CE

Device manual

Output module

UK

CR2011
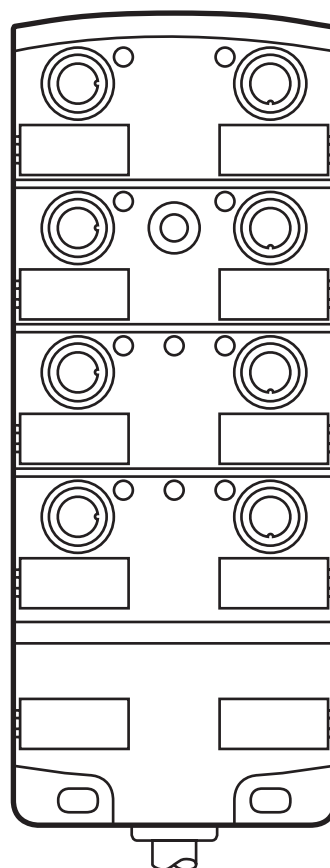
Contents

1 Preliminary note

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

► Instructions

→ Cross-reference

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

🛈 Information
Supplementary note.

UK

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 CR2011 output module enables decentralised triggering of actuators and proportional valves. The coil current can be monitored and controlled via the integrated current measurement.

4 Function

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

- As regards the output function the module can be configured. The module supports 5 operating modes:

  - binary outputs with current detection, up to 2.5 A

  - binary outputs without current detection, up to 4 A

  - PWM outputs with current detection, up to 2.5 A

  - PWM outputs without current detection, up to 4 A

  - current-controlled PWM outputs, up to 2.5 A

- The function current detection or current control can be selected by means of the wire connection. With the configuration as binary outputs 8 outputs are available. With the configuration as PWM outputs 2 outputs each are combined as a pair (= 4 outputs available).

- The outputs are activated via CANopen.

- There are 1 server SDO and the 3 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 nonvolatilely. Changed PDOs (PDO linking) are stored volatilely.

- The 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 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 module generates an emergency object. The COB ID of the EMCY object can be configured.

- The module stores the last 4 errors. The error code of the corresponding emergency object is stored.

- The module supports a reset function, i.e. assignment of the parameters to the factory default values (→ 9.1 Parameter list) upon request.

5 Dimensions and mounting

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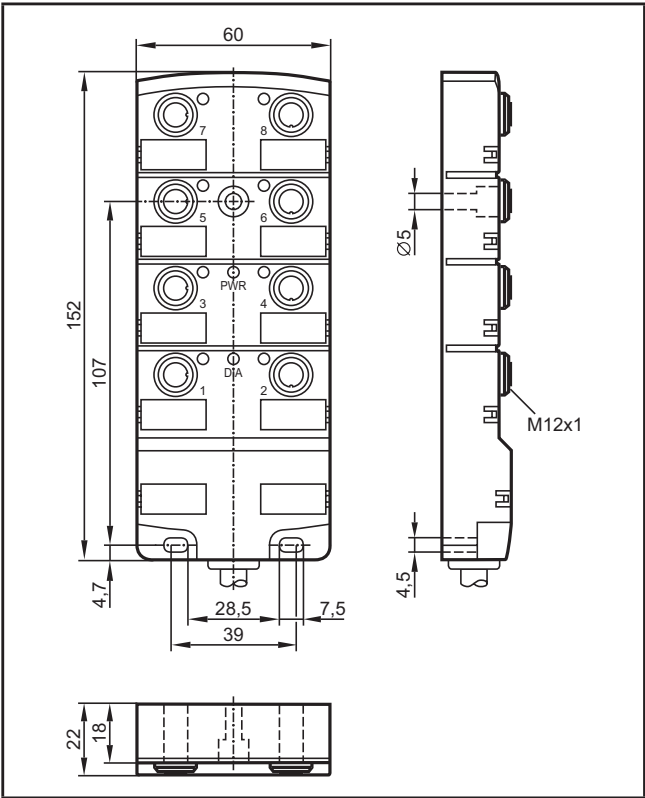
► Use suitable washers.

Tightening torque of the fixing screws: max. 1.8 Nm
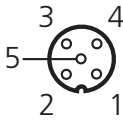
6 Electrical connection

⚠ To protect the whole system (wiring and output module) the individual electric circuits must be protected with max. 16A.
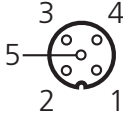
6.1 Wiring

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

6.2 Outputs without current monitoring

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

6.3 Outputs with current monitoring

M12 connector PIN	connection	
4	switching output L+	
2 (measuring resistor integrated)	external voltage -	
5	n.c.	

7 Operating indicators

LED colour	Status	Description
green	OFF	no supply voltage
	ON	module in the stand-by mode CANopen state: PREOPERATIONAL / PREPARED outputs = OFF
	flashing 2 Hz	module active CANopen state: OPERATIONAL outputs are updated
red	OFF	communication o.k.
	ON	communication disturbed - NodeGuard error (if NodeGuarding is active) - no synch objects (if synch monitoring is active)
yellow OUT	ON	binary output: output is active / ON analog output: PWM preset value is unequal to 0 preset current value > absolute value 100

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.
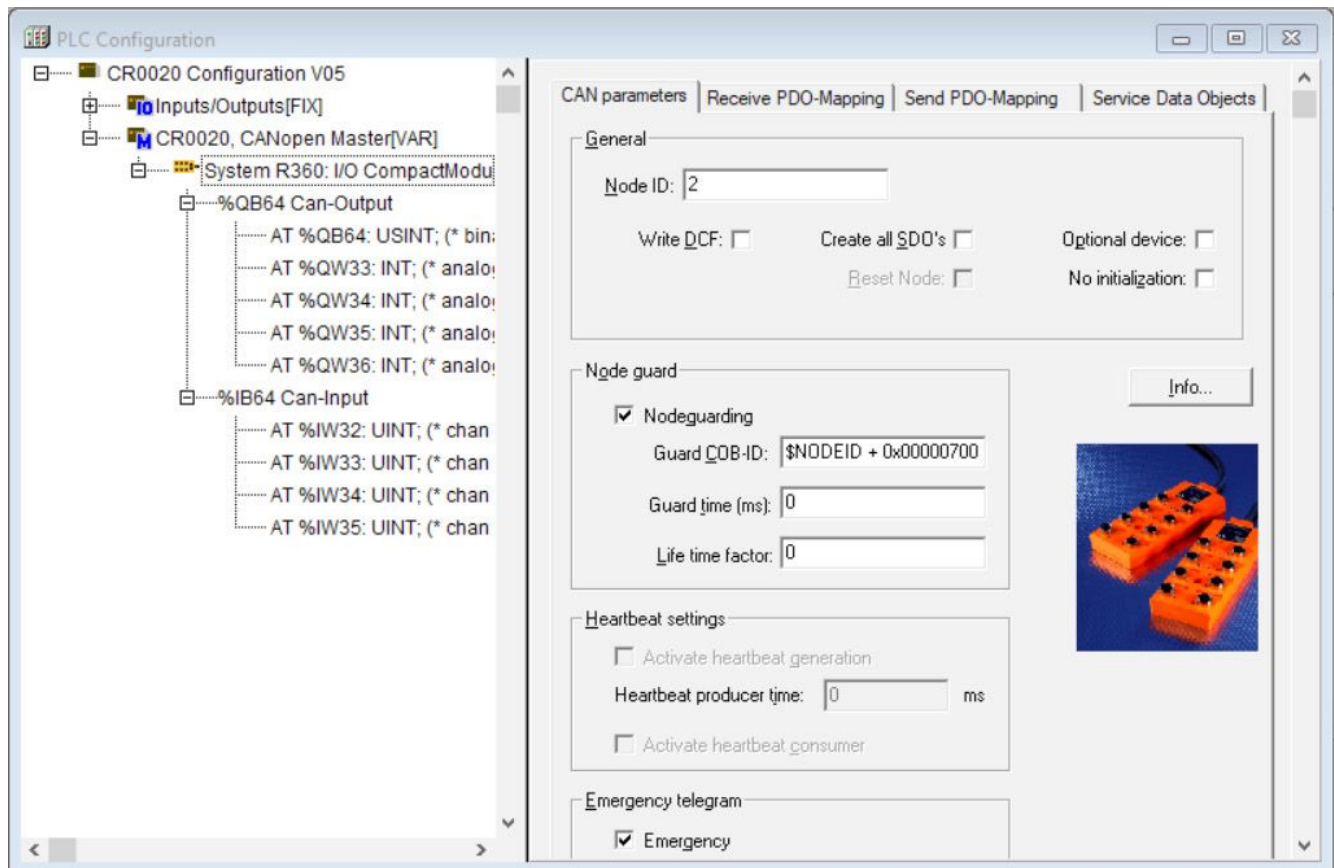
CODESYS dialogue "PLC configuration" (example)

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.
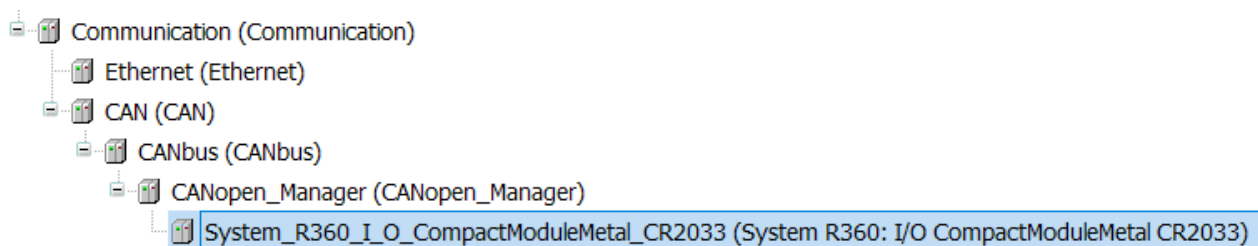
The CANopen communication is configured via the CODESYS configuration editor.

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.

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.

The monitoring time is indicated in microseconds [µs].

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

9.1 Parameter list

Parameter	Object directory index	Default value (factory preset)	Change automatically saved	Change effective
Manufacturer Specific Profile Area; index 2000 to 5FFF				
I/O Configuration	2000	8 binary outputs	yes	after Pre-Op
PWM Frequency	2001	0x64 (= 100 Hz)	yes	after Pre-Op
Node ID	20F0, 20F1	0x20 (= 32)	yes	after Pre-Op
Baud rate	20F2, 20F3	0x03 (= 125 kBit/s)	yes	after Pre-Op
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 PDO 1	1400 01	0x200 + Node ID	no	immediately
Trans Type Rec PDO 1	1400 02	synchronous 1	yes	immediately
COB ID Rec PDO 2	1401 01	0x300 + Node ID	no	immediately
Trans Type Rec PDO 2	1401 02	synchronous 1	yes	immediately
COB ID Trans PDO 1	1800 01	0x180 + Node ID	no	immediately
Trans Type Trans PDO 1	1800 02	after a change	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	152x 60 x 22 mm (L x W x H)
Device connection	PUR/PVC cable 2 m, 2 x 1.5mm² (operating voltage) / 3 x 0.5mm² (CAN interface) M12 connector for outputs
Operating temperature	-25...85 °C
Storage temperature	-40...90 °C
Protection rating,protection class	IP 67 III
Operating voltage (UB)	10...30 V DC
Current consumption	≤ 100 mA, without external load
Indicators	LED green: run LED LED red: diagnostic LED LED yellow: output status
Interface	CAN interface - ISO 11898 version 2.0
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
Node ID (default)	hex 20 (= 32)

10.1 Characteristics of the outputs

10.1.1 Digital outputs

8 semiconductor outputs, short-circuit/overload protected	
Switching voltage	10 ... 30 V DC
Switching current	max. 2 A (with current monitoring) max. 4 A (without current monitoring)
Total current	max. 16 A
Current monitoring of 2 channels each can be selected by means of wire connection, the following channels are combined: 1+2, 3+4, 5+6, 7+8	

10.1.2 PWM outputs

With the configuration as PWM output two outputs each are combined.
The output signal is present at one of the two outputs while the other output is OFF (left/right function, up/down function).
It is possible to immediately switch over from one output to the other.
The following channels are combined: 1+2; 3+4, 5+6, 7+8.

PWM frequency	20 ... 150 Hz
Pulse/break ratio	1 ... 1000 ‰
Resolution	1 ‰
Load current	max. 4 A (referred to the PWM value 1000 ‰.) With smaller PWM values this current value is reduced.
Value range	-1000 ... +1000 ‰ > +1000 ‰ are rounded to +1000 ‰ < -1000 ‰ are rounded to -1000 ‰
Value output	0 ... +1000 ‰ are present at the odd-numbered outputs (1, 3, 4, 7) -1000 ... 0 ‰ are present at the even-numbered outputs (2, 4, 6, 8)

10.1.3 Current outputs

With the configuration as current output two outputs each are combined: 1+2, 3+4, 5+6, 7+8

PWM frequency	20 ... 150 Hz
Control range	100 ... 2000 mA
Control resolution	2.5 mA
Setting resolution	1 mA
Precision	± 2% FS
Load current	max. 2 A
Load resistance	min. 12 Ω for UB = 24 V DC min. 6 Ω for UB = 12 V DC
Value range	-2000 ... +2000 mA
Values	> +2000 mA are rounded to +2000 mA. < -2000 mA are rounded to -2000 mA. 0 ... +100 mA are rounded to +100 mA. -100 ... 0 mA are rounded to -100 mA.
Value output	100 ... 2000 mA are present at the odd-numbered outputs (1, 3, 4, 7) -2000 ... -100 mA are present at the even-numbered outputs (2, 4, 6, 8)
Free-wheel diode is integrated!	To avoid a falsification of the measuring result, no external free-wheel diode must be connected in parallel with the load in operating mode "current-controlled output".

11 Object directory

11.1 Manufacturer Specific Profile Area; index 2000 to 5FFF

Index	S-Idx	Designation	Type	Default	Description
2000	0	I/O Configuration	u8, ro	0x04	Number of the entries = number of the output channels
2000	1	Output channel 1+2 *)	u8, rw	0x02	configuration channel pair 1/2 *) 0 = OFF 2 = binary output 4 = analog output (PWM) 5 = analog output (current-controlled)
2000	2	Output channel 3+4 *)	u8, rw	0x02	configuration channel pair 3/4 *) 0 = OFF 2 = binary output 4 = analog output (PWM) 5 = analog output (current-controlled)
2000	3	Output channel 5+6 *)	u8, rw	0x02	configuration channel pair 5/6 *) 0 = OFF 2 = binary output 4 = analog output (PWM) 5 = analog output (current-controlled)
2000	4	Output channel 7+8 *)	u8, rw	0x02	configuration channel pair 7/8 *) 0 = OFF 2 = binary output 4 = analog output (PWM) 5 = analog output (current-controlled)
2001	0	PWM Frequency	u8, rw	0x64 (100 Hz)	Setting in Hz Range = 20 Hz to 150 Hz Values below 20 Hz or above 150 Hz are not accepted. The existing value remains valid.
2002	0	Actual Current Values	u8, ro	0x04	Number of the entries = number of the measuring channels of current
2002	1	Actual Current Value Channel 1/2	u8, ro		Current values in mA
2002	2	Actual Current Value Channel 3/4	u8, ro		Current values in mA
2002	3	Actual Current Value Channel 5/6	u8, ro		Current values in mA
2002	4	Actual Current Value Channel 7/8	u8, ro		Current values in mA

Index	S-Idx	Designation	Type	Default	Description
20F0	0	Setting of the Node ID	u8, rw	0x20 (= 32)	The node ID used to access the output module in the CANopen network.
20F1	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 accepted if the entries 20F0 and 20F1 contain the same changed value. Values below 1 /above 127 are not accepted. After setting of the node ID a reset must be made (switch off the module for a short time) so that the new entries become valid.					
20F2	0	Setting of the Baud Rate	u8, rw	0x03	Baud rate of the CAN network 0 = 1000 kBaud 1 = 500 kBaud 2 = 250 kBaud 3 = 125 kBaud 4 = 100 kBaud 5 = 50 kBaud 6 = 20 kBaud 7 = 10 kBaud
20F3	0	Setting of the Baud Rate	u8, rw	0x03	Baud rate of the CAN network (as before)
A change is only accepted if the entries 20F2 and 20F3 contain the same changed value. Values above 7 are not accepted. After setting of the node ID a reset must be made (switch off the module for a short time) so that the new entries become valid.					

*) The combined output channels are always configured the same way.

Explanation of the abbreviations:

0x...=	hexadecimal value	str	=	string
0b...=	bit coded	rw	=	read-write
0d...=	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-Idx	Designation	Type	Default	Description
1000	0	Device Type	u32, ro	0xF0191	Profile 401; 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
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	0x20001	1 transmit PDO, 2 receive PDOs
1004	1	Number of synch. PDOs	u32, ro	0x20001	All PDOs can be transmitted synchronously.
1004	2	Number of asynch. PDOs	u32, ro	0x20001	All PDOs can be transmitted asynchronously.
1005	0	COB ID synch objekt	u32, rw	0x80000080	- Module expects synch message (bit 31 = 1) - 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	CR2012	
1009	0	HW version	str, ro	x.x	Hardware version
100A	0	SW version	str, ro	x.x	Software version
100B	0	Node ID	u32, ro		Only for information
100C	0	Guard Time	u16, rw	0x0000	Time in ms. Within this time the output module expects a "node guarding" of the network master. If the value 0 is entered here, this function is not supported.
100D	0	Life Time Factor	u8, rw	0x00	If no "node guarding" is received for "guard time" x "life time", the output module switches the outputs off. The CANopen state is not changed. The result from "guard time" x "life time" must be between 0 and 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.

Index	S-Idx	Designation	Type	Default	Description
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	0x01	If the string "load" is entered here, the parameters are assigned to the factory default values and are valid after the next reset.
1014	0	COB ID Emergency	u32, rw	0x40000080 +Node ID	- Output module does not react to external EMCY message (bit 31 = 1) - Output 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	u32, ro	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	0x200 + Node ID	- PDO is valid (bit 31 = 0) - CAN ID of the 1st receive PDO
1400	2	Trans Type	u8, rw	0x01	0 x 00 = synch acyclic 0x01...0xF0 = synch cyclic, number of the synch objects between two accesses 0xFC / 0xFD = not implemented 0xFE = asynch manuf. specific event, outputs are updated immediately 0xFF = asynch device profile event, outputs are updated immediately
1401	0	Receive PDO 2	u8, ro	0x02	Number of the entries receive PDO2 Analog outputs
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 0x01...0xF0 = synch cylic, outputs are only updated after "n" synch objects n = 0x01 (1) ... 0xF0 (240) 0xFC / 0xFD not implemented 0xFE = asynch man. spec. event; outputs are updated immediately 0xFF = asynch device profile event; outputs are updated immediately

Index	S-Idx	Designation	Type	Default	Description
1600	0	Mapping Rec PDO 1	u32, ro	0x01	Number of the application objects linked with the binary output PDO
1600	1	Index in the object directory	u32, rw	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 0b 0001 0000 = Out 5 0b 0010 0000 = Out 6 0b 0100 0000 = Out 7 0b 1000 0000 = Out 8
1601	0	Mapping Rec PDO 2	u32, ro	0x04	Number of the application objects linked with the analog output PDO
1601	1	Index in the object directory	u32, r0	0x6410 01	6410 Sldx 01 contains the preset value of the analog output channel 1 or 2. The value is interpreted as pulse/break ratio in ‰ or as preset current value (depending on the configuration of the index 2000).
1601	2	Index in the object directory	u32, r0	0x6410 02	6410 Sldx 02 contains the preset value of the analog output channel 3 or 4. The value is interpreted as pulse/break ratio in ‰ or as preset current value (depending on the configuration of the index 2000).
1601	3	Index in the object directory	u32, r0	0x6410 03	6410 Sldx 03 contains the preset value of the analog output channel 5 or 6. The value is interpreted as pulse/break ratio in ‰ or as preset current value (depending on the configuration of the index 2000).
1601	4	Index in the object directory	u32, r0	0x6410 04	6410 Sldx 04 contains the preset value of the analog output channel 7 or 8. The value is interpreted as pulse/break ratio in ‰ or as preset current value (depending on the configuration of the index 2000).
1800	0	Trans PDO 1	u8, ro	0x02	Number of the entries transmit PDO1, (actual current values)
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 0x01...0xF0 = synch cyclic, number of the synch objects between two transmissions 0xFC / 0xFD = not implemented 0xFE / 0xFF = PDO is not transmitted
1A00	0	Mapping Trans PDO 1	u32, ro	0x04	Number of the linked application objects

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Index	S-Idx	Designation	Type	Default	Description
1A00	1	Index in the object directory	u32, rw	0x2002 01	Idx 2002 01 contains the actual current value channel 1/2
				0x2002 02	Idx 2002 02 contains the actual current value channel 3/4
				0x2002 03	Idx 2002 03 contains the actual current value channel 5/6
				0x2002 04	Idx 2002 04 contains the actual current value channel 7/8

Explanation of the abbreviations:

0x...=	hexadecimal value	str	=	string
0b...=	bit coded	rw	=	read-write
0d...=	decimal value	ro	=	read only
		u8	=	unsigned 8 bit
		u16	=	unsigned 16 bit
		u32	=	unsigned 32 bit

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
0x5000	0x81	0x00	One channel or several channels not calibrated
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 via an entry in 1003 00
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

EMCY Code	Error Reg	Additional code	Description
0xFF00	0x81	bit coded	""Device Specific" - The output current could not be achieved because the load resistor is too high/small 0000 0001 channel pair 1, 2 load resistor is too high 0000 0010 channel pair 3, 4 load resistor is too high 0000 0100 channel pair 5, 6 load resistor is too high 0000 1000 channel pair 7, 8 load resistor is too high 0001 0000 channel pair 1, 2 load resistor is too small 0010 0000 channel pair 3, 4 load resistor is too small 0100 0000 channel pair 5, 6 load resistor is too small 1000 0000 channel pair 7, 8 load resistor is too small

Only the first error of an error group is indicated.

If there is for example an error "load resistor is too high" on channel pair 1/2 and then on channel pair 3/4, only the error which occured first is signalled.

CANopen does not allow to send two identical EMCY objects one after the other.

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)

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CiA	"CAN in Automation e.V." (user and manufacturer organisation in Germany /Erlangen) Definition and control body for CAN and CAN-based network protocols
CiA DS	Draft Standard (published CiA specification which usually has not been modified or supplemented for one year)
CiA DSP	Draft Standard Proposal (published CiA specification draft)
CiA WD	Work Draft (work draft accepted for discussion within CiA)
CiA DS 301	Specification for CANopen communication profile; describes the basic communication between network participants, such as the transfer of process data in real time, the exchange of data between units or the configuration stage. Depending on the application this is completed by the following CiA specifications:
CiA DS 401	Device profile for digital and 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	Specification for interfaces to programmable systems (IEC 1131)
CiA DS 406	Device profile for encoders
CiA DS 407	Application profile for local public transport
COB	CANopen Communication Object (PDO, SDO, EMCY, ...)
COB ID	CANopen Identifier of a Communication Object
Communication cycle	the synchronisation time to be monitored, max. time between 2 Sync objects
EMCY Object	Emergency Object (alarm message, device indicates an error)
Error Reg	Error Register (entry with an error code)
Guarding Error	Node or network participant could or can no longer be found Guard Master: one or several slaves no longer reply Guard Slave: no polling of the slave
Guard Time	During this time the network participant expects a "Node Guarding" of the network master
Heartbeat	Cyclic monitoring with parameter setting among network participants. In contrast to "node guarding" no superior NMT master is required.
ID (Identifier)	identifies a CAN message. The numerical value of the ID also contains a priority for the access to the bus system ID 0 = top priority
Idx	index; together with the S index it forms the address of an entry in the object directory
Life Time Factor	number of attempts in case of a missing Guarding reply
Monitoring	is used to describe the error class (guarding monitoring, synch etc.)
NMT	network management
NMT Master/ Slaves	The NMT master controls the operating states of the NMT slaves
Node Guarding	adjustable cyclic monitoring of slave network participants by a higher master node as well as the monitoring of this polling process by the slave participants
Node ID	node identifier (identification of a participant in the CANopen network)
Object (OBJ)	term for data/messages which can be exchanged in the CANopen network
Object directory	contains all CANopen communication parameters of a device as well as device-specific parameters and data Access to the individual entries is possible via the index and S index.
Operational	Operating state of a CANopen participant In this mode SDOs, NMT commands and PDOs can be transferred.

PDO	Process Data Object; in the CANopen network for transfer of process data in real time; such as the speed of a motor PDOs have a higher priority than SDOs; in contrast to the SDOs they are transferred without confirmation. PDOs consist of a CAN message with identifier and up to 8 bytes of user data.
PDO Mapping	describes the application data transferred with a PDO.
Pre-Op	Preoperational; operating state of a CANopen participant. After application of the supply voltage each participant automatically goes into this state. In the CANopen network only SDOs and NMT commands can be transferred in this mode but no process data.
Prepared	(also stopped) operating state of a CANopen participant In this mode only NMT commands are transferred.
Rec PDO (Rx PDO)	Receive Process Data Object
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 service data object
u8 (16, 32)	data type unsigned 8 (16, 32) bits
wo	write only