



COS-Series

Hardware-Description

2023 September

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Commissioning



1. Commissioning

1.1. Step 1 - Safety instructions

Before commissioning your DEDITEC product, please familiarize yourself with this manual and read the following points carefully:

- Damage caused by non-observance of these operating instructions will void the warranty or guarantee of this product. We do not accept any liability for consequential damage!
- We do not accept any liability for damage to property or personal injury that could result from improper handling or non-observance of the safety instructions!
- Avoid touching electronic components on the circuit board directly. This could lead to electrostatic discharges and destroy sensitive components. As a precaution, always discharge before touching an electrically grounded object.
- Unauthorized conversions or technical modifications to this product are not permitted for safety and approval reasons (CE) and will void the warranty or guarantee.
- Do not operate the module outside the maximum permissible technical data.
- The product is not suitable for operation in damp or wet environments.

1.2. Step 2 - Connecting the power supply

Select a suitable power supply* with sufficient power of at least 5 watts and an output voltage of, for example, +7VDC or +24VDC.

The 5-pin connector can be used to connect the power supply and CAN bus in parallel.

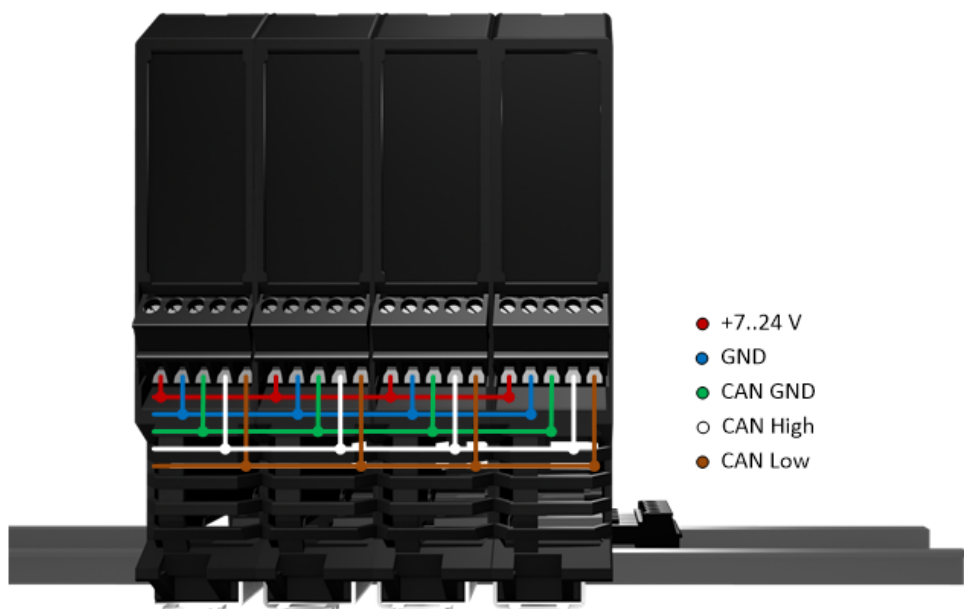
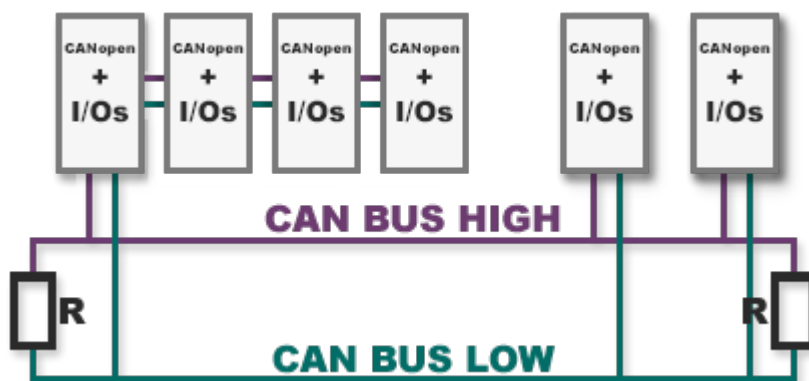


Pin	Description	Explanation
1	+7..24V	Power supply
2	GND	
3	CAN GND	CAN-Bus
4	CAN High	
5	CAN Low	

1.3. Step 3 - Installation

Modules of the COS series can be operated stand-alone or in a network.

In the network, the CAN bus and the power supply can be passed on via the in-rail bus connector.



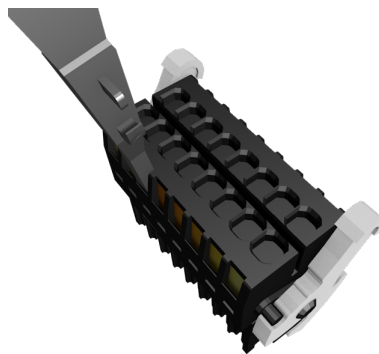
1.4. Step 4 - Connecting the I/O connectors

For the line connection to the I/O connectors you need an auxiliary tool, which is included in the scope of delivery.

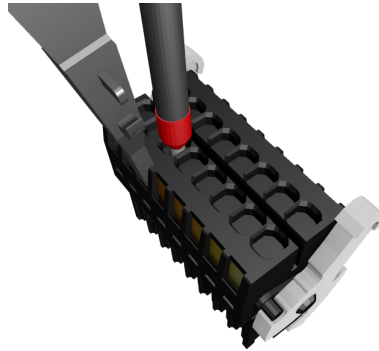


Please proceed as follows for connection:

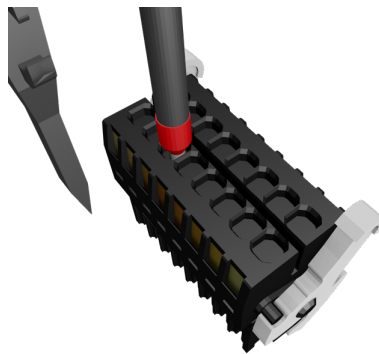
- Insert the operating tool firmly (downwards) into the side opening in the direction of the conductor connection.



- Strip 6-7mm of insulation from the connecting cable and insert it into the open terminal contact.



- Pull out the actuating tool again. Then check whether the line is firmly seated in the terminal!



Hardware Description



2. Hardware Description

2.1. General technical data

The modules of the COS series can be operated as stand-alone device as well as in a network of several COS modules.

Due to the CANopen profiles according to CiA® specification CiA 301, CiA 305 and CiA 401, this module is ideally suited for almost all application areas in modern automation technology.

Below you can see the technical data of the CAN interface as well as the module specifications.

Technical data interface:

Electrical data:

Supply voltage stand-alone:	7V to 24V DC via voltage plug
Supply voltage in network:	Internal via DIN Rail bus
Current consumption:	Max. 130mA/24V

Environment:

Ambient temperature:	+10..+50 °C
Humidity:	90
Condensation:	Not allowed

Mechanics:

Dimensions in mm (LxWxH):	111 x 22.5 x 117
Mounting:	Top-hat rail TS 35 x 7.5 mm

Interface:

CAN:	galvanically isolated via optocoupler
Baud rates:	1 Mbit/s, 800 Kbit/s, 500 Kbit/s, 250 Kbit/s, 125 Kbit/s, 100 Kbit/s, 50 Kbit/s, 20 Kbit/s, 10 Kbit/s or Autobaud
Node-ID:	Configurable via coding switch or LSS (0x01 .. 0x7F)

2.1.1. Specifications of the COS-DI08



Special features:

Digital inputs/outputs:

8 channels, separately as input or output via CAN configurable

Outputs:

Property:

High-side driver (plus switching)

Protective functions:

Overcurrent and overtemperature Protection

Switching voltage:

5,5V - 36V DC

Max. Switching current:

3A DC

Max. Switching capacity:

60W DC

Inputs:

Input voltage:

3,3V - 36V DC

Input resistance:

>1 Mohm

ESD-Protected:

+500 V

Reference voltage input:

The voltage level at the input pin determines the High/Low switching threshold

Determination of the switching threshold:

Input High when:

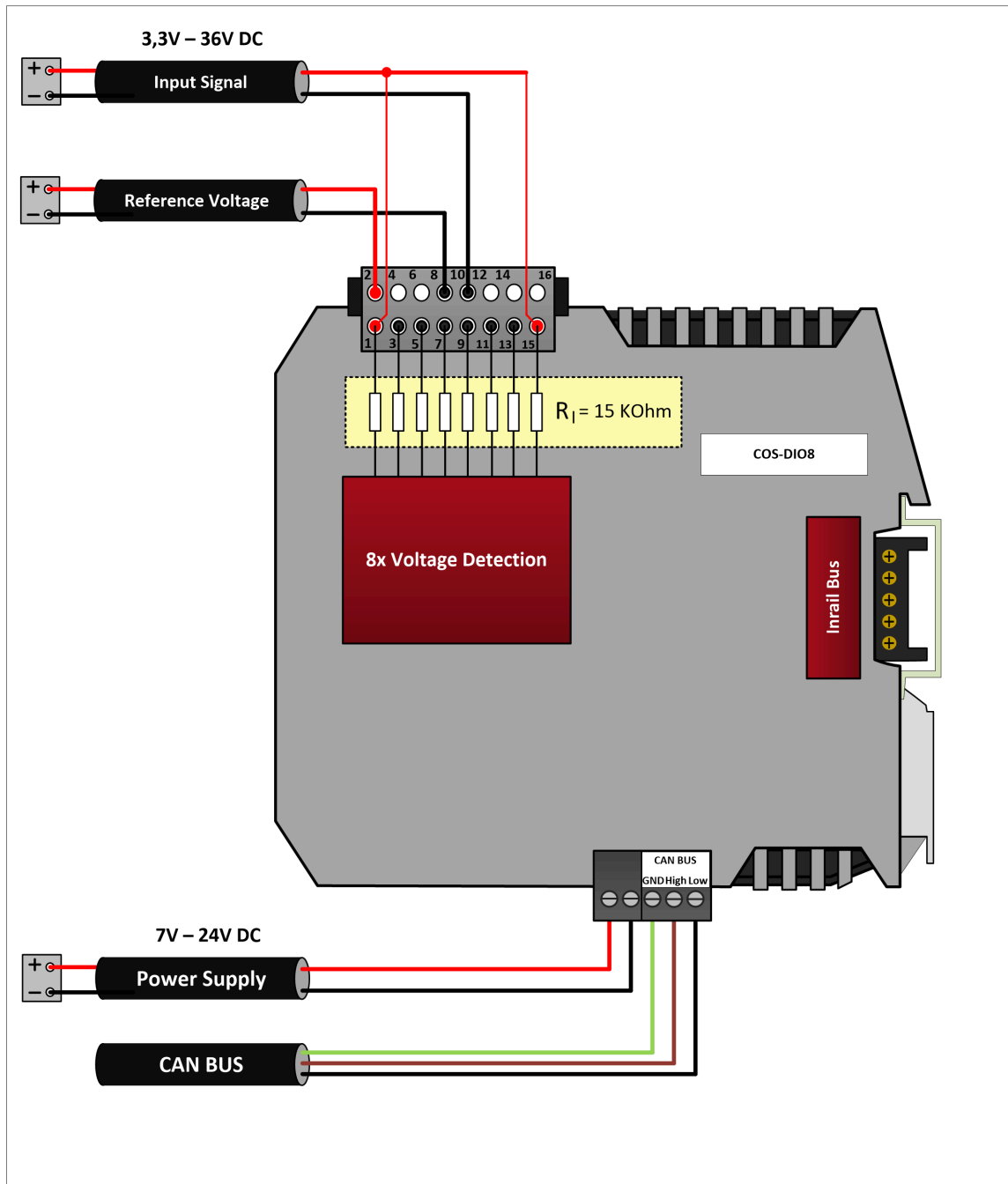
Input voltage $\geq \frac{1}{3}$ of the
Reference voltage

Input Low when:

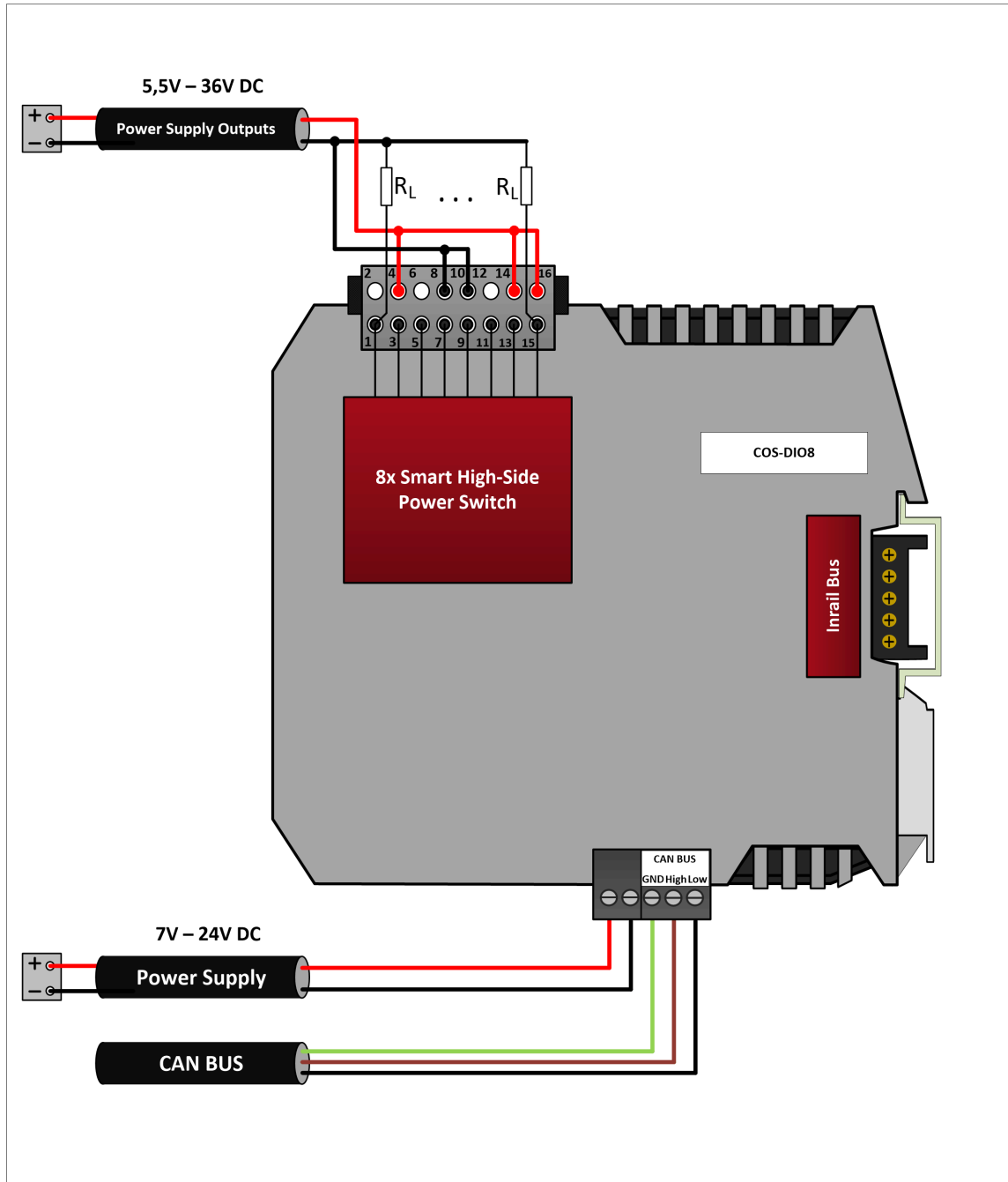
Input voltage $< \frac{1}{3}$ of
Reference voltage

2.1.1.1. Connection examples of a COS-DIO8

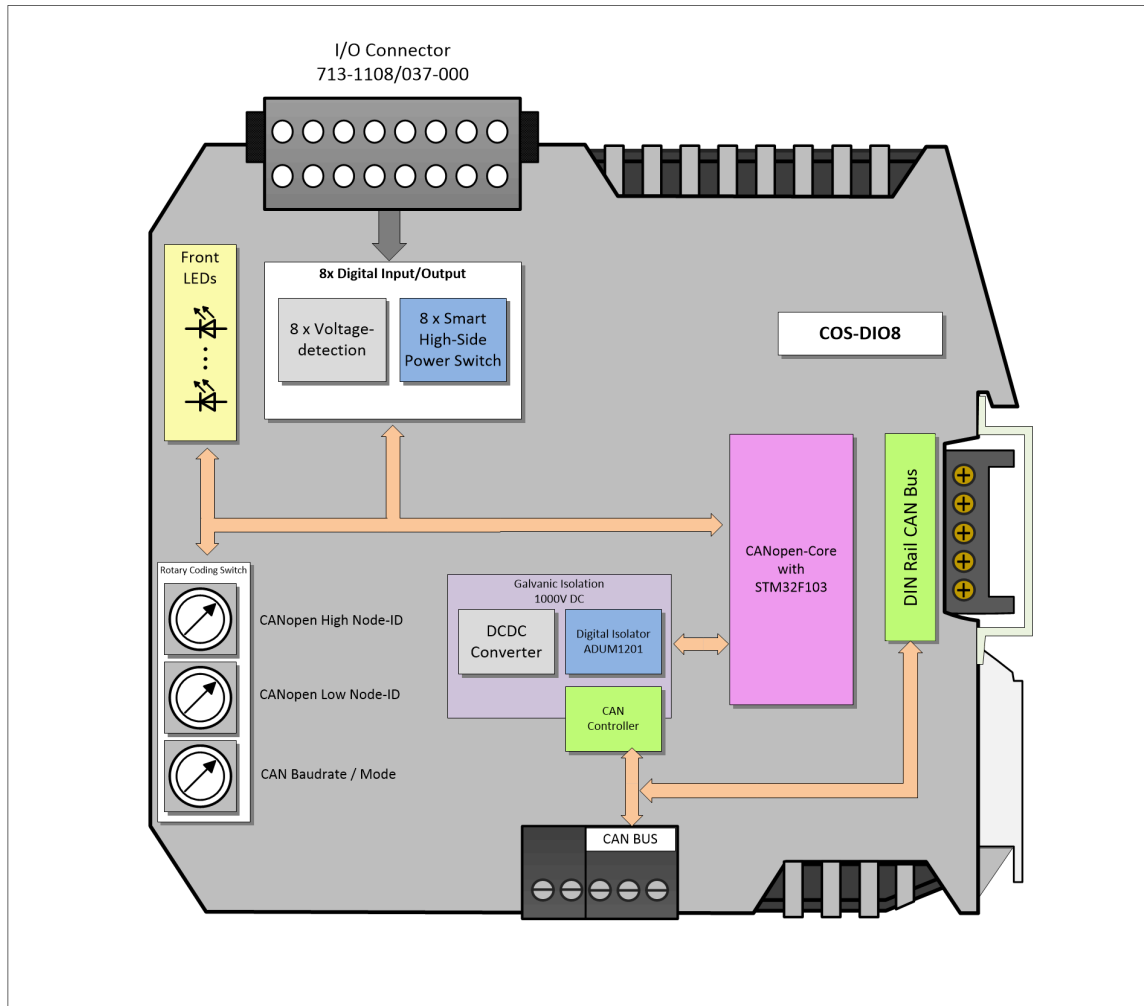
2.1.1.1.1. COS-DIO8 inputs



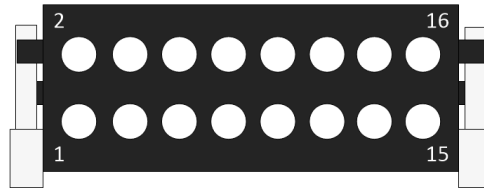
2.1.1.1.2. COS-DIO8 outputs



2.1.1.2. Block diagram of a COS-DIO8



2.1.1.3. Pin assignment



Port	Pin	Port	Pin
DIO1	1	DIO5	9
VCC+ Input	2	GND	10
DIO2	3	DIO6	11
VCC+ Output	4	-	12
DIO3	5	DIO7	13
-	6	VCC+ Output	14
DIO4	7	DIO8	15
GND	8	VCC+ Output	16

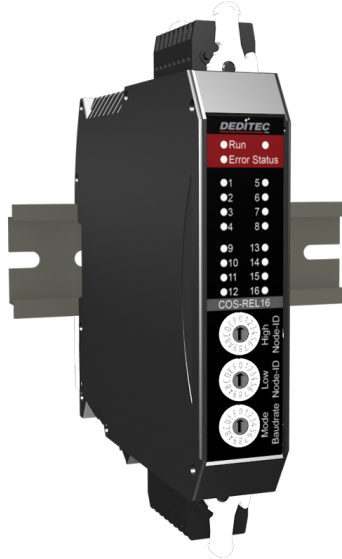
Attention:

Each connector has 3 VCC+ inputs, each of which is designed for a maximum load of 8A.

For example, if the total load of the connector is 20A, 3 VCC+ inputs must be used.

Total load	Required VCC+ pins
<= 8A	1
<= 16A	2
<= 24A	3

2.1.2. Specifications of the COS-REL16



Special features:

Digital outputs: 16 channels

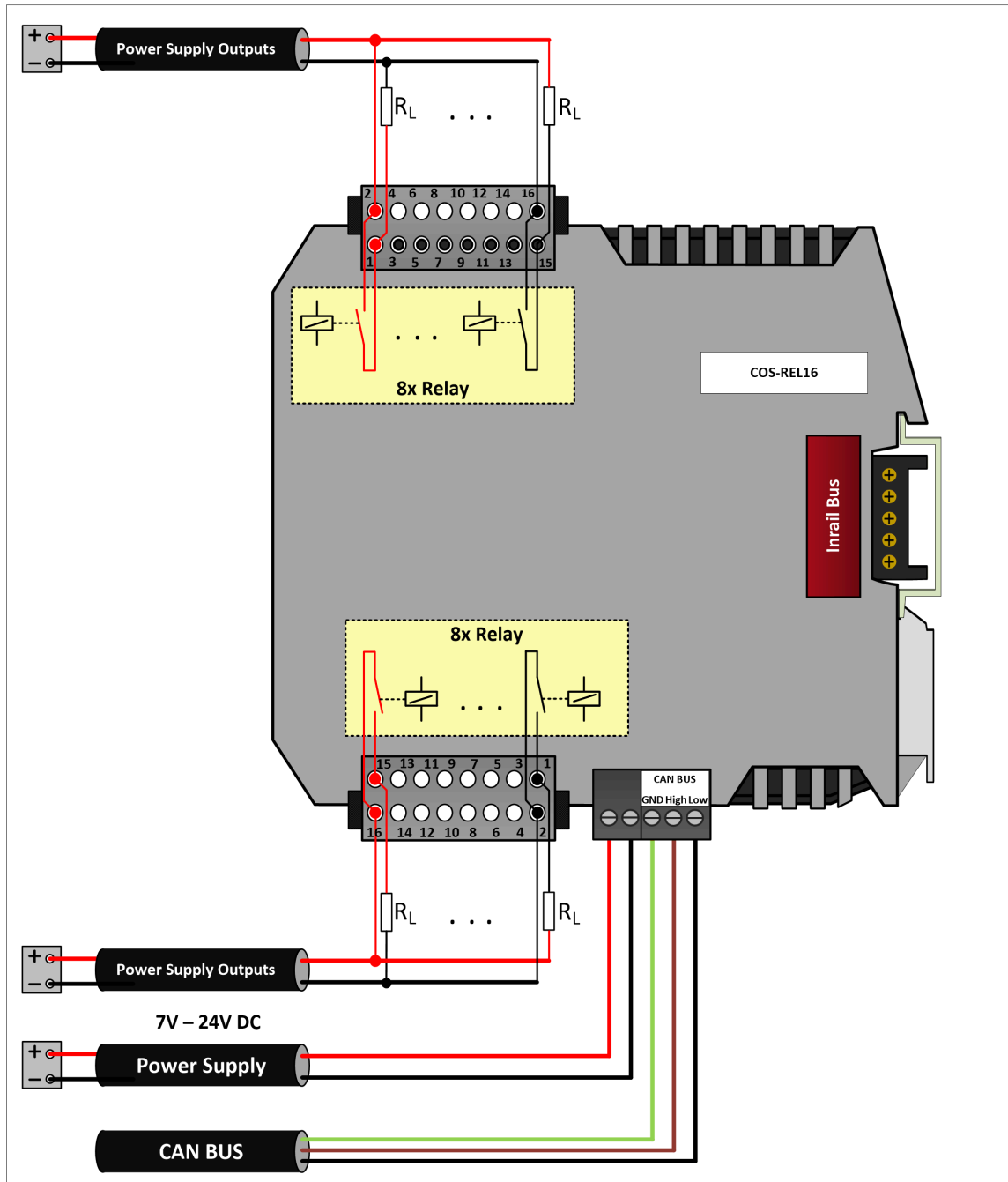
Technical data relay 3A

Type: Normally open (NO)
Max. Switching voltage: 48V AC / DC
Max. Switching current: 3A AC / DC
Max. Transport current: 3A AC / DC
Max. Switching power: 90W

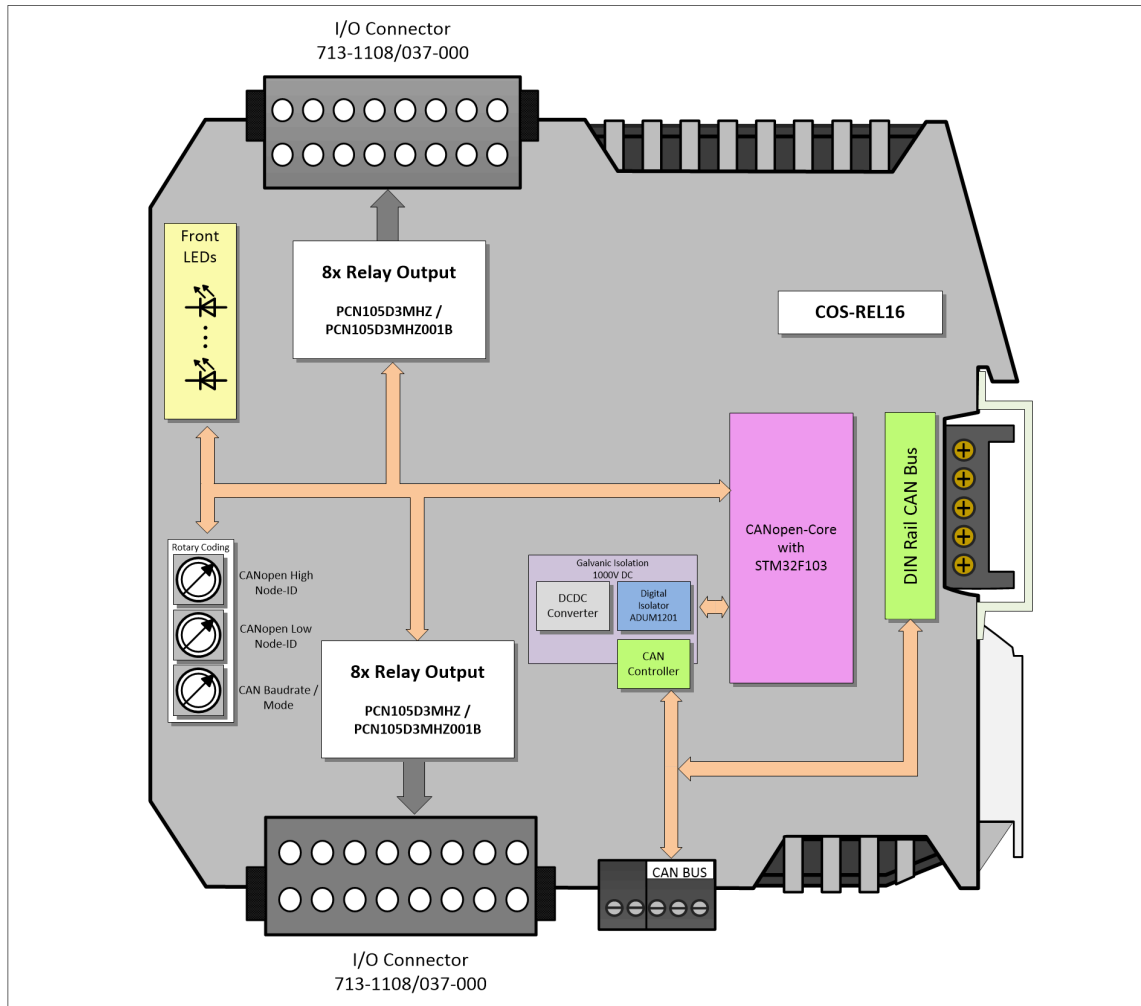
Technical data relay 5A

Type: Normally open (NO)
Max. Switching voltage: 48V AC / DC
Max. Switching current: 5A AC / DC
Max. Transport current: 5A AC / DC
Max. Switching power: 144W

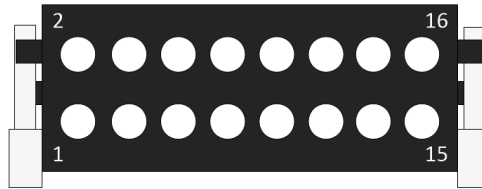
2.1.2.1. Connection examples of a COS-REL16



2.1.2.2. Block diagram of a COS-REL16



2.1.2.3. Pin assignment



Digital Output Channel	Pin	
Output Channel 1	1	2
Output Channel 2	3	4
Output Channel 3	5	6
Output Channel 4	7	8
Output Channel 5	9	10
Output Channel 6	11	12
Output Channel 7	13	14
Output Channel 8	15	16

2.1.3. Specifications of the COS-REL8



Special features:

Digitale Ausgänge: 8 channels

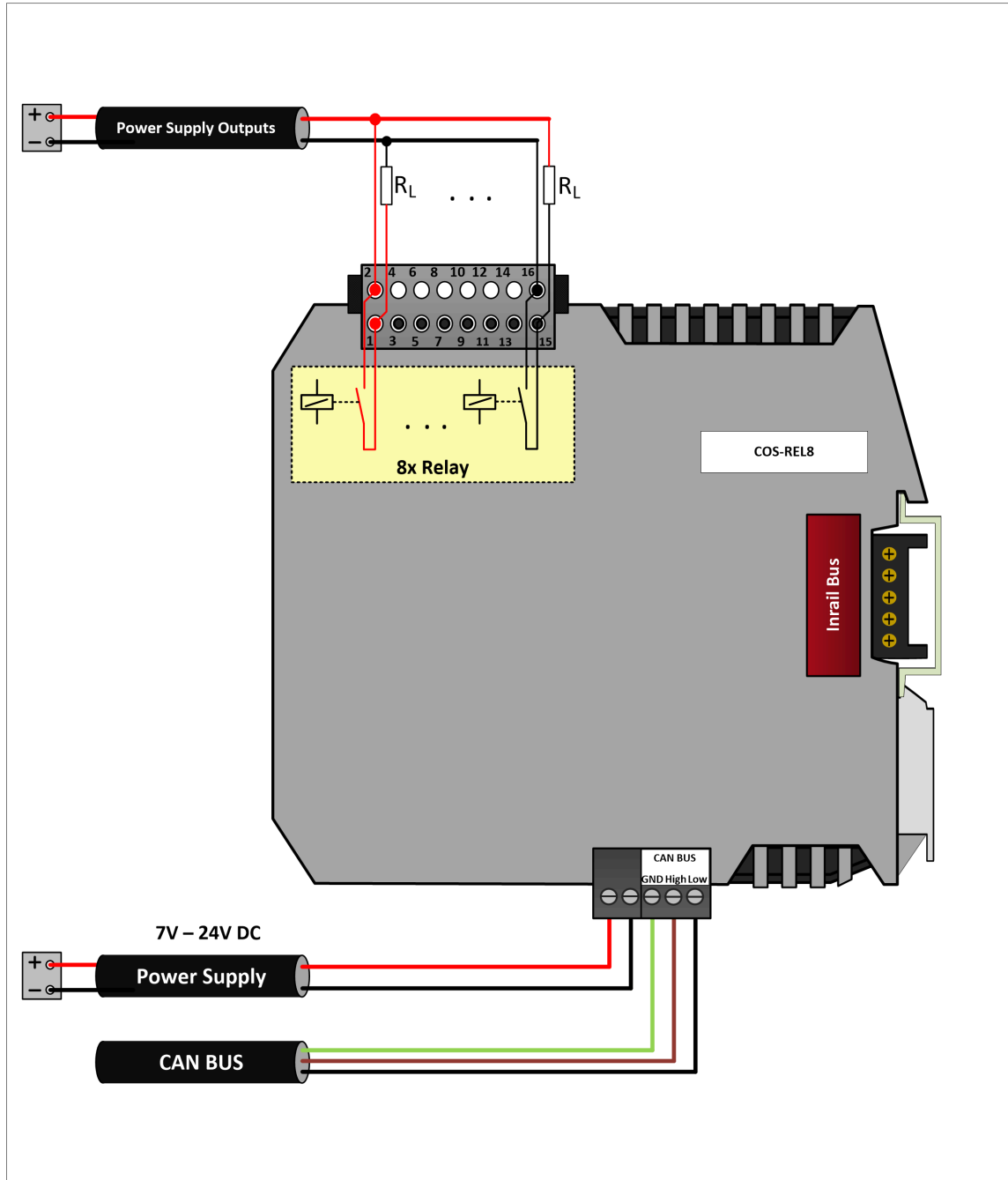
Technical data relay 3A

Type: Normally open (NO)
Max. Switching voltage: 48V AC / DC
Max. Switching current: 3A AC / DC
Max. Transport current: 3A AC / DC
Max. Switching power: 90W

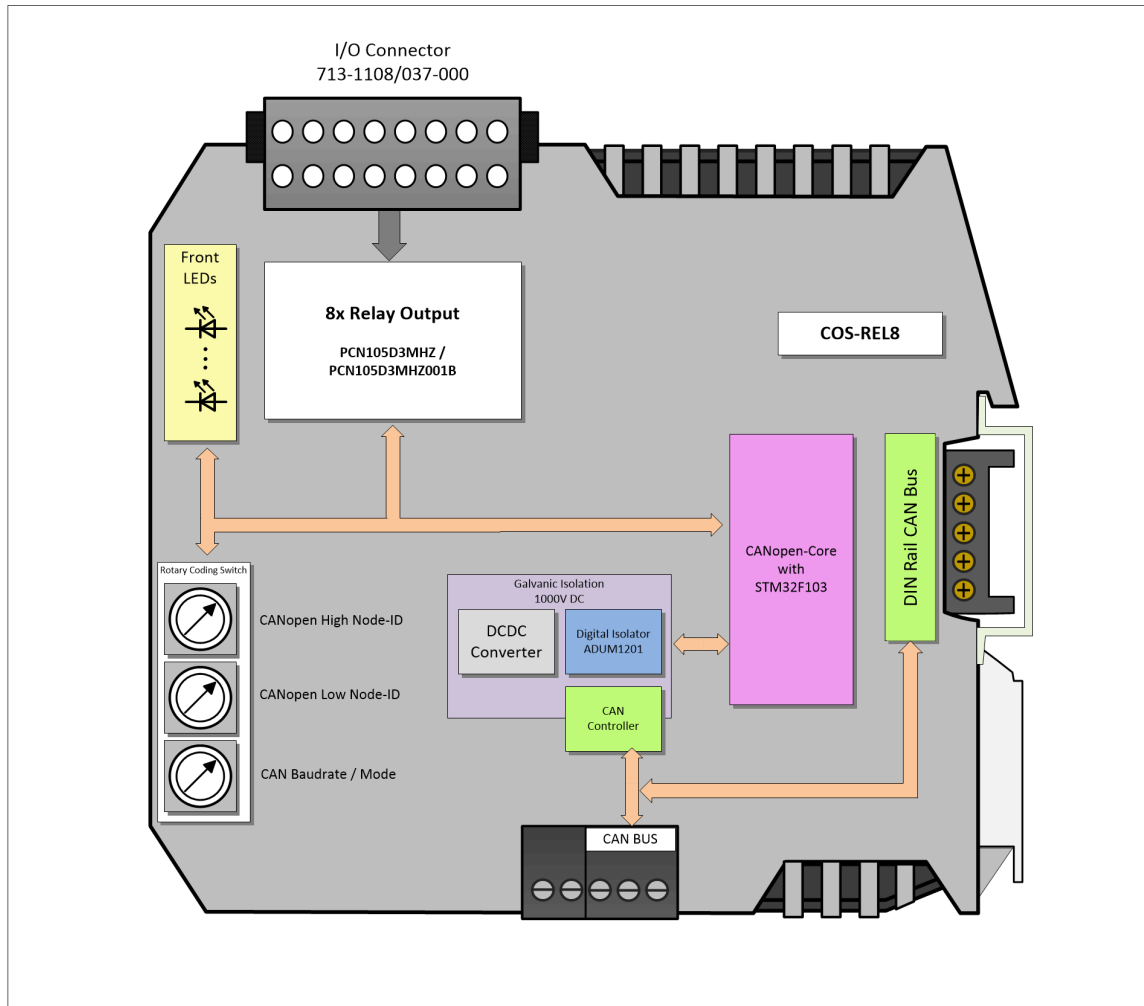
Technical data relay 5A

Type: Normally open (NO)
Max. Switching voltage: 48V AC / DC
Max. Switching current: 5A AC / DC
Max. Transport current: 5A AC / DC
Max. Switching power: 144W

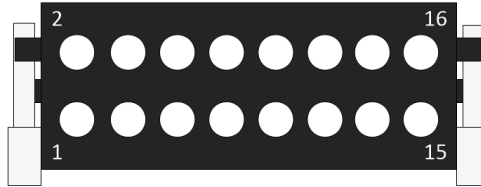
2.1.3.1. Anschlussbeispiele eines COS-REL8



2.1.3.2. Block diagram of a COS-REL8



2.1.3.3. Pin assignment



Digital Output Channel	Pin	
Output Channel 1	1	2
Output Channel 2	3	4
Output Channel 3	5	6
Output Channel 4	7	8
Output Channel 5	9	10
Output Channel 6	11	12
Output Channel 7	13	14
Output Channel 8	15	16

2.1.4. Specifications of the COS-REL4_UM



Special features:

Digital outputs:

4 changeover relay outputs

Technical data relay 12A

Type:

changeover contact (CO)

Max. Switching voltage:

48V AC / DC

Max. Switching current:

12A AC / DC

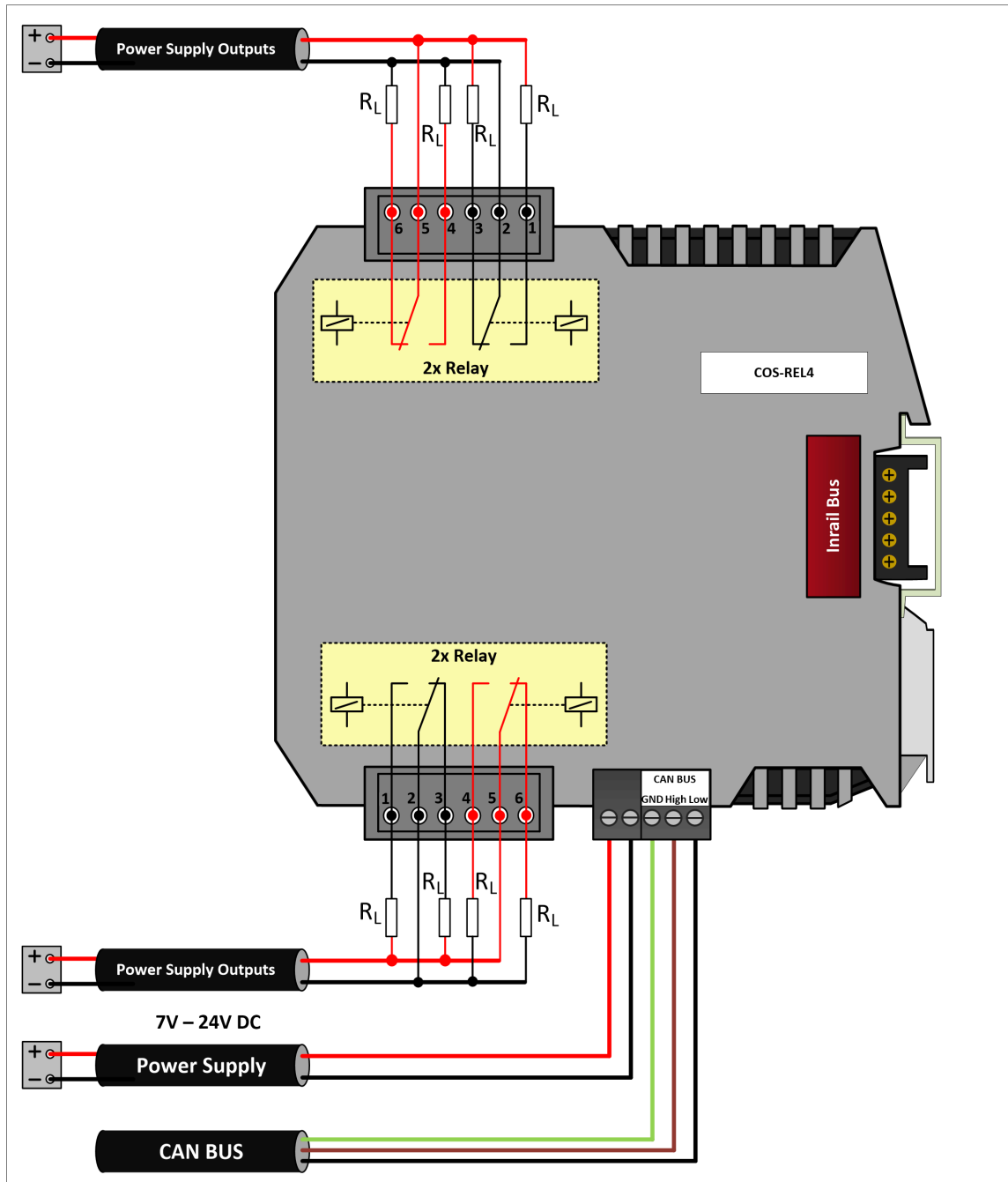
Max. Transport current:

12A AC / DC

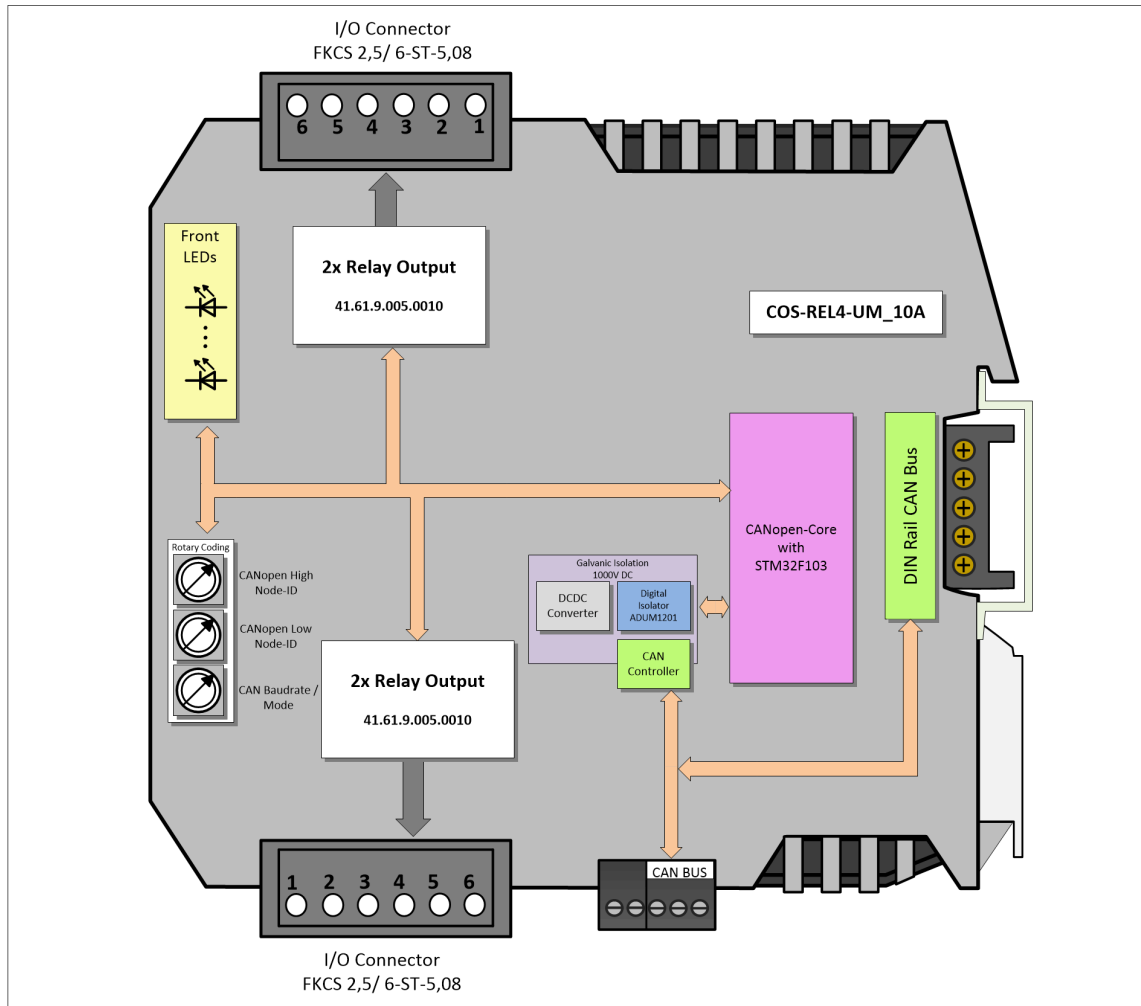
Max. Switching capacity:

574 VA

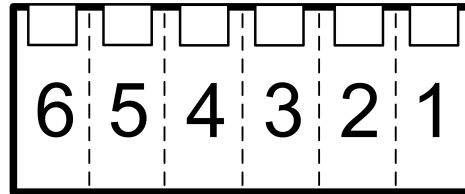
2.1.4.1. Connection examples of a COS-REL4_UM



2.1.4.2. Block diagram of a COS-REL4_UM

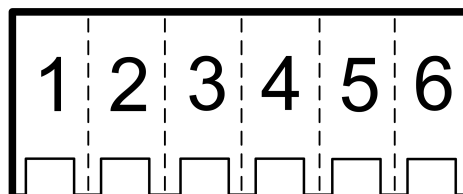


2.1.4.3. Pin assignment J1



Port	Pin	Analog Input Channel	Pin
Rel1 closer	1	Rel1 common	2
Rel1 opener	3	Rel2 closer	4
Rel2 common	5	Rel2 opener	6

2.1.4.4. Pin assignment J2



Port	Pin	Analog Input Channel	Pin
Rel3 closer	1	Rel3 common	2
Rel3 opener	3	Rel4 closer	4
Rel4 common	5	Rel4 opener	6

2.1.5. Specifications of the COS-AD16



Special features:

Analog inputs: 16 channels with 16 bit or 18 bit each
Resolution (single ended)

Technical data AD-16 converter

Voltage ranges: 0-5V, 0-10V, 0-20V, 0-40V,
±5V, ±10V, ±20V, ±40V

Current range: 0-50mA

Galvanic isolation: max. 500V for voltage supply
of the module

Input resistance: > 500kOhm

Integral Linearity Error: Min: -1.5 LSB / Max: +1.5 LSB

Bipolar Full-Scale Error: Min: – 50 LSB / Max: +50 LSB

Unipolar Full-Scale Error: Min: – 70 LSB / Max: +70 LSB

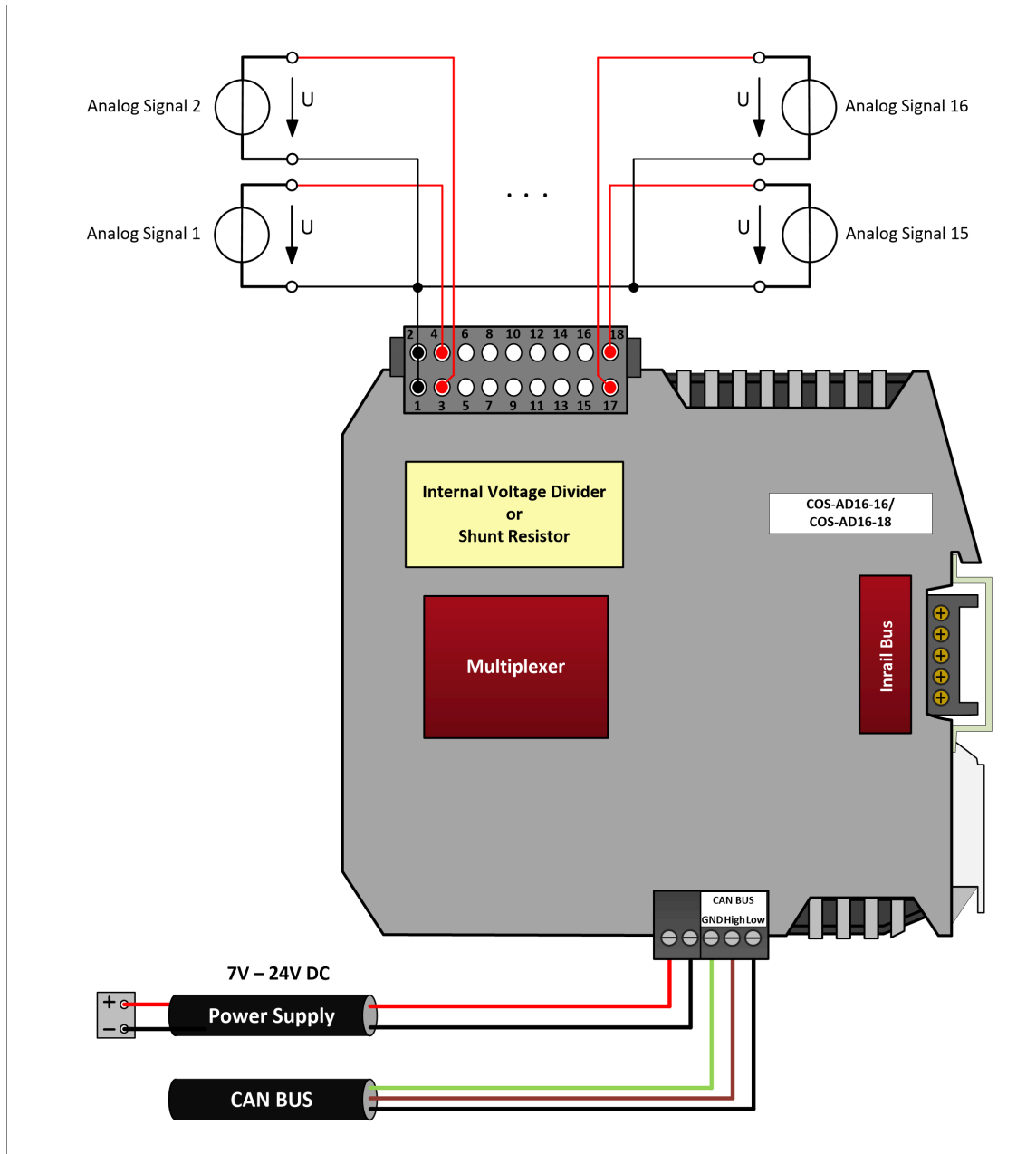
Accuracy: +3 ppm/C°

Zero Error Temp. drift: +1 ppm/C°

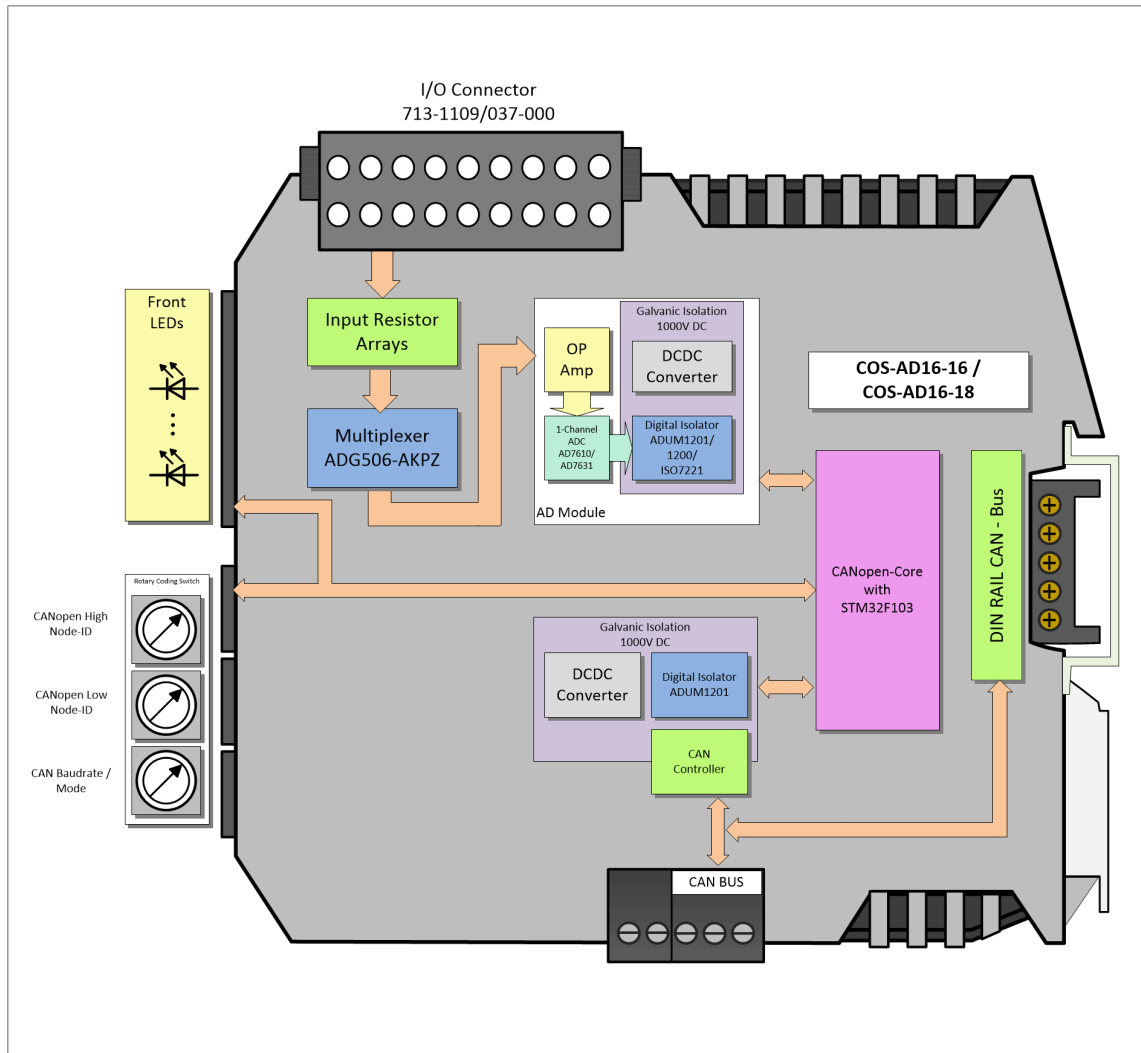
Full-scale error temp. drift: +1 ppm/°C

Conversion rate: 4μs

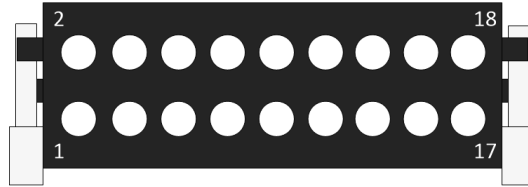
2.1.5.1. Connection examples of a COS-AD16



2.1.5.2. Block diagram of a COS-AD16



2.1.5.3. Pin assignment



Analog Input Channel	Pin	Analog Input Channel	Pin
AGND	1	AGND	2
Input Channel 1	3	Input Channel 2	4
Input Channel 3	5	Input Channel 4	6
Input Channel 5	7	Input Channel 6	8
Input Channel 7	9	Input Channel 8	10
Input Channel 9	11	Input Channel 10	12
Input Channel 11	13	Input Channel 12	14
Input Channel 13	15	Input Channel 14	16
Input Channel 15	17	Input Channel 16	18

2.1.6. Specifications of the COS-AD2-16_ISO / COS-AD2-18_ISO



Special features:

Analog inputs: 2 channels with 16 bit or 18 bit resolution

Technical data AD-2 16 bit converter

Voltage ranges: 0-5V, 0-10V, 0-20V, 0-40V
+5V, +10V, +0-20V, +0-40V

Current ranges: 0-50mA

Galvanic isolation: max. 500V for voltage supply of the module

Integral Linearity Error: Min: -1.5 LSB / Max: +1.5 LSB

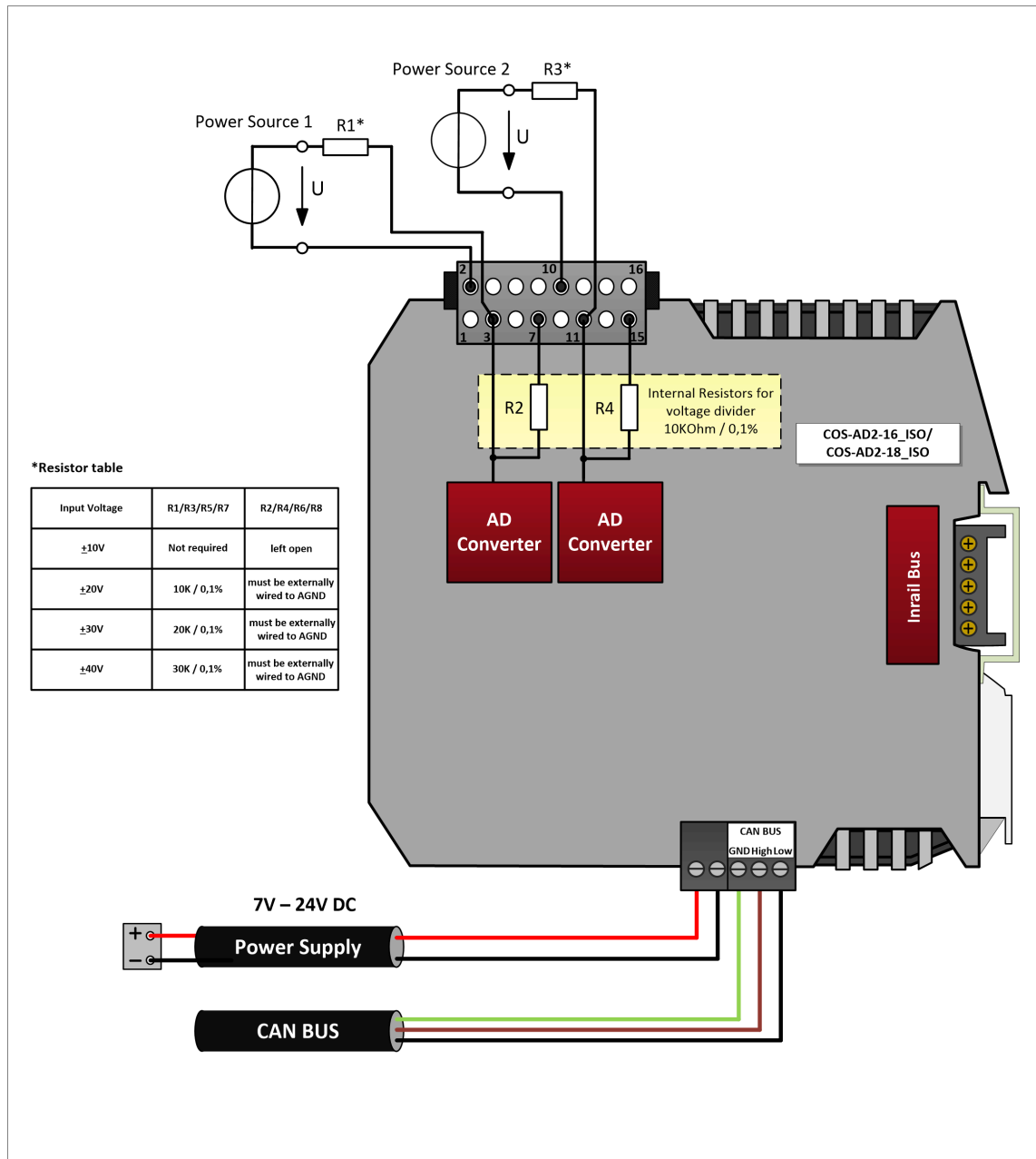
Bipolar Full-Scale Error: Min: -50 LSB / Max: +50 LSB

Unipolar Full-Scale Error: Min: -70 LSB / Max: +70 LSB

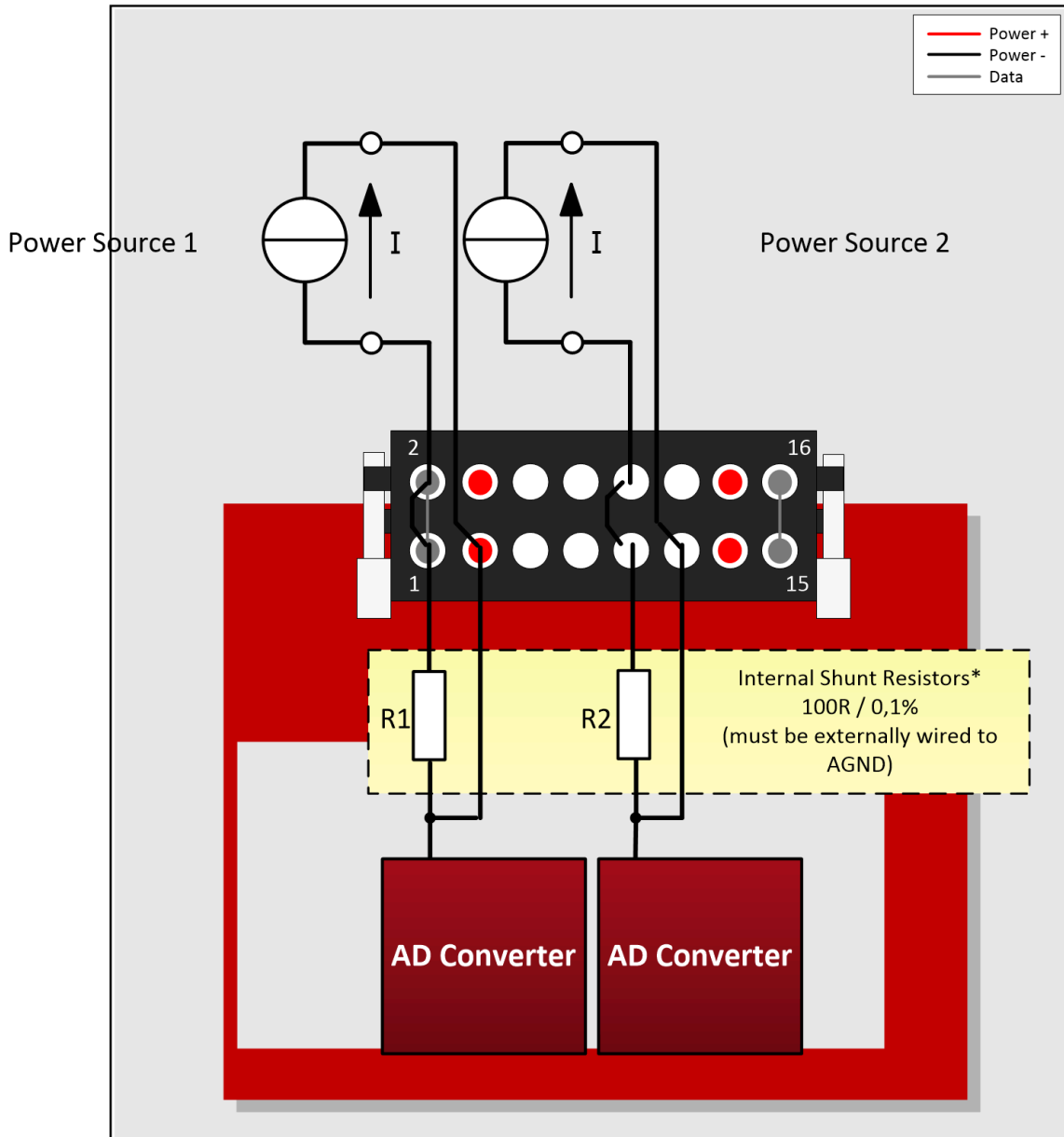
Full-Scale Error Temp Drift: ± 1 ppm/°C

2.1.6.1. Connection example of a COS-AD2-16_ISO / COS-AD2-18_ISO

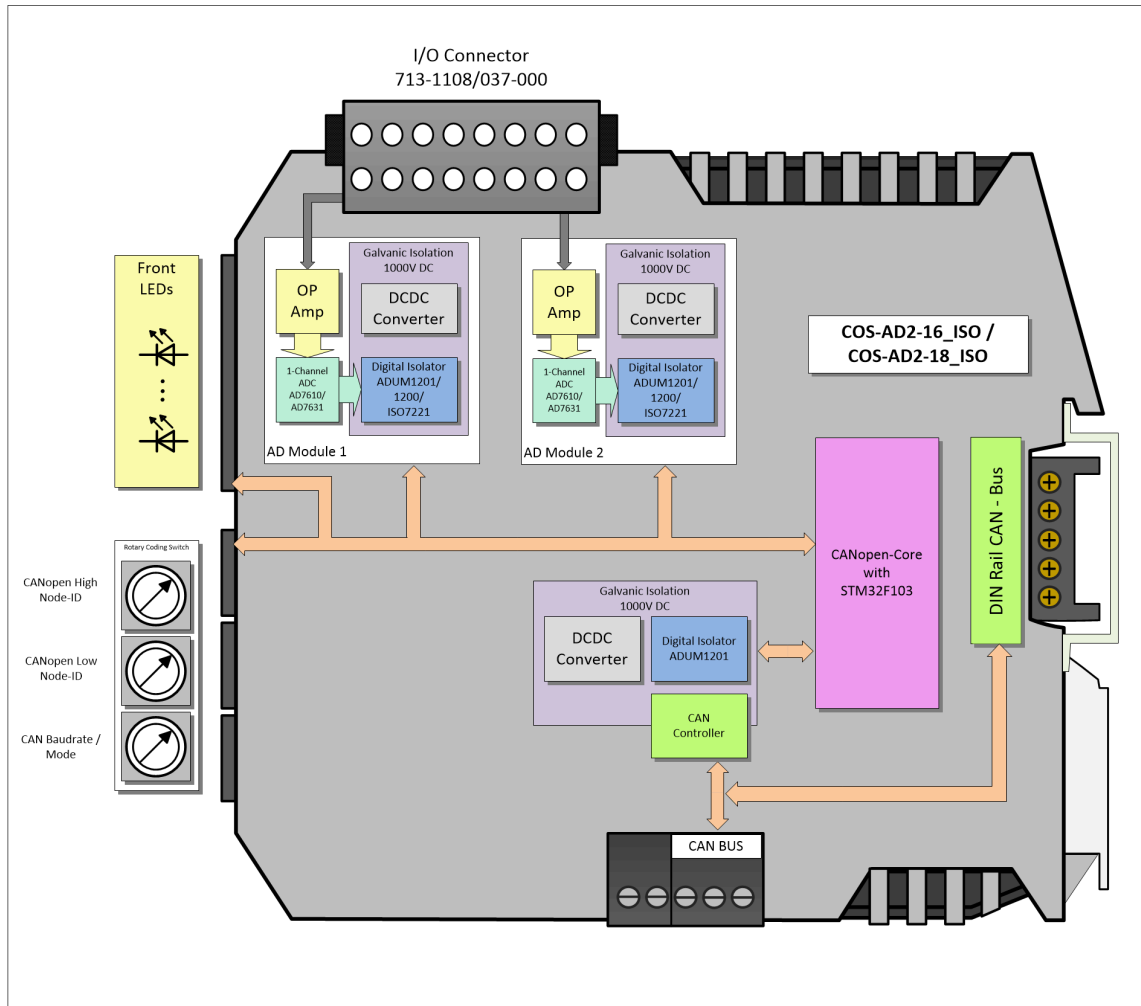
2.1.6.1.1. U-Mode



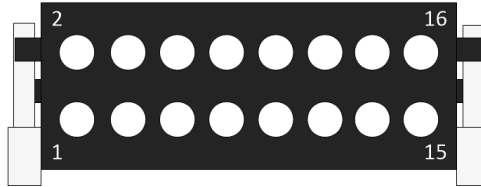
2.1.6.1.2. I-Mode



2.1.6.2. Block diagram of a COS-AD2-16_ISO / COS-AD2-18_ISO



2.1.6.3. Pin assignment



Analog Input Channel	Pin	Analog Input Channel	Pin
I-Mode 1	1	AGND 1	2
ADIN+ 1	3	AGND 1	4
ADIN- 1	5	AGND 1	6
U-Opt 1	7	AGND 1	8
I-Mode 2	9	AGND 2	10
ADIN+ 2	11	AGND 2	12
ADIN- 2	13	AGND 2	14
U-Opt 2	15	AGND 2	16

2.1.7. Specifications of the COS-DA4_16



Special features:

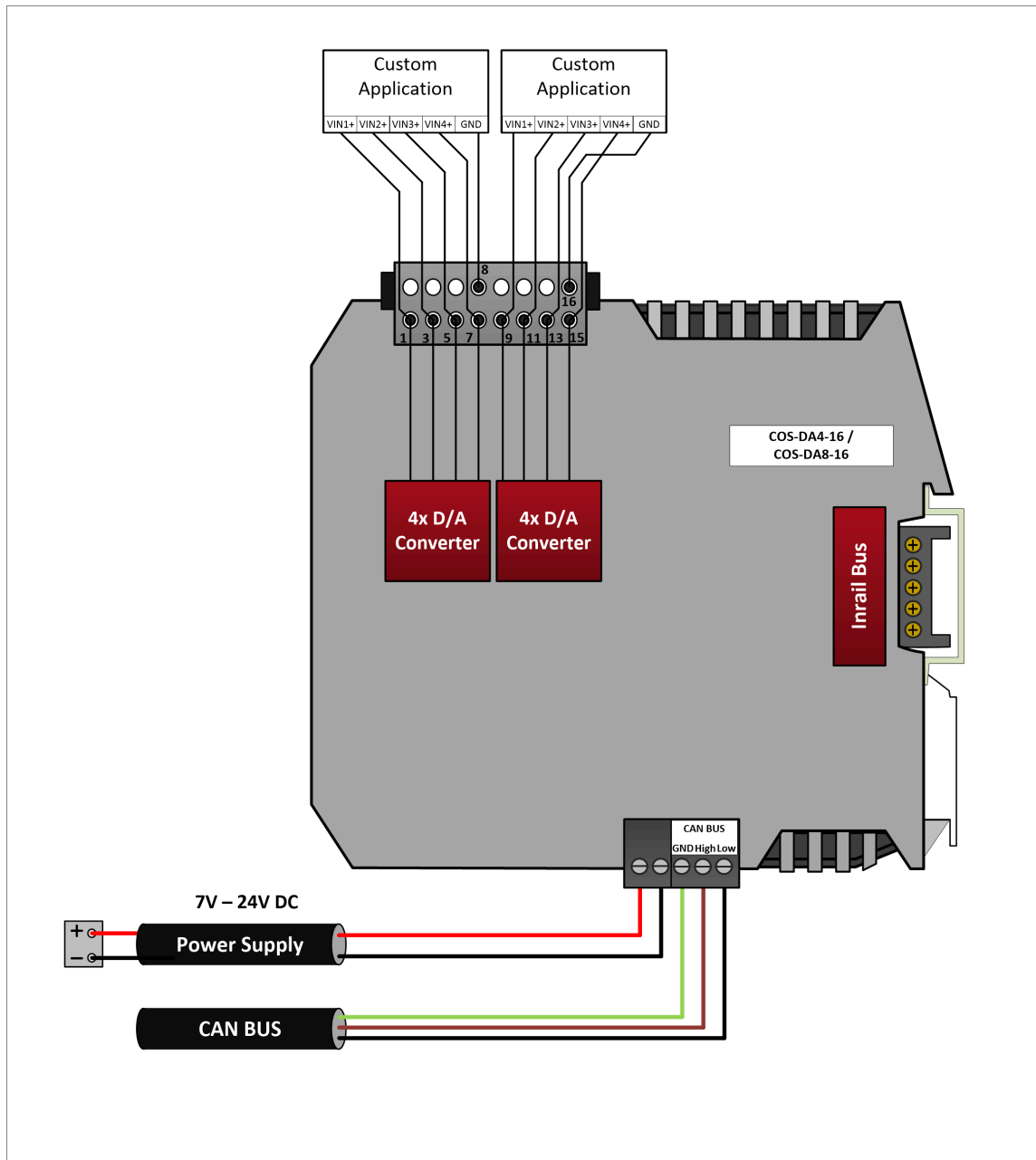
Analog outputs: 4 channels with 16 bit resolution

Technical data DA-4 transducer

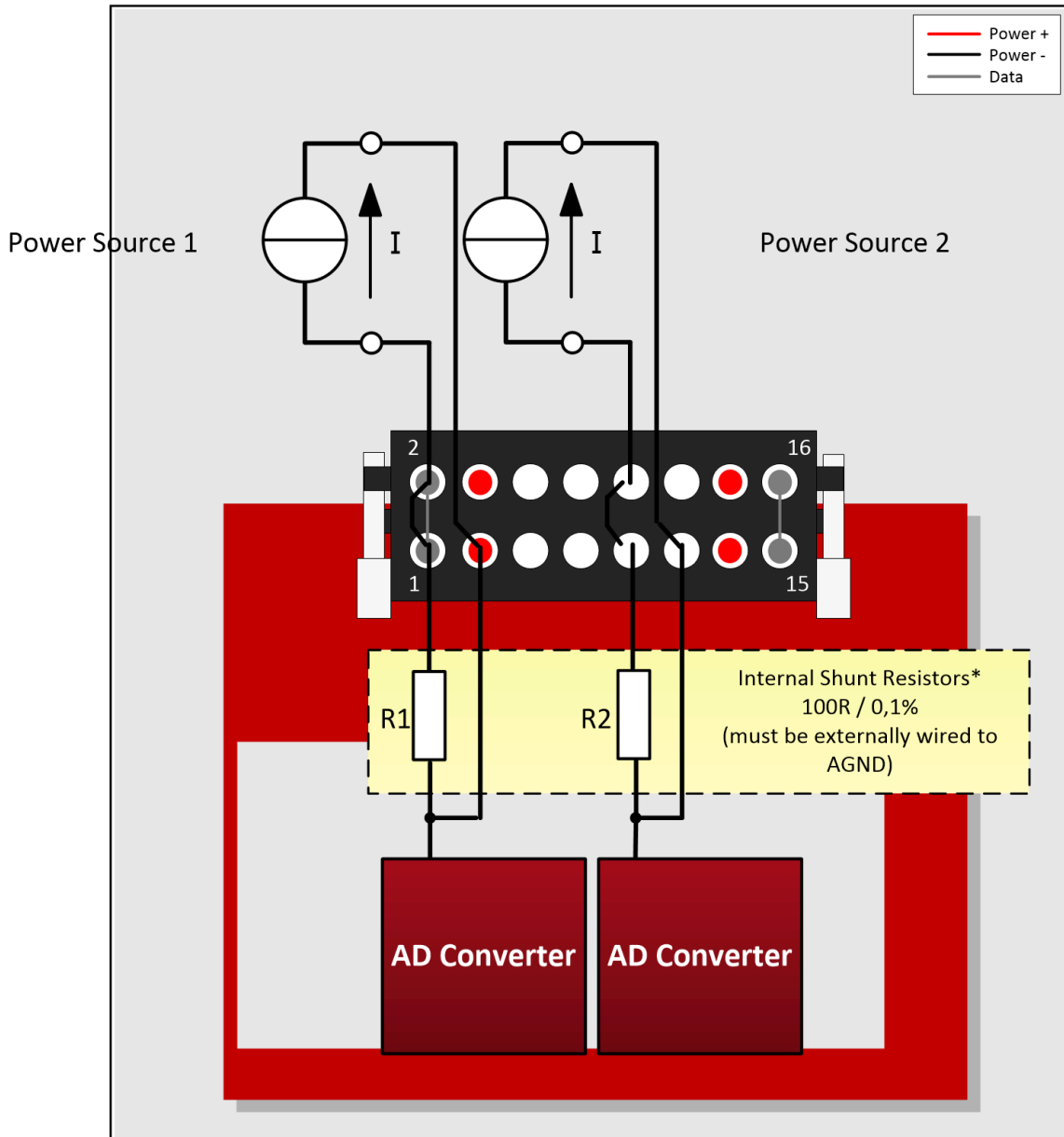
Voltage ranges:	0-5V, 0-10V, $\pm 5V$, $\pm 10V$
Galvanic isolation:	max. 500V
R load:	2 kOhm
Relative Accuracy:	Min: -16 LSB / Max: +16 LSB
Bipolar Zero Error (T = 25°C):	± 4 ppm FSR/°C
Zero-Scale Error (T = 25°C):	± 2 ppm FSR/°C
Full-Scale Error Temp. Drift:	± 1 ppm/°C

2.1.7.1. Connection example of a COS-DA4_16

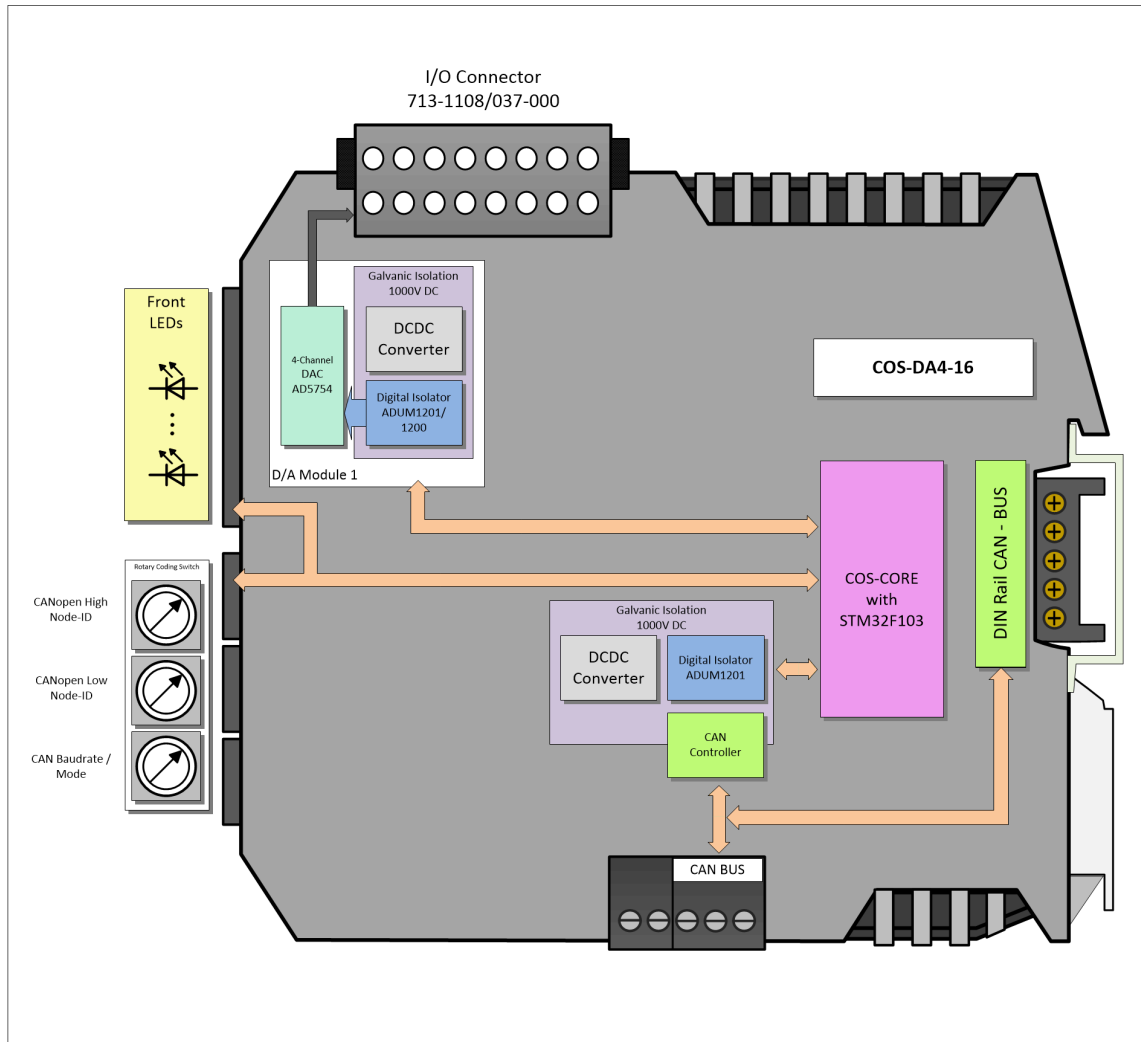
2.1.7.1.1. U-Mode



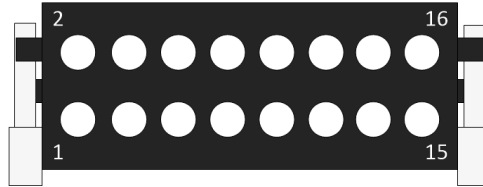
2.1.7.1.2. I-Mode



2.1.7.2. Block diagram of a COS-DA4_16



2.1.7.3. Pin assignment



Analog Output Channel	Pin	Analog Output Channel	Pin
VOUT 1	1	AGND 1	2
VOUT 2	3	AGND 1	4
VOUT 3	5	AGND 1	6
VOUT 4	7	AGND 1	8
VOUT 5	9	AGND 2	10
VOUT 6	11	AGND 2	12
VOUT 7	13	AGND 2	14
VOUT 8	15	AGND 2	16

2.1.8. Specifications of the COS-DA8-16



Special features:

Analog outputs:

8 channels with
16 bit resolution

Technical data DA-4 transducer

Voltage ranges:

0-5V, 0-10V, $\pm 5V$, $\pm 10V$

Galvanic isolation:

max. 500V

R load:

2 kOhm

Relative Accuracy:

Min: -16 LSB / Max: +16 LSB

Bipolar Zero Error ($T = 25^{\circ}C$):

± 4 ppm FSR/ $^{\circ}C$

Zero-Scale Error ($T = 25^{\circ}C$):

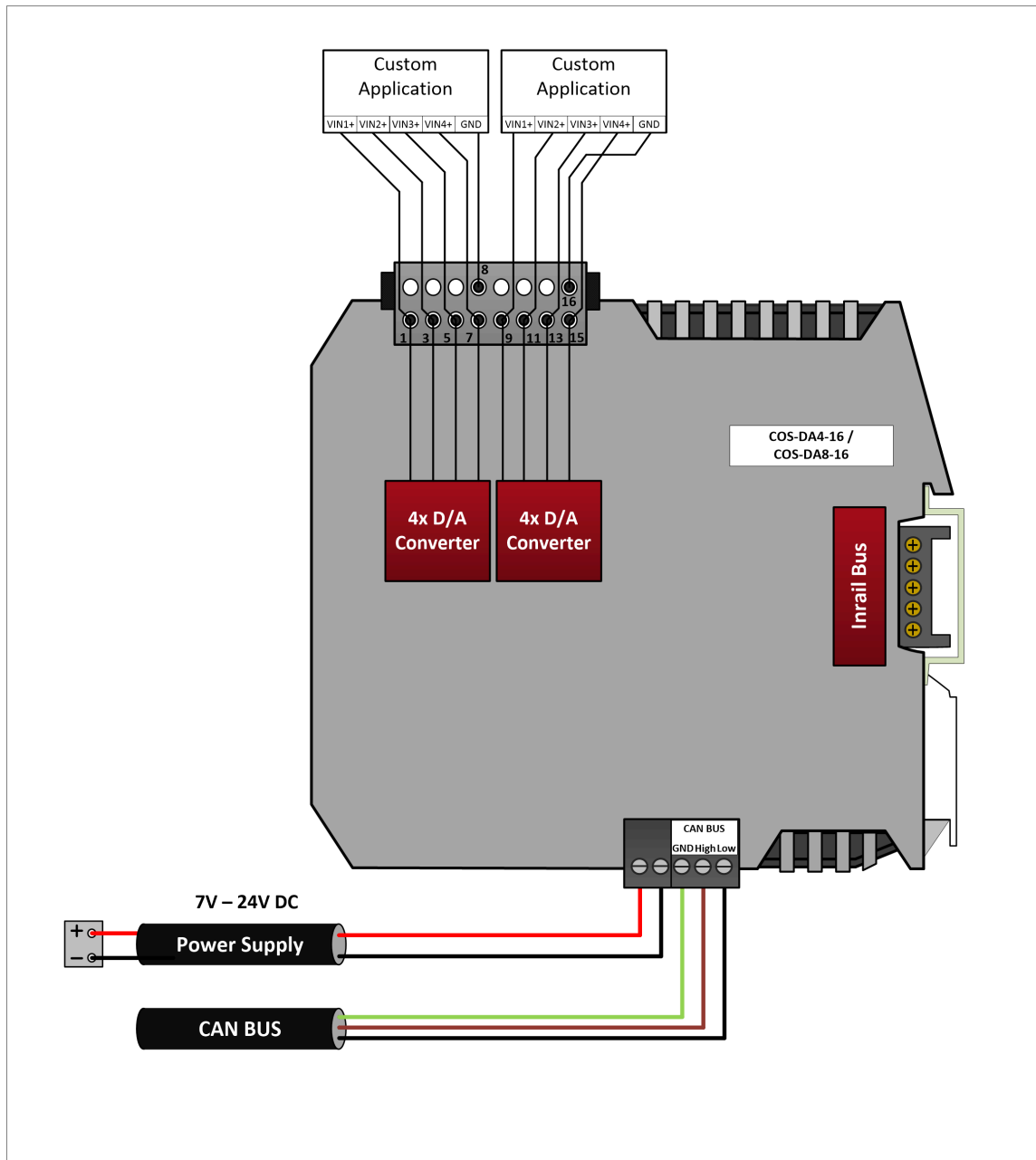
± 2 ppm FSR/ $^{\circ}C$

Full-Scale Error Temp. Drift:

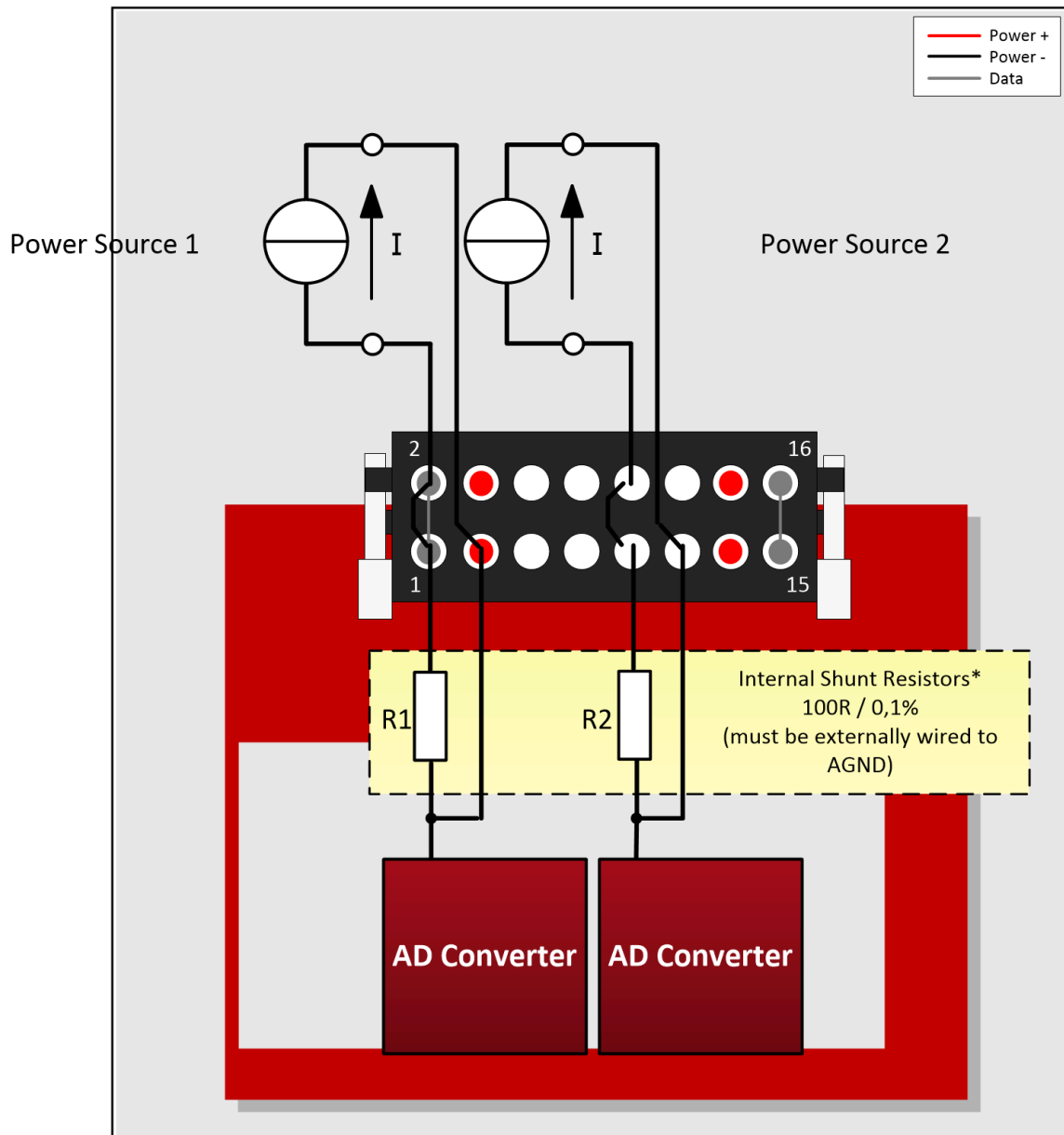
± 1 ppm/ $^{\circ}C$

2.1.8.1. Connection example of a COS-DA8_16

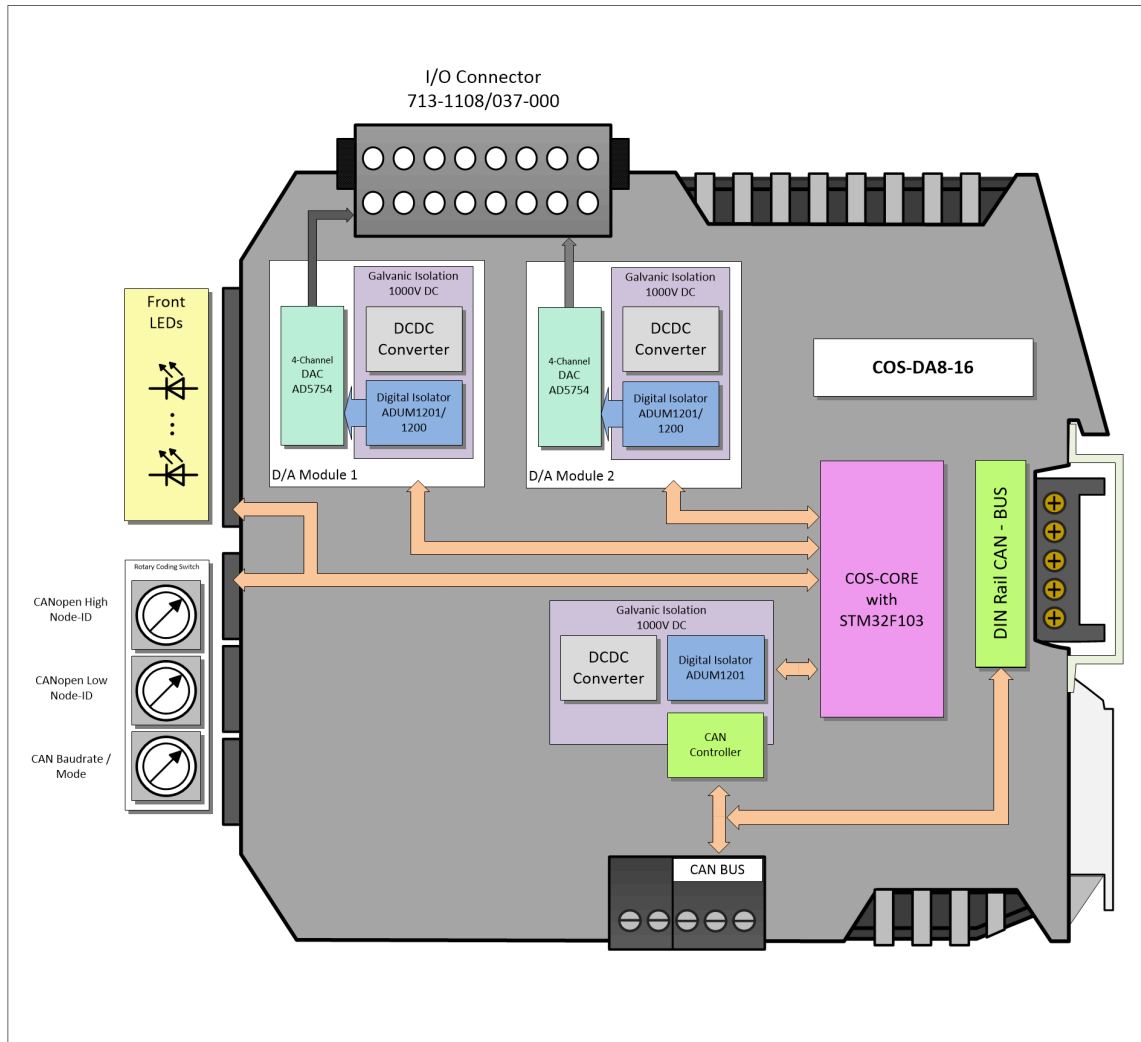
2.1.8.1.1. U-Mode



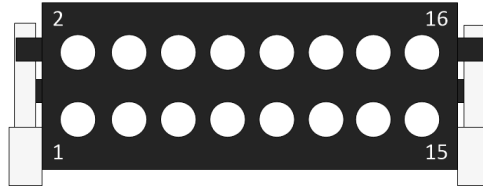
2.1.8.1.2. I-Mode



2.1.8.2. Block diagram of a COS-DA8_16



2.1.8.3. Pin assignment



Analog Output Channel	Pin	Analog Output Channel	Pin
VOUT 1	1	AGND 1	2
VOUT 2	3	AGND 1	4
VOUT 3	5	AGND 1	6
VOUT 4	7	AGND 1	8
VOUT 5	9	AGND 2	10
VOUT 6	11	AGND 2	12
VOUT 7	13	AGND 2	14
VOUT 8	15	AGND 2	16

2.1.9. Specifications of the COS-DA2-16_ISO



Special features:

Analog outputs:

2 channels with
16 bit resolution

Technical data DA-2 transducer

Voltage ranges:

0-5V, 0-10V, 0-20V
+5V, +10V, +0-20V

Current ranges:

0-20mA, 4-20mA, 0-24mA

Galvanic isolation:

max. 500V

R load:

1 kOhm

Relative Accuracy:

Min: -0,008 LSB / Max: +0,008 LSB

Bipolar Zero Error (T = 25°C):

±3 ppm FSR/°C

Zero-Scale Error (T = 25°C):

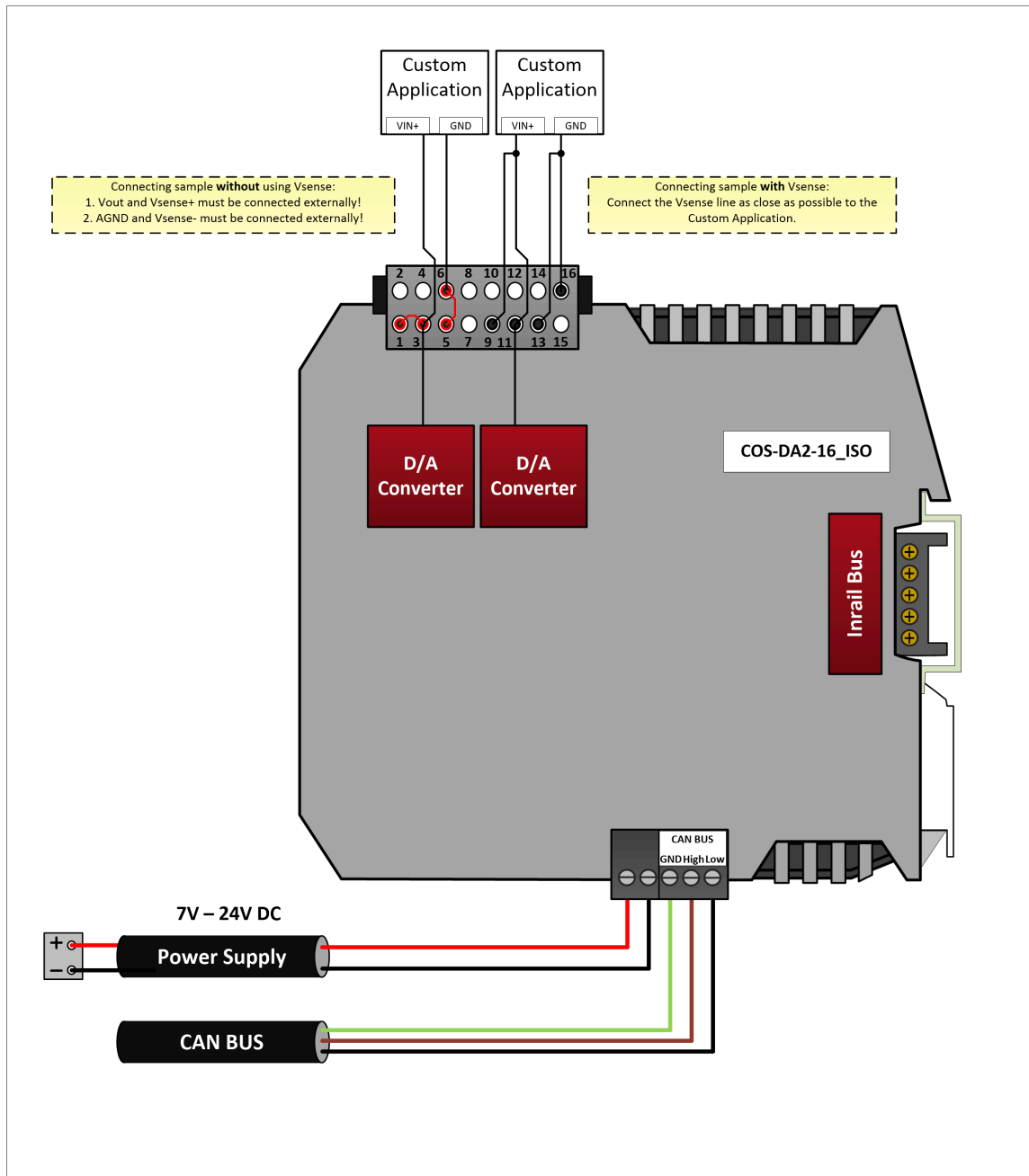
±2 ppm FSR/°C

Full-Scale Error Temp. Drift:

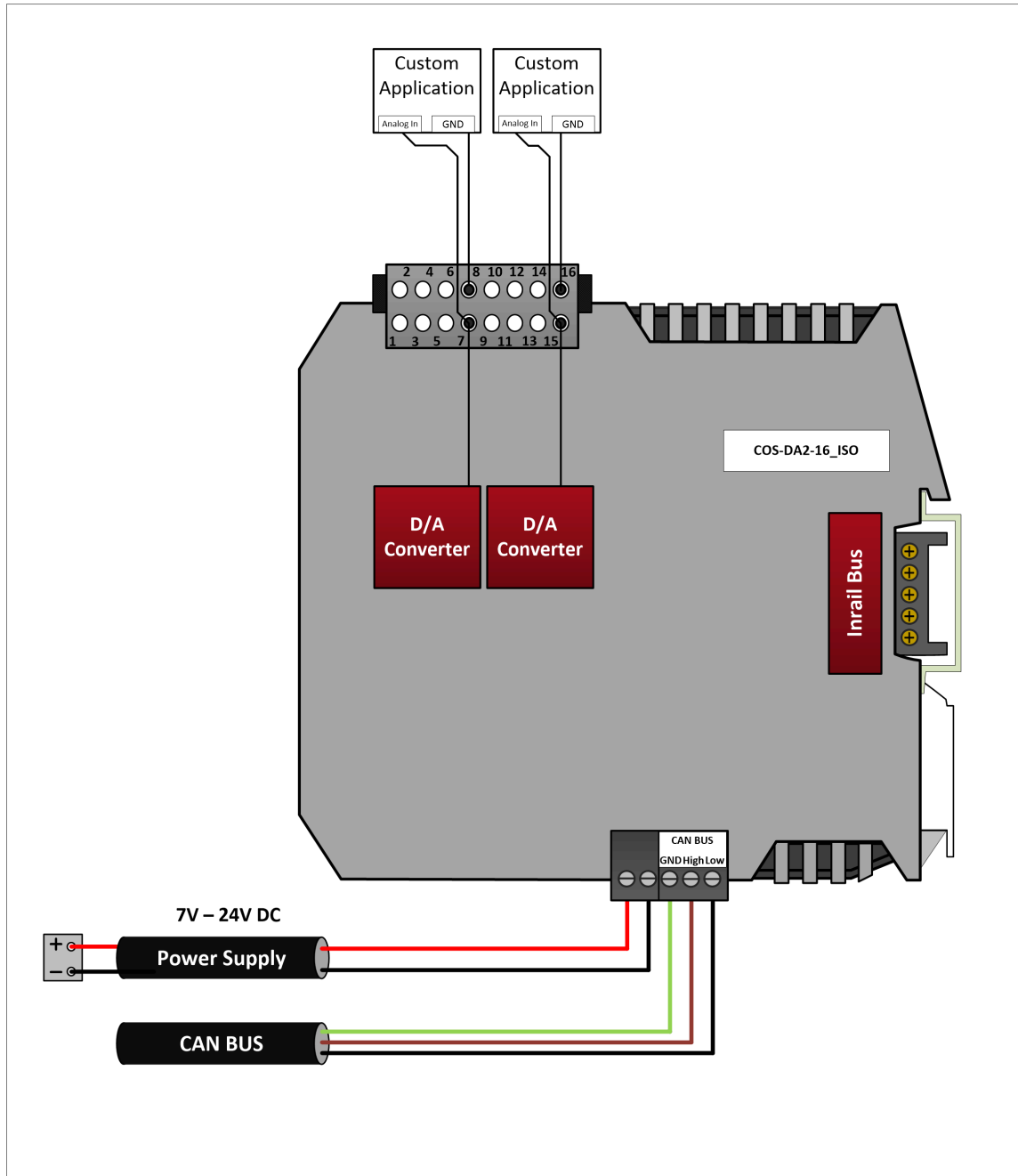
±1 ppm/°C

2.1.9.1. Anschlussbeispiel (2)

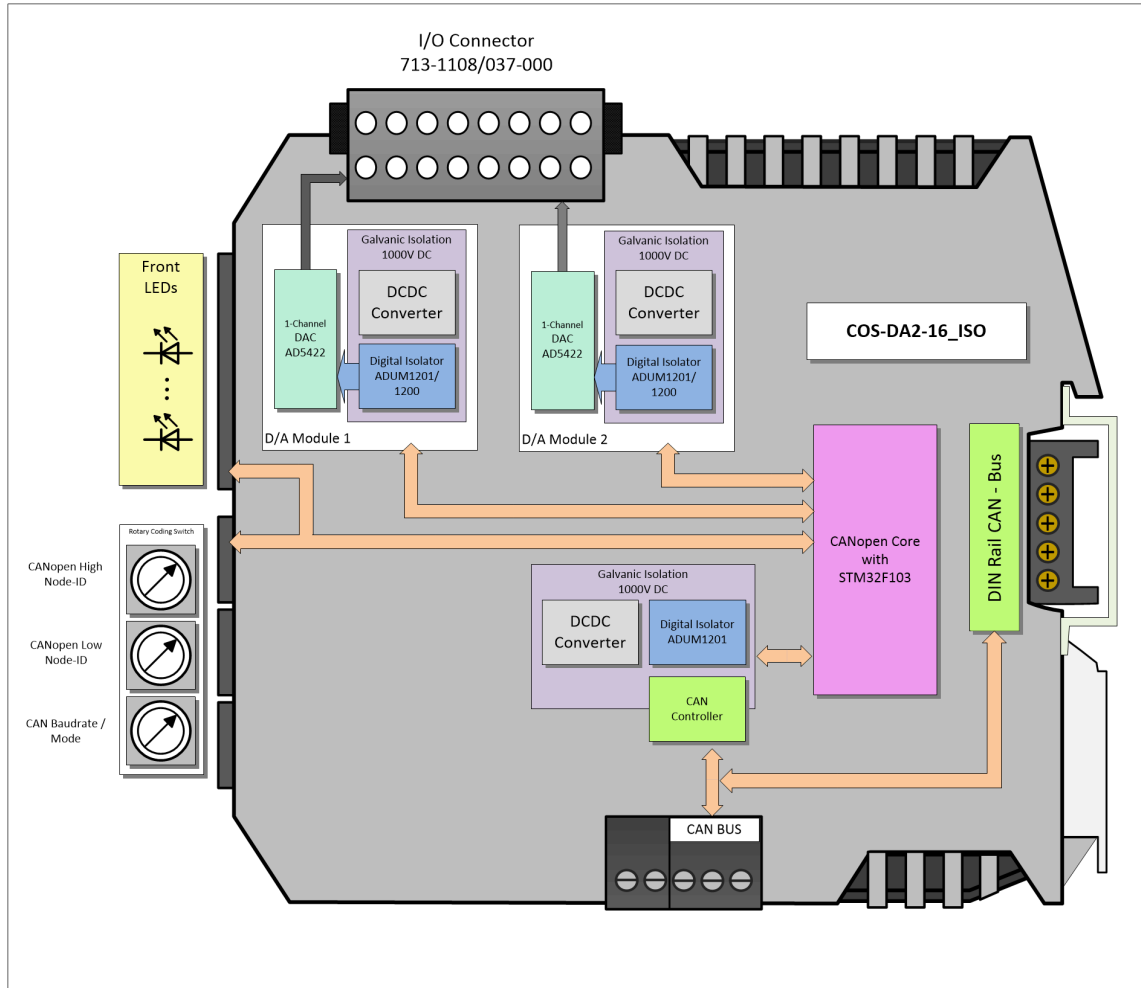
2.1.9.1.1. U-Mode



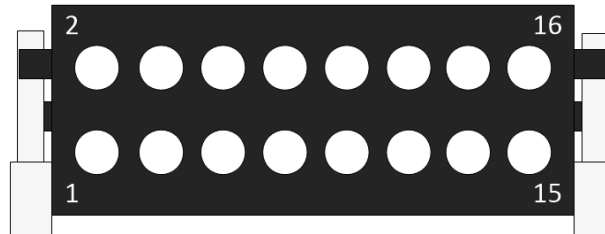
2.1.9.1.2. I-Mode



2.1.9.2. Block diagram of a COS-DA2_16_ISO



2.1.9.3. Pin assignment



Analog Output Channel	Pin	Analog Output Channel	Pin
VSENSE+ 1	1	AGND	2
VOUT 1	3	AGND	4
VSENSE- 1	5	AGND	6
IOUT 1	7	AGND	8
VSENSE+ 2	9	AGND	10
VOUT 2	11	AGND	12
VSENSE- 2	13	AGND	14
IOUT 2	15	AGND	16

2.1.10. Specifications of the COS-THERMOK4



Special features:

Temperature inputs: 2/4 channels with 14 bit AD converter

Technical data THERMOK4

Resolution: 0,25°C

Thermocouple: K-Type

Galvanic isolation: max. 500V

Channels 1 and 2 are galvanically isolated

from each other from channel 3 and 4

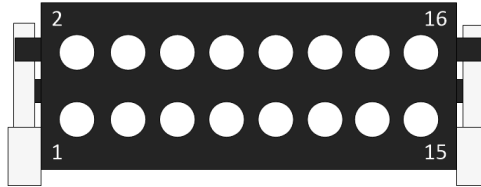
Maximum and minimum temperature: -200°C to +1350°C

Precision: ± 2°C from - 200°C to 700°C

± 4°C from 700°C to 1350°C

Safety: Cold junction compensation

2.1.10.1. Pin assignment



Analog Input Channel	Pin	Analog Input Channel	Pin
Channel 1 -	1	AGND 1	2
Channel 1 +	3	AGND 1	4
Channel 2 -	5	AGND 1	6
Channel 2 +	7	AGND 1	8
Channel 3 +	9	AGND 2	10
Channel 3 +	11	AGND 2	12
Channel 4 +	13	AGND 2	14
Channel 4 +	15	AGND 2	16

2.2. Coding switch

The operating mode, bit rate and the node number (Node ID) can be determined via coding switches.

The coding switches are located in the lower area of the front panel.



In this example the operating mode is CANopen, the bit rate is 250 kBit/s and the node ID is 0x24

Coding switch Mode Baud rate

Value	Operating mode	Description
0	CANopen	Bitrate = 1000 kBit/s
1	CANopen	Bitrate = 800 kBit/s
2	CANopen	Bitrate = 500 kBit/s
3	CANopen	Bitrate = 250 kBit/s
4	CANopen	Bitrate = 125 kBit/s
5	CANopen	Bitrate = 100 kBit/s
6	CANopen	Bitrate = 50 kBit/s
7	CANopen	Bitrate = 20 kBit/s
8	CANopen	Bitrate = 10 kBit/s
9	CANopen	Autobaud + LSS
A	CANopen	Autobaud
B	CANopen Bootloader	Bitrate = 250 kBit/s
C	CANopen Bootloader	Bitrate = 1000 kBit/s, Node ID = 0x7e
D	CAN 2.0 A/B	Use settings from EEPROM
E	CAN 2.0 A/B	Bitrate = 1000 kBit/s, CAN ID = 0x100
F	CANopen	Bitrate = 1000 kBit/s, Node ID = 0x7e

Attention

The coding switches are always queried at module start.

2.3. Control LEDs

In the upper part of the front panel there are 2 LEDs (Run and Error) in the left area, which indicate various CANopen states.

In addition, the status LED is located in the right area, which shows manufacturer-specific information.



Flashing states for Run and Error LED

State	Description
on	LED on
off	LED off
Flashing	LED flashes with
Flicker	LED flashes with 10 Hz
1 flash	LED 200 ms on, 1400 ms off
2 flashes	1x LED (200ms on, 200ms off), 200ms on, 1000ms off
3 flashes	2x LED (200ms on, 200ms off), 200ms on, 600ms off

CANopen Run LED

State	Description
Flashing	Pre-Operational
on	Operational
1 flash	Stopped

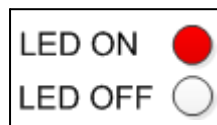
CANopen Error LED

State	Description
off	no error
1 flash	CAN-Controller Status "Error"
2 flashes	Heartbeat/Nodeguard Error
3 flashes	Synchronization error
4 flashes	Event Timer Error
on	CAN-Controller Status "Bus Off"

Status LED

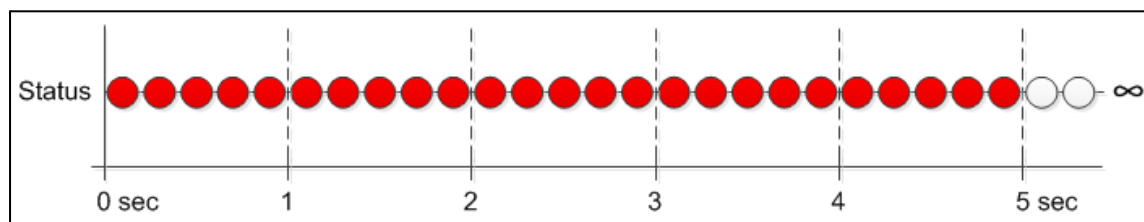
By means of the status LED it can be read in which state (application or bootloader) the module is. For this the status LED lights up for 5 seconds (application) or 2 seconds (bootloader). At the end of this sequence the LED may additionally flash "n times", but at least once, indicating the submode.

Explanation



Application

The boot process has been successfully completed and the product is in the application. The product is now ready for use.

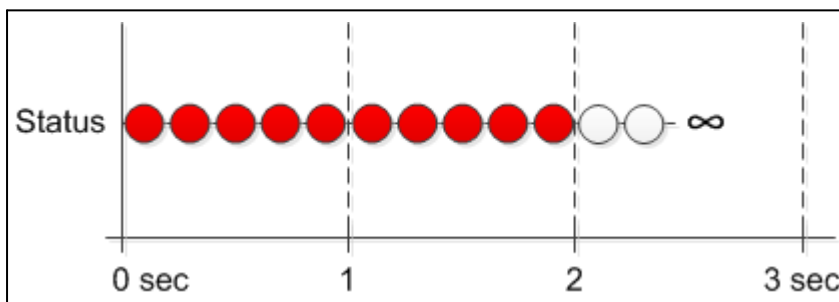


The status LED lights up for 5 seconds and goes out for about 300ms. The application sequence repeats itself.

Flashing to complete the sequence

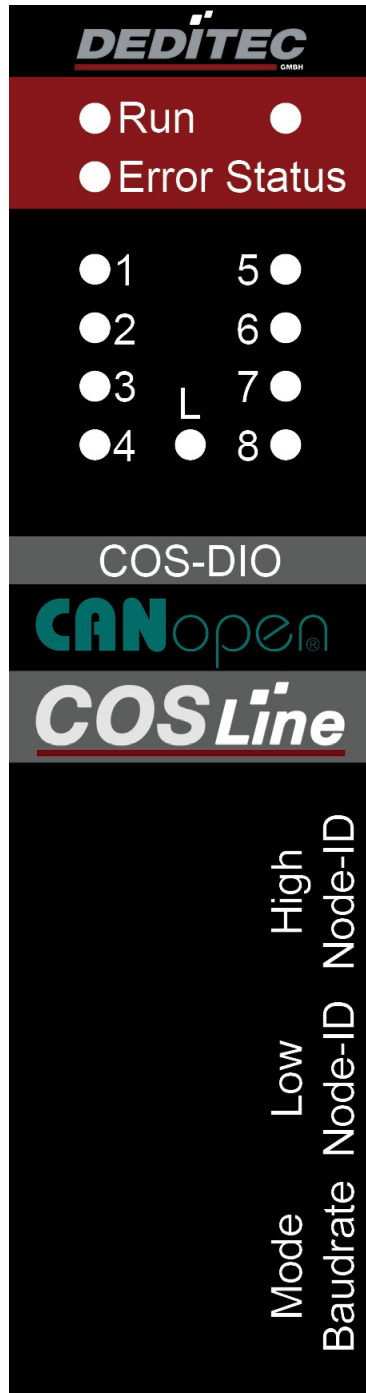
Number flashing	Description
x1	CANopen mode, NodeID and baud rate via coding switch
x2	CANopen mode, NodeID via coding switch, baud rate via autobaud successfully determined
x3	CANopen mode, NodeID via coding switch, baud rate via autobaud is still pending
x4	CANopen mode, fixed NodeID (0x7e) and baud rate (1000 kBit/s)
x10	Error during firmware update (only in the bootloader)

Bootloader



The status LED lights up for 2 seconds and goes out for about 300ms. The bootloader sequence repeats.

2.3.1. COS-DI08



LED "1" .. "8"

Shows the status of the respective input/output.

Configuration as input

- LED ON = input carries $> 1/3$ of the reference voltage
- LED OFF = input leads $\leq 1/3$ of the reference voltage

Configuration as output

- LED ON = output is switched
- LED OFF = output is not switched

LED "L"

- Shows whether the reference or switching voltage is present.

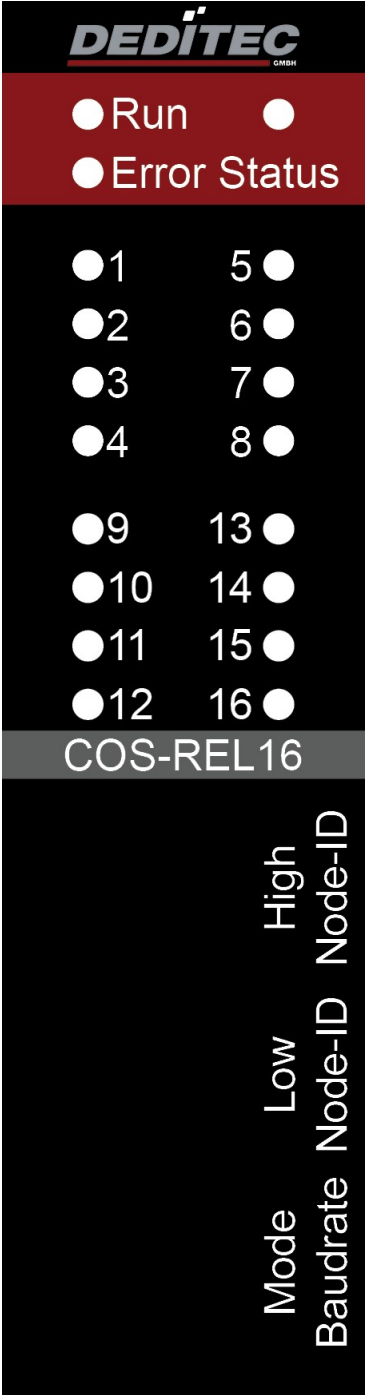
Configuration as input

- LED ON = reference voltage is applied
- LED OFF = reference voltage not applied

Configuration as output

- LED ON = switching voltage is present
- LED OFF = switching voltage is not present

2.3.2. COS-REL16



LED "1" .. "16"

Shows the status of the respective output

- LED ON = Relay is switched
- LED OFF = Relay is not switched

2.3.3. COS-REL8



LED "1" .. "8"

Shows the status of the respective output

- LED ON = Relay is switched
- LED OFF = Relay is not switched

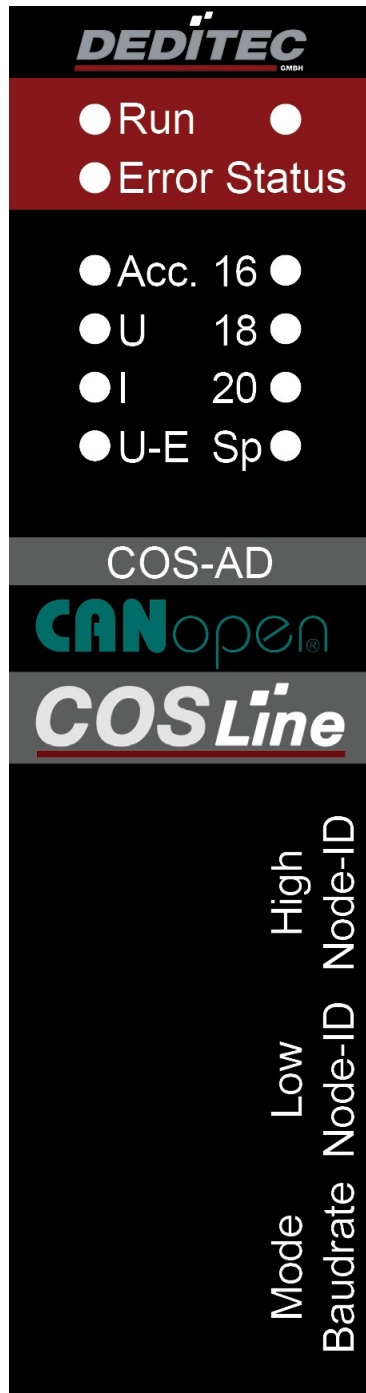
2.3.4. COS-REL4_UM



LED 1-4

Shows the switching state of the respective changeover contact.

2.3.5. COS-AD16-16



LED "Acc."

Blink when accessing A/D converter

LED "U"

Module is in U mode

LED "I"

Module is in I-mode

LED "U-E"

Module is in U-Extended mode

LED "16", "18", "20" und "Sp"

These LEDs indicate the resolution of the A/D converter.

- 16 = 16 Bit
- 18 = 18 Bit
- 20 = 20 Bit
- Sp = 24 Bit

2.3.6. COS-AD2-16_ISO



LED "Enabled"

Indicates whether the A/D converter is populated

LED "Access"

Blink when accessing A/D converter

LED "U-Mode"

Channel is in U mode

LED "I-Mode"

Channel is in I-mode

2.3.7. COS-DA4-16



LED "Enabled"

Indicates if the D/A converter is populated

LED "Access"

Blink when accessing D/A converter

LED "U-Mode"

Channels 1-4 or 5-8 are in U-mode

2.3.8. COS-DA2-16_ISO



LED "Enabled"

Indicates if the D/A converter is populated

LED "Access"

Blink when accessing D/A converter

LED "U-Mode"

Channels 1-4 or 5-8 are in U-mode

LED "I-Mode"

Channels 1-4 resp. 5-8 are in I-mode

2.3.9. COS-THERMOK4



LED "1" .. "4"

- Status = Indicates whether a temperature sensor is connected
- Access =Blinks when accessing the temperature channel

2.4. Firmware Update

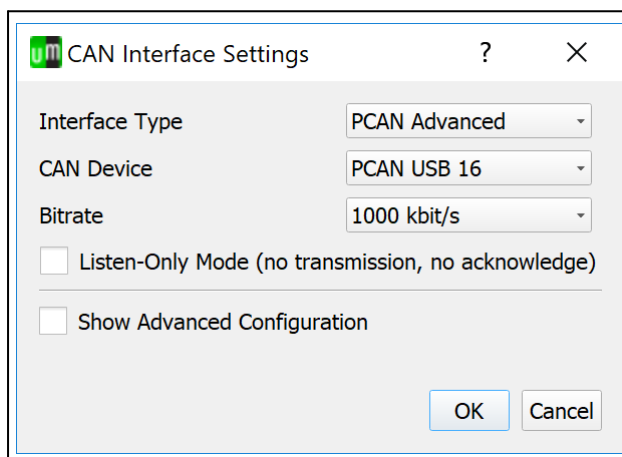
Updating the firmware by the emtas - CANopen UpdateManager tool.

Before updating the firmware, the module should be configured with the rotary coding switch (switch 3, position F) as follows:

Bitrate = 1000 kBit/s

Node ID = 0x7e

Under Settings -> Options a bitrate of 1000 kbit/s must be set.



Establish connection to the module

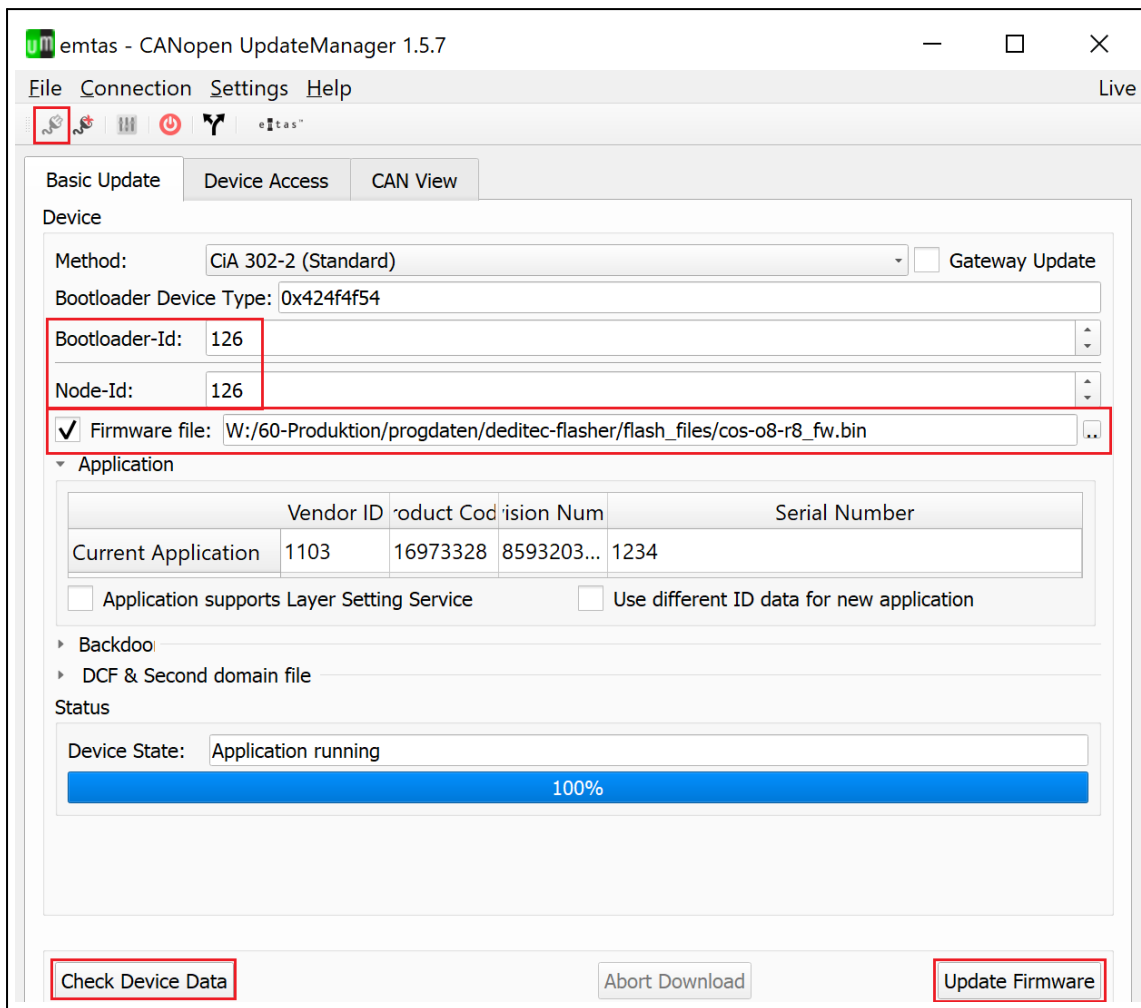
Bootloader-Id: 126

Node-Id: 126

Select firmware file

Check Device Data

Update Firmware



CANopen Protokoll



3. CANopen Protokoll

3.1. Identifier

By default, the CANopen identifiers are assigned according to the Predefined Connection Set, which is described in the CANopen communication profile DS-301

COB-ID	Object
0x000	Network Management
0x080	SYNC
0x080 + NodeID	EMERGENCY
0x180 + NodeID	Client PDO1
0x200 + NodeID	Server PDO1
0x280 + NodeID	Client PDO2
0x300 + NodeID	Server PDO2
0x380 + NodeID	Client PDO3
0x400 + NodeID	Server PDO3
0x480 + NodeID	Client PDO3
0x500 + NodeID	Server PDO4
0x580 + NodeID	Client SDO
0x600 + NodeID	Server SDO
0x700 + NodeID	Node Guarding

The COB-IDs are set and stored during the initial commissioning of the module, depending on the set node ID.

Thus, these COB-IDs are also active when the node ID is changed.

To adapt the COB-IDs to the new node ID, the communication parameters (0x1011:2 - **0x1011 Restore default parameters**) must be reset.

3.2. Network Management

By means of NMT messages (Network Management Messages) the operating state of the module can be changed.

Start Node

COB-ID	DLC	Byte0	Byte1
0	2	0x01	Node ID

Via the message "Start Node" the module is set to the state "Operational".
Only in this state a communication via PDO is possible.

Stop Node

COB-ID	DLC	Byte0	Byte1
0	2	0x02	Node ID

Via the message "Stop Node" the module is set to the state "Stopped".
In this state neither communication via SDO nor PDO is possible.

Enter Pre-Operational

COB-ID	DLC	Byte0	Byte1
0	2	0x80	Node ID

Via the message "Enter Pre-Operational" the module is set to the state "Pre-Operational".

In this state neither a communication via SDO nor PDO is possible.

Reset Node

COB-ID	DLC	Byte0	Byte1
0	2	0x80	Node ID

The message "Reset Node" triggers a hardware reset of the module.

After restarting the module, it is in the "Pre-Operational" state.

3.3. Object directory

All relevant data (process data, parameters, ...) of a CANopen module are made available to other bus stations in a uniform way in an object dictionary.

Each object has a 16-bit index and an 8-bit subindex.

For a better overview, the index area is divided into logical segments:

Index	Description
0x0001 .. 0x025F	Definition for data types
0x0260 .. 0x0FFF	reserved
0x1000 .. 0x1FFF	Communication profile
0x2000 .. 0x5FFF	Manufacturer profile
0x6000 .. 0x9FFF	Device profile
0xA000 .. 0xFFFF	reserved

3.3.1. Communication profile

The COS-Series module has implemented the following objects from the DS-301 communication profile:

Index	Description	Data type
0x1000	Device Type	unsigned 32
0x1001	Error Register	unsigned 8
0x1003	Predefined Error Field	unsigned 32
0x1003:1	Standard Error Field	unsigned 32
0x1003:2	Standard Error Field	unsigned 32
0x1003:3	Standard Error Field	unsigned 32
0x1003:4	Standard Error Field	unsigned 32
0x1003:5	Standard Error Field	unsigned 32
0x1003:6	Standard Error Field	unsigned 32
0x1003:7	Standard Error Field	unsigned 32
0x1003:8	Standard Error Field	unsigned 32
0x1005	COB ID SYNC	unsigned 32
0x1008	Manufacturer device name	visible string
0x100a	Manufacturer software version	visible string
0x100c	Guard time	unsigned 16
0x100d	Life time factor	unsigned 8

Index	Description	Data type
0x1010	Store parameters	unsigned 8
0x1010:1	Save all parameters	unsigned 32
0x1010:2	Save communication parameters	unsigned 32
0x1010:3	Save application parameters	unsigned 32
0x1010:4	Save manufacturer parameters	unsigned 32
0x1011	Restore default parameters	unsigned 8

Index	Description	Data type
0x1011:1	Restore all default parameters	unsigned 32
0x1011:2	Restore communication default parameters	unsigned 32
0x1011:3	Restore application default parameters	unsigned 32
0x1011:4	Restore manufacturer default parameters	unsigned 32
0x1014	COB ID EMCY	unsigned 32
0x1015	Inhibit Time Emergency	unsigned 16
0x1016	Consumer Heartbeat Time	unsigned 8
0x1016:1	Consumer Heartbeat Time 1	unsigned 32
0x1016:2	Consumer Heartbeat Time 2	unsigned 32
0x1017	Producer Heartbeat Time	unsigned 16
0x1018	Identity Object	unsigned 8
0x1018:1	Vendor Id	unsigned 32
0x1018:2	Product Code	unsigned 32
0x1018:3	Revision number	unsigned 32
0x1018:4	Serial number	unsigned 32

Index	Description	Data type
0x1029	Error behaviour	unsigned 8
0x1029:1	Communication Error	unsigned 8
0x1029:2	Specific Error Class	unsigned 8
0x1400	RPDO1 Communication Parameter	unsigned 8
0x1400:1	COB ID	unsigned 32
0x1400:2	Transmission Type	unsigned 8
0x1401	RPDO2 Communication Parameter	unsigned 8
0x1401:1	COB ID	unsigned 32
0x1401:2	Transmission Type	unsigned 8

Index	Description	Data type
0x1402	RPDO3 Communication Parameter	unsigned 8
0x1402:1	COB ID	unsigned 32
0x1402:2	Transmission Type	unsigned 8
0x1403	RPDO4 Communication Parameter	unsigned 8
0x1403:1	COB ID	unsigned 32
0x1403:2	Transmission Type	unsigned 8
0x1600	RPDO1 Mapping Parameter	unsigned 8
0x1600:1	Mapping Entry 1	unsigned 32
0x1600:2	Mapping Entry 2	unsigned 32
0x1600:3	Mapping Entry 3	unsigned 32
0x1600:4	Mapping Entry 4	unsigned 32
0x1600:5	Mapping Entry 5	unsigned 32
0x1600:6	Mapping Entry 6	unsigned 32
0x1600:7	Mapping Entry 7	unsigned 32
0x1600:8	Mapping Entry 8	unsigned 32
0x1601	RPDO2 Mapping Parameter	unsigned 8
0x1601:1	Mapping Entry 1	unsigned 32

Index	Description	Data type
0x1601:2	Mapping Entry 2	unsigned 32
0x1601:3	Mapping Entry 3	unsigned 32
0x1601:4	Mapping Entry 4	unsigned 32
0x1601:5	Mapping Entry 5	unsigned 32
0x1601:6	Mapping Entry 6	unsigned 32
0x1601:7	Mapping Entry 7	unsigned 32
0x1601:8	Mapping Entry 8	unsigned 32
0x1602	RPDO3 Mapping Parameter	unsigned 8

Index	Description	Data type
0x1602:1	Mapping Entry 1	unsigned 32
0x1602:2	Mapping Entry 2	unsigned 32
0x1602:3	Mapping Entry 3	unsigned 32
0x1602:4	Mapping Entry 4	unsigned 32
0x1602:5	Mapping Entry 5	unsigned 32
0x1602:6	Mapping Entry 6	unsigned 32
0x1602:7	Mapping Entry 7	unsigned 32
0x1602:8	Mapping Entry 8	unsigned 32
0x1603	RPDO4 Mapping Parameter	unsigned 8
0x1603:1	Mapping Entry 1	unsigned 32
0x1603:2	Mapping Entry 2	unsigned 32
0x1603:3	Mapping Entry 3	unsigned 32
0x1603:4	Mapping Entry 4	unsigned 32
0x1603:5	Mapping Entry 5	unsigned 32
0x1603:6	Mapping Entry 6	unsigned 32
0x1603:7	Mapping Entry 7	unsigned 32
0x1603:8	Mapping Entry 8	unsigned 32
0x1800	TPDO1 Communication Parameter	record

Index	Description	Data type
0x1800:1	COB ID	unsigned 32
0x1800:2	Transmission Type	unsigned 8
0x1800:3	Inhibit Time	unsigned 16
0x1800:4	Event Timer	unsigned 16
0x1801	TPDO2 Communication Parameter	record
0x1801:1	COB ID	unsigned 32
0x1801:2	Transmission Type	unsigned 8

Index	Description	Data type
0x1801:3	Inhibit Time	unsigned 16
0x1801:4	Event Timer	unsigned 16
0x1802	TPDO3 Communication Parameter	record
0x1802:1	COB ID	unsigned 32
0x1802:2	Transmission Type	unsigned 8
0x1802:3	Inhibit Time	unsigned 16
0x1802:4	Event Timer	unsigned 16
0x1803	TPDO4 Communication Parameter	record
0x1803:1	COB ID	unsigned 32
0x1803:2	Transmission Type	unsigned 8
0x1803:3	Inhibit Time	unsigned 16
0x1803:4	Event Timer	unsigned 16
0x1a00	TPDO1 Mapping Parameter	unsigned 32
0x1a00:1	Mapping Entry 1	unsigned 32
0x1a00:2	Mapping Entry 2	unsigned 32
0x1a00:3	Mapping Entry 3	unsigned 32
0x1a00:4	Mapping Entry 4	unsigned 32
0x1a00:5	Mapping Entry 5	unsigned 32

Index	Description	Data type
0x1a00:6	Mapping Entry 6	unsigned 32
0x1a00:7	Mapping Entry 7	unsigned 32
0x1a00:8	Mapping Entry 8	unsigned 32
0x1a01	TPDO2 Mapping Parameter	unsigned 32
0x1a01:1	Mapping Entry 1	unsigned 32
0x1a01:2	Mapping Entry 2	unsigned 32
0x1a01:3	Mapping Entry 3	unsigned 32

Index	Description	Data type
0x1a01:4	Mapping Entry 4	unsigned 32
0x1a01:5	Mapping Entry 5	unsigned 32
0x1a01:6	Mapping Entry 6	unsigned 32
0x1a01:7	Mapping Entry 7	unsigned 32
0x1a01:8	Mapping Entry 8	unsigned 32
0x1a02	TPDO3 Mapping Parameter	unsigned 32
0x1a02:1	Mapping Entry 1	unsigned 32
0x1a02:2	Mapping Entry 2	unsigned 32
0x1a02:3	Mapping Entry 3	unsigned 32
0x1a02:4	Mapping Entry 4	unsigned 32
0x1a02:5	Mapping Entry 5	unsigned 32
0x1a02:6	Mapping Entry 6	unsigned 32
0x1a02:7	Mapping Entry 7	unsigned 32
0x1a02:8	Mapping Entry 8	unsigned 32
0x1a03	TPDO4 Mapping Parameter	unsigned 32
0x1a03:1	Mapping Entry 1	unsigned 32
0x1a03:2	Mapping Entry 2	unsigned 32
0x1a03:3	Mapping Entry 3	unsigned 32
0x1a03:4	Mapping Entry 4	unsigned 32

Index	Description	Data type
0x1a03:5	Mapping Entry 5	unsigned 32
0x1a03:6	Mapping Entry 6	unsigned 32
0x1a03:7	Mapping Entry 7	unsigned 32
0x1a03:8	Mapping Entry 8	unsigned 32
0x1f51	Program Control	unsigned 8
0x1f51:1	Program Control	unsigned 8
0x1f80	NMT Startup	unsigned 32

3.3.1.1. 0x1000 Device Type

0x1601: Via the index 0x1000 the device type can be read

Subindex	Description	Data type	Access	Default
0	Device Type	unsigned 32	ro	0x0003 0191

Device Type

Bit	Description	Value [dec]
31	Special functionality	0
..		
24		
23	Manufacturer-specific PDO mapping implemented	0
22	reserved	0
21		

Bit	Description	Value [dec]
20		
19	Analog outputs implemented	0
18	Analog inputs implemented	0
17	Digital outputs implemented	1
16	Digital inputs implemented	1
15	Devices profile	401
..		
0		

3.3.1.2. 0x1001 Error Register

Via the index 0x1001 the error register of the module can be read

Subindex	Description	Data type	Access	Default
0	Error Register	unsigned 8	ro	0x00

Supported bits of the error register

Bit	Description
0	generic
1	-
2	-
3	-
4	communication
5	-
6	-
7	-

Possible errors

Value	Description
0x00	no error
0x01	generic error
0x10	communication error

3.3.1.3. 0x1003 Predefined Error Field

Via the index 0x1003 the error history of the module can be accessed.

Subindex 0 contains the number of errors that have occurred.

As soon as an error occurs, it is stored under subindex 1 and subindex 0 is incremented.

If there are further, older errors, the subindex of these errors is also incremented.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	rw	-
1	Error code	unsigned 32	ro	-
2	Error code n-1			
...				
10	Error code n-9			

The module supports up to 10 entries for errors. As soon as the 11th error occurs, the oldest error (subindex 10) is deleted.

To delete the entire error list, set subindex 0 to the value "0".

3.3.1.4. 0x1005 COB ID SYNC

The identifier for SYNC messages (synchronization message) can be set via index 0x1005.

SYNC messages can be used to trigger the sending of a PDO.

Subindex	Description	Data type	Access	Default
0	COB ID SYNC Message	unsigned 32	rw	0x80

3.3.1.5. 0x1008 Manufacturer device name

Via the index 0x1008 the module name can be read

3.3.1.6. 0x100A Manufacturer software version

The current software version (e.g. '1.00') can be read out via the index 0x100A.

Subindex	Description	Data type	Access	Default
0	Manufacturer software version	visible string	ro	-

3.3.1.7. 0x100C Guard Time

Via the index 0x100C the time [ms] for the device monitoring can be set.

This value is multiplied by **0x100D Life Time Factor**. The result of this multiplication is the Life Time.

By default, the guard time is configured to 0ms. Node guarding is therefore inactive!

Subindex	Description	Data type	Access	Default
0	Guard Time	unsigned16	rw	0

Note

CAN in Automation (CiA) recommends using only the Heartbeat protocol for device monitoring.

Node guarding should only be used in existing systems.

For more information, refer to the chapter **Device monitoring**.

3.3.1.8. 0x100D Life Time Factor

Via the index 0x100D a factor for the time of the device monitoring can be set. This factor is multiplied **0x100C Guard Time**. The result of this multiplication is the Life Time.

By default, the life time factor is configured with 0. Node guarding is therefore inactive!

Subindex	Description	Data type	Access	Default
0	Life Time Factor	unsigned8	rw	0

Note

CAN in Automation (CiA) recommends using only the Heartbeat protocol for device monitoring.

Node guarding should only be used in existing systems.

For more information, refer to the chapter **Device monitoring**.

3.3.1.9. 0x1010 Store parameters

Via index 0x1010 current module parameters can be stored in the EEPROM.

For saving a write access with the value 0x65766173 (= ASCII "save") must take place.

The subindex determines which parameters are to be saved.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	4
1	Save all parameters (0x1000 .. 0x9FFF)	unsigned 32	rw	0x0000 0001
2	Save communication (0x1000 .. 0x1FFF)			
3	Save application (0x6000 .. 0x9FFF)			
4	Save manufacturer (0x2000 .. 0x5FFF)			

3.3.1.10. 0x1011 Restore default parameters

Via index 0x1011 the module parameters can be reset to factory setting.

For resetting a write access with the value 0x64616F6C(= ASCII "load") must take place.

Via the subindex is determined which parameters are to be reset.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	4
1	Restore all parameters (0x1000 .. 0x9FFF)	unsigned 32	rw	0x0000 0001
2	Restore communication (0x1000 .. 0x1FFF)			
3	Restore application (0x6000 .. 0x9FFF)			
4	Restore manufacturer (0x2000 .. 0x5FFF)			

Attention

The factory settings are only active after restarting the module!

All individual settings are lost!

3.3.1.11. 0x1014 COB ID EMCY

Via index 0x1014 the COB-ID for Emergency Messages (EMCY) is defined.

Subindex	Description	Data type	Access	Default
0	COB-ID EMCY	unsigned 32	rw	0x80 NodeID +

3.3.1.12. 0x1015 Inhibit Time Emergency

Via the index 0x1015 the Inhibit Time (dead time) for EMCY messages (Emergency messages) can be defined.

The value is specified in the unit 100 us. (e.g. value 10 = 1000 us)

Subindex	Description	Data type	Access	Default
0	Inhibit Time Emergency	unsigned 16	rw	0

3.3.1.13. 0x1016 Consumer Heartbeat Time

Via index 0x1016 the consumer heartbeat time is defined.

The heartbeat protocol can be used to monitor other CANopen bus nodes. For this purpose the index **0x1017 Producer Heartbeat Time** of the device to be monitored must be active.

This device then sends a CAN message (heartbeat) cyclically in the defined time.

Index 0x1016 is quasi the counterpart to this. Here a time window is defined in which this heartbeat is expected.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	2
1	Consumer Heartbeat Time 1	unsigend 32	rw	0
2	Consumer Heartbeat Time 2	unsigend 32	rw	0

Consumer Heartbeat Time

Bit	Description	Value [dec]
31	reserved	0
..		
24		
23	Device address / NodeID	e.g. 0x3F
..		
16		
15	Heartbeat Producer Time [ms]	e.g. 1000 for 1Sec.
..		
0		

3.3.1.14. 0x1017 Producer Heartbeat Time

The Producer Heartbeat Time can be defined via the index 0x1017.

If the heartbeat producer is activated (value > 0), a heartbeat message is sent cyclically during this time to identifier "0x700 + nodeID".

The **Heartbeat Protokoll** is suitable for monitoring a node.

The value is specified in the unit 100 us. (e.g. value 10 = 1000 us)

Subindex	Description	Data type	Access	Default
0	Producer Heartbeat Time	unsigned 16	rw	0

3.3.1.15. 0x1018 Identity Object

Via the index 0x1018 general device information of the COS module can be queried

Subindex	Description	Data type	Access	Default
0	Anzahl der Einträge	unsigned 8	ro	4
1	Vendor ID	unsigned 32	ro	0x44F
2	Product Code	unsigned 32	ro	0x01027E18
3	Revision Number	unsigned 32	ro	-
4	Serial Number	unsigned 32	ro	-

Vendor ID

The Vendor ID is a unique manufacturer identification.

The DEDITEC Vendor ID has the value 0x44F.

Product Code

The Product Code is a manufacturer-specific identifier for identifying the hardware.

Revision Number

Here the firmware version of the module can be queried.

The version number is returned in ASCII - I.e. the value 0x34333231 means v12.34.

Serial Number

The Serial Number is the serial number of the module.

3.3.1.16. 0x1029 Error behaviour

The index 0x1029 describes the error behavior in the operating mode "Operational".

By default, the module switches to the "Pre-Operational" operating mode in the event of an operating fault (e.g. heartbeat timeout or bus off).

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	Communication Error	unsigned 8	rw	0

Communication Error

Value	Description
0	Switches to "Pre-Operational" operating state
1	Current operating state is maintained
2	Switches to "Stopped" operating state

3.3.1.17. 0x1400 Receive PDO1 Communication Parameter

The communication parameters for the RPDO (receive PDO) are defined via index 0x1400.

By default the top bit of the COB-ID is not set. RPDO1 is therefore active.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	2
1	COB ID	unsigned 32	rw	0x200 + NodeID
2	Transmission Type	unsigned 8	rw	255

COB ID

Bit	Description
31	PDO valid 0=valid, 1=invalid
30	reserved
29	Frame Type 0=11 Bit, 1=29 Bit
28	Identifier
..	
0	

Transmission Type

Value	Description
0	acyclic synchronous, module reacts to each SYNC message
1 .. 240	cyclic synchronous, Module reacts to every "nth" SYNC message
255	event-controlled, PDO is sent when the event timer expires

more information about Transmission Type you can find [here](#)

3.3.1.18. 0x1600 Receive PDO1 Mapping Parameter

Via the index 0x1600 the mapping parameters for the RPDO1 (receive PDO) are defined.

By default, subindex 1 is configured to map the incoming data (byte0 in the receive PDO) to the digital outputs (0x6200:1 - **0x6200 Write Output 8-Bit**).

Subindex 2 to 8 is a dummy mapping, a kind of placeholder.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	rw	8
1	Mapping Entry 1	unsigned 32	rw	0x6200 0108
2	Mapping Entry 2			0x0005 0008
3	Mapping Entry 3			0x0005 0008
4	Mapping Entry 4			0x0005 0008
5	Mapping Entry 5			0x0005 0008
6	Mapping Entry 6			0x0005 0008
7	Mapping Entry 7			0x0005 0008
8	Mapping Entry 8			0x0005 0008

Attention

By default RPDO1 is active. To edit the mapping entries the COB-ID (0x1400:1 - **0x1400 Receive PDO1 Communication Parameter**) must be set invalid.

Mapping Entry

Bit	Description
31	Index
..	
16	
15	Subindex
..	
8	
7	Length
..	
0	

Possible mapping

Mapping [hex]	Description
6200 01 08	Digital outputs Ch 01..08
0005 00 08	Dummy Mapping

3.3.1.18.1. Several COS-DIO8 modules in parallel connection

It is possible to connect up to 8 COS-DIO8 modules in parallel. Thus up to 64 outputs can be switched simultaneously with only one RPDO.

For this the Receive COB-ID in Index **0x1400 Receive PDO1 Communication Parameter** must be the same for all modules.

The index **0x1600 Receive PDO1 Mapping Parameter** must be configured individually for each module. Here it must be observed that the correct mapping is assigned to each module.

Example

The digital outputs (object 0x6200:1) of 4 COS-DIO8 modules are to be set with an RPDO.

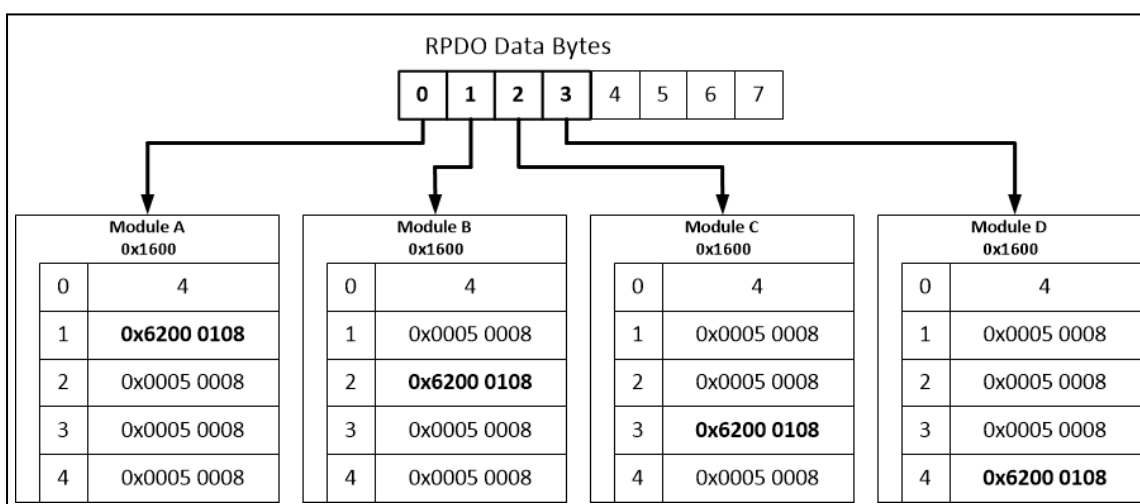
For this the Receive COB-ID (Object 0x1400:1) 0x123 is configured for all modules.

The mapping must be configured so that module A reacts to byte0, module B to byte1, module C to byte2 and module D to byte3.

Ideally, the number of valid mapping entries (object 0x1600:0) of all modules should have the same value (=4).

Now each module is assigned "its" byte. For this the value 0x62000108 must be entered into the respective subindex.

A dummy mapping (placeholder) with the value 0x00050008 must be entered in the subindices that are not required.



3.3.1.19. 0x1800 Transmit PDO1 Communication Parameter

Via the index 0x1800 the communication parameters for the 1st TPDO (transmit PDO) are defined.

By default the top bit of the COB-ID is not set. TPDO1 is therefore active.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	5
1	COB ID	unsigned 32	rw	0x180 + NodeID
2	Transmission Type	unsigned 8	rw	255
3	Inhibit Time	unsigned 16	rw	0
4	reserved	unsigned 8	const	0
5	Event Timer	unsigned 16	rw	0

COB ID

Bit	Description
31	PDO valid 0=valid, 1=invalid
30	RTR allowed 0=yes, 1=no
29	Frame Type 0=11 Bit, 1=29 Bit
28	Identifier
..	
0	

Transmission Type

Value	Description
0	acyclic synchronous, module reacts to each SYNC message
1 .. 240	cyclic synchronous, Module reacts to every "nth" SYNC message
255	event-controlled, PDO is sent when the event timer expires

Inhibit Time

The Inhibit Time (send delay time) is a period of time that must be waited between the sending of identical messages.

Event Timer

The event timer describes the send interval in which the PDO is automatically sent.

The value 0 deactivates the event timer.

3.3.1.20. 0x1801 Transmit PDO2 Communication Parameter

The communication parameters for the 2nd TPDO (transmit PDO) are defined via index 0x1801.

By default the top bit of the COB-ID is set. TPDO2 is therefore inactive.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	5
1	COB ID	unsigned 32	rw	0x8000 0280 + NodeID
2	Transmission Type	unsigned 8	rw	255
3	Inhibit Time	unsigned 16	rw	0
4	reserved	unsigned 8	const	0
5	Event Timer	unsigned 16	rw	0

COB ID

Bit	Description
31	PDO valid 0=valid, 1=invalid
30	RTR allowed 0=yes, 1=no
29	Frame Type 0=11 Bit, 1=29 Bit
28	Identifier
..	
0	

Transmission Type

Value	Description
0	acyclic synchronous, module reacts to each SYNC message
1 .. 240	cyclic synchronous, Module reacts to every "nth" SYNC message
255	event-controlled, PDO is sent when the event timer expires

Inhibit Time

The Inhibit Time (send delay time) is a period of time that must be waited between the sending of identical messages.

Event Timer

The event timer describes the send interval in which the PDO is sent automatically.

The value 0 deactivates the event timer.

3.3.1.21. 0x1802 Transmit PDO3 Communication Parameter

Via index 0x1802 the communication parameters for the 3rd TPDO (transmit PDO) are defined.

By default the top bit of the COB-ID is set. TPDO3 is therefore inactive.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	5
1	COB ID	unsigned 32	rw	0x8000 0380 + NodeID
2	Transmission Type	unsigned 8	rw	255
3	Inhibit Time	unsigned 16	rw	0
4	reserved	unsigned 8	const	0
5	Event Timer	unsigned 16	rw	0

COB ID

Bit	Description
31	PDO valid 0=valid, 1=invalid
30	RTR allowed 0=yes, 1=no
29	Frame Type 0=11 Bit, 1=29 Bit
28	Identifier
..	
0	

Transmission Type

Value	Description
0	acyclic synchronous, module reacts to each SYNC message
1 .. 240	cyclic synchronous, Module reacts to every "nth" SYNC message
255	event-controlled, PDO is sent when the event timer expires

Inhibit Time

The Inhibit Time (send delay time) is a period of time that must be waited between the sending of identical messages.

The value 0 disables the Inhibit Time.

Event Timer

The event timer describes the send interval in which the PDO is sent automatically.

The value 0 deactivates the event timer.

3.3.1.22. 0x1A00 Transmit PDO1 Mapping Parameter

Via index 0x1a00 the mapping parameters for the 1st TPDO (transmit PDO) are defined.

By default, subindex 1 is configured so that the states of the digital inputs (0x6000:1 - **0x6000 Read Input 8-Bit**) are mapped to byte0 in the transmit PDO.

Subindex 2 to 8 is a dummy mapping, a kind of placeholder.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	rw	8
1	Mapping Entry 1	unsigned 32	rw	0x6000 0108
2	Mapping Entry 2			0x0005 0008
3	Mapping Entry 3			0x0005 0008
4	Mapping Entry 4			0x0005 0008
5	Mapping Entry 5			0x0005 0008
6	Mapping Entry 6			0x0005 0008
7	Mapping Entry 7			0x0005 0008
8	Mapping Entry 8			0x0005 0008

Attention

By default TPD01 is active. To edit the mapping entries the COB-ID (0x1800:1 - **0x1800 Transmit PD01 Communication Parameter**) must be set invalid.

Mapping Entry

Bit	Description
31	Index
..	
16	
15	Subindex
..	
8	
7	Length
..	
0	

Possible mapping

Mapping [hex]	Description
6000 01 08	Digital inputs Ch 01..08
5010 01 10	Input counter Ch 01..08
..	
5010 08 10	
0005 00 08	Dummy Mapping

3.3.1.23. 0x1A01 Transmit PDO2 Mapping Parameter

Via index 0x1a01 the mapping parameters for the 2nd TPDO (transmit PDO) are defined.

By default, subindex 1..4 is configured to map input counters Ch 01..04 (0x2411:1..0x2411:4 - **0x2411 Read Input Counter 16 Bit**) to byte 0..7 in the 2nd TPDO (transmit PDO).

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	rw	4
1	Mapping Entry 1	unsigned 32	rw	0x2411 0110
2	Mapping Entry 2			0x2411 0210
3	Mapping Entry 3			0x2411 0310
4	Mapping Entry 4			0x2411 0410

Attention

By default, TPDO2 is inactive. The mapping entries can be edited directly. To activate PDO2 the COB-ID (0x1801:1 - **0x1801 Transmit PDO2 Communication Parameter**) must be set valid.

Mapping Entry

Bit	Description
31	Index
..	
16	
15	Subindex
..	
8	
7	Length
..	
0	

Possible mapping

Mapping [hex]	Description
6000 01 08	Digital inputs Ch 01..08
5010 01 10	Input counter Ch 01..08
..	
5010 08 10	
0005 00 08	Dummy Mapping

3.3.1.24. 0x1A02 Transmit PDO3 Mapping Parameter

Via index 0x1a02 the mapping parameters for the 3rd TPDO (transmit PDO) are defined.

By default, subindex 1..4 is configured to map input counters Ch 05..08 (0x2411:5..0x2411:8 - **0x2411 Read Input Counter 16 Bit**) to byte 0..7 in the 3rd TPDO (transmit PDO).

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	rw	4
1	Mapping Entry 1	unsigned 32	rw	0x2411 0510
2	Mapping Entry 2			0x2411 0610
3	Mapping Entry 3			0x2411 0710
4	Mapping Entry 4			0x2411 0810

Attention

By default TPDO3 is inactive. The mapping entries can be edited directly. To activate PDO3 the COB-ID (0x1802:1 - **0x1802 Transmit PDO3 Communication Parameter**) must be set valid.

Mapping Entry

Bit	Description
31	Index
..	
16	
15	Subindex
..	
8	
7	Length
..	
0	

Possible mapping

Mapping [hex]	Description
6000 01 08	Digital inputs Ch 01..08
5010 01 10	Input counter Ch 01..08
..	
5010 08 10	
0005 00 08	Dummy Mapping

3.3.1.25. 0x1F51 Program Control

The current program (e.g. firmware or bootloader) can be selected or controlled via the index 0x1F51.

This object is required if a new firmware is to be installed.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	Program Control	unsigned 8	rw	-

Program Control

Value	Description
0	startet das Modul im Bootloader

Other functions are not supported.

Attention:

Improper execution of the firmware update may result in the module not being able to be operated any longer.

It is therefore advisable to have the firmware update performed by an experienced user.

3.3.1.26. 0x1F80 MNT Startup

Via the index 0x1F80 the operating mode can be set after power-on/reset of the module.

The automatic change to operating mode "Operational" should only be used in environments where no NMT master is available.

Subindex	Description	Data type	Access	Default
0	MNT Startup	unsigned 32	rw	2

NMT Startup

Value	Description
2	Switches to "Pre-Operational" operating state
8	Switches to "Operational" operating state

Other functions are not supported.

3.3.2. Manufacturer profile

The COS-Series module has implemented the following vendor-specific objects:

Index	Description	Data type
0x2100	Custom Data	unsigned 8
0x2100:1	Custom Data 1	unsigned 32
0x2100:2	Custom Data 2	unsigned 32
0x2100:3	Custom Data 3	unsigned 32
0x2100:4	Custom Data 4	unsigned 32
0x2100:5	Custom Data 5	unsigned 32
0x2100:6	Custom Data 6	unsigned 32
0x2100:7	Custom Data 7	unsigned 32
0x2100:8	Custom Data 8	unsigned 32
0x5F00	DEDITEC Special	unsigned 8
0x5F00:1	ModuleState	unsigned 32
0x5F00:2	CfgModuleID	unsigned 32

Index	Description	Data type
0x5F00:3	ModuleType	unsigned 32
0x5F00:4	BootloadID0..3	unsigned 32
0x5F00:5	BootloadID4..7	unsigned 32
0x5F10	DEDITEC Register Mode Read	unsigned 8
0x5F10:1	Register Address	unsigned 32
0x5F10:2	Read Byte	unsigned 32
0x5F10:3	Read Word	unsigned 32
0x5F10:4	Read Long	unsigned 32
0x5F10:5	Read Byte + Increment Address	unsigned 32
0x5F10:6	Read Word + Increment Address	unsigned 32
0x5F10:7	Read Long + Increment Address	unsigned 32
0x5F10:8	Error Code	unsigned 32
0x5F20	DEDITEC Register Mode Write	unsigned 8
0x5F20:1	Register Address	unsigned 32

Index	Description	Data type
0x5F20:2	Write Byte	unsigned 32
0x5F20:3	Write Word	unsigned 32
0x5F20:4	Write Long	unsigned 32
0x5F20:5	Write Byte + Increment Address	unsigned 32
0x5F20:6	Write Word + Increment Address	unsigned 32
0x5F20:7	Write Long + Increment Address	unsigned 32
0x5F20:8	Error Code	unsigned 32

3.3.2.1. 0x2100 Custom Data

Via the index 0x2100 up to 8 double words (DWORD / 32 bit) can be stored in the EEPROM of the module.

A write access causes an automatic store. A write access to index 0x1010:0 or 0x1010:4 (Store parameters) is therefore not necessary.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	8
1	Custom Data 1	unsigned 32	rw	-
...				
8	Custom Data 8			

3.3.2.2. 0x2400 I/O Port Direction

Via the index 0x2400 it can be defined by means of a bit mask which of the I/O channels is to be used as input or output.

In the delivery state, all I/O channels are defined as inputs.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	I/O Port Direction Channel 1..8	unsigned 8	rw	0

Subindex 1

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1

I/O Port direction

Value	Description
0	Channel is defined as input
1	Channel is defined as output

3.3.2.3. 0x2401 Global Input Sample Rate

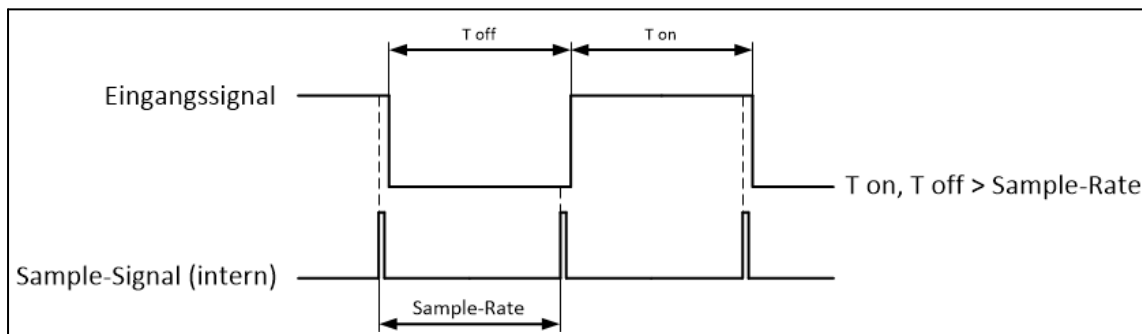
Via the index 0x2401 the global sampling rate [ms] of the digital inputs is defined.

The sampling rate can vary between 5ms and 255ms and is set to 100ms by default.

Subindex	Description	Data type	Access	Default
0	Global Input Sample Rate	unsigned 8	rw	0x64

A sampling rate of 100ms means that a signal must have a low level for at least 100ms and a high level for 100ms in order to be reliably recognized as a "logical 1".

The maximum counting frequency with this configuration is therefore approx. 5 Hz.



3.3.2.4. 0x2410 Read Input Counter 16 Bit

The input counters can be queried via index 0x2410.

Each input counter can be reset separately. To reset the counters, a read access must be made to **0x2411 Read and Reset Input Counter 16 Bit** on the corresponding subindex.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	8
1	Read Input Counter Ch 1	unsigned 16	ro	0
...				
8	Read Input Counter Ch 8			

3.3.2.5. 0x2411 Read and Reset Input Counter 16 Bit

Via index 0x2411 the input counters are queried and then automatically reset.

If the input counters are only to be read (i.e. without resetting), object **0x2410 Read Input Counter 16 Bit** should be used.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	8
1	Read and Reset Input Counter Ch 1	unsigned 16	ro	0
...				
8	Read and Reset Input Counter Ch 8			

3.3.2.6. 0x2420 A/D Mode

Via the index 0x2420 each channel can be set individually to an A/D mode.

The default mode is 0x40.

If an invalid mode was written, the value is not accepted.

The following is an overview of the modes:

Hex	Bit	Modus
0x0	16 Bit	0..10V
0x1	16 Bit	0..5V
0x2	16 Bit	0..2,5V
0x3	18 Bit	0..10V
0x4	16 Bit	0..20V
0x5	16 Bit	0..40V
0x40	16 Bit	± 10V
0x41	16 Bit	± 5V
0x42	16 Bit	± 2,5V
0x43	18 Bit	± 10V
0x44	16 Bit	± 20V
0x45	16 Bit	± 40V

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	16
1	A/D Mode Ch 1	unsigned 8	rw	0x40
...				
16	A/D Mode Ch 16			

3.3.2.7. 0x2421 Global A/D Filter Level

Via index 0x2421 the Global A/D Filter Level is set.

Subindex	Description	Data type	Access	Default
0	Global A/D Filter Level	unsigned 8	rw	0xa

3.3.2.8. 0x2440 D/A Mode

Via the index 0x2440 each channel can be set individually to a D/A mode.

The default mode is 0x40.

If an invalid mode was written, the value is not accepted.

The following is an overview of the modes:

Hex	Mode
0x0	0..10V
0x1	0..5V
0x40	+10V
0x41	+5V

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	8
1	D/A Mode Ch 1	unsigned 8	rw	0x40
...				
8	D/A Mode Ch 8			

3.3.2.9. 0x5F00 Deditec Special

Index is needed for internal purposes.

3.3.2.10. 0x5F10 Deditec Register Mode Read

Index is needed for internal purposes.

3.3.2.11. 0x5F20 Deditec Register Mode Write

Index is needed for internal purposes.

3.3.3. Device profile

The COS-Series module has implemented the following objects from the DS-401 device profile:

Digital inputs

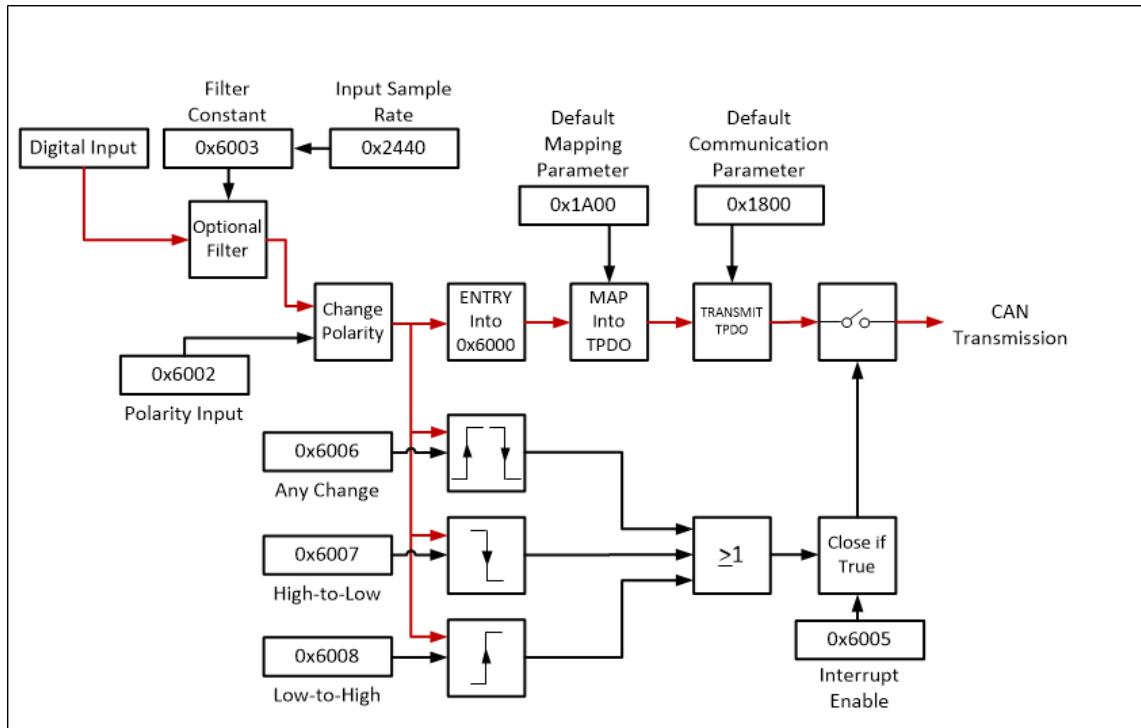
Index	Description	Data type
0x6000	Read Input 8 Bit	unsigned 8
0x6002	Polarity Input 8 Bit	unsigned 8
0x6003	Filter Constant Input 8 Bit	unsigned 8
0x6005	Global Interrupt Enable Digital	boolean
0x6006	Interrupt Mask Any Change 8 Bit	unsigned 8
0x6007	Interrupt Mask Low to High 8 Bit	unsigned 8
0x6008	Interrupt Mask High to Low 8 Bit	unsigned 8

Digital outputs

Index	Description	Data type
0x6200	Write Output 8 Bit	unsigned 8
0x6202	Polarity Output 8 Bit	unsigned 8
0x6206	Error Mode Output 8 Bit	unsigned 8
0x6207	Error Value Output 8 Bit	unsigned 8

3.3.3.1. Digital inputs

Context of the implemented objects for digital inputs



3.3.3.1.1. 0x6000 Read Input 8 Bit

Via index 0x6000 the state of the digital inputs is read.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	Read Input Channel 1..8	unsigned 8	ro	-

Subindex 1

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1

Value	Description
0	Input carries low level
1	Input carries high level

Example

The inputs 1..8 (= subindex 1) are read from device address 10 (=0x0A).

SDO Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x60A	8	0x40	0x00	0x60	0x01	0x00	0x00	0x00	0x00

Response Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x58 A	8	0x4F	0x00	0x60	0x01	0x88	0x00	0x00	0x00

In this example the input state is 0x88 (=0b10001000).

Only input 4 and 8 carry a logical high level.

3.3.3.1.2. 0x6002 Polarity Input 8 Bit

Via the index 0x6002 the polarity of the digital inputs is defined.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	Polarity Input Channel 1..8	unsigned 8	rw	0

Subindex 1

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1

Value	Description
0	Input is not inverted
1	Input is inverted

3.3.3.1.3. 0x6003 Filter Constant Input 8 Bit

Via index 0x6003 an input filter can be activated by means of a bit mask for each digital input.

The filter itself is defined in object.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	Filter Channel 1..8	unsigned 8	rw	0

Subindex 1

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1

Value	Description
0	Filter disabled
1	Filter activated

3.3.3.1.4. 0x6005 Global Interrupt Enable Digital 8 Bit

Index 0x6005 is used to define whether a PDO can be sent by a change of state of the inputs.

The trigger can be selected by the indices **0x6006 Interrupt Mask Any Change 8-Bit**, **0x6007 Interrupt Mask Low to High 8 Bit** and **0x6008 Interrupt Mask High to Low 8 Bit**.

Subindex	Description	Data type	Access	Default
0	Global Interrupt	boolean	rw	true

By default, a PDO is sent each time the status of the inputs changes.

3.3.3.1.5. 0x6006 Interrupt Mask Any Change 8 Bit

Via the index 0x6006 it is defined by which input, at falling or rising edge, a PDO is sent.

For this trigger the global interrupt **0x6005 Global Interrupt Enable Digital 8 Bit** must be active.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	IRQ Mask Any Change CH 1..8	unsigned 8	rw	0xff

Subindex 1

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1

Value	Description
0	Interrupt disabled
1	Interrupt enabled

3.3.3.1.6. 0x6007 Interrupt Mask Low to High 8 Bit

Via the index 0x6007 is defined by which input, at rising edge, a PDO is sent.

For this trigger the global interrupt **0x6005 Global Interrupt Enable Digital 8 Bit** must be active.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	IRQ Mask Low to High CH 1..8	unsigned 8	rw	0

Subindex 1

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1

Value	Description
0	Interrupt disabled
1	Interrupt enabled

3.3.3.1.7. 0x6008 Interrupt Mask High to Low 8 Bit

Via the index 0x6008 it is defined by which input, at falling edge, a PDO is sent. For this trigger the global interrupt **0x6005 Global Interrupt Enable Digital 8 Bit** must be active.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	IRQ Mask High to Low CH 1..8	unsigned 8	rw	0

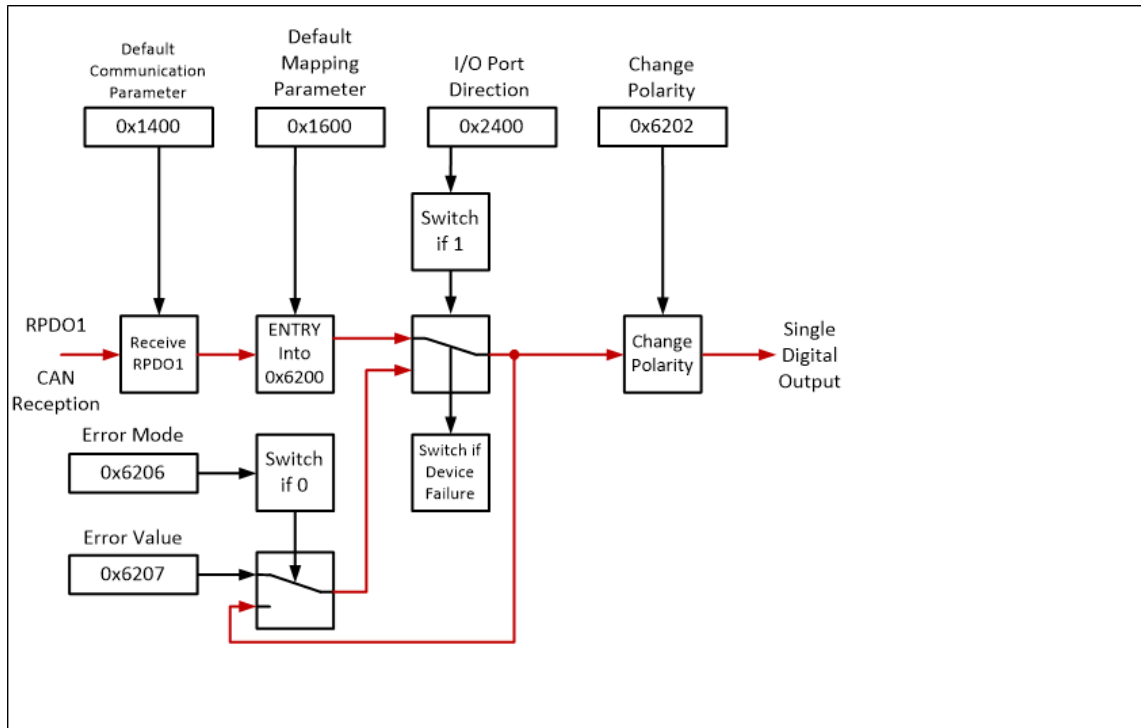
Subindex 1

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1

Wert	Description
0	Interrupt disabled
1	Interrupt enabled

3.3.3.2. Digital outputs

Context of the implemented objects for digital outputs



3.3.3.2.1. 0x6200 Write Output 8-Bit

Via the index 0x6200 the state of the digital outputs is set. In addition, the state can also be read back.

Notice: At the DIO8 channels must be defined as output before they can be set. See chapter **0x2400 I/O Port Direction**

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	Write Output Channel 1..8	unsigned 8	rw	0

Subindex 1

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1

Value	Description
0	Output is not switched
1	Output is switched

Example

It is written from device address 20 (=0x14) the outputs 1..8 (=subindex 1). Only output 2 and 7 are to be switched (=0b01000010 =0x42)

SDO Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x61 4	8	0x2F	0x00	0x62	0x01	0x42	0x00	0x00	0x00

Response Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x59 4	8	0x60	0x00	0x62	0x01	0x00	0x00	0x00	0x00

3.3.3.2.2. 0x6202 Polarity Output 8 Bit

Via index 0x6202 the polarity of the digital outputs is defined.

Subindex	Description	Data type	Access	Default
0	Anzahl der Einträge	unsigned 8	ro	1
1	Polarity Output Channel 1..8	unsigned 8	rw	0

Subindex 1

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1

Value	Description
0	Output is not inverted
1	Output is inverted

3.3.3.2.3. 0x6206 Error Mode Output 8 Bit

Index 0x6206 can be used to specify whether the outputs are to be switched to a special state in the event of an error.

The state itself is defined in object **0x6207 Error Value Output 8 Bit**.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	Error Mode Output 1..8	unsigned 8	rw	-

Subindex 1

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1

Value	Description
0	Output is not to be switched
1	Output is switched after 0x6207

3.3.3.2.4. 0x6207 Error Value Output 8 Bit

Via index 0x6207 a state can be defined separately for each output, which is set in case of an error.

For this, the error mode must be activated for the corresponding output in the object **0x6206 Error Mode Output 8 Bit**.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	1
1	Error Value Output 1..8	unsigned 8	rw	-

Subindex 1

Bit	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0
Port	DIO8	DIO7	DIO6	DIO5	DIO4	DIO3	DIO2	DIO1

Value	Description
0	Output is switched off
1	Output is switched on

3.3.3.3. Analog inputs

3.3.3.3.1. 0x6401 Read Analogue Input 16 Bit

The value of the analog inputs is read via index 0x6401.

Subindex	Description	Data type	Access	Default
0	Anzahl der Einträge	unsigned 8	ro	n*
1	Read Analogue Input Channel 1	integer 16	ro	-
...				
16	Read Analogue Input Channel 16			

n* = The number of entries depends on the number of available A/D channels.

Conversion from hex to volts:

The conversion depends on the selected range.

Hex	0-5V	0-10V	+5V	+10V
0x0000	0V	0V	-5V	-10V
0x8000	2,5V	5V	0V	0V
0xffff	5V	10V	5V	10V

3.3.3.3.2. 0x6401 Read Temperature Input 16 Bit

The value of the temperature inputs is read via index 0x6401.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	n*
1	Read Temperature Input Channel 1	integer 16	ro	-
...				
16	Read Temperature Input Channel 16			

n* = The number of entries depends on the number of existing temperature channels.

Bit	Description
0 - 12	Returns the read temperature value
13	Indicates if the temperature value is positive (logical "0") or negative (logical "1")
14	Not used
15	Returns a logical "1" if no sensor is connected

Interpretation of the hex values in °C:

To obtain the correct value in °C, the value read must be divided by 4.

Temperature	Hex
-100°C	0x3E70
-1°C	0x3FFC
-0,25°C	0x3FFF
0°C	0x0
0,25°C	0x1
1°C	0x4
1000°C	0xFA0

3.3.3.3.3. 0x6423 Analogue Input Global Interrupt Enable

Index 0x6423 is used to define whether a PDO can be sent by a change of state of the inputs.

The trigger can be selected via the indices **0x6424 Analogue Input Interrupt Upper Limit Integer**, **0x6425 Analogue Input Interrupt Upper Lower Integer** und **0x6426 Analogue Input Interrupt Delta Unsigned**.

Subindex	Description	Data type	Access	Default
0	Global Interrupt	boolean	rw	true

By default, a PDO is sent each time the status of the inputs changes.

3.3.3.3.4. 0x6424 Analogue Input Interrupt Upper Limit Integer

Via the index 0x6424 the voltage value is defined, which may not be exceeded without sending a PDO.

For this trigger the **globale Interrupt 0x6423** must be active.

Subindex	Description	Data type	Access	Default
0	Number of entries	integer 32	ro	1
1	InterruptUpperLimInt CH 1..16	integer 32	rw	0x0

3.3.3.3.5. 0x6425 Analogue Input Interrupt Lower Limit Integer

Index 0x6425 is used to define the voltage value that may not be undershot without a PDO being sent.

For this trigger the **globale Interrupt 0x6423** must be active.

Subindex	Description	Data type	Access	Default
0	Number of entries	integer 32	ro	1
1	InterruptLowerLimInt CH 1..16	integer 32	rw	0x0

3.3.3.3.6. 0x6426 Analogue Input Interrupt Delta Unsigned

Via the index 0x6426 the maximum difference to the voltage value is defined.

The voltage value must not exceed the difference, otherwise a PDO is sent.

For this trigger the **globale Interrupt 0x6423** must be active.

Subindex	Description	Data type	Access	Default
0	Number of entries	uinteger 32	ro	1
1	InterruptDelta UInt CH 1..16	uinteger 32	rw	0x0

3.3.3.4. Analog outputs

3.3.3.4.1. 0x6411 Write Analogue Output 16 Bit

Via the index 0x6411 the value of the analog outputs is written

Subindex	Description	Data type	Access	Default
0	Anzahl der Einträge	unsigned 8	ro	4/8*
1	Write Analogue Output Channel 1	integer 16	rw	-
...				
4/8	Read Analogue Output Channel 4/8			

*The number of entries depends on the number of connected analog outputs.

Example

The inputs 17..24 (= subindex 3) are read from device address 10 (=0x0A).

SDO Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x60A	8	0x40	0x00	0x60	0x03	0x00	0x00	0x00	0x00

Response Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x58 A	8	0x4F	0x00	0x60	0x03	0x88	0x00	0x00	0x00

In this example the input state is 0x88 (=0b10001000).

Only input 20 and 24 carry a logical high level.

Conversion from hex to volts:

The conversion depends on the selected range.

Hex	0-5V	0-10V	+5V	+10V
0x0000	0V	0V	-5V	-10V
0x8000	2,5V	5V	0V	0V
0xffff	5V	10V	5V	10V

3.3.3.4.2. 0x6443 Analogue Output Error Mode

Via the index 0x6443 the behavior of the analog outputs in case of an error is defined.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	4/8*
1	Error Mode Analogue Output 1	unsigned 8	rw	1
...				
4/8	Error Mode Analogue Output 1			

*The number of entries depends on the number of connected analog outputs.

Error Mode	Description
0	Output Set value to 0
1	Set output value according to 0x6444
2	Output Retain value

Example

The inputs 17..24 (= subindex 3) are read from device address 10 (=0x0A).

SDO Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x60 A	8	0x40	0x00	0x60	0x03	0x00	0x00	0x00	0x00

Response Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x58 A	8	0x4F	0x00	0x60	0x03	0x88	0x00	0x00	0x00

In this example the input state is 0x88 (=0b10001000).

Only input 20 and 24 carry a logical high level.

3.3.3.4.3. 0x6444 Analogue Output Error Value Integer

Via index 0x6444 an output value can be defined for each channel, which is set in case of an error,
if this has been activated by object 0x6443.

Subindex	Description	Data type	Access	Default
0	Number of entries	unsigned 8	ro	4/8*
1	Write Analogue Output Channel 1	integer 16	rw	-
...				
4/8	Read Analogue Output Channel 4/8			

3.4. Access via SDOs

Access to the object dictionary of a CANopen module takes place via so-called SDOs (Service Data Object) and is only permitted in the operating modes "Pre-Operational" and "Operational". Each SDO access is confirmed with a response frame.

Structure SDO Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Identifier	8	Com mand	Index		Subin dex	Data field			
			Bit 0..7	Bit 8..15		Bit 0..7	Bit 8..15	Bit 16..23	Bit 24..31

Example

The digital inputs 0..7 (=index 0x6000, subindex 1) are read from device address 10 (=0x0A).

SDO Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x60 A	8	0x40	0x00	0x60	0x01	0x00	0x00	0x00	0x00

Response Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x58 A	8	0x4F	0x00	0x60	0x01	0x88	0x00	0x00	0x00

Identifier

The parameters are transmitted on the ID 0x600 + 0x0A (NodeID) (Request).

The receiver acknowledges the parameters on the ID 0x580 + 0x0A (NodeID) (Response).

Command

The command in the request frame is composed of specifier (0x40 - Read Request) and the length (0x0 - undefined).

Accordingly, the receiver acknowledges with the command 0x4F (Read Response with 1 byte data).

Frequently used commands

Command	Number of bytes	Value
Write Request	1	0x2F
	2	0x2B
	3	0x27
	4	0x23
	indeterminate	0x22
Write Response	-	0x60
Read Request	-	0x40
Read Response	1	0x4F
	2	0x4B
	3	0x47
	4	0x43
	indeterminate	0x42
Error Response	-	0x80

3.4.1. SDO error messages

If an error occurs during SDO communication, the receiver acknowledges this with an SDO error frame.

The identifier and index refer to the device on which the error occurred.

Structure SDO Error Frame

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Identifier	8	0x80	Index		Sub-index	Error code			
			Bit 0..7	Bit 8..15		Bit 0..7	Bit 8..15	Bit 16..23	Bit 24..31

Possible error codes

Error code	Description
0x0504 0001	Command unknown
0x0601 0000	Access to object not allowed
0x0601 0001	Read access to object not allowed
0x0601 0002	Write access to object not allowed
0x0602 0000	Index unknown
0x0604 0041	Object cannot be mapped to PDO
0x0606 0000	no access due to hardware error

Error code	Description
0x0607 0010	wrong number of data bytes
0x0607 0012	Length too small
0x0607 0013	Length too long
0x0609 0011	Subindex unknown
0x0609 0030	Sent parameter out of range of values
0x0800 0000	undefined cause of error
0x0800 0020	Data cannot be transferred or stored
0x0800 0022	Data cannot be transferred or saved (incorrect operating mode)
0x0800 0024	Access to Flash failed

3.5. Device monitoring

To monitor a CANopen node there are two possibilities, respectively protocols:

- **Node-Guarding**
- **Heartbeat Protokoll**

Note

CAN in Automation (CiA) recommends using only the Heartbeat protocol for device monitoring.

Node guarding should only be used in existing systems.

3.5.1. Node-Guarding

With node guarding, a specific node (NMT master) requests one or more nodes to be monitored (NMT slaves) with CAN remote frames to report back with a CAN message consisting of the current operating state (e.g. pre-operational) and a toggle bit.

If a slave does not respond within a certain time (lifetime), this is interpreted as a node failure and triggers a nodeguarding error at the master.

This method can of course also be used to monitor the status of the NMT master itself. Each slave can determine whether a request came from the master in its "lifetime". If this request is missing, the slave assumes that the master itself has failed and then triggers a lifeguarding error.

3.5.2. Heartbeat Protokoll

Other nodes in the bus can be monitored via the heartbeat protocol. The node that is to be monitored (also heartbeat producer) cyclically sends a message (heartbeat) on the CAN bus. This message is received by one or more nodes (heartbeat consumer). For this purpose, the node number of the producer and a heartbeat time are configured in the heartbeat consumer. If the message of the configured node remains missing in the set time, e.g. due to a connection failure, the consumer triggers a heartbeat error.

3.6. Emergency

EMCY messages (Emergency messages) are used to signal internal errors of the module.

An error message is sent the first time an error occurs. If the cause of the error is eliminated and the error is no longer present, an error message with error code 0x0000 is also sent.

COB-ID	DLC	Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
0x80 + Node ID	8	Error Code		Error Regis ter	Manufacturer Specific Error Field				

Error Code

Error code of the occurred error

Error Register

Shows the current content of the error register (see also **0x1001 Error Register**)

Manufacturer Specific Error Field

Depending on the type of error, controller-specific data is located here, which identifies the error more precisely.

3.7. PDOs

PDOs (Process Data Objects) can be used to transfer process data. Communication by means of PDO is only available in the "Operational" operating mode.

A distinction is made between receive PDOs (also Receive, RX or RPDO) and transmit PDOs (also Transmit, TX or TPDO). The "direction" of the transfer was set from the point of view of the module. COS series modules send their input data (digital/analog inputs) with TPDOs and receive output data (digital/analog outputs) with RPDOs.

The transmission can be synchronous, asynchronous or event-driven.

Transmission Type	Transmission				
	cyclic	acyclic	synchronous	asynchronous	RTR
0		x	x		
1 .. 240	x		x		
241 .. 251	reserved				
252			x		x
253				x	x
254, 255				x	

Acyclic Synchronous transmission

With transmission type 0, PDOs work synchronously but not cyclically. With an RPDO, for example, the output value is not set until the next SYNC message is received.

So first several devices can be equipped with data (RPDO). Then these data can be set active at the same time (SYNC).

With a TPDO the SYNC message triggers the reading of the inputs and an immediate sending of the PDO, if the data have changed.

Cyclic Synchronous transmission

A cyclic transmission of TPDOs is achieved with Transmission Type 1..240. Here the data is sent after every "nth" SYNC message (n=1..240).

With RPDOs, the data is set active when the "nth" SYNC message is received.

RTR (Remote Frames)

The transmission type 252/253 applies to PDOs whose transmission must be requested by a remote frame. A distinction is made here between synchronous (252) and asynchronous (253). With synchronous, the data is only determined when a SYNC message is received. With asynchronous, the data is determined continuously.

Asynchronous transmission

With transmission type 254/255 the transmission type is asynchronous or also event-controlled. A distinction is made here between manufacturer-specific events (254) and events defined in the device profile (255).

3.8. Save in EEPROM

The CANopen variables are active immediately after setting. To make these variables permanently available, e.g. at module restart, they must be stored in the EEPROM. For this a write access to index **0x1010 Store parameters** must take place.

Saving should only be done in the "Pre-Operational" operating mode.

CAN Bus length



4. CAN Bus length

Bitrate [kBit/s]	Bus length [m]	Cable cross section [mm²]
1000	25	0,25 bis 0,34
800	50	0,34 bis 0,6
500	100	
250	250	
125	500	0,5 bis 0,6
100	650	0,75 bis 0,8
50	1000	
20	2500	not defined in CiA 303-1
10	5000	

Appendix



5. Appendix

5.1. Contact / Support

If you have any questions about the product or need assistance with commissioning, you can reach us at the following numbers:

Support Software

Tel. +49 (0) 22 32 / 50 40 8 – 20

Support Hardware

Tel. +49 (0) 22 32 / 50 40 8 – 30

Support via E-mail

support@deditec.de

5.2. Environment and disposal

You can return the defective or obsolete product to us at the end of its service life. As a manufacturer and distributor of electronic assemblies, we will take care of the proper disposal for you in accordance with the applicable legal regulations. For this purpose, it is best to use our return form on the homepage:

[Return form](#)

5.3. Revisionen

Rev 3.01	DEDITEC Design Update 2022
Rev 3.00	DEDITEC Design Update 2021
Rev 2.00	First DEDITEC Instruction

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