

# MCB-560

## CAN Open interface

### Technical manual



- 4 Analog inputs
- 8 Digital inputs
- Supply 24VDC



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# 1 Specifications

According to CiA Draft Standards DS301  
Version 4.2 and DS401 Version 3.0

Internal noise filtering for all inputs with  
individual setting for each channel

Watchdog output

8 Transmit PDO

Dynamic PDO mapping

Variable PDO identifier

All CANopen specific PDO transmission types  
supported:

synchronous, asynchronous, event driven, cyclic, acyclic  
and remote frame dependent.

Event timer and inhibit timer features for all transmit  
PDOs.

Nodeguarding

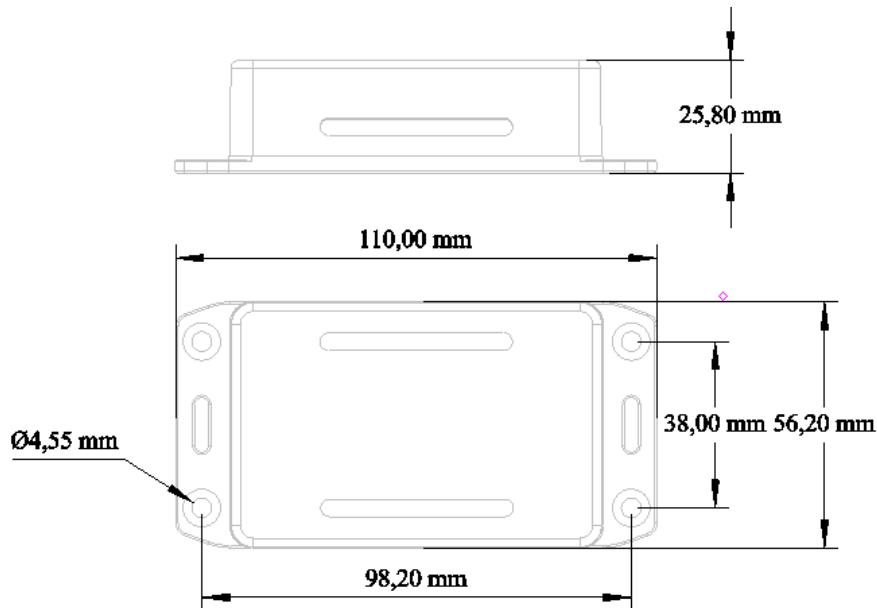
Lifeguarding

1 heartbeat producer

4 heartbeat consumer

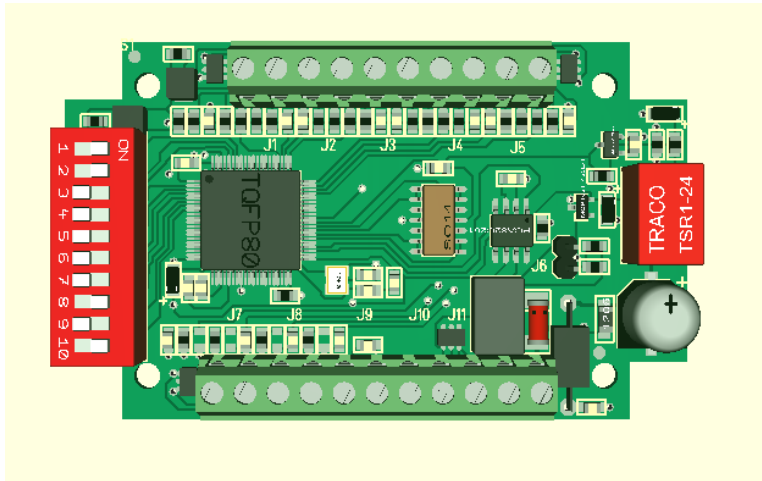
Emergency messages

<b>Power supply</b>	9 to 35 VDC
<b>Current requirement</b>	16 mA + sensors current
<b>Supply to sensors</b>	5 VDC
<b>Available current</b>	100 mA
<b>Analog inputs</b>	4 , voltage 0-5VDC
<b>Digital inputs</b>	8 , voltage 0-5VDC
<b>Resolution</b>	12 bits
<b>Dimensions</b>	110x55x26 mm
<b>Canopen std</b>	DS301/DS401
<b>Vbaud rate</b>	20k to 1M bits/s according to DIP SW
<b>ID</b>	1 to 127 according to DIP SW
<b>PDO</b>	8 maximum



## 2 DIP Switches

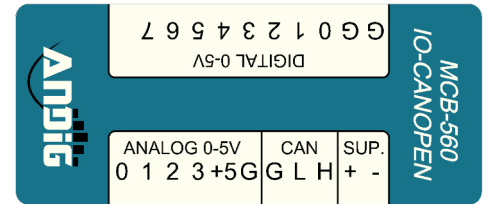
Remove the ABS cover in order to access to DIP-Switches



SW10	SW9	SW8	SW7	SW6	SW5	SW4	CAN-ID
OFF	OFF	OFF	OFF	OFF	OFF	OFF	0=reserved
OFF	OFF	OFF	OFF	OFF	OFF	ON	1=0x01
OFF	OFF	OFF	OFF	OFF	ON	OFF	2=0x02
ON	ON	ON	ON	ON	OFF	ON	125=0x7C
ON	ON	ON	ON	ON	ON	OFF	126=0x7E
ON	ON	ON	ON	ON	ON	ON	127=0x7F

SW3	SW2	SW1	Baud
OFF	OFF	OFF	1 Mbit/s
OFF	OFF	ON	800 kbit/s
OFF	ON	OFF	500 kbit/s
OFF	ON	ON	250 kbit/s
ON	OFF	OFF	125 kbit/s
ON	OFF	ON	50 kbit/s
ON	ON	OFF	20 kbit/s

## 3 Wiring



Terminal block, 2,54 pitch, screw mount.

SUP- : Power supply 0V

SUP+ : Power supply 9 .. 35 VDC

CAN-H : CAN High terminal

CAN-L : CAN Low terminal

CAN-G : CAN 0V terminal

Analog-G : Analog common 0V

Analog +5 : Analog power +5 VDC supply for sensors (joystick)

Analog-3 : Analog input number 3

Analog-2 : Analog input number 2

Analog-1 : Analog input number 1

Analog-0 : Analog input number 0

DIGITAL-G : Digital input (switches ...) common 0V

DIGITAL-G : Digital input (switches ...) common 0V

DIGITAL-0 : Digital input 0

DIGITAL-1 : Digital input 1

DIGITAL-2 : Digital input 2

DIGITAL-3 : Digital input 3

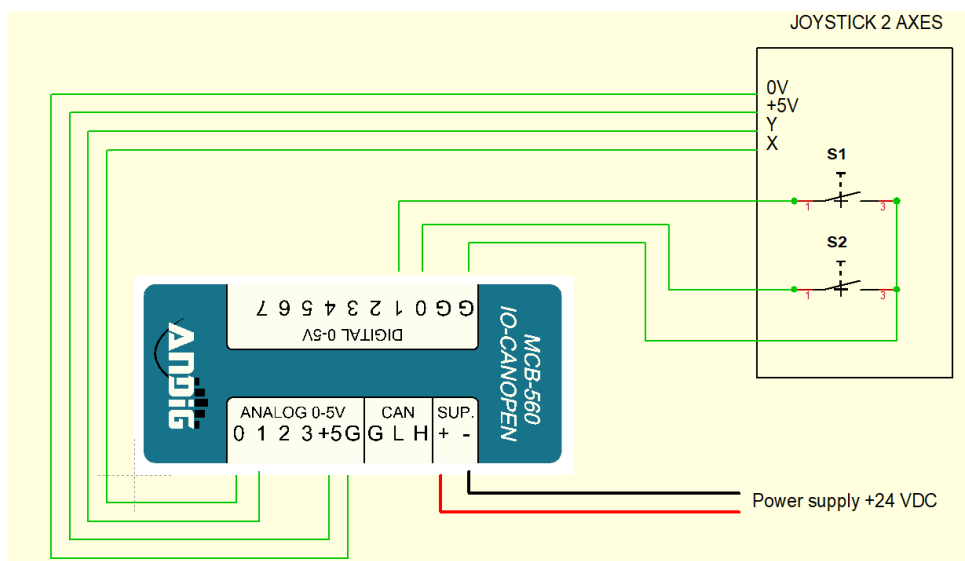
DIGITAL-4 : Digital input 4

DIGITAL-5 : Digital input 5

DIGITAL-6 : Digital input 6

DIGITAL-7 : Digital input 7

### 3.1 Example of wiring with a joystick :



## 4 Object dictionary

The CO4201 Single Chip CANopen Controller implements a complex object dictionary for CANopen I/O devices.

### 4.1 DS301: global Objects

Index	Sub-Index	Name	Acc.
0005	-	Dummy 8	wo
0006	-	Dummy 16	wo
0007	-	Dummy 32	wo
1000	-	Device Type	ro
1001	-	Error Register	ro
1002	-	Manufacturer Status Register	ro
1005	-	COB-ID Sync Identifier Sync Object	rw
1008	-	Device Name *2)	ro
1009	-	Hardware Version *2)	ro
100A	-	Software Version *2)	ro
100B	-	Node Id *5)	-
100C	-	Guard Time	rw
100D	-	Life Time Factor	rw
100E	-	COB-ID Guard *5)	-
1014	-	COB ID Emergency	rw
1015	-	Inhibit Time Emergency	rw
1016	0	Consumer Heartbeat Time	ro
	1	Consumer Heartbeat Time 1	rw
	2	Consumer Heartbeat Time 2	rw
	3	Consumer Heartbeat Time 3	rw
	4	Consumer Heartbeat Time 4	rw
1017	-	Producer Heartbeat Time	rw
1018	0	Identity Object	ro
	1	Vendor ID	ro
	2	Product Code	ro
	3	Revision Number	ro
	4	Serial Number	ro
1029	0	Error Behavior	ro
	1	In case of bus errors	rw
	2	In case of output errors	rw
2000	-	Device Manufacturer *3)	ro
2009	0	Silicon Serial Number	ro
	1	Silicon Serial Number L	ro
	2	Silicon Serial Number H	ro
2101	-	System Configuration	ro
2102	-	Remapping Enabled Info	ro
2103	-	Enable Guarding Warning	rw
2105	-	Internal Error Code	ro
2110	0	Test Object 01	ro
	1	Test Object 01.1	rw
2180	-	CAN Restart Time	rw
21C0	-	Timer Event Counter	ro
21C1	-	Timer Event Time	rw
2FFF	-	Factory Test Object *5)	rw

For the Object tables all values are shown in hexadecimal way.

For access type the following settings are valid  
 ro read only  
 wo write only

rw read and write access enabled

Notes:

\*1) This object cannot be written to in operational device state.

Only use this command in preoperational device state, otherwise the CO4201 will answer requests with SDO abort telegrams.

\*2) This objects show the chip type and version as visible strings.

\*3) This Objects shows "Frenzel + Berg" as visible string data type.

\*4) The New Node Id object gives the possibility to set a Node-Nr independent from the Node-Id Input Bits. With this feature the device may be configured by CAN bus line.

\*5) This object is not accessible for the application because of standard conforming reasons.

Note: All "Visible String" data type objects are restricted to a maximum of 20 characters.

The data type entries Index 0005 to 0007 are implemented for compatibility reasons. They may be mapped to RPDOs in order to define the appropriate space in the RPDO.

For the read only objects following data is set:

Index	Sub.	Name	Value in Hex.
1000		Device Type	008F 0191 h
1018	0	Identity Object	04h
	1	Vendor ID	0000 0058 h
	2	Product Code	0142 0100 h
	3	Revision Number	0 .. 0xFFFFFFFF
	4	Serial Number L	0 .. 0xFFFFFFFF
2009	0	Identity Object	02h
	1	Serial Number L	0 .. 0xFFFFFFFF
	2	Serial Number H	0 .. 0xFFFFFFFF
2101		System Configuration	Set according to the setting of the configuration input bits.

## 4.2 DS301: PDO Parameter Objects

Description of PDO Parameter objects:

These Objects enable dynamic PDO mapping, variable identifier distribution for PDOs and setting of the transmission mode, inhibit and event times.

For the CO4201 setting of all parameters may be done in the device state "operational" as well as in "preoperational" state.

Index	Sub-Index	Name	Acc.
1400	0	Receive PDO1 Communication Parameter	ro
	1	COB-ID	rw
	2	Transmission Type	rw
1401 ... 1407		Receive PDO2 to RPDO8 Communication Parameter same as 1400.00 .. 1400.02	rw
1600	0	Receive PDO1: Parameter mapping	rw
	1 to n	Mapped Object (max. 8 objects mappable)	rw
1601 ... 1607		Receive PDO2 to RPDO8 Parameter mapping Same as 1600	rw
1800	0	Transmit PDO1 Communication Parameter	ro
	1	COB-ID	rw
	2	Transmission Type	rw
	3	Inhibit Time	rw
	4	Reserved	rw
	5	Event Time	rw
1801 ... 1807		Transmit PDO2 to TPDO8 Communication Parameter same as 1800.00 .. 1800.05	rw
1A00	0	Transmit PDO1 Parameter mapping	rw
	1 to n	Mapped Object (max. 8 objects mappable)	rw
1A01 ... 1A07		Transmit PDO2 to TPDO8 Parameter mapping Same as 1A00	rw

**Note:**

The CO4201 supports 8 receive and 8 transmit PDOs. All Objects for higher PDO numbers are not implemented.

**Note:**

For detailed information about CANopen objects see additional brochure "Introduction to CANopen"

## 4.3 DS401: Digital Input Objects

Index	Sub-Index	Name	Acc.
5001	0 to n	Digital Input Filter Time	rw
5002	0 to n	Input Pull Up Enable	rw
6000	0 to n	Read digital input 8 bit	ro
6002	0 to n	Polarity input 8-bit	rw
6005		Global interrupt enable	rw
6006	0 to n	Interrupt mask: any change	rw
6007	0 to n	Interrupt mask rising edge	rw
6008	0 to n	Interrupt mask falling edge	rw
6100	0 to n	Read digital input 16 bit	ro
6120	0 to n	Read digital input 32 bit	ro

## 4.4 DS401: Analog Input Objects

Index	Sub-Index	Name	Acc.
5301	-	Analog Input Filter Size	rw
5302	0 to n	Analog Digital In Enable Analog	rw
5303	0 to n	Analog Digital In Enable Digital	rw
5320	-	Analog In Full Scale Value	rw
5322	0 to n	Analog Input Scaling Multiplier	rw
5323	0 to n	Analog Input Scaling Divider	rw
6401	0 to n	Read Analog Input 16 Bit	ro
6421	0 to n	Analog Input Interrupt Trigger	rw
6423		Analog Input global Interrupt Enable	rw
6424	0 to n	Analog Input Upper Limit	rw
6425	0 to n	Analog Input Lower Limit	rw
6426	0 to n	Analog Input Interrupt Delta	rw
6427	0 to n	Analog Input Interrupt Negative Delta	rw
6428	0 to n	Analog input interrupt positive delta	rw

## 4.5 Description of Object Dictionary

The following list gives a short description of all dictionary entries.

### 4.5.1 INDEX 0005

This object is implemented to enable reservation of data space in RPDOs by mapping dummy entries.

Index	0005
Name	Dummy 8
Description	
Data Type	Unsigned 8
Access modes	WO
PDO Mapping	Yes
Value Range	-
Default Value	0

### 4.5.2 INDEX 0006

This object is implemented to enable reservation of data space in RPDOs by mapping dummy entries.

Index	0006
Name	Dummy 16
Description	-
Data Type	Unsigned 16
Access modes	WO
PDO Mapping	Yes
Value Range	-
Default Value	0

#### 4.5.3 INDEX 0007

This object is implemented to enable reservation of data space in RPDOs by mapping dummy entries.

Index	0007
Name	Dummy 32
Description	-
Data Type	Unsigned 32
Access modes	WO
PDO Mapping	Yes
Value Range	-
Default Value	0

#### 4.5.4 INDEX 1000 : DEVICE TYPE

Description of the device type. The Object gives the CiA device profile number and additionally the functionality of the device.

Index	1000h	
Name	Device Type	
Description	-	
Data Type	Unsigned 32	
Access modes	RO	
PDO Mapping	No	
Value Range	-	
Default Value	Operation Mode CO4201	Value of Index 008F 0191 h

#### 4.5.5 INDEX 1001 : ERROR REGISTER

This object holds an error of the device.

Index	1001h
Name	Error Register
Description	-
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	-

The error register has the following structure

Bit	Meaning
0	Generic error. This bit is set, if any error is active
1	0
2	0
3	0
4	CAN bus or communication error
5	0
6	0

7	Device Error
---	--------------

#### 4.5.6 INDEX 1002 : STATUS REGISTER

This object gives additional information for the device

Index	1002h
Name	Status Register
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	-

#### 4.5.7 INDEX 1005 : COB-ID SYNC

Identifier of Can Object for the Synchronisation message. The CO4201 may only operate in Sync consumer mode. Generating of Sync messages is not possible. Therefore, the Identifier for the Sync message can only be set to the value range 1 ... 7FFh.

Index	1005h
Name	COB-ID Sync
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	1 ... 7FFh
Default Value	80h

#### 4.5.8 INDEX 1008 : DEVICE NAME

This object shows the name of the device as visible string.

Index	1008h
Name	Device Name
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	"CO4201"

#### 4.5.9 INDEX 1009 : HARDWARE VERSION

This object shows the hardware version and firmware version as visible string.

Index	1009h
Name	Hardware Version
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	-

#### 4.5.10 INDEX 100A : SOFTWARE VERSION

This object shows the software version as visible string.

Index	100Ah
Name	Software Version
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	-

#### 4.5.11 INDEX 100C : GUARD TIME

The objects at index 100Ch (Guard Time in milliseconds) and 100Dh (Life Time Factor) are used to implement the life guarding protocol. The Guard Time multiplied with the Life Time Factor gives the Life Time in milliseconds. It is 0 (zero) if not used.

Index	100Ch
Name	Guard Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	0

#### 4.5.12 INDEX 100D : LIFE TIME FACTOR

The objects at index 100Ch (Guard Time in milliseconds) and 100Dh (Life Time Factor) are used to implement the life guarding protocol. The Guard Time multiplied with the Life Time Factor gives the Life Time in milliseconds.

It is 0 (zero) if not used.

Index	100Dh
Name	Life Time Factor
Description	-
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	0

#### 4.5.13 INDEX 100E: COB-ID GUARD

Identifier of Can Object for the Node Guarding protocol. The Object is not represented in the object dictionary because of standard conforming reasons.

Index	100Eh
Name	COB-ID Guard
Description	-
Data Type	Unsigned 32
Access modes	-
PDO Mapping	No

Value Range	-
Default Value	700h + Node-ID

#### 4.5.14 INDEX 1014: COB-ID EMERGENCY

Identifier of Can Object for the emergency messages.

Index	1014h
Name	COB-ID Emergency
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	80h + Node-ID

#### 4.5.15 INDEX 1015: INHIBIT TIME EMERGENCY

Inhibit Time for emergency messages. If the Inhibit Time is set to 0, inhibit delay is disabled. The Inhibit Time is a multiple of 100usec, but the CO4201 offers a maximum resolution of 1 millisecond.

Index	1015h
Name	Inhibit Time Emergency
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

#### 4.5.16 INDEX 1016: CONSUMER HEARTBEAT TIME

Index 1016 is used to monitor the Heartbeat Consuming of up to four nodes.

Index	1016h
Name	Consumer Heartbeat Time
Description	-
Data Type	Structure

Index	1016h Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned char
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	4

Index	1016h Subindex 1
Name	Consumer Heartbeat Time 1
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Index	1016h Subindex 2
-------	------------------

Name	Consumer Heartbeat Time 2
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Index	1016h Subindex 3
Name	Consumer Heartbeat Time 3
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

Index	1016h Subindex 4
Name	Consumer Heartbeat Time 4
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

**Note:**

Either Heartbeat or node guarding may be allowed at the same time. Do not use both protocols at the same time. See additional brochure for further information about heartbeat protocol.

Heartbeat monitoring starts with the reception of the first heartbeat. The Producer Time should be greater than the Consumer Time. Ahead of the first heartbeat, the Producers status is unknown.

Structure of the Consumer Heartbeat Time

MSB LSB

Byte 3	Byte 2	Byte 1	Byte 0
Reserved	Node-ID	Heartbeat time	

The time has to be a multiple of 1ms.

#### 4.5.17 INDEX 1017: PRODUCER HEARTBEAT TIME

The producer heartbeat time defines the cycle time of the heartbeat. The producer heartbeat time is 0 if it is not used. The time has to be a multiple of 1ms.

Index	1017h
Name	Producer Heartbeat Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

**Note:**

Either Heartbeat or node guarding may be allowed at the same time. Do not use both protocols at the same time. See additional brochure for further information about heartbeat protocol.

#### 4.5.18 INDEX 1018: IDENTITY OBJECT

The object at index 1018h keeps general information about the device and the manufacturer frenzel + berg electronic. It cannot be modified.

Index	1018h
Name	Identity Object
Description	-
Data Type	Structure

Index	1018h Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned char
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	4

Index	1018h Subindex 1
Name	Vendor ID
Description	Registration Code of frenzel + berg electronic at the CIA
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	58h

Index	1018h Subindex 2
Name	Product Code
Description	Internal Product Code for CO4201 at frenzel + berg electronic
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	0142 0100 h

Index	1018h Subindex 3
Name	Revision Code
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	0 ... 0xFFFFFFFF
Default Value	-

Index	1018h Subindex 4
Name	Serial Number (only lower 32 bits)
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	No
Value Range	0 ... 0xFFFFFFFF
Default Value	-

#### 4.5.19 INDEX 1029: ERROR BEHAVIOUR

With object 1029 the CANopen chip can be configured to enter alternatively the preoperational or the stopped state or remain in the current state in case of a device failure. Device failures shall include the following communication errors:

Bus-off conditions of the CAN interface, Life guarding error, Serious device errors also can be caused by device

The value of the Error Classes is as follows: 0 = pre-operational  
(only if current state is operational)  
1 = no state change  
2 = stopped  
3 ... 127 = reserved

Index	1029h
Name	Error Behaviour Object
Description	-
Data Type	Structure

Index	1029h Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned char
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	2

Index	1029h Subindex 1
Name	Communication Error
Description	NMT state change in case of communication error
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	00h

Index	1029h Subindex 2
Name	Application Error
Description	NMT state change in case of pin EMY is at low level
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	00h

This Object shows "FRENZEL + BERG" as visible string. If OEMs do not want to give access to this entry, it may be removed from the EDS (electronic data sheet).

Index	2000h
Name	Device Manufacturer
Description	-
Data Type	Visible String
Access modes	RO
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	"FRENZEL + BERG"

#### 4.5.20 INDEX 2009 : SILICON SERIAL NUMBER

This Object returns the internal 64bit serial number of the controller.

Index	2009h
Name	Silicon Serial Number

Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	2

Index	Subindex 1
Name	Silicon Serial Number L
Description	
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0 .. 0xFFFFFFFF

Index	Subindex 2
Name	Silicon Serial Number H
Description	
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0 .. 0xFFFFFFFF

#### 4.5.21 INDEX 2102 : REMAPPING ENABLED INFO

This Object informs the user whether the system configuration enables remapping of the PDOs.

A value of 0 means that remapping is disabled, all other values indicate that remapping of the PDOs is enabled.

Index	2102h
Name	Remapping Enabled Info
Description	-
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	1

#### 4.5.22 INDEX 2103 : ENABLED GUARDING WARNING

This Object enables/disables transmission of emergency messages in case of a node guarding warning.

The condition of a guarding warning is met, if the time between two node guarding frames increases the guarding time given in object 100C independent of the setting of the life time (object 100D). The node guarding warning does not cause any NMT state change or switching the output pins to the error state. It is implemented to give the CANopen master an early information that the guarding interval has already exceeded the predefined value.

- 0: Guarding Warning is disabled
- 1: Guarding Warning is enabled

Index	2103h
Name	Enable Guarding Warning
Description	-
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

#### 4.5.23 INDEX 2105: INTERNAL ERROR CODE

This Object holds error information of the CANopen controller.

Index	2105h
Name	Internal Error Code
Description	-
Data Type	Unsigned 32
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	0 (no error condition)

#### 4.5.24 INDEX 2110: TEST OBJECT

This Object is implemented for testing purposes and should not be used.

The test entry does not have any functional behavior.

Index	2110h
Name	Test Object 01
Description	-
Data Type	Structure

Index	2110h Subindex 0
Name	Largest SubIndex supported
Description	-
Data Type	Unsigned char
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	0x01

Index	2110h Subindex 1
Name	Test Object 01
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	100 ... 1000
Default Value	500

#### 4.5.25 INDEX 2180: CAN RESTART TIME

This Object gives the restart time out for the CAN communication layer in case of bus off errors in milliseconds.

If the restart time is set to 0 automatic restart of the device in case of bus off is prohibited.

Index	2180h
Name	CAN Restart Time
Description	-
Data Type	Unsigned 16
Access modes	RW

PDO Mapping	No
Value Range	0 .. 50000
Default Value	1000 (restart after one second)

#### 4.5.26 INDEX 21C0: TIMER EVENT COUNTER

This counter is incremented automatically at intervals according to index 21C1. Via mapping of this index into any TPDO, a cyclic transmission of this TPDO can be triggered.

Index	21C0h
Name	Timer Event Counter
Description	-
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	YES
Value Range	
Default Value	

#### 4.5.27 INDEX 21C1: TIMER EVENT TIME

This index contains the time interval for incrementing the "Timer Event Counter" of index 21C0. If the time is set to 0, the counter will not be incremented.

Time is given in ms.

Index	21C1h
Name	Timer Event Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	NO
Value Range	0 ... 10000
Default Value	0

### 4.6 DS301: PDO Parameter Objects

#### 4.6.1 COMMUNICATION PARAMETER OBJECTS

The following table shows the communication parameter objects for Index 140x (Receive PDOs) and Index 180x (Transmit PDOs). The tables show Index 1400 as an example for all PDOs

The transmission type (sub-index 2) defines the mode for transmission / reception of the PDO. See table for detailed description of this entry.

Description of transmission type:

Type	PDO transmission				
	cyclic	acyclic	Sync related	Async.	Only on remote
0		X	X		
1-240	X		X		
241-251	Reserved				
252			X		X
253				X	X
254				X	
255				X	

Synchronous transmission types 0-240 and 252 mean that the transmission of the PDO shall be related to the

SYNC object. Asynchronous means that the transmission of the PDO is not related to the SYNC object.

A transmission type of zero means that the message shall be transmitted synchronously with the SYNC object but not periodically but only in case of data change.

A value between 1 and 240 means that the PDO is transferred synchronously and cyclically, the transmission type indicating the number of SYNC signals, which are necessary to trigger PDO transmissions or receptions.

The transmission types 252 and 253 mean that the PDO is only transmitted on reception of a remote frame. At transmission type 252, the data is updated (but not sent) immediately after reception of the SYNC object. At transmission type 253 the data is updated at the reception of the remote frame. These values are only possible for transmit PDOs.

Transmission type 255 means, the application event is defined in the device profile. For receive PDOs the reception of a PDO will update the mapped data (normally the analog or digital outputs).

Sub-index 3h contains the inhibit time. This time is a minimum interval for PDO transmission. The value is defined as multiple of 100ms.

In mode 254/255 additionally an event time can be used for TPDO. If an event timer exists for a TPDO (value not equal to 0) the elapsed timer is considered to be an event. The event time is a multiple of 1 ms. This event will cause the transmission of this TPDO in addition to otherwise defined events.

The PDO communication parameter objects have the same structure for all PDOs. The following Objects are used.

Sub-index 4h is reserved.

Index	PDO
1400h	Receive PDO1
1401h	Receive PDO2
1402h	Receive PDO3
1403h	Receive PDO4
1404h	Receive PDO5
1405h	Receive PDO6
1406h	Receive PDO7
1407h	Receive PDO8
1800h	Transmit PDO1
1801h	Transmit PDO2
1802h	Transmit PDO3
1803h	Transmit PDO4
1804h	Transmit PDO5
1805h	Transmit PDO6
1806h	Transmit PDO7
1807h	Transmit PDO8

Index	14xxh / 18xxh
Name	Receive / Transmit PDOx Communication Parameters

Description	-
Data Type	Structure

Index	14xxh / 18xxh Subindex 0	
Name	Largest SubIndex supported	
Description	-	
Data Type	Unsigned 8	
Access modes	RO	
PDO Mapping	No	
Value Range	-	
Default Value	2 / 5	

Index	14xxh / 18xxh Subindex 1	
Name	COB-ID	
Description	Identifier for CAN-Object for PDO	
Data Type	Unsigned 32	
Access modes	RW	
PDO Mapping	No	
Value Range	-	
Default Value	1400.01	Node-Id + 200h
	1401.01	Node-Id + 300h
	1402.01	Node-Id + 400h
	1403.01	Node-Id + 500h
	1404.01	80000000h
	1405.01	80000000h
	1406.01	80000000h
	1407.01	80000000h
	1800.01	Node-Id + 180h
	1801.01	Node-Id + 280h
	1802.01	Node-Id + 380h
	1803.01	Node-Id + 480h
	1804.01	80000000h
	1805.01	80000000h
	1806.01	80000000h
	1807.01	80000000h

An Identifier of 8xxxxxxxh means, that this PDO is disabled by default and must be enabled from the CANopen master by assigning a valid PDO ID.

Index	14xxh / 18xxh Subindex 2	
Name	Transmission Type	
Description	-	
Data Type	Unsigned 8	
Access modes	RW	
PDO Mapping	No	
Value Range	-	
Default Value	1400.02	FFh
	1401.02	FFh
	1402.02	FFh
	1403.02	FFh
	1404.02	FFh
	1405.02	FFh
	1406.02	FFh
	1407.02	FFh
	1800.02	FFh
	1801.02	FFh
	1802.02	FFh
	1803.02	FFh
	1804.02	1
	1805.02	1
	1806.02	FFh
	1807.02	FFh

Index	18xxh Subindex 4
Name	Reserved
Description	-

Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	-

Index	18xxh Subindex 5
Name	Event Time
Description	-
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

#### 4.6.2 PDO MAPPING OBJECTS

The following table shows the PDO Mapping Objects. The principle of PDO mapping is the same for all PDOs. The PDO Mapping table is the cross reference between the Object dictionary entries (for example the data of an digital output byte) and the data field inside an PDO data field (position in the data field of a CAN message for PDO transfer).

Sub index 0 determines the valid number of objects that have been mapped. The CO4201 allows a maximum of 8 mapped objects for each PDO. For changing the PDO mapping first sub index 0 must be set to 0 (mapping is deactivated). Then the objects can be remapped. When a new object is mapped by writing a sub-index between 1 and 8, the device may check whether the object specified by index /sub index exists. If the object does not exist or the object cannot be mapped, the SDO transfer will be aborted.

Sub-indexes 1 to 8 keep the pointers of the mapped objects as unsigned 32 values. The value is 0 if there is no mapped object. The structure for these pointers is as follows.

MSB	LSB		
Byte3	Byte2	Byte1	Byte0
Mapped index		Subindex	Length

Mapped Index and Sub index together are the Pointer to the Object dictionary data to be mapped at this location. Length gives the length of the mapped object in bits.

Index	160xh / 1A0xh
Name	Receive / Transmit PDO Mapping Parameters
Description	-
Data Type	Array

Index	160xh / 1A0xh SubIndex 0
Name	Largest SubIndex supported
Description	Number of mapped objects
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	See table below

Index	160xh / 1A0xh SubIndex 1 to 8
Name	Mapped object
Description	-
Data Type	Unsigned 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	See table below

#### 4.6.3 RECEIVE PDOs

The CANopen chip CO4201 uses the following default mapping entries for receive PDO mapping:

Index	Entry	Explanation
Receive-PDO1		
1600.00	3	RPDO1: 3 mapped objects
1600.01	62000108h	Digital Output Byte 1
1600.02	62000208h	Digital Output Byte 2
1600.03	62000308h	Digital Output Byte 3 *1)
Receive-PDO2		
1601.00	2	RPDO2: 2 mapped objects
1601.01	64110110h	Analog output 1 *1)
1601.02	64110210h	Analog output 2 *1)
Receive-PDO3		
1602.00	4	RPDO3: 4 mapped objects
1602.01	51000110h	PWM Value 1
1602.02	51000210h	PWM Value 2
1602.03	51000310h	PWM Value 3
1602.04	51000410h	PWM Value 4
Receive-PDO4		
1603.00	4	RPDO4: 4 mapped objects
1603.01	51000510h	PWM Value 5
1603.02	51000610h	PWM Value 6
1603.03	51000710h	PWM Value 7
1603.04	51000810h	PWM Value 8
Receive-PDO5		
1604.00	2	RPDO5: 2 mapped objects
1604.01	40010110h	Counter 1 Control
1604.02	40010210h	Counter 2 Control
Receive-PDO6		
1605.00	0	RPDO6: 0 mapped objects
Receive-PDO7		
1606.00	0	RPDO7: 0 mapped objects
Receive-PDO8		
1607.00	0	RPDO8: 0 mapped objects

\*1) Only valid, if the object exists and is not disabled with configuration setting

#### 4.6.4 TRANSMIT PDOs

The CANopen chip CO4201 uses the following default mapping entries for transmit PDO mapping:

Index	Entry	Explanation
Transmit - PDO1		
1A00.00	4	TPDO1: 4 mapped objects
1A00.01	60000108h	Digital Input Byte 1
1A00.02	60000208h	Digital Input Byte 2
1A00.03	60000308h	Digital Input Byte 3
1A00.04	60000408h	Digital Input Byte 4
Transmit - PDO2		
1A01.00	4	TPDO2: 4 mapped objects
1A01.01	64010110h	Analog Input Integer 1 *1)
1A01.02	64010210h	Analog Input Integer 2 *1)

1A01.03	64010310h	Analog Input Integer 3 *1)
1A01.04	64010410h	Analog Input Integer 4 *1)
Transmit – PDO3		
1A02.00	4	TPDO3: 4 mapped objects
1A02.01	64010510h	Analog Input Integer 5 *1)
1A02.02	64010610h	Analog Input Integer 6 *1)
1A02.03	64010710h	Analog Input Integer 7 *1)
1A02.04	64010810h	Analog Input Integer 8 *1)
Transmit – PDO4		
1A03.00	0	TPDO4: 0 mapped objects
Transmit – PDO5		
1A04.00	3	TPDO5: 3 mapped objects
1A04.01	40000120	Counter 1 Value
1A04.02	40020110	Counter 1 Status
1A04.03	40030110	Counter 1 Incs/sec
Transmit – PDO6		
1A05.00	3	TPDO6: 3 mapped objects
1A05.01	40000220	Counter 2 Value
1A05.02	40020210	Counter 2 Status
1A05.03	40030210	Counter 2 Incs/sec
Transmit – PDO7		
1A06.00	0	TPDO7: 0 mapped objects
Transmit – PDO8		
1A07.00	0	TPDO8: 0 mapped objects

\*1) Only valid, if the object exists and is not disabled with configuration setting

## 4.7 DS401: Digital Input Objects

The following objects are describing the functionality of the digital input lines of the CO4201. The CO4201 supports 8, 16 and 32bit access to the digital inputs.

The number of digital input bytes depends on the selected operation mode.

The mapping of the I/O lines to object 6000 is explained in chapter "Mapping I/O to Object Dictionary"

See also Index 5302 and 5303 that enable analog and digital functionality in Dual use mode for input pins Aix/Dix (ADIF = 1) in chapter DS401: Analog Input Objects

### 4.7.1 INDEX 5001: DIGITAL INPUT FILTER TIME

This object is implemented in order to configure the filter time of each digital input byte. The time has to be a multiple of 1ms.

Index	5001h
Name	Digital Input Filter Time
Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	-
Data Type	Unsigned 8
Access modes	RO

PDO Mapping	No
Value Range	-
Default Value	4

Index	Subindex 1 to 4 of input bytes
Name	Digital Input Filter Time Byte n
Description	
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	0 ... 30
Default Value	3

### 4.7.2 INDEX 5002: INPUT PULL UP ENABLE

This object enables/disables the pull up resistors at the digital input lines.

Index	5002h
Name	Input Pull Up Enable
Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	4

Index	Subindex 1
Name	Input Pull Up Enable 1
Description	Pull Up for Input Byte 1
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	0xFF

Index	Subindex 2
Name	Input Pull Up Enable 2
Description	Pull Up for Input Byte 2
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	0xFF

Index	Subindex 3
Name	Input Pull Up Enable 3
Description	Pull Up for Input Byte 3
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	0

Index	Subindex 4
Name	Input Pull Up Enable 4
Description	Pull Up for Input Byte 4
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	
Default Value	0xFF

### 4.7.3 INDEX 6000: READ DIGITAL INPUT 8 BIT

This object represents the digital input bytes. The value of the input lines is written to this object. Please note, that input pins are active low by default, so the inverted pin level is written to the input objects.

Index	6000h
Name	Digital Input 8 Bit
Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	Number of digital input bytes

Index	Subindex 1 to Nr of input bytes
Name	Digital Input 8 Bit Byte n
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	-

### 4.7.4 INDEX 6100: READ DIGITAL INPUT 16 BIT

This object enables 16-Bit access to the digital input bytes. The Object addresses the same data area as object 6000 but using unsigned integer data type. See Index 6000 for further details.

### 4.7.5 INDEX 6120: READ DIGITAL INPUT 32 BIT

This object enables 32-Bit access to the digital input bytes. The Object addresses the same data area as object 6000 but using unsigned long data type. See Index 6000 for further details.

### 4.7.6 INDEX 6002: POLARITY INPUT 8 BIT

With this object, the digital inputs may be inverted. See also Index 6000 for additional information.

Index	6002h
Name	Polarity Input 8 Bit
Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	Number of digital input bytes

Index	Subindex 1 to Nr of input bytes
Name	Polarity Input 8 Bit Byte n

Description	
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

### 4.7.7 INDEX 6005: GLOBAL INTERRUPT ENABLE

This object enables or disables globally the interrupt behaviour without changing the interrupt masks. In event-driven mode the device transmits the input values depending on the interrupt masks in objects 6006h, 6007h, and 6008h and the PDO transmission type.

TRUE (1) = global interrupt enabled  
FALSE (0) = global interrupt disabled

Index	6005h
Name	Global Interrupt Enable
Description	-
Data Type	Boolean
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	TRUE

### 4.7.8 INDEX 6006: INTERRUPT MASK ANY CHANGE

This object determines, which input lines shall activate an interrupt by any change of the input line. Both negative and positive edge will cause an interrupt, if enabled.

An interrupt will cause a PDO transmission in case of event driven transmission mode.

1 = interrupt enabled 0 = interrupt disabled

Index	6006h
Name	Interrupt Mask any change
Description	-
Data Type	Array

Index	Subindex 0
Name	Nr of Subobjects
Description	
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	Number of digital input bytes

Index	Subindex 1 to Nr of input bytes
Name	Interrupt Mask any change
Description	
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0FFh (interrupt enabled)

### 4.7.9 INDEX 6007: INTERRUPT MASK LOW TO HIGH

This object has the same structure and behaviour as

object 6006h but will cause interrupts only on rising edge of object index 6000. Note that input lines are active low, so rising edge of input data (object 6000) means falling edge of input port line. Default value is 0.

#### 4.7.10 INDEX 6008: INTERRUPT MASK HIGH TO LOW

This object has the same structure and behaviour as object 6006h but will cause interrupts only on falling edge of object index 6000. Note that input lines are active low, so falling edge of input data (object 6000) means rising edge of input port line.

Default value is 0.

### 4.8 DS401: Analog Input Objects

The following objects are describing the functionality of the analog input lines of the CO4201.

#### 4.8.1 INDEX 5301: ANALOG INPUT FILTER SIZE

This object is implemented in order to configure the filter time of the analog inputs. The time has to be a multiple of 1ms.

Index	5301h
Name	Analog Input Filter Size
Description	
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	0 ... 20
Default Value	10

#### 4.8.2 INDEX 5302: ANALOG DIGITAL IN ENABLE ANALOG

In Analog Digital Dual Use Mode ADIF = 1 (analog and digital processing enabled for input pins AI0/DI16 ... AI7/DI23) this object enables the analog processing for the input channels. Each bit represents 1 input channel.

Index	5302h
Name	Analog Digital In Enable Analog
Description	
Data Type	Array

Index	Subindex 0
Name	
Description	Nr of Subobjects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	1

Index	Subindex 1
Name	Analog Digital In Enable Analog
Description	

Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	0 ... 0xFF
Default Value	0xFF Analog processing is enabled for all 8 input channels

#### 4.8.3 INDEX 5303: ANALOG DIGITAL IN ENABLE DIGITAL

In Analog Digital Dual Use Mode ADIF = 1 (analog and digital processing enabled for input pins AI0/DI16 .. AI7/DI23) this object enables the digital processing for the input channels. Each bit represents 1 input channel.

Index	5303h
Name	Analog Digital In Enable Digital
Description	
Data Type	Array

Index	Subindex 0
Name	
Description	Nr of Subobjects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	1

Index	Subindex 1
Name	Analog Digital In Enable Digital
Description	
Data Type	Unsigned 8
Access modes	RW
PDO Mapping	No
Value Range	0 ... 0xFF
Default Value	0xFF Digital processing is enabled for all 8 input channels

#### 4.8.4 INDEX 5320: ANALOG IN FULL SCALE VALUE

This object is implemented in order to configure the Full Scale of the analog inputs.

Index	5320h
Name	Analog In Full Scale Value
Description	
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	0 ... 0x7FFF
Default Value	10000

The full scale value object is implemented in order to adapt the analog input value to a hardware, for example to get an input voltage directly in mV.

See object 6401 for further information

#### 4.8.5 INDEX 5322: ANALOG INPUT SCALING MULTIPLIER

The Analog Input Scaling Multiplier is implemented in order to adapt the scaling of the analog input channels

to the hardware.

Index	5322h
Name	Analog Input Scaling Multiplier
Description	
Data Type	Array

Index	Subindex 0
Name	
Description	Nr of Subobjects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	Number of analog outputs

Index	Subindex 1 to Nr of outputs
Name	Analog Input Scaling Multiplier
Description	
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	0 ... 20000
Default Value	If pin 29 is set to high level 10000 If pin 29 is set to low level 3000

See object 6401 for further information

#### 4.8.6 INDEX 5323: ANALOG INPUT SCALING DIVIDER

The Analog Out Scaling Divider is implemented in order to adapt the scaling of the analog input channels to the hardware.

Index	5323h
Name	Analog Input Scaling Divider
Description	
Data Type	Array

Index	Subindex 0
Name	
Description	Nr of Subobjects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	Number of analog outputs

Index	Subindex 1 to Nr of outputs
Name	Analog Input Scaling Divider
Description	
Data Type	Unsigned 16
Access modes	RW
PDO Mapping	No
Value Range	0 ... 20000
Default Value	If pin 29 is set to high level 10000 If pin 29 is set to low level 2842

See object 6401 for further information

#### 4.8.7 INDEX 6401: READ ANALOG INPUT 16 BIT

Object 6401, represents the value of the analog channels. The 16 bit conversion result of the analog input voltage is a signed value. The input pins are scanned only for positive voltages. The value is displayed in millivolt.

The mapping of the I/O lines to object 6401 is explained in chapter "Mapping I/O to Object Dictionary"

Index	6401h
Name	Read Analog Input
Description	-
Data Type	Array

Index	Subindex 0
Name	
Description	Number of mapped objects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	Number of analog input lines

Index	Subindex 1 to Nr of input lines
Name	Read Analog Input
Description	
Data Type	Signed 16
Access modes	RO
PDO Mapping	Yes
Value Range	-
Default Value	-

Scaling of the input data is done with the following formula:

$$ADC = 0xFFFF * V_{in} / V_{ref}$$

$$AIV = ADC * [5322.xx] / [5323.xx]$$

$$[6401.xx] = AIV * [5320.xx] / 0xFFFF$$

$$V_{out} = V_{ref} * DAC / 0x3FF$$

$V_{in}$  Input Voltage at input pin

$V_{ref}$  Reference Voltage supplied to controller pin 51 (AVRH)

ADC A/D Converter Value

AIV Analog Input Value

#### 4.8.8 INDEX 6421: ANALOG INPUT INTERRUPT TRIGGER

Object 6421 selects the event that shall cause a transmission interrupt for the selected analog channel.

There is one Subindex for each channel to enable individual setting according to application requirements.

Table of possible Trigger Conditions:

Bit Nr	Interrupt Trigger Selection
0	Input voltage greater than Upper Limit
1	Input voltage less than Lower Limit
2	Input changed by more than Delta
3	Input reduced more than Negative Delta
4	Input increased more than Positive Delta
5 to 7	Reserved (must be forced to zero)

Index	6421h
Name	Analog Input Interrupt Trigger
Description	-
Data Type	Array

Index	Subindex 0
Name	
Description	Number of mapped objects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	No
Value Range	-
Default Value	Number of analog input lines

Index	Subindex 1 to Nr of input lines
Name	Analog Input Interrupt Trigger
Description	Selects trigger condition
Data Type	Unsigned 8 (See Table of Trigger Conditions)
Access modes	RW
PDO Mapping	No
Value Range	0 ... 31
Default Value	7

#### 4.8.9 INDEX 6423: ANALOG INPUT INTERRUPT ENABLE

This object enables or disables globally the interrupt behaviour without changing the interrupt masks. The interrupt is disabled by default, in order to avoid transmission of analog input values. TRUE (1) = global interrupt enabled FALSE (0) = global interrupt disabled

Index	6423h
Name	Analog Input Interrupt Enable
Description	-
Data Type	Boolean
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	FALSE

#### 4.8.10 INDEX 6424/5/6/7/8: ANALOG INPUT INTERRUPT LIMITS

These objects give the Limit for generation of interrupts. All objects have the same structure. The function of the interrupt limit is only enabled, if the corresponding bit of object 6421 is set. All values of limit parameters are signed 32. So the user must take care not to exceed the range of the input data objects.

Note especially for limit calculations

For calculation whether an interrupt (PDO transmission) must be generated or not, the analog input data object (6401.xx) is always evaluated as signed value, even if an offset is set to simulate an unsigned value.

Table of Limit Function

Object	Object Name and Function
6424	Analog Input Upper Limit Generate interrupt if input voltage is greater than or equal to Upper Limit (6424)
6425	Analog Input Lower Limit Generate interrupt if input voltage is less than Lower Limit (6425)
6426	Analog Input Interrupt Delta Generate interrupt if input voltage changed by more than Interrupt Delta
6427	Analog Input Negative Delta Generate interrupt if input voltage reduced by more than Negative Delta
6428	Analog Input Positive Delta Generate interrupt if input voltage increased by more than Positive Delta

Index	6424/5/6/7/8
Name	See table above
Description	-
Data Type	Array

Index	Subindex 0
Name	
Description	Number of mapped objects
Data Type	Unsigned 8
Access modes	RO
PDO Mapping	NO
Value Range	-
Default Value	Number of analog input lines

Index	Subindex 1 to Nr of input lines
Name	See table above
Description	
Data Type	Integer 32
Access modes	RW
PDO Mapping	No
Value Range	-
Default Value	0

## 4.9 Emergency Messages

The CANopen chip supports several emergency messages. For all emergencies the same structure is used:

Byte								
0	1	2	3	4	5	6	7	
EMY-Code	1001	0	Chip-EC					

EMY-Code: Emergency-Error-Code according to DS301  
1001: Content of Object 1001  
Chip-EC: Chip-Error-Code as unsigned 32 value

Chip-Error-Code (hex)	May change		Description
	NMT	I/O	
8000 0000	X	X	CAN bus is bus off

4000 0000			CAN bus in error warning state
2000 0000			Node guarding warning
3000 0000	X	X	Life guarding error
0000 0001	X	X	Output Overload detected
0000 0000			Wake up from Power down

Emergency 2000 0000 (Node guarding warning) must be enabled with object 2103.

If more than one error is active at the same time, the bitmap of the CO4201-Codes for all active errors are combined with a logical or conjunction.

Some of the emergencies may cause a NMT state change and/or may force the output pins to the error state. This behaviour depends on the setting of object 1029.

If there is more than one error active at the same time, the Error Codes for all errors are logical OR combined and transmitted in one emergency message. This guarantees, that the last transmitted emergency message represents the complete system error state.

The ID for emergency transmission is fixed to: 0x80 + \$NodeID.

List of emergency messages:

Heartbeat Error							
30	81	01	00	00	00	00	10

This error occurs, if the monitored node fails to transmit the heartbeat within the specified Heartbeat Time in object 1016.

Node-Guarding Warning							
30	81	01	00	00	00	00	20

This warning occurs, if the masters fails to transmit the guarding remote frame within the specified Guard Time object 100C and if transmission is enabled in object 2103

Life-Guarding Error							
30	81	11	00	00	00	00	30

This error occurs, if the masters fails to transmit the guarding remote frame within the specified Life Time (Guard Time object 100C multiplied with Life Time Factor object 100D)

Output Overload Error							
10	23	01	00	01	00	00	00

This error occurs, if the output overload interrupt input pin (EMY pin 36) is active low.

CAN Bus in Error Warning state							
00	81	01	00	00	00	00	40

This error occurs, if the chips internal CAN module is in error warning state.

Return from CAN Bus OFF							
40	81	01	00	00	00	00	C0

This message indicates a return from Bus OFF state.

## 5 Example of initialisation

The master must initialise the MCB-560 before it can receive data from the MCB-560.

By default at power on, TPDO are mapped with the following objects :

Digital inputs :

TPDO0 : \$NODEID+0x180  
 6000 01 08 : Inputs 7-0  
 6000 02 08 : Inputs non wired on MCB-560  
 6000 03 08 : Inputs non wired on MCB-560  
 6000 04 08 : Inputs non wired on MCB-560

Analog inputs 0-3:

TPDO1 : \$NODEID+0x280  
 6401 01 10 : Analog 0  
 6401 02 10 : Analog 1  
 6401 03 10 : Analog 2  
 6401 04 10 : Analog 3

Analog inputs 4-7 : non wired on MCB-560

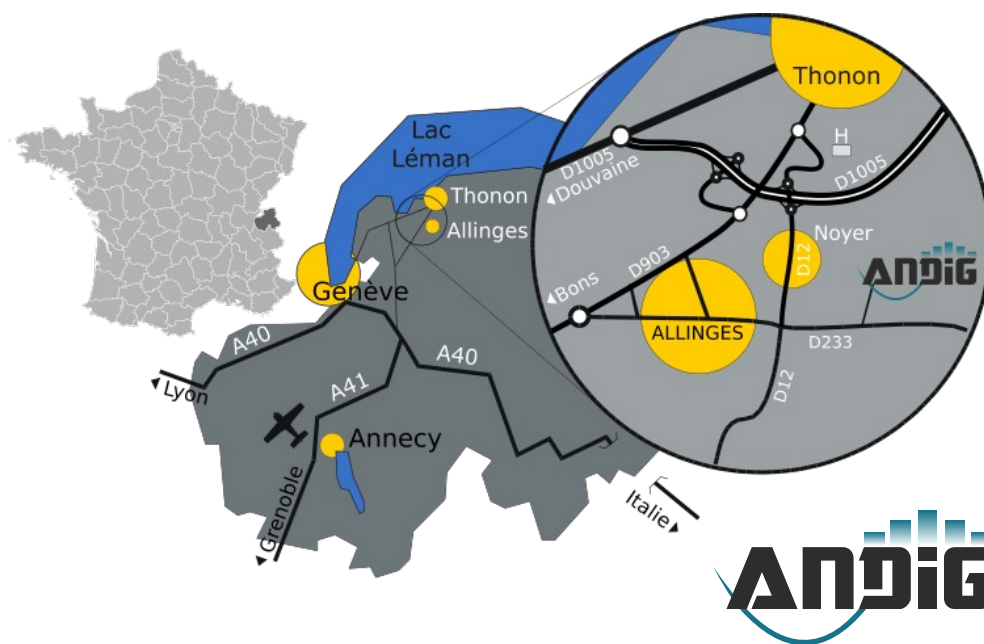
TPDO2 : \$NODEID+0x380  
 6401 05 10 : Analog 4  
 6401 06 10 : Analog 5  
 6401 07 10 : Analog 6  
 6401 08 10 : Analog 7

By default at power on, TPDO0 (digital inputs) is sent on input change.

If you want that TPDO1 (analog) is sent every 100 ms, use SDO transfer :

1801h, sub index 5, data uint16 = 100

(timer TPDO1 = 100 ms)



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