USE AND MAINTENANCE MANUAL

CAMOZZI
Automation

SERIES D
SERIES CX4
CANOPEN V 1.1

Contents

General recommendations

⚠ Please comply with the recommendations for safe use described in this document:

- Some hazards can only be associated with the product after it has been installed on the machine/equipment. It the responsibility of the end user to identify these hazards and reduce the risks associated with them.
- For information regarding the reliability of the components, contact Camozzi Automation.
- Read the information in this document carefully before using the product.
- Keep this document in a safe place and close at hand for the whole of the product's life cycle.
- Pass this document on to any subsequent owner or user.
- The instructions in this manual must be observed in conjunction with the instructions and additional information concerning the product in this manual, available from the following reference links:
  - Website http://www.camozzi.com
  - Camozzi general catalogue
  - Technical assistance service
- Assembly and commissioning must be performed exclusively by qualified and authorised 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.
- Use of appropriate personal protective equipment is recommended to minimise 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 property, or injury to persons or animals, contact Camozzi for advice.
- Do not make unauthorised modifications to the product. In this case, any damage or injury to property, persons or animals will be the responsibility of the user.
- It is recommended to comply with all safety regulations that apply to the product.
- Never intervene on the machine/system until you have verified that all working conditions are safe.
- Before installation or maintenance, ensure that the required 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, and the regular operation and sealing of the product must be checked. In the event of leaks or malfunction, the product must not be used.
- The product may only be used in observance of the specifications provided; if these requirements are not met, the product may only be used upon authorisation by Camozzi.
- Avoid covering the equipment with paint or other substances that may reduce heat dissipation.

1.1 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.

1.2 Use

- Make sure that the distribution network voltage and all operating conditions are within the permissible 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 upon authorisation by Camozzi.
- Follow the indications shown on the identification plate.

1.3 Limitations of use

- Do not exceed the technical specifications given in paragraph 2 (General characteristics and conditions of use) and in the Camozzi general catalogue.
- Do not install the product in environments where the air itself may cause hazards.
- With the exception of specific intended uses, do not use the product in environments where direct contact with corrosive gases, chemicals, salt water, water or steam may occur.

1.4 Maintenance

- Incorrectly performed maintenance operations can compromise the good working order of the product and harm surrounding persons.
- Check conditions to prevent sudden release of parts, then suspend the power supply and allow residual stresses to discharge before taking action.
- Assess the possibility of having the product serviced by a technical service center.
- Never disassemble a live unit.
- Isolate the product electrically 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, or replacement of worn parts, exclusively use the original Camozzi kits and ensure that operations are performed by specialised and authorised personnel. Otherwise product approval will be rendered invalid.

1.5 Ecological Information

- At the end of the product's life cycle, it is recommended to separate the materials for recycling.
- Follow the waste disposal regulations in force in your country.
- The product and relative parts all comply with the ROHS and REACH standards.

General characteristics and conditions of use

ELECTRICAL SECTION	
Power and bus connection type	M12 - 5 poles
Supply voltage Logic	24 V DC +/-25%
Supply voltage Power	24 V DC +/-10%
Valve maximum absorption	2.5 A
Maximum no. valve positions	64 (128 coils)
Coil power	1W (reduction to 0.5W after 100ms)
Maximum cable length	20 m
Protocol	CANopen

PNEUMATIC SECTION					
Versions		D1	D2	D4	D5
Valve construction		Spool with seals			
Valve functions		5/2 monostable and bistable 5/3 CC – CP – CO		2x3/2 NC 2x3/2 NO 1X3/2 NC+1X3/2 NO	
Materials	Body	Aluminium			
	Spool	Aluminium			
	Subbase	Technopolymer	Technopolymer	Aluminium	Technopolymer
	End cover	Technopolymer			
	Seal	HNBR			
Connections		Uses 2 and 4 Thread (only D4) or bushings, tube size variable according to the pitch			
Temperature		0 ÷ 50 °C			
Air feature		Compressed air filtered and not lubricated in class 7.4.4 according to ISO 8573-1: 2010. If lubrication is required, use only oils with max. viscosity. 32 Cst and the version with external servo drive. The servo drive air quality must be in class 7.4.4 according to ISO 8573-1: 2010 (do not lubricate).			
Valve pitch		10.5 mm	16 mm	25 mm	10.5 e 16 mm
Working pressure		-0.9 ÷ 10 bar			
Drive pressure		2.5 ÷ 7 bar 4,5 ÷ 7 bar (with working pressure higher than 6 bar for the 2x3/2 version)			
Flow rate		250 Nl/min	950 Nl/min	2000 Nl/min	250 ÷ 950 Nl/min
Assembly position		Any			
Degree of protection		IP65			

General description of the system

The CX4 CANopen module is a device for driving valves and/or managing digital and/or analogue I/O by connecting it to a CANopen network. The CX4 consists of power connectors, input and output connectors for the CANopen field bus and LEDs for system diagnostics. It is possible to connect the Series D coil valves on the right side of the CX4 , while on the left side it is possible to connect the digital and analogue I/O modules.

Nomenclature

The CX4 module can be used by just connecting the input and output modules; in this case the device will take the name of ***Series CX4 Stand Alone*** *module. If coil valves (with or without I/O modules) are connected to the CX4 on the pneumatic side, the device becomes a valve island and is called* ***Series D Valve Island Fieldbus****.*

The CX4 module, both in Series CX4 and Series D valve island fieldbus configurations, is a solution dedicated to Industry 4.0 because it is a *SMART* device capable of connecting to other devices or networks (ex. WiFi, USB, NFC) for information exchange. The system can transmit data of the main variables, the diagnostics of all the components of which the island is made. In addition, the system can configure the island and each connected module. The smart interfaces with the system are:

- **Camozzi UVIX** (*Universal Visual Interface*), a software that can be installed on a PC/server/gateway used by USB or included in a company network and accessible from other PCs (cap. 9).

- **NFCamApp** (*NFC Camozzi Application*), smartphone application for Android and iOS (cap. 10).

NOTE. In addition, in the Series D Serial valve island configuration, the system has **COILVISION** technology which monitors the correct operation of the coil valve. Each actuation of the coil, in different cyclic configurations and environmental conditions, is analysed to acquire information which, when processed by software algorithms, allows the health of the component to be diagnosed and predicted (par. 6.1.2).

Recipients

The manual is intended exclusively for qualified experts in control and automation technologies who have experience in the installation, commissioning, programming and diagnostics of programmable logic controllers (PLCs) and fieldbus systems.

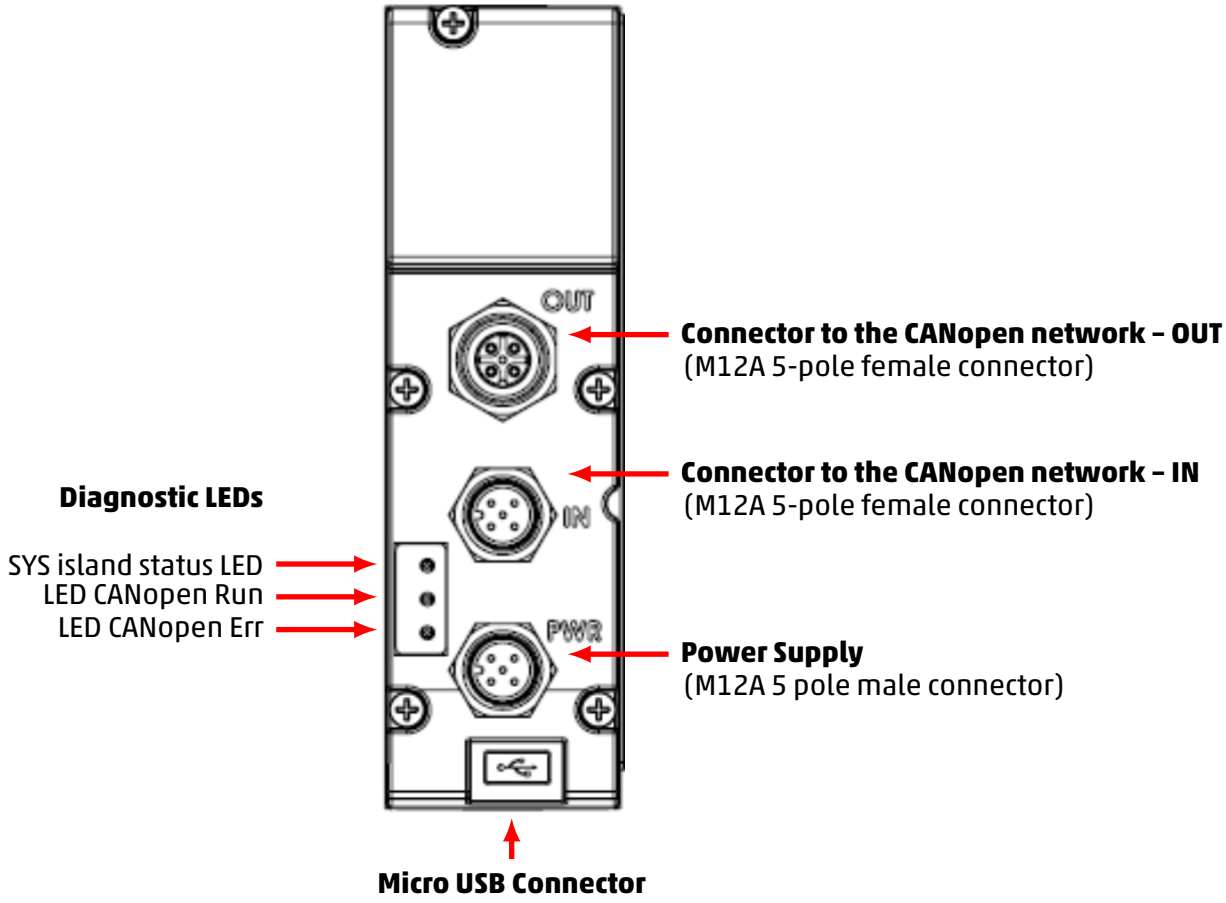
Installation

5.1 General installation instructions

For reasons of operator safety and to prevent functional damage to the system, before starting any installation or maintenance operation, disconnect:

- The air supply.
- The power supply of the control electronics and outputs/coil valves.

5.2 Connecting and warning components

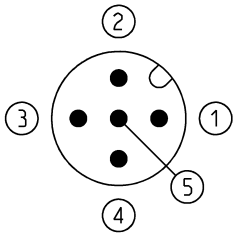


5.2.1 Power Supply Connector

The Power Supply connector is a 5-pole M12A male.

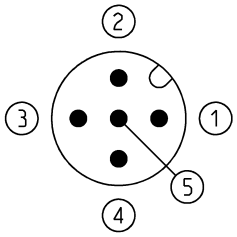
NOTE. To connect the system to the mains it is recommended to use the connectors from the Camozzi catalogue:

- CS-LF04HB, straight connector for power supply.

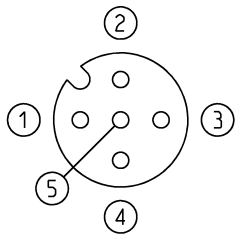
PIN	Signal	Description	Symbol
1	L24V	24 Vdc power supply (logic, digital inputs, analogue I/O): connect to the positive pole of the 24 Vdc power supply (referred to GND).	
2	P24V	24 Vdc power supply (digital outputs and valves): connect to the positive pole of the 24 Vdc power supply (referred to GND).	
3	GND	Common (reference pin 1 and 2): connect to the negative pole of the 24 Vdc power supply (compulsory).	
4	EARTH	Earth connection	
5	NC	Not Connected	

5.2.2 Connector to the CANopen network

The connectors for the CANopen network IN are M12A 5-pole male.

PIN	Signal	Description	Symbol
1	CAN_SHLD	Optional: Earth connection	
2	CAN_V+	Optional: CAN external power supply (dedicated to the optocouplers power and transmitters-receivers, if galvanic isolation of the bus node is applied)	
3	CAN_GND	Common reference for CAN bus	
4	CAN_H	CAN-H bus line	
5	CAN_L	CAN-L bus line	

The connectors for the CANopen network OUT are M12A 5-pole female.

PIN	Signal	Description	Symbol
1	CAN_SHLD	Optional: Earth connection	
2	CAN_V+	Optional: CAN external power supply (dedicated to the optocouplers power and transmitters-receivers, if galvanic isolation of the bus node is applied)	
3	CAN_GND	Common reference for CAN bus	
4	CAN_H	CAN-H bus line	
5	CAN_L	CAN-L bus line	

NOTE. To avoid malfunctions due to faulty wiring, it is recommended to connect the system to the CANopen network using the pre-wired cables from the Camozzi catalogue:

- CS-LF05HC, straight female M12 connector for Bus-IN.
- CS-LM05HC, straight female M12 connector for Bus-OUT.
- CS-LP05H0, male M12 termination resistor.

5.2.3 USB Connector

The USB communication connector is a standard micro version. The connector allows the CX4 to be connected to the UVIX interface for monitoring or configuration.

NOTE The dedicated USB connector can be found in the Camozzi catalogue:

- G11W-G12W-2, standard cable with micro-USB connector length 2m.

5.3 Power supply

The power supply is separated into *logic* (L24V), which allows the communication buses , the subbases of the pneumatic part and the I/O modules to be powered, and into *power* (P24V), which powers the valves and digital outputs . Therefore, for the system to work, it is essential to connect the logic power supply, otherwise the CX4 remains off. The two separate power supplies make it possible, if necessary, to disconnect the power supply to the valves while the bus power line remains active. The lack of power supply is signalled by the flashing red SYS island status LED. This problem is also signalled through a message via the network to provide for proper alarm management.
If the loads or inputs connected to the initial node require tighter tolerances of the supply voltage value, the node power supply voltage must respect these.
NOTE. The nominal power supply voltage of the CPU module is 24 Vdc ±10%.

5.3.1 Electropilot activation rules

In normal standard operation, the coil valves are activated, for 100 ms, with a power of 1 W (@ 24 V the absorbed current is therefore 41.6 mA). Subsequently, the coil valves are kept activated by reducing the absorbed power to 50% of the initial value, by means of a PWM control technique. The permitted power supply voltage for the series D valve island is 24 Vdc ± 10%, therefore the useful range is 21.6 Vdc ÷ 26.4 Vdc. The currents absorbed by the coil valve coils corresponding to the power supply range are 39 mA ÷ 48 mA (in typical conditions) in the first 100 ms of activation and subsequently 19.5 mA ÷ 24 mA in the power reduction phase due to the use of PWM. The continuous operation of the valve island is guaranteed for a maximum absorption of 2.5 A. In the worst conditions (maximum current absorption for 26.4 Vdc power supply) it is possible to activate up to 50 coils simultaneously with all the valves of the island off. Subsequently, it is possible to proceed by using the following formula:

No. of coils to be controlled simultaneously = 50 - (0,6 x No. active coils)

Example

- *If 10 coils are already active, 44 coils can be activated simultaneously.*
- *If 20 coils are already active, 38 coils can be activated simultaneously.*

NOTE. The maximum number of simultaneously active coils is 80. Each subsequent activation with respect to the previous group of coils must happen after 150 ms.

5.4 Connectable accessories

Series D pneumatic coil valves or I/O modules can be connected to the CX4 module. Here is the complete list of devices that can be connected to the CX4, with the respective references to the technical details in the manual.

- Series D subbase and coil valves in three different sizes (par. 6.1).
- 8- or 16-channel digital input module (par. 6.2).
- 8- or 16-channel digital output module (par. 6.3).
- Analog input module (par. 6.4):
  - RTD module (par. 6.4.5).
  - Thermocouple module 6.4.6).
  - Bridge module (par. 6.4.7).
  - Voltage/Current module (par. 6.4.8).
- Analog output module (par. 6.5).

5.5 Assembly

5.5.1 Dismantling and fitting CX4 module

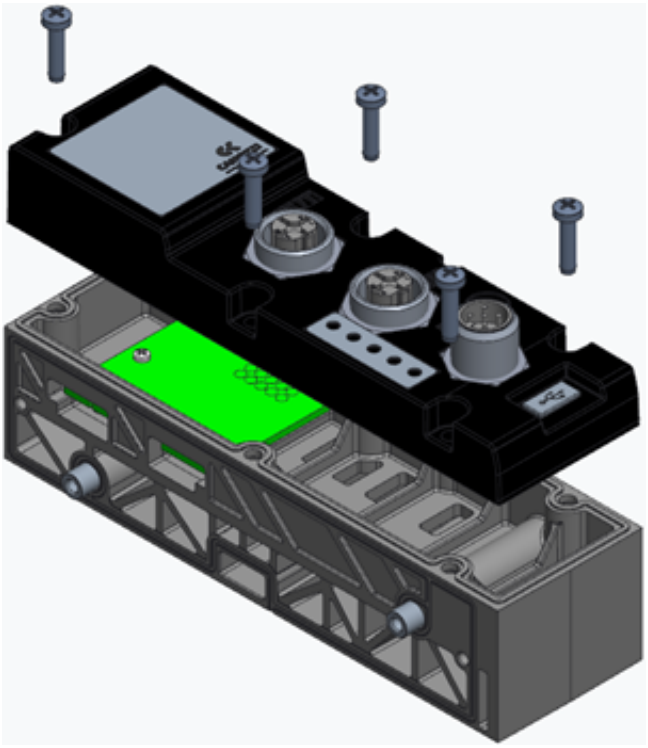
Dismantle the CX4 module as follows:

1. Switch off the power supply of the CX4 module to avoid problems for the device or user.
2. Loosen the 5 screws.
3. Pull the cover of the CX4 module carefully and without tilting from the manifold base.

Fit the CX4 module as follows:

1. Switch off the operating voltage supply of the CX4 module to avoid problems for the device or user.
2. Make sure that the gaskets are tight and not damaged.
3. Push the cover of the CX4 module carefully and without tilting as far as possible into the manifold base.
4. Tighten the 5 screws (Torque max 0.6 Nm).

NOTE. After an island modification, the mapping procedure is required (par. 7.3).

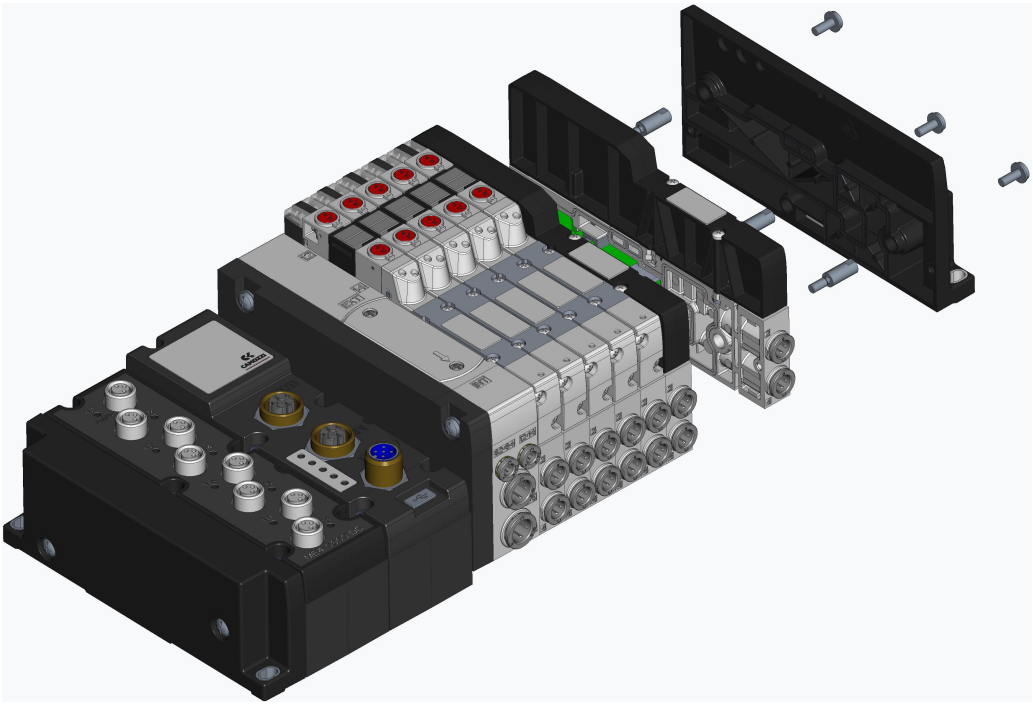


5.5.2 Series D subbases assembly

Dismantle and fit the Series D subbases as follows:

1. Switch off the power supply of the CX4 module to avoid problems for the device or user.
2. Unscrew the 3 screws to the cover at the end of the island and open the valves subbases pack.
3. Remove the valves subbases from the tie-rods and replace with the new modules.
4. Push the valves subbases as far as possible to allow a correct electrical contact.
5. Mount the cover at the end of the island and tighten the 3 screws (Torque max 0.9 Nm)

NOTE. The mapping procedure must be carried out in all those cases in which the valve subbases are added, removed, or moved (par. 7.3).

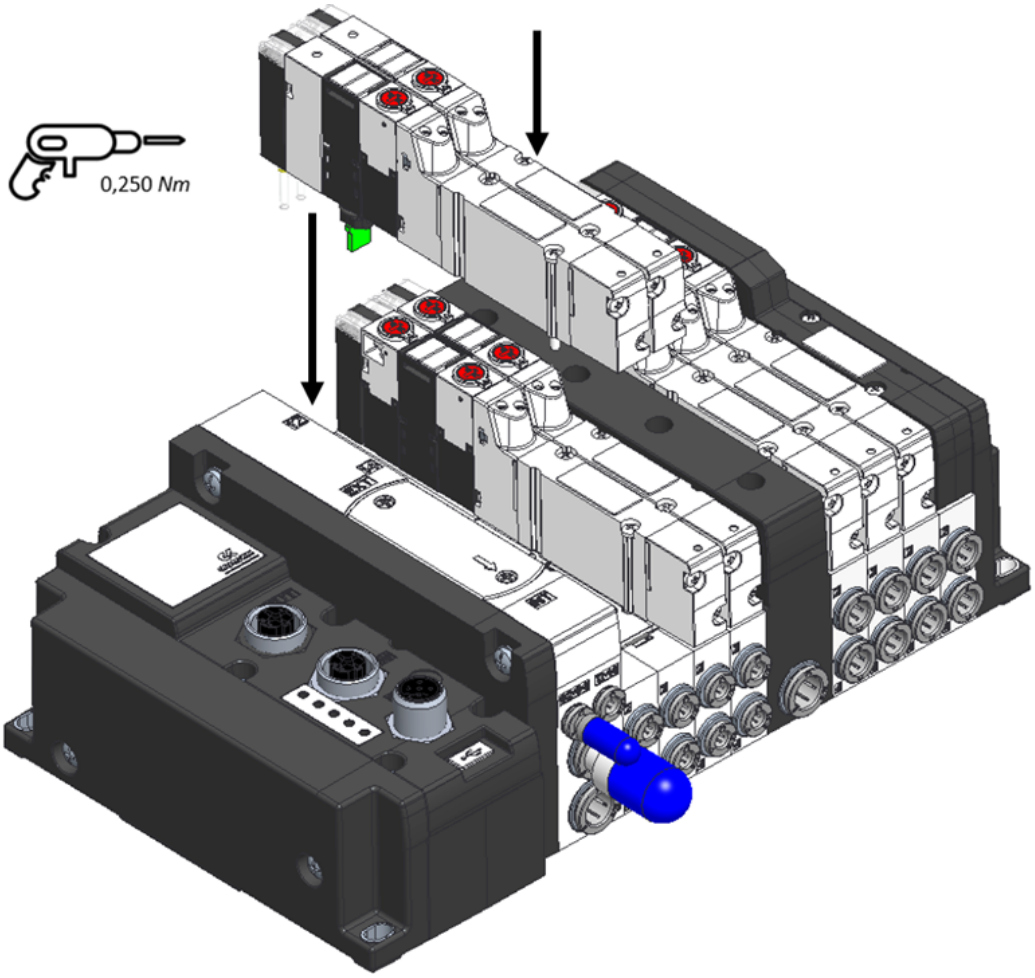


* Example for Series D1 Valve Island.

5.5.3 Dismantling and fitting Serie D coil valves

Dismantle and fit the Serie D coil valves on the same size subbases as follows:

1. Unscrew the 2 screws above the Serie D coil valves.
2. Pull the valves carefully and without tilting from the subbase to avoid damages.
3. Add the new valves carefully and without tilting to the subbase to avoid damages.
4. Tighten the 2 screws (Torque max 0.25 Nm (D1/D5), 0.5 Nm (D2), 2.0 Nm (D4)).
5. Reset the subbase information from UVIX interface or controller/PLC.



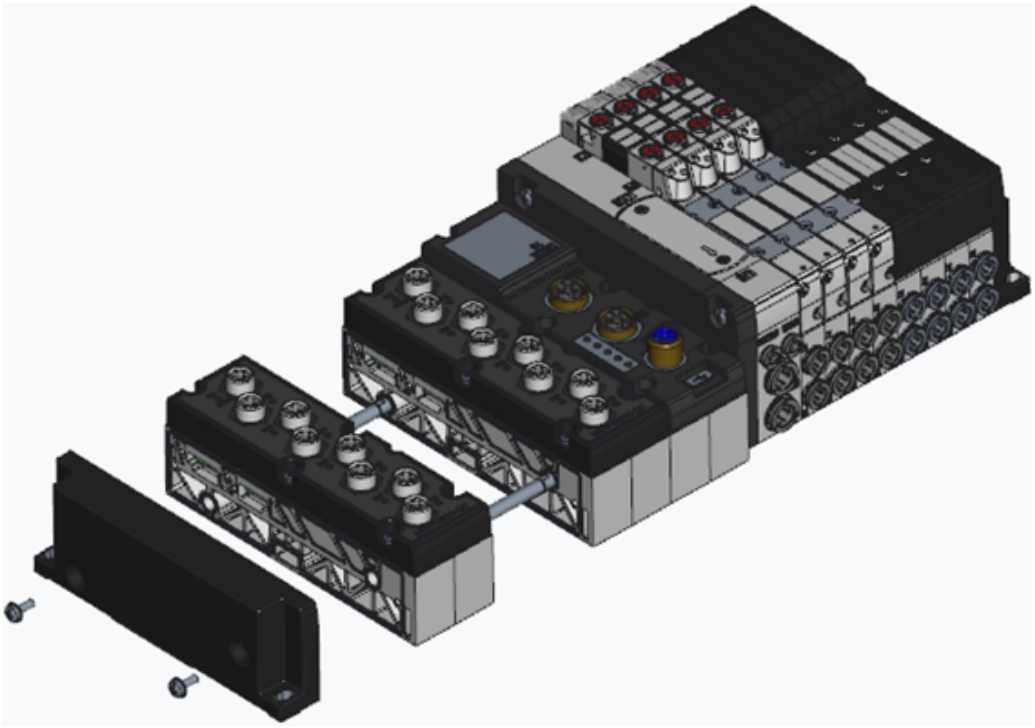
* Example for Series D1 Valve Island.

5.5.4 I/O modules assembly

Dismantle and fit the I/O modules as follows:

1. Switch off the power supply of the CX4 module to avoid problems for the device or user.
2. Unscrew the 2 screws to the cover at the end of the island and open the I/O pack.
3. Remove the I/O modules from the tie-rods and replace with the new modules.
4. Push the I/O modules as far as possible to allow a correct electrical contact.
5. Mount the cover at the end of the island and tighten the 2 screws (Torque max 0.9 Nm)

NOTE. The mapping procedure must be carried out in all those cases in which the I/O modules are added, removed, or moved (par. 7.3).



* Example for Series D1 Valve Island.

5.5.5 Dismantling and fitting I/O modules

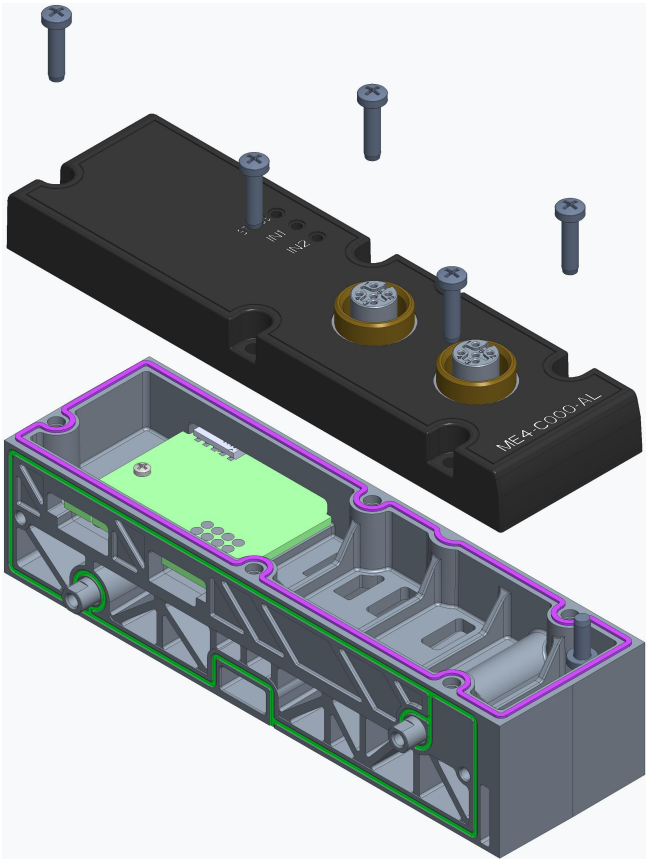
Dismantle the cover of the I/O module as follows:

1. Switch off the power supply of the CX4 module to avoid problems for the device or user.
2. Loosen the 5 screws.
3. Pull the cover of the I/O module carefully and without tilting from the manifold base.

Fit the cover of the I/O module as follows:

1. Switch off the operating voltage supply of the CX4 module to avoid problems for the device or user.
2. Make sure that the gaskets are tight and not damaged.
3. Push the cover of the I/O module carefully and without tilting as far as possible into the manifold base.
4. Tighten the 5 screws (Torque max 0.6 Nm).

NOTE. After an island modification, the mapping procedure is required (par. 7.3).

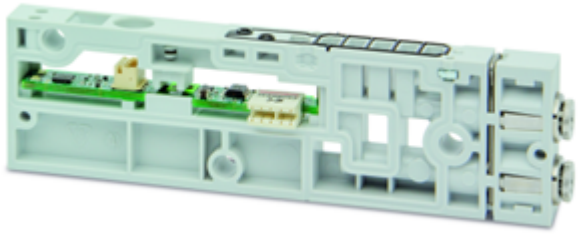
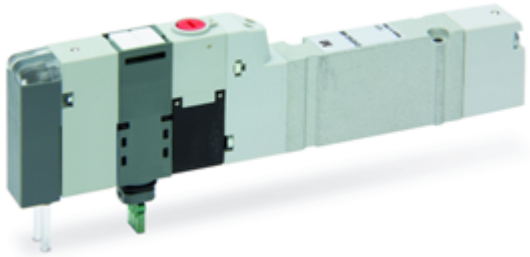


Accessories

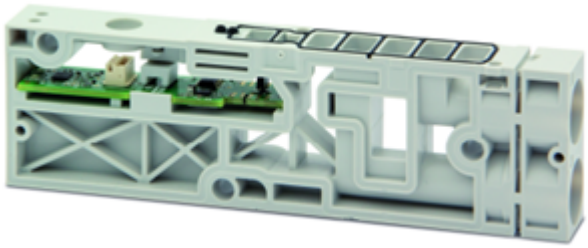
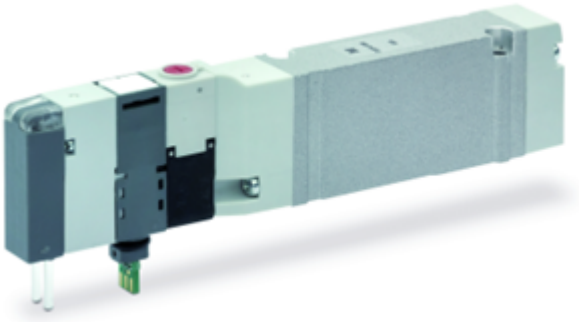
6.1 Series D valve subbase

The CX4 can be used to create a Series D Serial valve island by connecting the subbases on the pneumatic side to allow the new Camozzi Series D coil valves to be connected.
Series D valves are available in three sizes depending on the pitch:

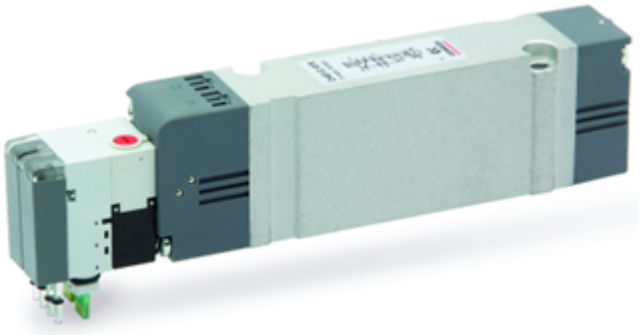
- Series D1 coil valves, 10.5 mm pitch

- Series D2 coil valves, 16 mm pitch

- Series D4 coil valves, 25 mm pitch

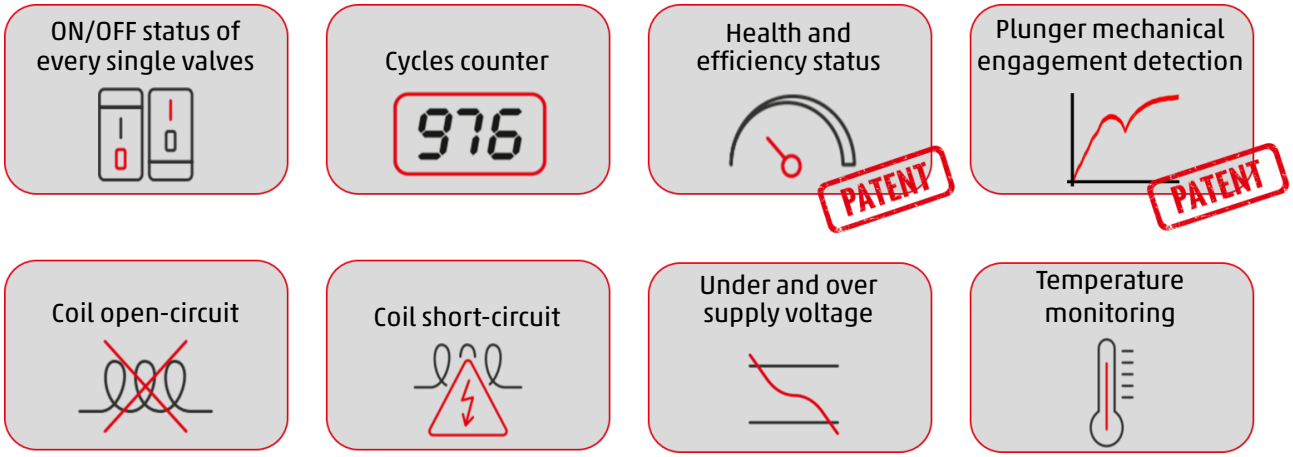



6.1.1 Technical Data

Key feature	Value
Construction	Balanced spool
Valve functions	2x3/2 NC/NO/NC+NO; 5/2; 5/3 CC/CO/CP
Materials	body, spool= AL; bases, end cover = technopolymer; bases = AL only D4; seals = HNBR
Attachments	Variable Bushings Ø (D1-D2-D5) Thread G3/8 (D4)
Ambient temperature	0÷50 °C
Fluid	• Compressed air filtered and not lubricated in class 7.4.4 according to ISO 8573-1: 2010. • If lubrication is required, use only oils with max. viscosity. 32 Cst and the version with external servo drive. • The servo drive air quality must be in class 7.4.4 according to ISO 8573-1:2010.
Voltage	24 Vdc
Voltage tolerance	±10%
Absorption	1 W
Insulation class	class F

6.1.2 Coilvision

The subbases of Series D valves are equipped with **COILVISION** technology. This technology was developed to constantly monitor the functional parameters of the coil that drives the spool. Each actuation of the coil, in different cyclic configurations and environmental conditions, is analysed to acquire information which, when processed by software algorithms, allows the health of the component to be diagnosed and predicted.
The information on the health status of the solenoid valve is data supplied by the CX4 module to the PLC and via the UVIX browser interface in the form of a percentage and gauge indicator (par. 9.3.4). Via UVIX, you can also receive a replace solenoid valve warning when its performance has deteriorated (par. 9.3.5). Below is all the information that can be obtained through COILVISION technology.



6.1.3 Features

The subbases that control the Series D coil valves can be configured in the management of the failsafe operation and in the management of piloting errors in the coil valves themselves .
Failsafe allows the subbase, in the absence of communication with the CX4 module, to set the status of the commands that drive the coil valves in order to avoid harmful and dangerous situations for devices or users. The parameters that can be configured are the ability to enable failsafe (*Fail Safe Enable*), which is disabled by default, and the state you want to set the valve coils to (*Fail Safe Status*). By default, the coil is off.
Coil management error locking can also be enabled (*Error Enable*). By default it is disabled. If enabled, errors do not simply disappear with the deactivation of the coil but the whole subbase and subsequently the whole system must be restarted.
NOTE. Possible errors on the coils are described in paragraph 6.1. Coil interrupt and coil over-current alarms can be configured as blocking.

6.1.4 Subbase diagnostics

The diagnostics of the subbases for the coil valves are defined by coded flashing of the yellow LED associated with the single coil (the subbase D4 is associated to two yellow LEDs with the same behaviour for each single coil).

Module status and alarms	LED status	Description of the status and solutions of the alarms
Normal operation without alarms	YELLOW OFF	The valve is not controlled.
	YELLOW ON	The valve has been operated correctly.

Module status and alarms	LED status	Description of the status and solutions of the alarms
Fault coil	 1 flash YELLOW @100 ms every 1 s	The coil did not energise properly. **Solution**: the alarm is not blocking, so try operating the coil valve again. If the problem persists, replace the coil valve.
Interrupted coil	 2 flashes YELLOW @100 ms every 1 s	The coil is interrupted or missing. This alarm may be blocking (if configured as such) and therefore the island must be restarted. **Solution**: replace the coil valve.
Overcurrent coil	 3 flashes YELLOW @100 ms every 1 s	The current consumption of the coil is excessive and therefore the coil valve is automatically switched off. **Solution**: replace the coil valve.
Overheating coil	 3 flashes YELLOW @100 ms every 1 s	The coil temperature is too high. This alarm may be blocking (if configured as such) and therefore the island must be restarted. **Solution**: remove the ON control on the coil valve and allow the coil to cool down. If the problem persists, replace the coil valve.
Overheating subbase	 5 flashes YELLOW @100 ms every 1	The subbase electronics temperature is too high. **Solution**: switch off the island and let the device cool down. If the problem persists, contact support, and replace the subbase.

NOTE. The interrupted coil and overcurrent alarms can block operation (configurable feature) and can only be reset by restarting the entire system.

6.2 Digital Input Module

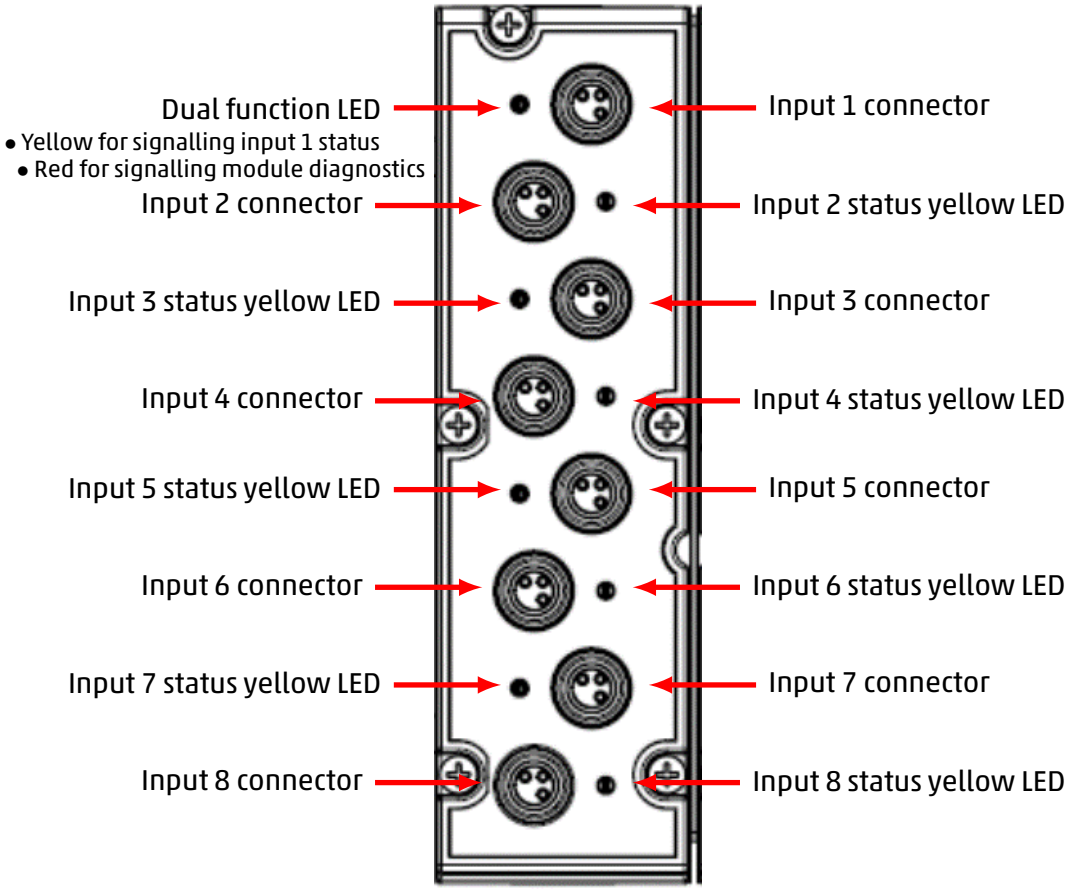
The digital input module allows 8 or 16 digital signals to be monitored. 2-wire or 3-wire digital sensors can be connected, with the option of powering the sensors directly through the module (24 V power supply).
After being connected to the CX4 module, the digital input module must be mapped from the island (par. 7.3). If the mapping procedure ends successfully, the digital input module waits to receive the configuration parameters from the CX4 module (maximum wait 1 minute). Upon receipt of these parameters, the module enters the normal operating state, and the digital inputs can be read. Otherwise, if the mapping procedure is not completed successfully, the module remains in an error state, deactivating any operational function.
There is a dedicated diagnostic LED for each input, although the LED of the first channel is used for general diagnostics. (par. 6.2.5).

6.2.1 Features

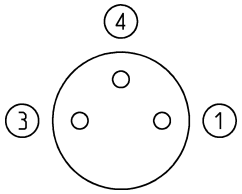
The configuration parameters for the digital input modules make it possible to act on both the input reading logic and on the temporal characteristics of the signals read.
For signal logic, it is possible to choose the polarity of each channel, i.e. the activation mode: each channel can be active high or active low (*Activation Mode*). In the first case, the channel will assume a high logic state in the presence of input voltage and a low logic state in the absence of voltage; in the second case, the reverse will apply.
Regarding the temporal characteristics of the input signals, configuration does not take place on a channel-by-channel basis: the values associated with the parameters in question have an effect on all input channels of the module. In particular, it is possible to specify two parameters: the minimum activation time and the minimum input re-reading period. The first parameter (*Minimum Activation Time*) indicates the amplitude of the minimum time interval in which the input signal to a certain channel must maintain the same state in order for that channel to be associated with the corresponding logical state: the purpose of this procedure is to filter out signals with an unstable level (anti-bounce). The second parameter (*Extension Time*) takes over after the anti-bounce filter has accepted the input value and is described as follows.

- At time t_0 there is a variation in the inputs not filtered by the anti-bounce system.
- At time $t_1 > t_0$ there is a further variation. At this point, two conditions can occur:
  - $t_1 - t_0 \geq$ *Extension Time*: the channel will assume the state determined by the value of the input signal at time t_1.
  - $t_1 - t_0 <$ *Extension Time*: the channel is placed in a waiting state for re-reading: at time $t_2 = t_0$ + *Extension Time*, he input is forcibly read and if the detected value differs from that acquired at time t_0, the channel assumes the new state, associated with the current signal value. If this not the case (i.e. at time t_2 the input value has returned to the same value as at time t_0), the channel will not detect any change in the signal.

6.2.2 Connections and signals of the 8 digital input module (M8 version)

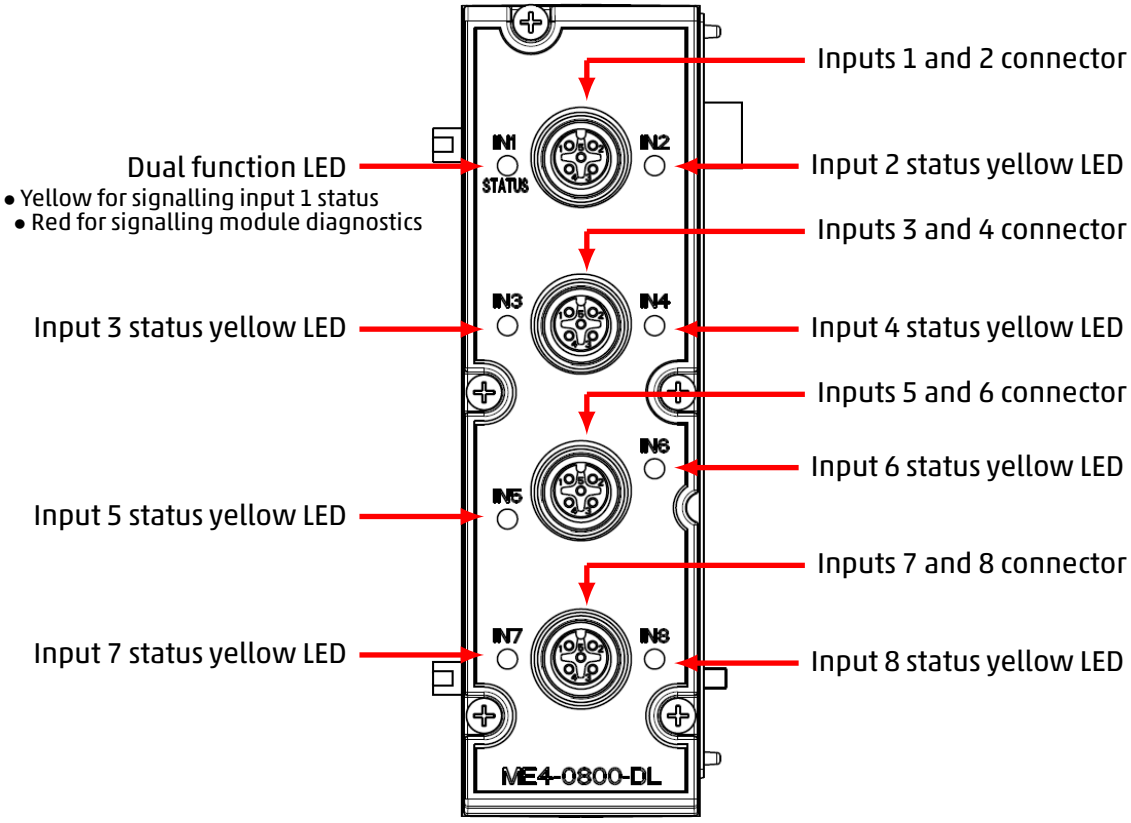


M8 connectors pinout

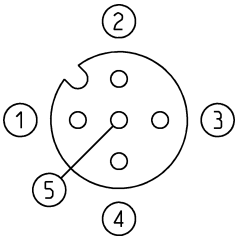
PIN	Signal	Description	Symbol
1	VCC	24 Vdc power supply for outside	
3	GND	GND reference	
4	Input	Input (max 100 mA for each input)	

NOTE. For the digital input modules, the M8 3-pole male connector for wiring is available in the Camozzi catalogue (cod. CS-DM03HB).

6.2.3 Connections and signals of the 8 digital input module (M12 version)



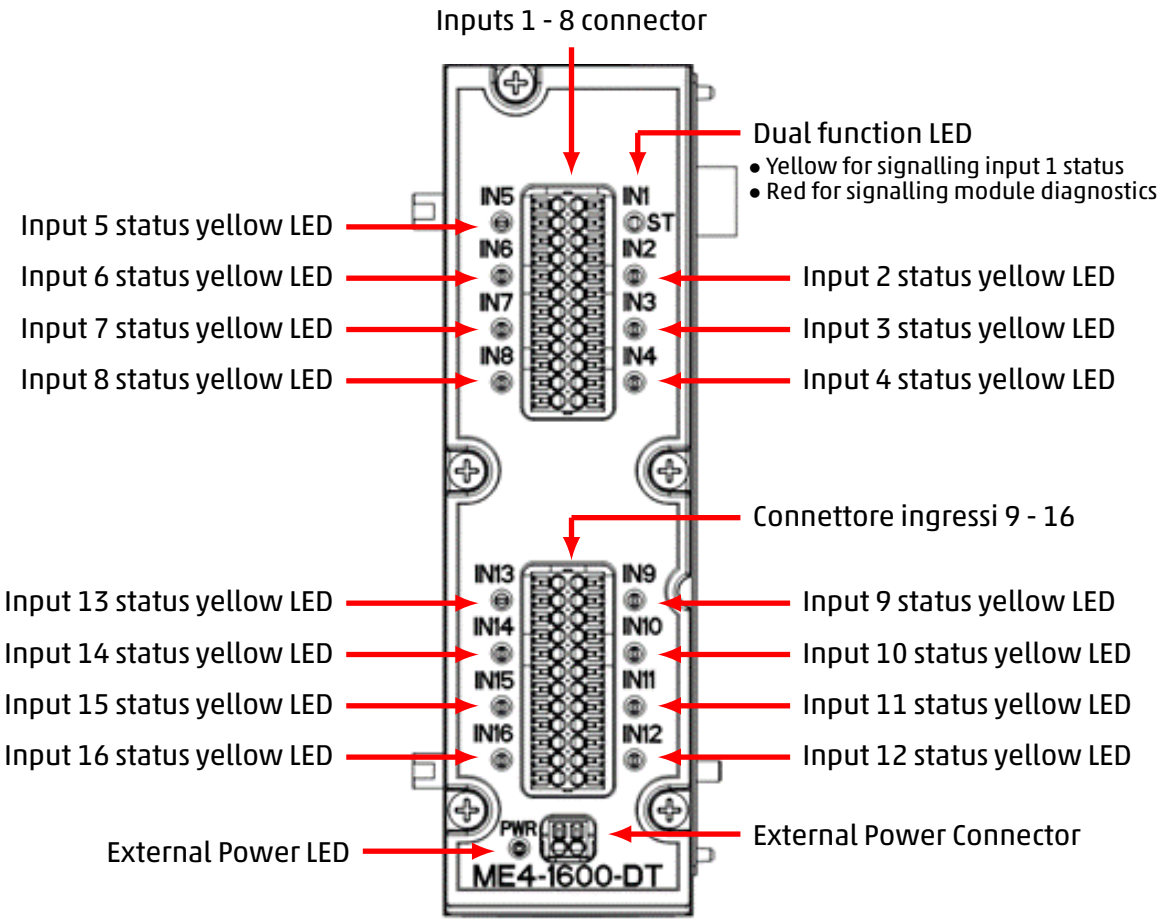
M12 connectors pinout

PIN	Signal	Description	Symbol
1	VCC	24 Vdc power supply for outside	
2	Input n+1	Input n+1 (max 100 mA for each input)	
3	GND	GND reference	
4	Input n	Input n (max 100 mA for each input)	
5	NC	Not connected	

N.B. The following connectors are available in the Camozzi catalog for digital input modules.

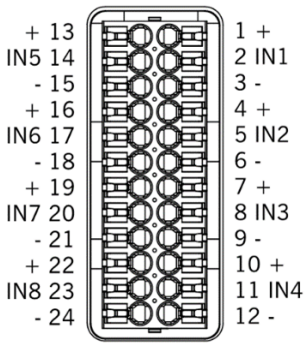
- Wired metal, straight, M12 A 5-pole male (cod. CS-LM05HC).
- Wired, straight, M12 A 5-pole male DOUBLE (cod. CS-LD05HF).

6.2.4 Connections and signals of the 16 digital input modules



Input connectors pinout

The 16-channel connector is a RTB (DFMC and FMC series from Phoenix).

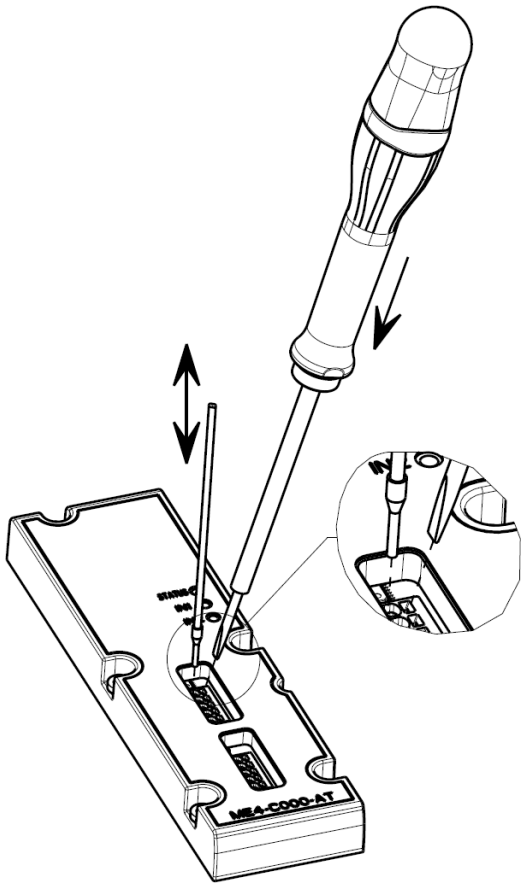
PIN	Signal	Description	Symbol
1, 4, 7, 10, 13, 16, 19, 22	VCC (+)	24 Vdc power supply for outside	
2, 5, 8, 11, 14, 17, 20, 23	Input n	Channel 1 input (max 50 mA for each input with internal power supply; 125 mA with external power supply)	
3, 6, 9, 12, 15, 18, 21, 24	GND (-)	GND reference	

External power supply connector pinout

PIN	Signal	Description	Symbol
1	+	Input power supply 24Vdc	+ - 
2	-	GND reference	

Connection mode

The cables must have a cross-section of 0.5mmq and a 0.4x2 screwdriver can be used to remove the terminal block from the module as per the datasheet.



6.2.5 Module diagnostics

General diagnostic LED

The signalling LED of the first channel has the dual function of indicating the module diagnostics, as well as the activation status of the channel itself. When the module experiences certain conditions, the LED behaves as described in the following table.

Module status and alarms	LED status	Description of the status and solutions of the alarms
Start-up End mapping End configuration	 RED OFF	The module enters this state upon power-up and at the end of the mapping phase or the reception of configuration parameters.
Mapped module	 RED ON	The LED is lit during the mapping phase and is turned off if this procedure is completed successfully.
Waiting for configuration parameters	 1 flash RED @100 ms every 2 s	The module is waiting for configuration parameters (maximum duration 1 minute).
Communication alarm	 2 flashes RED @100 ms every 2 s	The alarm indicates that there is no communication between the digital input module and the CX4 module. **Solution**: try restarting the whole island and verifying that the physical connection to the digital input module is secure. If the problem persists, contact support, and replace the digital input module.
Short circuit digital inputs	 RED ON	At least one of the digital inputs is short-circuited. **Solution**: remove the input sensor and check the connection. If the problem persists, replace the sensor.

Inputs status LED

When the module is in normal operating mode (fully operational and with no particular critical issues), the LED of the first channel behaves like the signalling LEDs of the remaining channels (from 2 to 16), i.e. it is lit and yellow when the input is active and off when the input is inactive.

Input status	LED status	Description
Input n inactive	YELLOW OFF	The LED indicates that the corresponding digital input is not active.
Input n activated	YELLOW ON	The LED indicates that the corresponding digital input has activated successfully.

Diagnostic LED of the external power supply

In the 16-channel configuration, the digital input module is equipped with a connector for the external power supply with associated signalling LED.

NOTE The external power supply can be enabled or disabled through the configuration parameters from the controller/PLC or from UVIX.

External power status	LED status	Description of the status and solutions of the alarms
Not configured	 LED OFF	Power for the digital inputs is supplied directly from the digital input module.
External power supply present	 GREEN ON	External power is present, and the digital inputs are externally powered. For this mode, the parameter for using the external power supply must be configured correctly.
No external power supply	 RED ON	The module is configured to receive an additional external power supply, but this is not being detected by the module. **Solution**: check that the power is reaching the module correctly and that the connection has been made correctly.
Configured (External power supply out of range)	 1 flash RED @100 ms very 1 s	The module is configured to receive an additional external power supply, but this has a value of <21 Vdc or >27 Vdc. **Solution**: change the value of the power supply from the outside, bringing it within the proper operating range (21 Vdc ≤ Vcc ≥ 27 Vdc).

6.3 Digital Output Module

The digital output module allows 8 or 16 digital signals to be provided outside the system. 2-wire or 3-wire digital actuators, type P or N, can be connected.
The digital output module, after being connected to the CX4 module, must be mapped by the island (par. 7.3). If the mapping procedure is completed successfully, the digital output module waits to receive the configuration parameters from the CX4 module (maximum wait 1 minute). Once these parameters have been received, the module enters the normal operational state, and the digital outputs can be activated. Otherwise, if the mapping procedure is not end successfully, the module remains in an error state, deactivating any operational functionality.
For each input there is a dedicated diagnostic LED, while for general diagnostics the LED of the first channel is used (par. 6.3.5).

6.3.1 Features

The configuration parameters of the digital output modules can be divided into several categories: activation mode, safety management with failsafe and PWM signal generation.
The parameters belonging to the first category consist of bit masks with different meanings.

- (*Module settings*): the value of this parameter is used to activate or deactivate individual functions related to the behaviour of the entire module (not the individual channels). Currently, only the least significant bit is set, which enables (1) or disables (0) the detection of no load by the power driver when a channel is activated. If detection is activated and at least one output is activated without the presence of a load, the module detects the fault, which is then signalled by a specific alarm.
- Channel enabling (*Enable output channels*): the single bits that make up the parameter value describe the enabling (1) or disabling (0) of individual output channels. If a non-enabled channel is activated during normal operation, the output driver does not supply voltage to the channel.
- Channel type setting (*Output channels mode*): each bit constituting the parameter value describes how the individual channels are activated. Each channel can be configured to supply type P (1) or type N (0) loads.

Below are the parameters involved in the second category: here too, the values represent bit masks with different meanings in each case.

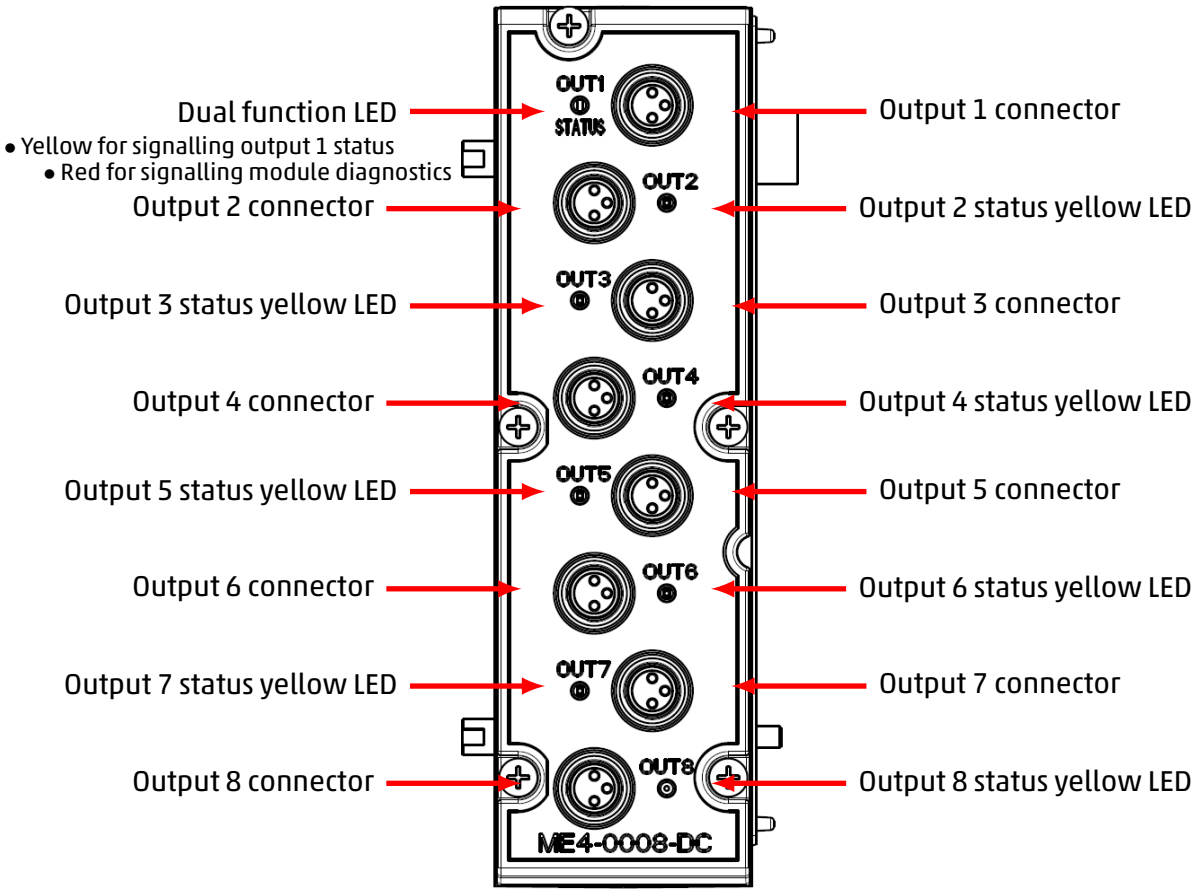
- Enabling the failsafe (*Fail safe enable*): the bits that make up the parameter value describe whether the failsafe is enabled (1) or disabled (0) on the relevant channel. The purpose is to ensure that the outputs assume a certain state if a communication alarm occurs: in the presence of such a fault, the channels with failsafe enabled will assume the value prescribed by the failsafe status parameter, while those with failsafe disabled will maintain the state they had at the time the communication alarm occurred.
- Failsafe status (*Fail safe status*): the bit mask representing the value of this parameter describes the status of the channels for which failsafe is enabled, should a communication alarm occur. In particular: 1 indicates that the corresponding channel should be activated, 0 that the corresponding channel should be deactivated.

Finally, the following are the parameters describing the operation of the output module as a PWM signal

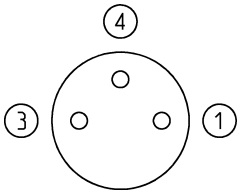
generator.

- PWM channel type setting (*Pwm channels*): the value of this parameter represents a bit mask indicating the mode of operation of individual channels. In particular: 1 indicates that the relevant channel should generate a PWM signal when activated, 0 indicates that the channel must instead operate in ON/OFF mode and therefore should generate a continuous signal when activated.
- PWM activation time (*Pwm activation time*): indicates the activation time for channels configured as PWM, in milliseconds (from 0 to 255). In particular, when a PWM channel is activated, it immediately assumes a duty cycle equal to 100% and maintains it until the specified time has elapsed: from that moment on, the PWM signal will be modulated with a duty cycle equal to the value of the Duty cycle per channel parameter (see below). The parameter has an effect on all of the module's channels.
- Duty cycle per channel (*Pwm channels duty cycle*): the value of this parameter describes the duty cycle to be applied to the individual PWM channels when they are activated, after the activation time has elapsed. It is expressed as a percentage (from 0 to 100) and is associated with the individual channel.

6.3.2 Connections and signals of the 8 digital output modules (M8 version)

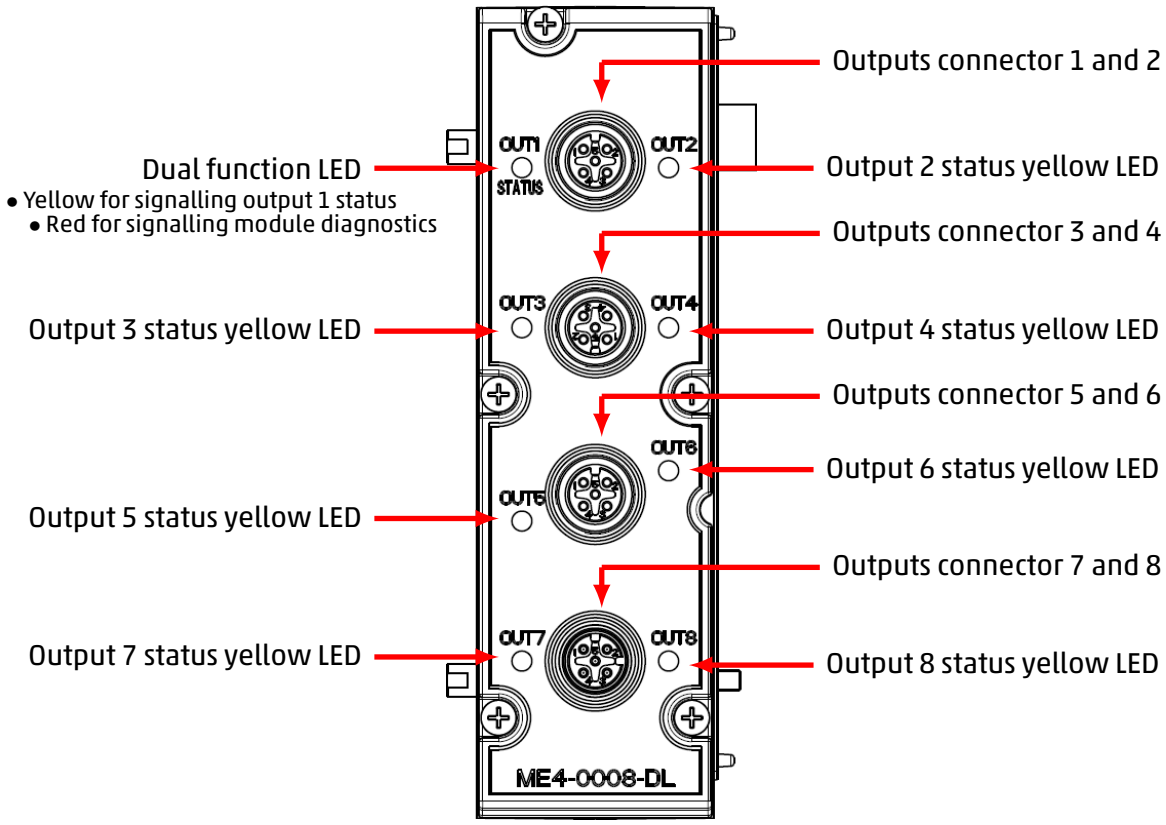


M8 connectors pinout

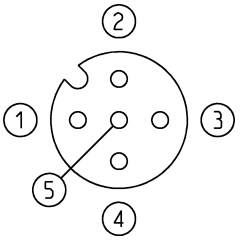
PIN	Signal	Description	Symbol
1	VCC	24 Vdc power supply for outside	
3	GND	GND reference	
4	Output	Output (max 125 mA for each output)	

NOTE. For the digital output modules, the M8 3-pole male connector for wiring is available in the Camozzi catalogue (cod. CS-DM03HB).

6.3.3 Connections and signals of the 8 digital output modules (M12 version)



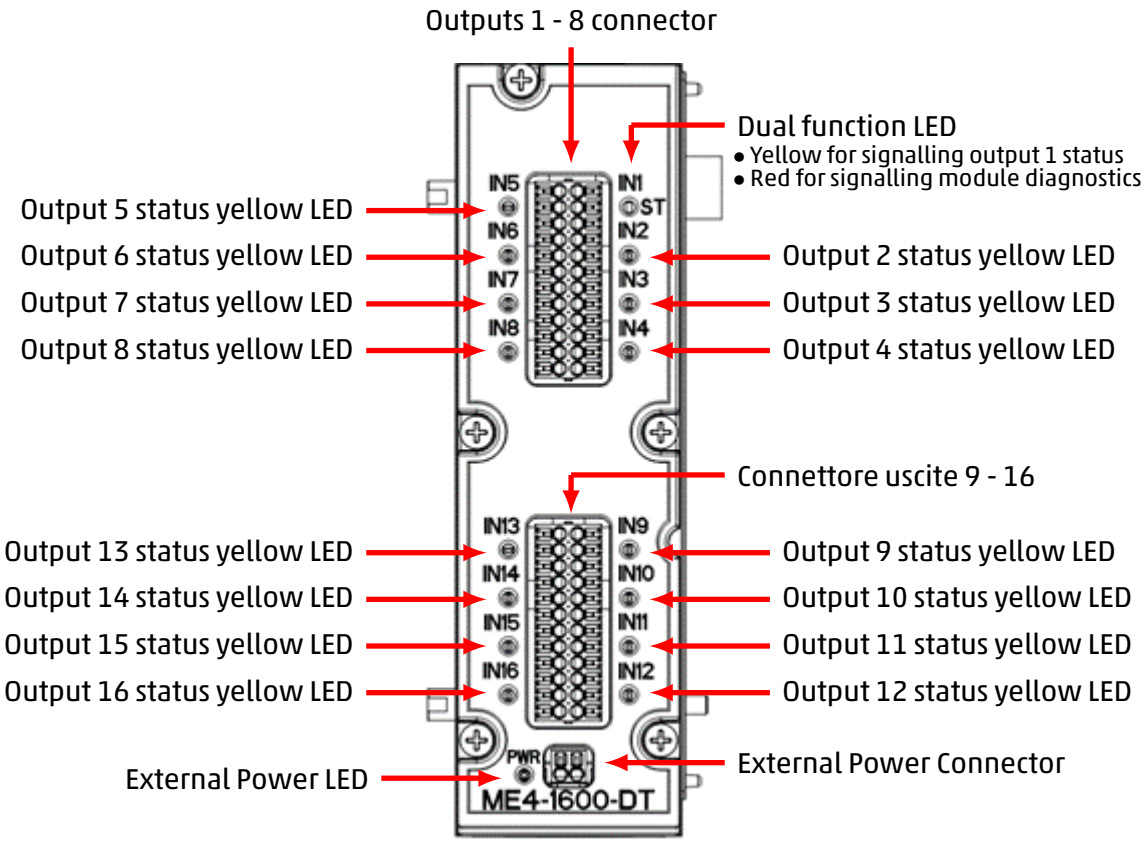
M12 connectors pinout

PIN	Signal	Description	Symbol
1	VCC	24 Vdc power supply for outside	
2	Output n+1	Output n+1 (max 125 mA for each output)	
3	GND	GND reference	
4	Output n	Output n (max 125 mA for each output)	
5	NC	Not connected	

N.B. The following connectors are available in Camozzi's catalog for digital output modules.

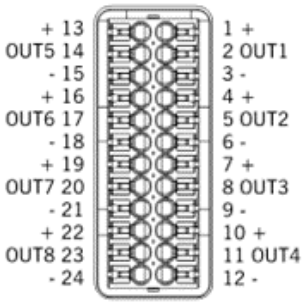
- Wired metal, straight, M12 A 5-pole male (cod. CS-LM05HC).
- Wired, straight, M12 A 5-pole male DOUBLE (cod. CS-LD05HF).

6.3.4 Connections and signals of the 16 digital output modules



Output connectors pinout

The 16-channel connector is a RTB (DFMC and FMC series from Phoenix). The cables must have a cross-section of 0.5 mm2 and a 0.4x2 screwdriver can be used to remove the terminal block from the module as per the datasheet.

PIN	Signal	Description	Symbol
1, 4, 7, 10, 13, 16, 19, 22	VCC (+)	24 Vdc power supply for outside	
2, 5, 8, 11, 14, 17, 20, 23	Output n	Output n (max 125 mA for each output)	
3, 6, 9, 12, 15, 18, 21, 24	GND (-)	GND reference	

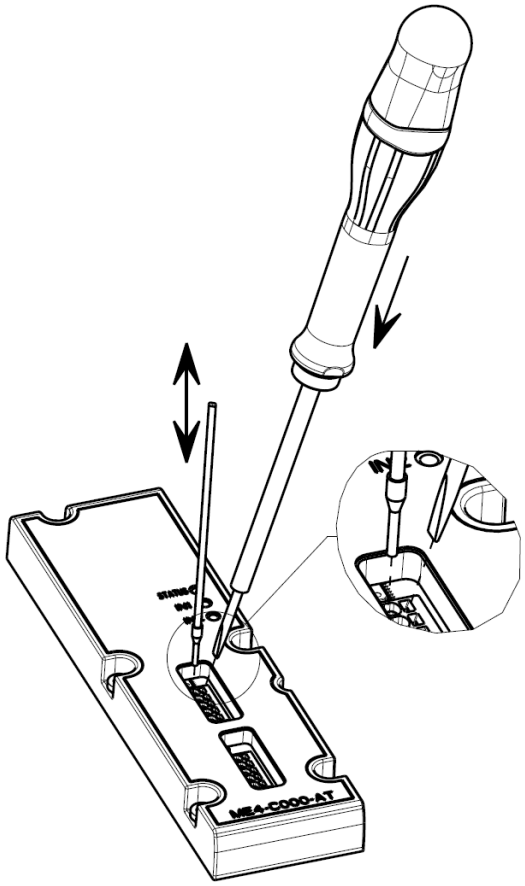
External power supply connector pinout

PIN	Signal	Description	Symbol
1	+	Input supply voltage 12÷32 Vdc	+ - 
2	-	GND reference	

NOTE. The 16-channel digital output module must be externally powered.

Connection mode

The cables must have a cross-section of 0.5mmq and a 0.4x2 screwdriver can be used to remove the terminal block from the module as per the datasheet.



6.3.5 Module diagnostics

General diagnostic LED

The signalling LED of the first channel has the dual function of indicating the module diagnostics, as well as the activation status of the channel itself. When the module experiences certain conditions, the LED behaves as described in the following table.

Module status and alarms	LED status	Description of the status and solutions of the alarms
Start-up End of the mapping End of the configuration phase	 RED OFF	The module enters this state when it is switched on, at the end of the mapping phase and when the configuration parameters are received.
Mapped module	 RED ON	The LED is lit during the mapping phase and is switched off if this procedure is completed successfully.
Waiting for configuration parameters	 1 flash RED @100 ms every 2 s	The module is waiting for configuration parameters (maximum duration 1 minute).
Short circuit on digital output channels	 RED ON	At least one of the digital outputs is short-circuited. **Solution**: check the connection and, if necessary, remove the output load and replace it.
Open circuit on digital output channels	 3 flashes RED @100 ms every 2 s	At least one output is not connected to the load and the open circuit is detected. **Solution**: check the load connection with the output connector.

Module status and alarms	LED status	Description of the status and solutions of the alarms
Undervoltage voltage supply (For 16-channel modules only)	 4 flashes RED @100 ms every 2 s	The supply voltage is less than 4.5 V. **Solution**: change the power supply value and return to the correct operating range (Vcc = 24 V).
No voltage supply (For 16-channel modules only)	 4 flashes RED @100 ms every 2 s	Circuit power is missing or shorted. **Solution**: check that the power reaches the module correctly and that the connection has been made correctly.
Communication alarm	 2 flashes RED @100 ms every 2 s	No response from the CX4 to output status and diagnostic signalling. **Solution**: contact support and replace the digital output module cover.

Outputs status LED

When the module is in normal operating mode (fully operational and with no particular critical issues), this LED behaves like the signalling LEDs of the remaining channels (from 2 to 16), i.e. it is lit and yellow when the output is active and off when the output is inactive.

Output status	LED status	Description
Output n inactive	YELLOW OFF	The LED indicates that the corresponding digital output is not active.
Output n activated	YELLOW ON	The LED indicates that the corresponding digital output has activated successfully.

Diagnostic LED of the external power supply

In the 16-channel configuration, the digital output module is equipped with a connector for the external power supply with associated signalling LED.
NOTE. It is mandatory for the external power supply to be connected.

External power status	LED status	Description of the status and solutions of the alarms
External power supply ok	GREEN OFF	The module is correctly receiving the additional external power supply.
No external power supply	GREEN OFF	The module does not detect the additional power supply and therefore cannot work. **Solution**: verify that power is reaching the module properly. If the problem persists, contact support, and replace the module.

6.4 Analogue Input Module

The analogue input module can monitor two analogue sensors simultaneously. The types of sensors that can be connected are:

- Resistance thermometers (RTD) for temperature measurement.
- Thermocouples for temperature measurement.
- Bridge for resistance measurement.
- Generic sensors with voltage or current outputs.

The analogue input module, after being connected to the CX4 module, must be mapped from the island (par. 7.3). If the mapping procedure is completed successfully, the module waits to receive the configuration parameters from the CX4 module. Upon receipt of these parameters, the module enters the normal operating state, and the analogue inputs can be read out. Otherwise, if the mapping procedure is not completed successfully, the module remains in an error state, deactivating any operational function.

6.4.1 Data format

Each channel restores the conversion of the corresponding input into a 16-bit or 32-bit word. The datum is represented in 2's complement and, depending on the module, corresponds to different values.

Module	Word transmitted	Data format	Size
RTD	16 bits	16 bits 2's complement	°C/10
THERMOCOUPLES	16 bits	16 bits 2's complement	°C/10
BRIDGE	32 bits	24 bits 2's complement	uV
VOLTAGE/CURRENT	16 bits	16 bits 2's complement 16 bits RAW (6.4.8)	mV, uA RAW

Each channel is also associated with a diagnostics byte which reports the errors indicated in the diagnostic. In case of correct operation, the diagnostics byte is equal to 0. Otherwise, it is possible to analyse the error by referring to the paragraph on the field bus.
If the diagnostics byte is different from 0, the bridge module will send data equal to 0x7FFFFF while all the others will transmit the value 0x7FFF (**NOTE.** this is not applied in case of *RAW* data format).
The data format used by the CX4 for communication with the PLC is of the *little endian* type for the CANopen protocol.

Example

In the little endian format, the least significant byte (LSB) is sent first. For example, the value 100000 uV (0x186A0) received from a BRIDGE module will be sent as follows:

	LSB	MID	MSB
Address	0x00	0x01	0x02
Data	0xA0	0x86	0x01

6.4.2 Features

The configurable parameters are the type of inputs, the transmission parameters and the filters to be applied to the inputs.

Inputs configuration

Each input must be appropriately configured, depending on the type of module used. For example, in the case of an RTD module, we could decide to have the following configuration:

- Channel 1: 4-wire PT100
- Channel 2: 2-wire PT1000

Or, for a Thermocouple module, the following configuration may be required:

- Channel 1: Type K thermocouple
- Channel 2: disabled

For a detailed description of the input configuration for the different analogue inputs, refer to the following paragraphs.

Transmission parameters configuration:

The modules can transmit data to the head in two different ways: in frequency and threshold.
When the transmission is configured in frequency (*Sampling Threshold* and *Sampling Threshold Timeout* parameters disabled), it is possible to set a transmission frequency (*Sampling Rate*) with which the module regularly transmits the acquired data to the head. **NOTE.** This parameter has nothing to do with the sampling frequency of the module inputs, which is fixed. To find out this frequency, refer to the Technical Data tables in this manual (par. 6.4).
When the transmission is configured as threshold (*Sampling Threshold* parameter other than zero), the module transmits the data to the head only if the current value is higher than the previous value of that set as threshold. If the input does not undergo changes beyond the threshold, the module still transmits the data when the timeout expires (*Sampling Threshold Timeout*). In the case of threshold operation, the *Sampling Frequency* parameter can be used to impose a limit on the frequency variation of the signal with respect to the threshold. In this way it is possible to reduce the shared bus occupation by the modules.

Example

Let's consider an RTD module with both channels enabled and with the following transmission configuration:

- *Sampling Frequency: 5 Hz*
- *Sampling Threshold: disabled*
- *Sampling Threshold Timeout: disabled*

the module sends the data acquired by the inputs and the related diagnostics to the PLC every 200 milliseconds.

If the configuration were instead:

- *Sampling Frequency: 1 Hz*
- *Sampling Threshold: 0.2 °C*
- *Sampling Threshold Timeout: 5 seconds*

The module transmits the data acquired by the inputs and the related diagnostics to the PLC in the following cases:

- *If the temperature measurement at the current time of either input exceeds the previous one by at least 0.2° C.*
- *If there is no temperature variation beyond the threshold for more than 5 seconds.*

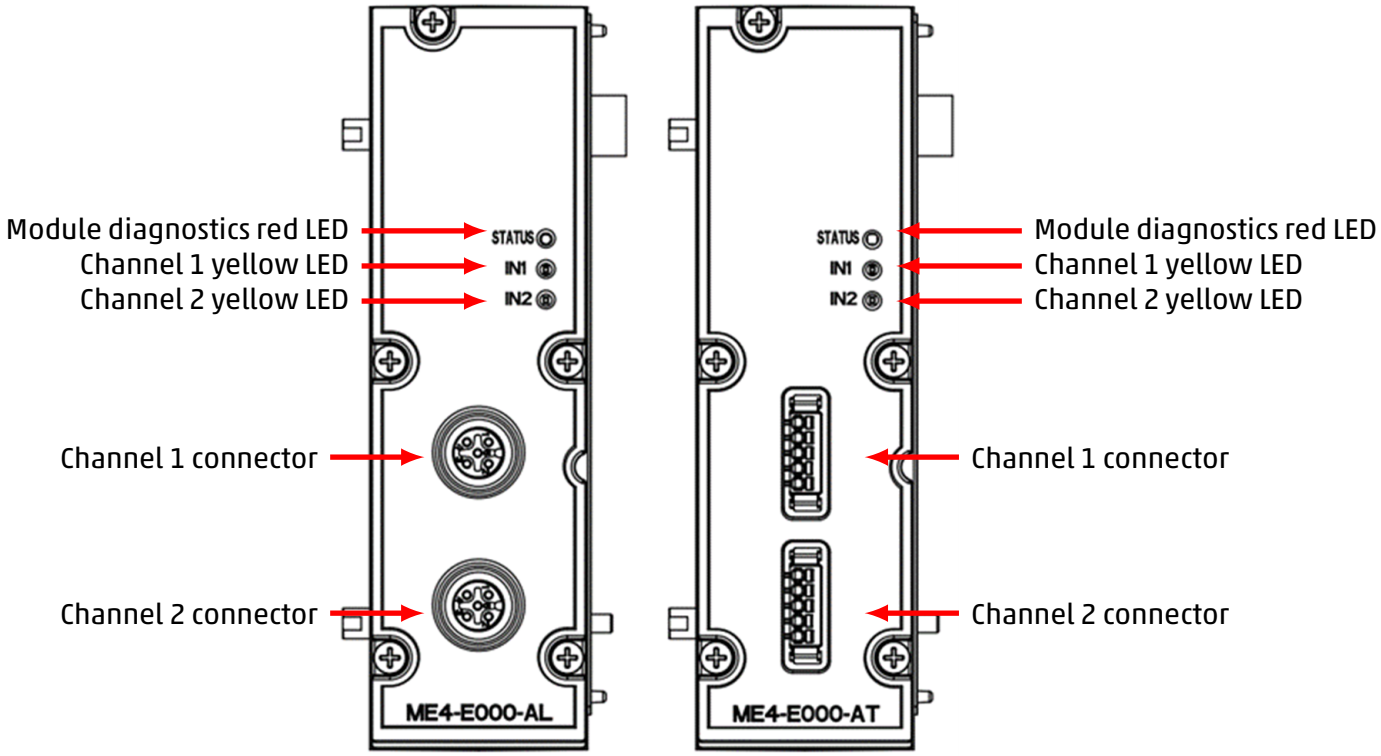
In the first case, if the temperature variation frequency with respect to the threshold were higher than 1 Hz, the transmission would be limited to 1 Hz.

Filter configuration:

Each input is equipped with a digital moving average filter. The maximum length of the filter impulse response is 128 samples. In the default configuration the filters are disabled.

6.4.3 Connections and signals of the modules

The analogue modules can have two types of connectors for connections with sensors. In the following figure, the left side shows an analogue module with 5-pole coded M12 A female connectors, while the right side shows an analogue module with 5-pole female TB connectors.



NOTE. The different types of analogue input modules have specific pinouts dedicated to their functionality. Visual indication of operation and diagnostics is via three LEDs.

6.4.4 Module diagnostics

NOTE. For a detailed description of the sensor faults, refer to the specific paragraphs of each module (RTD, thermocouples, bridge, and V/C modules).

Module status and alarms	LED STATUS	LED IN1	LED IN2	Description of the status and solutions of the alarms
Waiting for configuration parameters	 1 flash RED @100 ms every 2 s	YELLOW OFF	YELLOW OFF	The module is waiting for configuration parameters (maximum duration 1 minute).
Sensor working on channel 1	RED OFF	YELLOW ON	YELLOW OFF	The sensor connected to channel 1 is functioning correctly.
Sensor working on channel 2	RED OFF	YELLOW OFF	YELLOW ON	The sensor connected to channel 2 is functioning correctly.
Sensor alarm on channel 1	 2 flashes RED @100 ms every 2 s	 2 flashes YELLOW @100 ms every 2 s	YELLOW OFF	Sensor fault enabled and connected on channel 1. **Solution**: check the correct connection of the sensor and its power supply.

Module status and alarms	LED STATUS	LED IN1	LED IN2	Description of the status and solutions of the alarms
Bridge sensor missing on channel 1 (Blocking alarm only for bridge type module)	 3 flashes RED @100 ms every 2 s	 3 flashes YELLOW @100 ms every 2 s	 YELLOW OFF	Bridge sensor missing or faulty when configuring the module on channel 1. **Solution**: sensor connections and restart the module.
Sensor alarm on channel 2	 2 flashes RED @100 ms every 2 s	 YELLOW OFF	 2 flashes YELLOW @100 ms every 2 s	Sensor fault enabled and connected on channel 2. **Solution**: check that the sensor and its power supply are connected correctly.
Bridge sensor missing on channel 2 (Blocking alarm only for bridge type module)	 3 flashes RED @100 ms every 2 s	 YELLOW OFF	 3 flashes YELLOW @100 ms every 2 s	Bridge sensor missing or faulty when configuring the module on channel 2. **Solution**: check sensor connections and restart the module..

Module status and alarms	LED STATUS	LED IN1	LED IN2	Description of the status and solutions of the alarms
ADC communication error	 4 flashes RED @100 ms every 2 s	YELLOW OFF	YELLOW OFF	It occurs in the event of communication problems between the microcontroller and the ADC that measures the physical input quantity. **Solution**: contact support and replace the module.
Reference voltage 3.3 V error	RED ON	YELLOW OFF	YELLOW OFF	Occurs when there is a problem with the logic voltage (3.3 V). **Solution**: contact support and replace the module.

6.4.5 RTD Module (Resistance Temperature Detector)

Resistance temperature detectors (RTDs) can be connected to these analogue modules for temperature measurement. It is possible to configure some parameters individually to take the measurements.

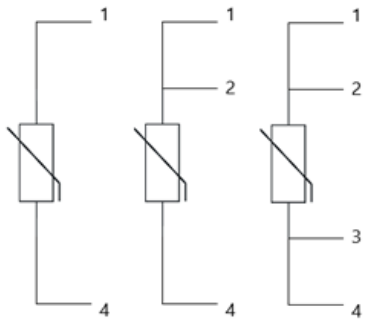
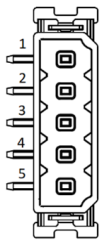
Dati tecnici

<table>
<tr><th>Key feature</th><th>Value</th></tr>
<tr><td>Sensor types</td><td>
<table>
<tr><th rowspan="2">Type</th><th colspan="2">Temperature [°C]</th></tr>
<tr><th>Minimum</th><th>Maximum</th></tr>
<tr><td>PT100 (385)</td><td>-200</td><td>850</td></tr>
<tr><td>PT100 (3926)</td><td>-200</td><td>630</td></tr>
<tr><td>PT200 (385)</td><td>-200</td><td>850</td></tr>
<tr><td>PT500 (385)</td><td>-200</td><td>850</td></tr>
<tr><td>PT1000 (385)</td><td>-200</td><td>850</td></tr>
<tr><td>Ni100 (618)</td><td>-60</td><td>180</td></tr>
<tr><td>Ni120 (672)</td><td>-80</td><td>260</td></tr>
<tr><td>Ni1000 (618)</td><td>-60</td><td>250</td></tr>
</table>
</td></tr>
<tr><td>Type of connections</td><td>2/3/4 wires</td></tr>
<tr><td>Number of inputs</td><td>2</td></tr>
<tr><td>Sensor connections</td><td>M12 A-coded 5 pole female connectors for each input
TB 5 pole female connectors for each input</td></tr>
<tr><td>Converter resolution</td><td>16 bit</td></tr>
<tr><td>Reading resolution</td><td>0.1 °C</td></tr>
<tr><td>Measurement error</td><td>< ±1 °C</td></tr>
<tr><td>Sampling frequency</td><td>4 Hz for each input</td></tr>
<tr><td>Digital filter</td><td>Moving average filter (configurable up to 128 samples) for each input</td></tr>
<tr><td>Signalling and diagnostics</td><td>Board diagnostics red LED
Yellow LED for each input</td></tr>
</table>

Electrical connections

The RTD wiring diagram is different depending on the number of wires used:

- 2-wire RTDs must be connected between pin 1 and pin 4 of the connector.
- 3-wire RTDs must be connected between pin 2 and pin 4 of the connector, compensation wire to pin 1.
- 4-wire RTDs must be connected between pin 2 and pin 3 of the connector, compensation wires to pin 1 and 4.

Possible types of connections (2/3/4 fili)	M12A connector	TB connector
		

Faults

The module is able to detect the following faults:

- RTD sensor disconnected or broken.
- Sensor temperature range exceeded by more than ± 1° C.

NOTE. Detection of compensation wire disconnection (A4- input for 3-wire RTD, A1 + and/or A4 + inputs for 4-wire RTD) can take several seconds.

6.4.6 Thermocouple module

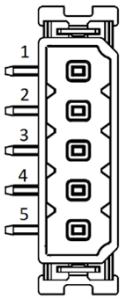
Thermocouples can be connected to these analogue modules for temperature measurement. It is possible to configure some parameters individually to take the measurements.

Technical Data

<table>
<tr><th>Key feature</th><th>Value</th></tr>
<tr><td>Sensor types</td><td>
<table>
<tr><th rowspan="2">Type</th><th colspan="2">Temperature [°C]</th></tr>
<tr><th>Minimum</th><th>Maximum</th></tr>
<tr><td>B</td><td>250</td><td>1820</td></tr>
<tr><td>E</td><td>-200</td><td>1000</td></tr>
<tr><td>J</td><td>-210</td><td>1200</td></tr>
<tr><td>K</td><td>-200</td><td>1372</td></tr>
<tr><td>N</td><td>-200</td><td>1300</td></tr>
<tr><td>R</td><td>-50</td><td>1768.1</td></tr>
<tr><td>S</td><td>-50</td><td>1768.1</td></tr>
<tr><td>T</td><td>-200</td><td>400</td></tr>
</table>
</td></tr>
<tr><td>Number of inputs</td><td>2</td></tr>
<tr><td>Sensor connections</td><td>M12 A-coded 5 pole female connectors for each input
TB 5 pole female connectors for each input</td></tr>
<tr><td>Converter resolution</td><td>16 bit</td></tr>
<tr><td>Reading resolution</td><td>0.1 °C</td></tr>
<tr><td>Measurement error</td><td>< < ±2°C for thermocouples E, J, K, N, T
< ±4°C for thermocouples B, R, S</td></tr>
<tr><td>Sampling frequency</td><td>4 Hz for each input</td></tr>
<tr><td>Digital filter</td><td>Moving average filter for each input
(configurable up to 128 samples)</td></tr>
<tr><td>Signalling and diagnostics</td><td>Board diagnostics red LED
Yellow LED for each input</td></tr>
</table>

Electrical connections

The thermocouple must be connected to pins 2 (positive) and 4 (negative) of the M12 or TB connector. Between pins 1 and 3 there is an RTD (PT100) on the circuit, which is needed to perform CJC (Cold Junction Compensation) fully automatically.

Pin	Signal	Description	M12A connector	TB connector
1	CJC	PT100 for cold junction compensation (do not connect)		
2	TC+	Thermocouple positive input		
3	CJC	PT100 for cold junction compensation (do not connect)		
4	TC-	Thermocouple negative input		
5	GND	Earth		

Faults

The module is able to detect the following faults:

- Thermocouples sensor disconnected or broken.
- Sensor temperature range exceeded by more than ± 2° C.

NOTE. Detection of thermocouple sensor disconnection may take several seconds.

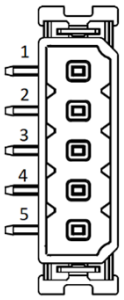
6.4.7 Bridge module

Bridge modules are based on resistive bridge operation with variable sensitivity (e.g. load cells).

Technical Data

Key feature	Value
Sensor types	4-wire resistor bridges (e.g. load cells) with variable bridge factor (sensitivity) are supported: from 2 mV/V to 255 mV/V at intervals of 1 mV/V
Number of inputs	2
Sensor connections	M12 A-coded 5 pole female connectors for each input TB 5 pole female connectors for each input
Converter resolution	24 bits
Reading resolution	1 uV
Measurement error	Dependent on the bridge factor
Sampling frequency	1 kHz for each input
Bridge excitation voltage	5 V
Digital filter	Moving average filter (configurable up to 128 samples) for each input
Signalling and diagnostics	Board diagnostics red LED Yellow LED for each input

Electrical connections

Pin	Signal	Description	M12A connector	TB connector
1	ECC1+	Positive excitation voltage of the resistor bridge (+ 5V)		
2	ECC1-	Negative excitation voltage of the resistor bridge (0V)		
3	SRB1+	Positive differential signal of the resistor bridge		
4	SRB1-	Negative differential signal of the resistor bridge		
5	GND	Earth		

Load cells

The load cells can be connected to the Bridge module to measure a force applied to an object by reading the voltage made by the resistor bridge. The voltage to weight conversion formula for load cells is as follows:

$$F = \frac{F_N \cdot U}{C \cdot U_{EXC}}$$

Dove:

- F is the force detected by the load cell (Kg)
- F_N is the capacity of the load cell (Kg)
- C is the sensitivity of the load cell (mV/V)
- U_{EXC} is the excitation voltage of the resistor bridge, this value is fixed and equal to 5V
- U is the voltage read by the load cell

Example

A load cell has the following characteristics: C = 2 mV/V e F_N = 5 Kg. Following the application of a force on the load cell, the module detects a voltage of 100 uV. Obtain the corresponding weight value:

$$F = \frac{5Kg \cdot 0.1mV}{2mV/V \cdot 5V} = 0.05Kg$$

Therefore, the weight value read corresponds to 50 grams.

Measurement error

The AD converter on the module includes a PGA (Programmable Gain Amplifier) whose gain is optimised according to the bridge factor set. This gain determines the full scale of the measurement and the related noise. The following table shows the full-scale errors for the most common bridge factors.

Bridge factor (mV/V)	Full scale (mV)	Error % (referring to full scale)
< 8	78,1	±0,0243
16	156,3	±0,0128
32	312,5	±0,0067
64	625,0	±0,0062
128	1250,0	±0,0056
256	2500,0	±0,0064

Faults

The module is able to detect the following faults:

- Short circuit between ECC + and ECC- pin (excitation voltage).
- Resistor bridge disconnected.
- Exceeding the full-scale value of the resistor bridge (U_{EXC}·) C dell'1%.

NOTE. The disconnection of the *resistor bridge* can only be detected at the moment the module is configured and not while in operating mode. The error remains set until a *resistor bridge* is inserted and a subsequent reconfiguration is performed.

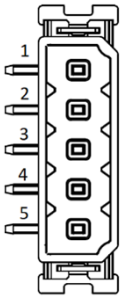
6.4.8 Voltage/Current module

The voltage/current (V/C) modules are analogue input modules that allow both analogue current and voltage measurements.

Technical Data

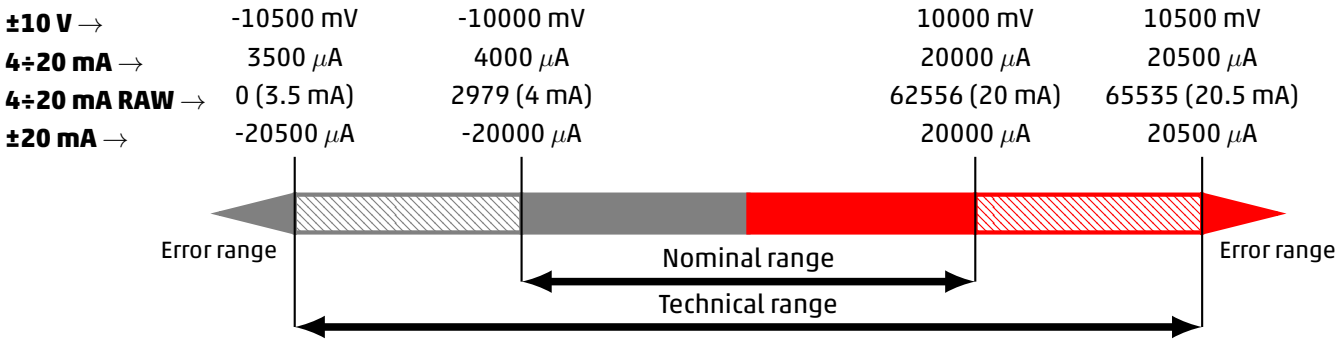
Key feature	Value
Sensor types	The following voltage and current inputs are supported: 0÷10 V 0÷10 V RAW ±10 V 4÷20 mA 4÷20 mA RAW 0÷20 mA ±20 mA
Number of inputs	2
Sensor connections	M12 A-coded 5 pole female connectors for each input TB 5 pole female connectors for each input
Converter resolution	16 bit
Reading resolution	1 mV 160.2 μV RAW 1 μA 259.4 nA RAW
Measurement error	< ±0.3% (relative to the full scale ±10 V) < ±0.3% (relative to the full-scale 0÷20mA)
Sampling frequency	100 Hz for each input
Bridge excitation voltage	5 V
Digital filter	Moving average filter (configurable up to 128 samples) for each input
Signalling and diagnostics	Board diagnostics red LED Yellow LED for each input

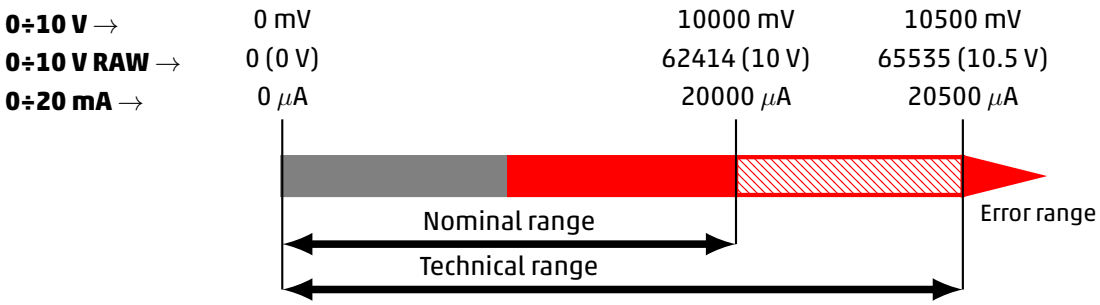
Electrical connections

Pin	Signal	Description	M12A connector	TB connector
1	+24EX	24 Vdc auxiliary voltage		
2	IN+	Positive voltage or current signal differential input		
3	GND	Earth		
4	IN-	Negative voltage or current signal differential input		
5	GND	Earth		

NOTE. Maximum absorption value: 200 mA per channel or 400 mA if there is only one sensor powered by the board.

Data range





Formato RAW

The 0÷10 V RAW and 4÷20 mA RAW configurations return a RAW value that must be converted in order to obtain the correspondent voltage or current value. In this case the measurement range is linearly mapped in a 16 bit number and it is considered the technical range.

$$\text{0÷10 V RAW} \rightarrow V(V) = \frac{10.5V}{65535} \cdot RAW_{VAL}$$

$$\text{4÷20 mA RAW} \rightarrow I(mA) = \frac{17mA}{65535} \cdot RAW_{VAL} + 3.5mA$$

Faults

The module is able to detect the following faults:

- Minimum and maximum voltage/current exceeded by ±60mV or ±60uA.
- 5 Open circuit (if channel configured with voltage).

NOTE. Open circuit detection (voltage configured channel) can take several seconds.

6.5 Analogue Output Module

The analogue output module can control two independent outputs with the following configurations:

- 0÷10 V voltage
- 0÷5 V voltage
- 0÷20 mA current
- 4÷20 mA currente

The analogue output module, after being connected to the CX4 module, must be mapped from the island (par. 7.3). If the mapping procedure ends correctly, the module waits for the reception of the configuration parameters from the CX4 module. Once these parameters have been received, the module enters normal operating status and the outputs, if enabled, can be set. Otherwise, if the mapping procedure does not finish correctly, the module remains in an error state by disabling any operational functionality.

Technical Data

Key feature	Value
Sensor types	0÷10 V 0÷5 V 0÷20 mA 4÷20 mA
Number of outputs	2
Sensor connections	M12 A-coded 5 pole female connectors for each input TB 5 pole female connectors for each input
Converter resolution	16 bit
Reading resolution	1 mV 1 μA
Measurement error	
Signalling and diagnostics	Board diagnostics red LED Yellow LED for each input

6.5.1 Data format

Each channel restores the conversion of the corresponding input into a 16-bits.

Module	Word transmitted	Data format	Size
VOLTAGE/CURRENT	16 bits	16 bits, 2's complement	mV, uA

The data format used by the CX4 for communication with the PLC is of the *little endian* type for the CANopen protocol.

Example

In the little endian format, the least significant byte (LSB) is sent first. For example, the value 5000 mV (0x1388) received from a V/C module will be sent as follows:

	LSB	MSB
Data	0x88	0x13

6.5.2 Features

The configurable parameters are the type of outputs and the safety management with failsafe. In fact, each output must be suitably configured as a voltage or current channel. In case of loss of communication with the PLC, it is also possible to assign default values, both in voltage and in current, to the analogue outputs (failsafe). In particular, for each channel you can:

- assign the value it had before the communication failure (failsafe disabled).
- Assign a desired value, configurable in the master configuration tool (failsafe enabled).

Example

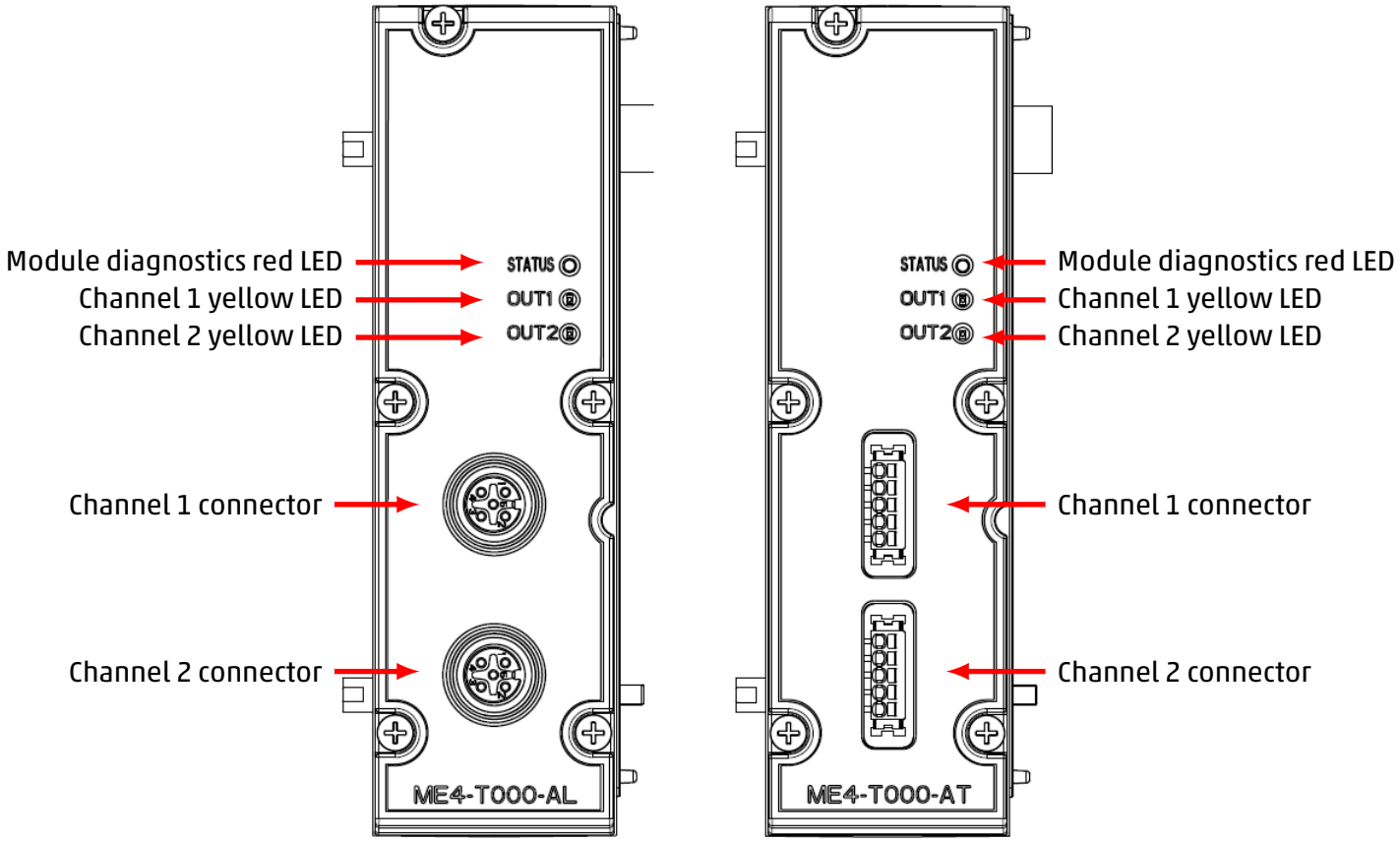
Considering an analogue outputs module with both channels enabled in voltage and failsafe enabled only on the second channel. In this case, the parameters configuration is as follows:

- *Channel Configuration Channel 1: 1 (0÷10 V)*
- *Channel Configuration Channel 2: 2 (0÷5 V)*
- *Fail Safe Enable Channel 1: 0*
- *Fail Safe Enable Channel 2: 1*
- *Fail Safe Value Channel 1: 0*
- *Fail Safe Value Channel 2: 3500*

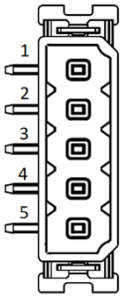
In case of loss of communication with the PLC, the value of channel 1 is equal to the last data received from the PLC before the failure, while on channel 2 the value of 3500 mV is set as a consequence of enabling the failsafe and setting the failsafe value.

6.5.3 Connections and signals of the modules

The analogue modules can have two types of connectors for connections with sensors. In the following figure, the left side shows an analogue module with 5-pole coded M12 A female connectors, while the right side shows an analogue module with 5-pole female TB connectors. The different types of analogue output modules have specific pinouts dedicated to their functionality. Visual indication of operation and diagnostics is via three LEDs.



Electrical connections

Pin	Signal	Description	M12A connector	TB connector
1	+24EX	24V auxiliary voltage		
2	OUT	Voltage or current signal output		
3	GND	Earth		
4	NC	Not connected		
5	NC	Not connected		

NOTE. Maximum absorption value: 200mA per channel or 400mA if there is only one sensor powered by the board

6.5.4 Module diagnostics

Module status and alarms	LED STATUS	LED IN1	LED IN2	Description of the status and solutions of the alarms
Waiting for configuration parameters	 1 flash RED @100 ms every 2 s	 YELLOW OFF	 YELLOW OFF	The module is waiting for configuration parameters (maximum duration 1 minute).
Output working (Channel 1)	 RED OFF	 YELLOW ON	 YELLOW OFF	The output to channel 1 is functioning correctly.
Output working (Channel 2)	 RED OFF	 YELLOW OFF	 YELLOW ON	The output to channel 2 is functioning correctly.
Communication fault	 2 flashes RED @100 ms every 2 s	 2 flashes YELLOW @100 ms every 2 s	 2 flashes YELLOW @100 ms every 2 s	Communication fault between head and module. **Solution**: contact support and replace the module.
No load (Channel 1)	 3 flashes RED @100 ms every 2 s	 3 flashes YELLOW @100 ms every 2 s	 YELLOW OFF	Load on the output 1 not present (This error is valid only for the current configuration). **Solution**: check connections with the load and restart the module.

Module status and alarms	LED STATUS	LED IN1	LED IN2	Description of the status and solutions of the alarms
No load (Channel 2)	 3 flashes RED @100 ms every 2 s	 YELLOW OFF	 3 flashes YELLOW @100 ms every 2 s	Load on the output 2 not present (This error is valid only for the current configuration). **Solution**: check connections with the load and restart the module.
Module error	 4 flashes RED @100 ms every 2 s	 4 flashes YELLOW @100 ms every 2 s	 4 flashes YELLOW @100 ms every 2 s	Occurs in case of the following problems: • Overheating • Undervoltage power supply • Internal DAC error **Solution**: contact support and replace the module.

Commissioning

7.1 Electrical connections

The following steps are recommended for the correct electrical connection of the system:

- Connect the IN connector to the CANopen network coming from the controller (or PLC).
- Connect the OUT connector to the next device in the CANopen network. If this connector is not used, close with the appropriate cap to ensure IP65 protection.
- Connect the power supply connector.

NOTE. The dedicated caps for IP65 protection of our connectors (for digital and analogue input/output modules and subnet) can be found in the Camozzi catalogue:

- CS-DFTP, M8 connector cover cap.
- CS-LFTP, M12 connector cover cap.

7.2 Start-up operation

The CX4 module performs a system-wide configuration check at start-up. This is called *mapping*. Specifically, the system configuration is determined by the type and position of the coil valve subbases and connected I/O modules. The system mapping is saved in the CX4 module's internal memory. If the mapping has never been stored or the configuration of the system has been modified, a new mapping request must be made (par. 7.3). During the mapping operation, the general diagnostic LEDs of each connected accessory device light up in sequence, first on the coil valve side and then on the I/O module side.

- If the mapping finishes successfully, the CX4 moves on to the next stage. Furthermore, the diagnostic LEDs of each recognized module are switched off.
- If the mapping is not completed correctly, a diagnostic alarm will be triggered (par. 8.1.2) and the CX4 module will not proceed with any other operations.

The second step at system start-up is the configuration of parameters. The CX4 will wait for a maximum of 1 minute for any parameters from the controller/PLC, otherwise the parameters saved in internal memory or the default parameters will be loaded. While waiting for the configuration parameters, the LEDs of the I/O modules flash until this operation is complete (The type of flashing is defined for each individual accessory module in chapter 6).
At the end of this second start-up phase, the system, managed by the CX4 module, switches into normal operation mode and is ready to perform the required operations.

7.3 Mapping

The CX4 module, in CX4 Series serial module or Series D serial valve island configuration, is extremely flexible and its configuration can be modified by removing, replacing or changing the positions of the coil valve subbases and/or I/O modules . Each time a change is made, the mapping procedure must be carried again out to correctly configure the entire system. The CX4 module must be aware of the composition of the entire island: number, type and location of coil valve subbases and I/O modules .
The mapping operation can be performed with the use of software, by sending a request for new mapping, without having to physically work with the island. A new mapping can be requested in the following ways:

- Camozzi UVIX as Gateway-USB (par. 9.8).
- NFCamApp, smartphone app (par. 10.6).

NOTE. Once the mapping request has been made, the CX4 module must be restarted.

7.4 Automatic mapping procedure for PDOs

The CX4 island can execute an automatic mapping procedure for the PDOs, to make the mapped object coherent with the effective modules mapped into the island.
The object that executes the automatic mapping in the 2023h (automatic mapping procedure, on the transition of the object from 0 to 1).
The PDOs are mapped as following (conformed to the Cia401 standard):

- TPDO:
  - TPDO1: the input modules are mapped following the order as they are placed into the island (independently if the modules are 8 bit, index 6000h, or 16 bit, index 6100h) until there are available byte in the PDO.
  - TPDO2: the first two 16bit analogue input modules are mapped (6401h).
  - TPDO3: the third and the fourth 16bit analogue input modules are mapped (6401h).
  - TPDO4: the fifth and the sixth 16bit analogue input modules are mapped (6401h).
  - TPDOx: since the non-standard COB-ID, these TPDOs are not compiled. They can be changed manually.
- RPDO:
  - RPDO1: the valves are mapped (oggetto 2200h). Then, the digital output modules (independently if modules are 8 bit, index 6200h, or 16 bit, index 6300h) following the order as they are placed into the island) until there are available byte in the PDO.
  - RPDO2: the first two 16bit analogue output modules are mapped (6411h).
  - RPDO3: the third and the fourth 16bit analogue output modules are mapped (6411h).
  - RPDO4: the fifth and the sixth 16bit analogue output modules are mapped (6411h)
  - RPDOx: since the non-standard COB-ID, these TPDOs are not compiled. They can be changed manually.

Once the PDOs are correctly mapped, the relative COB-ID is automatically enabled.
The object 2003h is not saved into the flash memory, it must be sent at every start of the island.

Mapping example

Composizione isola: 15 valvole, Moduli: DO8, DI8, DI16, DO16, DI8, AI8, AI16, AI16, AO16, AO16:

- TPDO1 (object 1A00h):
  - Sub0: 3;
  - Sub1: 6000h sub1;
  - Sub2: 6100h sub1;
  - Sub3: 6000h sub2.
- TPDO2 (object 1A01h):
  - Sub0: 4;
  - ub1: 6401h sub1;
  - Sub2: 6401h sub2;
  - Sub3: 6401h sub3;
  - Sub4: 6401h sub4.
- RPDO1 (object 1600h):
  - Sub0: 4;
  - Sub1: 2200h sub1;
  - Sub2: 2200h sub2;
  - Sub3: 6200h sub1;
  - Sub4: 6300h sub1.
- RPDO2 (object 1601h):
  - Sub0: 4;
  - Sub1: 6411h sub1;
  - Sub2: 6411h sub2;
  - Sub3: 6411h sub3;
  - Sub4: 6411h sub4.

7.5 Addressing and communication speed

The CX4 CANopen module must have a unique address in order to be correctly identified on the network and the communication speed (*Baud rate*) must be set.
To change the default information, you can use the UVIX interface for remote control or the LSS protocol, as specified by CiA. In addition, two proprietary Camozzi modes can be used to change these parameters.

- Camozzi UVIX as Gateway-USB (par. 9.2.2)
- NFCamApp, smartphone app (par. 10.5).

In case of using the LSS protocol, the object that must be considered is *Identity object* (1018h) of the object dictionary. It is composed by four fields:

- Vendor ID: equal to 0x97 for all CX4 CANopen device.
- Product code: equal to 0x5B for all CX4 CANopen device.
- Revision number: equal to 0x04 for all CX4 CANopen device.
- Serial number: whose number can be found on the device label.

The messages to configure the device via LSS protocol are:

Identifier	Payload (hex)	Description
0x7E5	04 01 00 00 00 00 00 00	Set all the devices into the LSS configuration mode. No replay to this message.
0x7E5	40 VI 00 00 00 00 00 00	VI stands for *Vendor ID*. For Camozzi devices is 0x97.
0x7E5	41 PC 00 00 00 00 00 00	PC stands for *Product Code*. For CX4CO devices is 0x5B.
0x7E5	42 RN 00 00 00 00 00 00	RN stands for *Revision Number*. For CX4CO devices is 0x04.
0x7E5	43 SN 00 00 00 00 00 00	SN stands for *Serial Number*. Look at the label of the device.
0x7E5	11 NN 00 00 00 00 00 00	NN stands for *Node Number*. Configure node ID.
0x7E5	13 00 NB 00 00 00 00 00	NB stands for *New Baudrate*. Configure bit timing.
0x7E5	17 00 00 00 00 00 00 00	Store command.

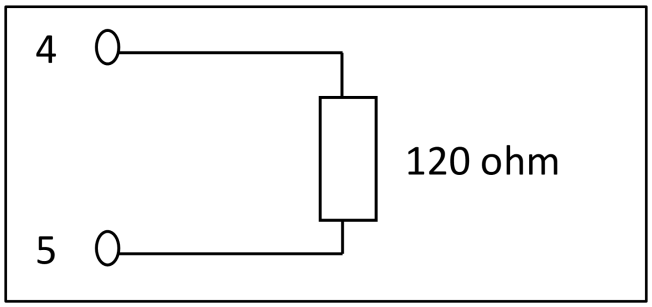
In case of using the application, once it is scanned the NFC tag of the device, it is possible to select the *Fieldbus* section, where it is possible to modify the communication parameters of the CAN bus via the button *Write fieldbus*.

In the event of failure to establish communication between the valve island and the controller, the problem is indicated by the bus diagnostic LED.

To connect the CX4 module to the CANopen bus, use a twisted and shielded four-core cable. The maximum length of the CANopen line depends on the baud rate (transmission speed), used as indicated in the following table. If the CPU module is the last node of the CANopen line, you must assemble the bus termination: for the CPU module, you need a CS-LP05H0 connector, which already contains the necessary resistors, and which must be assembled on the BUS OUT connector.

The diagram below shows the connection the resistors that make up the termination, the numbers refer to the pins of the BUS OUT connector.

Baud rate [kbits/s]	Maximum segment length [m]
20	2500
50	1000
125	500
250	250
500	100
800	50
1000	25



7.6 Configuration via EDS file

To configure the CX4 in a CANopen network, the EDS file must be imported to the programming software used for the controller. The configuration file describes the characteristics of the CANopen valve island and allows the Inputs/Outputs to be configured correctly. The EDS file can be found on the Camozzi website at:
http://catalogue.camozzi.com/Downloads

7.7 Address assignment

The volume of addresses of the Series D valve island in the CANopen network is limited as shown in the table.

Modules	Number of channels	Bytes per single module	Number of connectable modules	Assigned address volume	Maximum number of I/Os
Valve subbases	2	2 bits per coil	64	16 bytes	128 coils
8-channel digital input modules	8	1 byte	16	16 bytes	128 digital inputs
16-channel digital input modules	16	2 bytes	8	16 bytes	128 digital inputs
8-channel digital output modules	8	1 byte	16	16 bytes	128 digital outputs
16-channel digital output modules	16	2 bytes	8	16 bytes	128 digital outputs
Analogue input modules for RTD	2	4 bytes	8	32 bytes	16 analogue inputs for RTD
Analogue input modules for Thermocouples	2	4 bytes	8	32 bytes	16 analogue inputs for Thermocouples
Analogue input modules for BRIDGE	2	8 bytes	4	32 bytes	8 analogue inputs for BRIDGE
Analogue input modules for Voltage/Current	2	4 bytes	8	32 bytes	16 Analogue inputs for Voltage/Current
Analogue output modules for Voltage/Current	2	4 bytes	8	32 bytes	16 Analogue outputs for Voltage/Current

7.8 Object dictionary

The objects are defined by the CiA 301 profile, the CiA 401 profile and the manufacturer's specifications.

7.8.1 CiA 301 objects

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1000h	0	Device Type	U32	RO		0xFF7F0191
1001h	0	Error register	U8	RO	X	0x0
1002h	0	Manufacturer status register	U32	RO	X	0x0
1003h		Pre-defined error list				
	0	Number of error	U32	RW		0x0
	1	Standard error field	U32	RO		0x0
	2	Standard error field	U32	RO		0x0
	3	Standard error field	U32	RO		0x0
	4	Standard error field	U32	RO		0x0
	5	Standard error field	U32	RO		0x0
	6	Standard error field	U32	RO		0x0
	7	Standard error field	U32	RO		0x0
	8	Standard error field	U32	RO		0x0
1005h	0	COB_ID sync	U32	RW		0x80
1006h	0	Communication Cycle Period	U32	RW		0x0
1007h	0	Synchronous Window Length	U32	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1008h	0	Manufacturer device name	STR	CONST		CX4MCO
1009h	0	Manufacturer hardware version	STR	CONST		0x1
100Ah	0	Manufacturer software version	STR	CONST		0x0
100Ch	0	Guard time	U16	RW		0x0
100Dh	0	Life time factor	U16	RW		0x0
1010h		Store parameter field				
	0	Highest sub-index supported	U32	RO		0x1
	1	Save all parameters	U32	RW		0x0
1011h		Restore default parameters				
	0	Highest sub-index supported	U32	RO		0x1
	3	Restore application parameters	U32	RW		0x0
1012h	0	COB-ID time stamp	U32	RW		0x80000100
1014h	0	COB_ID emcy	U32	RO		0x80
1015h	0	Inhibit time emergency	U16	RW		0x0
1017h	0	Producer heartbeat time	U16	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1018h		Identity object				
	0	Number of entries	U8	RO		0x4
	1	Vendor id	U32	RO		0x97
	2	Product code	U32	RO		0x5B
	3	Revision number	U32	RO		0x4
	4	Serial number	U32	RO		0x0
1019h	0	Synchronous counter overflow value	U8	RW		0x0
1020h		Verify configuration				
	0	Highest sub-index supported	U32	RO		0x2
	1	Configuration date	U32	RW		0x0
	2	Configuration Time	U32	RW		0x0
1029h		Error behaviour				
	0	Highest sub-index supported	U8	RO		0x1
	1	Communication error	U8	RW		0x0
1200h		Server SDO parameter				
	0	Highest sub-index supported	U8	RO		0x2
	1	COIB-ID client->server	U32	RO		0x600
	2	COIB-ID server->client	U32	RO		0x580

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1400h		Rx PDO communication parameter 1				
	0	Highest sub-index supported	U8	RO		0x2
	1	COB-ID	U32	RW		0x200
	2	Transmission type	U8	RW		0xFF
1401h		Rx PDO communication parameter 2				
	0	Highest sub-index supported	U8	RO		0x2
	1	COB-ID	U32	RW		0x80000300
	2	Transmission type	U8	RW		0xFF
1402h		Rx PDO communication parameter 3				
	0	Highest sub-index supported	U8	RO		0x2
	1	COB-ID	U32	RW		0x80000400
	2	Transmission type	U8	RW		0xFF
1403h		Rx PDO communication parameter 4				
	0	Highest sub-index supported	U8	RO		0x2
	1	COB-ID	U32	RW		0x80000500
	2	Transmission type	U8	RW		0xFF

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1404h		Rx PDO communication parameter 5				
	0	Highest sub-index supported	U8	RO		0x2
	1	COB-ID	U32	RW		0x80000000
	2	Transmission type	U8	RW		0xFF
1405h		Rx PDO communication parameter 6				
	0	Highest sub-index supported	U8	RO		0x2
	1	COB-ID	U32	RW		0x80000000
	2	Transmission type	U8	RW		0xFF
1406h		Rx PDO communication parameter 7				
	0	Highest sub-index supported	U8	RO		0x2
	1	COB-ID	U32	RW		0x80000000
	2	Transmission type	U8	RW		0xFF
1407h		Rx PDO communication parameter 8				
	0	Highest sub-index supported	U8	RO		0x2
	1	COB-ID	U32	RW		0x80000000
	2	Transmission type	U8	RW		0xFF

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1600h		Rx PDO mapping parameter 1				
	0	Number of mapped objects	U8	RW		0x3
	1	Mapping entry 1	U32	RW		0x22000108
	2	Mapping entry 2	U32	RW		0x22000208
	3	Mapping entry 3	U32	RW		0x22000308
	4	Mapping entry 4	U32	RW		0x0
	5..8	Mapping entry X	U32	RW		0x0
1601h		Rx PDO mapping parameter 2				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1602h		Rx PDO mapping parameter 3				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1603h		Rx PDO mapping parameter 4				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1604h		Rx PDO mapping parameter 5				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1605h		Rx PDO mapping parameter 6				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1606h		Rx PDO mapping parameter 7				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1607h		Rx PDO mapping parameter 8				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1800h		Tx PDO communication parameter 1				
	0	Sub-index supported	U8	RO		0x5
	1	COIB-ID	U32	RW		0x180
	2	Transmission type	U8	RW		0xFE
	3	Inhibit time	U16	RW		0x0
	4	Compatibility entry	U8	RW		0x0
	5	Event timer	U16	RW		0X64

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1801h		Tx PDO communication parameter 2				
	0	Sub-index supported	U8	RO		0x5
	1	COIB-ID	U32	RW		0x80000280
	2	Transmission type	U8	RW		0xFF
	3	Inhibit time	U16	RW		0x0
	4	Compatibility entry	U8	RW		0x0
	5	Event timer	U16	RW		0X0
1802h		Tx PDO communication parameter 3				
	0	Sub-index supported	U8	RO		0x5
	1	COIB-ID	U32	RW		0x80000380
	2	Transmission type	U8	RW		0xFF
	3	Inhibit time	U16	RW		0x0
	4	Compatibility entry	U8	RW		0x0
	5	Event timer	U16	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1803h		Tx PDO communication parameter 4				
	0	Sub-index supported	U8	RO		0x5
	1	COIB-ID	U32	RW		0x80000480
	2	Transmission type	U8	RW		0xFF
	3	Inhibit time	U16	RW		0x0
	4	Compatibility entry	U8	RW		0x0
	5	Event timer	U16	RW		0X64
1804h		Tx PDO communication parameter 5				
	0	Sub-index supported	U8	RO		0x5
	1	COIB-ID	U32	RW		0x80000000
	2	Transmission type	U8	RW		0xFF
	3	Inhibit time	U16	RW		0x0
	4	Compatibility entry	U8	RW		0x0
	5	Event timer	U16	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1805h		Tx PDO communication parameter 6				
	0	Sub-index supported	U8	RO		0x5
	1	COIB-ID	U32	RW		0x80000000
	2	Transmission type	U8	RW		0xFF
	3	Inhibit time	U16	RW		0x0
	4	Compatibility entry	U8	RW		0x0
	5	Event timer	U16	RW		0x0
1806h		Tx PDO communication parameter 7				
	0	Sub-index supported	U8	RO		0x5
	1	COIB-ID	U32	RW		0x80000000
	2	Transmission type	U8	RW		0xFF
	3	Inhibit time	U16	RW		0x0
	4	Compatibility entry	U8	RW		0x0
	5	Event timer	U16	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1807h		Tx PDO communication parameter 8				
	0	Sub-index supported	U8	RO		0x5
	1	COIB-ID	U32	RW		0x80000000
	2	Transmission type	U8	RW		0xFF
	3	Inhibit time	U16	RW		0x0
	4	Compatibility entry	U8	RW		0x0
	5	Event timer	U16	RW		0x0
1A00h		Tx PDO mapping parameter 1				
	0	Number of mapped objects	U8	RW		0x2
	1	Mapping entry 1	U32	RW		0X10020020
	2	Mapping entry 2	U32	RW		0x60000108
	3..8	Mapping entry X	U32	RW		0X0
1A01h		Tx PDO mapping parameter 2				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1A02h		Tx PDO mapping parameter 3				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
1A03h		Tx PDO mapping parameter 4				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1A04h		Tx PDO mapping parameter 5				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1A05h		Tx PDO mapping parameter 6				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1A06h		Tx PDO mapping parameter 7				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1A07h		Tx PDO mapping parameter 8				
	0	Number of mapped objects	U8	RW		0x0
	1..8	Mapping entry X	U32	RW		0x0
1F80h	0	NMT start-up	U32	RW		0x0

7.8.2 CiA 301 object descriptions

7.8.2.1 1000h Device type

This object contains information on the type of device and its functions. It consists of two 16-bit fields, one describing the profile used, and a second containing additional specific information.

7.8.2.2 1001h Error register

This object contains the device's internal error mapping, it is a mandatory object for all devices and is part of the emergency objects. The values are defined in the table.

Bit	Optional	Description
0	Mandatory	Generic error
1	Optional	Current
2	Optional	Voltage
3	Optional	Temperature
4	Optional	Communication error
5	Optional	Profile-specific
6	Optional	Reserved
7	Optional	Reserved

7.8.2.3 1002h Manufacturer status register

This object contains the device status, it is manufacturer specific.

7.8.2.4 1003h Pre-defined error field

This object contains errors that have been identified on the device and have been signalled by the emergency message. This creates an error history. Sub-index 0 contains the number of errors that are currently saved, from sub-index 1 to sub-index 8. When there are no errors, it takes a value of zero. Each new error is saved at index 1 and the old ones are moved up an index. Entering zero into sub-index 0 deletes the error history, resetting all saved errors to zero. Each error consists of a 16-bit field containing the error code, defined by CANopen, and another 16-bit field containing additional manufacturer information.

Manufacturer info	Error type
0x2320	Valve overcurrent error
0x3120	Low master power error
0x4201	High master temperature error
0x4202	High sub-base temperature error
0x4203	High coil temperature error
0x8100	CANopen communication error
0x8110	CAN overrun error
0x8120	CAN Error Passive error
0x8130	Heartbeat or life-guard error
0x8140	CAN busoff recovery
0x8210	PDO length error
0x8220	Long PDO error
0xF001	Enumeration error
0xF002	485 mapping error
0xF003	CAN mapping error
0xF004	Valve error: N. fault coil
0xF005	Valve error: Interrupted Pilot
0xF006	Valve error: Comm.

7.8.2.5 1005h COB-ID sync

This object contains the configuration of the COB-ID of the synchronization (SYNC) message, indicating whether the device generates the message or not.

Bit	Value	Description
31(MSB)	X	Not used
30	0 1	Device does not generate SYNC message Device generates SYNC message
29	0 1	11-bits CAN-ID 29-bits CAN-ID
28-0	X	29-bit extended address
11-0	X	11-bit standard address

7.8.2.6 1006h Communication cycle period

This object contains the time in milliseconds of the cyclic communication of SYNC messages; when its value is null, the device does not send synchronism messages.

7.8.2.7 1007h Synchronous window length

This object contains the length of the time window for synchronous PDO messages, i.e. the time from the synchronism message within which these PDOs must arrive in order to be valid.
If the value is set to zero, the synchronization window is disabled.

7.8.2.8 1008h Manufacturer device name

This object contains the device name given by the manufacturer.

7.8.2.9 1009h Manufacturer hardware version

This object contains the hardware version of the device.

7.8.2.10 100Ah Manufacturer software version

This object contains the software version of the device.

7.8.2.11 100Ch Guard time

This object together with the following 100Dh represent the configuration of the *life guarding* protocol. The *Guard time* contains the time in which the *guarding* message is sent, expressed in ms; if it is set to zero, the *life guarding* protocol is disabled.

7.8.2.12 100Dh Life time factor

This object contains the number of *guarding* messages that may be lost. This value multiplied by the *Guard time* is the maximum amount of time in which the *guarding* messages must arrive in order to prevent an error and communication reset.

7.8.2.13 1010h Store parameter field

This object controls the storage of parameters in the permanent memory. With read access, the device provides information on its storage capacity.
There are different groups of parameters:

- Sub-index 00h contains the highest sub-index supported.
- Sub-index 01h refers to all parameters that can be stored in the CANopen device.
- Sub-index 02h refers to the communication parameters (indexes 1000h to 1FFFh).
- Sub-index 03h refers to the application parameters (indexes 6000h to 9FFFh).

7.8.2.14 1011h Restore default parameter

This object restores the default parameters. By means of a read operation, the device communicates information on the ability to restore these values. There are many different groups of parameters. To restore the default values, the *load* signal (00x64616f6c) must be written.
Different sub-indexes restore different parameters:

- Sub-index 1: all parameters.
- Sub-index 2: communication parameters.
- Sub-index 3: application parameters.

7.8.2.15 1012h COIB-ID time stamp

This object contains the configuration of the *time stamp* (TIME) message, indicating whether the device consumes or produces the message.

Bit	Value	Description
31(MSB)	0 1	Device does not consume the TIME message Device consumes the TIME message
30	0 1	Device does not produce the TIME message Device produces the TIME message
29	0 1	11-bit CAN-ID 29-bit CAN-ID
28-0	X	29-bit extended address
11-0	X	11-bit standard address

7.8.2.16 1014h COIB-ID EMCY

This object contains the configuration of the EMCY service.

Bit	Value	Description
31(MSB)	0 1	EMCY present / valid EMCY absent / invalid
30	0 1	Reserved
29	0 1	11-bit CAN-ID 29-bit CAN-ID
28-0	X	29-bit extended address
11-0	X	11-bit standard address

7.8.2.17 1015h Inhibit time emergency

This object contains the inhibit time of the EMCY message, which must be a multiple of 100 µs. If set to zero it disables the inhibit time.

7.8.2.18 1017h Producer heartbeat time

This object contains the configuration of the heartbeat protocol, indicating the time in which the *heartbeat* message is produced. The time must be a multiple of 1 millisecond. If set to zero *heartbeat* management is disabled.

7.8.2.19 1018h Identity object

This object contains information about the device:

Bit	Value	Description
0	4	Sub-index number
1	151h	Vendor ID
2	05Ah	Product code
3	001h	Revision number
4	000h	Serial number

7.8.2.20 1019h Synchronous counteroverflow value

This object contains the configuration of the SYNC message. If the value is set to zero, the SYNC message will have no parameter; if the value is between 2 and 240 then the SYNC message will have a parameter of one data byte, which will contain a counter.

7.8.2.21 1020h Verify configuration

This object contains the date and time of the last configuration. Sub-index 1 contains the date after 01/01/1984; sub-index 2 contains the number of seconds after midnight of the set day.

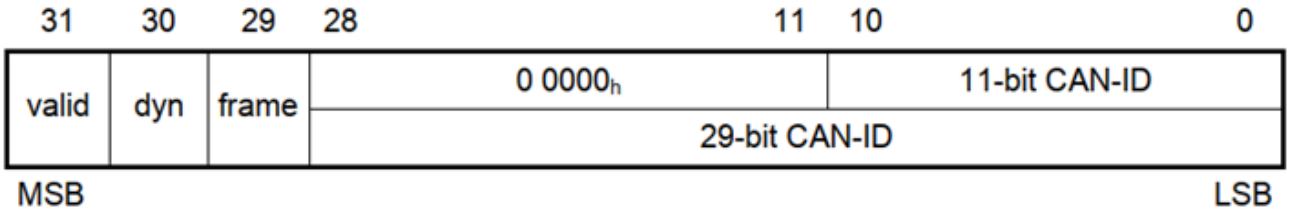
7.8.2.22 1029h Error behaviour

This object contains the type of error that can occur. Sub-index 0 contains the number of error classes; sub-index 1 contains the communication error; sub-indexes 2 to 254 should contain the errors specified by the CANopen profile or the errors defined by the manufacturer.
The error classes can be:

- 0, pre operational.
- 1, no change of state
- 2, stopped.
- 3-127, reserved.

7.8.2.23 1200h Server SDO parameter 1

The number of entities supported of objects in the SDO record is specified in sub-index 00h. In this device, the values at sub-index 01h and 02h specify the COB-ID for this SDO.



7.8.2.24 1400h - 1407h Receive PDO Communication Parameter

These objects contain the configuration of the PDO communication that the device can receive. The PDO transmission parameters are described in the document CIA301, section 7.4.8.1.
Sub-index 1 contains the COB-ID of the PDO:

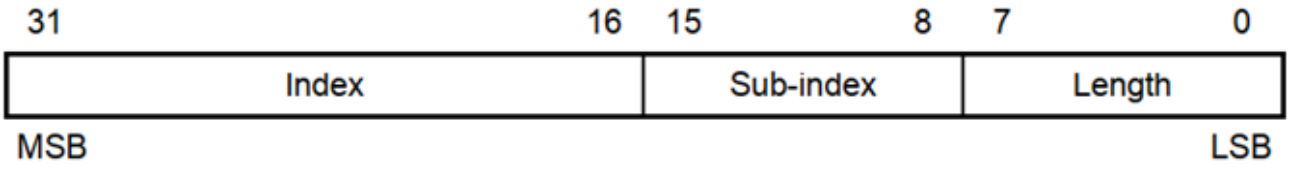
Bit	Value	Description
31(MSB)	0 1	PDO present / valid PDO absent / invalid
30	0 1	Reserved
29	0 1	11-bit CAN-ID 29-bit CAN-ID
29-11	X	29-bit CAN-ID (extended message)
10-0	X	11-bit CAN-ID (standard message)

Sub-index 2 contains the transmission type:

- Value = 0 → Synchronous transmission (with SYNC messages).
- Value = 1÷240 → Synchronous transmission every N SYNC messages.
- Value = 252-253 → Transmission only on transmission request (RTR).
- Value = 254 → Asynchronous transmission specific to manufacturer.
- Value = 255 → Asynchronous transmission specific to device profile.

7.8.2.25 1600h - 1607h Receive PDO Mapping Parameter

These objects contain the PDO mapping that the device is able to receive.
Sub-index 0 contains the number of objects mapped in the PDO; if the value is set to zero, it means that no object is mapped. Each *sub-index* from 1 to the previously specified number contains information on the object mapped in the PDO.



Below is the sequence for changing the mapping of a PDO:

- Disable the Rx PDO by setting bit 31, in sub-index 1 of the RPDO communication parameter, to a value of 1.
- Disable the existing mapping by setting sub-index 0 to zero.
- Change the mapping by editing the value of the corresponding sub-index.
- Enable mapping by setting sub-index 0 to the number of mapped objects.
- Enable the Rx PDO by setting bit 31, in sub-index 1 of the RPDO communication parameter, to the value 0.

7.8.2.26 1800h - 1807h Transmit PDO Communication Parameter

These objects contain the configuration of the PDO communication that the device can transmit. The PDO transmission parameters are described in the document CIA301, section 7.4.8.1. Sub-index 1 contains the COB-ID of the PDO.

Bit	Valore	Descrizione
31(MSB)	0 1	PDO present / valid PDO absent / invalid
30	0 1	RTR supported RTR not supported
29	0 1	11-bit CAN-ID 29-bit CAN-ID
29-11	X	29-bit CAN-ID (extended message)
10-0	X	11-bit CAN-ID (standard message)

Sub-index 2 contains the transmission type:

- Value = 0 → Synchronous transmission (with SYNC messages)

- Value = 1-240 → Synchronous transmission every N SYNC messages
- Value = 252-253 → Transmission only on transmission request (RTR)
- Value = 254 → Asynchronous transmission specific to manufacturer
- Value = 255 → Asynchronous transmission specific to device profile

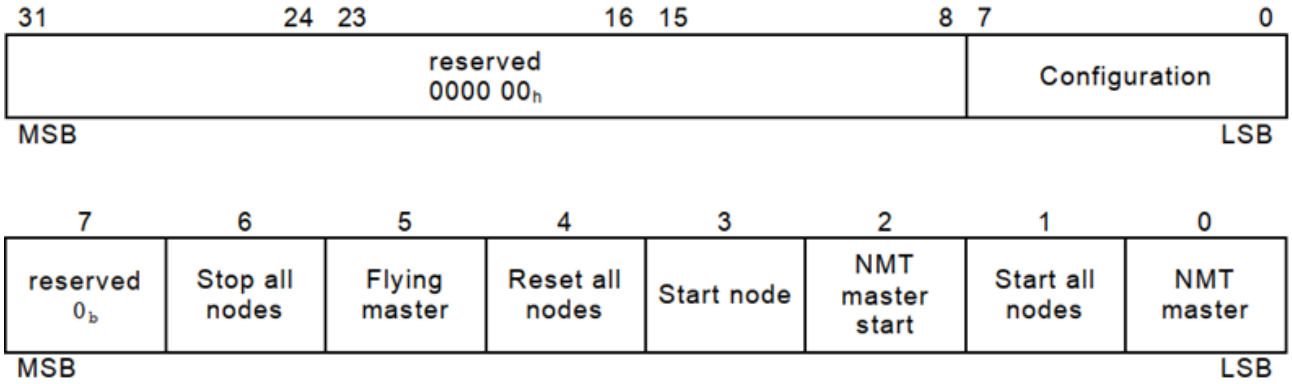
Sub-index 3 contains the minimum time interval with which the TPDO can be transmitted when the transmission type set is 255 or 254. This value is a multiple of 100 µs; if it is set to zero, the minimum interval is disabled.
Sub-index 4 is reserved.
Sub-index 5 contains the maximum time interval with which the TPDO is transmitted when the set transmission type is 255 or 254. This value is a multiple of 1 ms; if it is set to zero, the maximum interval is disabled.

7.8.2.27 1A00h - 1A07h Transmit PDO Mapping Parameter

Same as for RxPDO mapping.

7.8.2.28 1F80h NMT Startup

This object contains configuration of the master behaviour at *startup*, its value in bits is described in the following image.



Activation allows you to edit the 2-bit NMT *master start*:

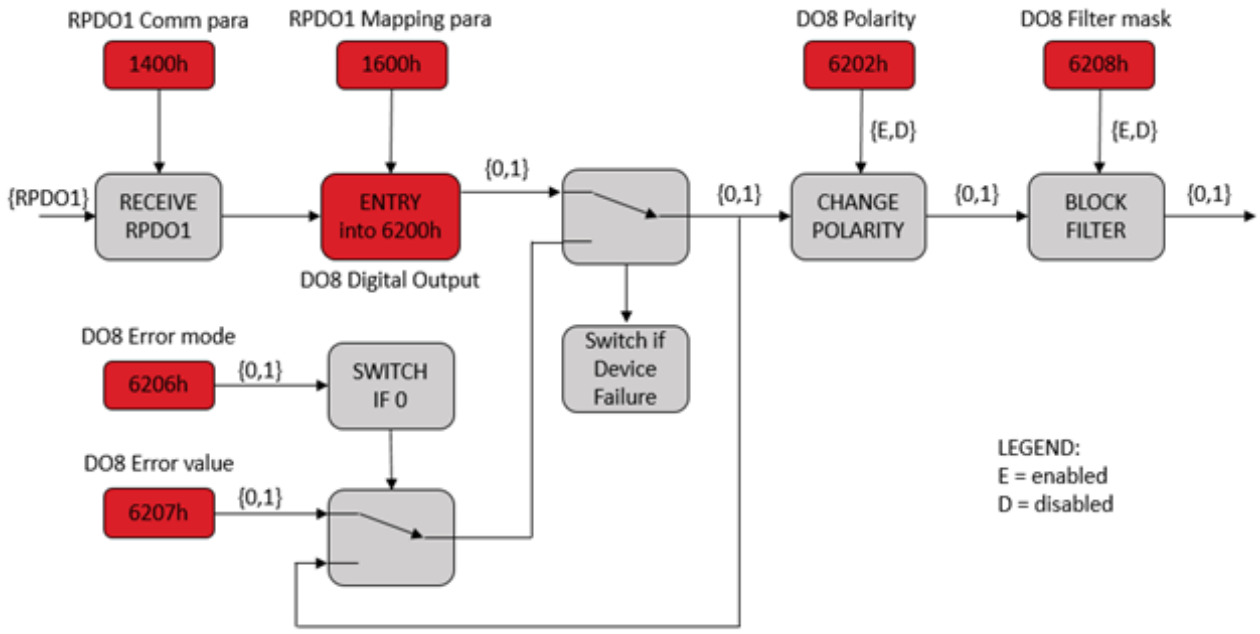
- 0 = Allows the device to enter operational state autonomously at *startup*.
- 1 = Does not allow the device to enter operational state autonomously.
- And to change the 3-bit Start node:
- 0 = The master must put the device into operational state.
- 1 = the device enters operational state immediately at *startup*.

Attempting to set a bit that is not managed by the device returns an object writing *abort* error.

7.8.3 Accessories module objects representation

7.8.3.1 Digital output 8 bits

The objects related to 8 bit digital output follow the schema, as specified by CiA401:

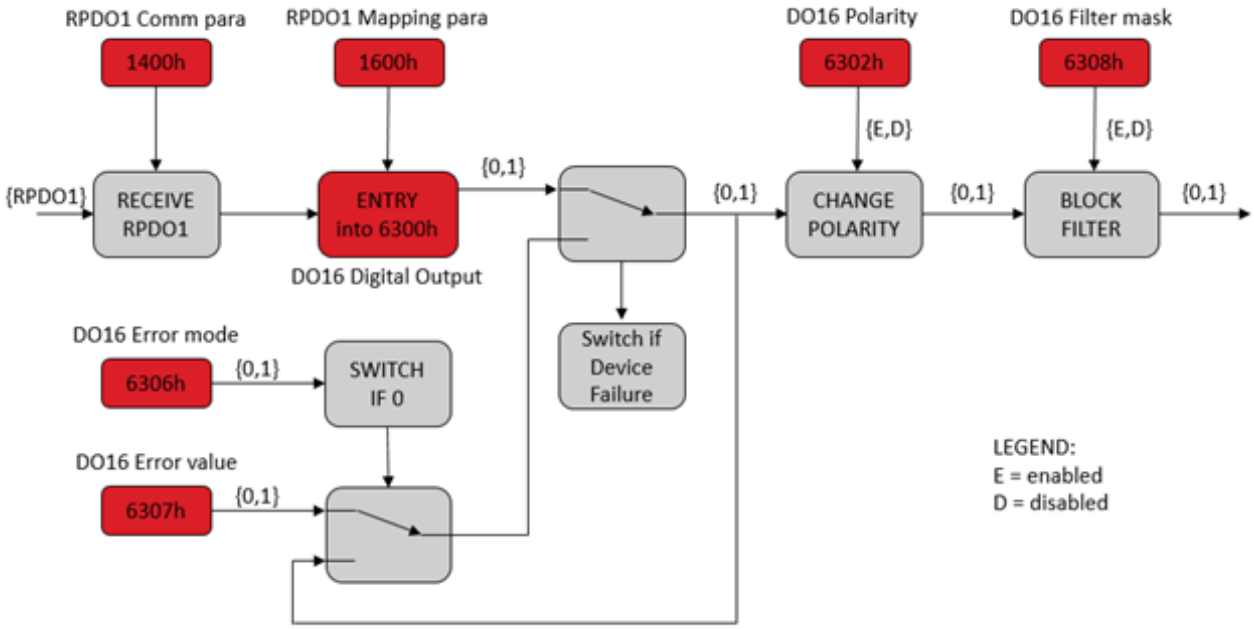


Besides, there are more related object in the *Manufacturer specific* section:

- 2500h, DO8 Module Setting.
- 2501h, DO8 PWM Channel Mode.
- 2502h, DO8 PWM Activation Time.
- 2503h, DO8 PWM Channel Duty Cycle.

7.8.3.2 Digital output 16 bits

The objects related to 16 bit digital output follow the schema, as specified by CiA401:

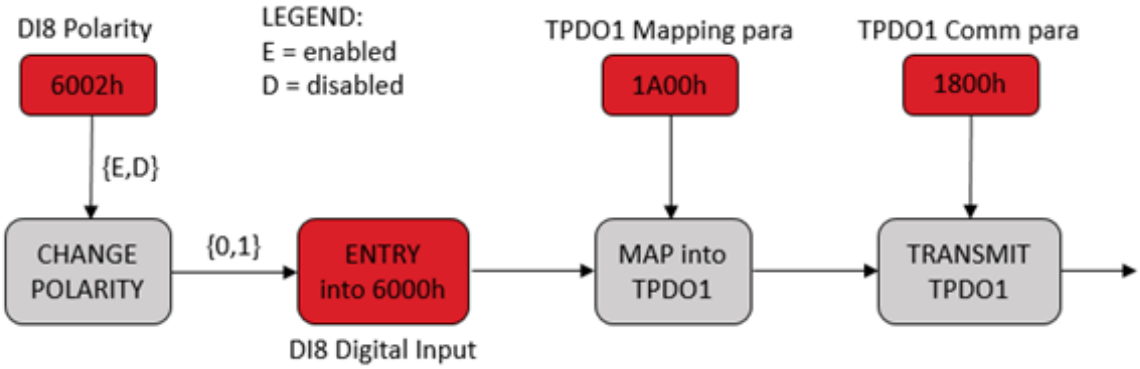


Besides, there are more related object in the *Manufacturer specific* section:

- 2510h, DO16 Module setting.
- 2511h, DO16 PWM Channel Mode.
- 2512h, DO16 PWM Activation Time.
- 2513h, DO16 PWM Channel Duty Cycle.

7.8.3.3 Digital input 8 bits

The objects related to 8 bit digital input follow the schema, as specified by CiA401:

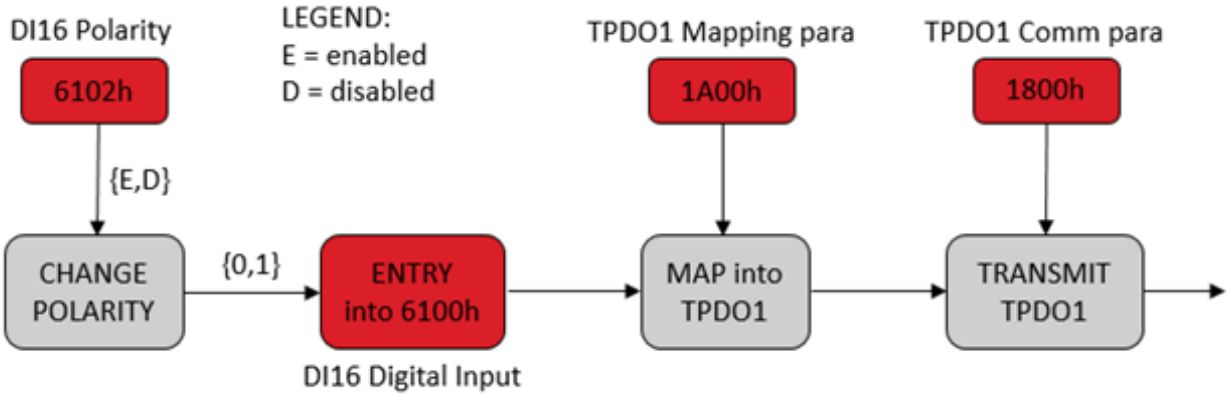


Besides, there are more related object in the *Manufacturer specific* section:

- 24A0h, DI8 Digital input Minimum activation time input.
- 24A1h, DI8 Digital Input Extension time input.

7.8.3.4 Digital input 16 bits

The objects related to 16 bit digital input follow the schema, as specified by CiA401:

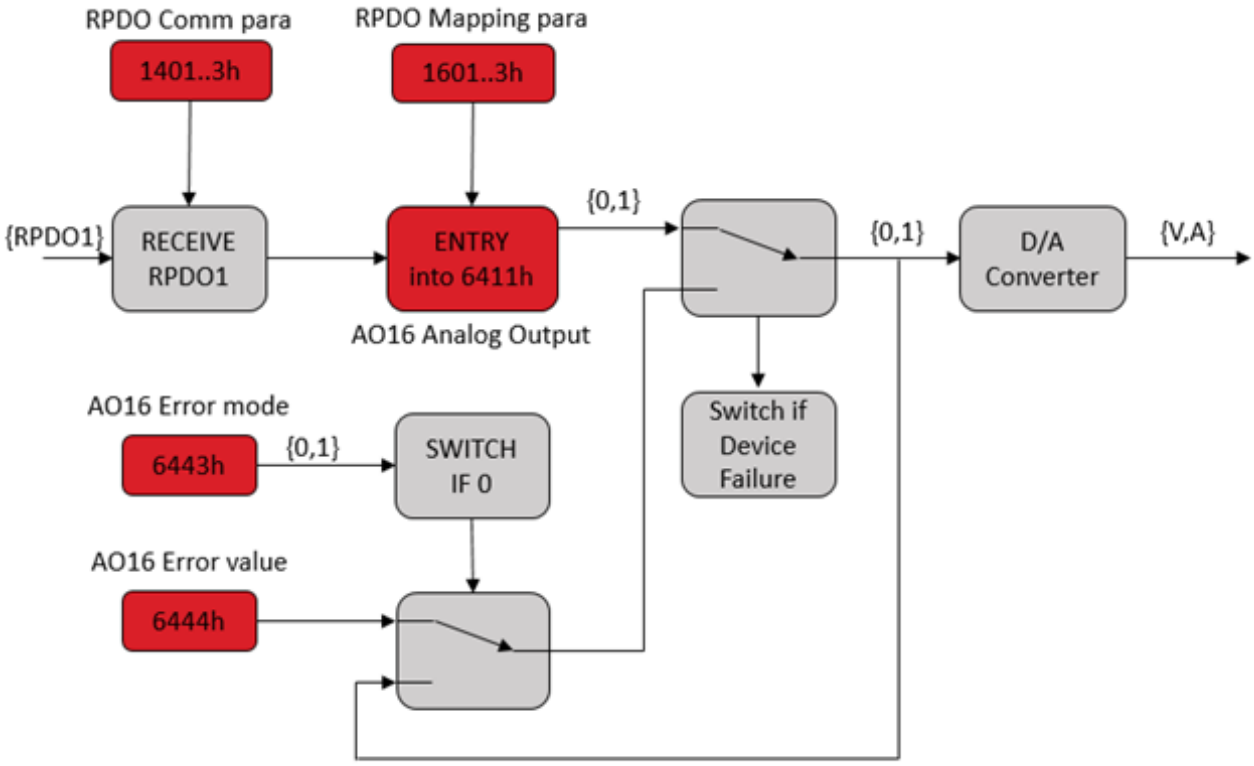


Besides, there are more related object in the *Manufacturer specific* section:

- 24B0h, DI16 Minimum activation time input.
- 24B1h, DI16 Extension time input.

7.8.3.5 Analog output 16 bits

The objects related to 16 bit analogue output follow the schema, as specified by CiA401:

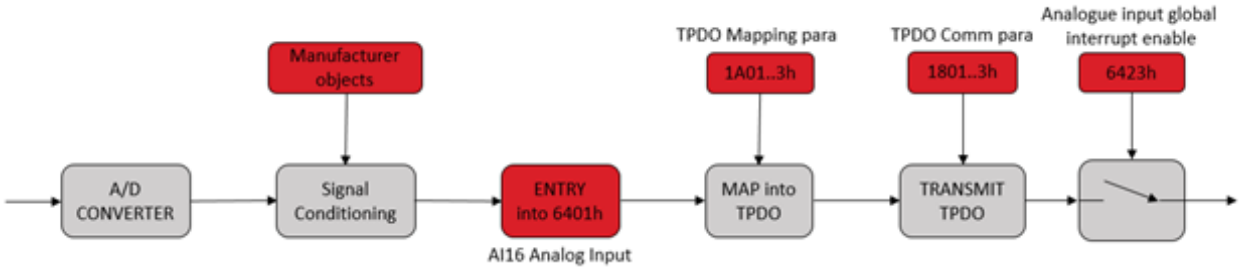


Besides, there are more related object in the *Manufacturer specific* section:

- 2640h, AO16 Module setting.

7.8.3.6 Analog input 16 bits

The objects related to 16 bit analogue input follow the schema, as specified by CiA401:

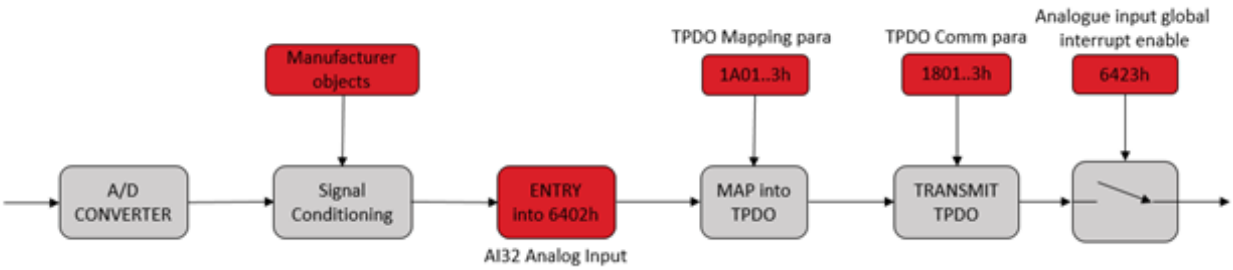


Besides, there are more related objects in the *Manufacturer specific* section (subdivided following the type of the submodule):

- 2600h, AI RTD Sensor Type.
- 2601h, AI RTD Sensor Wires.
- 2602h, AI RTD Sampling Threshold.
- 2603h, AI RTD Sampling Threshold Timeout.
- 2604h, AI RTD Sampling Rate.
- 2605h, AI RTD Filter.
- 2610h, AI TH Sensor Type.
- 2611h, AI TH Sampling Threshold.
- 2612h, AI TH Sampling Threshold Timeout.
- 2613h, AI TH Sampling Rate.
- 2614h, AI TH Filter.
- 2630h, AI CV Input Type.
- 2631h, AI CV Sampling Threshold.
- 2632h, AI CV Sampling Threshold Timeout.
- 2633h, AI CV Sampling Rate.
- 2634h, AI CV Filter.

7.8.3.7 Analog input 32 bits

The objects related to 32 bit analogue input follow the schema, as specified by CiA401:



Besides, there are more related object in the *Manufacturer specific* section:

- 2620h, AI BRG Factor.
- 2621h, AI BRG Sampling Threshold.
- 2622h, AI BRG Sampling Threshold Timeout.
- 2623h, AI BRG Sampling Rate.
- 2624h, AI BRG Filter.

7.8.4 Objects CiA 401 profile

ID	Sub	Description	Type	Access	PDO Mapping	Default value
6000h		DI8 Digital Input				
	0	Highest sub-index supported	U8	CONST		0x10
	1..32	Digital input x to y	U8	RO	X	0x0
6002h		DI8 Polarity				
	0	Highest sub-index supported	U8	CONST		0x10
	1..16	Polarity Input x to y	U8	RW		0XFF
6100h		DI16 Digital Input				
	0	Highest sub-index supported	U16	CONST		0x8
	1..8	Digital input x to y	U16	RO	X	0x0
6102h		DI16 Polarity				
	0	Highest sub-index supported	U16	CONST		0x8
	1..8	Polarity Input x to y	U16	RW		0XFFFF
6200h		DO8 Digital Output				
	0	Highest sub-index supported	U8	CONST		0x10
	1..32	Digital output x to y	U8	RW	X	0x0
6202h		DO8 Polarity				
	0	Highest sub-index supported		CONST		0x10
	1..16	Polarity output x to y	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
6206h		DO8 Error mode				
	0	Highest sub-index supported	U8	CONST		0x10
	1..16	Error mode output x to y	U8	RW		0x0
6207h		DO8 Error value				
	0	Highest sub-index supported	U8	CONST		0x10
	1..16	Error value output x to y	U8	RW		0x0
6208h		DO8 Filter mask				
	0	Highest sub-index supported	U8	CONST		0x10
	1..16	Filter mask output x to y	U8	RW		0x0
6300h		DO16 Digital Output				
	0	Highest sub-index supported	U16	CONST		0x8
	1..8	Digital output x to y	U16	RW	X	0x0
6302h		DO16 Polarity				
	0	Highest sub-index supported	U16	CONST		0x8
	1..8	Polarity output 16	U16	RW	X	0x0
6306h		DO16 Error mode				
	0	Highest sub-index supported	U16	CONST		0x8
	1..8	Error mode output x to y	U16	RW	X	0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
6307h		DO16 Error value				
	0	Highest sub-index supported	U16	CONST		0x8
	1..8	Error value output x to y	U16	RW	X	0x0
6308h		DO16 Filter mask				
	0	Highest sub-index supported	U16	CONST		0x8
	1..8	Filter mask output x to y	U16	RW	X	0x0
6401h		AI16 Analog input				
	0	Highest sub-index supported	I16	CONST		0x10
	1..16	Analog input x	I16	RO	X	0x0
6402h		AI32 Analog input				
	0	Highest sub-index supported	I32	CONST		0x8
	1..8	Analog input x	I32	RO	X	0x0
6411h		AO16 Analogue output				
	0	Highest sub-index supported	I16	CONST		0x10
	1..16	Analog output x	I16	RW	X	0x0
6423h	0	Analogue input global interr enable	BOOL	RW		0x0
6443h		AO16 Error mode				
	0	Highest sub-index supported	U8	CONST		0x8
	1..8	AO16 Error Mode Output Mod. x	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
6444h		AO16 Error value				
	0	Highest sub-index supported	I32	CONST		0x8
	1..8	AO16 Analog output – Mod. x	I32	RW		0x0

7.8.5 Cia 401 object descriptions

7.8.5.1 6000h DI8 Digital Input

This object contains the status of the digital inputs grouped in sets of 8.

7.8.5.2 6002h DI8 Polarity

This object defines the polarity of a group of a line of 8 inputs. The polarity can be inverted individually. If the bit assigned to the input is 1, the input is inverted; otherwise, it is not inverted.

7.8.5.3 6100h DI16 Digital Input

This object contains the status of the digital inputs grouped in sets of 16.

7.8.5.4 6102h DI16 Polarity

This object defines the polarity of a group of a line of 16 inputs. The polarity can be inverted individually. If the bit assigned to the input is 1, the input is inverted; otherwise, it is not inverted.

7.8.5.5 6200h DO8 Digital Output

This object contains the status of the digital outputs grouped in sets of 8.

7.8.5.6 6202h DO8 Polarity

This object defines the polarity of a group of a line of 8 outputs. The polarity can be inverted individually. If the bit assigned to the output is 1, the output is inverted; otherwise, it is not inverted.

7.8.5.7 6206h DO8 Error mode

This object occurs, in any case if an output is set to a default value (object 6207h), in the case of an internal device malfunction or a *Stop remote node* signal.
Object value and corresponding function:

- 1, the output value must assume the condition of the default value specified in object 6207h.
- 0, the output value must be maintained if an error occurs.

7.8.5.8 6207h DO8 Error value

If the corresponding value in object 6206h is active, the malfunction of the device sets the output to the configured value of this object.
Object value and corresponding function:

- 0, the output is set to 0 in the case of a malfunction, if object 6206 is enabled.
- 1, the output is set to 1 in the event of a malfunction, if object 6206 is enabled.

7.8.5.9 6208h DO8 Filter mask

This object defines the enable of the output for a group of 8 outputs.
Object value and corresponding function:

- 0, the received output value is ignored for the appropriate output channel, the old output value is maintained.
- 1, the output is set to the value received from the output.

7.8.5.10 6300h DO16 Digital Output

This object contains the status of the digital outputs grouped in sets of 16.

7.8.5.11 6302h DO16 Polarity

This object defines the polarity of a group of a line of 16 outputs. The polarity can be inverted individually. If the bit assigned to the output is 1 (P) the output is inverted; otherwise, it is not inverted (N).

7.8.5.12 6306h DO16 Error mode

This object occurs, in any case if an output is set to a default value (object 6307h), in the case of an internal device malfunction or a *Stop remote node* signal.
Object value and corresponding function:

- 1, the output value must assume the condition of the default value specified in object 6307h.
- 0, the output value must be maintained if an error occurs.

7.8.5.13 6307h DO16 Error value

If the corresponding value in object 6306h is active, the malfunction of the device sets the output to the configured value of this object.
Object value and corresponding function:

- 0, the output is set to 0 in the case of a malfunction, if object 6306 is enabled.
- 1, the output is set to 1 in the case of a malfunction, if object 6306 is enabled.

7.8.5.14 6308h DO16 Filter mask

This object defines an additional filter mask configurable on the output for a group of 16 outputs.
Object value and corresponding function:

- 0, the received output value is neglected for the appropriate output channel, the old output value must be maintained.
- 1, the output must be set to the value received from the output.

7.8.5.15 6401h AI16 Analog input

This object contains the status of the analogue inputs grouped in sets of 16.

7.8.5.16 6402h AI32 Analog input

This object contains the status of the analogue inputs grouped in sets of 32.

7.8.5.17 6411h AO16 Analog output

This object contains the status of the analogue outputs represented in a word of 16 bits.

7.8.5.18 6423h Analogue input global interrupt enable

This object enables sending the PDOs which contains in the mapped objects the one or both objects 6401h and 6402h, if PDOs are configured as event transmit (if the inputs change the message is sent). The sub-index *Transmission Type* of those PDOs must be configured as 0xFF or 0xFE. By default, the interrupt is not enabled. To set the threshold to send the message, it is necessary to refer to the custom object:

- Objects for RTD: 2602h, 2603h.
- Objects for TH: 2611h, 2612h.
- Objects for CV: 2631h, 2632h.
- Objects for BRIDGE: 2621h, 2621h.

7.8.5.19 6443h AO16ErrorModeOutput

This object occurs, in any case if an output is set to a default value (object 6444h), in the case of an internal device malfunction or a *Stop remote node* signal.
Object value and corresponding function:

- 1, the output value must assume the condition of the default value specified in object 6444h.
- 0, the output value must be maintained if an error occurs.

7.8.5.20 6444h AO16 Error value

If the corresponding value in object 6443h is active, the malfunction of the device sets the output to the configured value of this object.
Object value and corresponding function:

- 0, the output is set to 0 in the case of a malfunction, if object 6443h is enabled.
- 1, the output is set to 1 in the case of a malfunction, if object 6443h is enabled.

7.8.6 Custom manufacturer objects

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2000h		Status master				
	0	Highest sub-index supported	I16	CONST		0x2
	1	Supply voltage	I16	RO		0x0
	2	Temperature	I16	RO		0x0
2001h		Slave enumeration				
	0	Slave enumeration	U32	RW		0x0
2002h		System start behaviour				
	0	System start behaviour	U8	RW		0x0
2003h		Automatic Mapping Procedure				
	0	Automatic Mapping Procedure	U8	RW		0x0
21F0h		Dummy 8 bit for TPDO				
	0	Highest sub-index supported	U8	CONST		0x8
	1..8	DummyTbyte X	U8	RO	X	0x0
21F1h		Dummy 8 bit for RPDO				
	0	Highest sub-index supported	U8	CONST		0x8
	1..8	DummyRbyte X	U8	WO	X	0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2200h		Valves output 8				
	0	Highest sub-index supported	U8	CONST		0x10
	1	ValvesOutput_1_8	U8	RW	X	0x0
	2	ValvesOutput_9_16	U8	RW	X	0x0
	3..16	ValvesOutput_X_Y	U8	RW	X	0x0
2206h		Error mode valves				
	0	Highest sub-index supported	U8	CONST		0x10
	1	ErrorModeValves_1_8	U8	RW		0x0
	2	ErrorModeValves_9_16	U8	RW		0x0
	3..16	ErrorModeValves_X_Y	U8	RW		0x0
2207h		Error value valves				
	0	Highest sub-index supported	U8	CONST		0x10
	1	ErrorValueValves_1_8	U8	RW		0x0
	2	ErrorValueValves_9_16	U8	RW		0x0
	3..16	ErrorValueValves_X_Y	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
22A0h		Maintenance status				
	0	Highest sub-index supported	U8	CONST		0x8
	1	MaintenanceStatusValves_1_8	U8	RO	X	0x0
	2	MaintenanceStatusValves_9_16	U8	RO	X	0x0
	3..8	MaintenanceStatusValves_X_Y	U8	RO	X	0x0
22A1h		Health status				
	0	Highest sub-index supported	U8	CONT		0x80
	1	HealthStatusValve_1	U8	RO		0x0
	2	HealthStatusValve_2	U8	RO		0x0
	3.. 128	HealthStatusValve_3..128	U8	RO		0x0
22A2h		Cycle counter				
	0	Highest sub-index supported	U32	CONT		0x80
	1	CycleCounterValve_1	U32	RO		0x0
	2	CycleCounterValve_2	U32	RO		0x0
	3.. 128	CycleCounterValve_3..128	U32	RO		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
22A3h		Error counter				
	0	Highest sub-index supported	U32	CONT		0x80
	1	ErrorCounterValve_1	U32	RO		0x0
	2	ErrorCounterValve_2	U32	RO		0x0
	3.. 128	ErrorCounterValve_3..128	U32	RO		0x0
22A4h		Error latched valves				
	0	Highest sub-index supported	U8	CONST		0x08
	1	ErrorLatchedValves_1_8	U8	RW		0x0
	2	ErrorLatchedValves_9_16	U8	RW		0x0
	3..8	ErrorLatchedValves_X_Y	U8	RW		0x0
22E0h		Reset info slave				
	0	Reset info slave	U32	RW		0x0
22E1h		Enable fault coil alarm				
	0	Enable fault coil alarm	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
24A0h		DI8 Digital input Minimum activation time input				
	0	Highest sub-index supported	U8	CONST		0x10
	1	DI8 MinimumActivationTimeInput Mod 1	U8	RW		0x0
	2	DI8 MinimumActivationTimeInput Mod 2	U8	RW		0x0
	3..16	MinimumActivationTimeInput_X	U8	RW		0x0
24A1h		DI8 Digital Input Extension time input				
	0	Highest sub-index supported	U16	CONST		0x10
	1	DI8 ExtensionTimeInput Mod 1	U16	RW		0x0
	2	DI8 ExtensionTimeInput Mod 2	U16	RW		0x0
	3..16	DI8 ExtensionTimeInput Mod X	U16	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
24B0h		DI16 Minimum activation time input				
	0	Highest sub-index supported	U8	CONST		0x08
	1	DI16 MinimumActivationTimeInput Mod 1	U8	RW		0x0
	2	DI16 MinimumActivationTimeInput Mod 2	U8	RW		0x0
	3..8	DI16 MinimumActivationTimeInput Mod X	U8	RW		0x0
24B1h		DI16 Extension time input				
	0	Highest sub-index supported	U8	CONST		0x08
	1	DI16 ExtensionTimeInput Mod 1	U8	RW		0x0
	2	DI16 ExtensionTimeInput Mod 2	U8	RW		0x0
	3..8	DI16 ExtensionTimeInput Mod X	U8	RW		0x0
24B2h		DI16 Power Source				
	0	Highest sub-index supported	U8	CONST		0x08
	1	DI16 PowerSource Mod 1	U8	RW		0x0
	2	DI16 PowerSource Mod 2	U8	RW		0x0
	3..8	DI16 PowerSource Mod X	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2500h		DO8 module setting				
	0	Highest sub-index supported	U8	CONST		0x10
	1	DO8 ModuleSetting Mod 1	U8	RW		0x0
	2	DO8 ModuleSetting Mod 2	U8	RW		0x0
	3..16	DO8 ModuleSetting Mod X	U8	RW		0x0
2501h		DO8 PWM Channel Mode				
	0	Highest sub-index supported	U8	CONST		0x10
	1	DO8 PWMChannelMode Mod 1	U8	RW		0x0
	2	DO8 PWMChannelMode Mod 2	U8	RW		0x0
	3..16	DO8 PWMChannelMode Mod X	U8	RW		0x0
2502h		DO8 PWM Activation Time				
	0	Highest sub-index supported	U8	CONST		0x10
	1	DO8 PWMActivationTime Mod 1	U8	RW		0x0
	2	DO8 PWMActivationTime Mod 2	U8	RW		0x0
	3..16	DO8 PWMActivationTime Mod X	U8	RW		0x0
2503h		DO8 PWM Channel Duty Cycle				
	0	Highest sub-index supported	U8	CONST		0x80
	1..	DO8 DutyCycle Mod 1 Ch 1	U8	RW		0x0
	128					

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2510h		DO16 Module Setting				
	0	Highest sub-index supported	U16	CONST		0x8
	1	DO16 ModuleSetting Mod 1	U16	RW		0x0
	2	DO16 ModuleSetting Mod 2	U16	RW		0x0
	3..8	DO16 ModuleSetting Mod X	U16	RW		0x0
2511h		DO16 Module Setting				
	0	Highest sub-index supported	U16	CONST		0x8
	1	DO16 PWMChannelMode Mod 1	U16	RW		0x0
	2	DO16 PWMChannelMode Mod 2	U16	RW		0x0
	3..8	DO16 PWMChannelMode Mod X	U16	RW		0x0
2512h		DO16 PWM Activation Time				
	0	Highest sub-index supported	U16	CONST		0x8
	1	DO16 PWMActivationTime Mod 1	U16	RW		0x0
	2	DO16 PWMActivationTime Mod 2	U16	RW		0x0
	3..8	DO16 PWMActivationTime Mod X	U16	RW		0x0
2513h		DO16 PWM Channel Duty Cycle				
	0	Highest sub-index supported	U16	CONST		0x80
	1..	DO16 DutyCycle Mod 1 Ch 1	U8	WO		0x0
	128					

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2600h		AI RTD Sensor Type				
	0	Highest sub-index supported	U8	CONST		0x10
	1	AI RTD SensorType Mod 1 Ch 1	U8	RW		0x0
	2	AI RTD SensorType Mod 1 Ch 2	U8	RW		0x0
	3	AI RTD SensorType Mod 2 Ch 1	U8	RW		0x0
	4..16	AI RTD Sensor Type Mod X Ch Y	U8	RW		0x0
2601h		AI RTD Sensor Wires				
	0	Highest sub-index supported	U8	CONST		0x10
	1	AI RTD SensorWires Mod 1 Ch 1	U8	RW		0x0
	2	AI RTD SensorWires Mod 1 Ch 2	U8	RW		0x0
	3	AI RTD SensorWires Mod 2 Ch 1	U8	RW		0x0
	4..16	AI RTD SensorWires Mod X Ch Y	U8	RW		0x0
2602h		AI RTD Sampling Threshold				
	0	Highest sub-index supported	U8	CONST		0x8
	1	AI RTD SamplingThreshold Mod 1	U8	RW		0x0
	2	AI RTD SamplingThreshold Mod 2	U8	RW		0x0
	3..8	AI RTD SamplingThreshold Mod X	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2603h		AI RTD Sampling Threshold Timeout				
	0	Highest sub-index supported	U8	CONST		0x8
	1	AIRTDSamplingThresholdTimeout Mod 1	U8	RW		0x0
	2	AIRTDSamplingThresholdTimeout Mod 2	U8	RW		0x0
	3..8	AIRTDSamplingThresholdTimeout Mod X	U8	RW		0x0
2604h		AI RTD Sampling Rate				
	0	Highest sub-index supported	U8	CONST		0x8
	1	AI RTD SamplingThreshold Mod 1	U8	RW		0x0
	2	AI RTD SamplingThreshold Mod 2	U8	RW		0x0
	3..8	AI RTD SamplingThreshold Mod X	U8	RW		0x0
2605h		AI RTD Filter				
	0	Highest sub-index supported	U8	CONST		0x10
	1	AI RTD Filter Mod 1 Ch 1	U8	RW		0x0
	2	AI RTD Filter Mod 1 Ch 2	U8	RW		0x0
	3	AI RTD Filter Mod 2 Ch 1	U8	RW		0x0
	4..16	AI RTD Filter Mod X Ch Y	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2610h		AI TH Sensor Type				
	0	Highest sub-index supported	U8	CONST		0x10
	1	AI TH SensorType Mod 1 Ch 1	U8	RW		0x0
	2	AI TH SensorType Mod 1 Ch 2	U8	RW		0x0
	3	AI TH SensorType Mod 2 Ch 1	U8	RW		0x0
	4..16	AI TH SensorType Mod X Ch Y	U8	RW		0x0
2611h		AI TH Sampling Threshold				
	0	Highest sub-index supported	U8	CONST		0x8
	1	AI TH SamplingThreshold Mod 1	U8	RW		0x0
	2	AI TH SamplingThreshold Mod 2	U8	RW		0x0
	3..8	AI TH SamplingThreshold Mod X	U8	RW		0x0
2612h		AI TH Sampling Threshold Timeout				
	0	Highest sub-index supported	U8	CONST		0x8
	1	AI TH SamplingThresholdTimeout Mod 1	U8	RW		0x0
	2	AI TH SamplingThresholdTimeout Mod 2	U8	RW		0x0
	3..8	AI TH SamplingThresholdTimeout Mod X	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2613h		AI TH Sampling Rate				
	0	Highest sub-index supported	U8	CONST		0x8
	1	AI TH SamplingThreshold Mod 1	U8	RW		0x0
	2	AI TH SamplingThreshold Mod 2	U8	RW		0x0
	3..8	AI TH SamplingThreshold Mod X	U8	RW		0x0
2614h		AI TH Filter				
	0	Highest sub-index supported	U8	CONST		0x10
	1	AI TH Filter Mod 1 Ch 1	U8	RW		0x0
	2	AI TH Filter Mod 1 Ch 2	U8	RW		0x0
	3	AI TH Filter Mod 2 Ch 1	U8	RW		0x0
	4..16	AI TH Filter Mod X Ch Y	U8	RW		0x0
2620h		AI BRG Factor				
	0	Highest sub-index supported	U8	CONST		0x8
	1	AI BRG Factor Mod 1 Ch 1	U8	RW		0x0
	2	AI BRG Factor Mod 1 Ch 2	U8	RW		0x0
	3	AI BRG Factor Mod 2 Ch 1	U8	RW		0x0
	4..8	AI BRG Factor Mod X Ch Y	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2621h		AI BRG Sampling Threshold				
	0	Highest sub-index supported	U8	CONST		0x4
	1	AI BRG SamplingThreshold Mod 1	U8	RW		0x0
	2..4	AI BRG Sampling Threshold Mod X	U8	RW		0x0
2622h		AI BRG Sampling Threshold Timeout				
	0	Highest sub-index supported	U8	CONST		0x4
	1	AI BRG SamplingThresholdTimeout Mod 1	U8	RW		0x0
	2..4	AI BRG SamplingThresholdTimeout Mod X	U8	RW		0x0
2623h		AI BRG Sampling Rate				
	0	Highest sub-index supported	U8	CONST		0x4
	1	AI BRG SamplingThreshold Mod 1	U8	RW		0x0
	2..4	AI BRG SamplingThreshold Mod X	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2624h		AI BRG Filter				
	0	Highest sub-index supported	U8	CONST		0x8
	1	AI BRG Filter Mod 1 Ch 1	U8	RW		0x0
	2	AI BRG Filter Mod 1 Ch 2	U8	RW		0x0
	3	AI BRG Filter Mod 2 Ch 1	U8	RW		0x0
	4..8	AI BRG Filter Mod X Ch Y	U8	RW		0x0
2630h		AI CV Input Type				
	0	Highest sub-index supported	U8	CONST		0x10
	1	AI CV InputType Mod 1 Ch 1	U8	RW		0x0
	2	AI CV InputType Mod 1 Ch 2	U8	RW		0x0
	3	AI CV InputType Mod 2 Ch 1	U8	RW		0x0
	4..16	AI CV InputType Mod X Ch Y	U8	RW		0x0
2631h		AI CV Sampling Threshold				
	0	Highest sub-index supported	U8	CONST		0x8
	1	AI CV SamplingThreshold Mod 1	U8	RW		0x0
	2	AI CV SamplingThreshold Mod 2	U8	RW		0x0
	3..8	AI CV SamplingThreshold Mod X	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2632h		AI CV Sampling Threshold Timeout				
	0	Highest sub-index supported	U8	CONST		0x8
	1	AI CV SamplingThresholdTimeout Mod 1	U8	RW		0x0
	2	AI CV SamplingThresholdTimeout Mod 2	U8	RW		0x0
	3..8	AI CV SamplingThresholdTimeout Mod X	U8	RW		0x0
2633h		AI CV Sampling Rate				
	0	Highest sub-index supported	U8	CONST		0x8
	1	AI CV SamplingThreshold Mod 1	U8	RW		0x0
	2	AI CV SamplingThreshold Mod 2	U8	RW		0x0
	3..8	AI CV SamplingThreshold Mod X	U8	RW		0x0
2634h		AI CV Filter				
	0	Highest sub-index supported	U8	CONST		0x10
	1	AI CV Filter Mod 1 Ch 1	U8	RW		0x0
	2	AI CV Filter Mod 1 Ch 2	U8	RW		0x0
	3	AI CV Filter Mod 2 Ch 1	U8	RW		0x0
	4..16	AI CV Filter Mod X Ch Y	U8	RW		0x0

ID	Sub	Description	Type	Access	PDO Mapping	Default value
2640h		AO16 Module Setting				
	0	Highest sub-index supported	U8	CONST		0x10
	1	AO Module setting Mod 1 Ch 1	U8	RW		0x0
	2	AO Module setting Mod 1 Ch 2	U8	RW		0x0
	3	AO Module setting Mod 2 Ch 1	U8	RW		0x0
	4..16	AO Module setting Mod X Ch Y	U8	RW		0x0

7.8.7 Description of custom manufacturer objects

7.8.7.1 2000h Status master

This object contains the status of the master. It has two sub-indexes: 0x1 and 0x2, both accessible in read-only mode. The first sub-index contains the value of the supply voltage expressed in millivolts [mV]; the second sub-index contains the value of the temperature at which the master is working, this quantity is expressed in tenths of a degree Celsius [0.1 °C].

7.8.7.2 2001h Slave enumeration

This object represents a command to be sent to the device in order to carry out the numbering procedure required in case of adding or removing a valve position or changing the order of the sub-bases. To run the command, the user must send the device a write SDO whose data field contains the numeric password 12345678h.

7.8.7.3 2002h System start behaviour

This object contains the mode of use of the island parameters.

- Value 1: parameters set by PLC.
- Value 0: parameters set by the internal memory.

It is essential to set it with the correct value in order to have the configuration set by the PLC or the one saved in the device via the UVIX external environment.

7.8.7.4 2003h Automatic PDO mapping

This object executes the automatic mapping procedure for the PDOs. Whenever the value of this object goes from 0 to 1, the automatic mapping procedure is performed. Reference to chapter 7.3.

7.8.7.5 21F0h Dummy 8 bit for TPDO

This object contains dummy bytes (unused) which can be used in TPDO mapping.

7.8.7.6 21F1h Dummy 8bit for RPDO

This object contains dummy bytes (unused) which can be used in RPDO mapping.

7.8.7.7 2200h Valves output 8

This object contains the status of valves grouped in sets of 8.

7.8.7.8 2206h Error mode valves

This object contains the *failsafe* enabler, i.e. the behaviour the valves must adopt when communication with the PLC is lost. If the *failsafe* is active (bit=1) then the valves move to the status set by object 2207h (*Error value valves*), otherwise (bit=0) the valves maintain the last status set. The latter is the default behaviour.

The object is divided into 16 sub-indexes, each sub-index being a bit mask for setting the behaviour of each valve.

7.8.7.9 2207h Error value valves

This object contains the behaviour of the valves must adopt in case of error if the *failsafe* is enabled (object 2206h). Each bit is dedicated to a single: if the bit is active (bit=1) in case of error and with the *failsafe* enabled, the valve is set, reset otherwise. The latter is the default status.
The object is divided into 16 sub-indexes, each sub-index being a bit mask for setting the behaviour for each valve.

7.8.7.10 22A0h Maintenance status

The sub-indexes of this object, accessible in read-only mode, indicate whether a valve position needs to be replaced because the health of a coil is degraded. Each sub-index is a bit mask and each bit takes the following meaning.

- Value 0: valve position healthy.
- Value 1: valve position degraded (performance not guaranteed).

7.8.7.11 22A1h Health status

The sub-indexes of this object, accessible in read-only mode, contain the health status for each coil. The data can assume the following range: 0 ÷ 100, where 100 indicates that the coil of the sub-base is functioning correctly with the optimal health status, a lower value indicates that the coil's health status and therefore its performance are declining, up to a value below 5, where health status is too low and will be signalled via object 22A0h.

7.8.7.12 22A2h Cycle counter

This object contains the number of cycles for the coils/valves. Each valve is shown in a sub-index (as shown in the table above).

7.8.7.13 22A3h Error counter

This object contains the number of errors for the coils/valves. Each valve is shown in a sub-index (as shown in the table above).

7.8.7.14 22A4h Error latched valves

This object contains the error mode of behaviour on the valves.

- Value 1: non-blocking error, if the command on the valve is removed the error is reset.
- Value 0: blocking error, to reset the error, the power must be switched off and on again.

7.8.7.15 22E0h Reset info slave

This object represents a command to be sent to the device in order to reset all information regarding the efficiency, the number of cycles and the error number. To perform the reset, the user must send the device a write SDO whose data field contains the numeric password 1234h.

7.8.7.16 22E1h Enable fault coil alarm

This object enables signalling the warning related to the missing commutation of the coil measured on board of the subbase.

7.8.7.17 24A0h DI8 Digital input Minimum activation time input

The sub-indexes of this object, with read and write access, contain the minimum time that the input level must be maintained for it to be intercepted and signalled to the PLC (anti-bounce filter). Each value is expressed in one byte:

- Value 0: filter disabled.
- Value 1-255: value in ms.

This object relates to modules with 8 inputs.

7.8.7.18 24A1h DI8 Digital Input Extension time input

The sub-indexes of this object, with read and write access, contain the minimum duration of the input status. Each value is expressed in two bytes.

- Value 0: extension disabled.
- Value 1-1023: extension in ms.

This object relates to modules with 16 inputs.

7.8.7.19 24B0h DI16 Minimum activation time input

The sub-indexes of this object, with read and write access, contain the minimum time that the input level must be maintained for it to be intercepted and signalled to the PLC (anti-bounce filter). Each value is expressed in one byte.

- Value 0: filter disabled
- Value 1-255: value in ms.

This object relates to modules with 16 inputs.

7.8.7.20 24B1h DI16 Extension time input

The sub-indexes of this object, with read and write access, contain the minimum duration of the input status. Each value is expressed in two bytes.

- Value 0: extension disabled.
- Value 1-1023: extension in ms.

This object relates to modules with 16 inputs.

7.8.7.21 24B2h DI16 Power source

The sub-indexes of this object, which are accessible f in read and write mode, specify the power source for the input module groups with 16 inputs. Each sub-index is related to a module. If the value set in the sub-index is 0, the input power source is taken internally. If 1, it must be supplied externally.

7.8.7.22 2500h DO8 Module Setting

In the sub-indexes of this object, with read and write access, you can enable the open circuit alarm for a module of outputs grouped in sets of 8. Bit 0 in the module sub-index must be set to 1 to enable this mode.

7.8.7.23 2501h DO8 PWM Channel Mode

In the sub-indexes of this object, with read and write access, you can select the type of output channels, grouped in modules of 8. If the bit relating to the channel of the module sub-index is set to 1, the output will be PWM; otherwise, it will be on/off.

7.8.7.24 2502h DO8 PWM Activation Time

In the sub-indexes of this object, with read and write access, you can set the activation time of the outputs set in PWM (in object 2501h), grouped into modules of 8. This time is expressed in milliseconds and can be between 0 and 255 ms. Each sub-index of this object relates to one module.

7.8.7.25 2503h DO8 PWM Channel Duty Cycle

In the sub-indexes of this object, with read and write access, you can set the PWM value (if active in object 2501h). The duty cycle time can be set to a value between 0 and 100 (percentage value). Each sub-index relates to a single output grouped in modules of 8.

7.8.7.26 2510h DO16 Module Setting

In the sub-indexes of this object, with read and write access, you can enable the open circuit alarm for a module of outputs grouped in sets of 16. To enable this mode, bit 0 in the module sub-index must be set to 1.

7.8.7.27 2511h DO16 PWM Channel Mode

In the sub-indexes of this object, with read and write access, you can select the type of output channels, grouped in modules of 16. If the bit relating to the channel of the module sub-index is set to 1, the output will be PWM; otherwise, it will be on/off.

7.8.7.28 2512h DO16 PWM Activation Time

In the sub-indexes of this object, with read and write access, you can set the activation time of the outputs set in PWM (in object 2501h), grouped into modules of 16. This time is expressed in milliseconds and can be between 0 and 255 ms. Each sub-index of this object relates to one module.

7.8.7.29 2513h DO16 PWM Channel Duty Cycle

In the sub-indexes of this object, with read and write access, you can set the PWM value (if active in object 2501h). The *duty cycle* time can be set to a value between 0 and 100 (percentage value). Each sub-index relates to a single output grouped in modules of 16.

7.8.7.30 2600h AI RTD Sensor Type

In the sub-indexes of this object, with read and write access, you can set the type of sensor connected to a channel of a specific module.
The values that the sub-indexes can take, with the relative sensor specified, are:

- 0, channel disabled (no sensor connected)
- 1, PT100 (385)
- 2, PT200 (385)
- 3, PT500 (385)
- 4, PT1000 (385)
- 5, Ni100 (618)
- 6, Ni120 (672)
- 7, Ni1000 (618)
- 8, PT100 (3926)

7.8.7.31 2601h AI RTD Sensor Wire

In the sub-indexes of this object, with read and write access, you can set the number of wires of the sensor connected to a channel of a specific module.
The values that the sub-indexes can take, with their relative value specified, are:

- 0, 2 wires
- 1, 3 wires
- 2, 4 wires

7.8.7.32 2602h AI RTD Sampling Threshold

In the sub-indexes of this object, with read and write access, you can set the variation of the sensor read value for which you want to transmit the measurement.
The values that the sub-indexes can take, with their relative value specified, are:

- 0, Disabled
- 1, 0.1 °C
- 2, 0.2 °C
- 3, 0.3 °C
- 4, 0.4 °C
- 5, 0.5 °C
- 6, 1 °C
- 7, 2 °C
- 8, 3 °C
- 9, 4 °C

- 10, 8 °C
- 11, 10 °C
- 12, 16 °C
- 13, 50 °C
- 14, 100 °C
- 15, 200 °C

7.8.7.33 2603h AI RTD Sampling Threshold Timeout

In the sub-indexes of this object, with read and write access, you can set a value between 0 and 15 seconds, which indicates the transmission *timeout* of the values read by the channels of a specific module. When the module is set with threshold transmission, the data is sent each time the timeout is reached, regardless of the variation of the data. The *timeout* cannot be deactivated: the value 0 is interpreted as the default value, i.e. 1 second.

7.8.7.34 2604h AI RTD Sampling Rate

In the sub-indexes of this object, with read and write access, you can set he transmission frequency of the measurement of a specific module to the master.
The values that the sub-indexes can take, with the relative sensor specified, are:

- 0, disabled (threshold transmission)
- 1, 1 Hz
- 2, 2 Hz
- 3, 5 Hz
- 4, 10 Hz
- 5, 25 Hz
- 6, 50 Hz
- 7, 100 Hz
- 8, 250 Hz
- 9, 500 Hz
- 10, 10000 Hz

When the module is operating in threshold mode, this parameter determines the upper frequency limit with which the data will be sent to the master, regardless of the frequency of variation of the input signal with respect to the threshold. This parameter cannot be deactivated: the value 0 is interpreted by the slave as a default value, i.e. 1 kHz.

7.8.7.35 2605h AI RTD Filter

In the sub-indexes of this object, with read and write access, you can set a value between 0 and 128, which indicates the number of phases of the moving average filter that is applied to the measurement. If the value is set to 0 or 1, the filter is disabled.

7.8.7.36 2610h AI TH Sensor Type

In the sub-indexes of this object, with read and write access, you can set the type of TH sensor (thermocouple) connected to a channel of a specific module.
The values that the sub-indexes can take, with the relative sensor specified, are:

- 0, channel disabled (no sensor connected)
- 1, B
- 2, E
- 3, J
- 4, K
- 5, N
- 6, R
- 7, S
- 8, T

7.8.7.37 2611h AI TH Sampling Threshold

In the sub-indexes of this object, with read and write access, you can set the variation of the sensor read value for which you want to transmit the measurement.
The values that the sub-indexes can take, with their relative value specified, are:

- 0, Disabled
- 1, 0.1 °C
- 2, 0.2 °C
- 3, 0.3 °C
- 4, 0.4 °C
- 5, 0.5 °C
- 6, 1 °C
- 7, 2 °C
- 8, 3 °C
- 9, 4 °C
- 10, 8 °C
- 11, 10 °C
- 12, 16 °C
- 13, 50 °C
- 14, 100 °C
- 15, 200°C

7.8.7.38 2612h AI TH Sampling Threshold Timeout

In the sub-indexes of this object, with read and write access, you can set a value between 0 and 15 seconds, which indicates the transmission *timeout* of the values read by the channels of a specific module. When the module is set with threshold transmission, the data is sent each time the *timeout* is reached, regardless of the variation of the data. The timeout cannot be deactivated: the value 0 is interpreted as the default value, i.e. 1 second.

7.8.7.39 2613h AI TH Sampling Rate

In the sub-indexes of this object, with read and write access, you can set he transmission frequency of the measurement of a specific module to the master.
The values that the sub-indexes can take, with the relative sensor specified, are:

- 0, disabled (threshold transmission)
- 1, 1 Hz
- 2, 2 Hz
- 3, 5 Hz
- 4, 10 Hz
- 5, 25 Hz
- 6, 50 Hz
- 7, 100 Hz
- 8, 250 Hz
- 9, 500 Hz
- 10, 10000 Hz

When the module is operating in threshold mode, this parameter determines the upper frequency limit with which the data will be sent to the master, regardless of the frequency of variation of the input signal with respect to the threshold. This parameter cannot be deactivated: the value 0 is interpreted as the default value, i.e. 1 kHz.

7.8.7.40 2614h AI TH Filter

In the sub-indexes of this object, with read and write access, you can set a value between 0 and 128, which indicates the number of phases of the moving average filter that is applied to the measurement. If the value is set to 0 or 1, the filter is disabled.

7.8.7.41 2620h AI BRG Factor

In the sub-indexes of this object, with read and write access, you can set a value expressed in $\frac{mV}{V_{DC}}$ of the bridge connected to a channel of a specific module. If the set value is 0, the channel is disabled.

7.8.7.42 2621h AI BRG Sampling Threshold

In the sub-indexes of this object, with read and write access, you can set the variation of the sensor read value for which you want to transmit the measurement.
The values that the sub-indexes can take, with their relative value specified, are:

- 0, disabled
- 0, 1 µV
- 1, 2 µV
- 3, 3 µV
- 4, 4 µV
- 5, 5 µV
- 6, 10 µV
- 7, 20 µV

- 8, 30 µV
- 9, 40 µV
- 10, 80 µV
- 11, 100 µV
- 12, 160 µV
- 13, 500 µV
- 14, 1000 µV
- 15, 2000 µV

7.8.7.43 2622h AI BRG Sampling Threshold Timeout

In the sub-indexes of this object, with read and write access, you can set a value between 0 and 15 seconds, which indicates the transmission *timeout* of the values read by the channels of a specific module. When the module is set with threshold transmission, the data is sent each time the *timeout* is reached, regardless of the variation of the data. The timeout cannot be deactivated: the value 0 is interpreted as the default value, i.e. 1 second.

7.8.7.44 2623h AI BRG Sampling Rate

In the sub-indexes of this object, with read and write access, you can set he transmission frequency of the measurement of a specific module to the master.

- 0, disabled (threshold transmission)
- 1, 1 Hz
- 2, 2 Hz
- 3, 5 Hz
- 4, 10 Hz
- 5, 25 Hz
- 6, 50 Hz
- 7, 100 Hz
- 8, 250 Hz
- 9, 500 Hz
- 10, 10000 Hz

When the module is operating in threshold mode, this parameter determines the upper frequency limit with which the data will be sent to the master, regardless of the frequency of variation of the input signal with respect to the threshold. This parameter cannot be deactivated: the value 0 is interpreted by the slave as the default value, i.e. 1 kHz.

7.8.7.45 2624h AI BRG Filter

In the sub-indexes of this object, with read and write access, you can set a value between 0 and 128, which indicates the number of phases of the moving average filter that is applied to the measurement. If the value is set to 0 or 1, the filter is disabled.

7.8.7.46 2630h AI CV Input Type

In the sub-indexes of this object, with read and write access, you can set the type of generic input connected to a channel of a specific module.
The values that the sub-indexes can take, with the relative sensor specified, are:

- 0, channel disabled (no sensor connected)
- 1, 0÷10 V
- 2, ±10 V
- 3, 4÷20 mA
- 4, 0÷20 mA
- 5, ±20 mA

7.8.7.47 2631h AI CV Sampling Threshold

In the sub-indexes of this object, with read and write access, you can set the variation of the sensor read value for which you want to transmit the measurement.
The values that the sub-indexes can take, with their relative value specified, are:

- 0, disabled
- 0, 1 mV |µA
- 1, 2 mV |µA
- 3, 3 mV |µA
- 4, 4 mV |µA
- 5, 5 mV |µA
- 6, 10 mV |µA
- 7, 20 mV |µA
- 8, 30 mV |µA
- 9, 40 mV |µA
- 10, 80 mV |µA
- 11, 100 mV |µA
- 12, 160 mV |µA
- 13, 500 mV |µA
- 14, 1000 mV |µA
- 15, 2000 mV |µA

7.8.7.48 2632h AI CV Sampling Threshold Timeout

In the sub-indexes of this object, with read and write access, you can set a value between 0 and 15 seconds, which indicates the transmission *timeout* of the values read by the channels of a specific module. When the module is set with threshold transmission, the data is sent each time the *timeout* is reached, regardless of the variation of the data. The timeout cannot be deactivated: the value 0 is interpreted as the default value, i.e. 1 second.

7.8.7.49 2633h AI CV Sampling Rate

In the sub-indexes of this object, with read and write access, you can set he transmission frequency of the measurement of a specific module to the master.
The values that the sub-indexes can take, with the relative sensor specified, are:

- 0, disabled (threshold transmission)
- 1, 1 Hz
- 2, 2 Hz
- 3, 5 Hz
- 4, 10 Hz
- 5, 25 Hz
- 6, 50 Hz
- 7, 100 Hz
- 8, 250 Hz
- 9, 500 Hz
- 10, 10000 Hz

When the module is operating in threshold mode, this parameter determines the upper frequency limit with which the data will be sent to the master, regardless of the frequency of variation of the input signal with respect to the threshold. This parameter cannot be deactivated: the value 0 is interpreted as the default value, i.e. 1 kHz.

7.8.7.50 2634h AI CV Filter

In the sub-indexes of this object, with read and write access, you can set a value between 0 and 128, which indicates the number of phases of the moving average filter that is applied to the measurement. If the value is set to 0 or 1, the filter is disabled.

7.8.7.51 2640h AO16 Module Setting

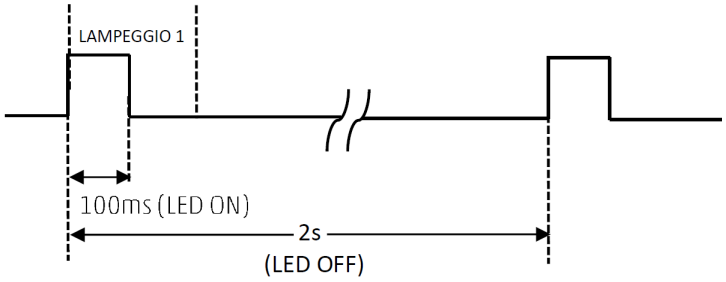
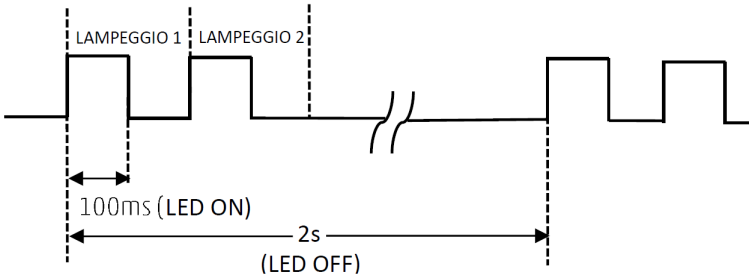
In the sub-indexes of this object, with read and write access, you can set the type of generic output connected to a channel of a specific module.
The values that the sub-indexes can take are:

- 0, disabled channel
- 1, 0÷10 V
- 2, 0÷5 V
- 3, 4÷20 mA
- 4, 0÷20 mA

Diagnostic

The diagnostics of the CX4 CANopen module is defined in three different ways.

- The status of the LEDs on the CX4 or on the individual modules connected to it 6. The following table provides the typical behaviour of the LEDs on our modules. The colour of the LEDs can be different for each module (the table refers to a red LED).

Symbol	LED state	Description
	RED OFF	Led is OFF
	RED ON	Led is ON
	FLASHING	The led flashes with a specified sequence for each diagnostic state: @XX [ms/Hz] per YY [s] • XX is the ON time of a led flashing. The flashing sequence is represented by an ON state and an OFF state of the same time. • YY is the time of the repeated flashing sequence. **Example 1**: 1 flash @100 ms every 2 s  **Example 2**: 2 flashes @100 ms every 2 s 

- I messaggi software che vengono instradati sulla rete CANopen.
- The UVIX user interface (ch. 9)

8.1 CX4 module

8.1.1 CANopen node

Diagnostics of the CANopen node are defined by the status of the two LEDs, Run CAN and Err CAN.

LED	Operation	Description
Run CAN	 GREEN OFF	The device is executing a reset.
	 1 flash GREEN @200 ms every 1,2 s	The device is in STOPPED state.
	 1 flash GREEN @200 ms every 400 ms (f = 2,5 Hz)	The device is in the PREOPERATIONAL state.
	 GREEN ON	The device is in the OPERATIONAL state.

LED	Operation	Description
Err CAN	 RED OFF	No error: the device is in the working condition.
	 1 flash RED @200 ms every 1,2 s	Warning Limit reached: at least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames).
	 2 flashes RED @200 ms every 1,8 s	Error Control Event: A guard event (NMT Slave or NMT-master) or a heartbeat event (Heartbeat consumer) has occurred.
	 3 flashes RED @200 ms every 2,2 s off	The sync message was not received in the set cycle time (dictionary object 1006h).
	 ROSSO ON	The CAN controller is bus off.

8.1.2 CX4 system diagnostics

The diagnostic is transmitted to the controller through the specific object of the Code Emergency dictionary specific to the CANopen CiA 301 profile. The following table shows the operation of the LEDs, the codes of the CANopen messages that manage the diagnostics of the entire system and the messages that can be displayed on the UVIX interface.

Module status and alarms	SYS LED	Diagnostic Status (0x1002)	CANopen Code	Extra Info CANopen	UVIX
Normal operation	 1 flash GREEN @100 ms every 1 s	0x00			
I/O modules absent	 1 flash GREEN @100 ms every 1 s	0x01			I/O modules absent
Valves absent	 1 flash GREEN @100 ms every 1 s	0x02			Valves absent
Valves substitution	 1 flash GREEN @100 ms every 1 s	0x03			Valve Subbase Substitution
Overheating alarm	 RED ON	0xFB	0x4201	Byte 1 = 0 Byte 2 = 0 Byte 3 = 0 Byte 4 = 0 Byte 5 = 0	Overheating CX4 module

Module status and alarms	SYS LED	Diagnostic Status (0x1002)	CANopen Code	Extra Info CANopen	UVIX
Undervoltage alarm	 RED ON	0xFC	0x3120	Byte 1 = 0 Byte 2 = 0 Byte 3 = 0 Byte 4 = 0 Byte 5 = 0	Undervoltage CX4 module
Alarm of mapping I/O modules error	 2 flashes RED @100 ms every 1 s	0xFD	0xF003	Byte 1 = 0 Byte 2 = 0 Byte 3 = 0 Byte 4 = 0 Byte 5 = 0	Mapping I/O modules error
Alarm of mapping valves error	 2 flashes RED @100 ms every 1 s	0xFE	0xF002	Byte 1 = 0 Byte 2 = 0 Byte 3 = 0 Byte 4 = 0 Byte 5 = 0	Mapping valves error
Alarm of mapping absent	 1 flash RED @100 ms every 1 s	0xFF	0xF001	Byte 1 = 0 Byte 2 = 0 Byte 3 = 0 Byte 4 = 0 Byte 5 = 0	Mapping absent
Alarms of valve errors or I / O module errors	 3 flashes RED @100 ms every 1 s	**NOTE.** The diagnostic states and CANopen and UVIX codes are specified for each single module in the following tables.			

8.1.3 Replace solenoid valve

This *warning* indicates that the optimal performance of at least one solenoid valve has deteriorated and is no longer guaranteed.
Solution: replace the deteriorated solenoid valve.
NOTE. To find out which solenoid valves on the island are in these conditions, you need to connect to the Camozzi user interface (UVIX) and check the health status of the individual solenoid valves (par. 9.3.4).

8.1.4 Over-temperature alarm

The CX4 module has reached or exceeded the limit temperature over which the normal operation of the device is not guaranteed and, if the condition persists, this can lead to the failure of a component on the board.
Solution: restart the island; if the problem persists, contact Camozzi support.

8.1.5 Undervoltage alarm

The CX4 module is powered with a voltage lower than the minimum acceptable value; therefore, correct operation of the system is not guaranteed.
Solution: check that the wiring is correct and that the wires are properly inserted into the connector. Check that the logic supply (pins 1 and 3) and power supply (pins 2 and 5) are physically present on the connector. If the problem persists, contact Camozzi support.

8.1.6 I/O module mapping error

During the mapping phase (par. 7.3), an error has occurred on the I/O modules. The mapping has failed at the first I/O module with the diagnostic LED off.
Solution: repeat the mapping procedure and replace where necessary the I/O module where the mapping ends (first I/O module with diagnostic LED off). If the problem persists, contact Camozzi support.

8.1.7 Solenoid valve mapping error

During the mapping phase (par. 7.3), a solenoid valve error has occurred on the subbase. The mapping has failed at the first subbase with the diagnostic LED off.
Solution: repeat the mapping procedure and replace where necessary the subbase where the mapping ends (first subbase with diagnostic LED off). If the problem persists, contact Camozzi support.

8.1.8 No mapping

After requesting a new system mapping (par. 7.3), an error has occurred both on the I/O modules and on the solenoid valve subbases. The mapping ends at the first accessory module (I/O module or subbase) with the diagnostic LED off.
Solution: repeat the mapping procedure and replace where necessary the accessory module where the mapping ends (first accessory module with diagnostic LED off). If the problem persists, contact Camozzi support.

8.1.9 Solenoid valve or I/O module alarms

These alarms are specific for each individual accessory module. The UVIX and CANopen messages are specified in the following tables, while the diagnostics via LEDs - found on each individual module - and the specific solutions are detailed in the accessories section (ch. 6).

8.2 Series D valve subbases

The following table shows the diagnostic status of the Series D coil valves, with the respective CANopen messages and the display on the UVIX interface. The coil valves display a diagnostic signal through LED signalling directly on the subbase where they are mounted. For details regarding LED diagnostics and possible solutions to any alarms, refer to the Accessories chapter (par. 6.1.4).

Module status and alarms	Diagnostic Status (0x1002)	CANopen Code	Extra Info CANopen	UVIX
Configuration parameters	0xE6	0xF011	Byte 1 = bus type = 2 (CAN) Byte 2 = board type = 1 (Dig. In) Byte 3 = board number Byte 4 = 0 Byte 5 = 0	
Overheating subbase	0xE8	0x4202	Byte 1 = bus type = 1 (485) Byte 2 = board type = 2 (bis. V.) Byte 3 = board number Byte 4 = 0 Byte 5 = 0	Overheating subbase
Overheating coil (Position 14/12)	0xE9	0x4203	Byte 1 = bus type = 1 (485) Byte 2 = board type = 2 (bis. V.) Byte 3 = board number Byte 4 = Pilot Id Byte 5 = 0	Overheating coil 14/12

Module status and alarms	Diagnostic Status (0x1002)	CANopen Code	Extra Info CANopen	UVIX
Overcurrent coil (Position 14/12)	0xEA	0x2320	Byte 1 = bus type = 1 (485) Byte 2 = board type = 2 (bis. V.) Byte 3 = board number Byte 4 = Pilot Id Byte 5 = 0	Overcurrent coil 14/12
Interrupted coil (Position 14/12)	0xEB	0xF005	Byte 1 = bus type = 1 (485) Byte 2 = board type = 2 (bis. V.) Byte 3 = board number Byte 4 = Pilot Id Byte 5 = 0	Interrupted coil 14/12
Fault coil (Position 14/12)	0xEC	0xF004	Byte 1 = bus type = 1 (485) Byte 2 = board type = 2 (bis. V.) Byte 3 = board number Byte 4 = Pilot Id Byte 5 = 0	Fault coil 14/12
Communication alarm	0xEF	0xF006	Byte 1 = bus type = 1 (485) Byte 2 = board type = 2 (bis. V.) Byte 3 = board number Byte 4 = 0 Byte 5 = 0	Communication alarm

8.3 Digital Input Module

The following table shows the diagnostic statuses of the digital inputs, with the respective CANopen messages and the display on the UVIX interface. The digital inputs also display a diagnostic signal via LED signalling directly on the module. Details on LED diagnostics and possible solutions to any alarms can be found in the chapter Accessories (par. 6.2.5).

Module status and alarms	Diagnostic Status (0x1002)	CANopen Code	Extra Info CANopen	UVIX
Short circuit on the channel n	0xDD	0x2321	Byte 1 = bus type = 2 (CAN) Byte 2 = board type = 1 (Dig. In) Byte 3 = board number Byte 4 = channel number Byte 5 = 0	Short circuit Group 0-3 Short circuit Group 4-7 Short circuit Group 8-11 Short circuit Group 12-15
Configuration parameters alarm	0xDE	0xF008	Byte 1 = bus type = 2 (CAN) Byte 2 = board type = 1 (Dig. In) Byte 3 = board number Byte 4 = 0 Byte 5 = 0	Configuration alarm
Communication alarm	0xDF	0xF007	Byte 1 = bus type = 2 (CAN) Byte 2 = board type = 1 (Dig. In) Byte 3 = board number Byte 4 = 0 Byte 5 = 0	Communication alarm

8.4 Digital Output Module

The following table shows the diagnostic statuses of the digital outputs, with the respective CANopen messages and the display on the UVIX interface. The digital outputs display a diagnostic signal via LED signalling directly on the module. Details on LED diagnostics and possible solutions to any alarms can be found in the chapter Accessories (par. 6.2.5).

NOTE. The 16-channel digital output modules mandatorily need external power supply.

Module status and alarms	Diagnostic Status (0x1002)	CANopen Code	Extra Info CANopen	UVIX
Short circuit on the channel n	0xCA	0x2322	Byte 1 = bus type = 2 (CAN) Byte 2 = board type = 1 (Dig. In) Byte 3 = board number Byte 4 = channel number Byte 5 = 0	Short Circuit Channel n
Open circuit on the channel n	0xCB	0x2323	Byte 1 = bus type = 2 (CAN) Byte 2 = board type = 1 (Dig. In) Byte 3 = board number Byte 4 = channel number Byte 5 = 0	Open Load Channel n
Undervoltage power line*	0xCC	0x3121	Byte 1 = bus type = 2 (CAN) Byte 2 = board type = 1 (Dig. In) Byte 3 = board number Byte 4 = 0 Byte 5 = 0	Under Voltage Power Supply

Module status and alarms	Diagnostic Status (0x1002)	CANopen Code	Extra Info CANopen	UVIX
No external power line*	0xCD	0x3122	Byte 1 = bus type = 2 (CAN) Byte 2 = board type = 1 (Dig. In) Byte 3 = board number Byte 4 = 0 Byte 5 = 0	Zero Voltage Power Supply
Configuration parameters alarm	0xCE	0xF00A	Byte 1 = bus type = 2 (CAN) Byte 2 = board type = 1 (Dig. In) Byte 3 = board number Byte 4 = 0 Byte 5 = 0	Configuration alarm
Communication alarm	0xCF	0xF009	Byte 1 = bus type = 2 (CAN) Byte 2 = board type = 1 (Dig. In) Byte 3 = board number Byte 4 = 0 Byte 5 = 0	Communication alarm

* Power supply alarms refer to the external power supply for 16-channel modules.

8.5 Analogue Input Module

The following table shows the diagnostic statuses of the analogue inputs, with the respective CANopen messages and the display on the UVIX interface. The analogue inputs display a diagnostic signal via LED signalling directly on the module. Details regarding LED diagnostics and possible solutions to any alarms can be found in the chapter Accessories (par. 6.4.4).

Module status and alarms	Diagnostic Status (0x1002)	CANopen Code	Extra Info CANopen	UVIX
Sensor fault on channel 1	0xB6	0xF00B	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number Byte 4 = 1 (channel id)	Sensor fault channel 1
Missing bridge on channel 1	0xB7	0xF0A1	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number Byte 4 = 1 (channel id)	Missing bridge channel 1
ADC communication alarm	0xB8	0xF00D	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number	ADC communication error
Alarm on the voltage reference 3.3V	0xB9	0xF00C	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number	RESDCDC error
Sensor fault on channel 2	0xBA	0xF0A0	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number Byte 4 = 2 (channel id)	Sensor fault channel 2
Missing bridge on channel 2	0xBB	0xF0A1	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number Byte 4 = 2 (channel id)	Missing bridge channel 1

Module status and alarms	Diagnostic Status (0x1002)	CANopen Code	Extra Info CANopen	UVIX
Configuration parameters alarm	0xBE	0xF010	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number	Configuration alarm
Communication alarm	0xBF	0xF00F	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number	Communication alarm

8.6 Analogue Output Module

The following table shows the diagnostic statuses of the analogue outputs, with the respective CANopen messages and the display on the UVIX interface. The analogue outputs display a diagnostic signal via LED signalling directly on the module. Details regarding LED diagnostics and possible solutions to any alarms can be found in the chapter Accessories (par. 6.5.4).

Module status and alarms	Diagnostic Status (0x1002)	CANopen Code	Extra Info CANopen	UVIX
Internal error	0xA9	0xF012	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number	Internal Error
Open circuit on the channel n	0xAA	0xF013	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number Byte 4 = 2 (channel id)	Channel n Open Load
Overheating module	0xAB	0xF014	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number	Board Over Heating
Power Supply Short Circuit	0xAC	0xF015	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number	Power Supply Short Circuit
Power Supply Under Voltage	0xAD	0xF016	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number	Power Supply Under Threshold
Configuration parameters alarm	0xAE	0xF017	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number	Configuration alarm
Communication alarm	0xAF	0xF018	Byte 1 = 2 (CAN bus) Byte 2 = Board Type Byte 3 = Board Number	Communication alarm

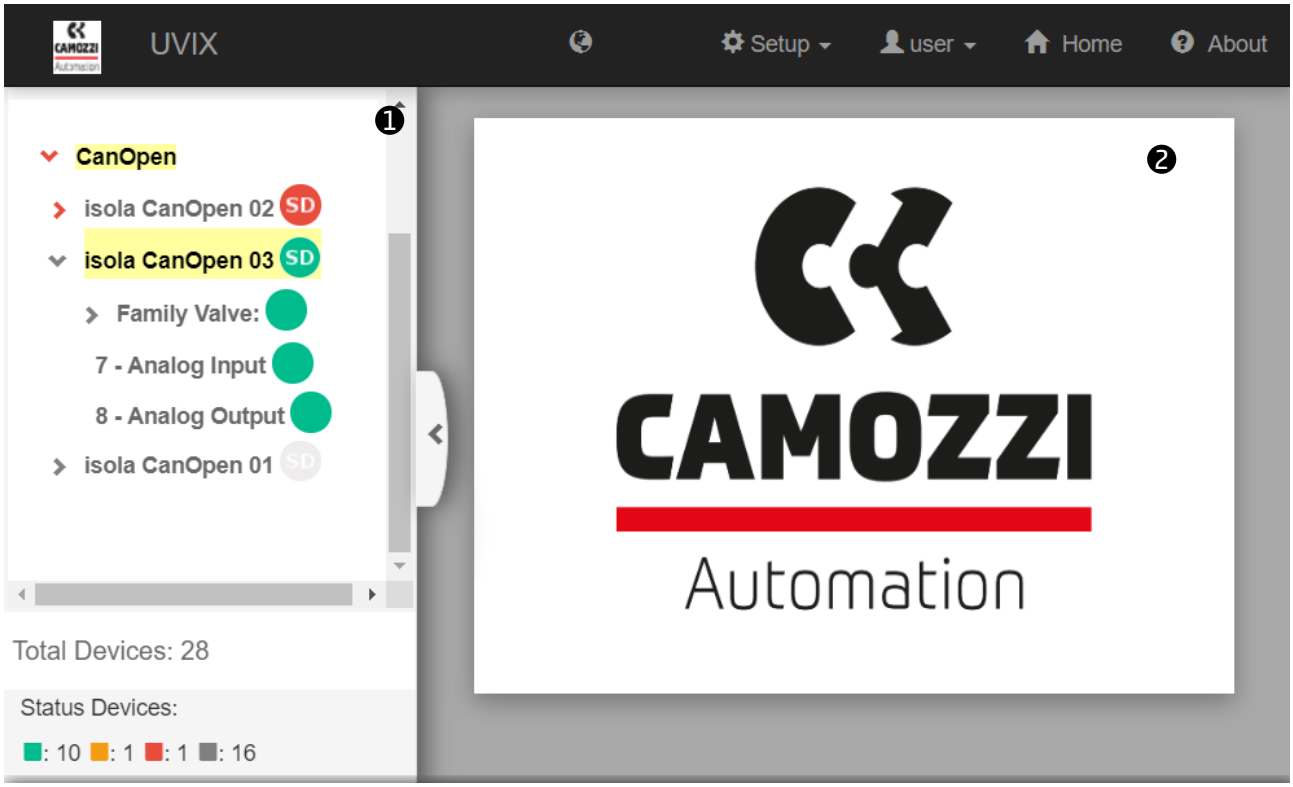
Uvix

9.1 Introduction

Camozzi's proprietary environment, called UVIX, allows the user to monitor and configure all new generation Camozzi devices (*Camozzi Smart Devices*) that support connection to it. Devices can be connected to UVIX in two ways: wireless or USB. This system has been implemented with a *web-based* architecture so that information can be accessed straightforwardly using a browser.
Monitoring consists of displaying all the device variables, whether they relate to operation, diagnostics, or parameterization.
For details on the UVIX architecture, its installation, and general operations, see the Manuale UVIX.

9.2 General information

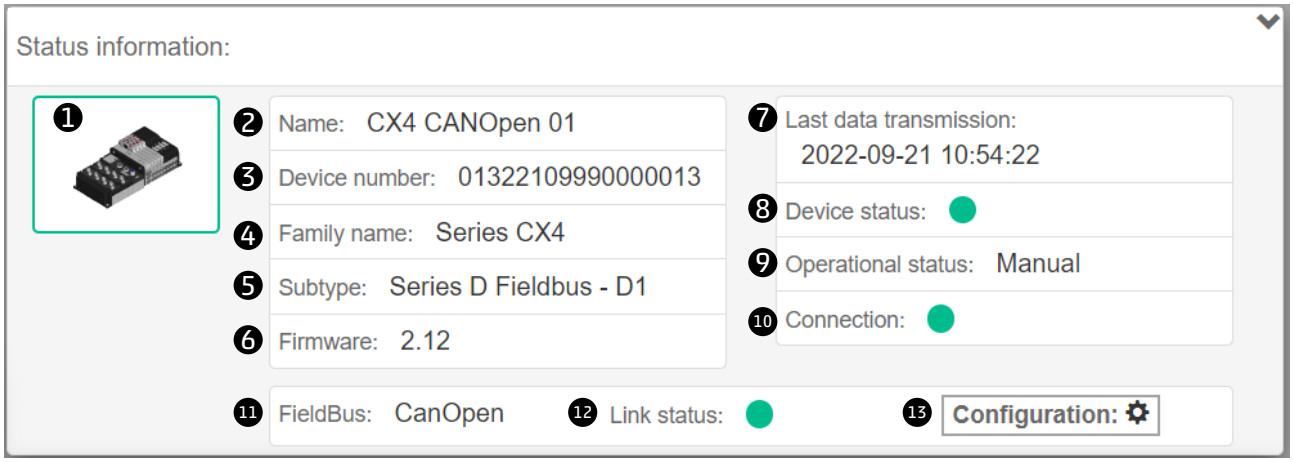
The devices connected to the UVIX are displayed in a tree diagram ❶ consisting of *Device Groups*, *Family* e *Devices*. Select one of the components to view in the main window ❷ all the information on the various devices and perform configuration operations or manual commands.
By selecting the CX4 module, in Stand-Alone or Valve Island configuration, or individual accessory modules, Series D coil valve subbases or I/O modules, general status information and details can be displayed. These are divided into variables, alarms and controls.



9.2.1 Status information

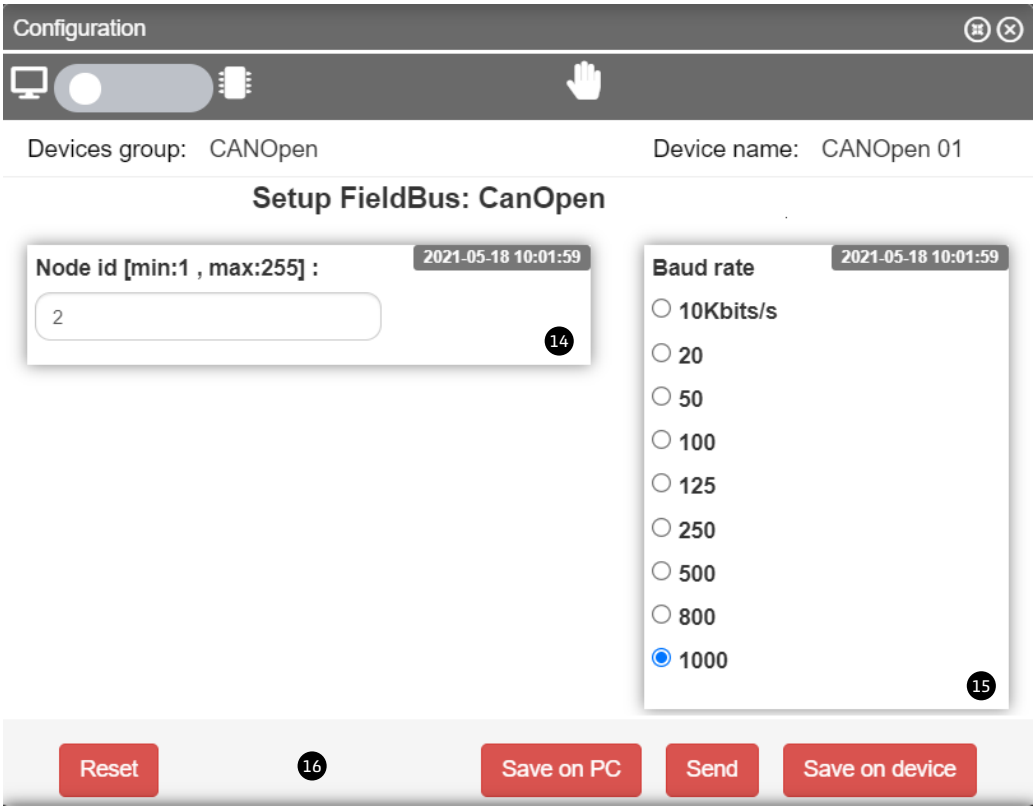
Select a Series CX4 module to view the main information.

- ❶ Series CX4 identification image..
- ❷ Device name, assigned when recognized and added in UVIX.
- ❸ Device identification number (17 characters).
- ❹ Device family name: *Series CX4*.
- ❺ Type of *Series D Fieldbus* according to the connected accessory modules:
  - *Stand-Alone*, with only I/O modules connected.
  - *D1* with at least one Series D1 solenoid valve connected.
  - *D2* with at least one Series D2 solenoid valve connected.
  - *D4* with at least one Series D4 solenoid valve connected.
  - *D5* with at least one Series D1 and one Series D2 solenoid connected.
- ❻ Firmware version.
- ❼ Date and time of the last transmission between CX4 module and UVIX.
- ❽ General status of the module: *Not available*, *Ok*, *Alarm*.
- ❾ Stato operativo del modulo:
  - *Init* → initialization of the CX4 module and accessory modules.
  - *Enumeration* → numbering of the accessory modules connected to the CX4 module (required if modules are replaced or moved with respect to the original configuration).
  - *Mapping* → mapping of the accessory modules connected to the CX module (required to check that there have been no changes since the last system configuration).
  - *Work* → normal operation.
  - *Manual* → manual operation.
  - *Configuration* → configuration of the parameters of the CX4 module and the accessory modules.
  - *Fatal error* → fatal error that renders the CX4 module inoperative.
- ❿ WiFi connection status: *Online*, *Offline*.
- ⓫ Fieldbus used by the module: CANopen.
- ⓬ Fieldbus communication status: *Online*, *Offline*.
- ⓭ Configuration of fieldbus-related parameters.



9.2.2 CANopen network configuration

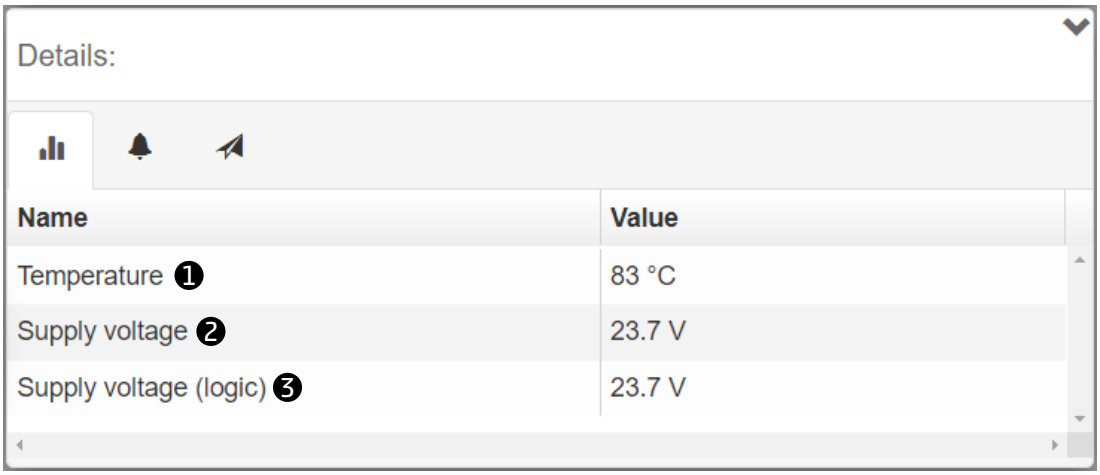
From the status information page, you can access the window for configuring certain fieldbus parameters ⓭. In the specific case of CANopen, you can configure the identification number of the node ⓮ and the Baud rate ⓯ (par. 7.5).
Using the buttons in the bottom bar of the configuration window ⓰, the configured parameters can be sent to the module, saved on the PC, saved on the device, or reset to default values.



9.2.3 Variables

The first tab of the details page deals shows the variables that are monitored by the CX4 module.

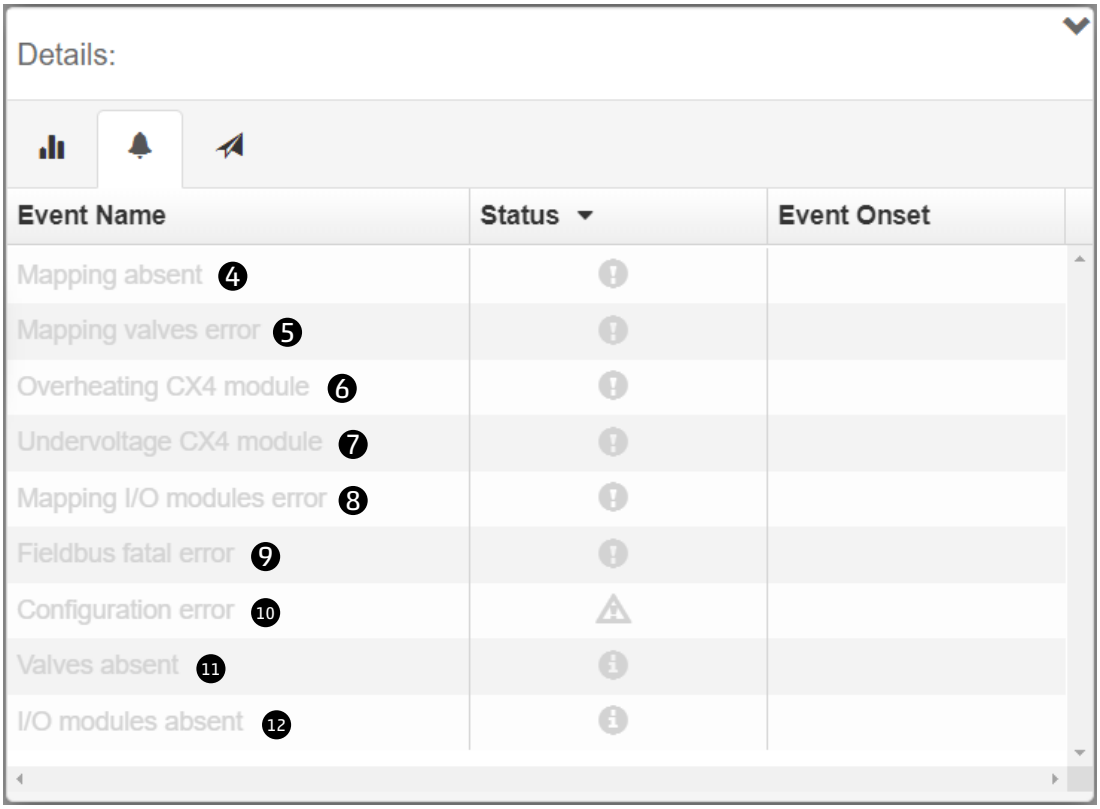
- ❶ Internal temperature of the module.
- ❷ Power voltage that supplies the subbases of the solenoid valves: the measurement is made by the first subbase connected (position 1) and is sent via serial communication. If there are no valves connected, this voltage is not displayed.
- ❸ Logic voltage that powers the module circuit board. Without this supply voltage, the entire system is without power and, therefore, turned off.



9.2.4 Alarms

The second tab on the details page displays possible CX4 module alarms.

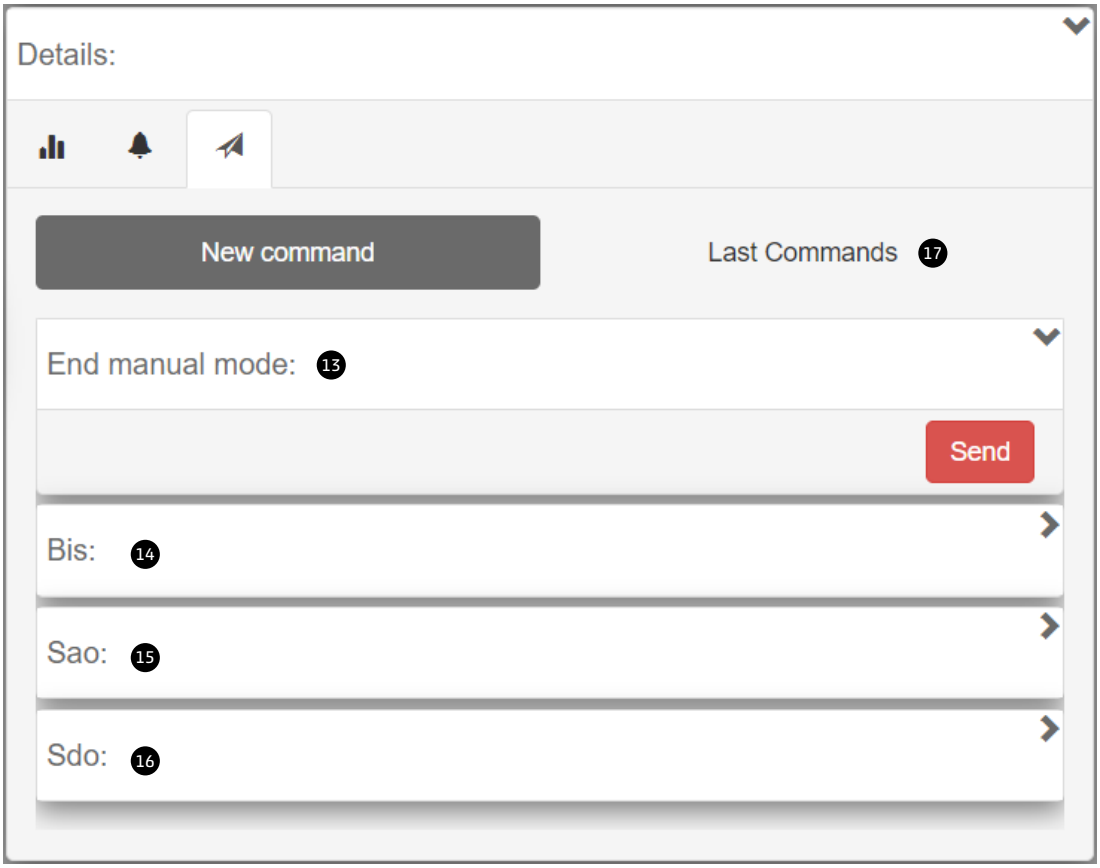
- ❹ No mapping: indicates that there are no accessory modules connected to the CX4 module.
- ❺ Valve mapping error: this can occur if the positions of the subbases of the solenoid valves have been changed, moving them from their original position or adding new ones, or if a subbase fails to respond to the mapping request from the CX4 module.
- ❻ CX4 module overheating.
- ❼ Supply voltage of the CX4 module lower than the voltage given in the specifications.
- ❽ I/O module mapping error: this can occur if the positions of the I/O modules have been changed, moving them from their original position or adding new ones, or if an I/O module fails to respond to the mapping request from the CX4 module.
- ❾ Fatal error on fieldbus: this occurs if the fieldbus protocol stack is incorrect.
- ❿ Configuration error
- ⓫ No valve mapping: indicates that there are no solenoid valve subbases connected to the CX4 module.
- ⓬ No I/O module mapping: indicates that there are no I/O modules connected to the CX4 module.



9.2.5 Commands

The third tab of details on the CX4 module shows the commands that can be sent via UVIX to the device. The *Manual Mode* command ⓭ allows you to control the system manually from UVIX, sending configuration parameters to the CX4 module and to the individual connected accessory modules. In manual mode, you can command the modules that include outputs (if present), such as the solenoid valves ⓮ (par. 9.3.6), digital outputs ⓯ (par. 9.5.5) and analogue outputs ⓰ (par. 9.7.5). The history of the commands sent to the CX4 module from when communication with UVIX was started can be viewed under *Last Commands* ⓱.

NOTE. If there are solenoid valve subbases connected to the CX4 module, the valve information can be reset at any time, without activating manual mode.



9.3 Series D coil valves and subbase

9.3.1 Status information

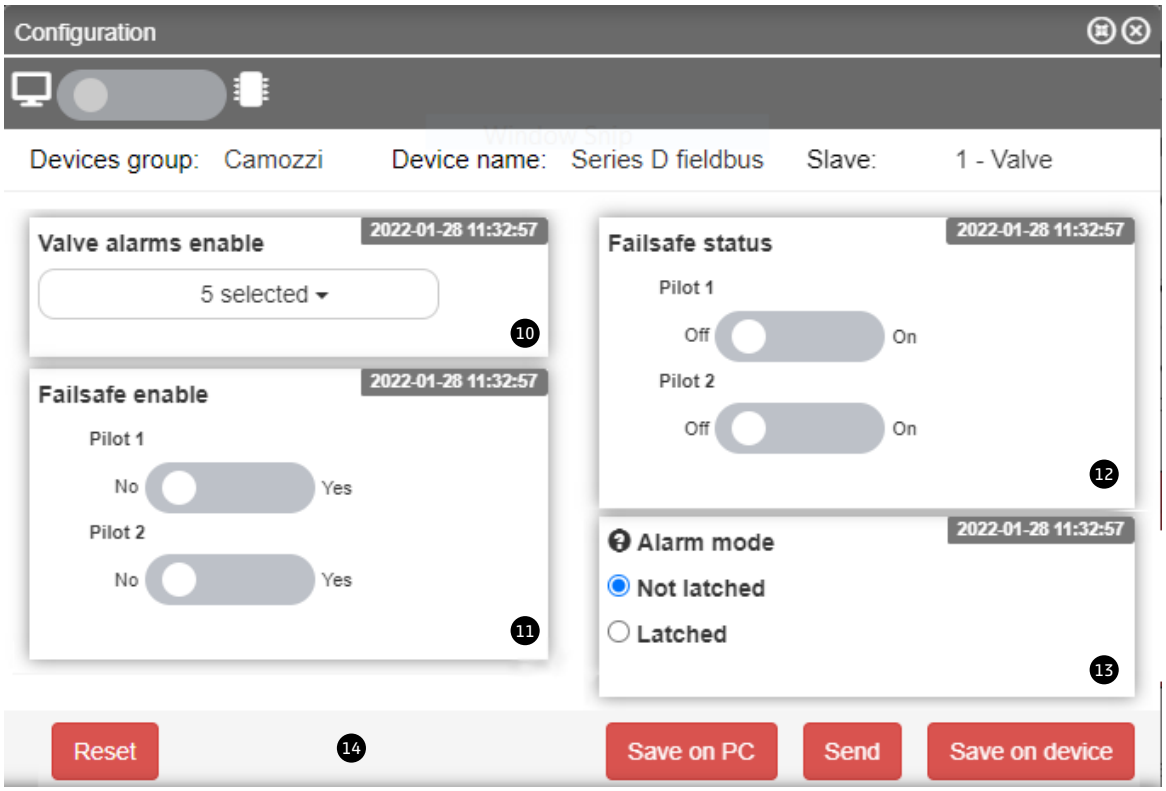
On the first page of UVIX, you can select one of the solenoid valves connected to the CX4 module in the configuration of a Series D valve island to view the general information of the individual subbase.

- ❶ Identification images of the coil valve mounted on the subbase.
- ❷ Position of the subbase in the assigned valve island after mapping.
- ❸ Name of the accessory module family: *Valve*.
- ❹ Solenoid valve family sub-type: 10 mm, 16 mm, 25 mm.
- ❺ Firmware version.
- ❻ Date and time of the last transmission of the variables between the subbase and UVIX.
- ❼ General status of the solenoid valve: *Not available*, *Ok*, *Alarm*.
- ❽ Operating status of the subbase:
  - *Init* → initialization (mapping and configuration of parameters).
  - *Work* → normal operation.
  - *Error* → subbase error.

9.3.2 Configuration

From the status information page, you can configure certain operating-related parameters of the solenoid valves ❾.

- ❿ Enable/disable the alarms that the valve can generate (default: all alarms enabled).
- ⓫ Enable/disable the Failsafe for each individual pilot: *Yes* enabled, *No* disabled (default).
- ⓬ Set the Failsafe status for each pilot for which the Failsafe has been enabled: *On* pilot activated, *Off* pilot deactivated (default).
- ⓭ Set the behaviour of the valve failure error (Coil Fault): *Latched*, *Not Latched* (default).
- ⓮ The buttons in the bottom bar of the tab allow you to send the configuration parameters to the module, save them on the PC, save them on the device or reset them to default values.

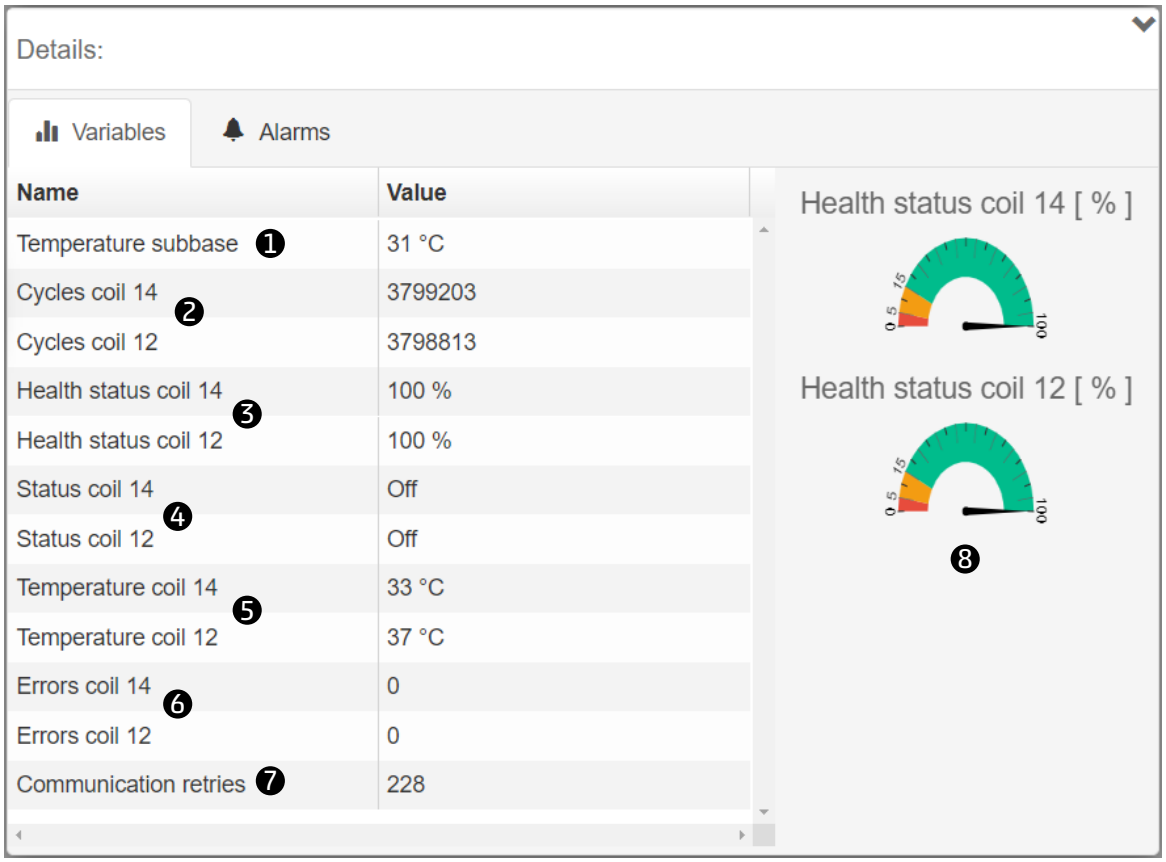


9.3.3 Details

9.3.4 Variables

The first tab on the details page shows the variables that are monitored by the subbase of an individual solenoid valve. These variables can be reset using the commands by selecting the CX4 module to which the subbases are connected (par. 9.3.6).

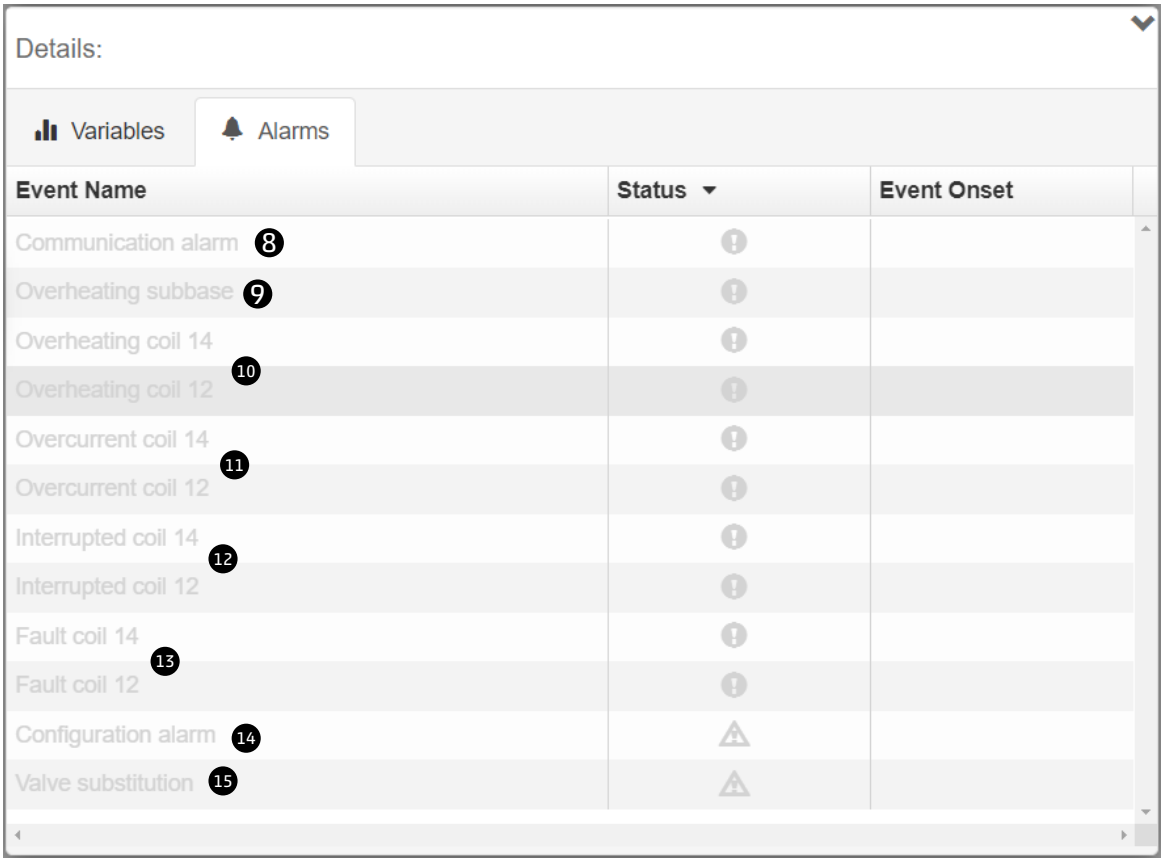
- ❶ subbase temperature.
- ❷ Cycles performed by the pilots in position 14 and position 12.
- ❸ Percentage health status of the pilots in position 14 and position 12.
- ❹ Status of the pilots in position 14 and position 12 (*On/Off*).
- ❺ Temperature of the pilots in position 14 and position 12.
- ❻ Errors of the pilots in position 14 and position 12.
- ❼ Communication errors between the CX4 module and the selected subbase.
- ❽ Gauge indicators that show graphically the percentage health status of the two pilots.



9.3.5 Alarms

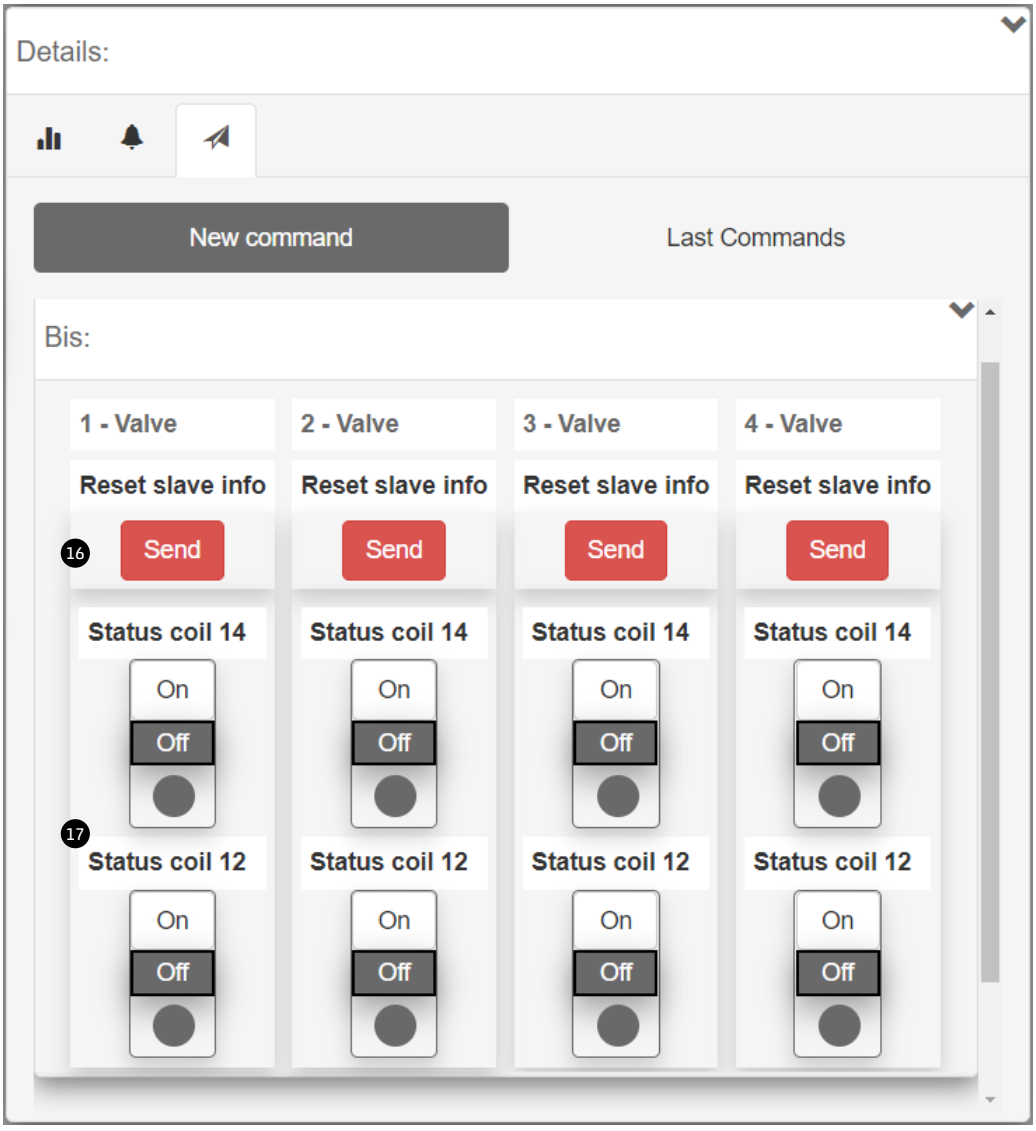
The second details tab displays the alarms of the subbase of the selected valve.

- ❽ Communication alarm due to communication failure between CX4 module and subbase.
- ❾ subbase overheating.
- ❿ Overheating of the pilots in position 14 and position 12.
- ⓫ Overcurrent of the pilots in position 14 and position 12.
- ⓬ Alarm - solenoid valves closed in position 14 and position 12.
- ⓭ Energization malfunction of the solenoid pilots in position 14 and position 12.
- ⓮ Alarm - configuration of subbase parameters.
- ⓯ Replace valve warning.



9.3.6 Commands

On the main page of the CX4 module (par. 9.2.5), there is a tab showing the commands for the solenoid valves. In particular, you can reset the valve information ❶❻ (cycles, errors, health status). This operation needs to be performed when the valve connected to the subbase is replaced and can also be performed in normal working mode.
You can also control the individual pilots (position 12 and 14) of the solenoid valves ❶❼. For this operation, the island must be in manual mode.



9.4 Digital Input Module

9.4.1 Status information

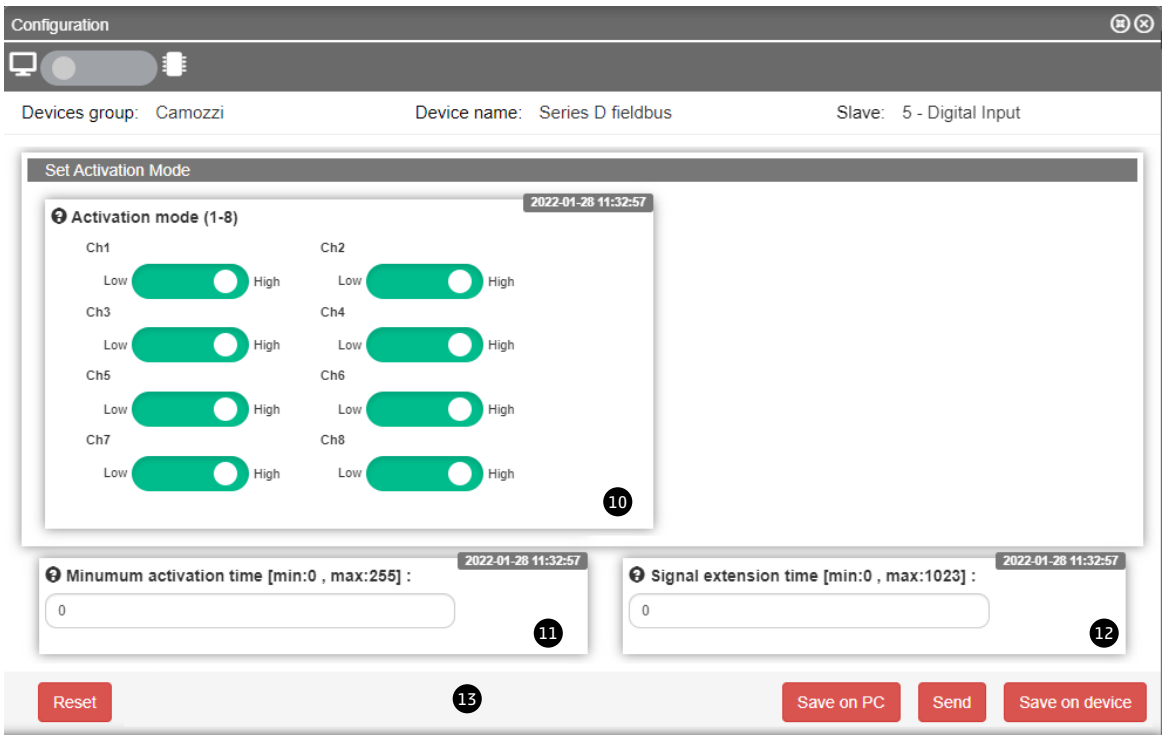
On the first page of UVIX, select one of the digital inputs connected to the CX4 module to view the general information of the accessory module.

- Identification images of the digital input module (8 or 16 channels).
- Module position assigned after mapping.
- Name of the accessory module family: *Digital Input*.
- Subtype of the family of the digital input module: 8 CH, 16 CH.
- Firmware version.
- Date and time of the last transmission of the variables between the module and UVIX.
- General status of the module: *Not available*, *Ok*, *Alarm*.
- Operating status of the module:
  - *Init* → initialization (mapping and configuration of parameters).
  - *Work* → normal operation.
  - *Error* → module error.

9.4.2 Configuration

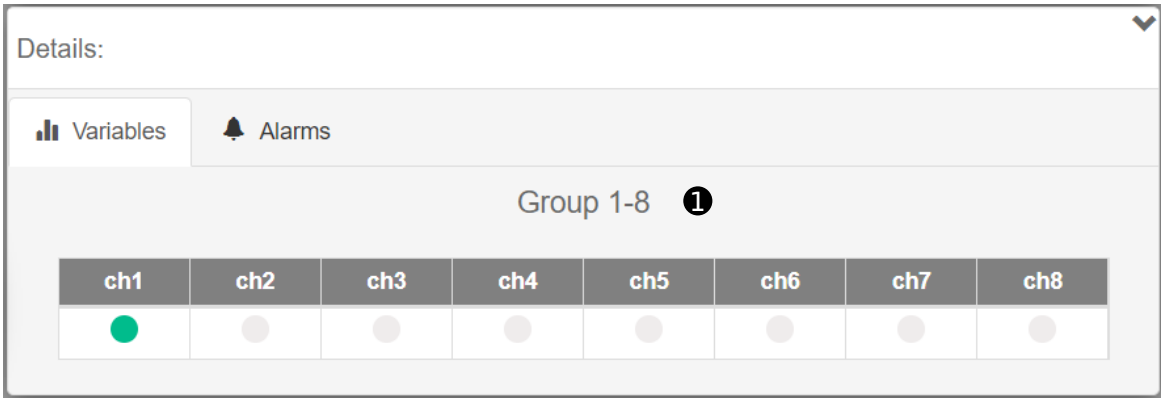
From the status information page, you can configure certain operating-related parameters of the digital input modules ❾.

- ❿ Parameter for the polarity of each channel, *High* or *Low* (default).
- ⓫ Minimum input level activation time in milliseconds (filtro *anti-bounce*, defualt: 0).
- ⓬ Minimum input rereading time in milliseconds (default: 0).
- ⓭ Using the buttons in the bottom bar of the configuration window, the configured parameters can be sent to the module, saved on the PC, saved on the device or reset to default values.



9.4.3 Variables

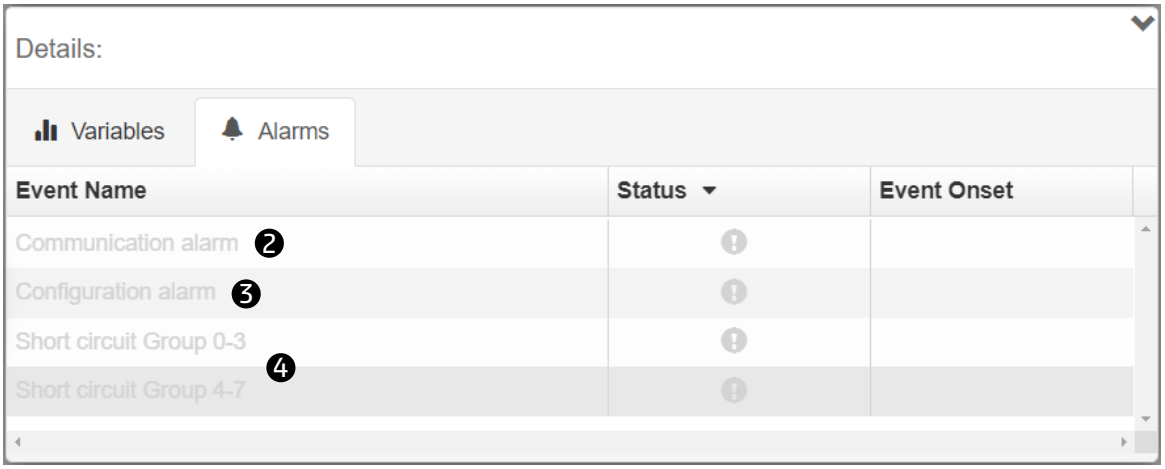
The first tab on the details page displays the status of the digital inputs ❶ : active, not active.



9.4.4 alarms

The second details tab displays the alarms of the digital input module.

- ❷ Communication alarm between the digital input module and the CX4 module.
- ❸ Configuration alarm of module parameters.
- ❹ Short-circuit of at least one digital input belonging to an input group. This alarm can be divided into two groups for modules with 8 channels or into four groups for modules with 16 channels.

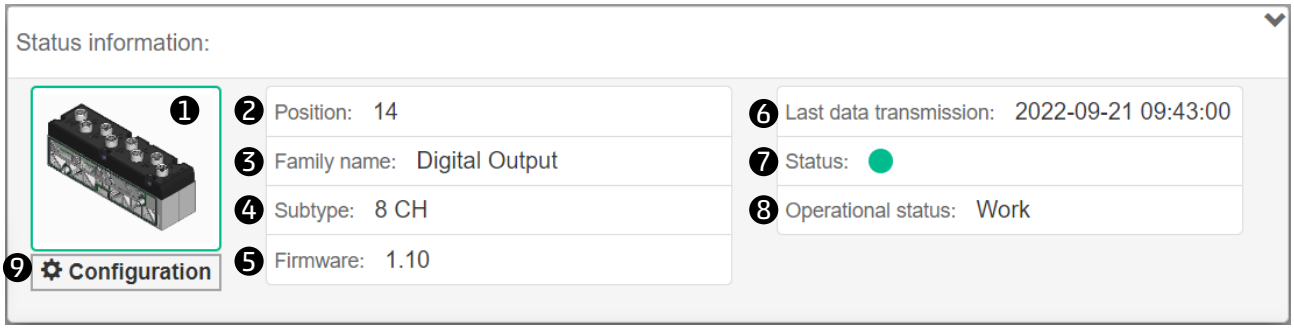


9.5 Digital Output Module

9.5.1 Status information

On the first page of UVIX, select one of the digital outputs connected to the CX4 module to view the general information of the accessory module.

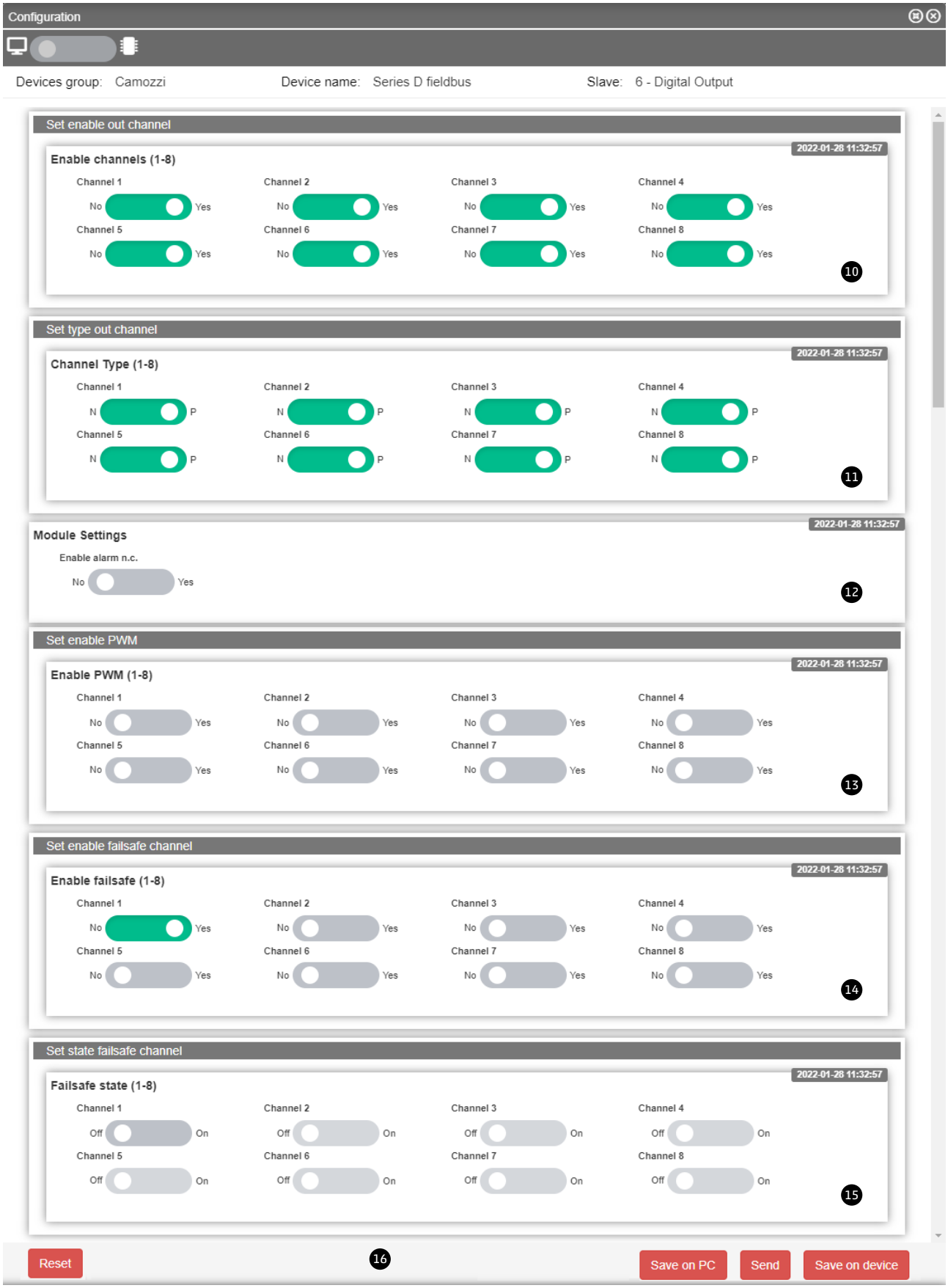
- Identification images of the digital output module (8 or 16 channels).
- Module position assigned after mapping.
- Name of the accessory module family: *Digital Output*.
- Subtype of the family of the digital output module: 8 CH, 16 CH.
- Firmware version.
- Date and time of the last transmission of the variables between the module and UVIX.
- General status of the module: *Not available*, *Ok*, *Alarm*.
- Operating status of the module:
  - *Init* → initialization (mapping and configuration of parameters).
  - *Work* → normal operation.
  - *Error* → module error.



9.5.2 Configuration

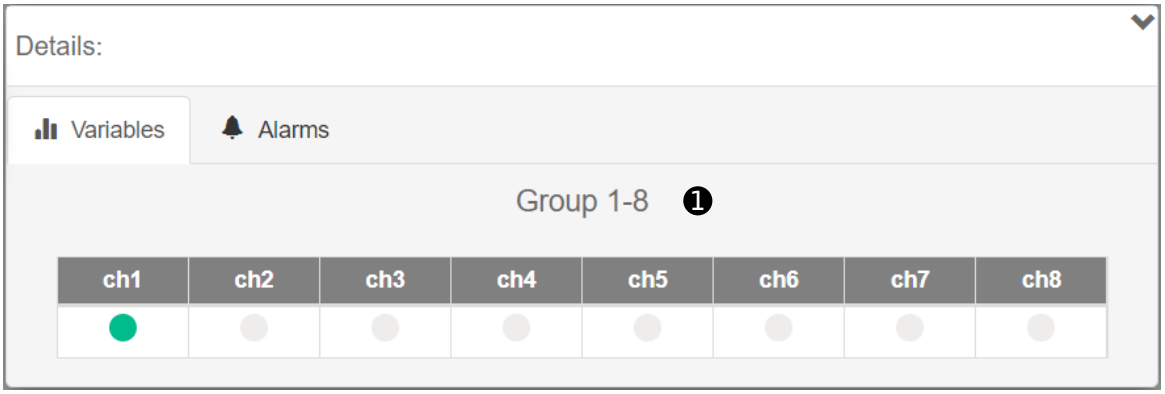
From the status information page, you can configure certain operating-related parameters of the digital output modules ❾.

- ❿ Enable output: *No* disabled, *Yes* enabled (default).
- ⓫ Set the type of individual output channel: *type N*, *type P* (default).
- ⓬ Enable the individual functions related to the whole module, see the detection of no load by the power driver.
- ⓭ Set the PWM for individual outputs: *Yes* enabled, *No* disabled (default).
- ⓮ Enable the protection failsafe, which can be set for the individual outputs: *Yes* enabled, *No* disabled (default).
- ⓯ Failsafe status, which can be set for the individual outputs: *On*, *Off* (default).
- ⓰ Using the buttons in the bottom bar of the configuration window, the configured parameters can be sent to the module, saved on the PC, saved on the device or reset to default values.


Configuration
Devices group: Camozzi
Device name: Series D fieldbus
Slave: 6 - Digital Output
Set enable out channel
2022-01-28 11:32:57
Enable channels (1-8)
Channel 1
Channel 2
Channel 3
Channel 4
Channel 5
Channel 6
Channel 7
Channel 8
No
Yes
10
Set type out channel
2022-01-28 11:32:57
Channel Type (1-8)
N
P
11
Module Settings
2022-01-28 11:32:57
Enable alarm n.c.
12
Set enable PWM
2022-01-28 11:32:57
Enable PWM (1-8)
13
Set enable failsafe channel
2022-01-28 11:32:57
Enable failsafe (1-8)
14
Set state failsafe channel
2022-01-28 11:32:57
Failsafe state (1-8)
Off
On
15
Reset
16
Save on PC
Send
Save on device

9.5.3 Variables

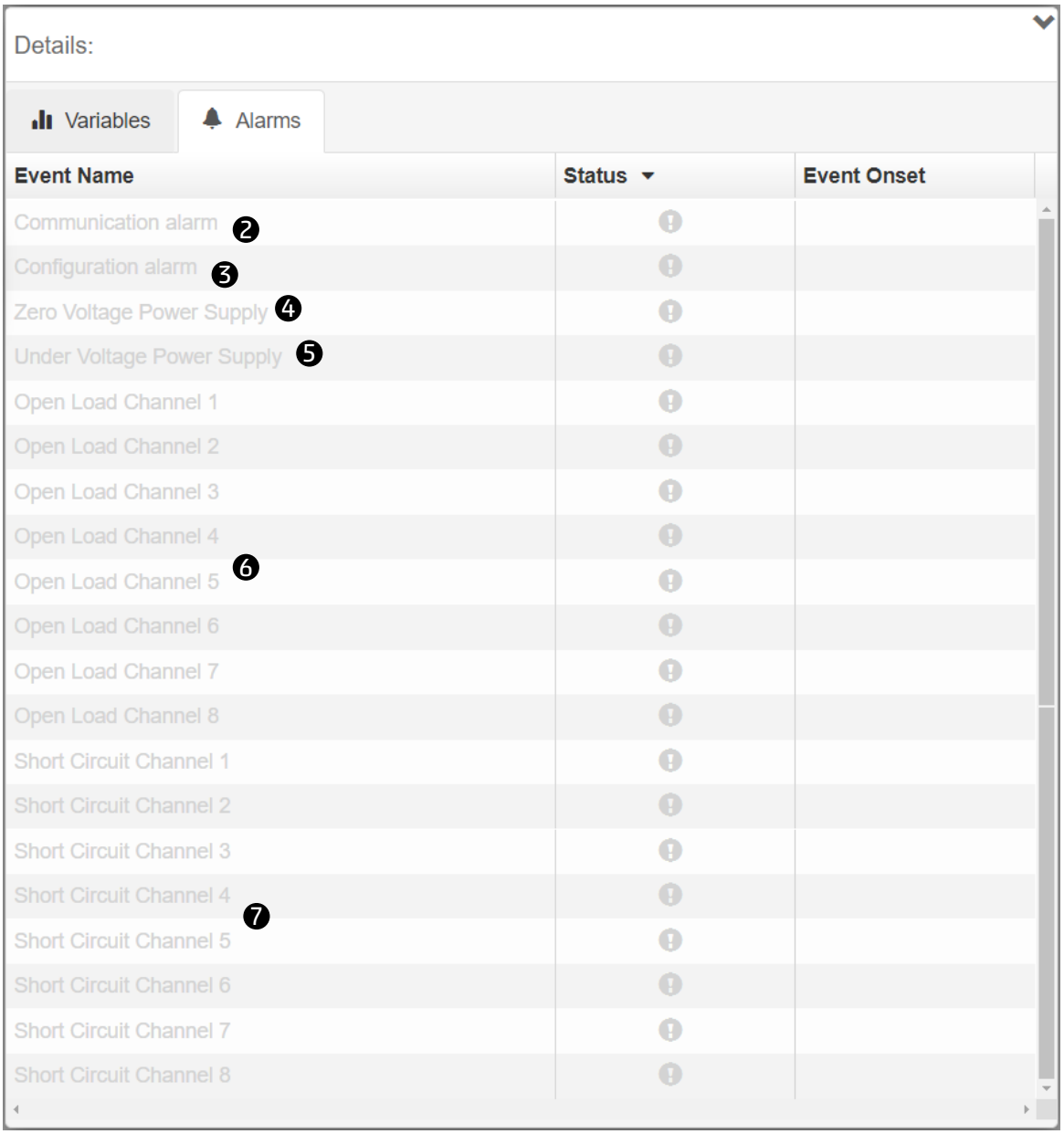
The first tab on the details page displays the status of the digital outputs ❶ : attiva, non attiva.



9.5.4 Allarmi

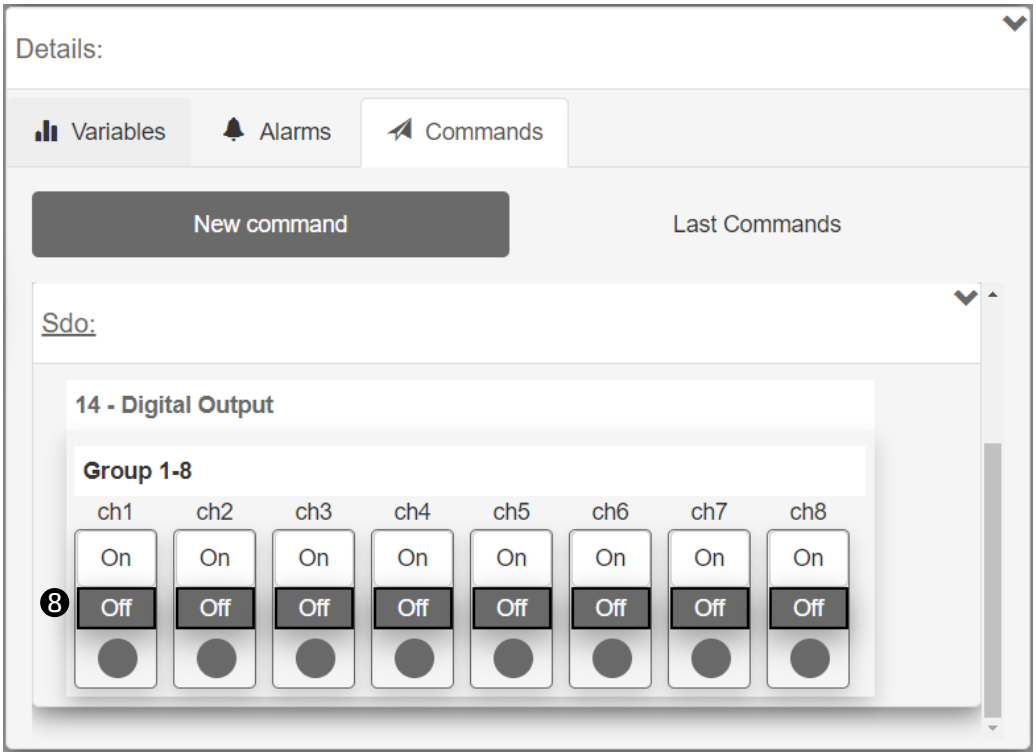
The second details tab displays the alarms of the digital output module.

- ❷ Communication alarm between the digital input module and the CX4 module.
- ❸ Configuration alarm of module parameters.
- ❹ No external power supply, required to power the digital outputs.
- ❺ The supply voltage is less than 4.5V.
- ❻ Circuit open on an output channel.
- ❼ Short circuit on an output channel.



9.5.5 Comands

On the main page of the CX4 module (par. 9.2.5) there is a tab showing the commands to pilot the individual channels of the digital outputs ❽. This tab is only visible in manual mode and if it has at least one digital output module. digitali.



9.6 Analogue Input Module

9.6.1 Status information

On the first page of UVIX, select one of the analogue inputs connected to the CX4 module to view the general information of the accessory module.

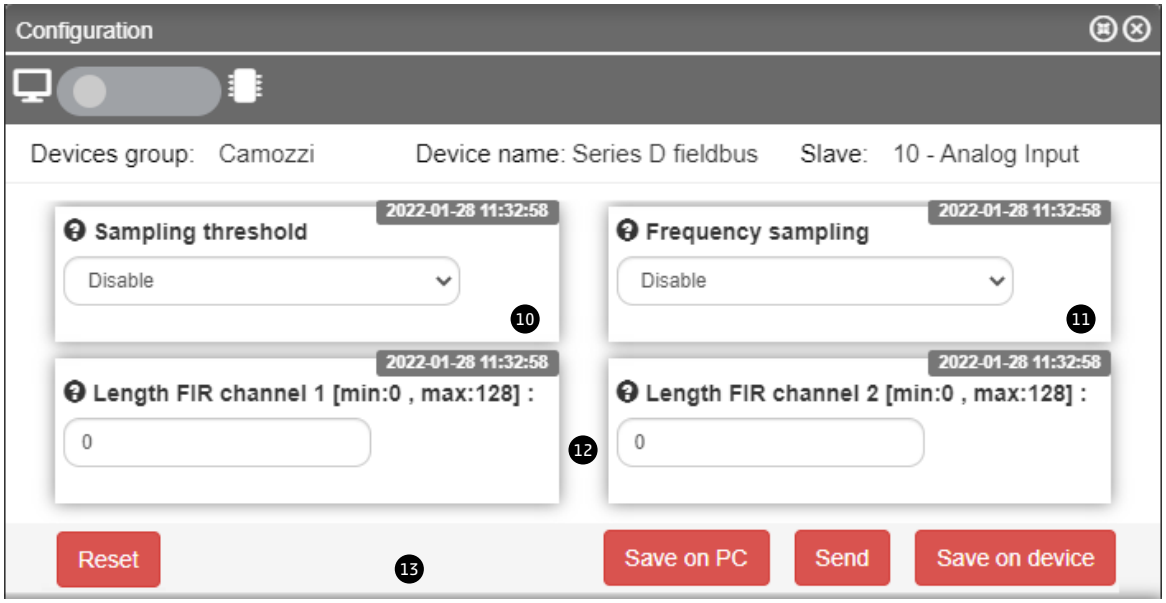
- Identification images of the analogue input module.
- Module position assigned after mapping.
- Name of the accessory module family: *Analog Input*.
- Subtype of the family of the analogue input module: *RTD*, *Thermocouple*, *Bridge*, *Voltage/Current*.
- Firmware version.
- Date and time of the last transmission of the variables between the module and UVIX.
- General status of the module: *Not available*, *Ok*, *Alarm*.
- Operating status of the module:
  - *Init* → initialization (mapping and configuration of parameters).
  - *Work* → normal operation.
  - *Error* → module error.

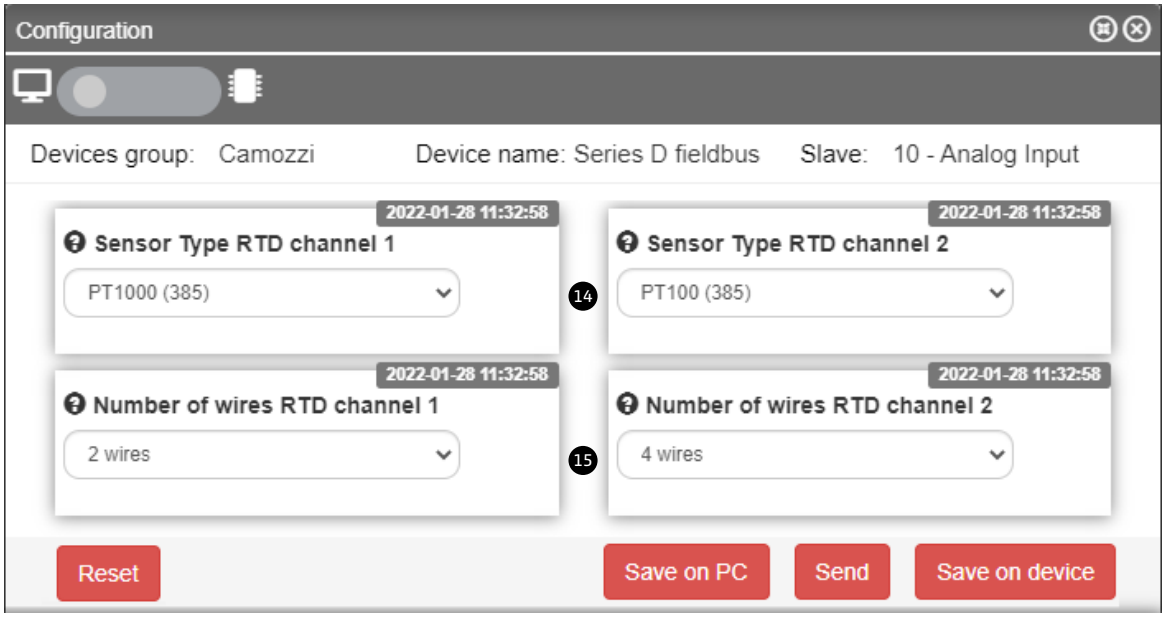
9.6.2 Configuration

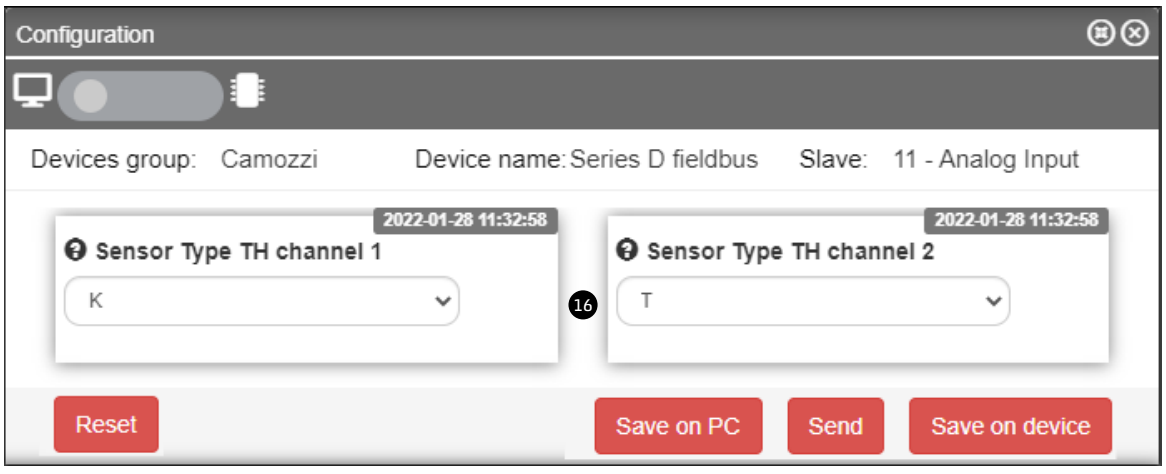
From the status information page, you can configure certain operating-related parameters of the analogue input modules ❾.

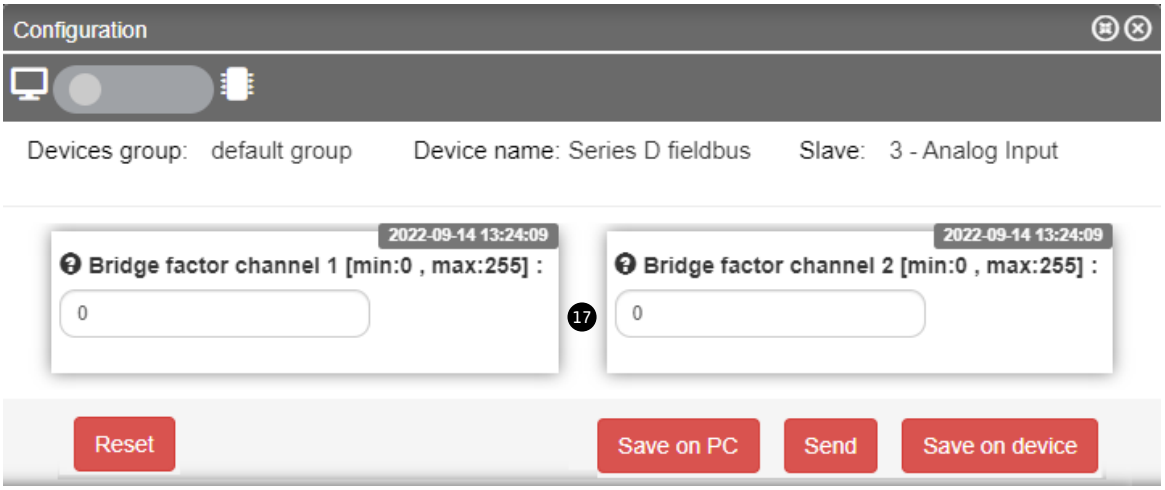
Some of these parameters are specific to individual subtypes, while others are common to all subtypes of the analogue input family.

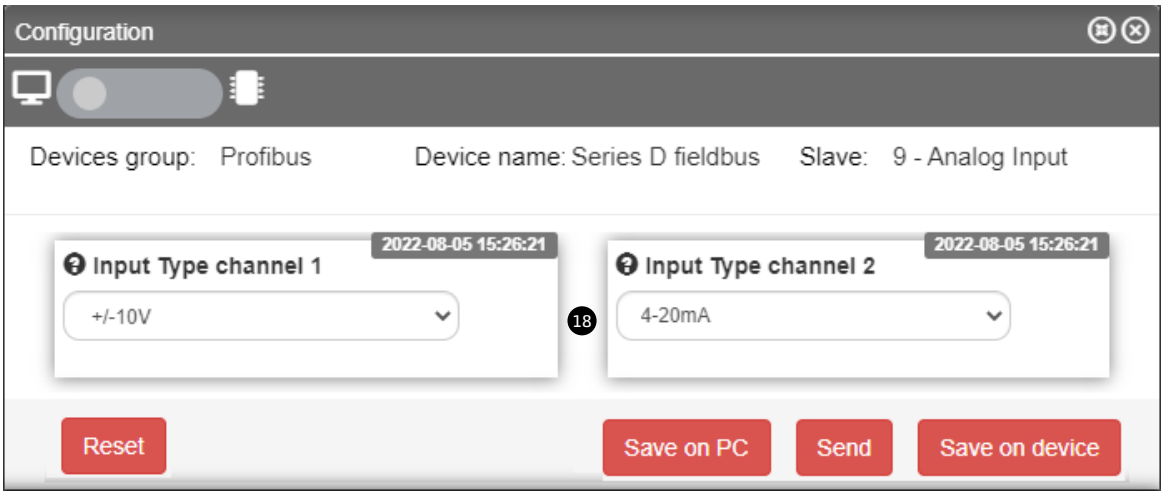
- ❿ Enable threshold-based transmission (default: *Disable*).
- ⓫ Enable frequency-based transmission (default: *Disable*).
- ⓬ Length of the impulse response of the FIR filter on channel 1 and channel 2.
- ⓭ Using the buttons in the bottom bar of the configuration window, the configured parameters can be sent to the module, saved on the PC, saved on the device or reset to default values.
- ⓮ Type of RTD for channel 1 and for channel 2.
- ⓯ Number of wires for the RTD sensor on channel 1 and channel 1.
- ⓰ Type of Thermocouple for channel 1 and for channel 2.
- ⓱ Type of Bridge for channel 1 and for channel 2.
- ⓲ Type of Voltage/Current module for channel 1 and for channel 2.


Configuration
Devices group: Camozzi
Device name: Series D fieldbus
Slave: 10 - Analog Input
2022-01-28 11:32:58
Sampling threshold
Disable
10
2022-01-28 11:32:58
Frequency sampling
Disable
11
2022-01-28 11:32:58
Length FIR channel 1 [min:0 , max:128] :
0
12
2022-01-28 11:32:58
Length FIR channel 2 [min:0 , max:128] :
0
Reset
13
Save on PC
Send
Save on device


Configuration
Devices group: Camozzi
Device name: Series D fieldbus
Slave: 10 - Analog Input
2022-01-28 11:32:58
Sensor Type RTD channel 1
PT1000 (385)
14
2022-01-28 11:32:58
Sensor Type RTD channel 2
PT100 (385)
2022-01-28 11:32:58
Number of wires RTD channel 1
2 wires
15
2022-01-28 11:32:58
Number of wires RTD channel 2
4 wires
Reset
Save on PC
Send
Save on device

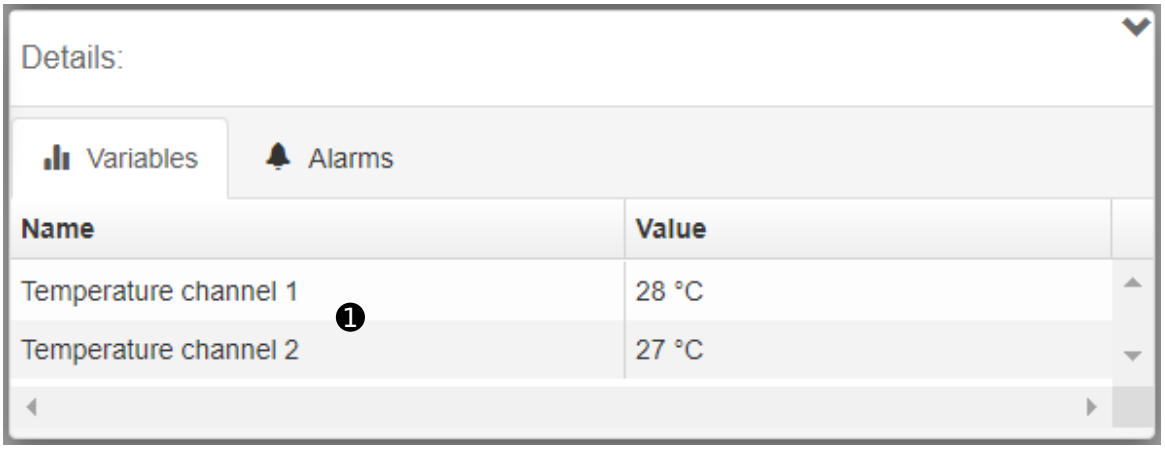

Configuration
Devices group: Camozzi
Device name: Series D fieldbus
Slave: 11 - Analog Input
2022-01-28 11:32:58
Sensor Type TH channel 1
K
16
2022-01-28 11:32:58
Sensor Type TH channel 2
T
Reset
Save on PC
Send
Save on device

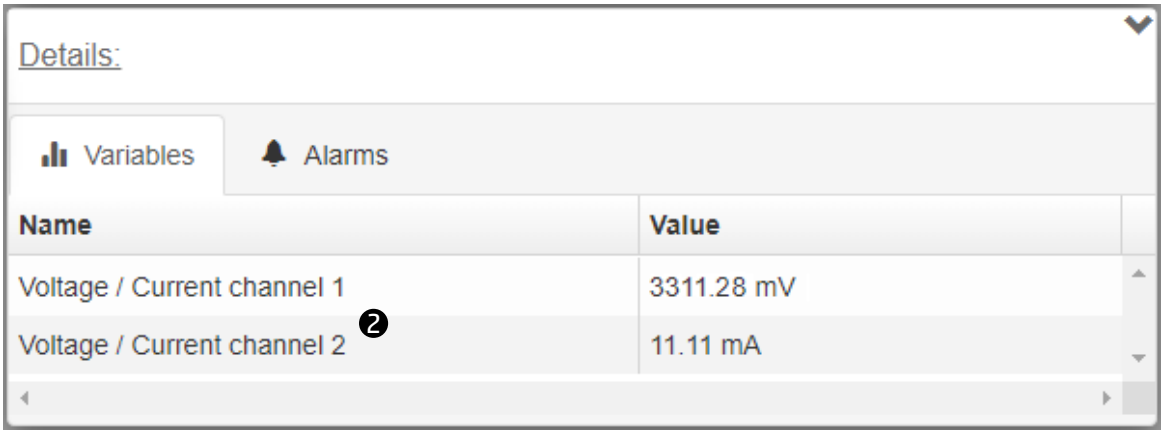

Configuration
Devices group: default group
Device name: Series D fieldbus
Slave: 3 - Analog Input
2022-09-14 13:24:09
Bridge factor channel 1 [min:0 , max:255] :
0
17
2022-09-14 13:24:09
Bridge factor channel 2 [min:0 , max:255] :
0
Reset
Save on PC
Send
Save on device

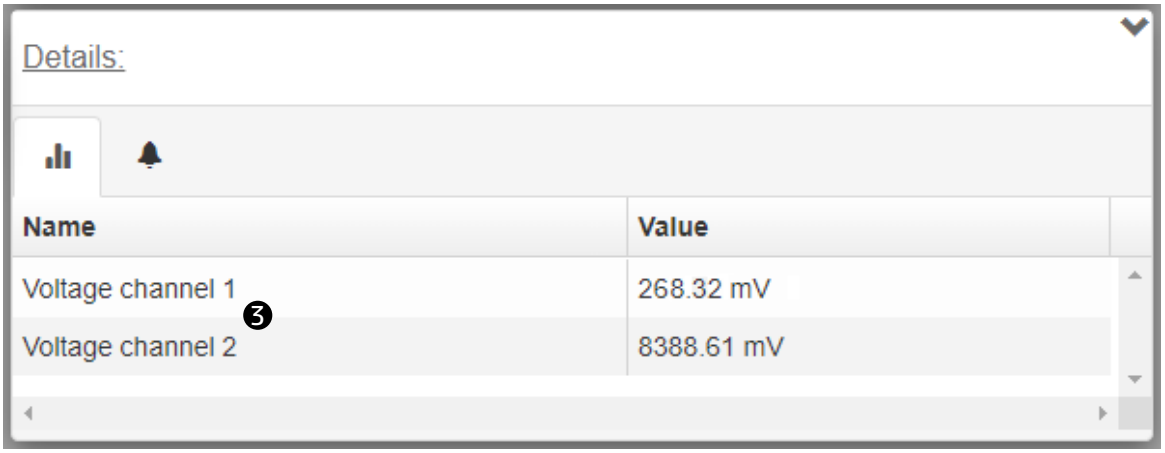

Configuration
Devices group: Profibus
Device name: Series D fieldbus
Slave: 9 - Analog Input
2022-08-05 15:26:21
Input Type channel 1
+/-10V
18
2022-08-05 15:26:21
Input Type channel 2
4-20mA
Reset
Save on PC
Send
Save on device

9.6.3 Variables

The first tab on the details page displays the variables monitored by the analogue input module for both channels: temperatures ❶ for RTD and Thermocouples, currents or voltages ❷ for Voltage/Current modules and voltages ❸ for the Bridges.



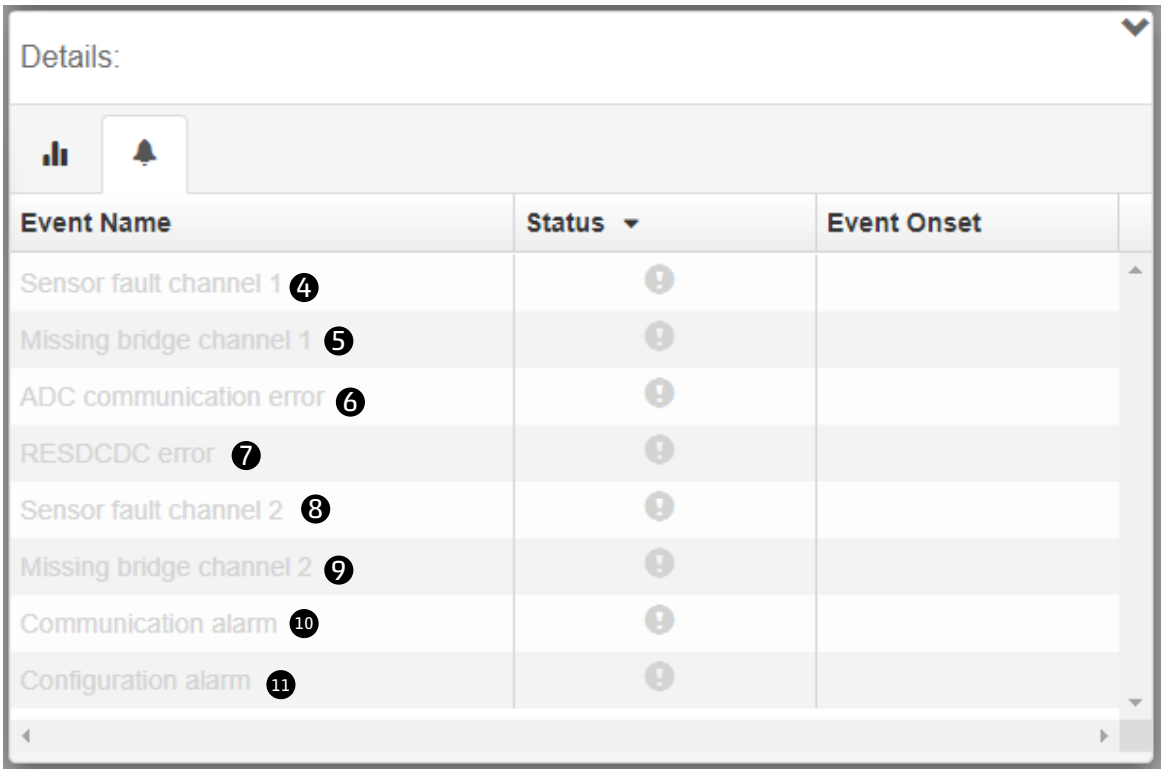




9.6.4 Alarms

The second details tab displays the alarms of the analogue input module.

- ❹ Malfunction of the sensor connected to channel 1.
- ❺ Bridge sensor connected to channel 1 missing or faulty (alarm for bridges only).
- ❻ Communication error with the internal ADC converter, which measures the relevant physical quantities.
- ❼ Error in 3.3V logic supply voltage.
- ❽ Malfunction of the sensor connected to channel 2.
- ❾ Bridge sensor connected to channel 2 missing or faulty (alarm for bridges only).
- ❿ Communication alarm between the analogue input module and the CX4 module.
- ⓫ Configuration alarm during parameterization.

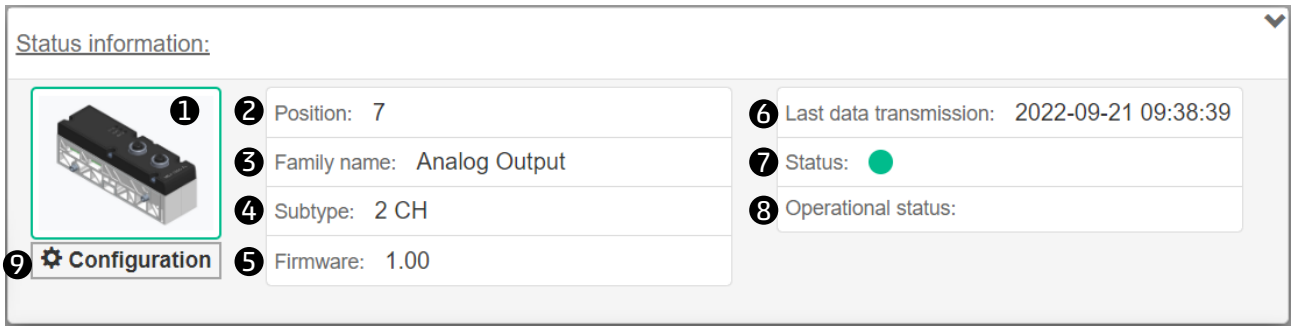


9.7 Analogue Output Module

9.7.1 Status information

On the first page of UVIX, select one of the analogue outputs connected to the CX4 module to view the general information of the accessory module.

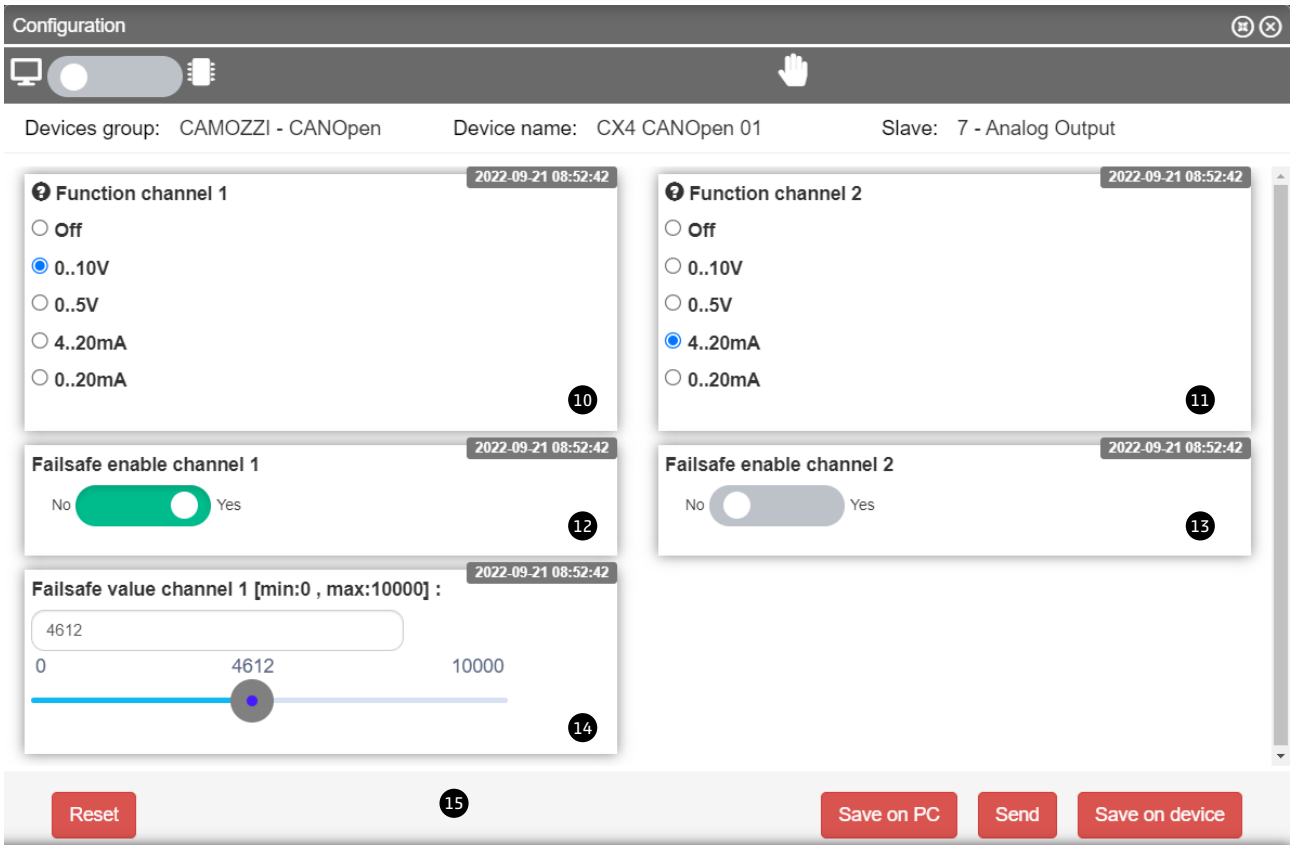
- ❶ Identification images of the analogue output module.
- ❷ Module position assigned after mapping.
- ❸ Name of the accessory module family: *Analog Output*.
- ❹ Subtype of the family of the analogue output module: 2 CH.
- ❺ Firmware version.
- ❻ Date and time of the last transmission of the variables between the analogue output module and UVIX.
- ❼ General status of the module: *Not available*, *Ok*, *Alarm*.
- ❾ Operating status of the module:
  - *Init* → initialization (mapping and configuration of parameters).
  - *Work* → normal operation.
  - *Error* → module error.



9.7.2 Configuration

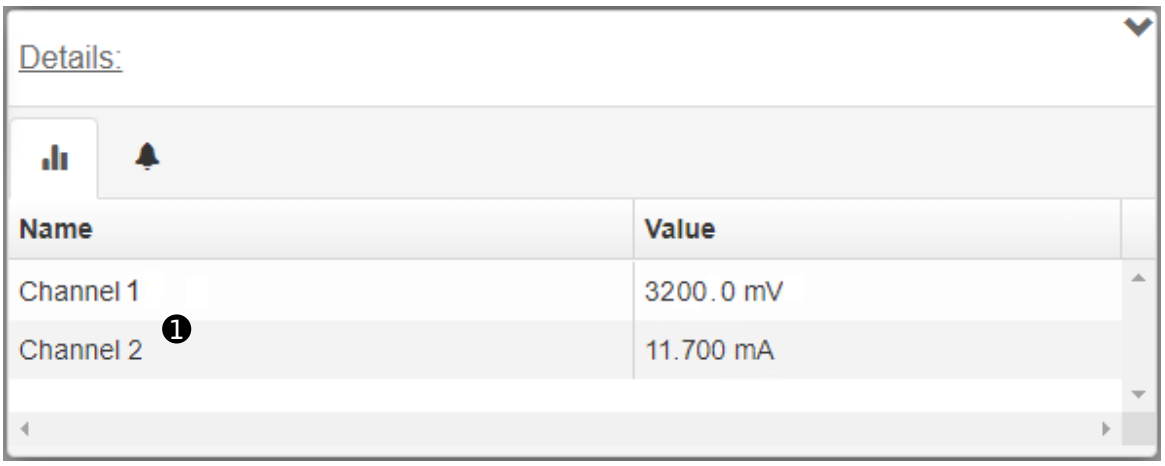
From the status information page, you can configure certain operating-related parameters of the digital output modules ❾.

- ❿ Type of analogue output (voltage or current) on channel 1.
- ⓫ Type of analogue output (voltage or current) on channel 2.
- ⓬ Enable Failsafe for channel 1: *Yes* enabled, *No* disabled (default).
- ⓭ Enable Failsafe for channel 2: *Yes* enabled, *No* disabled (default).
- ⓮ Failsafe value if enabled on the corresponding channel (mV/mA).



9.7.3 Variables

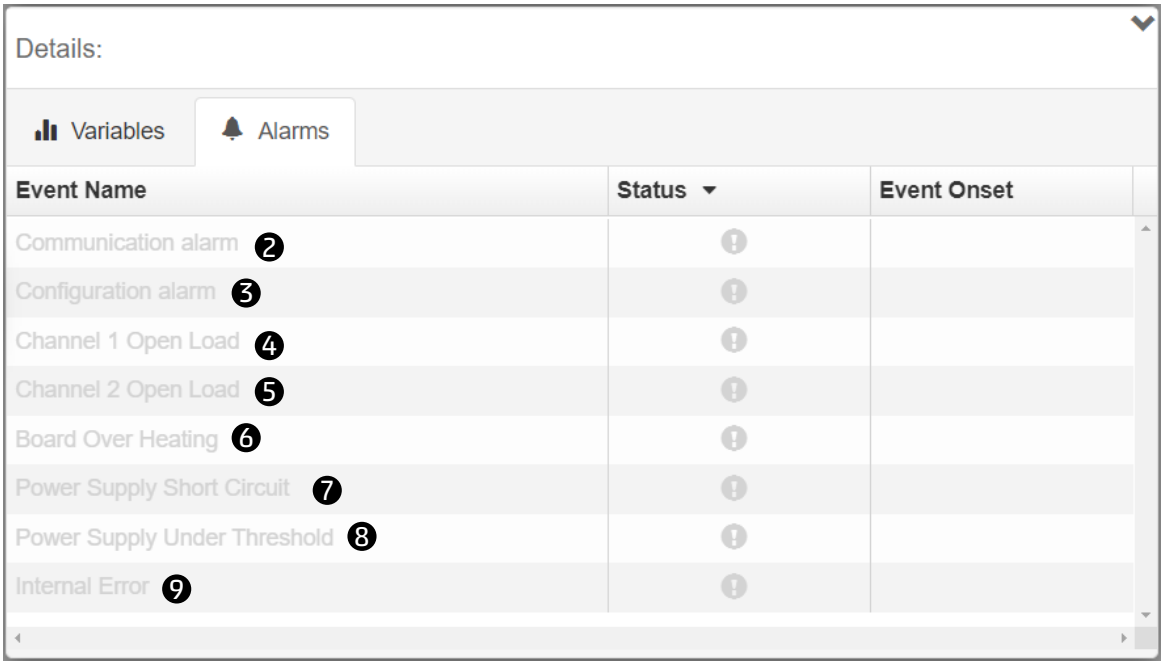
The first tab on the details page displays the analogue output module variables for both channels depending on how they are configured ❶.



9.7.4 Alarms

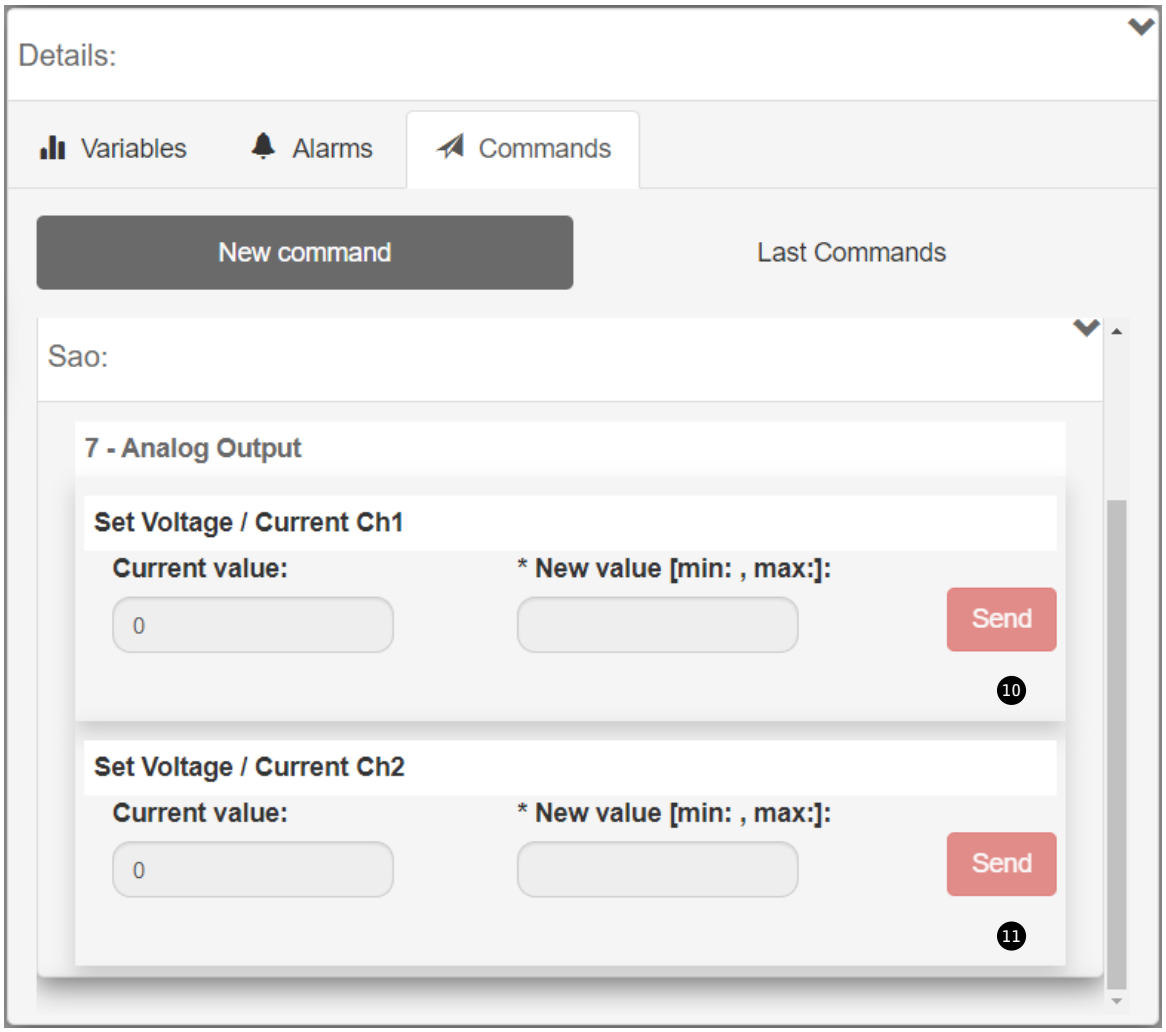
The second tab on the details page displays the alarms of the analogue input module.

- ❷ Communication alarm between the analogue output module and the CX4 module.
- ❸ Configuration alarm during parameterization.
- ❹ Open circuit on channel 1.
- ❺ Open circuit on channel 2.
- ❻ Overheating of analogue output module.
- ❼ Short circuit of module supply voltage.
- ❽ Module supply voltage too low.
- ❾ Internal error.



9.7.5 Commands

On the main page of the CX4 module (par. 9.2.5), there is a tab showing the commands for piloting the analogue output channels (❿ and ⓫) by setting the value of the output in the corresponding unit of measurement. This tab is only visible in manual mode and if it has at least one analogue output module.

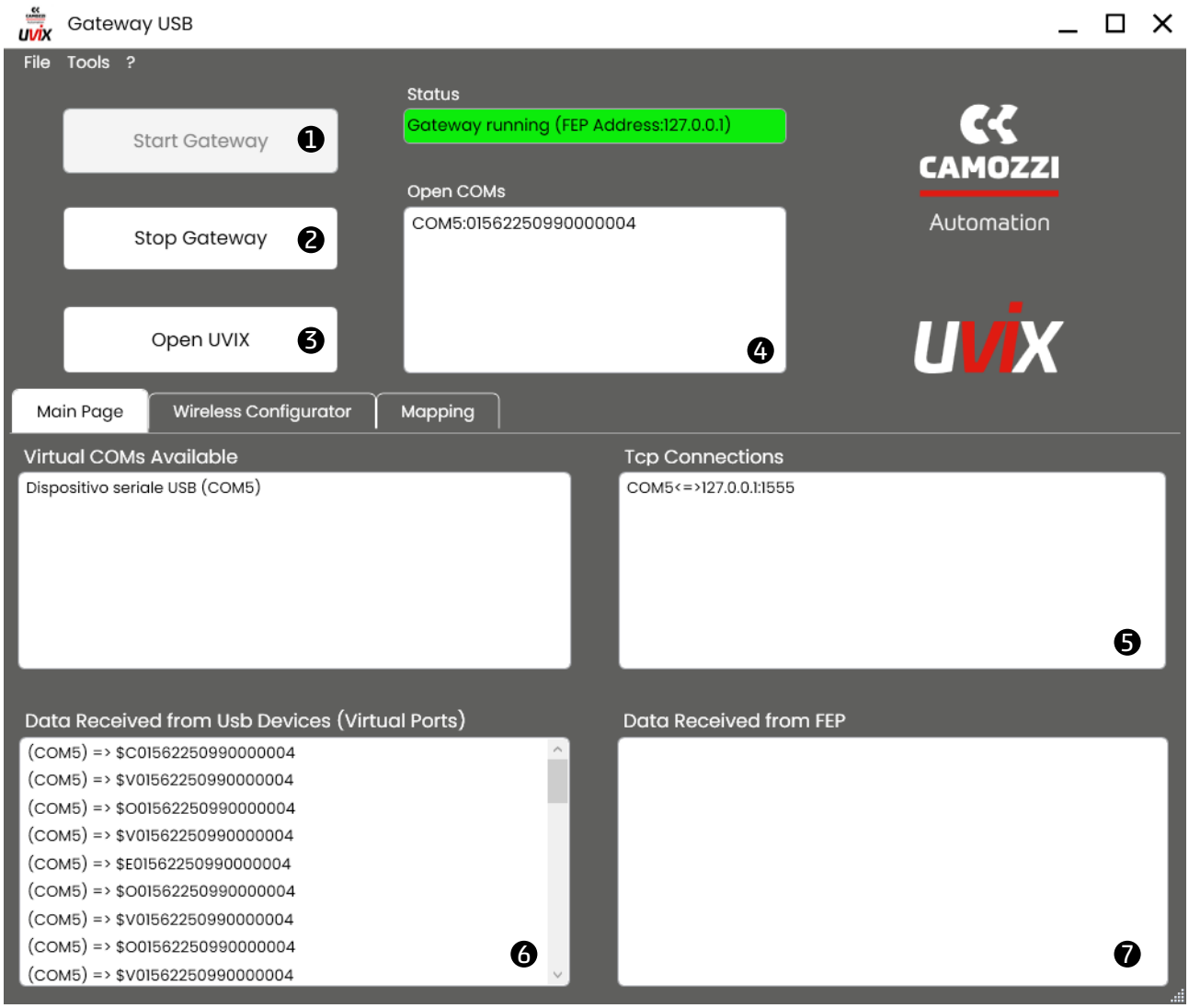


9.8 UVIX USB Gateway

The CX4 module can be connected to a PC via a USB cable. This connection - subject to prior installation of UVIX on the PC - allows you to communicate with the module through the Camozzi USB Gateway. For more information on using this tool, see the UVIX Manual.

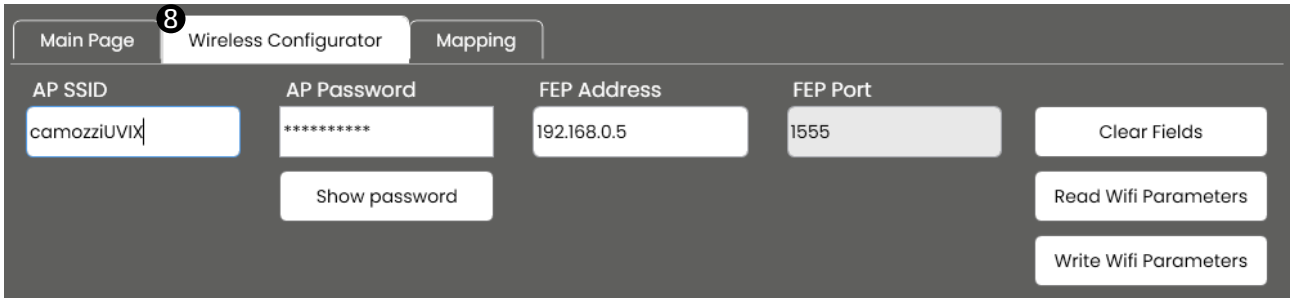
9.8.1 Main page

- ❶ Button to start up the USB Gateway and start communicating with the CX4 module.
- ❷ Button to stop communication with the CX4 module.
- ❸ Button to access the UVIX Browser interface.
- ❹ COM ports connecting the CX4 modules.
- ❺ Virtual COM ports available and addresses of TCP connection for the connected COM ports.
- ❻ Data received from the COM port.
- ❼ Data received on the FEP of the UVIX system.



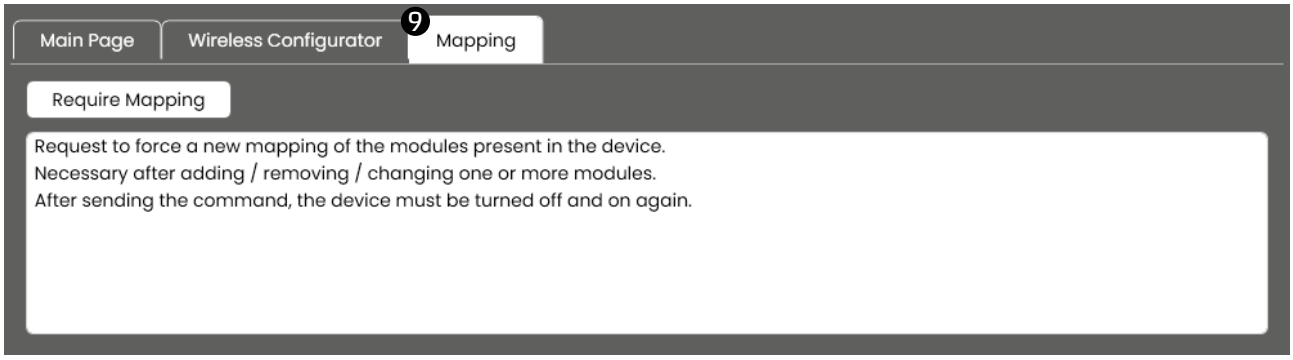
9.8.2 WiFi network configurator

In the tab for configuring the WiFi connection ❽ (if available), you can read the parameters of the current connection and write any new ones for a new connection.



9.8.3 Mapping

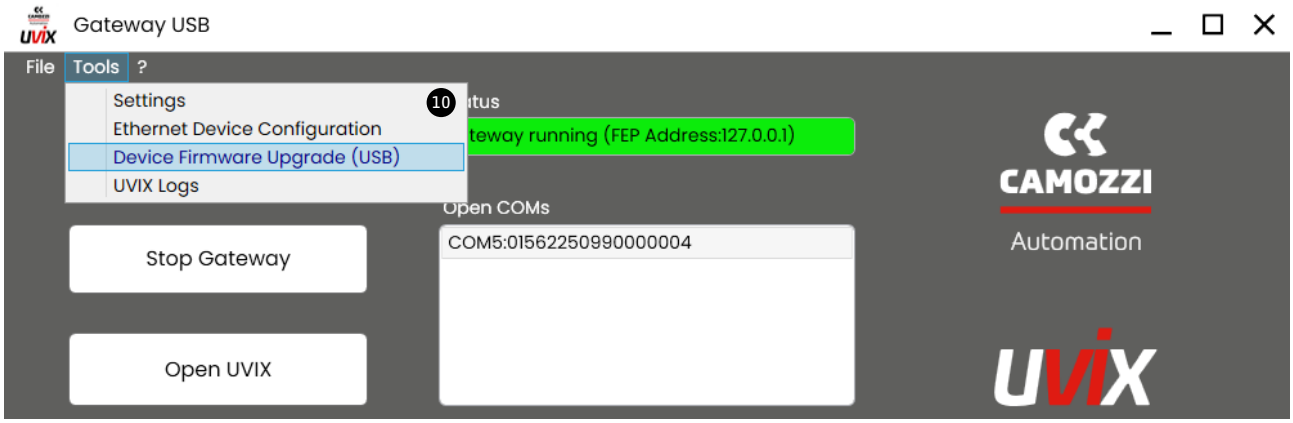
In the last tab that can be consulted via the USB gateway, you can send a mapping request to the CX4 module. The *Require Mapping* button ❾ remains pending until the next restart of the CX4 module.



9.8.4 Firmware update

⚠ Before carrying out this operation, you must contact Camozzi support.

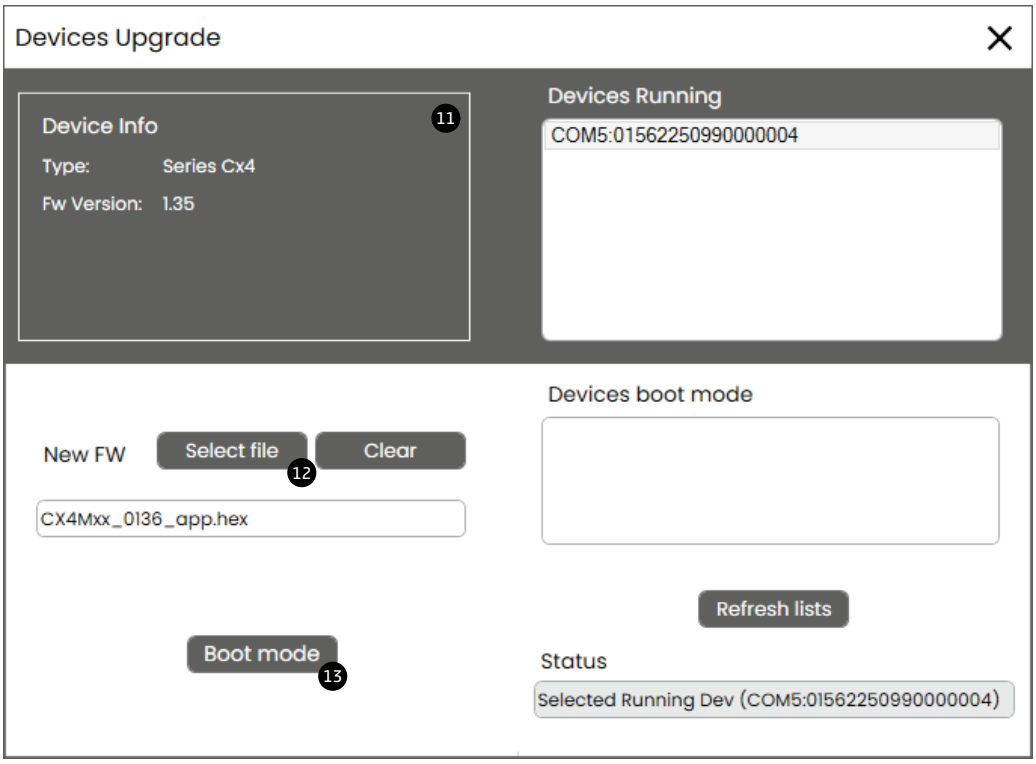
The USB Gateway allows you to update the firmware of the CX4 module through the window found under *Tools* → *Device Upgrade* ❿.



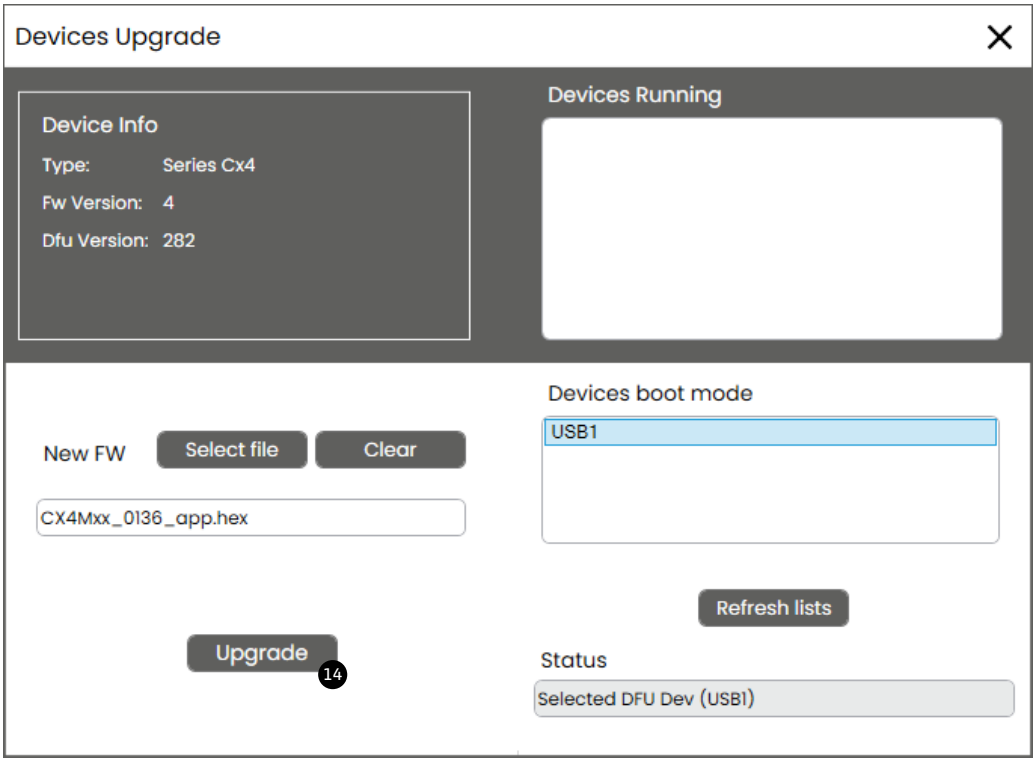
The firmware update window indicates the current version ⓫ and allows you to select the new executable to upload to the module ⓬. The name of the firmware executable to be loaded must have the following nomenclature:

- *CX4M*: indicates that the device is the CX4 master of the valve island.
- *xx*: indicates the fieldbus type, so CANopen → *CO*.
- *_0136_*: indicates the firmware version (in example the version is 01.36).
- *app.hex*: filename termination.

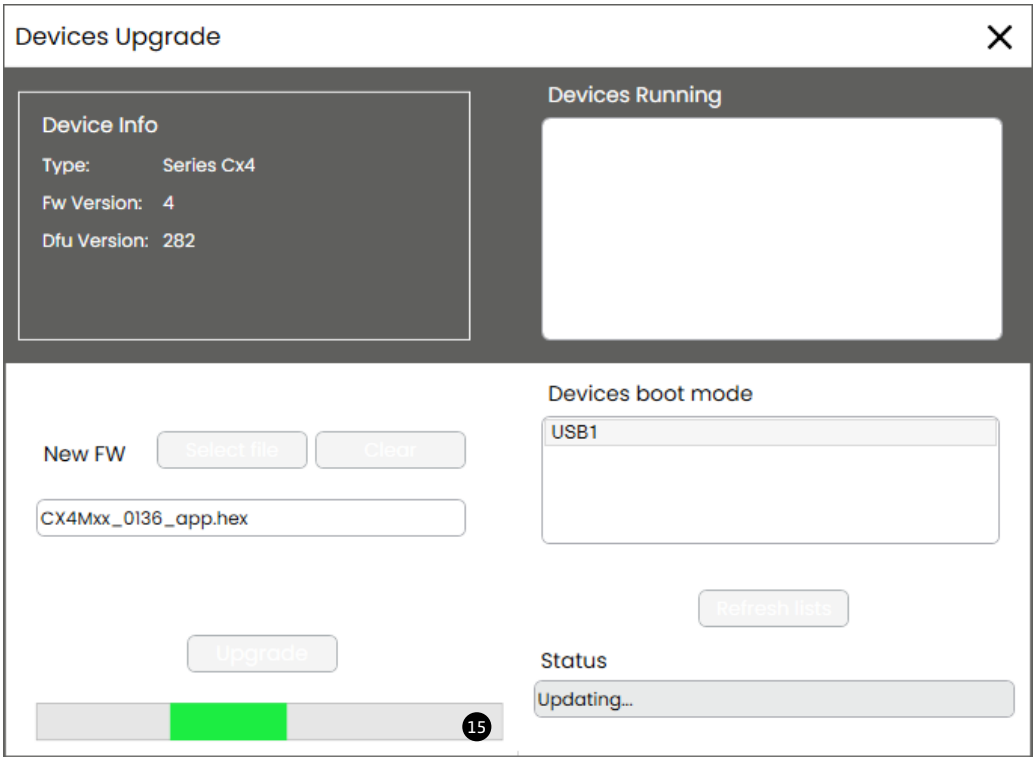
You must then put the device in *Boot* mode ⓭.



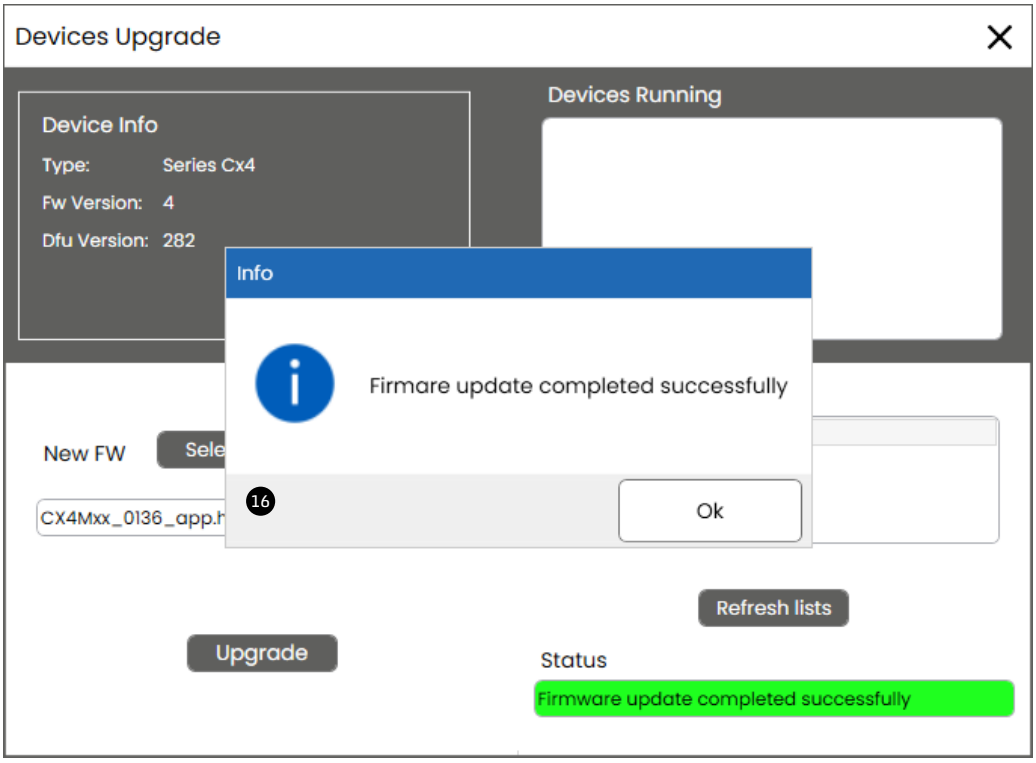
Once in Boot mode, the module is ready to load the new firmware into memory using the button ⓮.



Wait for the new firmware to be loaded ⓯.



When the new firmware programming is completed, a confirmation window will be displayed ⓰.



9.9 Communication with external applications

UVIX allows you to send managed variables to an external application that you create and customize to your needs. To configure this communication, refer to the UVIX Manual.
If the communication is properly configured, the Web Service will publish a message every time it receives a variable from the valve island.

- **TS**: date and time of the sent message.
- **DevGr**: name of the device group to which the valve island belongs (e.g. *Packaging Machine*).
- **DevSerNum**: serial number of the device of 17 characters (es. 01302103990000035).
- **DevType**: device family. → Cx04.
- **DevName**: device name.
- **SlvId**: device ID.
  - 0 if is a variable of the CX4 master of the valve island.
  - >=1 if is a variable of the slave of the valve island.
- **SlvType**: slave family..

SlvType	Device
Cx04	Master of the valve island
Bis	Series D coil valves and subbase
Sdi	Digital Input Module
Sdo	Digital Output Module
Sai	Analogue Input Module
Sao	Analogue Output Module

- **SlvName**: slave name. If the variable is from the valve island master, the value will be Cx04.

- **VarId**: variable ID.

SlvType	VarId	Variables	Unit	Description
Cx04	1	Firmware version	xx.xx	CX4 master firmware version
	2	Temperature	°C	Internal temperature of the CX4 master
	3	Supply voltage	dV	Valve island power supply voltage
	4	Supply voltage (logic)	dV	Valve island logic supply voltage
Bis	1	Firmware version	xx.xx	Subbase firmware version
	2	Temperature subbase	°C	Internal temperature of the subbase
	3	Cycles coil 14	nr	Pilot activation cycles (14/12)
	4	Cycles coil 12		
	5	Health status coil 14	%	Pilot health status (14/12)
	6	Health status coil 12		
	7	Status coil 14	0 (OFF) 1 (ON)	Pilot activation status (14/12)
	8	Status coil 12		
	13	Temperature coil 14	°C	Pilot temperature (14/12)
	14	Temperature coil 12		
	15	Errors coil 14	nr	Pilot activation errors (14/12)
	16	Errors coil 12		
	17	Communication retries	nr	Failure to respond in communication on 485 protocol

SlvType	VarId	Variables	Unit	Description
Sdi	1	Firmware version	xx.xx	Firmware version of the digital input module
	2	Group 1-8	0bxxxxxxxx	Input bit mask 1-8
	3	Group 9-16	0bxxxxxxxx	Input bit mask 9-16
	4	Group 17-24	0bxxxxxxxx	Input bit mask 17-24
	5	Group 25-32	0bxxxxxxxx	Input bit mask 25-32
Sdo	1	Firmware version	xx.xx	Firmware version of the digital output module
	2	Group 1-8	0bxxxxxxxx	Output bit mask 1-8
	3	Group 9-16	0bxxxxxxxx	Output bit mask 9-16
Sai	1	Firmware version	xx.xx	Firmware version of the analogue input module
	2	Temperature channel 1	°C	Temperature measured on channel 1 for RTDs or Thermocouples
	3	Voltage channel 1	mV	Voltage measured on channel 1 for Bridge
	4	Voltage / Current channel 1	mV/mA	Voltage or current measured on channel 1 for general voltage or current inputs
	5	Temperature channel 2	°C	Temperature measured on channel 2 for RTDs or Thermocouples
	6	Voltage channel 2	mV	Voltage measured on channel 2 for Bridge
	7	Voltage / Current channel 2	mV/mA	Voltage or current measured on channel 2 for general voltage or current inputs

SlvType	VarId	Variables	Unit	Description
Sao	1	Firmware version	xx.xx	Firmware version of the analogue output module
	2	Channel 1	mV/mA	Voltage or current generated on channel 1
	3	Channel 2	mV/mA	Voltage or current generated on channel 2

- **VarVal**: Value of the variable represented with the format or units seen in the previous table.

Esempi

Following are some examples of messages sent to external applications from a Series D valve island:

- Sending the logic supply voltage, which is 23.9 volts, of a Series D island called *Packaging Machine 1*.
  "TS":"2020-04-07T09:10:25", "DevGr":"default group", "DevSerNum":"01302103990000035", "DevType":"Cx04", "DevName":"Packaging Machine 1", "SlvId":0, "SlvType":"Cx04", "SlvName":"Packaging Machine 1", "VarId":4, "VarVal":"239"
- Sending the number of activation cycles performed by the pilot in position 14 (equal to 1838 cycles) of a Series D solenoid valve (with no associated name) in position 3 in a Series D valve island named *Assembly Machine*.
  "TS":"2022-01-28T15:21:05", "DevGr":"default group", "DevSerNum":"01302103990000121", "DevType":"Cx04", "DevName":"Assembly Machine", "SlvId":3, "SlvType":"Cx04", "SlvName":"Bis", "VarId":3, "VarVal":"1838"
- Sending the temperature (equal to 23 degrees centigrade) measured on channel 1 of an analog input (with no associated name) at position 10 in a Series D valve island named *Test Machine*.
  "TS":"2023-10-01T11:59:55", "DevGr":"default group", "DevSerNum":"01302103990001002", "DevType":"Cx04", "DevName":"Test Machine", "SlvId":10, "SlvType":"Cx04", "SlvName":"Sai", "VarId":2, "VarVal":"23"

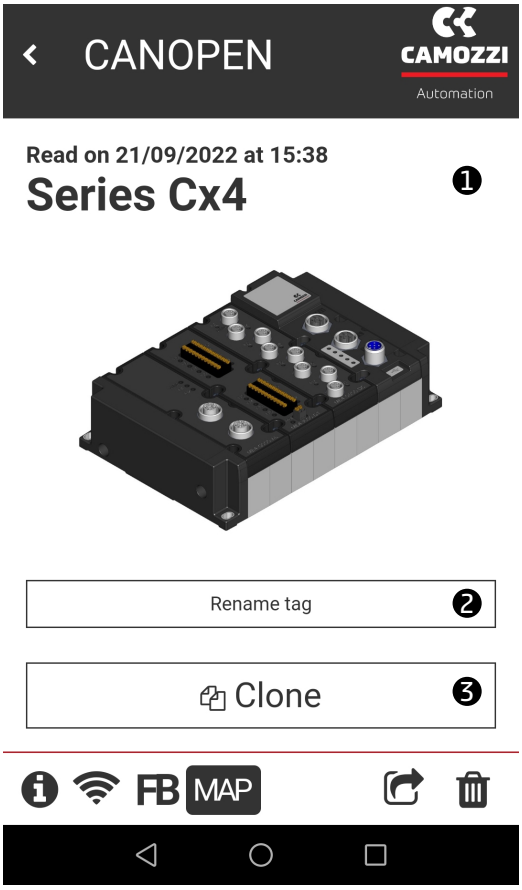
NFCamApp

10.1 Main overview

NFCamApp is an app for smartphones (Android and iOS) which allows you to communicate - via NFC technology - with the CX4 module to obtain general information on the module and on the valve island (if configured as such). You can also use the app for module configuration.

10.2 Main page

Once the CX4 module has been scanned, on the homepage, alongside the antenna positioned under the symbol NFC, you can view the Camozzi series of the device ❶ (*Series CX4*), assign a name to the device ❷ and clone ❸ the entire configuration (parameters of the CX4, the IO modules and the solenoid valve subbases) of the system, both in Stand Alone mode and as a Valve Island, to another system with a CX4 module compatible with the same fieldbus.



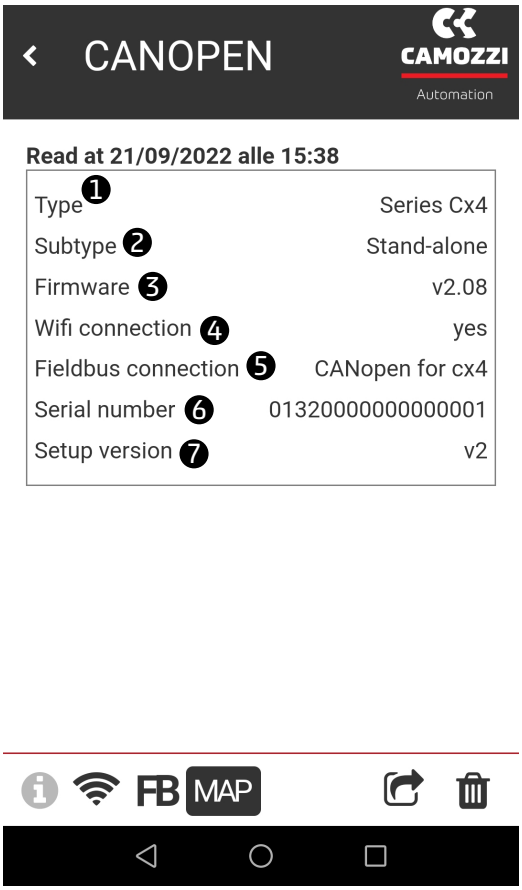
You can also access other pages of the app via the icons at the bottom of the homepage.

- ❹ General module information page.
- ❺ WiFi network information page (if available).
- ❻ Bus information page.
- ❼ Page to request new mapping.
- ❽ Share module and/or island configuration.
- ❾ Save the configuration of the scanned module or island.

10.3 General information

The first selectable page displays general information about the scanned CX4 module.

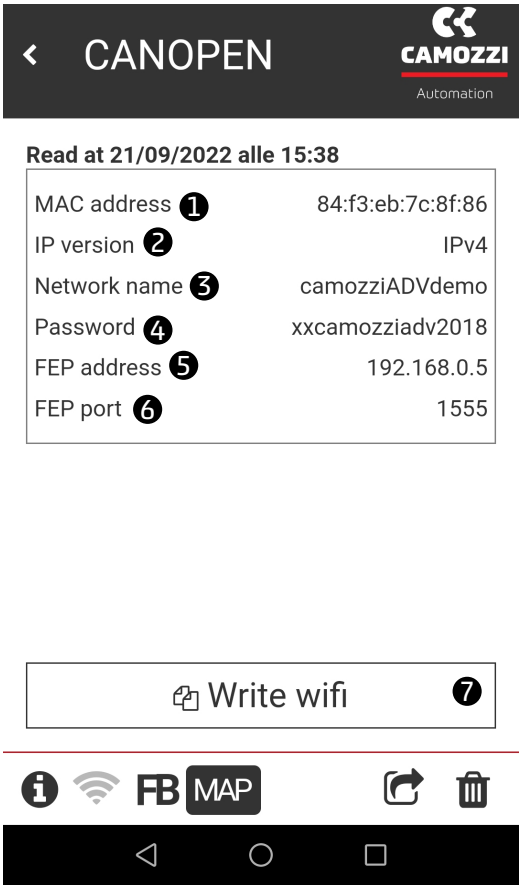
- ❶ Device family: *Series CX4*.
- ❷ Subtype of the CX4 module family: *Stand-alone*, D1, D2, D4 e D5.
- ❸ Firmware version.
- ❹ Status of the WiFi connection: *Yes* - WiFi module present, *No* – no WiFi module.
- ❺ Type of fieldbus: CANopen.
- ❻ The serial number consists of 17 characters.
- ❼ Version of the app.



10.4 WiFi information

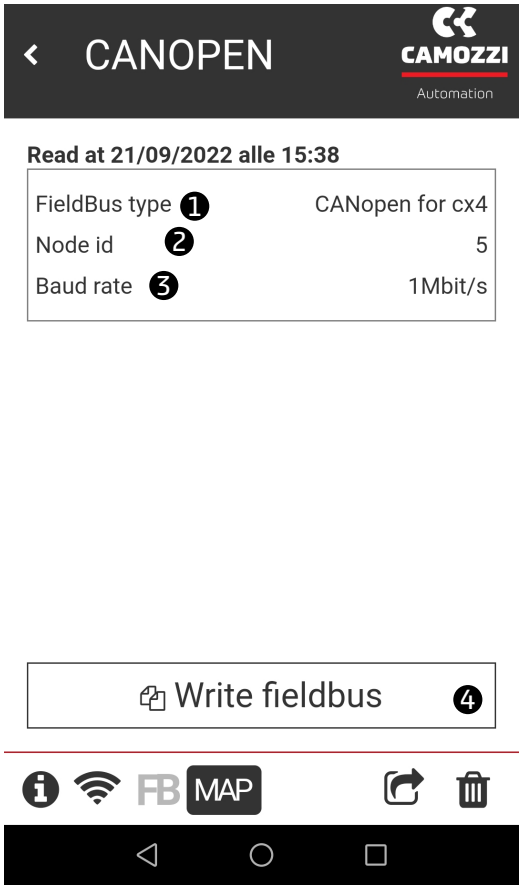
The WiFi connection information page is found only if there is a WiFi module connected inside the CX4 module, otherwise it is not displayed.

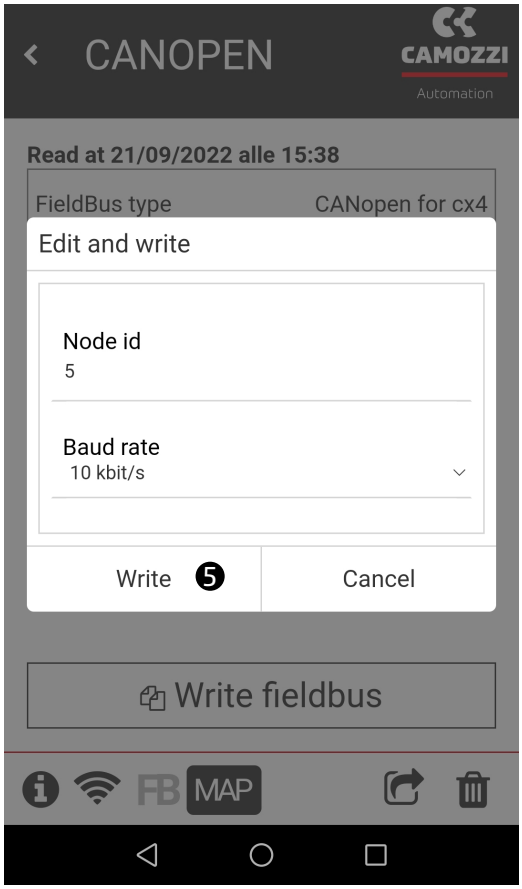
- ❶ MAC address of the WiFi module.
- ❷ IP version of the WiFi connection.
- ❸ Name of the WiFi network to which the device is connected.
- ❹ WiFi network password.
- ❺ FEP address to which the devices are connected.
- ❻ FEP port to which the device is connected.
- ❼ Button for changing the data of the WiFi network to which you want to connect the module.



10.5 Fieldbus configuration

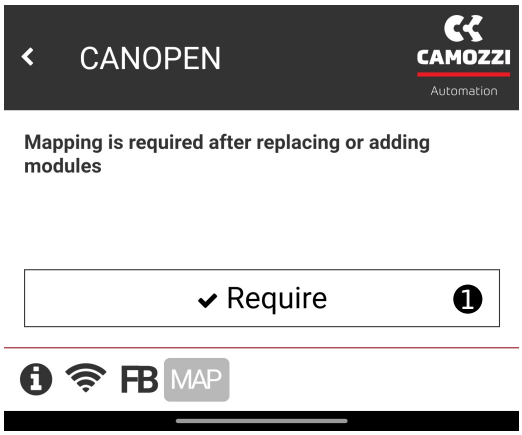
The CANopen protocol information page FB displays the name of the fieldbus ❶ and also the *Node id* ❷ and the baud rate ❸. These parameters are configurable (par. 7.5) using the write button ❹ and writing an NFC ❺ through the app.

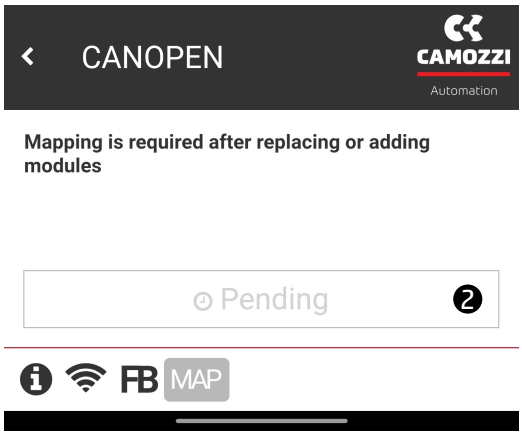




10.6 Mapping request

The last available page MAP in the app, you can request a new system mapping using the button *Require* ❶. Once the request has been made, it remains pending (the button will change to *Pending* ❷) until the next restart of the CX4 module.





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