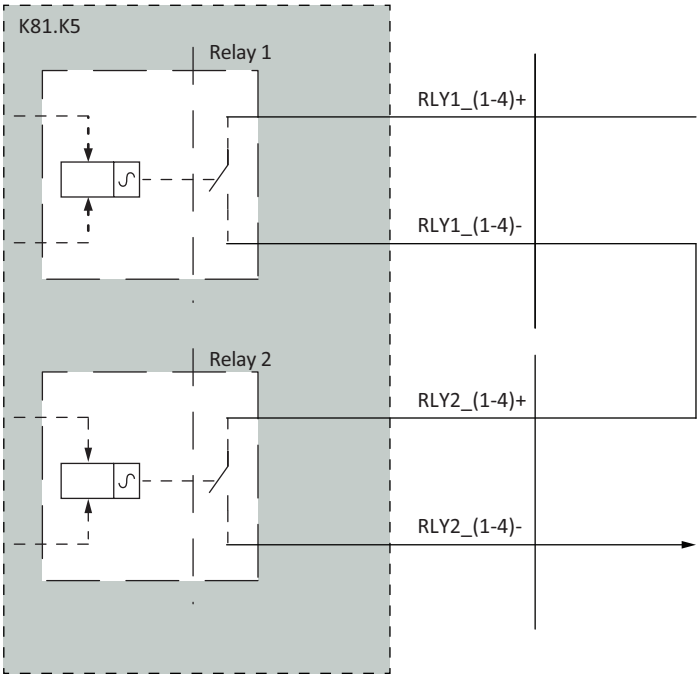
xx2400001531

The relay board manages two safe relays with four potential-free contacts. Each contact block is able to carry a current of up to 2A. Additionally, there is also a 8A VDC power output.

The two relays are controlled by the same signal and are interdependent, meaning all relay blocks are either active or inactive simultaneously. The VDC power output operates independently of the relay states and can be controlled separately.

Safe configuration of relays

For a safe usage of the two relays, the relays must be connected in series:



xx2400001652

For more details, see *Connector X2 and X3 (Customer powered) on page 24*.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

2.6 Relay board, DSQC1081
Continued

Note

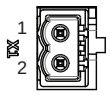
Loss of relay power from customer rail can, depending on application, lead to hazardous events. It is the responsibility of the integrator to perform a risk assessment for the application to decide if the Safe 24V Switching Device fulfils the requirements with respect to safety.

CAUTION

Service shall only be conducted by ABB personnel. The device must not be disassembled.

Connectors

Connector X1 (8A VDC power output)



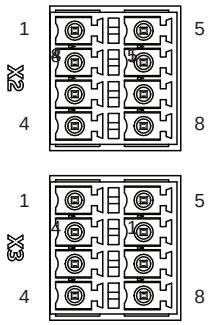
xx2400001670

	Description
Connection	8A VDC power output
Type	Phoenix CCA 2,5/2-G-5,08 P26THR

Pin	Name	Description	Device Mapping[i]
1	OUT+	VDC power out +	5
2	OUT-	VDC power out -	5

i See **Signal editor** in I/O Engineering.

Connector X2 and X3 (Customer powered)



xx2400001671

	Description
Connection	Relay output connector RLY1:1-4 RLY2:1-4
Type	Phoenix MCDN 1,5/4-G1-3,81 P26THR, 1749544

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

X2 Pin	Name	Description	Device Mapping[i]
1	RLY1_1+	Relay 1, contact 1+	4
2	RLY1_1-	Relay 1, contact 1-	4
3	RLY2_1+	Relay 2, contact 1+	4
4	RLY2_1-	Relay 2, contact 1-	4
5	RLY1_2+	Relay 1, contact 2+	4
6	RLY1_2-	Relay 1, contact 2-	4
7	RLY2_2+	Relay 2, contact 2+	4
8	RLY2_2-	Relay 2, contact 2-	4

i See **Signal editor** in I/O Engineering.

X3 Pin	Name	Description	Device Mapping[i]
1	RLY1_3+	Relay 1, contact 3+	4
2	RLY1_3-	Relay 1, contact 3-	4
3	RLY2_3+	Relay 2, contact 3+	4
4	RLY2_3-	Relay 2, contact 3-	4
5	RLY1_4+	Relay 1, contact 4+	4
6	RLY1_4-	Relay 1, contact 4-	4
7	RLY2_4+	Relay 2, contact 4+	4
8	RLY1_4-	Relay 2, contact 4-	4

i See **Signal editor** in I/O Engineering.

Status LEDs

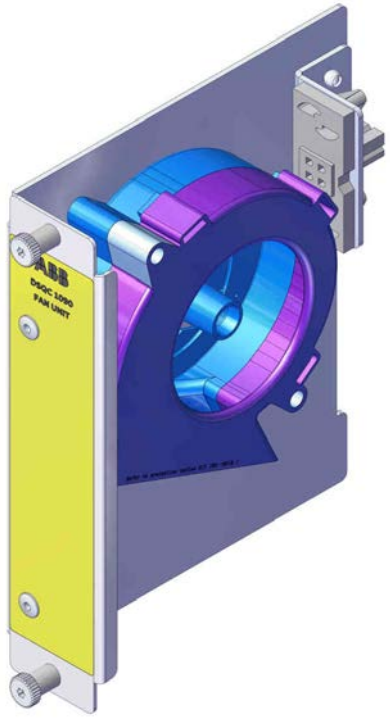
The relay board has the following status LEDs.

LED	LED color	Status
24V OUT	Green	Indicates that there is power available on the 8A VDC power output.
RLY1	Green	Indicates that relay 1 is closed.
RLY2	Green	Indicates that relay 2 is closed.

© Copyright 2024-2025 ABB. All rights reserved.

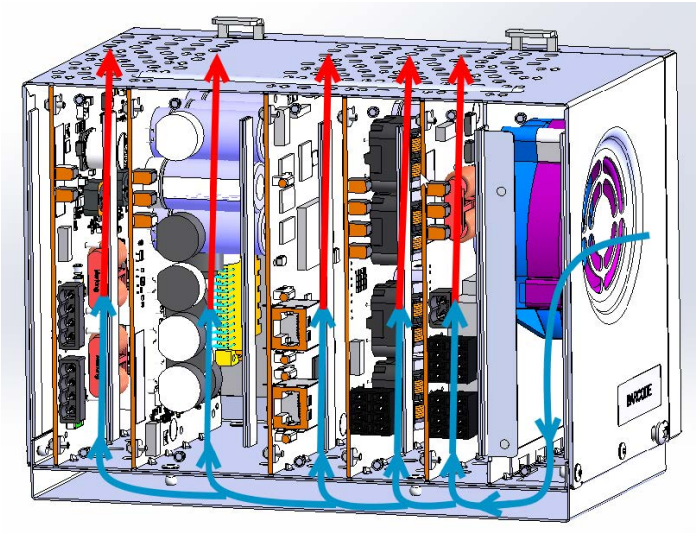
2.7 Fan unit board, DSQC1090

Description



xx2400001561

The fan unit provides a cooling airflow over the boards in the Safe 24V Switching Device. The fan unit has a 12VDC power supply.



xx2400001560

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

CAUTION

Service shall only be conducted by ABB personnel. The device must not be disassembled.

© Copyright 2024-2025 ABB. All rights reserved.

2.8 Technical data

WARNING

The technical data below must be fulfilled.

Dimensions and weight

Description	Data	Note
Dimension (Length x Width x Height)	107.4 mm	
Weight	2.81 kg	

Operating and storing conditions

Description	Data	Note
Operating temperature	+5°C to +65°C	
Storage temperature	+40°C to +70°C	
Permissible relative humidity	max 95%	Non-condensing
Degree of protection	IP20	

Supply voltage

Description	Data	Note
Voltage range	23.5V to 30.0V	The VDC power output voltage mirrors the supply voltage. For information about voltage drop, see tables for respective VDC power output.
Input current, IN_A + IN_B	20A total	
Over current protection	20A Fuse	One time fuse
Inrush current	<20A	
Surge protected	EN61000-4-5	
Reverse polarity protected	-30V	

4A VDC power output (digitally controlled)

Description	Data	Note
Rated current	4A	For VDC power out
Max current	5A	Over current protection limit
Typical short circuit current	5A	100ms/7s hick-up mode
Leakage current	Typical -1uA, max -500uA	
Rated voltage	24VDC	
Max voltage	30V	
Max voltage drop	1.5V	IN_A/B to PRx output

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Description	Data	Note
Max inductive load	10H	
Max capacitive load	40mF	
Recommended cable area	1.5 mm² or AWG 16-12.	
Surge protected	EN61000-4-5	
Thermal protection	Yes	
Max delay time	400 ms	at load within rated current
Number of operations during mission time	< 175k	

8A VDC power output (digitally controlled)

Description	Data	Note
Rated current	8A	For VDC power out
Max current	10A	Over current protection limit
Typical short circuit current	10A	100ms/7s hick-up mode
Leakage current	Typical -1uA, max -500uA	
Rated voltage	24VDC	
Max voltage	30V	
Max voltage drop	1.5V	IN_A/B to PRx output
Max inductive load	10H	
Max capacitive load	80mF	
Recommended cable area	2.5 mm² or AWG 12.	
Surge protected	EN61000-4-5	
Thermal protection	Yes	
Max delay time	400 ms	at load within rated current
Number of operations during mission time	< 175k	

Relay outputs, Customer powered

Description	Data	Note
Rated current	2A	
Max current	6A	
Typical short circuit current	Non protected output. No over-current limitation.	
Leakage current	N/A	
Rated voltage	24VDC	
Max voltage	30V	
Max voltage drop	0.2V	

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

2.8 Technical data
Continued

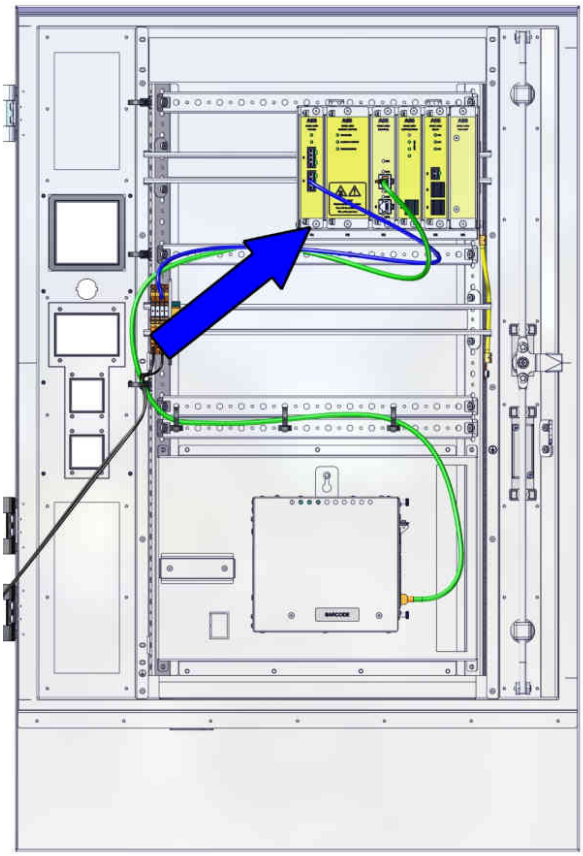
Description	Data	Note
Max inductive load	10H	**Note** External surge arrestor needed.
Max capacitive load	40mF/80mF	
Surge protected	EN61000-4-5	
Thermal protection	N/A	
Max delay time	400 ms	
Number of operations during mission time	< 175k	

© Copyright 2024-2025 ABB. All rights reserved.

3 Hardware installation

3.1 General installation information

Overview



xx2400001481

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.

Mounting and required installation space

The Safe 24V Switching Device is intended for use in an IP20 protected environment with standard air convection. It is installed vertically at the far right end on the mounting rail located on the controller door, ensuring adequate space beside the fan. There are no specific installation space requirements on the left side of the device.

Included in delivery

The following is included in the delivery:

- Base switching device

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

- Connector kits for distribution board and relay board
- Power cable to terminal block
- Ground cable
- Ethernet cable
- Connector for parallel power supply

© Copyright 2024-2025 ABB. All rights reserved.

3.2 Installing Safe 24V Switching Device

Required documents

Equipment	Note
Circuit diagram - OmniCore V400XT	*3HAC082020-008*
Product manual - OmniCore V400XT	*3HAC081697-001*

Installing Safe 24V Switching Device

Use this procedure to install the Safe 24V Switching Device. See also the product manual for the robot controller.

Note

The device is pre-installed on the mounting rail in the controller. Ethernet, power cable and ground cable are connected at delivery.

Note

The Safe 24V Switching Device complies with ISO 13849-1 in accordance with certification from an accredited body. The ISO 13849-1 compliance of the Safe 24V Switching Device is not validated by UL. The Safe 24V Switching Device is currently approved by UL for employment in OmniCore V400XT.

	Action	Note
1	**DANGER** Before commencing any work inside the cabinet make sure that the main power has been switched off.	
2	Verify that the pre-installed cables for power, Ethernet and protective earth are connected.	**Note** This device is connected to protective earth (PE) on the controller side. Do not connect the output side to PE, as this may cause unintended return current paths.
3	Connect wires to the outputs as required using the supplied connectors.	See included connector kits. For information about the pinout, see *Hardware overview on page 15*.
4	Configure the device.	See *Software commissioning* and *Application manual - I/O Engineering*.
5	Power on the robot controller.	
6	Perform the function tests to verify that the safety features work properly.	See the product manual for the controller.

© Copyright 2024-2025 ABB. All rights reserved.

This page is intentionally left blank

4 Software commissioning

4.1 Recommended work process

Prerequisites

The **Safety services** grant is mandatory for configuration of the Safe 24V Switching Device.

> **Note**
>
> The implementer of safety functions shall carefully consider implications of mixing different SIL level devices on the network.

Connecting the EtherNet/IP network

The Safe 24V Switching Device is based on EtherNet/IP and does not require any other hardware or software options to be connected to the robot controller. In this example, the device is connected to the robot controller which provides access to the *Private Network*. When the device is connected to the *Private Network*, the advantages of *Plug & Produce* is available.

When using the RobotWare options *3024-1 EtherNet/IP Scanner* or *3024-2 EtherNet/IP Adapter* more configuration possibilities are available. For more information see *Application manual - EtherNet/IP Scanner/Adapter*.

For more information about network connections on OmniCore, see *Operating manual - Integrator's guide OmniCore*.

Recommended work process

In order to use the Safe 24V Switching Device in your configuration, the following work process is recommended:

1. Install the device, see *Installing Safe 24V Switching Device*.
2. Configure the Safe 24V Switching Device (offline or online), see *Offline configuration* and *Online configuration*. Offline configuration can be used when there is no access to hardware, the Safe 24V Switching Device or the robot controller.

   > **Note**
   >
   > When working with the Safe 24V Switching Device, the configuration tool will update and download a new safety configuration to the controller.

3. Verify the parameters in the ABB Safety Configuration Report, see *Verifying safety parameters*.

   > **CAUTION**
   >
   > The user must confirm that all configuration data of the Safe 24V Switching Device was downloaded correctly by reading out all parameters from the module (safe output connection) and visually inspect the content.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

4 Validate the configuration of the Safe 24V Switching Device according to the validation process as described in *Application manual - Functional safety and SafeMove*.

WARNING

All downloaded configurations must be validated by user testing before the installation can be regarded as safe. User testing is the means by which all downloads are validated.

WARNING

The total intended safety functionality applied by the originator must be confirmed at commissioning of the Safe 24V Switching Device.

CAUTION

After the Safe 24V Switching Device is configured, the user must check that ownership has been assigned to the right originator.

5 When the configuration is done, see *Application manual - Functional safety and SafeMove* for instructions on how to work with the safety configuration.

© Copyright 2024-2025 ABB. All rights reserved.

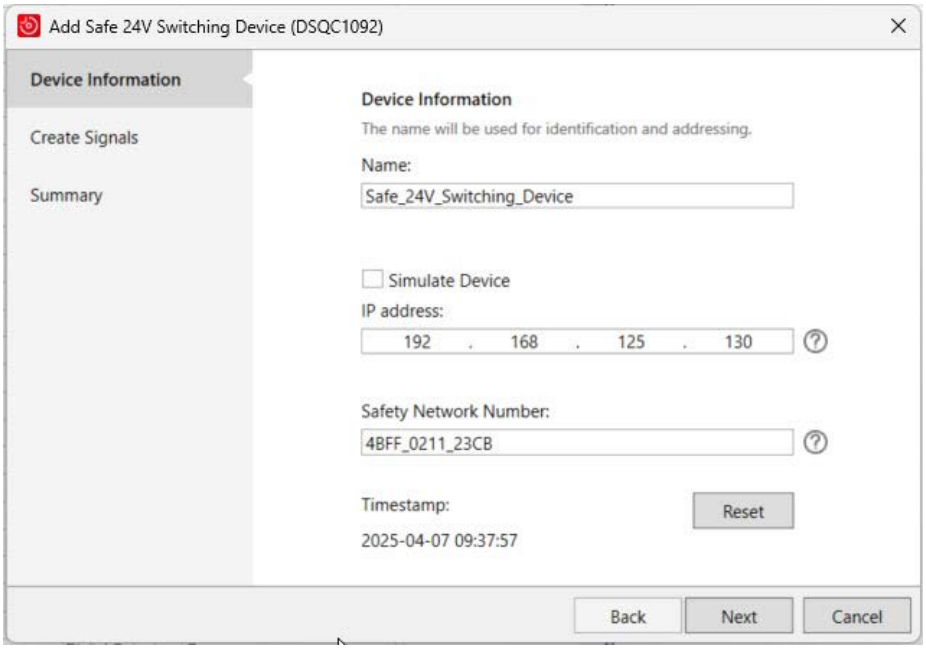
4.2 Offline configuration

General

This section describes the recommended working procedure when installing and configuring Safe 24V Switching Device in I/O Engineering. For general information about I/O Engineering, see *Application manual - I/O Engineering*.

Adding devices

1. In the **Controller** tab in RobotStudio, select **I/O Engineering**.
2. In the **I/O Project** menu, select **Open Project** and open the project to be configured.
3. In the **I/O Engineering** tab, select **Add ABB Device > Safe 24V Switching Device**.
4. In the **Device Information** dialog, define the following:



xx2400001535

- **Name**
- **Simulate Device**

  Select if the device shall be simulated.
- **IP address**

  Not applicable for simulated devices.
- **Safety Network Number**

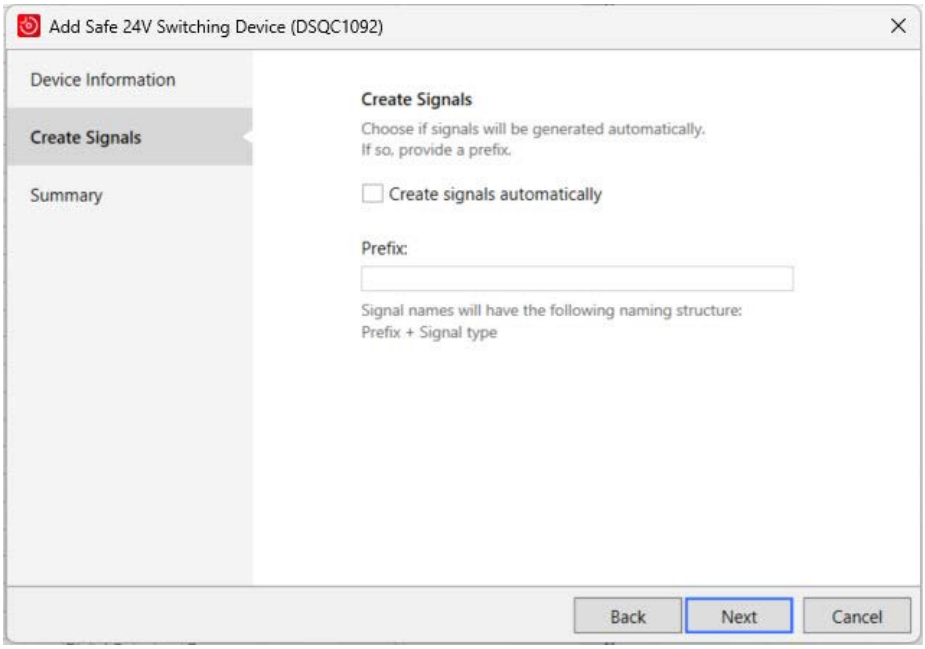
> **Tip**
>
> Select **Reset** to automatically retrieve a safety network number that is based on the current time stamp (displayed below).

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Select **Next**.

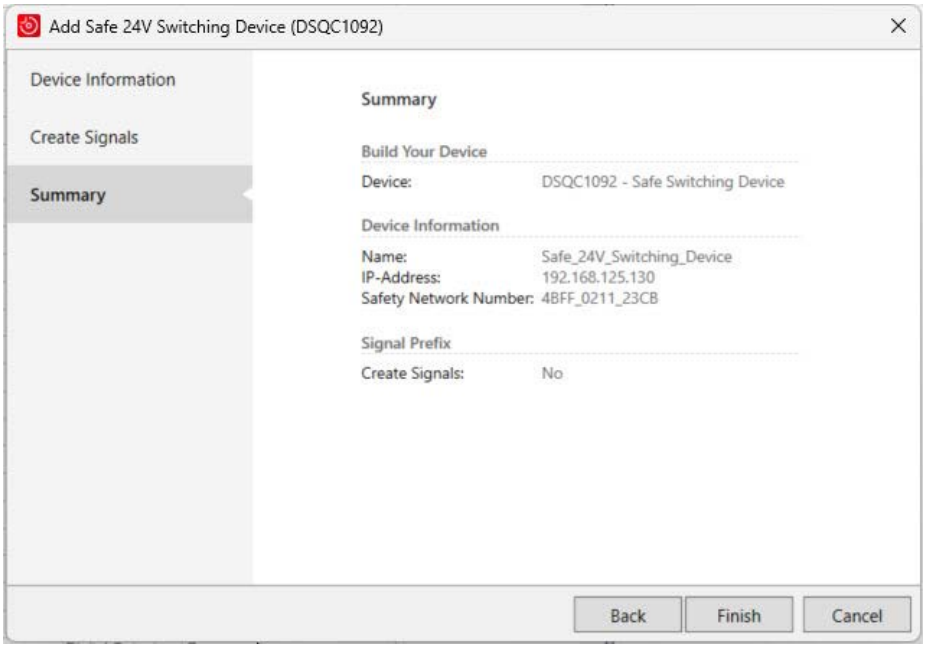
5 In the **Create Signals** dialog, define if new signals should be generated automatically and include a name prefix:



xx2400001536

Select **Next**.

6 The **Summary** is displayed:



xx2400001537

Select **Finish**.

7 The device is added to the I/O project and can now be configured.

8 When the configuration is finished, save the I/O project.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

9 When you have access to the hardware, write the configuration to the robot controller, see *Application manual - I/O Engineering*.

10 Pair the device with the configuration, see *Pairing a device with an existing configuration on page 47*.

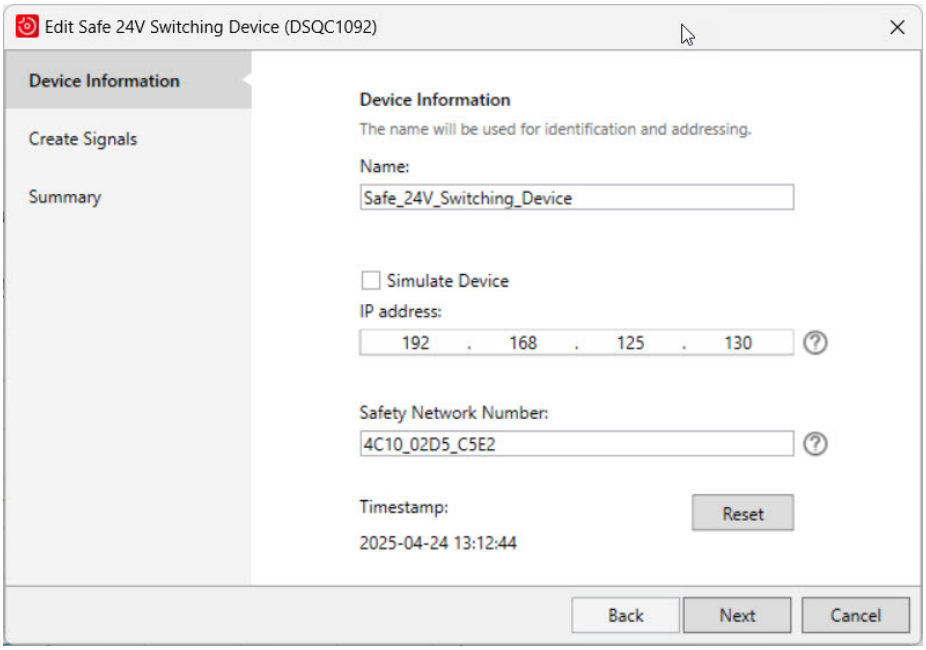
Updating I/O device selections

The I/O devices that were selected at creation can be modified.

1 In the **Controller** tab in RobotStudio, select **I/O Engineering**.

2 In the **Configuration** browser, right-click **Safe_24V_Switching_Device** and select **Edit**.

3 In the **Device Information** dialog, update the device name and/or the IP address:



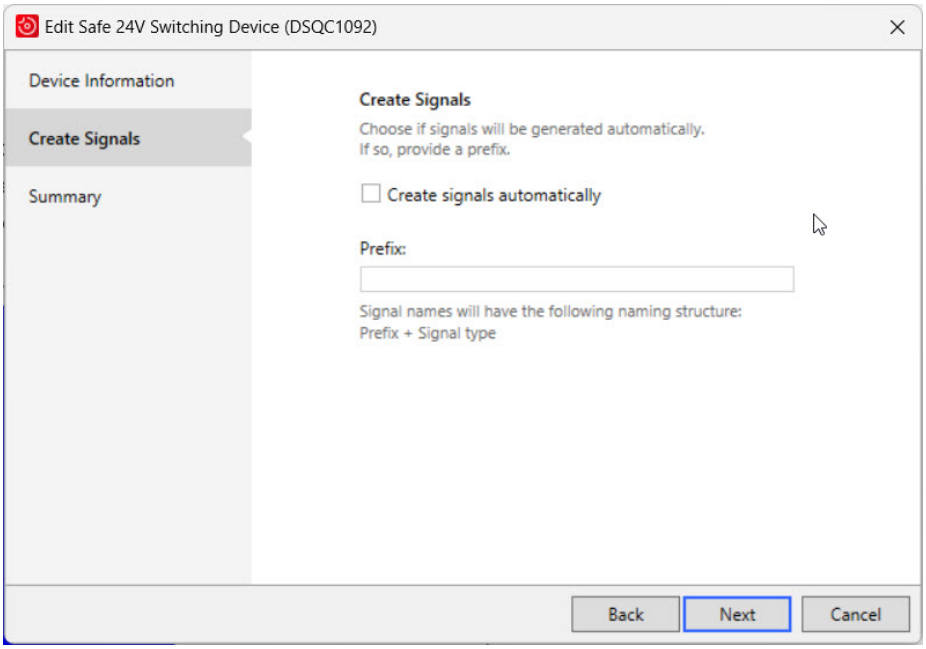
xx2500000747

Select **Next**.

4 In the **Create Signals** dialog, update the name prefix:

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.



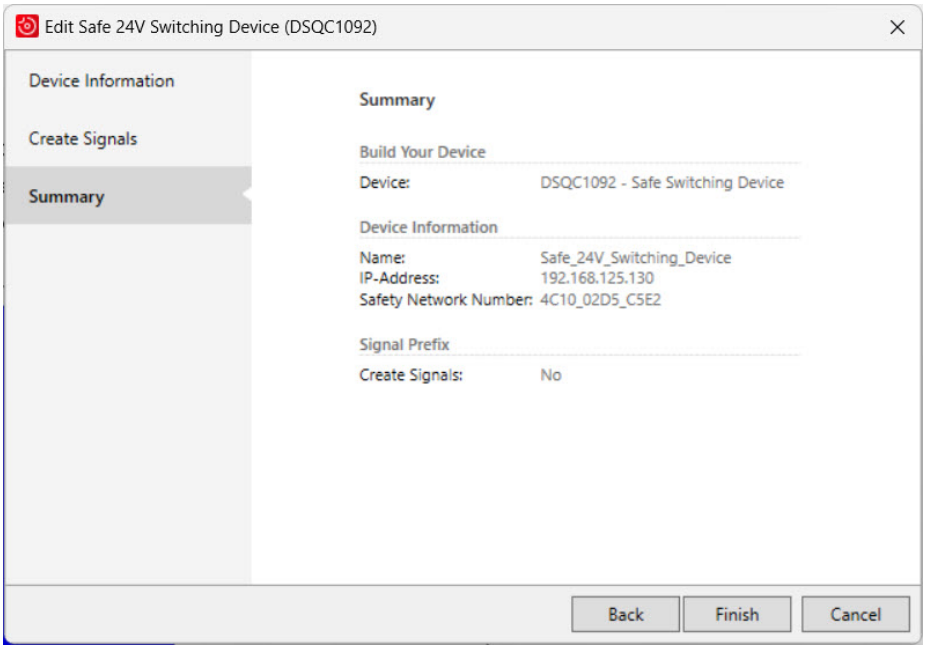
xx2500000748

Note

If no name prefix is defined, no signals will be added to the configuration.

Select **Next**.

5 The **Summary** is displayed:



xx2500000749

Select **Finish**.

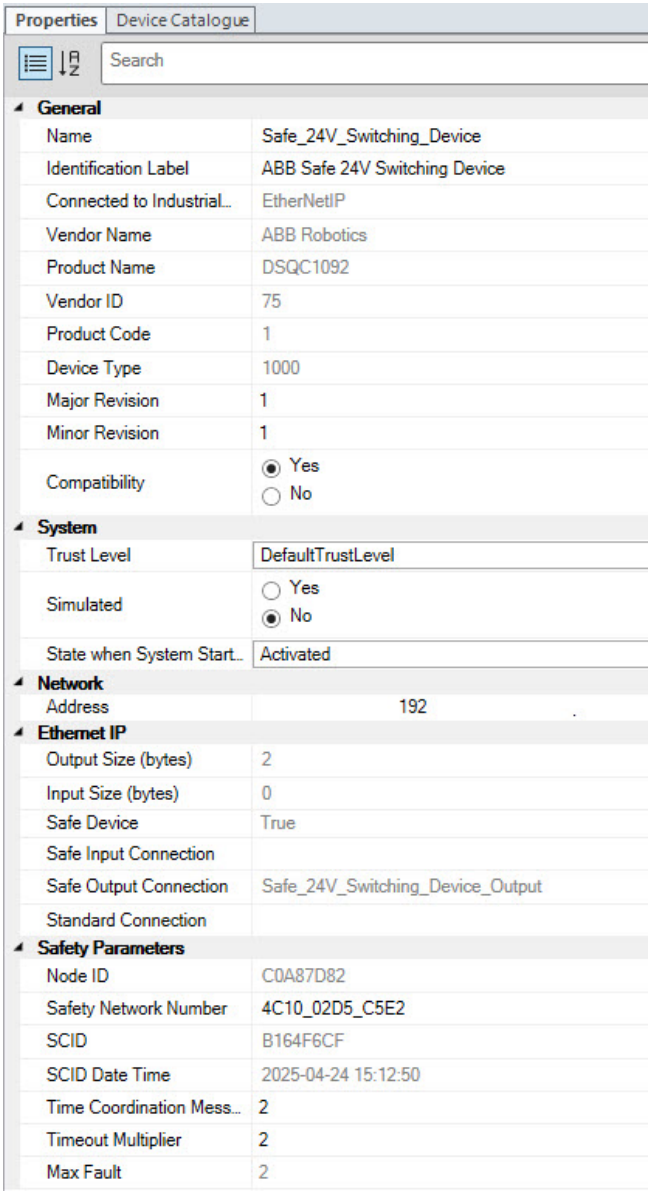
6 When the configuration is finished, save the I/O project.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Configure the Safe 24V Switching Device properties

1. In the **Controller** tab in RobotStudio, select **I/O Engineering**. The **I/O Engineering** tab is displayed.
2. In the **Configuration** browser, select Safe 24V Switching Device.
3. In the **Properties** browser, you can configure the following:



xx2500000752

Parameter	Description	Allowed values
Name	Enter the name to be used for the device.	A string with maximum 32 characters.
Identification Label	This parameter is an optional way to provide a label that will help the operator to identify the device.	A string with maximum 80 characters.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Parameter	Description	Allowed values
Compatibility	Select **Yes** or **No**, indicating if it should be possible to install devices that can emulate the exact device.	
Trust Level	Select an existing trust level that defines the behavior for external devices at different execution situations in the robot controller. See *Application manual - I/O Engineering* for more information about how to create trust levels.	
Simulated	Select **Yes** or **No**, indicating if the industrial network and all its connected I/O devices should be treated as simulated.	The default value is No.
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)	
Address	Enter the IP address for the device.	
Safety Network Number	Enter a unique safety network number for each safety network or safety sub-net.	
Time Coordination Message Multiplier	**Time Coordination Message Multiplier** is the minimum number of 128 uS increments it could take for a time coordination message to traverse from the consumer to the producer.	Default: 2.
Timeout Multiplier	The **Timeout Multiplier** can either be used to: • calculate the Network Time Expectation. • determine the number of ping intervals to wait without Correction before declaring a connection fault.	Default: 2.
Max Fault	Number of erroneous packets within one hour after which a connection is closed. Used by both producers and consumers.	Fixed value 2.

4 Save the configuration. See *Application manual - I/O Engineering* for more information.

Configure the safe output connection properties

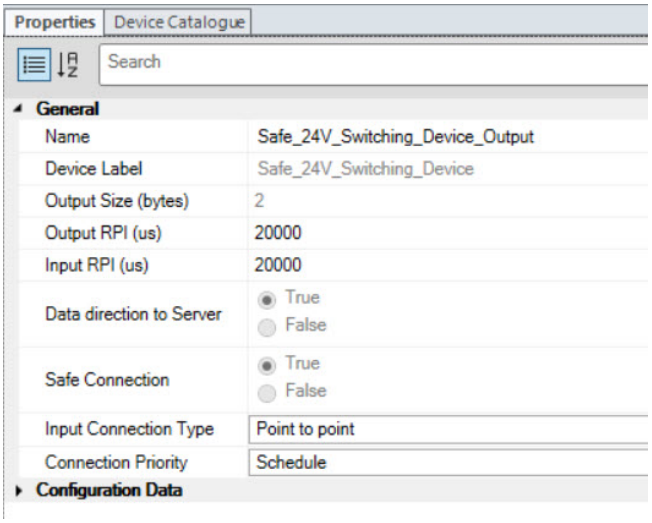
1 In the **Controller** tab in RobotStudio, select **I/O Engineering**. The **I/O Engineering** tab is displayed.

2 In the **Configuration** browser, select **Safe Output Connection**.

3 In the **Properties** browser, you can configure the following:

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.



xx2500000751

Parameter	Description	Allowed values
Name	Enter the name to be used for the device.	A string with maximum 32 characters.
Output RPI	*Output RPI* (Originator to Target Request Packet Interval) is the time between I/O packets from the scanner to the I/O device. Use this parameter to decide at which interval the scanner shall produce output data to the I/O device. The Request Packet Interval is specified in micro seconds. **Note** In case of connection problems, it is recommended to increase the Connection Timeout Multiplier.	Valid range: 10 -100 ms.
Connection Priority	The *Connection Priority* parameter specifies how I/O data is prioritized on the network. Network priority is accomplished by using Quality of Service (QoS) mechanisms in the device.	Allowed values are Low, High, Schedule, Urgent.

4 Save the configuration. See *Application manual - I/O Engineering* for more information.

© Copyright 2024-2025 ABB. All rights reserved.

4.3 Online configuration

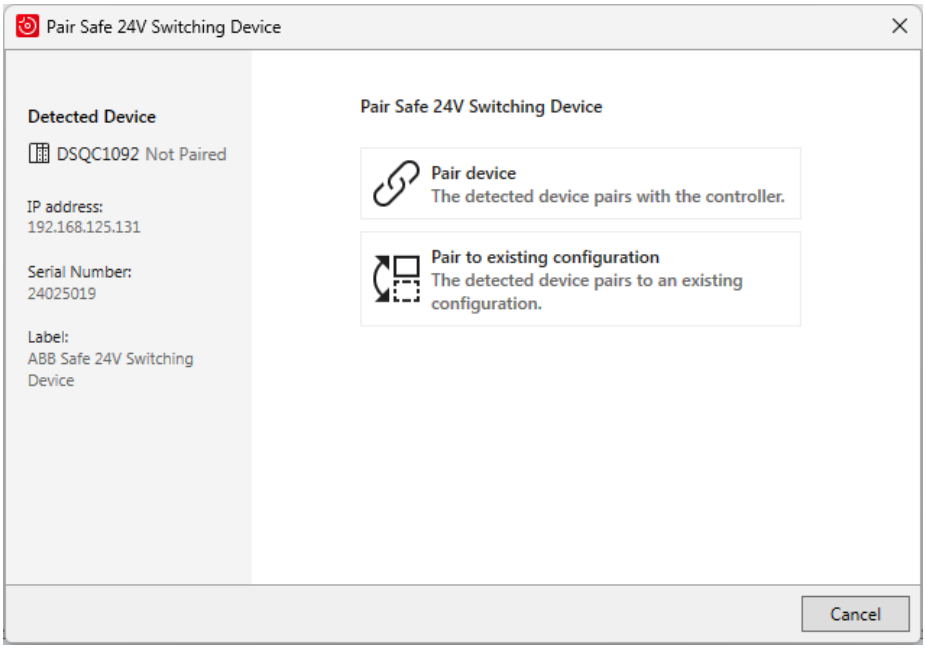
General

This section describes the working procedure when configuring devices online in I/O Engineering.

For general information about I/O Engineering, see *Application manual - I/O Engineering*.

Pairing a device with a controller

1. Start RobotStudio and connect to the OmniCore controller.
2. In **I/O Engineering**, select **Live** to access the **Live configuration**.
3. Request write access.
4. A new device is connected to the private network. The detected device appears in the **I/O System** tree.
5. Right-click the new device and select **Pair**.
6. The **Pair Safe 24V Switching Device** dialog is displayed. Select **Pair device**.

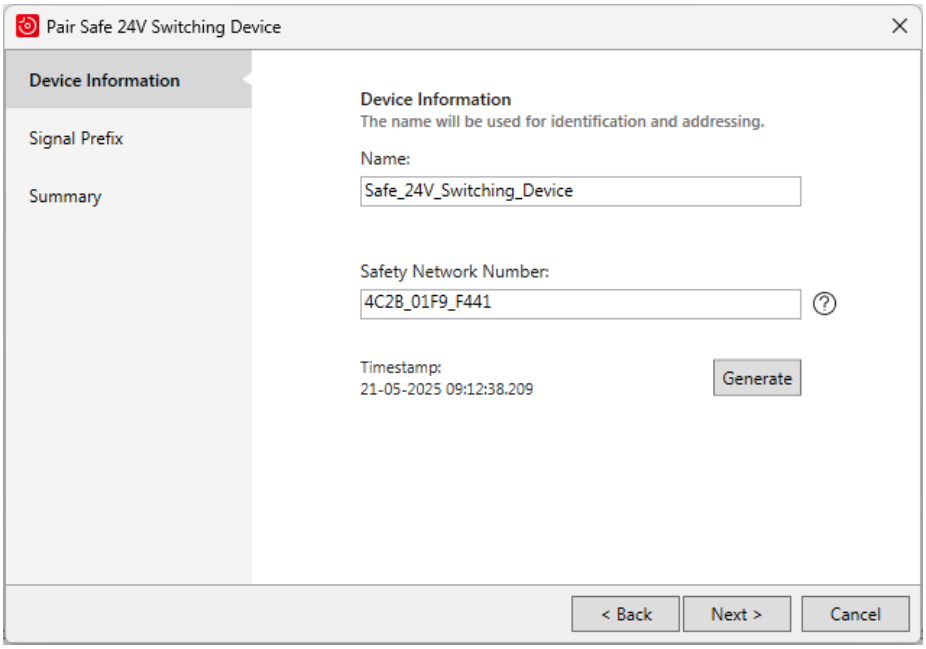


xx2400001538

7. In the **Device Information** view, complete the following fields:

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.



xx2400001539

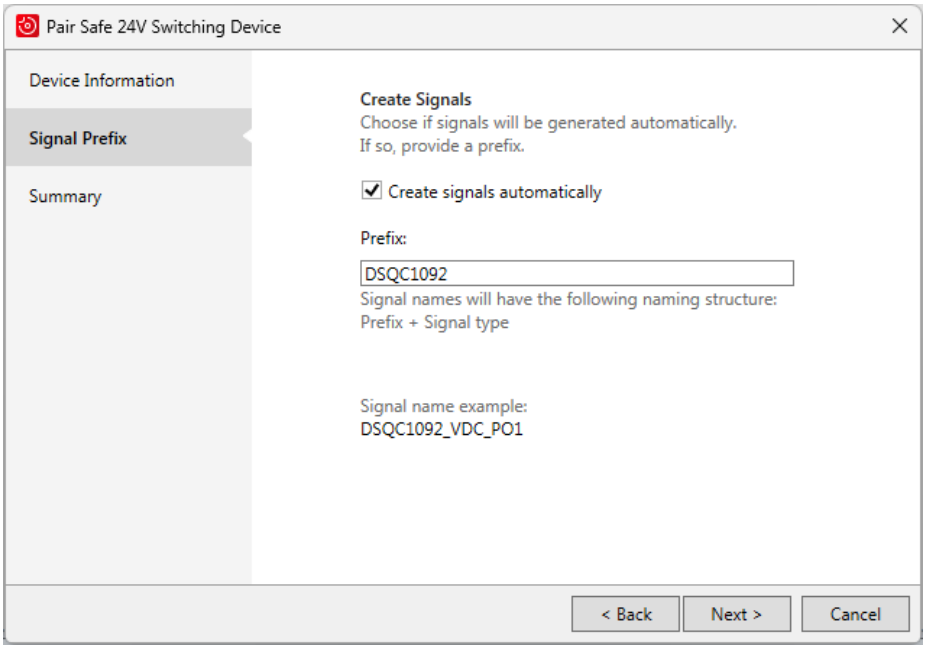
- **Name**: Select a name for the new device.
- **Safety Network Number**: Enter a unique safety network number.

> **Tip**
>
> Select **Generate** to automatically retrieve a safety network number that is based on the current time stamp (displayed below).

8 In the **Signal Prefix** view, complete the following fields:

Continues on next page

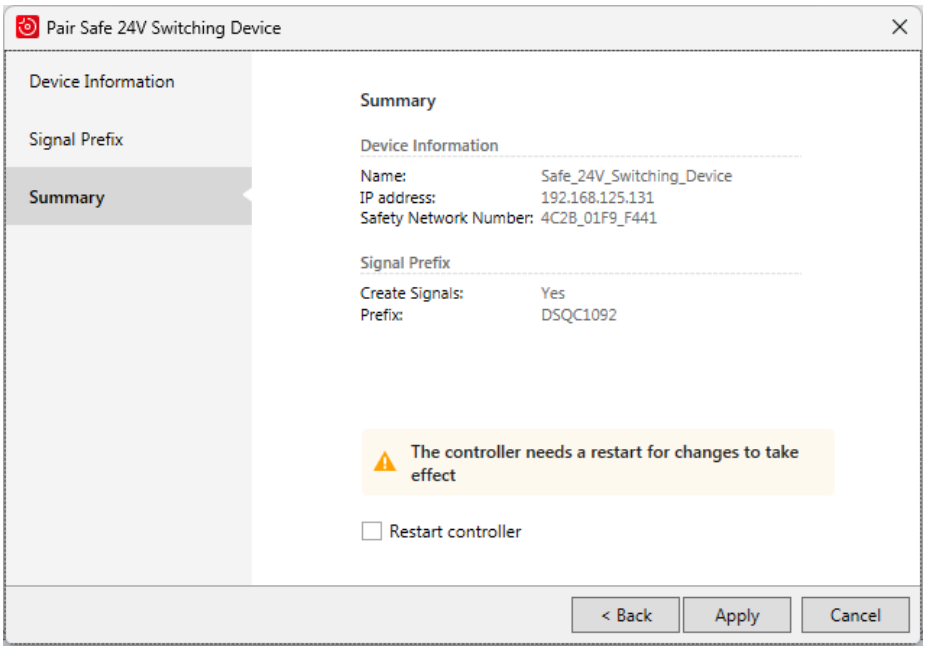
© Copyright 2024-2025 ABB. All rights reserved.



xx2400001540

- **Create Signals**: Select if signals should be generated automatically. If yes, also complete **Prefix**.
- **Prefix**: Enter the signal prefix to be used in signal names. Not mandatory.

9 The **Summary** view is displayed. Select **Restart controller** and then **Apply**.



xx2400001541

10 The device is now paired, and the configuration is written to the controller.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Pairing a device with an existing configuration

Existing device configurations found on the controller can be inherited by a new device. This means that devices can be created in the controller ahead of time without access to the physical device. See *Offline configuration*. This also extends to simulated devices that also can be turned into physical devices by configuring a new Safe 24V Switching Device using the simulated device configuration.

CAUTION

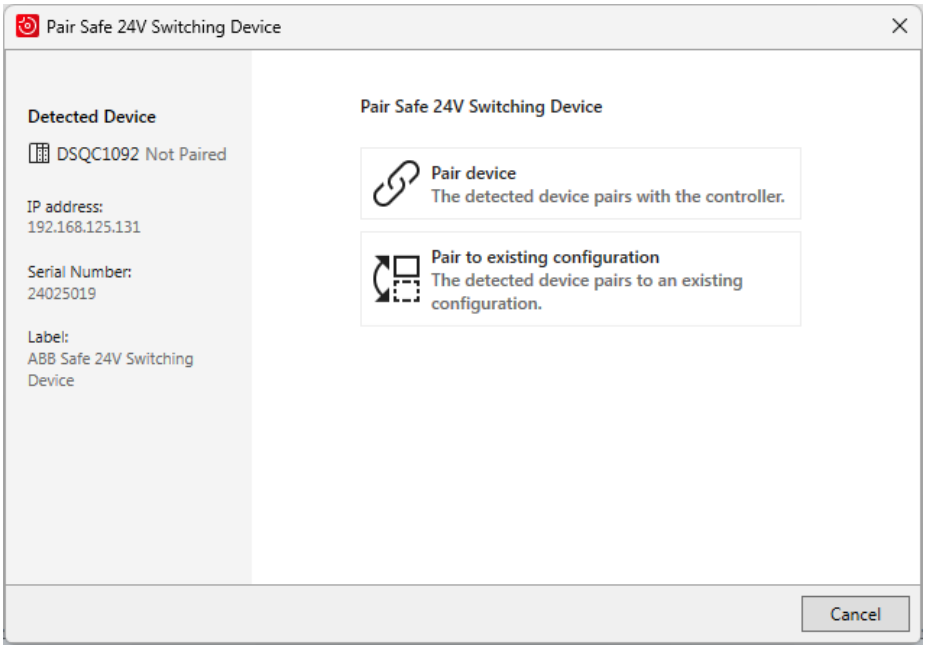
Before installing a new device into the safety network, the user must ensure that any pre-existing configuration is cleared from the new device.

CAUTION

The replacement device must be configured properly and operation of the replacement device shall be user verified.

1. Start RobotStudio and connect to the OmniCore controller.
2. In **I/O Engineering**, select **Live** to access the **Live configuration**.
3. Request write access.
4. A new device is connected to the private network. The detected device appears in the **I/O System** tree.
5. Right-click the new I/O device and select **Pair**.
6. The **Pair Safe 24V Switching Device** dialog is displayed. Select **Pair to existing configuration**.

   The **Pair Safe 24V Switching Device** dialog is displayed. Select **Pair to existing configuration**.

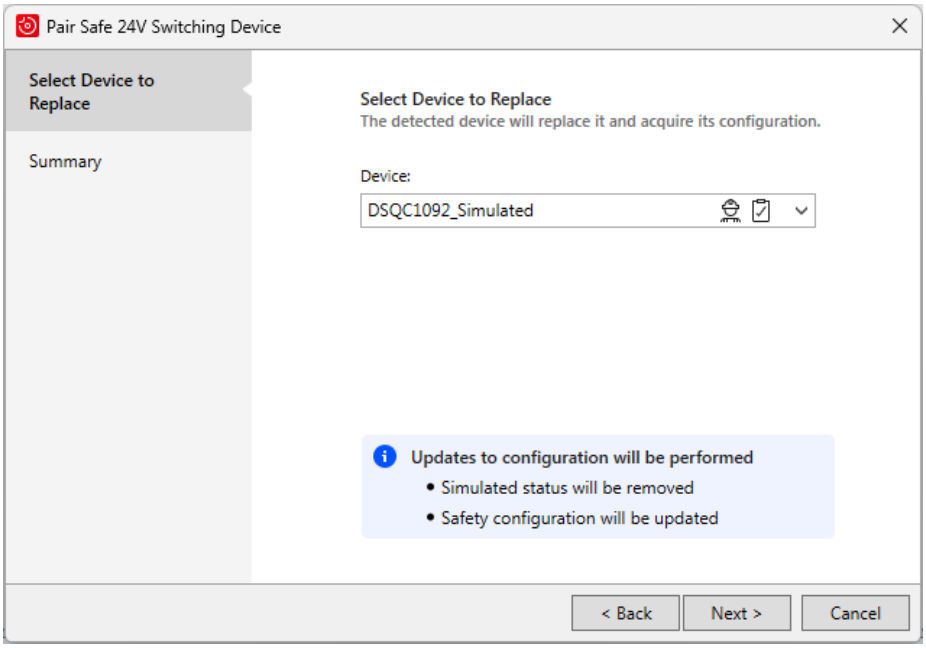


xx2400001538

Continues on next page

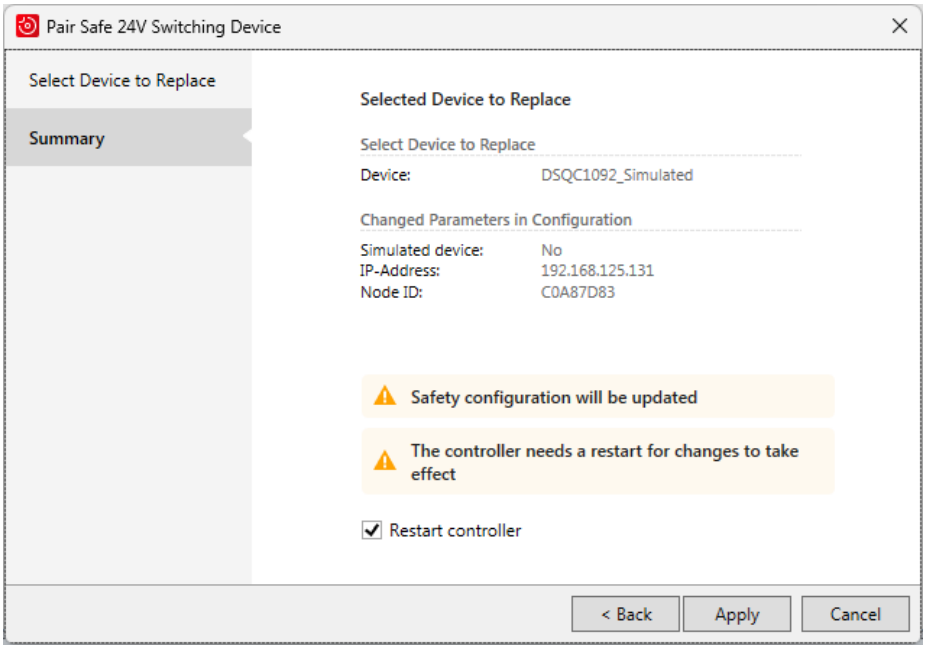
© Copyright 2024-2025 ABB. All rights reserved.

7 In the **Select Device to Replace** view, select the **Device** that should be replaced and then **Next**.



xx2400001542

8 The **Summary** view is displayed. Select **Restart controller** and then **Apply**.



xx2400001543

9 The device is now paired, and the configuration is written to the controller.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

Updating a device

Overview

Devices that need to be updated are highlighted with a red symbol. Updates are needed in the following cases:

- Device has a faulty configuration
- New device with identical name added to configuration
- Pairing is not correct

Limitations

- **Safety Network Number** cannot be updated if the device configuration is protected. In this state, it is still possible to create standard signals. However, if the Safety Configuration is locked, neither the **Safety Network Number** can be changed nor can new safe signals be created.
- Safety device cannot be updated if the safety configuration is locked.

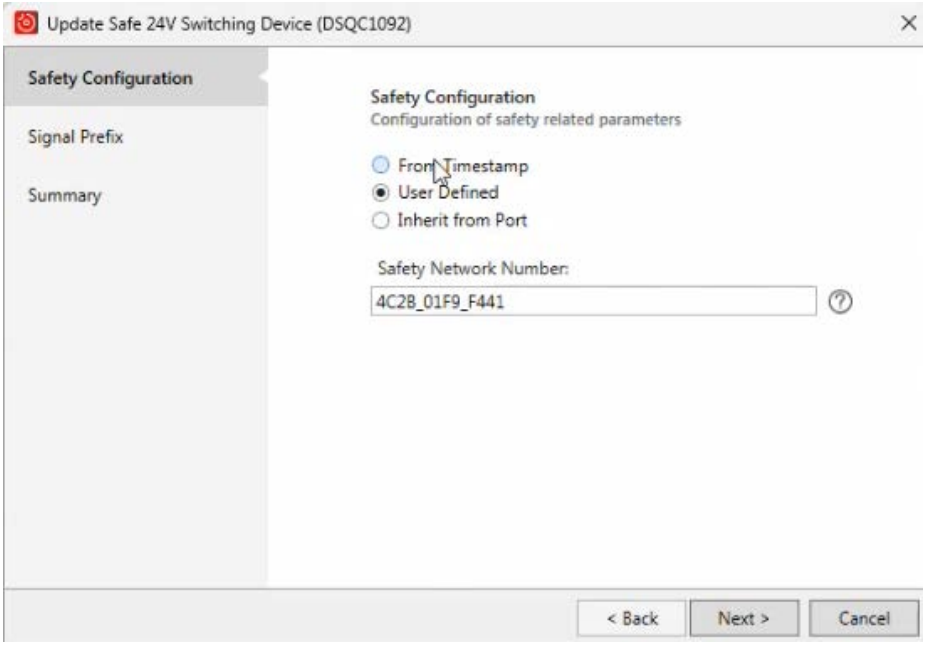
Procedure

1. Start RobotStudio and connect to the OmniCore controller.
2. In **I/O Engineering**, select **Live** to access the **Live configuration**.
3. Request write access.
4. Right-click the device in the **I/O System** tree and select **Update**.
5. In the **Safety Configuration** view, define how the **Safety Network Number** should be created and then select **Next**:

> **Note**
>
> The **Safety Network Number (SNN)** is applied to the device only if the port does not already have a predefined **SNN**. In such cases, the device inherits the **SNN** selected by the user.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.



- **From Timestamp**: Select if **Safety Network Number** should be created from timestamp, and then select **Generate**.
- **User Defined**: Select to add a **Safety Network Number** that is user defined.
- **Inherit from Port**: Select if **Safety Network Number** should be inherited from the port.

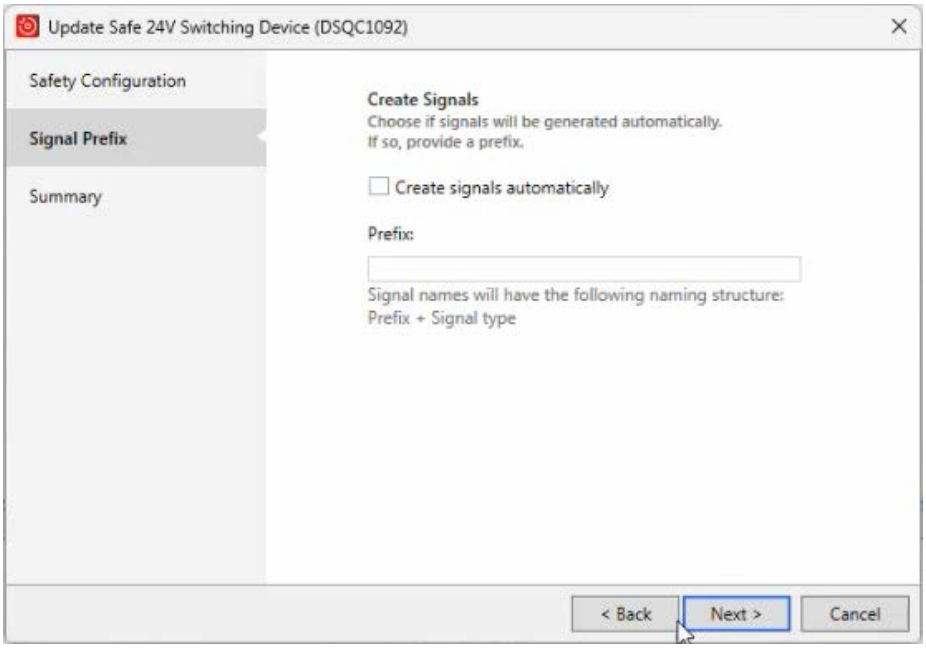
Note

These selections are not possible if the safety configuration is protected.

6 In the **Signal Prefix** view, complete the following fields and then select **Next**:

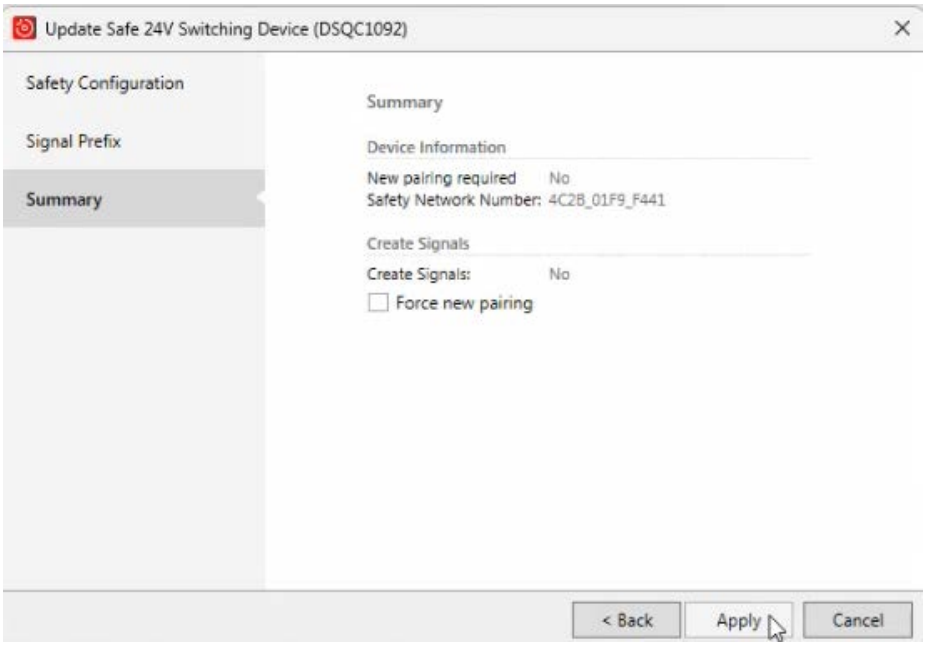
Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.



- **Create signals automatically**: Select if signals should be generated automatically. If yes, also complete **Prefix**.
- **Prefix**: Enter the signal prefix to be used in signal names.

7 In the **Summary** view, complete the following fields and then select **Apply**:



- **Force new pairing**: Select if a new pairing should be forced.

> **Note**
>
> This is helpful if the underlying reason for the incorrect configuration is unknown.

- **Restart the controller**: Select if the controller should be restarted.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

> **Note**
>
> The controller needs a restart for the changes to take effect.

8 The device is now updated.

Deactivating a device

Follow this procedure to deactivate a device.

> **Note**
>
> Devices can also be deactivated from the FlexPendant.

> **Note**
>
> Prerequisites for deactivating a device:
> - Connect as Local Client
> - Manual mode

1 Start RobotStudio and connect to the OmniCore controller. Request write access.
2 In **I/O Engineering**, select **Live** to access the **Live configuration**.
3 In the **I/O System** tree, right-click the device to be deactivated and select **Deactivate**.
4 The device is now deactivated.

Renaming a device

> **Note**
>
> Prerequisites for renaming a device:
> - Only applicable for EtherNet/IP devices
> - If running, the unit must first be deactivated
> - Write access

1 Start RobotStudio and connect to the OmniCore controller. Request write access.
2 In **I/O Engineering**, select **Live** to access the **Live configuration**.
3 In the **I/O System** tree, right-click the device to be renamed and select **Rename**.
4 The **Rename** dialog is displayed. Enter a new name for the device and select **Rename**.
5 The **Confirm deployment of configuration** dialog is displayed. Select **Yes** to confirm the name change.

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

> **Note**
>
> The current configuration of the controller will be overwritten.

6 The device name is changed and the controller restarts.

Resetting a device configuration

Use this function to reset the device to factory default. All active configurations including safety will be removed from the device. The controller configuration will, however, not be affected.

> **Note**
>
> Prerequisites for resetting a device configuration:
> - Manual mode
> - If running, the unit must first be deactivated
> - Write access

1 Start RobotStudio and connect to the OmniCore controller. Request write access.
2 In **I/O Engineering**, select **Live** to access the **Live configuration**.
3 In the **I/O System** tree, right-click the device to be reset to factory default and select **Reset**.
4 The **Reset device** dialog is displayed. Select **Reset**.

   The device and its settings will be reset, but the controller configuration will not be affected.

Copying a device to an offline project

Paired devices can be copied to an existing offline project. See *Application manual - I/O Engineering* for information about offline projects.

1 Start RobotStudio and connect to the OmniCore controller.
2 In **I/O Engineering**, select **Live** to access the **Live configuration**.
3 Request write access.
4 Right-click the paired device in the **I/O System** tree and select **Add to Project**. All available offline projects are displayed. Select the project to which the device should be copied.
5 The device configuration, including signals, is now copied to the offline project.

© Copyright 2024-2025 ABB. All rights reserved.

4.4 Verifying parameters in the ABB Safety Configuration Report

Verifying safety parameters

When configuring the Safe 24V Switching Device, a set of parameters are written to the safety controller configuration and can be viewed in the ABB Safety Configuration Report.

1. In the **Controller** tab in RobotStudio, select **Safety** > **Visual SafeMove**.
2. In the **Visual SafeMove** tab, select **Show Report** > **Controller configuration** to open the **ABB Safety Configuration Report**.
3. Verify the **Port** parameters:

Parameter	Description	Values/Examples
Id	The port id.	0
Node Id	The IP address of the port, defined in hexdecimal form.	192.168.125.1
Safety Network Number	A unique Safety Network Number is set during device configuration for each safety network or safety sub-net. The safety network number can either be defined manually, or be retrieved automatically based on the current time stamp.	4B12_02CD_273F

4. Verify the **Device** parameters:

Parameter	Description	Values/Examples
Device name	The name that is defined during the device configuration.	ABBIO
Node Id	The IP address of the device, defined in hexdecimal form. This is the IP address that is visible in the configuration.	192.168.125.89
Safety Network Number	A unique Safety Network Number is set during device configuration for each safety network or safety sub-net. The safety network number can either be defined manually, or be retrieved automatically based on the current time stamp.	4B12_02CD_273F
In Size Bits		0
Out Size Bits		16
scid	The Safety Configuration identifier/Checksum is a constant that is written in the safety configuration when the button **Apply** is pressed.	2F7C2FF1
scid Date Time	A time stamp for the configuration which in combination with **scid** forms the signature. Is set when the button **Apply** is pressed.	2021-08-12T17:02:59.359+02:00
Time Coordination Message Multiplier		5
Timeout Multiplier		2

Continues on next page

© Copyright 2024-2025 ABB. All rights reserved.

CAUTION

The user should assign **SNN** numbers for each safety network or safety subnet that are unique system-wide.

CAUTION

The configuration signature should only be considered verified after user testing. User testing is the means by which all downloads are validated.

CAUTION

When configuring an originator with connection data and/or target configuration data, the data must be downloaded to the target so it can be tested and verified. Only then can SCIDs from the target be confirmed.

5 Verify that the **Signals** work as expected:

Parameter	Description	Values/Examples
Name	Generated name: DeviceName_slotNo_Type+ix	ABBIO_0_DO1

© Copyright 2024-2025 ABB. All rights reserved.

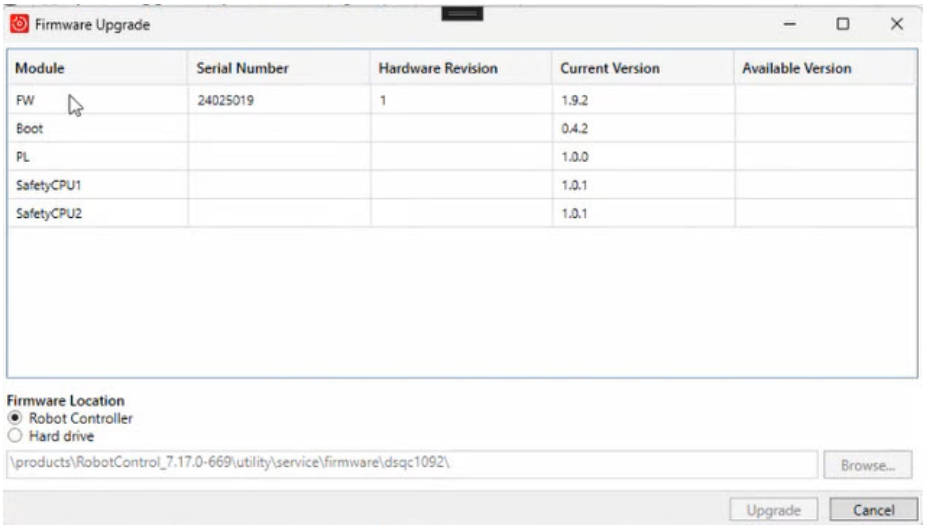
4.5 Upgrading firmware

Prerequisites

If the device is paired, it must be deactivated.

Upgrade firmware from I/O Engineering

1. Start RobotStudio and connect to the OmniCore controller.
2. In **I/O Engineering**, select **Live** to access the **Live configuration**.
3. Request write access.
4. In **I/O Engineering**, right-click the Safe 24V Switching Device and select **Upgrade**.
5. The **Firmware Upgrade** dialog is displayed:



xx2400002167

Select the location from which the firmware should be retrieved:

- Select **Robot Controller** if the firmware should be retrieved from the controller.
- Select **Hard drive** and browse to the location where the firmware is stored.

6. When an available new version of the firmware is detected, select **Upgrade**.

> **Note**
>
> The **Upgrade** button is enabled only if a new version is detected either in the default firmware path or in a browsed path.

7. The firmware is upgraded, and a message is displayed.

© Copyright 2024-2025 ABB. All rights reserved.

Index

A
adding device, 37
add to project, 53

C
connecting EtherNet/IP, 35

D
deactivating device, 52

E
EtherNet/IP
  connecting, 35

I
I/O device
  copy, 53
installing Safe 24V Switching Device, 33

N
network security, 9

O
offline project, 53

P
pair device, 44
pair safe power distribution device, 47

R
resetting device, 53

S
state when system startup, 42

T
trust level, 42

U
update device, 49

© Copyright 2024-2025 ABB. All rights reserved.

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

3HAC093252-001, Rev A, en

© Copyright 2024-2025 ABB. All rights reserved.
Specifications subject to change without notice.