

General

hipecs-CIO301 is a CANopen device for detecting positions of encoder signals with differential RS-422 levels. The module provides special functions for direct control of output depending on positions. Segmentation of paths is supported, too. Hence, pre-processing on the hipecs-CIO301 is possible to relieve the PLC. Generation of SYNC messages depending on positions is possible thanks to segmentation.

It is possible to clear the current position by activating a digital input or to preload a position value.

CANopen is available according to DS301 and DS401. All usual baud rates up to 1 Mbit/s supported.



Features

- 3 digital inputs
reset/preload of position value
- 2 digital outputs
PWM, set/reset according to position
- 1 encoder input (RS-422)
detection of tracks A, B and Z
- Plastic housing for mounting onto
DIN carrier rails
- Operating temperature 0...+55 °C
(opt. -40...+70 °C)

CANopen Features

- CAN baud rates up to 1 Mbit/s
- CAN bus ISO11898 with Transceiver TJA1050
- 4 Transmit- and 4 Receive-PDO
- Dynamic PDO Mapping
- Variable PDO Identifier
- CANopen PDO transfer modes:
synchronous, asynchronous, event triggered,
cyclic, acyclic and RTR
- Event Timer and Inhibit Timer for all
Transmit-PDO
- Node-Guarding, Lifeguarding und Heartbeat
- Emergency messages
- Minimum Boot-Up

Ordering information

Part	Order number
hipecs-CIO301-5i	EZ00000.2502.00
3/2 digital I/O, 1 encoder (+5 V DC), CAN isolated, 0...+55 °C	
hipecs-CIO301-5ie	EZ00000.3502.00
3/2 digital I/O, 1 encoder (+5 V DC), CAN isolated, -40...+70 °C	
hipecs-CIO301-24i	EZ00000.2501.01
3/2 digital I/O, 1 encoder (+24 V DC), CAN isolated, 0...+55 °C	
hipecs-CIO301-24ie	EZ00000.3501.01
3/2 digital I/O, 1 encoder (+23 V DC), CAN isolated, -40...+70 °C	

Technical data

Power supply System	Min.	Norm.	Max.
Supply voltage System/Bus	+11 V DC	+24 V DC	+32 V DC
Current consumption System/Bus			
Supply voltage I/O	+11 V DC	+24 V DC	+32 V DC
CAN bus Norm	ISO11898		
CiA Draft Standards	DS301 Version 4.0 and DS401 Version 2.0		
Conformance declaration	CE		
MTBF			

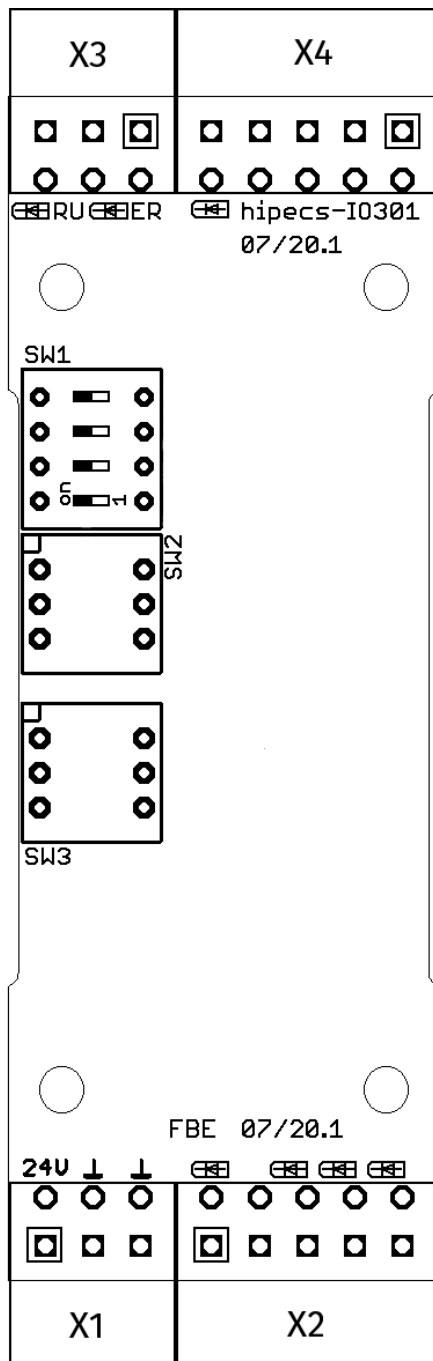
Digital inputs	
Number of inputs	3
Signal level LOW	0...+3 V DC
Signal level HIGH	+9...+32 V DC
Delay (CAN reaction time)	typ. 1 ms
Input current at 24 V DC	
Isolation from System/Bus	-

Digital Outputs	
Number of outputs	2
Switching character	High-side switching
Protection	Short-circuit proof, thermal shutdown etc.
Isolation from System/Bus	-
Delay (CAN reaction time)	typ. 1 ms
Loads	resistive, inductive, lamps
max. output current continuous	2 Ampere
Peak output current	4 Ampere

Encoder inputs	
Number of inputs	1
Interface	RS-422 (differential)
Tracks available	A, B, Z
Supply encoder	For encoder supply the main supply of the CIO301 is provided

Connectors and dimensions	
Connectors	Wago cage clamp Type 713
Cable cross-section [mm ²]	0.08...1.5 mm ² (massive/flexible)
Cable cross-section [AWG]	26...14 AWG (massive/flexible)
Stripping length	8 mm
Dimensions housing	approx. 17.8 x 90 x 62 mm (see picture "dimensions")
Operating temperature	0...+55 °C (optional -40...+70 °C)
Module weight	

Connectors assignment



Connector X1 (Power)

Pin-No.	Name	Description
1, 2	U1	+24 V DC
3, 4, 5, 6	GND	Ground

Connector X2 (digital I/O)

Pin-No.	Name	Description
1, 2, 5, 6	GND	Ground
3, 4	O0, O1	Digital output 0/1
7, 8	I0, I1	Digital input 0/1
9, 10	P	+24 V DC

Connector X3 (CAN)

Pin-No.	Name	Description
1, 2	G0	CAN ground
3, 4	H0	CAN-High
5, 6	L0	CAN-Low

Connector X4 (encoder input)

Pin-No.	Name	Description
1	GND	Ground
2	PO	Supply encoder (+24 V DC or +5 V DC)
3	A	Track A
4	\bar{A}	Track A inverted
5	B	Track B
6	\bar{B}	Track B inverted
7	Z	Track Z
8	\bar{Z}	Track Z inverted
9	P	+24 V DC
10	I2	Digital input 2

Attention:

X4.9, X2.9 and X2.10 are linked and looped-through from X1 for connecting the digital inputs.

Configuration Dip-Switch

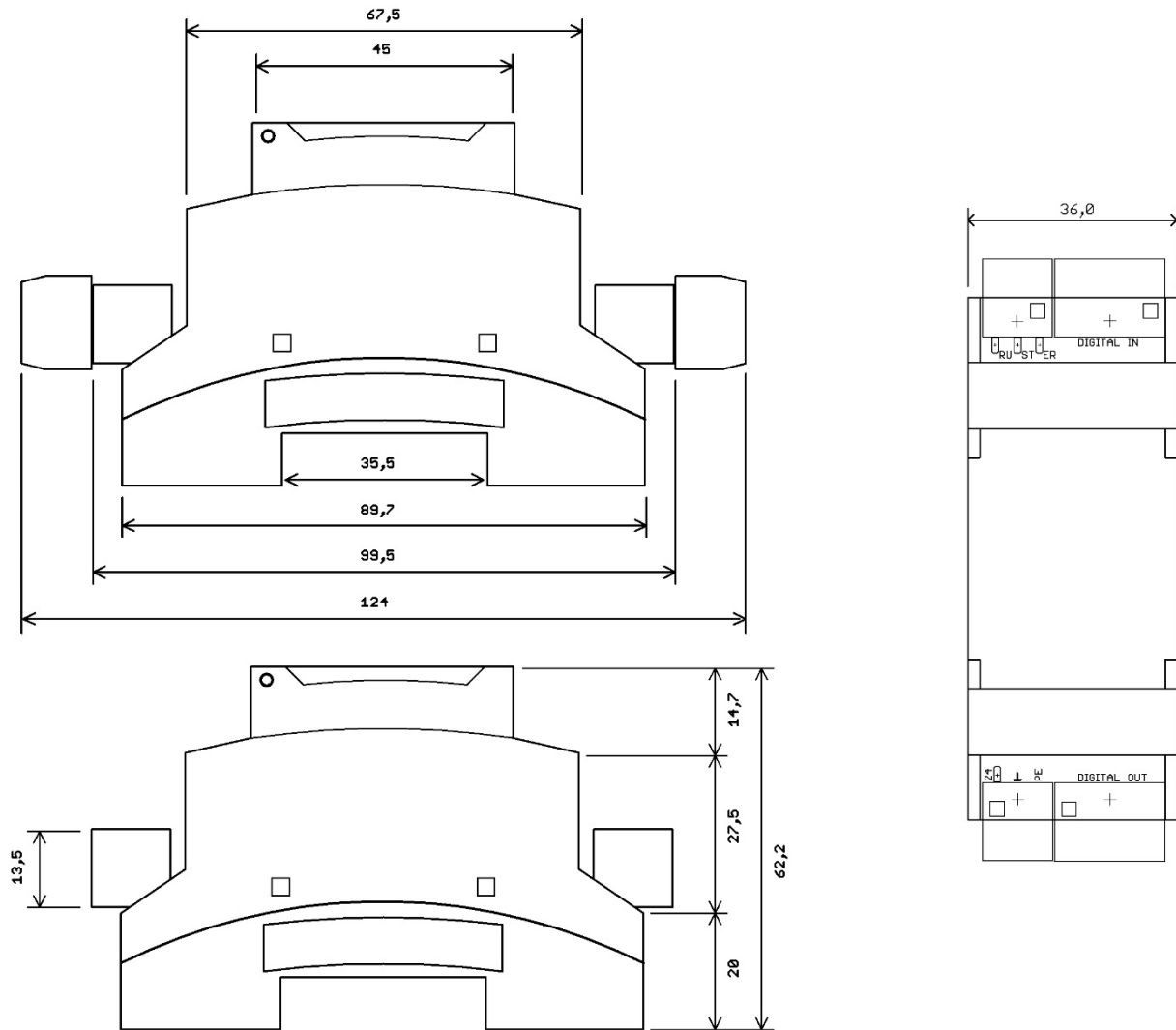
Switch Number						Function
SW3	SW2	SW1				
		4	3	2	1	
		RT				RT Termination CAN-Bus
			BD0	BD1	BD2	BDx Baud rate CAN-Bus
						IDx Setup node-ID Setup automatic start (device always OPERATIONAL)
		ON				CAN-Termination on (120 Ohm)
		OFF				CAN-Termination off
			OFF	OFF	OFF	1 Mbit/s
			ON	OFF	OFF	800 kBit/s
			OFF	ON	OFF	500 kBit/s
			ON	ON	OFF	250 kBit/s
			OFF	OFF	ON	125 kBit/s
			ON	OFF	ON	50 kBit/s
			OFF	ON	ON	20 kBit/s
			ON	ON	ON	Reserved
0	0					Reserved
0	1					Node ID = 1 (no automatic start)
0	2					Node ID = 2 (no automatic start)
...
7	E					Node ID = 126 (no automatic start)
7	F					Node ID = 127 (no automatic start)
8	1					Node ID = 1 (automatic start)
8	2					Node ID = 2 (automatic start)
...
F	E					Node ID = 126 (automatic start)
F	F					Node ID = 127 (automatic start)

CAN Signal-LED

States are coded according to DRP303-3.

LED	Color	Description
RUN-LED	green	off no supply or faulty flickering CAN not started flashing Stopped blinking Preoperational on Operational
ERR-LED	red	off no error 1x flashing CAN module in Error Warning State 2x flashing Node-Guarding error on Bus-Off

Dimensions



All measurements in mm

CANopen Object Dictionary**DS301: global objects**

Index	Sub-Index	Name	Access
0005	-	Dummy 8	ro
0006	-	Dummy 16	ro
0007	-	Dummy 32	ro
1000	-	Device Type	ro
1001	-	Error Register	ro
1002	-	Manufacturer Status Register	ro
1005	-	COB-ID SYNC	ro
1006	-	Communication Cycle Period	r/w
1008	-	Device Name	ro
1009	-	Hardware Version	ro
100A	-	Software Version	ro
100C	-	Guard Time	r/w
100D	-	Life Time Factor	r/w
100E	-	COB-ID Guard	-
1010	0	Store Parameter Field	ro
	1	Save all Parameter	r/w
	2	Save Communication Parameter	r/w
	3	Save Application Parameter	r/w
1011	0	Restore Default Parameter	ro
	1	Restore all Default Parameter	r/w
1014	-	COB ID Emergency	r/w
1015	-	Inhibit Time Emergency	r/w
1016	0	Consumer Heartbeat Time	ro
	1	Consumer Heartbeat Time 1	r/w
	2	Consumer Heartbeat Time 2	r/w
	3	Consumer Heartbeat Time 3	r/w
	4	Consumer Heartbeat Time 4	r/w
1017	-	Producer Heartbeat Time	r/w
1018	0	Identity Object	ro
	1	Vendor ID	ro
	2	Product Code	ro
	3	Revision Number	ro
	4	Serial Number	ro
1029		Error Behavior Object	ro
	1	Communication error	r/w
	2	Application error	r/w

All index values are hexadecimal. Values in tables are hexadecimal (0x...) or decimal.

ro read only
wo write only
r/w read and write

All visible string data types are 20 characters at max.

DS301: PDO Parameter objects

Description of PDO Parameter. With these indexes, dynamic PDO-Mapping, free selection of IDs, transmission type, inhibit and event time is possible. These settings are selectable in "operational" as well as "preoperational" mode.

Index	Sub-Index	Name	Access
1400	0	Receive-PDO1 Communication Parameter	ro
	1	COB-ID	r/w
	2	Transmission Type	r/w
1401...1403		Receive-PDO2 to RPDO4 Communication Parameter same as 1400	r/w
1600	0	Receive-PDO1 Parameter mapping	r/w
	1 to n	Mapped objects (max. 8 objects mappable)	r/w
1601...1603		Receive-PDO2 to RPDO4 Parameter mapping same as 1600	r/w
1800	0	Transmit-PDO1 Communication Parameter	ro
	1	COB-ID	r/w
	2	Transmission Type	r/w
	3	Inhibit Time	r/w
	4	Reserved	r/w
	5	Event Time	r/w
1801...1803		Transmit-PDO2 to TPDO4 Communication Parameter same as 1800	r/w
1A00	0	Transmit-PDO1 Parameter mapping	r/w
	1 to n	Mapped objects (max. 8 objects mappable)	r/w
1A01...1A03		Transmit-PDO2 to TPDO4 Parameter mapping same as 1A00	r/w

Specific objects

Index	Sub-Index	Name	Access
2000	-	Device Manufacturer	ro
2009	0	Serial Number 64 Bit	ro
	1	Serial Number 64 Bit LSDW	ro
	2	Serial Number 64 Bit MSDW	ro
2101	-	System Configuration	ro
2102	-	Remapping Enabled Info	ro
2103	-	Enable Guarding Warning	r/w
2105	-	Internal API State	ro
2110	0	Conformance Test Object	ro
	1	Range Check Object	r/w
2180	-	CAN Restart Time	r/w
21C0	-	Timer Event Counter	ro
21C1	-	Timer Event Time	r/w
2FFF	-	Factory Test Object	r/w

DS401: digital inputs

Index	Sub-Index	Name	Access
5001	0 to n	Digital Input Filter Time	r/w
6000	0 to n	Read digital input 8 bit	ro
6002	0 to n	Polarity input 8 bit	r/w
6005	-	Global Interrupt Enable	r/w
6006	0 to n	Interrupt Mask Any Change	r/w
6007	0 to n	Interrupt Mask Rising Edge	r/w
6008	0 to n	Interrupt Mask Falling Edge	r/w
6100	0 to n	Read Digital Input 16 Bit	ro
6120	0 to n	Read Digital Input 32 Bit	ro

DS401: digital outputs

Index	Sub-Index	Name	Access
5200	-	Reset Output Object on Error	r/w
5202	-	Output Overload Error Info	ro
5210	0 to n	Digital Output Access Enable	r/w
5220	0 to n	Digital Output Monitor	ro
6200	0 to n	Write Output 8 Bit	r/w
6206	0 to n	Error Mode Output	r/w
6207	0 to n	Error State Output	r/w
6300	0 to n	Write Digital Output 16 Bit	wo
6320	0 to n	Write Digital Output 32 Bit	wo

DS401: analog inputs

Index	Sub-Index	Name	Access
5301	-	Analog Input Filter Level	r/w
6401	0 to n	Analog Input 16 Bit	r/w
6421	0 to n	Analog Input Trigger Selection	r/w
6423	-	Analog Interrupt Enable	r/w
6424	0 to n	Analog Input Interrupt Upper Limit	r/w
6425	0 to n	Analog Input Interrupt Lower Limit	r/w
6426	0 to n	Analog Input Interrupt Delta	r/w
6427	0 to n	Analog Input Interrupt Negative Delta	r/w
6428	0 to n	Analog Input Interrupt Positive Delta	r/w

Product related specific objects sorted by function

Index	Sub-Index	Name	Access
4000	0 to n	Counter Value	ro
4001	0 to n	Counter Control	r/w
4002	0 to n	Counter Status	ro
4003	0 to n	Counter Speed	ro
4005	0 to n	Counter Active Detection Hysteresis	r/w
4006	0 to n	Counter Inactive Detection Time	r/w
4007	0 to n	Counter Preset Value	r/w
4008	0 to n	Counter New Operation Mode	r/w
4009	0 to n	Counter Speed Scaling	r/w
4010	0 to n	Counter Clear On Input	r/w
4011	0 to n	Counter Preset On Input	r/w
4020	0 to n	Actual Section Index Controller 1	r/w
4021	0 to n	Last Section Index Controller 1	r/w
4022	0 to n	Section Center Index Controller 1	r/w
4024	0 to n	Actual Section Short Index Controller 1	r/w
4025	0 to n	Last Section Short Index Controller 1	r/w
4026	0 to n	Section Center Short Index Controller 1	r/w
4027	0 to n	Section Short Index Divider Controller 1	r/w
4028	0 to n	Offset Of First Section Controller 1	r/w
4029	0 to n	Section Size Increments Controller 1	r/w
402A	0 to n	Section Hysteresis Increments Controller 1	r/w
4030	0 to n	Actual Section Index Controller 2	r/w
4031	0 to n	Last Section Index Controller 2	r/w
4032	0 to n	Section Center Index Controller 2	r/w
4034	0 to n	Actual Section Short Index Controller 2	r/w
4035	0 to n	Last Section Short Index Controller 2	r/w
4036	0 to n	Section Center Short Index Controller 2	r/w
4037	0 to n	Section Short Index Divider Controller 2	r/w
4038	0 to n	Offset Of First Section Controller 2	r/w
4039	0 to n	Section Size Increments Controller 2	r/w
403A	0 to n	Section Hysteresis Increments Controller 2	r/w
4040	-	Sync Send Event Object	r/w
4041	-	Sync Data Mapping	r/w
4080	0 to n	Counter Cam Command	r/w
4081	0 to n	Counter Cam New Position	r/w
4082	0 to n	Counter Cam Status	r/w
4083	0 to n	Counter Cam Output Lock	r/w
4090	0 to n	Position Window Control	r/w
4091	0 to n	Position Window Status	ro
4092	0 to n	Position Window Low Pos	r/w
4093	0 to n	Position Window High Pos	ro
40A0	0 to n	Speed Comparator Control	r/w
40A1	0 to n	Speed Comparator Status	ro
40A2	0 to n	Speed Limit	r/w
40B0	0 to n	Position Mode Indicator Control	r/w

Encoder

Index	Sub-Index	Name	Access
5100	0 to n	PWM Value	r/w
5101	0 to n	PWM Control	r/w
5106	0 to n	PWM Base Timer Steps	r/w
5107	0 to n	PWM Base Timer Prescaler	r/w

PWM

Object dictionary (description)

Following comes a short description of every dictionary entry.

DS301: Global objects

Index 0005

Dummy for spaces in PDO mapping (8-bit length).
Can be used, more than once.

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

Index 0006

Dummy for spaces in PDO mapping (16-bit length).
Can be used, more than once.

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

Index 0007

Dummy for spaces in PDO mapping (32-bit length).
Can be used, more than once.

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

Index 1000: Device Type

This index contains a description of the device type. Within are encoded the CiA profile code and additional specifications of the device.

Index	1000
Name	Device Type
Description	-
Data Type	Unsigned 32
Access	ro
PDO Mapping	No
Value Range	-
Default Value	0x0083 0191

Index 1001: Error Register

This index contains the internal error code in case of emergency.

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

The error register is built as shown. If more than one error occur, the values are combined via logical OR.

Bit	Description
0	Common error. This bit is set with every error.
1	0
2	0
3	0
4	CAN bus or communication error
5	0
6	0
7	Device error

Index 1002: Status Register

This index contains additional status information of the device.

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

Index 1005: COB-ID SYNC

This index sets the COB-ID for SYNC messages.

This device supports producer and consumer mode.

Index	1005
Name	COB-ID Sync
Description	-
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	1..0x7FF
Default Value	0x80

Index 1006: Communication Cycle Period

This index sets the interval for the SYNC. The given value is the interval length in μ s.

Index	1006
Name	Communication Cycle Period
Description	-
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index 1008: Device Name

This index contains the device name as a visible string.

¹⁾ xxx: Number of the product

Index	1008
Name	Device Name
Description	-
Data Type	Visible String
Access	ro
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	"hipecs-CIOxxx ¹⁾ "

Index 1009: Hardware Version

This index contains the revision code of the hardware as visible string.

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

Index 100A: Software Version

This index contains the firmware version as visible string.

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

Index 100C: Guard Time

Together with index 100D, this index represents the lifeguarding protocol. Values are in milliseconds.

Guard Time multiplied by Life Time Factor results in Life Time.

Set up 0 (zero), if not used.

Index	100C
Name	Guard Time
Description	-
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	
Default Value	0

Index 100D: Life Time Factor

Together with index 100C, this index represents the lifeguarding protocol. Values are factors.

Guard Time multiplied by Life Time Factor results in Life Time.

Set up with 0 (zero), if not used.

Index	100D
Name	Life Time Factor
Description	-
Data Type	Unsigned 8
Access	r/w
PDO Mapping	No
Value Range	
Default Value	0

Index 100E: COB-ID Guard

This index contains the ID for guarding protocol.

Index	100E
Name	COB-ID Guard
Description	-
Data Type	Unsigned 32
Access	-
PDO Mapping	No
Value Range	-
Default Value	0x700 + Node-ID

Index 1010: Store Parameter Field

This index gives the possibility to save the settings of the module.

Index	1010
Name	Store Parameter Field
Description	-
Data Type	Structure

Saving the settings is only possible in „Pre-Operational“ state.

To execute the save sequence write the command „save“ to the matching index.

Index	1010.00
Name	Number of indexes supported
Description	-
Data Type	Unsigned char
Access	ro
PDO Mapping	No
Value Range	-
Default Value	3

MSB		LSB	
e	v	a	s
0x65	0x76	0x61	0x73

Save all settings

Index	1010.01
Name	Save all Parameters
Description	
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	-

Save communication settings only
(PDO settings etc.)

Index	1010.02
Name	Save Communication Parameters
Description	
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	-

Save application settings only
(counter settings etc.)

Index	1010.03
Name	Save Application Parameters
Description	
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	-

Index 1011: Restore Default Parameter

This index gives the possibility to restore the default settings.

Index	1011
Name	Restore Default Parameter
Description	-
Data Type	Structure

Restoring the settings is only possible in „Pre-Operational“.

To execute the restore sequence write the command „load“ to the matching index and restart the module.

Index	1011.00
Name	Number of indexes supported
Description	-
Data Type	Unsigned char
Access	ro
PDO Mapping	No
Value Range	-
Default Value	1

MSB		LSB	
d	a	o	l
0x64	0x61	0x6F	0x6C

Restore all settings

Index	1011.01
Name	Restore all Default Parameter
Description	
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	-

Index 1014: COB-ID Emergency

This index sets the ID for emergency messages.

Index	1014
Name	COB-ID Emergency
Description	-
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0x80 + Node-ID

Index 1015: Inhibit Time Emergency

This index sets up a delay for transmitting any emergency.

The delay is a multiple of 100 μ s.

The value is a multiplier.

Index	1015
Name	Inhibit Time Emergency
Description	-
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0 (disabled)

Index 1016: Consumer Heartbeat Time

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

Index	1016
Name	Consumer Heartbeat Time
Description	-
Data Type	Structure

Attention:

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.

Index	1016.00
Name	Number of indexes supported
Description	-
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	4

Structure of the Consumer Heartbeat Time

MSB		LSB	
Byte3	Byte2	Byte1	Byte0
Reserved	Node-ID	Heartbeat time	

Index	1016.01...1016.04
Name	Consumer Heartbeat Time 1...4
Description	-
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index 1017: Producer Heartbeat Time

This index sets up the heartbeat cycle in an interval of one millisecond.

If it is not used, set up 0 (zero).

Attention:

Use either Heartbeat or Node-Guarding. Both at once is not allowed.

Index	1017
Name	Producer Heartbeat Time
Description	-
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index 1018: Identity Object

This index contains common information about the device and the manufacturer, frenzel + berg electronic GmbH & Co.KG. It cannot be modified.

Index	1018
Name	Identity Object
Description	-
Data Type	Structure

Index	1018.00
Name	Number of indexes supported
Description	-
Data Type	Unsigned char
Access	ro
PDO Mapping	No
Value Range	-
Default Value	4

Registration code of frenzel + berg electronic GmbH & Co.KG at the CiA

Index	1018.01
Name	Vendor ID
Description	
Data Type	Unsigned 32
Access	ro
PDO Mapping	No
Value Range	-
Default Value	0x58

Internal product code of the product at frenzel + berg electronic GmbH & Co.KG

Index	1018.02
Name	Product Code
Description	
Data Type	Unsigned 32
Access	ro
PDO Mapping	No
Value Range	-
Default Value	0x0003 0100

Index	1018.03
Name	Revision Code
Description	
Data Type	Unsigned 32
Access	ro
PDO Mapping	No
Value Range	-
Default Value	Revision of the device

Index	1018.04
Name	Serial Number
Description	
Data Type	Unsigned 32
Access	ro
PDO Mapping	No
Value Range	-
Default Value	0

Index 1029: Error Behavior

This index sets up whether the device switches its operating state in case of emergency, or not. Possible changes are Pre-Operational or Stopped. No change at all and keeping the current state is possible, too.

Index	1029
Name	Error Behavior Object
Description	-
Data Type	Structure

As communication error counts, e.g., Bus-Off, Heartbeat, Guarding or internal errors of the device.

Index	1029.00
Name	Number of indexes supported
Description	-
Data Type	Unsigned char
Access	ro
PDO Mapping	No
Value Range	-
Default Value	2

The values of the states are as follows:

- 0 Pre-Operational (only if Operational)
- 1 no change
- 2 Stopped
- 3...255 reserved

Index	1029.01
Name	Communication Error
Description	NMT state change in case of communication error
Data Type	Unsigned 8
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index	1029.02
Name	Application Error
Description	NMT state change in case of internal error due to hardware malfunction
Data Type	Unsigned 8
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

DS301: PDO Parameter Objects

Communication Parameter Objects

The transmission type for Transmit- and Receive-PDO are set up with sub-index 2.

Type	PDO transmission				
	cyclic	acyclic	synchronous	asynchronous	RTR
0		X	X		
1-240	X		X		
241-251	Reserved				
252			X		X
253				X	X
254				X	
255				X	

The synchronous transmission types 0...240 and 252 are dependent on the SYNC signal. Asynchronous transmission is independent from the SYNC.

Type 0 is triggered by the SYNC, however, a transmission is only made, if the PDO data changes.

A value between 1 and 240 says the transmission is synchronous and cyclic. The transmission type represents the needed number of SYNCs for triggering the PDO.

Type 252 triggers a transmission with the next available SYNC, but only if a RTR releases the PDO.

Type 253 transmits the PDO immediately, however, only on RTR.

With type 254 and 255, the manufacturer or the device profile set the conditions.

An inhibit time can be set in sub-index 3. The PDO are triggered by their conditions, but only transmitted if the inhibit time is up. This time is set as a multiple of 100 µs, a value of 0 (zero) renders the function useless.

In mode 254/255, an additional Event Time is set. This timer running out is considered an event. The time is set as a multiple of 1 ms. This event triggers a PDO transmission in addition to other possible events.

Index 1400 is an example for Receive-PDO and index 1800 is an example for Transmit-PDO.

Index	PDO
1400...14xx	Receive-PDO1...Receive-PDOxx
1800...18xx	Transmit-PDO1...Transmit-PDOxx

Index	14xx/18xx
Name	Receive-/Transmit-PDOx Communication Parameters
Description	-
Data Type	Structure

Index	14xx.00/18xx.00
Name	Number of indexes supported
Description	-
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	2/5

1400.01	ID + 200	1800.01	ID + 180
1401.01	ID + 300	1801.01	ID + 280
1402.01	ID + 400	1802.01	ID + 380
1403.01	ID + 500	1803.01	ID + 480
1404.01	ID + 80000000	1804.01	ID + 80000000
1405.01	ID + 80000000	1805.01	ID + 80000000
1406.01	ID + 80000000	1806.01	ID + 80000000
1407.01	ID + 80000000	1807.01	ID + 80000000

Index	14xx.01/18xx.01
Name	COB-ID
Description	Identifier for CAN-Object for PDO
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	

The table shows the default PDO-ID.

An Identifier von 8xxxxxxx means the PDO is rendered inactive. The CAN master has to assign a valid PDO-ID.

See table on top of the chapter.

Attention:

1804.02 and 1805.02 are preset with 0x01 instead of the default value.

Index	14xx.02/18xx.02
Name	Transmission Type
Description	-
Data Type	Unsigned 8
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0xFF

Multiple of 1 μ s.

Index	18xx.03
Name	Inhibit Time
Description	-
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index	18xx.04
Name	Reserved
Description	-
Data Type	-
Access	-
PDO Mapping	No
Value Range	-
Default Value	-

Multiple of 1 ms.

Index	18xx.05
Name	Event Time
Description	-
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

PDO mapping objects

The following table shows the PDO mapping entries. This is the same for all PDO. The mapping table is a linking index for entries of the object dictionary (e.g. data of digital outputs) and position in the PDO.

Sub-Index 0 gives the number of valid entries. The hipecs-CIOxxx supports up to eight entries each PDO. In order to change the mapping, sub-index 0 has to be set to 0 (zero) first (inactive). Now the entries can be altered. If a new entry is mapped, the hipecs-CIO50 checks whether the entry is valid or not. Invalid entries result in an abort.

All eight sub-indexes are pointer to the entries. A value of 0 (zero) means no entry. The pointer's structure is:

MSB		LSB	
Byte3	Byte2	Byte1	Byte0
mapped index		sub-index	Length

Index and sub-index combined are the pointer; Length is the data length of the pointer's target in bit.

Index	160x/1A0x
Name	Receive-/Transmit-PDO Mapping Parameters
Description	-
Data Type	Array

Index	160x/1A0x.00
Name	Number of indexes supported
Description	Number of mapped objects
Data Type	Unsigned 8
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	See table below

Index	160x/1A0x.01...160x/1A0x.08
Name	Mapped object
Description	
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	See table below

Receive-PDO

The hipecs-CIOxxx¹⁾ uses this default configuration for Receive-PDO.

Index	Entry	
Receive-PDO1		
1600.00	1	
1600.01	62000108	Digital output 0.0...0.7
Receive-PDO2		
1601.00	2	
1601.01	51000110	PWM value 1
1601.02	51000210	PWM value 2
Receive-PDO3		
1602.00	1	
1602.01	40010110	Counter control
Receive-PDO4		
1603.00	2	
1603.01	40800120	Counter cam command
1603.02	40810120	Counter cam new position
Receive-PDO5		
1604.00	0	
Receive-PDO6		
1605.00	0	
Receive-PDO7		
1606.00	0	
Receive-PDO8		
1607.01	0	

Transmit-PDO

The hipecs-CIOxxx¹⁾ uses this default configuration for Transmit-PDO.

Index	Entry	
Transmit-PDO1		
1A00.00	6	
1A00.01	60000108	Digital inputs 0.0...0.7
1A00.02	10010008	Error register
1A00.03	40020110	Counter 1 status
1A00.04	40820110	Counter 1 cam status
1A00.05	40910108	Counter 1 Position Window Status
1A00.06	40A10108	Counter 1 Speed Comparator Status
Transmit-PDO2		
1A01.00	1	
1A01.01	64010110	Internal temperature
Transmit-PDO3		
1A02.00	3	
1A02.01	40000120	Counter value
1A02.02	40020110	Counter status
1A02.03	40030110	Counter speed inc/s
Transmit-PDO4		
1A03.00	3	
1A03.01	40200110	Actual section index cnt.1
1A03.02	40210110	Last section index cnt.1
1A03.03	40220110	Section center index cnt.1
Transmit-PDO5		
1A04.00	0	
Transmit-PDO6		
1A05.00	0	
Transmit-PDO7		
1A06.00	0	
Transmit-PDO8		
1A07.00	0	

¹⁾ xxx: Number of the product

Specific Objects

Index 2000: Device Manufacturer

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

Index 2009: Serial Number 64 Bit

This index contains the serial number of this device.

Index	2009
Name	Serial Number 64 Bit
Description	-
Data Type	Array

Index	2009.00
Name	Number of indexes supported
Description	-
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	2

Index	2009.01
Name	Serial Number Low Double Word
Description	Bits 0...31 of the serial number
Data Type	Unsigned 32
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	2009.02
Name	Serial Number High Double Word
Description	Bits 32...63 of the serial number
Data Type	Unsigned 32
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index 2101: System Configuration

This index shows the current operating mode of the device.

Index	2101
Name	System Configuration
Description	-
Data Type	Unsigned 32
Access	ro
PDO Mapping	No
Value Range	-
Default Value	0

Index 2102: Remapping Enabled Info

This index shows, whether remapping the PDO is allowed or prohibited.

0 = remapping prohibited

1 = remapping allowed

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

Index 2103: Enabled Guarding Warning

This index enables an additional warning when Node-Guarding is used.

The CAN master is given an early report for an imminent Node-Guarding failure.

The warning is triggered when the Guard Time is up (Index 100C).

The NMT state remains unaffected.

Index	2103
Name	Enable Guarding Warning
Description	-
Data Type	Unsigned 8
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index 2105: Internal Error Code

These are internal error messages of the CANopen controller.

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

Index 2110: Test Object

This index is for internal test purposes only. It possesses no function and is not to use.

Index	2110
Name	Test Object 01
Description	-
Data Type	Structure

Index	2110.00
Name	Number of indexes supported
Description	-
Data Type	Unsigned char
Access	ro
PDO Mapping	No
Value Range	-
Default Value	1

Index	2110.01
Name	Range Check Object
Description	-
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	100...1000
Default Value	500

Index 2180: CAN Restart Time

With this index, the restart time for the CAN communication in case of a Bus-Off error is defined. The value is set in milliseconds.

0 (zero) disables this function.

Index	2180
Name	CAN Restart Time
Description	-
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	0...50000
Default Value	1000 (restart after one second)

Index 21C0: Timer Event Counter

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

Index	21C0
Name	Timer Event Counter
Description	-
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	
Default Value	

Index 21C1: Timer Event Time

This index contains the time interval for incrementing the “Timer Event Counter” of index 21C0.

Time is given in ms.

Index	21C1
Name	Timer Event Time
Description	-
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	0...10000
Default Value	0

Index 2FFF: Factory Test Object

For internal use at FBE only.

Do not use!

Index	2FFF
Name	Factory Test Object
Description	-
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	-

DS401: digital inputs

Index 5100: Digital Input Filter Time

This index sets the digital input filter time as a multiple of 1 ms.

Index	5100
Name	Digital Input Filter Time
Description	-
Data Type	Array

Index	5100.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	5100.01...5100.xx
Name	Digital Input Filter Time
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	0...30
Default Value	3

Index 6000: Read Digital Input 8 Bit

This index represents the values of the digital inputs.

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

Index	6000.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	6000.01...6000.xx
Name	Digital Input 8 Bit
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	-
Default Value	-

Index 6100: Read Digital Input 16 Bit

Same specifications as index 6000, only with 16-bit-access.

Index 6120: Read Digital Input 32 Bit

Same specifications as index 6000, only with 32-bit-access.

Index 6002: Polarity Input 8 Bit

With this index, the values of the digital inputs can be inverted.

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

Index	6002.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	6002.01...6002.xx
Name	Polarity Input 8 Bit
Description	
Data Type	Unsigned 8
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index 6005: Global Interrupt Enable

This index enables a global interrupt without changing the setups of the interrupt masks. In event mode the values are transmitted depending on indexes 6006, 6007, 6008 und the transmission type.

TRUE (1) = interrupt enable
FALSE (0) = interrupt disable

Index	6005
Name	Global Interrupt Enable
Description	-
Data Type	Boolean
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	TRUE

Index 6006: Interrupt Mask Any Change

This index gives whether an interrupt is created by any change. If enabled, both rising and falling edges are considered valid. Interrupts trigger PDO transmissions in event mode.

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

Index	6006.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

1 = Interrupt enable
0 = Interrupt disable

Index	6006.01...6006.xx
Name	Interrupt Mask any change
Description	
Data Type	Unsigned 8
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0xFF (interrupt enabled)

Index 6007: Interrupt Mask Low to High

Same specifications as index 6006, but only rising edges are valid. Default is 0 (zero) (disabled).

Index 6008: Interrupt Mask High to Low

Same specifications as index 6006, but only falling edges are valid. Default is 0 (zero) (disabled).

DS401: digital outputs

Index 5200: Output Reset on Error Option

This index determines whether the outputs restore their original states after acknowledging and dealing with a critical error.

0 (zero) maintains the original states of index 6200.xx. In case of an error, the outputs are set according to indexes 6206 and 6207. After the error cleared, the states of index 6200.xx are restored.

1 and greater overwrites the outputs permanently. The original states are not restored, since index 6200.xx is overwritten with the safe-states of error handling.

Index	5200
Name	Output Reset on Error Option
Description	-
Data Type	Unsigned 8
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	1

Index 5202: Output Overload Error Info

This index triggers a warning, in case the outputs are in overload condition (in that case the value is 0x01)

Index	5202
Name	Output Overload Error Info
Description	-
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index 5210: Digital Output Access Enable

This index controls write access to the output indexes 6200.xx, 6300.xx and 6320.xx. Access via PDO or SDO, or additional features like cam command, position window detection, speed control etc. is enabled separately.

Be aware, parts with write access to outputs may affect one another.

Access for each output is controlled separately.

Controls write access to outputs.

Index	5210
Name	Digital Output Access Enable
Description	-
Data Type	Array

Index	5210.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	No. of outputs

Index	5210.01...5210.xx
Name	Digital Output Access Enable
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0x00FF

Object 5210.xx: Digital Output Access Enable: Bit															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
								AR	SC	WC	CC				PS

Bit	Name	Function
0	PS	Enable PDO-/SDO-Access Controls output write access via SDO and PDO 0 Outputs not accessible via SDO and PDO 1 Outputs accessible via SDO and PDO
4	CC	Enable Cam-Controller Access Controls output write access via cam processor This bit is automatically, if the cam controller wants to execute a write operation to the corresponding output. 0 Outputs are not accessible by cam processor 1 Outputs accessible by cam processor
5	WC	Enable Window-Controller Access Controls output write access via window controller 0 Outputs are not accessible by window controller 1 Outputs accessible by window controller

Bit	Name	Function
6	SC	Speed Comparator
		Controls output write access via speed comparator
		0 Outputs are not accessible by speed comparator
7	AR	1 Outputs accessible by speed comparator
		Absolute/Relative Detection Output
		Controls write access for absolute or relative detection.
		0 Outputs are not accessible by abs./rel. detection.
		1 Outputs are accessible by abs./rel. detection.

Index 5220: Digital Output Monitor

This index returns the state of the digital outputs.

Index	5220
Name	Write to digital output
Description	-
Data Type	Array

Index	5220.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

This index returns the state of the digital outputs.
The objects are mappable into TPDO for monitoring outputs set by hardware units.

Index	5220.01...5220.xx
Name	Write to digital output
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	-
Default Value	0

Index 6200: Write to Digital Output

With this index the digital outputs are set.

Index	6200
Name	Write to digital output
Description	-
Data Type	Array

Index	6200.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	6200.01...6200.xx
Name	Write to digital output
Description	
Data Type	Unsigned 8
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	0

Index 6300: Write Digital Output 16 Bit

Same specifications as index 6200, only with 16-bit-access.

Index 6320: Write Digital Output 32 Bit

Same specifications as index 6200, only with 32-bit-access.

Index 6202: Change Polarity Output Byte

This index inverts the polarity of the digital outputs.

Index	6202
Name	Change Polarity Output Byte
Description	-
Data Type	Array

Index	6202.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	6202.01...6202.xx
Name	Change Polarity Output Byte
Description	
Data Type	Unsigned 8
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	0

Index 6206: Error Mode Output 8 Bit

With this is set, whether the outputs change to predefined states (index 6207) in case of an error.

Index	6206
Name	Error Mode Output 8 Bit
Description	-
Data Type	Array

Index	6206.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

1 = output changes according to index 6207
0 = output does not change

Index	6206.01...6206.xx
Name	Error Mode Output 8 Bit Byte 0
Description	
Data Type	Unsigned 8
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0xFF

Index 6207: Error Value Output 8 Bit

With this index, the error states for the outputs are predefined.

Index	6207
Name	Error Value Output 8 Bit
Description	-
Data Type	Array

Index	6207.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

0 = output disabled
1 = output enabled

Index	6207.01...6207.xx
Name	Error Value Output 8 Bit Byte 0
Description	
Data Type	Unsigned 8
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0 (Inactive, high level)

DS401: analog inputs

Index 5301: Analog Input Filter Level

This index sets the size of the internal filter for the input lines.

Index	5301
Name	Analog Input Filter Level
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	0...20
Default Value	10

Index 6401: Read Analog Input

With this index, the analog inputs are read.

Index	6401
Name	Read Analog Input
Description	-
Data Type	Array

Index	6401.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	6401.01...6401.xx
Name	Read analog input
Description	
Data Type	Signed 16
Access	ro
PDO Mapping	Yes
Value Range	-
Default Value	-

Index 6421: Analog Input Interrupt Trigger

With this index, the user selects the trigger conditions.

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

Index	6421.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

- Bit 0: Input voltage greater than upper level
- Bit 1: Input voltage less than lower level
- Bit 2: Input changed more than delta
- Bit 3: Input reduced more than negative delta
- Bit 4: Input increased more than positive delta
- Bit 5...7: reserved (must be forced to 0 (zero))

Index	6421.01...6421.xx
Name	Analog Input Interrupt Trigger
Description	
Data Type	Unsigned 8
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	7

Index 6423: Analog Input Interrupt Enable

This index enables/disables the global interrupt for analog input signals.

Disabled by default, to avoid bus overloads because of analog transmissions.

- 1 (true): enabled
- 0 (false): disabled

Index	6423
Name	Analog Input Interrupt Enable
Description	
Data Type	Boolean
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0 (false)

Index 6424: Analog Input Upper Limit

With this index, the upper limits for analog interrupts are set (for signal \geq limit).

Index	6424
Name	Analog Input Upper Limit
Description	-
Data Type	Array

Index	6424.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	6424.01...6424.xx
Name	Analog Input Upper Limit
Description	
Data Type	Integer 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index 6425: Analog Input Lower Limit

With this index, the lower limits for analog interrupts are set (for signal $<$ limit).

Index	6425
Name	Analog Input Lower Limit
Description	-
Data Type	Array

Index	6425.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	6425.01...6425.xx
Name	Analog Input Lower Limit
Description	
Data Type	Integer 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index 6426: Analog Input Interrupt Delta

With this index, the signal changes (delta) for analog interrupts are set (any change at all, reducing or increasing).

Index	6426
Name	Analog Input Interrupt Delta
Description	-
Data Type	Array

Index	6426.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	6426.01...6426.xx
Name	Analog Input Interrupt Delta
Description	
Data Type	Integer 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index 6427: Analog Input Negative Delta

With this index, the negative signal changes (delta) for analog interrupts are set (reducing only).

Index	6427
Name	Analog Input Negative Delta
Description	-
Data Type	Array

Index	6427.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	6427.01...6427.xx
Name	Analog Input Negative Delta
Description	
Data Type	Integer 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index 6428: Analog Input Positive Delta

With this index, the positive signal changes (delta) for analog interrupts are set (increasing only).

Index	6428
Name	Analog Input Positive Delta
Description	-
Data Type	Array

Index	6428.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	6428.01...6428.xx
Name	Analog Input Positive Delta
Description	
Data Type	Integer 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Product related specific objects sorted by function

Encoder

Configure the following indexes to set-up the encoder as counter:

- Index 4001 (Counter Control) (Start/Stop)
- Index 4007 (Counter Preset)
- Index 4008 (Counter New Operation Mode) (initialization)

To execute actions according to the counter value, configure the remaining indexes as well. Also pay special attention to indexes 4080...4083 (counter cam...)

Index 4000: Counter Value

This index returns the latest value of the encoder/counter.

Index	4000
Name	Counter Value
Description	-
Data Type	Array

Index	4000.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Regard this value with reference to the selected operation mode (index 4008).

Index	4000.01...4000.xx
Name	Counter Value
Description	
Data Type	Unsigned 32
Access	ro
PDO Mapping	Yes
Value Range	-
Default Value	-

Index 4001: Counter Control

This index controls the counter.

Index	4001
Name	Counter Control
Description	-
Data Type	Array

Index	4001.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Bit 0 = 0: counter stop

Bit 0 = 1: counter start

Bit 1...3: reserved

Bit 4 = 0: no change

Bit 4 = 1: when set to 1, counter is reset

Bit 5 = 0: no change

Bit 5 = 1: when set to 1, preload value from
index 4007.xx is accepted

Bit 6...15: reserved

Index	4001.01...4001.xx
Name	Counter Control
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	0

Index 4002: Counter Status

This index returns the state of the counter.

Index	4002
Name	Counter Status
Description	-
Data Type	Array

Index	4000.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Bit 0 = 0: counter inactive and stopped
Bit 0 = 1: counter initialized and running

Bit 1 = 0: Relative-Mode counting
no reset/preset by command/input
Bit 1 = 1: Absolute-Mode counting
reset/preset by command/input

Bit 2 = 0: counter very slow or inactive
Bit 2 = 1: counter active und rising

Bit 3 = 0: counter very slow or inactive
Bit 3 = 1: counter active and falling

Bit 4...7: shows setting of index 4001.xx

Bit 8...15: shows setting of active counter mode

Index	4002.01...4002.xx
Name	Counter Status
Description	
Data Type	Unsigned 16
Access	ro
PDO Mapping	Yes
Value Range	-
Default Value	0

Index 4003: Counter Speed inc/s

This index returns the counting speed after a division by the value of index 4009.xx.

Index	4003
Name	Counter Speed inc/s
Description	-
Data Type	Array

Index	4003.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Exceeding/falling below 30,000 increments/s the value is set to 30,001.

Index	4003.01...4003.xx
Name	Counter Speed inc/s
Description	
Data Type	Unsigned 16
Access	ro
PDO Mapping	Yes
Value Range	-
Default Value	0

Index 4005: Counter Active Detection Hysteresis

With this index, a hysteresis can be set, with the help of which a permanent change of the status between active and inactive status of the direction detection (bit 2 and 3 of the status object 4002) is avoided.

Index	4005
Name	Counter Active Detection Hysteresis
Description	-
Data Type	Array

Index	4005.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Small values enable fast motion detection, but increase the risk of the jitter effect becoming noticeable when the encoder is at a standstill.

Index	4005.01...4005.xx
Name	Counter Active Detection Hysteresis
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	0...10,000
Default Value	5

Index 4006: Counter Inactive Detection Time

This index sets a time of inactivity to detect a counting interruption.

Index	4006
Name	
Description	-
Data Type	Array

If the position is not changed within the "Counter Inactive Detection Time", bits 2 and 3 of the direction detection in status object 4002.xx are reset.

Index	4006.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

The idle time is set in ms.

Index	4006.01...4006.xx
Name	
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	0...10,000
Default Value	100

Index 4007: Counter Preset Value

With this index, the default value of the counter is set, and later adopted by setting the corresponding bit in index 4001.xx or a hardware input in the counter.

Index	4007
Name	Counter Preset Value
Description	-
Data Type	Array

Index	4007.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4007.01...4007.xx
Name	Counter Preset Value
Description	
Data Type	Signed 32
Access	r/w
PDO Mapping	Yes
Value Range	0...0xFFFF FFFF
Default Value	0

Index 4008: Counter New Operation Mode

This index sets the operation/counting mode of the encoder. Please refer to the next page “**operation modes**”.

Index	4008
Name	Counter New Operation Mode
Description	-
Data Type	Array

Index	4008.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

This setting is subject to change only when counter/encoder is disabled. Changing while running has no effect.

If a change is necessary while running, prepare the change by setting this index. For the change to take effect, the counter/encoder needs to be stopped and re-started.

Index	4008.01...4008.xx
Name	Counter New Operation Mode
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

4008.xx Counter New Operation Mode																	
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
AS						IZ	CAB	MD									

Bit	Name	Function
0..7	MD	Operation Mode. Details for operation modes are further below.
8	CAB	Change Track A and B Swap Track A and B
		0 Tracks A and B not swapped.
		1 Tracks A and B swapped. Signal inverted.
9	IZ	Invert Enable Function of Input Z Invert the enable function of Z and \bar{Z}
		0 No inversion of inputs Z and \bar{Z}
		1 Inversion of inputs Z and \bar{Z}
15	AS	Automatic Start at Start Node Automatic start of the counter at NMT command “start node” and changing to “operational” state.
		0 No automatic start. Start counter with write access to index 4001.
		1 Counter start automatically with NMT command “start node”.

Operation modes

- 0x00: counter/encoder disabled
- 0x01: counter/encoder incl. track A and B
Device is working as counter. The 32-bit counting value returns the position.
- 0x02: counter/encoder incl. track A, B, Z
Device is working as counter the 32-bit counting value returns the position.
The counting value is split in two 16-bit values, the lower part (bit 0...15) return the position of track A and B, and the higher part (bit 16...31) returns the number of revolutions of track Z. A rising pulse of track Z clears the counter of track A and B.
- 0x03: counter/encoder incl. track A, B and gate/enable Z
Device is working as counter the 32-bit counting value returns the position.
Input Z works as gate and enables/disables the counter.
The signals for the gate have to be at both Z inputs.
- 0x08: event counter (rising edge)
Device is working as event counter. Track A is for direction detection, track B counts the events.
- 0x09: event counter (falling edge)
Device is working as event counter. Track A is for direction detection, track B counts the events.
- 0x0A: event counter (rising edge) and gate/enable Z
Device is working as event counter. Track A is for direction detection, track B counts the events.
Input Z works as gate and enables/disables the counter.
The signals for the gate have to be at both Z inputs.
- 0x0B: event counter (falling edge) and gate/enable Z
Device is working as event counter. Track A is for direction detection, track B counts the events.
Input Z works as gate and enables/disables the counter.
The signals for the gate have to be at both Z inputs.

Index 4009: Counter Speed Scaling

This index sets a divider in case the counter/encoder returns very fast results.

Index	4009
Name	Counter Speed Scaling
Description	-
Data Type	Array

Index	4009.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4009.01...4009.xx
Name	Counter Speed Scaling
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	1...1000
Default Value	1

Index 4010: Counter Clear on Input

This index enables the user to reset the counter by applying a signal on a digital input.

Index	4010
Name	Counter Clear on Input
Description	-
Data Type	Array

Index	4010.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4010.01...4010.xx
Name	Counter Clear on Input
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Bit 0...3 = 0: no change

Bit 0 = 1: Reset on rising edge on input

Bit 1 = 1: Reset on falling edge on input

Bit 2 = 1: Reset on low-level on input

Bit 3 = 1: Reset on high-level on input

Bit 4...7: reserved

Bit 8...15: select digital input for reset

Index 4011: Counter Preset on Input

This index enables the acceptance of a default value by means of a signal at a digital input. The default value is taken from object 4007.

Index	4011
Name	Counter Preset on Input
Description	-
Data Type	Array

Attention:

In case preset value and reset are both set on the same input, reset takes priority.

Index	4011.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Bit 0...3 = 0: no change

- Bit 0 = 1: preset on rising edge on input
- Bit 1 = 1: preset on falling edge on input
- Bit 2 = 1: preset on low-level on input
- Bit 3 = 1: preset on high-level in input

Bit 4...7: reserved

Bit 8...15: select digital input for preset

Index	4011.01...4011.xx
Name	Counter Preset on Input
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index 402x / 403x: section processor

With the section processors, the work area of the position detection can be divided into sections of the same size. To calculate the sections, the respective section width and an offset from the zero position must be specified in counting steps.

The calculation is only carried out for positive positions and only if the encoder is operating in absolute mode. The counter changes to absolute mode if it has been reset by command or via a digital input or has been preset to a value.

The module supports two independent section processors.

The object area 402x is assigned to the section processor 1.

The object area 403x is assigned to the section processor 2.

Index 4020: Actual Section Index 1

This index returns the present section number of the current position.

Index	4020
Name	Actual Section Index 1
Description	-
Data Type	Array

Index	4020.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Attention:

- The calculation of the section number is possible in absolute-mode only, by providing and using a preset value.
- When setting a value of 0 (zero), the calculation is disabled and 0 (zero) is shown.
- Section number is only calculation, if the current position is equal or greater than the offset of the first section. Otherwise 0 (zero) is shown.

Index	4020.01...4020.xx
Name	Actual Section Index 1
Description	
Data Type	Unsigned 16
Access	ro
PDO Mapping	Yes
Value Range	0...0xFFFF
Default Value	-

Index 4021: Last Section Index 1

This index shows the section number that was last left. The value is changed when crossing a section boundary.

Index	4021
Name	Last Section Index 1
Description	-
Data Type	Array

Index	4021.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Attention:

The same conditions as for the calculation of the present section number are used.

Index	4021.01...4021.xx
Name	Last Section Index 1
Description	
Data Type	Unsigned 16
Access	ro
PDO Mapping	Yes
Value Range	0...0xFFFF
Default Value	-

Index 4022: Section Center Index 1

This index returns the present section number as soon as the center mark of the present section is passed.

Index	4022
Name	Section Center Index 1
Description	-
Data Type	Array

Index	4022.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4022.01...4022.xx
Name	Section Center Index 1
Description	
Data Type	Unsigned 16
Access	ro
PDO Mapping	Yes
Value Range	0...0xFFFF
Default Value	-

Index 4024: Actual Section Short Index 1

This index returns the present section number of the current position.

Index	4024
Name	Actual Section Short Index 1
Description	-
Data Type	Array

Index	4024.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Attention:

- The calculation of the section number is possible in absolute-mode only, by providing and using a preset value.
- When setting a value of 0 (zero), the calculation is disabled and 0 (zero) is shown.
- Section number is only calculation, if the current position is equal or greater than the offset of the first section. Otherwise 0 (zero) is shown.

Index	4024.01...4024.xx
Name	Actual Section Short Index 1
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	0...0xFF
Default Value	-

Index 4025: Last Section Short Index 1

This index returns the previous section number.

Index	4025
Name	Last Section Short Index 1
Description	-
Data Type	Array

Index	4025.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Attention:

The same conditions as for the calculation of the present section number are used.

Index	4025.01...4025.xx
Name	Last Section Short Index 1
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	0...0xFF
Default Value	-

Index 4026: Section Center Short Index 1

This index returns the present section number as soon as the center mark of the present section is passed.

Index	4026
Name	Section Center Short Index 1
Description	-
Data Type	Array

Index	4026.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4026.01...4026.xx
Name	Section Center Short Index 1
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	0...0xFF
Default Value	-

Index 4027: Section Short Index Divider 1

This index is used to calculate the 8-bit versions of the sections from the 16-bit versions.

Index	4027
Name	Section Short Index Divider 1
Description	-
Data Type	Array

Index	4027.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Attention:

A value of 0 (zero) is set and used as 1.

Index	4027.01...4027.xx
Name	Section Short Index Divider 1
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	0...0xFFFF
Default Value	1

Index 4028: Offset of first Section 1

This index sets the offset for the calculation of the present section number.

Index	4028
Name	Offset of first Section 1
Description	-
Data Type	Array

Index	4028.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4028.01...4028.xx
Name	Offset of first section 1
Description	
Data Type	Signed 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	-

Index 4029: Section Size Increments 1

This index sets the size of each section as steps (counter increments).

Index	4029
Name	Section Size Increments 1
Description	-
Data Type	Array

Index	4029.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4029.01...4029.xx
Name	Section Size Increments 1
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	-

Index 402A: Section Hysteresis Increments 1

Use this index to set a hysteresis to prevent the occurrence of the jitter-effect and the start of counting while the encoder is idle.

Index	402A
Name	Section Hysteresis Increments 1
Description	-
Data Type	Array

Index	402A.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	402A.01...402A.xx
Name	Section Hysteresis Increments 1
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	10

Index 4030: Actual Section Index 2

This index returns the present section number of the current position.

Index	4030
Name	Actual Section Index 2
Description	-
Data Type	Array

Index	4030.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Attention:

- The calculation of the section number is possible in absolute-mode only, by providing and using a preset value.
- When setting a value of 0 (zero), the calculation is disabled and 0 (zero) is shown.
- Section number is only calculation, if the current position is equal or greater than the offset of the first section. Otherwise 0 (zero) is shown.

Index	4030.01...4030.xx
Name	Actual Section Index 2
Description	
Data Type	Unsigned 16
Access	ro
PDO Mapping	Yes
Value Range	0...0xFFFF
Default Value	-

Index 4031: Last Section Index 2

This index returns the previous section number.

Index	4031
Name	Last Section Index 2
Description	-
Data Type	Array

Index	4031.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Attention:

The same conditions as for the calculation of the present section number are used.

Index	4031.01...4031.xx
Name	Last Section Index 2
Description	
Data Type	Unsigned 16
Access	ro
PDO Mapping	Yes
Value Range	0...0xFFFF
Default Value	-

Index 4032: Section Center Index 2

This index returns the present section number as soon as the center mark of the present section is passed.

Index	4032
Name	Section Center Index 2
Description	-
Data Type	Array

Index	4032.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4032.01...4032.xx
Name	Section Center Index 2
Description	
Data Type	Unsigned 16
Access	ro
PDO Mapping	Yes
Value Range	0...0xFFFF
Default Value	-

Index 4034: Actual Section Short Index 2

This index returns the present section number of the current position.

Index	4034
Name	Actual Section Short Index 2
Description	-
Data Type	Array

Index	4034.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Attention:

- The calculation of the section number is possible in absolute-mode only, by providing and using a preset value.
- When setting a value of 0 (zero), the calculation is disabled and 0 (zero) is shown.
- Section number is only calculation, if the current position is equal or greater than the offset of the first section. Otherwise 0 (zero) is shown.

Index	4034.01...4034.xx
Name	Actual Section Short Index 2
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	0...0xFF
Default Value	-

Index 4035: Last Section Short Index 2

This index returns the previous section number.

Index	4035
Name	Last Section Short Index 2
Description	-
Data Type	Array

Index	4035.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Attention:

The same conditions as for the calculation of the present section number are used.

Index	4035.01...4035.xx
Name	Last Section Short Index 2
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	0...0xFF
Default Value	-

Index 4036: Section Center Short Index 2

This index returns the present section number as soon as the center mark of the present section is passed.

Index	4036
Name	Section Center Short Index 2
Description	-
Data Type	Array

Index	4036.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4036.01...4036.xx
Name	Section Center Short Index 2
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	0...0xFF
Default Value	-

Index 4037: Section Short Index Divider 2

This index is used to calculate the 8-bit versions of the sections from the 16-bit versions.

Index	4037
Name	Section Short Index Divider 2
Description	-
Data Type	Array

Index	4037.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Attention:

A value of 0 (zero) is set and used as 1.

Index	4037.01...4037.xx
Name	Section Short Index Divider 2
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	0...0xFFFF
Default Value	1

Index 4038: Offset of first Section 2

This index sets the offset for the calculation of the present section number.

Index	4038
Name	Offset of first Section 2
Description	-
Data Type	Array

Index	4038.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4038.01...4038.xx
Name	Offset of first section 2
Description	
Data Type	Signed 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	-

Index 4039: Section Size Increments 2

This index sets the size of each section as steps (counter increments).

Index	4039
Name	Section Size Increments 2
Description	-
Data Type	Array

Index	4039.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4039.01...4039.xx
Name	Section Size Increments 2
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	-

Index 403A: Section Hysteresis Increments 2

Use this index to set a hysteresis to prevent the occurrence of the jitter-effect and the start of counting while the encoder is idle.

Index	403A
Name	Section Hysteresis Increments 2
Description	-
Data Type	Array

Index	403A.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	403A.01...403A.xx
Name	Section Hysteresis Increments 2
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	10

Index 4040: Sync Send Event Object

This index enables a SYNC to be triggered if there is a change in the selected object. The function is only active if the "SYNC-Producer" mode is selected for the configuration of the SYNC signal in object 1005.

The value to write to this index is assembled as follows:

Byte 3	Byte 2	Byte 1	Byte 0
0	Idx		Sub

Idx: Index of the changing object

Sub: Sub-Index of the changing object

You can use these indexes:

+ Actual Section/Last Section/Section Center

- Index 4020.xx
- Index 4021.xx
- Index 4022.xx
- Index 4024.xx
- Index 4025.xx
- Index 4026.xx
- Index 4030.xx
- Index 4031.xx
- Index 4032.xx
- Index 4034.xx
- Index 4035.xx
- Index 4036.xx

Index	4040
Name	Send Sync Event Object
Description	
Data Type	Unsigned 23
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Index 4041: Sync Data Mapping

This index enables the mapping of data in the SYNC telegram and its transmission with the SYNC. The function is only active if the "SYNC-Producer" mode is selected for the configuration of the SYNC signal in object 1005.

The value to write to this index is assembled as follows:

Byte 3	Byte 2	Byte 1	Byte 0
0	Idx		Sub

Idx: Index of the changing object

Sub: Sub-Index of the changing object

You can use these indexes:

+ Actual Section/Last Section/Section Center

- Index 4020.xx
- Index 4021.xx
- Index 4022.xx
- Index 4024.xx
- Index 4025.xx
- Index 4026.xx
- Index 4030.xx
- Index 4031.xx
- Index 4032.xx
- Index 4034.xx
- Index 4035.xx
- Index 4036.xx

+ Counter Value/Status/Speed

- Index 4000.xx
- Index 4002.xx
- Index 4003.xx

Index	4041
Name	Sync Data Mapping
Description	
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	0

Attention:

Transmitting data in a SYNC message is **not** compatible with CiA standard.

Index 408x: Cam processor

The module supports functions to set or reset outputs depending on a counter value. This function block is to be understood in a similar way to a cam switching mechanism. The commands to be executed are forwarded to the cam processor via a FIFO with 8 memory locations for positions and associated actions. The FIFO enables commands to be preloaded during operation. A FIFO memory set always includes a position and the associated command that is to be executed when this position is reached. When writing to the FIFO, it is important to note that the position must be written first and then the associated command. If the position and command are mapped in the same PDO, the CANopen stack automatically ensures that this sequence is adhered to. The following four indexes are used to enter values/events and to return the state of the command sequence.

Index 4080: Counter Cam Command

This index controls the command sequence. The commands are written to the FIFO of the cam control via this object.

Index	4080
Name	Counter Cam Command
Description	-
Data Type	Array

Index	4080.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	4080.01...4080.xx
Name	Counter Cam Command
Description	
Data Type	Unsigned 32
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	0

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
ACTION						C/F	EOA	reserved				CAM-R		FIFO-ADD	
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
OUT-ACT-T												OUT-CH			

FIFO-ADD ¹⁾ :	0:	no change
	1:	toggle/mutual toggle adds value to FIFO buffer
CAM-R ¹⁾ :	0:	no change
	1:	setting/mutual setting clears the status bit 9 of index 4082
EOA:	0:	with index 5210 "digital output access enable" write access to output indexes 6200.xx, 6300.xx and 6320.xx is granted for the cam controller. All other control bits are unchanged. The output might be accessible via SDO and PDO according to index 5210.
	1:	write access to outputs is blocked. Access only via com controller. Index 5210 is set to 0x0010, access to outputs only via cam controller.
C/F:	0:	no change
	1:	clear FIFO buffer
ACTION:	0:	no change
	X:	see table " Action "
OUT-CH:	X:	set corresponding output channel (each bit is a single channel)
OUT-ACT-T:	X:	set time for channel activity
reserved:		always 0 (zero)

Notes:

¹⁾ The command can be initiated by changing one of the two bits from 0 to 1. This means that a new command can be initiated with every write access to object 4080 by alternately setting or resetting the bits.

Table „**action**“

Code	Effect
0	No change
1	Set output (sets corresponding bit within index 6200.xx)
2	Reset output (clears corresponding bit within Index 6200.xx)
3	Set output and clear output after a set time

Index 4081: Counter Cam New Position

The positions for the cam control are set with this index.

Index	4081
Name	Counter Cam New Position
Description	-
Data Type	Array

Index	4081.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Attention:

This value must be set prior to toggling index 4080.

Index	4081.01...4081.xx
Name	Counter Cam New Position
Description	
Data Type	Unsigned 32
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	10

Index 4082: Counter Cam Status

This index shows the current status of the cam control.

Index	4082
Name	Counter Cam Status
Description	-
Data Type	Array

Index	4082.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Bit 0...7: returns state of index 4080.xx bit 0...7

Bit 8 = 0: no command sequence present
Bit 8 = 1: executing command sequence

Bit 9 = 0: no change
Bit 9 = 1: event of command sequence meet.
Clear with index 4080.xx bit 2/3.

Bit 10/11: reserved

Bit 12...15: length of command sequence (FIFO)

Index	4082.01...4082.xx
Name	Counter Cam Status
Description	
Data Type	Unsigned 16
Access	ro
PDO Mapping	Yes
Value Range	-
Default Value	0

Index 409x: position window detection

The device monitors the current position, being positioned between Min-Pos and Max-Pos. Depending on this, outputs may be set.

Position windows detection is always combined with a counter, meaning indexes with sub-index 1 belong to counter 1 etc.

The position windows processor checks the current position in intervals of 1 ms.

Small windows, passed in less than 1 ms, may not be detected.

Index 4090: Position Window Control

This index determines the behavior of the window controller.

Index	4090
Name	Position-Window-Control
Description	-
Data Type	Array

Index	4090.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	Nr of counters

This object controls the functions of the windows controller.

Index	4090.01...4090.xx
Name	Position-Window-Control
Description	
Data Type	Unsigned 16
Access	r/ww
PDO Mapping	Yes
Value Range	-
Default Value	0

4090.xx: Position-Window-Control-Bits																
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
AP	EOO	EOI		OUTCH											ER	EA

Bit	Name	Function
0	EA	Window-Controller Enable in Absolute Position Mode Enable detection of window position when counter in absolute mode. 0 Window-Controller disabled 1 Window-Controller enabled
1	ER	Window-Controller Enable in Relative Position Mode Enable detection of window position when counter in relative mode 0 Window-Controller disabled 1 Window-Controller enabled
8...11	OUTCH	Output-Channel Select output for displaying window controller results.

Bit	Name	Function
13	EOI	Enable Output Access for Window-Controller if Position is inside window Controls write access to outputs, if current position is inside the range of the window. Configure index 5210 for "write enable". 00 Outputs disabled for displaying the current position inside the window. 01 Outputs enabled for displaying the current position inside the window. Index 5210 bit 5 needs to be set for write access.
14	EOO	Enable Output Access for Window-Controller if Position is outside window Controls write access to outputs, if current position is outside the range of the window. Configure index 5210 for "write enable". 00 Outputs disabled for displaying the current position outside the window. 01 Outputs enabled for displaying the current position outside the window. Index 5210 bit 5 needs to be set for write access.
15	AP	Active Polarity Sets the polarity of the outputs. 0 Inside the position window low-level signals are set to the outputs 1 Inside the position window high-level signals are set to the outputs

Index 4091: Position Window Status

This index shows the state of the window controller.

Index	4091
Name	Position Window Status
Description	-
Data Type	Array

Index	4091.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	Nr of counters

This index shows the state of the window controller.

Index	4091.01...4091.xx
Name	Position Window Status
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	-
Default Value	

4091.xx: Position Window Status Bits							
7	6	5	4	3	2	1	0
WA						OAS	EN

Bit	Name	Function
0	EN	Window Controller is Enabled 0 Window Controller is disabled 1 Window-Controller is enabled
1	OAS	Window Controller Output Access Status It is shown, if the window controller has write access to the output objects. The state of index 5210 is read. 0 Window controller has no write access, outputs not accessible 1 Window controller has write access, outputs accessible
7	WA	Window is Active Shows, if the current position is inside the window defined by index 4092 „Position Window Low Pos” and index 4093 “Position Window High Pos” 0 Current position outside the window 1 Current position inside the window

Index 4092: Position Window Low Pos
Index 4093: Position Window High Pos

These indexes define the borders of the position window

Index	4092/4093
Name	Position Window Low Pos Position Window High Pos
Description	-
Data Type	Array

Index	4092.00/4093.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	Nr of counters

For detection of the position window these conditions are checked:

If
(current Pos >= [4092.xx])
and
(current Pos <= [4093.xx])
then the position is inside the window

Index	4092.xx/4093.xx
Name	Position Window Low Pos Position Window High Pos
Description	
Data Type	Signed 32
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	0

Index 40Ax: Speed comparator

The device checks if the current exceeds a set limit.

The speed comparator is always attached to a counter meaning objects with sub-index 1 go with counter 1 and so on.

The speed comparator checks with approx. 1 ms cycle time.

It may be possible for very short limit violations to go undetected when those are no longer than 1 ms.

Index 40A0: Speed Comparator Control

This index controls the behavior of the speed comparator.

Index	40A0
Name	Speed Comparator Control
Description	-
Data Type	Array

Index	40A0.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	Nr of counters

This object controls the function of the speed comparator.

Index	40A0.01...40A0.xx
Name	Speed Comparator Control
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	0

40A0.xx: Speed Comparator Control Bits																
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
AP	EOH	EOL		OUTCH												EN

Bit	Name	Function
0	EN	Enable Speed Comparator Activation of speed comparator 0 Speed comparator disabled 1 Speed comparator enabled
8...11	OUTCH	Output-Channel Selects the output for showing the speed comparator results.

Bit	Name	Function
13	EOL	Enable Output Access if Speed is less than or equal to Limit Controls write access of outputs if the current speed is less than or equal to the selected limit. Write access to the outputs has to be configured by index 5210. 00 Information "speed less than or equal limit" is not shown on outputs. 01 Information "speed less than or equal limit" is shown on outputs. Write access is configured with index 5210 bit 6.
14	EOH	Enable Output Access if Speed is higher than Limit Controls write access of outputs if the current speed is higher than the selected limit. Write access to the outputs has to be configured by index 5210. 00 Information "speed higher than limit" is not shown on outputs. 01 Information "speed higher than limit" is shown on outputs. Write access is configured with index 5210 bit 6.
15	AP	Active Polarity Sets the output polarity 0 Current speed is less than or equal limit: high-level Current speed higher than limit: low-level 1 Current speed is less than or equal limit: low-level Current speed higher than limit: high-level

Index 40A1: Speed Comparator Status

This index shows the current state of the speed comparator.

Index	40A1
Name	Speed Comparator Status
Description	-
Data Type	Array

Index	4091.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	Nr of counters

This object shows the state of the speed comparator.

Index	40A1.01...40A1.xx
Name	Speed Comparator Status
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	Yes
Value Range	-
Default Value	

40A1.xx: Speed Comparator Status Bits							
7	6	5	4	3	2	1	0
SH						OAS	EN

Bit	Name	Function
0	EN	Speed Comparator is Enabled 0 Window Controller is disabled 1 Window-Controller is enabled
1	OAS	Speed Comparator Output Access Status It is shown, if the speed comparator has write access to the output objects. The state of index 5210 is read. 0 Speed comparator has no write access, outputs not accessible 1 Speed comparator has write access, outputs accessible
7	SH	Speed is Higher than Limit Shows , if the current speed is higher than the limit set. 0 Current speed is less than the limit set 1 Current speed is higher than the limit set

Index 40A2: Speed Limit

This index sets the speed reference for the speed comparator.

Index	40A2
Name	Speed Limit
Description	-
Data Type	Array

Index	40A2.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	Nr of counters

This index sets the speed reference for the speed comparator.

Index	40A2.xx
Name	Speed Limit
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	0

Index 40Bx: Position mode detection

The device shows the operation mode of the counter (relative or absolute)

Index 40B0: Position Mode Indicator

This index controls the behavior of the position mode detection.

Index	40B0
Name	Position Mode Indicator
Description	-
Data Type	Array

Index	40A0.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	Nr of counters

This object controls the behavior of the position mode detection.

Index	40B0.01...40B0.xx
Name	Position Mode Indicator
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	0

40B0.xx: Position Mode Indicator Bits																
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
	MD1	MD0		OUTCH												EN

Bit	Name	Function
0	EN	Enable Position Mode Indicator Activate position mode detection 0 Position mode detection disabled 1 Position mode detection enabled
8..11	OUTCH	Output-Channel Output for the result of the position mode detection
14,	MD1	Mode Setting
13	MD0	Setting of the output mode 00 Output is set if position absolute If position changes to relative, output is not changed 01 Output is set if position relative If position changes to absolute, output is not changed 10 Output is set if position absolute If position changes to relative, output is reset 11 Output is set if position relative If position changes to absolute, output is reset

Index 5100: PWM Value

This index sets the PWM duty-cycle.

Index	5100
Name	PWM Value
Description	-
Data Type	Array

Index	5100.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Note:

- 0: 0 % duty-cycle
- 5,000: 50 % duty-cycle
- 10,000: 100 % duty-cycle

Index	5100.01...5100.xx
Name	PWM Value
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	Yes
Value Range	0...10,000
Default Value	0

Index 5101: PWM Control

This index enables and controls the PWM.

Index	5101
Name	PWM Control
Description	-
Data Type	Array

Index	5101.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	5101.01...5101.xx
Name	PWM Control
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	0

7	6	5	4	3	2	1	0
reserved		PWM-D/A	PWM-H/E	reserved		PWM-D/C	PWM-GO

15	14	13	12	11	10	9	8
reserved						PWM-TIMER	

- PWM-GO: 0: PWM disabled
 1: PWM enabled
- PWM-D/C: 0: PWM active by setting duty-cycle
 1: PWM active by setting output in index 6200.xx
- PWM-H/E: 0: clear index 5100.xx (duty-cycle) in error case
 1: maintain index 5100.xx in error case
- PWM-D/A: 0: prefer duty-cycle when time base is changed
 1: prefer on-timer when time base is changed
- PWM-TIMER: 00: PWM-channel registered to Timer 0
 01: PWM-channel registered to Timer 1
 10: PWM-channel registered to Timer 2
 11: PWM-channel registered to Timer 2

Index 5106: PWM Base Timer Steps

This index sets the steps of the PWM.

Index	5106
Name	PWM Base Timer Steps
Description	-
Data Type	Array

Index	5106.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

Index	5106.01...5106.xx
Name	PWM Base Timer Steps
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	Yes
Value Range	-
Default Value	1000

Index 5107: PWM Timer Prescaler

This index sets the prescaler of the PWM.

Index	5107
Name	PWM Timer Prescaler
Description	-
Data Type	Array

PWM time base: 16 MHz

Index	5107.00
Name	Number of indexes supported
Description	
Data Type	Unsigned 8
Access	ro
PDO Mapping	No
Value Range	-
Default Value	-

- 0: 16 MHz / 1
- 1: 16 MHz / 2
- 2: 16 MHz / 4
- 3: 16 MHz / 8
- 4: 16 MHz / 16
- 5: 16 MHz / 32
- 6: 16 MHz / 64
- 7: 16 MHz / 128
- 8: 16 MHz / 256

Index	5107.01...5107.xx
Name	PWM Timer Prescaler
Description	
Data Type	Unsigned 16
Access	r/w
PDO Mapping	Yes
Value Range	0...8
Default Value	4

Examples

Put up a command sequence via cam processor

- Set counter position for command 1
SDO: 600+ID 22 81 40 01 20 03 00 00
- Accept position and set output 0 when reached
SDO: 600+ID 22 80 40 01 01 04 00 00
- Set position for command 2
SDO: 600+ID 22 81 40 01 B0 04 00 00
- Accept position and clear output 0 when reached
SDO: 600+ID 22 80 40 01 02 08 00 00
- Set position for command 3
SDO: 600+ID 22 81 40 01 40 06 00 00
- Accept position, set output 1 when reached and clear output 1 after 1 s (1000 ms)
SDO: 600+ID 22 80 40 01 01 0C 81 3E
SDO: 600+ID 22 80 40 01 00 00 00 00

SYNC with data (**not** compatible with CiA; only when CIO301 is SYNC producer)

- Set object for SYNC triggering (e.g. 4020.01)
SDO: 600+ID 22 40 40 00 01 20 40 00
- Select data for transmission (e.g. 4000.01)
SDO: 600+ID 22 41 40 00 01 00 40 00

Emergency messages

All possible emergency messages of this device have the same structure as follows:

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

EMY-Code: Error code according to DS301
 1001: Value of index 1001
 CIO-Code: Error code as unsigned 32-bit-value

CIO-Code (hex)	Change		Description
	NMT	I/O	
1000 0000	X	X	Heartbeat Consumer Error
2000 0000			Node-Guarding Warning
3000 0000	X	X	Lifeguarding Error
4000 0000			CAN is in Error-Warning-State
8000 0000	X	X	Device was Bus-Off

The Node-Guarding warning has to be activated with index 2103.
 If more than one error occurs, the messages are combined by using logic OR.
 Some errors have to change the NMT state and/or cause a change of the output states. This behavior depends on the settings of index 1029.

The ID for emergency messages is fixed to 0x80 + Node-ID.

List of emergency messages:

A defined Heartbeat-Producer was not able to send the Heartbeat telegram.

Heartbeat Consumer Error							
30	81	01	00	00	00	00	10

The master is not able to do a RTR on the node.

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

The Lifeguarding time is up.

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

The outputs are overloaded.

Output Overload							
10	23	01	00	01	00	00	00

The internal CAN module is in Error-Warning-State.

CAN is in Error-Warning-State							
00	81	01	00	00	00	00	40

Successful return from Bus-Off.

Return from Bus-Off							
40	81	01	00	00	00	00	80

I/O Mapping (quick reference)

3 inputs/2 outputs/1 encoder EDS file: hipecs_CIO-yyy.eds ¹⁾	
Mapping in object dictionary	
Index	mapped data
6200.01	Digital outputs 0.0...0.7
5100.01	PWM Value 1
5100.02	PWM Value 2
4001.01	Counter Control
4080.01	Counter Cam Command
4081.01	Counter Cam New Position
6001.01	Digital inputs 0.0...0.7
1001.00	Error Register
4002.01	Counter Status
4082.01	Counter Cam Status
6401.01	Internal temperature
4000.01	Counter Value
4002.01	Counter Status
4003.01	Counter Speed inc/s
4020.01	Section Processor 1 Actual Section Index Counter 1
4021.01	Section Processor 1 Last Section Index Counter 1
4022.01	Section Processor 1 Section Center Index Counter 1
4030.01	Section Processor 2 Actual Section Index Counter 1
4031.01	Section Processor 2 Last Section Index Counter 1
4032.01	Section Processor 2 Section Center Index Counter 1
4091.01	Counter 1 Position Window Status
40A1.01	Counter 1 Speed Comparator Status

Default PDO Mapping	
PDO	mapped data
RPDO1	6200.01 Digital outputs 0...7
RPDO2	5100.01 PWM Value 1 5100.02 PWM Value 2
RPDO3	4001.01 Counter Control
RPDO4	4080.01 Counter Cam Command 4081.01 Counter Cam New Pos.
TPDO1	6000.01 Digital inputs 0...7 1001.00 Error Register 4002.01 Counter Status 4082.01 Counter Cam Status 4091.01 Counter 1 Position Window Status 40A1.01 Counter 1 Speed Comparator Status
TPDO2	6401.01 Internal temperature
TPDO3	4000.01 Counter Value 4002.01 Counter Status 4003.01 Counter Speed inc/s
TPDO4	4020.01 Actual Section Index Cnt. 1 4021.01 Last Section Index Cnt. 1 4022.01 Section Center Index Cnt. 1

¹⁾ yyy: Number of the product

History

Version	Release date	Changes/Remarks
V2.770_R000	20.03.2020	First release
V2.800_R000	18.05.2020	<p>New: device supports automatic start-up (refer to chapter "DIP-Switch")</p> <p>New: counter ready for automatic start (control bit within index 4008)</p> <p>New: index 21C0, 21C1 Timer with set time (customer selectable) for incrementing. Via mapping to TPDO triggering PDO is possible</p> <p>New: index 5210 controls write access to digital outputs (indexes 6200.xx, 6300.xx, 6320.xx) index 4083 obsolete</p> <p>New: position window detection (indexes 4090, 4091, 4092, 4093)</p> <p>New: speed comparator (indexes 40A0, 40A1, 40A2)</p> <p>New: position mode detection (index 40B0)</p>
V2.820_R000	02.06.2020	<p>New: index 5220 (digital output monitor)</p> <p>bug-fix: speed comparator only uses the absolute value of the speed</p> <p>bug-fix: automatic start of the counter at "start node"</p>
V2.841_R000	16.07.2020	<p>bug-fix: index 40B0 now working correctly</p> <p>new: write access to outputs 2...7 for special features possible (indexes 5210.03...5210.08)</p>
V2.841_R001	25.09.2020	<p>Update: Assignment connector X4</p> <p>Update: ordering information</p>

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