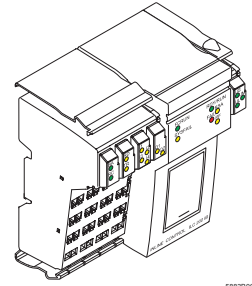


ILC 200 IB ILC 200 IB-PAC

Inline Controller with Programming Capabilities According to IEC 61131-3



Data Sheet 5883C04

07/2010

5883B001



ILC 200 IB and ILC 200 IB-PAC only differ in the scope of supply (see "Ordering Data" on page 20). Their function and technical data are identical.

For greater clarity, the Order Designation ILC 200 IB is used throughout this document.



This data sheet is only valid in association with the IB IL SYS PRO UM E User Manual, order no. 27 43 04 8.

- Direct connection of Inline I/O terminals
- INTERBUS remote bus devices can be connected via branch bus terminal. (as first device)
- Four 24 V DC inputs (two thereof can be used as 5 V inputs alternatively) and two 24 V DC outputs as high speed I/Os (fast inputs and outputs).
- Function modules for parameterizing the high speed inputs.



For further technical details please refer to the ILC 200 IB UM E user manual, order no. 27 29 72 9.

Product Description

The Inline Controller is a Remote Field Controller for the Inline installation system with IEC 61131-3 programming.

Features

- Automation and control functions according to IEC 61131-3
- Configuring and Programming using the automation software PC WORX 2 or PC WORX 3
- Project and program download via INTERBUS or RS-232 interface
- Preprocessing and application program on the Inline Controller
- INTERBUS protocol (IEC 61158)
- Master/slave functionality (system coupler)
- Complete Generation 4 functionality
- Comprehensive system diagnostics
- Firmware download via RS-232
- PCP 4.x

Applications

Distributed modular automation control (function units) in machines and systems.

Internal Circuit Diagram

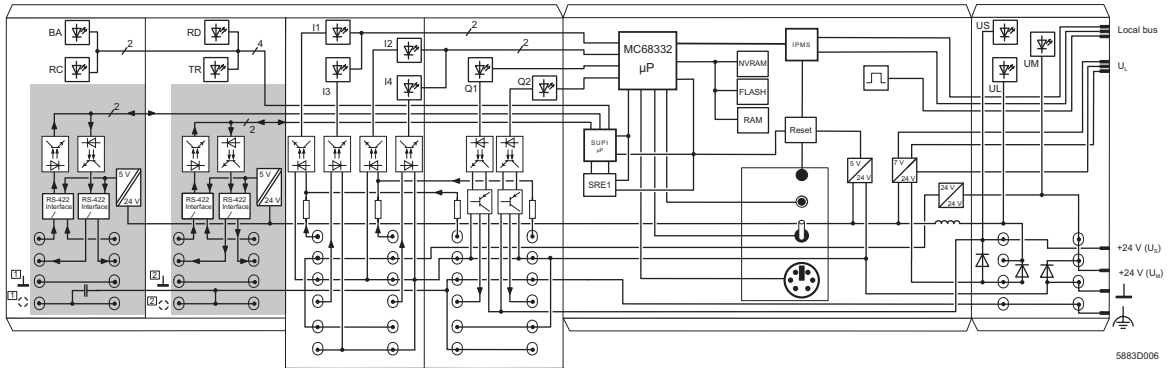
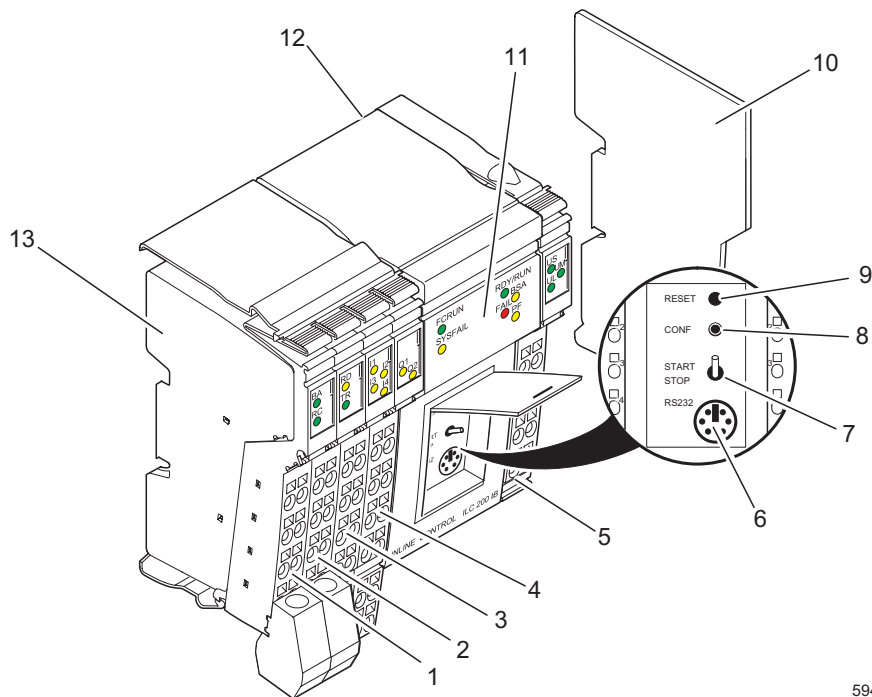


Figure 1 Internal wiring of the terminal points



The symbols are explained in the IB IL SYS PRO UM E User Manual.

Connecting and Operating Elements



5945B007

Figure 2 Structure of the ILC 200 IB

The Inline Controller consists of the following components:

- | | |
|---|--|
| 1 Connector 1: remote bus connection (INTERBUS IN) | 7 Start/Stop Switch |
| 2 Connector 2: remote bus connection (INTERBUS OUT) | 8 Configuration button |
| 3 Connector 3: input terminal points | 9 RESET button |
| 4 Connector 4: input and output terminal points | 10 End plate |
| 5 Connector 5: segment, main and ILC supply | 11 Diagnostics and status indicators |
| 6 RS-232 interface | 12 FE contact to DIN rail (right housing side, covered here) |
| | 13 Electronics base |

Local Diagnostic and Status Indicators

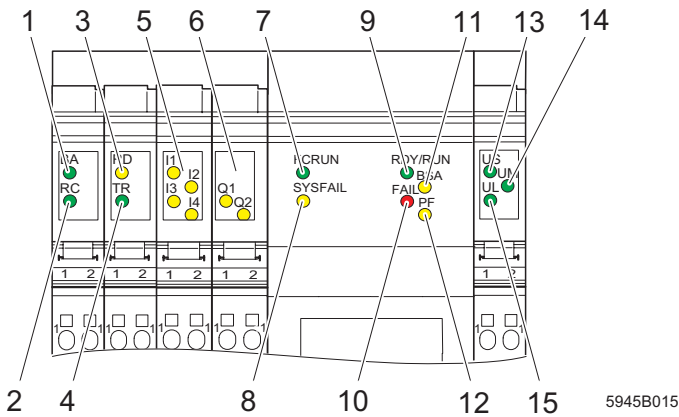


Figure 3 ILC 200 IB with appropriate connectors

Des.	Color	Meaning
BA (1)	Green LED	Remote bus active
	ON	Data transmission on INTERBUS active (Status of the higher-level controller board: Run)
	Flashing	ID cycle; no data transmission (Status of the higher-level controller board: Active)
	OFF	No data transmission
RC (2)	Green LED	Remote bus check
	ON	Higher-level controller board is connected
	OFF	Connection to the higher-level controller board interrupted or not yet established
RD (3)	Yellow LED	Remote bus disabled
	ON	Outgoing remote bus interface switched off
	OFF	Outgoing remote bus interface not switched off
TR (4)	Green LED	PCP active (transmission)
	ON	Inline Controller receiving or sending data
	OFF:	Inline Controller receiving or sending no data
I1, I2, I3, I4 (5)	Yellow LED	Input status
	ON	Corresponding input set
	OFF	Corresponding input not set
Q1, Q2 (6)	Yellow LED	Output status
	ON	Corresponding output set
	OFF	Corresponding output not set

Des.	Color	Meaning
FCRUN (7)	Green LED	Field Controller running
	ON	IEC 61131 runtime system successfully initialized and a program is running
	Flashing	IEC 61131 runtime system successfully initialized
	OFF	IEC 61131 runtime system not ready to operate
SYSFAIL (8)	Yellow LED	System failure
	ON	A runtime error has occurred in the program of the IEC 61131 runtime system; as intelligent bus terminal: higher-level bus bus stopped
	OFF	No error as intelligent bus terminal: higher-level bus bus is running
RDY/RUN (9)	Green LED	Module ready to operate/data transmission active (INTERBUS ready/ running)
	ON	Submaster in RUN state
	Flashing	Submaster in READY or ACTIVE state
	OFF	Controller board not ready to operate/no data transmission
FAIL (10)	Red LED	Controller failure
	ON	One of the following errors has occurred: - User error - I/O error - Bus error in the lower-level bus - Controller error
	OFF	None of the above mentioned errors occurred
BSA (11)	Yellow LED	Bus segment aborted
	ON	At least one bus segment in the lower-level bus disconnected
	OFF	No bus segment in the lower-level bus disconnected
PF (12)	Yellow LED	Peripheral fault
	ON	Peripheral fault on a device in the lower-level bus
	OFF	No peripheral fault in the lower-level bus
US (13)	Green LED	Segment supply
	ON	Voltage present in segment circuit
	OFF	Voltage not present in segment circuit
UM (14)	Green LED	Main supply
	ON	Voltage present in main circuit
	OFF	Voltage not present in main circuit
UL (15)	Green LED	ILC supply
	ON	Supply present (24 V controller supply/ 7.5 V communications power/interface supply, 24 V analog supply)
	OFF	Supply not present

Terminal Point Assignment

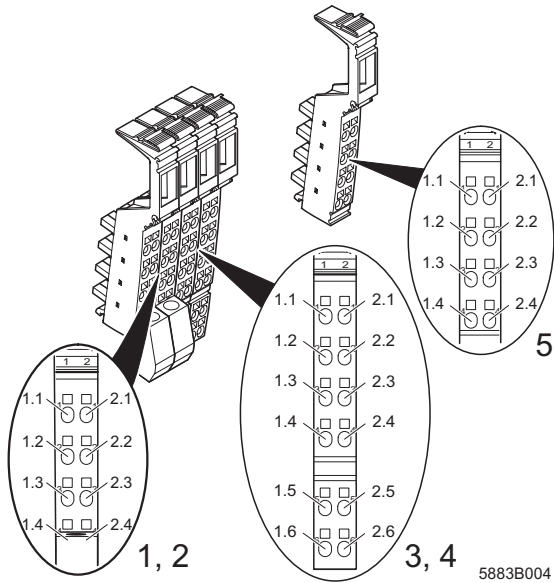


Figure 4 Terminal point assignment



The connectors are supplied with the ILC 200 IB-PAC Inline controller.

The connectors are not supplied with the ILC 200 IB Inline controller. Refer to the "Ordering Data" on page 20 for ordering the appropriate connector set.

Incoming and Outgoing Remote Bus

Terminal Point	Assignment		Wire Color/Remark
Connector 1	Incoming Remote Bus		
1.1	DO1	Receive	Wire color in the INTERBUS standard cable: green
2.1	DO1	Receive	Wire color in the INTERBUS standard cable: yellow
1.2	DI1	Send	Wire color in the INTERBUS standard cable: pink
2.2	DI1	Send	Wire color in the INTERBUS standard cable: gray
1.3	Ground		Wire color in the INTERBUS standard cable: brown
2.3	Not used		
1.4, 2.4	Shield		Connected with a capacitor to FE of the potential jumper
Connector 2	Outgoing Remote Bus		
1.1	DO2	Send	Wire color in the INTERBUS standard cable: green
2.1	DO2	Send	Wire color in the INTERBUS standard cable: yellow
1.2	DI2	Receive	Wire color in the INTERBUS standard cable: pink
2.2	DI2	Receive	Wire color in the INTERBUS standard cable: gray
1.3	Ground		Wire color in the INTERBUS standard cable: brown
2.3	RBST		
1.4, 2.4	Shield		Directly connected to FE of the potential jumper



If the outgoing remote bus interface is not used you must install a jumper (second connector). Terminal points 1.3/2.3 must be jumpered (see Figure 5).

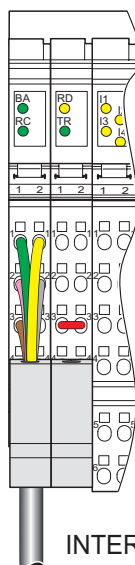


Figure 5 Jumper position

Fast Inputs and Outputs

Terminal Point	Assignment	Wire Color/Remark
Connector 3	24 V Input Terminals	
1.1	I1	Input 1
2.1	I2	Input 2
1.2	24 V (U_{MAIN})	Main circuit (initiator supply)
2.2	24 V (U_{MAIN})	Main circuit (initiator supply)
1.3	SGND	Signal ground
2.3	SGND	Signal ground
1.4	I3	Input 3
2.4	I4	Input 4
1.5	24 V (U_{MAIN})	Main circuit (initiator supply)
2.5	24 V (U_{MAIN})	Main circuit (initiator supply)
1.6	SGND	Signal ground
2.6	SGND	Signal ground
Connector 4	5 V Input Terminals and Output Terminals	
1.1	I1'	Input 1 for 5 V (either I1 or I1' to be used)
2.1	I2'	Input 2 for 5 V (either I2 or I2' to be used)
1.2	SGND	Signal ground
2.2	SGND	Signal ground
1.3	FE	Functional earth ground
2.3	FE	Functional earth ground
1.4	Q1	Output 1
2.4	Q2	Output 2
1.5	SGND	Signal ground
2.5	SGND	Signal ground
1.6	FE	Functional earth ground
2.6	FE	Functional earth ground



The maximum total current flowing through the potential jumpers is 8 A.



For further information on the high-speed inputs and outputs please refer to the ILC 200 IB UM E User Manual.

Function Blocks

Function blocks are available for input parameterization.

Overview of ILC 200 IB function blocks

Function Block	Short description
DIGITAL_IN	Reads the digital I/O channel
DIGITAL_OUT	Sets the digital I/O channel
DIO_CTU	Up counter with gate function
DIO_CTD	Down counter with gate function
DIO_EXT_CTU	Up counter with gate and additional function
DIO_EXT_CTD	Down counter with gate and additional function
DIO_PPWA	Measures pulse or period length
DIO_PWM	Creates a variable square-wave frequency
EVENT_INIT	Links an input with an event task
GET_EVENT	Reads the state of an event input



The ILC 200 IB function blocks cannot be instantiated.



Each of the four input channels can only be assigned one operating mode for program runtime. The channels are only available for other operating modes after a controller restart.



For a more detailed function block description including the technical data for the inputs and outputs in connection with the function blocks (limit frequencies, delay times, gate-controlled rise times) please refer to the ILC 200 IB UM E User Manual.



For additional information on programming the function blocks, please refer to the online help of the PC WORX 2 or PC WORX 3 automation software.

Supply Voltages

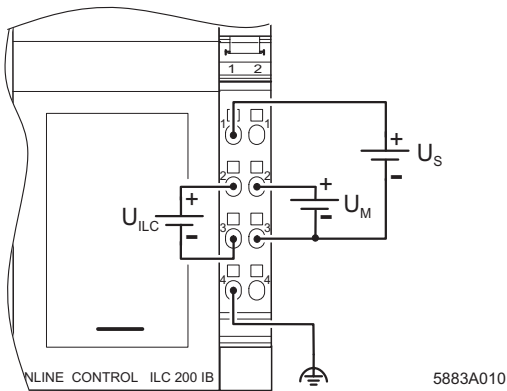


Figure 6 Connection example

Terminal Point	Assignment		Wire Color/Remark
Connector 5	Power Connector		
1.1	24 V DC (U_S)	24 V segment voltage supply	The supplied voltage is directly routed to the potential jumper.
1.2	24 V DC (U_{ILC})	24 V supply	The 7 V communications power (U_L) for the ILC and the connected local bus devices is generated from this voltage. The 24 V analog power (U_{ANA}) for the local bus devices is also generated.
2.1, 2.2	24 V DC (U_M)	24 V segment main voltage supply (Main Power)	The main voltage is routed to the local bus devices via the potential jumpers.
1.3	LGND	Reference potential logic ground	The potential is the reference ground for the communications power.
2.3	SGND	Reference potential segment ground	The reference potential is directly led to the potential jumper and is, at the same time, ground reference for the main and segment supply.
1.4, 2.4	FE	Functional earth ground (FE)	Functional earth ground must be connected through the voltage supply. The contacts are directly connected to the potential jumper and the FE spring on the bottom of the housing. The terminal is grounded when it is snapped onto a grounded DIN rail. Functional earth ground is only used to discharge interference.

**24 V Segment supply/
24 V Main supply**

The segment supply and main supply must have the same reference potential. A floating architecture is not possible.

24 V Segment Supply

There are several ways of providing the segment voltage at connector 5:

1. You can provide the segment voltage separately at the terminal points 1.1 and 2.3 (GND) (see Figure 6).
2. You can jumper the connections 1.1 and 2.1 (or 2.2) to ensure that the segment circuit is supplied from the main circuit.
3. You can create a switched segment circuit with a switch between terminal points 1.1 and 2.1 (or 2.2).



The 24 V segment supply has protection against polarity reversal and surge voltage.

It does not have short-circuit protection.

The user must provide short-circuit protection. The rating of the preconnected fuse must be such that the maximum permissible load current is not exceeded.

24 V Main Power:



The 24 V main supply has protection against polarity reversal and surge voltage.

It does not have short-circuit protection.

The user must provide short-circuit protection. The rating of the preconnected fuse must be such that the maximum permissible load current is not exceeded.

24 V ILC Supply



The 24 V ILC supply has protection against polarity reversal and surge voltage. These protective elements are only used to protect the power supply unit.

Jumpers



Terminals 1.3 and 2.3 on connector 5 can be jumpered if the communications power and the segment power are not to be electrically isolated.

Connection Example

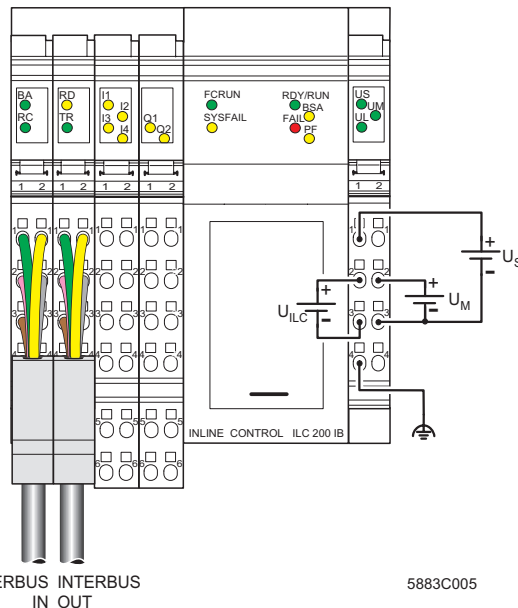


Figure 7 Typical cable connection to the Inline controller

Operating Elements of the Inline Controller

The control panel of the Inline Controller is behind a cover plate.

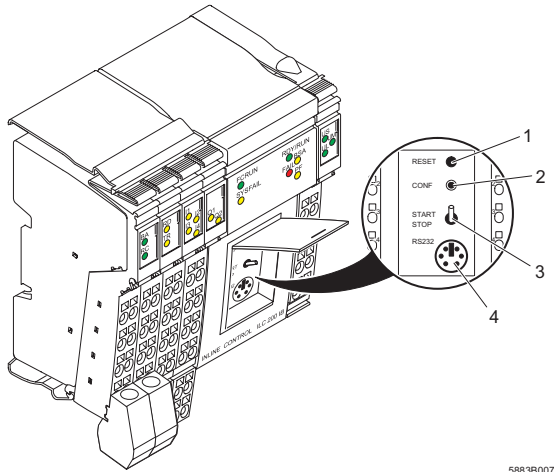


Figure 8 Operating elements of the Inline Controller

1 Reset button

The reset button is covered by the operator's panel and can only be set with a pen to prevent accidental setting. By pressing the reset button, the INTERBUS masterboard is completely initialized and re-booted (selftest, etc.). INTERBUS outputs are reset and inputs are not read. All parameter settings (logical addressing, event definitions, etc.) are lost. The boot process is completed after approximately 40 seconds.

2 Configuration button

If the configuration button is pressed during start up of the Inline Controller, the current INTERBUS configuration is read and passed on to the higher-level bus.



For further information on the configuration buttons please refer to the ILC 200 IB UM E User Manual.

3 Start/stop switch

The start/stop switch defines the operating state of the application program.

4 Serial RS-232 interface (mini-DIN female connector)

The serial interface (RS-232) of the Inline Controller connects an IBM-compatible PC with the PC WORX automation software. This operating software can be used to configure, parameterize, program, and diagnose the INTERBUS system. The application program, parameterization, and configuration can be stored on the internal parameterization memory using PC WORX. The serial interface on the front plate of the Inline Controller has been designed as a 6-pos. Mini-DIN female connector (PS/2).

The board is connected to the PC via the RS-232 cable PRG CAB MINI DIN (Order No. 27 30 61 1) as shown in the following.

Frontblende

RS-232-Kabel

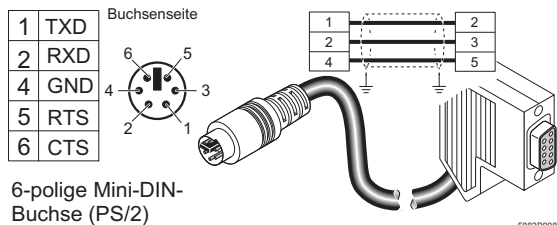


Figure 9 RS-232 interface and RS-232 cable for the connection with a PC

IEC-61131 Runtime System


An IEC 61131 runtime system is integrated in the Inline Controller. This IEC 61131 runtime system allows to process simple as well as complex automation and control functions. The automation functions are programmed with the automation software PC WORX. Programming may be carried out in the following IEC-61131 languages:


- IL (Instruction List)
- FBD (Function Block Diagram),
- LD (Ladder Diagram),
- OB (Sequential Function Chart) and
- ST (Structured Text)

The program can be modified while the control program is running. The IEC-61131 runtime system can process multiple user tasks which can be processed in a cyclic, time, or event-controlled way. The application program may be stored in the internal parameterization memory. Remanent flags (retain variables) may be stored in an 8 Kbyte NVRAM. The system also offers a large number of safety and diagnostic functions.

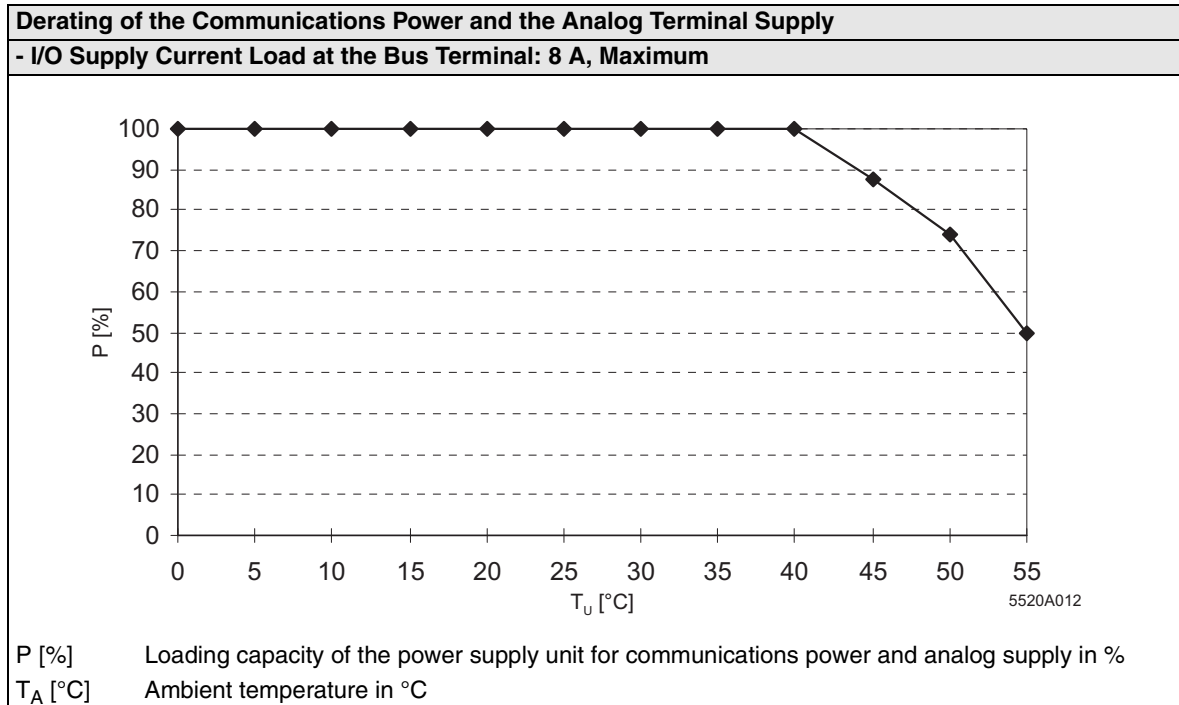
Technical Data

General Data			
Order designation	Order no.	ILC 200 IB ILC 200 IB-PAC	27 29 80 0 28 62 28 8
Dimensions			
Without connectors		110 mm x 120 mm x 71.5 mm (1.890 x 3.346 x 6.535 in.)	
With connectors		110 mm x 141.1 mm x 71.5 mm (1.890 x 3.346 x 6.535 in.)	
Weight			
Without connectors		320 g	
With connectors		420 g	

24 V Main Supply/24 V Segment Supply	
Connection method	Spring-cage terminals
Recommended cable lengths	30 m (98.43 ft.), maximum; routing cables through outdoor areas is not permissible
Voltage continuation	Through potential routing
Safety measure	
Surge voltage	Input protective diodes (can be destroyed by permanent overload)
Polarity reversal	Pulse loads up to 1500 W are short circuited by the input protective diode. Parallel polarity protection diodes; in the event of an error the high current through the diodes causes the preconnected fuse to blow.
	This 24 V area must be provided with an external fuse. The power supply unit must be able to supply 4 times the nominal current of the external fuse, to ensure that the fuse blows safely in the event of an error.

24 V Inline Controller Supply	
Connection method	Spring-cage terminals
Recommended cable lengths	30 m (98.43 ft.), maximum; routing cables through outdoor areas is not permissible
Voltage continuation	Through potential routing
Safety measure	<p>Input protective diodes (can be destroyed by permanent overload)</p> <p>Pulse loads up to 1500 W are short circuited by the input protective diode.</p> <p>Serial diode in the lead path of the power supply unit; in the event of an error only a low current flows. In the event of an error, the fuse in the external power supply unit does not trip. Ensure protection of 2 A by fuses through the external power supply unit.</p>
Surge voltage	
Polarity reversal	
	<p>This 24 V area must be provided with an external fuse. The power supply unit must be able to supply 4 times the nominal current of the external fuse, to ensure that the fuse blows safely in the event of an error.</p>
Nominal value	24 V DC
Tolerance	-15 % / +20 % (acc. to EN 61131-2/IEC 61131-2)
Ripple	±5 %
Permissible range	19.2 V to 30 V
Minimum current consumption at nominal voltage	153 mA DC (At no-load operation, i.e., incoming remote bus connected, no local bus devices are connected, bus inactive)
Maximum current consumption at nominal voltage	2.4 A DC


24 V Module Supply	
- Communications Power (Potential Jumper)	
Nominal value	7.5 V DC
Tolerance	±5 %
Ripple	±1.5 %
Maximum output current	2 A DC (observe derating)
Safety measure	Electronic short-circuit protection
- Analog Supply (Potential Jumper)	
Nominal value	24 V DC
Tolerance	-15 % / +20 %
Ripple	±5 %
Maximum output current	0.5 A DC (observe derating)
Safety measure	Electronic short-circuit protection



Safety Equipment	
Surge voltage (segment supply/main supply/bus terminal supply)	Input protective diodes (can be destroyed by permanent overload) Pulse loads up to 1500 W are short circuited by the input protective diode.
Polarity reversal (segment supply/main supply)	Parallel polarity protection diodes; in the event of an error the high current through the diodes causes the preconnected fuse to blow.
Polarity reversal (bus terminal supply)	Serial diode in the lead path of the power supply unit; in the event of an error only a low current flows. In the event of an error, the fuse in the external power supply unit does not trip. Ensure protection of 2 A by fuses through the external power supply unit.

INTERBUS	
Generation 4 features	
Number of I/O points	4096, maximum
Number of devices per configuration	512, maximum
Number of remote bus devices	254, maximum
Number of PCP devices	62, maximum
Number of remote bus levels	16, maximum

Bus Interface Higher-Level Bus	
Module ID	Variable: 3 _{dec} , 232 _{dec} , 233 _{dec} , 235 _{dec} (default: 233 _{dec})
Number of process data words	Configurable: = 0 words up to 10 words (default: 0 words)
Number of PCP words	Configurable: 0, 1, 2 or 4 words (default: 4 words)
Operating mode	PCP and process data operation with the higher-level INTERBUS controller board
Electrical Isolation	On both interfaces

Bus Interface Lower-Level Bus	
Interface	Inline local bus
Electrical Isolation	No
Number of devices (Number of devices that can be connected)	
Limitation through software	63, maximum
Limitation through current consumption from	
- Communications power U_L	2 A DC
- Analog supply U_{ANA}	0.5 A DC
	<p>Observe the current consumption of the modules</p> <p>Observe the logic current consumption of each device when configuring an Inline station. This information is given in every module-specific data sheet. The current consumption can differ depending on the individual module. The permissible number of devices that can be connected depends on the specific station structure.</p>

Diagnostic Interface	
Connection method	6-pos. MINI-DIN female connector (PS/2)
Interface type	RS-232
Transmission rate	9600 baud
Electrical Isolation	No

Optical Diagnostics	
Higher-level INTERBUS	BA, RC, RD, TR
Voltage Supply	UL, UM, US
IEC -61131 Runtime System	FCRUN, SYSFAIL
Lower-level INTERBUS	RDY/RUN, BSA, FAIL, PF

IEC 61131 Runtime System	
Speed	1.3 ms for instructions (typical)
Shortest cycle time (for cycle task)	5 ms
Program memory capacity	384 kbytes, 32 kbytes instruction in IL, typical
Number of control tasks	8 control tasks
Memory for retentive data	8 kbytes NVRAM

Ambient Conditions	
Degree of protection	IP20 (EN 60529/IEC 60529)
Temperature (according to EN 60204-1/IEC 60204-1)	
Operation	-25°C to 55°C (-13°F to 131°F)
Storage and transport:	-25°C to +75°C (-13°F to 167°F)
Humidity (according to EN 60204-1/IEC 60204-1)	
Storage and operation:	75 % on the average, 85 % occasionally (EN 60204-1/IEC 60204-1); no condensation
Air pressure	
Operation	70 kPa to 108 kPa (up to 3000 m [9843 ft.] above sea level)
Storage and transport	66 kPa to 108 kPa (up to 3500 m [11483 ft.] above sea level)
Vibration	2g, criterion 1 acc. to EN 60068-2-6/IEC 60068-2-6

Conformance With EMC Directive 98/37/EG


Noise Immunity Test According to EN 61000-6-2		
Electrostatic discharge (ESD)	EN 61000-4-2 IEC 61000-4-2	Criterion B 6 kV contact discharge 8 kV air discharge
Electromagnetic fields	EN 61000-4-3 IEC 61000-4-3	Criterion A Field strength: 8 V/m
Fast transients (burst)	EN 61000-4-4/ IEC 61000-4-4	Criterion B Supply lines: 2 kV Signal/data lines: 2 kV
Conducted interference	EN 61000-4-6 IEC 61000-4-6	Criterion A Test voltage 10 V
Noise emission of housing	EN 55011	Class A



Portable radiotelephone equipment ($P \geq 2$ W) must not be operated any closer than 2 m (6.56 ft). There should be no strong radio transmitters or ISM (industrial scientific and medical) devices in the vicinity.

Ordering Data

Ordering Data for Hardware and Software

Description	Order Designation	Order No.
Inline Controller; including connectors and labeling fields	ILC 200 IB-PAC	28 62 28 8
Inline Controller	ILC 200 IB	27 29 80 0
 <p>The listed connector set is needed for the complete fitting of the ILC 200 IB controller.</p>		
Connector set for the Inline Controller	ILC IB-PLSET	27 29 62 2
RS-232 cable	PRG CAB MINI DIN	27 30 61 1
IBS PC WORX 2 automation software (license-free version)	IBS PCWORX	27 29 35 0
Automation softwarePC WORX 3 DEMO	PC WORX 3 DEMO	27 30 96 7



The automation software IBS PC WORX 2 and PC WORX 3 is available with different licence levels. For the order number of the licence you need, please refer to the current "INTERBUS & AUTOMATION" catalog by Phoenix Contact.

Ordering Data for Documentation

Description	Order Designation	Order No.
Configuring and Installing INTERBUS Inline User Manual	IB IL SYS PRO UM E	27 43 04 8
Quick Start Guide IBS PC WORX 2.0	IBS PCWORX 2.0 QS UM E	90 00 05 3
PC WORX 2 User Manual (binder)	IBS PCWORX UM E	27 47 55 2
The binder includes the following documents:		
SYSTEM WORX Reference Manual	IBS SYSTEM WORX 2.0 UM E	90 00 04 7
PROGRAM WORX User Manual	IBS PROGRAM WORX 2.0 UM E	90 00 04 9
PROGRAM WORX User Manual Functions and Function Blocks	IBS PROGRAM WORX 2.0 FUB UM E	90 00 05 1
PROGRAM WORX User Manual Machine Sequential Function Chart - MSFC	IBS MACHINE WORX UM E	93 55 56 5
PC WORX 3.0 Quick Start Guide	PC WORX 3 QS UM E	28 28 72 7
Diagnostics Guide	IBS SYS DIAG DSC UM E	27 47 29 3



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This is available to be downloaded at www.phoenixcontact.com.

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