ICE1-*-G60L-V1D, ICE1-*-G60L-C1-V1D

Fieldbus Modules with Multiprotocol Technology

Manual





EtherNet/IP"

Ether**CAT**



Your automation, our passion.

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1 Safety

1.1 Introduction

1.1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- · Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal

Note

For full information on the product, refer to the further documentation on the Internet at www.pepperl-fuchs.com.

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- · EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Other documents

1.1.2 Manufacturer

Pepperl+Fuchs Group Lilienthalstraße 200, 68307 Mannheim, Germany Internet: www.pepperl-fuchs.com

1.1.3 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.



1.1.4 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:



Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.

This symbol brings important information to your attention.



Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols



Action

Note

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.





2 Product Description

2.1 Use and Application

Module Description

The ICE1-*-G60L-*- modules function as an interface in an industrial fieldbus system. They enable communication between a central controller at the control level and the decentralized sensors and actuators at the field level. To do so, in addition to the fieldbus interface, different variants of the modules have a different number of ports for digital inputs and outputs.

The following module types are described in this manual:

• Ethernet IO module with fixed number of inputs/outputs

8DI8DO modules

- ICE1-8DI8DO-G60L-V1D: Ethernet IO module with 8 digital inputs (8DI) and 8 digital outputs (8DO)
- ICE1-8DI8DO-G60L-C1-V1D: Ethernet IO module with 8 digital inputs (8DI), 8 digital outputs (8DO) and decentralized control function

16DI modules

- ICE1-16DI-G60L-V1D: Ethernet IO module with 16 digital inputs (16DI)
- Ethernet IO module with configurable inputs/outputs

16DIO modules

- ICE1-16DIO-G60L-V1D: Ethernet IO module with 16 digital inputs/outputs (16DIO), freely configurable
- ICE1-16DIO-G60L-C1-V1D: Ethernet IO module with 16 digital inputs/outputs (16DIO), freely-configurable and decentralized control function

The modules have an integrated 2-port switch, have multiprotocol capability and can be configured for EtherNet/IP, PROFINET, or EtherCAT. The resulting potential line or ring topologies that can be achieved enable reliable data communication and a significant reduction in the amount of wiring required, which therefore makes the costs for installation and maintenance reasonable. Simple and rapid extension is also possible.

The ICE1-*-G60L-* series modules have a robust metal housing made of die-cast zinc. Due to the fully encapsulated device housing, the module electronics are protected against environmental influences and can be used in a wide range of temperatures. Despite the robust design, the modules have compact dimensions and a low weight. They are especially suitable for use in machines and plants with a moderate I/O concentration on distributed assemblies.

Multiprotocol (EtherNet/IP, PROFINET, or EtherCAT)

The Ethernet IO modules are multiprotocol modules and allow you to select one of many different protocols for communication within a fieldbus system. As a result, multiprotocol modules can be integrated into different networks without the need to purchase protocol-specific modules. Thanks to this technology, you can also use one and the same module in different environments.

Using rotary coding switches in the lower area of the modules, you can comfortably and easily set both the protocol and the address of the module, provided the protocol to be used supports this. If you have chosen a protocol and started the cyclic communication once, the module remembers this setting and uses the selected protocol from this point on. To use another supported protocol with this module, perform a factory reset.



Special Product Features

Robust design

Connectivity options for the module series include the widespread M12 connector with A encoding for I/O signals and D coding for the network. In addition, the connectors are color-coded to prevent confusion of the ports. The output circuits are galvanically isolated from the rest of the network and the sensor electronics. Controllers are therefore reliably protected against noise. This does not apply to the 16DIO modules due to the configurable inputs/outputs.

Integrated web server

Network parameters such as IP address, subnet mask, and gateway can be adjusted via control switches (last byte of the IP address) or the integrated web server. The modules support the communication protocols BOOTP and DHCP for automated assignment of network parameters via the corresponding servers.

Integrated network switch

The integrated 2-port Ethernet switch of the modules allows you to set up a line topology for an EtherCAT® network or a ring topology for the EtherNet/IP network or PROFINET network. The additionally implemented DLR or MRP protocol allows you to design a highly available network infrastructure.

Redundancy function

The module firmware supports the redundancy function DLR (Device Level Ring) or MRP (Media Redundancy Protocol) for ring topologies. This means that if the connection is interrupted, the modules switch to an alternative ring segment and thus ensure interruption-free operation. The DLR class supported is "beacon-based" in accordance with the EtherNet/IP specification.

Fail-safe function

The modules with output functionality offer a fail-safe function. You can therefore choose the behavior of each individual output channel in the event of an interruption or a loss of communication.

QuickConnect

QuickConnect allows the modules to record the communication in an EtherNet/IP network particularly quickly through an accelerated boot-up process. This allows you to switch tools more quickly, for example.

Force Mode

"Force Mode" allows the simulation of process data at the inputs/outputs without the need to connect sensors and actuators. This means you can test an application in advance without a full physical application. It is possible to simulate input switching states or to switch outputs even without a controller. This feature eases and accelerates machine commissioning and can be used to test new production plants.

Decentralized control function on C1 modules

ICE1-*-G60L-**C1**-V1D modules with decentralized control function (DCU) can control applications independently using an integrated programmable logic. They can therefore run timers, counters and other functions and can optionally exchange data with a higher-level controller. The program's residual storage is ideal for plug and play operation. This allows installation and maintenance of these modules to be quick and intuitive. Details on programming the decentralized control function can be found in the chapter "Decentralized Control Function."

• Flex-Bit technology on 16DIO modules (IO mapping):

With Flex-Bit-technology, it is possible to change the IO mapping of process data. As a rule, each channel is statically assigned to a bit in the process data. This function allows the data direction of a channel to be determined, along with its process data bit assignment. By configuring the IO mapping, it is therefore possible to operate Ethernet IO modules in applications with bit mappings from other manufacturers.

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Automatic configuration of inputs/outputs on 16DIO modules via input/output profiles

The 16DIO modules can be used universally and offer a variety of input/output profiles as basic configuration. By selecting a predefined profile, you can very easily preconfigure a 16DIO module as, among other things, a 16DI, 16DO, or 8DI8DO module. This allows quick and easy replacement of existing modules within the plant.

2.2 Displays and Operating Elements



- 1 LED channel indicator
- 2 LED status indicator
- 3 Rotary switch



Note

The LEDs in the lower area of the Ethernet IO module have different names and functions depending on the selected protocol. The following LED descriptions are therefore divided into a general part (1), which is valid for all protocol settings, and LED descriptions for a specific protocol setting (2).



Figure 2.1

- E/IP: EtherNet/IP
- P: PROFINET
- EC: EtherCAT

Displays - General Part

Description for LED A, B, DIA, U_S, U_S, DCU/FM

LED	Function			
LED A (for each of X1 - X8)	White: channel A status is "on" Off: no error, not connected Bed: peripheral error (sensor/actuator overload or short circuit)			
DIA	· · · · · · · · · · · · · · · · · · ·			
LED B X1 - X8 B	White: channel B status is "on" Off: no error, not connected			
DIA	Red: peripheral error (sensor/actuator overload or short circuit)			
LED U _S	Green: voltage 19 V \leq U _S \leq 30 V Red: voltage U _S < 19 V or U _S > 30 V			
LED UL ¹	Green: voltage 19 V \leq U _L \leq 30 V Red: voltage U _L < 19 V or U _L > 30 V			
LED C/FM Only ICE1-8DI8DO- G60L-C1-V1D And ICE1-16DIO- G60L-C1-V1D	Blue: DCU function is stopped Flashing blue: DCU function is working Off: DCU function not active; Force Mode disabled Flashing red: DCU function error Flashing blue/red: Force Mode enabled			
LED FM For modules without decentralized control function (C1 modules)	Off: Force Mode disabled Flashing blue/red: Force Mode enabled			

Table 2.1

1. Only 8DI8DO and 16DIO

EtherNet/IP Displays

E/IP area: relevant LEDs Lnk/Act, MS, NS

LED	Function
LED Lnk/Act	Green: connection to an Ethernet node Flashing yellow: data exchange with an IO device Off: no connection
LED MS	Green: module ready for operation Flashing green: missing configuration Flashing red/green: self-test Red: non-recoverable, serious error Flashing red: minor recoverable error (e.g., incorrect configuration) Off: module switched off
LED NS	Green: module has at least one connection Flashing green: module has no connections IP address is available Red/green: module is performing a self-test Red: module has determined that the assigned IP address already exists Off: module is turned off or does not have an IP address

Table 2.2

PROFINET Displays

P area: relevant LEDs Lnk/Act, BF, DIA

LED	Function
LED Lnk/Act	Green: connection to an Ethernet node Flashing yellow: data exchange with an IO device Off: no connection
LED BF	Red: no configuration, slow or no physical connection Flashing red: no data exchange with IO device Off: no error
LED DIA	Red: watchdog timeout or diagnosis occurring, or system error Flashing red for 3 sec: DCP signal service triggered via the bus Off: no error

Table 2.3

EtherCAT Displays

LED **Function** LED X01 Green: connection to an Ethernet node Flashing yellow: data exchange with an IO device Off: no connection LED X02 Green: connection to an Ethernet node Flashing yellow: data exchange with an IO device Off: no connection LED RUN Green: OPERATIONAL status 1 x flashing green: SAFE OPERATIONAL status Flashing green: PRE-OPERATIONAL status Flickering green: module is starting up and is not yet in INIT state, or module is in BOOTSTRAP state and is loading firmware. Off: INIT status LED ERROR Red: control error, e.g., PDI watchdog timeout Flickering: error during booting Flashing red: incorrect configuration; general configuration error 1 x flashing red: local error, undesired status change 2 x flashing red: watchdog error Off: no error

EC area: relevant LEDs X01, X02, RUN, ERR

Operating Elements

Switch	Function
Rotary switch X100	Setting the fieldbus protocol Setting the IP address ¹
Rotary switch X10	Setting the IP address
Rotary switch X1	Setting the IP address

1. Only EtherNET/IP

Note

Details on setting the protocol and the IP address can be found in the chapter "Commissioning, Protocol Setting"



2.3 Interfaces and Connections

The contact arrangements below show the front view of the plug-in area of the connectors.

Fieldbus Connection X01, X02

- Connection: M12 socket, 4 pin, D-coded
- Color coding: green •



Figure 2.2 Schematic drawing of port X01, X02

Port	Pin	Signal	Function
Ports X01, X02	1	TD+	Transmit data +
	2	RD+	Receive data +
	3	TD-	Transmit data -
	4	RD-	Receive Data -
Table 2.4 Assignment of port X01, X02			

Table 2.4



Caution!

Risk of destruction!

Never route the power supply to the data cable.

Connection for Power Supply X03, X04

- Power supply with M12 power L-coded •
- Color coding: gray •



Caution!

Loss of function when the system supply voltage is too low.

Ensure in all cases that the supply voltage measured at the most remote participants (sensor/actuator) does not drop below 18 V DC in terms of system supply voltage.



Note

Power supply connection

When connecting the power supply, ensure a separate power supply to the sensor and system via Us and auxiliary supply via UL for e.g., actuators. Where the plant has a separate power supply concept for system current and load current, this means the sensor and system area of the Ethernet IO module can continue working even if there is a failure of the load power supply.

Where several Ethernet IO modules are connected in series, ensure the separate power supplies are connected properly U_s.U_I.



Figure 2.3 Schematic drawing of M12 L-encoding (plug); port X03 (IN)





Figure 2.4 Schematic drawing of M12 L-encoding (socket); port X04 (OUT)

Port	Pin	Signal	Function
Power supply	1	U _S (+24 V)	Sensor/system supply
700, 704	2	GND U _L	Ground/reference potential V _{Aux}
	3	GND U _S	Ground/reference potential V_s
	4	U _L (+24 V)	Auxiliary power supply (galv. insulated)
	FE (5)	FE (FE)	Functional ground



Note

For the system/sensor and actuator supply, use only power supplies that comply with PELV (protective extra-low voltage) or SELV (safety extra-low voltage). Power supplies according to EN 61558-2-6 (transformer) or EN 60950-1 (switching power supplies) fulfill these requirements.

Connection for Inputs/Outputs X1 ... X8

- Connection: M12 socket, 5 pin, A-coded
- Color coding: black



Figure 2.5 Schematic drawing of M12 socket, 5-pin, A-encoded, port X1 ... X8

Note

Depending on the module type, the pins of ports X1 ... X8 are occupied differently.



Note

For inductive loads of usage category DC13 (EN60947-5-1), the outputs are able to control currents of 1.6 A at a frequency of 1 Hz.

Modules ICE1-8DI8DO-G60L-V1D and ICE1-8DI8DO-G60L-C1-V1D

Port	Pin	Signal	Function
Inputs	1	+24 VDC	Sensor/system supply
A1 A4	2	IN B	Digital input B
	3	0 VDC	Ground/reference potential
	4	IN A	Digital input A
	5	FE (FE)	Functional ground



Product Description

Port	Pin	Signal	Function
Outputs	1	Not used	
X5 X8	2	OUT B	Digital output B
	3	0 VDC	Ground/reference potential
	4	OUT A	Digital output A
	FE (5)	FE (FE)	Functional ground

Module ICE1-16DI-G60L-V1D

Port	Pin	Signal	Function
Inputs	1	+24 VDC	Sensor/system supply
XTX8	2	In B	Digital input B
	3	0 VDC	Ground/reference potential
	4	In A	Digital input A
	FE (5)	FE (FE)	Functional ground

Modules ICE1-16DIO-G60L-V1D and ICE1-16DIO-G60L-C1-V1D

Port	Pin	Signal	Function
Outputs	1	+24 VDC	Sensor/system supply
×1×6	2	IN B/OUT B	Can be configured as digital input B or output B
	3	0 VDC	Ground/reference potential
	4	IN A/OUT A	Can be configured as digital input A or output A
	FE (5)	FE (FE)	Functional ground

2.4 Dimensions



Figure 2.6 ICE1-8DI8DO-G60L-V1D ICE1-8DI8DO-G60L-C1-V1D ICE1-16DI-G60L-V1D ICE1-16DIO-G60L-V1D ICE1-16DIO-G60L-V1D

3 Installation

3.1 General Information

Install the module with two M6x25/30 size screws on a level surface. The required torque is 1 Nm. Use washers according to DIN 125. For the installation holes, use a spacing of 237.3 mm to 239.7 mm.



Note

Power supply connection

When connecting the power supply, ensure a separate power supply to the sensor and system via U_s and auxiliary supply via U_L for e.g., actuators. Where the plant has a separate power supply concept for system current and load current, this means the sensor and system area of the Ethernet IO module can continue working even if there is a failure of the load power supply.

Where several Ethernet IO modules are connected in series, ensure the separate power supplies are connected properly $\rm U_{S}\,.U_{L}.$



Note

To dissipate interference currents and the EMC strength, the modules use a short circuit to ground with an M4 thread. This is marked with the symbol for grounding and the label "XE."

Note

Connect the module using a low-impedance connection with the reference ground. In the case of a grounded mounting surface, you can connect the module directly via the fixing screws.

	_		

Note

For non-grounded mounting surfaces, use a ground strap or a suitable FE conductor. Connect the ground strap or FE conductor to the grounding point using an M4 screw and place a washer and a serrated washer under the fixing screw if possible.

Note

To program the controller, please consult the manufacturer information and use only the appropriate accessories.



Note

For UL application:

Only connect Ethernet IO modules using a UL-certified cable with suitable ratings (CYJV or PVVA).

Approved only for indoor use. Please observe the maximum altitude of 2000 meters. Approved up to a maximum of pollution degree 2.



Warning!

Terminals, the housing of field-wired terminal boxes or components may exceed a temperature of 60 $^\circ\text{C}.$





Warning!

Use temperature-resistant cable with heat resistance up to at least 96 $^\circ\text{C}$ for the following Ethernet IO modules:

ICE1-8DI8DO-G60L-C1-V1D and ICE1-8DI8DO-G60L-V1D

ICE1-16DIO-G60L-V1D and ICE1-16DIO-G60L-C1-V1D

4 Commissioning, Protocol Setting

4.1 Setting Protocols

Multiprotocol

You can use the multiprotocol modules to select various protocols for communication within a fieldbus system. This allows you to integrate the multiprotocol modules into different networks without having to obtain a specific module for each protocol. This technology also allows you to use the same module in different environments. Using the rotary switches on the front of the modules, you can easily and conveniently set the protocol and address of the module if the protocol to be used supports this. Once you have selected a protocol and started the cyclical communication, the module recognizes these settings and uses the selected protocol from this point on. To use another supported protocol with this module, perform a factory reset.

Setting a Protocol

Multiprotocol modules have a total of three rotary switches. Alter the switch position for the first rotary switch X100 to set the protocol. For the other rotary switches, set the last two digits of the IP address when using EtherNet/IP.





Assigning the Protocol Using the Rotary Switches

Protocol	X100	X10	X 1
EtherNet/IP	0-2	0-9	0-9
PROFINET	Р	-	-
EtherCAT	EC	-	-

The default settings of the module do not contain any protocol settings. In this case, simply select the desired protocol. To use a modified rotary switch setting (protocol setting), you have to execute a power cycle or "Reset" of the web interface. Once you have set the protocol using the rotary switches, the module saves these settings as soon as it starts a cyclical communication. From this point, you can no longer change the protocol using the rotary switch. To change the protocol, perform a factory reset first.

If you set the rotary coding switch to an invalid position, the device signals this with a flash code: the BF/MS/ERR LED flashes red three times.

You can change the IP address depending on the selected protocol.



EtherNet/IP

If you use EtherNet/IP as the protocol, use rotary switch X100 to set the value 100 as the last octet of the IP address for the module. With the X100 rotary switch, you can set a value of 0 to 2 for the IP address. With the X10 and X1 rotary switches, you can set values between 0 and 9. You can use rotary switch X10 to configure position 10 of the last octet of the IP address. With rotary switch X1 you can configure position 1 of the last octet of the IP address.

The default setting for the first three octets of the IP address is 192.168.1.

Example: Rotary switch settings 2 (X100), 1 (X10), and 0 (X1) result in an IP address of 192.168.1.210 for EtherNet/IP.

Alternatively, the required network parameters can be obtained via DHCP or BOOTP if the rotary switch is set to zero.

PROFINET

If you use PROFINET as the protocol, set rotary switch X100 to the value "P."

EtherCAT

If you are using EtherCAT as the protocol, set rotary switch X100 to the value "EC."

Factory Settings

A factory reset erases any changes you have made to settings etc. and restores the factory settings. The saved protocol selection is also reset.

To perform a factory reset, set rotary switch X100 to 9, rotary switch X10 to 7 and rotary switch X1 to 9. Then switch the module off and on again. The factory settings are restored after 10 seconds.

To select a new protocol, follow the instructions in this chapter.





Caution!

Destruction of the Operating System

When restoring the factory settings, ensure that the module is connected to the power supply and switched on for **at least** 10 seconds. If it has been on for less than 10 seconds, the operating system may be destroyed. The module then has to be sent to Pepperl+Fuchs for repair.



5 Commissioning for EtherNet/IP

5.1 Preparation

To configure a module in the controller, you need an EDS file. Each of the module variants requires its own EDS file.

Downloading the EDS File

You can find the relevant EDS file in the **Software** section of the product detail page for the device.

To access the product detail page for the device, go to http://www.pepperl-fuchs.com and type information about the device, e.g., the product description or the item number, into the search function.

Use the hardware or network configuration tools from your controller manufacturer to install the EDS file for the module variant used. After installation, the modules can be found in the hardware catalog as "General Purpose Discrete I/O" devices.

Reading MAC IDs

Each module has a unique, manufacturer-assigned MAC ID that cannot be changed by the user. The assigned MAC ID is printed on the right-hand side of the module.

Setting the Network Parameters

Using the three control switches on the front of the modules, you can set the operating mode for receiving network parameters such as the IP address, subnet mask, and gateway address.

Please note that a fixed IP address is required to use QuickConnect.

Once the power supply has been restored, the modules read in the switch positions. The selected operating mode overwrites the saved settings.

The devices support the DHCP and BOOTP protocols for receiving the required network parameters such as IP address and subnet mask.

The factory settings of the static network parameters are:

- IP address: 192.168.001.001
- Subnet mask: 255.255.255.000
- Gateway address: 000.000.000.000

The following settings are possible via the rotary coding switches:

Rotary switch posi- tion	Function
000 (As delivered)	The DHCP and BOOTP functionality is activated as standard on deliv- ery. The network parameters are initially requested using DHCP requests. If this is not successful, the request is made using BOOTP requests. The network parameters are not saved; however, it is possi- ble to save them via the integrated web server.
000 (Network parameters already saved)	The last-saved network parameters are used (IP address, subnet mask, gateway address, DHCP on/off , BOOTP on/off).
001 to 254	The last three digits of the saved or default IP address are overwritten by the control switch setting.
255 to 298 (Default: 299)	The network parameters are requested via DHCP and BOOTP but are not saved.



Rotary switch posi- tion	Function
979	The device performs a reset to factory settings. The network parame- ters are also reset to the default values. Communication is not possi- ble in this operating mode.

Table 5.1

5.2 Configuration

Implicit and Explicit Messaging

The Ethernet IO modules support implicit and explicit messaging for EtherNet/IP communication. IO process data is transmitted on a cyclical basis via assembly objects and an existing connection using implicit messaging.

Low-priority data, non-time-critical data, configuration and diagnostic data can be exchanged via non-cyclical messages using explicit messaging.

Connections and Assembly Object

The Ethernet IO modules support connection types Exclusive Owner, Input Only and Listen Only for exchanging IO process data and communication via implicit messaging.

Exclusive owner

This connection is bidirectional: the controller sends data to the module and the module sends data to the controller. This type of connection is known as exclusive owner because it connects **one** module to the controller in each case.

Input only

With this type of connection, only the module sends data to the controller. The module sends a heartbeat, possibly at reduced intervals. This enables the controller to detect interruptions to the connection.

Listen only

This connection corresponds to the input only connection but can only be established if an exclusive owner or input only connection also exists between another module and the controller.

An "exclusive owner" connection is only available for modules with output functionality (variants 16DIO and 8DI8DO). By selecting the corresponding instance ID for the assembly object, you determine whether the module adds diagnostic data to the standard process data.

The 16DIO-variant Ethernet modules are universally applicable and provide a variety of profiles for basic configuration. Using these, you can preconfigure a 16DIO module as a 16DI, 16DO or 8DI/8DO module, among other things, and replace a module where required, for example. Each I/O channel can be used as an input or output for the 16DI/DO profile. If an I/O channel is used as an input, the PLC programmer should not set the corresponding output bit.

By using the preconfigured alternate profiles, the risk of incorrect configuration is reduced through the use of profiles 16DI, 16DO or 8DI/8DO. In these profiles, the I/O channels are configured as "input" or "output."

Ethernet IO modules of type ICE1-8DI8DO-G60L-C1-V1D ICE1-16DIO-G60L-C1-V1D have the DCU function. For these, the process data is extended in both directions by 18 additional bytes.



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5.2.1 16DIO Modules, Connections and Assembly Objects

Note

The possible profiles for the Ethernet IO module with configurable inputs/outputs are listed below.

First for the ICE1-16DIO-G60L-V1D module and then for the ICE1-16DIO-G60L-C1-V1D module with DCU function.

ICE1-16DIO-G60L-V1D

ICE1-16DIO-G60L-V1D: Ethernet IO module with 16 digital inputs/outputs (16DIO), freely configurable

16-DI/DO Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
16 DI/DO + DIA	Exclusive owner	Yes	Output: 100	2 byte
			Input: 101	7 byte
16 DI/DO	Exclusive owner	No	Output: 100	2 byte
			Input: 102	3 byte
16 DI/DO + DIA	Input only	Yes	Output: 193	0 byte
			Input: 101	7 byte
16 DI/DO	Input only	No	Output: 193	0 byte
			Input: 102	3 byte
16 DI/DO	Input only	No	Output: 193 Input: 102	0 byte 3 byte

Table 5.2

8-DI/DO Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
8 DI/DO + DIA	Exclusive owner	Yes	Output: 103	1 byte
			Input: 104	6 byte
8 DI/DO	Exclusive owner	No	Output: 103	1 byte
			Input: 105	2 byte
8 DI/DO + DIA	Input only	Yes	Output: 193	0 byte
			Input: 104	6 byte
8 DI/DO	Input only	No	Output: 193	0 byte
			Input: 105	2 byte

Table 5.3

16-DI Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
16 DI + DIA	Input only	Yes	Output: 193	0 byte
			Input: 101	7 byte
16 DI	Input only	No	Output: 193	0 byte
			Input: 102	3 byte

Table 5.4



8-DI Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
8 DI + DIA	Input only	Yes	Output: 193	0 byte
			Input: 104	6 byte
8 DI	Input only	No	Output: 193	0 byte
			Input: 105	2 byte

Table 5.5

16-DO Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
16 DO + DIA	Exclusive owner	Yes	Output: 100	2 byte
			Input: 106	5 byte
16 DO	Exclusive owner	No	Output: 100	2 byte
			Input: 107	1 byte

Table 5.6

8-DO Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
8 DO + DIA	Exclusive owner	Yes	Output: 103	1 byte
			Input: 106	5 byte
8 DO	Exclusive owner	No	Output: 103	1 byte
			Input: 107	1 byte

Table 5.7

8-DI/8-DO Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
8 DI/8 DO + DIA	Exclusive owner	Yes	Output: 103	1 byte
			Input: 104	6 byte
8 DI/8 DO	Exclusive owner	No	Output: 103	1 byte
		Ī	Input: 105	2 byte
8 DI/8 DO + DIA	Input only	Yes	Output: 193	0 byte
			Input: 104	6 byte
8 DI/8 DO	Input only	No	Output: 193	0 byte
			Input: 105	2 byte

Table 5.8

Generic Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
Generic 16 DI + DIA	Listen only	Yes	Output: 192	0 byte
			Input: 101	7 byte

2019-10

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
Generic 16 DI	Listen only	No	Output: 192	0 byte
			Input: 102	3 byte
Generic 8 DI + DIA	Listen only	Yes	Output: 192	0 byte
			Input: 104	6 byte
Generic 8 DI	Listen only	No	Output: 192	0 byte
			Input: 105	2 byte

Table 5.9

Even-Number DI/DO-Byte Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
16 DI/DO + DIA	Exclusive owner	Exclusive owner Yes 0	Output: 100	2 byte
			Input: 108	8 byte
16 DI/DO + DIA	Input No	Output: 193	0 byte	
			Input: 108	8 byte
Generic 16 DI + DIA	Listen only	Yes	Output: 192	0 byte
			Input: 104	6 byte

Table 5.10

ICE1-16DIO-G60L-C1-V1D (DCU Function)

Ethernet IO module with 16 digital inputs/outputs (16DIO), freely configurable and decentralized control function (DCU function).

16-DI/DO DCU Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
16 DI/DO + DIA + DCU	Exclusive owner	Yes	Output: 100	20 byte
			Input: 101	25 byte
16 DI/DO + DCU	Exclusive owner	No	Output: 100	20 byte
			Input: 102	21 byte
16 DI/DO + DIA + DCU	Input only	Yes	Output: 193	0 byte
			Input: 101	25 byte
16 DI/DO + DCU	Input only	No	Output: 193	0 byte
			Input: 102	21 byte

Table 5.11

8-DI/DO DCU Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
8 DI/DO + DIA + DCU	Exclusive owner	Yes	Output: 103	19 byte
			Input: 104	24 byte
8 DI/DO + DCU	CU Exclusive owner	No	Output: 103	19 byte
			Input: 105	20 byte



Connection	Type of connec- tion	Diagnosis	Instance ID	Length
8 DI/DO + DIA + DCU	Input only	Yes	Output: 193	0 byte
			Input: 104	24 byte
8 DI/DO + DCU	Input only	No	Output: 193	0 byte
			Input: 105	20 byte

Table 5.12

16-DI DCU Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
16 DI + DIA + DCU	Input only	Yes	Output: 193	0 byte
			Input: 101	25 byte
16 DI + DCU	Input only	No	Output: 193	0 byte
			Input: 102	21 byte

Table 5.13

8-DI DCU Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
8 DI + DIA + DCU	Input only	Yes	Output: 193	0 byte
			Input: 104	24 byte
8 DI + DCU	Input only	No	Output: 193	0 byte
			Input: 105	20 byte

Table 5.14

16-DO DCU Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
16 DO + DIA + DCU	Exclusive owner	Yes	Output: 100	20 byte
			Input: 106	23 byte
16 DO + DCU	Exclusive owner	No	Output: 100	20 byte
			Input: 107	19 byte

Table 5.15

8-DO DCU Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
8 DO + DIA + DCU	Exclusive owner	Yes	Output: 103	19 byte
			Input: 106	23 byte
8 DO + DCU	Exclusive owner	No	Output: 103	19 byte
			Input: 107	19 byte

Table 5.16



8-DI/8-DO DCU Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
8 DI/8 DO + DIA + DCU	Exclusive owner	Yes	Output: 103	19 byte
			Input: 104	24 byte
8 DI/8 DO + DCU	Exclusive owner N	No	Output: 103	19 byte
			Input: 105	20 byte
8 DI/8 DO + DIA + DCU	Input only	Yes	Output: 193	0 byte
			Input: 104	24 byte
8 DI/8 DO + DCU Input only No	No	Output: 193	0 byte	
			Input: 105	20 byte

Table 5.17

Generic DCU Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
Generic 16 DI + DIA +	Listen only	Yes	Output: 192	0 byte
DCU			Input: 101	25 byte
Generic 16 DI + DCU	Listen only	No	Output: 192	0 byte
			Input: 102	21 byte
Generic 8 DI + DIA +	Listen only	Yes	Output: 192	0 byte
DCU			Input: 104	24 byte
Generic 8 DI + DCU	Listen only	No	Output: 192	0 byte
			Input: 105	20 byte

Table 5.18

Even-Number DI/DO-Byte DCU Profiles

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
16 DI/DO + DIA + DCU	Exclusive owner	Yes	Output: 100	20 byte
			Input: 108	26 byte
16 DI/DO + DIA + DCU	Input	No	Output: 193	0 byte
			Input: 108	26 byte
Generic 16 DI + DIA +	Listen only	Yes	Output: 192	0 byte
DCU			Input: 104	26 byte

Table 5.19

5.2.2 16DI Modules, Connections and Assembly Objects



Note

The possible profiles for the Ethernet IO module ICE1-16DI-G60L-V1D with 16 inputs are listed below.



ICE1-16DI-G60L-V1D

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
16 bit in + diagnosis	Input only	Yes	Output: 193	0 byte
			Input: 101	4 byte
16 bit in	Input only	No	Output: 193	0 byte
			Input: 102	3 byte
16 bit in + diagnosis	Listen only	Yes	Output: 193	0 byte
			Input: 101	4 byte
16 bit in	Listen only	No	Output: 193	0 byte
			Input: 102	3 byte

Table 5.20

Note

5.2.3 8DI/8DO Modules, Connections and Assembly Objects



Listed below are the possible profiles for Ethernet IO modules with 8 inputs and 8 outputs.

Connection	Type of connec- tion	Diagnosis	Instance ID	Length
8 bit in/out + diagnosis	Exclusive owner	Yes	Output: 100	1 byte
			Input: 101	6 byte
8 Bit in/out	Exclusive owner	No	Output: 100	1 byte
			Input: 102	3 byte
8 bit in/out + diagnosis	Input only	Yes	Output: 193	0 byte
			Input: 101	6 byte
8 Bit in/out	Input only	No	Output: 193	0 byte
			Input: 102	3 byte
8 bit in/out + diagnosis	Listen only	Yes	Output: 192	0 byte
			Input: 101	6 byte
8 Bit in/out	Listen only	No	Output: 192	0 byte
			Input: 102	3 byte

ICE1-8DI8DO-G60L-V1D, ICE1-8DI8DO-G60L-C1-V1D

Table 5.21

5.2.4 Configuration Parameters

Depending on the module type, different assembly objects are used to transfer configuration parameters for Ethernet IO modules. The connections and assembly objects can be found in the previous sections.

Each Ethernet IO module has a fixed number of configuration parameters. The size is determined via the respective configuration assembly instance

Length of configuration parameter:

- 16DIO modules: 65/33 words (130/66 bytes) depending on profile selected
- 16DI modules: 1 word (2 bytes)
- 8DI/8DO modules: 17 words (34 bytes)



The following configuration parameters are available only for certain Ethernet IO module versions:

- 8DI8DO modules
 - Surveillance timeout: delay in output monitoring time on a channel
 - Fail-safe: initial state of a channel in the case of a fault
- 16DIO modules
 - Surveillance timeout: delay in output monitoring time on a channel
 - Fail-safe: initial state of a channel in the case of a fault
 - Process data direction
 - · IO mapping: bit assignment for channels

QuickConnect Configuration

QuickConnect (QC) accelerates the start-up process of all Ethernet IO modules. Activating this parameter enables network communication to start up particularly quickly.

If you activate QuickConnect, it takes no longer than 350 ms for the module to accept a TCP connection after it is switched on. The controller subsequently establishes the connection. This allows the module to achieve a start-up time of approximately 400 to 500 ms.

To use QC, the network must be arranged in a star or linear topology and the module must have a static IP address. Ring topologies and DHCP/BOOTP are not supported. Please note that there is no automatic check for duplicate IP addresses within the same network.

If QuickConnect is activated, the following parameters are fixed for the Ethernet interface of the module:

- 100 Mbit/s transfer rate
- Full duplex connection
- · Auto-negotiation and Auto-MDIX switched off

Note

A prerequisite for the use of QuickConnect is adherence to a strictly defined procedure. The Ethernet IO modules must be notified before switching off (inhibit instruction) and before switching on (uninhibit instruction).

A hard disconnection is not allowed during operation. Details of this procedure can be found in document ENET-AT001C-ENP from Rockwell Automation

The following options are available for using QuickConnect:

- Disabled (0) (default value)
- Enabled (1)

General Settings Configuration

Whether these general parameters are displayed depends on the type of Ethernet IO module used. Different parameters can be configured. Each bit in this bit field represents the state of a parameter.

The following options are available for use with each individual parameter:

- Disabled (0)
- Enabled (1)

	MSB								LSB							
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
For 16	DI 0r	16DI	O mo	dule	s witl	n DI p	orofile	es								
Word 0									RE S	DO R	DC R	DC L	RD O	RU L	WIL	FM L



	MSE	3							LSB	}						
For 16	DIO n	nodu	les w	ith D	IO pr	ofile,	DOp	orofil	e and	8DI/	8DO	profil	es			
Word 32									RE S	DO R	DR C	DC L	RD O	RU L	WIL	FM L
For 8D	I/8DC) mo	dules	;												
Word 16									RE S		DR C	DC L	RD O	RU L	WIL	FM L

Table 5.22

Legend

- FML (Force Mode Lock): allow (0)/block (1) use of Force Mode via the web server, default value: allow (0)
- WIL (Web Interface Lock): allow (0)/block (1) use of the web server, default value: allow (0)
- **RUL** (Report U_L Supply Voltage Fault): deactivate (0)/activate (1) diagnostic message when actuator supply is not present (U_L), default value: activate (1)
- **RDO** (Report DO Fault without U_L): deactivate (0)/activate (1) diagnostic message when actuator supply and output control is not present (U_L), default value: activate (1)
- **DCL** (DCU Lock) only for modules with DCU function: allow (0)/block (1) decentralized control function, default value: allow (0)
- DCR (DCU Run) only for modules with DCU function: deactivate (0)/start (1) DCU program, default value: (0)
- **DOR** (Digital Out Restart Mode) reset channel diagnosis when resetting digital output (0) or automatic restart after short circuit of digital output/return of actuator supply (1), default value: automatic restart (1)
- RES (Reserved): reserved parameter, default value: 0

Surveillance Timeout

The firmware of these modules enables you to set a delay time before the monitoring of the output currents starts, i.e., a surveillance timeout. You can set this for each individual output channel.

The delay time starts after the status of the output channel changes, i.e., when the channel is activated (after a rising edge) or deactivated (after a falling edge). After this time has elapsed, the monitoring of the output begins and the diagnosis begins reporting error states.

The "surveillance timeout" can be set between 0 ms and 255 ms. The default value is 80 ms. When the output channel is in a static state, i.e., when the channel is permanently switched on or off, the value is 100 ms.

	MSB															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	Port	X5, c	hann	el A (oin 4)	, poss	ible v	alues		255						
Word 1	Port	X5, c	hann	el B (pin 2)	, poss	ible v	alues	0	255						
Word 6	Port	X8, c	hann	el A (oin 4)	, poss	sible v	alues	0	255						

Surveillance Timeout Values for 8DI/8DO Modules

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	MSB	LSB
Word 7	Port X8, channel B (pin 2), possible values	s 0 255

Table 5.23

Surveillance Timeout Values for 16DIO Modules with DIO, DO and 8DI/8DO Profiles

	MSE	3							LSB							
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	Port	X1, c	hann	el A (j	oin 4)	, poss	sible v	alues	0	255						
Word 1	Port	X1, c	hann	el B (oin 2)	, poss	ible v	alues	0	255						
Word 14	Port	X8, c	hann	el A (j	oin 4)	, poss	sible v	alues	0	255						
Word 15	Port	X8, c	hann	el B (oin 2)	, poss	sible v	alues	0	255						

Table 5.24

Fail-safe function

The firmware of these modules provides a fail-safe function for the outputs. When configuring the modules, you can define the status of the outputs after an interruption or loss of EtherNet/IP communication.

The following options are available:

- **Set low (0)** = deactivate the output channel (digital value = 0)
- Set high (1) = activate the output channel (digital value = 1)
- Hold last (2) = hold the last output state (digital value reflects last state)

Fail-safe values for 8DI/8DO modules

	MSE	3							LSB	}						
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 8	Port	X5, c	hann	el A (pin 4)	, poss	sible v	alues	s O	2						
Word 9	Port	X5, c	hann	el B (pin 2)	, poss	sible v	alues	s O	2						
Word 14	Port	X8, c	hann	el A (pin 4)	, poss	sible v	alues	s O	2						
Word 15	Port	X8, c	hann	el B (pin 2)	, poss	sible v	alues	s O	2						

Table 5.25

Fail-safe values for 16DIO modules with DIO, DO and 8DI/8DO profiles

	MSB									LSB						
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 16	Port	X1, c	hann	el A (pin 4)	, pos	sible v	alues	0	2						
Word 17	Port	X1, c	hann	el B (pin 2)	, pos	sible v	alues	s O	2						



	MSB	LSB	
Word 30	Port X8, channel A (pin 4), possi	ible values 0 2	
Word 31	Port X8, channel B (pin 2), possi	ible values 0 2	

Table 5.26

Process Data Direction Configuration (Only for 16DIO Modules)

These parameters are only supported by Ethernet IO modules on which IO mapping can be configured; these are

- ICE1-16DIO-G60L-V1D
- ICE1-16DIO-G60L-C1-V1D.

With "Process Data Direction," you can determine the data direction for each channel depending on the selected profile and IO mapping.

In a 16 DI/DO profile, for example, each channel can be configured as an input and output, a pure input or a pure output. This has the advantage that each channel can be used universally.

The following options are available:

- Input 5/output (0) = input and output channel
- Input (1) = input channel
- Output (2) = output channel

Process Data Direction for 16DIO Modules with DIO Profile

	MSE	3							LSB	}						
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 16	Port	X1, c	hann	el A (oin 4),	poss	sible v	alues	s O	2, de	fault v	alue	= 0			
Word 17	Port	X1, c	hann	el B (oin 2),	poss	sible v	alues	s O	2, de	fault v	alue	= 0			
Word 47	Port	X8, c	hann	el A (oin 4),	poss	sible v	alues	30	2, de	fault v	alue	= 0			
Word 48	Port	X8, c	hann	el B (oin 2),	poss	sible v	alues	s O	2, de	fault v	alue	= 0			
Table 5.2	27															

Process Data Direction for 16DIO Modules with 16DI Profile

	MSE	3							LSB							
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 1	Port	X1, c	hann	el A (oin 4)	, stati	c valu	e 1								
Word 2	Port	X1, c	hann	el B (oin 2)	, stati	c valu	e 1								
Word 15	Port	X8, c	hann	el A (oin 4)	, stati	c valu	e 1								

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	MSB	LSB
Word 16	Port X8, channel B (pin 2), static value 1	

Table 5.28

Process Data Direction for 16DIO Modules with 16DO Profile

	MSE	3							LSB							
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 33	Port	X1, c	hann	el A (oin 4)	stati	c valu	e 2								
Word 34	Port	X1, c	hann	el B (oin 2)	, stati	c valu	e 2								
Word 47	Port	X8, c	hann	el A (oin 4)	stati	c valu	e 2								
Word 48	Port	X8, c	hann	el B (oin 2)	, stati	c valu	e 2								
Table 5.2	9															

Process Data Direction for 16DIO Modules with 8DI/8DO Profile

	MSE	3							LSB	}						
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 33	Port	X1, c	hann	el A (j	oin 4)	pose	sible \	alues	s 1	2, de	fault v	value	= 1			
Word 34	Port	X1, c	hann	el B (j	oin 2)	, poss	sible v	alues	51	2, de	fault v	alue	= 1			
Word 47	Port	X8, c	hann	el A (j	oin 4)	poss	sible v	alues	s1	2, de	fault v	value	= 2			
Word 48	Port	X8, c	hann	el B (oin 2)	, pose	sible \	alues	\$1	2, de	fault v	alue	= 2			

Table 5.30

IO Mapping Configuration (Only for 16DIO Modules)

Using IO mapping configuration, it is possible to alter the data structure of input/output data (I/O data). By default, each I/O channel is represented in order in the process data. Existing PLC programs may sometimes use a different channel assignment.

Using these parameters, all I/O channels can therefore be freely assigned to a bit in the I/O data. It is important to note that double assignments are not possible. If incorrect parameterization of the IO mapping is detected when transferring the configuration, the Ethernet IO module will report an error. Misconfiguration can be viewed via the status page of the web interface.

The permitted value range and the default value of the parameters depend on the selected profile. A channel can also be set inactive with the value 255.

For example, if a channel were configured with a value of 3, its status value would be transferred to the 3rd bit of process data. This applies to both data directions as long as they have been configured with the "Process Data Direction" for the channel. For further information about process data, see the chapter "Bit Assignment of Process Data."



IO Mapping for 16DIO Modules with 16DI/DO and 16DO Profiles

	MSE	3							LSB							
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 49	Port	X1, c	hann	el A (pin 4),	poss	sible v	alues	s O	15, 2	55, de	efault	value	= 0		
Word 50	Port	X1, c	hann	el A (pin 2),	, poss	ible v	alues	s O	15, 2	55, de	efault	value	= 1		
Word 63	Port	X8, c	hann	el A (pin 4),	poss	sible v	alues	s O	15, 2	55, de	efault	value	= 14		
Word 64	Port	X8, c	hann	el B (oin 2),	poss	sible v	alues	s O	15, 2	55, de	efault	value	= 15		

Table 5.31

IO Mapping for 16DIO Modules with 8DI/DO and 8DO Profiles

	MSE	3							LSB	3						
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 49	Port	X1, c	hann	el A (oin 4),	poss	sible v	alues	s O	7, 25	5, def	ault v	alue =	= 0		
Word 50	Port	X1, c	hann	el A (oin 2),	poss	sible v	alues	s O	7, 25	5, def	ault v	alue =	= 255		
Word 63	Port	X8, c	hann	el A (oin 4),	poss	sible v	alues	30	7, 25	5, def	ault v	alue =	= 7		
Word 64	Port	X8, c	hann	el B (oin 2),	poss	sible v	alues	s O	7, 25	5, def	ault v	alue =	= 255		

Table 5.32

IO Mapping for 16DIO Modules with 16DI Profiles

	MSE	3							LSB							
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 17	Port	X1, c	hann	el A (oin 4),	poss	ible v	alues	s O	15, 2	55, de	efault	value	= 0		
Word 18	Port	X1, c	hann	el A (pin 2),	poss	ible v	alues	s O	15, 2	55, de	efault	value	= 1		
Word 31	Port	X8, c	hann	el A (pin 4),	poss	ible v	alues	s O	15, 2	55, de	efault	value	= 14		
Word 32	Port	X8, c	hann	el B (oin 2),	poss	ible v	alues	s 0	15, 2	55, de	efault	value	= 15		

Table 5.33

IO Mapping for 16DIO Modules with 8DI Profiles

	MSE	3							LSB							
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 17	Port	X1, c	hann	el A (pin 4)	, poss	sible v	alues	s O	7, 25	5, def	ault v	alue :	= 0		
Word 18	Port	X1, c	hann	el A (pin 2)	, poss	sible v	alues	s O	7, 25	5, def	ault v	alue :	= 255		

	MSB	LSB
Word 31	Port X8, channel A (pin 4), possi	ible values 0 7, 255, default value = 7
Word 32	Port X8, channel B (pin 2), possi	ible values 0 7, 255, default value = 255

Table 5.34

IO Mapping for 16DIO Modules with 8DI/DO Profiles

	MSE	3							LSB							
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 49	Port	X1, c	hann	el A (j	oin 4)	, poss	sible v	alues	; 0	7, 25	5, def	ault v	alue =	= 0		
Word 50	Port	X1, c	hann	el A (j	oin 2)	, poss	sible v	alues	0	7, 25	5, def	ault v	alue =	= 1		
Word 63	Port	X8, c	hann	el A (j	oin 4)	, poss	sible v	alues	0	7, 25	5, def	ault v	alue =	= 6		
Word 64	Port	X8, c	hann	el B (j	oin 2)	, poss	sible v	alues	s 0	7, 25	5, def	ault v	alue =	= 7		

Table 5.35

5.2.5 Configuration Example



The configuration and commissioning procedure for modules that is described on the following pages is based on the RSLogix5000 software from Rockwell Automation. When using a control system from a different provider, please refer to the corresponding documentation. The configuration is based on the example of an ICE1-16DIO-G60L-V1D module. For other module versions, configuration is carried out with a few minor changes.

- 1. Install the EDS files for the modules in RSLogix5000 using the EDS hardware installation tool in the "Tools" menu.
- 2. Select the correct controller.
- 3. Add the desired Ethernet IO module to your EtherNet/IP communication interface by clicking on the right-hand mouse button and using the "New Module" command.



Figure 5.1

4. Select the Ethernet IO module you want to add and click the "Create" button.



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Eni	er Search Text for Mo	dule Type	Clear	Filters			Hide Filters	*
	Module Type Cate EnergyManagemer General Purpose D HMI Human-Machine In MDI to EtherNet/IF	gory Filters ItProducts iscrete I/O terface	*		Modi Online Parke Pepp Proso Reliar	ule Type Vendor Filters e Development Inc. (Automation Va er Hannifin Corporation erl + Fuchs ft Technology nce Electric	lue)	•
•	Catalog Number 295311 295312 295314 308626	Description ICE1-16DI-G60L-V1D ICE1-8DI8DO-G60L-V1D ICE1-8DI8DO-G60L-V1D ICE1-16DIO-G60L-V1D	Vendo Peppe Peppe Peppe Peppe	r rl + Fu rl + Fu rl + Fu rl + Fu	chs chs chs chs	Category General Purpose Discrete 1/0 General Purpose Discrete 1/0 General Purpose Discrete 1/0 General Purpose Discrete 1/0		
Act	551 Module Types Fr	ound					Add to Eavor	rites

Figure 5.2

- 5. Enter a name for the Ethernet IO module and the correct IP address. The name "Name01" and IP address "192.168.100.10" have been used in this example.
- 6. Click on the "Change" button.

aeneral"	Connection	Module Info	Internet Protocol	Port Configuration	n Network	
Type: Vendor: Parent:	3086 Pepp Loca	26 ICE1-16DIC erl + Fuchs I	-G60L-V1D			
Name: Descripti	ice1	ice16dio			thernet Address Private Network: PIP Address: Host Name:	192.168.1. 122
Module Revisio Electro Conne	Definition on: nic Keying: ctions:	1.002 Compatible M <none></none>	odule	ange		
ļ						



7. Change the settings for the module revision, electronic keying and connection type. Further details on the connection types can be found in the previous sections on connections and assembly objects.



Figure 5.4

- 8. Select the type of connection in "Connections." This determines which process and diagnostic data the module provides.
- 9. In the "Connections" tab of the module properties, you will see the selected connection type. You can also set the "Requested Packet Interval (RPI)" and "Input Type" on this tab. The minimum value for the RPI parameter is 5 ms.


Name	Req Inter	uested Packet val (RPI) (ms)	Connection ove EtherNet/IP	er Input Trigger
16 DI/DO (Exclusive Owner), CP 16 Bit Input = 102, CP	16 Bit Outpu 5.0	‡ 1.0 - 9999.9	Unicast	Cyclic 💂

Figure 5.5

- 10. Confirm the entries with "OK".
- **11.** In the "Controller Organizer," switch to the "Controller Tags" section. The controller tags for the configuration parameters have the same name as the module, followed by : C. You can define the parameters for surveillance timeout and fail-safe individually for each output channel, as shown in the following image:

ope: 101CE1_16DI0 - Show, All	lags			▼ Y. Enler A	lame Filter		
Name ::::[4	Value 🔶	Force Mask 🔶	Style	tyle Data Type		Class Description	
-ice16dio:C.Quick_Connect	0		Decimal	BOOL	Standard		
+ ice16dic:C.General_Settings	2#0100 1100	1	Binary	SINT	Standard		
ice16dio:C.Force_Mode_Lock	0		Decimal	BOOL	Standard		
ice16dio:C.Web_Interface_Lock	0		Decimal	BOOL	Standard		
ice16dio:C.Report_UL_Supply_Volta	1	Î.	Decimal	BOOL	Standard		
ice16dio:C.Report_DO_Fault_without	1	0	Decimal	BOOL	Standard	1	
-ice16dio:C.Not_Used1	0		Decimal	BOOL	Standard		
ice16dio:C.Not_Used2	0		Decimal	BOOL	Standard		
ice16dio:C.Digital_Out_Restart_Mode	1	/	Decimal	BOOL	Standard		
-ice16dio:C.Reserved1	0		Decimal	BOOL	Standard		
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0	(Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0	1	Decimal	INT	Standard	0	
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0	0	Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.Process_Data_Direction	0		Decimal	INT	Standard		
+ ice16dio:C.IO_Mapping_16_Channel	0		Decimal	INT	Standard		
+ ice16dio:C.IO_Mapping_16_Channel	1	li	Decimal	INT	Standard		
+ ice16dio:C.IO_Mapping_16_Channel	2		Decimal	INT	Standard		
+ ice16dio:C.IO_Mapping_16_Channel	3		Decimal	INT	Standard		
+ ice16dio.C.IO Mapping 16 Channel	4		Decimal	INT	Standard		

Figure 5.6

12. Configure the EtherNet/IP module and download the parameters to the controller.

Initial Settings for Connection Parameters

Configuration tools from other controller manufacturers may require additional parameters to be entered to establish a communication connection between your EtherNet/IP I/O scanner and the Ethernet IO modules. In such cases, the table below provides a list of useful parameters:

ICE1-16DIO-G60L-V1D/ICE1-16DIO-G60L-C1-V1D with 16DI/DO Profile and Diagnosis

Transport type	Exclusive owner					
Trigger mode	Cyclic					
Requested packet interval (RPI)	Minimum 1 ms					
Sender to target device (O>T) connection parameters						
Real-time transfer format	32 bit Run/Idle header					
Connection type	POINT2POINT					
Assembly instance ID	100					
Data type	USINT					
Data size	1 byte					
Data length	2 byte					
Target device to sender (T>O) connection	parameters					
Real-time transfer format	Pure, non-modal data connection					
Connection type	MULTICAST					
Assembly instance ID	101					
Data type	USINT					

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Data size	1 byte
Data length	7 byte

ICE1-16DI-G60L-V1D with Diagnosis

Transport type	Input only					
Trigger mode	Cyclic					
Requested packet interval (RPI)	Minimum 1 ms					
Sender to target device (O>T) connection parameters						
Real-time transfer format	Heartbeat					
Connection type	POINT2POINT					
Assembly instance ID	193					
Data type	USINT					
Data size	1 byte					
Data length	0 byte					
Target device to sender (T>O) connection	parameters					
Real-time transfer format	Pure, non-modal data connection					
Connection type	MULTICAST					
Assembly instance ID	101					
Data type	USINT					
Data size	1 byte					
Data length	4 byte					

ICE1-8DI8DO-G60L-V1D/ICE1-8DI8DO-G60L-C1-V1D with Diagnosis

Transport type	Exclusive owner					
Trigger mode	Cyclic					
Requested packet interval (RPI)	Minimum 1 ms					
Sender to target device (O>T) connection parameters						
Real-time transfer format	32 bit Run/Idle header					
Connection type	POINT2POINT					
Assembly instance ID	100					
Data type	USINT					
Data size	1 byte					
Data length	1 byte					
Target device to sender (T>O) connection	parameters					
Real-time transfer format	Pure, non-modal data connection					
Connection type	MULTICAST					
Assembly instance ID	101					
Data type	USINT					
Data size	1 byte					
Data length	6 byte					

5.3 Bit Assignment of Process Data

Input and Output Data

Actual values are specified for the input data and target values are specified for output data. Please note that the number of items of provider data (input data) is variable. It is dependent on whether you have selected that the diagnostics data should be transferred. The modules provide one byte for slot diagnostics or channel diagnostics—the module information byte. The diagnostics data supplements the standard process input data as additional bytes.

16DIO modules with decentralized control function

16DIO modules with decentralized control function (DCU) have an extended process data range with an additional 18 bytes in both directions. These are appended to the output data, module information byte or input data diagnoses. For further details on how to use the extended process data ranges, see the chapter "decentralized control function."

5.3.1



16DIO Modules, Bit Assignment of Process Data

X4-A

X8-A

Note

So that a diagnosis can be done within the module, the actual output statuses at the module-in addition to the actual input statuses-are reflected in the input data (output mirror).

X3-A

X7-A

X2-B

X6-B

X2-A

X6-A

16-bit output data, default IO mapping (assembly ID 100)									
INPLIT	Bit 7	Bit 6	Bit 5	Rit 4	Bit 3	Rit 2			

X3-B

X7-B

Byte 1	X8-B	
Table 5.36		

X4-B

Byte 0

16-bit input data with diagnosis, default IO mapping (assembly ID 101)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	Х3-В	X3-A	Х2-В	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	Х7-В	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Byte 3	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Byte 4	0	0	0	0	0	0	0	0
Byte 5	CE-X4B	CE-X4A	CE-X3B	CE-X3A	CE-X2B	CE-X2A	CE-X1B	CE-X1A
Byte 6	CE-X8B	CE-X8A	CE-X7B	CE-X7A	CE-X6B	CE-X6A	CE-X5B	CE-X5A

Table 5.37

16-bit input data with diagnostic and padding byte, default IO mapping (assembly ID 108)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	X3-B	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	Х7-В	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Byte 3	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Byte 4	0	0	0	0	0	0	0	0
Byte 5	CE-X4B	CE-X4A	CE-X3B	CE-X3A	CE-X2B	CE-X2A	CE-X1B	CE-X1A
Byte 6	CE-X8B	CE-X8A	CE-X7B	CE-X7A	CE-X6B	CE-X6A	CE-X5B	CE-X5A

2019-10

Bit 1

X1-B

X5-B

Bit 0

X1-A

X5-A

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INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 7	0	0	0	0	0	0	0	0

Table 5.38

16-bit input data without diagnosis, default IO mapping (assembly ID 102)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	Х3-В	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	Х7-В	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS

Table 5.39

8-bit output data, default IO mapping, not for 8DI/8DO (assembly ID 103)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X8-B	X7-A	X6-B	X5-A	X4-B	Х3-А	X2-B	X1-A

Table 5.40

8-bit input data with diagnostic, default IO mapping, not for 8DI/8DO (assembly ID 104)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X8-B	X7-A	X6-B	X5-A	X4-B	X3-A	X2-B	X1-A
Byte 1	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Byte 2	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Byte 3	0	0	0	0	0	0	0	0
Byte 4	CE-X4B	CE-X4A	CE-X3B	CE-X3A	CE-X2B	CE-X2A	CE-X1B	CE-X1A
Byte 5	CE-X8B	CE-X8A	CE-X7B	CE-X7A	CE-X6B	CE-X6A	CE-X5B	CE-X5A

Table 5.41

8-bit input data without diagnostic, default IO mapping, not for 8DI/8DO (assembly ID 105)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X8-B	X7-A	X6-B	X5-A	X4-B	X3-A	X2-B	X1-A
Byte 1	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Table 5 42	-	-						

Table 5.42

8-bit output data, default IO mapping, only for 8DI/8DO (assembly ID 103)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X8-B	X8-A	Х7-В	X7-A	X6-B	X6-A	X5-B	X5-A
Tablo 5 13								

Table 5.43

8-bit input data with diagnosis, default IO mapping, only for 8DI/8DO (assembly ID 104)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	Х3-В	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Byte 2	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Byte 3	0	0	0	0	0	0	0	0
Byte 4	CE-X4B	CE-X4A	CE-X3B	CE-X3A	CE-X2B	CE-X2A	CE-X1B	CE-X1A

			DIL D	BIT 4	BIT 3	BIT 2	BIT 1	BITO
Byte 5 CE	-X8B C	E-X8A	CE-X7B	CE-X7A	CE-X6B	CE-X6A	CE-X5B	CE-X5A

Table 5.44

8-bit input data without diagnosis, default IO mapping, only for 8DI/8DO (assembly ID 105)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X8-B	X7-A	X6-B	X5-A	X4-B	X3-A	X2-B	X1-A
Byte 1	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS

Table 5.45

0-bit input data with diagnosis, default IO mapping (assembly ID 106)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Byte 1	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Byte 2	0	0	0	0	0	0	0	0
Byte 3	CE-X4B	CE-X4A	CE-X3B	CE-X3A	CE-X2B	CE-X2A	CE-X1B	CE-X1A
Byte 4	CE-X8B	CE-X8A	CE-X7B	CE-X7A	CE-X6B	CE-X6A	CE-X5B	CE-X5A

Table 5.46

0-bit input data without diagnosis, default IO mapping (assembly ID 107)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS

Table 5.47

Legend

- X1-A X8-A: Status channel A (pin 4) of slots X1 to X8
- X1-B X8-B: Status channel B (pin 2) of slots X1 to X8
- MI-LVS: Module information byte-low system/sensor supply voltage •
- MI-LVA: Module information byte-low actuator supply voltage •
- MI-SCS: Module information byte-sensor short circuit on an M12 slot •
- MI-SCA: Module information byte-actuator short circuit on an M12 slot •
- MI-IME: Module information byte-internal module error •
- SCS-X1...SCS-X8: Sensor short circuit at slots X1 to X8 •
- CE-X1A...CE-X8A: Channel error, channel A (pin 4) on slot X1 to X8 •
- CE-X1B...CE-X8B: Channel error, channel B (pin 2) on slot X1 to X8

5.3.2 Modules with Decentralized Control Function, Bit Assignment of Process Data Extension

For Ethernet IO modules with decentralized control function (DCU), the process data range for input and output data has been extended by an additional 18 bytes. This process data extension is described below for the following Ethernet IO modules:

- ICE1-8DI8DO-G60L-C1-V1D
- ICE1-16DIO-G60L-C1-V1D.



Input Data for DCU Extension

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	16 bit I/O	DCU exte	nsion					
Byte n + 1								
Byte n + 2	INT I/O D	CU extens	ion					
Byte n + 3								
Byte n + 16	INT I/O D	CU extens	ion					
Byte n + 17								

Table 5.48

Legend

- 16-bit I/O DCU extension: bit states as input data for the decentralized control function (DCU function)
- INT I/O DCU extension: 8 word data types as input data for the decentralized control function (DCU function), e.g. transmission of program parameters.

Output Data for DCU Extension

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
16 bit I/O	DCU exter	nsion					
INT I/O D	CU extens	ion					
INT I/O D	CU extens	ion					
	Bit 7 16 bit I/O INT I/O D	Bit 7 Bit 6 16 bit I/O DCU extens INT I/O DCU extens	Bit 7 Bit 6 Bit 5 16 bit I/O DCU extension INT I/O DCU extension INT I/O DCU extension	Bit 7 Bit 6 Bit 5 Bit 4 16 bit I/O DCU extension INT I/O DCU extension INT I/O DCU extension	Bit 7 Bit 6 Bit 5 Bit 4 Bit 3 16 bit I/O DCU extension INT I/O DCU extension INT I/O DCU extension	Bit 7 Bit 6 Bit 5 Bit 4 Bit 3 Bit 2 16 bit I/O DCU extension INT I/O DCU extension INT I/O DCU extension INT I/O DCU extension	Bit 7 Bit 6 Bit 5 Bit 4 Bit 3 Bit 2 Bit 1 16 bit I/O DCU extension INT I/O DCU extension INT I/O DCU extension INT I/O DCU extension

Table 5.49

Legend

- 16-bit I/O DCU: bit states as output data for the decentralized control function (DCU function)
- INT I/O DCU extension: 8 word data types as output data for the decentralized control function (DCU function), e.g. transmission of counter states.

5.3.3 16DI Modules, Bit Assignment of Process Data

Input Data with Diagnosis (Assembly ID 101)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	Х3-В	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	Х7-В	X7-A	X6-B	X6-A	X5-B	X5-A



INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 2	0	0	0	0	0	MI-SCS	0	MI-LVS
Byte 3	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Table 5.50								

Input data without diagnosis (assembly ID 101)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	X3-B	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	Х7-В	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	MI-IME	0	0	0	0	MI-SCS	0	MI-LVS
Table 5.51	•	•						

16DI Legend

- X1-A X8-A: input status channel A (pin 4) for slots X1 to X8
- X1-B X8-B: input status channel B (pin 2) for slots X1 to X8
- MI-LVS: Module information byte-low system/sensor supply voltage
- MI-SCS: Module information byte-sensor short circuit on an M12 slot
- MI-IME: Module information byte—internal module error
- SCS-X1...SCS-X8: Sensor short circuit at slots X1 to X8

5.3.4 8DI/8DO Modules, Bit Assignment of Process Data

Note

So that a diagnosis can be done within the module, the actual output statuses at the module—in addition to the actual input statuses—are reflected in the input data (output mirror).

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	Х3-В	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	Х7-В	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Byte 3	0	0	0	0	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Byte 4	0	0	0	0	0	0	0	0
Byte 5	CE-X8B	CE-X8A	CE-X7B	CE-X7A	CE-X6B	CE-X6A	CE-X5B	CE-X5A
T-1-1- 5 50	-	-		-		-		

Input Data with Diagnosis (Assembly ID 101)

Table 5.52

Input data without diagnosis (assembly ID 102)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	X3-B	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	Х7-В	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	0	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Table E E2								

Table 5.53

Output data (assembly ID 100)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X8-B	X8-A	Х7-В	X7-A	X6-B	X6-A	X5-B	X5-A
Table 5.54		•	•					

8DI8DO Legend

- X1-A X4-A: Input status of channel A (pin 4) of slots X1 to X4
- X1-B X4-B: Input status of channel B (pin 2) of slots X1 to X4
- X5-A X8-A: Output status of channel A (pin 4) of slots X5 to X8
- X5-B X8-B: Output status of channel B (pin 2) of slots X5 to X8
- MI-LVS: Module information byte—low system/sensor supply voltage
- MI-LVA: Module information byte—low actuator supply voltage
- MI-SCS: Module information byte—sensor short circuit on an M12 slot
- MI-SCA: Module information byte-actuator short circuit on an M12 slot
- MI-IME: Module information byte-internal module error
- SCS-X1...SCS-X4: Sensor short circuit on slots X1 to X4
- CE-X5A...CE-X8A: Channel error in channel A (pin 4) on slots X1 to X8
- CE-X5B...CE-X8B: Channel error in channel B (pin 2) on slots X1 to X8



6 Commissioning for PROFINET

6.1 Preparation

The configuration and commissioning process for the modules described over the following pages was performed using TIA Portal V14 project planning software from SIEMENS. When using a control system from a different control system provider, please refer to the corresponding documentation.

GSDML File

To configure the modules in the control system, you need a GSD file in XML format. You can download this file from our website, https://www.pepperl-fuchs.com.

The file for the PROFINET modules is named GSDML-V2.3*-Pepperl+Fuchs-ICE1-yyyymmdd.xml. In this case, **yyyymmdd** is the issue date of the file.

Integrate the GSDML file into the TIA Portal using the GSD manager via the main menu "Options > Manage general station description files (GSD)." The modules with a PROFINET interface are subsequently available in the hardware catalog.

™ Siemens -	
Project Edit View Insert Online	Options Tools Window Help
	Support packages
	Manage general station description files (GSD)
	Show reference text
	Global libraries

Figure 6.1

MAC IDs

The modules have three MAC IDs assigned when they are delivered. These are unique and cannot be changed by the user.

SNMP

The modules support the SNMP Ethernet network protocol (Simple Network Management Protocol). The information from the network management system is displayed in accordance with MIB-II (Management Information Base), which is defined in RFC 1213.

6.2 Configuration

The configuration and commissioning process for the modules described over the following pages was performed using TIA Portal V14 project planning software from SIEMENS. When using a control system from a different control system provider, please refer to the corresponding documentation.

The configuration is based on the example of an ICE1-16DIO-G60L-V1D module. For other module versions, configuration is carried out with a few minor changes.



Note

To configure a module in the control system, you need a GSDML file



Integration of the PROFINET-IO Module into TIA

As an example, the following is an explanation of how to configure an Ethernet IO module as a Profinet type in the TIA portal, based on the ICE1-16DIO-G60L-C1-V1D module.





- 1. Install the GSDML file for the desired module in the TIA Portal
 - → Once the GSDML file for the PROFINET modules has been installed, the modules are available in the TIA portal hardware catalog.



2. Double-click on the desired module and select the corresponding PROFINET interface.

ork Connections HMI con	nection 💌 🖭 🥦 🗄
PLC_1515F	ICE1-16DIO-G6
CPU 1515F-2 PN	ICE1-16DIO-G6
	Select IO controller PLC_1515F.PROFINET interface_1
	PN_enet

Figure 6.3

 \mapsto A suitable element for the I/O function is automatically inserted into slot 1 of the rack.



			F Topol	ogy view	A Network view	Device view
evice overview						
Module	 Rack	Slot	I address	Q address	Туре	Article number
 ICE1-16DIO-G60L-C1-V1D 	0	0			ICE1-16DIO-G60L-C1-V1D	308627
► PN-IO	0	0 X1			ICE1-16DIO-G60L-C1-V1D	
16 DI/DO with DCU1_1	0	1	01	01	16 DI/DO with DCU1	
16 Bit I/O DCU Extension_1	0	2	23	23	16 Bit I/O DCU Extension	
8 INTI/O DCU Extension_1	0	3	256271	256271	8 INTI/O DCU Extension	

- → You can change the input and output addresses specified in the device overview. The 16DIO modules have extended I/O functionality. With these modules, you can choose between different profiles (e.g., 16 DI/DO) and use different modules in slot 1 of the rack. This has the advantage that you can replace each existing digital I/O module with a 16DIO module. By selecting a suitable profile and using IO mapping in the module parameters, I/O addresses in this PLC program of this module can be replaced without any changes. To change a profile, the module in slot 1 must be deleted and replaced with another. This is the same as adding a PROFINET module via the hardware catalog.
- → The following module profiles are available for configuration of a 16DIO module:



Figure 6.5



Assigning a Unique Device Name in the Control System

PROFINET IO devices are addressed in the PROFINET network via a unique device name. This can be freely assigned by the user but may only appear once in the network.

1. Select slot 0 in the module device view and assign an appropriate module name. In this example, the product name is "ICE-16DIO-G60L-V1D."



ICE1-16DIO-	G60L-V1D [N	lodule]		9	Properties	🗓 Info 🤢 🖞 Diagnostics	18-
General	IO tags	System constants	Texts				
- General							•
Catalog i	nformation		General				
· PROFINET in	terface [X1]						
General				Name:	ICE1-16DIO-G	60L-V1D	
Ethernet	addresses			Author	FA-CTSS-SYS		
✓ Advance	d options			notion.	inclus sits		
Interfa	ce options			Comment:			^
Media	redundancy						
Real ti	me settings						
· Port X	01 10/100 MBit	s [X1 P1 R]			-		× 1
Ge	neral			Rack:	0		
Por	t interconnecti	on		Slot:	0	1	
Por	t options		-		1.55		

- Figure 6.6
- Check the automatically assigned IP address in "PROFINET interface [x1] -> Ethernet addresses."
- **3.** Check whether control system and module are on the same Ethernet subsystem. If necessary, change the setting.

ICE1-16DIO-G60L-V1D [Module]	3	Properties 🚺 Info 🚯 🐍 Diagnostics	
General IO tags System constants	Texts		
▼ General Catalog information	Ethemet addresses		
▼ PROFINET interface [X1]	Interface networked with		
General			
Ethernet addresses	Subnet:	PN_enet	-
✓ Advanced options		Add new subnet	
Interface options			
Media redundancy	IP protocol		
Real time settings	ir protocor		
 Port X01 10/100 MBit/s [X1 P1 R] 	Itse IP protocol		
General	a ose a protocor	0	
Port interconnection		Set iP address in the project	
Port options		IP address: 192 . 168 . 0 . 2	
Hardware identifier		Subnet mask: 255 255 255 0	
 Port X02 10/100 MBit/s [X1 P2 R] 	-	lise sources	
General		(dee louiel	
Port interconnection		Router address: 0 0 0 0	
Port options		O IP address is set directly at the device	
Hardware identifier			
Hardware identifier	PROFINET		
Identification & Maintenance			
Hardware identifier		Generate PROFINET device name automatically	3
	PROFINET device name	ice1-16dio-g60l-v1d	2
	Converted name:	ice1-16dio-g60l-v1d	

4. Activate the selection "Generate PROFINET device name automatically," so that the device name is that which was assigned previously.



Note

Using a modified device name is not recommended for clarity reasons.



Assigning the Device Name to a PROFINET IO Module

So that each node in the PROFINET network can be assigned an IP address, each module must have a device name. A node search displays all PROFINET devices that have been found.

On delivery, the Ethernet IO modules are assigned three MAC addresses. These are unique and cannot be changed by the user. The first MAC address is shown on the housing of the Ethernet IO module. (See between X2 and X3). Using this, each device can be found in the list of available nodes and assigned a device name.

- 1. Connect the module to the PROFINET network.
- 2. In "Device View," select the module "Slot 0."





3. Open the dialog "Accessible devices" via the main menu "Online -> Accessible devices ...".

Figure 6.8



Commissioning for PROFINET

-		Type of the PG/PC interface PG/PC interface	e: PN/II	E (AX88772C US82.0 to Fa	💌 Ist Ethernet Ada 💌 🕐 🕻
	Accessible nodes of	f the selected interface:	1	11	
1.00	Device	Device type	Туре	Address	MAC address
	1515f-pnioc	CPU 1515F-2 PN	PN/IE	192.168.0.1	28-63-36-8A-FF-D5
Flash LED					
Online status informa	ation:				<u>S</u> tart search
Scan completed	. 2 devices found.				
? Retrieving device	e information				-
Scan and inform	ation retrieval completed.				

Figure 6.9

- 4. Select a module from those found.
 - → If the desired module is not displayed in the list of available nodes on the network, you can change the device filter and refresh the list. If the device still does not appear, please check your firewall settings.
- 5. Assign the selected PROFINET device name to the module.

General	Assign name							
Diagnostic status PROFINET interface Functions		Configured P	ROFINET de	vice				
Assign name		PROFINET	evice name:	ice16dio				
Reset to factory settings			Device type:	ICE1-16DIO-G60L-V1D				
		Device filter						
		Onlysh	ow devices of	the same type				
			ow devices wi	th bad parameter settings				
•	Only show devices without names							
	Accessible de	vices in the network:						
	IP address	MAC address	Device	PROFINET device name	Status			





Commissioning for PROFINET

 \mapsto If the device name was set successfully, this will be indicated by the status.

6. Complete the process by pressing the "Assign Name" button.



Replacing Devices Without a Removable Medium/Programming Unit

Note

The replacement device that will be used for a replacement without a removable medium/programming unit must still have its factory settings applied. If necessary, the factory settings must be restored.

PROFINET IO devices that support the "Device replacement without removable medium or programming unit" function can be replaced by identical devices in an existing PROFINET network. In such cases, the IO controller assigns the device name. To do so, it uses the configured topology and the neighborhoods determined by the IO devices. The Ethernet IO modules support the device replacement function without a removable medium/programming unit.

- 1. Click on the PLC in slot 1 (1).
- 2. In the "Profinet interface_1 [Module]" area, click on "Advanced options" (2).
- 3. Change to the "Properties" tab (3) and click on the option to replace a device without a removable medium (4).

			G		Topole	ogy view	A Network vie	w 🛛 Device vie
PLC_1515F	💌 📰 🏑 🖬 🗍 De	vice overview	(1					
Fall_0 0 1 2 3		Module PM 70W 120/230VAC PLC_1515F FROFINET interface_1 FROFINET interface_2 DI 16/DQ 16/24VDC/D.5A.B	Rack 0 0 0 0 0 0 0 0 0	Slot 0 1 X1 1 X2 2 3 4	1 address 6869	Q address 6465	Type PM 70W 120/230VA CPU 1515F-2 PN PROFINET interface PROFINET interface DI 16/DQ 16x24VD	Article no. 6EP1332-4BA00 6ES7 515-2PM00-0AB0 6ES7 523-1BL00-0AA0
K III > 75%			0	-	-			
PROFINET interface_1 [Modu	le]				S. Pro	perties	Linfo D	lagnostics
Advanced options Interface options Media redundancy Real time settings Port FX P1 P1	Call the user program if comm Support device replacement v Permit overwriting of device Use IEC V2.2 LLDP mode	unication errors occur vithout exchangeable medium names of all assigned IO devices						
Port [X1 P2 R] Web server access Hardware identifier	Media redundancy	30 5						
 Port [X1 P2 8] Web server access Hardware identifier 	Media redundancy	mrpdomain-1						
Port [X1 P2 R] Web server access Hardware identifier	Media redundancy	mrpdomain-1 Not device in the ring	21.81					
Port [X1 P2 R] Web server access Hardware identifier	Media redundancy	mrpdomain-1 Not device in the ring PROFINET methods_1 [X1] (Port_1 1 X1 PROFINET methods_1 [X1] (Port_2 1 X1	P1 8J					•

Note

A network topology is configured based on the connections between PROFINET ports on the individual devices. This can be reached via slot 0 of the PROFINET devices in use. Displaying all non-linked ports allows you to specify a suitable partner port in each case.

- 4. Define the network topology for the device replacement. To do so, select "Devices & networks" (1) and "Topology view" (2).
- 5. Use the mouse to drag a connection between the module and the PLC (3).



Project tree	I 1515F_16DIO Devices	& networks		_ 7 =>
Devices			Topology view	A Network view 🕅 Device view
1900	🔟 🔮 🖾 🖳 😫 🔍 ±		(2)	3
Name Add new device Add new device RC_1515F_16DIO RC_1515F_26PU Starter Common data Common data Common data	PICC 15515F CPU 1515F-2 PI	ICE1-16010-66 ICE1-16010-66 ICE1-16010-66		
Languages & resources	21 m	(3)	100%	
Card Reader/USB memory	Port X01 10/100 MBit/s IN	lodule	@ Properties	1 Info Diagnostics
	General 10 tags	System constants Texts	Suchard	Carne 135 andresses 1
	General Port interconnection Port options Hardware identifier	Port Interconnection	ICE116DIO-GGOL-C1-V1DIPNIO (X1) Medium: Copper Cable name:	[Port X01 10/100 MBirls [X1 P1 R]
		Partner port:		
			Monitoring of partner port is not po	ssible
			Alternative partners	
		Partner port:	Any partner	
			Medium:	length:
> Reference projects			<100 m	(dalasi
> Details view			Oladua	a caralt

Project tree	1515F_16DIO > Devices & networks
Devices	🖉 Topology view 🔒 Network view 📑 Device view
19 O O O 11 E	E II Q:
Name Add new device Add new device Devices & networks Devices & networks Common data Common data Documentation settings Compages & resources	PLC_1515F CPU 1515F-2 PN ICE1-16DIO-G6 PLC_1515F
Gonline access Displayhide interfaces GISPlayhide interfaces GISPLAYHIDE DESCRIPTION GISPLAYHIDE DESCRIPTION GISPLAYHIDE DESCRIPTION GISPLAYHIDE DESCRIPTION	C Port X01 10/100 MBit/s [Medule] C Port X01 10/100 MBit/s [Medule]
(a) (c i 6dio (192.168.0.20) (b) (olinice & diagonotics (a) 1515 (pnioc (192.168.0.1) (b) (metR) 82579UA Gigabit Network Con) (c) (c) (c) (c) (c) (c) (c) (c) (c)	General IO tags System constants Texts General General General Fort interconnection Fort options Hardware identifier Local port: Local port: Local port: Local port: Cable name: Cable name:
	Partner port: Monitoring of partner port is executed Mermative partners
Reference projects Details view	Partner port: [PLC_1515PPR0FINETinterface_1 [x1]Port_2 [x1 P2 R]

Figure 6.13

→ The port interconnection was successful if the link is shown in the "Topology View" and on the "Partner Port."



The Parameter Settings for the Modules

The parameter setting display depends on the module version in use and the version of the device description file. Each module has a unique set of parameters.

The parameter settings can be reached via the module device view:

- slot 0 (for 16DO and 8DI/8DO modules) and
- slot 1 (for 16DIO modules)





- 1. Select "Device View" (1) and the desired module (2) (in this example, slot 1 with a 16DIO module).
- 2. Then, in the "General" tab, select the "Module parameters" (3) area.

1515F_16DIO + PLC_151:	SF [CPU 1515F-2 PN] ► Distributed I	O PROFINETIO-System (100): PN	_enet >	ICE I-16DIC	J-G60L-C	1	
				Topol	ogy view	Metwork	Device vie
ICE1-16DIO-G60L-C1-V1D	🗾 🗉 🖻 👍 🎽 🔒 🛛 De	vice overview					
ALC: NO	A 1	Module Rack	Slot	1 address	Q address	Туре	Article numbe
100		▼ ICE1-16DIO-G60L-C1-V1D 0	0			ICE1-16DIO-G60L-C1-V10	308627
1000		PNHO B	0 X1	0.1	0.1	ICE1-16DIO-G60L-C1-V1D	
100		16 Bit I/O DCU Extension 1 0	2	23	2.3	16 Bit I/O DCU Extension	
	and the second se	8 INT I/O DCU Extension_1 0	3	256271	256271	8 INTI/O DCU Extension	5
							(2)
	×						\bigcirc
11 > 75%	· ····································	s		m			
6 DI/DO with DCU1_1 [Mo	[atube]			Q Pro	operties	Linfo Diag	nostics
General 10 tags	System constants Texts						
General	Module parameters						
Catalog information			_	_			
Inputs Module parameters	General Parameters						
I/O addresses	Report Alarms:	On					
Hardware identifier	Report Alarm UL:	On	-				
3	Report DO Fault without UL:	On					
	Force Mode:	Enabled		\frown			
	Web Interface:	Enabled	-	(4)			
	Control Startup:	Disabled (can be enabled by web interface		$\mathbf{\cdot}$			
	Digital-Out Restart Mode:	Automatic Restart after Failure					
	Fail Safe Configuration						
	Fail Safe Value Port1 Ch A:	SetLow					
	Fail Safe Value Port Ch B	SetLow	-				
	Fail Safe Value Port? Ch 41	SetLow					
	Fail Safe Value Port? Ch R.	Sation					
	Fail Safe Velue Port2 Ch &:	Catlow					
	Fail Safe Value Ports Chile	Sation					
	Fail Sale Value Ports Ch.S.	Set or					
	rail sale value Port4 Ch.A:	Serrow	111				
	Fail Sale value Port4 Ch.8:	Secrow	10.00				

 \rightarrow You can now carry out the desired parameter settings in the dialog (4).

Parameter Overview

The parameter groups are briefly described below.

Report Alarms

Enable/disable global PROFINET alarm messages.

Report Alarm U_L

Enable/disable PROFINET alarm reporting on absence of supply to actuator (U_L). If the global PROFINET alarm messages are disabled, this alarm will not be reported.

Report Alarm DO without UL

Enable/disable PROFINET alarm reporting on absence of supply to actuator (U_L) and activation of an output. If the global PROFINET alarm messages are disabled, this alarm will not be reported.

Force Mode

Allow/block use of Force Mode via the web server.

Web Interface

Allow/block use of the web server.

Decentralized control function DCU start-up (only for C1 modules)
 Disable/block decentralized control function or start DCU program.



• Digital-Out Restart Mode (supported with 16DIO modules)

Automatic restart after short circuit of digital output or reset of channel diagnosis when resetting the digital output.

Fail-Safe Configuration

These parameters are provided by module types with digital outputs. When configuring the modules, you can define the status of the outputs after an interruption or loss of communication.

The following options are available:

- 1. Set Low Deactivate the output channel (digital value = 0)
- 2. Set High Activate the output channel (digital value = 1)
- 3. Hold Last Hold the last output state (digital value matches last state)

The "Surveillance Timeout" parameter

This parameter is supplied by modules types that produce digital outputs.

The firmware of these modules enables you to set a delay time before the monitoring of the output currents starts, i.e., a surveillance timeout. You can set this for each individual output channel.

The delay time starts after the status of the output channel changes, i.e., when the channel is activated (after a rising edge) or deactivated (after a falling edge). After this time has elapsed, the monitoring of the output begins and the diagnosis begins reporting error states.

The surveillance timeout can be set between 0 ms and 255 ms. The default value is 80 ms. When the output channel is in a static state, i.e., when the channel is permanently switched on or off, the value is 100 ms.

IO Mapping Configuration (Only for 16DIO Modules)

Using IO mapping configuration, it is possible to alter the data structure of I/O data. By default, each I/O channel is represented in order in the process data. Existing PLC programs may use a different channel assignment

Using these parameters, all I/O channels can therefore be freely assigned to a bit in the I/O data. It is important to note that double assignments are not possible. If incorrect parameterization of the IO mapping is detected when transferring the configuration, the module reports an error.



Prioritized Start-Up/Fast Start-Up (FSU)

The modules with Fast Start-Up (FSU) support optimized system power-up. This ensures a quick restart after a power supply is restored after an interruption.

- 1. Select "Device View" (1) and the desired module (in this example, slot 1 for a 16DIO module with 8DI/8DO profile).
- 2. Then, in the "General" tab, select the "Advanced Options" area (2).
- 3. Click on the "Prioritized Start-Up" option (3) to enable prioritized startup.



6DIO PLC_1515F [CPU 1515F-2 PN]] ► Distributed I/O ► P	ROFINET IO-Syste	em (100): PN_	enet 🕨	ICE1-1	6DIO-G60	L-V1D	_ # =>
			· Topology vie	W	Netw	ork view	Jut Dev	ice view
	🖭 👘 🖾 🛛 Dev	ice overview						(1)_
49°		Module		Rack	Slot	I address	Q address	Туре
		▼ ICE1-16DIO-G60	L-V1D	0	0			ICE1-16DI
	1	PN-IO		0	0 X1			ICE1-16DI
		8 DI/8 DO_1		0	1	0	0	8 DI/8 DO
	_							
(III > 75%			101					
CE1-16DIO-G60L-V1D [Module]			Q Properties	11	Info 🔒	V Diag	nostics	10
Commit 10 tons 1 Sustain and	And Tests					1-2		-
 General Catalog information PROFINET interface [X1] General Ethernet addresses Advanced options Interface options Interface options Media redundancy Real time settings IO cycle Synchronization Mer Port X01 10/100 MBits 	ced options3 erface options3 rioritized startup Ise IEC V2.2 LLDP mode Diptional IO-Device dia redundancy)						
Port interconnection	MRP domain	mrpdomain-1		-				
Port options	Media redundancy role:	Not device in the ri	ng	_	_			
Hardware identifier	Ring port 1:	PN4O [X1]\Port X01	10/100 MBits [X	1 P1 R}				*
✓ Port X02 10/100 MBit/s	Ring port 2:	PNHO [XT]iPort XD2	10/100 MBitis [X	1 P2 R]				-
General Port interconnection Port options Hardware identifier		Diagnostics inter	mupts					
Hardware identifier Identification & Maintenance Hardware identifier M > 10	al time settings							

Figure 6.15





Resetting Modules to their Factory Settings

To reset the modules to the factory settings, you must search for accessible $\ensuremath{\mathsf{PROFINET}}$ nodes in the TIA Portal.

1. Open the dialog "Accessible devices" via the main menu "Online -> Accessible devices ...".



Figure 6.16

2. Select the module that you wish to reset to factory settings.

		Type of the PG/PC interfa PG/PC interfa	ce: Ph	VIE SIX AX88772C USB2.0 to Fi	sst Ethernet Ada 💌 🔞 🖸
	Accessible nodes of	f the selected interface:			
	Device	Device type	Туре	Address	MAC address
1. The second	1515f-pnioc	CPU 1515F-2 PN	PN/IE	192.168.0.1	28-63-36-8A-FF-D5
I D					
Flash LED					Start search
nline status informa	ation:				
Scan completed	. 2 devices found.				2
? Retrieving device	e information				5
Scan and inform	ation retrieval completed.	2			

3. Initiate the reset process by pressing the "Reset" button and then confirming the safety prompt.

Project new project	Unline access + ASIX AX88	772C USB2.0 to East Ethernet Adapter A	ice16dio [192.168.0.20] + ice16dio	
Devices				
Name Add new device Add new	Diagnostics General Diagnostic status MOPINET Interface Functions Assign P address Assign name Reset to factory settings Online & diego De	Reset to factory settings	00 -00 -81 -06 -88 -92 192 - 168 0 - 20 ice16dia	

Figure 6.18

Media Redundancy Protocol (MRP)

You can create a redundant PROFINET communication with the modules without the need for additional switches by using a ring topology. An MRP redundancy manager closes the ring, detects individual failures and, in the case of a fault, sends the data packets via the redundant path.

The following requirements must be met in order to use MRP:

- All devices must support MRP.
- MRP must be activated on all devices.
- The devices can only be connected via the ring ports. This means an interconnected topology cannot be used.
- A maximum of 50 devices are permitted in the ring.
- All devices must be part of the same redundancy domain.
- One device must be configured as the redundancy manager.



- All other devices must be configured as redundancy clients.
- Prioritized start-up (FSU) is not permitted.
- The watchdog time for all devices must be greater than the reconfiguration time (typically 200 ms, min. 90 ms for ICE1-* modules).
- We recommend using the automatic network setting on all devices.

The following images show a potential MRP ring configuration. The PLC is used as a redundancy manager and all other devices are used as clients. We recommend activating the diagnosis alarms to detect individual failures.



- 1. Select "Device View" (1) and the desired module in slot 0 (2).
- 2. Then, in the "General" tab, select the "Advanced Options -> Media Redundancy" (3). Set the "Media Redundancy Role" option to "Client" (4).

6DIO + PLC_1515F [CPU 15	515F-2 PN] → Distril	buted I/O	PROFINET IO-Sys	tem (100): P	N_enet	ICE1-1	16DIO-G60	L-V1D	_ # = ×
			Device overview	Topology	view	h Netw	work view	Dev	ice view
-			 Module ▼ ICE 1-16DIO-G ▶ PN-IO 8 DI/8 DO_1 	60L-V1D	Rack O O O	Slot 0 \ 0 X1 1	l address	Q address	Type ICE1-16DI ICE1-16DI 8 DI/8 DO
X m > 75% ICE1-16DIO-G60L-V1D [Modul: General IO tags System	e]	Texts	(S Propert	n ies 🏌	↓Info 🔒	Diag	nostics	
General Catalog information PROFINET interface [X1] General Ethernet addresses Advanced options Interface options Media redundancy Real time settings IO cycle Synchronization	Media redunda Media re	ANCY MRP dom edundancy ro Ring port Ring port	ain mrpdomain-1 le: Not device in the Client Client Client A Diagno 4 Domain setti	ring ring D2 10/100 MBith)-mupts ngs	(X1 P2 R)				*

Figure 6.19

- 3. Check the "Watchdog Time." To do so, select the "Real-Time Settings" area in this module.
- 4. Re-set the "Watchdog Time" if necessary (to at least 90 ms, usually 200 ms).

General 10 tags System constants Texts General Catalog information PROFINET interface [X1] General Ethernet addresses Advanced options Interface options Media redundancy General O cycle Update time Automatic Quoto Matchdog time Adapt update time when send clock changes Watchdog time Accepted update cycles without IO data: IO Port x01 10/100 MBit/s General Port interconnection Port options Hardware identifier Sync domain: syncdomain-default Domain settings Sync domain: syncdomain-default Domain settings 	ICE1-16DIO-G60L-V1D [Module		🔍 Pr	operties 🚺 Info	🚯 🛿 Diagnostics	18
 General Catalog information Real time settings Real time settings PROFINET interface [X1] General Ethernet addresses Advanced options Interface options Interface options Media redundancy General Automatic Can be set Adapt update time when send clock changes Watchdog time Accepted update cycles without IO data: IO cycle Adapt update time when send clock changes Watchdog time Accepted update cycles without IO data: IO port interconnection Port options Hardware identifier Sync domain: syncdomain-default Domain settings 	General IO tags Sys	tem constants Texts		15		
Ethernet addresses Update time Advanced options Interface options Interface options Media redundancy Can be set Can be set Can be set Adapt update time when send clock changes Adapt update time when send clock changes Watchdog time Accepted update cycles without IO data: Matchdog time: Vatchdog time: 200.000 ms Port X01 10/100 MBit/s General Port options Hardware identifier Synchronization Yest the set set set set set set set set set se	General Catalog information PROFINET interface [X1] General	Real time settings N cycle				
Synchronization Port X01 10/100 MBits General Port interconnection Port options Hardware identifier Port tinterconnection Port options Hardware identifier Hardware identifier Hardware identifier RT class: RT	Ethernet addresses Advanced options Interface options Media redundancy Real time settings IO cycle	Update time Automatic Can be set Adapt update time when send	2.004)	 v	ms ms
General Port interconnection Port options Hardware identifier Hardware identifier RT class: RT	Synchronization Port X01 10/100 MBit/s General Port interconnection Port options Hardware identifier Port 02 10/100 MBit/s	Watchdog time Accepted update cycles without IO data : Watchdog time :	100			▼ ms
Identification & Maintenance O IRT Hardware identifier	 Port X02 10/100 MBit/s General Port interconnection Port options Hardware identifier Hardware identifier Identification & Maintenance Hardware identifier 	Synchronization Sync domain: RT class:	Syncdomain-default]	Domain sett	ings

Figure 6.20

6.3 Assigning Process Data

This chapter describes how process data from the controller is assigned to the I/O channels in slot 1 of the modules.

The process data range extensions for 16DIO modules with distributed control function (DCU) are also described.

6.3.1 16DIO Modules, Bit Assignment of Process Data

The data structure of the process data in slot 1 depends on the IO mapping used. Ethernet IO modules with decentralized control function (DCU) have an expanded process data range in slot 2 and 3. This is therefore listed as optional. For further details on how to use the extended process data ranges, see the chapter "decentralized control function."

The following representations relate to the default settings of the respective profiles.

Input Data for 16DI/DO Profile (Default Profile)

This module provides two bytes of input data that depict the current status of the input and output channels.

Note

So that a diagnosis can be done within the module, the actual output statuses at the module—in addition to the actual input statuses—are reflected in the input data (output mirror).

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4 A	3B	3 A	2B	2 A	1B	1 A
Byte n+1	8B	8 A	7B	7 A	6B	6 A	5B	5 A
Table 6 1								

Table 6.1

The values refer to the following:

• 1A ... 8A: Actual status of input/output channel A (contact pin 4) for M12 connections 1 to 8.



1B ... 8B: Actual status of input/output channel B (contact pin 2) for M12 connections 1 to • 8.

Output Data for 16DI/DO Profile (Default Profile)

This module requires two bytes of output data for controlling the digital outputs.

Output	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4 A	3B	3 A	2B	2 A	1B	1 A
Byte n+1	8B	8 A	7B	7 A	6B	6 A	5B	5 A

Table 6.2

The values refer to the following:

- 1A ... 8A: Target status of output channel A (contact pin 4) for M12 connections 1 to 8.
- 1B ... 8B: Target status of output channel B (contact pin 2) for M12 connections 1 to 8.

Input Data for 8DI/DO Profile

This module provides one byte of input data that depicts the current status of the input and output channels.



Note

So that a diagnosis can be done within the module, the actual output statuses at the module—in addition to the actual input statuses—are reflected in the input data (output mirror).

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	8 A	7 A	6 A	5 A	4 A	3 A	2 A	1 A
Table 6.3								

The values refer to the following:

• 1A ... 8A: Actual status of input channel A (contact pin 4) for M12 connections 1 to 8.

Output Data for 8DI/DO Profile

This module requires one byte of output data for controlling the digital outputs.

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	8 A	7 A	6 A	5 A	4 A	3 A	2 A	1 A
Table 6.4								

Table 6.4

The values refer to the following:

1A ... 8A: Target status of output channel A (contact pin 4) for M12 connections 1 to 8.

Input Data for 16DI Profile

This module provides two bytes of input data that depict the current status of the input channels.

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4 A	3B	3 A	2B	2 A	1B	1 A
Byte n+1	8B	8 A	7B	7 A	6B	6 A	5B	5 A
Table 6 5								

Table 6.5

The values refer to the following:

1A ... 8A: Actual status of input channel A (contact pin 4) for M12 connections 1 to 8.



• 1B ... 8B: Actual status of input channel B (contact pin 2) for M12 connections 1 to 8.

Input Data for 8DI Profile

This module provides one byte of input data that depicts the current status of the input channels.

		DILD	DIL 4	BIT 3	Bit 2	BIT 1	BITU
Byte n 8 A	7 A	6 A	5 A	4 A	3 A	2 A	1 A

Table 6.6

The values refer to the following:

• 1A ... 8A: Actual status of input channel A (contact pin 4) for M12 connections 1 to 8.

Output Data for 16DO Profile

This module requires two bytes of output data for controlling the digital outputs.

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4B	3B	3 A	2B	2 A	1B	1 A
Byte n +1	8B	8 A	7B	7 A	6B	6 A	5B	5 A

Table 6.7

The values refer to the following:

- 1A ... 8A: Target status of output channel A (contact pin 4) for M12 connections 1 to 8.
- 1B...8B: Target status of output channel A (contact pin 2) for M12 connections 1 to 8.

Output Data for 8DO Profile

This module requires one byte of output data for controlling the digital outputs.

input B		Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n 8	3 A	7 A	6 A	5 A	4 A	3 A	2 A	1 A

Table 6.8

The values refer to the following:

• 1A ... 8A: Target status of output channel A (contact pin 4) for M12 connections 1 to 8.

Input Data for 8DI/8DO Profile

This module provides one byte of input data that depicts the current status of the input channels.

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4 A	3B	3 A	2B	2 A	1B	1 A

Table 6.9

The values refer to the following:

- 1A ... 4A: Actual status of input channel A (contact pin 4) for M12 connections 1 to 4.
- 1B ... 4B: Actual status of input channel B (contact pin 2) for M12 connections 1 to 4.



Output Data for 8DI/8DO Profile

This module requires one byte of output data for controlling the digital outputs.

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	8B	8 A	7B	7 A	6B	6 A	5B	5 A

Table 6.10

The values refer to the following:

- 5A ... 8A: Target status of output channel A (contact pin 4) for M12 connections 5 to 8.
- 5B ... 8B: Target status of output channel B (contact pin 4) for M12 connections 5 to 8.

6.3.2 Modules with Decentralized Control Function, Bit Assignment of Process Data Extension

For Ethernet IO modules with decentralized control function (DCU), the process data range for input and output data has been extended. The extension provides 16-bit output data in slot 2 and 8-INT output data in slot 3.

This process data extension is described below for the following Ethernet IO modules:

- ICE1-8DI8DO-G60L-C1-V1D
- ICE1-16DIO-G60L-C1-V1D

Output Data for DCU Extension

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0			
Byte n	16-bit I/C	16-bit I/O DCU extension: slot 2									
Byte n + 1											
Byte n	INT I/O D	CU exten	sion: slot 3	3							
Byte n + 1											
Byte n + 14	INT I/O D	CU exten	sion: slot 3	3							
Byte n + 15	1										

Table 6.11

The values refer to the following:

- 16-bit I/O DCU extension: bit states as output data for the decentralized control function (DCU function)
- INT I/O DCU extension: 8-word data types as output data for the decentralized control function (DCU function), e.g., for transmission of counter states.

Input Data for DCU Extension

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	16-bit I/C	DCU exte	ension: slo	ot 2				
Byte n + 1								
Byte n	INT I/O D	CU exten	sion: slot :	3				
Byte n + 1								
Byte n + 14	INT I/O D	CU exten	sion: slot :	3				
Byte n + 15]							
Table 6.12								



The values refer to the following:

- 16-bit I/O DCU extension: bit states as input data for the decentralized control function (DCU function)
- INT I/O DCU extension: 8-word data types as input data for the decentralized control function (DCU function), e.g., for transmission of program parameters.

6.3.3 16DI Modules, Bit Assignment of Process Data

Input Data

The module provides 2 bytes of status information for the digital inputs. The bits are assigned as follows:

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4A	3B	ЗA	2B	2A	1B	1A
Byte n+1	8B	8A	7B	7A	6B	6A	5B	5A
Byte n+1	8B	8A	7B	7A	6B	6A	5B	5A

Table 6.13

The values refer to the following:

- 1A ... 8A: Actual status of input channel A (contact pin 4) for M12 connections 1 to 8.
- 1B ... 8B: Actual status of input channel B (contact pin 2) for M12 connections 1 to 8.

6.3.4 8DI/8DO Modules, Bit Assignment of Process Data

Input Data

This module provides two bytes of input data that depict the current status of the input and output channels.



Note

So that a diagnosis can be done within the module, the actual output statuses at the module—in addition to the actual input statuses—are reflected in the input data (output mirror).

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4 A	3B	3 A	2B	2 A	1B	1 A
Byte n+1	8B	8 A	7B	7 A	6B	6 A	5B	5 A

Table 6.14

The values refer to the following:

- 1A ... 4A: Actual status of input channel A (contact pin 4) for M12 connections 1 to 4.
- 1B ... 4B: Actual status of input channel B (contact pin 2) for M12 connections 1 to 4.
- 5A ... 8A: Actual status of output channel A (contact pin 4) for M12 connections 5 to 8.
- 5B ... 8B: Actual status of output channel B (contact pin 2) for M12 connections 5 to 8.



Output Data

This module requires two bytes of status information for controlling the digital outputs.

Output	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	8B	8 A	7B	7 A	6B	6 A	5B	5 A
Table 6 15								

Table 6.15

The values refer to the following:

- 5A ... 8A: Target status of output channel A (contact pin 4) for M12 connections 5 to 8.
- 5B ... 8B: Target status of output channel B (contact pin 2) for M12 connections 5 to 8.

7 Commissioning for EtherCAT

7.1 Preparation

Downloading and Installing the ESI File

An ESI file (EtherCAT Slave Information file) is required to configure a module in the controller. The ESI file supports all module variants.

You can find the relevant ESI file in the **Commissioning** section of the product detail page for the device. To access the product detail page for the device, go to http://www.pepperl-fuchs.com and type information about the device, e.g. the product description or the item number, into the search function.

Use the hardware or network configuration tools from your controller manufacturer to install the ESI file for the module variant used. For TwinCat®, you usually have to copy the ESI file to the installation folder, for example: C: $TwinCAT\3.1\Config\Io\EtherCAT$. After installation, the modules are available in the hardware catalogs.

Reading MAC IDs

Each module has a unique MAC ID that is assigned by the manufacturer. The MAC ID cannot be changed by the user. The assigned MAC ID is printed on the front side of the module.

This MAC ID has no function for EtherCAT. For EoE (Ethernet over EtherCAT), the I/O module is assigned a virtual MAC ID.

7.2 Configuration

PDO Assignments

The module supports different PDO assignments for input and output data. There are assignments for bit or byte access with or without diagnostic data that are associated with the input data (TxPDO, I/O module to EtherCAT® controller).

You determine the data content by selecting the appropriate PDO.

The modules offer the following PDO assignments:

7.2.1 16DIO Modules, PDO Mapping

The 16DIO-variant Ethernet modules are universally applicable and provide a variety of profiles for basic configuration. With these, you can preconfigure a 16DIO module as a 16DI, 16DO or 8DI/8DO module and e.g. replace another if necessary. Each I/O channel can be used as an input or output for the 16DI/DO profile. If an I/O channel is used as an input, the PLC programmer should not set the corresponding output bit.

By using the preconfigured alternate profiles, the risk of incorrect configuration is reduced through the use of profiles 16DI, 16DO or 8DI/8DO. In these profiles, the I/O channels are configured as "input" or "output".

Ethernet IO modules of type ICE1-8DI8DO-G60L-C1-V1D ICE1-16DIO-G60L-C1-V1D have the DCU function. For these, the process data is extended in both directions by 4 additional bytes.

For this reason, each of the profiles supports flexible I/O bit mapping. Information on how to use flexible I/O bit mapping can be found in the following chapter, "Device Parameters" in the sections "Configuration of I/O direction (for 16DIO modules with/without DCU)" and "I/O mapping configuration (for 16DIO modules with/without DCU)"

Overview of the 16DIO Profiles in Byte Format

The following table provides an overview of the available I/O profiles and associated PDOs in byte format



ICE1-*-G60L-V1D, ICE1-*-G60L-C1-V1D

Commissioning for EtherCAT

Profile	For- mat	PDO			PDO content						
		Туре	Index	Size	Index	Size	Туре	Name			
16DI/DO	Byte	Input	0x1A00	2	0x6000:01	1.0	USINT	Physical inputs 0 7			
					0x6000:02	1.0	USINT	Physical inputs 8 15			
		Output	0x1600	2	0x6000:01	1.0	USINT	Physical outputs 0 7			
					0x6000:02	1.0	USINT	Physical outputs 8 15			
16DI	DI Byte Input	yte Input	Input	Input	Input	0x1A00	2	0x6000:01	1.0	USINT	Physical inputs 0 7
					0x6000:02	1.0	USINT	Physical inputs 8 15			
16DO	Byte	Output	0x1600	2	0x6200:01	1.0	USINT	Physical outputs 0 7			
					0x6200:02	1.0	USINT	Physical outputs 8 15			
8DI/DO	Byte	Input	0x1A10	1	0x6000:01	1.0	USINT	Physical inputs 0 7			
		Output	0x1610	1	0x6200:01	1.0	USINT	Physical outputs 0 7			
8DI	Byte	Input	0x1A10	1	0x6000:01	1.0	USINT	Physical inputs 0 7			
8DO	Byte	Output	0x1610	1	0x6200:01	1.0	USINT	Physical outputs 0 7			
8DI/8DO	Byte	Input	0x1A10	1	0x6000:01	1.0	USINT	Physical inputs 0 7			
		Output	0x1610	1	0x6200:01	1.0	USINT	Physical outputs 0 7			

Table 7.1

Overview of the 16DIO Profiles in Bit Format

Profile	For- mat	PDO			PDO conter	nt		
		Туре	Index	Size	Index	Size	Туре	Name
16DI/DO	Bit	Input	0x1A01	2	0x6020:01	0.1	BIT	Physical input 0
					0x6020:10	0.1	BIT	Physical input 15
		Output	0x1601	2	0x6220:01	0.1	BIT	Physical output 0
					0x6220:10	0.1	BIT	Physical output 15
16DI	Bit	Input	0x1A01	2	0x6020:01	0.1	BIT	Physical input 0
					0x6020:10	0.1	BIT	Physical input 15
16DO	Bit	Output	0x1601	2	0x6220:01	0.1	BIT	Physical output 0
					0x6220:10	0.1	BIT	Physical output 15
8DI/DO	Bit	Input	0x1A11	1	0x6020:01	0.1	BIT	Physical input 0
					0x6020:08	0.1	BIT	Physical input 7
		Output	0x1611	1	0x6220:01	0.1	BIT	Physical output 0
					0x6220:08	0.1	BIT	Physical output 7

Profile	For- mat	PDO			PDO content				
		Туре	Index	Size	Index	Size	Туре	Name	
8DI	Bit	Input	0x1A11	1	0x6020:01	0.1	BIT	Physical input 0	
					0x6220:08	0.1	BIT	Physical input 7	
8DO	Bit Output	0x1611	1	0x6220:01	0.1	BIT	Physical output 0		
					0x6220:08	0.1	BIT	Physical output 7	
8DI/8DO	Bit	Input	0x1A11	1	0x6020:01	0.1	BIT	Physical input 0	
					0x6020:08	0.1	BIT	Physical input 7	
		Output	0x1611	1	0x6220:01	0.1	BIT	Physical output 0	
					0x6220:08	0.1	BIT	Physical output 7	

The following tables show the process data mapping for each profile with the standard I/O direction and the default mapping parameters.



Note

The following tables show the process data for each profile with default mapping parameters for the Ethernet IO modules ICE1-16DIO-G60L-V1D and ICE1-16DIO-G60L-C1-V1D with DCU function

- X1A ... X8A: data from channel A (pin 4) from slot X1 to X8
- X1B ... X8B: data from channel B (pin 2) from slot X1 to X8

PDOs 0x1A00/0x1600, 16DI/DO Profile with Data in Byte Format

Mapping parameters (Default values, refer-		rs er-							
ence)			Process data						
			Input PDO: 0x1A00		Output PDO: 0x1600	Output PDO: 0x1600			
Index: Byte	Value	Port	Byte name	Bit	Byte name	Bit			
0x2304:01	0	X1A	Physical inputs 0 7	0	Physical outputs 0 7	0			
0x2304:02	1	X1B	Physical inputs 0 7	1	Physical outputs 0 7	1			
0x2304:03	2	X2A	Physical inputs 0 7	2	Physical outputs 0 7	2			
0x2304:04	3	X2B	Physical inputs 0 7	3	Physical outputs 0 7	3			
0x2304:05	4	ХЗА	Physical inputs 0 7	4	Physical outputs 0 7	4			
0x2304:06	5	X3B	Physical inputs 0 7	5	Physical outputs 0 7	5			
0x2304:07	6	X4A	Physical inputs 0 7	6	Physical outputs 0 7	6			
0x2304:08	7	X4B	Physical inputs 0 7	7	Physical outputs 0 7	7			
0x2304:09	8	X5A	Physical inputs 8 15	0	Physical outputs 8 15	0			
0x2304:0A	9	X5B	Physical inputs 8 15	1	Physical outputs 8 15	1			
0x2304:0B	10	X6A	Physical inputs 8 15	2	Physical outputs 8 15	2			
0x2304:0C	11	X6B	Physical inputs 8 15	3	Physical outputs 8 15	3			



Mapping parameters (Default values, refer- ence)			Process data					
			Input PDO: 0x1A00		Output PDO: 0x1600			
Index: Byte	Value	Port	Byte name	Bit	Byte name	Bit		
0x2304:0D	12	X7A	Physical inputs 8 15	4	Physical outputs 8 15	4		
0x2304:0E	13	X7B	Physical inputs 8 15	5	Physical outputs 8 15	5		
0x2304:0F	14	X8A	Physical inputs 8 15	6	Physical outputs 8 15	6		
0x2304:10	15	X8B	Physical inputs 8 15	7	Physical outputs 8 15	7		

PDO 0x1A0, 16DI Profile with Data in Byte Format

Mapping parameters (Default values, refer- ence)		Process data					
			Input PDO: 0x1A00		Output PDO:		
Index: Byte	Value	Port	Byte name	Bit	Byte name	Bit	
0x2304:01	0	X1A	Physical inputs 0 7	0	-	-	
0x2304:02	1	X1B	Physical inputs 0 7	1	-	-	
0x2304:03	2	X2A	Physical inputs 0 7	2	-	-	
0x2304:04	3	X2B	Physical inputs 0 7	3	-	-	
0x2304:05	4	ХЗА	Physical inputs 0 7	4	-	-	
0x2304:06	5	X3B	Physical inputs 0 7	5	-	-	
0x2304:07	6	X4A	Physical inputs 0 7	6	-	-	
0x2304:08	7	X4B	Physical inputs 0 7	7	-	-	
0x2304:09	8	X5A	Physical inputs 8 15	0	-	-	
0x2304:0A	9	X5B	Physical inputs 8 15	1	-	-	
0x2304:0B	10	X6A	Physical inputs 8 15	2	-	-	
0x2304:0C	11	X6B	Physical inputs 8 15	3	-	-	
0x2304:0D	12	X7A	Physical inputs 8 15	4	-	-	
0x2304:0E	13	X7B	Physical inputs 8 15	5	-	-	
0x2304:0F	14	X8A	Physical inputs 8 15	6	-	-	
0x2304:10	15	X8B	Physical inputs 8 15	7	-	-	

Process data for each I/O port: Input.

Table 7.4

PDO 0x1600, 16DO Profile with Data in Byte Format

Process data for each I/O port: **Output**.

Mapping parameters (Default values, refer- ence)		Process data						
			Input PDO:		Output PDO: 0x1600			
Index: Byte	Value	Port	Byte name	Bit	Byte name	Bit		
0x2304:01	0	X1A	-	-	Physical outputs 0 7	0		
0x2304:02	1	X1B	-	-	Physical outputs 0 7	1		
0x2304:03	2	X2A	-	-	Physical outputs 0 7	2		
0x2304:04	3	X2B	-	-	Physical outputs 0 7	3		
0x2304:05	4	ХЗА	-	-	Physical outputs 0 7	4		
0x2304:06	5	X3B	-	-	Physical outputs 0 7	5		
0x2304:07	6	X4A	-	-	Physical outputs 0 7	6		
0x2304:08	7	X4B	-	-	Physical outputs 0 7	7		
0x2304:09	8	X5A	-	-	Physical outputs 8 15	0		
0x2304:0A	9	X5B	-	-	Physical outputs 8 15	1		
0x2304:0B	10	X6A	-	-	Physical outputs 8 15	2		
0x2304:0C	11	X6B	-	-	Physical outputs 8 15	3		
0x2304:0D	12	X7A	-	-	Physical outputs 8 15	4		
0x2304:0E	13	X7B	-	-	Physical outputs 8 15	5		
0x2304:0F	14	X8A	-	-	Physical outputs 8 15	6		
0x2304:10	15	X8B	-	-	Physical outputs 8 15	7		

PDOs 0x1A10/0x1610, 8DI/DO Profile with Data in Byte Format

Process data for each I/O port: Input/output.

Mapping parameters (Default values, refer-		Duccess data							
ence)									
			Input PDO: 0X1A10		Output PDO: 0x1610				
Index: Byte	Value	Port	Byte name	Bit	Byte name	Bit			
0x2304:01	0	X1A	Physical inputs 0 7	0	Physical outputs 0 7	0			
0x2304:02	Inac- tive	X1B	-	-	-	-			
0x2304:03	1	X2A	Physical inputs 0 7	1	Physical outputs 0 7	1			
0x2304:04	Inac- tive	X2B	-	-	-	-			
0x2304:05	2	ХЗА	Physical inputs 0 7	2	Physical outputs 0 7	2			
0x2304:06	Inac- tive	X3B	-	-	-	-			
0x2304:07	3	X4A	Physical inputs 0 7	3	Physical outputs 0 7	3			
0x2304:08	Inac- tive	X4B	-	-	-	-			
0x2304:09	4	X5A	Physical inputs 0 7	0	Physical outputs 0 7	4			
0x2304:0A	Inac- tive	X5B	-	-	-	-			

Mapping parameters (Default values, refer- ence)			Process data					
			Input PDO: 0x1A10		Output PDO: 0x1610			
Index: Byte	Value	Port	Byte name	Bit	Byte name	Bit		
0x2304:0B	5	X6A	Physical inputs 0 7	5	Physical outputs 0 7	5		
0x2304:0C	Inac- tive	X6B	-	-	-	-		
0x2304:0D	6	X7A	Physical inputs 0 7	6	Physical outputs 0 7	6		
0x2304:0E	Inac- tive	X7B	-	-	-	-		
0x2304:0F	7	X8A	Physical inputs 0 7	7	Physical outputs 0 7	7		
0x2304:10	Inac- tive	X8B	-	-		-		

PDO 0x1A10, 8DI Profile with Data in Byte Format

Process data for each I/O port: Input.

Mapping pa (Default va ence)	aramete lues, ref	rs er-	Process data						
			Input PDO: 0x1A10	nput PDO: 0x1A10 Outpu					
Index: Byte	Value	Port	Byte name	Bit	Byte name	Bit			
0x2304:01	0	X1A	Physical inputs 0 7	0	-	-			
0x2304:02	Inac- tive	X1B	-	-	-	-			
0x2304:03	1	X2A	Physical inputs 0 7	1	-	-			
0x2304:04	Inac- tive	X2B	-	-	-	-			
0x2304:05	2	ХЗА	Physical inputs 0 7	2	-	-			
0x2304:06	Inac- tive	ХЗВ	-	-	-	-			
0x2304:07	3	X4A	Physical inputs 0 7	3	-	-			
0x2304:08	Inac- tive	X4B	-	-	-	-			
0x2304:09	4	X5A	Physical inputs 0 7	0	-	-			
0x2304:0A	Inac- tive	X5B	-	-	-	-			
0x2304:0B	5	X6A	Physical inputs 0 7	5	-	-			
0x2304:0C	Inac- tive	X6B	-	-	-	-			
0x2304:0D	6	X7A	Physical inputs 0 7	6	-	-			
0x2304:0E	Inac- tive	X7B	-	-	-	-			
0x2304:0F	7	X8A	Physical inputs 0 7	7	-	-			

Mapping parameters (Default values, refer- ence)			Process data					
			Input PDO: 0x1A10		Output PDO:			
Index: Byte	Value	Port	Byte name	Bit	Byte name	Bit		
0x2304:10	Inac- tive	X8B	-	-		-		

PDO 0x1610, 8DO Profile with Data in Byte Format

Process data for each I/O port: Output.

Mapping parameters (Default values, refer- ence)		Process data						
			Input PDO:		Output PDO: 0x1610			
Index: Byte	Value	Port	Byte name	Bit	Byte name	Bit		
0x2304:01	0	X1A	-	-	Physical outputs 0 7	0		
0x2304:02	Inac- tive	X1B	-	-	-	-		
0x2304:03	1	X2A	-	-	Physical outputs 0 7	1		
0x2304:04	Inac- tive	X2B	-	-	-	-		
0x2304:05	2	ХЗА	-	-	Physical outputs 0 7	2		
0x2304:06	Inac- tive	ХЗВ	-	-	-	-		
0x2304:07	3	X4A	-	-	Physical outputs 0 7	3		
0x2304:08	Inac- tive	X4B	-	-	-	-		
0x2304:09	4	X5A	-	-	Physical outputs 0 7	4		
0x2304:0A	Inac- tive	X5B	-	-	-	-		
0x2304:0B	5	X6A	-	-	Physical outputs 0 7	5		
0x2304:0C	Inac- tive	X6B	-	-	-	-		
0x2304:0D	6	X7A	-	-	Physical outputs 0 7	6		
0x2304:0E	Inac- tive	X7B	-	-	-	-		
0x2304:0F	7	X8A	-	-	Physical outputs 0 7	7		
0x2304:10	Inac- tive	X8B	-	-		-		

Table 7.8

PDOs 0x1A10/0x1610, 8DI/8DO Profile with Data in Byte Format

Process data for each I/O port: Input/output.
alue Port	Input PDO: 0x1A10					
alue Port			Output PDO: 0x1610	Output PDO: 0x1610		
	Byte name	Bit	Byte name	Bit		
X1A	Physical inputs 0 7	0	-	-		
X1B	Physical inputs 0 7	1	-	-		
X2A	Physical inputs 0 7	2	-	-		
X2B	Physical inputs 0 7	3	-	-		
ХЗА	Physical inputs 0 7 4		-	-		
X3B	Physical inputs 0 7	5	-	-		
X4A	Physical inputs 0 7	6	-	-		
X4B	Physical inputs 0 7	7	-	-		
X5A	-	-	Physical outputs 0 7	0		
X5B	-	-	Physical outputs 0 7	1		
) X6A	-	-	Physical outputs 0 7	2		
1 X6B	-	-	Physical outputs 0 7	3		
2 X7A	-	-	Physical outputs 0 7	4		
3 X7B	-	-	Physical outputs 0 7	5		
4 X8A	-	-	Physical outputs 0 7	6		
5 X8B	-	-	Physical outputs 0 7	7		
	X1A X1B X2B X2B X3A X3B X4A X4B X5A X5B X6A X6B X7A X8A X8A X8A	X1APhysical inputs 0 7X1BPhysical inputs 0 7X2APhysical inputs 0 7X2BPhysical inputs 0 7X3APhysical inputs 0 7X3BPhysical inputs 0 7X4APhysical inputs 0 7X4BPhysical inputs 0 7X5A-X5B-X6B-X7A-X8A-X8A-X8B-	X1A Physical inputs 0 7 0 X1B Physical inputs 0 7 1 X2A Physical inputs 0 7 2 X2B Physical inputs 0 7 3 X3A Physical inputs 0 7 4 X3B Physical inputs 0 7 5 X4A Physical inputs 0 7 6 X4B Physical inputs 0 7 7 X5A - - X5B - - X6B - - X7B - - X6B - - X7A - - X8B - - X8B - -	X1A Physical inputs 0 7 0 - X1B Physical inputs 0 7 1 - X2A Physical inputs 0 7 2 - X2B Physical inputs 0 7 3 - X3A Physical inputs 0 7 4 - X3B Physical inputs 0 7 5 - X4A Physical inputs 0 7 6 - X4A Physical inputs 0 7 7 - X5A - Physical inputs 0 7 7 - X5A - Physical inputs 0 7 7 - X5A - Physical outputs 0 7 7 - X6A - Physical outputs 0 7 - Physical outputs 0 7 X6B - - Physical outputs 0		

Table 7.9

PDOs 0x1A01/0x1601, 16DI/DO Profile with Data in Bit Format

Process data for each I/O port: Input/output.

Mapping parameters (Default values, reference)		Process data		
		Input PDO: 0x1A01	Output PDO: 0x1601	
Index: Byte	Value	Port	Bit	Bit
0x2304:01	0	X1A	Physical input 0	Physical output 0
0x2304:02	1	X1B	Physical input 1	Physical output 1
0x2304:03	2	X2A	Physical input 2	Physical output 2
0x2304:04	3	X2B	Physical input 3	Physical output 3
0x2304:05	4	ХЗА	Physical input 4	Physical output 4
0x2304:06	5	X3B	Physical input 5	Physical output 5
0x2304:07	6	X4A	Physical input 6	Physical output 6
0x2304:08	7	X4B	Physical input 7	Physical output 7
0x2304:09	8	X5A	Physical input 8	Physical output 8
0x2304:0A	9	X5B	Physical input 9	Physical output 9
0x2304:0B	10	X6A	Physical input 10	Physical output 10
0x2304:0C	11	X6B	Physical input 11	Physical output 11
0x2304:0D	12	X7A	Physical input 12	Physical output 12
0x2304:0E	13	X7B	Physical input 13	Physical output 13



Mapping parar (Default values	meters s, referen	ce)	Process data	
			Input PDO: 0x1A01	Output PDO: 0x1601
Index: Byte	Value	Port	Bit	Bit
0x2304:0F	14	X8A	Physical input 14	Physical output 14
0x2304:10	15	X8B	Physical input 15	Physical output 15

Table 7.10

PDO 0x1A01, 16DI Profile with Data in Bit Format

Process data for each I/O port: Input.

Mapping parameters (Default values, reference)		Process data			
			Input PDO: 0x1A01	Output PDO	
Index: Byte	Value	Port	Bit	Bit	
0x2304:01	0	X1A	Physical input 0	-	
0x2304:02	1	X1B	Physical input 1	-	
0x2304:03	2	X2A	Physical input 2	-	
0x2304:04	3	X2B	Physical input 3	-	
0x2304:05	4	ХЗА	Physical input 4	-	
0x2304:06	5	X3B	Physical input 5	-	
0x2304:07	6	X4A	Physical input 6	-	
0x2304:08	7	X4B	Physical input 7	-	
0x2304:09	8	X5A	Physical input 8	-	
0x2304:0A	9	X5B	Physical input 9	-	
0x2304:0B	10	X6A	Physical input 10	-	
0x2304:0C	11	X6B	Physical input 11	-	
0x2304:0D	12	X7A	Physical input 12	-	
0x2304:0E	13	X7B	Physical input 13	-	
0x2304:0F	14	X8A	Physical input 14	-	
0x2304:10	15	X8B	Physical input 15	-	

Table 7.11

PDO 0x1601, 16DO Profile with Data in Bit Format

Process data for each I/O port: **Output**.

Mapping parameters (Default values, reference)		Process data		
			Input PDO: 0x1A01	Output PDO: 0x1601
Index: Byte	Value	Port	Bit	Bit
0x2304:01	0	X1A	-	Physical output 0
0x2304:02	1	X1B	-	Physical output 1
0x2304:03	2	X2A	-	Physical output 2
0x2304:04	3	X2B	-	Physical output 3



Mapping parameters (Default values, reference)		Process data		
			Input PDO: 0x1A01	Output PDO: 0x1601
Index: Byte	Value	Port	Bit	Bit
0x2304:05	4	ХЗА	-	Physical output 4
0x2304:06	5	X3B	-	Physical output 5
0x2304:07	6	X4A	-	Physical output 6
0x2304:08	7	X4B	-	Physical output 7
0x2304:09	8	X5A	-	Physical output 8
0x2304:0A	9	X5B	-	Physical output 9
0x2304:0B	10	X6A	-	Physical output 10
0x2304:0C	11	X6B	-	Physical output 11
0x2304:0D	12	X7A	-	Physical output 12
0x2304:0E	13	X7B	-	Physical output 13
0x2304:0F	14	X8A	-	Physical output 14
0x2304:10	15	X8B	-	Physical output 15
Table 7.12			-	

PDOs 0x1A11/0x1611, 8DI/DO Profile with Data in Bit Format

Mapping parameters (Default values, reference)		Process data		
			Input PDO: 0x1A11 Output PDO: 0x1611	
Index: Byte	Value	Port	Bit	Bit
0x2304:01	0	X1A	Physical input 0	Physical output 0
0x2304:02	Inactive	X1B	-	-
0x2304:03	1	X2A	Physical input 1	Physical output 1
0x2304:04	Inactive	X2B	-	-
0x2304:05	2	ХЗА	Physical input 2	Physical output 4
0x2304:06	Inactive	X3B	-	-
0x2304:07	3	X4A	Physical input 3	Physical output 3
0x2304:08	Inactive	X4B	-	-
0x2304:09	4	X5A	Physical input 4	Physical output 4
0x2304:0A	Inactive	X5B	-	-
0x2304:0B	5	X6A	Physical input 5	Physical output 5
0x2304:0C	Inactive	X6B	-	-
0x2304:0D	6	X7A	Physical input 6	Physical output 6
0x2304:0E	Inactive	X7B	-	-
0x2304:0F	7	X8A	Physical input 7	Physical output 7
0x2304:10	Inactive	X8B	-	-

Process data for each I/O port: Input/output.

Table 7.13

PDO 0x1A11, 8DI Profile with Data in Bit Format

Process data for each I/O port: Input.

Mapping parameters (Default values, reference)		Process data		
			Input PDO: 0x1A11	Output PDO:
Index: Byte	Value	Port	Bit	Bit
0x2304:01	0	X1A	Physical input 0	-
0x2304:02	Inactive	X1B	-	-
0x2304:03	1	X2A	Physical input 1	-
0x2304:04	Inactive	X2B	-	-
0x2304:05	2	ХЗА	Physical input 2	-
0x2304:06	Inactive	X3B	-	-
0x2304:07	3	X4A	Physical input 3	-
0x2304:08	Inactive	X4B	-	-
0x2304:09	4	X5A	Physical input 4	-
0x2304:0A	Inactive	X5B	-	-
0x2304:0B	5	X6A	Physical input 5	-
0x2304:0C	Inactive	X6B	-	-
0x2304:0D	6	X7A	Physical input 6	-
0x2304:0E	Inactive	X7B	-	-
0x2304:0F	7	X8A	Physical input 7 -	
0x2304:10	Inactive	X8B	-	-

Table 7.14

PDO 0x1611, 8DO Profile with Data in Bit Format

Process data for each I/O port: Output.

Mapping parameters (Default values, reference)		Process data		
			Input PDO: 0x1A11	Output PDO: 0x1611
Index: Byte	Value	Port	Bit	Bit
0x2304:01	0	X1A	-	Physical output 0
0x2304:02	Inactive	X1B	-	-
0x2304:03	1	X2A	-	Physical output 1
0x2304:04	Inactive	X2B	-	-
0x2304:05	2	ХЗА	-	Physical output 4
0x2304:06	Inactive	X3B	-	-
0x2304:07	3	X4A	-	Physical output 3
0x2304:08	Inactive	X4B	-	-
0x2304:09	4	X5A	-	Physical output 4
0x2304:0A	Inactive	X5B	-	-
0x2304:0B	5	X6A	-	Physical output 5
0x2304:0C	Inactive	X6B	-	-

Mapping parameters (Default values, reference)		Process data		
			Input PDO: 0x1A11	Output PDO: 0x1611
Index: Byte	Value	Port	Bit	Bit
0x2304:0D	6	X7A	-	Physical output 6
0x2304:0E	Inactive	X7B	-	-
0x2304:0F	7	X8A	-	Physical output 7
0x2304:10	Inactive	X8B	-	-

Table 7.15

PDOs 0x1A11/0x1611, 8DI/8DO Profile with Data in Bit Format

Mapping parameters (Default values, reference)		Process data		
			Input PDO: 0x1A01	Output PDO: 0x1611
Index: Byte	Value	Port	Bit	Bit
0x2304:01	0	X1A	Physical input 0	-
0x2304:02	1	X1B	Physical input 1	-
0x2304:03	2	X2A	Physical input 2	-
0x2304:04	3	X2B	Physical input 3	-
0x2304:05	4	ХЗА	Physical input 4	-
0x2304:06	5	X3B	Physical input 5	-
0x2304:07	6	X4A	Physical input 6	-
0x2304:08	7	X4B	Physical input 7	-
0x2304:09	8	X5A	-	Physical output 0
0x2304:0A	9	X5B	-	Physical output 1
0x2304:0B	10	X6A	-	Physical output 2
0x2304:0C	11	X6B	-	Physical output 3
0x2304:0D	12	X7A	-	Physical output 4
0x2304:0E	13	X7B	-	Physical output 5
0x2304:0F	14	X8A	-	Physical output 6
0x2304:10	15	X8B	-	Physical output 7

Process data for each I/O port: Input/output.

Table 7.16

PDO 0x1A04, Error Register

The PDOs 0x1A00, 0x1A01, 0x1A10 or 0x1A11 can be flexibly combined with the PDOs 0x1A04 (error register) and/or 0x1A05 (diagnosis register).

PDO		Content	Content					
Index	Size	Index	Size	Name				
0x1A04	1	0x1001:01	1.0	USINT	Error register			
Table 7 17								

Table 7.17

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
0	0	0	0	0	0	0	0	No error
-	0	0	0	0	-	1	1	Output overload, MI-SCS
-	0	0	0	0	1	-	1	Voltage error, MI- LVS
1	0	0	0	0	-	-	1	Additional param- eter error func- tion, MI-PRM
1	0	0	0	0	-	-	1	Force Mode active, MI-FC
1	0	0	0	0	-	-	1	Additional device diagnosis func- tion, MI-IME

Content of the Error Register

Table 7.18

The symbol "-" can either be "0" or "1," if more than one error is active for each.

PDO 0x1A05, Diagnosis Register

The PDOs 0x1A00, 0x1A01, 0x1A10 or 0x1A11 can be flexibly combined with the PDOs 0x1A04 (error register) and/or 0x1A05 (diagnosis register).

PDO		Content					
Index Size		Index	Index Size Type		Name		
0x1A05	1	0x2001:01	4.0	UDINT	Diagnosis register		

Table 7.19

Content of the Diagnosis Register

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	MI-IME	MI-FC	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Byte 2	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Byte 3	CE-X4B	CE-X4A	CE-X3B	CE-X3A	CE-X2B	CE-X2A	CE-X1B	CE-X1A
Byte 4	CE-X8B	CE-X8A	CE-X7B	CE-X7A	CE-X6B	CE-X6A	CE-X5B	CE-X5A

Table 7.20

TwinCAT representation as UDINT: 0x Byte 4 - Byte 3 - Byte 2 - Byte 1

Legend

MI-LVS Module information byte-voltage for system/sensor performance low

- MI-LVA Module information byte-voltage for actuator low
- Module information byte-sensor short circuit at an M12 slot **MI-SCS**
- **MI-SCA** Module information byte-actuator short circuit
- **MI-PRM** Module information byte-parameter error
- MI-FC Module information byte-Force Mode active
- **MI-IME** Module information byte-internal error
- Sensor short circuit at slot X1 to X8 SCS-X1 ... SCS-X8



CE-X5A ... Channel error at output channel A (contact pin 4) of outputs X5 to X8. CE-X8A

CE-X5B ... Channel error at output channel B (contact pin 2) of outputs X5 to X8. CE-X8B

7.2.2 Modules with Decentralized Control Function, Bit Assignment of Process Data Extension

Ethernet IO modules with decentralized control function (DCU) have additional specific process data objects. They expand the process data range for input and output data by 2 bytes each.

This process data extension is described below for the following Ethernet IO modules:

- ICE1-8DI8DO-G60L-C1-V1D
- ICE1-16DIO-G60L-C1-V1D

PDO 0x1A06, DCU Inputs (2 Bytes)

These 2 bytes can be used for the decentralized control function (DCU function) as additional input data (TxPDO, EtherCAT® slave on controller). You can disable file transfer in the process data/PDO assignment of the engineering tool.

PDO		PDO content				
Index Size		Index	Size	e Type Name		
0x1A06	2	0x6040:01 1.0		USINT	DCU inputs 0 - 7	
		0x6040:02 1.0 USI		USINT	DCU inputs 8 - 15	

Table 7.21

PDO 0x1602, DCU Outputs (2 Bytes)

These 2 bytes can be used for the decentralized control function (DCU function) as additional output data (RxPDO, EtherCAT® controller on slave). You can disable file transfer in the process data/PDO assignment of the engineering tool.

PDO		PDO content				
Index Size		Index	Size Type Name		Name	
0x1602	2	0x6040:01	1.0	USINT	DCU outputs 0 - 7	
		0x6040:02 1.0		USINT	DCU outputs 8 - 15	

Table 7.22

PDO 0x1A08, Additional DCU Inputs, (8 Signed Integer)

These 8 signed integer values can be used for the decentralized control function (e.g., as a counter) as additional input data (TxPDO, EtherCAT® slave on controller). You can disable file transfer in the process data/PDO assignment of the engineering tool.

PDO		PDO content					
Index	ndex Size		Size	Туре	Name		
0x1A08	2	0x6080:01	2.0	INT	DCU additional input 0		
		0x6080:02	2.0	INT	DCU additional input 1		
		0x6080:03	2.0	INT	DCU additional input 2		
		0x6080:04	2.0	INT	DCU additional input 3		
		0x6080:05	2.0	INT	DCU additional input 4		
		0x6080:06	2.0	INT	DCU additional input 5		
		0x6080:07	2.0	INT	DCU additional input 6		
		0x6080:08	2.0	INT	DCU additional input 7		

Table 7.23

PDO 0x1604, Additional DCU Outputs (8 Signed Integer)

These 8 signed integer values can be used for the decentralized control function (DCU function) as additional output data (RxPDO, EtherCAT® controller on slave). You can disable file transfer in the process data/PDO assignment of the engineering tool.

PDO		PDO content					
Index	Size	Index	Size	Туре	Name		
0x1604	2	0x6280:01	2.0	INT	DCU additional output 0		
		0x6280:02	2.0	INT	DCU additional output 1		
		0x6280:03	2.0	INT	DCU additional output 2		
		0x6280:04	2.0	INT	DCU additional output 3		
		0x6280:05	2.0	INT	DCU additional output 4		
		0x6280:06	2.0	INT	DCU additional output 5		
		0x6280:07	2.0	INT	DCU additional output 6		
		0x6280:08	2.0	INT	DCU additional output 7		

Table 7.24

7.2.3 16DI Modules, PDO Assignment

PDO for the ICE1-16DI-G60L-V1D

The PDOs 0x1A00 or 0x1A01 control the input data of the module

PDO 0x1A00, Input Data in Byte Format

PDO		Content						
Index	Size	Index	Size	Туре	Name			
0x1A00	2	0x6000:01	1.0	USINT	Input channel X1A X4B			
		0x6000:02	1.0	USINT	Input channel X5A X8B			

Table 7.25

Index	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x6000:0 1	X4B	X4A	X3B	ХЗА	X2B	X2A	X1B	X1A
0x6000:0 2	X8B	X8A	X7B	X7A	X6B	X6A	X5B	X5A

Content of Input Channel X1A..X4B and Input Channel X5A..X8B

Table 7.26

The values refer to the following:

- X1A ... X8A: Actual status of the input channel A (contact pin 4) of the inputs X1 to X8.
- X1B ... X8B: Actual status of the input channel B (contact pin 2) of the inputs X1 to X8.

PDO 0x1A01, Input Data in Bit Format

PDO	PDO		Content						
Index	Size	Index	Size	Туре	Name				
0x1A01	2	0x6020:01	0.1	BIT	Input channel X1A				
		0x6020:02	0.1	BIT	Input channel X1B				
		0x6020:03	0.1	BIT	Input channel X2A				
		0x6020:04	0.1	BIT	Input channel X2B				
		0x6020:05	0.1	BIT	Input channel X3A				
		0x6020:06	0.1	BIT	Input channel X3B				
		0x6020:07	0.1	BIT	Input channel X4A				
		0x6020:08	0.1	BIT	Input channel X4B				
		0x6020:09	0.1	BIT	Input channel X5A				
		0x6020:0A	0.1	BIT	Input channel X5B				
		0x6020:0B	0.1	BIT	Input channel X6A				
		0x6020:0C	0.1	BIT	Input channel X6B				
		0x6020:0D	0.1	BIT	Input channel X7A				
		0x6020:0E	0.1	BIT	Input channel X7B				
		0x6020:0F	0.1	BIT	Input channel X8A				
		0x6020:10	0.1	BIT	Input channel X8B				

Table 7.27

The PDOs 0x1A00 and 0x1A01 can be combined with the PDO 0x1A04 (error register) and/or the PDO 0x1A05 (diagnosis register).

PDO 0x1A04, Error Register

PDO		Content	Content						
Index Size		Index	Size Type		Name				
0x1A04	1	0x1001:01	1.0	USINT	Error register				
Table 7 00									

Table 7.28



Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
0	0	0	0	0	0	0	0	No error
-	0	0	0	0	-	1	1	Output overload, MI-SCS
-	0	0	0	0	1	-	1	Voltage error, MI- LVS
1	0	0	0	0	-	-	1	Force Mode active, MI-FC
1	0	0	0	0	-	-	1	Additional device diagnosis func- tion, MI-IME

Content of the Error Register

Table 7.29

The symbol "-" can either be "0" or "1", if more than one error is active for each.

PDO 0x1A05, Diagnosis Register

PDO Content					
Index	Size	Index	Size	Туре	Name
0x1A05	1	0x2001:01	4.0	UDINT	Diagnosis register

Table 7.30

Content of the Diagnosis Register

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	MI-IME	MI-FC	0	0	0	MI-SCS	0	MI-LVS
Byte 2	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Byte 3	0	0	0	0	0	0	0	0
Byte 4	0	0	0	0	0	0	1	0

Table 7.31

TwinCAT representation as UDINT: 0x Byte 4 - Byte 3 - Byte 2 - Byte 1

Legend

- MI-LVS Module information byte—voltage for system/sensor performance low
- MI-SCS Module information byte—sensor short circuit at an M12 slot
- MI-FC Module information byte—Force Mode active
- MI-IME Module information byte—internal error
- SCS-X1 ... Sensor short circuit at slot X1 to X8

SCS-X8

7.2.4 8DI8DO Modules, PDO Assignment

PDO for the ICE1-8DI8DO-G60L-V1D and ICE1-8DI8DO-G60L-C1-V1D

The PDOs 0x1A00 or 0x1A01 control the input data of the modules. The PDOs 0x1600 or 0x1601 control the outputs of the modules.



PDO 0x1A00, Input Data in Byte Format

PDO		Content					
Index	Size	Index	Size	Туре	Name		
0x1A00	1	0x6000:01	1.0	USINT	Input channel X1A X8B		

Table 7.32

Content of port X1A ... X4B and port X5A ... X8B

Index	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x6000:0 1	X4B	X4A	X3B	ХЗА	X2B	X2A	X1B	X1A
0x6000:0 2	X8B	X8A	X7B	X7A	X6B	X6A	X5B	X5A

Table 7.33

The values refer to the following:

- X1A ... X8A: Actual status of the input channel A (contact pin 4) of the inputs X1 to X8.
- X1B ... X8B: Actual status of the input channel B (contact pin 2) of the inputs X1 to X8.

PDO 0x1A01, Input Data in Bit Format

PDO		Content			
Index	Size	Index	Size	Туре	Name
0x1A01	2	0x6020:01	0.1	BIT	Input channel X1A
		0x6020:02	0.1	BIT	Input channel X1B
		0x6020:03	0.1	BIT	Input channel X2A
		0x6020:04	0.1	BIT	Input channel X2B
		0x6020:05	0.1	BIT	Input channel X3A
	0x6020:06	0.1	BIT	Input channel X3B	
		0x6020:07	0.1	BIT	Input channel X4A
		0x6020:08	0.1	BIT	Input channel X4B
		0x6020:09	0.1	Bit	Input channel X5A
		0x6020:0A	0.1	Bit	Input channel X5B
		0x6020:0B	0.1	Bit	Input channel X6A
		0x6020:0C	0.1	Bit	Input channel X6B
		0x6020:0D	0.1	Bit	Input channel X7A
		0x6020:0E	0.1	Bit	Input channel X7B
		0x6020:0F	0.1	Bit	Input channel X8A
		0x6020:10	0.1	Bit	Input channel X8B

Table 7.34

The following PDOs are available for the input data (TxPDO of the module).

PDO 0x1A02, Output Status in Byte Format

If required, this object can provide real output statuses as input data to the controller (output mirror):



PDO		Content					
Index	Size	Index	Size	Туре	Name		
0x1A02	2	0x2200:01	1.0	USINT	Output channel X5A X8B		

Table 7.35

Content of output channel X5A ... X8B

Index	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x2200:0 1	X8B	X8A	X7B	X7A	X6B	X6A	X5B	X5A

Table 7.36

The values refer to the following:

- X5A ... X8A: Actual status of output channel A (contact pin 4) of outputs X5 to X8.
- X5B ... X8B: Actual status of output channel B (contact pin 2) of outputs X5 to X8.

PDO 0x1A03, Output Status in Bit Format

PDO		Content			
Index	Size	Index	Size	Туре	Name
0x1A03 2	2	0x2220:01	0.1	BIT	Output channel X5A
		0x2220:02	0.1	BIT	Output channel X5B
		0x2220:03	0.1	BIT	Output channel X6A
		0x2220:04	0.1	BIT	Output channel X6B
		0x2220:05	0.1	BIT	Output channel X7A
		0x2220:06	0.1	BIT	Output channel X7B
		0x2220:07	0.1	BIT	Output channel X8A
		0x2220:08	0.1	BIT	Output channel X8B

Table 7.37

The PDOs 0x1A01, 0x1A02 and 0x1A03 can be combined with the PDO 0x1A04 (error register) and/or the PDO 0x1A05 (diagnosis register).

PDO 0x1A04, Error Register

PDO		Content	Content					
Index	Size	Index	Size	Туре	Name			
0x1A04	1	0x1001:01	1.0	USINT	Error register			
T-1-1- 7 00			-					

Table 7.38

Content of the Error Register

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
0	0	0	0	0	0	0	0	No error
-	0	0	0	0	-	1	1	Output overload, MI-SCS
-	0	0	0	0	1	-	1	Voltage error, MI- LVS
1	0	0	0	0	-	-	1	Force Mode active, MI-FC



	511.6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	Description
1 C)	0	0	0	-	-	1	Additional device diagnosis func- tion, MI-IME

The symbol "-" can either be "0" or "1," if more than one error is active for each.

PDO 0x1A05, Diagnosis Register

PDO		Content				
Index	Size	Index	Size	Type Name		
0x1A05	1	0x2001:01	4.0	UDINT	Diagnosis register	

Table 7.40

Content of the Diagnosis Register

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	MI-IME	MI-FC	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Byte 2	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Byte 3	0	0	0	0	0	0	0	0
Byte 4	CE-X8B	CE-X8A	CE-X7B	CE-X7A	CE-X6B	CE-X6A	CE-X5B	CE-X5A

Table 7.41

TwinCAT representation as UDINT: 0x Byte 4 - Byte 3 - Byte 2 - Byte 1

Legend

MI-LVS Module information byte—voltage for system/sensor performance low

MI-LVA Module information byte—voltage for actuator low

MI-SCS Module information byte—sensor short circuit at an M12 slot

MI-SCA Module information byte-actuator short circuit

MI-FC Module information byte—Force Mode active

- MI-IME Module information byte—internal error
- SCS-X1 ... Sensor short circuit at slot X1 to X8 SCS-X8

CE-X5A ... Channel error at output channel A (contact pin 4) of outputs X5 to X8. CE-X8A

CE-X5B ... Channel error at output channel B (contact pin 2) of outputs X5 to X8. CE-X8B

PDO 0x1600, Output Data in Byte Format

PDO		Content					
Index	Size	Index	Size	Туре	Name		
0x1600	2	0x6200:01	1.0	USINT	Output channel X5A X8B		

Table 7.42

Content of Output Channel X5A...X8B

Index	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0x6200:0 1	X8B	X8A	X7B	X7A	X6B	X6A	X5B	X5A

Table 7.43

The values refer to the following:

- X5A ... X8A: Output data channel A (contact pin 4) of outputs X5 to X8.
- X5B ... X5B: Output data channel B (contact pin 2) of outputs X5 to X8.

PDO 0x1601, Output Data in Bit Format

PDO		Content						
Index	Size	Index	Size	Туре	Name			
0x1601	2	0x6220:01	0.1	BIT	Output channel X5A			
		0x6220:02	0.1	BIT	Output channel X5B			
		0x6220:03	0.1	BIT	Output channel X6A			
		0x6220:04	0.1	BIT	Output channel X6B			
		0x6220:05	0.1	BIT	Output channel X7A			
		0x6220:06	0.1	BIT	Output channel X7B			
		0x6220:07	0.1	BIT	Output channel X8A			
		0x6220:08	0.1	BIT	Output channel X8B			

Table 7.44

7.2.5 Device Parameters

The modules support different parameters. The parameters are sent to the module during commissioning of the controller.

The following parameters can be set:

Possible Parameter Options for the General Module Settings

Index (byte)	Parameter	Default	Available in module vari- ant
0x2300:01	Web interface locked: 0 = false, 1 = true	0	All module variants
0x2300:02	Force Mode locked: 0 = false, 1 = true	1	All module variants
0x2300:03	Disable all emergency messages: 0 = false, 1 = true	0	All module variants
0x2300:04	Disable UL emergency messages: 0 = false, 1 = true	0	Module variants with out- puts such as 16DO, 8DI/8DO, 16DIO
0x2300:05	Disable actuator emergency messages without U_L : 0 = false, 1 = true	0	Module variants with out- puts such as 16DO, 8DI/8DO, 16DIO
0x2300:06	DCU Start: 0 = locked, 1 = disabled, 2 = run	1	Module variants with decentralized control func- tion (DCU)
0x2300:07	Automatic restart of output after error: 0 = false, 1 = true	1	Only 16DIO module vari- ants

Table 7.45

Fail-Safe Function (for Modules with Output Channels)

The firmware on the module provides a fail-safe function for the outputs for interruptions or loss of communication. When configuring modules, you can define the status of the outputs after an interruption or a loss of communication.

The following options are available:

Deactivate the output channel, value = 0

Activate the output channel, value = 1

Keep the last output status, value = 2



Caution!

Possible faults where 16DIO modules have been configured incorrectly

For the 16DIO module with the 8DI/DO and 8DI/8DO profiles, each of the 16 possible output channels can be parameterized, as the directional configuration of the I/O ports is flexible. Be aware of your specific I/O direction configuration when customizing the "Fail-Safe Function" parameter. This will help avoid faults with your application.

Possible Fail-Safe Values for 16DIO Modules and Profile(s) with Outputs

Index (byte)	Parameter
0x2301:01	Fail-safe function port X1, channel A (pin 4), value range 0 2
0x2301:02	Fail-safe function port X5, channel B (pin 2), value range 0 2
0x2301:0F	Fail-safe function port X8, channel A (pin 4), value range 0 2
0x2301:10	Fail-safe function port X8, channel B (pin 2), value range 0 2
Table 7 46	

Table 7.46

Possible Fail-Safe Values for 8DI/8DO Modules

Index (byte)	Parameter
0x2301:01	Fail-safe function port X5, channel A (pin 4), value range 0 2
0x2301:02	Fail-safe function port X5, channel B (pin 2), value range 0 2
0x2301:07	Fail-safe function port X8, channel A (pin 4), value range 0 2
0x2301:08	Fail-safe function port X8, channel B (pin 2), value range 0 2
Table 7.47	

Surveillance Timeout (for Modules with Output Channels)

The module firmware allows you to set a delay time before monitoring of output currents begins. The delay time is also known as "Surveillance Timeout". You can define this for each individual output channel.

The delay time starts after the status of the output channel changes, i.e., if this is activated after a rising edge or is disabled after a falling edge. After this time has elapsed, the monitoring of the output begins and the diagnosis begins reporting error states. The value of the monitoring time limit is 0 ms to 255 ms. The default value is 80 ms. If the output channel is in a static state, i.e., permanently switched on or switched off, the value is 100 ms.





Caution!

Possible faults where 16DIO modules have been configured incorrectly

For the 16DIO module with the 8DI/DO and 8DI/8DO profiles, each of the 16 possible output channels can be parameterized, as the directional configuration of the I/O ports is flexible. Be aware of your specific I/O direction configuration when customizing the "Surveillance Timeout" parameter. This will help avoid faults with your application.

Possible Surveillance Timeout Values for 16DIO Modules and Profile(s) with Outputs

Parameter
Surveillance timeout port X1, channel A (pin 4), value range 0 255
Surveillance timeout port X1, channel B (pin 2), value range 0 255
Surveillance timeout port X8, channel A (pin 4), value range 0 255
Surveillance timeout port X8, channel B (pin 2), value range 0 255

Table 7.48

Possible Surveillance Timeout Values for 8DI/8DO Modules

Index (byte)	Parameter
0x2302:01	Surveillance timeout port X5, channel A (pin 4), value range 0 255
0x2302:02	Surveillance timeout port X5, channel B (pin 2), value range 0 255
0x2302:07	Surveillance timeout port X8, channel A (pin 4), value range 0 255
0x2302:08	Surveillance timeout port X8, channel B (pin 2), value range 0 255

Table 7.49

Configuration of I/O Direction (for 16DIO Modules)

The "I/O direction" parameter allows the input/output channels (I/O channels) of the module to be configured.

The following settings are possible:

Input/output = 0

lnput = 1

Output = 2

By configuring the I/O direction and using the appropriate I/O mapping configuration (see next section), you can adjust the module to match the most common standard I/O modules on the market. The appropriate settings are preconfigured for each profile (16DI/DO, 16DI, 16DO, 8DI/DO, 8DI, 8DO, 8DI/8DO). This means it is not necessary to adjust these parameters for most applications.

Possible Configuration of I/O Direction

Index (byte)	Parameter
0x2303:01	I/O direction configuration port X1A: Input/output = 0, input = 1, output = 2
0x2303:02	I/O direction configuration port X1A: Input/output = 0, input = 1, output = 2
0x2303:0F	I/O direction configuration port X1A: Input/output = 0, input = 1, output = 2
0x2303:10	I/O direction configuration port X1A: Input/output = 0, input = 1, output = 2
Table 7 50	- -

The following table provides an overview of the 16DIO profiles with preconfigured I/O direction. Certain channels have been set to inactive. Details of these settings see table "Standard I/O Mapping Configuration" on page 90 are in the following section.

Index	Port	16DI/DO	16DI	16DO	8DI/DO	8DI	8DO	8DI/8DO
0x2303:01	X1A	Input/out put	Input	Output	Input/out put	Input	Output	Input
0x2303:02	X1B	Input/out put	Input	Output	Input/out put	Input	Output	Input
0x2303:03	X2A	Input/out put	Input	Output	Input/out put	Input	Output	Input
0x2303:04	X2B	Input/out put	Input	Output	Input/out put	Input	Output	Input
0x2303:05	ХЗА	Input/out put	Input	Output	Input/out put	Input	Output	Input
0x2303:06	X3B	Input/out put	Input	Output	Input/out put	Input	Output	Input
0x2303:07	X4A	Input/out put	Input	Output	Input/out put	Input	Output	Input
0x2303:08	X4B	Input/out put	Input	Output	Input/out put	Input	Output	Input
0x2303:09	X5A	Input/out put	Input	Output	Input/out put	Input	Output	Output
0x2303:0A	X5B	Input/out put	Input	Output	Input/out put	Input	Output	Output
0x2303:0B	X6A	Input/out put	Input	Output	Input/out put	Input	Output	Output
0x2303:0C	X6B	Input/out put	Input	Output	Input/out put	Input	Output	Output
0x2303:0D	X7A	Input/out put	Input	Output	Input/out put	Input	Output	Output
0x2303:0E	X7B	Input/out put	Input	Output	Input/out put	Input	Output	Output
0x2303:0F	X8A	Input/out put	Input	Output	Input/out put	Input	Output	Output
0x2303:10	X8B	Input/out put	Input	Output	Input/out put	Input	Output	Output

Default Configuration of I/O Direction in 16DIO Profiles

Table 7.51



Caution!

Possible Malfunctions Caused By Misconfiguration of 16DIO modules

Choose the settings for "Configuration of I/O direction" and "I/O mapping configuration" carefully to avoid malfunctions.

I/O Mapping Configuration (for 16DIO Modules)

This parameter enables you to specify how the I/O channels are assigned to the associated process data.

• Each output control bit in the output data frame from the EtherCAT® controller can be assigned to your preferred output channel (X1A ... X8B). The available settings are 0 ... 7, 0 ... 15, depending on the I/O profile, or 255 to set it inactive.



- Each physical input bit to be transfered to the EtherCAT® controller can be assigned to your preferred bit position in the input data frame. The available settings are 0 ... 7, 0 ... 15 (0 = X1A ... 15 = X8B), or 255 for the inactive setting.
- For I/O channels that are configured as "input/output," the mapping configuration applies to the input direction (producing data) and output direction (consuming data).

The appropriate settings are preconfigured for each profile (16DI/DO, 16DI, 16DO, 8DI/DO, 8DI, 8DO, 8DI/8DO). This means that it is not necessary to adjust these parameters for most applications.

Possible I/O Mapping Configuration

Index (byte?)	Parameter
0x2304:01	I/O mapping configuration port X1A: 0 15 = process data channel 0 15, 255 = inactive
0x2304:02	I/O mapping configuration port X1B: 0 15 = process data channel 0 15, 255 = inactive
0x2304:0F	I/O mapping configuration port X8A: 0 15 = process data channel 0 15, 255 = inactive
0x2304:10	I/O mapping configuration port X8B: 0 15 = process data channel 0 15, 255 = inactive

Table 7.52

The following table provides an overview of the relationship between the preconfigured I/O port channel (X1A... X8B) and the I/O process data channel (0 \dots 15) for each profile.

		I/O proce	ess data c	hannel (0	15), 25	5 = inactiv	/e/not ava	ilable
Index (byte)	Port	16DI/DO	16DI	16DO	8DI/DO	8DI	8DO	8DI/8DO
0x2304:01	X1A	0	0	0	0	0	0	0
0x2304:02	X1B	1	1	1	255	255	255	1
0x2304:03	X2A	2	2	2	1	1	1	2
0x2304:04	X2B	3	3	3	255	255	255	3
0x2304:05	ХЗА	4	4	4	2	2	2	4
0x2304:06	X3B	5	5	5	255	255	255	5
0x2304:07	X4A	6	6	6	3	3	3	6
0x2304:08	X4B	7	7	7	255	255	255	7
0x2304:09	X5A	8	8	8	4	4	4	0
0x2304:0A	X5B	9	9	9	255	255	255	1
0x2304:0B	X6A	10	10	10	5	5	5	2
0x2304:0C	X6B	11	11	11	255	255	255	3
0x2304:0D	X7A	12	12	12	6	6	6	4
0x2304:0E	X7B	13	13	13	255	255	255	5
0x2304:0F	X8A	14	14	14	7	7	7	6
0x2304:10	X8B	15	15	15	255	255	255	7

Standard I/O Mapping Configuration

Table 7.53

Example of process data in the **byte** format:

 0x2304:0B (X6A) = 10 for the 16DI/DO profile means that input bit X6A is assigned to producing bit 10 (byte 1/bit 2) and that the output bit of consuming byte 1/bit 2 is used as output control information for port X6A.

Example of process data in the bit format:

 0x2304:0B (X6A) = 10 for the 16DI/DO profile means that input bit X6A is assigned to producing bit 10 and that the output bit of consuming bit 10 is used as output control information for port X6A.

7.2.6 Configuration Example with TwinCAT® 3

The configuration and commissioning of the modules described below refers to the software TwinCAT® 3 from Beckhoff Automation GmbH.

The configuration is based on the example of an ICE1-16DIO-G60L-V1D module. For other module versions, configuration is carried out with a few minor changes.

If you have a control system from a different provider, please refer to the corresponding documentation from the provider.



Caution!

Personal injury and property damage

Before you adjust the inputs or outputs of the module, make sure that no personal injury or property damage can occur.



Integrating the PLC

1. Install the ESI file of the module family in TwinCat®. In TwinCAT® 3, the ESI file is normally inserted in the installation folder C:\TwinCAT\3.1\Config\Io\EtherCAT.

→ After you restart TwinCAT®, the modules will be available in the hardware catalog.

2. Start TwinCat and open a new project.



Note

After creating the project, you must first take the following steps to establish communication with the PLC.

3. Select the "SYSTEM" option in "Solution Explorer" and click on the "Choose Target" button.



Figure 7.1

4. In the "Choose Target System" menu, click on the "Search (Ethernet)" button

Choose Target System		
	1.1)	ОК
		Cancel
		Search (Ethernet)
		Search (Fieldbus)
		Set as Default
Connection Timeout (s):	5	×

Figure 7.2

5. In the "Add Route Dialog" menu, click on the "Broadcast Search" button.

ICE1-*-G60L-V1D, ICE1-*-G60L-C1-V1D

Commissioning for EtherCAT

TwinCAT OS Version Comment	Host Name Connect A
Route Name (Remote): 1302PFN340 Target Route Remote Route	
· · · · · · · · · · · · · · · · · · ·	Route Name (Target):
Project None Static Temporary Temporary	Transport Type: T(
	Host Name O IP Addre
Static Temporary	Transport Type: If Address Info: Host Name DIP Addre

Figure 7.3

 \rightarrow TwinCAT® lists the found nodes in the menu.

6. Click on the desired device. In this example, "CX-19FDE4" for the PLC.

Enter Host Name / IP:				Refresh Status	Broadcast Search
Host Name Conn	ect Address	AMS NetId	TwinCAT	OS Version Comment	
1302PFN340	192.168.1.1	192.168.0.100	3.1.4018	Windows 7	
CX-19FDE4	192.168.1.22	5 25 253 228	3.1.4022	Win CE (6	
Route Name (Target):	CX-19FDE4			Route Name (Remote):	1302PFN340
Route Name (Target):	C%-19FDE4	1		Route Name (Remote): Target Boute	1302PFN340 Bemote Boute
Route Name (Target): AmsNetId:	CX-19FDE4 5.25.253.228.1	1		Route Name (Remote): Target Route © Project	1302PFN340 Remote Route © None
Route Name (Target): AmsNetId: Transport Type:	CX-19FDE4 5.25.253.228.1 [TCP_IP	1		Route Name (Remote): Target Route O Project O Static	1302PFN340 Remote Route O None O Static
Route Name (Target): AmsNetId: Fransport Type: Address Info: © Host Name @ I	CX-19FDE4 5.25.253.228.1 TCP_IP 192.168.1.22 PAddress	.1		Route Name (Remote): Target Route Project © Static © Temporary	1302PFN340 Remote Route None Static Temporary

Figure 7.4

- 7. In the "Address Info" area, change the setting to "IP Address."
- 8. Then click on the "Add Route" button.



Enter Host Nam	ne / IP:				Refresh S	Status	Broadcast Search
Host Name	Connect	Address	AMS NetId	TwinCAT	OS Version	Comment	
1302PFN340 CX-19FDE4	×	172.24.55.131 172.24.55.134	192.168.0.100.1.1 5.25.253.228.1.1	3.1.4018 3.1.4022	Windows 7 Win CE (6.0)		
oute Name (Targ	et):	CX-19FDE4			Route Name (F	Remote):	1302PFN340
ioute Name (Targ msNetld:	et):	CX-19FDE4 5.25.253.228.1.1			Route Name (F Target Route	Remote):	1302PFN340 Remote Route
koute Name (Targ msNetld: ransport Type: .ddress Info:	et):	CX-19FDE4 5.25.253.228.1.1 TCP_IP 172.24.55.134			Route Name (F Target Route © Project © Static © Temporary	Remote):	1302PFN340 Remote Route © None @ Static © Temporary

Figure 7.5

9. You will be prompted to create a password, but this is not necessary. Click on the "OK" button without entering data.

Logon In	formation	
-	Enter a user name and password that is valid for the remote system.	
	User name: Administrator	
	Password:	
	Encrypt Password (TwinCAT 3 only)	
	OK Cancel	

Figure 7.6

10. Click on the "Close" button in the "Add Route Dialog" menu.



Enter Host Name / IP:					Refresh Status	Broadcast Search
HostName	Connect	Address	AMS NetId	TwinCAT	OS Version Comment	
1302PFN340 CX-19FDE4	×	192.168.1.1 192.168.1.22	192.168.0.100 5.25.253.228	3.1.4018 3.1.4022	Windows 7 Win CE (6	
Route Name (Target):		CX-19FDE4			Route Name (Remote):	1302PFN340
Route Name (Target): AmsNetId: Fransport Type:		CX-19FDE4 5.25.253.228.1. TCP_IP	1		Route Name (Remote): Target Route © Project	1302PFN340 Remote Route O None
Route Name (Target): AmsNetId: Fransport Type: Address Info: © Host Name	@ IP Adu	CX-19FDE4 5.25.253.228.1. TCP_IP 192.168.1.22 dress	1		Route Name (Remote): Target Route Project Static Temporary	1302PFN340 Remote Route None Static Temporary

11. To save the connection to "CX-19FDE4" in the project, click on "CX-19FDE4" again within the "Choose Target System" dialog that is still open.

Choose Target System	— ×
B-2 -Local- (192.168.0.100.1.1)	ОК
	Cancel
	Search (Ethernet)
	Search (Fieldbus)

- Figure 7.8
- 12. Click on the "OK" button to confirm the save.

→ Now the status in TwinCAT will change from "Local" to "CX-19FDE4"

- 13. In the left-hand working area of "Solution Explorer", switch to the option "I/O." .
- 14. Right-click on "Devices" and select the "Add New Item..." option.



M TwinCAT Project7 - FILE EDIT VIEW PF O O IC I • III III IC • I III III III III • I		soft Visual Studio T BUILD DEBUG 1 は日日 フ・マ・ CX-19FDE4	TWINCAT PLC TOOL	S SCOPE	WINDOW Release •	TwinC/	Quick Lau AT RT (x86)	- (Ctrl+Q)	(م 1919	-	- ×
Solution Explorer		- 4 ×									Prop
0 0 Q 0 - 0 P											ertie
Search Solution Explorer	(Ctrl+	(i) P -									s -
 TwinCAT Project7 SYSTEM MOTION PLC SAFETY C++ VO Devices 	1.45										box
📸 Mappings		Add New Item	Ins								
	*0	Add Existing Item	Shift+Alt+A								
		Export EAP Config File									
	×	Scan									
	£	Paste	Ctri+V								

15. Then select "EtherCAT Master" and confirm with "OK."

ype:	🖻 🚟 EtherCAT	Ok
	EtherCAT Master	
	EtherCAT Slave	Cancel
	EtherCAT Automation Protocol (Network Variables)	
	EtherCAT Simulation	
	Profibus DP	
	W Profinet	
	🕀 cia CANopen	
	🐵 🚖 DeviceNet	T (T)
	⊕- ∱ EtherNet/IP	Target Type
	III SERCOS interface	PC only
	B-11/0 Beckhoff Lightbus	© CV anh
		© CX only
	Beckhoff Hardware	BX only
	H- w Miscellaneous	() All
		S All

Figure 7.10

16. In the "Device Found At" dialog, select the port for your PLC. In this example, the port is "PCI\Tcl8254x1"





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- 17. Click on the "OK" button to confirm the selection. "
- 18. Open the configuration tab for the TwinCAT project by double-clicking on "Device 3."

EILE EDIT VIEW PROJECT BUILD DEBUG TV 	/INCAT PLC <u>I</u> C ▶ Attach •	IOLS SCOPE <u>W</u> INDOW Release • Release •	HELP TwinCAT RT (x86) •	/ 	
Solution Explorer	General Adapter E	er			•
Solution 'TwinCAT Project2' (1 project) TwinCAT Project2 Solution 'TwinCAT Project2 MOTION MOTION	Description: Device Name: PCI Bus/Stot	OS (NDIS) O PCI PCI\Tcl8254x1 PCI\TCl8254X1	C DPRAM		
M PLC SAFETY Sec C++ ✓ ↓ /O ✓ ⁴ Devices	MAC Address: IP Address:	00 01 05 19 fd e4 192.168.1.11 (255.255.255.0) Promiscuous Mode (use with Win Vitual Device Names	Compatible Devices		
Device 3 (EtherCAT) Trage Trage Trage-Info SyncUnits	C Adapter Refere	ance	*		
 Inputs Im Outputs InfoData Mappings 	Number Bo	x Name Addr	Type In Size	Out S E-Bus (

- **19.** If you have not already done so, select the network adapter and install the driver for EtherCAT real-time communication.
- **20.** Click on the "Adapter" tab and then on "Compatible Devices ..." to select and install the EtherCAT driver. Follow the further instructions within the software to install the driver.



Integrating the Ethernet IO Module

1. Select the device. To do so, navigate to "Device 1 (EtherCAT)," right-click on "Devices" and select the option "Add New Item...."



2. Select the desired module.

Search:	Nam	e: Box1	<u>M</u> ultiple:	1	ОК
Iype:	Beckhoff Automation GmbH GmbH	& Co. KG			Cancel Port
	- ☐ ICE1-8DI8DO-G60L-V - ☐ ICE1-8DI8DO-G60L-V - ☐ ICE1-16DI0-G60L-V1 - ☐ ICE1-16DI0-G60L-V1 - ☐ ICE1-16DI0-G60L-V1 - ☐ > ICE1-16DI0-G60L-V1	D -V1D /1D D			⊙ D ⊚ B (Ethernet)
					OC.

Note

Selecting a profile as follows is only possible on 16DIO modules such as ICE1-16DIO-G60L-V1D and ICE1-16DIO-G60L-C1-V1D. For other module variants, the next step is not carried out.

3. Select the I/O profile if you are using a 16DIO module.



I6DI/D0 (Byte)		ОК
I6DI (Byte)		
I6DO (Byte)		Cancel
3DI/DO (Byte)	E	ouncer
BDI (Byte)		
BDO (Byte)		
BDI/8DO (Byte)	and the second se	
6DI/DO (Bit)		
I 6DI (Bit)		
I 6DO (Bit)	-	

4. Click on the "OK" button to confirm the selection.



Note

The default standard PDOs will be used according to the profile selected. If necessary, you may change the I/O profile by carrying out the following steps.

If you wish to change the I/O profile or remove the default activation of the error or diagnostic register, you can do so using the "Slots" tab. On the "Process Data" tab, you can also determine settings for the error and diagnosis register.

5. Configure the "slots" if necessary. Navigate to the "Slots" tab to change the slot configuration.







Caution!

Caution during parameter changes

If you change the I/O profile having changed the parameter settings on the "Start-Up" tab, the parameters on the "Start-Up" tab will remain as changed. If this is the case, delete the device from the configuration and then add it again. This will restore the default parameter settings and you will avoid unwanted parameter settings.

6. To configure the process data, go to the "Process Data" tab.



Figure 7.17

- 7. Select the input and output PDOs as described in the previous chapters on PDO assignment.
- 8. In the "Sync Manager" section, click on the "Inputs" option and select your input PDOs in the "PDO Assignment" area.
- **9.** For example, you can disable the check boxes "0x1A04" and "0x1A05" if you do not wish for error and diagnosis information to be sent to the EtherCAT® controller.
- **10.** In the "Sync Manager" section, click on the "Outputs" option and select your output PDOs in the "PDO Assignment" area if changes are necessary.



🔐 🔟 🖉 🌾 🎯 🔐 🕅 CX-19FE	DE4 -	≠ Atta	cii •	•	∄ ⊧		2 (3 4) 2 (3 4)		(xoo) 合 出 i	ŝ ‡
Solution Explorer + + ×	TwinCAT Proj	ect11 ↔	× Process	Data Slote	Startup	CoE - Oplin	na Onlina			4
Search Solution Explorer (Ctrl+ü)	Sync Manager			PDO List:	Statup	COL - Orm				
PLC *	SM Size	Туре	Flags	Index	Size	Name			Flags	1
SAFETY	0 1024	MbxOut		0x1A00	2.0	Physical I	nputs			
2++	1 1024	MbxIn		0x1600	2.0	Physical (Dutputs			
/0	2 2	Outputs		0x1A04	1.0	Error Reg	Ster			
E Devices	3 7	inputs		UX TAUS	4.0	Diagnosis	Register			
Service 1 (EtherCAT)			-							
🚼 Image	te Image									
🚼 Image-Info	PDO Assignme	nt (0x1C12):	-	PDO Content (0x1600):					-	
SyncUnits	🕼 0x1600			Index	Size	Offs	Name		^	
Inputs				0x6200:01	1.0	0.0	Physical Out	puts 07		
Outputs				0x6200:02	1.0	1.0	Physical Out	puts 815	*	
InfoData									>	
4 5 Box 1 (ICE1-16DIO-G60L-V1E	Download			Predefined PDO Assignment: (none)					7	
Module 1 (16DI/DO (Byte)	PDO Ass	ignment		Load PDO info from device						í.
Module 1 (Fror Register)	PDO Cor	figuration		Cons 11-2 Assistant						n l
Module 1 (Diagnosis Register)				Calling out the	orgennes in					0
WeState										
b InfoData	Name	(Online	Ty	pe	Size	>Ad	In/O	User	Li ^
Mappings	🔊 Physical In	pu		U	SINT	1.0	39.0	Input	0	
a mappings	4							interaction		ъ.

11. Navigate to the "Start-Up" tab and check the default device parameter settings.

🖹 🔟 🧔 🌂 🔞 🔐 🐛 🛛 CX-19F	DE4 ·	- Au		•	। स्टॉटेंट्रेट				± ‡	
olution Explorer 🔹 👻 🛪	TwinCAT Proj	ject11	a X							
● G G - G A -	General Ether	CAT DC	Process	Data Slots S	Startup CoE - Online	Online				
earch Solution Explorer (Ctrl+ü) 🛛 🕫 🕶	Traceition	Protocol	Inday	Data	Command					
¢	C OC:	C-F	0.1010.00	0.00 (7)	desserved as (0.1)	-170				
ALETY	C (PS)	CoE	0-1012:00	0x00 (0)	clear sm pdos (ux i)	-12) -12)				
AFEIT	C (PS)	CoE	0x1012:01	0x1600 (5632)	download pdo 0x10	12:01 index				
++	C (PS)	CoE	0x1C12:00	0x01 (1)	download pdo 0x10	12 count				I
0	C (PS)	CoE	0x1C13:01	0x1A00 (6656)	download pdo 0x10	13:01 index				I
Devices	C <ps></ps>	CoE	0x1C13:02	0x1A04 (6660)	download pdo 0x10	13:02 index				I
Device 1 (EtherCAT)	C <ps></ps>	CoE	0x1C13:03	0x1A05 (6661)	download pdo 0x10	13:03 index				I
* Image	C <ps></ps>	CoE	0x1C13:00	0x03 (3)	download pdo 0x10	13 count				I
	E <ip, ps=""></ip,>	EoE		3F 00 00 00	eoe init					I
i Timage-Info	C PS	CoE	0x2300:01	0x00 (0)	Web Interface Lock	ked: 0=false,	1=true			I
SyncUnits	C PS	CoE	0x2300:02	0x01 (1)	Force Mode Locke	d: O=false, 1	=true			I
Inputs	C PS	CoE	0x2300:03	0x00 (0)	Disable All Emerger	ncy Message	is: Q=false,	1=true		I
Outputs	C PS	COE	0x2300:04	0x00 (0)	Disable UL Emerge	ncy Message	es: 0=taise,	1=tr		I
	C PS	CoE	0x2300:05	0x00 (0)	Disable Actuator En	nergency Me	assages with	hout		I
	I PS	CoE	0x2301-01	0~00 (0)	Fail Safe Port X14 :	estalt alter r	-diule. Und	h 2		I
BOX 1 (ICE1-16DIO-G60L-VIL	C PS	CoE	0x2301:02	0x00 (0)	Fail Safe Port X1R	e Outrut: Ou	low 1-high	h 2		I
 Module 1 (16DI/DO (Byte) Physical Inputs Physical Outputs 	Move Up] [Move	Down]		New	Delete		Edit		
Module 1 (Error Register)	Name		Online	Тур	pe Size	>Ad	In/O	User	Li ^	1
Middule 1 (Diagnosis Regis	Physical In	nu		115	INT 10	39.0	Input	0		
WcState	- Filysicar II	iha		05	1141 1.0	35.0	input	U	*	1

Figure 7.19



12. In order to change a parameter setting, double-click on a parameter, then the "Edit" dialog box will open. The new value can be entered in the data entry panel.

dit CANopen	Startup Entry				X
Transition	Index	(hex):	2302		ОК
🗹 P -> S	⊡S->P Sub-I	ndex (dec):	1		Cancel
⊠ S→0	©0→S □Va	lidate	Complete Access		
Data (hexbin):	50				Hex Edit
Validate Mask]
Comment	Surveillance Timeout Po	rt X1A as Out	put: 0255		Edit Entry
Index	Name	Flags	Value	Unit	*
	TxPDO Mapping (8Bit)	RO			
. ■ 1C00:0	Sync Manager Communicatio	RO	>4<		
IC12:0 ■ 1C12:0	Sync Manager 2 Assignment	RW			
+ 1C13:0	Sync Manager 3 Assignment	RW			
€-1C32:0	Sync Manager 2 Synchronizati	RO			
	Sync Manager 3 Synchronizati	RO			
2001	Diagnostic Register	R0 P	0x00000000 (0)		E
	Restore Factory Defaults	RW			
+ 2300:0	General Device Settings	RO			
± 2301:0	Fail Safe Configuration	RW			
⊟-2302:0	Surveillance Timeout Configur	RW			
2302:01	PortX1A	RW	101		
- 2302:02	PortX1B	RW			
2302:03	PortX2A	RW	<u></u>		
- 2302:04	PortX2B	RW			

Figure 7.20

13. Click on the "OK" button to confirm the entries.



EoE IP Address

i.

Note

An IP address must be set if the web server is to be used for the module in future. If web server services are not to be facilitated, you can also disable this option. The following steps describe how to do this.

1. Navigate to the "EtherCAT" tab.

TwinCAT Project3 - Microsoft Visual Studio EILE EDIT VIEW PROJECT BUILD DEBUG Th O - O Io -	▼1 Qui MINCAT PLC IOOLS SCOPE ▶ Attach R 	ick Launch (Ctrl+ <u>W</u> INDOW <u>H</u> E elease • Tw	-Q) ♪ LP inCAT RT (≡ ♡ ₼	- □ ×86) •
Solution Explorer ▼ # × ○ ○ ໖ `o - ∅ ▶ -	TwinCAT Project3 P × General EtherCAT DC Process Data	Slots Startup Co	oE - Online O	nine
Image Image I	Type: ICE1-16DIO-G60L-V10 Product/Revision: 51 / 1 Auto Inc Addr: 0 EtherCAT Addr: 1001 * Identification Value: 0 Previous Port: Master	Adva	nced Settings	4
▶ 團 InfoData ▶ 爲 Box 1 (ICE1-16DIO-G60L-V1D) 鞏 Mappings	Name Online	Type	Size	>Ad *

- 2. Click on the "Advanced Settings" button.
- 3. Navigate to the "EoE" entry under the "Mailbox" option.

General	EoE		
- Behavior - Timeout Settings - Identification - FMMU / SM - Init Commands - Mailbox - CoE - FoE - FoE - Distributed Clock - ESC Access	Virtual AAC Id: Switch Port Switch Port DHCP IP Address Subnet Mask: Default Gateway: DNS Server: DNS Name: Time Stamp Requested	02 01 05 10 03 e9 192.168.1.0 255.255.255.0 192.168.1.11 Box_1_ICE1_16D	
		-	OK Abb

Figure 7.22

- 4. If no web server services are to be used, disable the "Virtual Ethernet Port" option by clicking on the tick.
- 5. To enable web server services, click on "IP Port" and "IP Address", then enter the IP settings according to those of the local network adapter.
- 6. Click on the "OK" button to confirm the changes.





Activating Configuration

1. If the module is connected to the EtherCAT network, select "TWINCAT" in the menu bar and then "Activate Configuration."



Figure 7.23



Caution!

Personal injury and property damage

Before you adjust the inputs or outputs of the module, make sure that no personal injury or property damage can occur.

- 2. Select "TWINCAT" in the menu bar again and then "Restart TwinCAT (Config Mode)."
- Confirm the check box with "Yes". The device then switches to the status "OP" and transfers I/O data.





ICE1-*-G60L-V1D, ICE1-*-G60L-C1-V1D Commissioning for EtherCAT

Image: Solution Explorer Image:	≫ - 🤄 - 4 •] winCAT Proje	Attach •	-] 2	Release	 TwinCAT I ≤ ≤ 	R <mark>T (x86)</mark> ක ක ක	
Search Solution Explorer (Ctrl+a) P - SAFETY C++ I/O Devices Medices	Variable Rags Value: New Value: Comment:	96 Force	Réléase]	C	Write		
 Image Image Image-Info SyncUnits Inputs Outputs InfoData Box 2 (ICE1-16DIO-G60L-V1D) Box 3 (ICE1-16DI-G60L-V1D) Box 4 (ICE1-8DI8DO-G60L-C1) Inputs (Byte) 			ſ		96		
Gutputs (Byte) Gyte WcState Gyte Gyt							

Figure 7.24

4. Click on the "Write" button to set a module output.



i

Note

Configuration of the PLC and module is now complete. You may now create your user program.

8 The Integrated Web Server

8.1 Overview and Module Addressing

The modules have an integrated web server that provides functions for configuring the modules and status and diagnostic information.

With the help of a standard web browser, you can access the available functions via an existing TCP/IP connection. To use the web server, the modules must have their own IP addresses. The modules have different default IP addresses depending on the protocol variant set.



Note

You have to assign a free IP address that is different to the factory setting to the modules before using the web server. For details, see the chapter "Displays and Controls," section "Operating Elements."



Menu Structure

Note

The web server can be used with different web browsers. The "Mozilla Firefox" and "Google Chrome" browsers can be used without any further changes to settings. When using "Microsoft® Internet Explorer," it may be necessary to disable automatic configuration in the LAN settings.

Home Page (Status)

This page shows the current status of the entire module and the status of each individual channel. Upcoming diagnoses are reported in the same way as they are to the controller.

This page serves as a starting point for access to the integrated web server.

Depending on the selected protocol, the URL to open the home page will be different.

• For EtherNet/IP and Profinet:

Enter http://in the address bar of your web browser, followed by the IP address, e.g., http://192.168.1.1.

• For EtherCAT:

Enter http://[IP address]/status.htm in the address bar of your web browser, e.g., http://192.168.1.1/status.htm.

If the module home page does not open, please check your browser and firewall settings.



Figure 8.1

PLC process data and module overview

The "Consuming Data/Producing Data" process data, including "Diagnosis" diagnostic data, is displayed in tabular hexadecimal form in the "PLC process data" area, as well as graphically in the "Module Overview" area.

You can find details on diagnostic data encoding in the chapter for bit assignment of process data appropriate for the selected protocol.

Channel overview

The "Channel overview" table is divided into three different areas. These show the status of the physical input and output data of the channels as well as process data sent to and received from the controller. Channel errors are reported in the last column.

For each channel, the table shows the channel direction, current channel status, IO mapping configured via the controller and the currently mapped process data (Pr/Co). Pr/Co stands for "produced" and "consumed," both from the perspective of that module.

By clicking on the calculator icon, the input and output addresses from the controller can be assigned to provide an overview of the mapping values. Changes to the IO mapping on 16DIO modules are only possible via the controller.



Caution!

Serious injuries or property damage

Improper use of the "Force Mode" function can result in serious injury or property damage. Be careful when you use the "Force Mode" function. Please consider the consequences of using it.


Force Mode

Force Mode can be helpful when commissioning the machine or during fault repair within the machine. The data for the input and output channels can be overwritten and set independently via the web server. It is therefore possible to set each output manually and simulate each input, regardless of the process data output from the controller or the actual status of the physical input.

You can activate "Force Mode" with the "Switch Force Mode on" button. It can be used across the board in offline mode without a connection to the controller, or in online mode with a connection to the controller. If you leave the status page or the web server, "Force Mode" automatically switches off.

This function is used for test purposes. The input and output data can be set from this website and the physical input data as well as the logical output data of the controller can be overwritten.

If "Force Mode" is activated via the web server in offline mode, it is not possible to connect to a controller.

To use "Force Mode" in online mode, the web interface and "Force Mode" must be activated in the controller parameterization.

If "Force Mode" is activated via the web server in online mode, it will automatically be switched off when "fail-safe" conditions occur (e.g. connection interruption, controller on STOP, internal module fault).

Note

User authentication is required to use "Force Mode". Users can be created and changed on the system side. The default password for the "admin" user is "private."

Module overview	PLC process da	tă (values are st	hown in hexadecimal n	otation)		
	Consuming Da	ta (Byte C - Byte	n)	Pro	ducing Data (Byte 0 - Byte n)	
X1	Output: 04			Inp	ut: 22	
	Switch Force	mode on				
	Mak	duna yon W	abraita			
X2	Channel Men	dung von w	ebseite			
0 000	Port	-				_
	X1 A	🕜 Warni	ng: Forcemode a	activation.	Continue?	_
	X1B/					
W • T • W	X2 A					
	100 / C 1					
	X2 B (ок	Abbrechen	
X4	X2 B (X3 A (ОК	Abbrechen	
X4 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	X2 B (X3 A (X3 B (Pn 2)	Input	On 0.5	0К	Abbrechen	
AN OLA OLA XI OLA OLA SI LINKAR BEDAN ULU	X2 B (X3 A (X3 B (Pin 2) X4 A (Pin 4)	input	On 0.5	DK	Abbrechen	
XI Control Control Co	X2 B (X3 A (X3 B (Pin 2) X4 A (Pin 4) X4 B (Pin 2)	Input	On 0.5 On 0.6 On 0.7	0K	Abbrechen	
X3 X4 X4 X4 X5 X5 X5 X5 X5 X5 X5 X5 X5 X5	X2 B (X3 A (X3 B (Pn 2) X4 A (Pn 4) X4 B (Pn 2) X5 A (Pn 4)	Input Input Input Output	On 0.5 Off 0.6 Off 0.7 Off 0.0	0K	Abbrechen	
X4 X4 X4 X4 X4 X4 X4 X4 X4 X4	X2 8 (X3 A (X3 B (Pn 2) X4 A (Pn 4) X4 B (Pn 2) X5 A (Pn 4) X5 B (Pn 2)	Input Input Input Output	On 0.5 OT 0.6 OT 0.7 OT 0.0 OT 0.1	DK	Abbrechen	
A X3 A A	X2 B (X3 A (X3 B (Pn 2) X4 A (Pn 4) X4 B (Pn 2) X5 A (Pn 4) X5 B (Pn 2) X5 A (Pn 4)	Input Input Input Output Output	On 0.5 OT 0.6 OT 0.7 OT 0.0 OT 0.1 OT 0.1	0K	Abbrechen	
x3 x4 x4 x4 x4 x4 x4 x4 x4 x4 x4	X2 B (X3 A (X3 B (Pn 2) X4 A (Pn 4) X4 B (Pn 2) X5 A (Pn 4) X5 B (Pn 2) X5 A (Pn 4) X5 B (Pn 2) X6 A (Pn 4)	Input Input Input Output Output Output Output	On 0.5 OT 0.6 OT 0.7 OT 0.0 OT 0.1 OT 0.1 OT 0.2 OT 0.3	DK	Abbrechen	
A X3 A X3 A X3 A X3 A X3 A X3 X3 X3 X4 X3 X5 X5	X2 B (X3 A (X3 B (Pn 2) X4 A (Pn 4) X4 B (Pn 2) X5 A (Pn 4) X5 B (Pn 2) X5 A (Pn 4) X5 B (Pn 2) X6 A (Pn 4) X6 B (Pn 2) X7 A (Pn 4)	Input Input Input Output Output Output Output Output	On 0.5 CE 0.6 DEE 0.7 DEE 0.1 DEE 0.2 DEE 0.3 DEE 0.4	DK	Abbrechen	
A A X3 A A X3 LexAct 55 DX U, U, U, X01 X02 RUNERR 100 x10 x1 X0 1 SUS X02 1 SUS X02 1 SUS X02 1 SUS X02 1 SUS X02 1 SUS X02	X2 8 (X3 A (X3 B (Pn 2) X4 A (Pn 4) X4 B (Pn 2) X5 A (Pn 4) X5 B (Pn 2) X5 A (Pn 4) X5 B (Pn 2) X6 A (Pn 4) X6 B (Pn 2) X7 A (Pn 4) X7 B (Pn 2)	Input Input Input Output Output Output Output Output Output	On 0.5 On 0.6 On 0.7 On 0.1 On 0.1 On 0.2 On 0.3 On 0.4 On 0.5	DK	Abbrechen	
X4 X0 Lexker BP X3 X01 X02 RUNESR x100 x10 x1 y01 X02 RUNESR x100 x10 x1 x01 X02 RUNESR x100 x10 x1 x01 X02 RUNESR x10 x10 x10 x1 x01 x02 x01 X02 RUNESR x01 x02 x01 x02 x02 x02 x04	X2 B (X3 A (X3 B (Pn 2) X4 A (Pn 4) X4 B (Pn 2) X5 A (Pn 4) X5 B (Pn 2) X5 A (Pn 4) X6 B (Pn 2) X6 A (Pn 4) X7 B (Pn 2) X8 A (Pn 4)	Figur Figur Output Output Output Output Output Output Output	On 0.5 OI 0.6 OI 0.7 OI 0.1 OI 0.1 OI 0.2 OI 0.3 OII 0.4 OII 0.5 OII 0.6	DK	Abbrechen	

Click on the "Switch Force Mode on" button.

Figure 8.2

The following window appears for password entry

Consuming Data (Byte 0 - Byte n) Producing Data (Byte 0) - By
Windows-Sicherheit	
Der Server '192.168.0.2" fordert Ihren Benutzernamen und Ihr Kennwort an. Der Server ist von "IO-Device".	
Anmeldedaten speichern	
OK Abbrechen	
	Windows-Sicherheit Der Server '192.168.0.2" fordert Ihren Benutzernamen und Ihr Kennwort an. Der Server ist von "TO-Device". admin

Figure 8.3

The user name is "admin." The password is "private."

If "Force Mode" has been successfully activated, the text "Force Mode enabled" appears in the display.

Iodule overview	PLC process da	atā (values an	e shown i	n hexadecim	al notation)			
	Consuming Da	<u>ata</u> (Byte 0 - B	yte n)		E	Producing Data (Byte 0 - By	te n)
	Output: 04				1	nput: 2A		
	Switch Force	emode off			1	orcemode ena	bled	
² 🗛 • 🚓 • 🔊 ^{X0}	Channel overvie	ew						
• • • • •	19	Physical I/0	Ds		PLC process data			
	Port/Ch.	Direction	State	Forcing	Simulation	Mapping	Pr/Co	Diagnosis
A A A X ⁷	X1 A (Pin 4)	input	Off		OTX	0.0	0/-	
	X1 B (Pin 2)	Input	On		01X	0.1	1/-	
	X2 A (Pin 4)	Input	Off	-	OIX	0.2	0/-	
XS	X2 B (Pin 2)	input	Off	+:	01X	0.3	1/-	
	X3 A (Pin 4)	Input	Off	-2	01X	0.4	0/-	
LinkiAct BF DIA UL Us	X3 B (Pin 2)	Input	On	23	01X	0.5	1/~	
X01 X02 RUNERR	X4 A (Pin 4)	Input	Off	•	01X	0.6	0/-	
	X4 B (Pin 2)	Input	Off	-	01X	0.7	0/-	
UU X10 X1 X01	X5 A (Pin 4)	Output	Off	OIX	-	0.0	-/0	
8US X02	X5 B (Pin 2)	Output	Off	01X	-	0.1	-/0	
6	X6 A (Pin 4)	Output	On	OIX		0.2	-/1	
	X6 B (Pin 2)	Output	Off	OIX	-	0.3	-/0	
	X7 A (Pin 4)	Output	50	01X		0.4	-/0	
A A	X7 B (Pin 2)	Output	On	018		0.5	-/0	
	X8 A (Pin 4)	Output	Off	OIX		0.6	-/0	
	X8 B (Pin 2)	Output	Off	OTX		0.7	-/0	



In the "Forcing" column, you can set the physical output data of the individual channels using the "0" and "1" buttons. The "X" button cancels Forcing for the respective channel.

In the same way, using the "Simulation" column, you can simulate the input data of individual channels before mapping into the process data.

To visualize the Force Mode manipulation in the web server, the behavior of the LEDs is displayed in the "Module Overview" area.

The Configuration Page (Config)

Click on the "Config" tab in the menu bar of the start window. This tab allows you to configure network parameters such as the IP address, reset the module to factory settings and initiate a firmware update.

PEPPERL+FUCHS						
						ICE1 Webserver
tatus	Config	System	Control	Contact		
Confi	g					
The rotary IP Setting	switch is set to 300 s) (dec).				
Parameter IP-Address Subnet Ma	r Settings s 192.168. isk 255.255.	0.2				
Gateway	192,168,	0.2				
Submit Result:						
Submit Result: Restore Fi	actory Settings					
Submit Result: Restore Fi Restoring th Applying th	actory Settings factory settings affe re factory settings v	ct all network para vill cause all netwo	meters including fiel rk connection to be (dbus specific settings. closed!		
Submit Result: Restore F Restoring t Applying th Note: If the	actory Settings factory settings affe re factory settings v module has rotary	ect all network para will cause all network	meters including fiel ink connection to be of IP address depends	dbus specific settings. closed! s on their settings.		

Figure 8.5

IP Settings

- IP address, readable and writable
- Subnet mask, readable and writable
- · Gateway address, readable and writable

Clicking on the "Submit" button transfers the new parameters to the module. The new settings take effect on the module once the power supply has been switched off and back on.

Restore Factory Settings

In the "Restore Factory Settings" area, you can reset the module to factory settings.

Note

Please note that by restoring factory settings, the PROFINET name and IP address of the modules are also reset to their default settings. Access to the module web server and data exchange in the PROFINET network may no longer work after reset.

Firmware Update:

By clicking on the "Firmware Update" button, you can replace the current module firmware with a newer version.

ooning	14 http://192.168.0.2/fwup.htm	
The rotary switch is set to 300 (dec). IP Settings IP-Address 192].168.0.2	Firmware Update	^
Subnet Mask 255 255 255 0 Gateway 192 168 0 2	Choose file to load:	Durchsuchen
Submit	Upload	
Result Restore Factory Settings	Ready	
Restoring factory settings affect all network paran Applying the factory settings will cause all network		_
Note: If the module has rotary switches, the new I		
Please confirm to restore the factory settings		
Firmware Update		-

Figure 8.6

i

Note

A detailed description of the firmware update procedure can be found in the chapter "Firmware Update."



System Page

Click on the "System" tab in the menu bar of the start window. On this tab, you will find information on the connection status as well as module system information. You can also authorize users, create and change passwords.

atus	Sonfig S	ystem Control	Contact				ICE1 Webserv
	his	General Information			Create new I	ISEr	
Maharada		Custom Alloritation		-			
Network Red 0	100 MDale Cilli	System Time Cinese Starter	10104 *	E	nter new user	credentials	
Port 1	No Link	Puetern Meessage	12104 S		Login		
Poet 1	NO LINK	System message	OK OK	ſ			
Address	00:0D:81:06:BB:9	2 Elimmana	0	-	Passwo	rd:	
IP Address	192.168.0.2	Name	Pennerl+Fuchs ICE1 PROF	NET			
Subnetmask	255.255.255.0	Version	V2108-22(B10016)	- Contraction of the second seco	Repea	ŧ	
Gateway	192.168.0.2	Date	7.2.2018	L			
Profinet		Device	10.0000000000	1100	r aroun		
State	Connected	Name	ICE1-16DIO-G60L-V1D	0.56	Our O	Sec. Sec.	
Name of Station	ice16dio	Ordering Number	308626		e user O	Aamin	
		Hardware	V6.1				
		Senal Number	40000058712487		Create	Cancel	
		Production Date	06 / 2018		Consecutive Const	Contraction of the	
	ent						
User Manageme			Edit				
User Manageme Username	P	ermissions	Eun Des				

Figure 8.7

Connection Status

The "Connection Status" area shows the current status of each Ethernet port in terms of connection, transfer rate and transfer mode, along with the network parameters and PROFINET status of the module.

- Status of the LAN ports:
 - Duplex mode (full, half duplex)
 - Transfer rate (10 Mbit, 100 Mbit)
- Network address:
 - MAC ID

General Information

In the "General Information" area, you will find system-related information on runtime, firmware version, and module manufacturer information.

- Size and data direction of the assembly instances
- Status of the EtherNet/IP connection:
 - Stand-by
 - Wait-for-Connection
 - Operational
 - Device status:
 - System runtime
 - System information
 - Number of restarts of the I/O system
- Firmware version and date





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- Device information
- Revision:
 - Item number
 - Serial number
 - Week and year of production

User Management

In "User Management," you can change existing user passwords with the "Edit" button. In the "Create User" area, you can add more users with "Write" or "Admin" permissions. Only those with "Admin" access may create new users or change passwords.



Note

The status information on this tab is updated only when it is re-opened or refreshed in the web browser.

Control page (decentralized control function)

The decentralized control function (DCU) is only an optional extension on ICE1-*-G60L-**C1**-V1D modules. With this function, control and monitoring tasks can be run directly on the device via a decentralized control function. In doing so, the respective module can either send status information to a higher-level PLC (online operation) or operate independently without bus communication (offline operation).

PEPPERL+FUCHS						
	ICE1 Webserver					
Status Config System Con	troi Contact					
Distributed Control Control Status: NO PROGRAM	Program Information: - No valid program loaded - Variables:					
Run Stop Reset Disable Control Upload DCU Program or Mapping Durchsuchen Durchsuchen	ol					
Upload Program Control autostart						

Figure 8.8

Modules without decentralized control function (DCU) do not show any usable information on this website.



Note

Details on using the functions on the control page can be found in the "Decentralized Control Function" chapter, in the sub-section "DCU Web Interface".





Contact Page

The "Contact" tab provides contact data for Pepperl+Fuchs GmbH.

PEPPERL+FUCHS								
				ICE1 Webserve				
Status Ports	System User	Contact						
epperl+Fuchs Glo	obal Headquart	ers						
Vorld Headquarters Peppel+Fuchs GmbH Jilienthalstraße 200 8307 Mannheim Sermany	North American He Pepperl+Fuchs Inc. 1600 Enterprise Park Twinsburg, Ohio 4400 USA	adquarters way 87	Asia Headquarters Peppert+Fuchs Asia Pte. Ltd. P+F Building 18 Ayer Rajah Crescent Singapore 139942					
Phone: +49 621 776-0 Fax: +49 621 776-1000	Phone: +1 330 425- Fax: +1 330 425-460	3555 7	Phone: +65 6779-9091 Fax: +65 687-31637					
E-mail: info@de.pepperl-fuchs.com Website: www.pepperl-fuchs.de	E-mail: sales@us.p Website: www.pepp	epperl-fuchs.com erl-fuchs.us	E-mail: sales@sg.pepperl-fuchs.com Website: www.pepperl.fuchs.com.sg					

8.3 Reading Out the Process and Diagnostic Data (JSON)

JSON Objects

You can read out the process and diagnostic data of the modules using the integrated web server. The web server provides the data in the standardized JSON format. The data is accessed via a web browser.



Note

Various web browsers can be used to call up JSON objects. How JSON objects are shown may differ depending on which web browser is used. In this manual they are shown in version 60.0.2 of Mozilla Firefox under Windows 10. When using Internet Explorer or Google Chrome, the information will be shown as raw data (see JSON response as raw data S.XY). However, the JSON objects themselves will not differ.



Calling up the JSON object

- 1. To call up the JSON object, open your web browser.
- 2. Enter the following command in the address bar:
- 3. [IP address]/info.json, e.g., 192.168.1.123/info.json

Structure of the JSON object

The diagram below shows the structure of the JSON object, using the ICE1-16DIO-G60L-C1-V1D module as an example:

name:	"ICE1-16DIO-G60L-C1-V1D"
fw-version:	"V2.1.0.11-2.2 (RCU10017-V1)"
hw-version:	"V6.1"
mac:	"00:0D:81:06:6D:6F"
bus:	1
failsafe:	0
<pre>minputs:</pre>	
0:	30
1:	105
<pre>voutputs:</pre>	
0:	28
1:	73
<pre> consuming: </pre>	
0:	28
1:	65
<pre> producing: </pre>	
0:	30
1:	109
▼ diag:	
0:	68
1:	8
2:	0
3:	0
▼ dcu:	
state:	1
autostart:	0
<pre>> public:</pre>	[]
<pre>consuming_bits:</pre>	[]
<pre>consuming_ints:</pre>	[]
<pre>producing_bits:</pre>	[]
<pre>producing_ints:</pre>	[]

Figure 8.9

Note

For modules without the decentralized control function (DCU), the object ends after the entry for "diag:."

Example of JSON response as raw data

In addition to this structured representation of the JSON response, you can also access a representation of the raw data.

The following table describes the contents of the individual entries. [n] = number of bytes:

Name	Data Type	Description
Name	String	Module name
fw-version	String	Firmware version
hw-version	String	Hardware version
mac	String	Module MAC ID

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Name	Data Type	Description
bus	Number	0 = No connection to fieldbus 1 = Connected to fieldbus
failsafe	Number	0 = Outputs in normal mode 1 = Outputs in failsafe mode
inputs	Number[2]	Byte 0 = Actual status of input port $X1 - X4$ (channel A/B) Byte 1 = Actual status of input port $X5 - X8$ (channel A/B)
outputs	Number[2]	Byte 0 = Actual status of output port $X1 - X4$ (channel A/B) Byte 1 = Actual status of output port $X5 - X8$ (channel A/B)
consuming	Number[2]	Byte 0 = Data from PLC at port $X1 - X4$ (channel A/B) Byte 1 = Data from PLC at port $X5 - X8$ (channel A/B)
producing	Number[2]	Byte 0 = Data sent to PLC at port $X1 - X4$ (channel A/B) Byte 1 = Data sent to PLC at port $X5 - X8$ (channel A/B)
diag	Number[4]	 Contains module diagnostic data Byte 0: Bit 0 = Power supply error in the system/sensor (U_s) Bit 1 = Power supply error in the actuator (U_L) Bit 2 = Sensor overload Bit 3 = Actuator overload Bit 6 = Force mode active Bit 7 = Internal module error (Invalid IO data) Byte 1 = Sensor overload at port X1 X8 Byte 2 = Actuator overload at port X1 X4 (channel A, B) Byte 3 = Actuator overload at port X5 X8 (channel A, B)
dcu	Object	Only available for DCU modules
dcu/state	Number	Current state of the DCU: • 0 = Locked • 1 = No program • 2 = Disabled • 3 = Stop • 4 = Run • 5 = Error
dcu/auto- start	Number	0 = Local autostart disabled 1 = Local autostart enabled
dcu/public	Number [32]	Contains the values of the DCU public variables $(P0 - P31)$
dcu/con- suming_bits	Number [2]	DCU 16-bit exchange data set by PLC
dcu/produc- ing_bit	Number [2]	DCU 16-bit exchange data set by a DCU program
dcu/con- suming_ints	Number [8]	DCU 16-byte data exchange words set by PLC
dcu/produc- ing_ints	Number [8]	DCU 16-byte data exchange words set by a DCU program

Table 8.1

Thus, the bit assignment of the data generally follows the following logic:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	Х3-В	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	Х7-В	X7-A	X6-B	X6-A	X5-B	X5-A
Table 8.2	•	•	•	•	•	•	•	

Г

The values refer to the following:

The Integrated Web Server

- X1-A ... X8-A: Actual status of input/output channel A (contact pin 4) for M12 connections 1 to 8.
- X1-B ... X8-B: Actual status of input/output channel B (contact pin 2) for M12 connections 1 to 8.

Note

The bit assignment of the diagnostic data from byte 1 (diag – Byte 1) is arranged according to a different logic, since a sensor short circuit can only result from an overload at pin 1. The table below shows the corresponding bit assignment.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 1	X8	X7	X6	X5	X4	Х3	X2	X1

Table 8.3

Description of the displayed byte values within the JSON object

The process data of the module is shown in decimal format in the JSON object. Consult the respective bit numbering for the precise meaning of the displayed values:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Bit num- bering	128	64	32	16	8	4	2	1
Byte 0	X4-B	X4-A	Х3-В	X3-A	Х2-В	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	Х7-В	X7-A	Х6-В	X6-A	Х5-В	X5-A

Table 8.4

For this process data, the bit status (0 or 1) is multiplied by the corresponding bit numbering.

The following examples demonstrate this logic:

- Activated digital input at port X3-B: Byte 0 of the input data shows the value 32 as the port status in bit 5 (1 [bit status] x 32 [value])
- Activated digital output at port X8-A: Byte 1 of the output data shows the value 64 as the port status in bit 6 (1 [bit status] x 64 [value])

If multiple bits are set simultaneously, their values are totaled according to their byte assignment. The following example demonstrates this logic for the output data and input data.

Output data for byte 0 and byte 1:

• Port X3-A, port X2-B, and port X2-A are activated outputs, which means that bits 4, 3, and 2 in byte 0 are each 1 x bit numbering.

The total value of byte 0 = 16 + 8 + 4 = 28

 Port X8-A, port X6-B, and port X5-A are activated outputs, which means that bits 6, 3, and 0 in byte 1 are each 1 x bit numbering.

The total value of byte 1 = 64 + 8 + 1 = 73



Note

To enable internal module diagnosis, the actual output statuses at the module—in addition to the actual input statuses—are reflected in the input data (output mirror). To receive the pure input data, the values of the output data must therefore be subtracted from the total value of the input data in the JSON object. ().

Input data for byte 0 and byte 1:

• Input data for byte 0 = 30

The pure input data is calculated by subtracting the output data of byte 0 = 28 from the displayed input data.

Therefore, the pure input data from byte 0 = 30 - 28 = 2

Based on the bit numbering for the ports, it can be concluded that Port X1-B is an activated input.

• Total value of the inputs for byte 1 = 105

The pure input data is calculated by subtracting the output data of byte 0 = 73

Therefore, the pure input data from byte 1 = 105 - 73 = 32

Based on the bit numbering for the ports, it can be concluded that Port X7-B is an activated input.

Data under the "consuming" and "producing" headings only refers to pure communication between the module and a control panel. If the values of the input and output data differ from those displayed here, another source (for example, forcing via the web server) must also be involved in the communication. Which values are the result of another source can be ascertained by subtracting. In this case, the input data from the data in the "producing" section and the output data from the data in the "consuming" section can be subtracted according to their byte assignment.



9 Decentralized Control Function

9.1 Basic Information

Overview

The ICE1-*-G60L-**C1**-V1D variant Ethernet IO modules have a decentralized control (DCU) function. Using this, the modules can execute user programs that have been created with a small external tool called **LDMicro**. These user programs are created in a ladder logic and are called "DCU programs." This means that the user can add additional control logic, which is stored directly in the module and is independent of a higher-level control. This ranges from simple Boolean operations of the inputs and outputs through to autonomous programs. To a PLC, the module appears as a normal slave module with 8 bit output data and 16 bit input data.



Note

Inputs or outputs that are used by the DCU application can no longer be directly controlled by the PLC. However, the inputs or outputs can communicate with the PLC since the corresponding cyclic bits are read and written by the DCU program.

Cyclic Data and Parameters

Consuming Data (PLC to Ethernet IO Module)

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4A	3B	ЗA	2B	2A	1B	1A
Byte n +1	8B	8A	7B	7A	6B	6A	5B	5A

Table 9.1

Legend

- 1A ... 8A: output status channel A (pin 4) of slots X1 to X8
- 1B ... 8B: output status channel B (pin 4) of slots X1 to X8

Producing Data (Ethernet IO Module to PLC)

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4A	3B	ЗA	2B	2A	1B	1A
Byte n +1	8B	8A	7B	7A	6B	6A	5B	5A

Table 9.2

Legend

Note

- 1A ... 8A: current status of channel A (pin 4) of slots X1 to X8
- 1B ... 8B: current status of channel B (pin 4) of slots X1 to X8

Depending on the protocol set, the module may contain additional cyclic data bytes. Details can be found in the respective chapters on process data for the individual protocols.



Data Exchange

Note

The following information on data exchange between Ethernet IO module and PLC only applies to the ICE1-16DIO-G60L-C1-V1D modules.

- The modules provide additional cyclic data explicitly for data exchange between the PLC and DCU program. The DCU program can accept commands and data from the PLC and responds with execution results.
- The width of the exchanged data is 16 bits plus 8 data words (as a signed 16-bit integer) in each direction.
- The data exchange bits can be written with the "YEn" bit variables in LDMicro.
- The data exchange bits can be read with the "XEn" bit variables in LDMicro.
- The symbols for the integer variables "EIn" and "EOn" allow the reading and writing of data exchange words.

PROFINET

						A REAL PROPERTY AND A REAL
Wodule Module	 Rack	Slot	I address	Q address	Туре	Article number
 ICE1-16DIO-G60L-C1-V1D 	0	0			ICE1-16DIO-G60L-C1-V1D	308627
> PN40	0	0 X1			ICE1-16DIO-G60L-C1-V1D	
16 DI/DO with DCU1_1	0	1	0_1	01	16 DI/DO with DCU1	
16 Bit I/O DCU Extension_1	0	2	23	23	16 Bit I/O DCU Extension	
8 INTI/O DCU Extension_1	0	3	256271	256271	8 INT I/O DCU Extension	

Figure 9.1 DCU data exchange area in the TIA Portal

In the PROFINET protocol, the data exchange area consists of 2 additional slots (2 and 3). Slot 2 contains the 16-bit exchange data and slot 3 the 16-byte exchange data words.

EtherNet/IP

The exchange data is made available within the cyclical Ethernet/IP data. The format of this data can changed depending on the assembly currently selected (16DIO, 16DI, 8DI/8DI etc.).

The following cyclic data applies to the standard 16DIO modules with DCU. For further information, please refer to the chapter "Commissioning for EtherNet/IP," sub-section "Modules with Decentralized Control Function, Bit Assignment of Process Data Extension."

Byte	Function			
0	Input data			
1	Input data			
2	General diagnosis			
3	Sensor diagnosis			
4	Reserved			
5	Actuator diagnosis 1			
6	Actuator diagnosis 2			
7	DCU bit exchange byte 1			
8	DCU bit exchange byte 2			
9	DCU integer exchange 1 MSB			
10	DCU integer exchange 1 LSB			
11	DCU integer exchange 2 MSB			
12	DCU integer exchange 2 LSB			
24	DCU integer exchange 8 MSB			
25	DCU integer exchange 8 LSB			

Cyclic Producing Data

Table 9.3

Cyclic Consuming Data

Byte	Function
0	Output data
1	Output data
2	DCU bit exchange byte 1
3	DCU bit exchange byte 2
4	DCU integer exchange 1 MSB
5	DCU integer exchange 1 LSB
6	DCU integer exchange 2 MSB
7	DCU integer exchange 2 LSB
20	DCU integer exchange 8 MSB
21	DCU integer exchange 8 LSB

Table 9.4

EtherCAT

vinCAT Project3 👳 🗙		
General EtherCAT DC P	rocess Data Slots Startup	
Slot	Module	ModuleIdent
10 Module	16DI/DO (Byte)	0x00010001
Error Register	Error Register	0x00020001
🔁 Diagnosis Register	Diagnosis Register	0x00030001
🔁 Control Data	Control Data (Bit)	0x00040002
🔁 Control Additional Data	Control Additional Data (Signed Integer 16bit)	0x00050001





Decentralized Control Function

Name	Туре	Size	>Ad	In/O	User	Linked to
Physical Inputs 07	USINT	1.0	46.0	Input	0	
Physical Inputs 815	USINT	1.0	47.0	Input	0	
🕫 Error Register	USINT	1.0	48.0	Input	0	
🕫 Diagnosis Register	UDINT	4.0	49.0	Input	0	
Control Inputs 07	USINT	1.0	53.0	Input	0	
🕫 Control Inputs 815	USINT	1.0	54.0	Input	0	
Control Additional Input 0	INT	2.0	55.0	Input	0	
Control Additional Input 1	INT	2.0	57.0	Input	0	
Control Additional Input 2	INT	2.0	59.0	Input	0	
Control Additional Input 3	INT	2.0	61.0	Input	0	
🕫 Control Additional Input 4	INT	2.0	63.0	Input	0	
Control Additional Input 5	INT	2.0	65.0	Input	0	
Control Additional Input 6	INT	2.0	67.0	Input	0	
Control Additional Input 7	INT	2.0	69.0	Input	0	
🕫 WcState	BIT	0.1	1522.1	Input	0	

Figure 9.3 Control exchange variables in TwinCAT3

In EtherCAT, the two data exchange areas are organized as additional slots. The eight signed integer values are displayed directly as variables of type INT and size 2.

Module Parameters

The ICE1-*-G60L-**C1**-V1D modules have an additional PLC parameter that controls the startup behavior of the decentralized control function.

DCU Start Parameters

Disabled	The DCU application starts in the disabled state
Locked	The DCU application is disabled and cannot be started via the web inter- face.
Run	The DCU application starts in the RUN status and executes a valid, loaded DCU program.

DCU Start Parameters in the TIA Portal

					2	Topology v	view 🚮	Network view	Device	view
å t _`		Device overview								
8	^	Wodule		Rack	Slot	1 address	Q address	Туре	Article	
-	E	 ICE1-16DIO-G60L-C1-V1D 		0	0			ICE1-16DIO-G60L-C1-V1D	308627	
		PN-IO		0	0 X1			ICE1-16DIO-G60L-C1-V1D		
		16 DI/DO with DCU1_1		0	1	01	01	16 DI/DO with DCU1		
		16 Bit I/O DCU Extension_1		0	2	45	34	16 Bit I/O DCU Extension		
	~	8 INT I/O DCU Extension_1		0	3	256271	256271	8 INTI/O DCU Extension		
	•	<				111				
6 DI/DO with DCU1_1 [/	Module]					🔍 Properti	es 🐴	Info 🚯 🖁 Diagnosti	cs I	
General IO tags	Syste	m constants Texts					-			
General		Report Alarm UL:	On	6						
Catalog information		Report DO Fault without UL:	On	0						
Inputs		Force Mode:	Force Mode: Enabled							
Module parameters		Web Interface:	En	abled						
Hardware identifier		Control Startup:	Dis	abled (can be er	nabled by wel	b interface)			
	1	Digital-Out Restart Mode:	Lo	cked (di	sabled ai	nd cannot be	enabled by	web interface)		
			RU	abled (N (enab	ied and r	nabled by wel nodule starts	in RUN mor	de)		
		Fail Safe Configuration								
	Eail Cafe Value Port1 (h à							and the second sec		
		Fail Safe Value Port1 Ch.A:	Se	t Low				-		

Figure 9.4

The DCU start parameters are activated/deactivated in "Control Startup" (1).

DCU Programming

DCU/LDMicro Framework Conditions

Max. rungs	99
Max. bits	99
Max. integers	99
Max. line count (compiled program)	4096
Min. µDCU cycle time	10 ms

9.2 LDMicro Programming Tool

LDMicro User Interface

Open source ladder logic programming tool: Download LDMicro at: https://www.pepperl-fuchs.de or http://cq.cx/ladder.pl#dl





Figure 9.5

With LDMicro, the user can create programs in a ladder-diagram style in line with EN 61131-3. In a ladder-diagram style, all elements of the program are arranged on horizontal lines (rungs). The paths are always executed from left to right without an established rung order. This concept has its origin in hard-wired relay circuits.

LDMicro offers a wide variety of applications:

- · Bit operations such as contacts, coils, setting/resetting
- Edge detection
- Time switches and enabling/disabling delays
- Incrementing/decrementing/circulating counter
- Arithmetic operations (16 bits, signed)

DCU programs that have been created with LDMicro can:

- Use all inputs and outputs on the module
- Respond to diagnostic events (short circuit, low voltage, etc.)
- Communicate with a connected PLC
- Release information about the network

File Types

Program files for LDMicro are named with .ld. These files can be loaded, edited and saved via the LDMicro application.

To compile a DCU program for the DCU application, first select the correct destination type under "Settings -> Microcontroller -> Interpretable Bytecode."

It is also possible to set the cycle time (Settings -> MCU parameters). A cycle time of 10 ms or more is recommended.



Then select **Compile -> Compile as ...** from the menu and choose a location and a name for where the compiled program should be saved. The result is a .int file.



This file can now be uploaded to the DCU application via the web interface.

File Types

Note

LDMicro recognizes the following types of data:

Bit	0 or 1
Int	16 bit integer (-32768 to +32767)
Т	Timer
С	Counter

Conventions for Naming

LDMicro

There are three types of bits with a compulsory naming convention:

Туре	Convention	Example
Input bit	Must begin with "X"	X1A, X5P
Output bit	Must begin with "Y"	Y2B, Y3P
Internal relay	Must begin with "R"	R1, RRun, RStart

μControl

Туре	Convention	Example
Physical I/O input data	X followed by port number and channel	X1A, X5B
Physical I/O output data	Y followed by port number and channel	У2В, У7А
Cyclic data for PLC	Y followed by "P" and bit num- ber	YP5, YP15
Cyclic data from the PLC	X followed by "P" and bit num- ber	XPO, XP6
Special bits	"X" or "Y" followed by _ (underscore) and a name	X_DIA, Y_STOP
Integer values for I/Os	IN or OUT followed by byte number	IN1, IN2, OUT1, OUT2
Integer values for specific information	_ (underscore) followed by a name	_SCS, _CE1

Available Data

This data is available in the LDMicro program itself. Simply name a bit or integer variable in LDMicro according to the following list.

Basic input/output data

Symbol	Direction	Туре	Description
Xn[A/B]	Input	Bit	Reads the digital input status of port n (1 8). Channel A or B
Yn[A/B]	Output	Bit	Writes digital output status to port n (1 8). Channel A or B
OUT[0/1]	Output	Int	Writes 8 output statuses as INT (0 = X1 X4, 1 = X5 X8)
IN[0/1]	Input	Int	Reads 8 input statuses as INT (0 = X1 X4, 1 = X5 X8

Data Exchange with PLC

Symbol	Direction	Туре	Description
XPn	Input	Bit	Reads consuming bit from PLC (consumption data) n = 0 15
YPn	Output	Bit	Writes producing bit for PLC (data creation) $n = 0 \dots 15$
XCn[A/B]	Input	Bit	Reads consuming data from PLC for port n (1 8). Channel A or B)
YPn[A/B]	Output	Bit	Writes producing data for PLC for port n (1 8). Channel A or B
XEn*	Input	Bit	Reads data exchange bit n (0 15)
YEn*	Output	Bit	Writes data exchange bit n (0 15)
Eln*	Input	Int	Data exchange value from PLC n = 0 7
EOn*	Input	Int	Data exchange value for PLC $n = 0$ 7

* Only available on 16DIO module.

Diagnosis Information

Symbol	Direction	Туре	Description
X_DIA	Input	Bit	Diagnosis master bit
X_SCS	Input	Bit	Sensor diagnosis bit
X_SCA	Input	Bit	Actuator diagnosis bit
X_LVS	Input	Bit	Sensor supply voltage error
X_LVA	Input	Bit	Actuator supply voltage error
X_COMM	Input	Bit	Cyclic connection to PLC estab- lished
_scs	Input	Int	Sensor short-circuit information per port
_CE1	Input	Int	Channel error LSB
_CE2	Input	Int	Channel error MSB

Symbol	Direction	Туре	Description
Y_STOP	Output	Bit	Causes the DCU application (DCU) to stop
Y_DIS	Output	Bit	Causes the DCU application (DCU) to lock itself

Special

SymbolDirectionPnOutput		Туре	Description		
_Pn	Output	Int	Data for publishing. $n = 0 - 31$		
_MSG	Output	Int	Shows message with the corre- sponding number on web GUI		
X_Bn	Input	Bit	Virtual button on web GUI pressed n = button number 1 10		
X_First	Input	bit	Is only set on first program run after switch-on or reset.		

Physical inputs and outputs

The symbols XnA and XnB allow the DCU program to read the corresponding physical input directly. A contact given this icon is interpreted as closed when the respective input pin is connected to + 24 V_{DC} (e.g. pin 1). The symbols XnA and XnB allow you to directly control a physical digital output. A coil named with this symbol would activate the corresponding output pin, which then supplies + 24 V_{DC}.

Physical inputs and outputs that are used in a DCU program are separated from the corresponding cyclic data to and from the PLC. However, this cyclic data can still be read and manipulated by the DCU program to communicate or exchange information with the PLC. Physical inputs and outputs that are NOT used can still be directly controlled by a PLC.

Direct Access to Cyclic Bits

The module provides the PLC with 16-bit cyclic input data (producing data), which is shown in the DCU program with the symbol YPn, whereby n is a bit within a range of 0 to 15. A coil with this name would control the corresponding cyclic bit in the data of the module. Only cyclic bits that are separated from physical inputs and outputs because they are used in a DCU program can be manipulated in this way.

The 8-bit cyclic output data from the PLC (consuming data) can also be read with a DCU program with the symbol XPn; n represents a bit within a range of 0 to 7. This allows the DCU application to respond to events that are triggered by the PLC.

Channel-related reading and manipulation of consuming and producing data through the channel

The symbols XCnA and XCnB read the consuming cyclic bit received from the PLC that controls the specified output channel. Even if the output channel is controlled by the DCU program and therefore not directly by the PLC, the program is able to react to the status of the bit.

The symbols YPnA and YPnB manipulate the producing data for the specified channel, which is sent to the PLC via the cyclic data. This allows a DCU program to simulate an input state to the PLC irrespective of the real channel state.

In doing so, the active process data mapping is observed.

Channels 1 ... 4

Physical port/chan-	Port/ch annel							
nel	1/A	1/B	2/A	2/B	3/A	3/B	4/A	4/B
Reading the consum- ing bit	XC1A	XC1B	XC2A	XC2B	ХСЗА	XC3B	XC4A	XC4B
Manipulating the pro- ducing bit	YP1A	YP1B	YP2A	YP2B	YP3B	YP3B	YP4A	YP4B

Channels 5 ... 8

Physical port/chan-	Port/ch annel							
nel	5/A	5/B	6/A	6/B	7/A	7/B	8/A	8/B
Reading the consum- ing bit	XC5A	XC5B	XC6A	XC6B	XC7A	XC7B	XC8A	XC8B
Manipulating the pro- ducing bit	YP5A	YP5B	YP6A	YP6B	YP7B	YP7B	YP8A	YP8B

Data Exchange

Note

The following information on data exchange between Ethernet IO module and PLC only applies to the ICE1-16DIO-G60L-C1-V1D modules.

- The modules provide additional cyclic data explicitly for data exchange between the PLC and DCU program. The DCU program can accept commands and data from the PLC and responds with execution results.
- The width of the exchanged data is 16 bits plus 8 data words (as a signed 16-bit integer) in each direction.
- The data exchange bits can be written to LDMicro with the "YEn" bit variables.
- The data exchange bits can be read in LDMicro with the "XEn" bit variables.
- The data exchange bits are independent of the process data mapping in use.
- The symbols for the integer variables "Eln" and "EOn" allow the reading and writing of data exchange words.

9.3 DCU Web Interface

Distributed Control Web Interface

PEPPERL+FUCH	5	
		ICE1 Webserver
Status Config System C	sntrol Contact	
Distributed Control	Program Information:	
NO PROGRAM	Variables:	
Run Stop Reset Disable Cor	trol	
Upload DCU Program or Mapping		
Upload Program		

Figure 9.6 Control web interface without loaded program

The control web interface enables the user to upload programs to the DCU application and manage the control status.

	JHS				
				ICE1 Webserv	/er
Status Config System	Control	Contact			
Distributed Control	_	4 Program information:	5 (6 7	
DISABLED 1		Lines: 24, Bits: 7 / 99, Ints: 0 / 99, Cycle Time: 10 Variables:	0000 µS	Î	
		Action	Symbol	Value	
Run Stop Reset Dis	able Control	Read physical input Port X1 Ch. A	X1A	1	
		Read physical input Port X2 Ch. A	X2A	1	
Upload DCU Program or Mapping	(2)	Read physical input Port X3 Ch. A	X3A	0	
	人 4ノ	Write physical Output Port X5 Ch. A	Y5A	0	
Durchsuchen.		Write physical Output Port X5 Ch. B	Y5B	0	
		Read PLC consuming bit 0	XP0	1	
			100000C		

Figure 9.7 Control web interface with loaded program

- 1 Displays current DCU status and buttons to manage the decentralized control function
- 2 Uploading a program or mapping file
- **3** Auto-start box to automatically run a preloaded program immediately after switching on the power supply
- 4 The "Program Information" area shows basic information on the program, and a list of all module functions used by the decentralized control function

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- 5 Changes the number format in the "Value" column to integer variables.
- 6 Opens the mapping dialog to create a specific variable mapping.
- 7 Enables/disables variable forcing

User Name and Password

To change the control status or upload programs, you can use the "WRITE" or "ADMIN" user names.



Note

The default password for the "ADMIN" user is "private."

Control Status

The following control statuses are displayed:

Status	Description
NO PROGRAM	No program has been loaded or the uploaded file is not a valid program.
LOCKED	The DCU application is locked by the master configuration (PLC).
DISABLED	The DCU application is disabled. There is no program running and the DCU application has no control over the inputs and outputs.
STOP	The DCU application controls the inputs and outputs that are used in the loaded program, but the program is stopped. All other inputs and outputs can still be controlled by the master.
RUN	The DCU application controls the inputs and outputs that are used in the loaded program, and the program is executed. All other inputs and outputs can still be controlled by the master.

Uploading a Program to the DCU Application

Programs that are created and compiled with LDMicro can be uploaded directly into the DCU application. Select the program file (.int) and press the "Upload" button.

Program upload is NOT permitted if the DCU application is in RUN mode. WRITE or ADMIN user rights are required to upload a DCU program.

You can also upload a variable mapping file (.map).

						ICE1 Web	oserver
lome	Config	Status	System Control	Contact			
			Choose File to Upload				
Diete	ibuted Ca	mtral	Carles - Computer + Local [Disk (C:) + LDmicro_c		Search LDmicro_c	٩
Distri	Duled Co	onuoi	Organize - New folder			100	
Control 6	Status			^ Name ^	Date modified	Туре	Size
Control 3	status.		Desktop	Counter.int	3/17/2016 5:06 PM	INT File	1 KB
NO BROCRAM		DAM	Libraries	counter_extern.int	1/15/2018 3:02 PM	INT File	3 KB
NU	FRUG	RAW	Computer	= Counter_slow.int	6/1/2017 11:48 AM	INT File	1 KB
			Elana Dick Drive (A)	counter_test.int	6/1/2017 11:45 AM	INT File	1 KB
Run	Stop R	leset D	Report Disk Unive (Ac)	delay.int	4/11/2018 1:28 PM	INT File	4.KB
-	Lesinger Land	orational Lans	SPacurda Pin	delay_test.int	6/1/2017 11:39 AM	INT File	4 KB
Upload C	Control Program		AY NE 77	democase.int	3/29/2016 2:02 PM	INT File	2.KB 🛱
			Documents and Settings	eip_cert.int	3/20/2017 9:13 AM	INT File	1 KB
		Browse	Deciments and settings	eip_cert_2.int	3/31/2017 10:05 AM	A INT File	1 KB
Unload	Program		Perflogs	Example_Programs	9/19/2017 2:06 PM	Shortcut	2 KB
opidadi	riogiani		Program Files	my_delay.int	3/1/2017 10:00 AM	INT File	4 KB
Contr	rol autostart		ProgramData	my_delay2.int	3/1/2017 10:03 AM	INT File	4 KB
			Becovery	myFirst_int	3/17/2017 11:52 AN	A INT File	I KB
			Svsint	pf_sps.int	10/20/2016 5:12 PN	4 INT File	8 KB 📖
			System Volume Information	pf_sps_2sec.int	11/16/2016 2:28 PN	4 INT File	8 KB 🖕
			in the second se	* (11		
			File name: delau	- 6	urtom Filer (* int		

Figure 9.8

Program Information

The box on the right-hand side displays certain information about the program currently loaded. The I/O table shows all the physical inputs and outputs that are used by the PLC program. Only these I/Os are controlled by the DCU program. All other I/Os can be controlled by a fieldbus master (if available).

Auto Start

If the Auto Start check box is enabled, the DCU application starts automatically in RUN mode if the module is switched on and if a valid program is loaded.



Note

Only use "Control Autostart" if there is no connection to a PLC. Otherwise, the PLC will not recognize the module. To ensure that the control function is executed in conjunction with a PLC, the corresponding device parameters must be activated. For PROFINET, for example, this is called "Control Start-Up"

Specific Mapping

Typically, mapping between a variable and the respective module function is conducted implicitly based on the variable name (according to chapter "LDMicro Programming Tool," see table "Fundamental input/output data"). In the example, a variable named Y5B is automatically associated with the module function "Set physical output port 5 channel B." If this approach is used, no further mapping is required.

To improve the readability of the DCU program, it may be useful to identify variables according to their function in the application. For example, if an output is to activate a yellow LED, the variable can be Y_LEDyellow.

Such a variable name is not known to the module and therefore is not associated with a function. This variable is therefore not displayed in the variables list, but the assignment of this variable to a physical output can be carried out manually using variable mapping.



	DCU variable mapping
Curent Mapping: T1 1 T2 T3 T4 T5 T6 T7	Map variable to a function: Select a function 2 Number: Channel: Channel A
Download map fil	Create Mapping Delete Mapping e 3 s Apply Changes Cancel

Creating the Mapping with the Mapping Dialog

Figure 9.9

The mapping dialog shows a list of all variables in the current program (1), which cannot be mapped automatically by their names.

Each of these variables can be linked to a device function by selecting the variable. After that, the function drop-down list is filled with possible functions for this variable type.

Once a function is selected, it may be necessary to specify this further. For example, select a number or a port and channel (2).

By clicking on "Create Mapping", the variable is connected to this function.

The "Delete Mapping" button cancels an existing mapping.

Once all the required variables have been mapped, click on the "Apply Changes" button to send the changes to the module.

The variables list on the DCU page now shows the newly-assigned variables with the original function name in parentheses.

You can download the current mapping for backup, re-use or external editing purposes (3).

The "Clear all mappings" button deletes all existing mappings in the module.

Manually Creating a Mapping File

Variable mapping can also be generated simply by uploading a mapping file.

The file is structured as follows:

[CustomName];[Symbol]\r\n

Example:

XStart;X1A

YLED;Y5B

This file must have the ".map" extension.

Forcing Variables

Any variables in a DCU program that are mapped to a module function can be manipulated (forcing). This means that the value can be changed manually, directly from the web interface.

Input variables, i.e., variables that are filled with data from the module, can be manipulated to a certain value, which is then read by the DCU program. Input data for a DCU program can thus be manipulated, e.g., for test purposes.

Output variables, i.e., variables that are written by a DCU program to change the module state, can be set to a specific value. This is transmitted directly to the module function with which the variable is mapped. This enables the function to be manipulated directly. Output variables are only processed when the decentralized control function (DCU) is in the "RUN" state.

Turiubico.		
Action	Symbol	Valu
Read physical input Port X1 Ch. A	X1A	0 0
Write physical Output Port X5 Ch. A	Y5A	1 [
Write physical Output Port X5 Ch. B	Y5B	0 0
Write physical Output Port X6 Ch. A	Y6A	0 0
Write physical Output Port X6 Ch. B	Y6B	0 0
Write physical Output Port X7 Ch. A	Y7A	0 0
Write physical Output Port X7 Ch. B	Y7B	0 0
Write physical Output Port X8 Ch. A	Y8A	1 6
Write physical Output Port X8 Ch. B	Y8B	0 0
Read PLC consuming channel Port X1 Ch. A	XC1A	0 0
Simulate input to PLC Port X1 Ch. A	YP1A	0 0
Write exchange bit 5	YE5	1 [



Starting/stopping and operating forcing

To start variable forcing, the user clicks on the "F" button in the program information. The buttons revolve around "X." Clicking on the button again ends variable forcing.

All variables in the list gain an additional "F" button in the "Value" column. Clicking on this button opens a small dialog, where the user can enter a forcing value for this variable. Bit variables only provide "0" and "1" buttons, since bit variables can only be set to 0 or 1.

A number can be entered for integer variables.

The button marked with an "X" immediately ends forcing for this variable. A forced variable in the list is highlighted in yellow.

Uploading a DCU Program and Mapping Batch

The DCU program and mapping files can also be uploaded via an HTTP POST request. An example of a Perl script is described below. This can be used directly for the batch upload.



POST Request to Upload Files

URI	/upload?cmd=store&fullpage=false				
Method	POST				
MIME type	multipart/form-data				
Form fields	path	dcu			
	submit	upload			
	file	[file to upload] (as applica- tion/octet-stream)			
Filename	dc.int for program file dc.map for mapping file				

Use of the Perl Script

The following example of a batch file shows a Perl script (transfer.pl) for batch uploading files to the decentralized control function (DCU).

This line uploads a DCU program file (dc.int) to the module with the IP address 192.168.1.20: perl -w .\transfer.pl -s dc.int -t dcu 192.168.1.20 -a IO-Device:admin:private

The procedure for a mapping file is the same:

perl -w .\transfer.pl -s dc.map -t dcu 192.168.1.20 -a IO-Device:admin:private

Note

Π

The term "IO-Device" must remain unchanged.

You may need to adapt the user name and/or password to the real module configuration. Any user with at least "WRITE" permissions can be used.

10 Firmware Update:

Overview

If the modules require a firmware update, you can use the software provided by Pepperl+Fuchs on the Internet. Visit the product page for the respective module, ICE1-*-G60L-V1D, at **www.pepperl-fuchs.com** to download it.

You can update the module firmware using the embedded web server. To do this, you must first open the home page of the web server.

Depending on the selected protocol, the URL to open the home page will be different.

If the module home page does not open, please check your browser and firewall settings.



Note

The web server can be used with various web browsers. The "Mozilla Firefox" and "Google Chrome" browsers can be used without any further changes to settings. When using "Microsoft® Internet Explorer," it may be necessary to disable automatic configuration in the LAN settings.



Firmware Update Process

Note

Do not interrupt the update process. Once the firmware update has been completed, you will be prompted to restart the module.

The firmware file must be downloaded and saved on the PC with the web server installed.

- **1.** Go to the home page of the web server:
 - For EtherNet/IP and Profinet:

Enter http://in the address bar of your web browser, followed by the IP address, e.g., http://192.168.1.1.

• For EtherCAT:

Enter http://[IP-Adresse]/status.htm in the address bar of your web browser, e.g., http://192.168.1.1/status.htm.





Figure 10.1

- 2. Click on the "Config" tab.
- 3. Click on the "Firmware Update" button.

Config	S Upload Config - Internet Explorer	
	ttp://192.168.0.2/fwup.htm	
The rotary switch is set to 300 (dec). IP Settings		î
Parameter Settings IP-Address 192 168 0 2 Subpet Mark 255 255 255 0	Firmware Update	
Gateway 192.168.0.2	Choose file to load:	Durchsuchen
Submit	Upload	
Result		
Restore Factory Settings	Ready	
Restoring factory settings affect all network paral Applying the factory settings will cause all network		
Note: If the module has rotary switches, the new	4	
Please confirm to restore the factory settings	β	
Firmware Update		
e		



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4. Click on the "Browse" button, select the appropriate ZIP file in your local directory and confirm the process with the "Upload" button.

→ Transferring the firmware takes about 30 secs. There is a visual progress indicator.

ttp://192.108.1.4/twup.ntm	
[Message from webpage
Firmware Update	(Update finished. Please restart the device
Choose file to load:	
C:\temp\Firmware\F10014 FW-Update	
Upload	ОК
Update finished	
OK Uploading: webif/version.txt> web	^
Uploading: webif/Thumbs.db> web	
Uploading: webif/testgui.htm> web OK	
Uploading: webif/system.htm> web	
on	

Figure 10.3

5. Restart the module. To do this, switch the power supply of the module off and on again.

 \mapsto The module has now loaded the new firmware version.

- 6. You can check the new firmware version via the web server. Go to the home page of the web server again.
- 7. Click on the "System" tab in the menu bar of the start window. Here you can check the current firmware version.



					ICEI WE
lome	Config	States System	Control	Contact	
System	1				
Connection St	latus	General Information			
Network		System			
Port 0	100 MBil/s FULL	Time Since Startup	7.s		
Port 1	No Link	System Message	OK		
Phy MAC Address	00.0D:81:03:63.1	C Restarts of IO-Syste	em O		
IP Address	192,168,1.4	Firmware	Popport+Eucho	ICE1 EthorNot/ID	
Subnetmask	255 255 255 0	Marrian	V2 1 0 2 1 0 /U	10014)	
Gateway	0.0.0.0	Date	7.6 2017	(0014)	
Ethernet/IP		Device	1.0.2011		
State	Wait for Connect	ion Name	ICE1-16DI-G60	L-V1D	
		Ordering Number	295311		
		Hardware	V2.1		
		Serial Number	4000005871109	95	
		Production Date	09/2017		
User Managen	ment				
Username	I	ermissions	Edit	Del	
admin	1	Admin	1	A	

Figure 10.4



11 Troubleshooting

11.1 General Diagnostic Processing

The modules offer extended diagnostic behavior especially for the output channels, to determine errors in the transfer. The firmware of the modules distinguishes between five different types of errors.

Channel Errors

A channel error is determined by comparing the target value set by a controller and the actual value of an output channel.

Target value	Actual value	Comment
Active	Active	OK, no diagnosis
Off	Off	OK, none
Active	Off	 Short circuit Channel display is red Channel error bit is set in the diagnosis Channel is locked after error repair
Off	Active	Feeding back a voltage Red and yellow/white channel indicators are switched on Channel error bit is set in the diagnosis Channel is not locked after error repair



Note

If both output channels of an M12 slot are activated when a channel error occurs, the controller locks both channels, even if only one channel is affected by the error. If only one channel is activated, the controller locks only this one. Locked channels are disabled and remain "off" if you do not reset them via the controller.

When activating (rising edge of the channel state) or deactivating (falling edge) an output channel, channel errors are filtered for the duration that you set via the parameter "Surveillance Timeout" in the module configuration. The value of this parameter covers a range of 0 to 255 ms; the factory setting is 80 ms.

The filter is used to prevent premature error messages when you switch on a capacitive load or switch off an inductive load, as well as other voltage peaks during a status change.

If a channel is static while it is permanently on or off, the controller uses a fixed duration of 5 ms for filtering the error messages.

Voltage Error at the M12 Slots

On each M12 input socket of the module, pin 1 delivers a monitored sensor voltage U_S . In the event of a sensor short circuit, a voltage error is reported. Both channel indicators of the M12 input socket light up red and the corresponding error bit "sensor short circuit" is set in the diagnostic bytes.

The error message is filtered by the parameter "Surveillance Timeout."

Overload of the Current Drivers

The current drivers of the modules with output functionality (variant 16DIO, 8DI8DO) report an error if they identify an overload. This error is reported by setting the corresponding channel error bits in the diagnostic bytes.

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In the event of an overload, the status indicator of the active output channel lights up red. If both output channels of an M12 slot are active during an overload, both status indicators light up red.

The error message is filtered by the parameter "Surveillance Timeout."

Note

If both output channels of an M12 slot are activated when a channel error occurs, the controller locks both channels, even if only one channel is affected by the error. If only one channel is activated, the controller locks only this one. Locked channels are disabled and remain "off" if you do not reset them via the controller.



Reactivating a locked output channel after eliminating an error

- 1. Set the locked outputs to zero via the controller.
- Activate the outputs set to zero.

 \mapsto The outputs are activated again.

Actuator Supply Errors

The level of the voltage value is monitored globally and modularly at the connections for the power supply of the actuators. If the U_L actuator supply leaves the voltage value range of 18 V to 30 V, an error is reported.

The U_L indicator lights up red and the actuator low voltage bit is set in the module information byte. If output channels are activated, the voltage error is also indicated by setting the appropriate error bits of the M12 slots.

Note

Each output channel is locked if it is activated while a U_L supply voltage error is present. This means that the controller has to reset the output channel for correct operation when the status of the U_L supply voltage returns to normal. We recommend that all output channels are disabled via the controller as soon as the low voltage is detected. Otherwise, when the voltage value returns to normal, each active output channel will report a diagnosis because it is locked.

Errors in the System/Sensor Supply

The level of the voltage value of the system/sensor supply is also monitored globally. A voltage that is either below or above the voltage range of 18 V to 30 V generates an error message.

The U_S indicator lights up red and the sensor low voltage bit is set in the module information byte.

The error message has no effect on the outputs and is not filtered but instead reported immediately.



Caution!

Loss of function when the system supply voltage is too low.

Ensure in all cases that the supply voltage measured at the most remote participants (sensor/actuator) does not drop below 18 V DC in terms of system supply voltage.

11.2

Diagnostics Indicator in the Integrated Web Server

The modules show the channel status, module status, and fault diagnosis on the status page of the embedded web server in plain text.

For information on how to call up the status page, .



PEPPERL+FU	CHS						
							ICE1 Webserv
atus Config System	Control	Contact					
Status							
Module overview	PLC process d	ata (vaiues ar	e shown	in hexadecimal noi	tation)		
	Consumina D	ata (Byte 0 - E	Byte n)		E	Producing Data (Byte 0 - Byte n)	
X1	Output: 00 04				1	nput: 20 00	
	Switch Forc	emode on]				
	Channel overvi	ew					
	Phy	sical I/Os		PLC process	s data	1	
	Port/Ch.	Direction	State	Mapping	Pr/Co	Diagnosis	
X3	X1 A (Pin 4)	In/Out	Off	0.0	0/0	Sensor (Pin 1) overload	
	X1 B (Pin 2)	In/Out	Off	0.1	070	Sensor (Pin 1) overload	
	X2 A (Pin 4)	In/Out	Off	0.2	0/0		
	X2 B (Pin 2)	In/Out	Off	0.3	0/0		
	X3 A (Pin 4)	In/Out	Off	0.4	0/0		
MSNS Inklast SE DIA	X3 B (Pin 2)	In/Out	On	0.5	1/0		
	X4 A (Pin 4)	In/Out	Off	0.6	0/0		
	X4 B (Pin 2)	In/Out	OII	0.7	0/0		
x100 x10 x1 X01	X5 A (Pin 4)	In/Out	Off	1.0	0/0		
	X5 B (Pin 2)	In/Out	OII	1.1	0/0	-	
XO1 BUS X02	X6 A (Pin 4)	In/Out	Off	1.2	0/1	Actuator overload	
	X6 B (Pin 2)	In/Out	O/I	1.3	0/0		
	and the second se			1.4	0/0		
	X7 A (Pin 4)	In/Out	Contract of the second	-			
x03 0 X04	X7 A (Pin 4) X7 B (Pin 2)	In/Out In/Out	Off	1.5	0/0		
	X7 A (Pin 4) X7 B (Pin 2) X8 A (Pin 4)	In/Out In/Out In/Out	Oll	1.5	0/0		

Figure 11.1

Depending on the module, up to 5 bytes of diagnostic data is displayed in the process data area on the status page. The diagnostic bytes are structured as follows in order from left to right:

11.3 Module Diagnostic Information via EtherNet/IP

Note

If the protocol for the module is set as "EtherNet/IP", diagnosis information occurs through process data when the appropriate assembly objects are used (see chapter "Commissioning for EtherNet/IP," sub-chapter "Bit Assignment of Process Data").

11.4

Alarm Signals and Error Messages from Modules via PROFINET

Note

Alarm signals and error messages are only transmitted via PROFINET if the parameter for diagnosis is activated in the controller when the modules are configured.

If the modules detect a fault state, they trigger an alarm signal. The modules support diagnostic alarms. Diagnostic alarms are triggered by periphery faults, such as overloads, short circuits, and low voltage.

An alarm is triggered both by incoming events (e.g., sensor short circuits) and outgoing events. The alarms are evaluated dependent on the PROFINET IO controller used.



Evaluating Alarms in the TIA portal

If a diagnostics alarm is triggered, the user program in the TIA portal is interrupted and a diagnostics block is called. The following blocks are used:

Cause	OB call
Peripheral fault (short circuit, overload, wire break, low voltage on an I/O mod- ule)	OB B2
Complete system failure	OB B6

The initial information regarding the cause and type of fault is provided by the OB called and its start information. More detailed information regarding the error event can be obtained in the error OB by calling SFB 54 RALRM (read supplementary alarm information). For this purpose, SFB 54 must called in every error OB.

If the error OB called does not exist in the CPU, the CPU switches into the STOP operating state.

A diagnostics data record can also be called via its data record number using the system function block SFB 52 "RDREC" in OB 1.

The Structure of the Diagnostics Data Records

Block version 0x0101 and the format identifier (USI, User Structure Identifier) 0x8000 are used to display the diagnostics data records.

The data values "ChannelNumber" and "ChannelError" contain the following values, depending on the error that has occurred:

Type of error	Reference	ChannelNumber	ChannelErrorType
Low sensor or actua- tor power supply volt- age	Module	0x8000	0x0002
Sensor short circuit	M12 slot	0x0001 to 0x0008 M12 slot number	0x0102
Actuator short circuit	Channel A of an M12 slot	0x0001 to 0x0008 M12 slot number	0x0100
Actuator short circuit	Channel B of an M12 slot	0x0001 to 0x0008 M12 slot number	0x0101

If there is an accumulation of errors, the channel diagnosis section, including the "Channel-Number," "ChannelProperties," and "ChannelErrorType" data values, is repeated for every error in the diagnostics data record.

To display diagnostics, select the faulty module in the distributed peripherals of the online TIA Portal, accessed via the project navigation. Click on the maintenance icon to open the online diagnosis for slot 1.

Switch to the "Channel Diagnostics dialog to display the pending module diagnostics



Diagnostics General	Chann	el diagnosti	s	
Diagnostic status				
Channel diagnostics				
		Channel	o. Error	
		6	Actuator short circuit channel A	
		4	Sensor short circuit	
	-			
	- 1			
			1	
		۲.	III >	

Figure 11.2

11.5 Alarm Signals and Error Messages from Modules via EtherCAT

If a recognized fault is detected during parameterization, the module sends error messages to the master. The coding of the first and second parts of the error messages is based on specifications CiA 301 and CiA 401. The third part of the error message is the known (manufacturer-defined) diagnosis register.

The error message is in an 8 byte format and is coded as follows:

Contents of an Error Message

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Error code)	Error register CoE 0x1001	Diagnosis	register			

Table 11.1

Contents of the Error Register (CoE Register 0x1001):

	Error register (CoE 0x1001), byte 3								
Error code Byte 1, byte 2	B7	B6	B5	B4	В3	B1	В0	Description of the fault (Bit 7–Bit 0)	
0x0000	0	0	0	0	0	0	0	No error	
0x2300	0	0	0	0	0	1	1	Output over- load, MI-SCS or MI-SCA	
0x3100	0	0	0	0	1	0	1	Voltage error, MI-LVS	
0x3300	0	0	0	0	1	0	1	Voltage error at outputs, MI-LVA	
0xF000	1	0	0	0	0	0	1	Additional "Forc- ing" function, MI- FC	
0xFF00	1	0	0	0	0	0	1	Additional "device diagno- sis" function, MI- IME	
Content of the Diagnosis Register

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 4	MI-IME	MI-FC	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Byte 5	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Byte 6	CE-X4B	CE-X4A	CE-X2B	CE-X2A	CE-X2A	CE-X2A	CE-X1B	CE-X1A
Byte 7	CE-X8B	CE-X8A	CE-X7B	CE-X7A	CE-X6A	CE-X6A	CE-X5B	CE-X5A
Byte 8	0	0	0	0	0	0	0	0

Legend:

- MI-LVS: Module information byte-voltage for power/sensor supply low
- MI-LVA: Module information byte-voltage for actuator low
- MI-SCS: Module information byte-sensor short circuit on an M12 slot
- MI-SCA: Module information byte-actuator short circuit
- MI-FC: Module information byte-forcing active
- MI-IME: Module information byte-internal module error
- CE-X1A ... CE-X8A: Channel error, channel A (pin 4) of slots X1 to X8
- CE-X1B ... CE-X8B: Channel error, channel B (pin 2) of slots X1 to X8

The following example shows the error message received by a TwinCAT master regarding an actuator voltage power fault:

😢 3 21.11.2016 16:16:41 390 ms | 'Box 1 (0980 ESL 393-121 8D' (1001): CoE - Emergency (Hex: 3300, 05, '02 00 00 00 00').

Figure 11.3



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