MULTI FIELDBUS INTERFACE

INSTRUCTIONS FOR USE | C6 REMOTE I/OS

Original manual
Document 20179299 EN 01

Preface

The described hard- and software are developments of the KEB Automation KG. The enclosed documents correspond to conditions valid at printing. Misprint, mistakes and technical changes reserved.

Signal words and symbols

Certain operations can cause hazards during the installation, operation or thereafter. There are safety informations in the documentation in front of these operations. Security signs are located on the device or machine. A warning contains signal words which are explained in the following table:

⚠ DANGER	Dangerous situation, which will cause death or serious injury in case of non-observance of this safety instruction.
⚠ WARNING	Dangerous situation, which may cause death or serious injury in case of non-observance of this safety instruction.
⚠ CAUTION	Dangerous situation, which may cause minor injury in case of non-observance of this safety instruction.
NOTICE	Situation, which can cause damage to property in case of non-observance.

RESTRICTION

Is used when certain conditions must meet the validity of statements or the result is limited to a certain validity range.

Is used when the result will be better, more economic or trouble-free by following these procedures.

More symbols

►	This arrow starts an action step.
• / -	Enumerations are marked with dots or indents.
=>	Cross reference to another chapter or another page.

Note to further documentation.
www.keb.de/nc/search

Laws and guidelines

KEB Automation KG confirms with the EC declaration of conformity with the CE mark on the unit name plate, that the device complies with the essential safety requirements.

The EC declaration of conformity can be downloaded on demand via our website. Further information is provided in chapter "Certification".

Warranty

The warranty on design, material or workmanship for the acquired device is given in the current terms and conditions.

Here you will find our current terms and conditions.
www.keb.de/terms-and-conditions

Further agreements or specifications require a written confirmation.

Support

Through multiple applications not every imaginable case has been taken into account. If you require further information or if problems occur which are not treated detailed in the documentation, you can request the necessary information via the local KEB Automation KG agency.

The use of our units in the target products is beyond of our control and therefore exclusively the responsibility of the machine manufacturer, system integrator or customer.

The information contained in the technical documentation, as well as any user-specific advice in spoken and written and through tests, are made to best of our knowledge and information about the application. However, they are considered for information only without responsibility. This also applies to any violation of industrial property rights of a third-party.

Selection of our units in view of their suitability for the intended use must be done generally by the user.

Tests can only be done within the application by the machine manufacturer. They must be repeated, even if only parts of hardware, software or the unit adjustment are modified.

Copyright

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Glossary

0V	Earth-potential-free common point
1ph	1-phase mains
3ph	3-phase mains
AC	AC current or voltage
ASCL	Asynchronous sensorless closed loop
AWG	American wire gauge
B2B	Business-to-business
CAN	Fieldbus system
CODESYS	Operating system of the standard control and programming environment
CODESYS Safety-PS	Safety programming system
COMBIVERT	KEB drive converters
COMBIVIS	KEB start-up and parameterizing software
DC	DC current or voltage
DIN	German Institut for standardization
EMC	Electromagnetic compatibility
Emergency stop	Shutdown of a drive in emergency case (not de-energized)
Emergency switching off	Switching off the voltage supply in emergency case
EN	European standard
EtherCAT	Real-time Ethernet bus system of the company Beckhoff
Ethernet	Real-time bus system - defines protocols, plugs, types of cables
FE	Functional earth
FSoE	Functional Safety over Ethernet
GND	Reference potential, ground
Head module	Description for the bus coupler or small control in the KEB-I/O EtherCat system.
HMI	Human machine interface (touch screen)
IEC	International standard
IP xx	Degree of protection (xx for level)
KEB-I/O EtherCAT SPS	Small control system from the KEB-I/O system
KEB-I/O EtherCAT System	I/O module family
MCM	American unit for large wire cross sections
MTTF	Mean service life to failure
NN	Sea level
PA	Potential equalization
PE	Protective earth
PELV	Protective Extra Low Voltage
PFD	Term used in the safety technology (EN 61508-1...7) for the size of error probability
PFH	Term used in the safety technology (EN 61508-1...7) for the size of error probability per hour
PLC	Programmable logic controller
Port	Part of a network address to the assignment of TCP and UDP connections
POU	Program Organization Unit
RJ45	Modular connector with 8 lines
Safety Package	Plug in for COMBIVIS studio 6 with safety functionally
Safety PLC	Safety programmable logic controller
Safety PLCopen	Library of the certified basic level safety blocks
SELV	Safety Extra Low Voltage (< 60 V)
SIL	The security integrity level is a measure for quantifying the risk reduction. Term used in the safety technology (EN 61508 -1...7).
USB	Universal serial bus

Standards for control & automation

DGUV regulation 3	Electrical installations and equipment
DIN 46228-1	Wire-end ferrules; Tube without plastic sleeve
DIN 46228-4	Wire-end ferrules; Tube with plastic sleeve
DIN IEC 60364-5-54	Low-voltage electrical installations - Part 5-54: Selection and erection of electrical equipment - Earthing arrangements, protective conductors and protective bonding conductors (IEC 64/1610/CD)
DIN VDE 0100-729	Low-voltage electrical installations - Part 7-729: Requirements for special installations or locations - Operating or maintenance gangways (IEC 60364-7-729); German implementation HD 60364-7-729
EN 1037	Safety of machinery - Prevention of unexpected start-up; German version EN 1037
EN 55011	Industrial, scientific and medical equipment - Radio frequency disturbance characteristics - Limits and methods of measurement (IEC/CISPR 11); German version EN 55011
EN 55021	Interference to mobile radiocommunications in the presence of impulse noise - Methods of judging degradation and measures to improve performance (IEC/CISPR/D/230/FDIS); German version prEN 55021
EN 60204-1	Safety of machinery - electrical equipment of machines Part 1: General requirements (VDE 0113-1, IEC 44/709/CDV)
EN 60439-1	Low-voltage switchgear and controlgear assemblies - Part 1: Type-tested and partially type-tested assemblies (IEC 60439-1); German version EN 60439-1
EN 60529	Degrees of protection provided by enclosures (IP Code) (IEC 60529)
EN 60664-1	Insulation coordination for equipment within low-voltage systems Part 1: Principles, requirements and tests (IEC 60664-1)
EN 60721-3-1	Classification of environmental conditions - Part 3-1: Classification of groups of environmental parameters and their severities - Section 1: Storage (IEC 104/648/CD)
EN 60721-3-2	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 2: Transportation and handling (IEC 104/670/CD)
EN 60721-3-3	Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities; section 3: Stationary use at weatherprotected locations; Amendment A2 (IEC 60721-3-3); German version EN 60721-3-3
EN 61000-2-1	Electromagnetic compatibility (EMC) - Part 2: Environment - Section 1: Description of the environment - Electromagnetic environment for low-frequency conducted disturbances and signalling in public power supply systems
EN 61000-2-4	Electromagnetic compatibility (EMC) - Part 2-4: Environment; Compatibility levels in industrial plants for low-frequency conducted disturbances (IEC 61000-2-4); German version EN 61000-2-4
EN 61000-4-2	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test (IEC 61000-4-2); German version EN 61000-4-2
EN 61000-4-3	Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3); German version EN 61000-4-3
EN 61000-4-4	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test (IEC 61000-4-4); German version EN 61000-4-4
EN 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement

	techniques - Surge immunity test (IEC 61000-4-5); German version EN 61000-4-5
EN 61000-4-6	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields (IEC 61000-4-6); German version EN 61000-4-6
EN 61000-4-34	Electromagnetic compatibility (EMC) - Part 4-34: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with mains current more than 16 A per phase (IEC 61000-4-34); German version EN 61000-4-34
EN 61131-2	Programmable controllers - Part 2: Equipment requirements and tests (IEC 61131-2)
EN 61373	Railway applications - Rolling stock equipment - Shock and vibration tests (IEC 61373)
EN 61439-1	Low-voltage switchgear and controlgear assemblies - Part 1: General rules (IEC 121B/40/CDV); German version FprEN 61439-1
EN 61508-1...7	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1...7 (VDE 0803-1…7, IEC 61508-1…7)
EN 61800-2	Adjustable speed electrical power drive systems - Part 2: General requirements - Rating specifications for low voltage adjustable frequency a.c. power drive systems (VDE 0160-102, IEC 61800-2)
EN 61800-3	Speed-adjustable electrical drives. Part 3: EMC requirements and specific test methods (VDE 0160-103, IEC 61800-3)
EN 61800-5-1	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy (IEC 61800-5-1); German version EN 61800-5-1
EN 61800-5-2	Adjustable speed electrical power drive systems - Part 5-2: Safety Requirements - Functional (IEC 22G/264/CD)
EN 62061	Safety of machinery - functional safety of electrical, electronic and programmable electronic safety-related systems (VDE 0113-50, IEC 62061)
EN ISO 13849-1	Safety of machinery - safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1); German version EN ISO 13849-1
UL 61800-5-1	American version of the EN 61800-5-1 with „National Deviations“

1 Basic Safety Instructions

This instrcutions for use contains the information necessary for the intended use of the described product (control unit, operating material, software etc.).

The safety instructions can be supplemented by local, country or application-specific safety instructions. This list is not exhaustive. Non-observance will lead to the loss of any liability claims.

ATTENTION

Hazards and risks through ignorance.

- ► Read the instruction manual!
- ► Observe the safety and warning instructions !
- ► If anything is unclear, please contact KEB !

1.1 Target group

This manual is written for qualified personnel from construction, project planning, service and commissioning. Qualified personnel for the purpose of this instruction manual must have the following qualifications:

Knowledge and understanding of the safety instructions.

- Knowledge of automation technology.
- Knowledge of functional safety.
- Skills for the installation and assembly of electrical equipment.
- Detection of hazards and risks of the electrical drive technology.
- Understanding of the function in the used machine.
- Knowledge of the operation of the operating system Windows.
- Knowledge of the *DIN IEC 60364-5-54*.
- Knowledge of national safety regulations (e.g. *DGUV regulation 3*).

1.2 Transport, storage and proper use

The transport is carried out by qualified persons in accordance with the environmental conditions specified in this manual. The devices shall be protected against excessive strains.

Electronic devices contain electrostatic sensitive components.

- ► Avoid contact.
- ► Wear ESD-protective clothing.

Do not store the devices

- in the environment of aggressive and/or conductive liquids or gases.
- with direct sunlight.
- outside the specified environmental conditions.

1.3 Installation

⚠ DANGER

Do not operate in an explosive environment!

► The device is not intended for the use in potentially explosive environment.

To prevent damages to the device:

- Make sure that no components are bent and/or isolation distances are changed.
- The device must not be put into operation in case of mechanical defects. There is no compliance with applicable safety standards any more.
- Do not allow moisture or mist to penetrate the unit.
- Avoid dust permeating the device. Allow for sufficient heat dissipation if installed in a dust-proof housing.
- Note installation position and minimum distances to surrounding elements. Do not cover the ventilation openings.
- Assembly according to the specified degree of protection.
- Make sure that no small parts fall into the device during assembly and wiring (drilling chips, screws etc.). This also applies to mechanical components, which can lose small parts during operation.
- Check the reliable fit of the device connections in order to minimize contact resistance and avoid sparking.
- The safety instructions are to be kept!

1.4 Electrical connection

⚠ DANGER

Voltage at the terminals and in the device!

Danger to life due to electric shock !

► Never work on the open device or never touch exposed parts.

► For any work on the unit switch off the supply voltage and secure it against switching on.

► Install suitable protective devices for personal protection.

► Never bridge upstream protective devices (also not for test purposes).

► Install all required covers and protective devices for operation.

For a trouble-free and safe operation, please pay attention to the following instructions:

- The electrical installation shall be carried out in accordance with the relevant requirements.
- Cable cross-sections and fuses must be dimensioned according to the design of the machine manufacturer. Specified minimum / maximum values may not be fallen below /exceeded.

- Within systems or machines the person installing electrical wiring must ensure that on existing or new wired safe ELV circuits the EN requirement for safe insulation is still met!
- When using components without isolated inputs/outputs, it is necessary that equipotential bonding exists between the components to be connected (e.g. by the equipotential line). Disregard can cause destruction of the components by equalizing currents.

1.5 Start-up and operation

When the device is installed in machines, startup (i. e. the start of the intended use) is prohibited until it is determined that the machine complies with the machine directive; *EN 60204-1* must be observed.

- During operation, all covers and doors shall be kept closed.
- Use only approved accessories for this device.
- Never touch terminals, busbars or cable ends.

1.6 Maintenance

The following maintenance work has to be carried out when required, but at least once per year by authorized and trained personnel.

► Check unit for loose screws and plugs and tighten if necessary.

► Clean devices from dirt and dust deposits. Pay attention especially to cooling fins and protective grid of the fans.

► Examine and clean extracted air filter and cooling air filter of the control cabinet.

1.7 Preventive Maintenance

⚠ DANGER

Unauthorized exchange, repair and modifications!

Unpredictable malfunctions!

► The function of electronic devices can be affected by the setting and parameterisation. Never replace without knowledge of the application.

► Modification or repair is permitted only by KEB Automation KG authorized personnel.

► Only use original manufacturer parts.

► Infringement will annul the liability for resulting consequences.

1.8 Disposal

Electronic devices of the KEB Automation KG are exclusively professional devices for further industrial processing (so-called B2B devices).

Unlike devices mainly used in private households, these devices may not be disposed at the collection centres of public sector disposal organisations. They must be disposed after the end of use in accordance with national applicable law to environmentally correct disposal of electrical and electronic equipment.

The following table lists the entry numbers by country:

Country	WEEE-Reg.-No.	Manufacturer/authorized representative name
Germany	12653519	KEB Automation KG

The packaging must be feed to paper and cardboard recycling.

2 Product Description

2.1 General Description

The I/O modules are intended to perform motion and speed control tasks within an EtherCAT network.

The housing mount consists of an aluminum profile with an integral snap-on device used to snap the module to a 35mm DIN mounting rail. The housing trough including the optical fibres for the status indicators, the side face and the front is made of plastic and contains the module. The optical fibres for the signal state indicators (LEDs) are located next to the spring-assisted combi plug. They slightly protrude from the housing and allow a clear diagnosis at a glance.

2.2 Intended Use

The device is only connected to internal Ethernet networks without leaving the system and being exposed to TNVs.

2.3 Improper use

Using the device in a manner not specified by the manufacturer may affect the protection provided by the device.

3 Operation

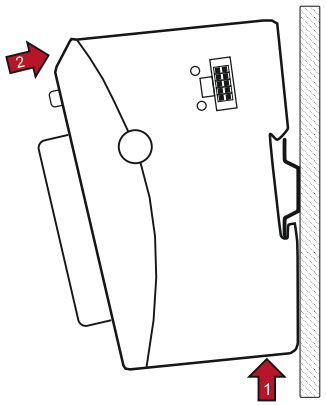
3.1 Installation

3.1.1 Mechanical Installation

The I/O modules are intended for mounting rail installation (according DIN EN 50022, 35 x 7.5 mm).

3.1.1.1 To snap on a single module

- Push the module against the mounting rail from below, allowing the metal spring to snap in between mounting rail and mounting areas as illustrated.
- Push the module against the mounting wall until it snaps in.



*

3.1.1.2 To interconnect two modules

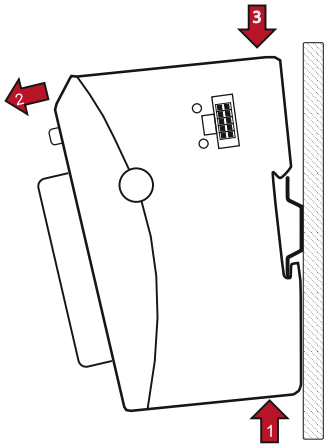
- After you have snapped the first module on the mounting rail, snap the second module to the right in about 1cm distance to the first module on the mounting rail.
- Push the second module along the mounting rail towards the first module until you hear the locking device snap in.

3.1.1.3 To disconnect two modules

- Push down the unlock button of the module to be disconnected from the module to the left of it.
- Push the module to be removed to approx. 1 cm distance.

3.1.1.4 To take down a single module

- Push the module up and against the metal spring located on the under-side of the rail guide.
- Tip the module away from the mounting rail as shown in the illustration.
- Pull the module down and out of the mounting rail.



3.1.2 Mounting and distances

The device is designed for DIN-rail mounting in closed cabinets and the like that provide protection against fire risks, environmental conditions and mechanical effects.

The mounting rail is mounted horizontally. The socket connector of the modules point forward. In order to ensure sufficient ventilation through the convection slots of the modules, the minimum distance of 20 mm upwards and 35 mm to adjacent devices and control cabinet surfaces must not be fallen below. The lateral distance to external devices and control cabinet surfaces must not be less than 20 mm.

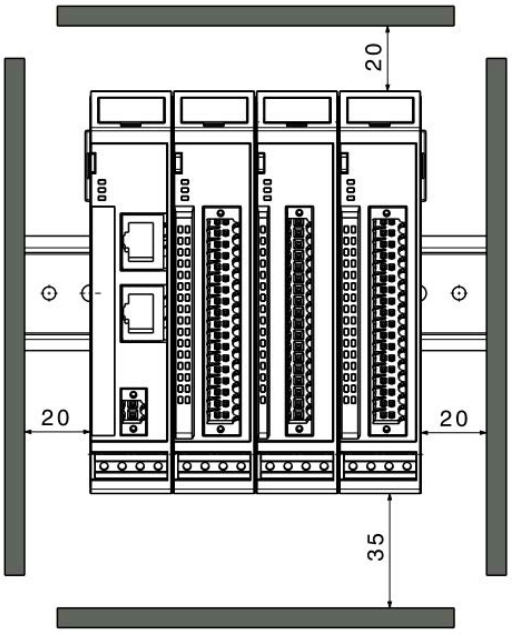


Figure 1: Mounting and distances

3.1.3 Electrical Installation

Module interconnection

The different modules connect electrically by pushing the individual modules together. This automatically connects them to the EtherCAT bus system and supplies power to the EtherCAT communication modules. Please note that the maximum current supplied by the bus coupler limits the number of KEB I/O modules you may connect to a single block.

The module does not require external supply with 24Vdc. It is supplied via the internal E-bus connector.

A functional equipotential bonding serves, among other things, the large-surface derivation of disturbances. This improves the interference immunity while simultaneous reduction of emitted interference. This is done via a metallic foot in case of C6 Remote I/O modules, which locks into position on the mounting rail during mounting. The module does not require external supply with 24Vdc. It is supplied via the internal E-bus connector.

A functional equipotential bonding serves, among other things, the large-surface derivation of disturbances. This improves the interference immunity while simultaneous reduction of emitted interference. This is done via a metallic foot in case of C6 Remote I/O modules, which locks into position on the mounting rail during mounting. The module requires only 24Vdc and converts the communication between different bus systems.

The module does not require external supply with 24Vdc and is supplied via the internal E-bus connector.

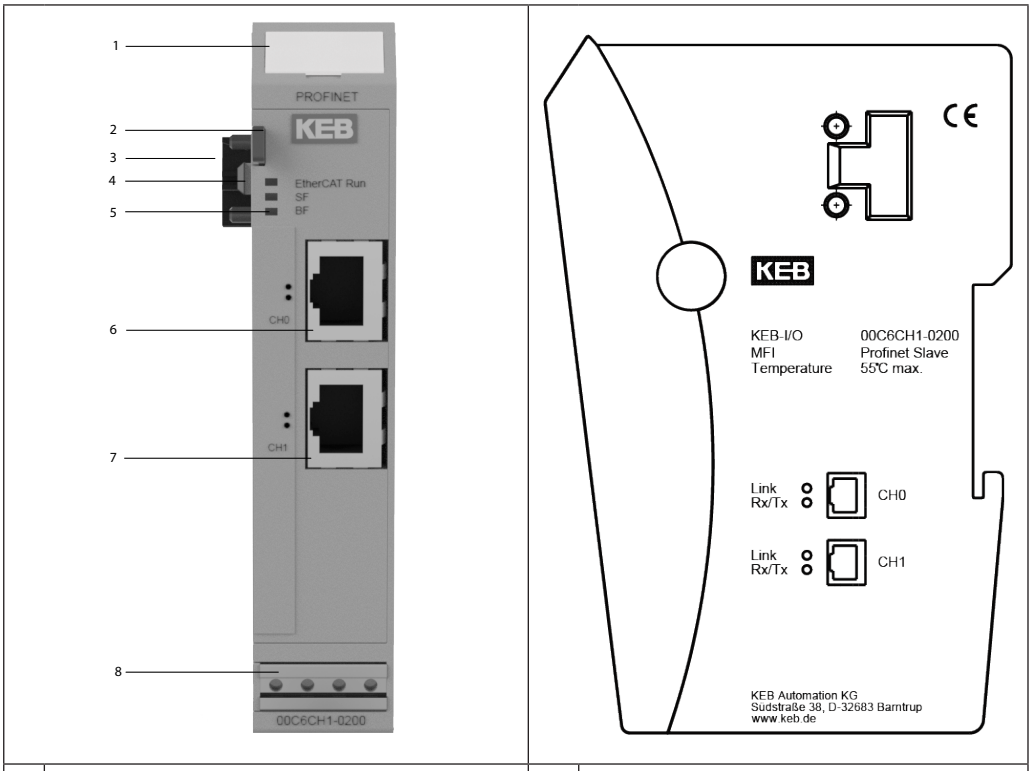
ATTENTION **Undefined conditions due to HF interference.**

Pay attention on large well conducting connections between

- mounting rail and mounting plate,
- mounting plate and earthing.

4 PROFINET-PN-Slave

4.1 Front / side view



1	Identification clip	5	Status LEDs
2	Release lever	6	PROFINET interface 1
3	E-bus connector	7	PROFINET interface 2
4	Module locking / E bus	8	Grounding/shield connection

Figure 2: PROFINET-DP 00C6CH1-0200

4.2 Terminals

The module needs no separate 24V connector. Power is supplied to the module through the E-bus connector.

4.3 Status LEDs

4.3.1 „EtherCAT Run“ LED

The LED labelled „EtherCAT Run“ indicates the state of the EtherCAT ASIC.

Status	LED, flash code	Explanation
Init	Red, on	Initializing, no data exchange
Pre-Op	Red/green, 1:1	Pre-operational, no data exchange
Safe-Op	Red/green, 3:1	Safe operation state, inputs readable
Op	Green, on	Operational, unrestricted data exchange

4.3.2 „PROFINET“ LED

The „PROFINET-LEDs“ display the status of the module regarding to PROFINET.

4.3.2.1 SF LED

The LED with the identification „SF“ (System Fault) has the following meaning.

LED, flash code	Explanation
Red, on	System failure
Off	System working OK

4.3.2.2 BF LED

The LED with the identification „BF“ (Bus Fault) has the following meaning.

LED, flash code	Explanation
Red, on	Bus not communicating
Off	Bus OK

4.3.2.3 RJ45-Port LEDs

- LED CH0

Link

The LED on channel 0 with the identification „Link” has the following meaning:

LED, flash code	Explanation
Green, on	Link status active
Off	No link detected

RX/TX

The LED on channel 0 with the identification „RX/TX“ has the following meaning:

LED, flash code	Explanation
Yellow, on	Communication active
Off	No communication

- LED CH1

Link

The LED on channel 1 with the identification „LINK” has the following meaning:

LED, flash code	Explanation
Green, on	Link status active
Off	No link detected

RX/TX

The LED on channel 1 with the identification „RX/TX“ has the following meaning:

LED, flash code	Explanation
Yellow, on	Communication active
Off	No communication

4.3.3 Function

The module PROFINET-PN slave is a gateway EtherCAT/PROFINET-PN. It enables the data exchange between EtherCAT system and PROFINET-PN system.

4.3.3.1 Data

The module provides up to 384 byte for user data. The size may be selected via the pdo assignment table.

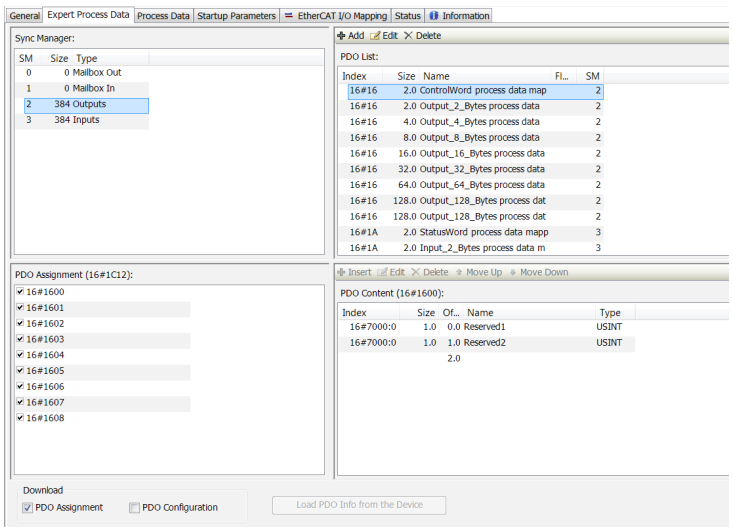


Figure 3: Expert Process Data

The PDO assignments are divided into different data sizes from 2 Bytes up to 128 Bytes.

Variable	Data type	Number	Explanation
2 Bytes Input	USINT	2	2 Bytes Input Module
4 Bytes Input	USINT	4	4 Bytes Input Module
8 Bytes Input	USINT	8	8 Bytes Input Module
16 Bytes Input	USINT	16	16 Bytes Input Module
32 Bytes Input	USINT	32	32 Bytes Input Module
64 Bytes Input	USINT	64	64 Bytes Input Module
128 Bytes Input	USINT	128	128 Bytes Input Module
2 Bytes Output	USINT	2	2 Bytes Output Module
4 Bytes Output	USINT	4	4 Bytes Output Module
8 Bytes Output	USINT	8	8 Bytes Output Module
16 Bytes Output	USINT	16	16 Bytes Output Module
32 Bytes Output	USINT	32	32 Bytes Output Module
64 Bytes Output	USINT	64	64 Bytes Output Module
128 Bytes Output	USINT	128	128 Bytes Output Module

4.3.3.2 Module start up parameters

The module can be configured with the following parameters from the EtherCAT internal bus:

Parameter name	Index in EtherCAT OD	Data type	Length	Explanation
StationName	#x8000	USINT ARRAY	8 byte	Name of station as array of 8 bytes
IPAddress	#x8001	USINT ARRAY	4 byte	IP address to be assigned to station as 4 octet array.
SubnetMask	#x8002	USINT ARRAY	4 byte	Subnet mask to be assigned to station as 4 octet array.
Default Gateway	#x8003	USINT ARRAY	4 byte	Default gateway to be assigned to station as 4 octet array.
ConfigurationFlags	#x8010	UINT	2 byte	Bitmask that enables the configuration of feature of the module. If least significant bit is high, the EtherCAT status of the EtherCAT internal bus is exported to the external bus in the first byte of the Input Mapping of the external fieldbus protocol. The default value for this parameter is 0x00000001 (exporting enabled).

4.3.3.3 Module control word

Two bytes are provided to allow to control the behavior of the module during data exchange. Reserved for future use.

Variable name	Index/Sub Index in EtherCAT OD	Data type	Length	Explanation
Reserved1	#x7000:1	USINT	1 byte	free
Reserved2	#x7000:2	USINT	1 byte	free

4.3.3.4 Module status word

Two bytes are provided for monitoring the status of the module during data exchange.

Variable name	Index/Sub Index in Ether-CAT OD	Data type	Length	Explanation
LinkStatusPort0	#x6000:1	BOOL	1 Bit	Lin status of PROFINET port 0 True = cable connected False = cable disconnected
LinkStatusPort1	#x6000:2	BOOL	1 Bit	Link status of PROFINET port 1 True = cable connected False = cable disconnected
IOReadError	#x6000:3	BOOL	1 Bit	Communication error master -> slave (PROFINET external bus) True = error False = communication OK
IOWriteError	#x6000:4	BOOL	1 Bit	Communication error slave -> master (PROFINET external bus) True = error False = communication OK
Reserved	#x6000:6	USINT	1 byte	Reserved for future use

4.3.3.5 Configuration of the data module

The following files are needed to configure the module:

File name	Explanation
KEB_C6_MFI_Profinet.xml	ESI file for internal EtherCAT slave
KEB_C6_MFI_Profinet_GSDML.xml	GSDML configuration file of the PROFINET slave

The number and length of the data modules can be configured. The ratio of input data to output data is always 1:1. Select the required data modules in the respective configurators.

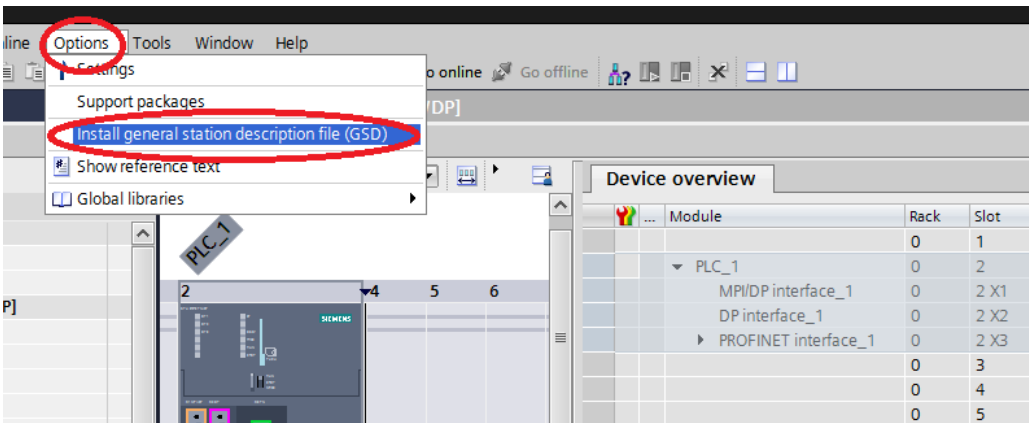
Make sure that the configuration of the EtherCAT side and the PROFIBUS side is identical.

4.3.3.6 PROFINET

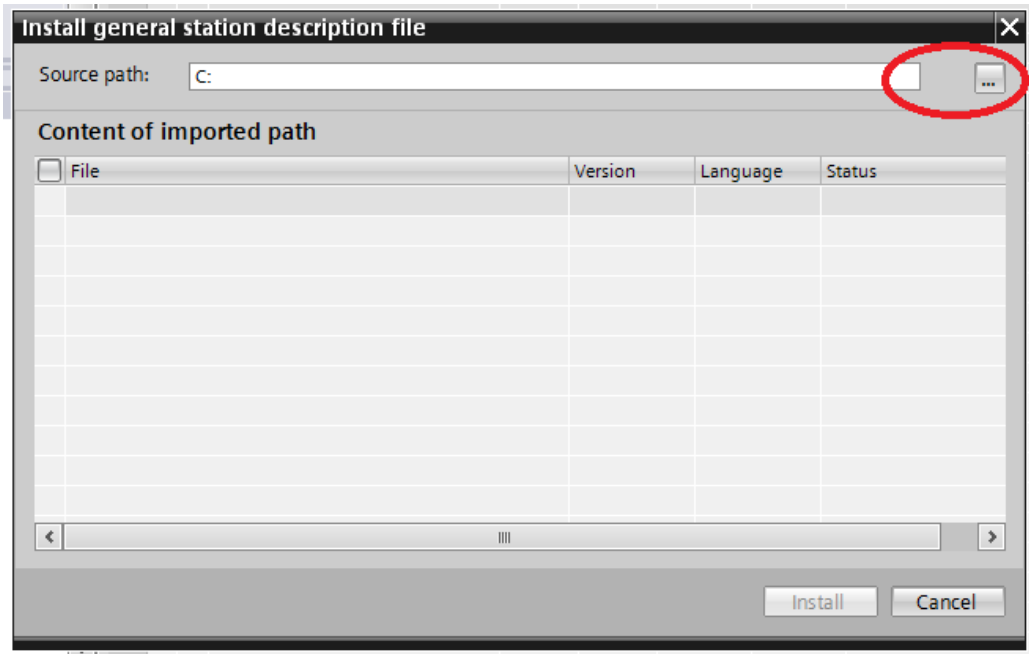
The file KEB_C6_MFI_Profinet_GSDML.xml is required for the configuration of the PROFINET. This file must be imported into the used PROFINET master configurator.

Example:
Siemens S7 as PROFINET master, configuration with step 7.

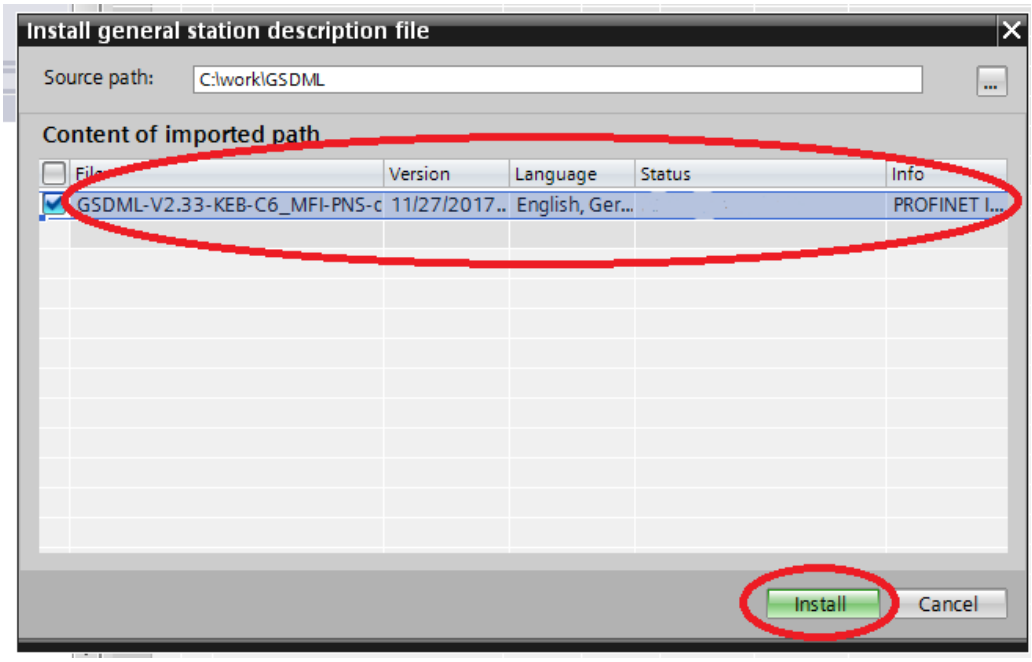
Installation of the GSDML file.
In Siemens TIA portal, go to Options ->Install general description files



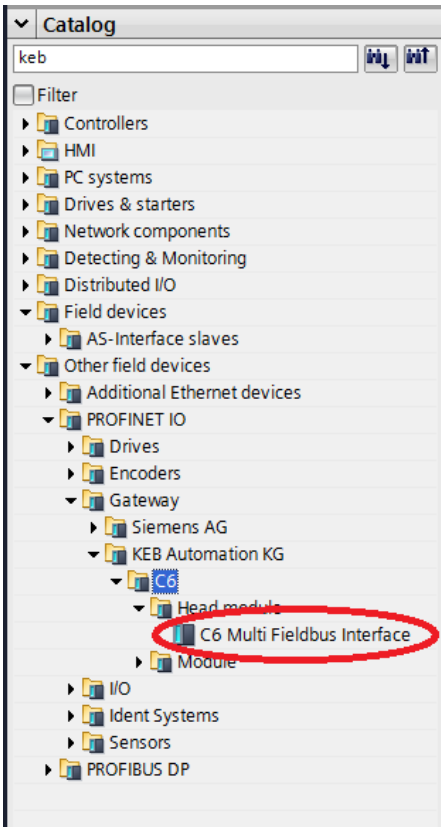
Go to the folder containing the file and select it.



The file is transferred into the system with clicking ‚Install' in the following view:



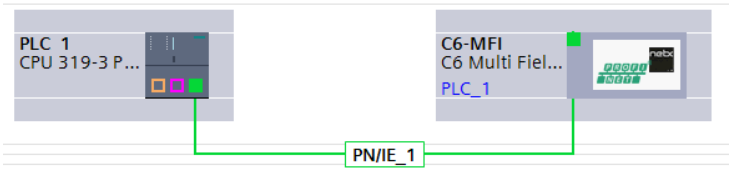
A new ‚KEB' file was opened in other field devices/PROFINET IO/Gateway/KEB Automation/C6/Head Module during installation:



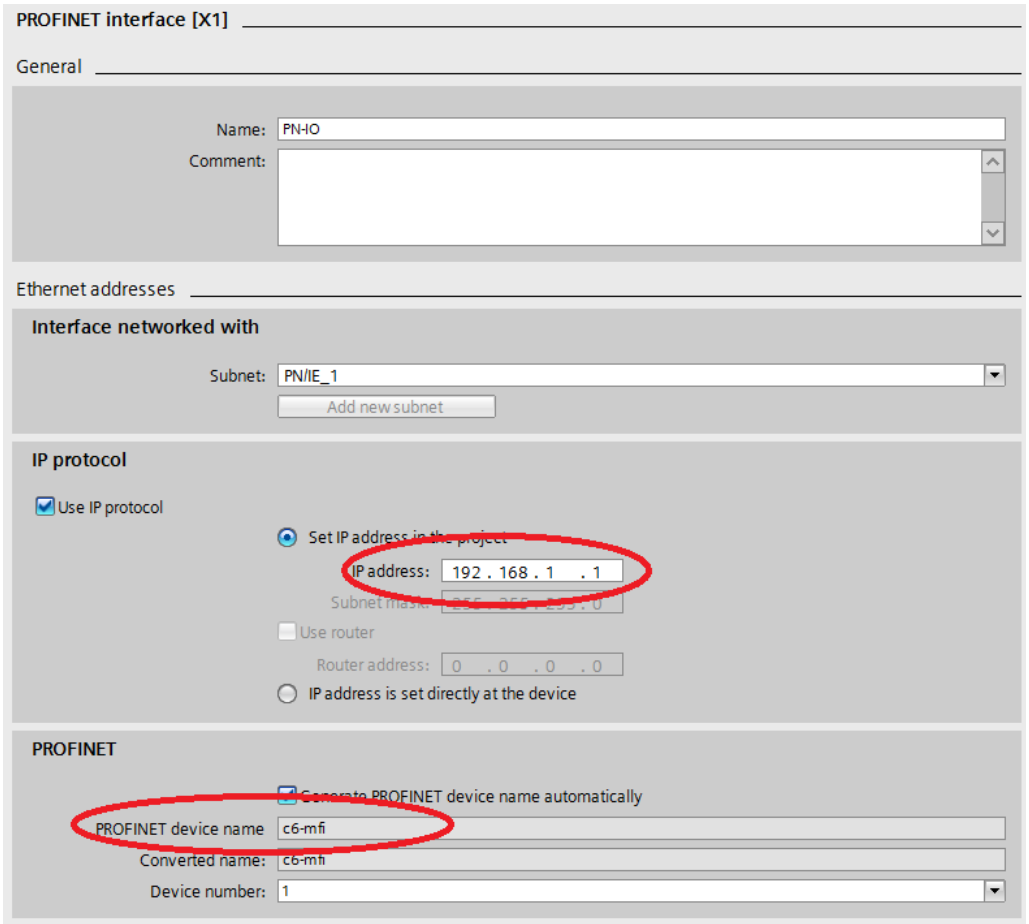
Installation of the GSDML file is completed.

Hardware configuration

After you have added one instance of the new installed unit for configuration, this can be configured as follows:



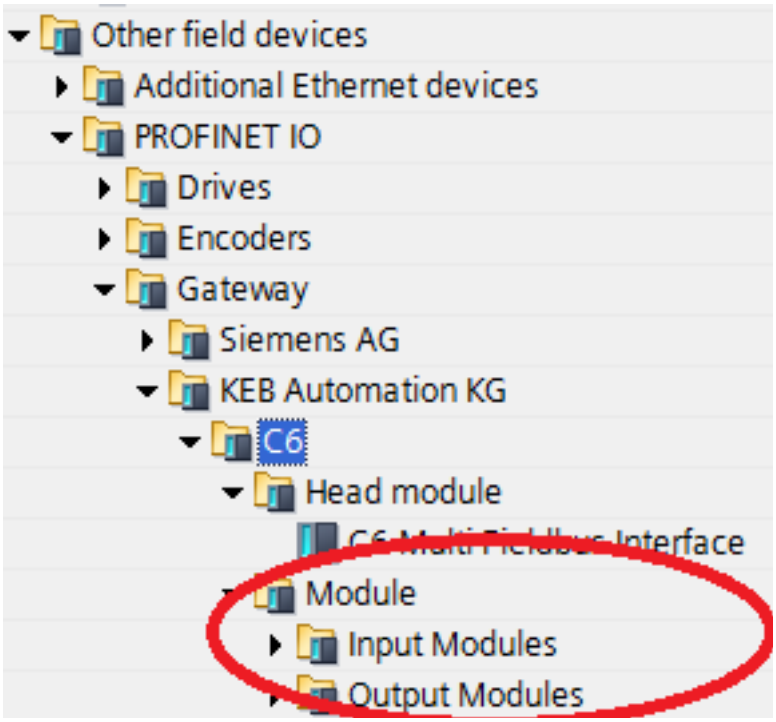
With double-click on the C6-MFI device, you go to the unit properties, where the relevant properties can be set.



Here you can assign an IP address to the station, and change the PROFINET device name, if you want to change it from the default value c6-mfi. The name you assign here must match the corresponding name that you assign in configuration parameter #x8000 (Station name) in the EtherCAT startup parameter. The IP address/Subnet mask/Router address configured here will always prevail over the corresponding parameter #x8001, #x8002 and #x8003 unless the radio button “IP address is set directly at device” is checked.

Process data configuration

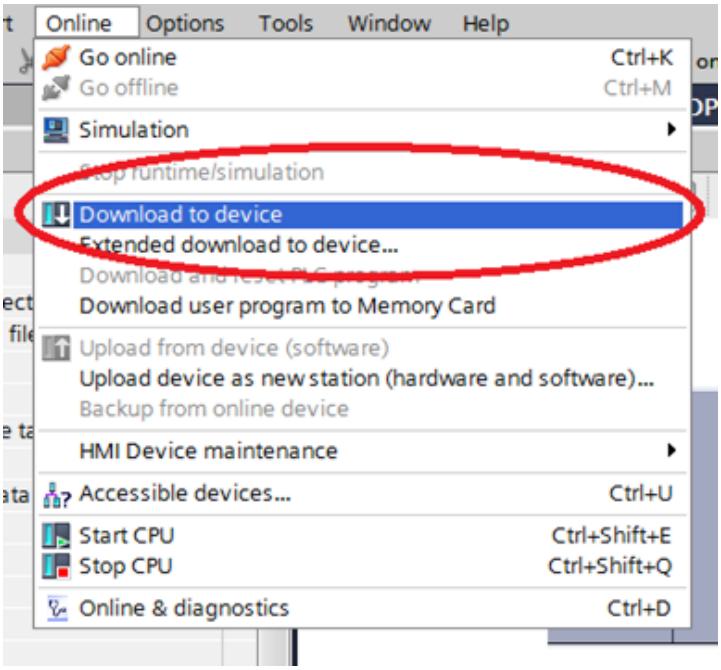
The available process data are listed under other field devices/PROFINET IO/Gateway/ KEB Automation/C6/Module



Select the desired Input/Output Modules and insert them in the “Device Overview”:

Module	...	Rack	Slot	I address	Q address	Type	Article number
C6-MFI		0	0			C6 Multi Fieldbus I...	00.C6.CH1-0200
PN-IO		0	0 X1			C6-MFI	
2 Bytes ESM status		0	1	68...69		2 Bytes Input	
2 Bytes Input_2		0	2	70...71		2 Bytes Input	
4 Bytes Input_1		0	3	72...75		4 Bytes Input	
8 Bytes Input_1		0	4	76...83		8 Bytes Input	
16 Bytes Input_1		0	5	84...99		16 Bytes Input	
32 Bytes Input_1		0	6	100...131		32 Bytes Input	
64 Bytes Input_1		0	7	132...195		64 Bytes Input	
64 Bytes Input_2		0	8	196...259		64 Bytes Input	
64 Bytes Input_3		0	9	260...323		64 Bytes Input	
64 Bytes Input_4		0	10	324...387		64 Bytes Input	
64 Bytes Input_5		0	11	388...451		64 Bytes Input	
		0	12				
2 Byte Output_1		0	13		64...65	2 Byte Output	
4 Bytes Output_1		0	14		66...69	4 Bytes Output	
8 Bytes Output_1		0	15		70...77	8 Bytes Output	
16 Bytes Output_1		0	16		78...93	16 Bytes Output	
32 Bytes Output_1		0	17		94...125	32 Bytes Output	
64 Bytes Output_1		0	18		126...189	64 Bytes Output	
64 Bytes Output_2		0	19		190...253	64 Bytes Output	
64 Bytes Output_3		0	20		254...317	64 Bytes Output	
64 Bytes Output_4		0	21		318...381	64 Bytes Output	
64 Bytes Output_5		0	22		382...445	64 Bytes Output	

After completing the settings, the new hardware configuration is transferred to the controller, selecting Online/Download to device.



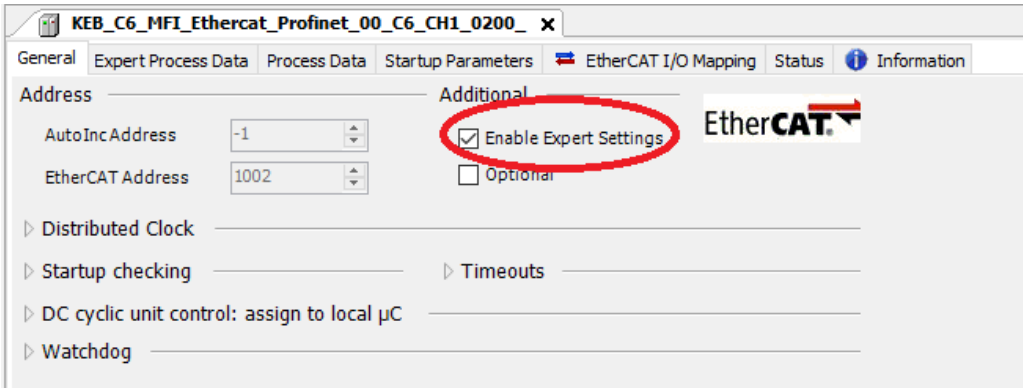
EtherCAT

Corresponding PDOs are available for the configuration of EtherCAT process data:

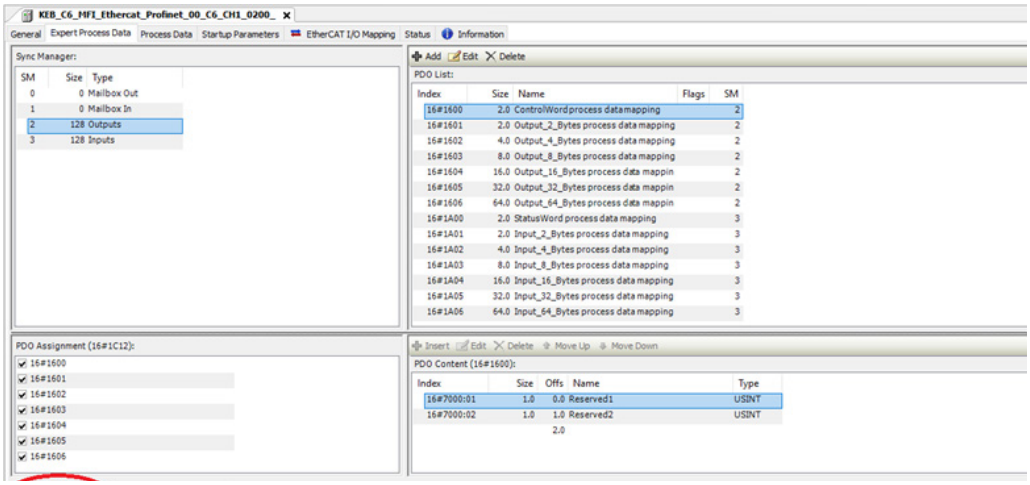
Index	Output variable	Index	Input variable
0x1600	Control word	0x1A00	Status word
0x1601	Output_2_Bytes	0x1A01	Input_2_Bytes
0x1602	Output_4_Bytes	0x1A02	Input_4_Bytes
0x1603	Output_8_Bytes	0x1A03	Input_8_Bytes
0x1604	Output_16_Bytes	0x1A04	Input_16_Bytes
0x1605	Output_32_Bytes	0x1A05	Input_32_Bytes
0x1606	Output_64_Bytes	0x1A06	Input_64_Bytes

When the PROFINET module is for configuration, the process data length to be used can be adjusted in the range process data of the module in COMBIVIS studio 6. This adjustment must agree with the adjustment of the PROFINET slave in the used PROFINET configurator.

In COMBIVIS studio 6, after adding the device KEB_C6_MFI_Ethercat_Profinet module, enable expert setting in the General tab.



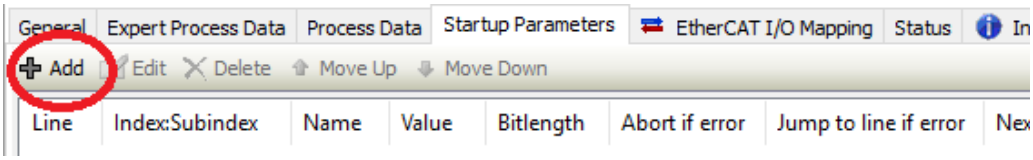
Then select the suitable PDO mapping corresponding to the one selected for the PROFINET device:



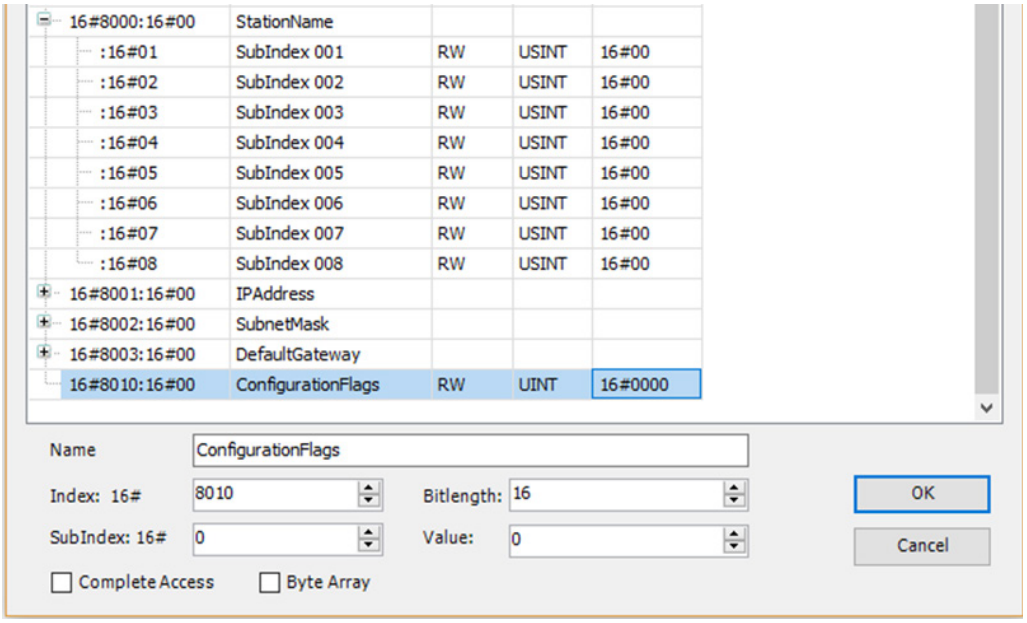
Leave the check box “Download PDO Assignment” selected.

Startup parameter configuration

The startup parameter can be configured selecting the “Startup Parameters” tab and then pressing the “Add” button:



The following dialog is displayed:



Here you can add the values for StationName, IP Address, SubnetMask and Default Gateway.

If the parameter StationName is added, it must match the one inserted in the PROFINET configuration in TIA Portal. If not set, the default name “c6-smart” will be used.

The parameters IP Address, SubnetMask and Default Gateway are not mandatory to be set, and if not they will be used from the one assigned by the PROFINET master.

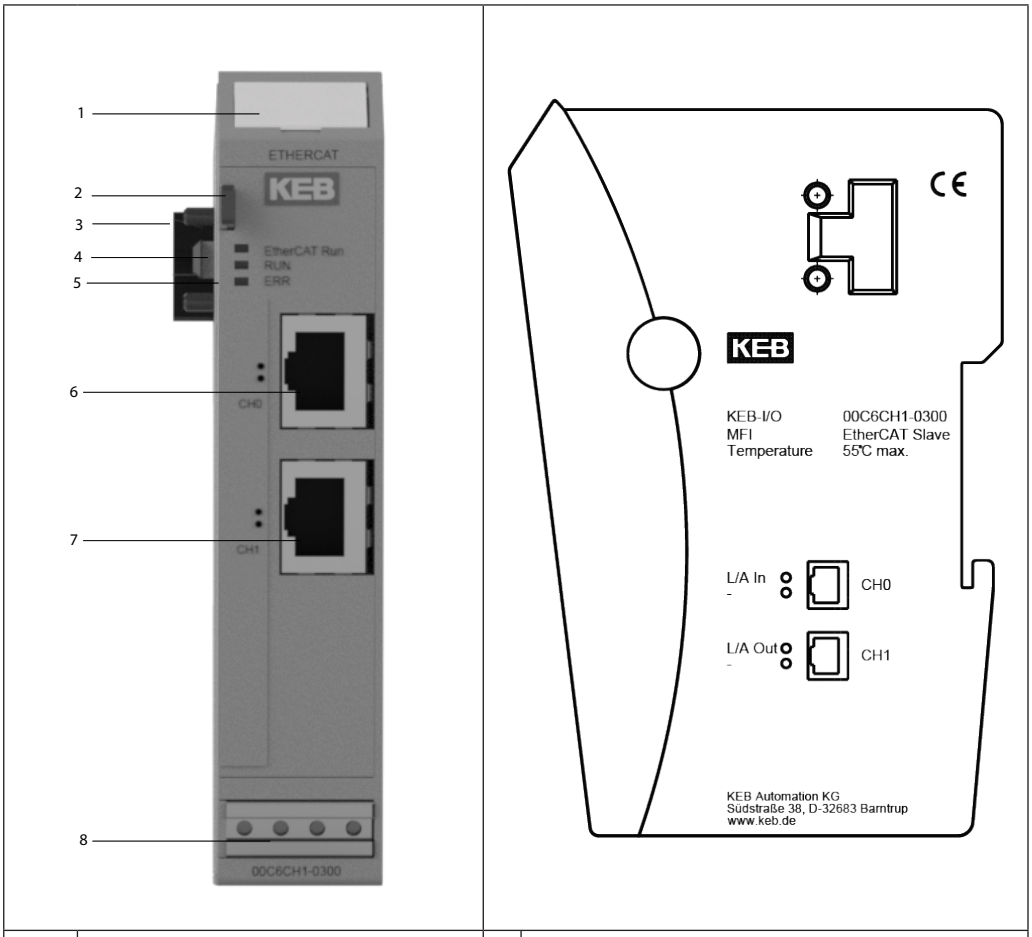
4.4 PROFINET-PN-Slave Technical Data

Material No.	00C6CH1-0200
Fieldbus1 (system)	EtherCAT 100 Mbit/s
EtherCAT file	KEB_C6_MFI.xml
Fieldbus2	PROFINET-PN-Slave
Implementation type	NetX
Connector	2 RJ 45 Ethernet connector
Baud rate	max. 100 Mbit/s
Recognition	automatically
Addressing	via EtherCAT variable
WxHxD	25x120x90mm
Installation	35mm DIN mounting rail
Controller	ASIC ET1200
Connector	10-pin system plug in side wall (E bus connector)
Term. module	not required
Voltage supply	not required, occurs via the internal E bus connector. Voltage supply must occur via the SELV/PELV circuit.
E-bus load	400mA
Electrical insulation	modules electrically insulated from one another and from the bus
Storage temperature	-25°C…+70°C
Operating temperature	0°C…+55°C
Relative humidity	5%…95% without condensation
Weight	120 g
Degree of protection	IP20 (not evaluated by UL)
Interference immunity	Zone B
Pollution degree	Degree II
Maximum operating altitude	2000 m

Table 1: PROFINET-PN-Slave - Technical data

5 EtherCAT-EC-Slave

5.1 Front



1	Identification clip	5	Status LEDs
2	Release lever	6	EtherCAT interface 1
3	E-bus connector	7	EtherCAT interface 2
4	Module locking / E-bus	8	Grounding/shield connection

Figure 4: EtherCAT-EC 00C6CH1-0300

5.2 Terminals

The module needs no separate 24V connector. Power is supplied to the module through the E-bus connector.

5.3 Status LEDs

5.3.1 „EtherCAT Run“ LED

The LED with the identification „EtherCAT Run“ indicates the state of the EtherCAT ASIC.

Status	LED, flash code	Explanation
Init	Red, on	Initializing, no data exchange
Pre-Op	Red/green, 1:1	Pre-operational, no data exchange
Safe-Op	Red/green, 3:1	Safe operation state, inputs readable
Op	Green, on	Operational, unrestricted data exchange

5.3.2 „EtherCAT“ LED

The „EtherCAT-LEDs“ display the status of the module regarding to EtherCAT.

5.3.2.1 RUN LED

The GREEN LED with the identification „RUN“ has the following meaning:

LED, flash code	Explanation
Off	The device is in state INIT
Blinking	The device is in state PREOPERATIONAL
Single Flash	The device is in state SAFEOPERATIONAL
On	Device is in operational status

5.3.2.2 ERR LED

The RED LED with the identification „ERR“ has the following meaning:

LED, flash code	Explanation
On	Application controller failure
Double Flash	Process Data Watchdog Timeout/EtherCAT Watchdog Timeout
Single Flash	Local Error
Blinking	Invalid configuration/General Configuration Error (Example: State change commanded by master is impossible due to register or object settings). It is recommended to check and correct settings and hardware options.
Off	No Error - EtherCAT communication is in working condition.

5.3.2.3 RJ45-Port LEDs

- LED CH0

L/A

The LED on channel 0 with the identification „L/A" has the following meaning:

LED, flash code	Explanation
On	Link detected/no activity
Off	No link detected
Flickering	Link detected/activity

- LED CH1

L/A

The LED on channel 1 with the identification „L/A" has the following meaning:

LED, flash code	Explanation
On	Link detected/no activity
Off	No link detected
Flickering	Link detected/activity

5.3.3 Function

The module EtherCAT-EC slave is a gateway EtherCAT/EtherCAT. It enables the data exchange between EtherCAT system (internal eBus) and an other EtherCAT system (external).

5.3.3.1 Data

The module provides up to 384 byte for user data. The size may be selected via the pdo assignment table.

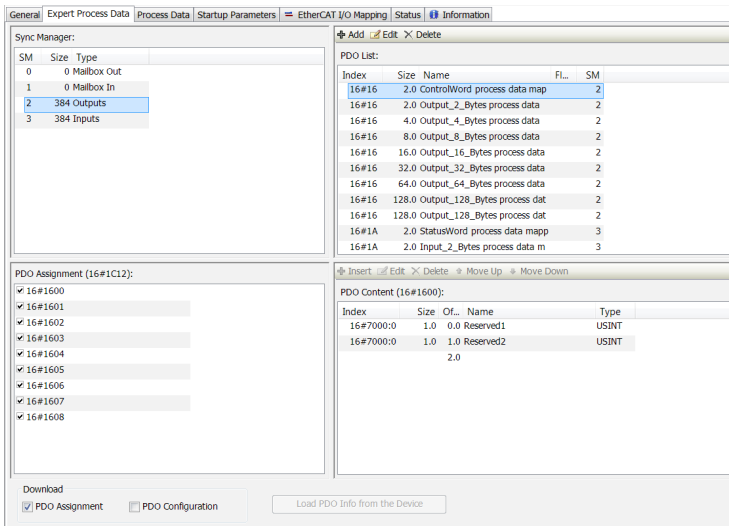


Figure 5: Expert Process Data

The PDO assignments are divided into different data sizes from 2 Bytes up to 128 Bytes.

Variable	Data type	Number	Explanation
2 Bytes Input	USINT	2	2 Bytes Input Module
4 Bytes Input	USINT	4	4 Bytes Input Module
8 Bytes Input	USINT	8	8 Bytes Input Module
16 Bytes Input	USINT	16	16 Bytes Input Module
32 Bytes Input	USINT	32	32 Bytes Input Module
64 Bytes Input	USINT	64	64 Bytes Input Module
128 Bytes Input	USINT	128	128 Bytes Input Module
2 Bytes Output	USINT	2	2 Bytes Output Module
4 Bytes Output	USINT	4	4 Bytes Output Module
8 Bytes Output	USINT	8	8 Bytes Output Module
16 Bytes Output	USINT	16	16 Bytes Output Module
32 Bytes Output	USINT	32	32 Bytes Output Module
64 Bytes Output	USINT	64	64 Bytes Output Module
128 Bytes Output	USINT	128	128 Bytes Output Module

5.3.3.2 Module start up parameters

The module can be configured with the following parameters from the EtherCAT internal bus:

Parameter name	Index in EtherCAT OD	Data type	Length	Explanation
ConfigurationFlags	#x8010	UINT	2 byte	Bitmask that enables the configuration of feature of the module. If least significant bit is high, the EtherCAT status of the EtherCAT internal bus is exported to the external bus in the first byte of the Input Mapping of the external fieldbus protocol. The default value for this parameter is 0x00000001 (exporting enabled).

5.3.3.3 Module control word

Two bytes are provided to allow to control the behavior of the module during data exchange. Reserved for future use.

Variable name	Index/Sub Index in EtherCAT OD	Data type	Length	Explanation
Reserved1	#x7000:1	USINT	1 byte	Not used
Reserved2	#x7000:2	USINT	1 byte	Not used

5.3.3.4 Module status word

Two bytes are provided for monitoring the status of the module during data exchange.

Variable name	Index/Sub Index in EtherCAT OD	Data type	Length	Explanation
LinkStatusPort0	#x6000:1	BOOL	1 bit	Lin status of EtherCAT port 0 True = cable connected False = cable disconnected
LinkStatusPort1	#x6000:2	BOOL	1 Bit	Link status of EtherCAT port 1 True = cable connected False = cable disconnected
IOReadError	#x6000:3	BOOL	1 bit	Communication error master -> slave (EtherCAT external bus) True = error False = communication OK
IOWriteError	#x6000:4	BOOL	1 bit	Communication error slave -> master (EtherCAT external bus) True = error False = communication OK
ESM_Status	#x6000:6	USINT	1 byte	Status of the ESM relative to EtherCAT external bus. The possible values are: 1 „Init“ 2 „Pre-Operational“ 3 „Bootstrap“ 4 „Safe-Operational“ 8 „Operational“

5.3.3.5 Configuration of the data module

The following files are needed to configure the module:

File name	Explanation
KEB_C6_MFI_Ethercat.xml	ESI file for the internal EtherCAT slave
KEB_C6_MFI_Ethercat_External.xml	ESI file for the external EtherCAT slave

The number and length of the data modules can be configured. The ratio of input data to output data is always 1:1. Select the required data modules in the respective configurators.

Make sure that the configuration of the EtherCAT internal e-bus side and the EtherCAT external side is identical.

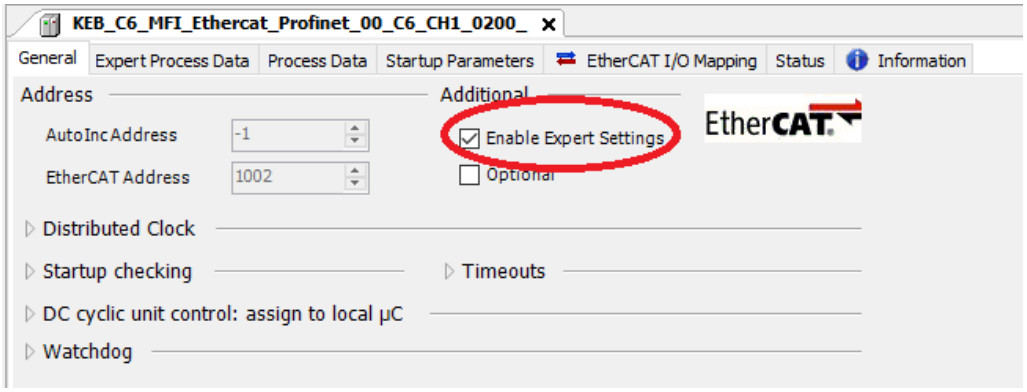
5.3.3.6 EtherCAT external bus

EtherCAT

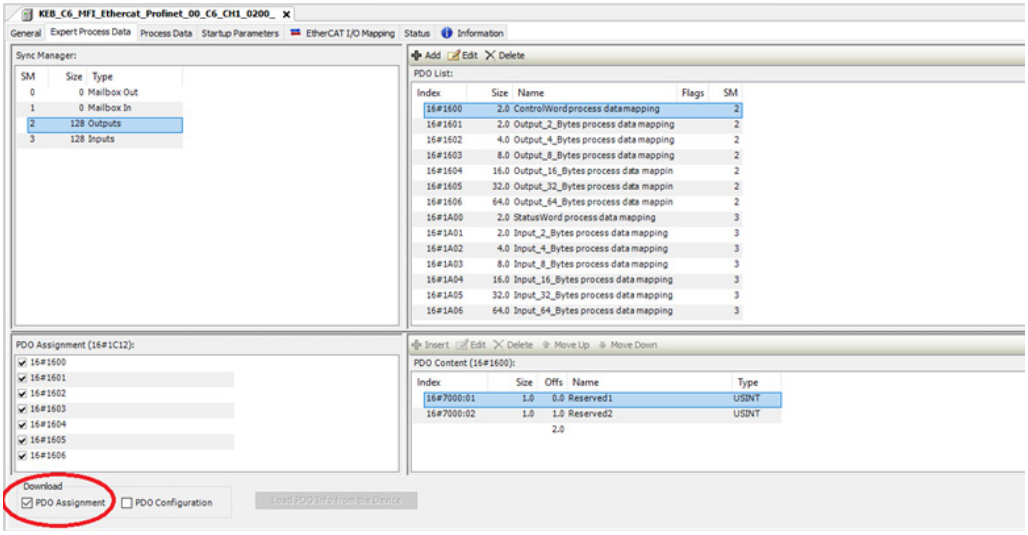
Corresponding PDOs are available for the configuration of EtherCAT process data:

Index	Output variable	Index	Input variable
0x1600	Control word	0x1A00	Status word
0x1601	Output_2_Bytes	0x1A01	Input_2_Bytes
0x1602	Output_4_Bytes	0x1A02	Input_4_Bytes
0x1603	Output_8_Bytes	0x1A03	Input_8_Bytes
0x1604	Output_16_Bytes	0x1A04	Input_16_Bytes
0x1605	Output_32_Bytes	0x1A05	Input_32_Bytes
0x1606	Output_64_Bytes	0x1A06	Input_64_Bytes
0x1607	Output_128_Bytes	0x1A07	Input_128_Bytes
0x1608	Output_128_Bytes	0x1A08	Input_128_Bytes

In COMBIVIS studio 6, after adding the device KEB_C6_MFI_Ethercat_Ethercat module, enable expert setting in the General tab:



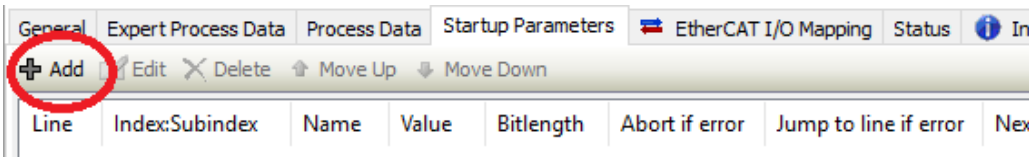
Then select the suitable PDO mapping corresponding to the one selected for the PROFINET device:



Leave the check box “Download PDO Assignment” selected.

Startup parameter configuration

The startup parameter can be configured selecting the “Startup Parameters” tab and then pressing the “Add” button:



Here you can change the values for parameter ConfigurationFlags.

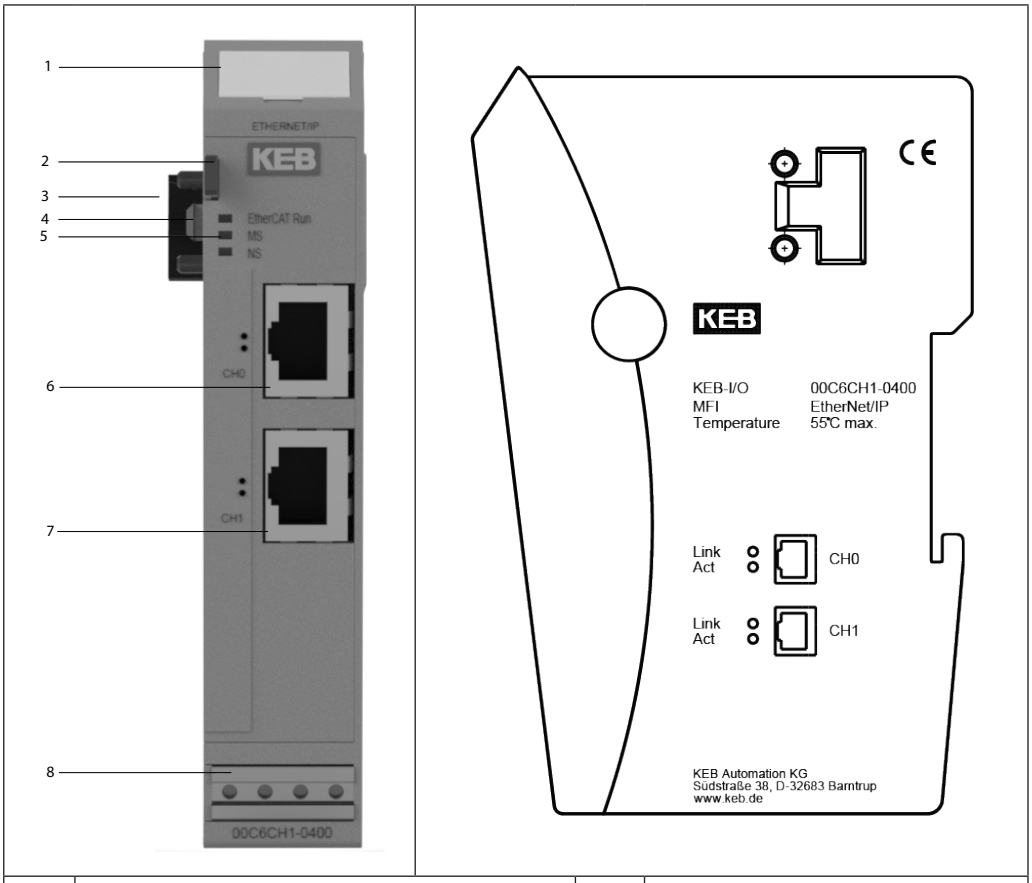
5.4 EtherCAT-EC-Slave Technical Data

Material No.	00C6CH1-0300
Fieldbus1 (system)	EtherCAT 100 Mbit/s
EtherCAT file	KEB_C6_MFI_EtherCAT.xml
Fieldbus2	EtherCAT Slave
Implementation type	NetX
Connector	2 RJ 45 Ethernet connector
Baud rate	max. 100 Mbit/s
Recognition	automatically
Addressing	Topological or via EtherCAT Device Alias (set by EtherCAT master in external bus)
WxHxD	25x120x90mm
Installation	35mm DIN mounting rail
Controller	ASIC ET1200
Connector	10-pin system plug in side wall: E bus connector
Term. module	not required
Voltage supply	not required, occurs via the internal E bus connector. Voltage supply must occur via the SELV/PELV circuit.
E-bus load	400mA
Electrical insulation	modules electrically insulated from one another and from the bus
Storage temperature	-25°C…+70°C
Operating temperature	0°C…+55°C
Relative humidity	5%…95% without condensation
Weight	120 g
Degree of protection	IP20 (not evaluated by UL)
Interference immunity	Zone B
Pollution degree	Degree II
Maximum operating altitude	2000 m

Table 2: EtherCAT-EC-Slave - Technical data

6 ETHERNET/IP-EI-Slave

6.1 Front



1	Identification clip	5	Status LEDs
2	Release lever	6	ETHERNET interface 1
3	E bus connector	7	ETHERNET interface 2
4	Module locking / E bus		Grounding/shield connection

Figure 6: Ethernet/IP-EI 00C6CH1-0400

6.2 Terminals

The module needs no separate 24V connector. Power is supplied to the module through the E-bus connector.

6.3 Status LEDs

6.3.1 „EtherCAT Run“ LED

The LED labelled „EtherCAT Run“ indicates the state of the EtherCAT ASIC.

Status	LED, flash code	Explanation
Init	Red, on	Initializing, no data exchange
Pre-Op	Red/green, 1:1	Pre-operational, no data exchange
Safe-Op	Red/green, 3:1	Safe operation state, inputs readable
Op	Green, on	Operational, unrestricted data exchange

6.3.2 „ETHERNET/IP“ LED

The „ETHERNET/IP-LEDs“ display the status of the module regarding to ETHERNET/IP.

6.3.2.1 MS LED (Module Status LED)

The LED with the identification „MS“ has the following meaning:

LED, flash code	Explanation
Off	No power supplied to module
Flashing green/red	Device is performing its power up testing
Flashing green	Standby, the device has not been configured
Green	Device is in operational status
Flashes red	Device has detected minor fault
Red	Device has detected major fault

6.3.2.2 NS LED (Network Status LED)

The LED with the identification „NS” has the following meaning:

LED, flash code	Explanation
Off	No power supplied to device or no IP address assigned
Flashing green	IP address assigned to device, but no connection established or previous established connection has timed out
Green	At least a connection to the device has been established
Flashing green/red	Power On Self Test
Red	The device is in conflict mode

6.3.2.3 RJ45-Port LEDs

- LED CH0

Link

The LED on channel 0 with the identification „Link” has the following meaning:

LED, flash code	Explanation
Green, on	Link status active
Off	No link detected

Act - RX/TX

The LED on channel 0 with the identification „Link” has the following meaning:

LED, flash code	Explanation
Yellow, on	Communication active
Off	No communication

- LED CH1

Link

The LED on channel 1 with the identification „LINK” has the following meaning:

LED, flash code	Explanation
Green, on	Link status active
Off	No link detected

Act - RX/TX

The LED on channel 1 with the identification „ACT” has the following meaning:

LED, flash code	Explanation
Yellow, on	Communication active
Off	No communication

6.3.3 Function

The module ETHERNET/IP-EI slave is a gateway EtherCAT/Ethernet/IP-EI. It enables the data exchange between EtherCAT system and Ethernet/IP-EI system.

6.3.3.1 Data

The module provides up to 384 byte for user data. The size may be selected via the pdo assignment table.

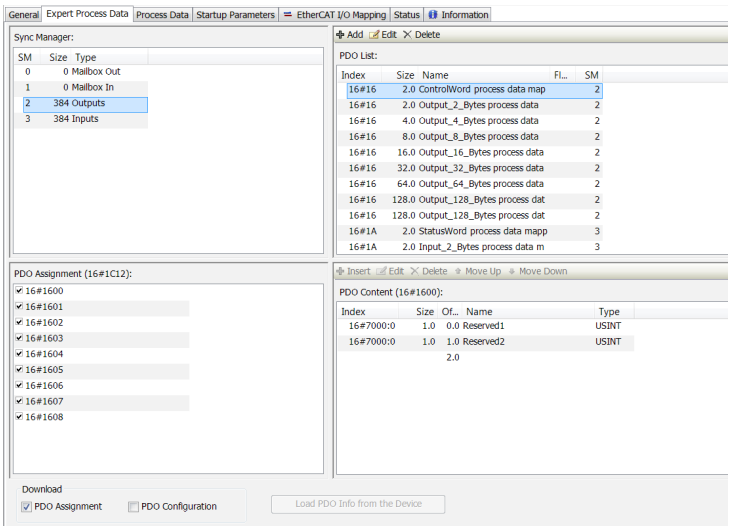


Figure 7: Expert Process Data

The PDO assignments are divided into different data sizes from 2 Bytes up to 128 Bytes.

Variable	Data type	Number	Explanation
2 Bytes Input	USINT	2	2 Bytes Input Module
4 Bytes Input	USINT	4	4 Bytes Input Module
8 Bytes Input	USINT	8	8 Bytes Input Module
16 Bytes Input	USINT	16	16 Bytes Input Module
32 Bytes Input	USINT	32	32 Bytes Input Module
64 Bytes Input	USINT	64	64 Bytes Input Module
128 Bytes Input	USINT	128	128 Bytes Input Module
2 Bytes Output	USINT	2	2 Bytes Output Module
4 Bytes Output	USINT	4	4 Bytes Output Module
8 Bytes Output	USINT	8	8 Bytes Output Module
16 Bytes Output	USINT	16	16 Bytes Output Module
32 Bytes Output	USINT	32	32 Bytes Output Module
64 Bytes Output	USINT	64	64 Bytes Output Module
128 Bytes Output	USINT	128	128 Bytes Output Module

6.3.3.2 Module start up parameters

The module can be configured with the following parameters from the EtherCAT internal bus:

Parameter name	Index in EtherCAT OD	Data type	Length	Explanation
IPAddress	#x8001	USINT ARRAY	4 byte	IP address to be assigned to station as 4 octet array
SubnetMask	#x8002	USINT ARRAY	4 byte	Subnet mask to be assigned to station as 4 octet array
Default Gateway	#x8003	USINT ARRAY	4 byte	Default gateway to be assigned to station as 4 octet array
ConfigurationFlags	#x8010	UINT	2 byte	Bitmask that enables the configuration of feature of the module. If least significant bit is high, the EtherCAT status of the EtherCAT internal bus is exported to the external bus in the first byte of the Input Mapping of the external fieldbus protocol. The default value for this parameter is 0x00000001 (exporting enabled).

6.3.3.3 Module Control Word

Two bytes are provided to allow to control the behavior of the module during data exchange. Reserved for future use.

Variable name	Index/Sub Index in EtherCAT OD	Data type	Length	Explanation
Reserved1	#x7000:1	USINT	1 byte	Not used
Reserved2	#x7000:2	USINT	1 byte	Not used

6.3.3.4 Module Status Word

Two bytes are provided for monitoring the status of the module during data exchange.

Variable name	Index/Sub Index in Ether-CAT OD	Data type	Length	Explanation
LinkStatusPort0	#x6000:1	BOOL	1 bit	Lin status of Ethernet/IP port 0 True = cable connected False = cable disconnected
LinkStatusPort1	#x6000:2	BOOL	1 bit	Link status of Ethernet/IP port 1 True = cable connected False = cable disconnected
IOReadError	#x6000:3	BOOL	1 bit	Communication error master -> slave (Ethernet/IP external bus) True = error False = communication OK
IOWriteError	#x6000:4	BOOL	1 bit	Communication error slave -> master (Ethernet/IP external bus) True = error False = communication OK
Reserved	#x6000:6	USINT	1 byte	Reserved for future use

6.3.3.5 Configuration of the data module

The following files are needed to configure the module:

File name	Explanation
KEB_C6_MFI_EthernetIP.xml	ESI file for internal EtherCAT bus
KEB_C6_MFI_EthernetIP.eds	EDS file for the EthernetIP network configuration

The number and length of the data modules can be configured. The ratio of input data to output data is always 1:1. Select the required data modules in the respective configurators.

Make sure that the configuration of the EtherCAT side and the Ethernet/IP side is identical.

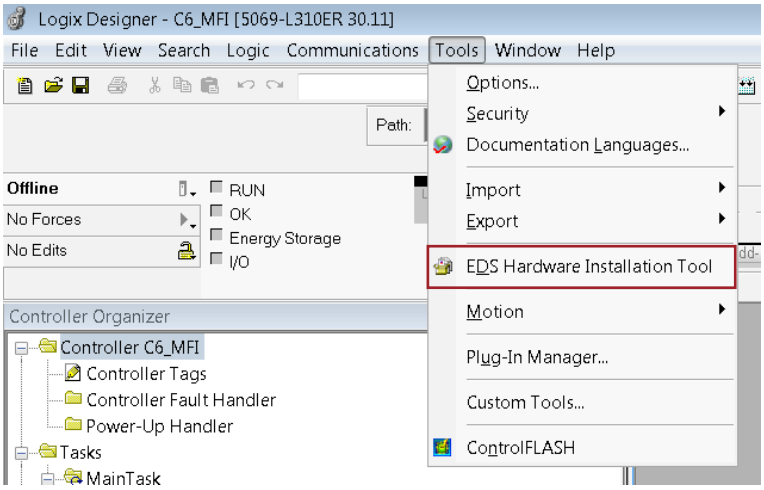
6.3.3.6 Ethernet/IP

Example:

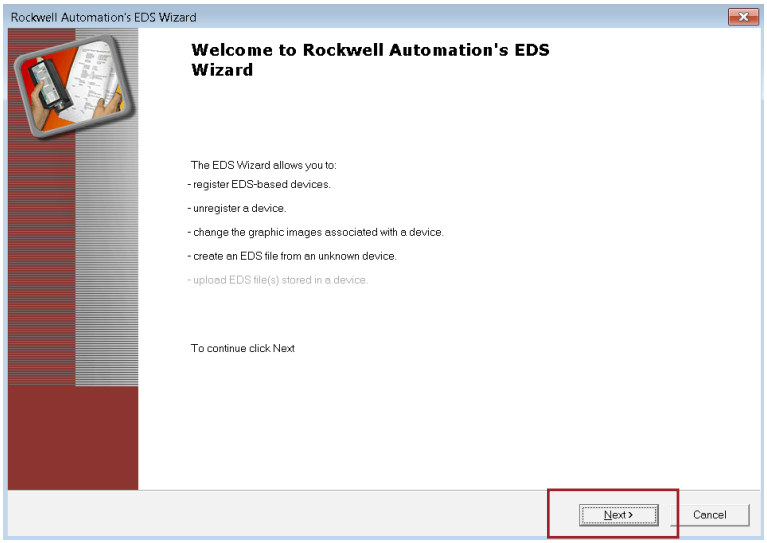
Allen Bradley Compact Logix as Ethernet/IP Scanner, configuration with Studio 5000.

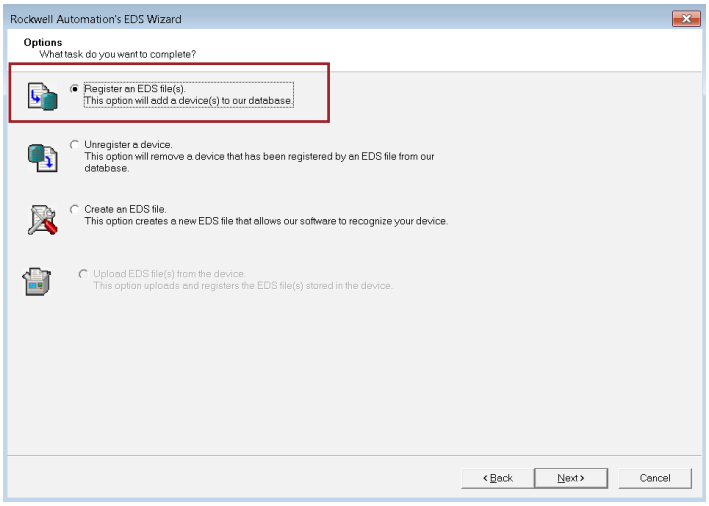
Installation of the EDS file.

In Studio 5000, open the EDS Hardware Installation Tool. Tools -> EDS Hardware Installation Tool. The EDS Hardware Installation Tool will provide a guided installation of the EDS file.

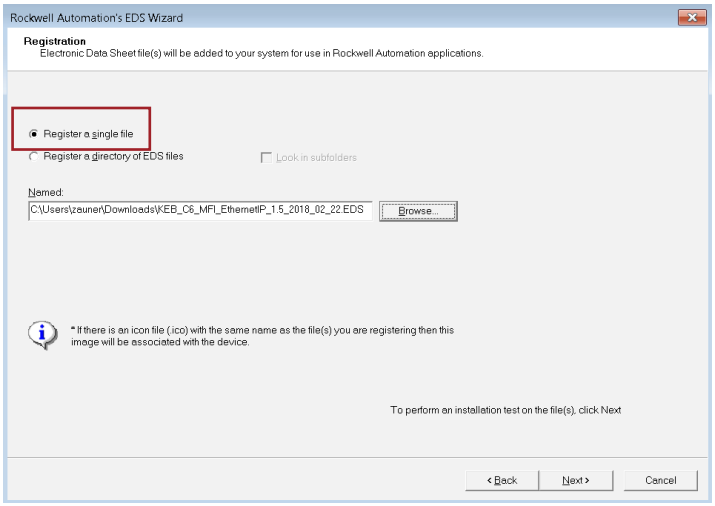


Select the “Register and EDS file(s)” option.

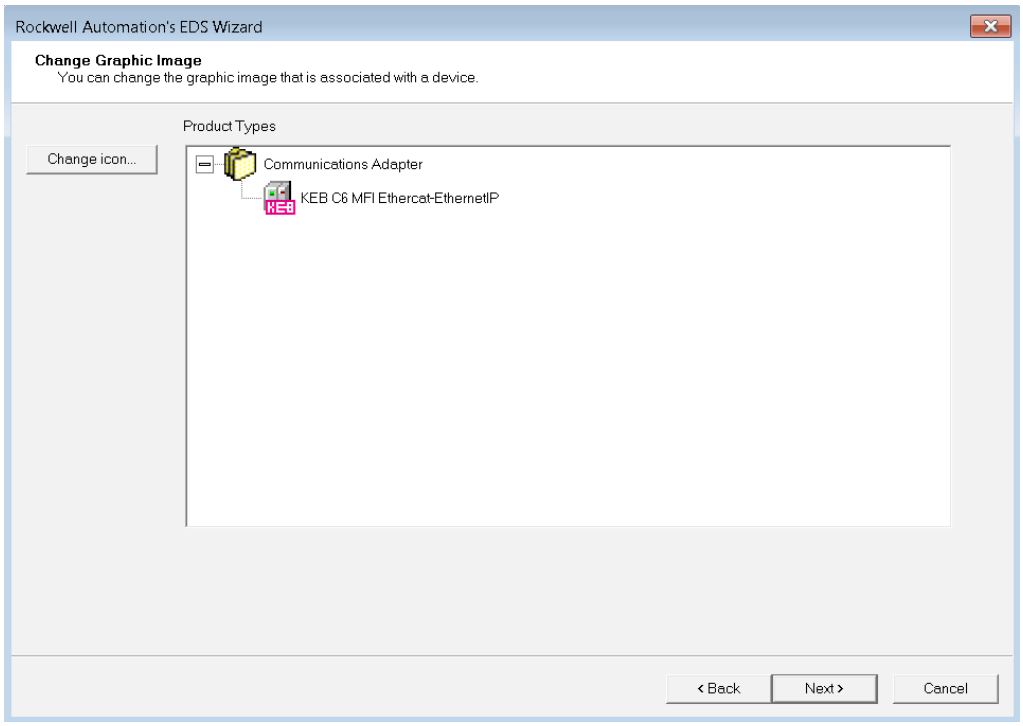


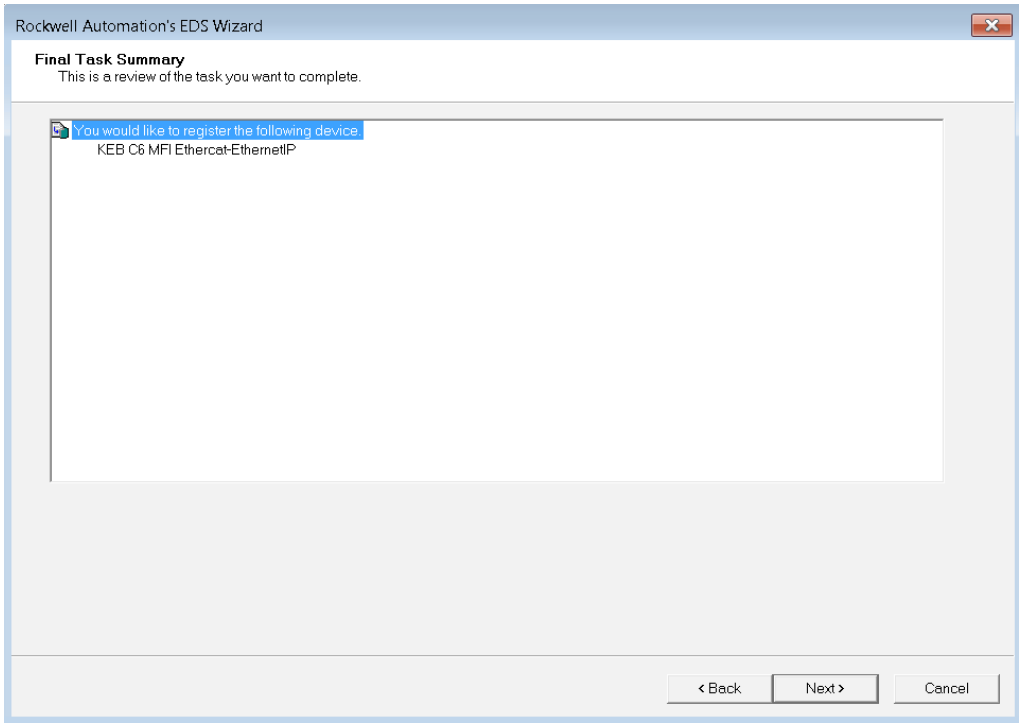


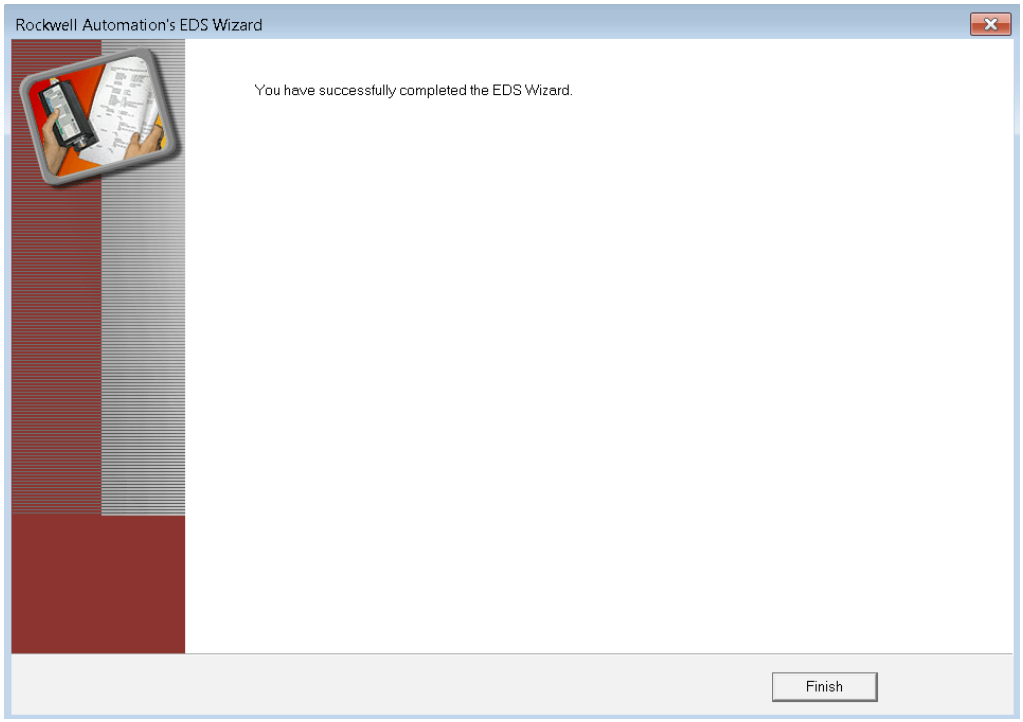
Browse and select the KEB_C6_MFI_EthernetIP.EDS file.



After successfully installing the EDS file, select next until the wizard is completed. The KEB icon has already been associated with the C6 MFI EDS.



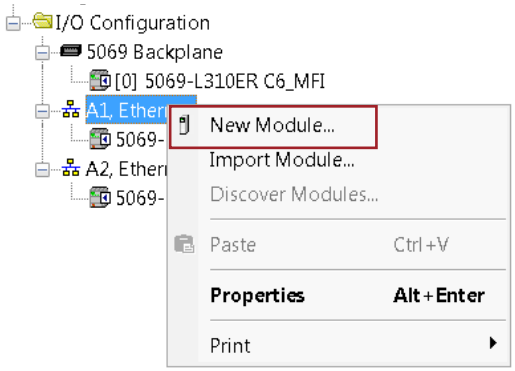




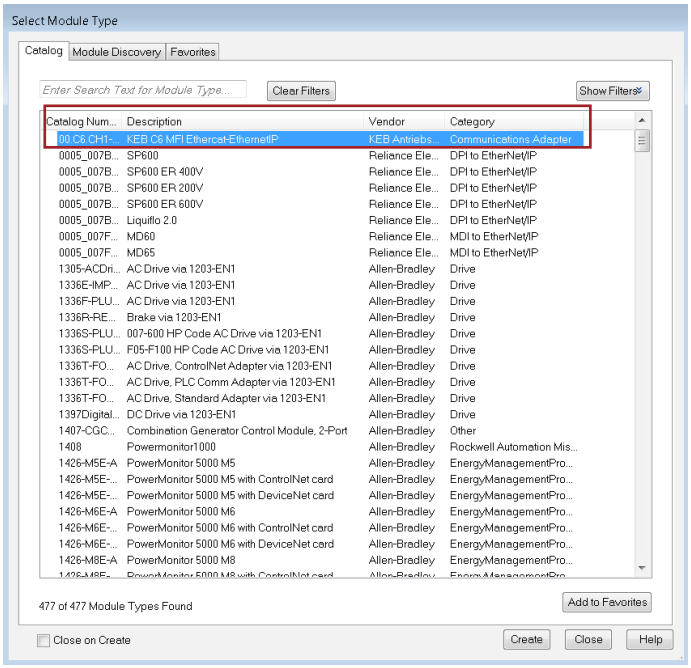
Hardware and Process Data Configuration

After you have successfully added the MFI into the device database, the MFI can be configured as follows:

Add the MFI into the I/O Configuration according to your physical network. Right-click on the desired interface and select “New Module”.

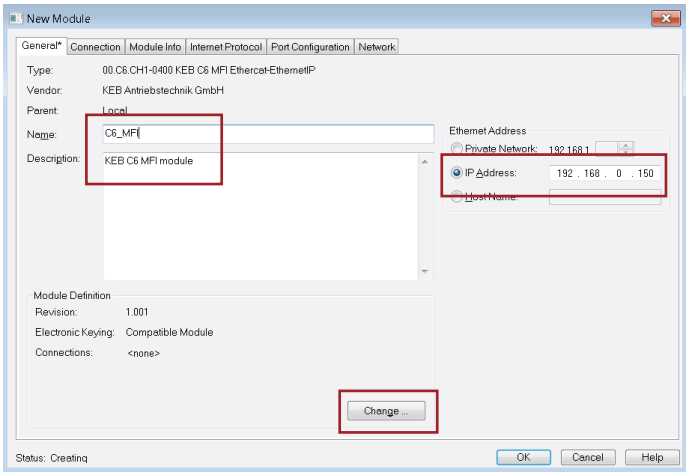


Select the C6 MFI from the device database and select Create.

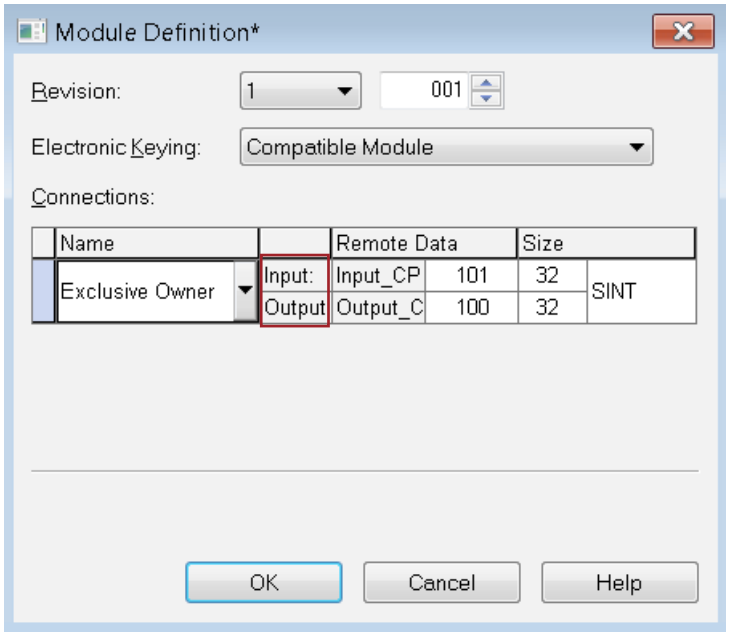


After selecting Create, the New Module window will open allowing you to configure the module.

Add a descriptive name for the Name entry and configure the IP Address.

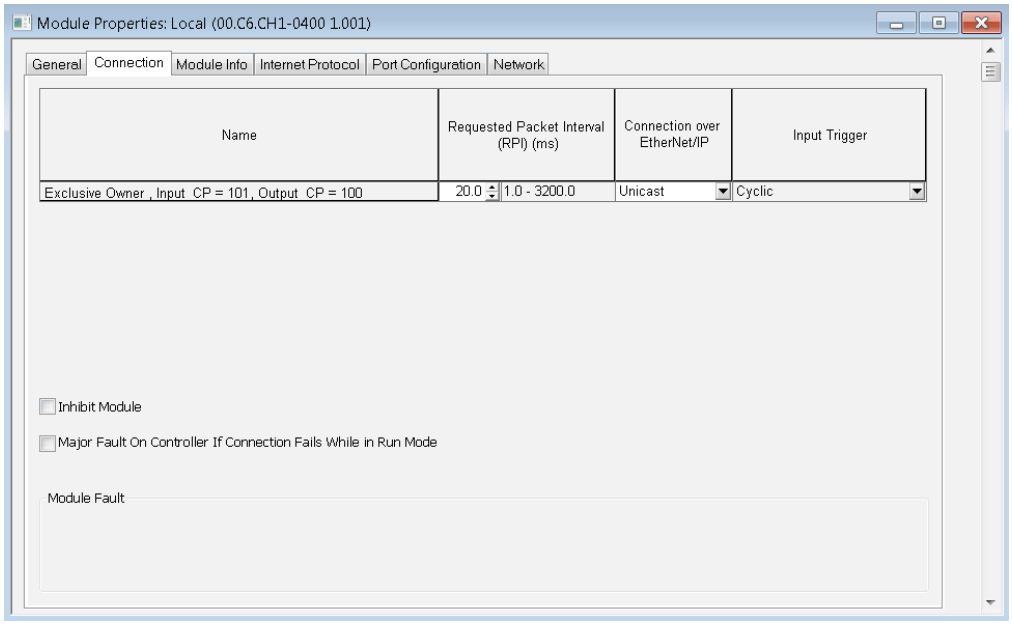


Then, select the desired Input/Output size by selecting “Change” and set “Connections” name to Exclusive Owner.



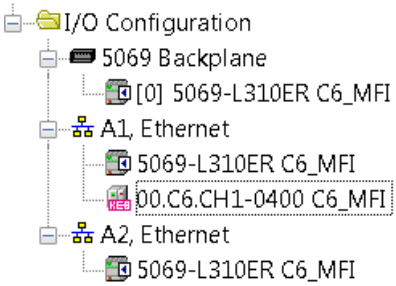
The defined IP address and Input/Output length must match the corresponding settings in the COMBIVIS studio 6 (See EtherCAT section)

Next, the Requested Packet Interval (RPI) can be configured in the “Connection” tab.

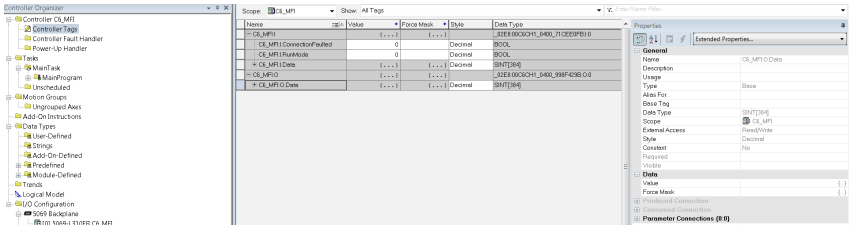


Finally, select “OK” to finish the configuration of the module.

After successfully adding the C6 MFI module into the I/O Configuration the C6 MFI icon will be displayed under the desired interface.



At this point the process data will now be available in the Controller Tags.



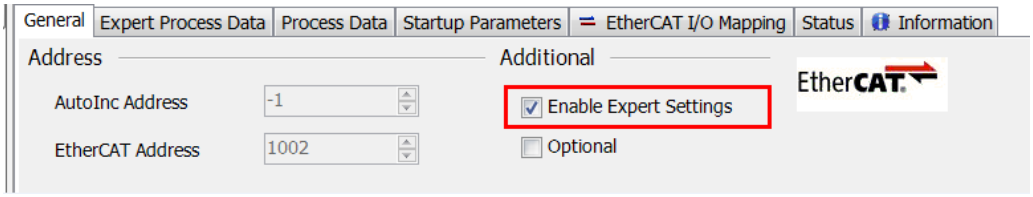
EtherCAT

Corresponding PDOs are available for the configuration of EtherCAT process data:

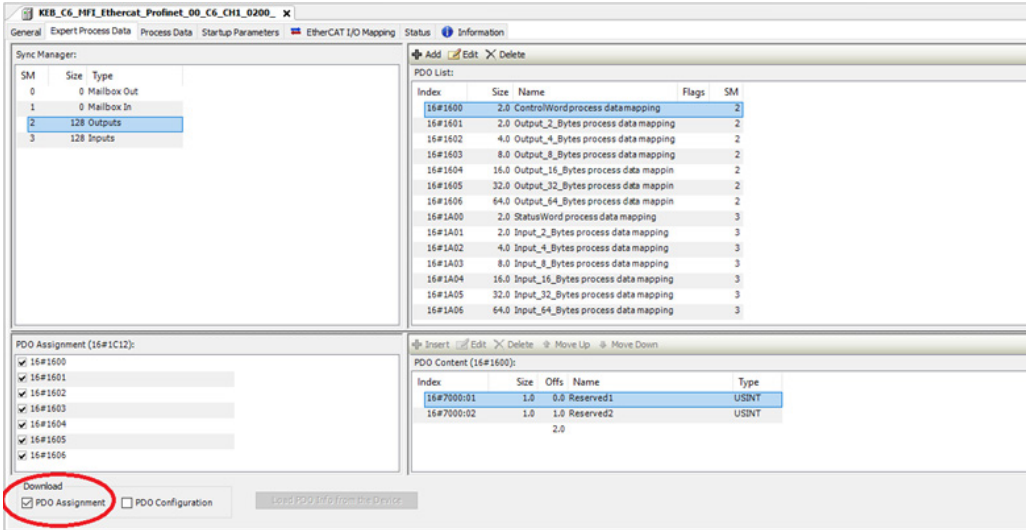
Index	Output variable	Index	Input variable
0x1600	Control word	0x1A00	Status word
0x1601	Output_2_Bytes	0x1A01	Input_2_Bytes
0x1602	Output_4_Bytes	0x1A02	Input_4_Bytes
0x1603	Output_8_Bytes	0x1A03	Input_8_Bytes
0x1604	Output_16_Bytes	0x1A04	Input_16_Bytes
0x1605	Output_32_Bytes	0x1A05	Input_32_Bytes
0x1606	Output_64_Bytes	0x1A06	Input_64_Bytes
0x1607	Output_128_Bytes	0x1A07	Input_128_Bytes
0x1608	Output_128_Bytes	0x1A08	Input_128_Bytes

When the Ethernet/IP module is for configuration, the process data length to be used can be adjusted in the range process data of the module in COMBIVIS studio 6. This adjustment must agree with the adjustment of the Ethernet/IP adapter in the used Ethernet/IP configurator.

In COMBIVIS studio 6, after adding the device KEB_C6_MFI_EthernetIP module, enable expert setting in the General tab.



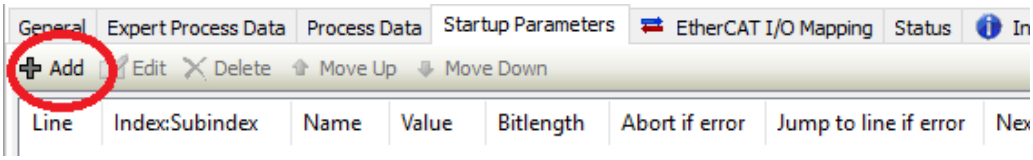
Then select the suitable PDO mapping corresponding to the one selected for the EtherNetIP device:



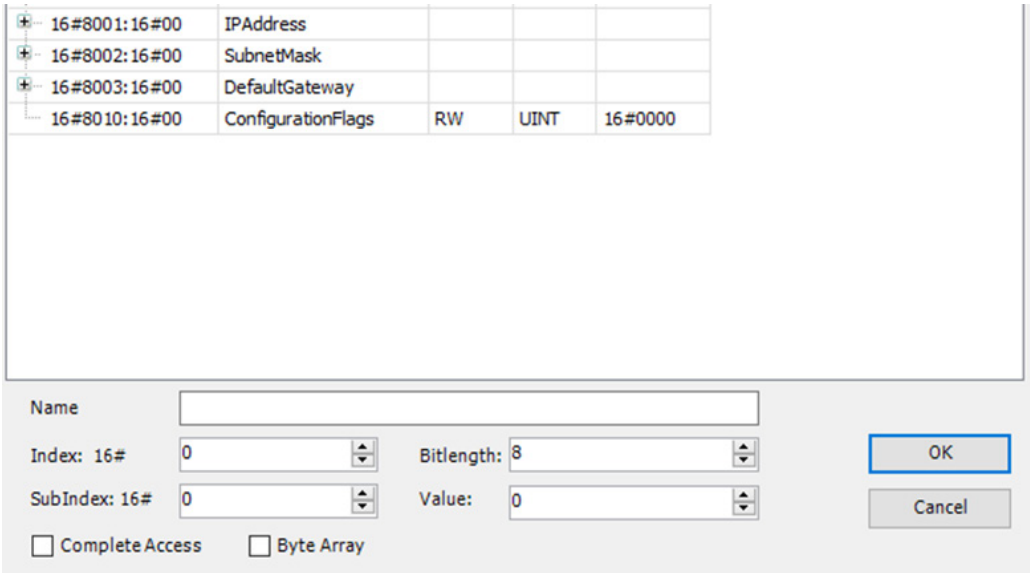
Leave the check box “Download PDO Assignment” selected.

Startup parameter configuration

The startup parameter can be configured selecting the “Startup Parameters” tab and then pressing the “Add” button:



The following dialog is displayed:



Here you can add the values for IP Address, SubnetMask, Default Gateway and ConfigurationFlags parameters.

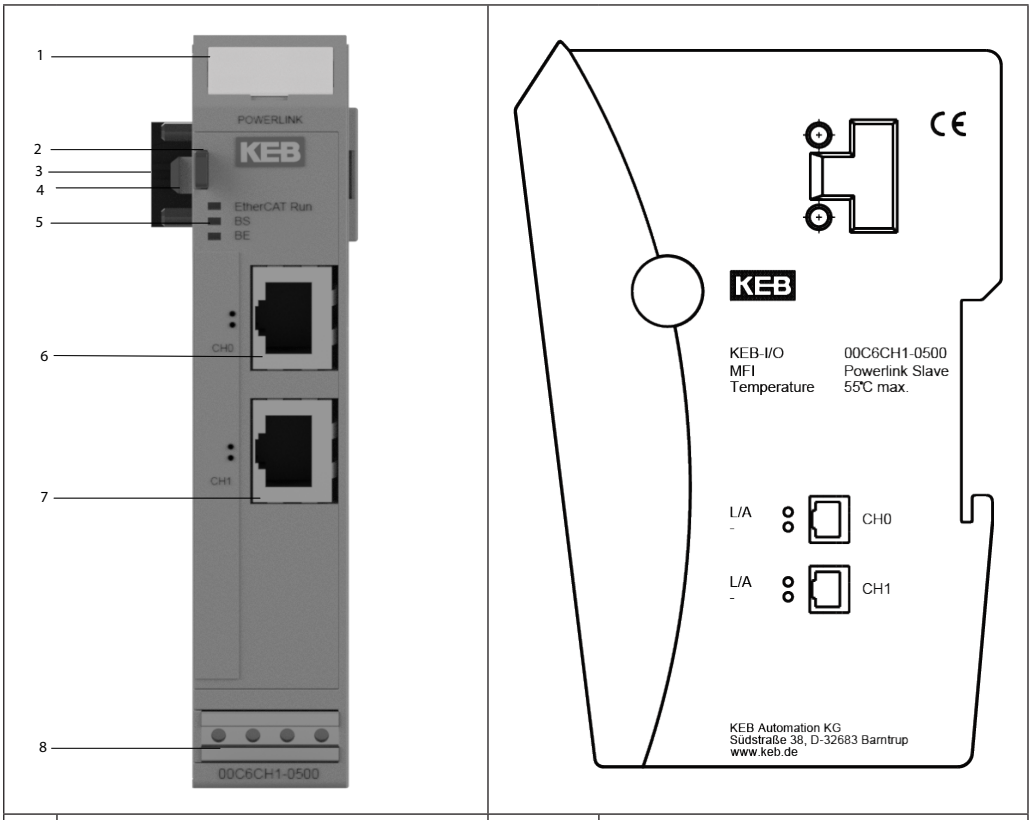
6.4 Ethernet/IP-EI-Slave Technical Data

Material No.	00C6CH1-0400
Fieldbus1 (system)	EtherCAT 100 Mbit/s
EtherCAT file	KEB_C6_MFI_EthernetIP.xml
Fieldbus2	Ethernet/IP-EI-Slave
Implementation type	NetX
Connector	2 RJ 45 Ethernet connector
Baud rate	max. 100 Mbit/s
Recognition	automatically
Addressing	via EtherCAT variable
WxHxD	25x120x90mm
Installation	35mm DIN mounting rail
Controller	ASIC ET1200
Connector	10-pin system plug in side wall: E bus connector
Term. module	not required
Voltage supply	not required, occurs via the internal E bus connector. Voltage supply must occur via the SELV/PELV circuit.
E-bus load	400mA
Electrical insulation	modules electrically insulated from one another and from the bus
Storage temperature	-25°C…+70°C
Operating temperature	0°C…+55°C
Relative humidity	5%…95% without condensation
Weight	120 g
Degree of protection	IP20 (not evaluated by UL)
Interference immunity	Zone B
Pollution degree	Degree II
Maximum operating altitude	2000 m

Table 3: Ethernet-EI-Slave - Technical data

7 POWERLINK-PL-Slave

7.1 Front



1	Identification clip	5	Status LEDs
2	Release lever	6	POWERLINK interface 1
3	E bus connector	7	POWERLINK interface 2
4	Module locking / E bus	8	Grounding/shield connection

Figure 8: POWERLINK-PL 00C6CH1-0500

7.2 Terminals

The module needs no separate 24V connector. Power is supplied to the module through the E-bus connector.

7.3 Status LEDs

7.3.1 „EtherCAT Run“ LED

The LED labelled „EtherCAT Run“ indicates the state of the EtherCAT ASIC.

Status	LED, flash code	Explanation
Init	Red, on	Initializing, no data exchange
Pre-Op	Red/green, 1:1	Pre-operational, no data exchange
Safe-Op	Red/green, 3:1	Safe operation state, inputs readable
Op	Green, on	Operational, unrestricted data exchange

7.3.2 „POWERLINK“ LED

The „POWERLINK LEDs“ display the status of the module regarding to Powerlink Controlled Node.

7.3.2.1 BS LED

The LED labelled „BS“ (Bus State) is a GREEN LED and has the following meaning:

LED, flash code	Explanation
Off	Slave initializing
Blinking (2.5 Hz)	Slave in Stopped state
Flickering (10 Hz)	Slave in Basic Ethernet state
Single Flash	Slave in Pre-Operational1 state
Double Flash	Slave in Pre-Operational2 state
Triple Flash	Slave in ReadyToOperate State
On	Slave in Operational state

7.3.2.2 BE LED

The LED labelled „BE” (Bus Error) is a RED LED has the following meaning:

LED, flash code	Explanation
On	Slave has detected an error
Off	Slave has no error

7.3.2.3 RJ45 Port LEDs

- LED CH0

L/A

The LED on channel 0 with the identification „L/A” has the following meaning:

LED, flash code	Explanation
On	Link detected/no activity
Off	No link detected
Flickering (load dependent)	Link detected/activity

- LED CH1

L/A

The LED on channel 1 with the identification „L/A” has the following meaning:

LED, flash code	Explanation
On	Link detected/no activity
Off	No link detected
Flickering (load dependent)	Link detected/activity

7.3.3 Function

The module POWERLINK-PL slave is a gateway EtherCAT/Powerlink. It enables the data exchange between EtherCAT system (internal eBus) and an external Powerlink network.

7.3.3.1 Data

The module provides up to 384 byte for user data. The size may be selected via the pdo assignment table.

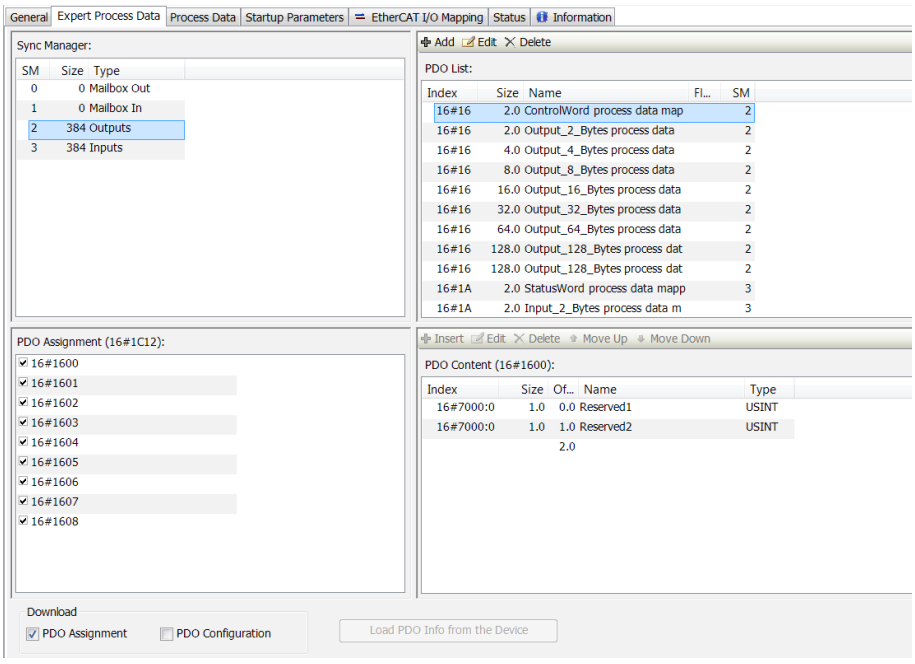


Figure 9: Expert Process Data

The PDO assignments are divided into different data sizes from 2 Bytes up to 128 Bytes.

Variable	Data type	Number	Explanation
2 Bytes Input	USINT	2	2 Bytes Input Module
4 Bytes Input	USINT	4	4 Bytes Input Module
8 Bytes Input	USINT	8	8 Bytes Input Module
16 Bytes Input	USINT	16	16 Bytes Input Module
32 Bytes Input	USINT	32	32 Bytes Input Module
64 Bytes Input	USINT	64	64 Bytes Input Module
128 Bytes Input	USINT	128	128 Bytes Input Module
2 Bytes Output	USINT	2	2 Bytes Output Module
4 Bytes Output	USINT	4	4 Bytes Output Module
8 Bytes Output	USINT	8	8 Bytes Output Module
16 Bytes Output	USINT	16	16 Bytes Output Module
32 Bytes Output	USINT	32	32 Bytes Output Module
64 Bytes Output	USINT	64	64 Bytes Output Module
128 Bytes Output	USINT	128	128 Bytes Output Module

7.3.3.2 Module start up parameters

The module can be configured with the following parameters from the EtherCAT internal bus:

Parameter name	Index in EtherCAT OD	Data type	Length	Explanation
NodeID	#x8000	USINT	1 Byte	Powerlink Node ID
ConfigurationFlags	#x8010	UINT	2 byte	Bitmask that enables the configuration of feature of the module. If least significant bit is high, the EtherCAT status of the EtherCAT internal bus is exported to the external bus in the first byte of the Input Mapping of the external fieldbus protocol. The default value for this parameter is 0x00000001 (exporting enabled)

7.3.3.3 Module Control Word

Two bytes are provided to allow to control the behavior of the module during data exchange. Reserved for future use.

Variable name	Index/Sub Index in EtherCAT OD	Data type	Length	Explanation
Reserved1	#x7000:1	USINT	1 Byte	free
Reserved2	#x7000:2	USINT	1 Byte	free

7.3.3.4 Module Status Word

Two bytes are provided for monitoring the status of the module during data exchange.

Variable name	Index/Sub Index in EtherCAT OD	Data type	Length	Explanation
LinkStatusPort0	#x6000:1	BOOL	1 bit	Link status of POWERLINK port 0 True = cable connected False = cable disconnected
LinkStatusPort1	#x6000:2	BOOL	1 bit	Link status of POWERLINK port 1 True = cable connected False = cable disconnected
IOReadError	#x6000:3	BOOL	1 bit	Communication error master -> slave (POWERLINK network) True = error False = communication OK
IOWriteError	#x6000:4	BOOL	1 Bit	Communication error slave -> master (POWERLINK network) True = error False = communication OK
Reserved	#x6000:6	USINT	1 byte	Status of the POWERLINK state machine. The possible values are: - 0x09 „Initializing“ - 0x29 „Reset application“ - 0x39 „Reset communication “ - 0x1C „Not active “ - 0x1D „PreOperational1“ - 0x5D „PreOperational2“ - 0x6D „ReadyToOperate“ - 0xFD „Operational“ - 0x4D „Stopped“ - 0x1E „Basic Ethernet“

7.3.3.5 Configuration of the data module

The following files are needed to configure the module:

File name	Explanation
KEB_C6_MFI_Powerlink.xml	ESI file for internal EtherCAT slave
KEB_C6_MFI_Powerlink.xdd	XDD file for internal Powerlink slave

The number and length of the data modules can be configured. The ratio of input data to output data is always 1:1. Select the required data modules in the respective configurators.

Make sure that the configuration of the EtherCAT side and the Ethernet/IP side is identical.

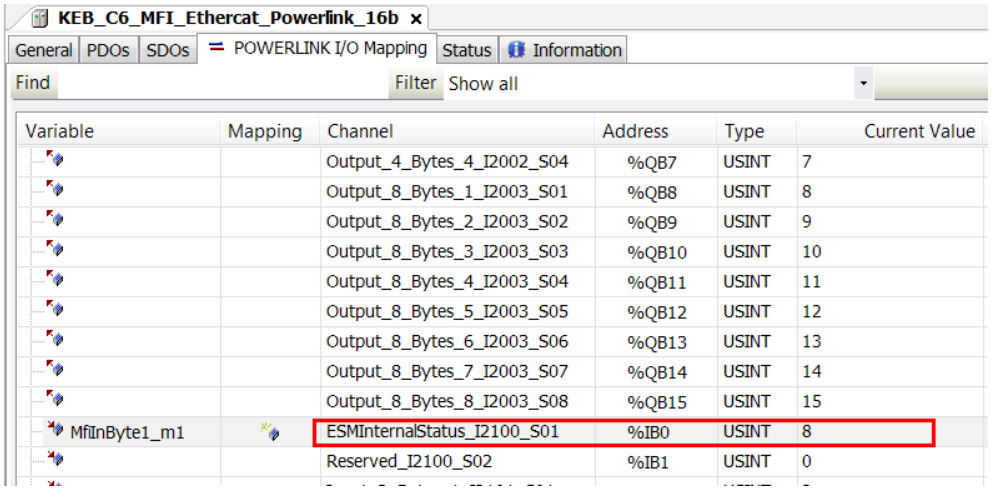
7.3.3.6 Powerlink external bus

EtherCAT

Corresponding PDOs are available for the external slave configuration, depending on the used xdd –file.

Index	Output variable	Index	Input variable
0x2000	Reserved 1*16 bit	0x2100	Esm internal status
0x2001	Output1 _1*16 bit	0x2101	Input1 _1*16 bit
0x2002	Output2_2*16 bit	0x2102	Input2_2*16 bit
0x2003	Output4_4*16 bit	0x2103	Input4_4*16 bit
0x2004	Output8_8*16 bit	0x2104	Input8_8*16 bit
0x2005	Output16_16*16 bit	0x2105	Input16_16*16 bit
0x2006	Output32_32*16 bit	0x2106	Input32_32*16 bit
0x2007	Output128_128*16 bit	0x2107	Input128_128*16 bit

The Powerlink slave Esm internal status provides the status of the EtherCAT slave statemachine.



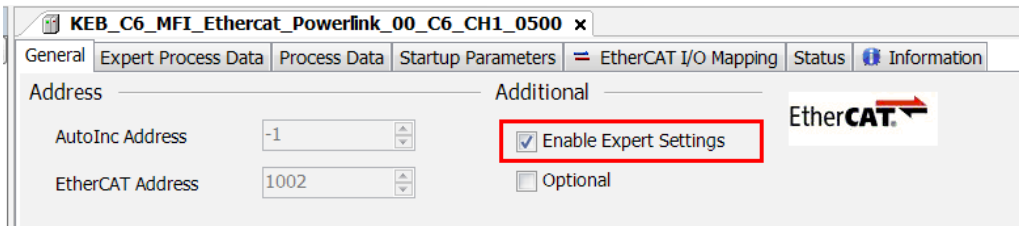
ESM	EtherCAT slave state machine
Init	1
Pre-operational	2
Saveoperational	4
Operational	8

Figure 10: POWERLINK I/O mapping

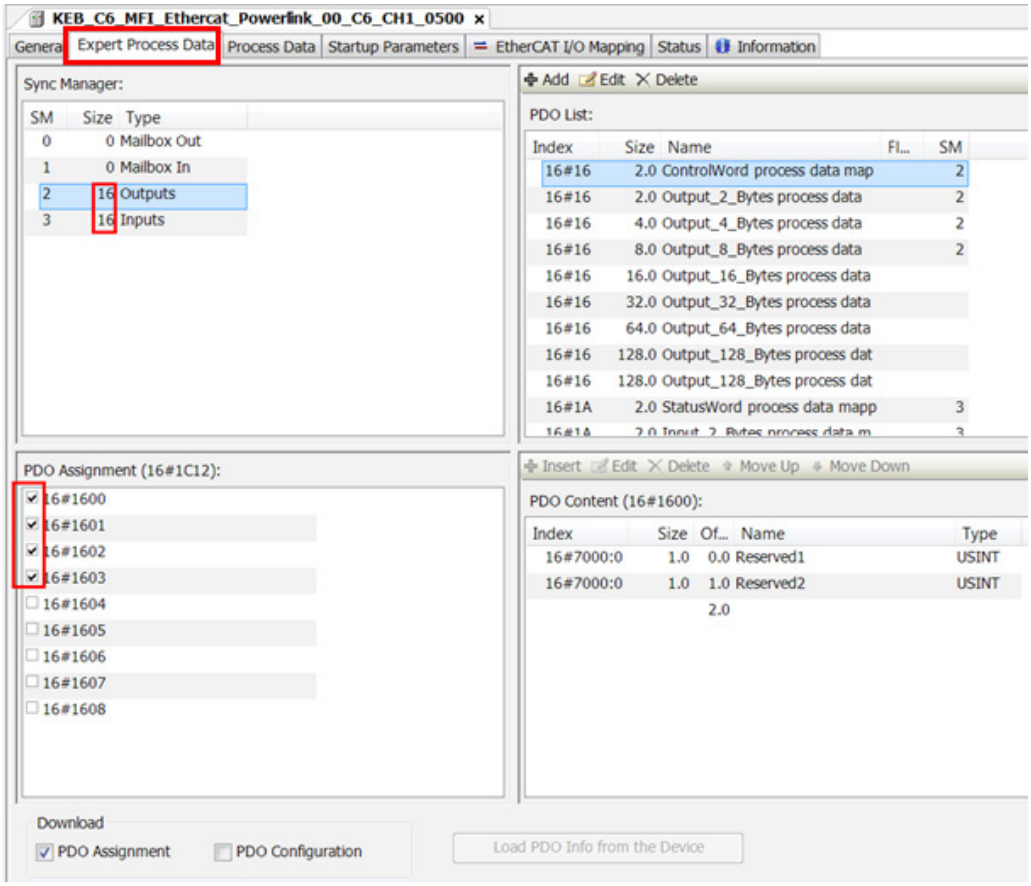
When the POWERLINK module is for configuration, the process data length to be used can be adjusted in the range process data of the module in COMBIVIS studio 6. This adjustment must agree with the adjustment of the Powerlink external slave in the used Powerlink configurator.

Keep in mind that if the exporting of the EtherCAT internal eBus ESM status is enable, it is mandatory to add one extra byte to the external POWERLINK input data.

In COMBIVIS studio 6, after adding the device KEB_C6_MFI_EtherCAT_Powerlink module, enable expert setting in the General tab:



Then select the suitable PDO mapping corresponding to the one selected for the Powerlink device:

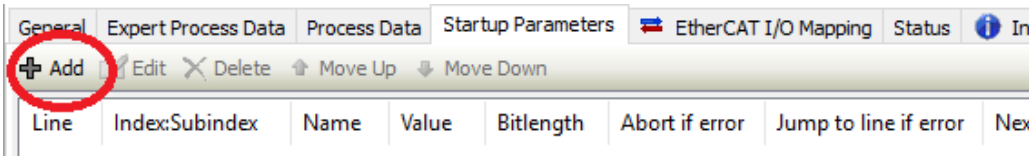


e.g. to 16 byte

Leave the check box “Download PDO Assignment” selected.

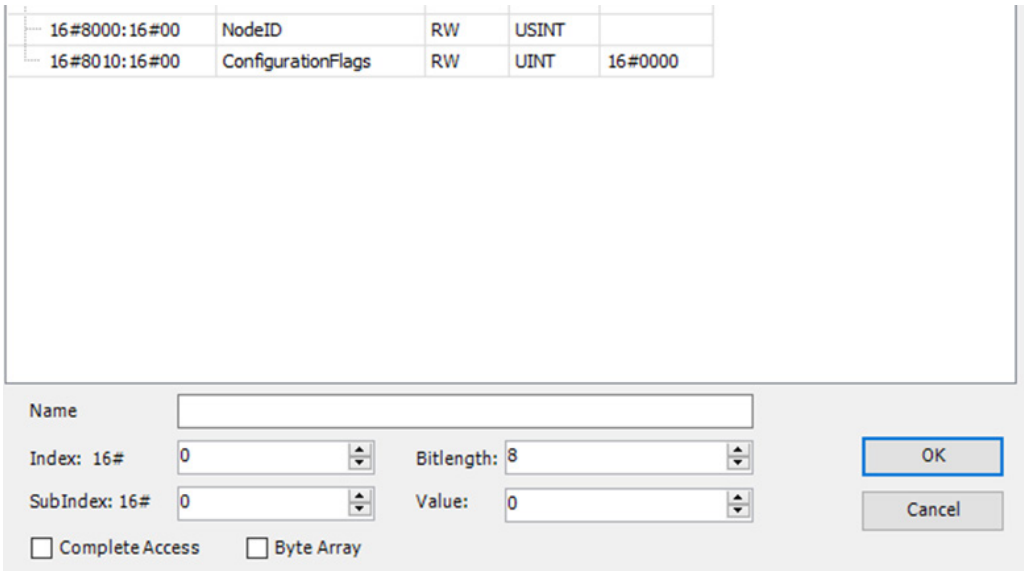
Startup parameter configuration

The startup parameter can be configured selecting the “Startup Parameters” tab and then pressing the “Add” button:



The following dialog is displayed:

Here you can add the values for parameters StationName, IP Address, SubnetMask, Default Gateway and ConfigurationFlags.



7.4 POWERLINK-PL-Slave Technical Data

Material No.	00C6CH1-0500
Fieldbus1 (system)	EtherCAT 100 Mbit/s
EtherCAT file	KEB_C6_MFI_Powerlink.xml
Fieldbus2	Powerlink
Implementation type	NetX
Connector	2 RJ 45 Ethernet connector
Baud rate	max. 100 Mbit/s
Recognition	automatically
Addressing	via EtherCAT variable
WxHxD	25x120x90mm
Installation	35mm DIN mounting rail
Controller	ASIC ET1200
Connector	10-pin system plug in side wall: E bus connector
Term. module	not required
Voltage supply	not required, occurs via the internal E bus connector. Voltage supply must occur via the SELV/PELV circuit.
E bus load	400mA
Potential separation	Modules electrically insulated from one another and from the bus
Storage temperature	-25°C…+70°C
Operating temperature	0°C…+55°C
Relative humidity	5%…95% without condensation
Weight	120 g
Degree of protection	IP20 (not evaluated by UL)
Interference immunity	Zone B
Pollution degree	Degree II
Maximum operating altitude	2000 m

Table 4: POWERLINK-PL-Slave - Technical data

8 Certificates and Approvals

8.1 EU Declaration of conformity

Document No. / month.year: ce_ca_remv-C6C-IO-e_en / 04.2018

Manufacturer: KEB Automation KG
Südstraße 38
32683 BARNTRUP
Germany

Product type:

Control type	yyC6Cxx – xxxx
Control size	yy = 00 x = any letter or number
Voltage category	24 V

The above given product is in accordance with the following directives of the European Union

Number: **EMC : 2014 / 30 / EU**
Text: Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility.

Number: **Hazardous Substances: 2011 / 65 / EEC**
Text: Directive on the approximation of the laws of the Member States relating on the restriction of the use of certain hazardous substances in electrical and electronic equipment.

Responsible: KEB Automation KG
Südstraße 38
32683 BARNTRUP

Place, date: Barntrup, 10. April 2018

Issued by:

i.A. W. Hovestadt / Conformance Officer

W. Wiele / Technical Manager

This declaration certifies the conformity with the named directives, but does not contain any assurance of quality.

The safety instructions, described in the instruction manual are to be followed.

EU DECLARATION OF CONFORMITY

Annex 1

Document-No. / month.year: ce_co_remv-C6C-IO-e_en / 04.2018

Product type:		
	Control Series	yyC6Cxx – xxxx
	Size	yy = 00 x = any letter or number
	Voltage category	24 Vdc

The conformity of the above given product to the European Directive 2014/30/EU (for electromagnetic compatibility) is given by complete approval / testing to the following European harmonized standards. Base for the complete approval is the definition of a complete PDS (power drive system). For not exceeding the required limits or minimum levels of immunity it is necessary to use the KEB defined filters and observe the given wiring specifications. These will be delivered with every product as part 1 of the documents.

EN - Standard	Text
EN 61000 – 6 – 4 / 2007 + A1 / 2011	Electromagnetic compatibility (EMC) – Part 6-4: Generic Standard – Emission standard for industrial environment
EN 61000 – 6 – 2 / 2005 + Cor 2011	Electromagnetic compatibility (EMC) – Part 6-2: Generic Standard – Immunity standard for industrial environment

The conformity of the above given product to the European Directive 2011/65/EU (for restrictions of the use for certain hazardous substances in electrical and electronic equipment) is given by qualification of components and manufacturing process within the ISO 9001 QM system. The necessary information and declarations are documented and memorized.

The above given product was developed, manufactured and tested within an internal quality management system. This ISO 9001 QM system was approved by:

Notified body:	TÜV - CERT
Adress:	Zertifizierungsstelle des RWTÜV Steubenstrasse 53 D - 45138 Essen
No. of approval	041 004 500
Dated:	20.10.1994
Valid until:	December 2018

8.2 UL Approval

c UL us LISTED Prog. Cntrl. E479848	UL certification is indicated by the adjacent logo and the E-file number on the nameplate of KEB products. The instructions in the manual must be observed.

The supply source and ext. circuits intended to be connected to this device shall be galv. separated from mains supply or hazardous live voltage by reinforced or double insulation and meet the requirements of SELV circuit of UL/EC 61010-201.

The device is intended to be supplied from an isolated Limited Energy Source per UL61010-1, 3rd ed cl. 9.4 or Limited Power Source per UL60950-1 or Class 2 per NEC.

8.3 RoHs Declaration of Conformity

RoHS 2011/65/EU	Conforms to: EN 50581: Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances RoHs Directive 2011/65/EU

9 Change history

Version	Date	Description
00	2018-06	Pre-series
01	2019-01	Series version

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