

General Description

The CANit-10 is a low cost CANopen Unit with 8 digital inputs and 8 digital outputs suitable for DC 24 V. The I/O's are positive switching and opto-isolated from the bus and the system supply. All outputs are short-circuit protected.

The EA-Module CANit-10 is based on the high performance Single Chip CANopen Controller CO4011B, which offers the complex implementation of the CANopen standards DS301 and DS401. All usual baud rates up to 1 MBit are supported.

Features

- CANopen remote I/O Module according to CiA Draft Standards DS301 Version 4.0 and DS401 Version 2.0
- Separated power supplies for system/bus and Inputs/Outputs (DC 24 V)
- 8 digital Input Channels optoisolated from bus and system supply, DC 24 V, Positive Switching, Input Filter 70us
- 8 digital Output Channels optoisolated from bus and system supply, DC 24 V / 0,6A Positive Switching, Short Circuit Protected
- Output overload monitoring
- Internal noise filtering for all inputs with individual setting for each channel
- CAN-Baudrate up to 1Mbit
- CAN bus ISO11898 transceiver 82C251
- 2 Transmit- and 1 Receive PDOs
- 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.
- Storing and restoring of object dictionary to non-volatile memory
- Nodeguarding, Lifeguarding, Heartbeat
- Emergency messages
- Minimum boot up
- Available as single board, built in a plastics housing with open frontside or in a closed aluminium housing. Both housings are suitable for mounting on a carrier rail.
- Operating temperature -40 to +85 °C

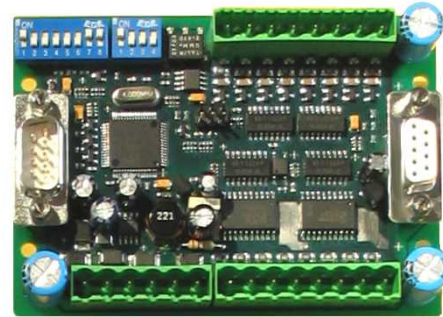


Photo CANit-10ZV



Photo CANit-10P with Plastics-Housing



Photo CANit-10M with Alu-Housing

Ordering Information

Part	Description
CANit-10ZV	PCB without housing, screw holes CAN plug direction vertical
CANit-10ZH	PCB without housing, screw holes, CAN plug direction horizontal
CANit-10P	With plastics housing green, mounting on carrier rail possible, CAN plug direction vertical
CANit-10M	With aluminium housing black / RAL5021, mounting on carrier rail possible, CAN plug direction horizontal

Technical Data

The CANopen Unit CANit-10 has separated power supplies for the system/bus and the digital I/Os.

	Min.	Norm.	Max.
Nominal system / bus supply voltage DC	9 V	24 V	34 V
Current consumption system / bus	---	50 mA	65 mA
Nominal I/O supply voltage DC	11,8 V	24 V	36 V
CAN bus norm	ISO11898		
Transceiver	PCA82C251T Manufacturer Philips		
CiA Draft Standards	DS301 Version 4.0 and DS401 Version 2.0		
Conformance designation	CE		

Digital Inputs	
Number of inputs	8
Switching	Positive
Signal Level LOW	0...3 V
Signal Level HIGH	9...34 V
Input delay (CAN reaction time)	typ 1 ms max 2 ms
Input filter	70 us
Input current DC 24V	5 mA
Isolation from bus / system supply	60 V

Digital Outputs	
Number of outputs	8
Switching	Positive
Short circuit protected	Yes
Isolation from bus / system supply	60 V
Output supply voltage	DC 24 V (11,8 - 36 V)
Output delay (CAN reaction time)	typ 1 ms max 2 ms
Type of load	resistive, inductive, lamps
Continuous output current	0,6 A
Continuous output current > 55°C	0,45 A
Peak output current	1,5 A max.1 sec.
Output Overload monitoring	Common emergency message for all outputs

Connectors and Measurement	
Connectors	PCB multi connectors with screw-cage clamp princip, plug direction vertical, grid 5,08 mm
Cross section [mm ²]	0,08 to 2,5 mm ²
Cross section [AWG]	14 to 28 AWG
Strip length	6 mm
Measurement CANit-10 board	100 x 72 x 27 mm
Measurement CANit-10 housings	see pictures measurement housings
Operating temperature	-40 .. 85°

Pin Assignment PL1 and PL2

Pin No.	Name	Function
1	---	PL1 connected to PL2
2	CANL	CAN-Bus Low
3	G1	Ground System supply
4	---	PL1 connected to PL2
5	SHL	Optional jumpered shield
6	G1	Ground System supply
7	CANH	CAN-Bus High
8	---	PL1 connected to PL2
9	CANV+	Optional power supply for system DC 24V (Standard Power Supply PL5 PIN4)

Pin Assignment PL4

Pin No.	Name	Function
1	OUT07	Digital Output DC 24V
2	OUT06	Digital Output DC 24V
3	OUT05	Digital Output DC 24V
4	OUT04	Digital Output DC 24V
5	OUT03	Digital Output DC 24V
6	OUT02	Digital Output DC 24V
7	OUT01	Digital Output DC 24V
8	OUT00	Digital Output DC 24V

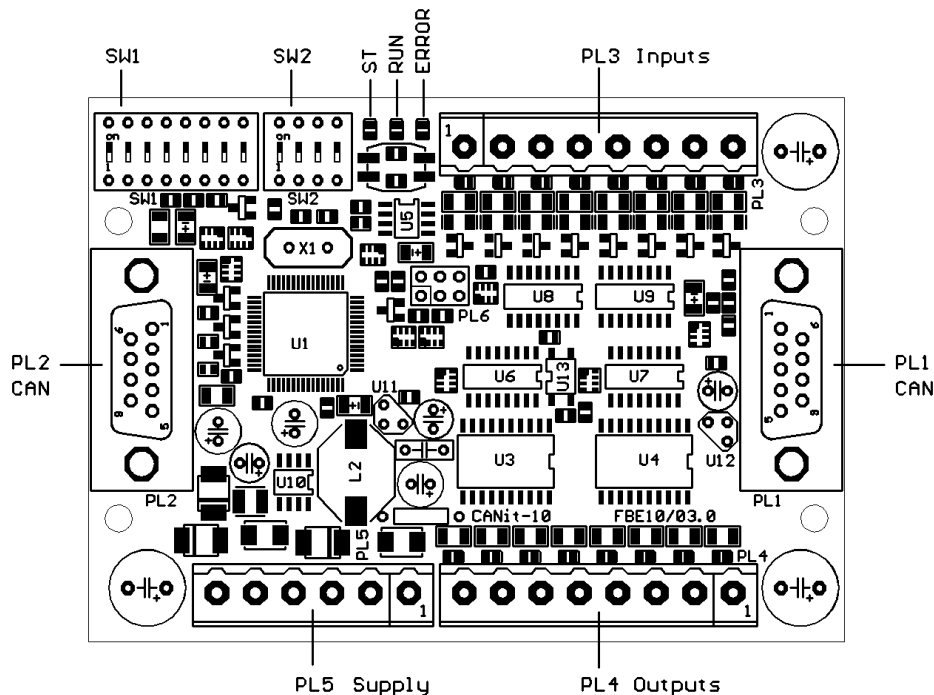
Pin Assignment PL3

Pin No.	Name	Function
1	IN00	Digital Input DC 24V
2	IN01	Digital Input DC 24V
3	IN02	Digital Input DC 24V
4	IN03	Digital Input DC 24V
5	IN04	Digital Input DC 24V
6	IN05	Digital Input DC 24V
7	IN06	Digital Input DC 24V
8	IN07	Digital Input DC 24V

Pin Assignment PL5

Pin No.	Name	Function
1	G2	Power-Ground for Inputs- and Outputs
2	P2	Power DC 24V for Outputs
3	G1	Ground System Supply
4	P1	Power DC 24V for System The system can also be supplied with the CAN-Connectors PL1/PL2 PIN9.
5	NC	not connected
6	PE	Shield

Placeplan



Configuration Dip Switches SW1 and SW2

The configuration of the CANit-10 will be set with dip switches SW1 and SW2.

DIP Switch SW1 (Node identifier selection)								
Switch Number								Function
1	2	3	4	5	6	7	8	
	ID6	ID5	ID4	ID3	ID2	ID1	ID0	
ON								CAN-Termination resistor ON
OFF								CAN-Termination resistor OFF
	X	X	X	X	X	X	X	Node ID selection
	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Programmable Node ID
	OFF	OFF	OFF	OFF	OFF	OFF	ON	Node ID = 1
	OFF	OFF	OFF	OFF	OFF	ON	OFF	Node ID = 2
	
	ON	ON	ON	ON	ON	ON	OFF	Node ID = 126
	ON	ON	ON	ON	ON	ON	ON	Node ID = 127

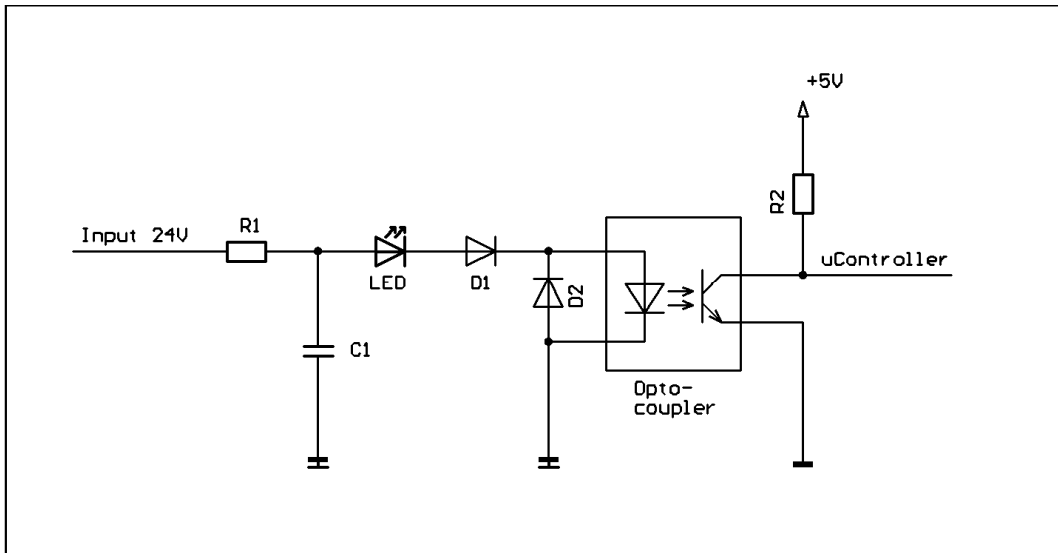
DIP Switch SW2 (Baud rate selection)				
Switch Number				Function
1	2	3	4	
BD2	BD1	BD0	reserved	
X	X	X		Baud rate selection
OFF	OFF	OFF		1 Mbit / sec
OFF	OFF	ON		800 kbit / sec
OFF	ON	OFF		500 kbit / sec
OFF	ON	ON		250 kbit / sec
ON	OFF	OFF		125 kbit / sec
ON	OFF	ON		50 kbit / sec
ON	ON	OFF		20 kbit / sec
ON	ON	ON		10 kbit / sec

With jumpers J1 and J2 (placed on the bottom side of the CANit-10) the CAN-connectors PL1 and PL2 (PIN5) can be connected to shield.

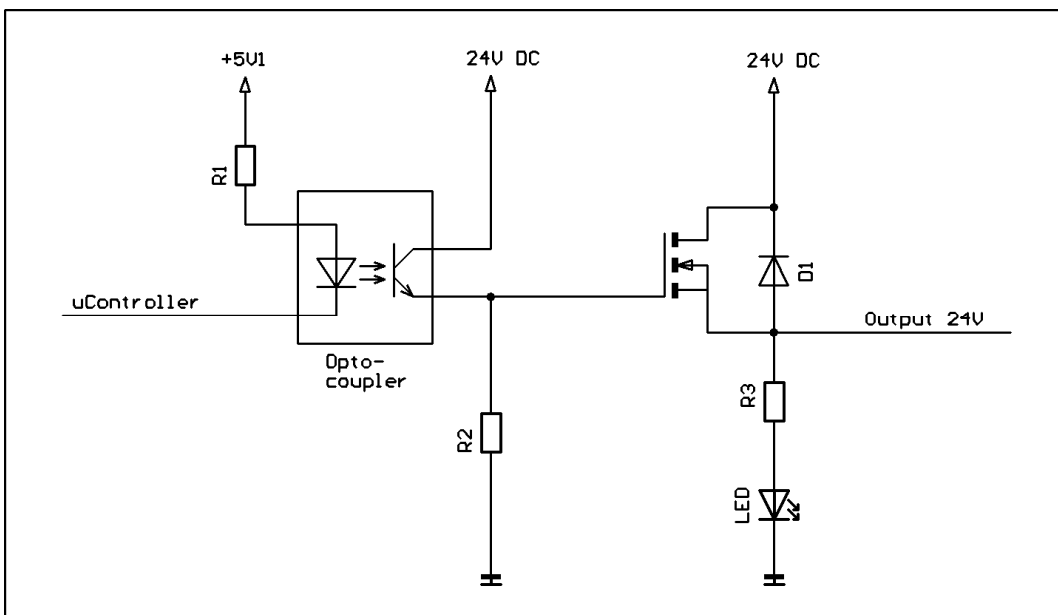
CAN Signal LED's

- ST-LED (yellow)**
 The Chip-Status-LED shows the status of the CO4011B CANopen-Chip. This yellow LED is always blinking.
 10% duty cycle indicates no error
 50% duty cycle indicates uncritical error or warning (no NMT state change, outputs not in error condition)
 90% duty cycle indicates critical error (NMT state change or outputs in error condition)
- RUN-LED (green)**
 The CANopen-RUN-LED shows NMT state according to DRP303-3
- ERROR-LED (red)**
 The CANopen-Error-LED shows the error state according to DRP303-3

Circuit Diagram Digital Inputs



Circuit Diagram Digital Outputs



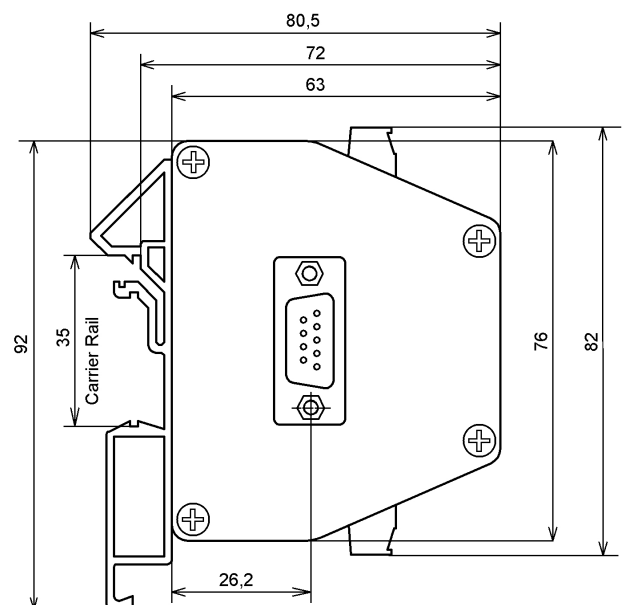
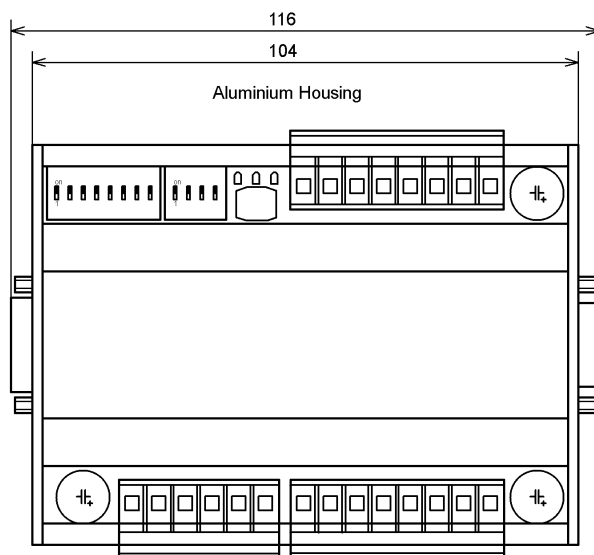
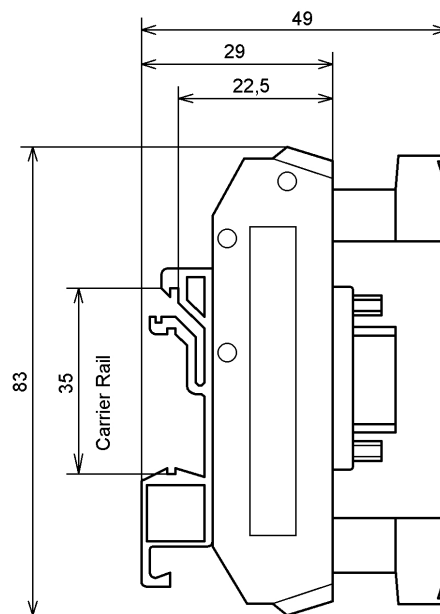
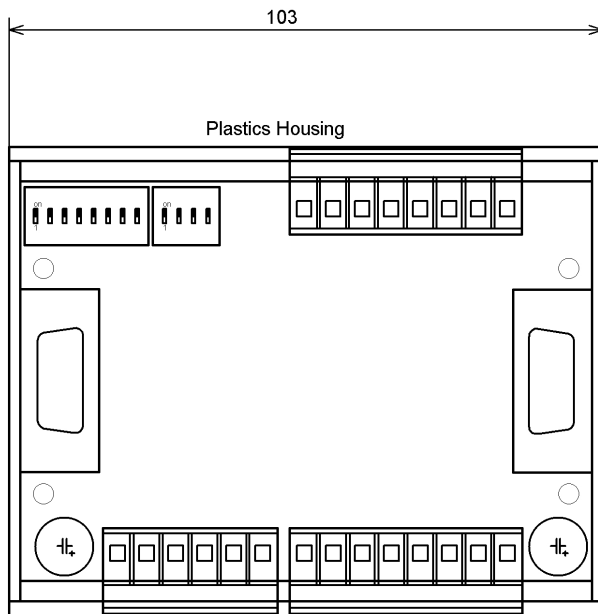
CANopen Unit CANit-10

frenzel + berg

CANopen Unit with 8/8 digital In-/Outputs DC 24V Positive Switching



Measurement Housings



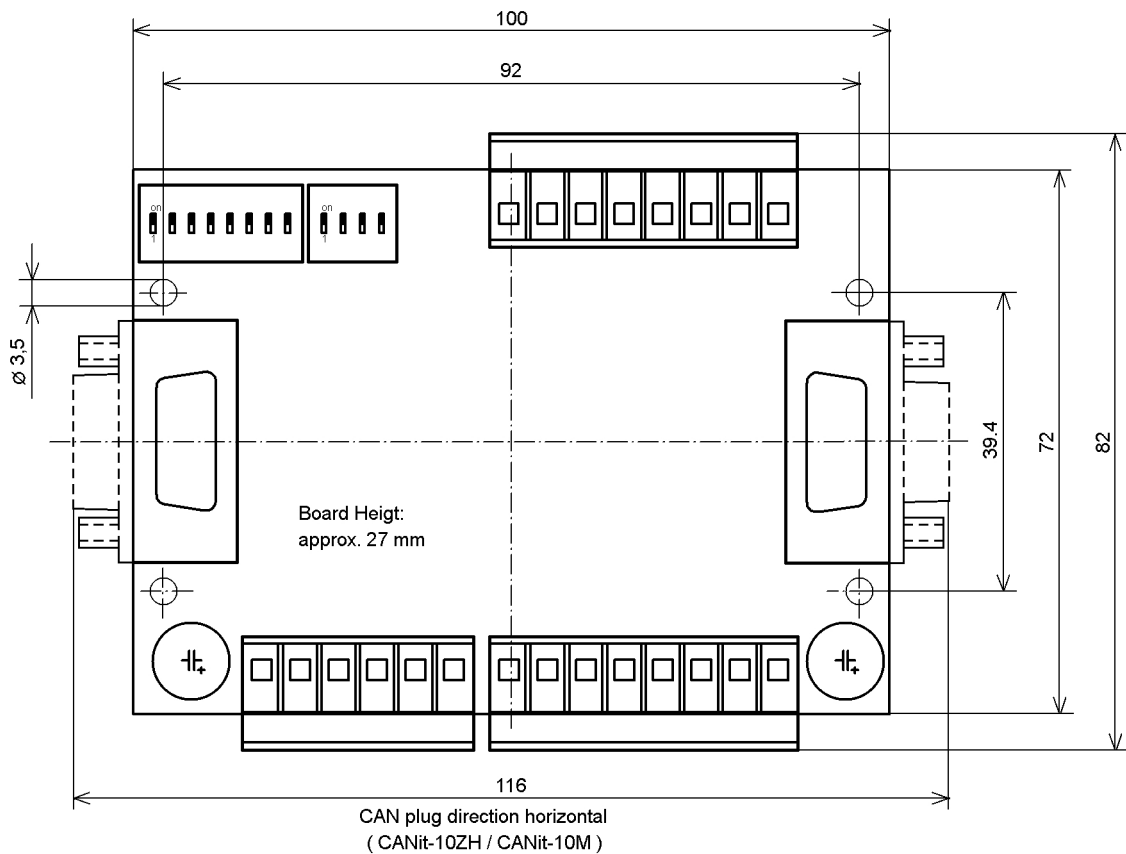
CANopen Unit CANit-10

frenzel + berg

CANopen Unit with 8/8 digital In-/Outputs DC 24V Positive Switching



Board Measurement



Object Dictionary

The CANit-10 Single Chip CANopen Controller CO4011B implements a complex object dictionary for CANopen I/O devices. (For detailed information about CANopen objects see additional brochure "Introduction to CANopen")

CANit-10 Objects

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

rww read and write access enabled by SDO, write only by PDO

Index	Sub-Index	Name	Data type	Acc.	Map-able	Default Value / Note	Object Category
0005	-	Dummy 8	Unsigned 8	wo	yes	0 h	Global
0006	-	Dummy 16	Unsigned 16	wo	yes	0 h	Global
0007	-	Dummy 32	Unsigned 32	wo	yes	0 h	Global
1000	-	Device Type	Unsigned 32	ro	no	0003 0191 h	Global
1001	-	Error Register	Unsigned 8	ro	yes	-	Global
1002	-	Manufacturer Status Register	Unsigned 32	ro	yes	-	Global
1005	-	COB-ID Sync Identifier Sync Object	Unsigned 32	ro	no	80 h	Global
1008	-	Device Name	Visible String	ro	no	"CO4011B"	Global
1009	-	Hardware Version	Visible String	ro	no	-	Global
100A	-	Software Version	Visible String	ro	no	active Version	Global
100B	-	Node Id (Not Accessible - Read by DIP-Switch 1)	Unsigned 8	-	no	DIP-Switch 1 Nr 2-8 = ID6-ID0	Global
100C	-	Guard Time	Unsigned 16	rw	no	0 h	Global
100D	-	Life Time Factor	Unsigned 8	rw	no	0 h	Global
100E	-	COB-ID Guard (Not Accessible - Read by DIP-Switch 1 + 700 h)	Unsigned 32	-	no	700 h + Node-ID	Global
1010		Store Parameters (only in preoperational device state)	Array	-	-	-	Global
	0	Nr of Subobjects	Unsigned 8	ro	no	4 h	Global
	1	Store All Parameters	Unsigned 32	rw	no	-	Global
	2	Store Communication Parameters	Unsigned 32	rw	no	Not supported	Global
	3	Store Application Parameters	Unsigned 32	rw	no	Not supported	Global
1011		Reload Default Parameter (only in preoperational device state)	Array	-	-	-	Global
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Global
	1	Restore All Parameters	Unsigned 32	rw	no	-	Global
1014	-	COB ID Emergency	Unsigned 32	rw	no	80 h + Node-ID	Global
1015	-	Inhibit Time Emergency	Unsigned 16	rw	no	0 h (disabled)	Global
1017	-	Producer Heartbeat Time	Unsigned 16	rw	no	0 h	Global

Index	Sub-Index	Name	Data type	Acc.	Map- pable	Default Value / Note	Object Category
1018		Identity Object	Record	-	-	-	Global
	0	Nr of Subobjects	Unsigned 8	ro	no	04 h	Global
	1	Vendor ID	Unsigned 32	ro	no	0000 0058 h	Global
	2	Product Code	Unsigned 32	ro	no	0140 1102 h	Global
	3	Revision Number	Unsigned 32	ro	no	active Rev. Code	Global
1029	4	Serial Number	Unsigned 32	ro	no	0 h	Global
		Error Behavior Object	Array	-	-	-	Global
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	Global
	1	Communication error	Unsigned 8	rw	no	0 h	Global
1400	2	Application error	Unsigned 8	rw	no	0 h	Global
		Receive PDO1 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	2 h	PDO
	1	COB-ID	Unsigned 32	rw	no	200 h + Node-ID	PDO
1600	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO
		Receive PDO1 - Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	1 h	PDO
1800	1	Mapped Object	Unsigned 32	rw	no	6200 01 08 h Dig. Output OUT00-OUT07	PDO
		Transmit PDO1 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	PDO
	1	COB-ID	Unsigned 32	rw	no	180 h + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO
	3	Inhibit Time	Unsigned 16	rw	no	0 h	PDO
1801	4	Compatibility Entry	Unsigned 8	rw	no	-	PDO
	5	Event Time	Unsigned 16	rw	no	0 h	PDO
		Transmit PDO2 - Communication Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	PDO
	1	COB-ID	Unsigned 32	rw	no	8000 02 80 h + Node-ID	PDO
	2	Transmission Type	Unsigned 8	rw	no	FF h	PDO
1A00	3	Inhibit Time	Unsigned 16	rw	no	0 h	PDO
	4	Compatibility Entry	Unsigned 8	rw	no	-	PDO
	5	Event Time	Unsigned 16	rw	no	0 h	PDO
1A01		Transmit PDO1 – Mapping Parameters	Record	-	-	-	PDO
	0	Nr of Subobjects	Unsigned 8	rw	no	1 h	PDO
2000	1	Mapped Object	Unsigned 32	rw	no	6000 01 08 h Dig. Input IN00 – IN07	PDO
		Transmit PDO2 – Mapping Parameters	Record	-	-	-	PDO
2002	0	Nr of Subobjects	Unsigned 8	rw	no	0 h	PDO
	-	Device Manufacturer	Visible String	ro	no	"FRENZEL+BERG"	Global
		Application Info	Record	-	-	-	Global
	0	Nr of Subobjects	Unsigned 8	ro	no	5 h	Global
	1	Application Vendor Name	Visible String	rw	no	"FRENZEL+BERG"	Global
	2	Application Name	Visible String	rw	no	"CO4011B"	Global
2002	3	Application Add-Info	Visible String	rw	no	"FRENZEL+BERG"	Global
	4	Application Version1	Unsigned 32	rw	no	active Version	Global

	5	Application Version2	Unsigned 32	rw	no	active Rev. Code	Global
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Index	Sub-Index	Name	Data type	Acc.	Map-pable	Default Value / Note	Object Category
2100	-	New Node Id (Used to set a Node-Nr. independent from the Node-Id Input Bits on Switch 1)	Unsigned 8	rw	no	0 h	Global
2101	-	System Configuration	Unsigned 32	ro	no	Setting of Config. Input Pins	Global
2102	-	Remapping Enabled Info	Unsigned 8	ro	no	1 h (enabled)	Global
2103	-	Enable Guarding Warning	Unsigned 8	rw	no	0 h (disabled)	Global
2110	-	Enable Boot Up Message	Unsigned 8	rw	no	1 (enabled)	Global
2180	-	CAN Restart Time	Unsigned 16	rw	no	1000 h (restart after one second)	Global
2FF8	-	Wake Up NMT State after Power Down with Stop Node	Unsigned 8	rw	no	2 h	Power Down
2FF9	-	Power Down with Stop Node	Unsigned 32	rw	no	0 h	Power Down
2FFA	-	Wake Up Confirm Time	Unsigned 16	rw	no	1000 h	Power Down
2FFB	-	Power Down Delay Time	Unsigned 16	rw	no	500 h	Power Down
2FFC	-	Power Down Wake Up Counter	Unsigned 32	rw	yes	0 h	Power Down
2FFD	-	Reset Power Down Input Pin Enable	Unsigned 32	rw	no	0 h	Power Down
2FFE	-	Power Down Enable	Unsigned 32	rw	no	0 h	Power Down
2FFF	-	Switch to Power Down Mode	Unsigned 32	wo	no	0 h	Power Down
5001		Write 0/1 to Dig. Input (OR)	Array	-	-	-	Dig. Input
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Input
	1	Logical OR Mask for Input Byte	Unsigned 8	rww	yes	0 h	Dig. Input
5002		Write 0/1 to Dig. Input (AND)	Array	-	-	-	Dig. Input
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Input
	1	Logical AND Mask for Input Byte	Unsigned 8	rww	yes	FF h	Dig. Input
5003		Filter Time Digital Inputs	Array	-	-	-	Dig. Input
	0	Nr of Subobjects	Unsigned 8	ro	no	8 h	Dig. Input
	1..8	Filter Time IN00..IN08	Unsigned 8	rw	no	5 h (5 milliseconds)	Dig. Input
5200	-	Reset Output Object on Error	Unsigned 8	rw	no	1 h	Dig. Output
6000		Digital Input 8 Bit	Array	-	-	-	Dig. Input
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Input
	1	Digital Input Byte 0	Unsigned 8	ro	yes	-	Dig. Input
6002		Polarity Input 8 Bit	Array	-	-	-	Dig. Input
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Input
	1	Polarity Input Byte 0	Unsigned 8	rw	no	0 h	Dig. Input
6003		Filter Enable Input 8 Bit	Array	-	-	-	Dig. Input
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Input
	1	Filter Enable 8 Bit Byte 0	Unsigned 8	rw	no	0 h	Dig. Input
6005		Global Interrupt Enable	Unsigned 8	rw	no	FF h	Dig. Input
6006		Interrupt Mask any Change	Array	-	-	-	Dig. Input
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Input
	1	Interrupt Mask Any Change	Unsigned 8	rw	no	FF h (interrupt enabled)	Dig. Input

Index	Sub-Index	Name	Data type	Acc.	Map- pable	Default Value / Note	Object Category
6007		Interrupt Mask Rising Edge	Array	-	-	-	Dig. Input
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Input
	1	Interrupt Mask Rising Edge	Unsigned 8	rw	no	0 h (interrupt disabled)	Dig. Input
6008		Interrupt Mask Falling Edge	Array	-	-	-	Dig. Input
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Input
	1	Interrupt Mask Falling Edge	Unsigned 8	rw	no	0 h (interrupt disabled)	Dig. Input
6100		Read Digital Input 16 Bit	Array	-	-	-	Dig. Input
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Input
	1	Read Digital Input 16 Bit UnsignedInteger 0	Unsigned 16	yes	no	-	Dig. Input
6120		Read Digital Input 32 Bit	Array	-	-	-	Dig. Input
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Input
	1	Read Digital Input 32 Bit Long 0	Unsigned 16	yes	no	-	Dig. Input
6200		Write Digital Output 8 Bit	Array	-	-	-	Dig. Output
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Output
	1	Dig. Output Byte 1	Unsigned 8	rw	yes	0 h	Dig. Output
6202		Change Polarity Output 8 bit	Array	-	-	-	Dig. Output
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Output
	1	Polarity Output Byte 1	Unsigned 8	rw	no	0 h	Dig. Output
6206		Error Mode Output 8 bit	Array	-	-	-	Dig. Output
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Output
	1	Error Mode Output 8 Bit Byte 1	Unsigned 8	rw	no	FF h	Dig. Output
6207		Error State Output	Array	-	-	-	Dig. Output
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Output
	1	Error Value Output 8 Bit Byte 1	Unsigned 8	rw	no	0 h (Inactive, high level)	Dig. Output
6300		Write Digital Output 16 bit	Array	-	-	-	Dig. Output
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Output
	1	Dig. Output Word 1	Unsigned 16	rww	yes	-	Dig. Output
6320		Write Digital Output 32 bit	Array	--	-	-	Dig. Output
	0	Nr of Subobjects	Unsigned 8	ro	no	1 h	Dig. Output
	1	Dig. Output Long 1	Unsigned 32	rww	yes	-	Dig. Output

Notes: DS301 Global Objects

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

Notes: 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 CO4011B setting of all parameters may be done in the device state "operational" as well as in "preoperational" state.

Notes: DS401 Digital Input Objects

The objects 5001 and 5002 are implemented for debug purposes, because the CANopen object 6000 does not allow write access to an input line. With objects 5001 and 5002 a debug environment may simulate setting

or resetting of input lines. The CO4011B first scans the physical input lines and then processes the scanned values with the debug parameters.

Index 5001 and 5002 make direct bit manipulation of single bits possible.

Index 5001 enables bit setting by using a bit wise logical OR conjunction with index 6000 while index 5002 performs a logical AND conjunction with index 6000 and therefore enables resetting of single bits.

Objects 5001 and 5002 are always working in continuous execution mode. This means that logical operations with object 6000 are performed in each internal input scan cycle

With object 5003 an individual filter constant (value in msec) may be assigned to each input line. This gives great flexibility to prevent inputs from distortion. The default value for filter constant is 5msec. The filter constants enable object is at index 6003.

Emergency Messages

The CO4011B 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						CO4011-Code

EMY-Code: Emergency-Error-Code according to DS301

1001: Content of Object 1001

CO4011-Code: Emergency-Error-Code for CO4011 as unsigned 32 value

CO4011-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 0100			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 CO4011-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.

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

Data Mapping to Dictionary

Operation mode 15							
8 dig. Inputs / 8 dig. Outputs							
EDS-file: CO4011B15.EDS							
Data Mapping to Dictionary							
Index.	Mapped I/O Signal bit/value						
SubIndex	7	6	5	4	3	2	1 0
6000.01	IN07 to IN00						
6200.01	OUT07 to OUT00						
6400.xx	Not available						
6401.xx	Not available						
Default PDO Mapping							
PDO	Mapped Data						
RPDO1	6200.01 dig. output OUT00 to 07						
TPDO1	6000.01 dig. input IN00 to IN07						

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