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I/O mapping

Simple I/O communication via 2-wire cables

Application note
107967_en_01

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1 Description

This application note describes an I/O communication solution for company-internal 2-wire cables, e.g., telephone cable or master cable. The range covered is up to 20 kilometers.

Extension modules receive the I/O signals. The signals are then transmitted to the SHDSL extender via an RS-485 front module.

The white thumbwheel on the extension modules is used to set the I/O MAP address. Programming knowledge is not required.

You need the following:

Description	Order No.	Designation	Link to product
RS-485 front module	2702184	RAD-RS485-IFS	phoenixcontact.net/product/2702184
I/O extension module	2901535	RAD-DI4-IFS	phoenixcontact.net/product/2901535
	2901536	RAD-DOR4-IFS	phoenixcontact.net/product/2901536
SHDSL extender	2313669	PSI-MODEM-SHDSL/SERIAL	phoenixcontact.net/product/2313669
Programming cable	2903447	RAD-CABLE-USB	phoenixcontact.net/product/2903447
Latest PSI-CONF software as of V2.50			

Make sure you always use the latest documentation.
It can be downloaded using the links provided above.

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Table of contents

1 Description 1
2 Safety notes 2
3 Installation 2
4 Schematic view 3
5 Setting the thumbwheel 3
6 Configuring the SHDSL extender 4
7 Increasing timeout for the front modules 10

2 Safety notes

This application note does **not** replace the device-specific documents. Please follow the safety notes in the associated packing slips for the devices.

WARNING: Explosion hazard when used in potentially explosive areas

Please follow the safety notes in the associated packing slips for installation in Zone 2.

In potentially explosive areas, only snap the device on or off the DIN rail connector and connect or disconnect cables when power is disconnected.

The switches of the device that can be accessed may only be actuated when the power supply to the device is disconnected.

3 Installation

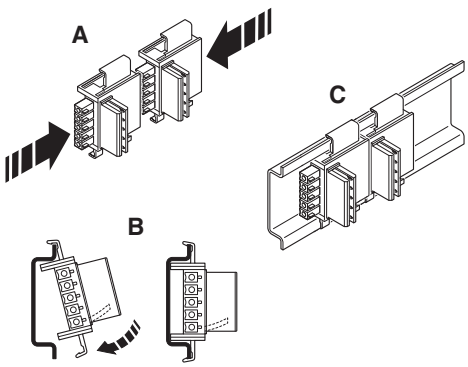

Figure 1 Installing the DIN rail connector

For the schematic view, please refer to the next page.

- Mount the RS-485 front module and the I/O extension module onto the DIN rail connector as described in the packing slip.

The DIN rail connector is used to bridge the power supply and communication. A separate power supply or data cable is therefore not required for the I/O extension module.

- Install the SHDSL extender as described in the packing slip.

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4 Schematic view

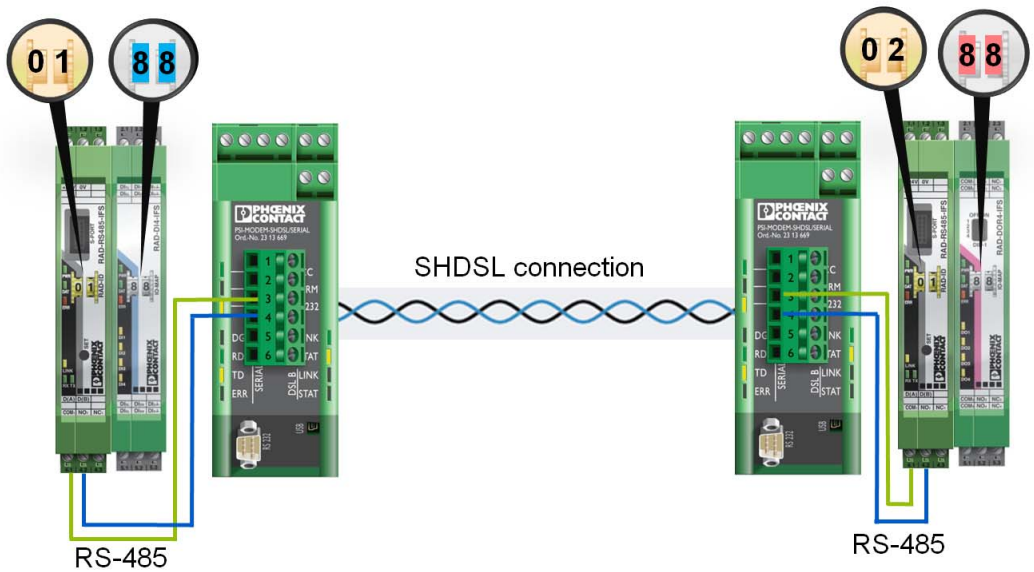

Figure 2 Schematic view

Table 1 RS-485 interface

RAD-RS485-IFS front module	PSI-MODEM-SHDSL/SERIAL SHDSL extender
Port 4.1	Port 3
Port 4.2	Port 4

Table 2 SHDSL interface

SHDSL extender 1	SHDSL extender 2
Port A (a and b[1])	Port B (a and b[1])

[1] Connect a and b as desired.

5 Setting the thumbwheel

Use the thumbwheel on the front to address the wireless modules and the extension modules.

Front module

- The role of the master and slave must be assigned in order for the front modules to communicate.
  - The master address is 01.
  - The slave address is between 02 ... 99 (02 in our example).

I/O extension modules

- Set the same address (e.g., 88) on both extension modules. In this way, the inputs are assigned the corresponding outputs.

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6 Configuring the SHDSL extender

Use the latest version of the PSI-CONF software. Download the latest software at phoenixcontact.net/product/2313669.

- Connect the SHDSL extender to the PC using a USB cable.
- Start the PSI-CONF software.
- Select the SHDSL extender.

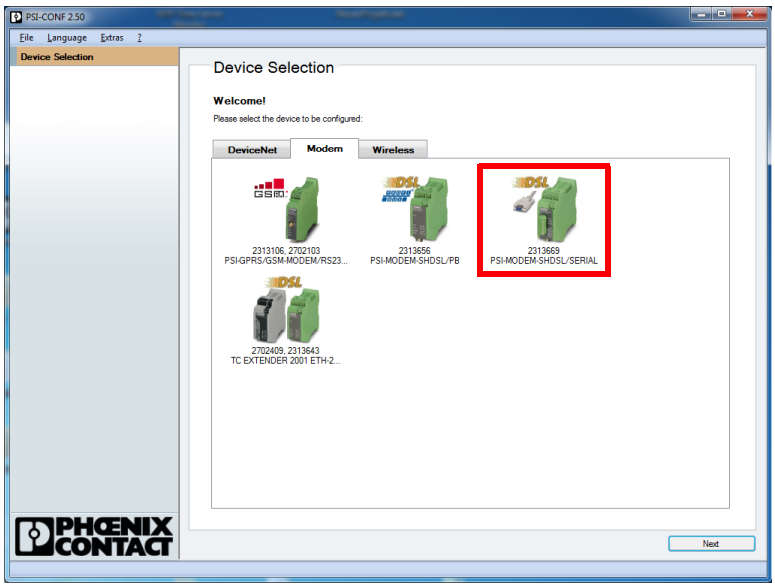

Figure 3 Selecting the device

- Click “Online Configuration” for device configuration.

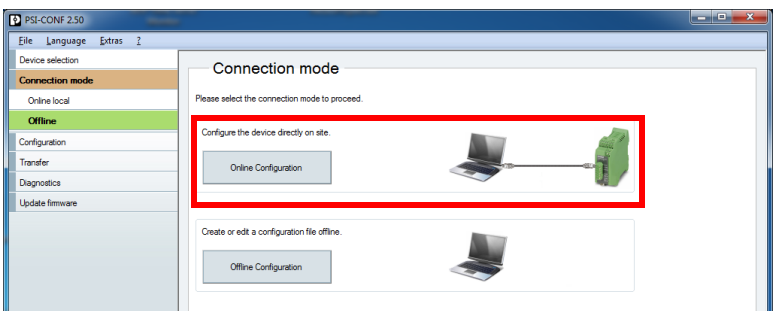

Figure 4 Online configuration

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- Create a new project file. This file can be used as a backup file in case you need to replace an SHDSL extender.
- Select “Point-to-point wizard” to set up a point-to-point connection.

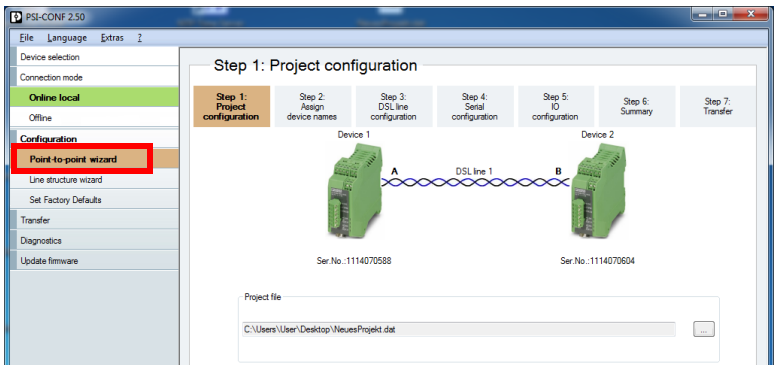

Figure 5 Point-to-point wizard

- In step 2, enter a name for the SHDSL extender.

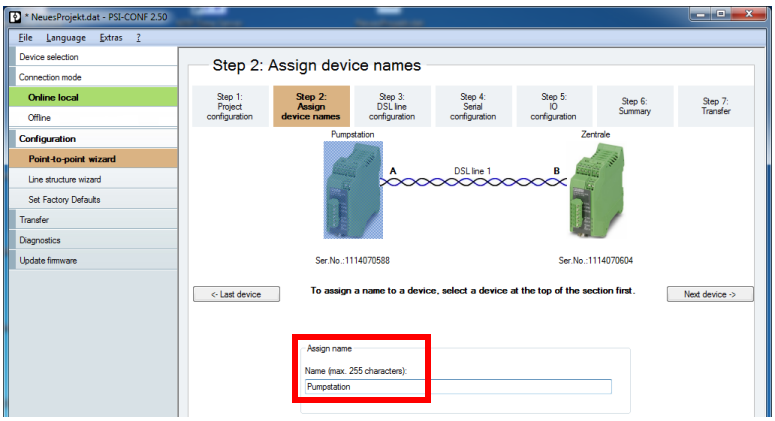

Figure 6 Assigning the device name

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- In step 3, set the parameters for the SHDSL line. Enter the following values for the example on Page 2.
  - Length of the 2-wire cable: 5000 meters
  - Diameter: 0.5 mm

The software calculates an expected data rate of 534 kbps. This value is high enough for I/O mapping. Usually, much lower data rates are required.

The calculated data rate only is a guide value. It may differ considerably in practice. The following factors may influence the data rate:

- Twisting of the cables
- State of the cables
- Insulation
- Contact resistance
- External errors

There are two different modes to set the SHDSL rate:

- Automatic
- Manual

- Select automatic mode.

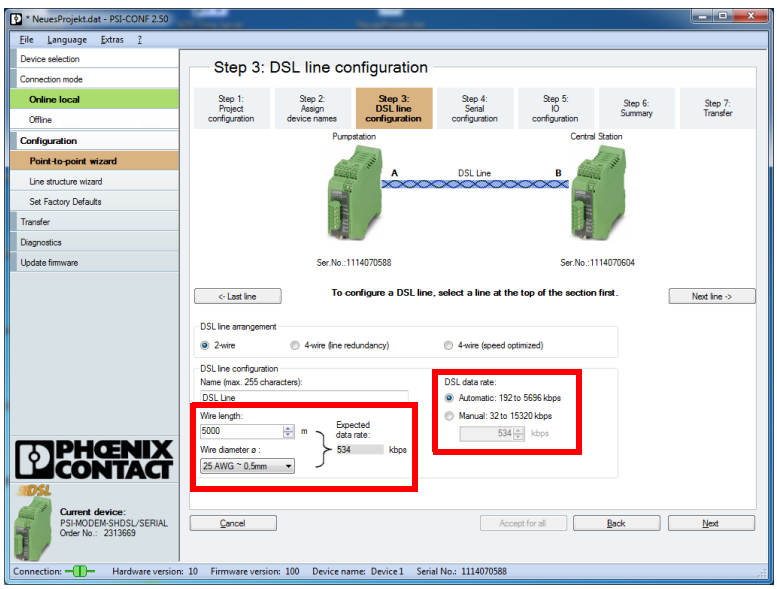

Figure 7 Configuring the SHDSL line

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- In step 4, the serial interface can be configured. Select the following values for the two SHDSL extenders:
  - Interface type: RS-485
  - Parity: Even
  - Baud rate (bps): 19200
  - Stop bits: 1
  - Data bits: 8
- Click “Accept settings for all devices”.

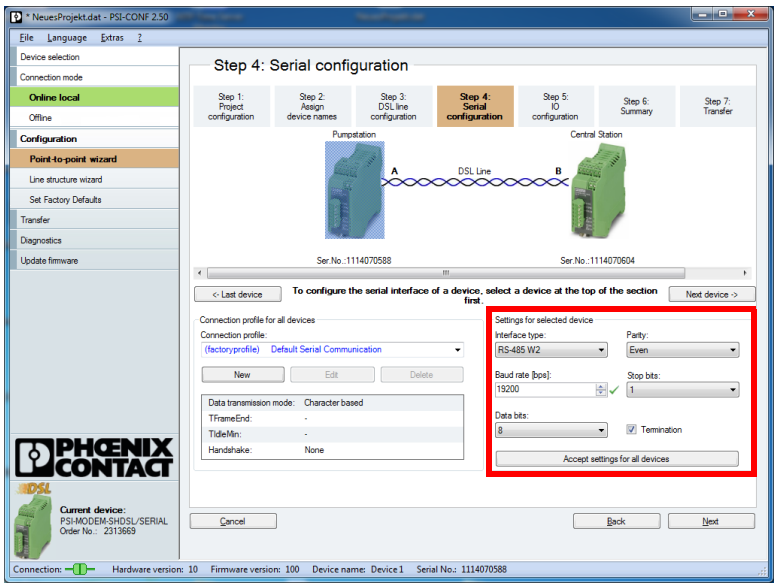

Figure 8 Configuring the serial interface

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- In step 5, the switching outputs can be configured. If external errors, for example, influence the transmission negatively, the switching output may trigger a warning.

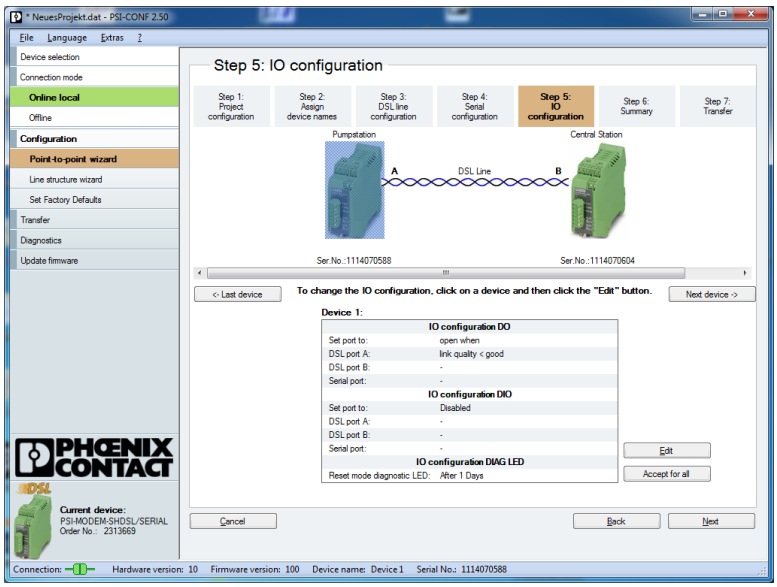

Figure 9 Configuring the switching outputs

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Step 6 provides an overview of all the settings.

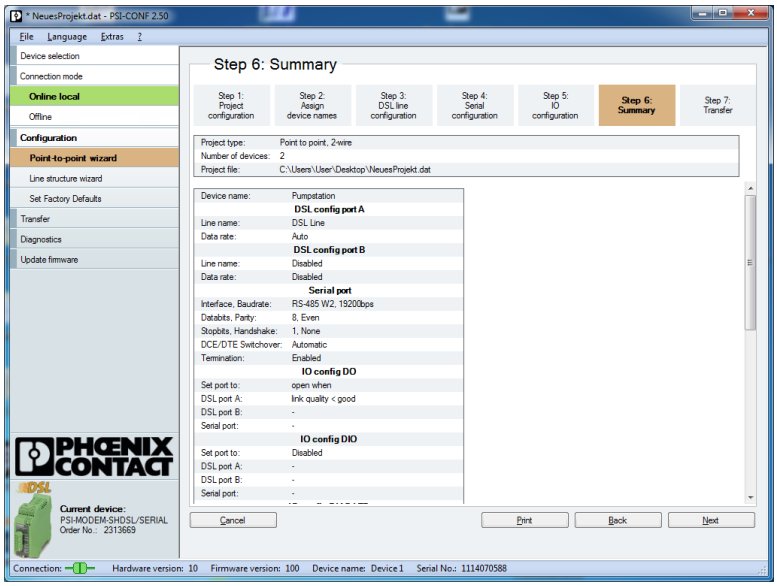

Figure 10 Checking the settings

The last step is used to transfer the settings to the devices.

- Click “Transfer”. Wait until the transfer is complete.
- Connect the USB cable to the second SHDSL extender.
- Click “Transfer”.

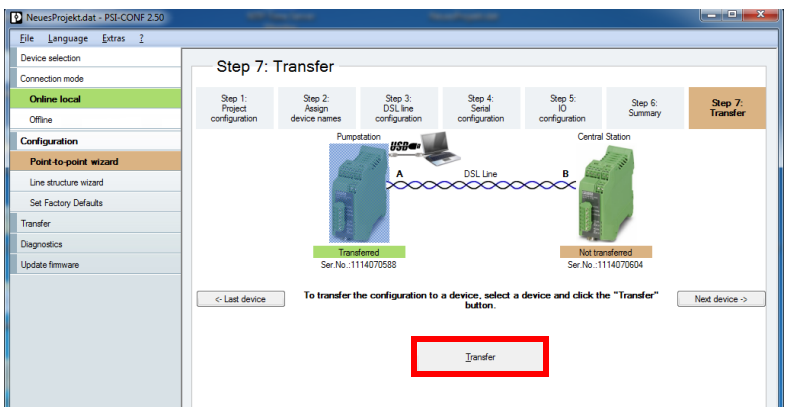

Figure 11 Transferring the settings to the SHDSL extender

Configuration of the two SHDSL extenders is now complete.

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7 Increasing timeout for the front modules

The transmission rate for the data packets is slower via the SHDSL connection than via a direct connection between the two RS-485 front modules.

To avoid timeout error messages, the timeout period must be increased for both front modules.

- Use the RAD-CABLE-USB USB cable (Order No. 2903447) for that purpose.

WARNING: Explosion hazard when used in potentially explosive areas

The USB cable is **not** suitable for use in potentially explosive areas.

– Use the USB cable in safe areas only.

- Connect the front module to the PC using the USB cable.
- Start the PSI-CONF software.
- Select the front module.

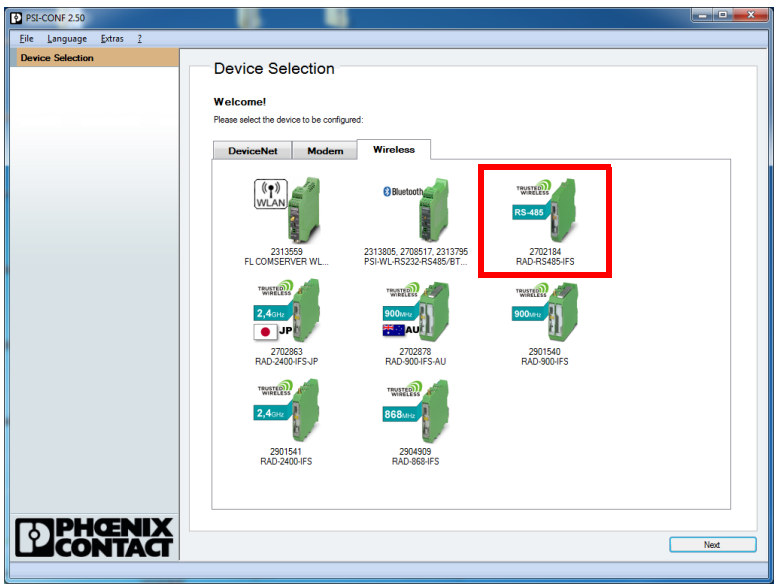

Figure 12 Selecting the device

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- Click “Local Device (Modbus mode)”.
- Click “Read”.
- An online mode message appears. Click “OK”.
- Save the project to the PC.

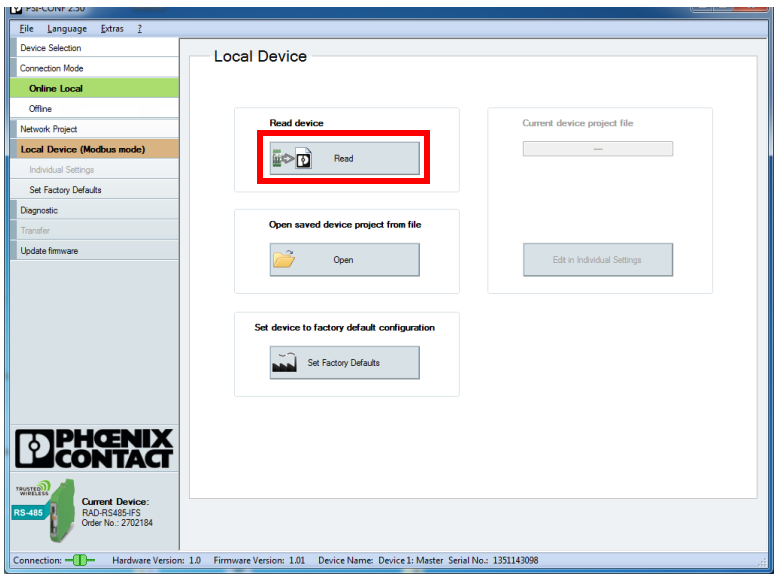

Figure 13 Creating a project

- Click “Edit in Individual Settings”.

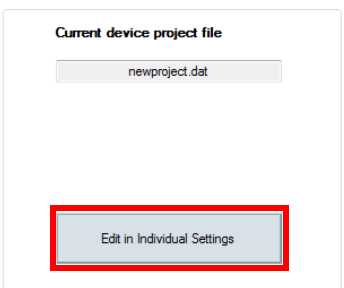

Figure 14 Editing the individual settings

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- Switch to the “Serial Port” tab.
- Set the following:
  - Master Timeout Offset: 300 ms
  - Time Between Polls: 200 ms
- Click “Transfer”.

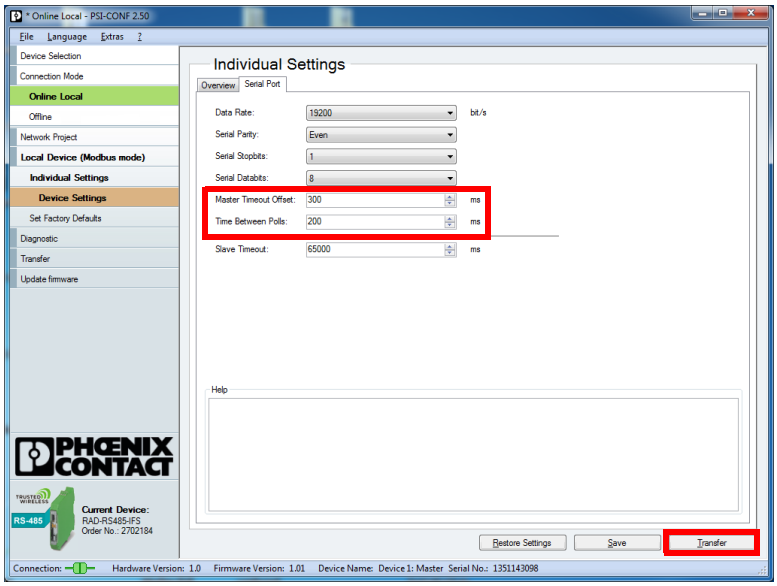

Figure 15 Entering the timeout

- Transfer the values to the front module.

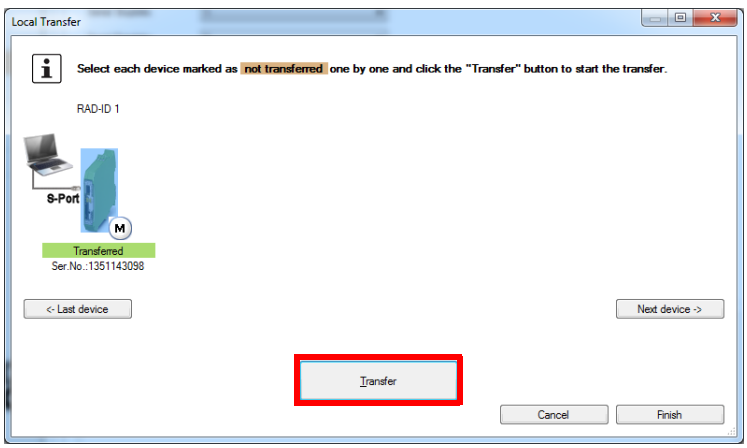

Figure 16 Transferring the settings to the front module

- Wait until the transfer is complete.
- Connect the USB cable to the second front module.
- Repeat all the steps to increase the timeout for the second front module (from Page 10).

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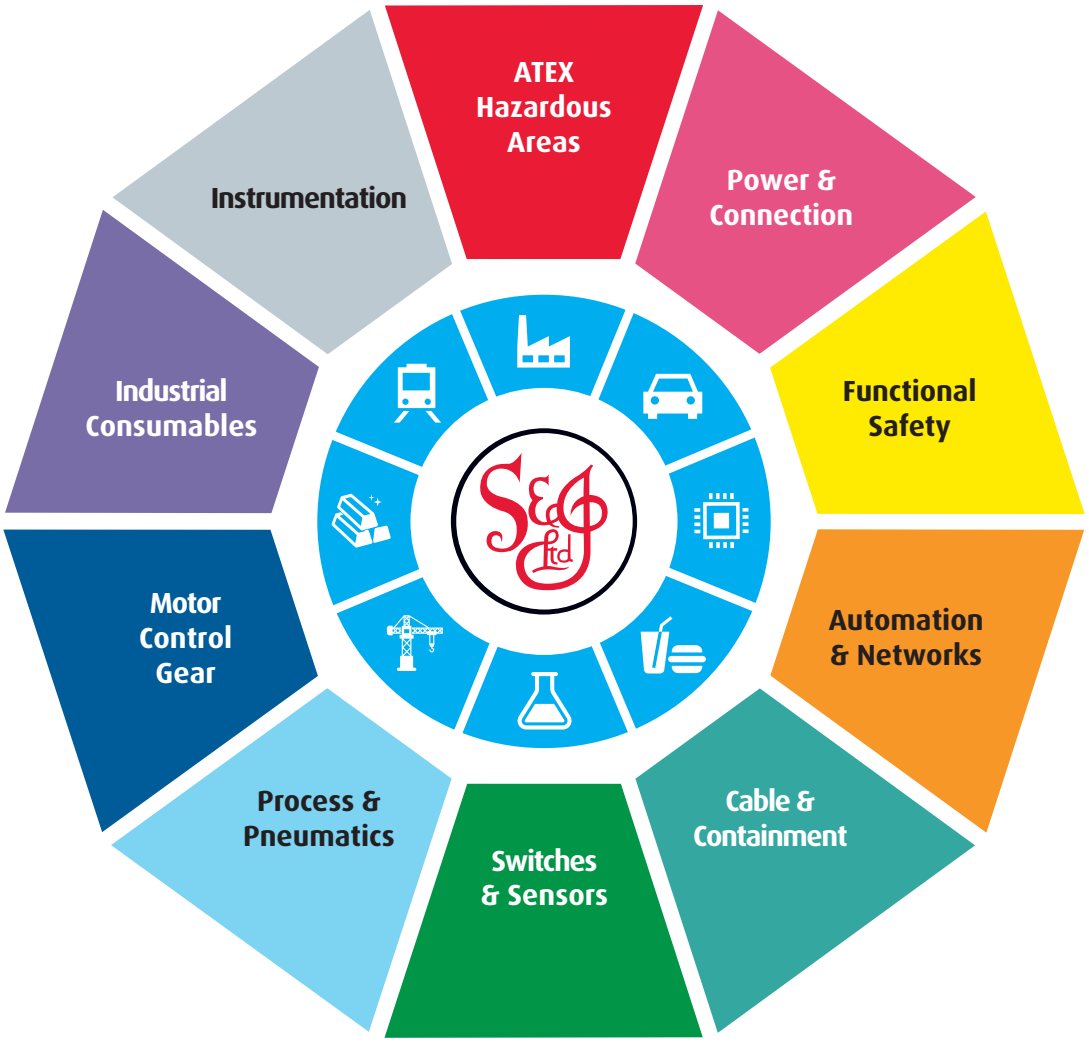

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