



***Operation and maintenance instructions CPU ETHERCAT Series CX05 fieldbus node***



***Made in Italy***

The products are designed and manufactured in conformity with the following directives:

- 2004/108/CE

They also comply partially or totally with regard to the applicable parts of the following standards:

- CEI EN 61131-2

The website [www.camozzi.it](http://www.camozzi.it) contains a section to download the relative CE Declarations of Conformity

## 1. Product identification

	<p>Tabella di conversione della data di produzione.</p>		86-1400-0001 Rev. D																																																																																																																																																																																																		
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	<b>Operation and maintenance instructions</b> <b>CPU ETHERCAT Series CX05 module</b>	5000005030
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## 2. General recommendations

The recommendations regarding safe use in this document should be observed at all times.

- Some hazards can only be associated with the product after it has been installed on the machine/equipment. It is the task of the final user to identify these hazards and reduced the associated risks accordingly.
- The products dealt with in this manual may be used in circuits that must comply with the standard EN ISO 13849-1.
- For information regarding component reliability, contact Camozzi.
- Before proceeding with use of the product, carefully read all information in this document.
- Conserve this document in a safe place accessible to all personnel throughout the product life cycle.
- This document should accompany the product in the event of transfer to a new owner or user.
- The instructions in this manual must be observed together with the instructions and additional information regarding the product in this manual, available from the following reference links:
  - web site <http://www.camozzi.com>
  - Camozzi general catalogue
  - Technical assistance service
- Assembly and start-up operations must be performed exclusively by qualified and authorized personnel on the basis of these instructions.
- It is the responsibility of the system/machine designer to ensure the correct selection of the most suitable pneumatic component according to the intended application.
- It is recommended to use suitable protections to minimize the risk of physical injury.
- For all situations not contemplated in this manual and in situations in which there is the risk of potential damage to objects, or injury to persons or animals, contact Camozzi for advice.
- Never make unauthorized modifications to the product. In this case, any damage or injury to objects, persons or animals will be the responsibility of the user.
- All relevant product safety standards must be observed at all times.
- Never intervene on the machine/system before verifying that all working conditions are safe.
- Before installation and maintenance, ensure that the specific envisaged safety locks are active, and then disconnect the electrical mains (if necessary) and system pressure supply, discharging all residual compressed air from the circuit and deactivating residual energy stored in springs, condensers, recipients and gravity.
- After installation or maintenance, the system pressure and electrical power supply (if necessary) must be reconnected, after which the operator must check correct operation and sealing efficiency of the product. In the event of sealing failure or malfunction, the product must not be used.

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- The product may only be used in observance of the specifications provided; if these requirements are not met, the product may only be used on authorisation by Camozzi.
- Avoid covering the equipment with paint or other substances that may reduce heat dissipation.

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### 3. General characteristics and conditions of use

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#### General characteristics and conditions of use

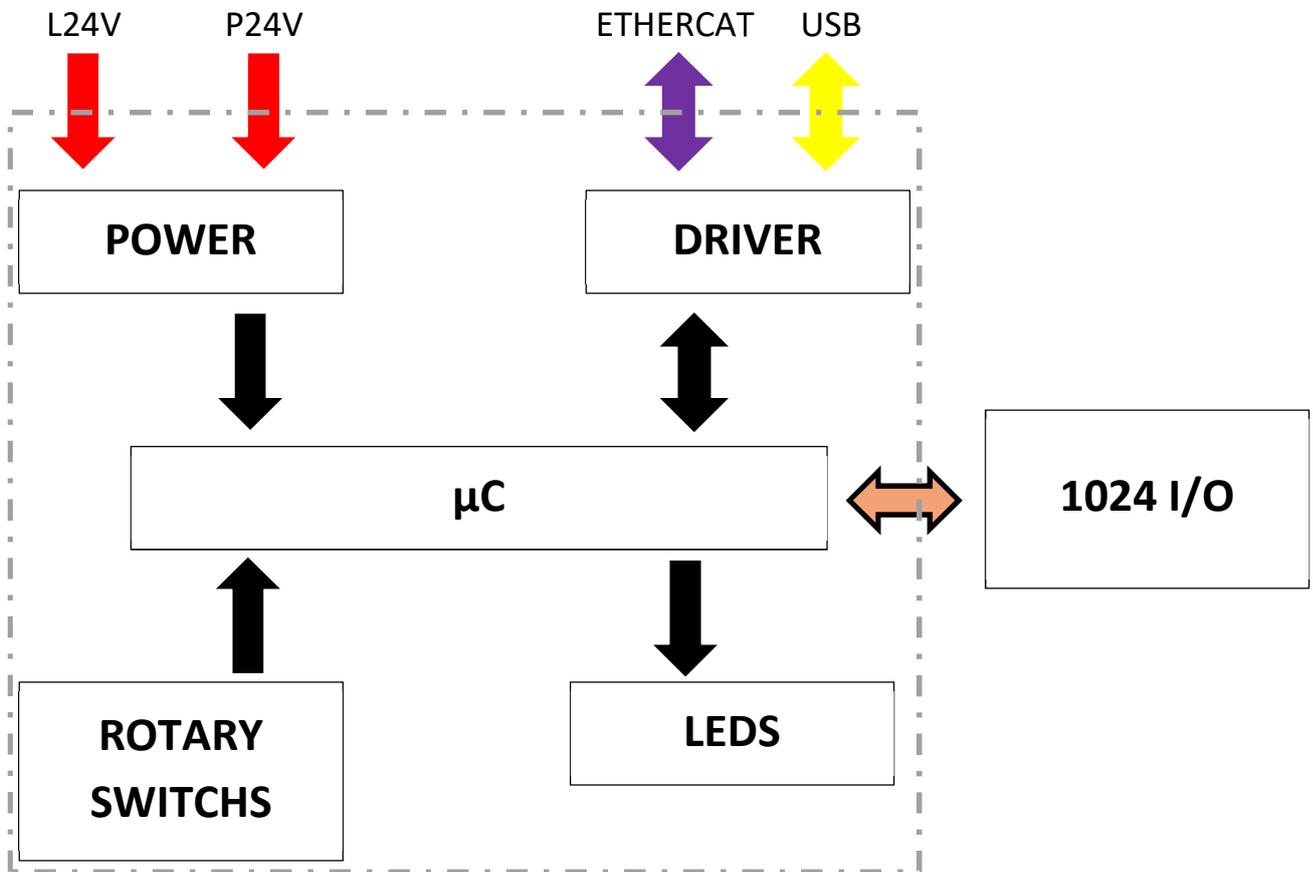
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<b>Assembly position</b>	Any
<b>Overall dimensions</b>	L = 122,6 mm; W = 90,7 mm; H = 48,9 mm
<b>Weight</b>	425 gr approximately
<b>Ambient temperature</b>	0 ÷ 50 °C
<b>Ambient humidity</b>	Max 90%
<b>IP protection rating according to EN 60529</b>	IP65 (full system)
<b>Vibrations</b>	In according with CEI EN 61131-2
<b>Continuous shock</b>	In according with CEI EN 61131-2
<b>Electrical connection</b>	M12
<b>Electrical power supply</b>	24Vdc -15%/+20%
<b>Digital Output Current consumption</b>	Max 4,5A (limited by resettable fuse)
<b>Logic, Digital Input and Analog I/O Current consumption</b>	Max 2,0A (limited by resettable fuse)
<b>Total Current consumption</b>	Max 4,8A @ 20°C (not limited by fuse)
<b>Output maximum number</b>	1024
<b>Input maximum number</b>	1024
<b>Protocol</b>	Ethercat
<b>Baud rate</b>	100Mbit/s (automatic selection)

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The device integrates a 2-port switch that allows you to realize a linear bus topology.

#### 4. Electrical circuit



#### 5. Product storage and transport

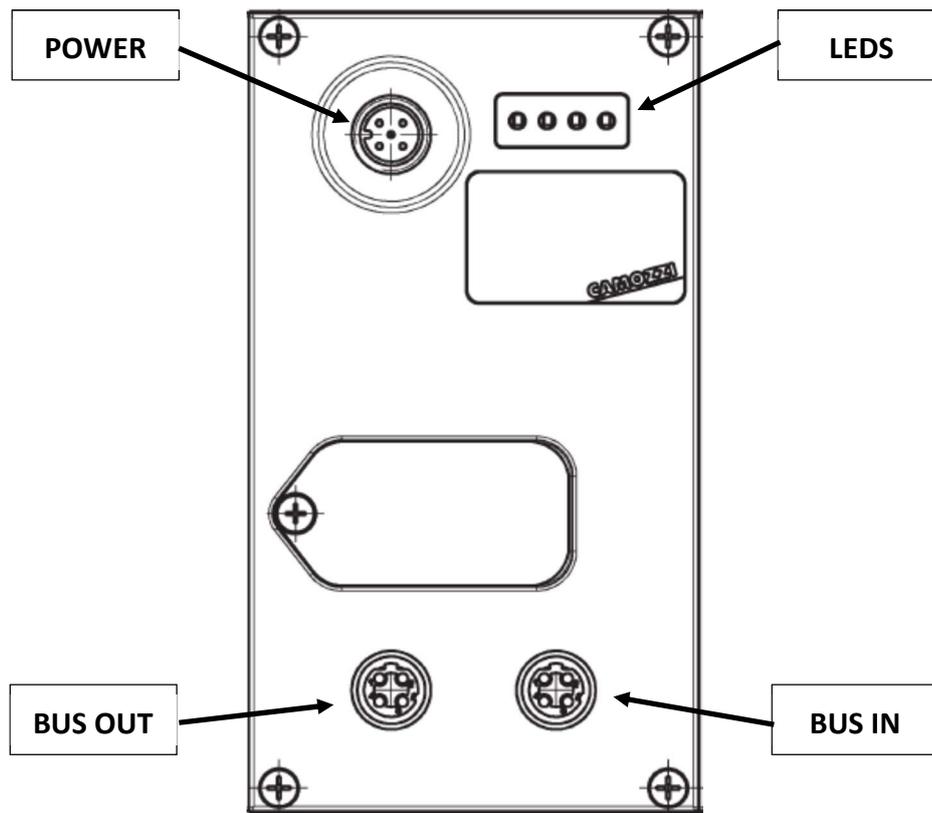
- Adopt all measures possible to avoid accidental damage to the product during transport, and when available use the original packaging.
- Observe the specified storage temperature range of -10 - 50 °C.

#### 6. System general description

The CPU module allow to control and manage the activation of digital and / or analog outputs according to the commands received from the Ethercat external bus and to transmit on the external bus diagnostic information provided by the system and the digital and/or analog inputs.

The system consists of a CPU module (Ethercat slave device) that communicates with a Ethercat Master via the bus.

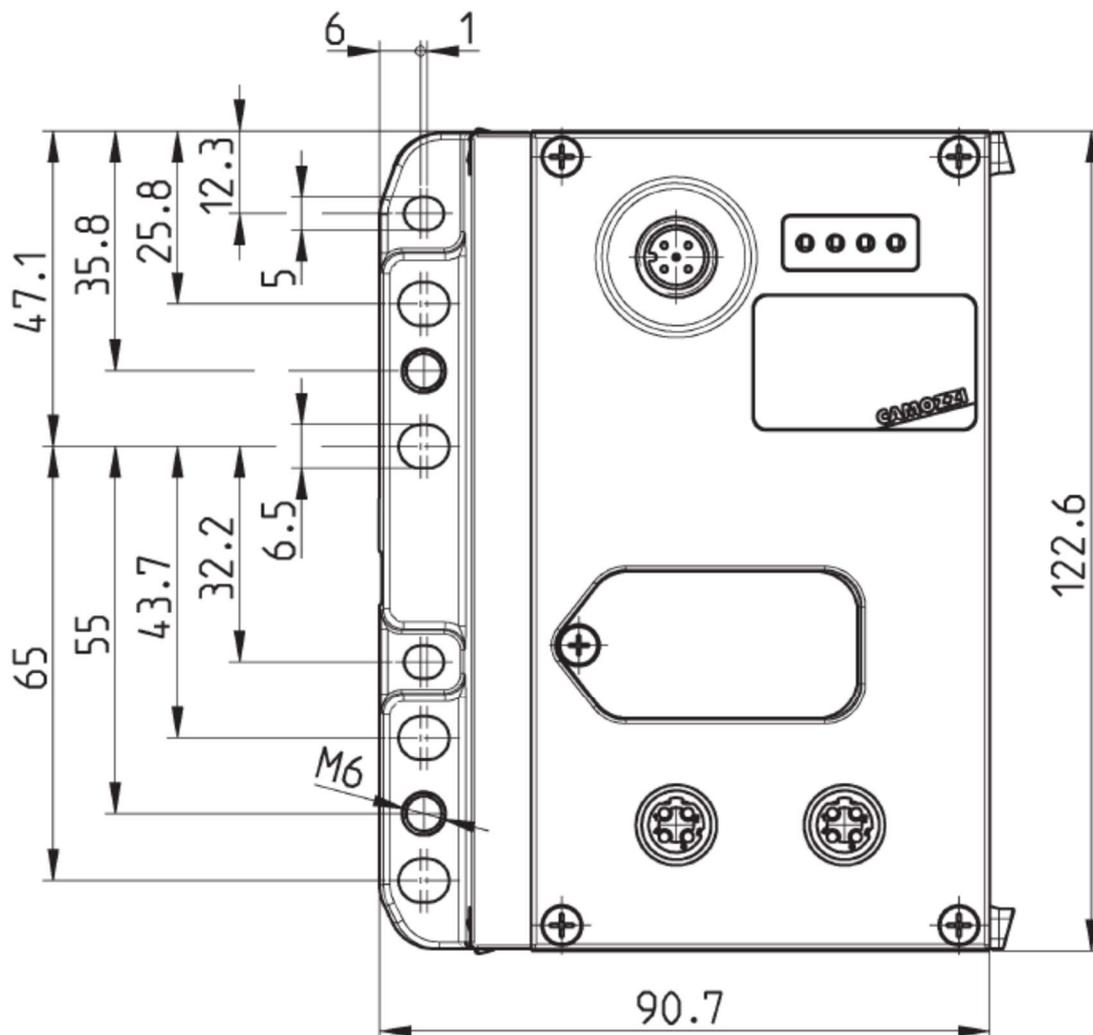
On the right side of the CPU module you can connected the input and output modules, analog and digital, and adapters that allow you to connect integrally the island a few series of valves. In addition a number of modules that allow you to remotely locate the modules above. For more details refer to the "**Operation and maintenance - Bus System Internal Camozzi**" manual.



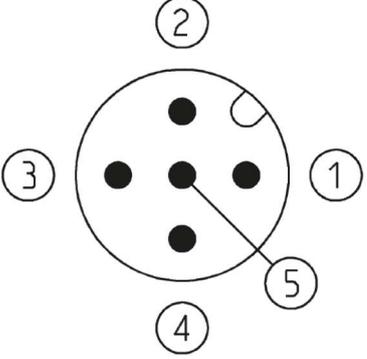
## 7. Installation and start-up

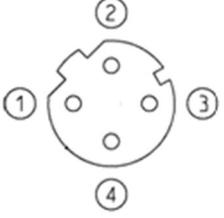
- During unpacking, take great care not to damage the product.
- Check whether there are any fault caused by product transport or storage.
- Separate all packaging material to enable the recovery or disposal in accordance with current standards in the country of use.
- Before operating the component, ensure that the stated specifications and performance correspond to requirements.
- During component installation, ensure suitable voltage overload protection devices are fitted.
- During component installation, ensure that no hazards are generated due to mechanical movements.
- Install the component in an area where the set-up and maintenance phases are easily performed without generating hazards for the operator.
- Close off any connections with suitable safety caps/covers.
- The components must be fixed correctly using, where possible, the specific anchors and ensuring that the fixture remains efficient even when the actuator is repeatedly used at a high frequency and in the presence of strong vibrations.
- In the case of strong vibrations envisage suitable devices/systems able to dampen the effect on the component.

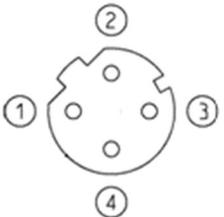
- Envisage the installation of dehumidifiers to avoid the formation of humidity or condensation on internal components.
- If the device is used to activate an actuator on which any accidental movement can generate a hazard, envisage suitable locking devices on the mobile section of the actuator.
- Ensure that the connectors are correctly connected and secured.
- The device can be connected to DIN rails using the relative elements PCF-E520 fitted on the rear of the body.
- The component can be directly fixed to a support using the 8 holes (of which 2 threaded M6) present on the side of the body



- This illustrates the pins of the M12 connector located on the upper section CPU module:

POWER Connector M12A 5 poles male			
Pin	Signal	Description	
1	<b>L24V</b>	24Vdc power supply (logic, digital input, analog I/O): connect to the positive pole of the 24Vdc power supply (ref. <b>GND</b> ).	
2	<b>P24V</b>	24Vdc power supply (digital output): connect to the positive pole of the 24Vdc power supply (ref. <b>GND</b> ).	
3	<b>GND</b>	Common (reference pin 1 and 2): connect to the negative pole of the 24Vdc power supply (compulsory).	
4	<b>EARTH</b>	Earth connection	
5	<b>NC</b>	Not connected	

BUS IN Connector M12D 4 poles Female			
Pin	Signal	Description	
1	<b>TD+</b>	Transmit data +	
2	<b>RD+</b>	Receive data +	
3	<b>TD-</b>	Transmit data -	
4	<b>RD-</b>	Receive data -	

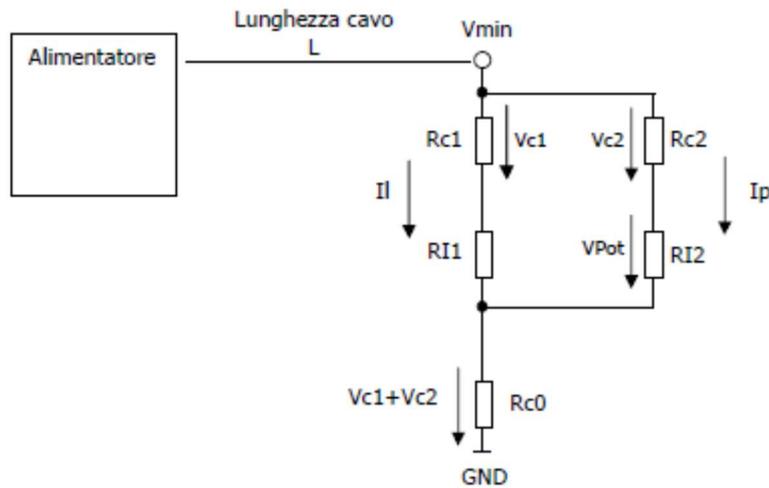
BUS OUT Connector M12D 4 poles Female			
Pin	Signal	Description	
1	<b>TD+</b>	Transmit data +	
2	<b>RD+</b>	Receive data +	
3	<b>TD-</b>	Transmit data -	
4	<b>RD-</b>	Receive data -	

For electrical connection are available the following wired connectors.

CONNECTOR	CODE	DESCRIPTION
POWER	CS-LF04HB	Power supply straight connector
	CS-LR04HB	Power supply angled connector
BUS IN BUS OUT	CS-SM04H0	Bus-In and Bus-OUT straight M12 male connector
	CS-SB04HB-D100	Straight moulded cable
	CS-SB04HB-D500	
	CS-SB04HB-DA00	
	CS-SC04HB-D100	Angled moulded cable
	CS-SC04HB-D500	
CS-SC04HB-DA00		

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- Use only power able to ensure a reliable electrical isolation of the supply voltage according to IEC 742 / EN 60742 / VDE 0551 with a minimum strength of 4 kV isolation Protected Extra Low Voltage, PELV.
- The user must take the necessary measures to prevent damage to the system caused by non-periodic overvoltage spikes on the power lines produced by power break to high-energy equipment.
- The voltage interruptions are permitted according to the severity level PS2.
- About electromagnetic compatibility, the CPU module is designed to work in area A.
- The board implements a protection against inversion of polarity on the power supply voltage.
- The power supply voltage must be within the range of 24V±10%.  
The rated voltage of the CPU module is 24 VDC -15% / + 20% (as indicated by the Standard IEC 61131-2). If the loads connected to the initial node may require severest tolerances of the value of the supply voltage, the power supply voltage must comply with these. If the inputs connected to the initial node may require in the severest tolerances of the value of the supply voltage, the logic supply voltage of the node must comply with these.  
For example, if you connect the valves HN Series, the tolerance of the power supply voltage must be ± 10%. If you connect the CSH sensors with power supply 10-30V (-58% / + 25%), the tolerance of the logic supply voltage is -15% / + 20%.  
For the system it is mandatory to connect the logic voltage (pin 1), otherwise the initial module remains off.  
For the correct operation of the system is mandatory to connect to the initial module the logic voltage (pin 1), the power voltage (pin 2), the reference to 0 V (GND, pin 3) and the earth.
- On supply cables of a valve group, it produces a voltage drop that dependent by load. This can create that the supply voltage (logic and power) does not fall within the allowable tolerance. If the sections of the cables for the power supply and for the logic power supply are the same, it is possible to apply the following formula in order to calculate the length. To limit the effects of induced noises, it is recommended to limit the length of the power cable to 3 mt.  
Before is necessary to calculate:
  - The maximum current value for Logic+Input (I1) and for Power (I2)
  - The minimum power supply value expected during operation (Vmin), whereas it depends on the load connected and that the mains voltage can have oscillations.
Use the value below in the following formula explained by the electrical drawing.



- $I_i$  = Logic current + SPI input current
- $I_p$  = Power current (loads)
- $R_{c1} + R_{c2}$  = Cable resistance
- $R_{c0}$  = Common cable resistance
- $L$  = Cable length

In order to calculate the cable length use this formula:

$$L \leq \frac{[(V_{\min} - V_{p\min}) \times S \times K_{cu}]}{(2I_p + I_i)}$$

Where:

- $V_{p\min}$ : minimum tension necessary for output
- $V_{\min}$ : minimum tension expected from power supply
- $I_i$ : current necessary for logic and sensor
- $I_p$ : current necessary for output
- $S$ : cable section
- $K$ : cable conductance (copper conductance  $K_{cu} = 56 \text{ m}/(\text{mm}^2 \cdot \Omega)$ )

Example:

$V_{\min} = 24 \text{ V}$

$V_{p\min} = 21.6 \text{ V}$

$I_i = 1 \text{ A}$

$I_p = 1 \text{ A}$  (40 Series H coils)

$S = 0,75 \text{ mm}^2$

$K_{cu} = 56 \text{ m}/(\text{mm}^2 \cdot \Omega)$

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$$L \leq \frac{[(24 - 21,6) \times 0,75 \times 56]}{(2+1)} = 33,6m$$

- To improve immunity to disturbance and prevent damage, it is recommended to connect the device to the circuit earthing system using any one of the holes on the aluminium body.
- In order to connect the CPU module to Ethercat bus, is recommended to use a CAT5 complies with specification.
- The Ethercat segment maximum length is 100 mt. If it is necessary to exceed the maximum lengths indicated below, you must to use repeater.
- For configuration of the CPU module and the connected modules, download the set-up file of the software **CX-Configurator** from the web site <http://www.camozzi.com> and proceed with installation according to the instructions on screen displayed during the process. For more details, please refer to the "**Operating and Maintenance Instructions - CX Configurator**".
- In order to configure the CX05 CPU module with a programmer/PC it is necessary to use the archive CX\_camozzi\_ethercat\_v23\_128.xml. In addition to the slave characteristic data (ID Number, revision, etc.), the ESI file contains the identifiers of the modules that are used for the hardware configuration of the PLC. The ESI file of the CPU module can be downloaded from the website Camozzi.
- The CPU module CX05 is compatible with networks with distributed clock, but it can't generate this clock. The management of I / O is not isochronous.
- The CPU module CX05 is configured with 128 input byte and 128 output byte. It isn't possible to change the data dimension.
- The user must calculate the minimum size of the data necessary for the functioning of CX05 node and the modules connected to it. The information regarding the size of the data occupied by the individual modules and their meaning (correspondence between bits and input / physical output) are contained in the manual "**Operating and Maintenance Instructions - Bus System Internal Camozzi**".  
Furthermore, the **CX-Configurator** software calculates automatically the size of the data used by the CX05 node and by the modules connected to it. For more details on using the configurator and in particular of this feature, refer to the manual "**Operating and Maintenance Instructions - CX Configurator**".
- The PLC recognizes the different nodes connected to the network sequentially and then assigns them all the necessary parameters to the Ethernet communication (address, gateway, and subnet mask). The default values of these parameters are as follows:  
Name: cx3ethercat  
IP Address: 192.168.192.30  
Gateway: 192.168.192.99  
Subnet mask: 255.255.255.0

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You can modify the above parameters of the node within the **CX-Configurator** configuration software. For more details on using the configurator and in particular of this feature, refer to the manual "**Operating and Maintenance Instructions - CX Configurator**".

- Before starting up the configuration software **CX-Configurator**, connect the module to the PC using a standard USB cable (is available the accessory G11W-G12W-2), then connect the electrical power supply via connector M12. The CPU module is fitted with a Micro USB connector under the transparent panel. To access the connector, remove the transparent panel by loosening the screw securing it to the cover of the module. After completing all settings, exit the software **CX-Configurator**, remove the USB cable and re-fit the transparent panel to restore the specified IP protection rating.
- On start-up of the software **CX-Configurator** the system verifies communication between the device and the PC where the configuration software is installed. In the event of communication failure, an error message is displayed.

Type of fault	Causes	Remedy
Communication failure between CPU module and PC	Electrical power supply not connected	Connect the Electrical power supply by means of the M12 connector POWER.
	USB cable not connected	Connect the USB cable to one of the ports available on the PC and to the Micro USB connector under the transparent panel on the device.
	USB drivers not installed	Contact the Camozzi technical assistance service.

- In the table below are shown the PDO managed by CX05.

INDEX	SUB-INDEX	NAME	VALUES	DESCRIPTION	
0x1600	0	RxPDO	128	Number of entries	
	1	SubIndex 1	0x2000:01,8	Pointer to Outputs – Index (0x2000), SubIndex 1 Lencht 8 bit	Output byte number 1
	2	SubIndex 2	0x2000:02,8	Pointer to Outputs – Index (0x2000), SubIndex 2 Lencht 8 bit	Output byte number 2
	...	SubIndex ...	0x2000: ... ,8	Pointer to Outputs – Index (0x2000), SubIndex ... Lencht 8 bit	Output byte number ...
	127	SubIndex 127	0x2000:7F,8	Pointer to Outputs – Index (0x2000), SubIndex 127 Lencht 8 bit	Output byte number 127
	128	SubIndex 128	0x2000:80,8	Pointer to Outputs – Index (0x2000), SubIndex 128 Lencht 8 bit	Output byte number 128
0x1A00	0	TxPDO	128	Numero di voci	
	1	SubIndex 1	0x2000:01,8	Pointer to Outputs – Index (0x2000), SubIndex 1 Lencht 8 bit	Input byte number 1

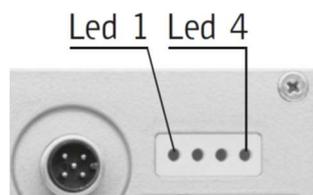
	2	SubIndex 2	0x2000:02,8	Pointer to Outputs – Index (0x2000), SubIndex 2 Lencht 8 bit	Input byte number 2
	...	SubIndex ...	0x2000: ... ,8	Pointer to Outputs – Index (0x2000), SubIndex ... Lencht 8 bit	Input byte number ...
	127	SubIndex 127	0x2000:7F,8	Pointer to Outputs – Index (0x2000), SubIndex 127 Lencht 8 bit	Input byte number 127
	128	SubIndex 128	0x2000:80,8	Pointer to Outputs – Index (0x2000), SubIndex 128 Lencht 8 bit	Input byte number 128

## 8. Use

- Ensure that the electrical power supply and all other operating conditions remain within the admissible values.
- The product may only be used in observance of the specifications provided; if these requirements are not met, the product may only be used on authorization by Camozzi.
- Observe the specifications on the identification data plate.

## 9. Troubleshooting and/or exceptional circumstances

- The following is the meaning of the LEDs on the top panel of the CPU Unit:



<b>Led 3 (RUN)</b>	
 OFF	<b>INIT:</b> The device is in state INIT
 Blinking	<b>PRE-OPERATIONAL:</b> The device is in state PRE-OPERATIONAL
 Single flash	<b>SAFE-OPERATIONAL:</b> The device is in state SAFE-OPERATIONAL
 Fixed	<b>OPERATIONAL:</b> The device is in state OPERATIONAL
<b>Led 4 (ERR)</b>	
 OFF	<b>No error:</b> The EtherCAT communication of the device is in working condition.
 Fixed	<b>Invalid Configuration:</b> General Configuration Error Possible reason: State change commanded by master is impossible due to register or object settings.
 Fixed	<b>Local Error:</b> Slave device application has changed the EtherCat state autonomously. Possible reason 1: A host watchdog timeout has occurred. Possible reason 2: Synchronization Error, device enters Safe-Operational automatically.
 Fixed	<b>Application Watchdog Timeout:</b> An application watchdog timeout has occurred. Possible reason: Sync Manager Watchdog timeout.
<b>Led 2 (LINK1)</b>	<b>Led 1 (LINK2)</b>
 Fixed	The IN port isn't connected to network  The IN port isn't connected to network

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 Fixed	The IN port is connected to network	The OUT port is connected to network
 Blinking	The IN port receive/send Ethernet frame	The OUT port receive/send Ethernet frame

## 10.Limitations on use

- Never exceed the technical specifications stated in the paragraph "General characteristics" and the Camozzi general catalogue.
- Do not install the product in environments where the air itself may generate hazards.
- With the exception of specific intended applications, do not use the product in environments where there is the risk of direct contact with corrosive gas, chemical products, salt water, water or steam.

## 11.Maintenance

- If performed incorrectly, maintenance may impair efficient operation of the product and harm persons in the vicinity.
- Check all conditions to prevent the inadvertent release of parts, and disconnect the power supply to enable the discharge of residual pressure from the system before performing work.
- Check whether it is possible to have the product serviced at a technical assistance centre.
- Never disassemble units when electrically powered.
- Shut off electric supplies before maintenance.
- Always remove accessories before maintenance.
- Always wear the correct personal protective equipment as envisaged by local authorities and in compliance with current legislation.
- In the event of maintenance, replacement of worn parts, use exclusively the original Camozzi kits and ensure that operations are only performed by specialized and authorized personnel. Otherwise product approval will be rendered invalid.

## 12.Environmental notes

- At the end of the product's life cycle, separate the relative materials to enable recycling.
- Observe all current standards in the country of use governing waste disposal.
- The product and relative parts all comply with the standards ROHS and REACH.

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### **13. Contacts**

#### ***Camozzi spa***

#### ***Società Unipersonale***

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[www.camozzi.com](http://www.camozzi.com)

#### ***Product Certification***

National and International Directives, Regulations and Standards

[productcertification@camozzi.com](mailto:productcertification@camozzi.com)

#### ***Technical assistance***

Technical information

Product information

Special products

Tel.+39 030 3792390

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