

Device manual Input/output module CR2013



CE

Contents

1	Preliminary note	. 3
2	Safety instructions	. 3
3	Function and features	. 3
4	Function	. 4
5	Mounting	. 5
6	Electrical connection.	. 5 . 5
	6.2 Pin connection / inputs	. 6 . 6
7	Operating indicators	. 6
8	Set-up 8.1 PLC configuration in CODESYS 2.3 8.2 PLC configuration in CODESYS 3.5 8.2.1 Heartbeat configuration 8.2.2 SyncMonitoring 8.3 Electronic Data Sheet.	. 7 . 7 . 8 . 8 . 9 . 9
9	Parameter setting	10 10
10) Technical data	.11
11	Object directory.11.1 Manufacturer Specific Profile Area; index 2000 to 5FFF11.2 Communication Profile Area; index 1000 to 1FFF	12 12 14
12	2 Fault correction	18 18
13	3 Maintenance, repair and disposal.	19
14	Declaration of conformity	19
15	5 Terms and abbreviations.	19

1 Preliminary note

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

- Instructions
- \rightarrow Cross-reference



Important note

Non-compliance may result in malfunction or interference.



Information

Supplementary note.

2 Safety instructions

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

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

The device may only be installed, connected and commissioned by qualified personnel.

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

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

3 Function and features

The CR2013 input/output module is used for the decentralised connection of controls and indicators to CAN bus.

4 Function

- The I/O module supports binary and analog inputs and outputs and is therefore classified in the device profile "I/O module" to CiA DS 401.
- As regards the input and output function the I/O module can be configured.
- There are 1 server SDO and the 4 default PDOs to CiA DS 401. The PDO mapping cannot be changed (static PDO mapping). The default identifiers are assigned according to the "predefined connection set".
- The COB IDs of the PDOs as well as the transmission type (synch/asynch) of the individual PDOs can be configured. The transmission type is stored non-volatilely. Changed PDOs (PDO linking) are stored volatilely.
- The I/O module expects a synch object. The CAN identifier of the synch object can be configured. After a change the ID is automatically stored non-volatilely.
- The I/O module supports "node guarding". The "guard time", "life time factor" and the CAN identifier of the guard object can be configured and are stored non-volatilely.
- The I/O module generates an emergency object. The COB ID of the EMCYobject can be configured.
- The I/O module stores the last 4 errors. The error code of the corresponding emergency object is stored.
- In addition to the CANopen error register, there is a device-specific status register which contains the states of the output drivers.
- The I/O module supports a reset function, i.e. assignment of the parameters to the factory default values (→ 9.1 Parameter list) upon request.

5 Mounting



6 Electrical connection

To protect the whole system (wiring and I/O module) the individual electric circuits must be protected with max. 16 A.

6.1 Wiring

	core colour	potential
	red	10 30 V DC
	black	GND
	white	CAN_H
CAN interface	blue	CAN_L
	green	CAN_GND

6.2 Pin connection / inputs

M12 connector PIN	connection	
1	sensor supply L+	
3	sensor supply L-	
4	signal input (switch, sensor)	5
2	signal input (analog sensor)	2 1
5	n.c.	

6.3 Pin connection / outputs

M12 connector PIN	connection	
4	switching output L+	³ ~ ⁴
3	external voltage -	5-600
5	n.c.	2 1

7 Operating indicators

LED colour	Status	Description
	OFF	no supply voltage
green	ON	module in the stand-by mode CANopen state: PREOPERATIONAL / PREPARED outputs = OFF, input states are not transferred
	flashing 2 Hz	module active CANopen state: OPERATIONAL outputs are updated, input states are transferred
	OFF	communication o.k.
red	ON	 communication disturbed NodeGuard error (if NodeGuarding is active) no synch objects (if synch monitoring is active) CANopen interface fault
yellow IN	ON	input is ON
	ON	binary output: output is active / ON analog output: PWM preset value is greater than 1%
yellow OUT	flashing 1 Hz	output driver indicates error: – short circuit/overload/no load (worst case load current < 900mA) – too high a temperature/undervoltage/overvoltage The LED function can be blocked (→ 9.1 Parameter list, index 2002).

8 Set-up

8.1 PLC configuration in CODESYS 2.3

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

PLC Configuration	
Inputs/Outputs[FIX] Group CR0020, CANopen Master[VAR] Gro	CAN parameters Receive PDO-Mapping Send PDO-Mapping Service Data Objects
AT %QW35: INT; (* analo; —— AT %QW36: INT; (* analo; —— AT %QW36: INT; (* analo; —— AT %IW32: UINT; (* chan —— AT %IW33: UINT; (* chan —— AT %IW34: UINT; (* chan —— AT %IW35: UINT; (* chan	Ngde guard
<	Activate heartbeat generation Heartbeat producer time: 0 ms Activate heartbeat consumer Emergency telegram F Emergency

CODESYS dialogue "PLC configuration" (example)

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

8.2 PLC configuration in CODESYS 3.5

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

- Click on [Tools] / [Device Repository].
- Select [Fieldbuses] / [CiA CANopen] / [CiA Remote Device] and click on [Install].
- Select EDS file and click on [Open].
- In CODESYS 3.5 the devices are integrated as CiA remote devices in the device tree under a [CANopen_Manager] element.

```
Communication (Communication)
```

- CAN (CAN)
 - CANbus (CANbus)
 - GANopen_Manager (CANopen_Manager)

System_R360_I_O_CompactModuleMetal_CR2033 (System R360: I/O CompactModuleMetal CR2033)

The CANopen communication is configured via the CODESYS configuration editor.

8.2.1 Heartbeat configuration

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

General	General	
PDOs	Node ID: 1 SDO Channels	s (1/1 active)
SDOs		
CANopen I/O Mapping	Enable Expert Settings Optional Device Enable Size Broducing No Initialization	Reset Node: Sub-001
Status		300.001
Information	✓ Nodeguarding	
	Enable Nodeguarding	C Enable Heartbeat Producing
	Guard Time (ms): 0	Producer Time (ms): 200
	Life Time Factor: 0	Heartbeat Consuming (1/1 active)
	Emergency	⊿ TIME
	Enable Emergency	Enable TIME Producing
	COB-ID: \$NODEID+16#80	COB-ID (Hex): 16# 100
		Enable TIME Consuming
	⊿ Checks at Startup	
	Check Vendor ID Check Product Number	Check Revision Number

UK

8.2.2 SyncMonitoring

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

General	♣ Add SDO 🗹 Edit 🗙 Delete 🔹 Move Up 🔹 Move Down										
PDOs	Line Index:Subindex Name		Value		Bit length	Abort if error		Jump to line if error	Next		
SDOs	1	16#1	00C:16#00 Set Guardtime		time	me 16#0000000					0
CANanan I/O Mananing	2	16#1	#1 Select Item from Object Directory				×				
Canopen I/O Mapping	3	16#1									
Status	4	16#1	Index:Sub	oindex	Name		AccessType	Type	Defa	ult	^
Information	5	16#1	II		Pre-defined error field	Type	20.0	Derdant			
Information	6	16#1	16#10	05:16#00	COB-ID SYN	C message	RW	UDINT	16#8	30000080	-
	7	16#1	16#10	06.16#00	Communica	tion cycle period	RW	LIDINT	0		-
	8	16#1	16#10	0C·16#00	Guard time	don cycle penod	RW	LIINT	0		-
	9	16#1	16#10	0D:16#00	Life time fac	tor	RW	USINT	0		-
	10	16#1	16#10	10	Store param	neters		03111			-
	11	16#1	+ 16#10	11	Pestore def	ault narameters					-
	12	16#1	16#10	14.16#00	COB-ID EM		PW/		¢NOI	CEID+16#0000080	-
	13	16#1	10#10	16	Consumer b	eartheat time		ODINI	φNOL	JEID+10#00000000	~
	14	16#1	16#10	17.16#00	Droducor bo	arthoat time	DW/	LIINT	0		-
	15	16#1	10#10	17.10#00	1 receive D		NVV	UINI	U		-
	16	16#1	10#14	00	2. receive P	DO parameter					-
	17	16#1	10#14	00	2. Teceive P						-
	18	16#1	16#18	00	1. transmit	PDO parameter					-
	19	16#1	# 16#18	01	2. transmit	PDO parameter					- ~
	20	16#1	<							>	
	21	16#1	Name:	Unl	known Object						
	22	16#1	Index:	164	±1006	A Bit len	ath: 8				
			SubIndev:	16#	±0	Valuer	10000				
	SDO T	imeout	Subindex.	101		Value.	100000			OK Conce	
essages - Total 0 error(s), 0 war	nina(s), (0 mess								Cance	

The monitoring time is indicated in microseconds [µs].

OOL xDone
OOL xError
🤈 eDiaginfo

8.3 Electronic Data Sheet

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

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

9 Parameter setting

With the function "Restore" (\rightarrow 11 Object directory, Index 1011) the parameters can be assigned to the factory default values (except the baud rate and the node ID). With the next power on they become valid.

9.1 Parameter list

Parameter	Oject Default value directory (factory preset) index		Change automatically saved	Change effective			
Manufacturer Specific Profile Area; index 2000 to 5FFF							
I/O Configuration	2000	binary inputs/ outputs	yes	after Pre-Op			
PWM Frequency	2001	0x64 (= 100 Hz)	yes	after Pre-Op			
Status message outputs	2002	0x01 (= ON)	yes	immediately			
Filter function	2003	0x00 (= OFF)	yes	immediately			
Node ID	20F0, 20F1	0x20 (= 32)	yes	after reset			
Baud rate	20F2, 20F3	0x03 (= 125 kBit/s)	yes	after reset			
Communication Profile Area; Index 1000 to 1FFF							
COB ID Synch Object	1005	0x80	yes	immediately			
Communication Cycle	1006	0 (Off)	yes	after Pre-Op			
Guard Time	100C	0 (Off)	yes	immediately			
Life Time Factor	100D	0 (Off)	yes	immediately			
COB ID Guarding	100E	0x700 + Node ID	yes	immediately			
COB ID EMCY	1014	0x80 + Node ID	yes	immediately			
COB ID Rec PDO1	1400 01	0x200 + Node ID	no	immediately			
Trans Type Rec PDO1	1400 02	synchronous 1	yes	immediately			
COB ID Rec PDO2	1401 01	0x300 + Node ID	no	immediately			
Trans Type Rec PDO2	1401 02	synchronous 1	yes	immediately			
COB ID Trans PDO1	1800 01	0x180 + Node ID	no	immediately			
Trans Type Trans PDO1	1800 02	after a change	yes	immediately			
COB ID Trans PDO2	1801 01	0x280 + Node ID	no	immediately			
Trans Type Trans PDO2	1802 02	synchronous 1	yes	immediately			

The life time factor 0 is interpreted as 1.

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

10 Technical data

Housing	8-channel splitter box made of polyamide (PA) with integrated electronics, fully potted
Dimensions	152 mm x 60 mm x 22 mm (L x W x H)
Device connection	cable connection 2m 2 x 1.5mm ² (operating voltage) / 3 x 0.5mm ² (CAN interface) M12 connector for inputs/outputs
Operating temperature	-2585 °C
Storage temperature	-4090 °C
Protection rating, protection class	IP 67 III
Operating voltage (U _B)	1030 V DC, SELV
Current consumption	≤ 100 mA, without external load
Indicators	LED green: run LED LED red: diagnostic LED LED yellow: input/output status
Interface	CAN interface - ISO 11898
Baud rate	10 Kbits/s 1 Mbits/s
Communication profile	CANopen
Device profile	I/O module to CiA DS401, CiA DS301 V3.0
CAN	Full-CAN 2.0
Binary inputs	sockets 1, 3, 5, 7
Switch-on level	0.40.7 U _B
Switch-off level	0.20.24 U _B
Detectable pulses	
Without filter function	$ti \ge 20 ms (typ.)$
Analog inputs	sockets 2, 4, 6, 8
Posolution	$\geq 50 \text{ K}\Omega$
Accuracy	< + 1.0% ES
Accuracy	The output impedance of the analog source should be max 10 kO
Sensor supply L	300 mA
Binary outputs	sockets 2 4 6 8
	semiconductor outputs, short-circuit and overload protected, diagnostic capability
Switching voltage	1030 V DC
Switching current	max. 4 A
ľ	(loads < 900 mA can generate the error signal "wire break")
Overload current	4,4 A
Total current	16 A

UK

PWM outputs	sockets 2, 4, 6, 8
Output frequency	20200 Hz
PWM pulse/break ratio	1100%
Resolution	1%
	With a configuration as PWM output the status LED is permanently lit for PWM values \ge 1%. No diagnosis is possible.

11 Object directory

11.1 Manufacturer Specific Profile Area; index 2000 to 5FFF

Index	S-ldx	Designation	Туре	Default	Description
2000	0	I/O configuration	u8, ro	0x08	Number of the entries (= number of the I/O channels)
2000	1	I/O channel 1 *)	u8, rw	0x01	0 = OFF 1 = binary input
2000	2	I/O channel 2 *)	u8, rw	0x02	0 = OFF 2 = binary output 3 = analog input 4 = analog output (PWM)
2000	3	I/O channel 3 *)	u8, rw	0x01	0 = OFF 1 = binary input
2000	4	I/O channel 4 *)	u8, rw	0x02	0 = OFF 2 = binary output 3 = analog input 4 = analog output (PWM)
2000	5	I/O channel 5 *)	u8, rw	0x01	0 = OFF 1 = binary input
2000	6	I/O channel 6 *)	u8, rw	0x02	0 = OFF 2 = binary output 3 = analog input 4 = analog output (PWM)
2000	7	I/O channel 7 *)	u8, rw	0x01	0 = OFF 1 = binary input
2000	8	I/O channel 8 *)	u8, rw	0x02	0 = OFF 2 = binary output 3 = analog input 4 = analog output (PWM)
2001	0	PWM Frequency	u8, rw	0x64 (= 100 Hz)	Setting in Hz Range = 20Hz to 200Hz Values below 20Hz or above 200Hz are not accepted. The existing value remains valid.

Index	S-ldx	Designation	Туре	Default	Description
2002	0	Output monitoring ON / OFF	u8, rw	0x01	 0 = OFF Short circuit, overload, output open (no load), undervoltage, overvoltage or too high a temperature is neither indicated by EMCY nor by LED. 1 = ON In the case of a short circuit, overload, output open (no load), undervoltage, overvoltage or too high a temperature on an output the corresponding EMCY object is transferred, the output LED flashes. (The switching threshold for "output open" can be as high as an output current of 900 mA).
2003	0	Filter function ON / OFF	u8, rw	0x00	0 = OFF On the binary inputs switching pulses ≥ 2 ms are detected. 1 = ON On the binary inputs switching pulses ≥ 20 ms are detected.
20F0	0	Setting of the Node ID	u8, rw	0x20 (= 32)	The node ID used to access the output module in the CANopen network. A change is only
20F1	0	Setting of the Node ID	u8, rw	0x20 (= 32)	accepted if the entries 20F0 and 20F1 contain the same changed value. Values below 1 / above 127 are not accepted.
20F2	0	Setting of the Baud Rate	u8, rw	0x03	Baud rate of the CAN network A change is only accepted if the entries 20F2
20F3	0	Setting of the Baud Rate	u8, rw	0x03	and 20F3 contain the same changed value. Values above 7 are not accepted. 0 = 1000 kBaud 1 = 500 kBaud 2 = 250 kBaud 3 = 125 kBaud 4 = 100 kBaud 5 = 50 kBaud 6 = 20 kBaud 7 = 10 kBaud

*) Values which cannot be assigned to the channels are not accepted.

Explanation of the abbreviations

0x...= 0b...= 0d...=

hexadecimal value	str =	string
bit coded	rw =	read-write
decimal value	ro =	read only
	u8 =	unsigned 8 bit
	u16 =	unsigned 16 bit
	u32 =	unsigned 32 bit

11.2 Communication Profile Area; index 1000 to 1FFF

Index	S-ldx	Designation	Туре	Default	Description
1000	0	Device Type	u32, ro	0xF0191	Profile 301 Inputs and outputs, binary and analog
1001	0	Error Register	u8, ro	0x00	Bit-coded to profile 301, the following is supported: 0b 0000 0000 no error 0b 0000 0001 generic error 0b 0001 0000 communication error 0b 1000 0000 manufacturer specific
1002	0	State Register; used as device- specific error register	u8, ro	0x00	0b 0000 0000 normal operation Error on OUT1 OUT4 (short circuit, open, temperature / voltage too high / too low) 0b 0000 0001 OUT 1 0b 0000 0010 OUT 2 0b 0000 0100 OUT 3 0b 0000 1000 OUT 4
1003	0	Pre-defined Error field	u8, ro	0x04	An error list with 4 entries is supported.
1003	1 - 4	Error History	u32, ro	0x00	Error occured, coded according to the EMCY list, the last error is in the sub-index 1.
1004	0	Number of PDOs	u32, ro	0x20002	2 transmit PDOs, 2 receive PDOs
1004	1	Number of synch. PDOs	u32, ro	0x20002	All PDOs can be transmitted synchronously.
1004	2	Number of asynch. PDOs	u32, ro	0x20002	ALL PDOs can be transmitted asynchronously.
1005	0	COB ID synch object	u32, rw	0x80000080	 I/O module expects synch message (bit 31 1) I/O module generates no synch message (bit 30 = 0) 11-bit identifier system (bit 29 = 0) Identifier of the synch message
1006	0	Communic. Cycle	u32, rw	0x00000000	Max. time between 2 synch objects in µs; Useful resolution = 1ms
1008	0	Device Name	str, ro	CR2013	
1009	0	HW version	str, ro	HW_Ver x.x	
100A	0	SW version	str, ro	SW_Ver x.x	
100B	0	Node ID	u32, ro	-	Only for information
100C	0	Guard Time	u16, rw	0x0000	Time in ms; Within this time the I/O module expects a "node guarding" of the network master. If the value 0 is entered here, this function is not supported.

Index	S-ldx	Designation	Туре	Default	Description
100D	0	Life Time Factor	u8, rw	0x00	If no "node guarding" is received for "guard time" x "life time", the I/O module switches the outputs off. The CANopen state is not changed. The result from "guard time" x "life time" must be in the range from 0 to 65535.
100E	0	COB ID guarding	u32, rw	0x00000700 + Node ID	CAN identifier of the node guard object
100F	0	Number of SDOs			Not implemented, only the default SDO is supported.
1010	0	Number of save options	u8, ro	0x01	Number of the "save" options
1010	1	"save all parameters"	u32, rw	0x02	All parameters are automatically saved after a change.
1011	0	Number of restore options	u8, ro	0x01	Number of the "restore" options
1011	1	"reset for all parameters"	u32, rw	0x02	If the string "load" is entered here, the pa- rameters are assigned to the factory default values and are valid after the next reset.
1014	0	COB ID Emergency	u32, rw	0x40000080 + Node ID	 I/O module does not react to external EMCY message (bit 31 = 0) I/O module generates EMCY message (bit 30 = 1) 11-bit ID (bit 29 = 0) ID = 0x80 + node ID CAN identifier can be changed by the user.
1200	0	Server SDOs	u8, ro	0x02	Number of the entries
1200	1	COB ID Rec SDO	u32, ro	0x600 + Node ID	- SDO is valid (bit 31 = 0) - CAN ID of the receive SDO
1200	2	COB ID Trans SDO		0x580 + Node ID	- SDO is valid (bit 31 = 0) - CAN ID of the transmit SDO
1400	0	Receive PDO 1	u8, ro	0x02	Number of the entries receive PDO1 Binary outputs
1400	1	COB ID	u32, rw	0x0200 + Node ID	- PDO is valid (bit 31 = 0) - CAN ID of the 1st receive PDO
1400	2	Trans Type	u8, rw	0x01	0x00 = synch acyclic 0x010xF0 = synch cyclic, number of the synch objects until the outputs are updated. 0xFC not implemented 0xFD not implemented 0xFE = asynch manuf. specific event, outputs are updated immediately 0xFF = asynch device profile event, outputs are updated immediately
1401	0	Receive PDO 2	u8, ro	0x02	Number of the entries receive PDO2 Analog outputs

Index	S-ldx	Designation	Туре	Default	Description
1401	1	COB ID	u32, rw	0x300 + Node ID	- PDO is valid (bit 31 = 0) - CAN ID of the 2nd receive PDO
1401	2	Trans Type	u8, rw	0x01	0x00 = synch acyclic 0x010xF0 = synch cyclic, number of the synch objects until the outputs are updated. 0xFC / 0xFD not implemented 0xFE / 0xFF outputs are updated immediately
1600	0	Mapping Re- ceive PDO 1	u32, ro	0x01	Number of the application objects linked with the binary output PDO
1600	1	Index in the object directory	u32, ro	0x6200 01	6200 Sldx 01 contains 1 byte (binary outputs) 0b 0000 0001 OUT 1 0b 0000 0010 OUT 2 0b 0000 0100 OUT 3 0b 0000 1000 OUT 4
1601	0	Mapping Re- ceive PDO 2	u32, ro	0x04	Number of the linked application objects
1601	1	Index in the object directory	u32, ro	0x641001	6410 Sldx 01 contains the preset value of the analog output channel 2. The value is interpre- ted as pulse/break ratio in %. 0 = continuously OFF, 100 = continuously ON Values above 100 are rounded to 100 inter- nally.
1601	2	Index in the object directory	u32, ro	0x641002	6410 Sldx 02 contains the preset value of the analog output channel 4. The value is interpre- ted as pulse/break ratio in %. 0 = continuously OFF, 100 = continuously ON Values above 100 are rounded to 100 inter- nally.
1601	3	Index in the object directory	u32, ro	0x641003	6410 Sldx 03 contains the preset value of the analog output channel 6. The value is interpre- ted as pulse/break ratio in %. 0 = continuously OFF, 100 = continuously ON Values above 100 are rounded to 100 inter- nally.
1601	4	Index in the object directory	u32, ro	0x641004	6410 Sldx 04 contains the preset value of the analog output channel 8. The value is interpre- ted as pulse/break ratio in %. 0 = continuously OFF, 100 = continuously ON Values above 100 are rounded to 100 inter- nally.
1800	0	Transmit PDO 1	u8, ro	0x02	Number of the entries transmit PDO1 (binary inputs)
1800	1	COB ID	u32, rw	0x180 + Node ID	- PDO is valid (bit 31 = 0) - CAN ID of the 1st transmit PDO
1800	2	Trans Type	u8, rw	0xFF	0x00 = synch acyclic 0x010xF0 = synch cyclic, number of the synch objects between two transmissions 0xFC / 0xFD = not implemented 0xFE / 0xFF = PDO is transmitted in the case of an input change

UK

Index	S-ldx	Designation	Туре	Default	Description
1801	0	Transmit PDO 2	u8, ro	0x02	Number of the entries
1801	1	COB ID	u32, rw	0x280 + Node ID	- PDO is valid (bit 31 = 0) - CAN ID of the 2nd transmit PDO
1801	2	Trans Type	u8, rw	0x01	0x00 = synch acyclic 0x010xF0 = synch cyclic, number of the synch objects between two transmissions 0xFC / 0xFD = not implemented 0xFE / 0xFF = PDO is transmitted if the analog value changes by > 4 digits
1A00	0	Mapping Transmit PDO 1	u32, ro	0x01	Number of the linked application objects
1A00	1	Index in the object directory	u32, ro	0x600001	6000 Sldx 01 contains 1 byte (binary inputs) 0b 0000 0001 IN 1 0b 0000 0010 IN 2 0b 0000 0100 IN 3 0b 0000 1000 IN 4
1A01	0	Mapping Transmit PDO 2	u32, ro	0x04	Number of the linked application objects
1A01	1	Index in the object directory	u32, ro	0x640101	6401 Sldx 01 contains the value of the analog input channel 2, not processed. Type u16, left- aligned (bit 15 = MSB, bit 6 = LSB). With trans type 0 asynchronous the PDO is transmitted only in the case of a change of > 4 digits.
1A01	2	Index in the object directory	u32, ro	0x640102	6401 Sldx 02 contains the value of the analog input channel 4, not processed. Type u16, leftaligned (bit 15 = MSB, bit 6 = LSB). With trans type 0xFE/FF asynchronous the PDO is transmitted only in the case of a change of > 4 digits.
1A01	3	Index in the object directory	u32, ro	0x640103	6401 Sldx 03 contains the value of the analog input channel 6, not processed. Type u16, left- aligned (bit 15 = MSB, bit 6 = LSB). With trans type 0 asynchronous the PDO is transmitted only in the case of a change of > 4 digits.
1A01	4	Index in the object directory	u32, ro	0x640104	6401 Sldx 04 contains the value of the analog input channel 8, not processed. Type u16 left- aligned (bit 15 = MSB, bit 6 = LSB). With trans type 0 asynchronous the PDO is transmitted only in the case of a change of > 4 digits.

Explanation of the abbreviations:

0x...= hexadecimal value

0b...= bit coded

0d...= decimal value

string str =

read-write rw =

- ro =
- read only unsigned 8 bit u8 =
- u16 =
- unsigned 16 bit unsigned 32 bit u32 =

12 Fault correction

12.1 EMCY Object

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

EMCY Code	Error reg	Additional code	Description
0x2300	0x03	output channel bit-coded	"Device output current": - Short circuit or no load on a binary output - Overvoltage or undervoltage on a binary output - Temperature switch-off on a binary output Auto-reset after rectification of the error *)
0x6100	0x11	0x00	"Internal software": - Overflow of a Rx queue, e.g. frequency of the RxPDOs is too high, only external reset via an entry in 1003 00
0x6101	0x11	0x00	"Internal software": - Overflow of a Tx queue, e.g. device does not communicate with the bus, only external reset with an entry in 1003 00
0x6200	0x81	0x00	"User software" - A binary output is to have the state "1" although this channel is not configured as a binary output. - An analog output is to have a value > 0 although this channel is not configured as an analog output Reset after correction of the data or with outputs OFF
0x8100	0x11	0x00	"Monitoring" (guarding error) - For the "guard time" x "life time factor" no guard object is received. Reset after node is active again
0x8200	0x11	0x00	"Monitoring " (synch error) - For "communication cycle" no synch object is received. Only in OPERATIONAL Reset with the next synch OBJ or PREOP

*) In the case of a short circuit or overload the output stage switches off automatically.

It remains switched off until the corresponding output is switched OFF and then ON again. The error message is then automatically reset.

Only the first error of an error group is indicated. If there is for example a short circuit on channel 1 and then on channel 2, only the short circuit which occured first is signalled. CANopen does not allow to send two identical EMCY objects one after the other.

But the currently valid states of the output drivers are stored in the status register 1002.

13 Maintenance, repair and disposal

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

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

14 Declaration of conformity

The CE Declaration of Conformity is available at: www.ifm.com.

15 Terms and abbreviations

0b	binary value (for bit coding), e.g. 0b0001 0000
0d	decimal value, e.g. 0d100
0x	hexadecimal value, e.g. 0x64 (= 100 decimal)
Baudrate	transmission speed (1 baud = 1 bit/s)
CAL	CAN Application Layer CAN-based network protocol on application level
CAN	Controller Area Network (bus system for use in mobile applications)
CAN_H	CAN-High; CAN connection /cable with high voltage level
CAN_L	CAN-Low; CAN connection /cable with low voltage level
CANopen	CAN-based network protocol on application level with an open configuration interface (object directory)
CiA	"CAN in Automation e.V." (user and manufacturer organisation in Germany /Erlangen) Definition and control body for CAN and CAN-based network protocols
CiA DS	Draft Standard (published CiA specification which usually has not been modified or supple- mented for one year)
CiA DSP	Draft Standard Proposal (published CiA specification draft)
CiA WD	Work Draft (work draft accepted for discussion within CiA)
CiA DS 301	Specification for CANopen communication profile; describes the basic communication between network participants, such as the transfer of process data in real time, the exchange of data between units or the configuration stage. Depending on the application this is completed by the following CiA specifications:
CiA DS 401	Device profile for digital and analog I/O modules
CiA DS 402	Device profile for drives
CiA DS 403	Device profile for HMI
CiA DS 404	Device profile for measurement and control technology
CiA DS 405 CiA DS 406	Specification for interfaces to programmable systems (IEC 1131) Device profile for encoders
CiA DS 407	Application profile for local public transport
COB	CANopen Communication Object (PDO, SDO EMCY)
COB ID	CANopen Identifier of a Communication Object

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

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