MCM260X

Modbus RTU - CANopen expansion module

User manual - Manuale d'uso

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Introduction

Thank you for choosing a Pixsys instrument.
The MCM260X modules are a series of digital/analog expansions for PLC that implement the Modbus RTU protocol with RS485 interface or the CANopen protocol.
There are 6 versions of the expansion module, in continuous voltage for the models MCM260X-1AD, MCM260X-2AD, MCM260X-3AD, MCM260X-9AD, while for the models with relay outputs or analog inputs/outputs MCM260X-4AD, MCM260X-5AD operation is required in low continuous and alternating voltage.

1 Safety guidelines

Read carefully the safety guidelines and programming instructions contained in this manual before connecting/using the device.
Disconnect power supply before proceeding to hardware settings or electrical wirings to avoid risk of electric shock, fire, malfunction.
Do not install/operate the device in environments with flammable/explosive gases.
This device has been designed and conceived for industrial environments and applications that rely on proper safety conditions in accordance with national and international regulations on labour and personal safety. Any application that might lead to serious physical dama ge/ life risk or involve medical life support devices should be avoided.
Device is not conceived for applications related to nuclear power plants, weapon systems, flight control, mass transportation systems.
Only qualified personnel should be allowed to use device and/or service it and only in accordance to technical data listed in this manual.
Do not dismantle/modify/repair any internal component.
Device must be installed and can operate only within the allowed environmental conditions. Overheating may lead to risk of fire and can shorten the lifecycle of electronic components.

1.1 Organization of safety notices

Safety notices in this manual are organized as follows:

Safety notice	Description
Danger!	Disregarding these safety guidelines and notices can be life-threatening.
Warning!	Disregarding these safety guidelines and notices can result in severe injury or substantial damage to property.
Information!	This information is important for preventing errors.

1.2 Safety Precautions

Danger!	CAUTION - Risk of Fire and Electric Shock This product is UL listed as DIN-rail mounting process control equipment. It must be mounted in an enclosure that does not allow fire to escape externally.
Danger!	If the output relays are used past their life expectancy, contact fusing or burning may occasionally occur. Always consider the application conditions and use the output relays within their rated load and electrical life expectancy. The life expectancy of output relays varies considerably with the output load and switching conditions.
Warning!	Devices shall be supplied with limited energy according to UL 61010-1 3rd Ed, section 9.4 or LPS in conformance with UL 60950-1 or SELV in conformance with UL 60950-1 or Class 2 in compliance with UL 1310 or UL 1585.
Warning!	Loose screws may occasionally result in fire. For screw terminals, tighten screws to tightening torque is 0.5 Nm for 5 mm Pitch terminal blocks or 0.25 Nm for 3.81 mm Pitch terminal blocks.

Warning!	A malfunction in the Digital Controller may occasionally make control operations impossible or prevent alarm outputs, resulting in property damage. To maintain safety in the event of malfunction of the Digital Controller, take appropriate safety measures, such as installing a monitoring device on a separate line.

1.3 Precautions for safe use

Be sure to observe the following precautions to prevent operation failure, malfunction, or adverse affects on the performance and functions of the product. Not doing so may occasionally result in unexpected events. Do not handle the Digital Controller in ways that exceed the ratings.

- The product is designed for indoor use only. Do not use or store the product outdoors or in any of the following places.
  - Places directly subject to heat radiated from heating equipment.
  - Places subject to splashing liquid or oil atmosphere.
  - Places subject to direct sunlight.
  - Places subject to dust or corrosive gas (in particular, sulfide gas and ammonia gas).
  - Places subject to intense temperature change.
  - Places subject to icing and condensation.
  - Places subject to vibration and large shocks.
- Installing two or more controllers in close proximity might lead to increased internal temperature and this might shorten the life cycle of electronic components. It is strongly recommended to install cooling fans or other air-conditioning devices inside the control cabinet.
- Always check the terminal names and polarity and be sure to wire properly. Do not wire the terminals that are not used.
- To avoid inductive noise, keep the controller wiring away from power cables that carry high voltages or large currents. Also, do not wire power lines together with or parallel to Digital Controller wiring. Using shielded cables and using separate conduits or ducts is recommended. Attach a surge suppressor or noise filter to peripheral devices that generate noise (in particular motors, transformers, solenoids, magnetic coils or other equipment that have an inductance component). When a noise filter is used at the power supply, first check the voltage or current, and attach the noise filter as close as possible to the Digital Controller. Allow as much space as possible between the Digital Controller and devices that generate powerful high frequencies (high-frequency welders, high-frequency sewing machines, etc.) or surge.
- A switch or circuit breaker must be provided close to device. The switch or circuit breaker must be within easy reach of the operator, and must be marked as a disconnecting means for the controller.
- Wipe off any dirt from the Digital Controller with a soft dry cloth. Never use thinners, benzine, alcohol, or any cleaners that contain these or other organic solvents. Deformation or discoloration may occur.
- The number of non-volatile memory write operations is limited. Therefore, use EEprom write mode when frequently overwriting data, e.g.: through communications.
- The device must be protected by:

MCM260X-1AD:	4A Fast Fuse (F)	MCM260X-4AD:	1A Fast Fuse (F)
MCM260X-2AD:	1A Fast Fuse (F)	MCM260X-5AD:	1A Fast Fuse (F)
MCM260X-3AD:	4A Fast Fuse (F)	MCM260X-9AD:	5A Fast Fuse (F)

1.4 Environmental policy / WEEE

Do not dispose electric tools together with household waste material.
According to European Directive 2012/19/EU on waste electrical and electronic equipment and its implementation in accordance with national law, electric tools that have reached the end of their life must be collected separately and returned to an environmentally compatible recycling facility.

2 Composition of acronym

The MCM260X series includes the following models:

MCM260X-	
MCM260X-1AD	Power supply 12..24 Vdc 16 Static Outputs 12..24Vdc
MCM260X-2AD	Power supply 12..24 Vdc 16 Digital inputs PNP 12..24Vdc 2 Analog inputs 0...10V 3 Encoders/Counters
MCM260X-3AD	Power supply 12..24 Vdc 8 Digital inputs PNP 12..24Vdc 8 Static Outputs 12..24Vdc 3 Encoders/Counters
MCM260X-4AD	Power supply 12..24 Vdc/Vac 8 Digital inputs PNP 12..24Vdc 8 Relay outputs 2 Analog inputs 0...10V 3 Encoders/Counters
MCM260X-5AD	Power supply 12..24 Vdc/Vac 4 Universal analog inputs 2 Analog outputs 0..10V / 4..20mA
MCM260X-9AD	Power supply 12..24 Vdc 4 Universal analog inputs 2 Analog outputs 0..10V / 4..20mA 16 Static outputs 12..24Vdc / Digital inputs PNP 12..24Vdc 4 Encoders/Counters

3 Technical data

3.1 General characteristics

Displays	4 0.52 inch displays RUN, COM LEDs and I/O status LEDs
Operating conditions	Temperature: 0-50 °C -Humidity 35..95 Rh% Max. altitude: 2000m
Protection	IP30 container
Materials	Container: Self-extinguishing polycarbonate Front: Self-extinguishing polyamide
Weight	Approximately 250 g

3.2 Hardware characteristics

3.2.a MCM260X-1AD

Power supply	12..24 Vdc ± 15%	Consumption 100VA max
Digital outputs	16 static outputs 12-24Vdc	Max 700mA per output Max 3A in total for all the outputs
Communication port	2 modes to select: - RS485 with Modbus RTU protocol - CAN with CANopen protocol	Galvanically isolated Up to 115200 baud Up to 1Mbit

3.2.b MCM260X-2AD

Power supply	12..24 Vdc ± 15%	Consumption 10VA max
Digital inputs	16 inputs PNP 12-24Vdc	V_{IL} = 4.3V V_{IL} = 8.0V
Encoder/Counter inputs	3 encoders/counters superimposed on the PNP digital inputs	32 bit resolution Maximum frequency 80KHz
Analog inputs	2 inputs 0..10V superimposed on the digital inputs	45000 points resolution
Communication port	2 modes to select: - RS485 with Modbus RTU protocol - CAN with CANopen protocol	Galvanically isolated Up to 115200 baud Up to 1Mbit

3.2.c MCM260X-3AD

Power supply	12..24 Vdc ± 15%	Consumption 50VA max
Digital inputs	8 inputs PNP 12-24Vdc	V_{IL} = 4.3V V_{IL} = 8.0V
Encoder/Counter inputs	3 encoders/counters superimposed on the PNP digital inputs	32 bit resolution Maximum frequency 80KHz
Digital outputs	8 static outputs 12-24Vdc	Max 700mA per output Max 3A in total for all the outputs
Communication port	2 modes to select: - RS485 with Modbus RTU protocol - CAN with CANopen protocol	Galvanically isolated Up to 115200 baud Up to 1Mbit

3.2.d MCM260X-4AD

Power supply	12..24 Vdc/Vac ± 15%	Consumption 20VA max
Digital inputs	8 inputs PNP 12-24Vdc	V_{IL} = 4.3V V_{IL} = 8.0V
Encoder/Counter inputs	3 encoders/counters superimposed on the PNP digital inputs	32 bit resolution Maximum frequency 80KHz
Analog inputs	2 inputs 0..10V superimposed on the digital inputs	45000 points resolution
Relay outputs	8 relay outputs with single in common	Contact data: 5A at 250Vac, 30Vdc resistive load 2A at 250Vac, 30Vdc inductive load Max exchange power 1250 VA, 150W resistive load 500 VA, 60W inductive load Max 10A in total
Communication port	2 modes to select: - RS485 with Modbus RTU protocol - CAN with CANopen protocol	Galvanically isolated Up to 115200 baud Up to 1Mbit

3.2.e MCM260X-5AD

Power supply	12..24 Vdc/Vac ± 15%	Consumption 20VA max
Analog inputs	4 inputs that can be configured via software **Thermocouples**: type K, S, R, J, T, E, N, B; automatic compensation of cold junction at 0..50°C. **Resistance thermometers**: PT100, PT500, PT1000, Ni100, PTC1K, NTC10K (ß 3435K) **V/I input**: 0-10V, 0-20 or 4-20mA, 0-60mV, 0-1V, 0-5V. **Potentiometer**: 1..150KΩ	Galvanically insulated from power supply and communication port 16 bit resolution Tolerance (25 °C) +/-0.2% ±1 digit (on F.s.)
Analog outputs	2 outputs that can be configured via software: 0-10V or 4-20mA	16 bit resolution
Sensor power supply output	Output to power supply 0-10V or 4-20mA normalized sensors to be connected to analog inputs	Galvanically insulated from power supply and communication port 24 Vdc, 100mA max
Communication port	2 modes to select: - RS485 with Modbus RTU protocol - CAN with CANopen protocol	Galvanically isolated Up to 115200 baud Up to 1Mbit

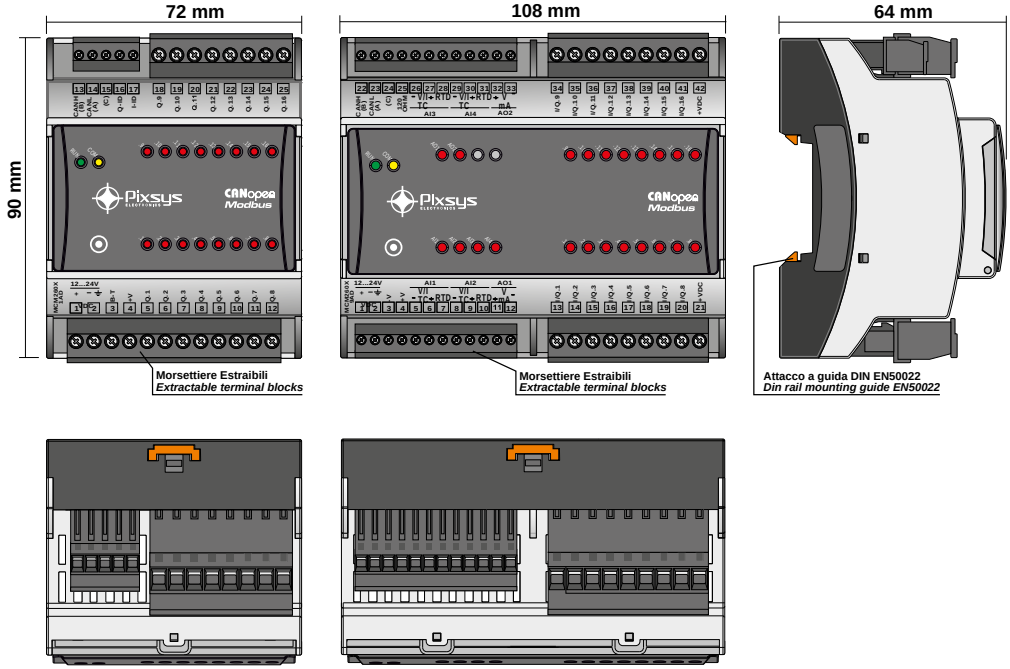
3.2.f MCM260X-9AD

Power supply	12..24 Vdc ± 15%	Consumption 100VA max
Digital inputs	16 inputs PNP 12-24Vdc (Superimposed on the digital outputs)	V_{IL} = 4.3V V_{IL} = 8.0V
Encoder/Counter inputs	4 encoders/counters superimposed on the PNP digital inputs	32 bit resolution Maximum frequency 80KHz
Analog inputs	4 inputs that can be configured via software **Thermocouples**: type K, S, R, J, T, E, N, B; automatic compensation of cold junction at 0..50°C. **Resistance thermometers**: PT100, PT500, PT1000, Ni100, PTC1K, NTC10K (ß 3435K) **V/I input**: 0-10V, 0-20 or 4-20mA, 0-60mV, 0-1V, 0-5V. **Potentiometer**: 1..150KΩ	Galvanically insulated from power supply and communication port 16 bit resolution Tolerance (25 °C) +/-0.2% ±1 digit (on F.s.)
Digital outputs	16 static outputs 12-24Vdc (superimposed on the digital inputs)	Max 700mA per output Max 2A in total for each group of 8 outputs (Q.1-Q.8 and Q.9-Q.16)
Analog outputs	2 outputs that can be configured via software: 0-10V or 4-20mA	16 bit resolution
Sensor power supply output	Output to power supply 0-10V or 4-20mA normalized sensors to be connected to analog inputs	Galvanically insulated from power supply and communication port 24 Vdc, 100mA max
Communication port	2 modes to select: - RS485 with Modbus RTU protocol - CAN with CANopen protocol	Galvanically isolated Up to 115200 baud Up to 1Mbit

3.3 Software features

Manual configuration via terminal	It is possible to manually configure the parameters related to the communication of each device using the terminal with display and buttons present on the inside of the top cover of the instrument, accessible through the opening towards the bottom of the cover itself
Configuration via app MyPixsys via NFC	It is possible to configure the parameters relating to the communication of each device using the MyPixsys app and transferring the data via NFC. Simply move your smartphone close to the antenna present on the cover of the instrument, in the point marked by the symbol ⦿. Configuration via the MyPixsys app is possible with the instrument both on and off. When activated by a reader/interrogator supporting NFC-V protocol, the controller is to be considered a VICC (Vicinity Inductively Coupled Card) according to ISO/IEC 15693 and it operates at a frequency of 13.56 MHz. The device does not intentionally emit radio waves.
Termination resistance	You can automatically activate a termination resistance of the communication line by setting a specific parameter
Communication protocol	The device can operate in two communication modes. The mode is selected in the configuration phase, via terminal or using the MyPixsys app. Only the selected mode will be active

4 Dimension and installation

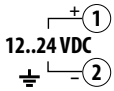
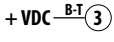
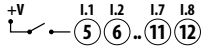
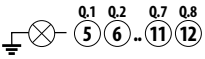


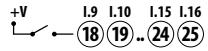
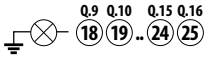
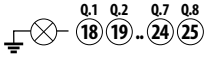
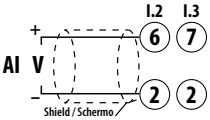
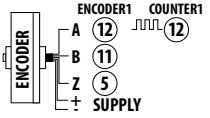
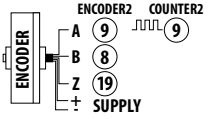
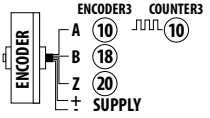
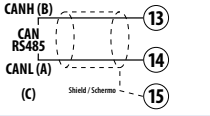
4.1 Electric connections

Caution! This regulator was designed and built in compliance with the Low Voltage 2014/35/UE (LVD) and Electromagnetic compatibility 2014/30/UE (EMC) Directives. For installation in industrial environments it is advisable to take the precautions below:

- Distinguish the power supply line from the power lines.
- Avoid proximity with contactor units, electromagnetic contactors, high power motors and use filters in any event.
- Avoid proximity with power units, particularly if with phase control.
- The use of network filters is recommended on the power supply of the machine in which the instrument will be installed, particular in case of 230Vac power supply.
  The regulator is devised to be assembled with other machines. Therefore, the EC marking of the regulator does not exempt the manufacturer of the system from the safety and conformity obligations imposed for the machine as a whole.
- **Wiring of 3.81 mm terminal block**: use crimped tube terminals or flexible/rigid copper wire with diameter up to 1.5 mm^2 / 16 AWG. Cable stripping lenght max 7 mm. Operating temperature: -40°C ÷ +130°C.
- **Wiring of 5 mm terminal block**: use crimped tube terminals or flexible/rigid copper wire with diameter up to 2.5 mm^2 / 14 AWG. Cable stripping lenght max 9 mm. Operating temperature: -40°C ÷ +130°C.
- It is possible to connect on a single terminal two wires with same diameter comprised between 0.14 and 0.75mm2.

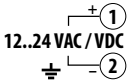
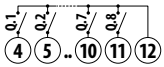
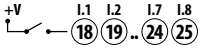
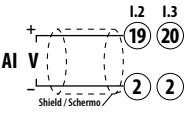
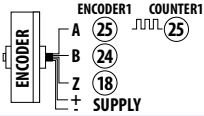
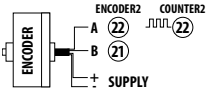
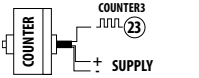
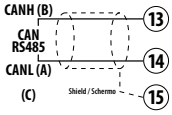
4.1.a MCM260X-1/2/3AD

	Power supply 12..24Vdc ±15% • 1: +Vdc • 2: -Vdc
	Power supply of the logic part of the device only. If the +Vdc voltage is taken to clip 3 and not to clip 1, the outputs are not active.
	Common clip for digital inputs 12..24Vdc
	MCM260X-2AD, MCM260X-3AD Digital inputs PNP 24Vdc 5: Input 1 6: Input 2 7: Input 3 8: Input 4 9: Input 5 10: Input 6 11: Input 7 12: Input 8
	MCM260X-1AD Static Outputs 24Vdc 5: Output 1 6: Output 2 7: Output 3 8: Output 4 9: Output 5 10: Output 6 11: Output 7 12: Output 8

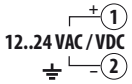
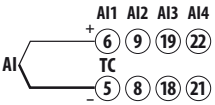
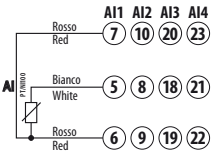
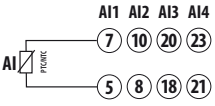
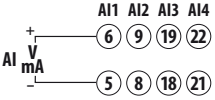
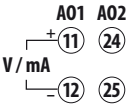
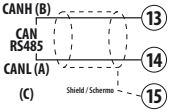
	MCM260X-2AD Digital inputs PNP 24Vdc 18:Input 9 19:Input 10 20:Input 11 21:Input 12 22:Input 13 23:Input 14 24:Input 15 25:Input 16
	MCM260X-1AD Static Outputs 24Vdc 18:Output 9 19:Output 10 20:Output 11 21:Output 12 22:Output 13 23:Output 14 24:Output 15 25:Output 16
	MCM260X-3AD Static Outputs 24Vdc 18:Output 1 19:Output 2 20:Output 3 21:Output 4 22:Output 5 23:Output 6 24:Output 7 25:Output 8
	Analog inputs 0...10V 16bit (MCM260X-2AD only)* 6: Input 1 7: Input 2 2: Input reference
	MCM260X-2AD, MCM260X-3AD Encoder/Counter 1 inputs 12:Encoder 1 phase A / Counter 1 input 11:Encoder 1 phase B 5: Encoder 1 phase Z
	MCM260X-2AD, MCM260X-3AD Encoder/Counter 2 inputs 9: Encoder 2 phase A / Counter 2 input 8: Encoder 2 phase B 19:Encoder 2 phase Z (available on MCM260X-2AD only)
	MCM260X-2AD, MCM260X-3AD Encoder/Counter 3 inputs 10:Encoder 3 phase A / Counter 3 input 18:Encoder 3 phase B (available on MCM260X-2AD only) 20:Encoder 3 phase Z (available on MCM260X-2AD only)
	Field bus: 13:CANH / (B) RS485+ 14:CANL / (A) RS485- 15:(C) GND for CANbus and Modbus RTU

	Automatic routing clips (Modbus RTU only) 16: Automatic routing output 17: Automatic routing input

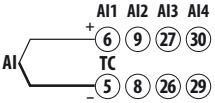
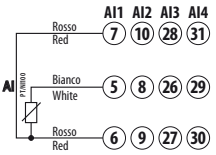
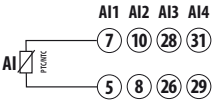
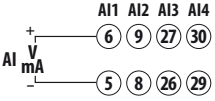
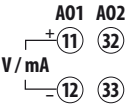
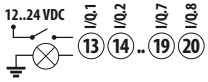
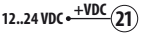
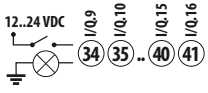
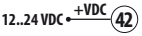
4.1.b MCM260X-4AD

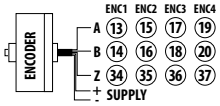
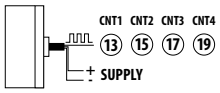
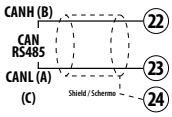
	Power supply 12..24Vac/Vdc ±15% 1: +Vdc 2: -Vdc
	Common clip for digital inputs 12..24Vdc
	Relay outputs 4: Output 1 5: Output 2 6: Output 3 7: Output 4 8: Output 5 9: Output 6 10: Output 7 11: Output 8 12: Common relay
	Digital inputs PNP 24Vdc 18: Input 1 19: Input 2 20: Input 3 21: Input 4 22: Input 5 23: Input 6 24: Input 7 25: Input 8
	Analog inputs 0..10V / 16bit 19: Input 1 20: Input 2 2: Input reference
	Encoder/Counter 1 inputs 25: Encoder 1 phase A / Counter 1 input 24: Encoder 1 phase B 18: Encoder 1 phase Z
	Encoder/Counter 2 inputs 22: Encoder 2 phase A / Counter 2 input 21: Encoder 2 phase B
	Counter 3 input 23: Counter 3 input
	Field bus: 13: CANH / (B) RS485+ 14: CANL / (A) RS485- 15: (C) GND for CANbus and Modbus RTU
	Automatic routing clips (Modbus RTU only) 16: Automatic routing output 17: Automatic routing input

4.1.c MCM260X-5AD

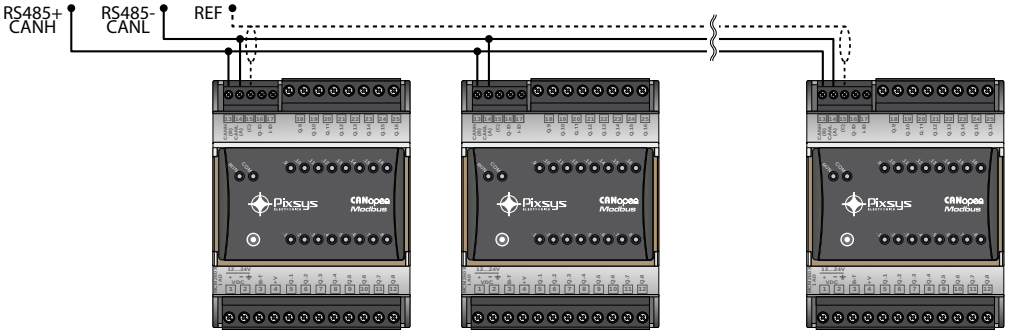
	Power supply 12..24Vac/dc ±15% 1: +Vdc 2: -Vdc
	Power supply for normalized sensors
	**Analog inputs for thermocouples K, S, R, J, T, E, N, B.** • Respect the polarity • To avoid extensions use a compensating cable and clips that suit the thermocouple used (compensating)
	**Analog inputs for resistance thermometers PT100, Ni100.** • For the three wire connection use cables with the same section • For the two wire connection short circuit clips 6 and 7 (AI1), 9 and 10 (AI2), 19 and 20 (AI3), 22 and 23 (AI4). 
	**Analog inputs for resistance thermometers NTC, PTC, PT500, PT1000 and linear potentiometers.**
	**Analog inputs for normalized current and voltage signals.** • Respect the polarity.
	Analog outputs AO1 and AO2
	Field bus: 13: CANH / (B) RS485+ 14: CANL / (A) RS485- 15: (C) GND for CANbus and Modbus RTU
	Automatic routing terminals (Modbus RTU only) 16: Automatic routing output 17: Automatic routing input

4.1.d MCM260X-9AD

	Power supply 12..24Vdc ±15% 1: +Vdc 2: -Vdc
	Power supply for normalized sensors
	**Analog inputs for thermocouples K, S, R, J, T, E, N, B.** • Respect the polarity • To avoid extensions use a compensating cable and clips that suit the thermocouple used (compensating)
	**Analog inputs for resistance thermometers PT100, Ni100.** • For the three wire connection use cables with the same section • For the two wire connection short circuit clips 6 and 7 (AI1), 9 and 10 (AI2), 27 and 28 (AI3), 30 and 31 (AI4). 
	**Analog inputs for resistance thermometers NTC, PTC, PT500, PT1000 and linear potentiometers.**
	**Analog inputs for normalized current and voltage signals.** • Respect the polarity. Power supply of sensor with clips 3 and 4.
	Analog outputs AO1 and AO2
	Digital inputs PNP 24Vdc / Static outputs 24Vdc 13:Input / Output 1 14:Input / Output 2 15:Input / Output 3 16:Input / Output 4 17:Input / Output 5 18:Input / Output 6 19:Input / Output 7 20:Input / Output 8
	Positive for power supply of static outputs 1..8
	Digital inputs PNP 24Vdc / Static outputs 24Vdc 34:Input / Output 9 35:Input / Output 10 36:Input / Output 11 37:Input / Output 12 38:Input / Output 13 39:Input / Output 14 40:Input / Output 15 41:Input / Output 16
	Positive for power supply of static outputs 9..16

	Use push-pull encoders only Max frequency 80KHz
	PNP input Max frequency 80KHz
	Field bus: 22:CANH / RS485+ 23:CANL / RS485- 24:C GND for CANbus and Modbus RTU
	Terminator of the communication line in manual mode. To permanently insert the 120 ohm termination resistance through wiring, connect clip 25 to clip 23 using a wire.

4.2 Connection to the communication line



Below is the diagram for the connection of more than one MCM260X to a RS485 line or CAN network.

5 Device SET-UP

To be used as I/O module, the MCM260X needs a configuration procedure to set the correct parameters that manage the communication. This configuration procedure may be run through the terminal (display and keys) or via the MyPixsys app. Below is the procedure to change the parameters via the terminal.

5.1 Numeric indicators (internal display)

The internal display, in combination with the pushbuttons ▶, ◀ and **SET** is used to configure the module. In the power on phase the display shows the firmware version while in normal operation, in the absence of anomalies, the display remains off. In case of anomalies it shows the number of the active error. In the configuration phase it shows the parameter being entered.

5.2 Meaning of the status lights (LED)

RUN LED (green)	indicates that the device is on and distinguished the various operating phases
COM LED (amber)	indicates the effective communication of the MCM260X with other devices
MCM260X-1AD	.1 .. .16 indicate the status of the outputs Q.1 .. Q.16
MCM260X-2AD	.1 .. .16 indicate the status of the inputs I.1 .. I.16
MCM260X-3/4AD	.1 .. .8 indicate the status of the inputs I.1 .. I.8 .1 .. .8 indicate the status of the outputs Q.1 .. Q.8
MCM260X-5AD	AI1 .. AI4 indicate the status of the analog inputs AI1..AI4 (on: active input working correctly, flashing: input in error, off: input not activate. AO1 .. AO2 indicates the status of the analog outputs AO1 and AO2 (on: active output).
MCM260X-9AD	.1 .. .16 indicate the status of the inputs/output I/Q.16 AI1 .. AI4 indicate the status of the analog inputs AI...AI4 (on: active input working correctly, flashing: input in error, off: input not activate. AO1 .. AO2 indicates the status of the analog outputs AQ1 and AO2 (on: active output).

5.3 Changing the configuration parameters from the terminal

	Press	Effect	Execute
1	One of the buttons when the display is on	0000 appears on the display with the first number flashing, to indicate that the instrument is waiting for the entry of the password to access the parameters.	
2	▶ or ◀	The flashing number changes and the next number can now be changed with **SET**.	Enter the password (default value 1234)
3	**SET** to confirm the password	The display shows the name of the first configuration parameter	
4	▶ or ◀	The available parameters are scrolled down	
5	**SET**	The display shows the value of the selected parameter.	
6	**SET** + ▶ o ◀	The value of the parameter is increased or decreased	Enter the new data that will be saved when releasing the keys. To change another parameter go back to point 4
7	▶ + ◀	The configuration procedure is left, the display will turn off. The configuration is left automatically after 20 sec from last pressing a key.	

5.4 Changing to the configuration parameters from the MyPixsys app

Scan the Qr-Code
to download the app
from Google Play Store®

The MCM260X modules are supported by the MyPixsys App and through an Android™ smartphone with NFC antenna you can configure the instruments without the need for wiring and without the aid of dedicated hardware. The App allows you to read, view and change the parameters related to addressing and communication. It can also save them, send them by email, restore them from previous backups or restore them to factory values.

Procedure:

- Identify the position of the NFC antenna in the phone (usually centrally, behind the rear cover, or at one of the ends in case of metal chassis). The MCM260X antenna is located at the front, below the symbol ⦿.
- Make sure that the NFC sensor of the phone is enabled and that there are no metal materials between the telephone and the instrument (e.g. aluminum cover or cover with magnetic stand)
- It may also be useful to enable the system sounds on the phone, since the notification sound confirms the successful detection of the instrument by the phone.

The initial screen of the App shows a bar with four tabs: SCAN, DATA, WRITE, EXTRA.

Move to the first SCAN tab to read the data already present on the instrument; the phone must be put into contact with the front of the module, making sure that the position of the phone antenna coincides with that of the instrument as much as possible.

The App emits a notification sound as soon as the presence of the instrument is detected and then identifies the model and reads the set of parameters.

The graphic interface shows the progress of the procedure and moves to the second DATA tab.

You can now move the smartphone away from the instrument and make the changes requested more comfortably. The parameters of the instruments are broken down into collapsible groups and are displayed with name, current value and index of reference to the manual. Click the row in line with the parameter to open the relevant setting screen, displaying the available options in detail (in case of multiple choice parameters) or the minimum/maximum/decimal limits (for numeric parameters), including the text description. Once the desired value is set, the relevant row is updated and highlighted in the DATA tab (keep pressed above the row to cancel the changes).

To download the changed modification in the device move to the third WRITE tab, position the phone again in contact with the instrument as you did for the reading mode and wait for the notification of operation complete.

After writing the parameters, the MCM260X will run a restart procedure, needed to update the configuration with the changes just written.

In addition to the operation for read -> change -> write parameters, MyPixsys App also provides additional functionalities that can be accessed from the EXTRA tab, like saving / uploading and sending via email of the entire configuration and the reset to factory values of the device.

5.5 Table of the configuration parameters that can be accessible from the terminal and via the MyPixsys app

CONN Communication interface

It selects the communication interface that will be used by the instrument for the connection to the communication bus. Depending on the interface selected, the CANopen (slave) protocol or the Modbus RTU protocol (slave) will be activated.

CAn

485 (default)

SLAd Slave CANopen address

Indicates the address assigned to the communication module in a CANopen network.

1..127 (default 1)

bd.rt CANopen bus speed

Indicates the communication speed of the module in CANopen mode.

50K

625K

100K

125K

250K

500K

1Mb (default)

SLAd Modbus slave address

Indicates the address assigned to the communication module in a Modbus network.

1..254 (default 1)

bd.rt Modbus bus speed

Indicates the communication speed of the module in Modbus mode.

2400

4800

9600

19.2

28.8

38.4

57.6 (default)

115.2

S.P.P. Modbus data format

Indicates the format of the serial data of the module in Modbus mode.

8.n.1 (default)

8.o.1

8.E.1

8.n.2

8.o.2

8.E.2

SE.dE Response delay in Modbus *(ms)*

Indicates the minimum time from receiving the query after which the module will forward its response to the master in Modbus mode.

0...250 (default 1)

tErM Line termination resistance status

Indicates the status of the line terminator of the module. The terminator must be activated in the last module present on the communication line (both in CAN and in RS485).

OFF (default)

120

100

Old.C Compatibility mode with the old version of MCM260

Only for MCM260X-1,2,3,4,5AD.

Indicates whether the module must work in compatibility mode with the old MCM260-xAD version. By setting the compatibility to YES, the module will behave exactly like the corresponding MCM260-xAD; therefore, to use it please refer to the manual of the old model (code: 2300.10.070). This mode is useful when replacing modules that no longer work in existing systems.

noLL. = No-compatibility with the old MCM260 version. Use this selection in system with LogicLab CAN/Modbus master

YES = Full-compatibility with the old MCM260 version

noCo. = No-compatibility with the old MCM260 version. This selection activate the standard CANopen slave mode

CoMP. CAN Compatibility mode

Only for MCM260X-9AD.

Indicates if the module must work in systems with Master CAN LogicLab or Master CANopen.

LLAb. = Use this selection in systems with LogicLab CAN master

CAMo. = Use this selection in systems with standard CANopen master. This selection activate the standard CANopen slave mode

PASS Password to access the configuration parameters

Indicates the password that must be entered when accessing next, to change the configuration parameters through both the terminal and the MyPixsys app.

Set a personalized password, different from the default one (1234). It may be useful to prevent access to the configuration of the module to unauthorized personnel.

Pay close attention when changing this parameter and keep the set password in a safe place.

If you do not know the password it will not be possible to access and change the parameters!

0000...8888 (default 1234)

nFcL NFC functionality block

Indicates whether the NFC functionality block (change of the parameters through the MyPixsys app) is active (EnAb) or not (diS). Blocking the NFC functionality may be useful to increase the level of security of the module configuration and prevent unauthorized people from accessing and changing the data.

diS (default)

EnAb

5.6 Restore to factory settings

You can restore the configuration parameters to their factory settings by entering the password 9999. Warning: using this procedure in a module present in a plant could compromise the operation of the entire system.

6 Table of the configuration parameters for the models MCM260X-1/2/3/4AD

In addition to the parameters that can be accessed from the terminal or the MyPixsys app, each MCM260X module features a series of parameters that regulate its operation. Below is the table with a complete list of the parameters.

6.1 UNIT A - GENERAL CONFIGURATION

1 Communication interface *(Word modbus 2001)*

See paragraph *6.3*

2 CANopen slave address *(Word modbus 2002)*

See paragraph *6.3*

3 CANopen slave speed *(Word modbus 2003)*

See paragraph *6.3*

4 Modbus slave address *(Word modbus 2004)*

See paragraph *6.3*

5 Modbus slave speed *(Word modbus 2005)*

See paragraph *6.3*

6 Modbus data format *(Word modbus 2006)*

See paragraph *6.3*

7 Modbus response delay *(Word modbus 2007)*

See paragraph *6.3*

8 Modbus offline time *(Word modbus 2008)*

In case of Modbus protocol enabled, it determines the time of inactivity of the serial before stating the offline condition.

0	Offline management disabled (**Default**)
1..60000 [ms]	Inactivity time before the offline.

9 Reserved *(Word modbus 2009)*

10 Line termination resistance status *(Word modbus 2010)*

See paragraph *6.3*

11 Compatibility mode with the old version of MCM260 *(Word modbus 2011)*

See paragraph *6.3*

12 Digital outputs status offline *(Word modbus 2012)*

It determines the status of the digital outputs Q1..Q16 when the module offline conditions occurs or when starting in case of Modbus protocol enabled. Disabled = 0, Enabled = 1.

bit 0 Output Q1 status (**Default 0**).

...

bit 15 Output Q16 status.

13 Password to access the configuration parameters *(Word modbus 2013)*

See paragraph *6.3*

14 NFC functionality block *(Word modbus 2014)*

See paragraph *6.3*

15 Reserved *(Word modbus 2015)*
16 Reserved *(Word modbus 2016)*
17 Reserved *(Word modbus 2017)*
18 Reserved *(Word modbus 2018)*
19 Reserved *(Word modbus 2019)*
20 Reserved *(Word modbus 2020)*

6.2 UNIT B - ANALOG INPUTS

21 AI1 input lower limit *(Word modbus 2021)*
22 AI2 input lower limit *(Word modbus 2022)*

Analog input lower limit. E.g.: with input 0..10 V this parameter indicates the value assumed by the input in line with 0V
-32767..+32767, **Default**: 0.

23 AI1 input upper limit *(Word modbus 2023)*
24 AI2 input upper limit *(Word modbus 2024)*

Analog input upper limit. E.g.: with input 0..10 V this parameter indicates the value assumed by the input in line with 10V
-32767..+32767. **Default**:10000

25 Liner limit beyond limits AI1 *(Word modbus 2025)*
26 Liner limit beyond limits AI2 *(Word modbus 2026)*

In case of linear input, it allows the process to exceed the limits (Par. 21..22 and 23..24).
0 Disabled (**Default**).
1 Enabled

27 AI1 offset calibration *(Word modbus 2027)*
28 AI2 offset calibration *(Word modbus 2028)*

Offset calibration. Value added to or taken from the process displayed
-10000..+10000 [digit]. **Default** 0.

29 AI1 gain calibration *(Word modbus 2029)*
30 AI2 gain calibration *(Word modbus 2030)*

Gain calibration. Value to be multiplied by the process to calibrate on the operating point. E.g.: to correct the 0..1000 operating scale that displays 0..1010, set the parameter to -1.0
-1000 (100.0%)...+1000 (+100.0%), **Default**: 0.0.

31 Reserved *(Word modbus 2031)*
32 Reserved *(Word modbus 2032)*

33 AI1 input filter *(Word modbus 2033)*
34 AI2 input filter *(Word modbus 2034)*

Analog input reading filter: it increases the stability of the reading of the corresponding analog input. Indicates the number of samples to average in the process calculation.
1...30. (**Default**: 10)

6.3 UNIT C - DIGITAL INPUTS

35 Digital input filter *(Word modbus 2035)*

It defines the time during which the digital input must remain stable before being considered valid.

0..200 [0.5 ms basis], **Default**: 2 x 0.5 = 1 ms.

36 Encoder/counter setup 1 *(Word modbus 2036)*
37 Encoder/counter setup 2 *(Word modbus 2037)*
38 Encoder/counter setup 3 *(Word modbus 2038)*

It determines the mode of operation of the encoder input or mono-directional counter.

0 Disabled (**Default**).
1 Encoder x2 phase A-B.
2 Encoder x4 phase A-B
3 Encoder x2 phase A-B-Z
4 Encoder x4 phase A-B-Z
5 Counter Up.
6 Counter Down.

39 Encoder/counter preset value 1 *(Word modbus 2039)*
40 Encoder/counter preset value 1 L *(Word modbus 2040)*
41 Encoder/counter preset value 2 *(Word modbus 2041)*
42 Encoder/counter preset value 2 L *(Word modbus 2042)*
43 Encoder/counter preset value 3 *(Word modbus 2043)*
44 Encoder/counter preset value 3 L *(Word modbus 2044)*

It determines the value that will be loaded in the register of the calculations for the encoder or counter when the loading command is given.

The register value is at 32 bit. Access via the Modbus protocol thus takes place through two consecutive words (16 bit).

-32767..+32767 [digit], **Default**: 0.

45 Reserved *(Word modbus 2045)*
46 Reserved *(Word modbus 2046)*
47 Reserved *(Word modbus 2047)*
48 Reserved *(Word modbus 2048)*
49 Reserved *(Word modbus 2049)*
50 Reserved *(Word modbus 2050)*

7 Table of the configuration parameters for the model MCM260X-5AD

7.1 UNIT A - GENERAL CONFIGURATION

1 Communication interface *(Word modbus 2001)*

See paragraph *6.3*

2 CANopen slave address *(Word modbus 2002)*

See paragraph *6.3*

3 CANopen slave speed *(Word modbus 2003)*

See paragraph *6.3*

4 Modbus slave address *(Word modbus 2004)*

See paragraph *6.3*

5 Modbus slave speed *(Word modbus 2005)*

See paragraph *6.3*

6 Modbus data format *(Word modbus 2006)*

See paragraph *6.3*

7 Modbus response delay *(Word modbus 2007)*

See paragraph *6.3*

8 Modbus offline time *(Word modbus 2008)*

In case of Modbus protocol enabled, it determines the time of inactivity of the serial before stating the offline condition.

0	Offline management disabled (**Default**)
1..60000 [ms]	Inactivity time before the offline.

9 Reserved *(Word modbus 2009)*

10 Line termination resistance status *(Word modbus 2010)*

See paragraph *6.3*

11 Reserved *(Word modbus 2011)*

12 Reserved *(Word modbus 2012)*

13 Password to access the configuration parameters *(Word modbus 2013)*

See paragraph *6.3*

14 NFC functionality block *(Word modbus 2014)*

See paragraph *6.3*

15 Reserved *(Word modbus 2015)*
16 Reserved *(Word modbus 2016)*
17 Reserved *(Word modbus 2017)*
18 Reserved *(Word modbus 2018)*
19 Reserved *(Word modbus 2019)*
20 Reserved *(Word modbus 2020)*

7.2 UNIT B - ANALOG INPUTS

21 AI1 sensor type *(Word modbus 2021)*
22 AI2 sensor type *(Word modbus 2022)*
23 AI3 sensor type *(Word modbus 2023)*
24 AI4 sensor type *(Word modbus 2024)*

Sensor selection / analog input configuration

0	Disabled (**Default**).	
1	Tc-K	-260 °C..1360 °C
2	Tc-S	-40 °C..1760 °C
3	Tc-R	-40 °C..1760 °C
4	Tc-J	-200 °C..1200 °C
5	Tc-T	-260 °C..400 °C
6	Tc-E	-260 °C..980 °C
7	Tc-N	-260 °C..1280 °C
8	Tc-B	100 °C..1820 °C
9	Pt100	-100 °C..600 °C
10	Ni100	-60 °C..180 °C
11	NTC10K	-40 °C..125 °C
12	PTC1K	-50 °C..150 °C
13	Pt500	-100 °C..600 °C
14	Pt1000	-100 °C..600 °C
15	0..1V	
16	0..5V	
17	0..10 V	
18	0..20 mA	
19	4..20 mA	
20	0..60 mV	
21	Potentiometer (set the value in parameter 34..37)	

25 Degree type *(Word modbus 2025)*

0	°C	Degrees centigrade (**Default**)
1	°F	Degrees Fahrenheit
2	K	Kelvin

26 AI1 input lower limit *(Word modbus 2026)*
27 AI2 input lower limit *(Word modbus 2027)*
28 AI3 input lower limit *(Word modbus 2028)*
29 AI4 input lower limit *(Word modbus 2029)*

Analog input lower limit only if normalized. E.g.: with input 4..20 mA V this parameter indicates the value associated to 4 mA
-32767..+32767, **Default**: 0.

30 AI1 input upper limit *(Word modbus 2030)*
31 AI2 input upper limit *(Word modbus 2031)*
32 AI3 input upper limit *(Word modbus 2032)*
33 AI4 input upper limit *(Word modbus 2033)*

Analog input upper limit only if normalized. E.g.: with input 4..20 mA V this parameter indicates the value associated to 20 mA
-32767..+32767. **Default**:1000

34 AI1 potentiometer value *(Word modbus 2034)*
35 AI2 potentiometer value *(Word modbus 2035)*
36 AI3 potentiometer value *(Word modbus 2036)*
37 AI4 potentiometer value *(Word modbus 2037)*

It selects the value of the potentiometer connected to the analog input
1..150 kohm. **Default**: 10kohm

38 Liner limit beyond limits AI1 *(Word modbus 2038)*
39 Liner limit beyond limits AI2 *(Word modbus 2039)*
40 Liner limit beyond limits AI3 *(Word modbus 2040)*
41 Liner limit beyond limits AI4 *(Word modbus 2041)*

In case of linear input, it allows the process to exceed the limits (Par. 26..29 and 30..33).
0 Disabled (**Default**).
1 Enabled

42 AI1 offset calibration *(Word modbus 2042)*
43 AI2 offset calibration *(Word modbus 2043)*
44 AI3 offset calibration *(Word modbus 2044)*
45 AI4 offset calibration *(Word modbus 2045)*

Offset calibration. Value added to or taken from the process displayed (e.g. it normally corrects the ambient temperature value).
-10000..+10000 [digit] (decimal.degrees for temperature sensors). **Default** 0.

46 AI1 gain calibration *(Word modbus 2046)*
47 AI2 gain calibration *(Word modbus 2047)*
48 AI3 gain calibration *(Word modbus 2048)*
49 AI4 gain calibration *(Word modbus 2049)*

Gain calibration. Value to be multiplied by the process to calibrate on the operating point. E.g.: to correct the 0..1000°C operating scale that displays 0..1010°C, set the parameter to -1.0
-1000 (100.0%)...+1000 (+100.0%), **Default**: 0.0.

50 Reserved *(Word modbus 2050)*
51 Reserved *(Word modbus 2051)*
52 Reserved *(Word modbus 2052)*
53 Reserved *(Word modbus 2053)*

54 AI1 input filter *(Word modbus 2054)*
55 AI2 input filter *(Word modbus 2055)*
56 AI3 input filter *(Word modbus 2056)*
57 AI4 input filter *(Word modbus 2057)*

Analog input reading filter: it increases the stability of the value of the analog reading. Indicates the number of samples to average in the process calculation.
1...50. (**Default**: 10)

70 Maximum difference for new AI1 sampling *(Word modbus 2070)*
71 Maximum difference for new AI2 sampling *(Word modbus 2071)*
72 Maximum difference for new AI3 sampling *(Word modbus 2072)*
73 Maximum difference for new AI4 sampling *(Word modbus 2073)*

Defines the maximum absolute difference between the current process value and the new sampling to consider this acceptable value (and therefore inserted in the average managed by the parameter "54..57 Input filter") or discard it.
1..32767 [thents of °C or digit], **Default**: 30

74 Max duration rejection of AI1 sampling *(Word modbus 2074)*
75 Max duration rejection of AI2 sampling *(Word modbus 2075)*
76 Max duration rejection of AI3 sampling *(Word modbus 2076)*
77 Max duration rejection of AI4 sampling *(Word modbus 2077)*

Defines the maximum absolute difference between the current process value and the new sample, in order to determine if the value should be discarded or accepted as valid
(and therefore considered while calculating the average managed by the parameter "54..57 Input filter")
0..200 [thents of second], **Default**: 45

58 AI1and AI2 conversion frequency *(Word modbus 2058)*
59 AI3and AI4 conversion frequency *(Word modbus 2059)*

Conversion frequency of the digital analog converter. Lower frequencies slow down the sampling but increase the reading precision; on the contrary, higher frequencies increase the sampling time to the detriment of the reading precision of the analog input.

0	4 Hz	5	17 Hz (**Default**)	10	62 Hz
1	6 Hz	6	20 Hz	11	123 Hz
2	8 Hz	7	33 Hz	12	242 Hz
3	10 Hz	8	39 Hz	13	470 Hz
4	12 Hz	9	50 Hz		

7.3 UNIT C - ANALOG OUTPUTS

60 AO1 output type *(Word modbus 2060)*
61 AO2 output type *(Word modbus 2061)*

It selects the operating mode of the analog output.
0 0..10 V (**Default**)
1 4..20 mA.

62 AO1 output lower limit *(Word modbus 2062)*
63 AO2 output lower limit *(Word modbus 2063)*

Continuous output range lower limit (value associated to 0 V / 4 mA).
-32767..+32767 [digit], **Default**: 0.

64 AO1 output upper limit *(Word modbus 2064)*
65 AO2 output upper limit *(Word modbus 2065)*

Continuous output range upper limit (value associated to 10 V / 20 mA).
-32767..+32767 [digit], **Default**: 1000.

66 AO1 output value in error *(Word modbus 2066)*
67 AO2 output value in error *(Word modbus 2067)*

It determines the value of the analog output in case of error or anomaly.
The value must range between the minimum and maximum limits of the output.
-32767..+32767 [digit], **Default**: 0.

68 Output mode in AO1 error *(Word modbus 2068)*
69 Output mode in AO2 error *(Word modbus 2069)*

It determines the analogue outputs management in case a *"device out of line"* error occurs.
0 No action on the exit
1 Set the output with the parameter value 66..67 *"Valore uscita in errore"*. (**Default**)

78..100 Reserved *(Word modbus 2078..2100)*

8 Table of the configuration parameters for the model MCM260X-9AD

8.1 UNIT A - GENERAL CONFIGURATION

1 Communication interface *(Word modbus 2001)*

See paragraph *6.3*

2 CANopen slave address *(Word modbus 2002)*

See paragraph *6.3*

3 CANopen slave speed *(Word modbus 2003)*

See paragraph *6.3*

4 Modbus slave address *(Word modbus 2004)*

See paragraph *6.3*

5 Modbus slave speed *(Word modbus 2005)*

See paragraph *6.3*

6 Modbus data format *(Word modbus 2006)*

See paragraph *6.3*

7 Modbus response delay *(Word modbus 2007)*

See paragraph *6.3*

8 Modbus offline time *(Word modbus 2008)*

In case of Modbus protocol enabled, it determines the time of inactivity of the serial before stating the offline condition.

0	Offline management disabled (**Default**)
1..60000 [ms]	Inactivity time before the offline.

9 Reserved *(Word modbus 2009)*

10 Line termination resistance status *(Word modbus 2010)*

See paragraph *6.3*

11 Reserved *(Word modbus 2011)*

12 Digital outputs status offline *(Word modbus 2012)*

It determines the status of the digital outputs Q1..Q16 when the module offline conditions occurs or when starting in case of Modbus protocol enabled. Disabled = 0, Enabled = 1.

bit 0 Output Q1 status (**Default 0**).

...

bit 15 Output Q16 status.

13 Password to access the configuration parameters *(Word modbus 2013)*

See paragraph *6.3*

14 NFC functionality block *(Word modbus 2014)*

See paragraph *6.3*

15 Reserved *(Word modbus 2015)*

16 Reserved *(Word modbus 2016)*

17 Reserved *(Word modbus 2017)*

18 **Reserved** *(Word modbus 2018)*
19 **Reserved** *(Word modbus 2019)*
20 **Reserved** *(Word modbus 2020)*

8.2 UNIT B - ANALOG INPUTS

21 **AI1 sensor type** *(Word modbus 2021)*
22 **AI2 sensor type** *(Word modbus 2022)*
23 **AI3 sensor type** *(Word modbus 2023)*
24 **AI4 sensor type** *(Word modbus 2024)*

Sensor selection / analog input configuration

0	Disabled (**Default**).	
1	Tc-K	-260 °C..1360 °C
2	Tc-S	-40 °C..1760 °C
3	Tc-R	-40 °C..1760 °C
4	Tc-J	-200 °C..1200 °C
5	Tc-T	-260 °C..400 °C
6	Tc-E	-260 °C..980 °C
7	Tc-N	-260 °C..1280 °C
8	Tc-B	100 °C..1820 °C
9	Pt100	-100 °C..600 °C
10	Ni100	-60 °C..180 °C
11	NTC10K	-40 °C..125 °C
12	PTC1K	-50 °C..150 °C
13	Pt500	-100 °C..600 °C
14	Pt1000	-100 °C..600 °C
15	0..1V	
16	0..5V	
17	0..10 V	
18	0..20 mA	
19	4..20 mA	
20	0..60 mV	
21	Potentiometer (set the value in parameter 34..37)	

25 **Degree type** *(Word modbus 2025)*

0	°C	Degrees centigrade (**Default**)
1	°F	Degrees Fahrenheit
2	K	Kelvin

26 **AI1 input lower limit** *(Word modbus 2026)*
27 **AI2 input lower limit** *(Word modbus 2027)*
28 **AI3 input lower limit** *(Word modbus 2028)*
29 **AI4 input lower limit** *(Word modbus 2029)*

Analog input lower limit only if normalized. E.g.: with input 4..20 mA V this parameter indicates the value associated to 4 mA
-32767..+32767, **Default**: 0.

30 **AI1 input upper limit** *(Word modbus 2030)*
31 **AI2 input upper limit** *(Word modbus 2031)*
32 **AI3 input upper limit** *(Word modbus 2032)*
33 **AI4 input upper limit** *(Word modbus 2033)*

Analog input upper limit only if normalized. E.g.: with input 4..20 mA V this parameter indicates the value associated to 20 mA
-32767..+32767. **Default**:1000

34 AI1 potentiometer value *(Word modbus 2034)*
35 AI2 potentiometer value *(Word modbus 2035)*
36 AI3 potentiometer value *(Word modbus 2036)*
37 AI4 potentiometer value *(Word modbus 2037)*

It selects the value of the potentiometer connected to the analog input
1..150 kohm. **Default**: 10kohm

38 Liner limit beyond limits AI1 *(Word modbus 2038)*
39 Liner limit beyond limits AI2 *(Word modbus 2039)*
40 Liner limit beyond limits AI3 *(Word modbus 2040)*
41 Liner limit beyond limits AI4 *(Word modbus 2041)*

In case of linear input, it allows the process to exceed the limits (Par. 26..29 and 30..33).
0 Disabled (**Default**).
1 Enabled

42 AI1 offset calibration *(Word modbus 2042)*
43 AI2 offset calibration *(Word modbus 2043)*
44 AI3 offset calibration *(Word modbus 2044)*
45 AI4 offset calibration *(Word modbus 2045)*

Offset calibration. Value added to or taken from the process displayed (e.g. it normally corrects the ambient temperature value).
-10000..+10000 [digit] (decimal.degrees for temperature sensors). **Default** 0.

46 AI1 gain calibration *(Word modbus 2046)*
47 AI2 gain calibration *(Word modbus 2047)*
48 AI3 gain calibration *(Word modbus 2048)*
49 AI4 gain calibration *(Word modbus 2049)*

Gain calibration. Value to be multiplied by the process to calibrate on the operating point. E.g.: to correct the 0..1000°C operating scale that displays 0..1010°C, set the parameter to -1.0
-1000 (100.0%)...+1000 (+100.0%), **Default**: 0.0.

50 Reserved *(Word modbus 2050)*
51 Reserved *(Word modbus 2051)*
52 Reserved *(Word modbus 2052)*
53 Reserved *(Word modbus 2053)*

54 AI1 input filter *(Word modbus 2054)*
55 AI2 input filter *(Word modbus 2055)*
56 AI3 input filter *(Word modbus 2056)*
57 AI4 input filter *(Word modbus 2057)*

Analog input reading filter: it increases the stability of the value of the analog reading. Indicates the number of samples to average in the process calculation.
1...50. (**Default**: 10)

85 Maximum difference for new AI1 sampling *(Word modbus 2085)*
86 Maximum difference for new AI2 sampling *(Word modbus 2086)*
87 Maximum difference for new AI3 sampling *(Word modbus 2087)*
88 Maximum difference for new AI4 sampling *(Word modbus 2088)*

Defines the maximum absolute difference between the current process value and the new sampling to consider this acceptable value (and therefore inserted in the average managed by the parameter "54..57 Input filter") or discard it.
1..32767 [thents of °C or digit], **Default**: 30

89 Max duration rejection of AI1 sampling *(Word modbus 2089)*
90 Max duration rejection of AI2 sampling *(Word modbus 2090)*
91 Max duration rejection of AI3 sampling *(Word modbus 2091)*
92 Max duration rejection of AI4 sampling *(Word modbus 2092)*

Defines the maximum absolute difference between the current process value and the new sample, in order to determine if the value should be discarded or accepted as valid
(and therefore considered while calculating the average managed by the parameter "54..57 Input filter")
0..200 [thents of second], **Default**: 45

58 AI1and AI2 conversion frequency *(Word modbus 2058)*
59 AI3and AI4 conversion frequency *(Word modbus 2059)*

Conversion frequency of the digital analog converter. Lower frequencies slow down the sampling but increase the reading precision; on the contrary, higher frequencies increase the sampling time to the detriment of the reading precision of the analog input.

0	4 Hz	5	17 Hz (**Default**)	10	62 Hz
1	6 Hz	6	20 Hz	11	123 Hz
2	8 Hz	7	33 Hz	12	242 Hz
3	10 Hz	8	39 Hz	13	470 Hz
4	12 Hz	9	50 Hz		

8.3 UNIT C - ANALOG OUTPUTS

60 AO1 output type *(Word modbus 2060)*
61 AO2 output type *(Word modbus 2061)*

It selects the operating mode of the analog output.
0 0..10 V (**Default**)
1 4..20 mA.

62 AO1 output lower limit *(Word modbus 2062)*
63 AO2 output lower limit *(Word modbus 2063)*

Continuous output range lower limit (value associated to 0 V / 4 mA).
-32767..+32767 [digit], **Default**: 0.

64 AO1 output upper limit *(Word modbus 2064)*
65 AO2 output upper limit *(Word modbus 2065)*

Continuous output range upper limit (value associated to 10 V / 20 mA).
-32767..+32767 [digit], **Default**: 1000.

66 AO1 output value in error *(Word modbus 2066)*
67 AO2 output value in error *(Word modbus 2067)*

It determines the value of the analog output in case of error or anomaly.
The value must range between the minimum and maximum limits of the output.
-32767..+32767 [digit], **Default**: 0.

68 Reserved *(Word modbus 2068)*
69 Reserved *(Word modbus 2069)*
70 Reserved *(Word modbus 2070)*
71 Reserved *(Word modbus 2071)*

8.4 UNIT D - DIGITAL INPUTS

72 Digital input filter *(Word modbus 2072)*

It defines the time during which the digital input must remain stable before being considered valid.

0..200 [0.5 ms basis], **Default**: 2 x 0.5 = 1 ms.

73 Encoder/counter setup 1 *(Word modbus 2073)*
74 Encoder/counter setup 2 *(Word modbus 2074)*
75 Encoder/counter setup 3 *(Word modbus 2075)*
76 Encoder/counter setup 4 *(Word modbus 2076)*

It determines the mode of operation of the encoder input or mono-directional counter.

0 Disabled (**Default**).
1 Encoder x2 phase A-B.
2 Encoder x4 phase A-B
3 Encoder x2 phase A-B-Z
4 Encoder x4 phase A-B-Z
5 Counter Up.
6 Counter Down.

77 Encoder/counter preset value 1 *(Word modbus 2077)*
78 Encoder/counter preset value 1 L *(Word modbus 2078)*
79 Encoder/counter preset value 2 *(Word modbus 2079)*
80 Encoder/counter preset value 2 L *(Word modbus 2080)*
81 Encoder/counter preset value 3 *(Word modbus 2081)*
82 Encoder/counter preset value 3 L *(Word modbus 2082)*
83 Encoder/counter preset value 4 *(Word modbus 2083)*
84 Encoder/counter preset value 4 L *(Word modbus 2084)*

It determines the value that will be loaded in the register of the calculations for the encoder or counter when the loading command is given.

The register value is at 32 bit. Access via the Modbus protocol thus takes place through two consecutive words (16 bit).

-32767..+32767 [digit], **Default**: 0.

85 Reserved *(Word modbus 2085)*
86 Reserved *(Word modbus 2086)*
87 Reserved *(Word modbus 2087)*
88 Reserved *(Word modbus 2088)*
89 Reserved *(Word modbus 2089)*
90 Reserved *(Word modbus 2090)*
91 Reserved *(Word modbus 2091)*
92 Reserved *(Word modbus 2092)*
93 Reserved *(Word modbus 2093)*
94 Reserved *(Word modbus 2094)*
95 Reserved *(Word modbus 2095)*
96 Reserved *(Word modbus 2096)*
97 Reserved *(Word modbus 2097)*
98 Reserved *(Word modbus 2098)*
99 Reserved *(Word modbus 2099)*
100 Reserved *(Word modbus 2100)*

9 Modbus RTU

Depending on the type of flashing, the RUN LED indicates all the operating statuses of the Modbus RTU protocol.

RUN LED flashing	Type of flashing
Blink_fast	Rapid flashing at 50msec
Blink_medium	Flashing at 200msec
Blink_slow	Flashing at 600msec
LED_on	LED always on
Blink_3_on	LED on for 1sec, 3 flashes for 150msec
Blink_1_off	Slow flashing of 40msec every 1.2sec
Blink_3_off	LED off for 1sec, 3 flashes for 150msec

Status	RUN LED flashing
Boot-up	Blink_fast
Normal operating module	LED_on
Off-line signal	Blink_medium

9.1 Characteristics of the Modbus RTU slave protocol

The support provided for the slave Modbus RTU mode is an isolated RS485 serial with the possibility of activating the line terminator from 120 to 100 ohm automatically from the parameter.

Baud-rate	It can be selected from the parameter 2400 bits/s 28800 bits/s 4800 bits/s 38400 bits/s 9600 bits/s 57600 bits/s 19200 bits/s 115200 bits/s	
Format	It can be selected from the parameter 8, n, 1 (8bit, no parity, 1 stop) 8, o, 1 (8bit, odd parity, 1 stop) 8, e, 1 (8bit, even parity, 1 stop) 8, n, 2 (8bit, no parity, 2 stop) 8, o, 2 (8bit, odd parity, 2 stop) 8, e, 2 (8bit, even parity, 2 stop)	
Functions supported	WORD READING (max. 50 word) SINGLE WORD WRITING MULTIPLE WORD WRITING (max 50 word)	(code 0x03, 0x04) (code 0x06) (code 0x10)

9.2 Modbus RTU communication areas

9.2.a MCM260X-1AD, MCM260X-2AD, MCM260X-3AD, MCM260X-4AD

Modbus address	Description	Read Write	Reset value
0	Device type It contains the device identification code 521: MCM260X-1AD, 522: MCM260X-2AD 523: MCM260X-3AD, 524: MCM260X-4AD	RO	
1	Firmware version It contains the device firmware version	RO	
2	Boot version It contains the device boot program version	RO	
3	Compatibility with old MCM260 Indicates whether the device is running in compatibility mode with the old MCM260 series active (1) or not (0)	R/W	

Modbus address	Description	Read Write	Reset value
5	Slave address It contains the slave address set for the communication on the network with Modbus protocol	RO	
6	Status/error flag Bit 0: incorrect configuration parameters Bit 1: incorrect encoder calculation values Bit 2: - Bit 3: incorrect calibration data Bit 4: incorrect calibration constants Bit 5: incorrect CANopen memory data Bit 6: calibration missing Bit 7: out of range parameter Bit 8: FRam memory error Bit 9: offline terminal Bit 10: NFC password not set Bit 11: low power supply voltage Bit 12: AI1 out of range Bit 13: AI2 out of range Bit 14: - Bit 15: -	RO	
7	Terminal status/error flag Bit 0: eeprom memory reading error Bit 1: eeprom memory writing error Bit 2: incorrect parameters	RO	
999	I-ID input status	RO	
1000 1050	Digital input status It contains the logic status of the digital inputs: Bit 0: Input 1 Bit 1: Input 2 Bit 2: Input 3 Bit 3: Input 4 Bit 4: Input 5 Bit 5: Input 6 Bit 6: Input 7 Bit 7: Input 8 Bit 8: Input 9 Bit 9: Input 10 Bit 10: Input 11 Bit 11: Input 12 Bit 12: Input 13 Bit 13: Input 14 Bit 14: Input 15 Bit 15: Input 16	RO	
1001 1051	Analog input 1 It contains the rescaled value of the analog input 0..10V no. 1	RO	
1002 1052	Analog input 2 It contains the rescaled value of the analog input 0..10V no. 2	RO	
1003 1054	Encoder/Counter calculations no. 1 H Most significant word of the double-word that contains the calculations of encoder/counter no. 1	RO	

Modbus address	Description	Read Write	Reset value
1004 1053	Encoder/Counter calculations no. 1 L Least significant word of the double-word that contains the calculations of encoder/counter no. 1	RO	
1005 1056	Encoder/Counter calculations no. 2 H Most significant word of the double-word that contains the calculations of encoder/counter no. 2	RO	
1006 1055	Encoder/Counter calculations no. 2 L Least significant word of the double-word that contains the calculations of encoder/counter no. 2	RO	
1007 1058	Encoder/Counter calculations no. 3 H Most significant word of the double-word that contains the calculations of encoder/counter no. 3	RO	
1008 1057	Encoder/Counter calculations no. 3 L Least significant word of the double-word that contains the calculations of encoder/counter no. 3	RO	
1009 1060	Calculations detected 1 s encoder/counter no. 1 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1010 1059	Calculations detected 1 s encoder/counter no. 1 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1011 1062	Calculations detected 1 s encoder/counter no. 2 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1012 1061	Calculations detected 1 s encoder/counter no. 2 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1013 1064	Calculations detected 1 s encoder/counter no. 3 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1014 1063	Calculations detected 1 s encoder/counter no. 3 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1015 1066	Calculations detected 100 ms encoder/counter no. 1 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1016 1065	Calculations detected 100 ms encoder/counter no. 1 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1017 1068	Calculations detected 100 ms encoder/counter no. 2 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1018 1067	Calculations detected 100 ms encoder/counter no. 2 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1019 1070	Calculations detected 100 ms encoder/counter no. 3 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1020 1069	Calculations detected 100 ms encoder/counter no. 3 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1099	Q-ID output status	R/W	

Modbus address	Description	Read Write	Reset value
1100	Digital output status It contains the logic status of the digital outputs (default 0): Bit 0: output 1 Bit 1: output 2 Bit 2: output 3 Bit 3: output 4 Bit 4: output 5 Bit 5: output 6 Bit 6: output 7 Bit 7: output 8 Bit 8: output 9 Bit 9: output 10 Bit 10: output 11 Bit 11: output 12 Bit 12: output 13 Bit 13: output 14 Bit 14: output 15 Bit 15: output 16	R/W	
1101	Encoder/Counter commands no. 1 H	R/W	
1102	Encoder/Counter commands no. 2 H	R/W	
1103	Encoder/Counter commands no. 3 H Bit0 = Preset value loading Bit1 = Loading preset at next impulse Z The bits of the commands are taken automatically to 0 once the command is executed.	R/W	
1201.. ..1454	Logic status of the outputs of the slaves on the bus These words contain the logic status of the digital outputs of all the slaves on the bus: based on the set slave address the instrument determines its reference word (e.g. Slave 1-word 1201 .. Slave 10-word 1210...) and sets the outputs based on the value of the word. It is used to set all the outputs by writing in broadcast on the slaves on the bus	WO	
1502	Access to the Slave Address Automatic Assignment function. To use the Slave Address Automatic Assignment function you need to connect the Q-ID clip to the I-ID clip of the next module: the first will have I-ID free, while in the last one the clip Q-ID will be free. For the entry (exit) of all the modules connected to the bus, in the Slave Address Automatic Assignment function you need to write 1 (0) on this word in broadcast. Once the address is assigned (see following word), exit from the procedure by writing 0 on this word, obviously with the slave address just assigned.	R/W	
1503	Slave address assignment In order to assign the address write the password 1234 on this word: the address used to write will be one that the slave will assign to itself. The new address will be assigned only with the module with the I-ID input disabled and currently still with the assignment procedure active, and will respond to the writing command.	R/W	
2001	Parameter 1	R/W	
...	...	R/W	
2050	Parameter 50 The parameters written in these addresses (2001..2050) are saved in the memory at every writing on this area.	R/W	

Modbus address	Description	Read Write	Reset value
4001	Parameter 1 (10 s delay)	R/W	
...	...	R/W	
4050	Parameter 50 (10 s delay) The parameters written in these addresses (4001..4050) are saved in the memory after 10 seconds from the last writing on this area.	R/W	

9.2.b MCM260X-5AD

Modbus address	Description	Read Write	Reset value
0	Device type It contains the device identification code 525: MCM260X-5AD	RO	
1	Firmware version It contains the device firmware version	RO	
2	Boot version It contains the device boot program version	RO	
3	Compatibility with old MCM260 Indicates whether the device is running in compatibility mode with the old MCM260 series active (1) or not (0)	R/W	
5	Slave address It contains the slave address set for the communication on the network with Modbus protocol.	RO	
6	Status/error flag Bit 0: incorrect configuration parameters Bit 1: incorrect encoder calculation values Bit 2: - Bit 3: incorrect calibration data Bit 4: incorrect calibration constants Bit 5: incorrect CANopen memory data Bit 6: calibration missing Bit 7: out of range parameter Bit 8: FRam memory error Bit 9: offline terminal Bit 10: NFC password not set Bit 11: low power supply voltage Bit 12: AI1 out of range Bit 13: AI2 out of range Bit 14: AI3 out of range Bit 15: AI4 out of range	RO	
7	Terminal status/error flag Bit 0: eeprom memory reading error Bit 1: eeprom memory writing error Bit 2: incorrect parameters	RO	
8	AI1..2 input cold junction temperature	RO	
9	AI3.4 input cold junction temperature	RO	
1000	AI1 analog input value	RO	
1001	AI2 analog input value	RO	
1002	AI3 analog input value	RO	
1003	AI4 analog input value	RO	
1100	AO1 analog output value	R/W	
1101	AO2 analog output value	R/W	

Modbus address	Description	Read Write	Reset value
2001	Parameter 1	R/W	
...	...	R/W	
2100	Parameter 100 The parameters written in these addresses (2001..2100) are saved in the memory at every writing on this area.	R/W	
4001	Parameter 1 (10 s delay)	R/W	
...	...	R/W	
4100	Parameter 100 (10 s delay) The parameters written in these addresses (4001..4100) are saved in the memory after 10 seconds from the last writing on this area.	R/W	

9.2.c MCM260X-9AD

Modbus address	Description	Read Write	Reset value
0	Device type It contains the device identification code 529: MCM260X-9AD	RO	
1	Firmware version It contains the device firmware version	RO	
2	Boot version It contains the device boot program version	RO	
5	Slave address It contains the slave address set for the communication on the network with Modbus protocol.	RO	
6	Status/error flag Bit 0: incorrect configuration parameters Bit 1: incorrect encoder calculation values Bit 2: - Bit 3: incorrect calibration data Bit 4: incorrect calibration constants Bit 5: incorrect CANopen memory data Bit 6: calibration missing Bit 7: out of range parameter Bit 8: FRam memory error Bit 9: offline terminal Bit 10: NFC password not set Bit 11: low power supply voltage Bit 12: AI1 out of range Bit 13: AI2 out of range Bit 14: AI3 out of range Bit 15: AI4 out of range	RO	
7	Terminal status/error flag Bit 0: eeprom memory reading error Bit 1: eeprom memory writing error Bit 2: incorrect parameters	RO	
8	AI1..2 input cold junction temperature	RO	
9	AI3.4 input cold junction temperature	RO	

Modbus address	Description	Read Write	Reset value
1000 1050	Digital input status It contains the logic status of the digital inputs: Bit 0: Input 1 Bit 1: Input 2 Bit 2: Input 3 Bit 3: Input 4 Bit 4: Input 5 Bit 5: Input 6 Bit 6: Input 7 Bit 7: Input 8 Bit 8: Input 9 Bit 9: Input 10 Bit 10: Input 11 Bit 11: Input 12 Bit 12: Input 13 Bit 13: Input 14 Bit 14: Input 15 Bit 15: Input 16	RO	
1001 1051	AI1 analog input value	RO	
1002 1052	AI2 analog input value	RO	
1003 1053	AI3 analog input value	RO	
1004 1054	AI4 analog input value	RO	
1005 1056	Encoder/Counter calculations no. 1 H Most significant word of the double-word that contains the calculations of encoder/counter no. 1	RO	
1006 1055	Encoder/Counter calculations no. 1 L Least significant word of the double-word that contains the calculations of encoder/counter no. 1	RO	
1007 1058	Encoder/Counter calculations no. 2 H Most significant word of the double-word that contains the calculations of encoder/counter no. 2	RO	
1008 1057	Encoder/Counter calculations no. 2 L Least significant word of the double-word that contains the calculations of encoder/counter no. 2	RO	
1009 1060	Encoder/Counter calculations no. 3 H Most significant word of the double-word that contains the calculations of encoder/counter no. 3	RO	
1010 1059	Encoder/Counter calculations no. 3 L Least significant word of the double-word that contains the calculations of encoder/counter no. 3	RO	
1011 1062	Encoder/Counter calculations no. 4 H Most significant word of the double-word that contains the calculations of encoder/counter no. 4	RO	
1012 1061	Encoder/Counter calculations no. 4 L Least significant word of the double-word that contains the calculations of encoder/counter no. 4	RO	

Modbus address	Description	Read Write	Reset value
1013 1064	Calculations detected 1 s encoder/counter no. 1 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1014 1063	Calculations detected 1 s encoder/counter no. 1 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1015 1066	Calculations detected 1 s encoder/counter no. 2 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1016 1065	Calculations detected 1 s encoder/counter no. 2 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1017 1068	Calculations detected 1 s encoder/counter no. 3 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1018 1067	Calculations detected 1 s encoder/counter no. 3 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1019 1070	Calculations detected 1 s encoder/counter no. 4 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1020 1069	Calculations detected 1 s encoder/counter no. 4 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 1 s	RO	
1021 1072	Calculations detected 100 ms encoder/counter no. 1 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1022 1071	Calculations detected 100 ms encoder/counter no. 1 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1023 1074	Calculations detected 100 ms encoder/counter no. 2 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1024 1073	Calculations detected 100 ms encoder/counter no. 2 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1025 1076	Calculations detected 100 ms encoder/counter no. 3 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1026 1075	Calculations detected 100 ms encoder/counter no. 3 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1027 1078	Calculations detected 100 ms encoder/counter no. 4 H Most significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	
1028 1077	Calculations detected 100 ms encoder/counter no. 4 L Least significant word of the double-word that contains the number of calculations of encoder/counter detected in 100 ms	RO	

Modbus address	Description	Read Write	Reset value
1100	Digital output status It contains the logic status of the digital outputs (default 0): Bit 0: output 1 Bit 1: output 2 Bit 2: output 3 Bit 3: output 4 Bit 4: output 5 Bit 5: output 6 Bit 6: output 7 Bit 7: output 8 Bit 8: output 9 Bit 9: output 10 Bit 10: output 11 Bit 11: output 12 Bit 12: output 13 Bit 13: output 14 Bit 14: output 15 Bit 15: output 16	R/W	
1101	AO1 analog output value	R/W	
1102	AO2 analog output value	R/W	
1103	Encoder/Counter commands no. 1 H	R/W	
1104	Encoder/Counter commands no. 2 H	R/W	
1105	Encoder/Counter commands no. 3 H	R/W	
1106	Encoder/Counter commands no. 4 H Bit0 = Preset value loading Bit1 = Loading preset at next impulse Z The bits of the commands are taken automatically to 0 once the command is executed.	R/W	
1201.. ..1454	Logic status of the outputs of the slaves on the bus These words contain the logic status of the digital outputs of all the slaves on the bus: based on the set slave address the instrument determines its reference word (e.g. Slave 1-word 1201… Slave 10-word 1210...) and sets the outputs based on the value of the word. It is used to set all the outputs by writing in broadcast on the slaves on the bus	WO	
2001	Parameter 1	R/W	
...	...	R/W	
2100	Parameter 100 The parameters written in these addresses (2001..2100) are saved in the memory at every writing on this area.	R/W	
4001	Parameter 1 (10 s delay)	R/W	
...	...	R/W	
4100	Parameter 100 (10 s delay) The parameters written in these addresses (4001..4100) are saved in the memory after 10 seconds from the last writing on this area.	R/W	

10 CANopen

Depending on the type of flashing, the RUN LED indicates all the operating statuses of the CANopen protocol.

RUN LED flashing name	Type of flashing
Blink_fast	Rapid flashing at 50msec
Blink_medium	Flashing at 200msec
Blink_slow	Flashing at 600msec
LED_on	LED always on
Blink_3_on	LED on for 1sec, 3 flashes for 150msec
Blink_1_off	Slow flashing of 40msec every 1.2sec
Blink_3_off	LED off for 1sec, 3 flashes for 150msec

Status	RUN LED flashing
Boot-up	Blink_fast
Pre-Operational	Blink_slow
Operational	LED_on
Stopped	Blink_1_off
Pre-Operational with Emergency	Blink_medium
Operational with Emergency	Blink_3_on
Stopped with Emergency	Blink_3_off

10.1 SET-UP of slave CANopen node

A CANopen network requires a 120 Ω end of line resistance. If more devices are to be connected in cascade, it is necessary to insert in the last MCM260 of the network, at the end of the line.

10.2 Slave CANopen node operation

At power on, after boot-up, the module will switch to the Pre-Operational status automatically (RUN LED Blink_slow blinking). In this status no transmission/reception of PDO is admitted, but only of SDO. To change from Pre-Operational to Operational, an NMT from a master.

10.3 EDS Files

EDS files of the various models are available in the download area at www.pixsys.net.

11 CANopen in detail

CAN (Controller Area Network) is a Multimaster bus system. The messages are sent to the bus with a certain priority, defined by the COB ID (Communication Object Identifier). CANopen is a protocol defined by the DS 301 CIA specifications (CAN in automation). The CANopen is formed above the CAL (CAN Application Layer, a high level communication protocol for CAN-based networks). The CAL defines 4 types of service elements:

- **CMS**: (CAN-based Message Specification): defines a set of objects (Variables, Events, Domains) that determine how the CAN interface can access the functions of the network nodes.
- **NMT**: (Network Management): defines all the master-slave type services of a network, such as node initialization, start and stop, error detection.
- **DBT**: (Distributor): defines a dynamic distribution of the CAN identifiers for the network nodes, called COB-ID (Communication Object Identifier)
- **LMT**: (Layer Management): offers the possibility to change parameters such as the NMT address of a node, bit-timing and baud-rate of a CAN interface.

CMS defines 8 priority levels, each with 220 COB-ID.
The other identifies are reserved for NMT, DBT and LMT.

11.a CAN Application Layer (CAL)

COB-ID	Description
0	NMT start/stop services
1..220	CMS priority object 0
221..440	CMS priority object 1
441..660	CMS priority object 2
661..880	CMS priority object 3
881..1100	CMS priority object 4
1101..1320	CMS priority object 5
1321..1540	CMS priority object 6
1541..1760	CMS priority object 7
1761..2015	NMT Node Guarding
2016..2031	NMT, LMT, DBT services

CAL does not define the content of the CMS objects; it defines how but not what. CANopen provides the implementation of a system control distributed using the CAL protocols and services.

11.1 Object Dictionary

The Object dictionary is fundamental for a CANopen device. All the data and information regarding the configuration are saved in it. It is an orderly group of objects, where each is addressed by a 16 bit ID. The object dictionary is divided into 3 areas, where each area is represented by a table that lists all of its objects:

Communication Profile Area (0x1000-0x1FFF addresses): contains all the fundamental communication parameters and is common to all the CANopen devices.

Manufacturer Specific Profile Area (0x2000-0x5FFF address): in this area each manufacturer may implement its specific functionalities.

Standardized Device Profile Area (0x6000-0x9FFF addresses): defines the input/output transmission/reception modes. It is defined by the DS-401 standard (Device Profile for I/O devices)

In the object dictionary, an addressing scheme is used to
access the device parameters, communication, functions and data. Each address is defined by a 16 bit number that indicates the address row of the table. A maximum of 65536 addresses are permitted.
If an object is composed of several elements, these are
identified by means of sub-indexes. Each sub-index indicates the
individual column address of the object, allowing a maximum of 256 sub-indexes.
If the address consists of simple variables (8bit unsigned, 16bit unsigned,
etc.), the sub-index is always zero. For the other objects, such as arrays, records, etc., sub-index 0 will indicate the
maximum number of sub-indexes of the object.

Data is coded in the following sub-indexes:
- object name describing the functions
- a data type attribute
- an access attribute: read only, write only or read/write

11.b CANopen object dictionary structure

Index (Exadecimal)	Object
0x0000	Not used
0x0001- 0x001F	Static data types
0x0020 - 0x003F	Complex data types
0x0040 - 0x005F	Manufacturer specific data types
0x0060 - 0x007F	Profile specific static data types
0x0080 - 0x009F	Profile specific complex data types
0x00A0 - 0x0FFF	Reserved
0x1000 - 0x1FFF	Communication Profile (DS-301)
0x2000 - 0x5FFF	Manufacturer specific parameters
0x6000 - 0x9FFF	Parameters from standardized device profiles
0xA000 - 0xFFFF	Reserved

11.1.1 CANopen communication model

CALopen defines 4 types of messages:

1 **Administrative message**: Layer management, network management and identification services (network initialization, configuration and supervision). Services and protocols are according to LMT, NMT and DBT elements.

2 **Service Data Object (SDO)**: provides client access to objects of the object dictionary of the device (server) using indexes and sub-indexes. A response is generated for every CAN message: one SDO requires 2 identifiers. SDO requests and responses always contain 8 bytes.

3 **Process Data Object (PDO)**: transfers data in real-time data. The transfer is limited from 1 to 8 bytes and its content is defined by its CAN-identifier only.

Each PDO is described by 2 objects in the object dictionary:

- **PDO Communication Parameter**: it contains the COB-ID used, the type of transmission, inhibit time and period.
- **PDO Mapping Parameter**: contains a list of allocations of objects in the object dictionary mapped in the PDO. It can be configured via SDO messages if the mapping is supported by the device.

There are 2 types of PDO transmission:

- **Synchronous**: it is regulated by the reception of a SYNC object (acyclic, non periodical, or cyclic, which means that the transmission is periodically controlled every 1,2,...,240 by SYNC messages).
- **Asynchronous**: the transmission is regulated by a remote transmission request from another device or by a specific event defined in the device profile (change of the input value, timer, etc.)

- **Inhibit time** for a PDO defines the minimum time between the transmission of two consecutive PDOs. It is a part of the PDO Communication Parameter and is defined as an unsigned 16bit integer (unit is 100µsec).
- **Event time period** defines how the PDO transmission is regulated when a specific time has elapsed. It is defined as an unsigned 16bit integer (unit is milliseconds). The PDO transmits data without overloading and the messages are not confirmed: one PDO requires a CAN-identifier (no more than 8 bytes can be transmitted with 1PDO.

4 **Predefined Messages or Special Function Objects**: it is a list of important pre-defined messages:

- **Synchronization (SYNC)**: it regulates the transmission of inputs/outputs synchronizing the PDOs. It is one of the COB-IDs with the highest priority.
- **Time Stamp**: it gives the devices a common time reference.
- **Emergency**: the event is regulated by errors within the device.
- **Node/Life Guarding**: the NMT master monitors the status of the slave nodes (node guarding). The

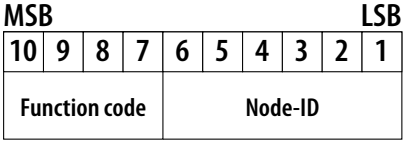
nodes may monitor the status of the NMT master (life guarding): it starts in the NMT slave after receiving a first node guarding message from the NMT master. It detects errors in the network interface of the devices: a remote transmission request from the NMT master to a particular node triggers a response containing the node status.

- **Boot-up**: an NMT slave transmits a message after the transition from the Initialising status to the Pre-Operational status.

SDOs are typically used to configure the devices of a CANopen network, while PDOs are used for fast data transfer. All the CANopen devices should have at least one PDO, all the other communication objects are optional.

11.1.2 CANopen Pre-defined Connection Set

When a device must respond to a request from the master, a default frame is used. It comprises 11 bits, with the first 7 bits (LSB) used for the **Node-ID** (node address, range 1..127, defined by the manufacturer's specific configurations), and the last 4 bits (MSB) used for the **Function Code**.



Pre-defined connection set defines 4 Rx PDO, 4 TX PDO, 1 SDO, 1 Emergency Object and 1 Node-Error-Control Identifier. It also supports the transmission in broadcast of NMT Module Control Services, SYNC and Time Stamp objects. The complete CAN identifier assignment scheme is shown below:

11.1.2.a Broadcast objects of the CANopen Pre-defined Connection Set

Object	Function Code (bit 7...10)	COB-ID	Communication parameters
NMT Module Control	0000	0x000	-
SYNC	0001	0x080	0x1005, 0x1006, 0x1007
Time Stamp	0010	0x100	0x1012, 0x1013

11.1.2.b Peer-to-Peer objects of the CANopen Pre-defined Connection Set

Object	Function Code (bit 7...10)	COB-ID	Communication parameters
Emergency	0000	0x81 – 0xFF	0x1024, 0x1015
PDO1 (transmitted)	0011	0x181 – 0x1FF	0x1800
PDO1 (received)	0100	0x201 – 0x27F	0x1400
PDO2 (transmitted)	0101	0x281 – 0x2FF	0x1801
PDO2 (received)	0110	0x301 – 0x37F	0x1401
PDO3 (transmitted)	0111	0x381 – 0x3FF	0x1802
PDO3 (received)	1000	0x401 – 0x47F	0x1402
PDO4 (transmitted)	1001	0x481 – 0x4FF	0x1803
PDO4 (received)	1010	0x501 – 0x57F	0x1403
SDO (transmitted/received)	1011	0x581 – 0x5FF	0x1200
SDO (received/client)	1100	0x601 – 0x67F	0x1200
NMT Error Control	1110	0x701 – 0x77F	0x1016, 0x1017

All the peer-to-peer identifiers are different; as a result, only one master device can communicate with each slave node (up to 127 nodes). Two slaves cannot communicate because they do not know the node-ID of the other, only the master knows them.

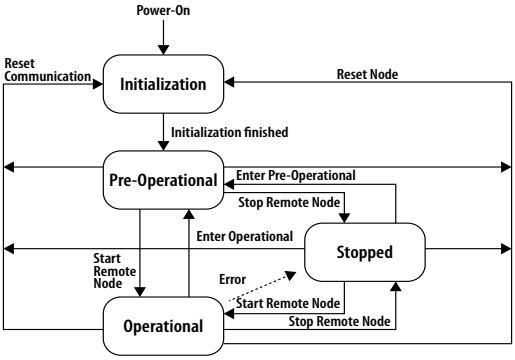
11.1.3 CANopen identifier distribution

The COB-ID can be determined in 3 ways:

- **Pre-defined Connection Set**: it is the way shown in the previous section. Allocation is by default and other configurations are not necessary.
- **PDO identifiers (COB-ID)**: they can be modified after powering on the instrument, when it is in the Pre-Operational status (see next section). In this status, new values can be written in the Object Dictionary only with the SDO.
- **Using DBT (Distributor, a service CAL)**: the nodes are initially identified by their node-ID. The Node-ID of the slave node can be configured by internal dip-switches or by LMT (Layer Management, a CAL service). When the network initializes and boots, the master communicates with each connected slave with a 'telegram' (an NMT service). Once this connection has been established, DBT provides allocation of CAN identifiers for communication of SDOs and PDOs to the nodes.

11.1.4 CANopen boot-up procedure

Network initialization supports two boot-up processes: Minimum boot-up and Extended boot-up. The first is a pre-requisite for a CANopen device, the second is optional but is necessary if the COB-ID must be allocated by the DBT services. The transition diagram below shows a minimum boot-up procedure for a CANopen node.



The NMT services allow the status to be changed in each condition. NMT messages are formatted by a CAN-header (COB-ID = 0) and 2 data byte. A byte contains the requested service (NMT command specifier) and the other contains the Node-ID (0 for broadcast mode). A CANopen network can only have an NMT master, which brings NMT messages and controls the initialization processes.
The CANopen devices supporting only the minimum boot-up enter the Pre-Operational
status automatically, immediately after ending the initialization. In this status, COB-ID allocation and parameter setting are possible from SDOs only.
The MCM260X module moves automatically to the Pre-Operational status after ending the boot-up.

11.1.5 Communication profile: initialization

In most cases, a default configuration is assigned to the Object dictionary, if there are no other user configurations saved. The default configuration does not provide for any pre-set PDO. To use the PDO, both Tx and Rx, in the module initialization phase it is necessary for the CANopen master to execute the correct mapping.

11.1 Communication Profile Area

The table below shows all the objects of the Communication Profile Area:

Index	Name	Type	R/W
0x1000	Device type	32bit unsigned	CONST
0x1001	Error register	8bit unsigned	R
0x1003	Pre-defined Error Field	Array 32bit unsigned	R/W
0x1005	COB-ID SYNC message	32bit unsigned	R
0x1006	Communication Cycle Period	32bit unsigned	R/W
0x1008	Manufacturer Device Name	String	CONST
0x1009	Manufacturer Hardware Version	String	CONST
0x100A	Manufacturer Software Version	String	CONST
0x100B	Node ID	8bit unsigned	R
0x100C	Guard Time	16bit unsigned	R/W
0x100D	Life Time Factor	8bit unsigned	R/W
0x1010	Store Parameters	Array 32bit unsigned	R/W
0x1011	Restore default Parameter	Array 32bit unsigned	R/W
0x1014	COB-ID Emergency Object	32bit unsigned	R
0x1015	Inhibit time Emergency Object	16bit unsigned	R/W
0x1017	Producer Heartbeat Time	16bit unsigned	R/W
0x1018	Identity Object	Record 32bit unsigned	R
0x1029	Error Behaviour	Array 8bit unsigned	R/W
0x1400	Receive PDO communication parameter 1	Record 32bit unsigned	R/W
0x1401	Receive PDO communication parameter 2	Record 32bit unsigned	R/W
0x1402	Receive PDO communication parameter 3	Record 32bit unsigned	R/W
0x1403	Receive PDO communication parameter 4	Record 32bit unsigned	R/W
0x1600	Receive PDO mapping parameter 1	Record 32bit unsigned	R/W
0x1601	Receive PDO mapping parameter 2	Record 32bit unsigned	R/W
0x1602	Receive PDO mapping parameter 3	Record 32bit unsigned	R/W
0x1603	Receive PDO mapping parameter 4	Record 32bit unsigned	R/W
0x1800	Transmit PDO communication parameter 1	Record 32bit unsigned	R/W
0x1801	Transmit PDO communication parameter 2	Record 32bit unsigned	R/W
0x1802	Transmit PDO communication parameter 3	Record 32bit unsigned	R/W
0x1803	Transmit PDO communication parameter 4	Record 32bit unsigned	R/W
0x1A00	Transmit PDO mapping parameter 1	Record 32bit unsigned	R/W
0x1A01	Transmit PDO mapping parameter 2	Record 32bit unsigned	R/W
0x1A02	Transmit PDO mapping parameter 3	Record 32bit unsigned	R/W
0x1A03	Transmit PDO mapping parameter 4	Record 32bit unsigned	R/W

11.1.1 Device Type

This object indicates the device type:

Index	Subindex	Name	Type	Default	R/W
0x1000	0	Device type	32bit unsigned	-	CONST

Structure:

Bit 24…31 MSB	Bit 16…23	Bit 8...15	Bit 0...7 LSB
0x00	$0000b_{19}\ b_{18}\ b_{17}\ b_{16}$	0x01	0x91

b_{16}	0	If there are no **digital inputs**
	1	If there is at least one **digital input**
b_{17}	0	If there are no **digital outputs**
	1	If there is at least one **digital output**
b_{18}	0	If there are no **analog inputs**
	1	If there is at least one **analog input**
b_{19}	0	If there are no **analog outputs**
	1	If there is at least one **analog output**

For MCM260X-1AD the value is 0x00020191
For MCM260X-2AD the value is 0x00050191
For MCM260X-3AD the value is 0x00030191
For MCM260X-4AD the value is 0x00030191
For MCM260X-9AD the value is 0x000F0191

Least significant word (LSW) is always 0x0191 = 401^{dec} corresponding to the DS standard of the CAN.

11.1.2 Error Register

This object contains an indication regarding the internal errors and is a sub-set of the emergency type messages.

Index	Sub - index	Name	Type	Default	R/W
0x1001	0	Error register	8bit unsigned	-	R

Structure:

Number of bits	Meaning
0	Generic error
1	Current
2	Voltage
3	Temperature

Number of bits	Meaning
4	Communication
5	Specific device profile
6	Reserved
7	Specific of the manufacturer

If there is an error, bit 0 is always set to 1.

11.1.3 Pre-defined Error Field

This object contains information about the last 10 errors detected. The new error will be entered in Sub-index 1 and the information regarding the error in Sub-index 10 will be lost.

Index	Subindex	Name	Type	Default	R/W
0x1003	0	Number of errors	Array 8bit unsigned	-	R/W
	1	Standard error field (always the last error)	Array 32bit unsigned	-	R
	...	...	...	-	...
	10	Standard error field (first error)	Array 32bit unsigned	-	R

Structure:

Bit 16..31 MSW	Bit 0..15 LSW
Additional info	Error code

Additional info refers to the first 2 bytes of the additional code of the Emergency telegram. Error code is an error code in the Emergency telegram.

11.1.4 COB-ID SYNC message

This object contains the COB-ID for the synchronization messages.

Index	Subindex	Name	Type	Default	R/W
0x1005	0	COB-ID SYNC	32bit unsigned	0x00000080	R

Structure:

Bit 16..31 MSW	Bit 0..15
0 (reserved)	COB-ID

11.1.5 Communication Cycle Period

This message contains the maximum time (msec) between two SYNC messages (2msec resolution). If the value is 0, there is no monitoring with SYNC.

Index	Subindex	Name	Type	Default	R/W
0x1006	0	Communication Cycle Period	32bit unsigned	0	R/W

11.1.6 Manufacturer Device Name

Index	Subindex	Name	Type	Default	R/W
0x1008	0	Manufacturer Device Name	String	M260	CONST

11.1.7 Manufacturer Hardware Version

Index	Subindex	Name	Type	Default	R/W
0x1009	0	Manufacturer Hardware Version	String	Actual hardware version	CONST

11.1.8 Manufacturer Software Version

Index	Subindex	Name	Type	Default	R/W
0x100A	0	Manufacturer Software Version	String	Actual software version	CONST

11.1.9 Node ID

Index	Subindex	Name	Type	Default	R/W
0x100B	0	Node ID	8bit unsigned	0	R

11.1.10 Guard Time

This object defines the Guarding Time (time between two queries, in msec).

Index	Subindex	Name	Type	Default	R/W
0x100C	0	Guard Time	16bit unsigned	0	R/W

11.1.11 Life Time Factor

This object is part of the Node Guarding protocol. No monitoring if equal to 0.

Index	Subindex	Name	Type	Default	R/W
0x100D	0	Life Time Factor	8bit unsigned	0	R/W

11.1.12 Store Parameters

This object saves the user parameters permanently if the *"save"* string (ASCII 0x65766173) is written in Sub-index 1.

Index	Subindex	Name	Type	Default	R/W
0x1010	0	Number of sub-indexes	Array 8bit unsigned	1	R
	1	Store all parameters	Array 32bit unsigned	1 (*"save"* string to save)	R/W

11.1.13 Restore Default Parameters

This object allows the user parameters saved to be reset and the default values to be loaded. If the *"load"* string (ASCII 0x64616F6C) is written in Sub-index 1, the standard default parameters will be loaded at each power on (until the new *"save"* command is written).

Index	Subindex	Name	Type	Default	R/W
0x1011	0	Number of sub-indexes	Array 8bit unsigned	2	R
	1	Load standard default parameters	Array 32bit unsigned	1 (*"load"* string for standard default)	R/W

11.1.14 COB-ID Emergency Object

Index	Subindex	Name	Type	Default	R/W
0x1014	0	COB-ID EMCY	32bit unsigned	0x80 + module - ID	R

Structure:

Bit 31	Bit 11...30	Bit 0...10
0(valid) / 1(invalid)	0 Reserved	COB-ID

11.1.15 Inhibit Time Emergency Object

This object indicates the time that must have elapsed before transmitting another Emergency (in minutes).

Index	Subindex	Name	Type	Default	R/W
0x1015	0	Inhibit Time EMCY	16bit unsigned	0	R/W

11.1.16 Producer Heartbeat Time

This message contains the time between two Heartbeat messages (msec). No monitoring if equal to Heartbeat.

Index	Subindex	Name	Type	Default	R/W
0x1017	0	Producer Heartbeat Time	16bit unsigned	0	R/W

11.1.17 Identity Object

This object lists the specifications of the device's manufacturer.

Index	Subindex	Name	Type	Default	R/W
0x1018	0	Number of sub-indexes	Record 8bit unsigned	4	R
	1	Manufacturer ID	Record 32bit unsigned	PIX	R
	2	Device description	Record 32bit unsigned	260	R
	3	Review number	Record 32bit unsigned	-	R
	4	Serial number	Record 32bit unsigned	-	R

11.1.18 Error Behaviour

This object specifies which status the module must switch to in case of communication error.

Index	Subindex	Name	Type	Default	R/W
0x1029	0	Number of sub-indexes	Array 8bit unsigned	1	R
	1	Communication error	Array 8bit unsigned	0	R/W

Structure:

Communication error	Action
0	Change to the PRE-OPERATIONAL status (only if the status was OPERATIONAL)
1	There are no status changes
2	Change to the STOPPED status

11.1.19 Receive PDO Communication Parameter

This object sets the communication parameters of the supported Rx PDO.
The COB-ID of the default PDO is set by the DS301 standard.

Index	Subindex	Name	Type	Default	R/W
0x1400 0x1401 0x1402 0x1403	0	Number of sub-indexes	Record 8bit unsigned	2	R
	1	COB-ID	Record 32bit unsigned	0x1400 0x200 + Module-ID 0x1401 0x300 + Module-ID 0x1402 0x400 + Module-ID 0x1403 0x500 + Module-ID	R/W
	2	Type of transmission	Record 8bit unsigned	255	R/W

Structure of the COB-ID:

Bit 31	Bit 30	Bit 29...11	Bit 0...10
0(valid) / 1(invalid)	0(RTR permitted) / 1(RTR not permitted)	0 Reserved	COB-ID

Digital and analog inputs are transmitted in case of Change Of Value (COV). The transmission modes are explained in the following table (RTR = Remote Transmission Request received):

Type of transmission	PDO transmission					TxPDO (inputs)	RxPDO (outputs)
	cyclic	acyclic	synchro- nous	asynchro- nous	RTR only		
0		X	X			If COV is transmitted with each SYNC	It sets outputs after each SYNC as requested by the last PDO received
1...240	X		X			Transmission every i SYNC (i = 1...240)	It sets outputs after each SYNC as requested by the last PDO received
241..251	Reserved						
252			X		X	Data is still read with the SYNC, but not sent, as requested by RTR	Not supported
253				X	X	Requested by RTR	COV
254				X		COV	COV
255				X		COV	COV

11.1.20 Receive PDO Mapping Parameter

This object defines the data transmitted by the PDO. Sub-index 0 contains the number of valid objects for the PDO.

Index	Subindex	Name	Type	Default	R/W
0x1600 0x1601 0x1602 0x1603	0	Number of objects	Record 8bit unsigned	-	R/W
	1...8	Object mapped in the PDO	Record 32bit unsigned	-	R/W

Object structure:

Bit 16..31	Bit 8..15	Bit 0..7
Index	Sub-index	Object length

Index: object address that must be transmitted
Sub-index: Object sub-index that must be transmitted
Object length: length in bit (not more than 8 bytes may be transmitted with a PDO; therefore the sum of the object length must not exceed 64.

11.1.21 Transmit PDO Communication Parameter

This object sets the communication parameters for the supported Tx PDO.
The default COB-ID of the PDO is set by the DS301 standard.

Index	Subindex	Name	Type	Default	R/W
0x1800 0x1801 0x1802 0x1803	0	Number of sub-indexes	Record 8bit unsigned	5	R
	1	COB-ID	Record 32bit unsigned	0x1800 0x180 + Module-ID 0x1801 0x280 + Module-ID 0x1802 0x380 + Module-ID 0x1803 0x480 + Module-ID	R/W
	2	Type of transmission	Record 8bit unsigned	255	R/W
	3	Inhibit Time	Record 16bit unsigned	50	R/W
	5	Event Timer	Record 16bit unsigned	0	R/W

Structure of the COB-ID:

Bit 31	Bit 30	Bit 29...11	Bit 0...10
0(valid) / 1(invalid)	0(RTR permitted) / 1(RTR not permitted)	0 Reserved	COB-ID

Digital and analog inputs are transmitted in case of Change Of Value (COV). The transmission modes are explained in the following table (RTR = Remote Transmission Request received):

Type of transmission	PDO transmission					TxPDO (inputs)	RxPDO (outputs)
	cyclic	acyclic	synchro-nous	asynchro-nous	RTR only		
0		X	X			If COV is transmitted with each SYNC	It sets outputs after each SYNC as requested by the last PDO received
1...240	X		X			Transmission every i SYNC (i = 1...240)	It sets outputs after each SYNC as requested by the last PDO received
241..251	Reserved						
252			X		X	Data is still read with the SYNC, but not sent, as requested by RTR	Not supported
253				X	X	Requested by RTR	COV
254				X		COV	COV
255				X		COV	COV

Inhibit Time is the minimum time between two consecutive PDO with the same COB-ID (time unit of 100msec).
Event Timer defines the time after which a PDO is transmitted, even if no change of data has occurred (msec). It can be used with transmission types 254 and 255 only.

11.1.22 Transmit PDO Mapping

This object defines the data transmitted by the PDO. Sub-index 0 contains the number of valid objects for the PDO.

Index	Subindex	Name	Type	Default	R/W
0x1A00 0x1A01 0x1A02 0x1A03	0	Object number	Record 8bit unsigned	-	R/W
	1...8	Object mapped in PDO	Record 32bit unsigned	-	R/W

Object structure:

Bit 16...31	Bit 8...15	Bit 0...7
Index	Sub-index	Object length

Index: object address that must be transmitted
Sub-index: object sub-index that must be transmitted
Object size: length in bit of the object (not more than 8 bytes may be transmitted with a PDO; therefore the sum of the object length must not exceed 64.

11.2 Manufacturer Specific Parameter Area

The table below shows all the objects of the Manufacturer Specific Parameters Area:

Index	Name	Type	R/W
0x2000	Device specifications	Array 16bit signed	R/W
0x3000	MCM260X parameters	Array 16bit signed	R/W
0x3001	Encoder/Counter calculations	32bit signed	R
0x3002	Encoder/Counter preset	32bit signed	R/W
0x3003	Encoder/Counter commands	8bit unsigned	R/W
0x3004	Encoder/Counter calculations 1s	32bit signed	R
0x3005	Encoder/Counter calculations 100ms	32bit signed	R
0x4007	Status/error flags	16bit unsigned	R

11.2.1 Device specification

This object defines some configuration parameters of the MCM260X

Index	Subindex	Name	Type	Default	R/W
0x2000	0	Number of sub-indexes	Array 8bit unsigned	19	R
	1	CANopen bus speed	Array 16bit signed	6	R
	2	Reserved	Array 16bit signed	0	R
	3	Boot-up time	Array 16bit signed	120	R/W
	4	CANopen status after boot-up	Array 16bit signed	0x7F	R/W
	5	Digital input filter	Array 16bit signed	2	R/W
	6...19	...	Reserved		R/W

1 CANopen bus speed *(idx 0x2000, s-idx 1)*

IS a read only object. It reports the status of parameter 2. It may change by Index 0x0300 Sub-Index 2.

0	50 kbit/s	4	250 kbit/s
1	62.5 kbit/s	5	500 kbit/s
2	100 kbit/s	6	1 Mbit/s (**Default**)
3	125 kbit/s		

3 Boot-up time *(idx 0x2000, s-idx 3)*

This object defines the duration of the boot-up duration (10 ms units)
10..1000 cents of s (10 = 100ms .. 100 = 1s). (**Default**: 120)

4 CANopen status after boot-up *(idx 0x2000, s-idx 4)*

According to the CANopen standard, once the boot-up has been completed, the device must automatically switch to the Pre-Operational status. It is the default configuration (0x7F), but it is possible to move to other statuses:

0	Boot-up
4	Stopped
5	Operational
0x7F	Pre-operational (**Default**)

5 Digital input filter *(idx 0x2000, s-idx 5)*

It reports the status of parameter 35 for all MCM260X-1/2/3/4AD and of parameter 72 for MCM260X-9AD.
0..200 [0.5 ms basis], **Default**: 2 x 0.5 = 1 ms.

11.2.2 MCM260X parameters

The index 0x3000 object defines all the configuration parameters for the MCM260X modules.
Please refer to the paragraph "Table of the configuration parameters for the models MCM260X-1/2/3/4AD" and paragraph "Table of the configuration parameters for the model MCM260X-9AD" for a complete description of the single parameters.

Index	Subindex	Name	Type	Default	R/W
0x3000	0	Number of sub-indexes	Array 16bit signed	50 for MCM26X-1/2/3/4AD 100 for MCM260X-9AD	R
	1..50 1..100	parameters MCM260X-1/2/3/4AD MCM260X-9AD parameters	Array 16bit signed	-	R/W

11.2.3 Encoder/Counter calculations

The 0x3001 index object contains all the registers of the encoder/counter calculations.

Index	Subindex	Name	Type	Default	R/W
0x3001	0	Number of sub-indexes	Array 8bit unsigned	3 MCM260X-1/2/3/4AD 4 MCM260X-9AD	R
	1	Encoder/Counter calculations 1	Array 32bit signed	-	R
	2	Encoder/Counter calculations 2	Array 32bit signed	-	R
	3	Encoder/Counter calculations 3	Array 32bit signed	-	R
	4	Encoder/Counter calculations 4	Array 32bit signed	-	R

11.2.4 Encoder/Counter preset

The 0x3002 index object contains all the registers of the encoder/counter presets.

Index	Subindex	Name	Type	Default	R/W
0x3002	0	Number of sub-indexes	Array 8bit unsigned	3 MCM260X-1/2/3/4AD 4 MCM260X-9AD	R
	1	Encoder/Counter preset 1	Array 32bit signed	-	R/W
	2	Encoder/Counter preset 2	Array 32bit signed	-	R/W
	3	Encoder/Counter preset 3	Array 32bit signed	-	R/W
	4	Encoder/Counter preset 4	Array 32bit signed	-	R/W

11.2.5 Encoder/Counter commands

The 0x3003 index object contains all the registers of the commands for the encoders/counters.

Index	Subindex	Name	Type	Default	R/W
0x3003	0	Number of sub-indexes	Array 8bit unsigned	3 MCM260X-1/2/3/4AD 4 MCM260X-9AD	R
	1	Encoder/Counter commands 1	Array 8bit unsigned	-	R
	2	Encoder/Counter commands 2	Array 8bit unsigned	-	R
	3	Encoder/Counter commands 3	Array 8bit unsigned	-	R
	4	Encoder/Counter commands 4	Array 8bit unsigned	-	R

11.2.6 Encoder counter calculations 1s

The 0x3004 index object contains all the registers with the calculations recorded by the encoders/ counters at 1 second intervals.

Index	Subindex	Name	Type	Default	R/W
0x3004	0	Number of sub-indexes	Array 8bit unsigned	3 MCM260X-1/2/3/4AD 4 MCM260X-9AD	R
	1	Encoder/Counter 1s calculations 1	Array 32bit signed	-	R/W
	2	Encoder/Counter 1s calculations 2	Array 32bit signed	-	R/W
	3	Encoder/Counter 1s calculations 3	Array 32bit signed	-	R/W
	4	Encoder/Counter 1s calculations 4	Array 32bit signed	-	R/W

11.2.7 Encoder/Counter calculations 100ms

The 0x3005 index object contains all the registers with the calculations recorded by the encoders/ counters at 100 ms intervals.

Index	Subindex	Name	Type	Default	R/W
0x3005	0	Number of sub-indexes	Array 8bit unsigned	3 MCM260X-1/2/3/4AD 4 MCM260X-9AD	R
	1	Encoder/Counter 100ms calculations 1	Array 32bit signed	-	R/W
	2	Encoder/Counter 100ms calculations 2	Array 32bit signed	-	R/W
	3	Encoder/Counter 100ms calculations 3	Array 32bit signed	-	R/W
	4	Encoder/Counter 100ms calculations 4	Array 32bit signed	-	R/W

11.2.8 Status/error flags

The 0x4007 index object contains all the registers of the error/anomaly signaling flags.

Index	Subindex	Name	Type	Default	R/W
0x4007	0	Number of sub-indexes	Array 8bit unsigned	2	R
	1	Status/error flag	Array 16bit unsigned	-	R/W
	2	Terminal status/error flag	Array 16bit unsigned	-	R/W

Status/error flags *(idx 0x4007, s-idx 1)* **16bit unsigned**

bit 0 incorrect configuration parameters
bit 1 incorrect encoder calculation values
bit 2 -
bit 3 incorrect calibration data
bit 4 incorrect calibration constants
bit 5 incorrect canopen memory data
bit 6 calibration missing
bit 7 out of range parameter

bit 8 FRam memory error
bit 9 terminal offline
bit 10 NFC password not set
bit 11 low power supply voltage
bit 12 AI1 out of range
bit 13 AI2 out of range
bit 14 AI3 out of range
bit 15 AI4 out of range

Terminal status/error flags *(idx 0x4007, s-idx 2)* **16bit unsigned**

bit 0 eeprom memory reading error
bit 1 eeprom memory writing error
bit 2 incorrect parameters

11.3 Standard Device Profile Area

The table below lists all the specific Pixsys parameters supported:

Index	Name	Type	R/W
0x6000	Digital Input	Array 8bit unsigned	R
0x6005	Global Interrupt enable Digital 8 bit	Array 8bit unsigned	R/W
0x6006	Interrupt mask any change 8 bit	Array 8bit unsigned	R/W
0x6007	Interrupt Mask Low-to-High 8 bit	Array 8bit unsigned	R/W
0x6008	Interrupt Mask High-to-Low 8 bit	Array 8bit unsigned	R/W
0x6200	Digital Output	Array 8bit unsigned	R/W
0x6206	Digital Output Error Mode	Array 8bit unsigned	R/W
0x6207	Digital Output Error Value	Array 8bit unsigned	R/W
0x6401	Read Analogue input 16bit	Array 16bit unsigned	R
0x6411	Write Analogue output 16bit	Array 16bit unsigned	R/W
0x6421	Analogue input Trigger Selection	Array 8bit unsigned	R/W
0x6423	Analogue input Global Interrupt Selection	Boolean	R/W
0x6424	Analogue input Interrupt Upper Limit Integer	Array 16bit unsigned	R/W
0x6425	Analogue input Interrupt Lower Limit Integer	Array 16bit unsigned	R/W
0x6426	Analogue input Interrupt Delta Unsigned	Array 16bit unsigned	R/W
0x6427	Analogue input Negative Delta Unsigned	Array 16bit unsigned	R/W
0x6428	Analogue input Positive Delta Unsigned	Array 16bit unsigned	R/W
0x6443	Analogue Output Error Mode	Array 16bit unsigned	R/W
0x6444	Analogue Output Error Value	Array 16bit unsigned	R/W
0x67FE	Error Behaviour	Array 8bit unsigned	R/W

11.3.1 Digital Input

This object contains the status of the digital inputs. Sub-index 1 the first 8 channels, sub-index 2 the second 8 where present.

Index	Subindex	Name	Type	Default	R/W
0x6000	0	Review number	Array 8bit unsigned	2 MCM260X-2AD 1 MCM260X-3AD 1 MCM260X-4AD 2 MCM260X-9AD	R
	1	1St input block	Array 8bit unsigned	0	R
	2	2nd input block	Array 8bit unsigned	0	R

11.3.2 Global interrupt Enable Digital 8 bit

This object enables the transmission of the digital inputs via PDO. If the value is 1, the transmission is carried out according to the rules set by the objects 0x6006, 0x6007, 0x6008 and the type of transmission of the PDO. If the value is 0, the digital inputs are not transmitted.

Index	Subindex	Name	Type	Default	R/W
0x6005	0	Global Interrupt Enable Digital 8 bit	8bit unsigned	1	R/W

11.3.3 Interrupt Mask Any Change 8 bit

This object defines the inputs that transmit their status in case of switching (Global Interrupt must be enabled, Index 0x6005 = 1).

Index	Subindex	Name	Type	Default	R/W
0x6006	0	Review number	Array 8bit unsigned	2 MCM260X-2AD 1 MCM260X-3AD 1 MCM260X-4AD 2 MCM260X-9AD	R
	1	1St input block	Array 8bit unsigned	255	R/W
	2	2nd input block	Array 8bit unsigned	255	R/W

bit $_i$	0	Channel $_i$ transmission not carried out in case of status change
	1	Channel $_i$ transmission carried out in case of status change

11.3.4 Interrupt Mask Low-to-High 8 bit

This object defines the inputs that transmit their status in case of positive transition (Global Interrupt must be enabled, Index 0x6005 = 1).

Index	Subindex	Name	Type	Default	R/W
0x6007	0	Review number	Array 8bit unsigned	2 MCM260X-2AD 1 MCM260X-3AD 1 MCM260X-4AD 2 MCM260X-9AD	R
	1	1St input block	Array 8bit unsigned	0	R/W
	2	2nd input block	Array 8bit unsigned	0	R/W

bit $_i$	0	Channel $_i$ transmission not carried out in case of positive transition
	1	Channel $_i$ transmission carried out in case of positive transition

11.3.5 Interrupt Mask High-to-Low 8 bit

This object defines the inputs that transmit their status in case of negative transition (Global Interrupt must be enabled, Index 0x6005 = 1).

Index	Subindex	Name	Type	Default	R/W
0x6008	0	Review number	Array 8bit unsigned	2 MCM260X-2AD 1 MCM260X-3AD 1 MCM260X-4AD 2 MCM260X-9AD	R
	1	1St input block	Array 8bit unsigned	0	R/W
	2	2nd input block	Array 8bit unsigned	0	R/W

bit $_i$	0	Channel $_i$ transmission not carried out in case of negative transition
	1	Channel $_i$ transmission carried out in case of negative transition

11.3.6 Digital Output

This object contains the status of the digital outputs in the modules.

Index	Subindex	Name	Type	Default	R/W
0x6200	0	Review number	Array 8bit unsigned	2 MCM260X-1AD 1 MCM260X-3AD 1 MCM260X-4AD 2 MCM260X-9AD	R
	1	1st output block	Array 8bit unsigned	0	R/W
	2	2nd output block	Array 8bit unsigned	0	R/W

11.3.7 Error Mode Output 8bit

This object defines whether the output must switch to a pre-defined status in case of error. If the error is eliminated, the outputs maintain the pre-defined status.

Index	Subindex	Name	Type	Default	R/W
0x6206	0	Review number	Array 8bit unsigned	2 MCM260X-1AD 1 MCM260X-3AD 1 MCM260X-4AD 2 MCM260X-9AD	R
	1	1st output block	Array 8bit unsigned	255	R/W
	2	2nd output block	Array 8bit unsigned	255	R/W

b_i	0	Channel $_i$ output does not switch in case of error
	1	Channel $_i$ output switches in case of error

11.3.8 Error Value Output 8bit

This object defines the values that the outputs must assumed in case of error (the corresponding bits in Mode Output Error, 0x6206, must be enabled).

Index	Subindex	Name	Type	Default	R/W
0x6207	0	Review number	Array 8bit unsigned	2 MCM260X-1AD 1 MCM260X-3AD 1 MCM260X-4AD 2 MCM260X-9AD	R
	1	1st output block	Array 8bit unsigned	0	R/W
	2	2nd output block	Array 8bit unsigned	0	R/W

b_i	0	$Channel_i$ output switches to 0 in case of error
	1	$Channel_i$ output switches to 1 in case of error

Example:
If 0x6206, Sub-index 0 = 1, Sub-index 1 = 2 = 0x02;
0x62607, Sub-index 0 = 1, Sub-index 1 = 0 = 0x00
It means that output 2 is set to 0, while output 1 does not switch in case of error.

11.3.9 Analogue Input 16bit

This object contains the value of the 16 bit digital inputs.

Index	Subindex	Name	Type	Default	R/W
0x6401	0	Number of analog inputs	Array 8bit unsigned	2 MCM260X-2AD 2 MCM260X-4AD 4 MCM260X-5AD 4 MCM260X-9AD	R
	1	1st input	Array 16bit signed	-	R
	2	2nd input	Array 16bit signed	-	R
	3	3rd input	Array 16bit signed	-	R
	4	4th input	Array 16bit signed	-	R

11.3.10 Analogue Output 16bit

This object contains the value of the 16 bit digital outputs.

Index	Subindex	Name	Type	Default	R/W
0x6411	0	Number of analog outputs	Array 8bit unsigned	2 MCM260X-5AD 2 MCM260X-9AD	R
	1	1st output	Array 16bit signed	0	R/W
	2	2nd output	Array 16bit signed	0	R/W

11.3.11 Analogue Input Interrupt Trigger Selection

This object defines the transmission conditions: When 1 is written in the 0x6423 object the transmission is carried out.

Index	Subindex	Name	Type	Default	R/W
0x6421	0	Number of analog inputs	Array 8bit unsigned	2 MCM260X-2AD 2 MCM260X-4AD 4 MCM260X-5AD 4 MCM260X-9AD	R
	1	1st input trigger	Array 8bit unsigned	7	R/W
	2	2nd input trigger	Array 8bit unsigned	7	R/W
	3	3rd input trigger	Array 8bit unsigned	7	R/W
	4	4th input trigger	Array 8bit unsigned	7	R/W

Sub-index structure:

Bit	Transmission conditions	Index
0	Threshold value excess (>)	0x6424
1	Threshold value excess (<)	0x6425
2	Change in the input value greater than delta compared to the last transmission	0x6426
3	Decrease in the input value greater than delta compared to the last transmission	0x6427
4	Excess of the input value above the delta compared to the last transmission	0x6428
5..7	Reserved	-

11.3.12 Analogue Input Global Interrupt Enable

This object was used to control the transmission of the digital inputs via PDO. If the value is 1, the transmission is carried out and depends on the 0x6421 object and the type of transmission of the PDO. If the value is 0, transmission is not permitted.

Index	Subindex	Name	Type	Default	R/W
0x6423	0	Global Interrupt Enable Analogue input 16bit	Boolean	0	R/W

11.3.13 Analogue Input Interrupt Upper Limit Integer

This object enables the monitoring through analog input threshold. If configured in the 0x6423 object, transmission takes place if the value is ≥ of the threshold value when a trigger condition is set.

Index	Subindex	Name	Type	Default	R/W
0x6424	0	Number of analog inputs	Array 8bit unsigned	2 MCM260X-2AD 2 MCM260X-4AD 4 MCM260X-5AD 4 MCM260X-9AD	R
	1	Upper limit 1st input	Array 16bit signed	0	R/W
	2	Upper limit 2nd input	Array 16bit signed	0	R/W
	3	Upper limit 3rd input	Array 16bit signed	0	R/W
	4	Upper limit 4th input	Array 16bit signed	0	R/W

11.3.14 Analogue Input Interrupt Lower Limit Integer

This object enables the monitoring through analog input threshold. If configured in the 0x6423 object, transmission takes place if the value is ≤ of the threshold value when a trigger condition is set.

Index	Subindex	Name	Type	Default	R/W
0x6425	0	Number of analog inputs	Array 8bit unsigned	2 MCM260X-2AD 2 MCM260X-4AD 4 MCM260X-5AD 4 MCM260X-9AD	R
	1	Lower limit 1st input	Array 16bit signed	0	R/W
	2	Lower limit 2nd input	Array 16bit signed	0	R/W
	3	Lower limit 3rd input	Array 16bit signed	0	R/W
	4	Lower limit 4th input	Array 16bit signed	0	R/W

11.3.15 Analogue Input Interrupt Delta Unsigned

If enabled, it conditions the transmission of the current value of the analog input with the previously transmitted value. The new value is transmitted only if higher than the previous + Delta, or if lower than the previous – Delta.

Index	Subindex	Name	Type	Default	R/W
0x6426	0	Number of analog inputs	Array 8bit unsigned	2 MCM260X-2AD 2 MCM260X-4AD 4 MCM260X-5AD 4 MCM260X-9AD	R
	1	1st input delta	Array 16bit unsigned	0	R/W
	2	2nd input delta	Array 16bit unsigned	0	R/W
	3	3rd input delta	Array 16bit unsigned	0	R/W
	4	4th input delta	Array 16bit unsigned	0	R/W

11.3.16 Analogue Input Interrupt Negative Delta Unsigned

If enabled, it conditions the transmission of the current value of the analog input with the previously transmitted value. The new value is transmitted only if lower than the previous – Delta.

Index	Subindex	Name	Type	Default	R/W
0x6427	0	Number of analog inputs	Array 8bit unsigned	2 MCM260X-2AD 2 MCM260X-4AD 4 MCM260X-5AD 4 MCM260X-9AD	R
	1	1st input delta	Array 16bit unsigned	0	R/W
	2	2nd input delta	Array 16bit unsigned	0	R/W
	3	3rd input delta	Array 16bit unsigned	0	R/W
	4	4th input delta	Array 16bit unsigned	0	R/W

11.3.17 Analogue Input Interrupt Positive Delta Unsigned

If enabled, it conditions the transmission of the current value of the analog input with the previously transmitted value. The new value is transmitted only if higher than the previous – Delta.

Index	Subindex	Name	Type	Default	R/W
0x6428	0	Number of analog inputs	Array 8bit unsigned	2 MCM260X-2AD 2 MCM260X-4AD 4 MCM260X-5AD 4 MCM260X-9AD	R
	1	1st input delta	Array 16bit unsigned	0	R/W
	2	2nd input delta	Array 16bit unsigned	0	R/W
	3	3rd input delta	Array 16bit unsigned	0	R/W
	4	4th input delta	Array 16bit unsigned	0	R/W

11.3.18 Analogue Output Error Mode

This object defines whether the output must switch to a pre-defined status (see 0x6444 object) in case of error. If the error is eliminated, the outputs maintain the pre-defined status.

Index	Subindex	Name	Type	Default	R/W
0x6443	0	Number of analog outputs	Array 8bit unsigned	2 MCM260X-5AD 2 MCM260X-9AD	R
	1	Error Mode 1ª output	Array 8bit unsigned	1	R/W
	2	Error Mode 2ª output	Array 8bit unsigned	1	R/W

b_i	0	Output remains unchanged
	1	Output switches in case of error

11.3.19 Analogue Output Error Value Integer

This object defines the value assumed by the analog output in case of error. For this happen the 0x6443 object must be equal to 1.

Index	Subindex	Name	Type	Default	R/W
0x6444	0	Number of analog outputs	Array 8bit unsigned	4 MCM260X-5AD 4 MCM260X-9AD	R
	1	Error Value 1ª output	Array 16bit signed	0	R/W
	2	Error Value 2ª output	Array 16bit signed	0	R/W

11.3.20 Error Behaviour

This object has the same meaning as the Error Behaviour 0x1029.

Index	Subindex	Name	Type	Default	R/W
0x67FE	0	Sub-index number	Array 8bit unsigned	1	R
	1	Communication error	Array 8bit unsigned	0	R/W

Structure:

Communication error	Action
0	Change to the PRE-OPERATIONAL status (only if the status was OPERATIONAL)
1	There are no status changes
2	Change to the STOPPED status

11.4 PDO transmission

Data transmission from PDO is permitted only in the Operational status. When the module changes its status to Operational, TX PDO is transmitted once with type 254 and 255.
In order to prevent CAN bus overflow, default value for the 0x6423 object is false, so change for analog inputs are not transmitted. To prevent overflow with 0x6423=true, a long Inhibit Time can be selected, or appropriate values for Threshold and Delta (0x6421...0x6428) can be set.

11.4.1 PDO Mapping

If customer specific configurations are not used, the object dictionary is assigned with a default configuration according to standard device profile DS401 (see paragraph 6.1.5). If the module is in the Pre-Operational status, the configuration can be modified via SDO.

11.5 Monitoring via SYNC

In Operational status, if the communication cycle period is not equal to 0, monitoring is carried out with the first SYNC message.
If the SYNC message is not received in time (communication cycle period), a blink code is provided and the status does not change. 0x8100, Error Register: 0x81, Additional Code 00 04 00 00 00). The error regarding the SYNC message will be shown in the LED even if the master requires a status change.
The LED returns to its normal operating status only after a new SYNC message in Operational status, and a new Emergency message is sent to show that SYNC monitoring works correctly again (Error Code:0x0000, Error Register 0x81, Additional Code 00 04 00 00 00).

11.6 Node Guarding

Node Guarding starts when the first remote transmit request message (RTR) is received in the COB-ID (0x700 + Module-ID). If the module does not receive the corresponding message, Node Guarding is not monitored. **Default** configuration requires that Node Guarding is not activated
(Guard Time 0x100C=0, Life Time Factor 0x100D=0). The NMT master queries the other devices at regular intervals, regulated by the Guard Time 0x100C, and the response messages contain the internal status of the nodes. In case of an RTR request with Guard Time not set, there is no monitoring via Node Guarding but the module responds in any case, communicating its internal status.

Status codes:

Code	Status
127	Pre-Operational
5	Operational
4	Stopped

If the Node Guarding message is not received by the Life Time, there will be a blink. An Emergency message is sent (Error Code:0x8130, Error Register: 0x11, Additional Code 00 04 00 00 00) and the module switches to the status required by the 0x67FE object.
As soon as the Node Guarding is restored, an Emergency message is sent (Error Code:0x0000, Error Register: 0x11, Additional Code 00 04 00 00 00), without switching status.
N.B. IT is possible to use either the Node Guarding protocol or the Heartbeat protocol, not both.

11.7 Monitoring via Heartbeat

The Heartbeat generator cyclically generates a message (timed by the 0x1017 object). During this time it transmits the status of the node. Monitoring starts when the first message is generated.
If the corresponding Heartbeat message is not received by the time stated in the 0x1016 object, there will be a blink. An Emergency message is sent (Error Code:0x8130, Error Register: 0x11, Additional Code 00 05 JJ 00 00, where JJ is the number of the node that timed the EMCY message) and the module switches to the status required by the 0x67FE object.
As soon as the Node Guarding is restored, another emergency message is sent (Error Code:0x0000, Error Register: 0x11, Additional Code 00 05 JJ 00 00) to communicate that the Heartbeat works correctly again, without any status change.
The Heartbeat protocol is used if (and only if) the 0x1017 object is configured (Producer Heartbeat Time).

11.8 Emergency

There are 4 events that may generate emergency messages:

- Critical error situation generated/ superimposed to the module;
- Important information to be communicated to other devices;
- Restore from an error;
- Power-on with loaded settings equal to the default settings (when configurations have not been saved yet or when those saved have been deleted from the module).

The structure of the emergency messages is shown in the following table:

Error Code	Error Register	Additional Code	Meaning
0x0000	0x00	00 00 00 00 00	Pre-defined Error Field 0x1003 Sub-index 0 set to 0 or all errors deleted
0x5000	0x81	00 01 00 00 00	Hardware configuration change after power on or node reset (communication
0x5000	0x81	00 02 00 00 00	Flash errors An error was generated when the configuration was saved in the flash memory
0x5000	0x81	00 03 AA BB CC	The programmed configurations does not coincide with the current one AA: physical modules where an error occurred BB: logical module where an error occurred CC: cause of the error
0x5000	0x81	00 09 00 00 00	Queue overflow of emergency messages
0x8100	0x81	00 04 00 00 00	Time between two SYNC above the Communication Cycle Period
0x8110	0x11	00 01 00 00 00	Internal receive buffer overflow Status switched as defined by the 0x67FE object
0x8110	0x11	00 02 00 00 00	Internal transmission buffer overflow Status switched as defined by the 0x67FE object
0x8120	0x11	00 03 00 00 00	CAN Controller in Error Passive Mode
0x8130	0x11	00 04 00 00 00	Time between two Node Guarding greater than Guard Time x Life Time Factor
0x8130	0x11	00 05 DD 00 00	Time between two Heartbeat greater than the configured one DD: node that caused the overflow

0x8210	0x81	00 05 EE FF GG	PDO was sent with a number of bytes smaller than configured one in communication profile PDO data is discarded EE: configured value FF: actual value, number of bytes sent GG: number of PDO
0x8220	0x81	00 06 HH II JJ	PDO was sent with a number of bytes greater than configured one in Communication Profile Only the first n data is used (n = total length configured in the Object Dictionary) HH: configured value II: current value, number of bytes sent JJ: PDO number
0xFF00	0x81	00 06 KK 00 00	Module bus error Status switches to Stopped PP: Module position
0xFF00	0x81	LL 07 MM NN PP	Diagnostic messages LL: diagnostic byte MM: Module position NN: Error status and channel number PP: Current module error number

12 Error messages

The display of the terminal is used also to show any error/anomaly messages.
Below are the possible error messages with the relevant description

Error	Cause	Solution
E-01	Incorrect configuration parameters	Check that the configuration parameters are correct
E-02	Incorrect encoder calculation values	Check that the encoder calculations are correct
E-03	-	
E-04	Incorrect calibration data	Contact support
E-05	Incorrect calibration constants	Contact support
E-06	Incorrect CANopen memory data	Contact support
E-07	Calibration missing	Contact support
E-08	Out of range parameter	Take the parameter back to the admitted ranges
E-09	FRam memory error	Contact support
E-10	Offline terminal	Contact support
E-11	NFC password not set	Contact support
E-12	Low power supply voltage	Check the power supply voltage
E-13	AI1 out of range	Check the connection with the probe and that they are intact
E-14	AI2 out of range	Check the connection with the probe and that they are intact
E-15	AI3 out of range	Check the connection with the probe and that they are intact
E-16	AI4 out of range	Check the connection with the probe and that they are intact
E-17	Terminal eeprom memory reading error	Contact support
E-18	Terminal eeprom memory writing error	Contact support
E-19	Incorrect parameters in the terminal	Contact support

Notes / Updates