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User manual

UM EN ILC 1XX

Installing and operating the ILC 130 ETH,
ILC 150 ETH, ILC 155 ETH, ILC 170 ETH 2TX,
and ILC 190 ETH 2TX Inline controllers

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INSPIRING INNOVATIONS

User manual

Installing and operating the ILC 130 ETH, ILC 150 ETH, ILC 155 ETH, ILC 170 ETH 2TX, and ILC 190 ETH 2TX Inline controllers

This user manual is valid for:

Designation	Revision (HW) or later	Version (FW) or later	Order No.
ILC 130 ETH	01	3.01	2988803
ILC 150 ETH	00	2.00	2985330
ILC 155 ETH	01	2.04	2988188
ILC 170 ETH 2TX	01	3.00	2916532
ILC 190 ETH 2TX	00	3.70	2700527

Please observe the following notes

User group of this manual

The use of products described in this manual is oriented exclusively to qualified electricians or persons instructed by them, who are familiar with applicable standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.

Explanation of symbols used and signal words

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety measures that follow this symbol to avoid possible injury or death.

There are three different categories of personal injury that are indicated with a signal word.

DANGER This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING This indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

This symbol together with the signal word **NOTE** and the accompanying text alert the reader to a situation which may cause damage or malfunction to the device, hardware/software, or surrounding property.

This symbol and the accompanying text provide the reader with additional information or refer to detailed sources of information.

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Table of contents

1 Introduction

1.1 Purpose of this manual

This manual helps you to start up and operate the following Inline controllers:
– ILC 130 ETH,
– ILC 150 ETH,
– ILC 155 ETH,
– ILC 170 ETH 2TX or
– ILC 190 ETH 2TX.

1.2 Hardware and software requirements

HW/SW	Description				
Inline controller	**ILC 130 ETH**	**ILC 150 ETH**	**ILC 155 ETH**	**ILC 170 ETH 2TX**	**ILC 190 ETH 2TX**
Parameterization memory, plug-in	No	No	No	For the ordering data, see Section "Accessories" on page 5-8	For the ordering data, see Section "Accessories" on page 5-8
Ethernet cable	Ethernet cable for connecting the Inline controller to a PC				
Connecting cable	Connecting cable for connecting the Inline controller to a PC (V.24 (RS-232) cable, optional)				
Automation software versions (Service Pack = SP)					
PC Worx	$\geq$ 5.20 SP3 ****	$\geq$ 5.10 SP 1 *	$\geq$ 5.20 **	$\geq$ 5.20 SP 2 ***	$\geq$ 6.10 SP 1 *****
PC Worx Express	$\geq$ 5.20 SP 3 ****	$\geq$ 5.20 **	$\geq$ 5.20 **	$\geq$ 5.20 SP 2 ***	$\geq$ 6.10 SP 1 ***

* Part of the AUTOMATIONWORX Software Suite 2007 1.30 Service Pack 1

** Part of the AUTOMATIONWORX Software Suite 2008 1.40

*** Part of the AUTOMATIONWORX Software Suite 2008 1.40 Service Pack 2

**** Part of the AUTOMATIONWORX Software Suite 2008 1.40 Service Pack 3

***** Part of the AUTOMATIONWORX Software Suite 2007 1.60 Service Pack 1

	For the ordering data for hardware, software, and additional documentation, please refer to Section "Technical data and ordering data" on page 5-1.

PROFINET IO device functions

ℹ️ **ILC 170 ETH 2TX and ILC 190 ETH 2TX**

Please observe that the PROFINET IO device functions of these controllers are only available with the following software versions or later:

ILC 170 ETH 2TX   PC Worx Version 6.00 Service Pack 2 or later (part of the AUTOMATIONWORX Software Suite 2009 1.50 Service Pack 2)

ILC 190 ETH 2TX   PC Worx Version 6.10 Service Pack 1 or later (part of the AUTOMATIONWORX Software Suite 2010 1.60 Service Pack 1)

The PC Worx Express software does not support this function.

2 Description of the Inline controller

2.1 General description of the Inline controller

The Inline controller is a compact controller with integrated Ethernet and INTERBUS connections.

ℹ️ The ILC 130 ETH, ILC 150 ETH, ILC 155 ETH,ILC 170 ETH 2TX, and ILC 190 ETH 2TX Inline controllers have the same appearance and numerous identical functions.

The main difference lies in the varying memory sizes, which are available to the user.

The ILC 150 ETH and ILC 155 ETH Inline controllers are approved for use in zone 2 potentially explosive areas. Observe the notes in Section 2.3 on page 2-7.

The ILC 170 ETH 2TX and ILC 190 ETH 2TX Inline controllers also have a second Ethernet interface and a slot for an SD memory card (parameterization memory).

In the following, the term Inline controller is used in general. Differences between the various controllers are particularly mentioned where necessary.

For additional information about the different memory sizes, please refer to Section 5.1, "Technical data" from page 5-1 onwards.

IEC 61131 control performance

The Inline controller is continuously configured and programmed in accordance with IEC 61131 using the automation software PC Worx. PC Worx can be operated via the network (Ethernet). The powerful processor can be programmed in all five IEC 61131 programming languages and ensures quick control task processing.

Integrated Ethernet connection

The integrated Ethernet connection (using twisted pair cable) provides for the Ethernet connectivity. Throughout the Ethernet network, the Inline controller can be accessed via Ethernet and TCP/IP or UDP/IP. A standardized Ethernet interface is available for each of the ILC 130 ETH, ILC 150 ETH, and ILC 155 ETH Inline controllers. The ILC 170 ETH 2TX and ILC 190 ETH 2TX controllers have two fully implemented Ethernet connections, which are switched inside the device.

Integrated communication functions enable direct and effective data exchange via Ethernet. The Ethernet network provides universal options for communicating with the Inline controller. Using the send and receive communication blocks, information, e.g.,necessary coupling variables, can be exchanged between Inline controllers via Ethernet. This enables distributed, modular automation solutions to be configured.

The existing IEC 61131-5 blocks have thus been extended to include a transparent TCP/IP mode and a transparent UDP/IP mode.

When using the AX OPC server provided in the AUTOMATIONWORX Software Suite Version 1.30 or later, Inline controller data is available in the Ethernet network in a standardized format and can be used for the different visualization Inline packages.

PROFINET IO device functions (ILC 170 ETH 2TX and ILC 190 ETH 2TX)

The PROFINET protocol can additionally be used via the Ethernet interfaces of the ILC 170 ETH 2TX and ILC 190 ETH 2TX Inline controllers. In this case, the Inline controllers can be used as a PROFINET IO device. This function is only available with the following device and software versions or later:

ILC 170 ETH 2TX	Hardware "02"/Firmware "3.5x" or later, together with the PC Worx software, Version 6.00 Service Pack 2 or later
ILC 190 ETH 2TX	Hardware "00"/Firmware "3.70" or later, together with the PC Worx software, Version 6.10 Service Pack 1 or later

> **i** Please refer to Section "ILC 170 ETH 2TX (ILC 190 ETH 2TX) as a PROFINET IO device" on page 3-5 for information on how to configure the ILC 170 ETH 2TX or ILC 190 ETH 2TX Inline controllers as a PROFINET IO device with the PC Worx software.

Integrated INTERBUS connection

An Inline local bus as well as an INTERBUS remote bus can be connected via the INTERBUS connection. In this way you can create a complete INTERBUS system (maximum of 4 remote bus levels) using the Inline controller as the distributed control system.

The I/O level is connected to the Inline controller using INTERBUS.

> **i** Please note that the ILC 130 ETH does not support connection of the INTERBUS remote bus.

V.24 (RS-232) interface

This interface can be used to **either** assign the IP address of the Inline controller and to access the controller using the Diag+ diagnostic tool **or** to communicate with serial I/O devices via function blocks.

> **i** The Inline controller cannot be programmed via the V.24 (RS-232) interface.

Parameterization memory/SD card (ILC 170 ETH 2TX and ILC 190 ETH 2TX)

The ILC 170 ETH 2TX and ILC 190 ETH 2TX Inline controllers have a plug-in parameterization memory in the form of an SD card. This memory can be used to save programs and configurations, which belong to your project, e.g., the visualization project.

> **i** The parameterization memory is not supplied as standard with the ILC 170 ETH 2TX and ILC 190 ETH 2TX Inline controllers. Use only a parameterization memory provided by Phoenix Contact (for the ordering data, see Section "Accessories" on page 5-8).

> **(!)** **NOTE: Parameterization memory (SD card) – formatting note**
> The SD card is preformatted and designed for use with Phoenix Contact devices. Ensure that the SD card is not reformatted.

2.2 Possible fields of application of the Inline controller

2.2.1 ILC 130 ETH

The **ILC 130 ETH** Inline controller can be used as a distributed control system of an Inline station, which is connected to an Ethernet system. An Inline local bus (Figure 2-1) can then be connected to the Inline controller.

Inline local bus

Ethernet   7805A020
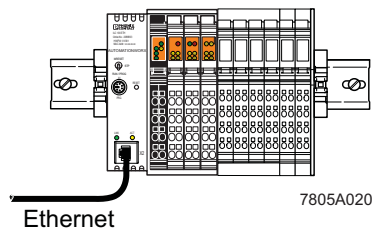
Figure 2-1   Connected Inline local bus

> ℹ️ Please note that the ILC 130 ETH does not support connection of the INTERBUS remote bus.

2.2.2 ILC 150 ETH, ILC 155 ETH, ILC 170 ETH 2TX, and ILC 190 ETH 2TX

The Inline controllers (ILC 150 ETH/ILC 155 ETH/ILC 170 ETH 2TX/ILC 190 ETH 2TX) can be used as a distributed control system of an Inline station, which is connected to an Ethernet system. A single Inline local bus (Figure 2-2) as well as a complete INTERBUS system with a maximum of 4 remote bus levels (Figure 2-3) can be connected to the Inline controller.
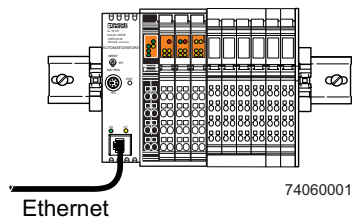
Inline local bus

Ethernet   74060001

Figure 2-2   Connected Inline local bus

Remote bus levels
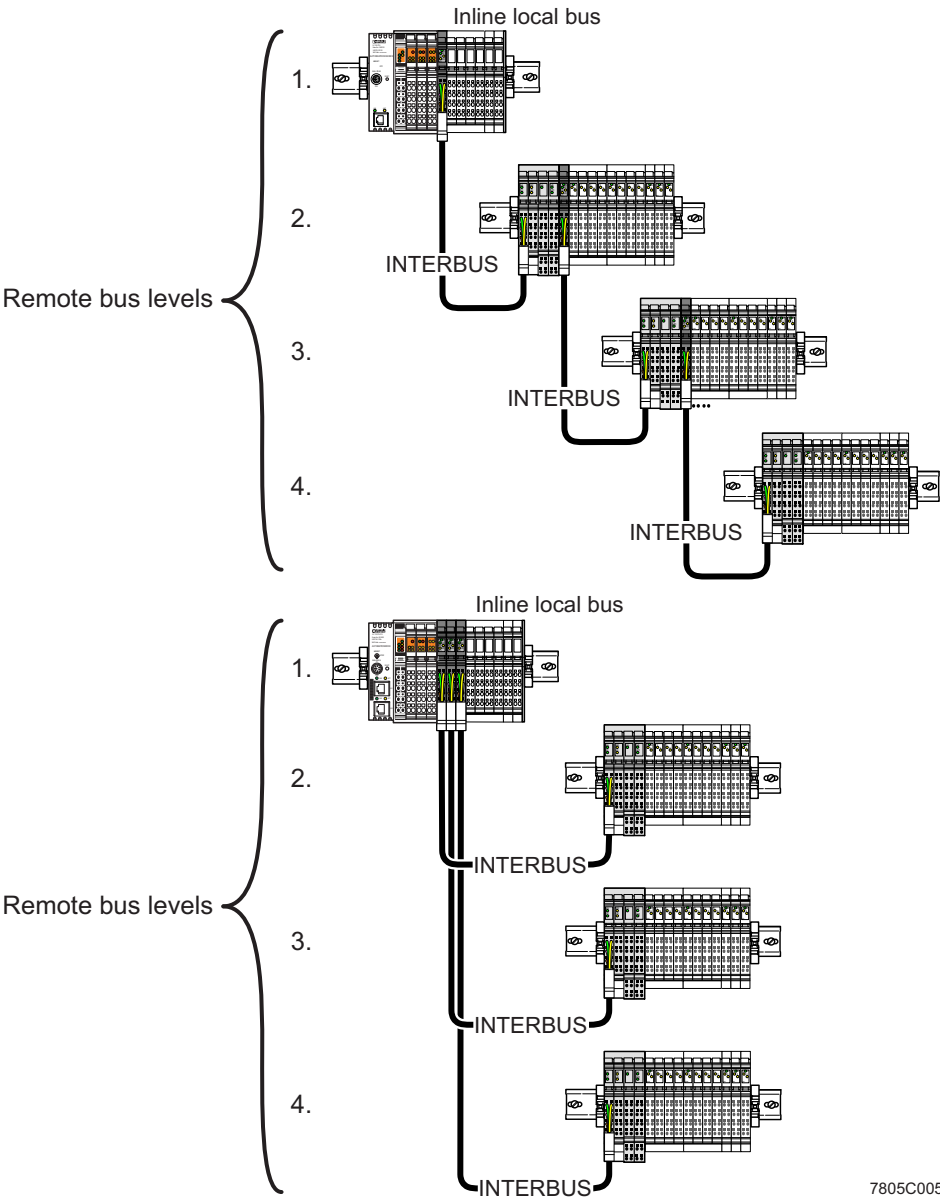
Figure 2-3   Remote bus levels

2.2.3 ILC 170 ETH 2TX and ILC 190 ETH 2TX as a PROFINET IO device in a PROFINET network

The following figure shows the example of a ILC 170 ETH 2TX as a PROFINET IO device in a PROFINET network.
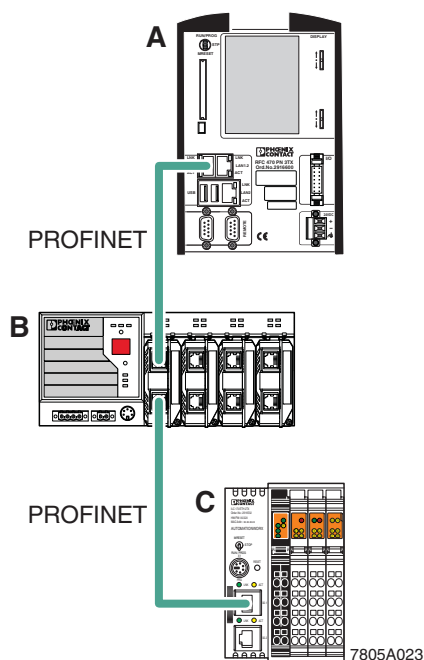
Figure 2-4   PROFINET IO device using the example of the ILC 170 ETH 2TX

Key:

A   PROFINET IO controller (in the example RFC 470 PN 3TX Remote Field Controller)

B   Managed switch

C   PROFINET IO device (in the example: ILC 170 ETH 2TX)

For additional information on how to integrate the ILC 170 ETH 2TX and ILC 190 ETH 2TX Inline controllers as a PROFINET IO device in a PROFINET network, please refer to Section "ILC 170 ETH 2TX (ILC 190 ETH 2TX) as a PROFINET IO device" on page 3-5.

2.2.4 Applicative system redundancy with ILC 170 ETH 2TX or ILC 190 ETH 2TX

The following figure shows an example of applicative system redundancy. The example shows an IO device with control function (ILC 170 ETH 2TX) that is connected with a switch to a PROFINET network. Identical application programs run on both higher-level IO controllers. To achieve synchronization both IO controllers are connected with a switch over an Ethernet connection. IO controller A functions as a primary IO controller, IO controller B functions as a backup IO controller.

The ILC 190 ETH 2TX also supports applicative system redundancy.

Controllers with applicative (programmed) redundancy

Network redundancy with Media Redundancy Protocol (MRP)

IO devices with Phoenix Redundancy Layer
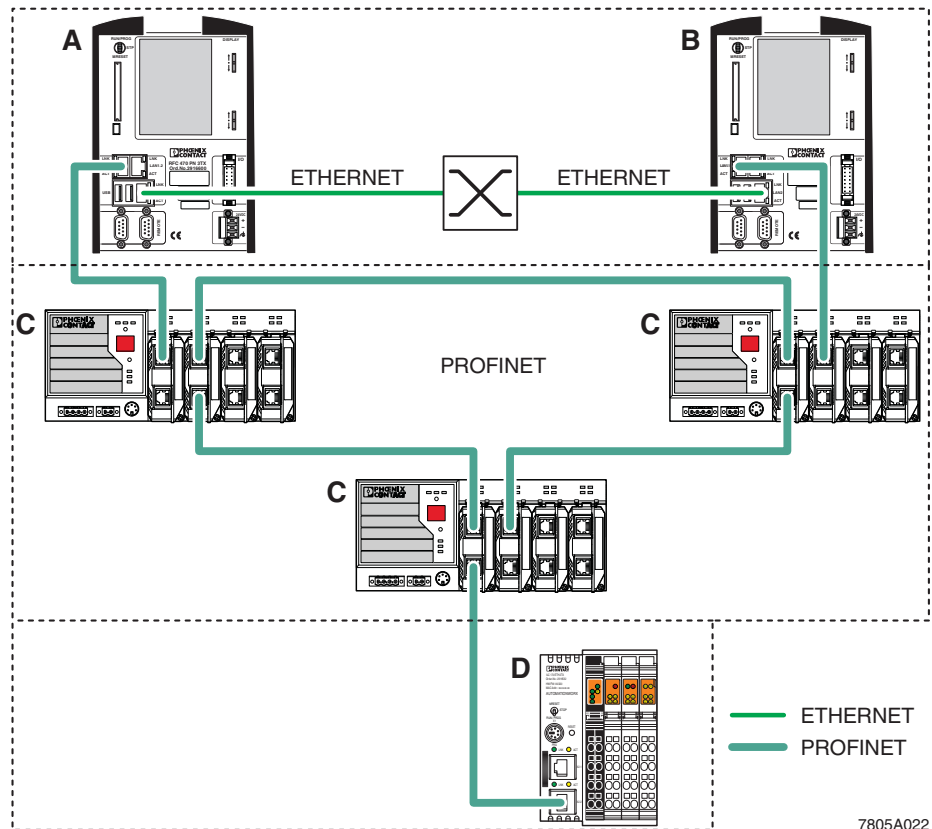
Figure 2-5   Applicative system redundancy – An example

For further information on applicative system redundancy, please refer to the AH EN APPLICATIVE SYSTEM REDUNDANCY. This application note can be downloaded at www.phoenixcontact.net/catalog.

A   Primary IO controller (in the example: RFC 470 PN 3TX Remote Field Controller)
B   Backup IO controller (in the example: RFC 470 PN 3TX Remote Field Controller)
C   Managed switches
D   IO device with control function
     (in the example: ILC 170 ETH 2TX with IO device function and
     Phoenix Redundancy Layer)

2.3 Notes on using the Inline controller (ILC 150 ETH/ILC 155 ETH) in potentially explosive areas

Approval according to EC directive 94/9 (ATEX) ⟨Ex⟩ II 3G Ex nAC II T4 X

The Inline controller (ILC 150 ETH/ILC 155 ETH) conforms to the requirements of protection type "n" and can be installed in a zone 2 potentially explosive area. The Inline controller (ILC 150 ETH/ILC 155 ETH) is a category 3G item of electrical equipment.

⚠️ **WARNING: Explosion hazard**
Only Inline terminals that are approved for use in potentially explosive areas may be snapped onto the Inline controller.

Before using an Inline terminal in a zone 2 potentially explosive area, first check that the terminal has been approved for installation in this area.

For a list of terminals approved for zone 2 potentially explosive areas, please refer to the AH EN IL EX ZONE 2 application note.

Check the labeling on the Inline terminal and the packaging (see Figure 2-6).

Figure 2-6   Typical labeling of terminals for use in potentially explosive areas

⚠️ **WARNING: Explosion hazard**

Prior to startup, make sure that the following points and instructions are observed.

1. When working on the Inline controller, always disconnect the supply voltage.
2. The Inline controller must only be installed, started up, and maintained by qualified specialist personnel.
3. Mount the Inline controller in a control cabinet or metal housing. The minimum requirement for both items is IP54 protection according to EN 60529.
4. The Inline controller must not be subject to mechanical strain and thermal loads, which exceed the limits specified in the product documentation.
5. The Inline controller must not be repaired by the user. Repairs may only be carried out by the manufacturer. The Inline controller is to be replaced by an approved controller of the same type.
6. Only category 3G equipment may be connected to Inline controllers in zone 2.
7. Observe all applicable standards and national safety and accident prevention regulations for installing and operating equipment.

Restrictions

⚠️ **WARNING:** Explosion hazard

When using the controller in potentially explosive areas, observe the technical data and limit values specified in the corresponding documentation (user manual, package slip).

⚠

WARNING: Explosion hazard, restrictions regarding the Inline system

– Please make sure that the **maximum permissible current of 4 A** flowing through potential jumpers U_M and U_S (total current) is not exceeded when using the Inline terminals in potentially explosive areas.

2.4 Unpacking the Inline controller

The Inline controller is supplied in an ESD bag together with a package slip with installation instructions. Please read the complete package slip carefully before unpacking the Inline controller.

NOTE: Electrostatic discharge

The Inline controller contains components, which may be damaged or destroyed by electrostatic discharge. When handling the Inline controller, observe the necessary safety precautions against electrostatic discharge (ESD) according to EN 61340-5-1.

NOTE:

To avoid possible damage to the Inline controller, unpack and pack the controller in accordance with the ESD regulations.

2.5 Connection and operating elements

**ILC 130 ETH, ILC 150 ETH,
ILC 155 ETH**

Figure 2-7   Structure of the Inline controller (ILC 130 ETH, ILC 150 ETH, ILC 155 ETH; shown in the figure: ILC 150 ETH)

The Inline controller consists of the following components:

1 Electronics base
2 Mode selector switch
3 Reset button
4 V.24 (RS-232) interface
5 Ethernet connection
6 Connector 1: terminal points for voltage supply
7 Connector 2: output terminal points
8 Connectors 3 and 4: input terminal points
9 Diagnostic and status indicators
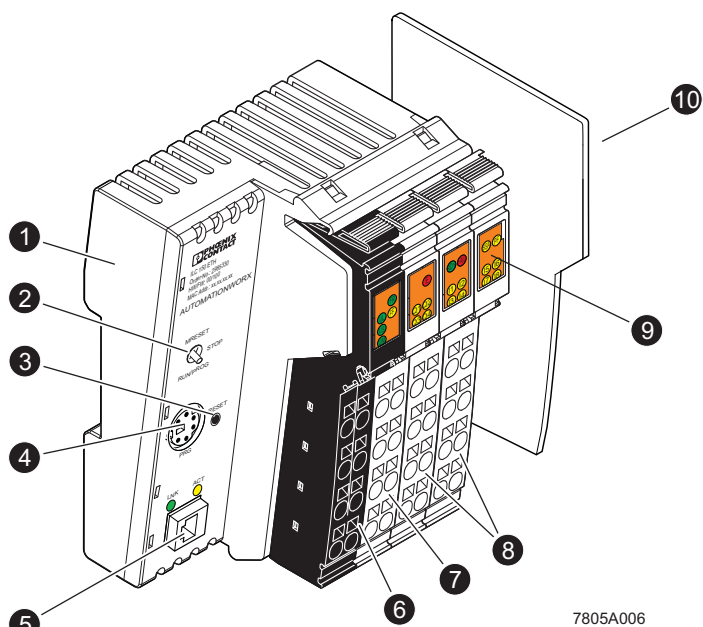**10** End plate
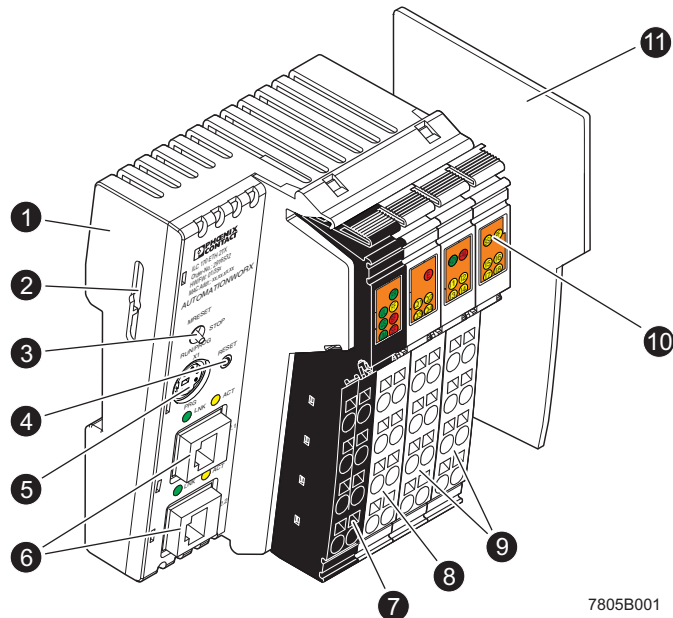
ILC 170 ETH 2TX,
ILC 190 ETH 2TX

Figure 2-8   Structure of the Inline controller (ILC 170 ETH 2TX, ILC 190 ETH 2TX; shown in the figure: ILC 170 ETH 2TX)

The Inline controller consists of the following components:

1   Electronics base

2   Slot for the parameterization memory/card holder (SD card).

> **i**   The SD card is not supplied as standard with the ILC 170 ETH 2TX/ILC 190 ETH 2TX Inline controllers.
>
> Please refer to the ordering data in Section "Accessories" on page 5-8.

3   Mode selector switch

4   Reset button

5   V.24 (RS-232) interface (X1)

6   Ethernet interfaces (X2.1/X2.2)

7   Connector 1: terminal points for voltage supply

8   Connector 2: output terminal points

9   Connectors 3 and 4: input terminal points

10   Diagnostic and status indicators

11   End plate
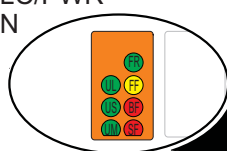
2.6   Diagnostic and status indicators

ℹ️ The descriptions for diagnostic and status indicators apply to all the Inline controllers listed on the inner cover page of this manual.

The diagnostic and status indicators are used for quick local error diagnostics.
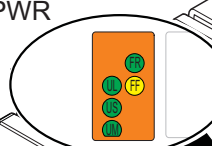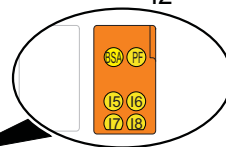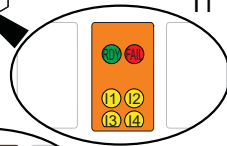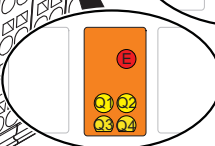

Figure 2-9   Diagnostic and status indicators

Local diagnostic and status indicators

Des.	Color	Status	Meaning
ETH: State of the Ethernet interface **(applies to both interfaces (X2.1, X2.2) for the ILC 170 ETH 2TX/ILC 190 ETH 2TX)**			
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 inactive
		ON	Data transmission (activity): The Ethernet interface transmits or receives data.
PROFINET: (ILC 170 ETH 2TX/ILC 190 ETH 2TX)			
BF	Red		Status of PROFINET IO communication/communication error (BusFail)
		OFF	The PROFINET IO controller has established an active communication connection to at least one PROFINET IO device.
		ON	No PROFINET IO communication available (no link status at the Ethernet ports).
		Flashing	No communication connection to the PROFINET IO controller, the connection is being established. Link status available.
SF	Red		System failure (PROFINET)
		OFF	PROFINET diagnostics not present.
		ON	PROFINET diagnostics present.

Des.	Color	Status	Meaning
PLC: Diagnostics of the Inline controller			
FR	Green		Inline controller running
		OFF	IEC 61131 runtime system not ready to operate.
		Flashing	IEC 61131 runtime system successfully initialized. Control function in READY/STOP state, program not processed.
		ON	IEC 61131 runtime system successfully initialized and a program is running. Control function in RUN state.
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
FR + FF		Flashing	Applies to ILC 170 ETH 2TX and ILC 190 ETH 2TX only: There is no SD card in the Inline controller.
PWR: Supply voltage (See also Section "Remote bus" on page 2-25)			
UL	Green		24 V supply U_{ILC} for generation of the voltages U_L and U_{ANA}
		OFF	Supply voltage not present
		ON	Supply voltage present (indication if 24 V supply voltage U_{ILC} present)
US	Green		24 V supply for segment circuit
		OFF	Supply voltage not present
		ON	Supply voltage present
UM	Green		24 V supply for main circuit
		OFF	Supply voltage not present
		ON	Supply voltage present
IL: INTERBUS diagnostics			
RDY	Green		INTERBUS master ready to operate/data transmission active (INTERBUS ready/running)
		OFF	INTERBUS master not ready to operate.
		Flashing	INTERBUS master in READY or ACTIVE state.
		ON	INTERBUS master in RUN state.
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.

Des.	Color	Status	Meaning
PF	Yellow		Peripheral fault
		OFF	Peripheral fault on a device in the connected bus
		ON	Peripheral fault of a device in the connected bus (local bus or remote bus)
I/O: Digital inputs and outputs			
I1 to I8	Yellow		Inputs 1 to 8
		OFF	Corresponding input not set
		ON	Corresponding input is set
E	Yellow		Error
		OFF	No short circuit/overload at one of the outputs 1 to 4
		ON	Short circuit/overload at one of the outputs 1 to 4
Q1 to Q4	Yellow		Outputs 1 to 4
		OFF	Corresponding output not set
		ON	Corresponding output is set

2.7 Mode selector switch

The mode selector switch is used to define the operating state of the application program.

The RUN/PROG and STOP positions have a toggle button function and the MRESET position a pushbutton function. After releasing the button in the MRESET position, it returns to the STOP position.

Table 2-1   Inline controller operating modes

| Operating mode	Explanation
RUN/PROG	The application program is in the RUN state.
	The PC Worx/PC Worx Express software can be used for program and configuration modifications.
	The monitoring and online functions can be used.
STOP	The application program is in the STOP state.
MRESET	Retain data and the application program are deleted.
	Set the mode selector switch in the following sequence to perform deletion of retain data and the application program:
	• Set the switch to the MRESET position for three seconds.
	• Release the switch for less than three seconds.
	• Set the switch to the MRESET position for three seconds.
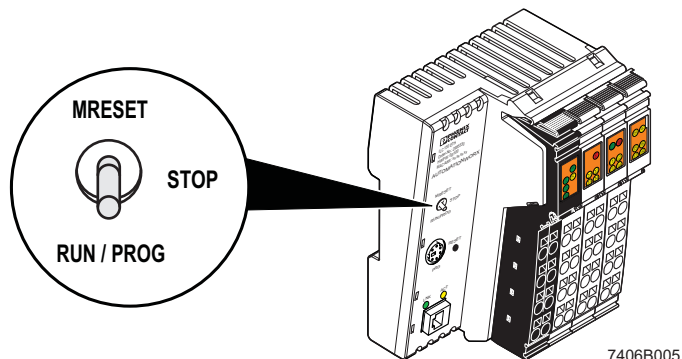
Figure 2-10   Mode selector switch

2.8   Reset button (concealed)

The reset button (see item 3 in Figure 2-7 on page 2-9 or item 4 in Figure 2-8 on page 2-10) on the Inline controller can only be operated with a pin and is therefore protected against accidental activation.

If you carry out a voltage reset at the same time as you press the reset button, this resets the Inline controller to its default settings.

Procedure

Hold down the reset button and switch the supply voltage of the Inline controller off and on again. Release the reset button only after the FR (green) and FF (yellow) LEDs flash alternately.

The Inline controller has been initialized successfully and reset to its default settings only after the FR (green) and RDY (green) LEDs are flashing. The control function is in the READY/STOP state, a program is not processed. This procedure can take up to a minute, approximately.

2.9   Parameterization memory

The parameterization memory can be used to save programs and configurations, which belong to your project. In addition, application-specific data can also be stored on the parameterization memory. See also Section "Parameterization memory and Internet Explorer" on page 3-12.

ILC 130 ETH, ILC 150 ETH, ILC 155 ETH

The ILC 130 ETH, ILC 150 ETH, and ILC 155 ETH Inline controllers have an integrated parameterization memory.

ILC 170 ETH 2TX, ILC 190 ETH 2TX

The ILC 170 ETH 2TX and ILC 190 ETH 2TX Inline controllers have a plug-in parameterization memory in the form of an SD card. This plug-in parameterization memory is essential for operating the Inline controller. The parameterization memory is available in the following size.

NOTE: It is not permitted to operate the ILC 170 ETH 2TX and ILC 190 ETH 2TX Inline controllers without parameterization memory.

The parameterization memory is recognized during initialization of the Inline controller. Ensure that the parameterization memory has been inserted before switching on the controller to enable the controller to use it.

Only insert and remove the parameterization memory when the Inline controller supply voltage is disconnected.

The parameterization memory must not be removed during operation of the Inline controller.

Use only a parameterization memory provided by Phoenix Contact (for the ordering data, see Section "Accessories" on page 5-8).

NOTE: Parameterization memory (SD card) – formatting note

The SD card is preformatted and designed for use with Phoenix Contact devices. Ensure that the SD card is not reformatted.