Device manual

Input/output module CompactModule metal

CR2032

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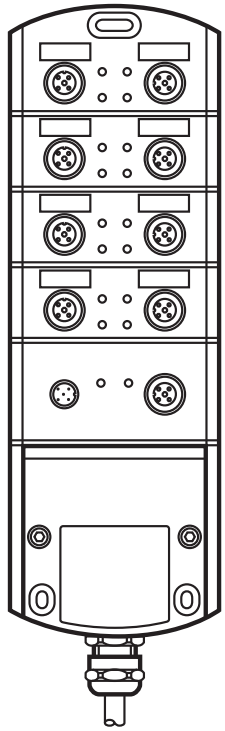

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Contents

1 Preliminary note

Technical data, approvals, accessories and further information at www.ifm.com.

► Instructions
→ Cross-reference

Important note
Non-compliance may result in malfunction or interference.

Information
Supplementary note.

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2 Safety instructions

This description is part of the unit. It contains texts and drawings concerning the correct handling of the module and must be read before installation or use.

Observe the information of the description. Non-observance of the notes, operation which is not in accordance with use as prescribed below, wrong installation or handling can result in serious harm concerning the safety of persons and plant.

The instructions are for authorised persons according to the EMC and low voltage guidelines. The unit must be installed and commissioned by a skilled electrician (programmer or service technician). The device may only be installed, connected and commissioned by qualified personnel.

Disconnect the device externally before doing any work on it. If necessary, also disconnect separately supplied output load circuits.

If the unit is not supplied by the mobile on-board system (12/24 V battery operation) it must be ensured that the external voltage is generated and supplied according to the criteria for safety extra-low voltage (SELV) as this is supplied without further measures to the connected controller, the sensors, and the actuators.

The wiring of all signals in connection with the SELV circuit of the unit must also comply with the SELV criteria (safe extra-low voltage, safe electrical separation from other electric circuits).

If the supplied SELV voltage has an external connection to ground (SELV becomes PELV) the responsibility lies with the user and the respective national regulations for installation must be complied with. All statements in these operating instructions refer to the unit the SELV voltage of which is not grounded.

The terminals may only be supplied with the signals indicated in the technical data or on the unit label and only the approved accessories of ifm electronic gmbh may be connected.

The unit can be operated within a wide temperature range according to the technical specification indicated below. Due to the additional self-heating the housing walls can have high perceptible temperatures when touched in hot environments.

In case of malfunctions or uncertainties please contact the manufacturer. Tampering with the unit can lead to considerable risks for the safety of persons and plant. It is not permitted and leads to the exclusion of any liability and warranty claims.

3 Function and features

The CR2032 I/O module enables decentralised evaluation of sensor signals and decentralised triggering of actuators and proportional valves.

The module supports binary/analogue inputs/outputs and is therefore classified in the device profile "I/O module" to CiA DS 401.

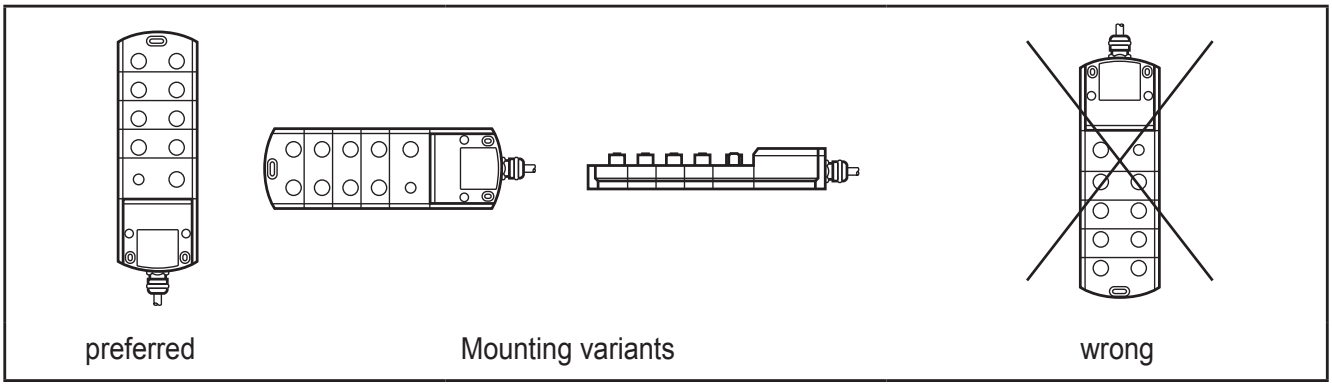
4 Function

- As regards the input/output functions, the module can be configured and it supports the following functions:
  - analogue inputs (0...10/32 V, 0...20 mA, ratiometric, binary and binary with diagnosis)
  - binary inputs
  - binary outputs with diagnostic capability (wire break and short circuit)
  - PWM outputs up to 2 A
- There are 1 server SDO and the 4 default PDOs to CiA DS 401.
  The PDO mapping cannot be changed (static PDO mapping). The default identifiers are assigned according to the "predefined connection set".
- The COB IDs of the PDOs as well as the transmission type (synch / asynch) of the individual PDOs can be configured.
- The module expects a synch object. The CAN identifier of the synch object can be configured.
- The module supports "node guarding" and "heartbeat". The "guard time", the "life time factor" and the "heartbeat time" can be configured. When there are no heartbeat or node guarding signals, the outputs are automatically switched off by the operating system.
- The module generates an emergency object. The COB ID of the EMCY object can be configured.
- The module stores the last error. The error code of the corresponding emergency object is stored.
- The module supports a reset function, i.e. assignment of the parameters to the factory default values* upon request.

*) factory default values → 8.1 Parameter list

5 Mounting

To protect the module against mechanical stress it must be mounted so that it lies completely flat on an even mounting surface. To do so, three cylinder screws with hexagon socket (M5 x L) to DIN 912 or DIN 7984 must be used.



To avoid contact corrosion between the mounting screws and the module housing, do not use any stainless steel screws or nickel-plated screws! In very corrosive environments such as extremely salty air, we recommend to use screws with surface finishing on a zinc/nickel basis with thick-film passivation and sealing. For normal corrosive requirements zinc-plated screws are sufficient.

6 Electrical connection

To guarantee the electrical interference protection of the module, the housing must be connected to GND (e.g. to the ground of the vehicle).

Due to the maximum operating temperature of 85 °C and the internal heating of the unit, the respective minimum rated temperature of the connection cable must be taken into account.

6.1 M12 sockets

► Use sockets with gold-plated contacts.

► Use protective caps (supplied) for unconnected connectors of the I/O module.

6.2 Tightening torque of the cover screws (terminal chamber)

To close the terminal chamber the cover screws are tightened with a tightening torque of 1.2 Nm.

6.3 M16 cable gland

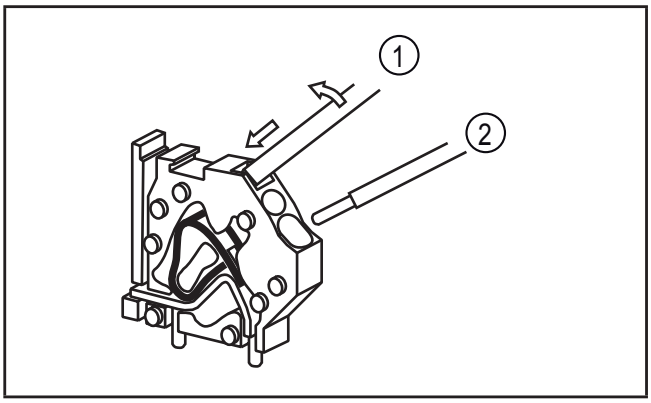
Use a suitable cable to ensure ingress resistance of the M16 cable gland.

If the M12 connectors are used for the device supply and CAN connection, close the terminal chamber with the supplied M16 cover plug (remove the cable gland and insert the M16 cover plug).

6.4 Definition of short-circuit and overload protection

- Short-circuit test:
  All outputs must withstand a short-circuit current limited to 60 A flowing between output and ground (GND) or supply voltage (+V_{BB}).
  Test duration: 3 minutes
- Overload test:
  Outputs must not be destroyed by a 100 % overload.
  (e.g. nominal switching current IN = 2 A ® 100 % overload = 4 A)
  Test duration: 5 minutes

6.5 CAGE CLAMP ® connection technology



1: Screw driver
2: Wire

► Insert screw driver and tilt slightly.
> spring opens
► Insert wire.
► Remove screw driver.
> spring closes

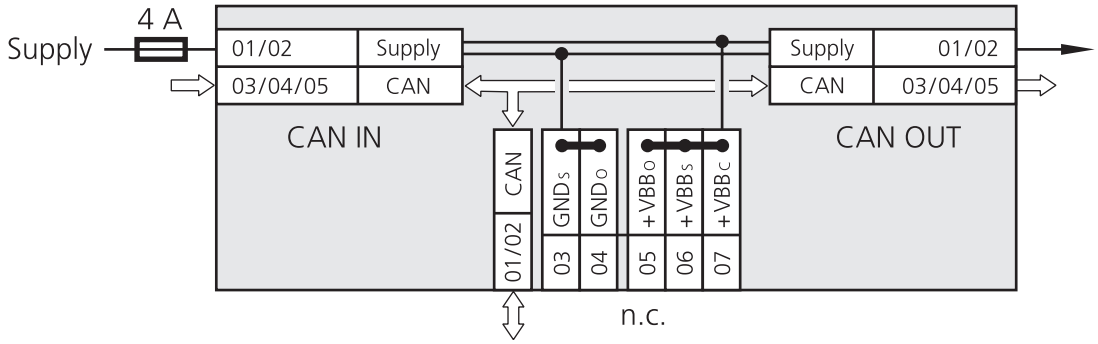
6.6 Fuses

To protect the whole system (wiring and module) the individual electric circuits are to be protected using fuses according to the type of connection and jumper settings. The M12 plugs are designed for max. 4 A, the clamps for max. 16 A.

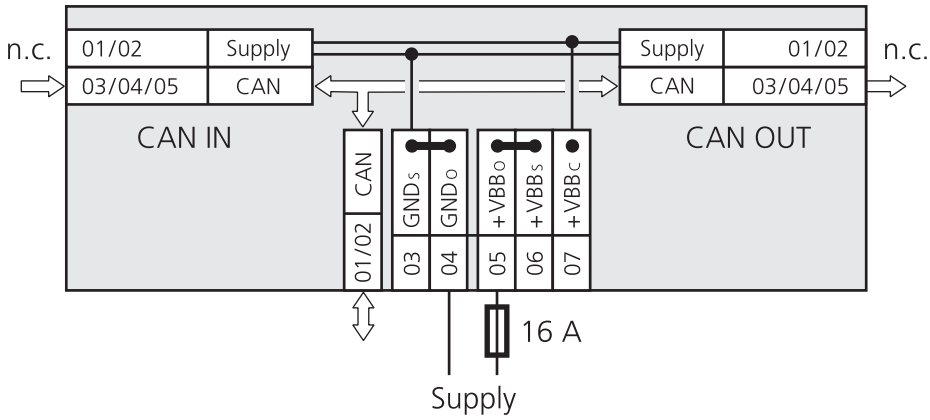
Example	Connection (→ 6.7)	Jumpers	Fuse
1	Supply via M12 CANin/CANout plug	3+4 / 5+6+7	4A
2	Supply via clamps (not via M12 CANin/CANout plug)	3+4 / 5+6	16A
3	Separate supply via clamps and M12 CANin/CANout plug	6+7	16A 4A
4	Supply via clamps (via M12 CANin/CANout plug)	6+7	16A 4A

6.7 Examples types of connection

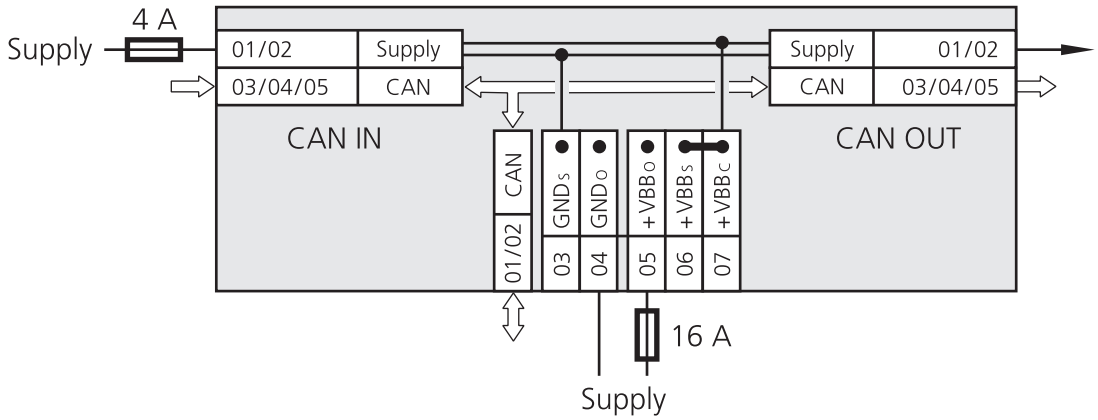
Example 1



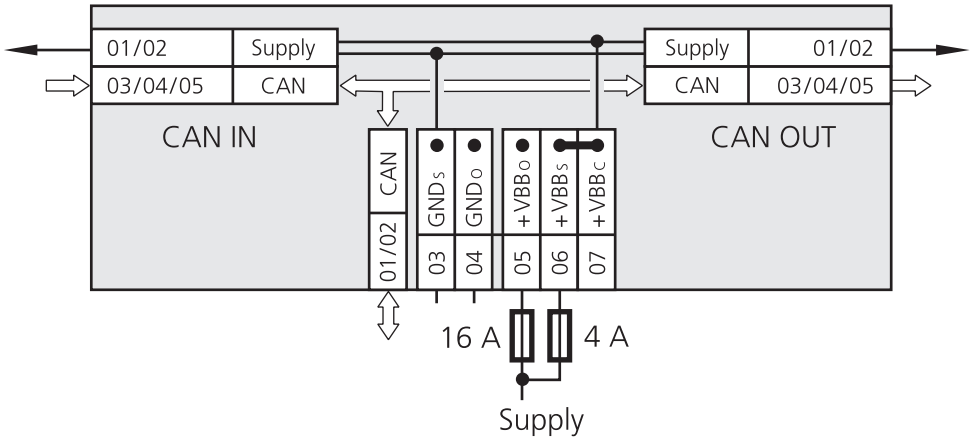
Example 2



Example 3



Example 4



= jumper inserted

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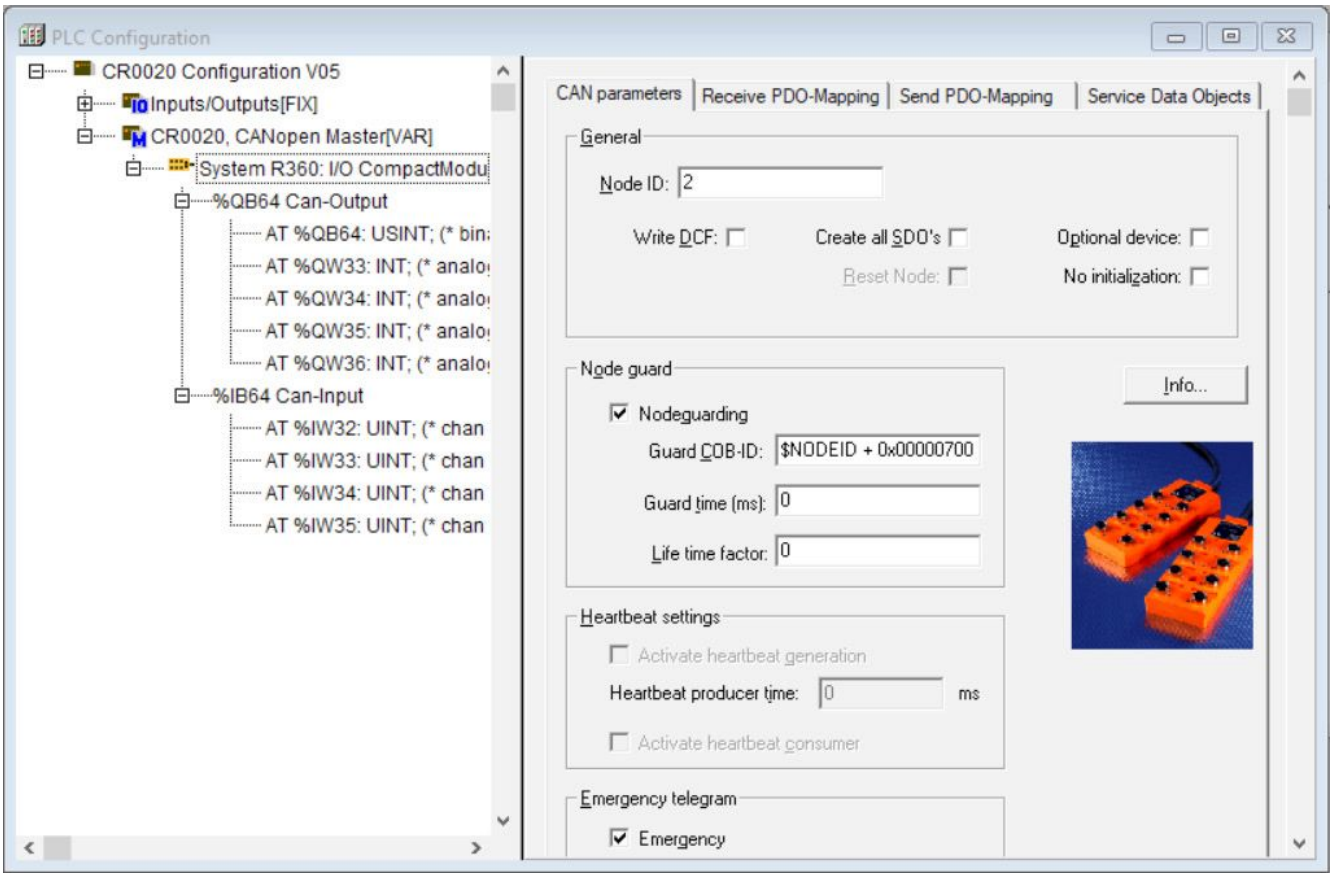
7 Set-up

7.1 PLC configuration in CODESYS 2.3

Parameter setting of the device functions and of the CAN interface is directly done from the application programmed with CODESYS 2.3. To do so, the "Electronic Data Sheet" (EDS) is integrated via the CODESYS PLC configuration.



CODESYS dialogue "PLC configuration" (example)

For a description of the setting and application of the "PLC configuration“ dialogue see the CODESY manual and the CODESYS online help.

7.2 PLC configuration in CODESYS 3.5

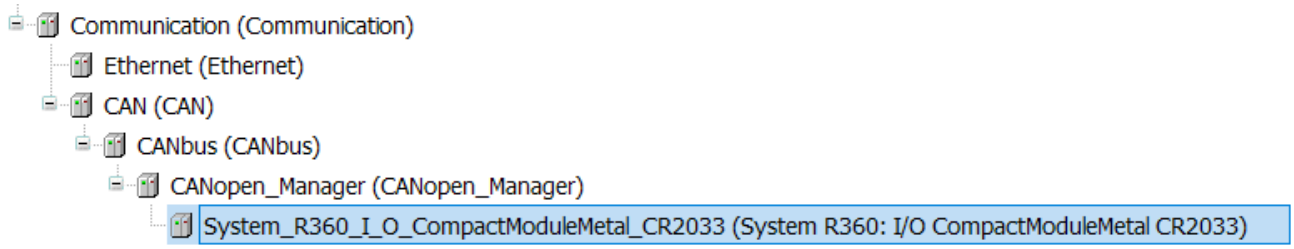
The "Electronic Data Sheet“ (EDS) is installed in the [Device Repository]. Proceed as follows in the main menu:

► Click on [Tools] / [Device Repository].

► Select [Fieldbuses] / [CiA CANopen] / [CiA Remote Device] and click on [Install].

► Select EDS file and click on [Open].

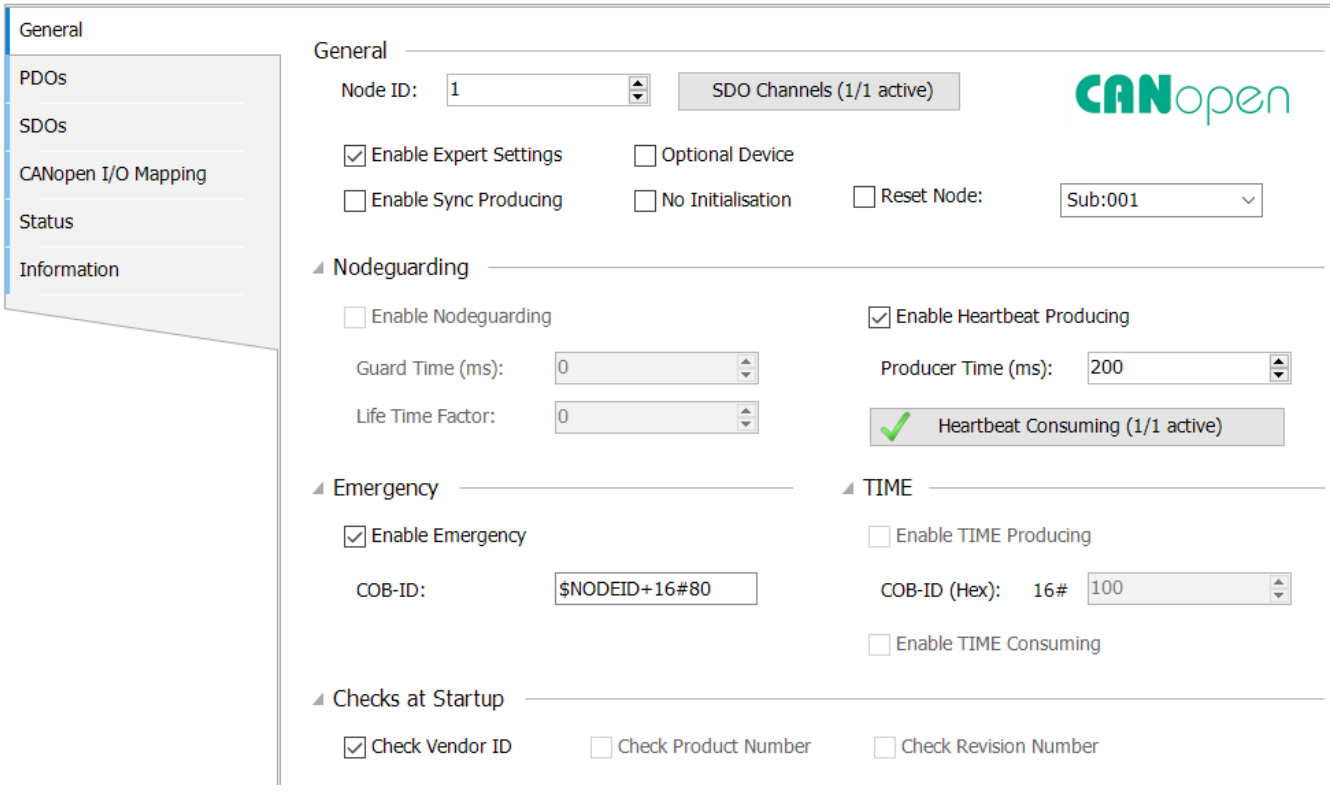
> In CODESYS 3.5 the devices are integrated as CiA remote devices in the device tree under a [CANopen_Manager] element.



The CANopen communication is configured via the CODESYS configuration editor.

7.2.1 Heartbeat configuration

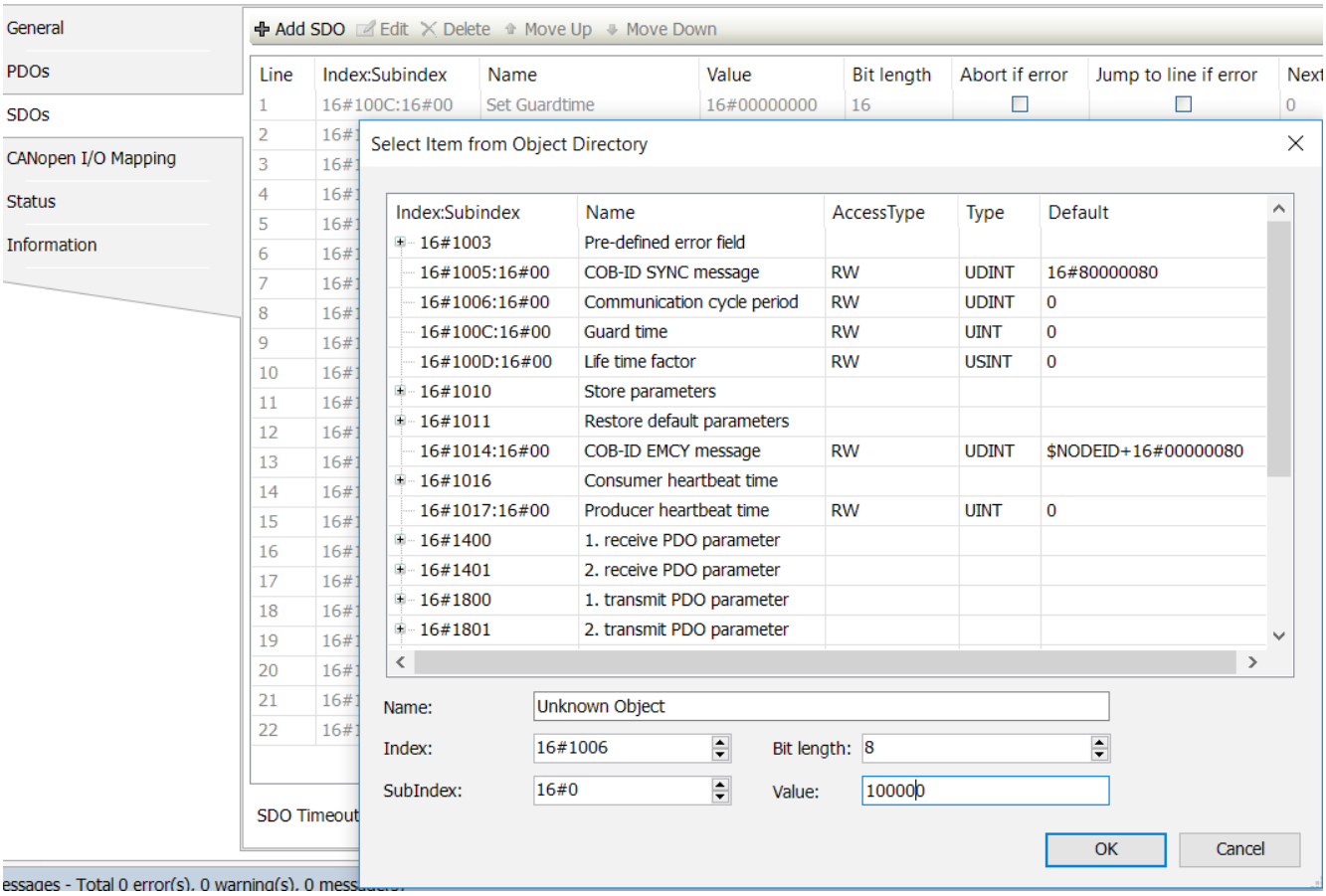
The function [Reset Node] must be activated on the tab [General] so that the device applies the parameters set for heartbeat monitoring of the CANopen Manager.

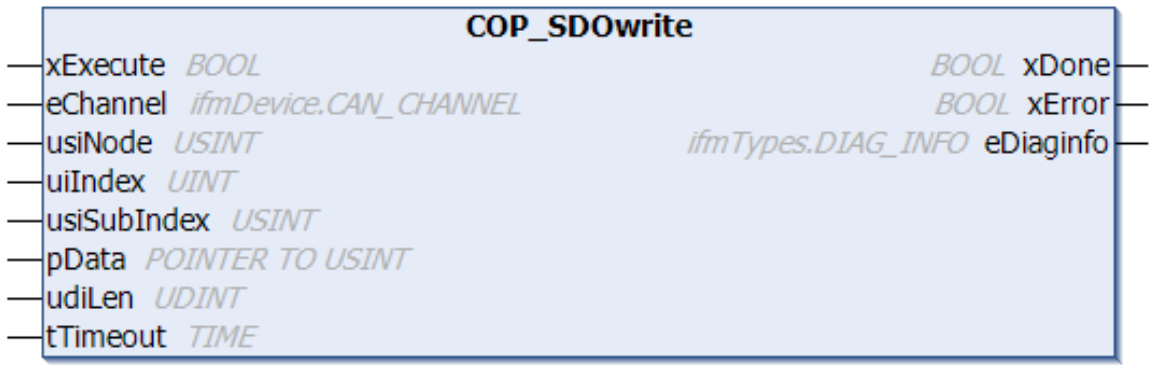


7.2.2 SyncMonitoring

To activate the device-internal monitoring of the Sync cycle, the monitoring time has to be written into the object directory entry 0x1006. This is possible by supplementing the SDO list in the CANopen configurator or during the operating time via the function block COP_SDOwrite.

The monitoring time is indicated in microseconds [µs].





7.3 Electronic Data Sheet

The EDS contains the description of all parameters and I/O data of the device in a format defined by CANopen. The EDS files are provided for all CANopen slaves by ifm electronic.

The EDS files are available at www.ifm.com.

8 Parameter setting

Automatic saving of the communication and unit parameters can be activated or deactivated by means of the "save all parameters" entry (see object directory, index 1010). When the value 0x02 is entered into SIdx 01, all parameters are automatically saved if changes were made.

With the value 0x00 there is no automatic saving, i.e. changed parameters will only be valid until the unit is switched off or until the next reset is made.

With the function "restore" (see object directory, index 1011) the parameters (except the baud rate and the node ID) can be assigned to the factory default values. With the next power on they become valid.

8.1 Parameter list

Parameter	Index in object directory	Default (factory preset)	Change automatically saved	Change effective
Manufacturer Specific Profile Area; index 2000 to 5FFF				
I/O Configuration	2000	binary inputs/ outputs	adjustable	after PreOp
PWM Frequency	2001	0x64 (100Hz)	adjustable	after PreOp
Node ID *)	20F0, 20F1	0x20 (0d32)	yes	after a reset
Baud rate *)	20F2, 20F3	0x04 (125 Kbits/s)	yes	after a reset
Communication Profile Area; Index 1000 to 1FFF				
COB ID Synch Objekt	1005	0x80	adjustable	after a reset
Communication Cycle	1006	0x00 (Off)	adjustable	immediately
Guard Time	100C	0x00 (Off)	adjustable	immediately
Life Time Factor	100D	0x00	adjustable	immediately
Save Parameter	1010	0x02 (AutoSave ON)	yes	immediately
COB ID EMCY	1014	0x80 + Node ID	adjustable	after a reset
Consumer Heartbeat time	1016	0x00 (Off)	adjustable	immediately
Producer Heartbeat time	1017	0x00 (Off)	adjustable	immediately
COB ID Rec PDO 1	1400 01	0x200 + Node ID	adjustable	after a reset
Trans Type Rec PDO 1	1400 02	0x01 (synchronous)	adjustable	immediately
COB ID Rec PDO 2	1401 01	0x300 + Node ID	adjustable	after a reset
Trans Type Rec PDO 2	1401 02	0x01 (synchronous)	adjustable	immediately
COB ID Trans PDO 1	1800 01	0x180 + Node ID	adjustable	after a reset
Trans Type Trans PDO 1	1800 02	0xFF (asynchronous)	adjustable	immediately

Parameter	Index in object directory	Default (factory preset)	Change automatically saved	Change effective
Event Timer Trans PDO1	1800 05	0x00	adjustable	immediately
COB ID Trans PDO 2	1801 01	0x280 + Node ID	adjustable	after a reset
Trans Type Trans PDO 2	1801 02	0x01 (synchronous)	adjustable	immediately
Event Timer Trans PDO2	1801 05	0x00	adjustable	immediately

The life time factor 0 is interpreted as 1.
The first guard protocol is assessed as "start guarding" even if guarding is not active at this time (guard time = 0).

*) Observe the position of the hex-code switch!
Entries in the object directory are only valid if the hex-code switches for baud rate (S1) and/or node ID (S2, S3) are in the position "F".
(For position and coding of the hex-code switches see connecting and operating elements → 9 Technical data)

Explanation of the abbreviations:

0x...= hexadecimal value
0b...= bit coded
0d...= decimal numerical value

str = string
rw = read-write
ro = read only
u8 = unsigned 8 bit
u16 = unsigned 16 bit

9 Technical data

CR2032

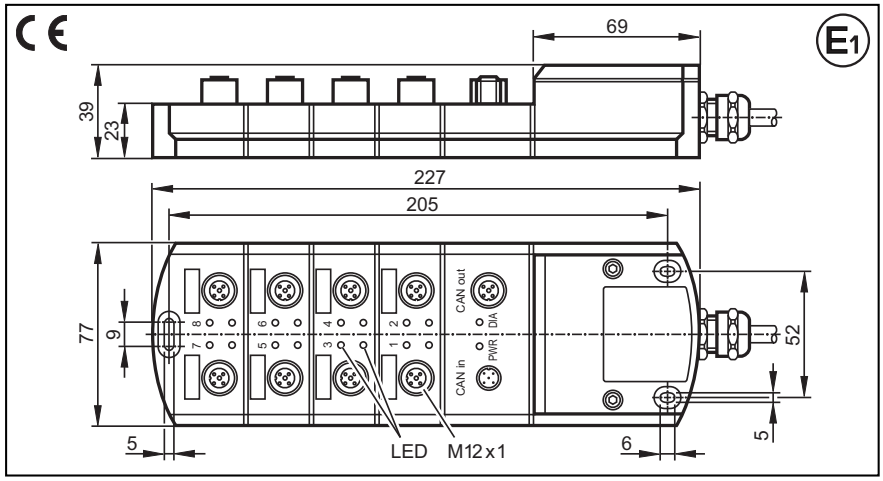
CompactModule Metal

I/O module
digital and analogue
for R360 system

CANopen interface

Surface electrostatically
coated (cathodic immersion)

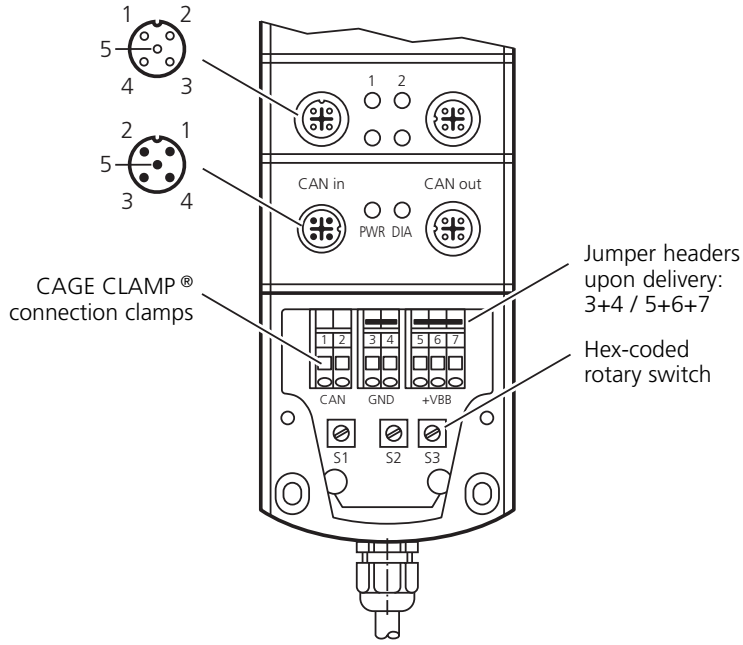
10...32 V DC



Technical data	8 inputs (4 digital and 4 analogue/digital) 8 outputs (4 digital and 4 digital/PWM)
Housing	Die-cast zinc housing with 8 outputs and terminal chamber surface electrostatically coated (cathodic immersion), black
Dimensions (l x w x h)	227 x 77 x 39 mm (without cable gland)
Installation	Screw connection by means of 3 M5 x l screws to DIN 912 or DIN 7984
Connections	
Operating voltage and CAN bus	7-pole terminal strip with CAGE CLAMP® connection technology (2 x 2-pole / 1 x 3-pole) 0.08...4 mm² (AWG 28...AWG 12), nominal current 20 A Identical potentials can be linked using a jumper header (GND and U_B potentials linked upon delivery) Cable entry via M16 cable gland
Inputs/Outputs CANin/CANout	8 x M12 connector (socket), 5-pole 2 x M12 connector (plug/socket), 5-pole
Weight	1.35 kg
Inputs	8
can be configured as	4 digital, positive-switching (high side) 4 analogue, 0...10/32 V, 0/4...20 mA, ratiometric or digital, positive-switching, with diagnostic capability
Sensor supply I_{max}	400 mA
Outputs	8
can be configured as	4 digital, positive-switching (high side), with diagnostic capability 4 digital, positive-switching (high side), with diagnostic capability or PWM channel
switching current per output	max. 2 A
total current	max. 16 A
Operating voltage U_B	10...32 V DC
Current consumption	≤ 60 mA (without external load at 24 V DC)
Operating temperature	–40...85 °C
Storage temperature	–40...85 °C
Protection	IP 67
Interface	CAN interface 2.0 B, ISO 11898
Baud rate	20 Kbits/s...1 Mbit/s (default setting 125 Kbits/s) (adjustable using hex-code switches in the terminal chamber or via the CANopen object directory)
Communication profile	CANopen, CiA DS 301 version 4, CiA DS 401 version 2.1
Node ID (default)	hex 20 (= dec 32) (adjustable using hex-code switches in the terminal chamber or via the CANopen object directory)
Displays	1 LED green (PWR) 1 LED red (diagnosis, DIA) 16 LEDs yellow (status of the inputs / outputs)

CR2032 | **Technical data**

Connecting and operating elements



Hex-code switch coding

Switch	Position	Description
S1 Baud rate	0 1 2 3 4 5 6 7 8...E F	1000 Kbits/s 800 Kbits/s 500 Kbits/s 250 Kbits/s 125 Kbits/s 100 Kbits/s 50 Kbits/s 20 Kbits/s not defined adjustment via object directory (default)
S2 Node ID $_H$	0...7 F	high nibble, e.g. 20 hex (= 32 dec) adjustment via object directory (default)
S3 Node ID $_L$	0...E F	low nibble, e.g. 20 hex (= 32 dec) adjustment via object directory (default)

Operating states (LEDs)

LED	Status	Description
PWR (green)	OFF ON 2.0 Hz	no supply voltage module in stand-by mode CANopen status: PREOPERATIONAL / PREPARED outputs = OFF module active CANopen status: OPERATIONAL outputs are updated
DIA (red)	OFF ON	communication OK communication disturbed • node guard / heartbeat error (if node guarding / heartbeat is activated) • no synch objects (if synch monitoring is activated)
IN (yellow)	ON 2.0 Hz	binary output switched diagnosis failure
OUT (yellow)	ON	binary output: output switched (ON) analogue output: PWM preset value ≠ 0

CR2032	Characteristics of the inputs / outputs
Inputs Channel 1, 3, 5, 7 (pin 4)	■ Digital inputs, with diagnostic capability Switch-on level 0.7 U_B Switch-off level 0.3 U_B Input resistance 3.21 kΩ Input frequency max. 50 Hz
Channel 1, 3, 5, 7 (pin 2) can be configured as ...	■ Analogue inputs voltage, current, ratiometric or digital positive-switching
	Voltage inputs Input voltage 0...10/32 V Resolution 10 bits Input resistance 50/30 kΩ Input frequency 50 Hz Accuracy ± 1 % FS
	Current inputs Input current 0/4...20 mA Resolution 10 bits Input resistance 400 Ω Input frequency 50 Hz Accuracy ± 1 % FS
	Ratiometric inputs for potentiometric transducers (e.g. joystick) Function $((U_{IN} – ½U_B) ÷ ½U_B)$ x 1000 ‰ Value range 0...1000 ‰
	Digital inputs, with diagnostic capability Switch-on level 0.7 U_B Switch-off level 0.4 U_B Input resistance 30 kΩ Input frequency max. 50 Hz
Outputs Channel 2, 4, 6, 8 (pin 4) can be configured as ...	■ Semiconductor outputs, with diagnostic capability (wire break and short circuit) short-circuit and overload protected Switching voltage 10...32 V DC Switching current max. 2 A
	■ PWM outputs PWM frequency 20...250 Hz Pulse duty factor 0...1000 ‰ Resolution 1 ‰ Switching current max. 2 A (referred to PWM value 1000 ‰.)
Channel 2, 4, 6, 8 (pin 2) can be configured as ...	■ Semiconductor outputs, with diagnostic capability (wire break and short circuit) short-circuit and overload protected Switching voltage 10...32 V DC Switching current max. 2 A
Note	also see wiring (following page)

	Test standards and regulations
Climatic test	Damp heat to EN 60068-2-30, test Db (≤ 95% rel. humidity, non-condensing) Salt mist test to EN 60068-2-52, test Kb, severity level 3 Protection test to EN 60529
Mechanical resistance	Vibration to EN 60068-2-6, test Fc Shock to EN 60068-2-27, test Ea Bump to EN 60068-2-29, test Eb
Immunity to conducted interference	to ISO 7637-2: 2004, pulses 2a, 3a, 3b, 4, severity level 4, function state A to ISO 7637-2: 2004, pulse 1, 2b, severity level 4, function state C to ISO 7637-2: 2004, pulse 5, severity level 1, function state A
Immunity to interfering fields	according to UN/ECE-R10 at 100 V/m (E1 type approval) and DIN EN 61000-6-2 (CE)
Interference emission	according to UN/ECE-R10 (E1 type approval) and DIN EN 61000-6-3 (CE)
Tests for railway applications	EN 50155 clause 12.2 mechanical/climatic tests EN 50121-3-2 EMC noise emission and noise immunity additional information on request

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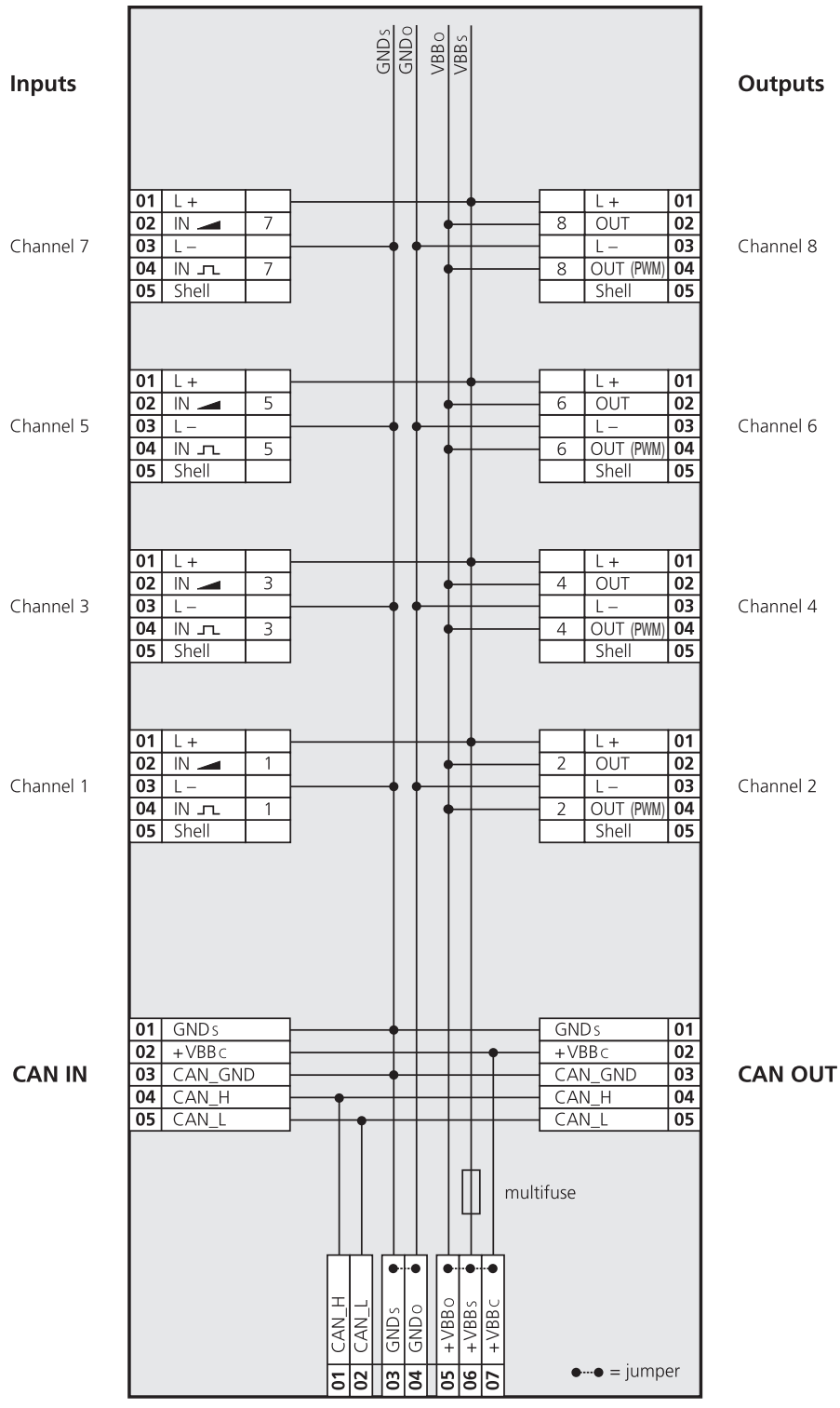
CR2032 | **Wiring**

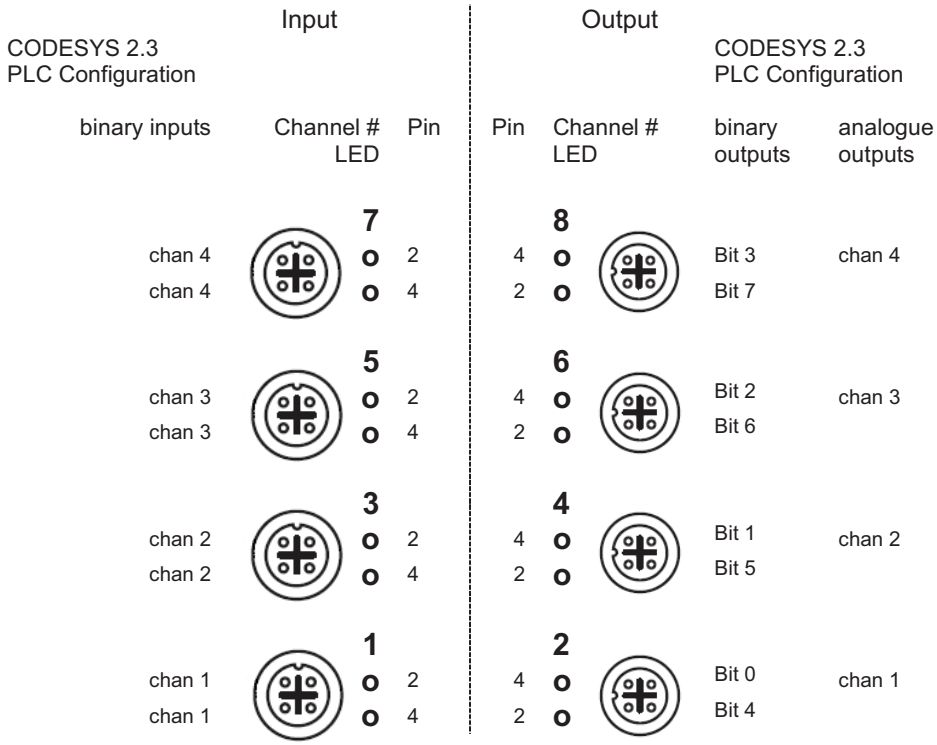


CAN Interface / Supply

Abbreviations

CAN_H = CAN interface (high)
CAN_L = CAN interface (low)
GND_O = ground (output)
GND_S = ground (module)
PWM = output for pulse-width modulated signals
VBB_C = operating voltage (via CANin/CANout plug)
VBB_O = operating voltage (output)
VBB_S = operating voltage (module)

CR2032 | **Assignment of the LEDs to the connections**



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10 Fault correction

10.1 EMCY Object

The following error codes to DSP-401 and DSP-301 are supported:

EMCY Code	Error Reg	Additional Code	Description
0x3300	0x05	0x00	"Output Voltage" Supply voltage V_{BBO} of the outputs is missing
0x6100	0x11	0x00	"Internal Software“ Overflow of a Tx queue, e.g. frequency of the RxPDOs is too high. Only external reset via an entry in 1003 00
0x6101	0x11	0x00	"Internal Software" Overflow of a Tx queue e.g. device does not communicate with the bus. Only external reset via an entry in 1003 00
0x8000	0x11	0x00	"Monitoring" (Synch Error) For "communication cycle" no synch object is received (only in OPERATIONAL). Reset with the next synch OBJ or PREOP.

EMCY Code	Error Reg	Additional Code	Description
0x8130	0x11	0x00	"Monitoring" (Guarding Error/Heartbeat Error) For "guard time" x "life time factor" no guard object is received or heartbeat object outside the expected time. Reset after node is active again.
0xFF00	0x81	bit coded 00 KK LL 00 00 00 KK LL 00 00	"Device Specific" 0b 0000 0001 channel 2, pin 4 short circuit 0b 0000 0010 channel 4, pin 4 short circuit 0b 0000 0100 channel 6, pin 4 short circuit 0b 0000 1000 channel 8, pin 4 short circuit 0b 0001 0000 channel 2, pin 2 short circuit 0b 0010 0000 channel 4, pin 2 short circuit 0b 0100 0000 channel 6, pin 2 short circuit 0b 1000 0000 channel 8, pin 2 short circuit 0b 0000 0001 channel 2, pin 4 wire break 0b 0000 0010 channel 4, pin 4 wire break 0b 0000 0100 channel 6, pin 4 wire break 0b 0000 1000 channel 8, pin 4 wire break 0b 0001 0000 channel 2, pin 2 wire break 0b 0010 0000 channel 4, pin 2 wire break 0b 0100 0000 channel 6, pin 2 wire break 0b 1000 0000 channel 8, pin 2 wire break

Explanation of the abbreviations:

0x...= hexadecimal value
0b...= bit coded
0d...= decimal value

str = string
rw = read-write
ro = read only
u8 = unsigned 8 bit
u16 = unsigned 16 bit

11 Object directory

11.1 Manufacturer Specific Profile Area; index 2000 to 5FFF

Index	S-Idx	Name	Type	Default	Description
2000	0	I/O Configuration	u8, ro	0x10	Number of the entries (= number of the I/O channels)
2000	1	Configuration input channel 1, pin 4	u8, rw	0x0A0	0 = OFF A = binary input B = binary input with diagnosis
2000	2	Configuration output channel 2, pin 4	u8, rw	0x02	0 = OFF 2 = binary output 4 = analogue output (PWM)
2000	3	Configuration input channel 3, pin 4	u8, rw	0x0A	0 = OFF A = binary input B = binary input with diagnosis

Index	S-Idx	Name	Type	Default	Description
2000	4	Configuration output channel 4, pin 4	u8, rw	0x02	0 = OFF 2 = binary output 4 = analogue output (PWM)
2000	5	Configuration output channel 5, pin 4	u8, rw	0x0A	0 = OFF A = binary input B = binary input with diagnosis
2000	6	Configuration output channel 6, pin 4	u8, rw	0x02	0 = OFF 2 = binary output 4 = analogue output (PWM)
2000	7	Configuration input channel 7, pin 4	u8, rw	0x0A	0 = OFF A = binary input B = binary input with diagnosis
2000	8	Configuration output channel 8, pin 4	u8, rw	0x02	0 = OFF 2 = binary output 4 = analogue output (PWM)
2000	9	Configuration input channel 1, pin 2	u8, rw	0x03	0 = OFF 3 = voltage 0...10,000 mV 6 = ratiometric 0...1000 ‰ 7 = current 0...20,000 µA 9 = voltage 0...32,000 mV A = binary input with analogue evaluation B = binary input with analogue evaluation (with diagnosis)
2000	0A	Configuration output channel 2, pin 2	u8, rw	0x02	0 = OFF 2 = binary output
2000	0B	Configuration input channel 3, pin 2	u8, rw	0x03	0 = OFF 3 = voltage 0...10,000 mV 6 = ratiometric 0...1000 ‰ 7 = current 0...20,000 µA 9 = voltage 0...32,000 mV A = binary input with analogue evaluation B = binary input with analogue evaluation (with diagnosis)
2000	0C	Configuration output channel 4, pin 2	u8, rw	0x02	0 = OFF 2 = binary output
2000	0D	Configuration input channel 5, pin 2	u8, rw	0x03	0 = OFF 3 = voltage 0...10,000 mV 6 = ratiometric 0...1000 ‰ 7 = current 0...20,000 µA 9 = voltage 0...32,000 mV A = binary input with analogue evaluation B = binary input with analogue evaluation (with diagnosis)

Index	S-Idx	Name	Type	Default	Description
2000	0E	Configuration output channel 6, pin 2	u8, rw	0x02	0 = OFF 2 = binary output
2000	0F	Configuration input channel 7, pin 2	u8, rw	0x03	0 = OFF 3 = voltage 0...10,000 mV 6 = ratiometric 0...1000 ‰ 7 = current 0...20,000 µA 9 = voltage 0...32,000 mV A = binary input with analogue evaluation B = binary input with analogue evaluation (with diagnosis)
2000	10	Configuration output channel 8, pin 2	u8, rw	0x02	0 = OFF 2 = binary output
2001	0	PWM Frequency	u8, rw	0x64 (100 Hz)	Setting in Hz (20...250 Hz) If an invalid value is entered, the previous value remains valid.
20F0 20F1	0	Setting of the Node ID *)	u8, rw	0x20 (= 0d32)	The node ID used to access the module in the CANopen network.
20F2 20F3	0	Setting of the Baud rate *)	u8, rw	0x04	Baud rate of the CAN network 0 = 1000 kBaud 1 = 800 kBaud 2 = 500 kBaud 3 = 250 kBaud 4 = 125 kBaud (default) 5 = 100 kBaud 6 = 50 kBaud 7 = 20 kBaud

*) The entries 20F0/20F1 and 20F2/20F3 must always contain identical values. The new entries are valid after a reset (switching the module off/on).
Values outside the permissible ranges will be rejected.

Observe hex-code switch position!
Entries under 20F0/20F1 and 20F2/20F3 are only valid if the hex-code switches for baud rate (S1) and/or node ID (S2, S3) are in the position "F".
(For position and coding of the hex-code switches see connecting and operating elements → 9 Technical data)

Explanation of the abbreviations:

0x...= hexadecimal value
0b...= bit coded
0d...= decimal value

str = string
rw = read-write
ro = read only
u8 = unsigned 8 bit
u16 = unsigned 16 bit

11.2 Communication Profile Area; index 1000 to 1FFF

Index	S-Idx	Designation	Type	Default	Description
1000	0	Device type	u32, ro	0x000F0191	Profile 401; Inputs and outputs, binary and analogue
1001	0	Error register	u8, ro	0x00	Bit-coded to profile 301, the following is supported: 0b 0000 0000 no error 0b 0000 0001 generic error 0b 0001 0000 communication error 0b 1000 0000 manufacturer specific
1003	0	Pre-defined errorfield	u8, ro	0x04	An error list with 4 entries is supported.
1003	1...4	Error history	u32, ro	0x00	Error occured, coded according to the EMCY list, the last error is in the subindex 1.
1005	0	COB ID synch objekt	u32, rw	0x00000080	- Module generates no synch message (bit 30 = 0) - 11-bit identifier system (bit 29 = 0) - Identifier of the synch message
1006	0	Communic Cycle.	u32, rw	0x00000000	Max. time between 2 synch objects in µs. Useful resolution = 1ms
1008	0	Device name	str, ro	CR2032	Device name
1009	0	HW Version	str, ro	x.x	Hardware version
100A	0	SW Version	str, ro	x.x	Software version
100C	0	Guard time	u16, rw	0x0000	Time in ms Within this time the output module expects a "node guarding" of the network master. If the value 0 is entered here, this function is not supported. Note: Node monitoring with "node guarding" or "heartbeat" can only to be used as an alternative.
100D	0	Life time factor	u8, rw	0x00	If no "node guarding" is received for "guard time" x "life time", the module switches the outputs off. The module changes the CANopen status to PREOP. The result from "guard time" x "life time" must be between 0 and 65535.
1010	0	Number of save options	u8, ro	0x01	Number of the "save" options
1010	1	"Save all parameters”	u32, rw	0x02	Automatic saving of all changed parameters OFF/ON. 0 = AutoSave OFF 2 = AutoSave ON

Index	S-Idx	Designation	Type	Default	Description
1011	0	Number of re-store options	u8, ro	0x01	Number of the "restore" options
1011	1	"reset for all parameters"	u32, rw	0x01	If the string "load" is entered here, the parameters are assigned to the factory default values and are valid after the next reset.
1014	0	COB ID Emergency	u32, rw	0x00000080 + Node ID	- EMCY is valid (Bit 31 = 0) - EMCY is not valid (Bit 31 = 1) - 11 Bit ID (Bit 29 = 0) - ID = 0x80 + Node ID CAN identifier can be changed by the user.
1016	0	Number of options Consumer heartbeat time	u8, ro	0x01	Number of the monitored units
1016	1	Consumer heartbeat time	u32, rw	0x00	Heartbeat monitoring time for node n. Monitoring of only one node is supported. 0x0nn**tttt** = monitoring time [ms] 0x0**nn**tttt = node number (If nn or tttt = 0, no monitoring is carried out) Note: Node monitoring with "node guarding" or "heartbeat" is only to be used as an alternative.
1017	0	Producer heartbeat time	u16, rw	0x00	Time interval [ms] where the incli-nation sensor generates a producer heartbeat.
1018	0	Number of identity objects	u8, ro	0x01	Device identification
1018	1	Vendor ID	u32, ro	0x0069666D	Vendor ID to CiA specification
1400	0	Receive PDO 1	u8, ro	0x02	Number of the entries Rec PDO 1 Binary outputs
1400	1	COB ID PDO 1	u32, rw	0x200 + Node ID	- PDO is valid (bit 31 = 0) - CAN-ID des 1. Rec PDOs
1400	2	Trans Type PDO 1	u8, rw	0x01	0x00 = synch acyclic 0x01...0xF0 = synch cylic, Outputs are only updated after "n" synch objects. n = 0x01 (1) ... 0xF0 (240) 0xFC/0xFD not implemented 0xFE = asynch manuf. specific event, outputs are updated immediately 0xFF = asynch device profile event, outputs are updated immediately
1401	0	Receive PDO 2	u8, ro	0x02	Number of the entries Rec PDO 2 Analogue outputs

Index	S-Idx	Designation	Type	Default	Description
1401	1	COB ID PDO 2	u32, rw	0x300 + Node ID	- PDO is valid (Bit 31 = 0) - CAN ID of the 2nd Rec PDOs
1401	2	Trans Type PDO 2	u8, rw	0x01	0x00 = synch acyclic 0x01...0xF0 = synch cylic, Outputs are only updated after "n" synch objects. n = 0x01 (1) ... 0xF0 (240) 0xFC/0xFD not implemented 0xFE = asynch manuf. specific event, outputs are updated immediately 0xFF = asynch device profile event, outputs are updated immediately
1600	0	Mapping Rec PDO 1	u32, ro	0x01	Number of the application objects linked with the binary output PDO
1600	1	Index in the object directory	u32, ro	0x6200 01	6200 Sldx 01 contains 1 byte binary outputs 0b 0000 0001 channel 2, pin 4 0b 0000 0010 channel 4, pin 4 0b 0000 0100 channel 6, pin 4 0b 0000 1000 channel 8, pin 4 0b 0001 0000 channel 2, pin 2 0b 0010 0000 channel 4, pin 2 0b 0100 0000 channel 6, pin 2 0b 1000 0000 channel 8, pin 2
1601	0	Mapping Rec PDO 2	u32, ro	0x04	Number of the application objects linked with the analogue output PDO
1601	1	Index in the object directory	u32, ro	0x6411 01	6411 Sldx 01 contains the preset value of the analogue output channel 2, pin 4. Depending on the configuration of the index 2000 the value can be interpreted as pulse/break ratio in ‰ (PWM). 0 ‰ = constant OFF 1000 ‰ = constant ON Values > 1000 ‰ are internally rounded off to 1000 ‰
1601	2	Index in the object directory	u32, ro	0x6411 02	6411 Sldx 02 contains the preset value of the analogue output channel 4, pin 4. (see also S-Idx 1)
1601	3	Index in the object directory	u32, ro	0x6411 03	6411 Sldx 03 contains the preset value of the analogue output channel 6, pin 4. (see also S-Idx 1)
1601	4	Index in the object directory	u32, ro	0x6411 04	6411 Sldx 04 contains the preset value of the analogue output channel 8, pin 4. (see also S-Idx 1)
1800	0	Trans PDO 1	u8, ro	0x05	Number of the entries Trans PDO 1 Binary inputs
1800	1	COB ID PDO 1	u32, rw	0x180 + Node ID	- PDO is valid (bit 31 = 0) - CAN ID of the 1st Trans PDOs

Index	S-Idx	Designation	Type	Default	Description
1800	2	Trans Type PDO 1	u8, rw	0xFF	0x00 = synch acyclic 0x01...0xF0 = synch cyclic; Inputs are only transferred after "n" synch objects. n = 0x01 (1) ... 0xF0 (240) 0xFC/0xFD not implemented 0xFE = asynch man. spec. event; Inputs are immediately transferred. 0xFF = asynch device profile event; Inputs are immediately transferred.
1800	5	Event timer Trans PDO 1	u16, rw	0x00	Max. transfer break in trans type "asynch" (0...65535 ms) When this time has elapsed the PDO is transferred even if the appl. event has not occurred.
1801	0	Trans PDO 2	u8, ro	0x05	Number of the entries Trans PDO 2 Analogue inputs
1801	1	COB ID PDO 2	u32, rw	0x280 + Node ID	- PDO is valid (Bit 31 = 0) - CAN ID of the 2nd Trans PDOs
1801	2	Trans Type PDO 2	u8, rw	0x01	0x00 = synch acyclic 0x01...0xF0 = synch cyclic; Analogue values are only transferred after "n" synch objects. n = 0x01 (1) ... 0xF0 (240) 0xFC/0xFD not implemented 0xFE = asynch man. spec. event; Analogue values are immediately transferred. 0xFF = asynch device profile event; When configured as binary input, a modified value is transferred immediately. Inputs configured as analogue inputs are not concerned, for these inputs the event timer has to be activated.
1801	5	Event timer Trans PDO 2	u16, rw	0x00	Max. transfer break in trans type "asynch" (0...65535 ms) When this time has elapsed the PDO is transferred even if the appl. event has not occurred.
1A00	0	Mapping Trans PDO 1	u32, ro	0x01	Number of the linked application objects (Binary inputs)
1A00	1	Index in the object directory	u32, ro	0x2020 01	IIdx 2020, Sldx 01 contains the binary value, channel 1, pin 4 01 00 00 00 00 00 00 00 with diagnosis: FE FF 00 00 00 00 00 00 = short circuit to V_{BB} FF FF 00 00 00 00 00 00 = wire break/short circuit to ground

Index	S-Idx	Designation	Type	Default	Description
1A00	2	Index in the object directory	u32, ro	0x2020 02	Idx 2020, SIdx 02 contains the binary value, channel 3, pin 4 00 00 01 00 00 00 00 00 with diagnosis: 00 00 FE FF 00 00 00 00 = short circuit to V_{BB} 00 00 FF FF 00 00 00 00 = wire break/short circuit to ground
1A00	3	Index in the object directory	u32, ro	0x2020 03	Idx 2020, SIdx 04 contains the binary value, channel 5, pin 4 00 00 00 00 01 00 00 00 with diagnosis: 00 00 00 00 FE FF 00 00 = short circuit to V_{BB} 00 00 00 00 FF FF 00 00 = wire break/short circuit to ground
1A00	4	Index in the object directory	u32, ro	0x2020 04	Idx 2020, SIdx 04 contains the binary value, channel 7, pin 4 00 00 00 00 00 00 01 00 with diagnosis: 00 00 00 00 00 00 FE FF = short circuit to V_{BB} 00 00 00 00 00 00 FF FF = wire break/short circuit to ground
1A01	0	Mapping Trans PDO 2	u32, ro	0x04	Number of the linked application objects Analogue inputs
1A01	1	Index in the object directory	u32, ro	0x2002 01	Idx 2002, SIdx 01 contains the analogue value channel 1, pin 2 voltage 0...10,000 mV ratiometric 0...1000 ‰ current 0...20,000 µA voltage 0...32,000 mV binary input with analogue evaluation 01 00 00 00 00 00 00 00 binary input with analogue evaluation (with diagnosis) FE FF 00 00 00 00 00 00 = short circuit to V_{BB} FF FF 00 00 00 00 00 00 = wire break/short circuit to ground

Index	S-Idx	Designation	Type	Default	Description
1A01	2	Index in the object directory	u32, ro	0x2002 02	Idx 2002, SIdx 02 contains the analogue value channel 3, pin 2 voltage 0...10,000 mV ratiometric 0...1000 ‰ current 0...20,000 µA voltage 0...32,000 mV binary input with analogue evaluation 01 00 00 00 00 00 00 00 binary input with analogue evaluation (with diagnosis) 00 00 FE FF 00 00 00 00 = short circuit to V_{BB} 00 00 FF FF 00 00 00 00 = wire break/short circuit to ground
1A01	3	Index in the object directory	u32, ro	0x2002 03	Idx 2002, SIdx 03 contains the analogue value channel 5, pin 2 voltage 0...10,000 mV ratiometric 0...1000 ‰ current 0...20,000 µA voltage 0...32,000 mV binary input with analogue evaluation 01 00 00 00 00 00 00 00 binary input with analogue evaluation (with diagnosis) 00 00 00 00 FE FF 00 00 = short circuit to V_{BB} 00 00 00 00 FF FF 00 00 = wire break/short circuit to ground
1A01	4	Index in the object directory	u32, ro	0x2002 04	Idx 2002, SIdx 04 contains the analogue value channel 7, pin 2 voltage 0...10,000 mV ratiometric 0...1000 ‰ current 0...20,000 µA voltage 0...32,000 mV binary input with analogue evaluation 01 00 00 00 00 00 00 00 binary input with analogue evaluation (with diagnosis) 00 00 00 00 00 00 FE FF = short circuit to V_{BB} 00 00 00 00 00 00 FF FF = wire break/short circuit to ground

Explanation of the abbreviations:

0x...= hexadecimal value
0b...= bit coded
0d...= decimal value

str = string
rw = read-write
ro = read only
u8 = unsigned 8 bit
u16 = unsigned 16 bit

12 Maintenance, repair and disposal

As the module does not contain any components which must be maintained by the user, the housing must not be opened.
The maintenance of the module may only be carried out by the manufacturer.

The disposal must be carried out according to the corresponding national environmental regulations.

13 Declaration of conformity

For test standards and regulations → 9 Technical data.

The CE Declaration of Conformity and the E1-approval are available at: www.ifm.com.

14 Terms and abbreviations

0b ...	binary value (for bit coding), e.g. 0b0001 0000
0d ...	decimal numerical value, e.g. 0d100
0x ...	hexadecimal value, e.g. 0x64 (= 100 decimal)
Baudrate	transmission speed (1 baud = 1 bit/s)
CAL	CAN Application Layer CAN-based network protocol on application level
CAN	Controller Area Network (bus system for use in mobile applications)
CAN_H	CAN-High; CAN connection /cable with high voltage level
CAN_L	CAN-Low; CAN connection /cable with low voltage level
CANopen	CAN-based network protocol on application level with an open configuration interface (object directory)
CiA	"CAN in Automation e.V." (user and manufacturer organisation in Germany/Erlangen) Definition and control body for CAN and CAN-based network protocols
CiA DS	Draft Standard (published CiA specification which usually has not been modified or supplemented for one year)
CiA DSP	Draft Standard Proposal (published CiA specification draft)
CiA WD	Work Draft (work draft accepted for discussion within CiA)
CiA DS 301	Specification for CANopen communication profile; describes the basic communication between network participants, such as the transfer of process data in real time, the exchange of data between units or the configuration stage. Depending on the application this is completed by the following CiA specifications:
CiA DS 401	Device profile for digital and analogue I/O modules
CiA DS 402	Device profile for drives
CiA DS 403	Device profile for HMI
CiA DS 404	Device profile for measurement and control technology
CiA DS 405	Specification for interfaces to programmable systems (IEC 61131-3)
CiA DS 406	Device profile for encoders
CiA DS 407	Application profile for local public transport

COB	CANopen Communication Object (PDO, SDO EMCY, ...)
COB ID	CANopen Identifier of a Communication Object
Communication cycle	the synchronisation time to be monitored, max. time between 2 Sync objects
EMCY Object	Emergency Object (alarm message, device indicates an error)
Error Reg	Error Register (entry with an error code)
Guarding Error	Node or network participant could or can no longer be found Guard Master: one or several slaves no longer reply Guard Slave: no polling of the slave
Guard Time	During this time the network participant expects a "Node Guarding" of the network master
Heartbeat	Cyclic monitoring with parameter setting among network participants. In contrast to "node guarding" no superior NMT master is required.
ID (Identifier)	identifies a CAN message. The numerical value of the ID also contains a priority for the access to the bus system ID 0 = top priority
Idx Index;	together with the S index it forms the address of an entry in the object directory
Life Time Factor	number of attempts in case of a missing Guarding reply
Monitoring	is used to describe the error class (guarding monitoring, synch etc.)
NMT	network management
NMT-Master/-Slaves	The NMT master controls the operating states of the NMT slaves
Node Guarding	adjustable cyclic monitoring of slave network participants by a higher master node as well as the monitoring of this polling process by the slave participants
Node ID	node identifier (identification of a participant in the CANopen network)
Object (OBJ)	term for data/messages which can be exchanged in the CANopen network
Object directory	contains all CANopen communication parameters of a device as well as device-specific parameters and data. Access to the individual entries is possible via the index and S index.
Operational	Operating state of a CANopen participant. In this mode SDOs, NMT commands and PDOs can be transferred.
PDO	Process Data Object; in the CANopen network for transfer of process data in real time; such as the speed of a motor. PDOs have a higher priority than SDOs; in contrast to the SDOs they are transferred without confirmation. PDOs consist of a CAN message with identifier and up to 8 bytes of user data.
PDO Mapping	describes the application data transferred with a PDO.
Pre-Op	Preoperational; operating state of a CANopen participant. After application of the supply voltage each participant automatically goes into this state. In the CANopen network only SDOs and NMT commands can be transferred in this mode but no process data.
Prepared	(also stopped) operating state of a CANopen participant In this mode only NMT commands are transferred.
Rec PDO (Rx PDO)	Receive Process Data Object (also Rx PDO)
ro	read only (unidirectional)
rw	read-write (bidirectional)
Rx-Queue	reception buffer
s16	data type signed 16 bit

SDO	Service Data Object; With this object direct access to the object directory of a network participant is possible (read/write). An SDO can consist of several CAN messages. The transfer of the individual messages is confirmed by the addressed participant. With the SDOs devices can be configured and parameters can be set.
Server SDO	process and parameter set to make the object directory of a network participant available to other participants (clients).
S-Idx (SIdx)	Subindex within the object directory of a CANopen device
Start Guarding	start node guarding
str	data type string (variable for strings such as text "load")
Sync Error	missing Sync OBJ in the adjustable communication cycle
Sync OBJ	synchronisation object for simultaneous update in the complete network or for accepting process data of the respective parameterised PDOs.
Sync Windows	time during which the synchronous PDOs have to be transferred
Time Stamp	time stamp to align existing clocks in network participants
Trans PDO (Tx PDO)	transmit process data object
Trans SDO (Tx SDO)	transmit service data object
Tx-Queue	(transmit) transmission buffer
u8 (16, 32)	data type unsigned 8 (16, 32) bits
wo	write only