Publisher's Note

Service and Support

Website:

www.murrelektronik.com

In addition, our Customer Service Center (CSC) will be glad to assist you:

Our Customer Service Center can support you throughout your project during planning and the conception of customer applications, configuration, installation, and startup. We also offer competent consulting or – in more complex cases – we even provide direct onsite support.

The Customer Service Center provides support tools. It performs measurements for fieldbus systems, such as PROFINET DP, DeviceNet, CANopen, and AS interface, as well as energy, heat, and EMC measurements.

Our coworkers at the Customer Service Center provide their competence, know-how, and years of experience. They are familiar with how products made of various hardware and software manufacturers interact.

You can contact the Customer Service Center at

telephone number +49 (0) 71 91 47-424

or by email at csc@murrelektronik.de.

About the User Manual and its Structure

Bus Manual:
General explanations and functions for each bus.

On this subject, please click on the links to the next page.

System/Product Manuals:
Describe the system and product-specific features.

Art. No.   Designation

56931   IMPACT20 PROFIBUS
56932   IMPACT20 CANopen
56933   IMPACT20 DeviceNet
56934   IMPACT20 EtherCAT
56935   IMPACT20 EtherNet/IP
56936   IMPACT20 PROFINET

www.murrelektronik.com

The following links will provide you with more information on bus systems, as well as the standards and specifications on which they are based:

>>> **EtherCAT (www.ethercat.org)**

Table of Contents

Important Information

Basic Knowledge Required

This manual contains general information on the system and the product.

To understand this manual, you need to know about automation systems.

Symbols and Icons

This manual contains information and instructions you must comply with in order to maintain safety and avoid personal injury or damage to property. They are identified as follows:

 Notes indicate important information.

 Warnings contain information that, if ignored, may cause damage to equipment or other assets or, if you fail to comply with safety precautions, may constitute a danger to the user's health and life.

 These instructions are recommendations issued by Murrelektronik.

Intended Purpose

Before starting the devices, read this manual carefully. Keep it in a location that is accessible to all users at all times.

The products that are described in this manual were developed, manufactured, tested, and documented in compliance with the relevant safety standards. In normal cases, these products do not constitute any danger to persons or objects, provided the handling specifications and safety instructions described in this manual are observed. They meet the specifications of the European EMC Directive (2004/108/EC).

> **WARNING**
>
> **Devices from the IMPACT20 series are not safety devices conforming to the relevant standards.**
>
> **Do not use the OFF state of the outputs to implement safety-related requirements of the system/machine.**

The products are designed for industrial use. An industrial environment is defined as one in which loads are not connected directly to the public low-voltage power grid. Additional measures must be taken if the products are used in private, business, or trade environments.

The safe, troublefree functioning of the products requires proper transportation, storage, mounting, and careful operation. Operation of the devices for their intended purposes is only guaranteed when the devices are fully mounted.

Current safety and accident prevention laws valid for a specific application must be observed for the configuration, installation, setup, maintenance, and testing of the devices. The power supply must comply with SELV or PELV. Power sources in accordance with EN 61558-2-6 (transformer) or EN 60950-1 (switched-mode power supply) meet these requirements.

Only use cables that meet the requirements and regulations for safety, electromagnetic compatibility, and, if necessary, telecommunications terminal equipment specifications.

> **Information on cables and accessories made by Murrelektronik GmbH for this product is contained in Chapter Accessories.**

Qualified Personnel

Only qualified, trained electricians knowledgeable in the safety standards of automation systems may configure, install, set up, maintain, and test the devices. The requirements concerning qualified personnel are dependent on the requirements profiles described in ZVEI and VDMA. For this reason, electricians must know the contents of the manual "Weiterbildung in der Automatisierung" (Further Training in Automation Systems) issued by ZVEI and VDMA and published by Maschinenbau-Verlag, Post Box 710864, 60498 Frankfurt, Germany) before installing and maintaining the devices. They are therefore electricians who are capable of assessing the work executed and any possible dangers arising from this due to their professional training, knowledge, experience, and their knowledge of the pertinent standards; or who have a level of knowledge equivalent to professional training due to their many years of activity in a comparable field.

Only Murrelektronik technical personnel are allowed to execute work on the hardware and software of our devices, if they are devices not described in this manual.

⚠️ **Unqualified tampering with the hardware or software, or failure to observe the warnings cited in this manual may result in severe personal injury or damage to property.**

1   System Description

1.1   Description of the Impact20 Product Family

IMPACT20 is a compact fieldbus I/O station. It combines 8 inputs and 8 outputs or 16 inputs or 16 outputs in a confined space. Due to its compact dimensions, the IMPACT20 is designed for use in switch cabinets, terminal boxes, and on control panels. An IMPACT20 module comprises a fieldbus-specific connection and a fixed number of I/O slots. The I/O functions are module-dependent and are unchangeable. All I/O connections are designed as spring-loaded clamping terminals. They are clearly arranged so that functional relationships are logically recognizable.

The IMPACT20 product family groups signals at I/O level decentrally and places this information on the fieldbus (e.g. Ethernet/IP).

Fieldbus Protocols

Impact20 is supplied for the following fieldbus protocols:

- PROFIBUS

- CANopen

- DeviceNet

- EtherCAT

- Ethernet/IP

- ProfiNet

Module Variants

- Module with 16 digital inputs

- Module with 8 digital inputs and 8 digital outputs

- Module with 16 digital outputs

Functions

- Easy to recognize, directly assigned status and diagnostic LEDs

- Clear, unmistakable slot designation

- Signal identification on the module

- Terminal-specific disconnection in the event of an error

- Group diagnostic and single-channel short-circuit diagnostic over the bus

1.2   System Components

1.2.1   Product Designation Code

The designation of the IMPACT20 product family is based on a scheme that indicates the fieldbus and I/O function of individual devices.

Examples:

Name			Description
IMPACT20	**EC**	**DI8 DO8**	

I/O Channels

D   = Digital
I   = Input
O   = Output

Fieldbus System

P   = ProfiBus
C   = CANopen
DN   = DeviceNet
EC   = EtherCat
E   = EtherNet/IP
PN   = ProfiNet

Product Family
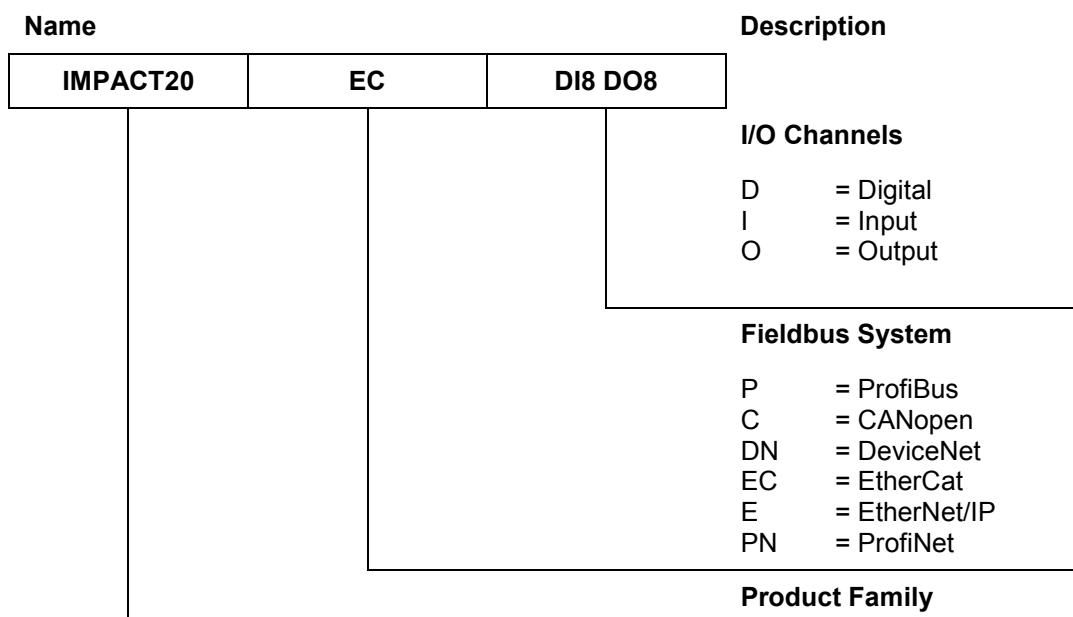
Fig. 1:   Example of product designation

1.2.2   Product Overview

Article Number	Description
56 912	IMPACT20 EC DI16
56 913	IMPACT20 EC DI8 DO8
56 914	IMPACT20 EC DO16

Table 1: Fieldbus module EtherCAT

1.2.3   System Design Principle
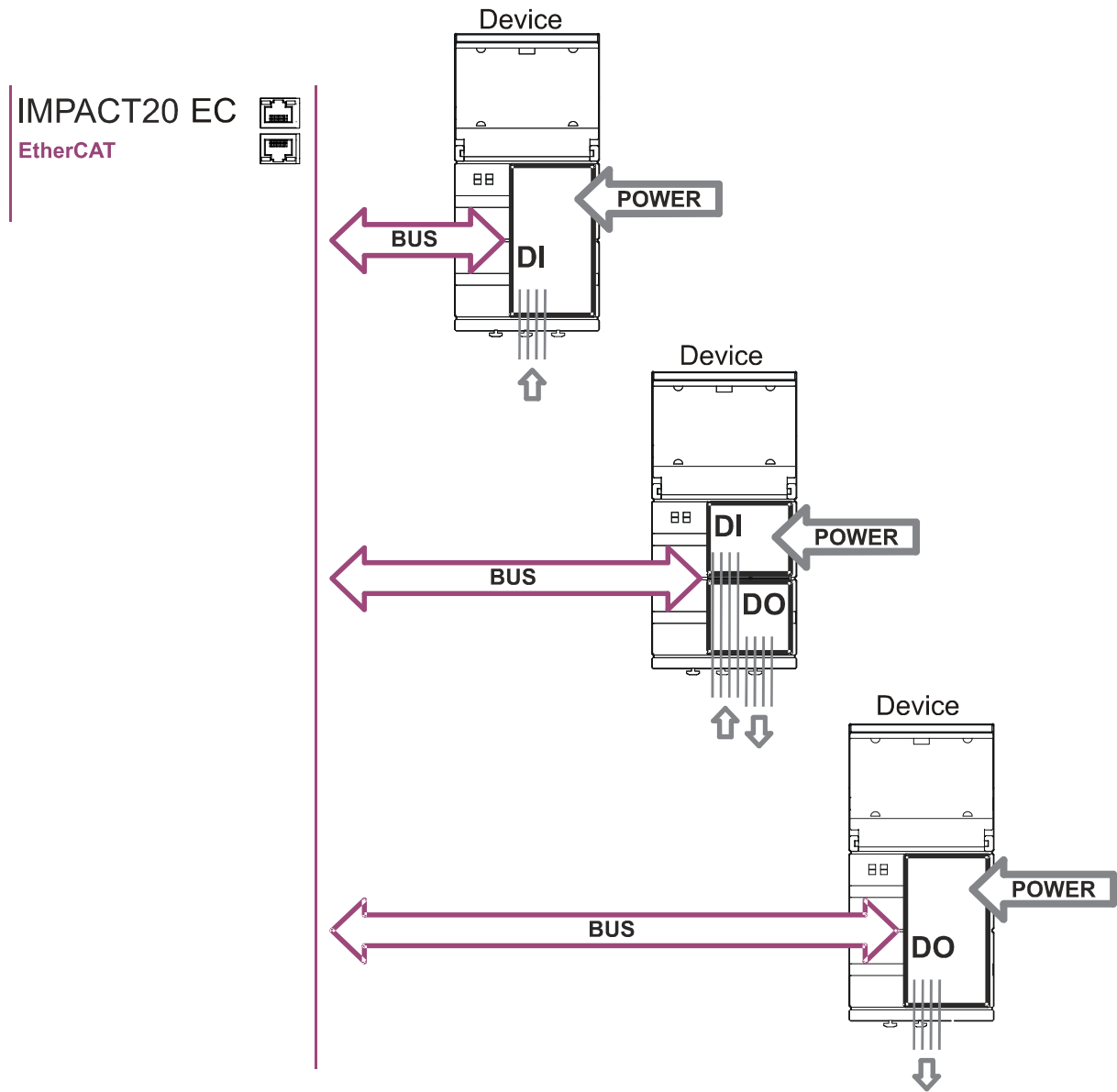
Fig. 2:   System design principle

2 Configuration

This chapter contains information that is relevant during the electromechanical planning phase.

2.1 Power Supply

2.1.1 Configuration Notes

Bus modules require a DC voltage power supply of typically 24 VDC (SELV / PELV) that must comply with the regulations for conventional industrial power supplies.

To optimize immunity from interference, we advise you to tap sensor, bus and actuator power supply from a number of different power sources. Primary switched-mode or regulated power supplies should be used.

Power supply unit performance is dependent on the number and power requirements of the connected users.

In any case, make sure that the system voltage – measured at the most remote slave – does not drop below 18 VDC when viewed from the system power supplies. System behavior becomes undefined if the sensor and bus power supply drops below 18 VDC. IMPACT20 modules then generate an undervoltage diagnostic visually and over the fieldbus.

Primary switched-mode power supply units generally permit an increase in output voltage via nominal voltage in order to compensate for line losses.

Modules with digital inputs support the direct connection of commercially available sensors. Depending on the total power requirements resulting from the number of slaves, or the use of sensors with high power consumption, a separate power supply may be required for the sensors.

2.2   Galvanic Isolation

To optimize electromagnetic compatibility and increase bus stability, the bus must be galvanically isolated from the remaining electronics.
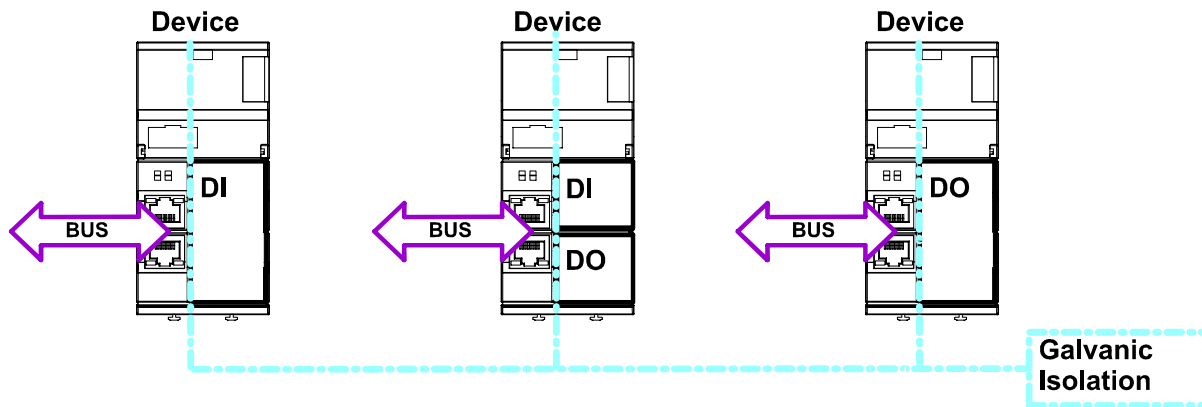
Fig. 3:   Impact20 modules – galvanic isolation

2.3   Electromagnetic Compatibility (EMC)

The units comply with the requirements of EC Directive 2004/108/EC "Electromagnetic Compatibility".

These units conform with Class A devices. They may cause radio interference in residential areas. In this case, the operator may be required to implement suitable countermeasures.

The devices described in this manual meet the relevant standards for electromagnetic compatibility in themselves. However, this does not assume that their electromagnetic compatibility is also guaranteed when built into a system.

For this reason, the user is urgently advised to observe the instructions below concerning installation in accordance with EMC requirements.

Protection Against Electrostatic Discharge

The products described in this manual contain complete semiconductor components that may be destroyed or damaged by electrostatic discharge (ESD).

Damage does not necessarily lead to an immediately detectable failure or malfunction. However, it may become evident with a delayed reaction or sporadically.

When handling these devices, make sure that the safety precautions for ESD-sensitive devices that are well-known in general practice are maintained. In particular, note the following items:

> **Do not disconnect or connect plugs or connectors live.**
>
> **The person handling the devices must discharge themselves electrostatically before they come in direct contact with the devices, e.g. by touching a grounded part of the system, or by wearing an ESD antistatic wrist strap connected to ground.**

Grounding

A short (as short as possible) low-impedance connection is required between the grounding point and reference ground to discharge interference voltages that act between the device and reference ground.

The inductance of normal FE cables represents a high impedance for high-frequency interference voltages.

> **Make sure that the DIN mounting rail, on which the device is mounted, has a low-impedance connection to ground.**

Wiring Arrangement

Avoid EMC problems by keeping to the following basic rules of wiring arrangement:

- Route the data wiring at the greatest possible distance from the power lines. Keep a minimum distance of 10 cm.

- Only cross data and power lines at right angles.

- Route data wires and power cables in separate, shielded ducts.

- Take into consideration the potential interference of other devices or wires when arranging wires.

- Keep the greatest possible distance from frequency converters, motor cables, and other devices, and from cables that emit high-frequency interference.

Power Failures and Dips

Transient power failures and dips (<10 ms) do not normally impair operation since the power supply to the electronics is buffered by integrated capacitors. However, this does not apply to the power supply of sensors and actuators connected to the module. Their high power demand can not be met by capacitors integrated in the device. For this reason, short-term interruptions in actuator voltage may cause undesired switching operations.

If an input signal that lasts for less than 1 ms changes, the input filters prevent the change of the input state reported to the controller. Longer interruptions to sensor power supply may lead to an input signal change.

Separate Power Supplies

Sensors and actuators can be powered by a separate power supply unit. A separate power supply improves the electromagnetic compatibility of the overall system.

Suppression of Inductive Loads

The outputs of the devices described in this manual have an integrated protection circuit against high-energy interference voltages, e.g. that occur when inductive loads are switched.

Varistor or bipolar suppressor diode
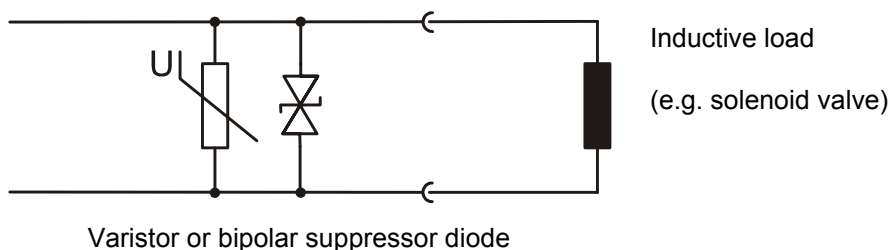
Fig. 4:   Suppression of inductive loads

A suppressor diode guarantees rapid reduction in the energy stored in the magnetic field of an inductive load. However, with inductive loads, e.g. loads within the maximum current carrying capacity range of a channel and at switching frequencies > 1 Hz, we advise the use of commercially available protection circuits that are capable of reducing the energy stored in the connected inductances.

The high voltages when inductive loads are switched off generate strong fields in the wiring and this may lead to interference in adjacent circuits or devices.

Murrelektronik offers a wide selection of suppressor products. Refer to our catalog or visit our online shop at www.murrelektronik.com

Other Measures and Limits

In specific system configurations, the requirements for interference emission and immunity from interference can only be met with additional measures since the EMC within a system is dependent on the individual components made by other manufacturers.

Mains filters are a suitable measure to reduce cable-bound interference. Various manufacturers offers optical-fiber converters. This type of data transmission is basically immune to EMC interference. However, it does not apply to the converter electronics. Therefore, use of fiber-optics does not eliminate all EMC problems.

Our accredited test center will answer any further queries you may have concerning EMC. There you will receive advice on certain methods to conform with the EMC Directive for the systems you have built.

Murrelektronik-Prüfzentrum (Test Center),

Grabenstrasse 27,

D-71570 Oppenweiler,

Phone +49 (0) 71 91 47-334,

Fax +49 (0) 71 91 47-323,

pruefzentrum@murrelektronik.de

3   Mounting and Installation

3.1   Mounting

3.1.1   Mounting IMPACT20 Modules on DIN Mounting Rails

⚠️ **Make sure that the DIN mounting rail, on which the device is mounted, has a low-impedance connection to ground.**
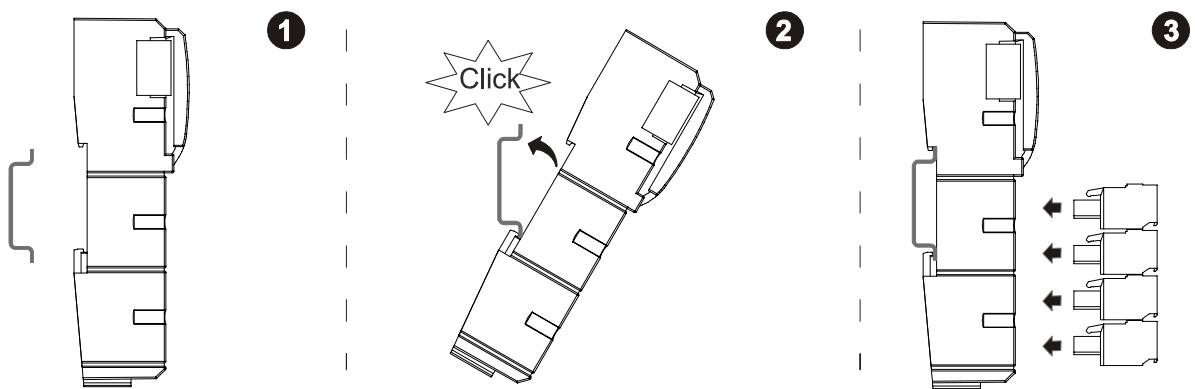
Fig. 5:   Mounting IMPACT20 modules on DIN mounting rails

3.1.2   Distances
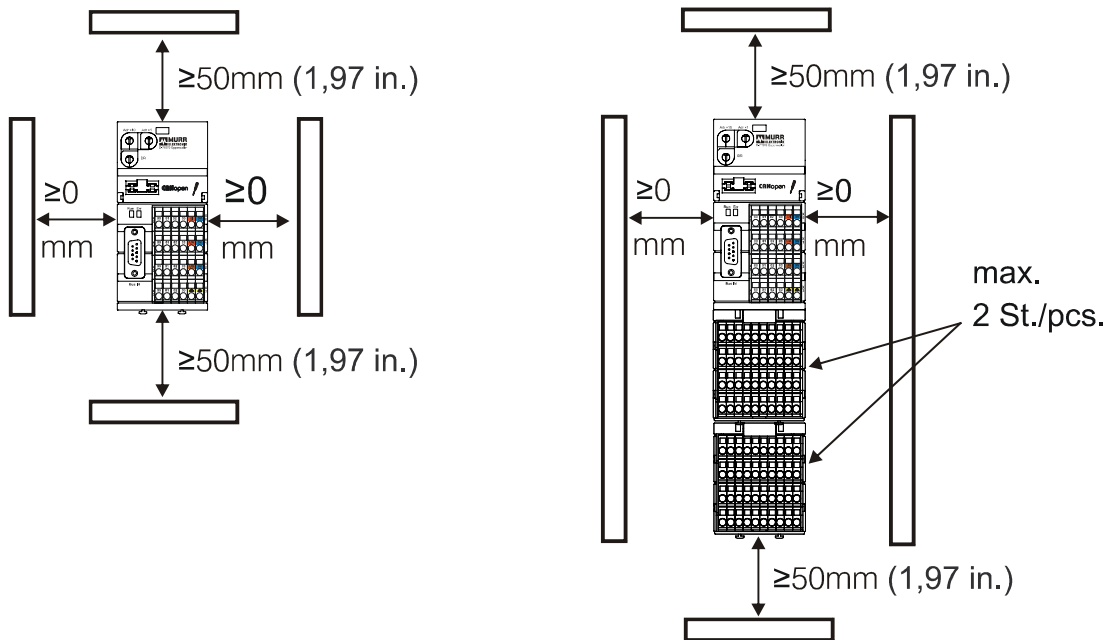
Fig. 6:   Distances

3.1.3   Installation Position
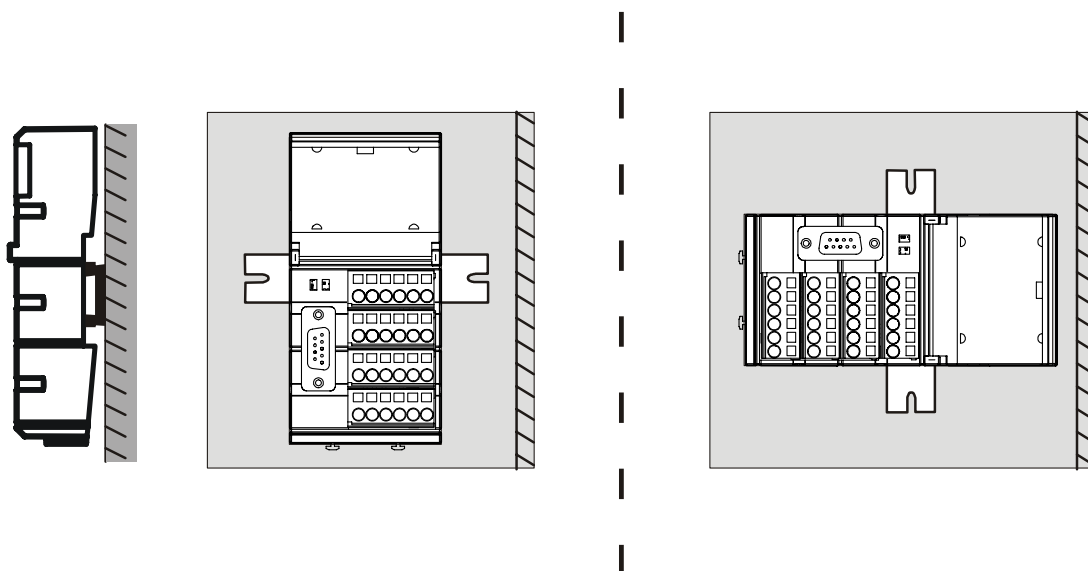
Fig. 7:   Installation position

3.2   Wiring Terminals

3.2.1   Connecting Sensors and Actuators

⚠️ **WARNING**

Devices from the IMPACT20 series are not safety devices conforming to the relevant standards.

Do not use the OFF state of the outputs to implement safety-related requirements of the system/machine.

3.2.1.1   Sensor Power Supply

Sensor can be powered by the IMPACT20 module. The sensor power supply is protected by a self-resetting short-circuit proof transistor for each module. The maximum current draw for the sensor power supply is 0.7 A per module.

3.2.1.2   Actuators

The maximum current draw of IMPACT20 modules per channel is 2 A. Please remember that the maximum total current of 8 A at the UA terminal may not be exceeded.

⚠️ **CAUTION**

If the polarity of the module and actuator power supplies are reversed, this may damage the module.

3.2.2   Terminal Overviews of IMPACT20 Modules

3.2.2.1   DI16 Modules

Please use the current INAs: Point A only lists the EtherCAT (without "IN")
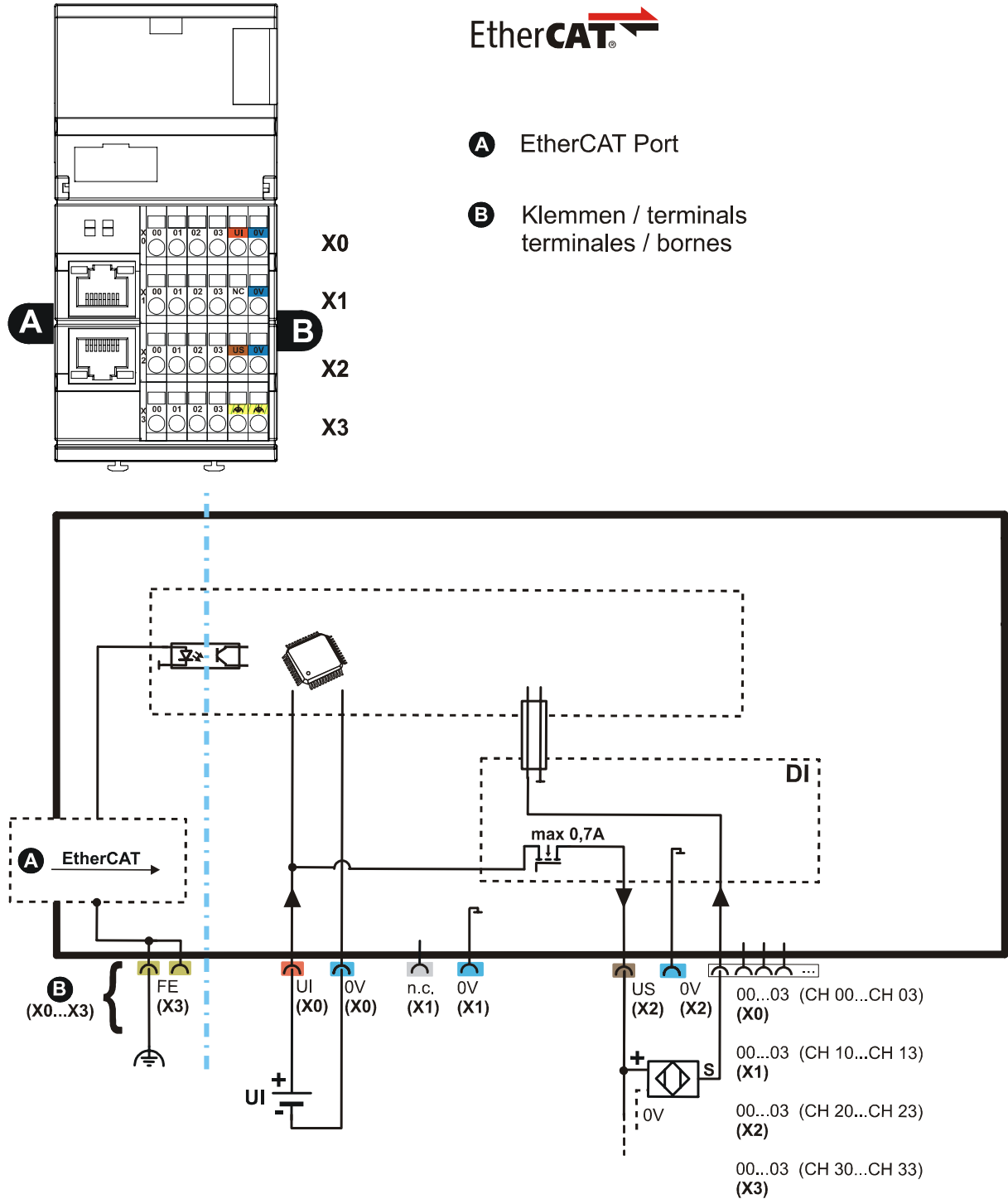
Fig. 8:   Terminal overview of Impact20 DI16 modules

3.2.2.2 DI8 DO8 Modules

A EtherCAT Port

B Klemmen / terminals
terminales / bornes
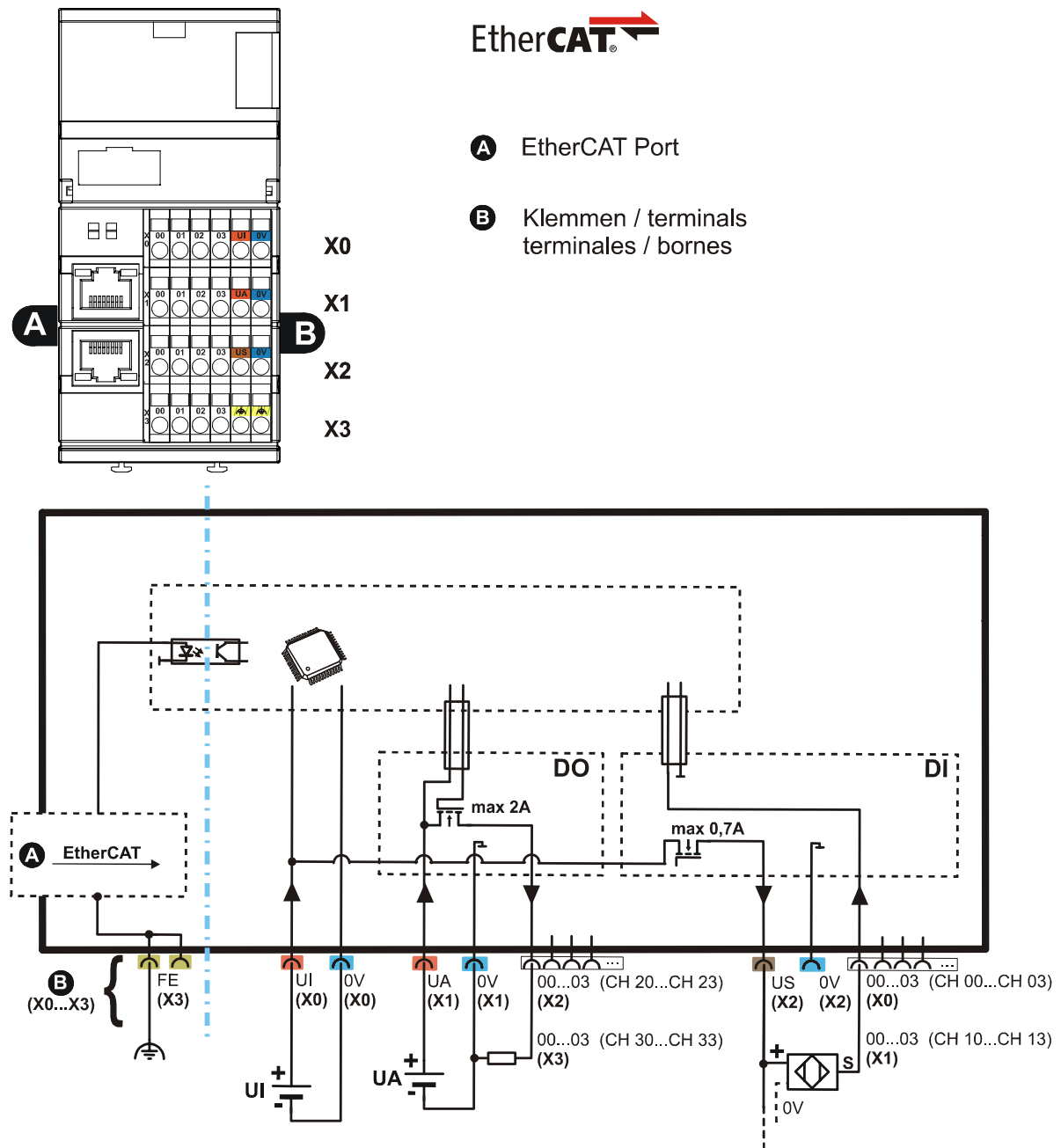
Fig. 9: Terminal overview of Impact20 DI8DO8 modules

3.2.2.3   DO16 Modules

A   EtherCAT Port

B   Klemmen / terminals
    terminales / bornes
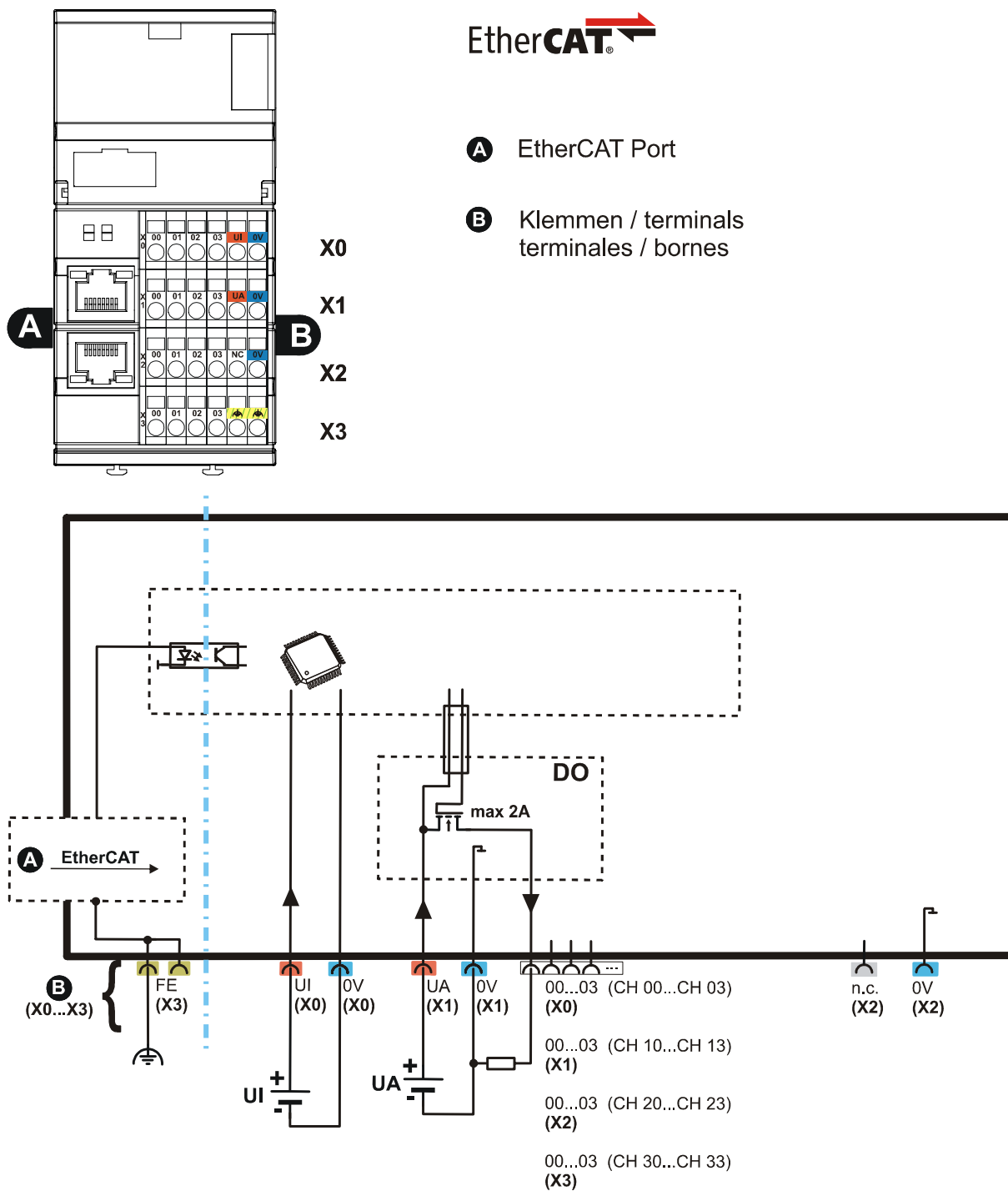
Fig. 10: Terminal overview of Impact20 DO16 modules

Murrelektronik offers label sheet Art. No. 56113 to label the terminals. Please refer to our Catalog.
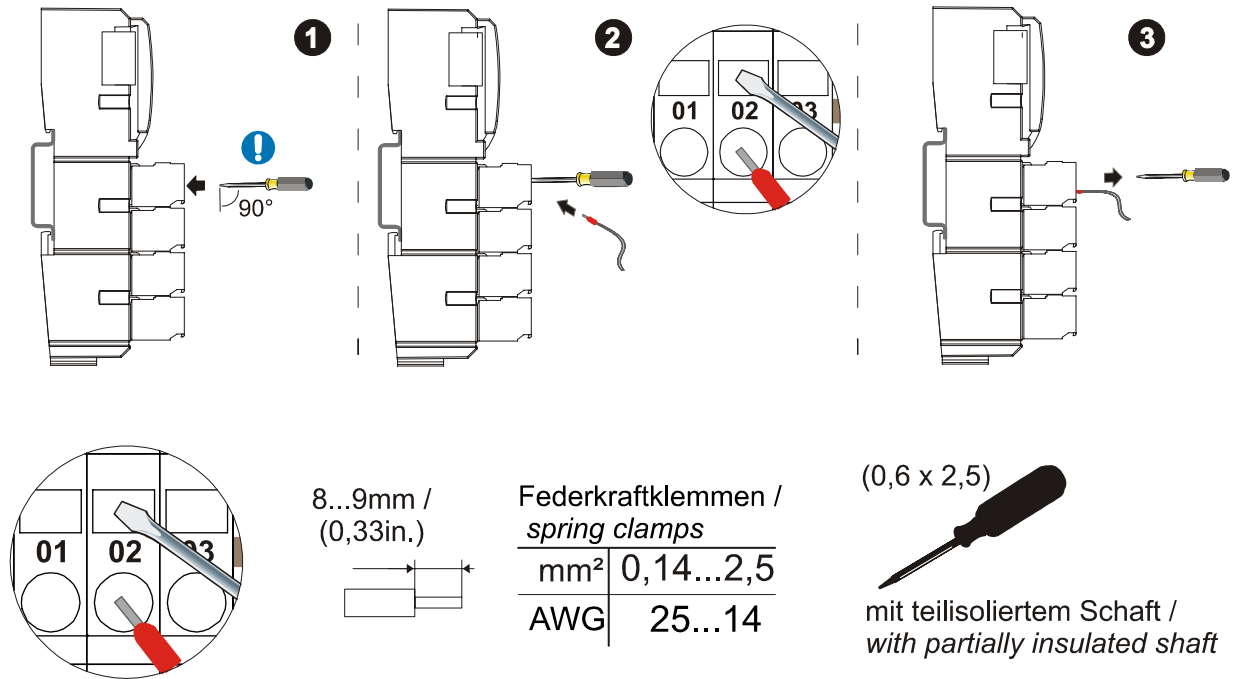
Fig. 11: Wiring terminals

3.2.2.4   Removing Terminals
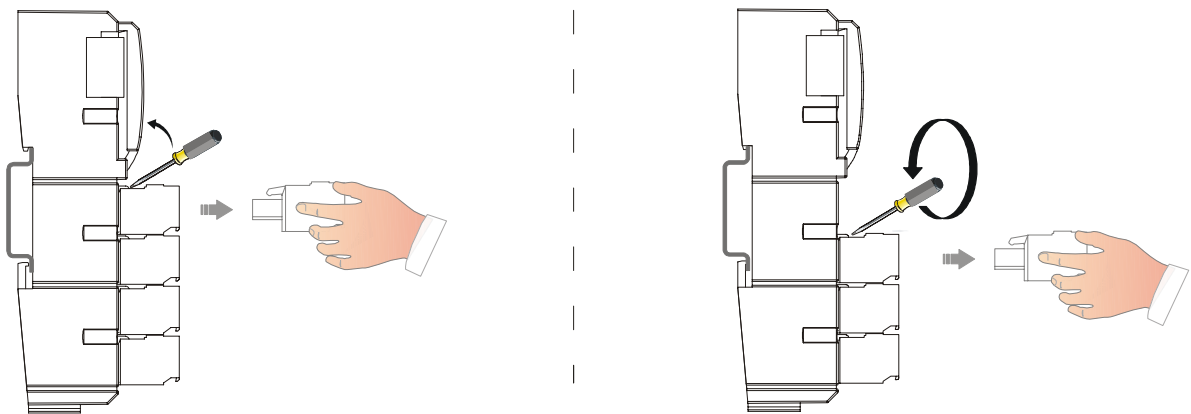
Fig. 12: Removing terminals

3.3   Installing the EtherCAT Bus

Impact20 modules in the Figure are depicted connected to the bus in bus topology. This requires the use of a special switch.

Two RJ45 sockets for EtherCAT are located on the Impact20 module. One socket is for incoming signals, the other is for looping through the bus signal.
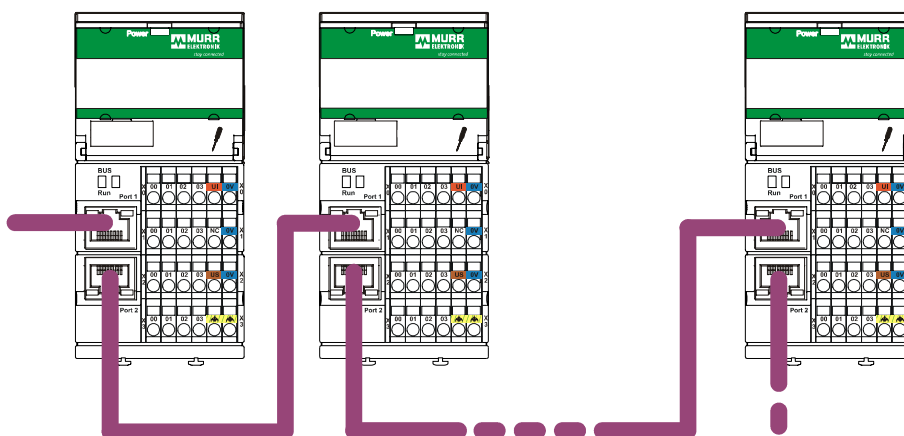
Fig. 13: EtherCAT in bus topology

4 EtherCAT Bus System

4.1 Startup

4.1.1 ESI (EtherCAT Slave Information)

The IMPACT20-EC ESI (Murrelektronik IMPACT20.xml) is a configuration file in XML format. All current IMPACT20 EC devices are capable of running with this file.

> **!** **The latest XML files are retrievable over the web from:**
> **http://www.murrelektronik.com in the service section under / Technical Data.**

> **!** **If the corresponding ESI file is installed incorrectly, all the relevant parameters can be read out from the device automatically.**

4.1.2 Configuration

4.1.2.1 Example: Integrating an IMPACT20 device in a TwinCAT® - configuration

The section below describes an example of simply integrating and putting into service an IMPACT20 EC device in a TwinCAT® configuration. First connect the IMPACT20 EC module to your control unit and add it to an existing project or create a new project as described in the manufacturer's instructions:

1. Copy the IMPACT20 EC ESI to the TwinCAT® folder in which the other ESI files are located (as default, you will find them under /Programme/TwinCAT/IO/EtherCAT).

2. Open the TwinCAT® System Manager.

3. Create a new project, if necessary, and insert your I/O device (Ethernet card) in the new project.

4. Right-click on your I/O device to scan all the connected EtherCAT slaves (boxes).

On the left side, you will then find the associated IMPACT20 EtherCAT module:
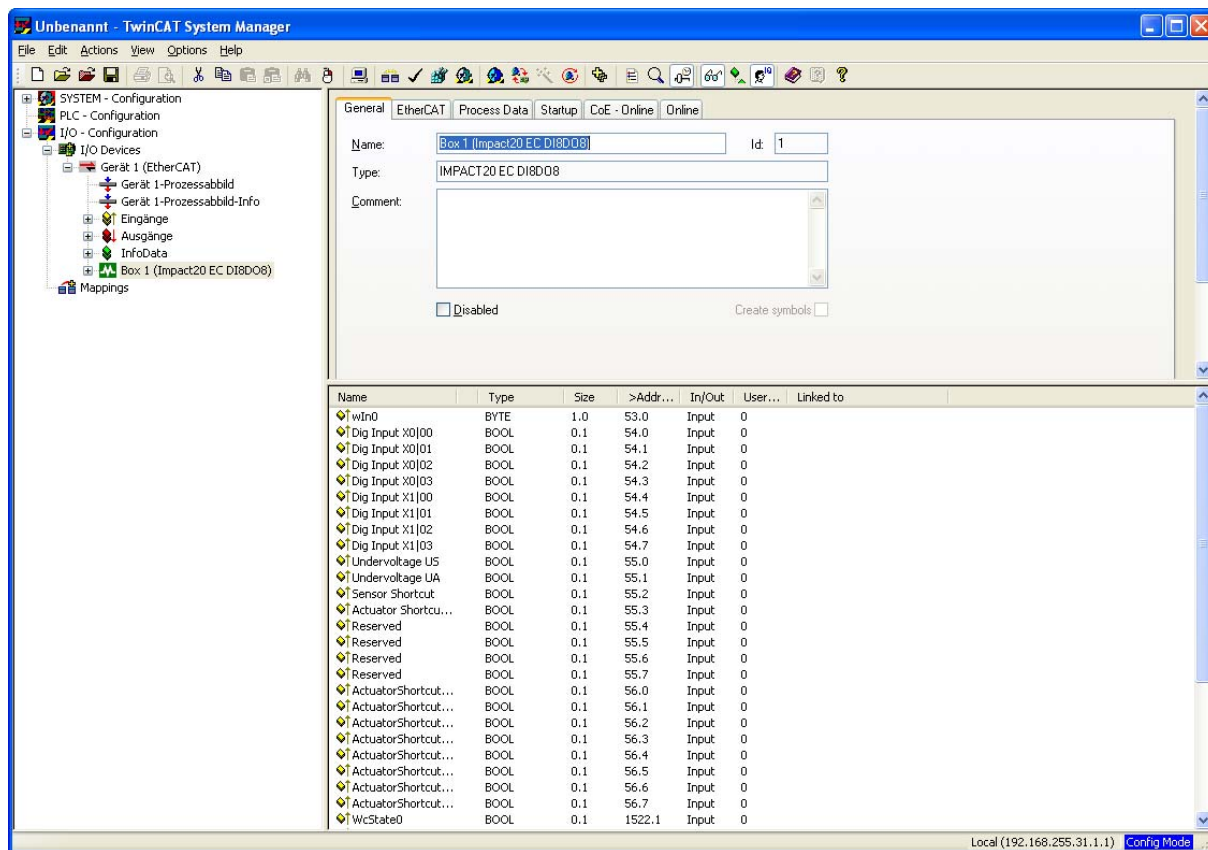
Fig. 14: Integrating an IMPACT20 device in a TwinCAT® configuration

4.1.2.2   Parameterizing Input Filters (DI8/DO8 and DI16 only)

IMPACT20 modules offer you the opportunity to select from 4 different filters for input signals:

    0.   ~1 ms (default)

    1.   ~250 µs

    2.   ~500 µs

    3.   ~1 ms

    4.   ~3 ms

In order to be clearly detected, a stable gHigh signal must be present for at least the time you se-
lected.

The 1 ms filter is activated as default after the modules are switched on. To select another filter, trans-
fer a value corresponding to filters using the CoE index 2000_{hex} / SubIndex 1. Refer to the table below
for this value:

CoE-Index 2000hex SubIndex 1	Value	Filter time
	0	1 ms
	1	250 µs
	2	500 µs
	3	1 ms
	4	3 ms

Table 2: Filter selection

Transferring Filters using CoE Online (also possible in service)

1. Choose the module you want to parameterize from the left of TwinCAT.

2. Select the CoE Online tab from the right.

3. Expand the Index 2000 by clicking on the + symbol.

4. Double-click to transfer the required value to the module.
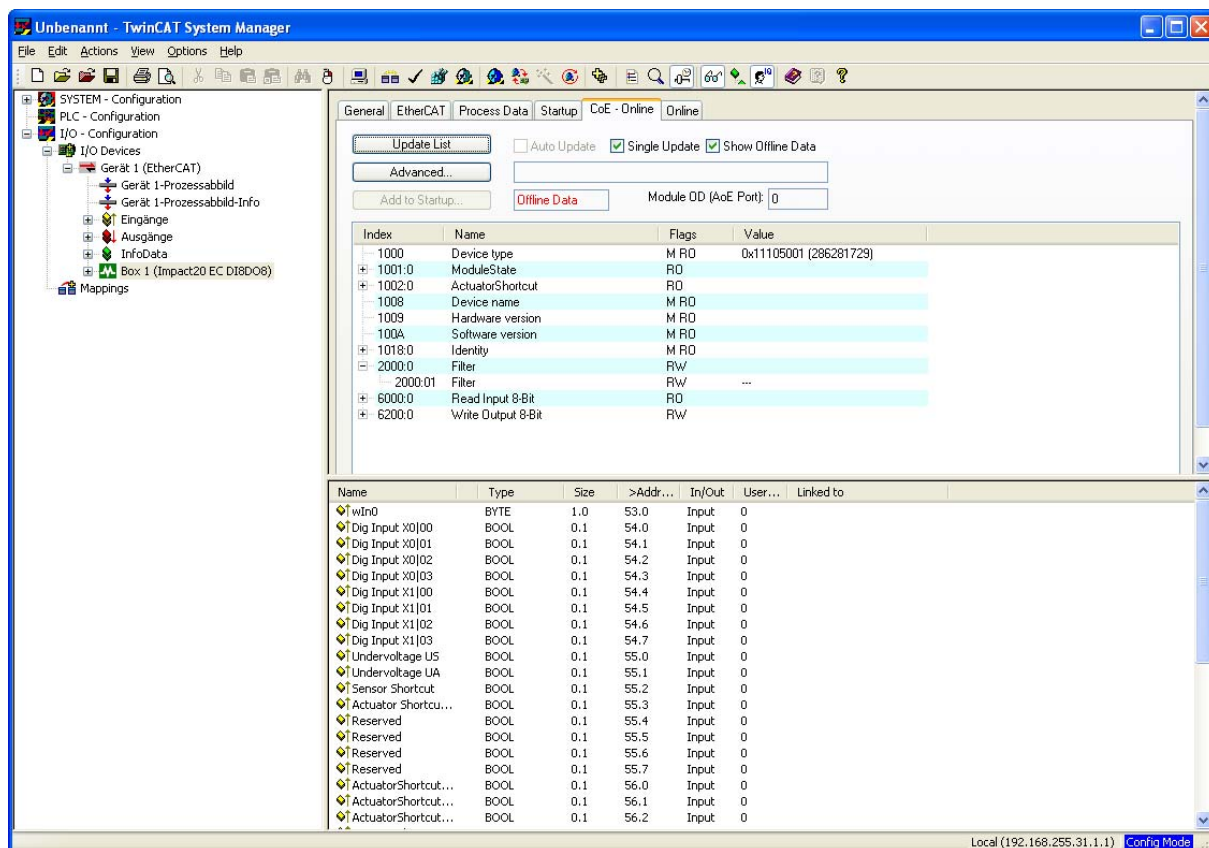
Fig. 15: Transferring filters using CoE online

Transferring filters during module startup (parameters are transferred when the module is logged on to the bus)

1. Choose the module you want to parameterize from the left of TwinCAT.

2. Select the Startup tab from the right.

3. Click on the New... button.

4. Expand the Index 2000 by clicking on the + symbol.

5. Choose the SubIndex 2000:01.

6. In the input field "Data", write the required value (please enter the leading zero).

7. Under "Transition", tick the checkboxes I->P and S->p .

8. Close the box by clicking on OK.

9. Restart the module and the controller to accept the filter.
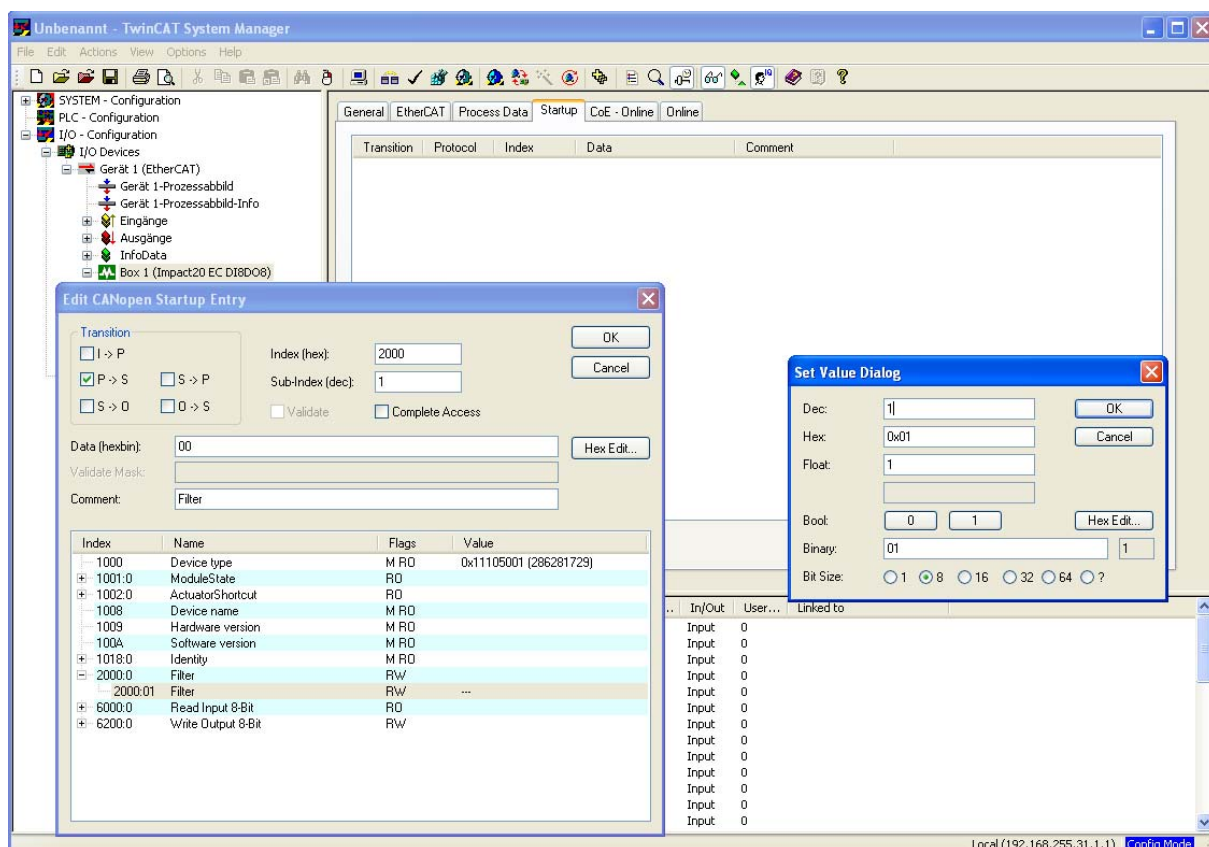
Fig. 16: Transferring filters during module startup

4.1.2.3   IMPACT20-related Variable Names

"State"	Contains the variable module state and, if necessary ActuatorShortcut (not IMPACT20 DI16-EC, 56912). Accordingly, you will find all diagnostic data here.
"ModuleState"	Contains module diagnostic bits for undervoltage, sensor short-circuit, and actuator short-circuit (only device-related).
"ActuatorShortcut"	Contains the exact channel diagnostic for actuator short-circuits.
wOut0	Contains the digital output bits and a stuffing byte wOut.
wIn0	Contains the digital input bits and a stuffing byte wIn0.
DigOutput	56913 (DI8/DO): 8 digital outputs 56914 (DO16): 16 digital outputs
DigInput	56913 (DI8/DO): 8 digital inputs 56912 (DI16): 16 digital inputs

4.1.3 Mapping I/O Data

The table below displays the input and output instances for each module with the corresponding length:

Module	Number of output bytes	Number of input bytes		
		I/O	Diagnostic	Stuffing Bytes
IMPACT20 EC DI16, 56912	1 stuffing byte	16 bits	8 bits	1 byte
IMPACT20 EC DI8/DO8, 56913	8 bits digital outputs + 1 stuffing byte	8 bits	2 x 8 bits	1 byte
IMPACT20 EC DO16, 56914	16 bits digital outputs + +1 stuffing byte	0	3 x 8 bits	1 byte

Table 3: Input and output instances for every module with corresponding length

4.2 Correlation Between Terminal and Channel ID
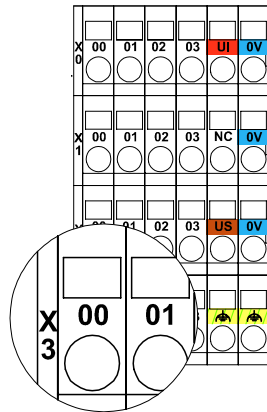
Channel ID

1st digit = terminal row

2nd digit = terminal

Example

Terminal row X3 + terminal 00 = channel 30

Terminal row X3 + terminal 01 = channel 31

Fig. 17: Example of channel ID

4.2.1.1   Overview of Channel Bit Assignment

Row	16 DI			
X0	00 (DI)	01 (DI)	02 (DI)	03 (DI)
	KN 00	KN 01	KN 02	KN 03
	Output bit X.0	Output bit X.1	Output bit X.2	Output bit X.3
X1	00 (DI)	01 (DI)	02 (DI)	03 (DI)
	KN 10	KN 11	KN 12	KN 13
	Output bit X.4	Output bit X.5	Output bit X.6	Output bit X.7
X2	00 (DI)	01 (DI)	02 (DI)	03 (DI)
	KN 20	KN 21	KN 22	KN 23
	Output bit X+1.0	Output bit X+1.1	Output bit X+1.2	Output bit X+1.3
X3	00 (DI)	01 (DI)	02 (DI)	03 (DI)
	KN 30	KN 31	KN 32	KN 33
	Output bit X+1.4	Output bit X+1.5	Output bit X+1.6	Output bit X+1.7
	24 V / current as per input characteristic Type 3			

Table 4: Channel assignment for DI modules

Row	16 DO			
X0	00 (DO)	01 (DO)	02 (DO)	03 (DO)
	KN 00	KN 01	KN 02	KN 03
	Output bit X.0	Output bit X.1	Output bit X.2	Output bit X.3
X1	00 (DO)	01 (DO)	02 (DO)	03 (DO)
	KN 10	KN 11	KN 12	KN 13
	Output bit X.4	Output bit X.5	Output bit X.6	Output bit X.7
X2	00 (DO)	01 (DO)	02 (DO)	03 (DO)
	KN 20	KN 21	KN 22	KN 23
	Output bit X+1.0	Output bit X+1.1	Output bit X+1.2	Output bit X+1.3
X3	00 (DO)	01 (DO)	02 (DO)	03 (DO)
	KN 30	KN 31	KN 32	KN 33
	Output bit X+1.4	Output bit X+1.5	Output bit X+1.6	Output bit X+1.7
	24 V / max. 2			

Table 5: Channel assignment for DO modules

Row	DI8 / DO8			
X0	00 (DI)	01 (DI)	02 (DI)	03 (DI)
	KN 00	KN 01	KN 02	KN 03
	Input bit X.0	Input bit X.1	Input bit X.2	Input bit X.3
X1	00 (DI)	01 (DI)	02 (DI)	03 (DI)
	KN 10	KN 11	KN 12	KN 13
	Input bit X.4	Input bit X.5	Input bit X.6	Input bit X.7
X2	00 (DO)	01 (DO)	02 (DO)	03 (DO)
	KN 20	KN 21	KN 22	KN 23
	Output bit X.0	Output bit X.1	Output bit X.2	Output bit X.3
X3	00 (DO)	01 (DO)	02 (DO)	03 (DO)
	KN 30	KN 31	KN 32	KN 33
	Output bit X.4	Output bit X.5	Output bit X.6	Output bit X.7
	DI: 24 V / current as per input characteristic Type 3 DO: 24 V / max. 2			

Table 6: Channel assignment for DIDO modules

5   Diagnostics and LED Displays

All IMPACT20 modules have separate and well arranged LEDs for device and I/O status. These displays are located on the front of the device.

The following diagnostics are displayed visually and signaled over the fieldbus:

- Sensor short-circuit as group signal

- Actuator short-circuit by channel and group signal

- Module power supply undervoltage UI (module power supply is less than 18 V).

- Actuator power supply undervoltage UA (actuator power supply is less than 18 V).
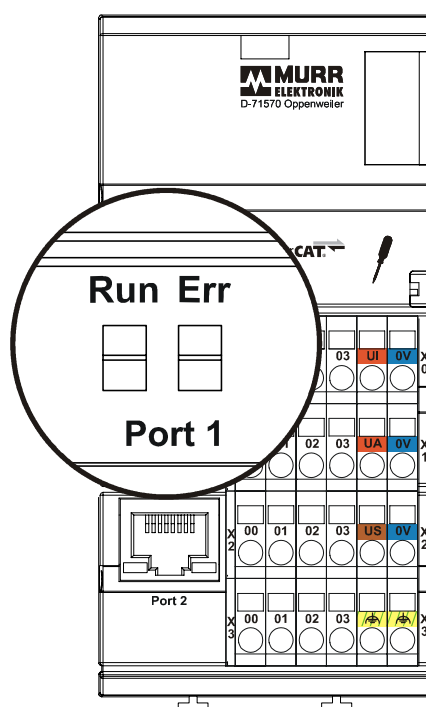
5.1   Function of Bus Status LEDs

Fig. 18: EtherCAT module: Bus LEDs

5.1.1   Signal States of Bus Status LEDs

Name	LED	Status	Description
ERROR (red)	off	No error	Device operating normally (Device OK)
	Single flash	Unsolicited State Change	Slave changed the EtherCAT status. The "Change" parameter in the AL status register was set to 01 (change/error).
	Flickering	Booting Error	A booting error was detected.
	Double flash	Application Watchdog Timeout	Watchdog Timeout occurred.
	Triple flash	Reserved	Reserved
	On	PDI Watchdog Timeout	PDI Watchdog Timeout occurred.
RUN (green)	Flickering	INITIALIZATION or BOOTSTRAP	Device boots and has not yet reached INIT state.
	Single flash	SAFE-OPERATIONAL	Device in SAFE-OPERATIONAL state
	Blinking	Pre-Operational	The device is in PRE-OPERATIONAL state
	On	Operational	The device is in OPERATIONAL state
	off	INIT	Device in INIT mode.
L/A (green)	off	No Link	No link present
	On	Link	Link present, no or defective activity on bus
	Flickering	Activity	Link present, device in data exchange

Table 7: Bus status LEDs on module front panel

A distinction is made between the following indicator states:

|	
LED on:	Constant on
LED off:	Constant off
LED flickering:	On / off phase at a rate of approx. 10 Hz: on for approx. 50 ms and off for approx. 50 ms.
LED blinking:	On / off phase at a rate of approx. 2.5 Hz: on for approx. 200 ms followed by off for approx. 200 ms.
LED single flash:	a single flash (approx. 200 ms) followed by a long off phase (approx. 1000 ms).
LED double flash:	A sequence of two short flashes (approx. 200 ms), the pause between two flashes is approx. 200 ms. This sequence is terminated by a long off-phase (approx. 1000 ms).
LED triple flash:	A sequence of three short flashes (approx. 200 ms), the pause between three flashes is approx. 200 ms. This sequence is terminated by a long off-phase (approx. 1000 ms).
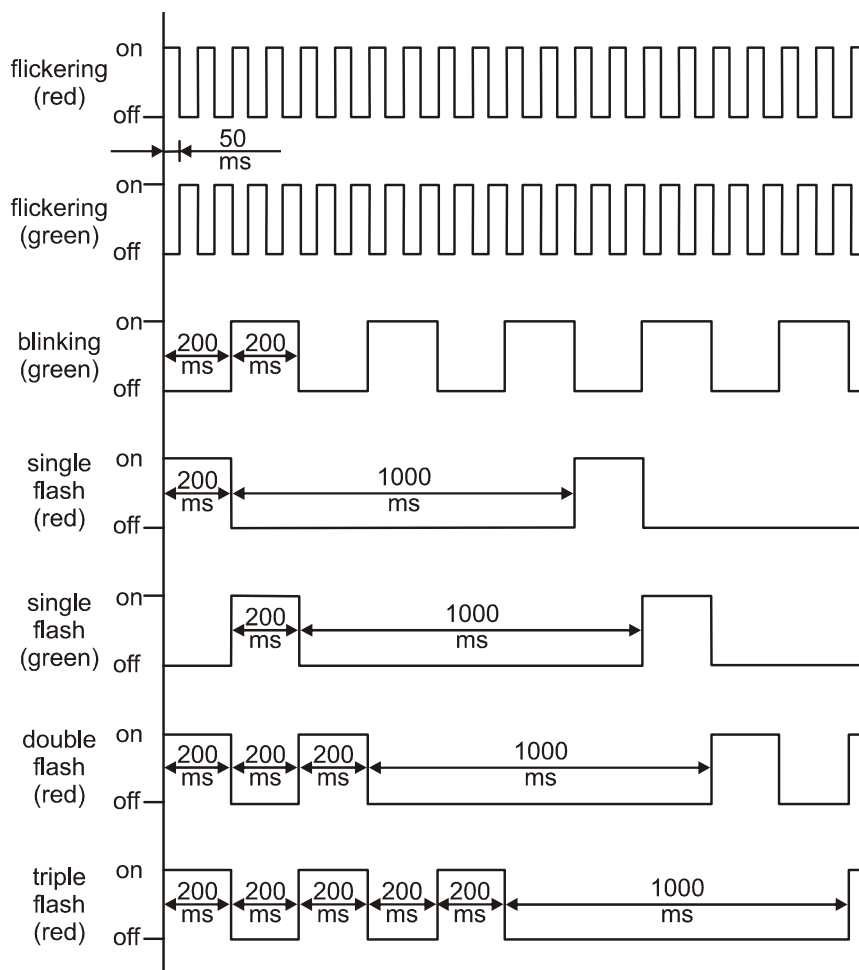
Fig. 19: Status of bus displays and flash rates

5.1.2   Module and Actuator Power Supplies

An LED is provided for each of the module power supply terminals "UI" and actuator power supply terminals "UA".

- The LEDs under "**UI**" show the status of the module and sensor power supplies.

- The LEDs under "**UA**" show the status of the digital outputs.

5.1.3   Threshold Values of the Module Power Supply UI

There are two thresholds for undervoltage detection:

12 V < UI < 18 V   The device continues to function but

- The UI LED lights up red.

- The associated diagnostic was transferred to the Master.

< 12 V   The device performs a power reset.
                          All outputs are reset to 0.

5.1.4   Threshold Values of the Power Supply UA

There is one threshold for undervoltage detection:

12 V < UA < 18 V   The device continues to function but

- The UA LED lights up red.

- The associated diagnostic was transferred to the Master.

< 12 V   - The UA LED is off.
                          - All outputs are reset to 0.

5.1.5   LED Displays UI and UA

LED Displays UI and UA	Response	State
	green	Power supply OK (≥ 18 V)
	red	Undervoltage (< 18 V)
	off	Voltage ≤ approx. 12 V

Table 8: LED module power supply

> **!** **Please note that the sensor power supply voltage (US terminal) is connected internally to the module power supply voltage (UI terminal). This ensures that the two terminals have the same voltage.**

5.2   Signal-Logic Display and LED Behavior

A separate status display is assigned to every channel. This is labeled **"00 to 03"**. The status display is located below the associated terminal and shows the status of the inputs and outputs.

5.2.1   Correlation Between Signal-logic Display and LED Behavior at the Input

LED Display		Logic Value	Voltage at Input	Signal
	off	0	< 11 V	Input with NO contact function
	Yellow	1	11 to 30.2 V (dependent on US)	

Table 9: LED at input of digital modules

5.2.2   Correlation Between Signal-logic Display and LED Behavior at the Output

LED Display		Logic Value	Voltage at output	Signal
	off	0	0 V	Output
	Yellow	1	12 to 30.2 V (dependent on UA)	

Table 10: LED at output of digital modules

5.3   Short-Circuit or Overload of Sensor Power Supply US

Response of IMPACT20 modules to short-circuit or overload of sensor power supply:

- The bus transmits the diagnostic data to the Master.

- The diagnostic LED at the associated terminal lights up red.

LED Display US	Response	State
	off	Power supply OK
	red	Overload or short-circuit of sensor power supply.

Table 11: LED periphery power supply

After rectification of the overload or short-circuit, the sensor power supply is immediately available again.

5.4   Short-Circuit or Overload of Actuators

Response of IMPACT20 modules to short-circuit or overload of outputs:

- The bus transmits diagnostic data to the Master.

- The diagnostic LED on the associated terminal lights up red.

LED Display	Response	State
	Off / yellow	Output with no overload / short-circuit
	red	Output in overload / short-circuit case

Table 12: LED at output of digital modules

After rectifying the overload or short-circuit, the output is only available after UA switchoff or channel reset.

5.5   Diagnostics via the Fieldbus

5.5.1 Diagnostics via I/O Data

The following diagnostics are reported:

- Sensor short-circuit group signal

- Actuator shutdown by channel and group signal

- Module / sensor power supply undervoltage (The power supply U_S is lower than 18V)

- Actuator power supply undervoltage (the power supply U_A is lower than 18 V)

With EtherCAT , the diagnostics are sent in separate diagnostic telegrams.

5.5.2 Diagnostics via I/O Data

In the I/O data section, access to the diagnostic messages is via Objects 1001H (Module State) and 1002H (ActuatorShortcut, not for IMPACT20-EC DI16 56912). The associated transmit PDO is the Object 1A01 (ErrorState).

Bit assignment in Object 1001H (ModuleState)

This object contains device-related diagnostics. A set bit corresponds to an existing diagnostic.
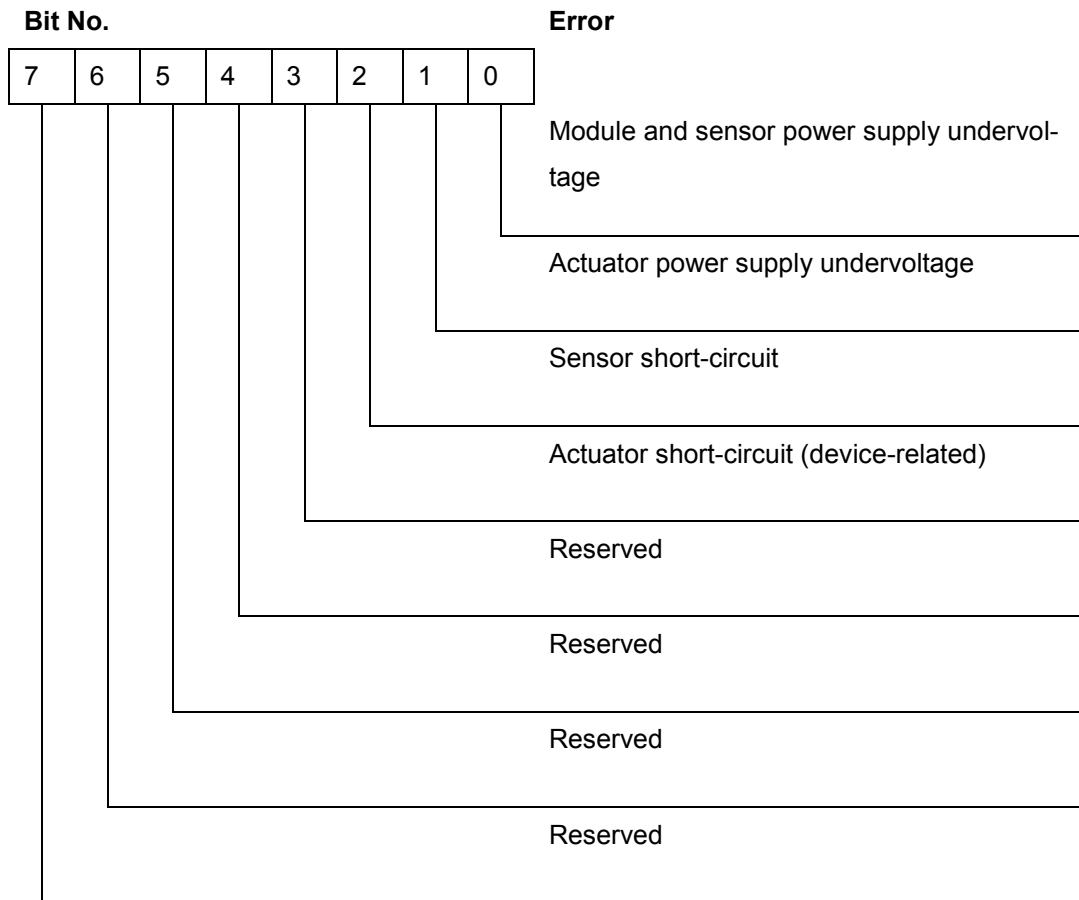
Fig. 20: Bit assignment in Object 1001H (ModuleState)

Bit assignment in Object 1002H (ActuatorShortcut)

This object contains channel-precise actuator short-circuit diagnostics. A set bit corresponds to an existing diagnostic.

Bit assignment DI8/DO8
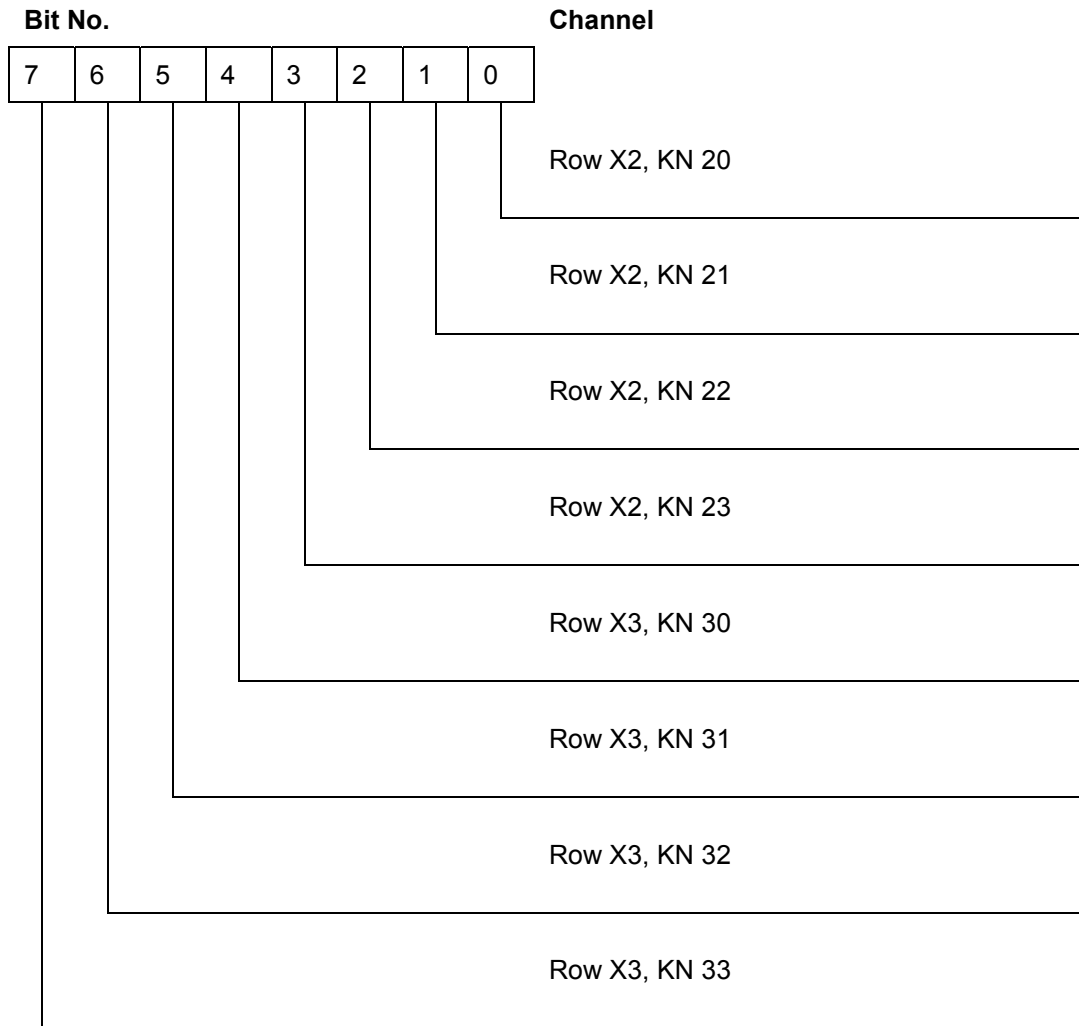
Fig. 21: Actuator short-circuit bit assignment DI8DO8

Bit assignment for DO16 Part 1

Bit No.								**Channel**
7	6	5	4	3	2	1	0	

Row X0, KN 00

Row X0, KN 01

Row X0, KN 02

Row X0, KN 03

Row X1, KN 10

Row X1, KN 11

Row X1, KN 12

Row X1, KN 13
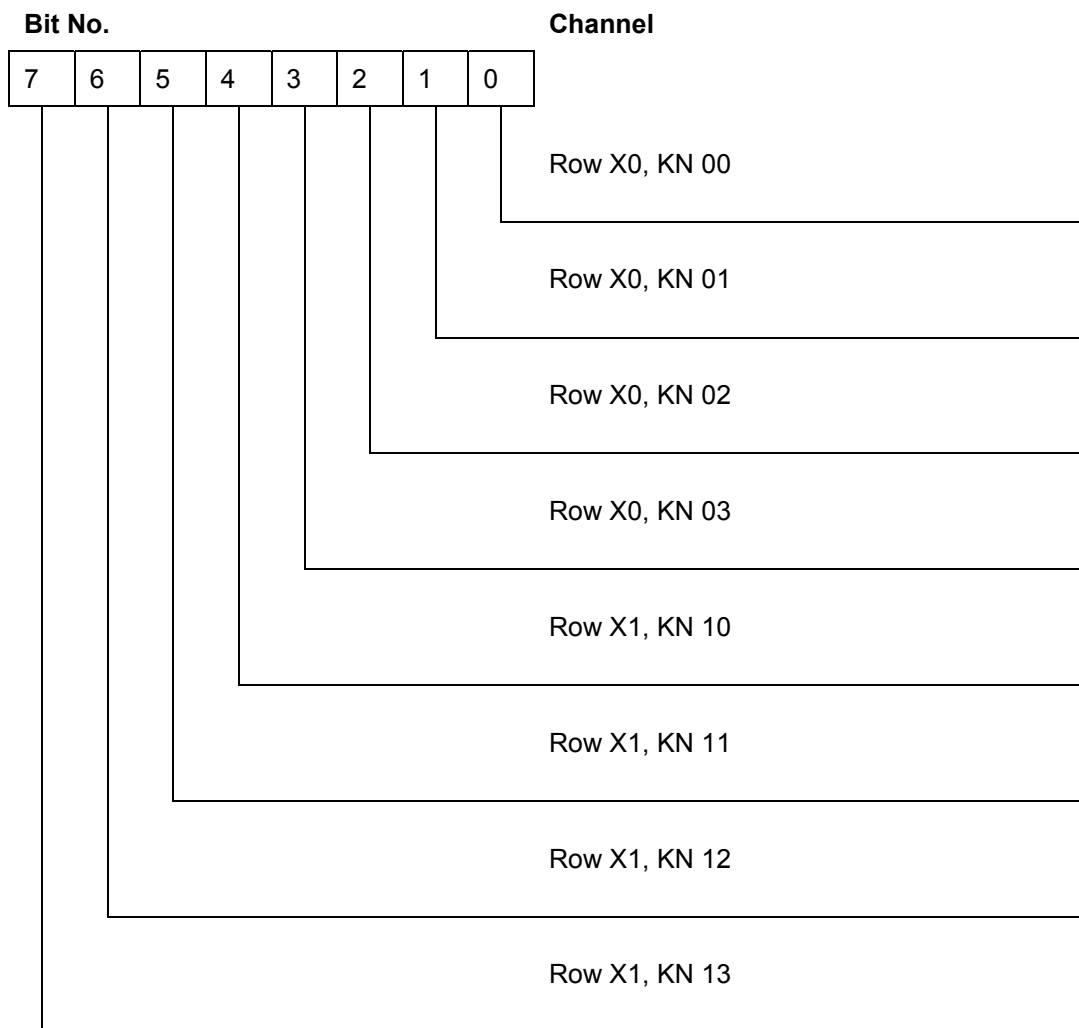
Fig. 22: Actuator short-circuit bit assignment DO16 Part 1

Bit assignment for DO16 Part 2

| **Bit No.** | | | | | | | | **Channel** |

15	14	13	12	11	10	9	8

Row X2, KN 20

Row X2, KN 21

Row X2, KN 22

Row X2, KN 23

Row X3, KN 30

Row X3, KN 31

Row X3, KN 32

Row X3, KN 33
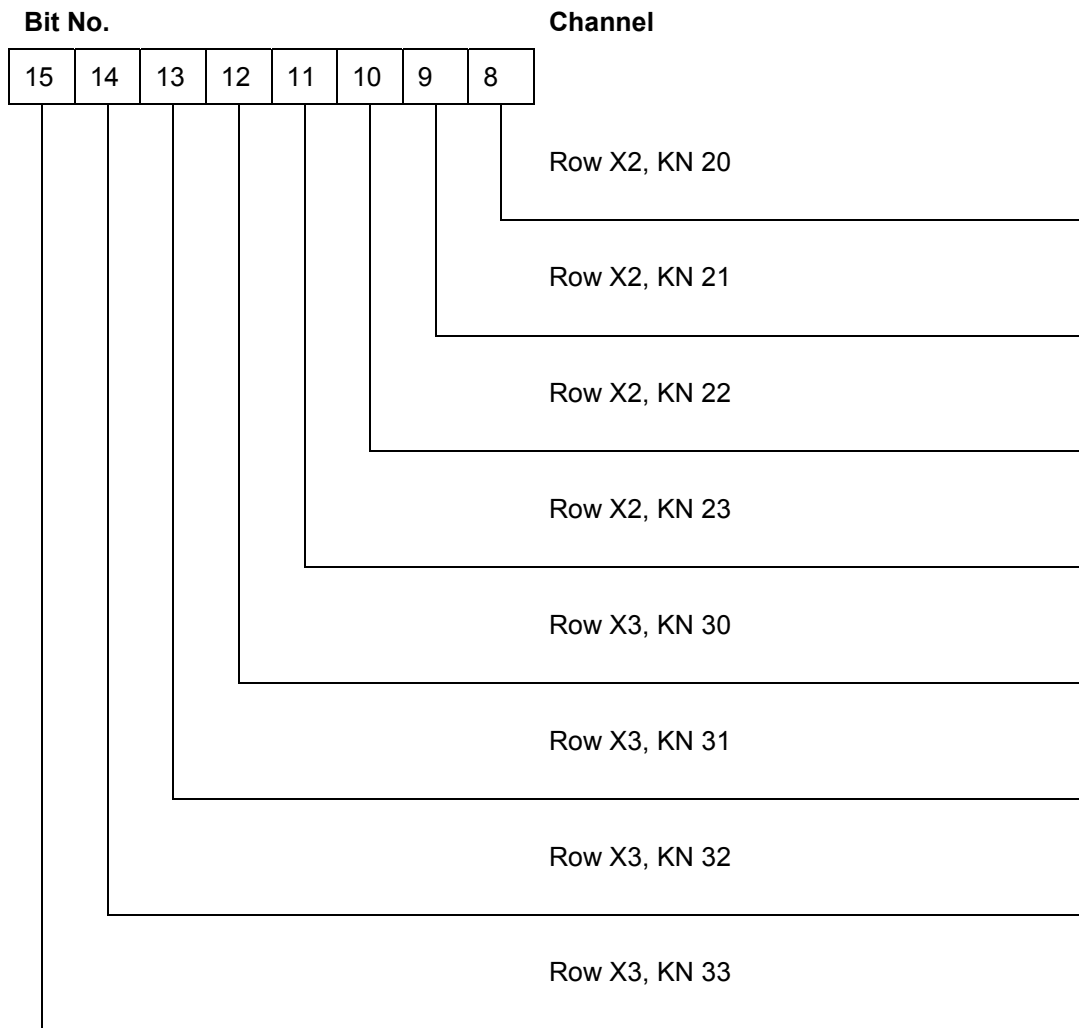
Fig. 23: Actuator short-circuit bit assignment DO16 Part 2

6   Technical Data

6.1   EtherCAT IP20 Module

	IMPACT20 EC DI16 Art. No.: 56912	IMPACT20 EC DI8 DO8 Art. No.: 56913	IMPACT20 EC DO16 Art. No.: 56914
General			
Terminals X0 and X1	16 inputs	8 inputs	16 outputs
Terminals X2 and X3		8 outputs	
EMC			
EN 61131-2	Product standard		
EN 61000-4-2 ESD	Contact ± 4 kV, air ± 8 kV		
EN 61000-4-3 RF-Field & GSM	10 V/m		
EN 61000-4-4 Burst	± 2 kV DC inputs, ± 1 kV signal lines Asym./sym. ± 500 V		
EN 61000-4-5 Surge	Asym. ± 1 kV		
EN 61000-4-6 HF-asymmetric	10 V		
EN 61000-4-8 Magnetic field 50 Hz	30 A/m		
EN 55011 Emission	QP 40 dBµV/m (30 … 230 MHz) QP 47 dBµV/m (230 … 1000 MHz) Class B		
Ambient Conditions			
Operating temperature	0°C ... +55 °C		
Storage temperature	-25°C ... +70 °C		
Enclosure type according to EN 60529	IP 20		

	IMPACT20 EC DI16 Art. No.: 56912	IMPACT20 EC DI8 DO8 Art. No.: 56913	IMPACT20 EC DO16 Art. No.: 56914
General			
Mechanical Ambient Conditions			
Oscillation according to EN 60068 Part 2-6	5 … 60 Hz: constant amplitude 0,35 mm; 60 … 150 Hz: constant acceleration 5 g		
Shock according to EN 60068 Part 2-27	Amplitude 15 g, 11 ms duration		
Miscellaneous			
Dimensions (LxWxH)	117 x 56 x 47 mm		
Mounting dimension (L xW)	117 x 56 mm		
Weight	Approx. 170 g		

	IMPACT20 EC DI16 Art. No.: 56912	IMPACT20 EC DI8 DO8 Art. No.: 56913	IMPACT20 EC DO16 Art. No.: 56914
Bus Data			
Transfer protocol	EtherCAT		
Cycle time	50 µs		
Electrical isolation	500 V between bus and internal logic by opto couplers		
Vendor ID	79dez, 4Fhex		
I/O data length input and diagnostics	4 bytes	4 bytes	4 bytes
I/O data length output		2 bytes	3 bytes
Connection Possibilities			
Sensor and actuator supply	Cage clamp max. 2.5 mm²		
Bus connection	2 x RJ45		
Sensor	4 x 4 terminal block connectors	2 x 4 terminal block connectors	-
Outputs	-	2 x 4 terminal block connectors	4 x 4 terminal block connectors
Maximum length of output cable	-	with 0.75 mm² max. 10 m, with 0.34 mm² max. 5 m	
Maximum length of input cable	< 30 m		-
Power Supply			
Operating voltage range logic UI	18 … 30.2 V DC		
Current consumption (only, UI)	120 mA		
Actuator supply UA power over cage clamp connection	max. 8 A		
Reverse voltage protection module electronics	Yes		
Reverse voltage protection actuator supply	-	Yes	
Reverse voltage protection sensor supply US	Yes		-
Overvoltage protection	Yes (suppressor diode)		

	IMPACT20 EC DI16 Art. No.: 56912	IMPACT20 EC DI8 DO8 Art. No.: 56913	IMPACT20 EC DO16 Art. No.: 56914
Inputs			
Number of inputs	16	8	-
Delay time for signal change	min. 500 µs		-
Input characteristics	EN 61131-2, Type 3		-
Outputs			
Number of outputs	-	8	16
Actuator current load	-	approx. 2 A per actuator	
Delay time for signal change		min. 500 µs	
Delay time for signal change with inductive load		max. 100 ms	
Lamp load	-	max. 40 W	
Sensor power supply US			
Max. current	0.7 A		-
Short circuit protection for sensors with automatic restart	Yes		-
Reverse polarity protection	Yes		-

Table 13: Technical Data

6.1.1   Dimensioning
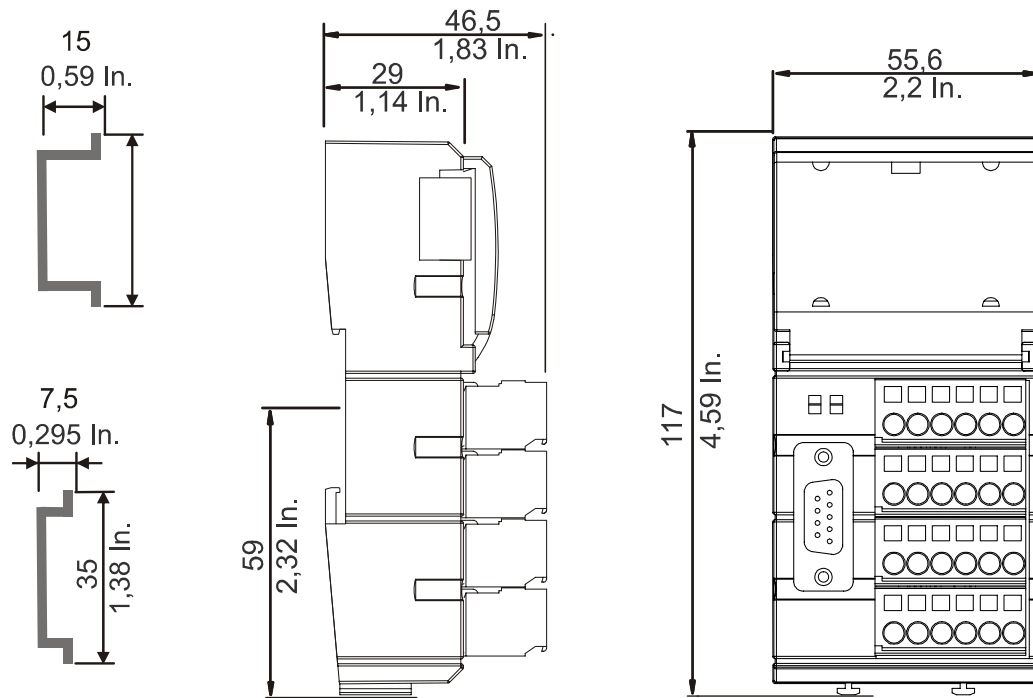
Fig. 24: Dimensioning

The dimensions of all IMPACT20 modules are identical.

7   Accessories

7.1   Label Sheets

Article Number	Description
56113	Label Sheets

Table 14: Accessories, Label Sheets

7.2   Coding Elements for Terminals

Article Number	Description
56115	Coding elements for terminals

Table 15: Accessories, Coding Elements for Terminals

7.3   Blind Plugs RJ45

Article Number	Description
58150	Blind plugs RJ45

Table 16: Accessories, blind plugs

7.4   Fieldbus Cables

Article Number	Description
7000-00000-8409999	Bus cable for EtherNet/IP, 100 m collar
7000-99711-7960060	Bus cable RJ45 – RJ45, straight 0.6 m
7000-99711-7960100	Bus cable RJ45 – RJ45, straight 1.0 m
7000-99711-7960150	Bus cable RJ45 – RJ45, straight 1.5 m
7000-99711-7960300	Bus cable RJ45 – RJ45, straight 3.0 m

Table 17: Fieldbus cables

7.5   Fieldbus Connectors

Article Number	Description
7000-99051-0000000	RJ45 Ethernet connector, straight shielded, 4-pin, IP20 self-connecting

Table 18: Fieldbus connectors

7.6   I/O Cable

Murrelektronik offers a wide range of actuator and sensor products. This ranges from connectors, cables, and adapters through to special-purpose requirements. Refer to our catalog or visit our inline shop at
www.murrelektronik.com*.*

7.7   Recommended Power Supply Units

Primary switched-mode power supply units from Murrelektronik are specially designed to power automation systems. For this reason, we recommend this system type to power modules.

Murrelektronik offers a comprehensive selection of primary switched-mode power supply units. Refer to our catalog or visit our inline shop at
www.murrelektronik.com*.*

7.8   MICO

- • – Fire protection (EN 60950-1)

- • – Operating voltage protection (EN 61131-2)

- • – Operating state memory device (EN 61131-1)

Article Number	Description	Nominal operating branch-circuit current (full load)	
9000-41034-0100400	MICO 4.4 (4 channels)	each 4 A	
9000-41034-0100600	MICO 4.6 (4 channels)	each 6 A	
9000-41034-0401000	MICO 4.10 (4 channels)	each 10 A	
9000-41042-0100400	MICO 2.4 (2 channels)	each 4 A	
9000-41042-0100600	MICO 2.6 (2 channels)	each 6 A	
9000-41042-0401000	MICO 2.10 (2 channels)	each 10 A	

Table 19: Overview of MICO variants

7.9   Voltage Terminal Block

Article Number	Description
56078	Voltage terminal block gray / gray / brown / blue
56079	Voltage terminal block gray / gray / yellow / blue
56080	Voltage terminal block yellow / blue / yellow / blue
56081	Voltage terminal block brown / blue / brown / blue
56109	Voltage terminal block brown / brown / blue / blue
56110	Voltage terminal block blue / blue / yellow / yellow
56111	Voltage terminal block blue / yellow / brown / blue

Table 20: Voltage Terminal Block Accessories

7.9.1   Description

Voltage terminal blocks are small aids that assist in the simple bridging or chaining of a required level or voltage.

Fig. 25: Application information

7.9.2   Mounting Dimensions
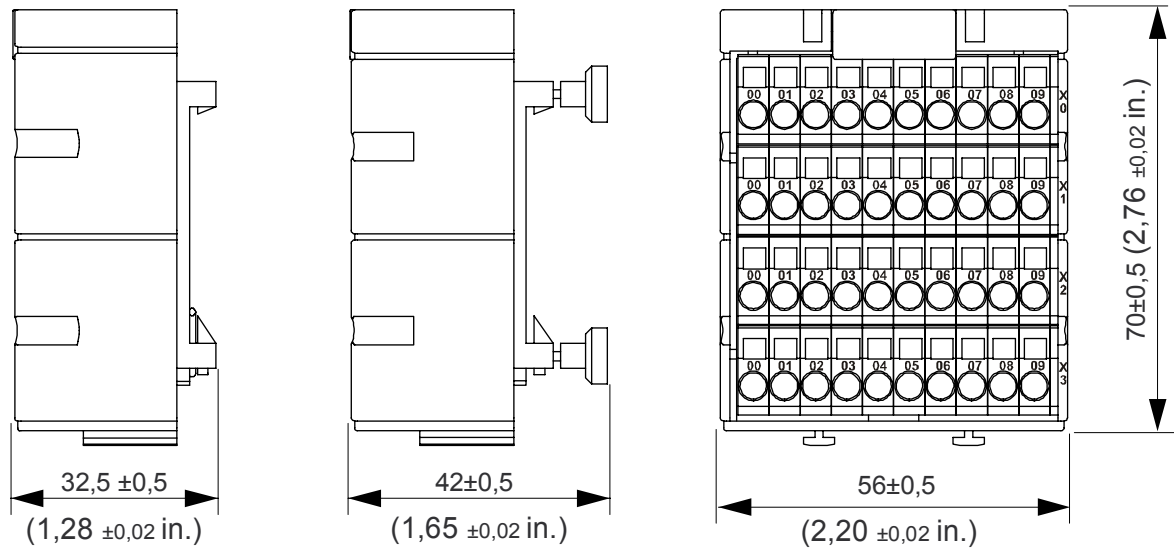
Fig. 26: Mounting Dimensions

7.9.3   Mounting Position/Distances

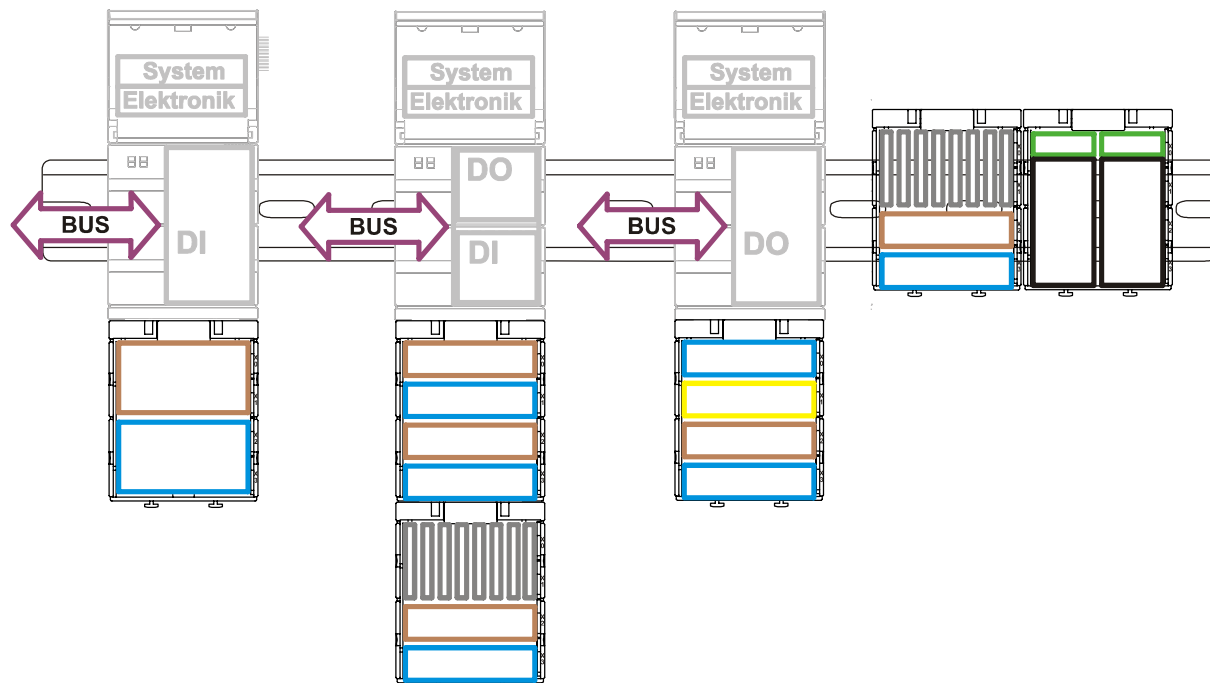|	
Einbaulage / Mounting position	beliebig / any
Abstand / Distance	beliebig / any

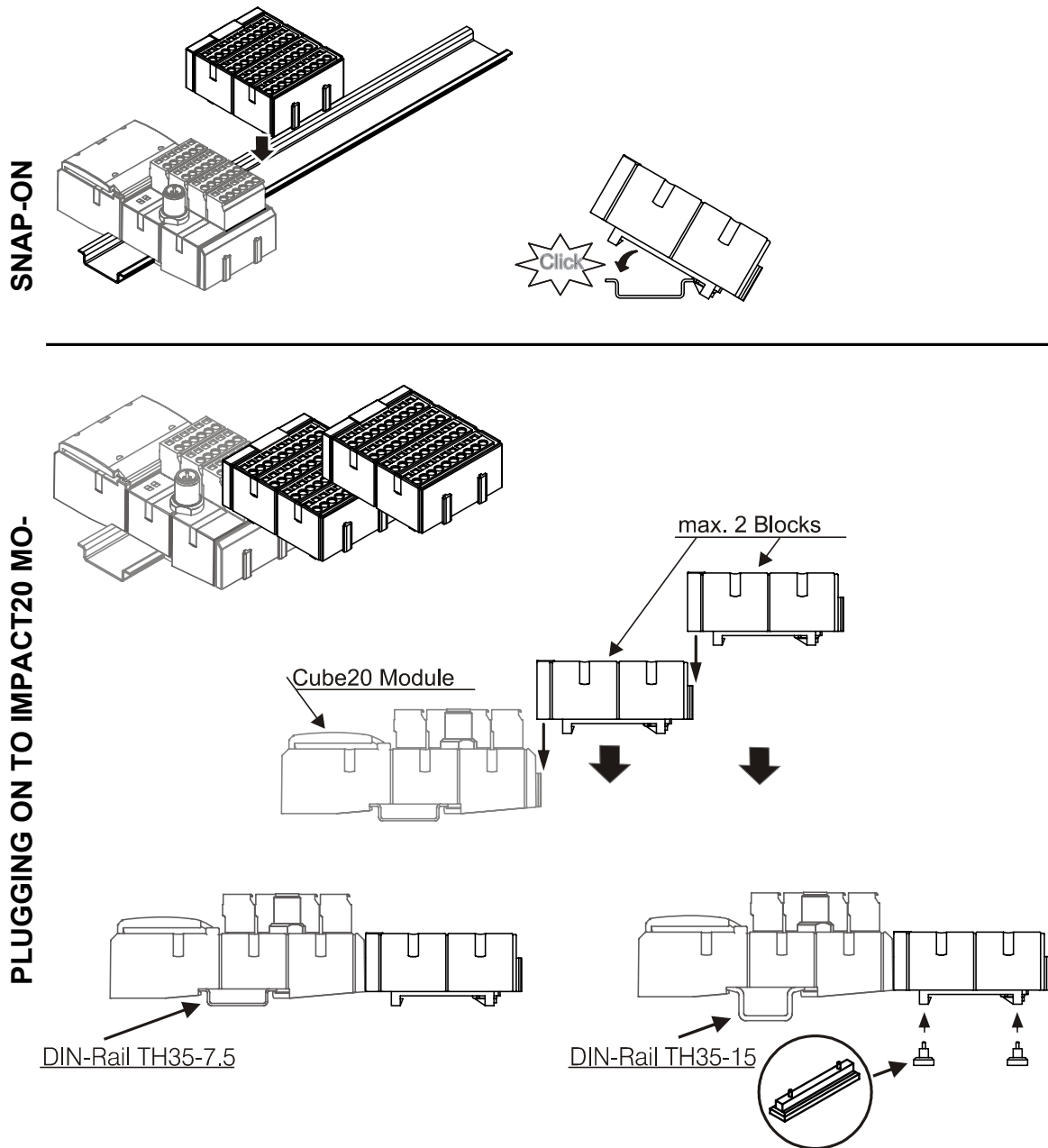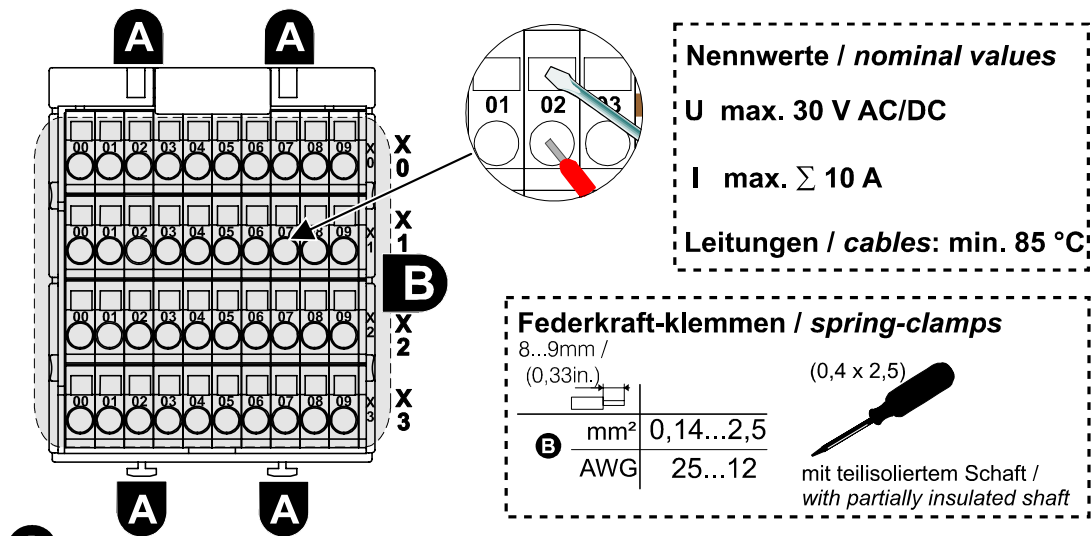## 7.9.4   Mounting on DIN Mounting Rail and on Module

Fig. 27: Mounting the voltage terminal block on DIN mounting rails and on IMPACT20 module

7.9.5   Installation

7.9.5.1   Terminal Overview Art. Nos. 56078, 56079, 56080, 56081, 56084, 56109, 56110, 56111

Nennwerte / *nominal values*

U   max. 30 V AC/DC

I   max. $\sum$ 10 A

Leitungen / *cables*: min. 85 °C

Federkraft-klemmen / *spring-clamps*

8...9mm / (0,33in.)

(0,4 x 2,5)

	mm²	0,14...2,5
B	AWG	25...12

mit teilisoliertem Schaft / *with partially insulated shaft*

A   Modulverbindung / *Module-connection*

B

	Art.-No. 56078	Art.-No. 56079		
X0	grau / grey	grau / grey	X0	(00...09)
X1	grau / grey	grau / grey	X1	(00...09)
X2	(Us +24 V) braun / brown	(FE) gelb / yellow	X2	(00...09)
X3	(0 V) blau / blue	blau / blue (0 V)	X3	(00...09)

	Art.-No. 56080	Art.-No. 56081	Art.-No. 56084	Art.-No. 56111		
X0	(FE) gelb / yellow	(Us +24 V) braun / brown	grau / grey	(0 V) blau / blue	X0	(00...09)
X1	(0 V) blau / blue	(0 V) blau / blue	grau / grey	(FE) gelb / yellow	X1	(00...09)
X2	(FE) gelb / yellow	(Us +24 V) braun / brown	grau / grey	(Us +24 V) braun / brown	X2	(00...09)
X3	(0 V) blau / blue	(0 V) blau / blue	grau / grey	(0 V) blau / blue	X3	(00...09)

	Art.-No. 56109	Art.-No. 56110		
X0	(Us +24 V) braun / brown	(0 V) blau / blue	X0	(00...09)
X1	(Us +24 V) braun / brown	(0 V) blau / blue	X1	(00...09)
X2	(0 V) blau / blue	(FE) gelb / yellow	X2	(00...09)
X3	(0 V) blau / blue	(FE) gelb / yellow	X3	(00...09)

7.9.5.2   Terminal Overview Art.No. 56082

Nennwerte / *nominal values*

U AC/DC max. 30 V
I max. 10 A
I max. ∑ 20 A

Leitungen / *cables*: min. 85 °C

Federkraft-klemmen / *spring-clamps*

(0,4 x 2,5)

		8 mm ... 9 mm
B	mm²	0,08...4
	AWG	28...12

mit teilisoliertem Schaft /
with partially insulated shaft

		8 mm
C	mm²	0,13...1,5
	AWG	28...16
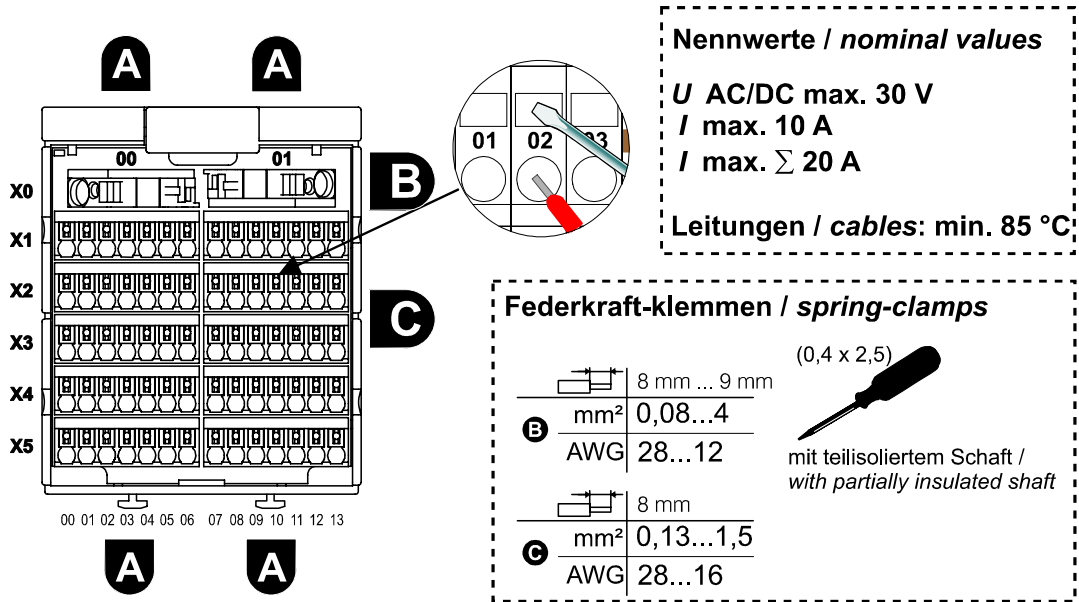
A Modulverbindung / *Module-connection*

B Einspeiseklemmme / *Input terminal*

C

	Art.-No. 56082			
X0	grün / *green*	(00)		(01)
X1	schwarz / *black*	(00...06)		(07...13)
X2	schwarz / *black*	(00...06)		(07...13)
X3	schwarz / *black*	(00...06)		(07...13)
X4	schwarz / *black*	(00...06)		(07...13)
X5	schwarz / *black*	(00...06)		(07...13)
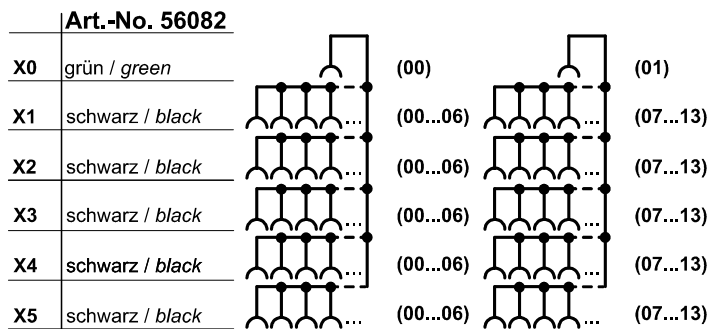
7.9.6   Technical Data of IMPACT20 Voltage Terminal Blocks

The IMPACT20 voltage terminal block is an expansion module for all IMPACT20 modules. It is fitted with 4 terminal rows that are electrically connected in various ways.
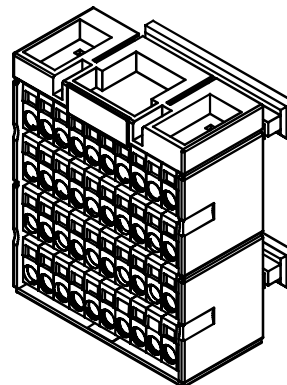
7.9.6.1   Technical Data Art. Nos. 56078, 56079, 56080, 56081, 56084, 56109, 56110, 56111

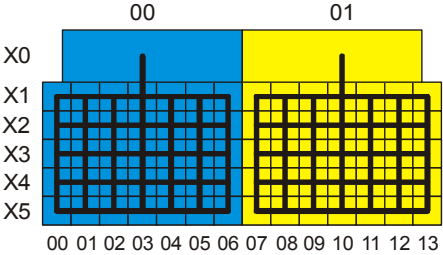| Technische Daten / *Technical data*	
Spannung / *voltage*	AC/DC max. 30 V
Strom / *current*	max. 10 A
Umgebungsbedingungen / *Ambient conditions*	
Arbeitstemperatur / *Operating temperature*	0°C to +55°C
Lagertemperatur / *Storage temperature*	-40°C to +85°C
Schutzart nach EN 60529 / *Enclosure type according to IEC 60529*	IP20
Mechanische Beanspruchung / Mechanical ambient conditions	
EN 60068 Part 2-6 Schwingprüfung / *Oscillation according to DIN IEC 60068 Part 2-6*	5 g
EN 60068 Part 2-27 Schockprüfung / *Shock according to DIN IEC 60068 Part 2-27*	15 g / 11 ms
Anschlussmöglichkeiten / Connection possibilities	
Federkraftklemmen / *spring clamps*	
Betätigungswerkzeug / *Operation tool*	mit teilisoliertem Schaft; / with partly insulated shaft Klinge / blade (2.5 x 0.4) mm
Anschlussquerschnitt / *Terminal cross-section*	0.14 mm² to 2.5 mm², AWG 25 … AWG 12
Abisolierlänge / *Stripping length*	8 mm to 9 mm 0.33 in.
Sonstiges / Miscellaneous	
Gewicht / *Weight*	70 g
Maße (L x B x H) / *Dimensions (L x W x H)*	
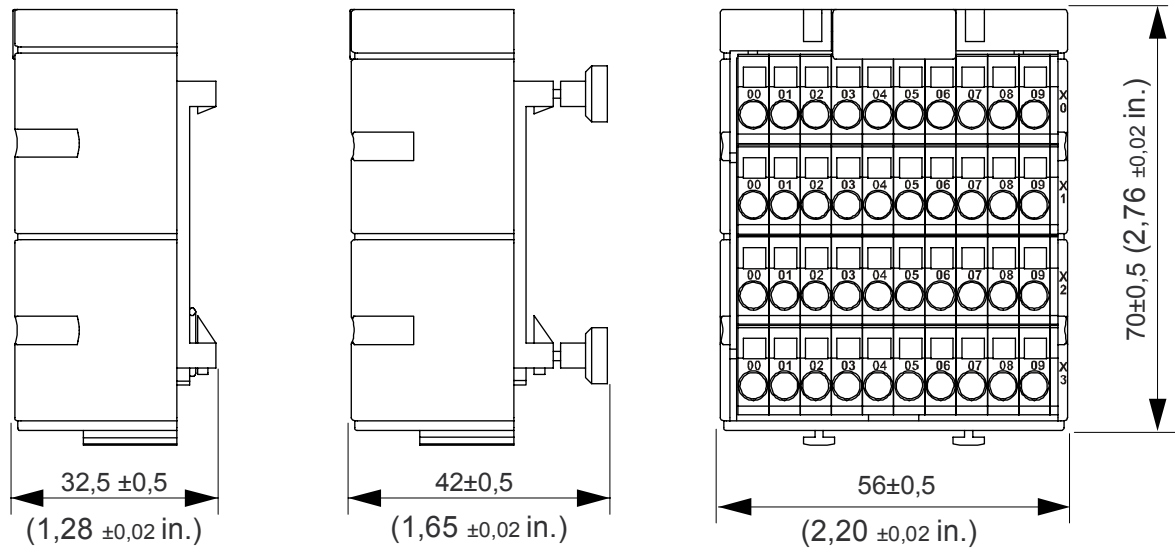
32,5 ±0,5
(1,28 ±0,02 in.)

42±0,5
(1,65 ±0,02 in.)

56±0,5
(2,20 ±0,02 in.)

70±0,5 (2,76 ±0,02 in.)

Montage / *Mounting*	
Einbaulage / *Mounting position*	beliebig / *any*
Abstand / *Distance*	beliebig / *any*

7.9.6.2 Technical Data Art. No. 56082

Art. No.	Benennung / *Name*	Ausführung / *Construction*
56082	Potenzialklemmenblock / *Potential terminal block*	
		gebrückt / *bridged* ▬▬▬▬
Technische Daten / *Technical Data*		
Spannung / *voltage*		AC/DC max. 30 V
Strom / *current*		max. 10 A mit Leitungen für / *with cables for* min. 85 °C
Summenstrom / *combined current*		20 A
Umgebungsbedingungen / *Ambient Conditions*		
Arbeitstemperatur / *Operating temperature*		0°C to +55°C
Lagertemperatur / *Storage temperature*		–40°C to +85°C
Schutzart nach EN 60529 / *Enclosure type according to IEC 60529*		IP20
Mechanische Beanspruchung / *Mechanical ambient conditions*		
EN 60068 Part 2-6 Schwingprüfung / *Oscillation according to DIN IEC 60068 Part 2-6*		5 g
EN 60068 Part 2-27 Schockprüfung / *Shock according to DIN IEC 60068 Part 2-27*		15 g / 11 ms
Anschlussmöglichkeiten zwei Einspeiseklemmen / *Connection possibilities two Input terminals*		
Federkraftklemmen / *spring clamps*		
Betätigungswerkzeug / *Operation tool* (Wago No. 210-620)		mit teilisoliertem Schaft; / with partly insulated shaft Type 2, Klinge / blade (3.5 x 0.5) mm
Anschlussquerschnitt / *Terminal cross-section*		0,08 mm² … 4 mm², AWG 28 … AWG 12
Abisolierlänge / *Stripping length*		8 mm to 9 mm

Anschlussmöglichkeiten 2 x 35 Potenzialklemmen / *Connection possibilities 2 x 35 Potential terminals*	
Push In Feder-Anschluss / *Push In spring connection*	
Anschlussquerschnitt / *Terminal cross-section*	0,13 mm² … 1,5 mm², AWG 28 … AWG 16
Abisolierlänge / *Stripping length*	8 mm
Sonstiges / *Miscellaneous*	
Gewicht / *Weight*	107 g
Maße (L x B x H) / *Dimensions (L x W x H)*	

32,5 ±0,5
(1,28 ±0,02 in.)

42±0,5
(1,65 ±0,02 in.)

56±0,5
(2,20 ±0,02 in.)

70±0,5 (2,76 ±0,02 in.)

Montage / *Mounting*	
Einbaulage / *Mounting position*	beliebig / *any*
Abstand / *Distance*	beliebig / *any*

Glossary

Byte	Equivalent to 8 bits
DI	Digital Input
DIN	Deutsches Institut für Normung (German Standards Institute)
DO	Digital Output, Digitale Ausgänge
I/O	Input/Output
EC	EtherCAT
EC Directive 2004/108/EC	EMC Directive.
EMC	Electromagnetic Compatibility.
EN	European Standard
ESD	Electrostatic Discharge
FE	Function ground
I	Current
I/O	Input/Output
IEC	International Electrotechnical Commission
IGMP	Internet Group Management Protocol
IP20	Ingress Protection, protection degree to DIN EN 60529 1st digit = protection against contact and foreign bodies 2nd digit = protection against water 2: Protection against the ingress of solid foreign bodies above a diameter of 12.5 mm, protection against access by finger 0: No protection against inclusion
ISO	International Standard Organization
LED	Light Emitting Diode
LSB	Least Significant Bit.
MSB	Most Significant Bit.
PAA	Process map of outputs

PAE	Process map of inputs
PELV	Protective Extra Low Voltage
Power-LED	LED to signal operating status
RPI	Requested Packet Interval
SELV	Safety Extra Low Voltage.
U	voltage
US (brown terminal)	Sensor power supply (output)
UA (red terminal)	Actuator Power Supply
UI (red terminal)	Module and sensor power supply.
VDMA	Verband Deutscher Maschinen- und Anlagenbau e.V. (Association of German Machinery and Industrial Equipment Manufacturers)
VZ	Sign (+ or -)
ZVEI	Zentralverband Elektrotechnik- und Elektronikindustrie e.V. (German Electrical and Electronic Manufacturers' Association).

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