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Installing and starting up the SD FLASH 512MB MODULAR MUX multiplexer system

User manual

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User manual

Installing and starting up the SD FLASH 512MB MODULAR MUX multiplexer system

UM EN SD FLASH 512MB MODULAR MUX, Revision 02 2019-03-11

This user manual is valid for:

Designation	Revision	Order No.
SD FLASH 512MB MODULAR MUX	03	2701872

105752_en_02

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1 For your safety

Read this user manual carefully and keep it for future reference.

1.1 Identification of warning notes

This symbol indicates hazards that could lead to personal injury.

There are three signal words indicating the severity of a potential injury.

DANGER
Indicates a hazard with a high risk level. If this hazardous situation is not avoided, it will result in death or serious injury.

WARNING
Indicates a hazard with a medium risk level. If this hazardous situation is not avoided, it could result in death or serious injury.

CAUTION
Indicates a hazard with a low risk level. If this hazardous situation is not avoided, it could result in minor or moderate injury.

This symbol together with the **NOTE** signal word warns the reader of actions that might cause property damage or a malfunction.

Here you will find additional information or detailed sources of information.

1.2 Qualification of users

The use of products described in this user manual is oriented exclusively to electrically skilled persons or persons instructed by them. The users must be familiar with the relevant safety concepts of automation technology as well as applicable standards and other regulations.

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1.3 Field of application of the product

1.3.1 Intended use

The SD FLASH 512MB MODULAR MUX SD card is intended for creation of a multiplexer system in combination with the ILC 131 ETH controller.

Two of these SD cards, with two ILC 131 ETHs and the individually required input and output terminals, form a multiplexer system that requires no programming.

1.3.2 Foreseeable misuse

The SD FLASH 512MB MODULAR MUX multiplexer system is not intended for implementation of safety-related startup inhibits.

- Always implement the safety-related startup inhibits outside of the multiplexer system using safety-related parts of the controller.
- When doing so, observe the relevant basic and proven safety principles.

1.3.3 Modifications to the products

Modifications to the hardware and firmware of the ILC 131 ETH Inline controller are not permitted.

Modifications to the SD FLASH 512MB MODULAR MUX SD card are not permitted.

Incorrect operation or modifications to the products can endanger your safety or damage the products. Do not repair the products yourself. If the products are defective, please contact Phoenix Contact.

1.4 Safety notes

Observe the country-specific installation, safety, and accident prevention regulations.

During startup and maintenance work, proceed in accordance with the five safety rules of DIN EN 50110-1. In general, the rules should be observed in the order indicated below:

– Disconnect safely
– Ensure power cannot be switched on again
– Verify safe isolation from the supply
– Ground and short circuit
– Cover or safeguard adjacent live parts

Once the work is complete, perform the above steps again in reverse order.

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NOTE: Risk of unauthorized network access

Connecting devices to a network via Ethernet always entails the risk of unauthorized access to the network.

Therefore, please check your application for an option for disabling active communication channels (e.g., SNMP, FTP, BootP, DCP, etc.) or setting passwords to prevent third parties from accessing the controller without authorization and modifying the system.

Because of the controller's communication interfaces, we advise against using the controller in safety-critical applications without additional security appliances.
Please take additional protective measures in accordance with the IT security requirements and the standards applicable to your application (e.g., virtual networks (VPNs) for remote maintenance access, firewalls, etc.) for protection against unauthorized network access.

On first request, you shall release Phoenix Contact and the companies associated with Phoenix Contact GmbH & Co. KG, Flachsmarktstrasse 8, 32825 Blomberg in accordance with §§15ff.AktG (German Stock Corporation Act), hereinafter collectively referred to as “Phoenix Contact”, from all third-party claims made due to improper use.

For the protection of networks for remote maintenance via VPN, Phoenix Contact offers the mGuard product series of security appliances, which you can find described in the latest Phoenix Contact catalog (phoenixcontact.net/products).

Additional measures for protection against unauthorized network access are listed in the AH EN INDUSTRIAL SECURITY application note. The application note can be downloaded at phoenixcontact.net/products.

NOTE: Damage due to modifications to the SD card

If you modify files on the SD FLASH 512MB MODULAR MUX SD card, you damage the application contained on the SD card. If this is the case, the SD card can no longer be used for creating a multiplexer system.

- Do not modify or delete any files on the SD card.
- Do not format the SD card.

NOTE: Data loss due to removing the SD card during operation

If you remove the SD card during operation, data will be lost.

- Do not remove the SD card during operation.

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2 Description of the SD FLASH 512MB MODULAR MUX multiplexer system

2.1 Hardware and software requirements

- Two ILC 131 ETH Inline controllers (Order No. 2700973)
- Two SD FLASH 512MB MODULAR MUX SD cards (Order No. 2701872) with multiplexer software
- Ethernet cable for directly connecting the two Inline controllers to each other
- Optional: two adapters for wireless communication, e.g., FL EPA 2 (Order No. 1005955)
- Required Inline input terminals and Inline output terminals
- Web browser

The ordering data for hardware, software, and additional documentation can be found in Section “Technical data and ordering data” on page 40.

2.2 Structure of the multiplexer system

Using two SD FLASH 512MB MODULAR MUX SD cards, it is possible to create a multiplexer system consisting of two ILC 131 ETH Inline controllers. You do not need to program the Inline controllers. Each station of the multiplexer system consists of one Inline controller including the SD card and the connected Inline terminals. Communication between the two stations can either be established using an Ethernet cable or a wireless connection. In order to be able to communicate via a wireless network, an adapter for wireless communication is required for each station (e.g., FL EPA 2 adapter).
Both stations can be integrated into an Ethernet network. The multiplexer software that is installed on the SD card is used to implement the required configuration.

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3 Startup

The following sections describe how to start up the multiplexer system step by step, taking into account the different connection options.

3.1 Connecting stations via Ethernet cable or wireless network

Sections 3.1.1 to 3.1.8 describe how to establish a direct connection between the two multiplexer system stations using the Ethernet interfaces of the Inline controllers.

- Follow the instructions in Sections 3.1.1 to 3.1.8.
- Adhere to the sequence of the sections.

3.1.1 Mounting the Inline controllers

- Mount the ILC 131 ETH Inline controllers at a suitable position on a 35 mm standard DIN rail.

Additional information on mounting and removing the Inline controllers can be found in the "Installing and operating the ILC 131 ETH, ILC 151 ETH, ILC 171 ETH 2TX, ILC 191 ETH 2TX, ILC 131 ETH/XC and ILC 151 ETH/XC Inline controllers" user manual. Additional information on mounting and removing Inline terminals can be found in the IB IL SYS PRO UM E user manual (for INTERBUS), the IL SYS INST UM E Inline installation manual, the Inline system manual for your bus system or the corresponding data sheets of the Inline terminals used.
The documents can be downloaded at phoenixcontact.net/products.

3.1.2 Inserting SD cards into the Inline controllers

- Lightly push an SD card into the SD card holder of each Inline controller until it snaps into place.

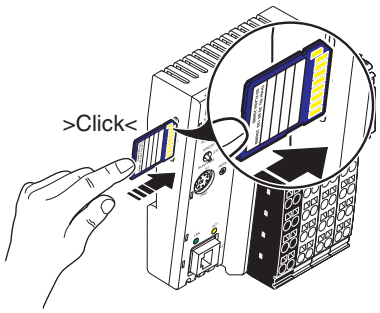

Figure 3-1 Inserting the SD card

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The SD cards contain the multiplexer software. They remain in the Inline controllers during operation. Write protection for the SD cards must **not** be activated because data is saved to the SD cards.

3.1.3 Connecting the Inline controllers to each other

The two Inline controllers are connected to each other via their respective Ethernet connections. There are two possible connection options:

– Direct connection between the Inline controllers
– Wireless connection between the Inline controllers

Direct connection between the Inline controllers

- Connect the two Inline controllers to each other using an Ethernet cable.

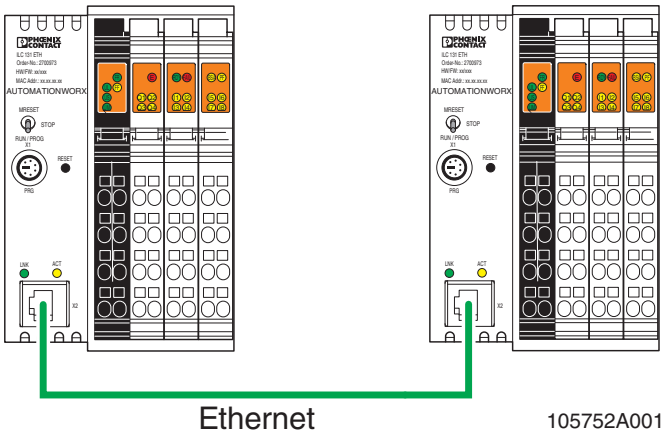

Figure 3-2 Direct connection between the Inline controllers using an Ethernet cable

Wireless connection between the Inline controllers

For the wireless connection between the Inline controllers, you require an adapter for each Inline controller (e.g., FL EPA 2 adapter, Order No. 1005955).

Further adapters can be found in Section “Ordering data” on page 40.

- Connect each Inline controller to an adapter for wireless communication using an Ethernet cable.

Observe the notes and descriptions provided in the respective user manuals and packing slips for the adapters used.

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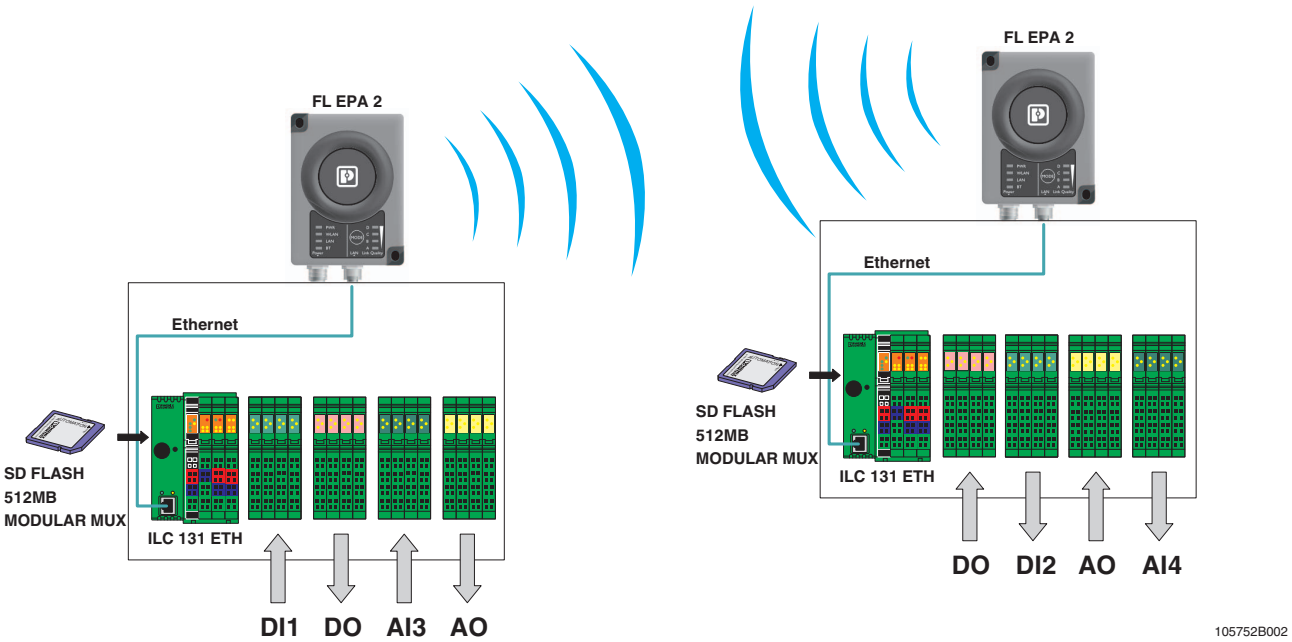

Figure 3-3 Schematic view of the wireless connection

3.1.4 Configuring master and slave

- Configure an Inline controller as master. Wire 24 V DC to input I1 (terminal point 1.1 to 1.2). To do this, insert a jumper as shown in Figure 3-4.

The second Inline controller will then automatically be configured as slave. The slave does not receive any signal at input I1.

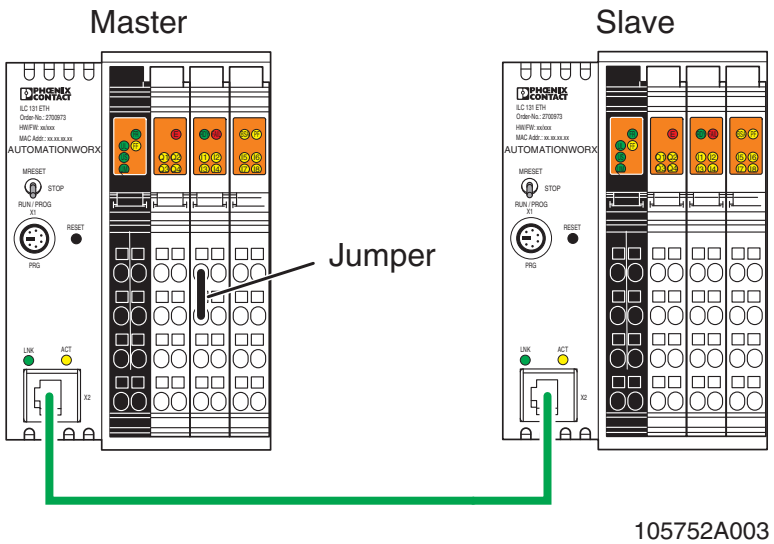

Figure 3-4 Configuring the Inline controllers as master and slave

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The digital inputs are only used for configuration purposes, they are not available as I/O ports.

Connection assignment of the supply, actuators and sensors

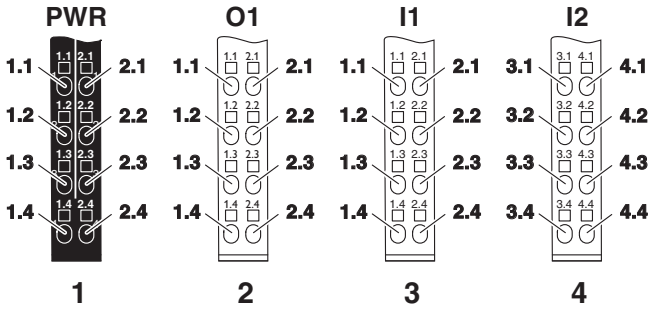

Figure 3-5 Terminal points of Inline connectors

Power connector 1, PWR			
Terminal point	**Assignment**	**Terminal point**	**Assignment**
1.1	U_S	2.1	U_M
1.2	U_L	2.2	U_M
1.3	GND U_L	2.3	GND U_M/U_S
1.4	FE	2.4	FE

Output connector 2, O1			
Terminal point	**Assignment**	**Terminal point**	**Assignment**
1.1	OUT1	2.1	OUT2
1.2	GND	2.2	GND
1.3	FE	2.3	FE
1.4	OUT3	2.4	OUT4

Input connector 3, I1			
Terminal point	**Assignment**	**Terminal point**	**Assignment**
1.1	IN1	2.1	IN2
1.2	U_S	2.2	U_S
1.3	GND	2.3	GND
1.4	IN3	2.4	IN4

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Input connector 4, I2			
Terminal point	**Assignment**	**Terminal point**	**Assignment**
3.1	IN5	4.1	IN6
3.2	U_S	4.2	U_S
3.3	GND	4.3	GND
3.4	IN7	4.4	IN8

3.1.5 Mounting I/O terminals

- Connect the required I/O terminals side by side to the Inline controllers.

Additional information on mounting and removing the Inline controllers can be found in the "Installing and operating the ILC 131 ETH, ILC 151 ETH, ILC 171 ETH 2TX, ILC 191 ETH 2TX, ILC 131 ETH/XC and ILC 151 ETH/XC Inline controllers" user manual. Additional information on mounting and removing Inline terminals can be found in the IB IL SYS PRO UM E user manual (for INTERBUS), the IL SYS INST UM E Inline installation manual, the Inline system manual for your bus system or the corresponding data sheets of the Inline terminals used.
The documents can be downloaded at phoenixcontact.net/products.

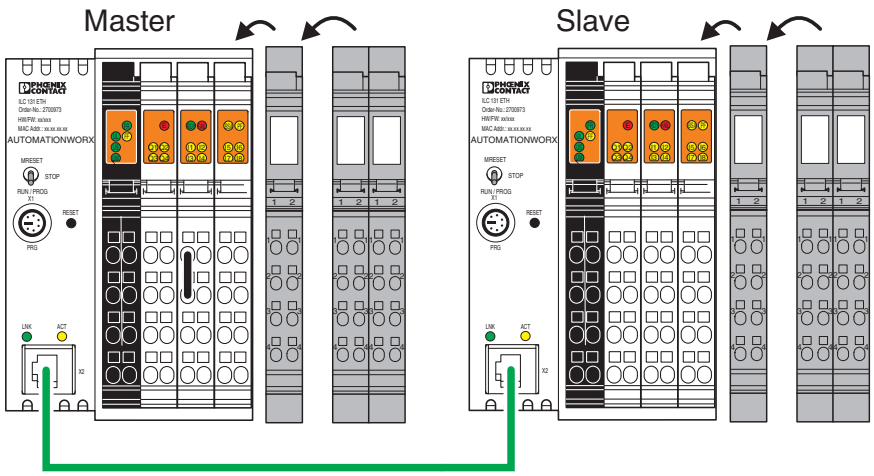

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Figure 3-6 Connecting I/O terminals side by side to the Inline controllers

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3.1.6 Connecting the supply voltages

Only use power supplies that are suitable for operation with capacitive loads (increased inrush current). Additional information on the supply voltage can be found in the “Installing and operating the ILC 131 ETH, ILC 151 ETH, ILC 171 ETH 2TX, ILC 191 ETH 2TX, ILC 131 ETH/XC and ILC 151 ETH/XC Inline controllers” user manual.

- Connect the supply voltage to both Inline controllers, as shown in Figure 3-7.

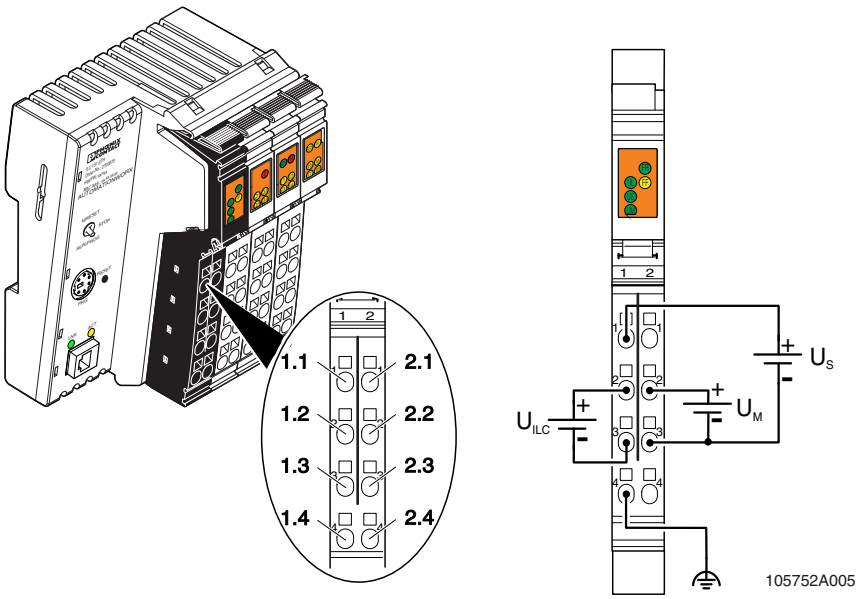

Figure 3-7 Connecting the supply voltages

3.1.7 Defining the operating state of the application program

- For each Inline controller, set the mode selector switch to the RUN/PROG position.

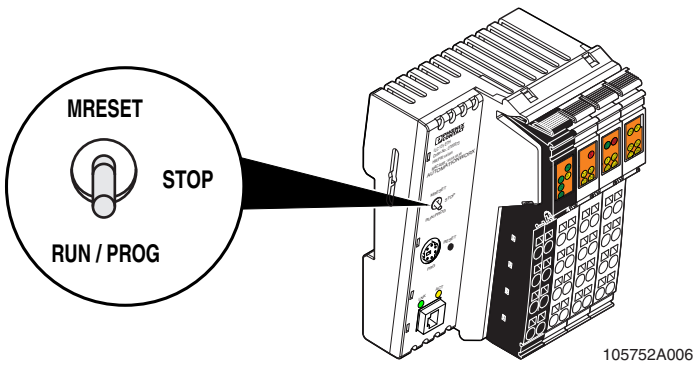

Figure 3-8 Mode selector switch of the Inline controller

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When the multiplexer system is started up for the first time (approx. 30 – 40 seconds), the Inline controller first indicates a bus error (FAIL LED lights up/output Q2 flashes at 4 Hz), because a new bus configuration was detected. The device then automatically reads in the bus configuration. After a short time, the bus error display goes out and both Inline controllers are restarted. The IP addresses are assigned automatically and the connection between the Inline controllers is established automatically.

If you subsequently modify the bus configuration, it must be read in again (see Section 3.1.8).

For information on the diagnostic and status indicators of the Inline controllers, please refer to Section A 1 on page 42.

3.1.8 Reading in the bus configuration

If you subsequently modify a bus configuration that has been read in automatically, the bus configuration must be read in again. You need to manually initiate the reading process for the bus configuration.

- Apply a 24 V DC pulse to input I8 of each Inline controller, as shown in Figure 3-9.

The pulse must be applied while the relevant FAIL LED of the Inline controller is flashing, otherwise the software block will be reset automatically.

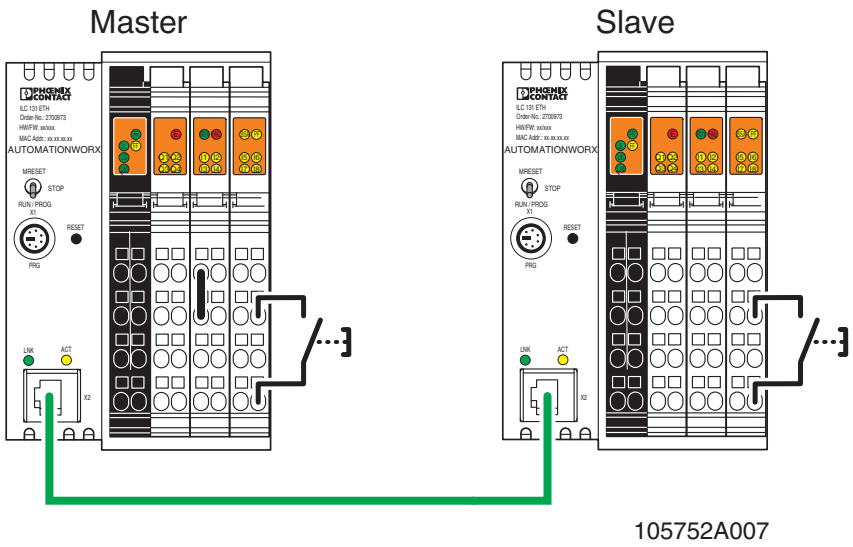

Figure 3-9 Applying a 24 V DC pulse to input I8 of the Inline controllers

Once you have applied the pulse to both Inline controllers, both Inline controllers will be restarted. The IP addresses are assigned automatically and the connection between the Inline controllers is established automatically. The multiplexer system switches to normal operating state. The pending I/O signals are transmitted. The LEDs Q1 to Q4 are used to indicate possible errors, see Section A 1 on page 42.

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3.2 Using SafetyBridge technology for the multiplexer system in the wireless network

When using I/O modules with SafetyBridge Technology in the multiplexer system, you need to configure each SafetyBridge module as described in the user manual for the respective module.

The following wireless modules can be used as adapters for wireless connection of the Inline controllers:

– FL BT EPA 2 (Order No. 1005869)
– FL EPA 2 (Order No. 1005955)
– FL EPA 2 RSMA (Order No. 1005957)

You can set the operating mode for the adapter via the “Mode” button on the adapter used. Additional information on the “Mode” button and individual operating modes can be found in the user manual of the adapter used.

In order to operate the system in compliance with the SafetyBridge specification, use the adapters for wireless communication in a mode with PROFINET/PROFIsafe optimization.

NOTE: Not a safe application

In order to ensure correct use, subsequent safety logic (an evaluation unit) is required.

Additional information on how to use the multiplexer system in conjunction with SafetyBridge Technology can be found in the
AH EN SD FLASH 512MB MODULAR MUX SAFETYBRIDGE application note.

The application note can be downloaded at phoenixcontact.net/product/2701872.

3.3 Integrating the multiplexer system into an Ethernet network

Sections 3.3.1 to 3.3.11 describe how to integrate the two multiplexer system stations into an Ethernet network.

- Follow the instructions in Sections 3.3.1 to 3.3.11.
- Adhere to the sequence of the sections.

3.3.1 Mounting the Inline controllers

- Mount the ILC 131 ETH Inline controllers at a suitable position on a 35 mm standard DIN rail.

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Additional information on mounting and removing the Inline controllers can be found in the "Installing and operating the ILC 131 ETH, ILC 151 ETH, ILC 171 ETH 2TX, ILC 191 ETH 2TX, ILC 131 ETH/XC and ILC 151 ETH/XC Inline controllers" user manual. Additional information on mounting and removing Inline terminals can be found in the IB IL SYS PRO UM E user manual (for INTERBUS), the IL SYS INST UM E Inline installation manual, the Inline system manual for your bus system or the corresponding data sheets of the Inline terminals used.
The documents can be downloaded at phoenixcontact.net/products.

3.3.2 Inserting SD cards into the Inline controllers

- Lightly push an SD card into the SD card holder of each Inline controller until it snaps into place.

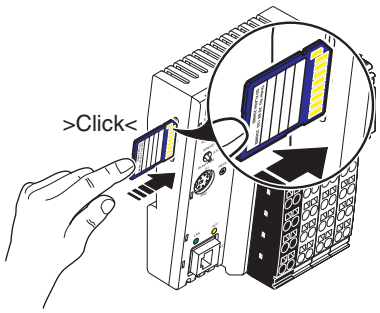

Figure 3-10 Inserting the SD card

The SD cards contain the multiplexer software. They remain in the Inline controllers during operation. Write protection for the SD cards must **not** be activated because data is saved to the SD cards.

3.3.3 Configuring master and slave

- Configure an Inline controller as master. Wire 24 V DC to input I1 (terminal point 1.1 to 1.2). To do this, insert a jumper as shown in Figure 3-11.

The second Inline controller will then automatically be configured as slave. The slave does not receive any signal at input I1.

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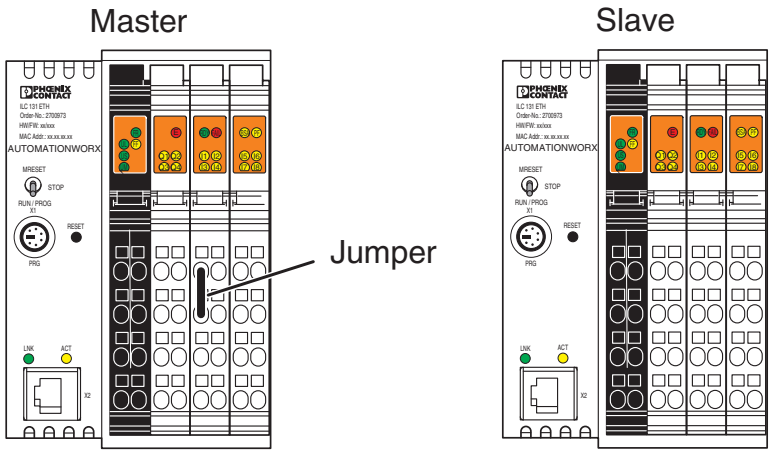

Figure 3-11 Configuring the Inline controllers as master and slave

The digital inputs are only used for configuration purposes, they are not available as I/O ports.

Connection assignment of the supply, actuators and sensors

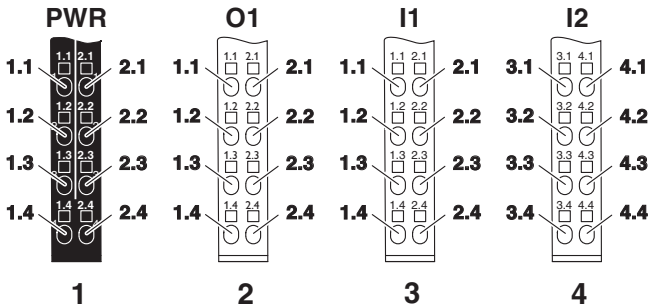

Figure 3-12 Terminal points of Inline connectors

Power connector 1, PWR			
Terminal point	**Assignment**	**Terminal point**	**Assignment**
1.1	U_S	2.1	U_M
1.2	U_L	2.2	U_M
1.3	GND U_L	2.3	GND U_M/U_S
1.4	FE	2.4	FE

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Output connector 2, O1			
Terminal point	**Assignment**	**Terminal point**	**Assignment**
1.1	OUT1	2.1	OUT2
1.2	GND	2.2	GND
1.3	FE	2.3	FE
1.4	OUT3	2.4	OUT4

Input connector 3, I1			
Terminal point	**Assignment**	**Terminal point**	**Assignment**
1.1	IN1	2.1	IN2
1.2	U_S	2.2	U_S
1.3	GND	2.3	GND
1.4	IN3	2.4	IN4

Input connector 4, I2			
Terminal point	**Assignment**	**Terminal point**	**Assignment**
3.1	IN5	4.1	IN6
3.2	U_S	4.2	U_S
3.3	GND	4.3	GND
3.4	IN7	4.4	IN8

3.3.4 Configuring the behavior after a voltage reset

- Wire 24 V DC to input I5 (terminal point 3.1 to 3.2) for each of the two Inline controllers. To do this, insert a jumper into each controller, as shown in Figure 3-13.

Wiring 24 V DC to input I5 (terminal point 3.1 to 3.2) causes the IP addresses of the Inline controllers to be kept after a voltage reset. When this wiring is not in place, the default IP addresses will be automatically assigned to the Inline controllers after a voltage reset.

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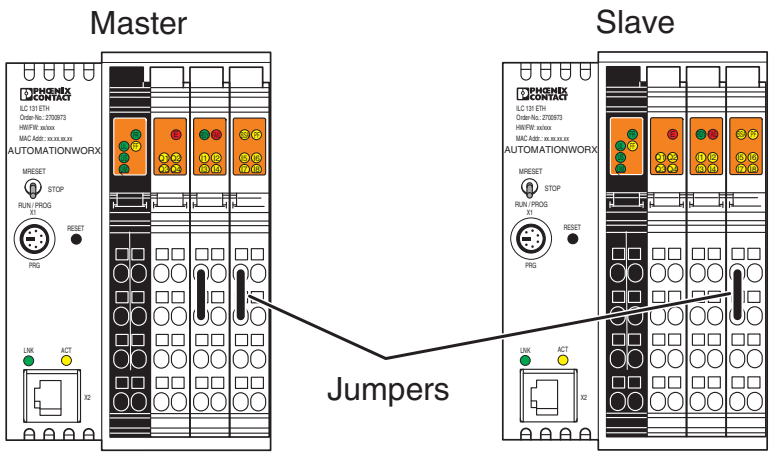

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Figure 3-13 Wiring in order to keep the IP address after a voltage reset

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3.3.5 Connecting the Inline controllers to a PC

- First connect the Inline controller that has been configured as master to a PC using an Ethernet cable (see Figure 3-14).
- Then follow the instructions in Sections 3.3.6 to 3.3.7.

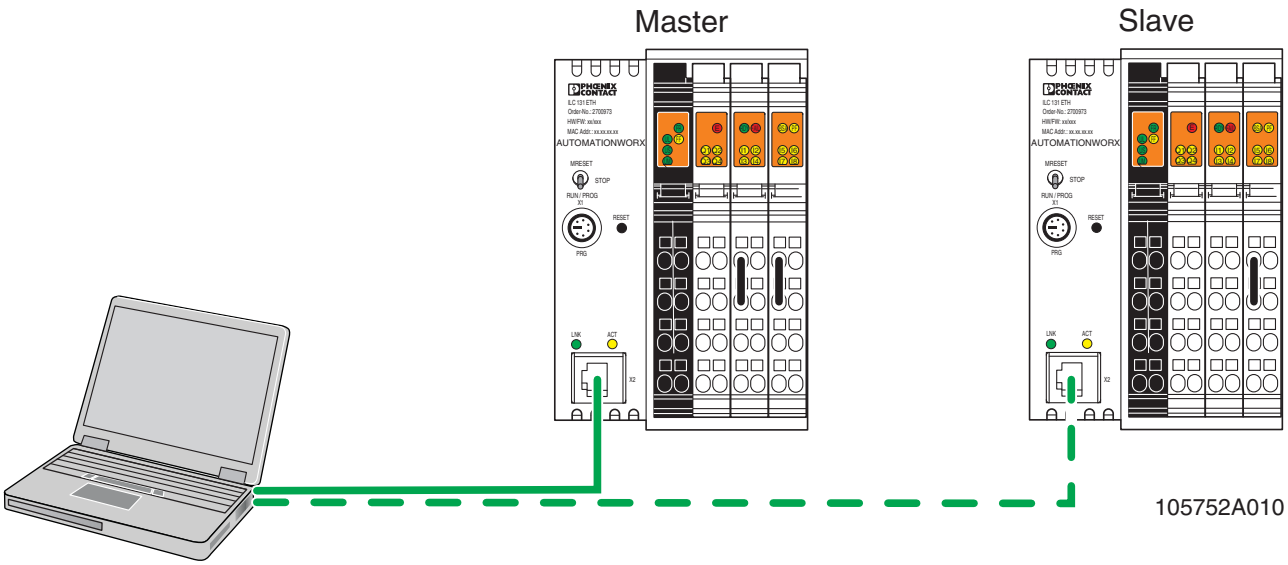

Figure 3-14 Connecting the Inline controllers to a PC

- When you have assigned the master IP address as described in Sections 3.3.6 to 3.3.7, go back to Section 3.3.5 and repeat the instructions in Sections 3.3.5 to 3.3.7 for the slave.

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3.3.6 Connecting the voltage supply

Only use power supplies that are suitable for operation with capacitive loads (increased inrush current). Additional information on the supply voltage can be found in the “Installing and operating the ILC 131 ETH, ILC 151 ETH, ILC 171 ETH 2TX, ILC 191 ETH 2TX, ILC 131 ETH/XC and ILC 151 ETH/XC Inline controllers” user manual.

- Connect the supply voltage to the Inline controller, as shown in Figure 3-15.

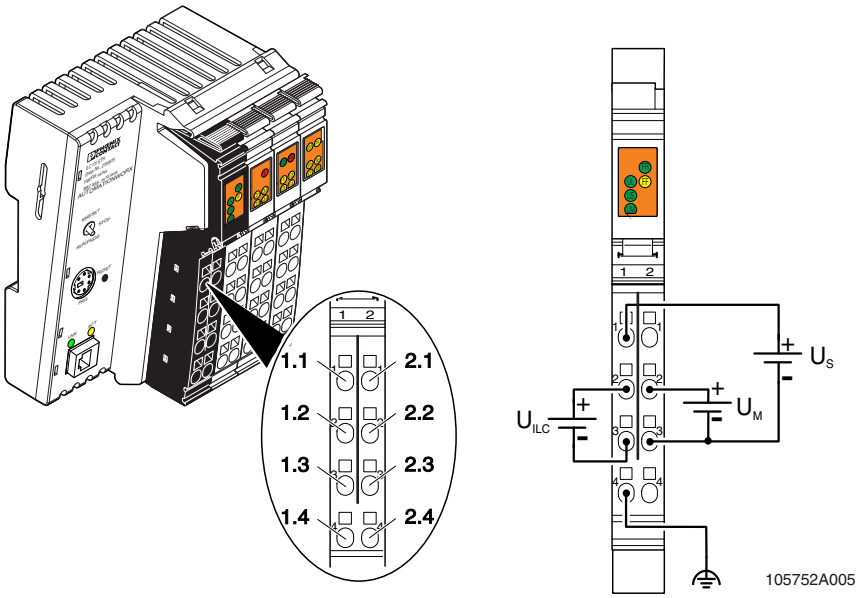

Figure 3-15 Connecting the supply voltage

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3.3.7 Assigning the IP address for the Inline controller

The IP address for the Inline controller in the network is assigned via the web interface of the multiplexer system.

- Open your web browser.
- Enter one of the following addresses, depending on for which Inline controller you want to assign the IP address in the network:
  - http://192.168.0.2 (default IP address for the master)
  - http://192.168.0.3 (default IP address for the slave)

The web interface of the multiplexer system opens.

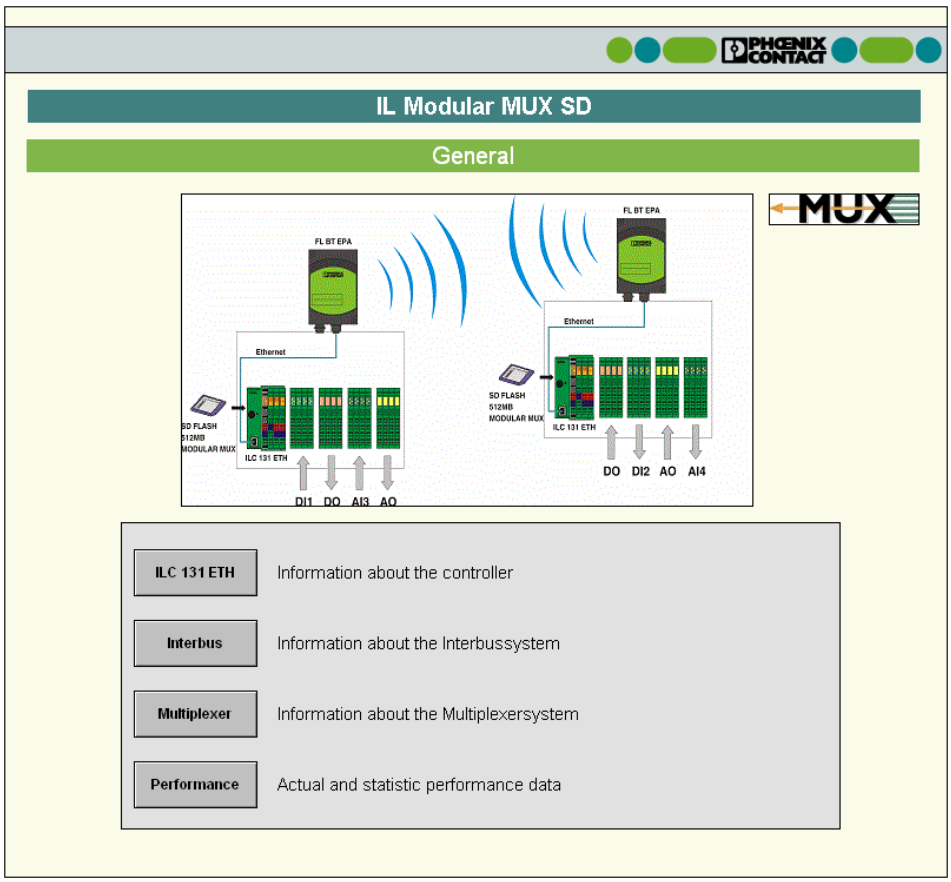

Figure 3-16 “General” start page of the web interface (master window)

- Click the “ILC 131 ETH” button.
- In the window that opens, click the “Set IP Address” button.

The “Set IP Address of ILC 131 ETH” page for assigning an IP address to the Inline controller (Figure 3-17) opens.

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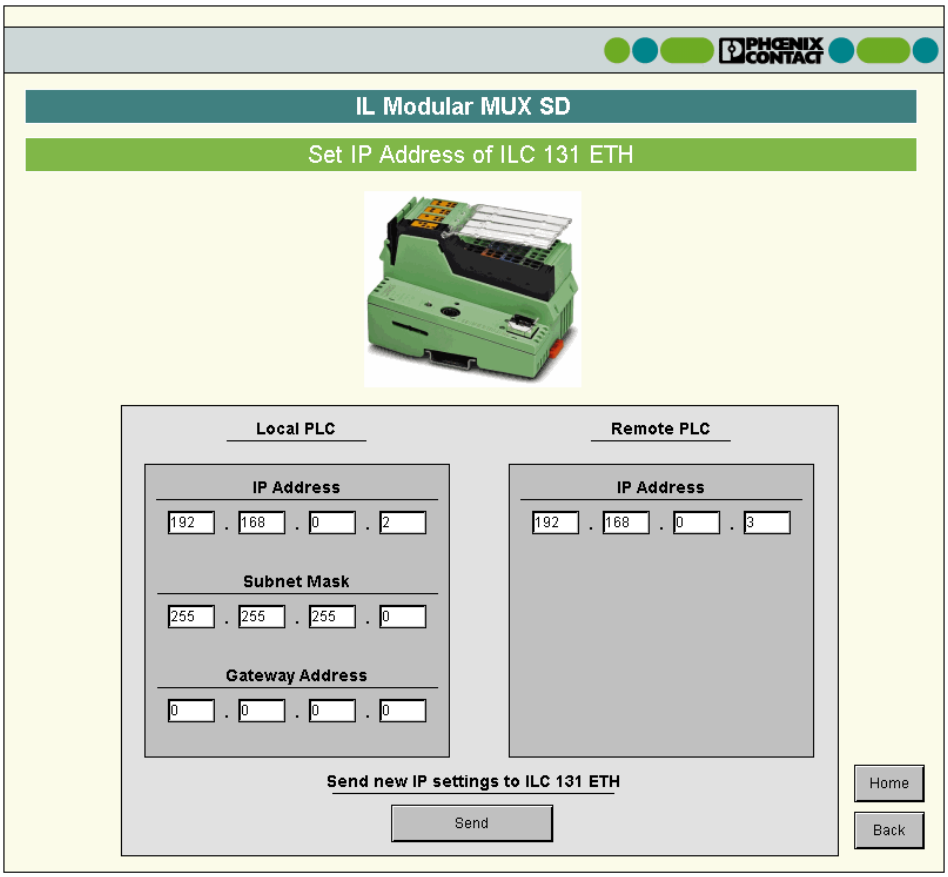

Figure 3-17 “Set IP Address of ILC 131 ETH” page

- In the “Local PLC” area, set the IP address, the subnet mask and the gateway address for the Inline controller for which you have opened the multiplexer web interface.
- In the “Remote PLC” area, enter the IP address of the other Inline controller.
- To transfer the modified IP address to the Inline controller, click the “Send” button.

Once you have assigned the IP address to the first Inline controller (master), you must also assign an IP address to the second Inline controller (slave). Sections 3.3.5 to 3.3.7 describe step by step how to proceed.

- Go back to Section 3.3.5.
- Follow the instructions in Sections 3.3.5 to 3.3.7.
- Adhere to the sequence of the sections.

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3.3.8 Mounting I/O terminals

- Disconnect power to the Inline controllers.
- Connect the required I/O terminals side by side to the Inline controllers. Make sure that they are arranged in a complementary way.

Additional information on mounting and removing the Inline controllers can be found in the “Installing and operating the ILC 131 ETH, ILC 151 ETH, ILC 171 ETH 2TX, ILC 191 ETH 2TX, ILC 131 ETH/XC and ILC 151 ETH/XC Inline controllers” user manual. Additional information on mounting and removing Inline terminals can be found in the IB IL SYS PRO UM E user manual (for INTERBUS), the IL SYS INST UM E Inline installation manual, the Inline system manual for your bus system or the corresponding data sheets of the Inline terminals used.
The documents can be downloaded at phoenixcontact.net/products.

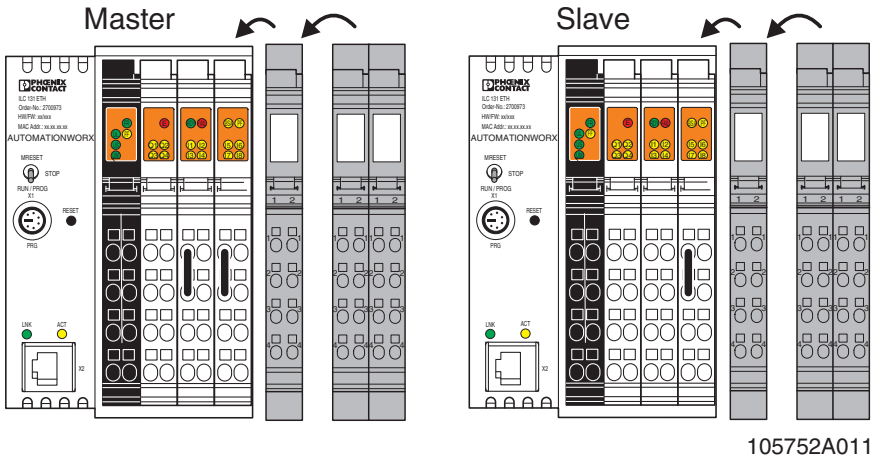

Figure 3-18 Connecting I/O terminals side by side to the Inline controllers

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3.3.9 Connecting the Inline controllers to the network

After assigning the IP addresses to the Inline controllers (see Sections 3.3.5 to 3.3.7), you can connect the Inline controllers to the network.

- Connect each Inline controller to the network using an Ethernet cable (Figure 3-19).

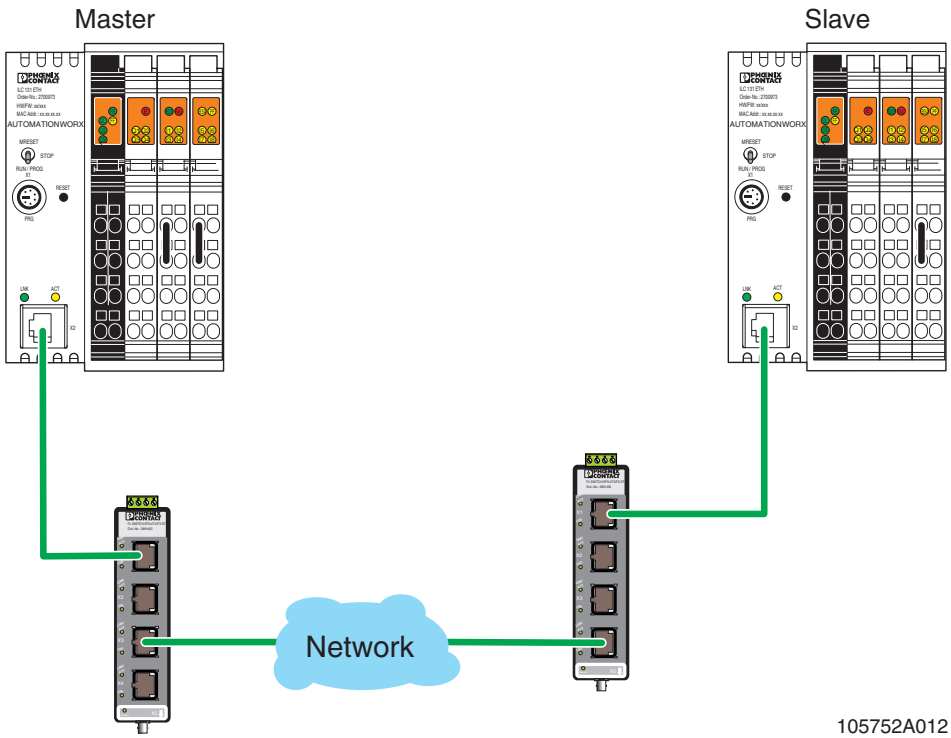

Figure 3-19 Inline controllers in the network

- Switch on power for the Inline controllers.

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3.3.10 Defining the operating state of the application program

- For each Inline controller, set the mode selector switch to the RUN/PROG position.

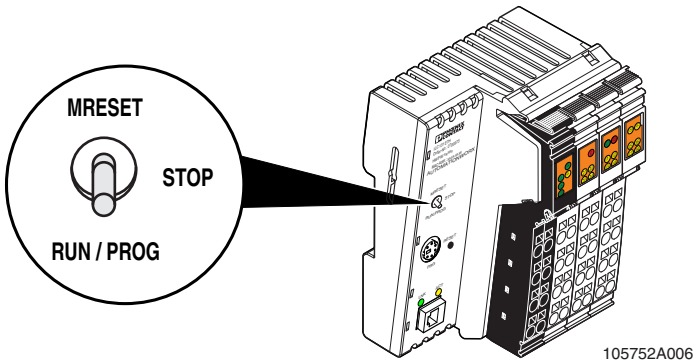

Figure 3-20 Mode selector switch of the Inline controller

When the multiplexer system is started up for the first time (approx. 30 – 40 seconds), the Inline controller first indicates a bus error (FAIL LED lights up/output Q2 flashes at 4 Hz), because a new bus configuration was detected. The device then automatically reads in the bus configuration. After a short time, the bus error display goes out and both Inline controllers are restarted. The IP addresses are assigned automatically and the connection between the Inline controllers is established automatically.

If you subsequently modify the bus configuration for the Inline controllers, it must be read in again (see Section 3.3.11). The IP addresses of the Inline controllers are reset to the default IP addresses. To prevent IP addresses from being reset, the behavior after a voltage reset must be configured as described in Section 3.3.4.

For information on diagnostic and status indicators of the Inline controllers, please refer to Section A 1.

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3.3.11 Reading in the bus configuration

If you subsequently modify a bus configuration that has been read in automatically, the bus configuration must be read in again. You need to manually initiate the reading process for the bus configuration.

- Apply a 24 V DC pulse to input I8 of each Inline controller, as shown in Figure 3-21.

The pulse must be applied while the relevant FAIL LED of the Inline controller is flashing, otherwise the software block will be reset automatically.

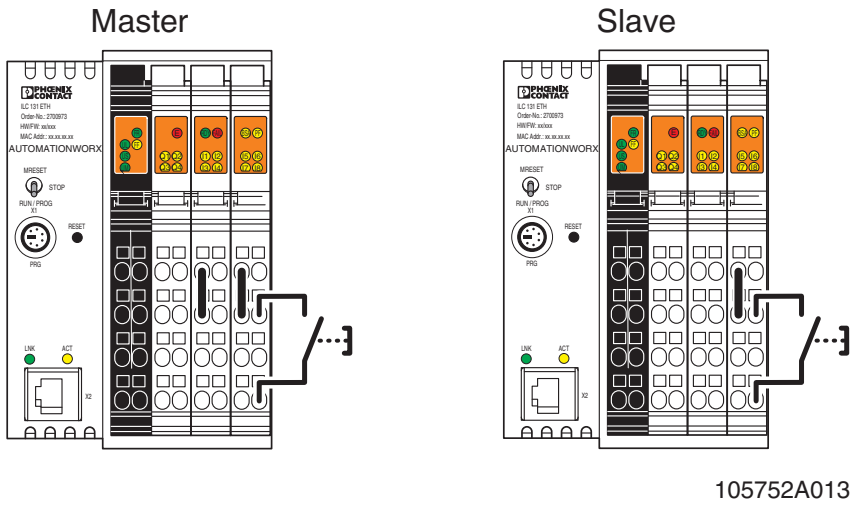

Figure 3-21 Applying a 24 V DC pulse to input I8 of the Inline controllers

Once you have applied the pulse to both Inline controllers, both Inline controllers will be restarted. The IP addresses are assigned automatically and the connection between the Inline controllers is established automatically. The multiplexer system switches to normal operating state. The pending I/O signals are transmitted. The LEDs Q1 to Q4 indicate possible errors, see Section A 1.

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4 Web interface

4.1 “General” start page

Once you have entered the IP address http://192.168.0.2 (default IP address of the master) or http://192.168.0.3 (default IP address of the slave) in the web browser, the web interface start page for the selected Inline controller opens.

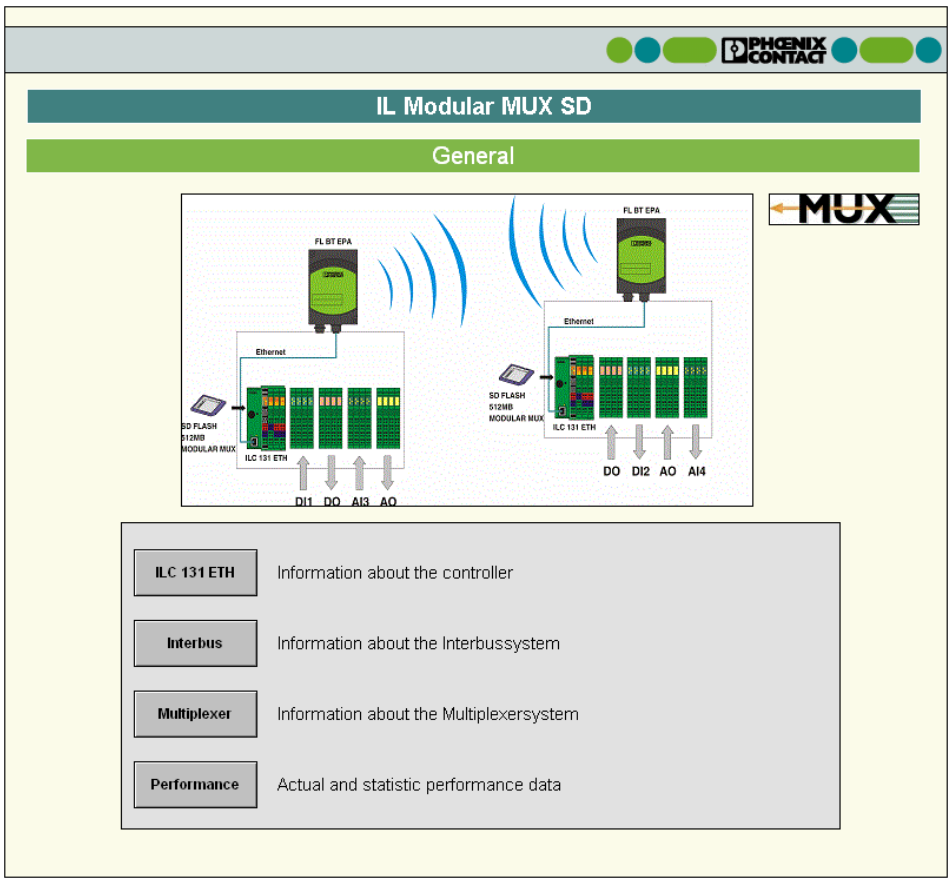

Figure 4-1 Web interface: “General” start page

On the “General” start page of the web interface, you will find four buttons enabling you to access other web interface pages. These pages are described in Sections 4.2 to 4.5.

The “Performance” button is only displayed for the master.

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4.2 “State of ILC 131 ETH” page

On the “State of ILC 131 ETH” page, you will find current information on the Inline controller.

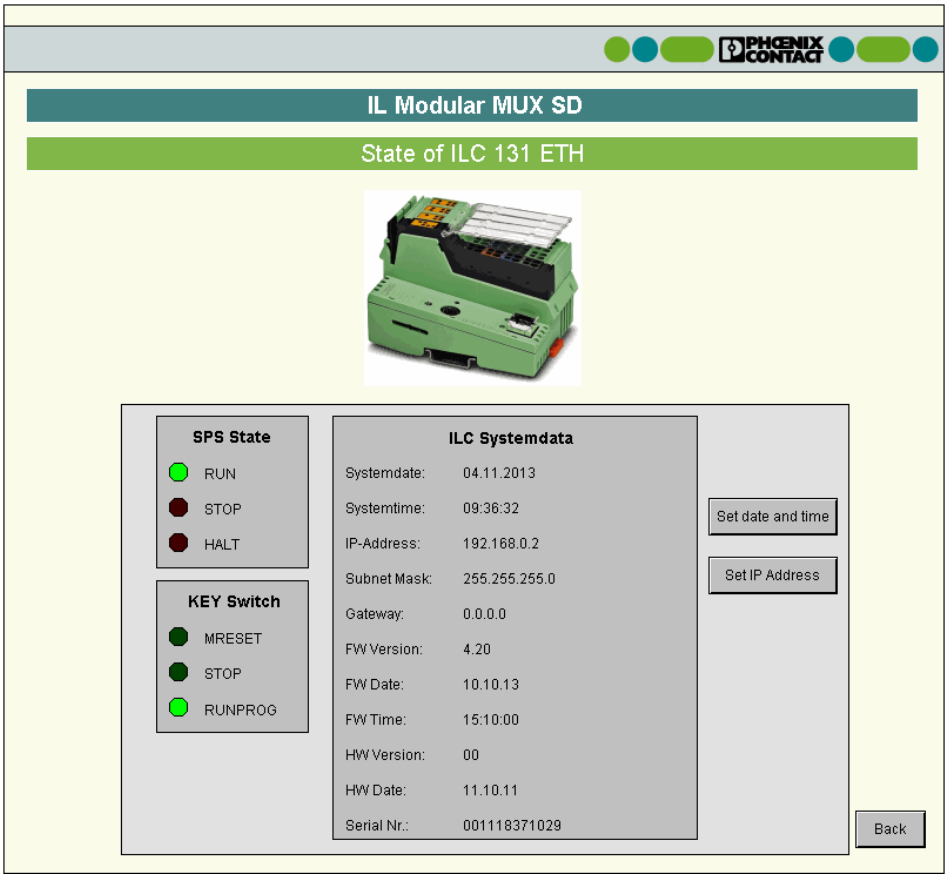

Figure 4-2 Web interface: “State of ILC 131 ETH” page

On the “State of ILC 131 ETH” page, you will find two buttons enabling you to access other web interface pages. These pages are described in Sections 4.2.1 to 4.2.2.

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4.2.1 “Set date and time of ILC 131 ETH” page

On the “Set date and time of ILC 131 ETH” page, you can modify the system time for the Inline controller.

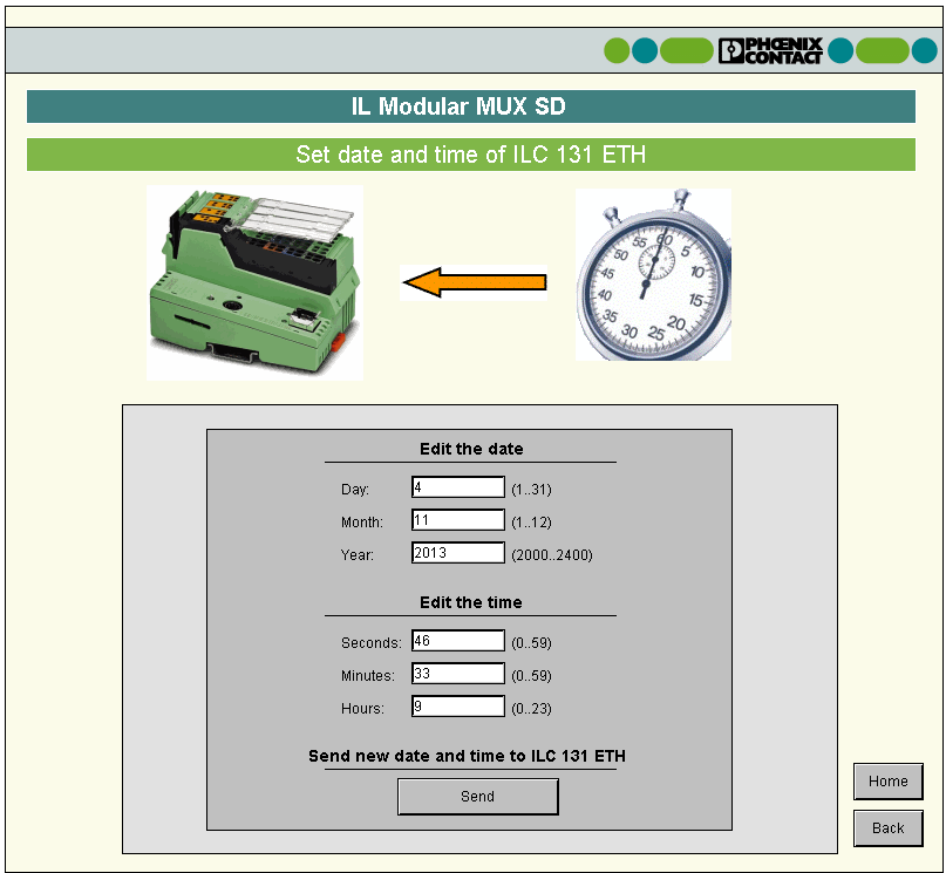

Figure 4-3 Web interface: “Set date and time of ILC 131 ETH” page

- Enter the desired values for the date and time in the corresponding fields.
- To transfer the modified system time to the Inline controller, click the “Send” button.

The “Home” button takes you back to the “General” start page (see Section 4.1).
The “Back” button takes you back to the “State of ILC 131 ETH” page (see Section 4.2).

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4.2.2 “Set IP Address of ILC 131 ETH” page

On the “Set IP Address of ILC 131 ETH” page, you can modify the IP address of the Inline controller.

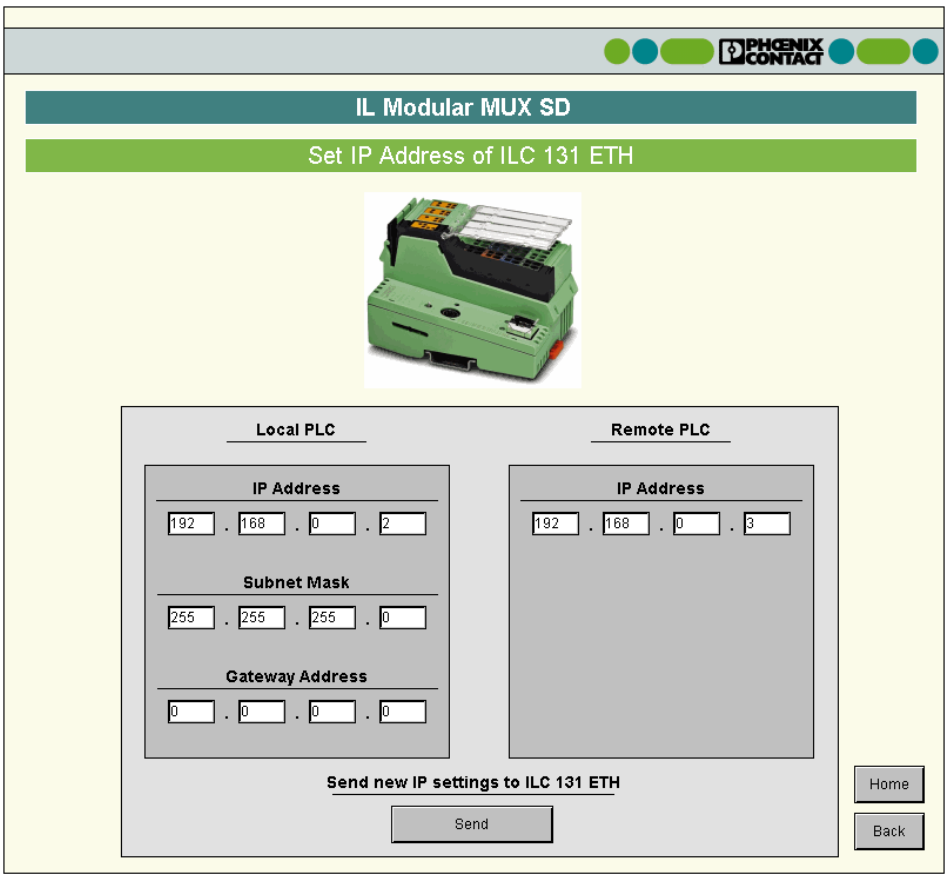

Figure 4-4 Web interface: “Set IP Address of ILC 131 ETH” page

- In the “Local PLC” area, set the IP address, the subnet mask and the gateway address for the Inline controller for which you have opened the multiplexer web interface.
- In the “Remote PLC” area, enter the IP address of the other Inline controller.
- To transfer the modified IP address to the Inline controller, click the “Send” button.

Please note: By default, the IP address of the Inline controller is automatically reset to its default IP address after a voltage reset. In order to prevent this from happening, you must configure the behavior after a voltage reset as described in Section 3.3.4.

The “Home” button takes you back to the “General” start page (see Section 4.1).
The “Back” button takes you back to the “State of ILC 131 ETH” page (see Section 4.2).

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4.3 “Interbus” page

On the “Interbus” page, you will find current information on the connected INTERBUS network.

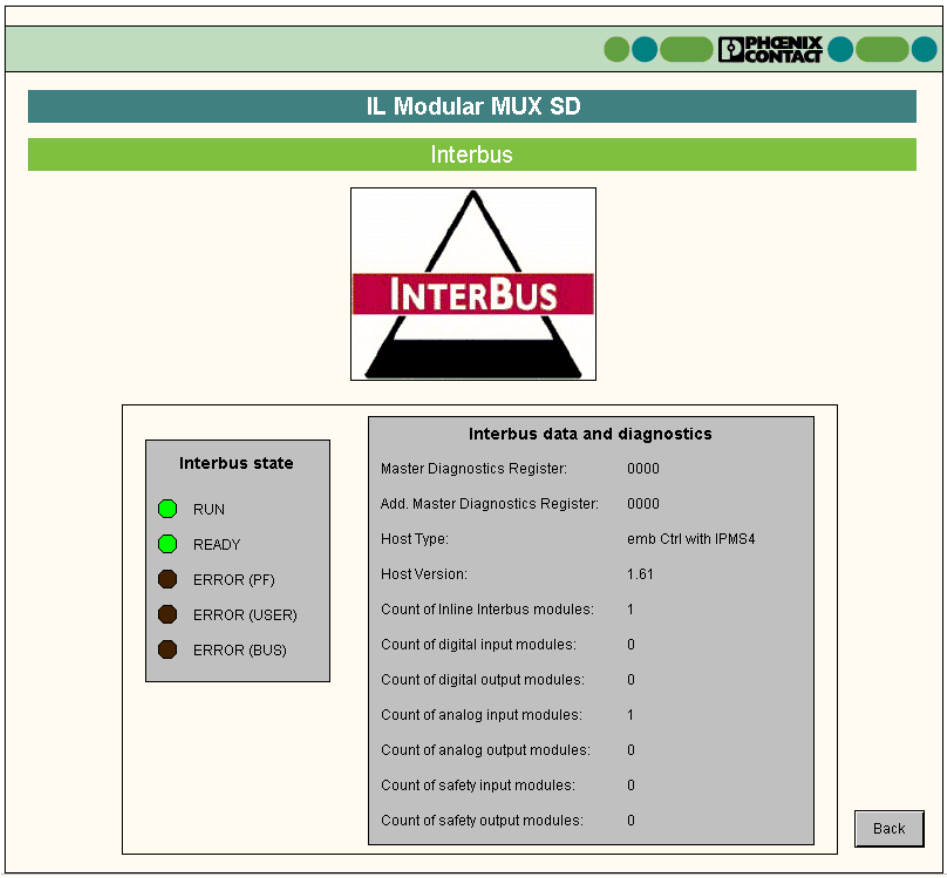

Figure 4-5 Web interface: “Interbus” page

The “Back” button takes you back to the “General” start page (see Section 4.1).

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4.4 “Multiplexer” page

On the “Multiplexer” page, you will find diagnostic information on the multiplexer system.

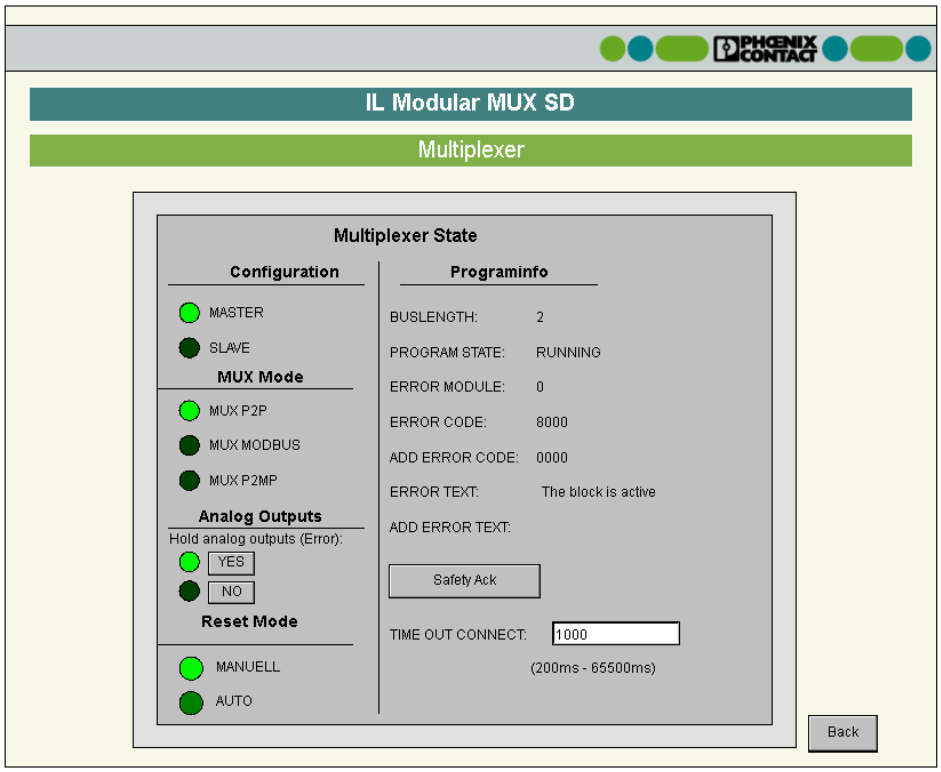

Figure 4-6 Web interface: “Multiplexer” page

The “Back” button takes you back to the “General” start page (see Section 4.1).

You can view possible diagnostic error codes under “Programinfo”:

– ERROR CODE: Error code
– ADD ERROR CODE: Additional error code providing details on the “ERROR CODE”.

With the “Safety Ack” button you can acknowledge a SafetyBridge communication error (only in conjunction with SafetyBridge).

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The table below provides an overview of possible error codes:

Table 4-1 Diagnostic error codes

Error code	Meaning	
0000_{hex}	The block is not active.	
8000_{hex}	The block is active.	
$C110_{hex}$	The IP address could not be changed/set, error message of “FB_Set_IP_Adress” block.	
$C120_{hex}$	The IP address could not be read, error message of “FB_Set_IP_Adress” block.	
$C210_{hex}$	The bus configuration could not be read, error message of “FB_BusStart” block. The additional error code “ADD ERROR CODE” provides more information on this error message.	
	ADD ERROR CODE	Meaning
	0001_{hex}	“ALARM_STOP” not executed
	0002_{hex}	“CREATE_CONFIGURATION” not executed
	0003_{hex}	“COMPLETE_READ_CONFIGURATION” not executed (device number)
	0004_{hex}	“COMPLETE_READ_CONFIGURATION” not executed (ID code and PD length)
$C220_{hex}$	The bus configuration could not be started, error message of “FB_BusStart” block. The additional error code “ADD ERROR CODE” provides more information on this error message.	
	ADD ERROR CODE	Meaning
	0001_{hex}	“ALARM_STOP” not executed
	0002_{hex}	“CONFIRM_DIAGNOSTICS” not executed
	0003_{hex}	“CONTROL_PARAMETERIZATION” not executed
	0004_{hex}	“INITIATE_LOAD_CONFIGURATION” not executed
	0005_{hex}	“TERMINATE_LOAD_CONFIGURATION” not executed
	0006_{hex}	“CONFIRM_DIAGNOSTICS” not executed
	0007_{hex}	“ACTIVATE_CONFIGURATION” not executed
	0008_{hex}	“START_DATA_TRANSFER” not executed
$C340_{hex}$	Error when comparing the two bus systems (master only), error message of “FB_Connection” block. The additional error codes “ADD ERROR CODE” provide more information on this error message.	

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Table 4-1 Diagnostic error codes

Error code	Meaning	
	ADD ERROR CODE	Meaning
	0000_{hex}	No error has occurred
	0001_{hex}	Timeout during connection establishment
	0002_{hex}	The connection is interrupted.
	0003_{hex}	Manual acknowledgment required
	0004hex	SafetyBridge communication breakdown
	0101_{hex}	The bus length of the master is greater than the bus length of the slave.
	0102_{hex}	The bus length of the slave is greater than the bus length of the master.
	$02xx_{hex}$	The bus configuration of the master does not match the bus configuration of the slave (xx = number of faulty bus segment). Please note the following when determining the faulty bus segment: Associated AO1 modules that are operated together on an AI2 module are viewed as one bus device.
$C350_{hex}$	Slave error, error message of “FB_Connection” block	
	0000_{hex}	The slave reports its status every time a write command is sent by the master. If a malfunction or an error has occurred, this is reported to the master via the status and indicated in this error code. In this case, more precise error diagnostics can only be performed for the slave.
$C4xx_{hex}$	Device error of an INTERBUS device in the connected bus system (xx = number of faulty bus segment). Please note the following when determining the faulty bus segment: Associated AO1 modules that are operated together on an AI2 module are viewed as one bus device. The additional error codes “ADD ERROR CODE” provide more information on this error message.	
	ADD ERROR CODE	Meaning
	8001_{hex}	Measuring range exceeded (overrange)
	8002_{hex}	Open circuit
	8004_{hex}	No valid measured value available
	8010_{hex}	Configuration invalid
	8020_{hex}	DAC voltage has fallen below the permissible value.
	8040_{hex}	Module faulty (replacement required)
	8080_{hex}	Below measuring range (underrange)

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4.5 “Performance of the data transfer” page

The “Performance of the data transfer” page is only displayed for the master.

On the “Performance of the data transfer” page, you will find information on the performance of the multiplexer system.

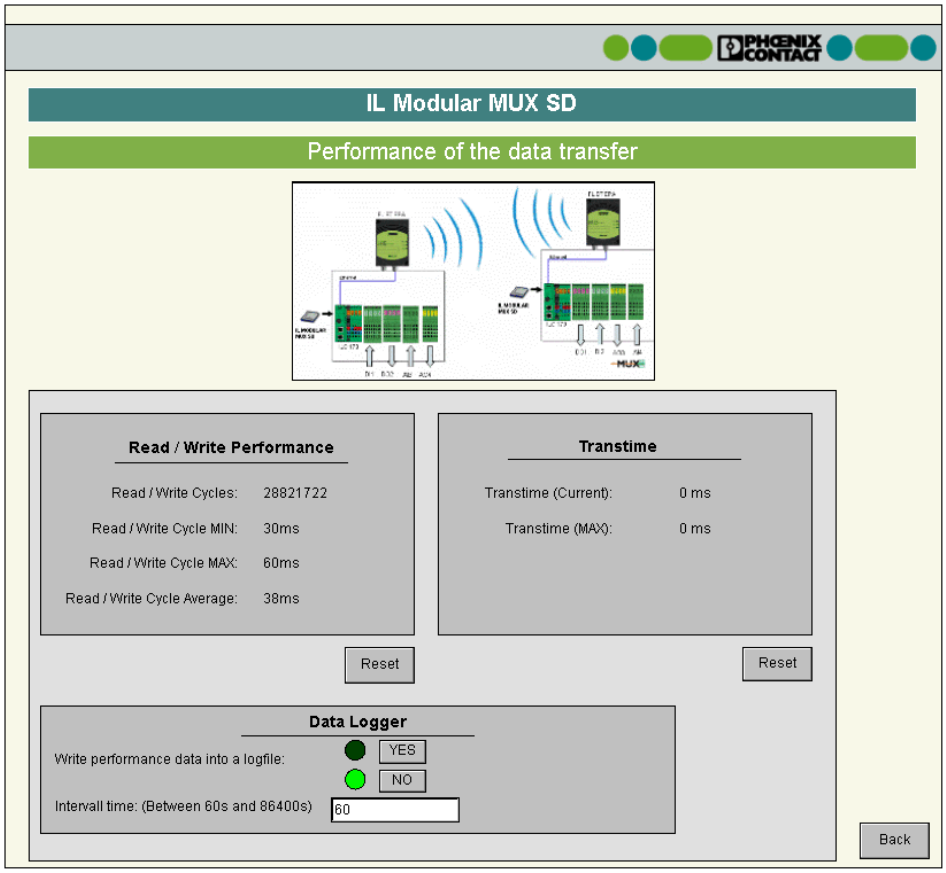

Figure 4-7 Web interface: “Performance of the data transfer” page

In the “Read/Write Performance” area, you will find information regarding the reading and writing speeds during data transfer in the multiplexer system. The table below provides an overview of the values displayed in this area:

Table 4-2 Values displayed under “Read/Write Performance”

Value	Meaning
Read/Write Cycles	Number of read and write cycles between master and slave
Read/Write Cycle MIN	Shortest cycle time
Read/Write Cycle MAX	Longest cycle time

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Table 4-2 Values displayed under “Read/Write Performance”

Value	Meaning
Read/Write Cycle Average	Average cycle time within the current time interval (“Interval time”, see below)

You can reset the values displayed under “Read/Write Performance” by clicking the “Reset” button.

The SafetyBridge transmission time is shown in the “Transtime” area (only in conjunction with SafetyBridge).

You can reset the values displayed under “Transtime” by clicking the “Reset” button.

In the “Data Logger” area, you can choose whether you want to create a log file for the reading and writing speeds. The log file is saved to the SD card, see Section 4.5.1

- Click the “YES” button if you want to create a log file.
- Under “Interval time”, specify the time interval for writing the current values to the log file.

If you do not want to create a log file, the reading and writing speeds are averaged within the specified time interval and then indicated as “Read/Write Cycle Average” in the “Read/Write Performance” area.

- Click the “NO” button if you do not want to create a log file or if the current values should no longer be written to the log file.

The “Back” button takes you back to the “General” start page (see Section 4.1).

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4.5.1 Opening the log file

The log file, including the saved reading and writing speeds, is stored to the SD card. The log file can be called up via FTP (for example via the “ftp://10.202.238.25” address in Figure 4-8).

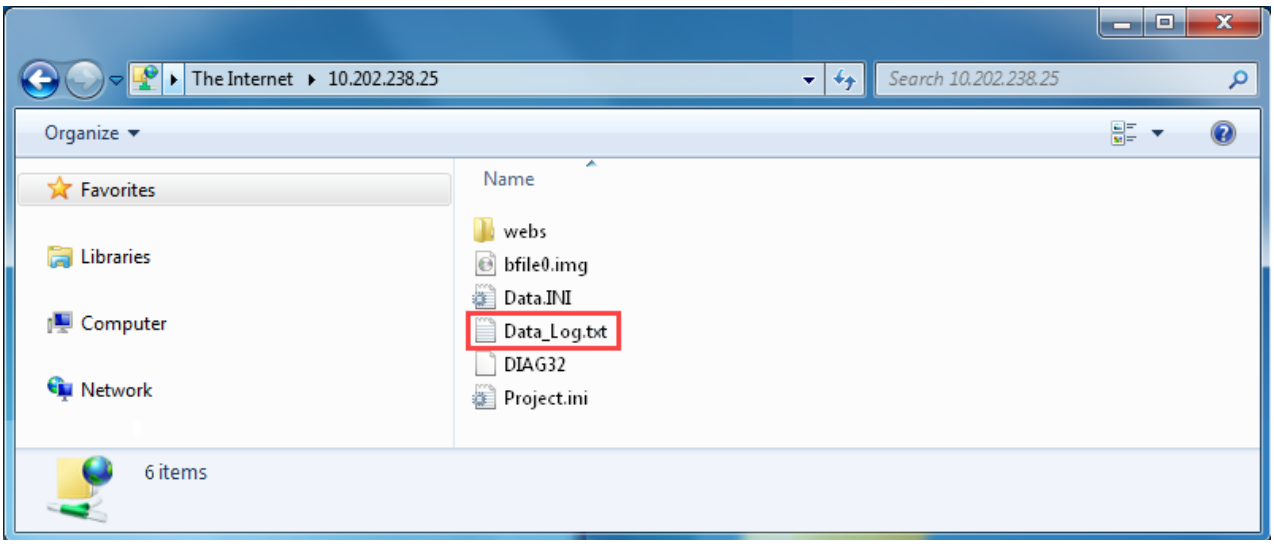

Figure 4-8 Log file in the SD card directory

If more than 1 MB of data (approx. 5000 measured values) is saved to the log file, the log file will be deleted from the SD card.

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5 Technical data and ordering data

5.1 Technical data

The technical data for the ILC 131 ETH Inline controllers can be found in the “Installing and operating the ILC 131 ETH, ILC 151 ETH, ILC 171 ETH 2TX, ILC 191 ETH 2TX, ILC 131 ETH/XC and ILC 151 ETH/XC Inline controllers” user manual.

The technical data for the Inline terminals used can be found in the data sheets for the Inline terminals.

The documents can be downloaded at phoenixcontact.net/products.

5.2 Ordering data

5.2.1 Modules

Description	Type	Order No.	Pcs./Pkt.
SD card with multiplexer software for ILC 131 ETH	SD FLASH 512MB MODULAR MUX	2701872	1
Inline controller, including accessories (connectors and marking fields)	ILC 131 ETH	2700973	1

5.2.2 Accessories

Description	Type	Order No.	Pcs./Pkt.
Combined Ethernet wireless module with Bluetooth and WLAN, internal antenna, WLAN: AP and client, 2.4 GHz and 5 GHz, Bluetooth: 2.1+EDR/4.0, PAN up to 7 connections, IP65, 9 V DC ... 30 V DC, M12 connection, WEB, AT commands and “Mode” button	FL EPA 2	1005955	1
Combined Ethernet wireless module with Bluetooth and WLAN, exchangeable omni antenna included, WLAN: AP and client, 2.4 GHz and 5 GHz, Bluetooth: 2.1+EDR/4.0, PAN up to 7 connections, IP65, 9 V DC ... 30 V DC, M12 connection, WEB, AT commands and “Mode” button	FL EPA 2 RSMA	1005957	1
Bluetooth/Ethernet wireless module, 2.1+EDR/4.0, PAN P2P, internal antenna, IP65, 9 V DC ... 30 V DC, M12 connection, WEB, AT commands and “Mode” button	FL BT EPA 2	1005869	1

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Description	Type	Order No.	Pcs./Pkt.
Network cable, Ethernet CAT5 (100 Mbps), 4-pos., PUR, RAL 5021 (water blue), shielded, straight M12 SPEEDCON / IP67 connector (D-coding) to straight RJ45 / IP20 connector, cable length: 1 m	NBC-MSD/1,0-93E/R4AC SCO	1407360	1
Network cable, Ethernet CAT5 (100 Mbps), 4-pos., PUR, RAL 5021 (water blue), shielded, straight M12 SPEEDCON / IP67 connector (D-coding) to straight RJ45 / IP20 connector, cable length: 2 m	NBC-MSD/2,0-93E/R4AC SCO	1407361	1
Network cable, Ethernet CAT5 (100 Mbps), 4-pos., PUR, RAL 5021 (water blue), shielded M12 SPEEDCON / IP67 connector (D-coding) to straight RJ45 / IP20 connector, cable length: 5 m	NBC-MSD/5,0-93E/R4AC SCO	1407362	1

5.2.3 Documentation

Description	Type	Order No.	Pcs./Pkt.
User manual, English, Installing and operating the ILC 131 ETH, ILC 151 ETH, ILC 171 ETH 2TX, ILC 191 ETH 2TX, ILC 131 ETH/XC and ILC 151 ETH/XC Inline controllers	UM EN ILC 1X1	–	1
Data sheets for the Inline terminals used	DB EN IB IL...	–	1
User manual, English, Configuring and installing the INTERBUS Inline product range	IB IL SYS PRO UM E	–	1
User manual, English Automation terminals of the Inline product range	IL SYS INST UM E	–	1
Application note, English Using the SD FLASH 512MB MODULAR MUX multiplexer system in conjunction with SafetyBridge technology	AH EN SD FLASH 512MB MODULAR MUX SAFETYBRIDGE	–	1

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A Technical appendix

A 1 Digital I/Os and diagnostic and status indicators

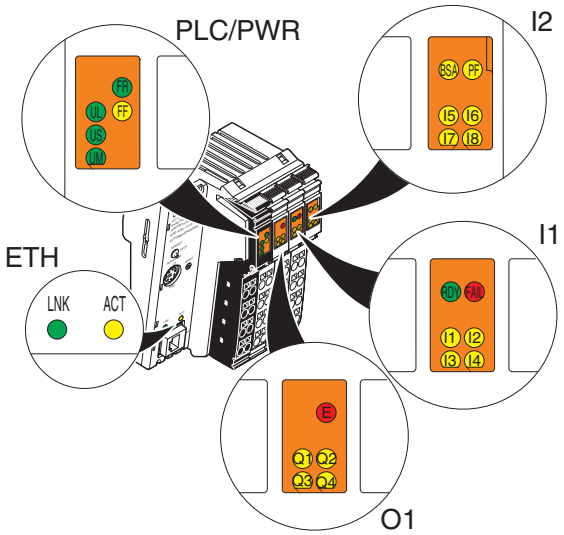

Figure A-1 Diagnostic and status indicators of the Inline controller

Table A-1 Diagnostic and status indicators of the Inline controller

Des.	Color	Status	Meaning
ETH: state of the Ethernet interface			
LNK	Green	Off	Connection not established successfully
		On	Connection established successfully (Link): the Inline controller is able to contact another network device.
ACT	Yellow	Off	Data transmission not active
		On	Data transmission active (Activity): the Ethernet interface is sending or receiving data.

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Table A-1 Diagnostic and status indicators of the Inline controller

Des.	Color	Status	Meaning
PLC: Inline controller diagnostics			
FR	Green		Inline controller running
		Off	IEC 61131 runtime system not ready to operate.
		Flashing	IEC 61131 runtime system successfully initialized. Controller in READY/STOP mode, program not being executed.
		On	IEC 61131 runtime system successfully initialized and program running. The controller is in RUN mode.
FF	Yellow		Failure
		On	A runtime error has occurred in the IEC 61131 runtime system program.
		Off	No runtime error has occurred in the IEC 61131 runtime system program.
PWR: supply voltage			
UL	Green		24 V supply U_{ILC} for generating voltages U_L and U_{ANA}
		Off	Supply voltage is not present.
		On	Supply voltage is present (the presence of the 24 V supply voltage U_{ILC} is indicated)
US	Green		24 V supply for segment circuit
		Off	Supply voltage is not present.
		On	Supply voltage is present.
UM	Green		24 V supply for main circuit
		Off	Supply voltage is not present.
		On	Supply voltage is present.
IL: INTERBUS diagnostics			
RDY	Green		INTERBUS master ready to operate/data transmission active (INTERBUS ready/running)
		Off	The INTERBUS master is not ready to operate.
		Flashing	The INTERBUS master is in READY or ACTIVE mode.
		On	The INTERBUS master is in RUN mode.
FAIL	Red		Failure
		Off	No error occurred:
		On	One of the following errors has occurred: – Bus error in the connected bus (remote bus/local bus) – Controller error
BSA	Yellow		Bus segment aborted
		Off	Bus segment(s) in the connected bus not switched off.
		On	One or more bus segments in the connected bus are switched off.
PF	Yellow		Peripheral fault
		Off	No peripheral fault on a device in the connected bus
		On	Peripheral fault on a device in the connected bus (local bus or remote bus)

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Table A-1 Diagnostic and status indicators of the Inline controller

Des.	Color	Status	Meaning
I/O: digital inputs and outputs			
I1 to I8	Yellow		Inputs 1 to 8
		Off	Corresponding input is not set.
		On	Corresponding input is set.
E	Yellow		Error
		Off	No short circuit/overload at one output/several outputs
		On	Short circuit/overload has occurred at one or more of the outputs 1 to 4.
Q1 to Q4	Yellow		Outputs 1 to 4
		Off	Corresponding output is not set.
		On	Corresponding output is set.

Table A-2 Diagnostic indicator on the IB IL 24 LPSDO 8 V2-PAC and IB IL 24 PSDI 8-PAC SafetyBridge modules

LED	IB IL 24 LPSDO 8 V2-PAC	IB IL 24 PSDI 8-PAC	Meaning
P	Off	Off	No safe communication
	On	On	Secure communication
	Flashing	Flashing	Acknowledgment required A network error occurred.
	Flashing	Off	No safe communication A network error has occurred.

Table A-3 Function description of the digital outputs

Output	Internal designation	Associated LED	Meaning
Q1	ONBOARD_OUTPUT_BIT0	Flashes at 1 Hz (1 s clock)	Device error on an INTERBUS device in the connected bus (analog modules)
		Flashes at 4 Hz (250 ms clock)	Error on the slave (bus error, fault, system failure, etc.)
Q2	ONBOARD_OUTPUT_BIT1	Flashes at 1 Hz (1 s clock)	Error when setting/reading the IP address
		Flashes at 4 Hz (250 ms clock)	Error when reading/starting the bus configuration

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Table A-3 Function description of the digital outputs

Output	Internal designation	Associated LED	Meaning
Q3	ONBOARD_OUTPUT_BIT2	Flashes at 1 Hz (1 s clock)	Error when establishing the communication (no connection)
		Flashes at 2 Hz (500 ms clock)	Error when sending or receiving data
		Flashes at 4 Hz (250 ms clock)	SafetyBridge communication breakdown
		Flashes at 8 Hz (125 ms clock)	"Manual" operating mode: Manual acknowledgment via I7 required
			"Automatic" operating mode: Automatic acknowledgment Message can be acknowledged via I7.
Q4	ONBOARD_OUTPUT_BIT3	Flashes at 1 Hz (1 s clock)	Bus length of the master does not match the bus length of the slave.
		Flashes at 4 Hz (250 ms clock)	Bus configuration of the master does not match the bus configuration of the slave.

Table A-4 Function description of the digital inputs

Input	Internal designation	Function	Actuation
I1	ONBOARD_INPUT_BIT0	Configuration 0 = slave 1 = master	Via fixed wiring
I2	ONBOARD_INPUT_BIT1	Configuration of manual or automatic acknowledgment of a SafetyBridge communication error; TRUE = automatic, FALSE = manual	Via fixed wiring The I2 assignment must be set identically for master and slave.
		WARNING: Risk of injury due to unexpected machine start-up Automatic acknowledgment of a SafetyBridge communication error may cause an unexpected machine startup. • If you do not want the machine to start up/restart automatically, configure the safety logic accordingly.	
I5	ONBOARD_INPUT_BIT4	Selection for IP address settings (0 = automatic/1 = manual)	Via fixed wiring

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Table A-4 Function description of the digital inputs

Input	Internal designation	Function	Actuation
I7	ONBOARD_INPUT_BIT6	“Manual” operating mode: Acknowledgment of a SafetyBridge communication error “Automatic” operating mode: Acknowledgment of Q3 message	Button
I8	ONBOARD_INPUT_BIT7	ILC 131 ETH cold restart Reading in the bus configuration, see Section “Reading in the bus configuration” on page 15	Button

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A 2 Configuring the Inline input terminals and Inline output terminals

Numerous digital and analog input and output terminals from the Inline Modular product line can be connected to the Inline controller. Suitable terminals are indicated on the Internet at phoenixcontact.net/products with the following logo:

The table below lists possible combinations for complementary terminal arrangement:

Table A-5 Possible combinations for complementary terminal arrangement

Outputs / Inputs	IB IL 24 PWR IN/F-D-PAC	IB IL 24 PWR IN/2-F-D-PAC	IB IL 24 SEG/F-D-PAC	IB IL 120 DI 1-PAC	IB IL 230 DI 1-PAC	IB IL 24 DI 2-PAC	IB IL 24 DI 2-NPN-PAC	IB IL 24 DI 4-PAC	IB IL 24 DI 8-PAC	IB IL 24 DI 8 T2-PAC	IB IL 24 DI 16-PAC	IB IL 24 DI 32/HD-PAC	IB IL AI 2/SF-PAC	IB IL AI 2/SF-230-PAC	IB IL 24 SAFE 1-PAC
IB IL DO 1 AC-PAC	(1)+	(1)+	(1)+	1	1	1	1	–	–	–	–	–	–	–	–
IB IL 24 DO 2-PAC	2	2	2	1	1	2	2	–	–	–	–	–	–	–	2
IB IL 24 DO 2-2A-PAC	2	2	2	1	1	2	2	–	–	–	–	–	–	–	2
IB IL 24 DO 2-2A-NPN-PAC	2	2	2	1	1	2	2	–	–	–	–	–	–	–	2
IB IL 24 DO 4-PAC	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–
IB IL 24 DO 8-PAC	–	–	–	–	–	–	–	–	8	8	–	–	–	–	–
IB IL 24 DO 8-2A-PAC	–	–	–	–	–	–	–	–	8	8	–	–	–	–	–
IB IL 24 DO 16-PAC	–	–	–	–	–	–	–	–	–	–	16	–	–	–	–
IB IL 24 DO 32/HD-PAC	–	–	–	–	–	–	–	–	–	–	–	32	–	–	–
IB IL 24/230 DOR 1/W-PAC	(1)+	(1)+	(1)+	1	1	1	1	–	–	–	–	–	–	–	–
IB IL 24/230 DOR 1/W-PC-PAC	(1)+	(1)+	(1)+	1	1	1	1	–	–	–	–	–	–	–	–
IB IL 24/230 DOR 4/W-PAC	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–
IB IL 24/230 DOR 4/W-PC-PAC	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–
2 x IB IL AO 1/SF-PAC	–	–	–	–	–	–	–	–	–	–	–	–	2	2	–

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Table A-5 Possible combinations for complementary terminal arrangement

Outputs / Inputs	IB IL 24 PWR IN/F-D-PAC	IB IL 24 PWR IN/2-F-D-PAC	IB IL 24 SEG/F-D-PAC	IB IL 120 DI 1-PAC	IB IL 230 DI 1-PAC	IB IL 24 DI 2-PAC	IB IL 24 DI 2-NPN-PAC	IB IL 24 DI 4-PAC	IB IL 24 DI 8-PAC	IB IL 24 DI 8 T2-PAC	IB IL 24 DI 16-PAC	IB IL 24 DI 32/HD-PAC	IB IL AI 2/SF-PAC	IB IL AI 2/SF-230-PAC	IB IL 24 SAFE 1-PAC
2 x IB IL AO 1/U/SF-PAC	–	–	–	–	–	–	–	–	–	–	–	–	2	2	–
1 x IB IL AO 1/SF -PAC 1 x IB IL AO 1/U/SF-PAC	–	–	–	–	–	–	–	–	–	–	–	–	2	2	–
1 x IB IL AO 2/U/BP-PAC	–	–	–	–	–	–	–	–	–	–	–	–	2	2	–

Key:

1, 2, 4, 8, 16, 32	Number of available channels
–	Combination not possible
+	Should be operated with the IB IL 24 DO 2-PAC terminal, otherwise only the fuse and not the main voltage will be monitored.

Table A-6 Suitable terminals for the SafetyBridge system

Safe input and output modules that can be used	
IB IL 24 PSDI 8-PAC	IB IL 24 LPSDO 8-PAC
	or
	IB IL 24 LPSDO 8 V2-PAC

Observe the associated user manual.

NOTE: Not a safe application
In order to ensure correct use, subsequent safety logic (an evaluation unit) is required.

Table A-7 Permissible complementary arrangement of analog terminals

Analog range	Modules to be used
0 V ... 10 V	1 x IB IL AI 2/SF ↔ 1 x IB IL AO 1/SF
0 V ... 10 V	1 x IB IL AI 2/SF ↔ 2 x IB IL AO 1/SF
0 V ... 10 V	1 x IB IL AI 2/SF ↔ 1 x IB IL AO 1/U/SF
0 V ... 10 V	1 x IB IL AI 2/SF ↔ 2 x IB IL AO 1/U/SF
0 V ... 10 V	1 x IB IL AI 2/SF ↔ 1 x IB IL AO 1/SF and 1 x IB IL AO 1/U/SF

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Table A-7 Permissible complementary arrangement of analog terminals

Analog range	Modules to be used
0 mA ... 20 mA	1 x IB IL AI 2/SF ↔ 1 x IB IL AO 1/SF
0 mA ... 20 mA	1 x IB IL AI 2/SF ↔ 2 x IB IL AO 1/SF
4 mA ... 20 mA	1 x IB IL AI 2/SF ↔ 1 x IB IL AO 1/SF
4 mA ... 20 mA	1 x IB IL AI 2/SF ↔ 2 x IB IL AO 1/SF
±10 V	1 x IB IL AI 2/SF ↔ 1 x IB IL AO 2/U/BP

The onboard terminals of the Inline controller are only used for configuration purposes, they are not available as I/O terminals.

A 3 INTERBUS

Both Inline input terminals and Inline output terminals are connected to the ILC 131 ETH using INTERBUS.

Number of I/O points	max. 4096
Number of bus segments	max. 63
Transmission speed	500 kbps

Only use Inline terminals with a uniform transmission speed in the entire connected Inline system (local bus and remote bus).

A 4 Network interface

1 x Ethernet 10/100Base-T(X)

Speed	10 Mbps (10Base-T), 100 Mbit (100Base-TX), half duplex, full duplex, auto negotiation.
Connection technology	CAT5 twisted pair cable Twisted pair cable with a conductor cross section of 0.14 mm^2 to 0.22 mm^2 8-pos. RJ45 female connector

Owing to the configuration of the Inline controllers as master and slave (see Section 3.1.4 and Section 3.3.3), the default IP addresses are automatically assigned to the Inline controllers during the first startup of the multiplexer system. These addresses are required for accessing the web interface. The following table indicates the default IP addresses for both the master and slave:

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Table A-8 Default IP addresses (factory settings) - after master/slave configuration

Inline controller	Configuration	Default IP address
ILC 131 ETH	Master	192.168.0.2
ILC 131 ETH	Slave	192.168.0.3

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B Appendix for document lists

B 1 List of figures

Section 3

Section 4

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Appendix A

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B 2 List of tables

Section 4

Appendix A

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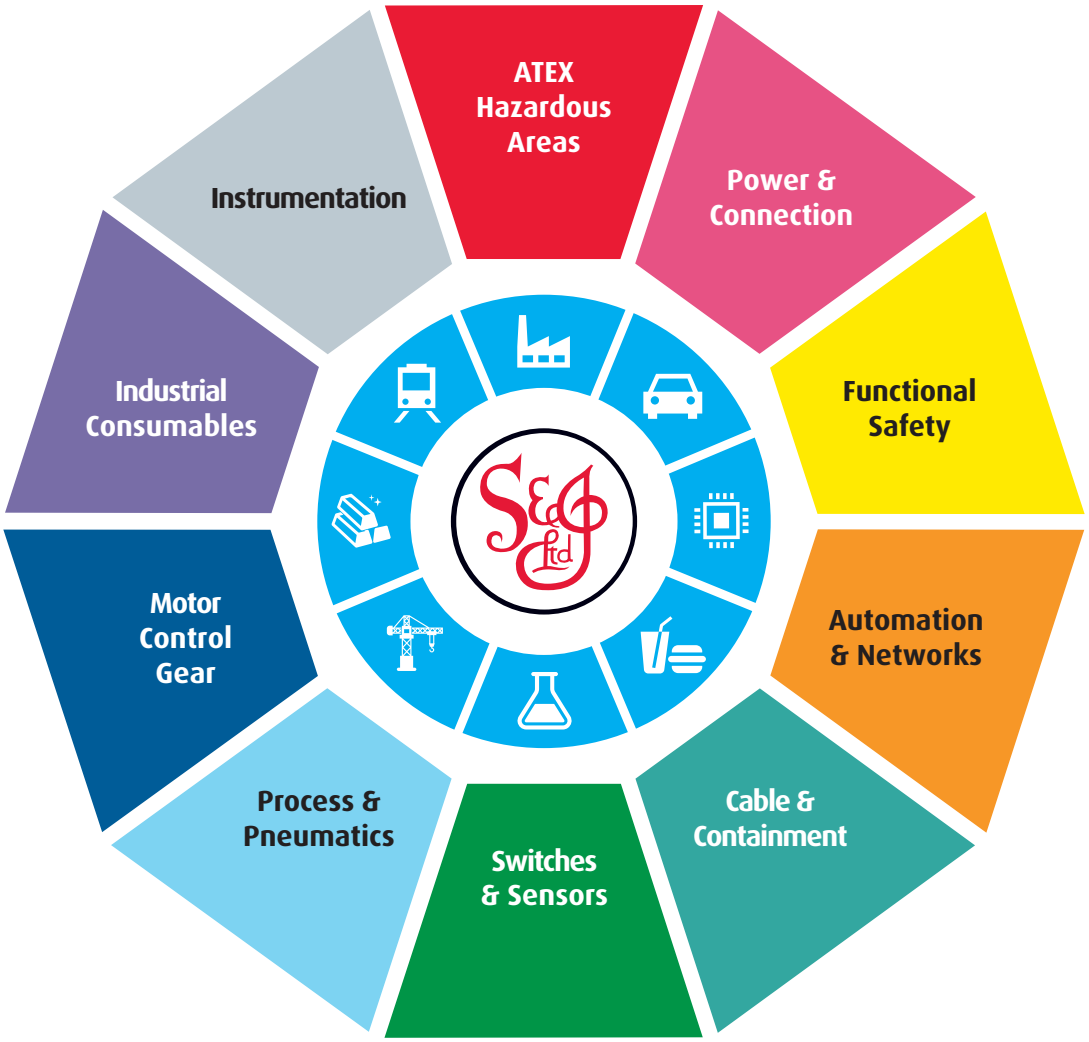

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