

RIO40SE

Digital/Analogue deported module



Communication Manual

Read manual before installing and follow all instructions with this icon:



Serad RIO40SE

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I. Introduction

The RIO40SE module is a bus Digital/Analogue deported inputs/outputs module.

Configuration:

- 24 digitals inputs
- 16 digitals outputs
- 4 analogues inputs.
- 3 analogues outputs

II. Communication

According version, the communication can be done via

- CANopen bus
- EtherCAT CoE bus
- USB/Serial Modbus
- Modbus TCP

The communication is based on:

- The standard CiA 301 version 4.2.0 of 21 February 2011: “CANopen application layer and communication profile”
- The standard CiA 401 version 3.0.0 of 03 June 2008 “Device profile for generic I/O modules”

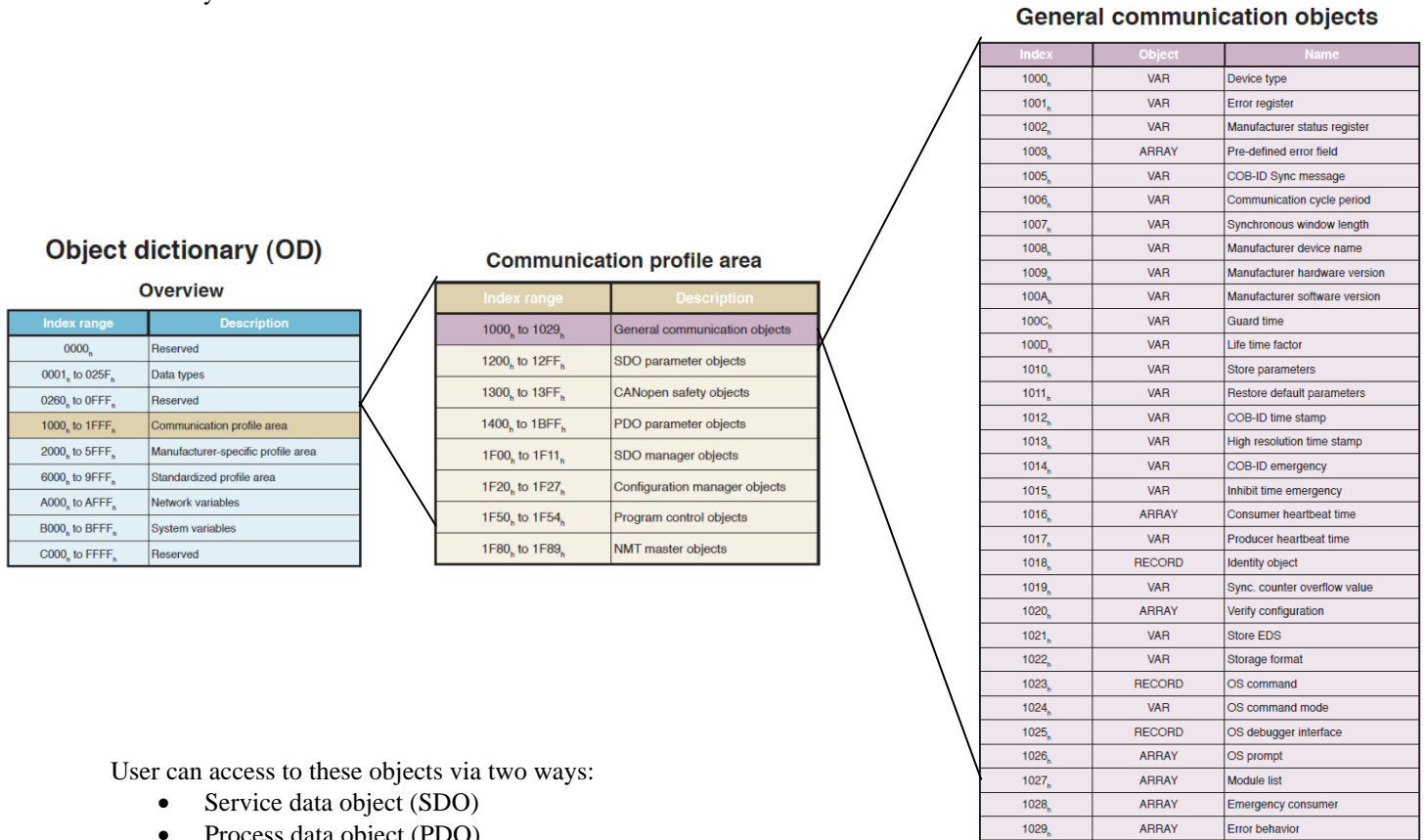
II.1 CAN configuration

The following options exist for configuring the drive:

- CANOpen Node-ID (Hardware: Refer to Installation Guide)
- Terminating resistor (Hardware: Refer to Installation Guide)
- Baud rate (Hardware: Refer to Installation Guide)

II.1.1 CAN communication layer concepts

The concept is based on “Object” which is identified by its Index and SubIndex. These objects are stored in a dictionary:



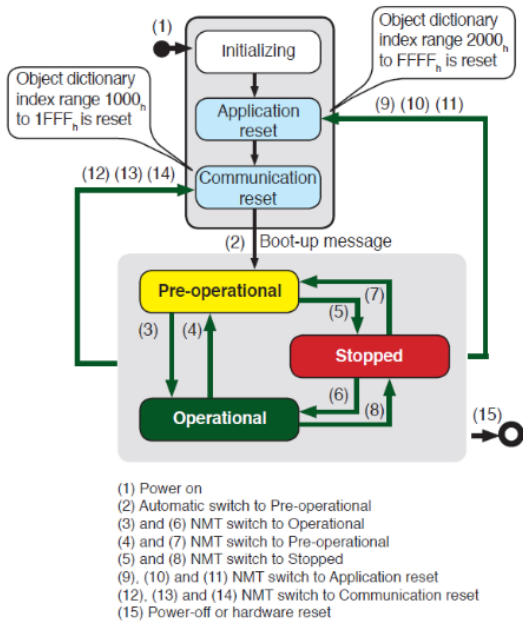
User can access to these objects via two ways:

- Service data object (SDO)
- Process data object (PDO)

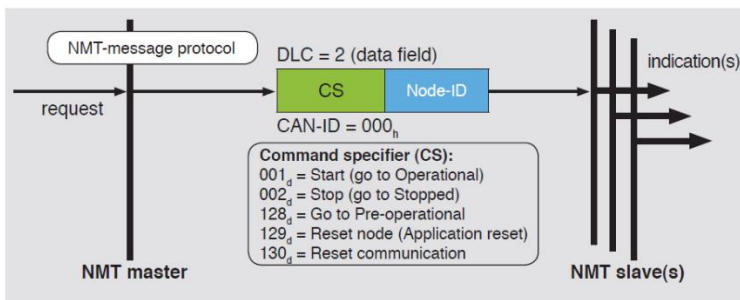
A network management controlled by a defined state machine allow to control the communication. Special function protocols add the notion of synchronization, Time-Stamp and Emergency.

II.1.1.1 Network Management (NMT)

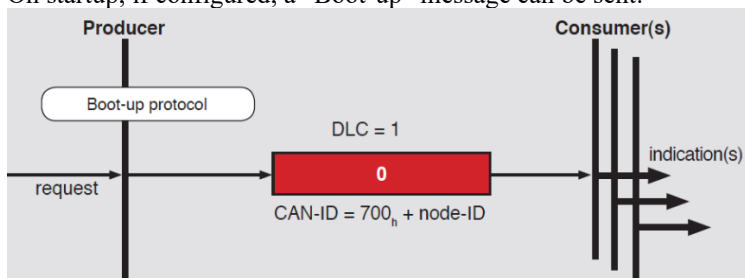
The network management apply the following state machine:



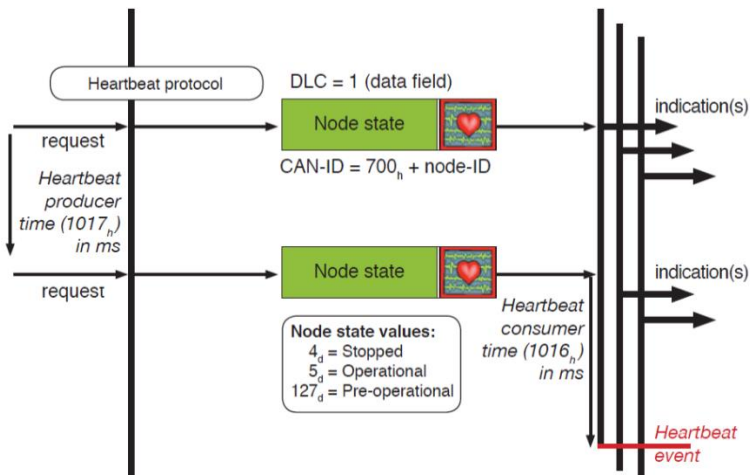
User can control it with the NMT message protocol:



On startup, if configured, a “Boot-up” message can be sent:



If configured, to ensure do not have problem on communication link, the heartbeat protocol can be used (as producer and/or consumer):



II.1.1.3 Process data object (PDO)

The real-time data transfer is performed by means of "Process Data Objects (PDO)". The transfer of PDO is performed with no protocol overhead.

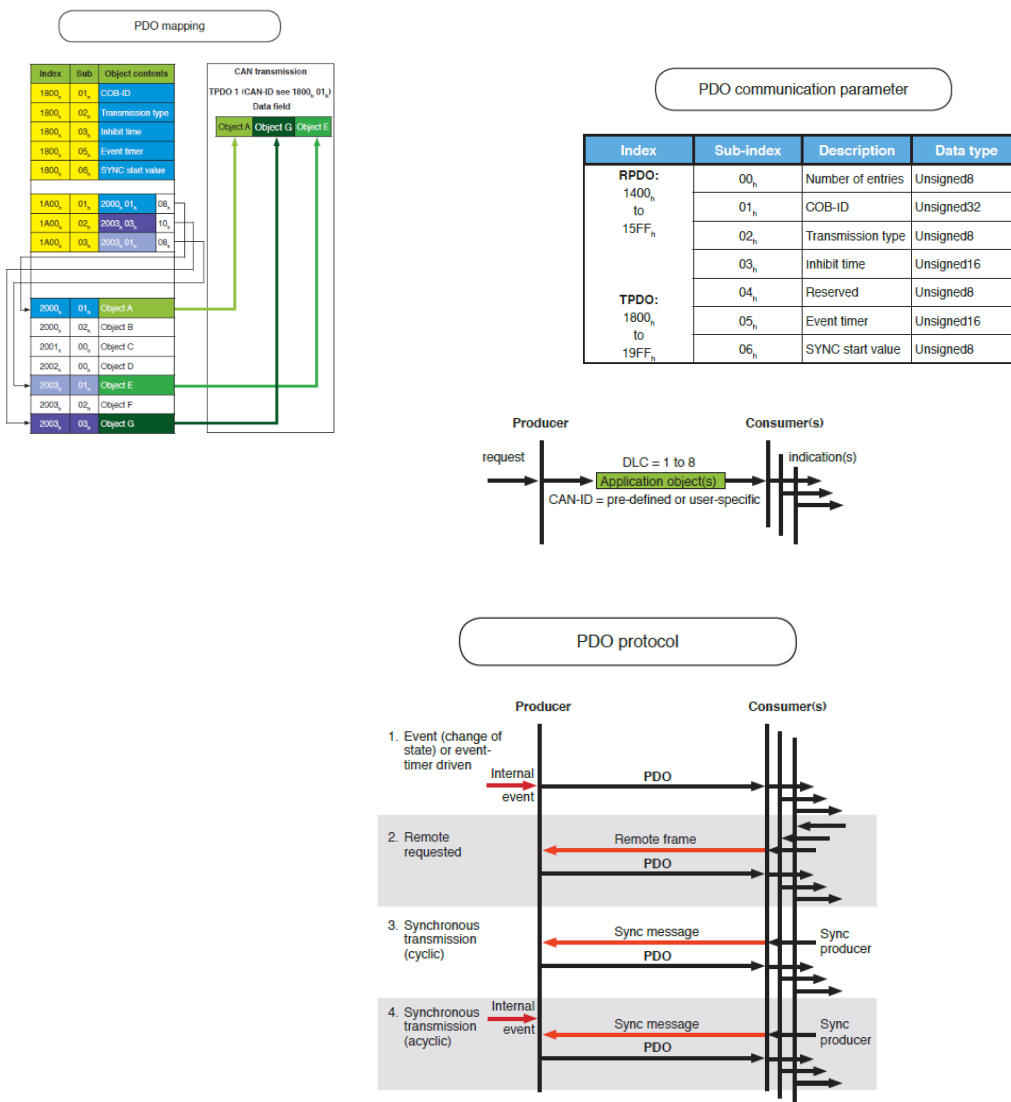
The PDO correspond to objects in the object dictionary and provide the interface to the application objects. Data type and mapping of application objects into a PDO is determined by a corresponding default PDO mapping structure within the object dictionary.

There are two kinds of use for PDO. The first is data transmission and the second data reception. It is distinguished in Transmit-PDO (TPDO) and Receive-PDO (RPDO). CANopen devices supporting TPDO are PDO producer and CANopen devices supporting RPDO are called PDO consumer.

The PDO communication parameter describes the communication capabilities of the PDO.

The PDO mapping parameter contains information about the contents of the PDO.

For each PDO the pair of communication and mapping parameter is mandatory. The objects introduced above are described above.



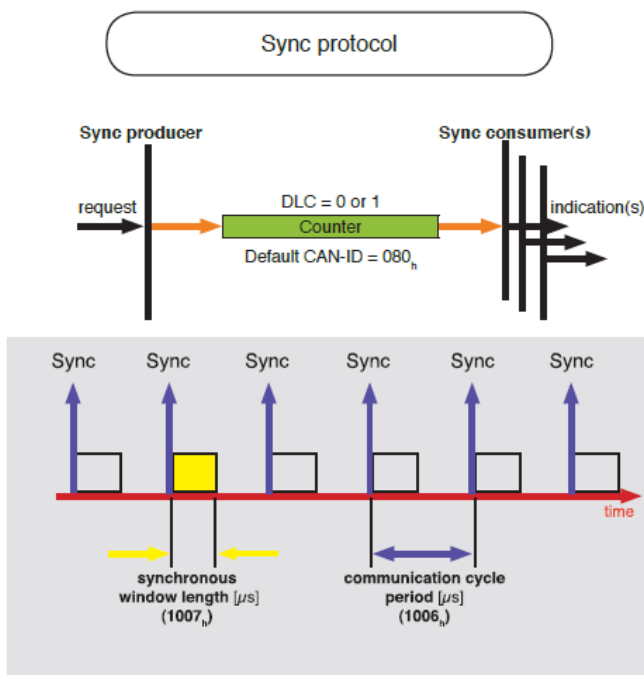
II.1.1.4 Special protocols

Sync protocol

The SYNC producer broadcasts the synchronization object periodically. This SYNC provides the basic network synchronization mechanism. The time period between the SYNCs is specified by the standard parameter communication cycle period, which may be written by a configuration tool to the drive devices during the boot-up process. There may be a time jitter in transmission by the SYNC producer corresponding approximately to the latency due to some other message being transmitted just before the SYNC. The SYNC consumer may use the communication cycle period manufacturer specific.

The optional parameter counter is used to define an explicit relationship between the current SYNC cycle and PDO transmission.

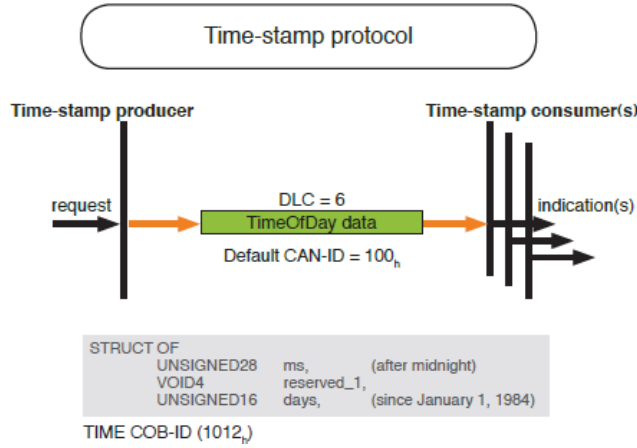
In order to guarantee timely access to the network the SYNC is given a very high priority CAN-ID Drive that operate synchronously may use the SYNC object to synchronize their own timing with that of the synchronization object producer.



Time-stamp protocol

The TIME producer broadcasts the time stamp object. This TIME provides the simple network clock. There may be a time jitter in transmission by the TIME producer corresponding approximately to the latency due to some other message being transmitted just before the TIME.

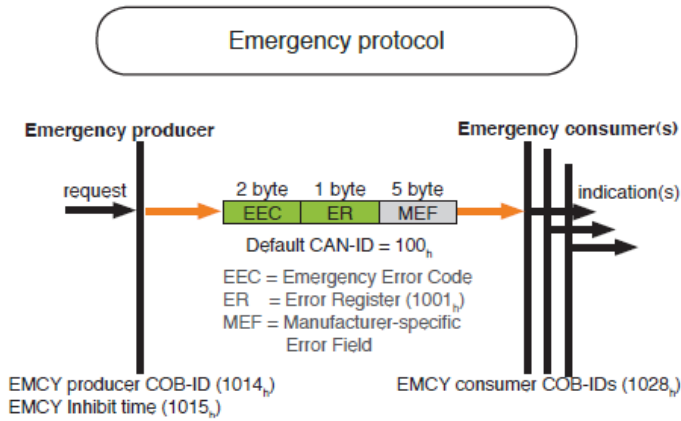
In order to guarantee timely access to the network the TIME is given a very high priority CAN-ID. Drive devices that operate a local clock may use the TIME object to adjust their own time base to that of the time stamp object producer.



Emergency protocol

Emergency objects are triggered by the occurrence of a Drive device internal error situation and are transmitted from an emergency producer on the CANopen device. Emergency objects are suitable for interrupt type error alerts. An emergency object is transmitted only once per 'error event'. No further emergency objects shall be transmitted as long as no new errors occur on a Drive device.

Zero or more emergency consumers may receive the emergency object. The reaction on the emergency consumer(s) specific.



Emergency error codes

00xx _h	Error reset or no error	60xx _h	Device software
10xx _h	Generic error	61xx _h	internal
20xx _h	Current	62xx _h	user
21xx _h		63xx _h	data set
22xx _h		70xx _h	Additional modules
23xx _h	device output side	80xx _h	Monitoring
30xx _h	Voltage	81xx _h	communication
31xx _h		8110 _h	CAN overrun
32xx _h		8120 _h	Error Passive (EP)
33xx _h		8130 _h	Life Guard Error
40xx _h	Temperature	8140 _h	recovered from Bus-off
41xx _h		82xx _h	Protocol error
42xx _h	device	8210 _h	PDO not processed
50xx _h	Device hardware	8220 _h	length exceeded
		90xx _h	External error
		F0xx _h	Additional functions
		FFxx _h	Device-specific

II.2 Ethernet configuration (ProfNet, EthernetIP, Modbus TCP...)

To run correctly, user can configure some Ethernet parameters.

The IP Address/Mask/Gateway. And if DHCP is used to define the IP Address.

If IP address ended by 255 (xxx.xxx.xxx.255) then it is the Node ID defined by the DIP switch which is taken.

Object description	
Attribute	Value
Index	0x2205
Name	Ethernet Parameters (Only for ENET version)
Object Code	Record
Data Type	parameters
Category	Mandatory

Entry description	
Attribute	Value
Sub-Index	0x00
Description	Highest sub-index supported
Entry Category	Mandatory
Access	c
PDO Mapping	Tx
Value Range	0x04
Default Value	0x04
Sub-Index	0x01
Description	Enable DHCP
Entry Category	Mandatory
Access	rw-NV
PDO Mapping	None
Value Range	unsigned16
Default Value	FALSE
Value Range	0x02
Description	IP Address
Entry Category	Mandatory
Access	rw-NV
PDO Mapping	None
Value Range	unsigned32
Default Value	192.168.1.1
Value Range	0x03
Description	SubNetMask
Entry Category	Mandatory
Access	rw-NV
PDO Mapping	None
Value Range	unsigned32
Default Value	255.255.255.0
Value Range	0x04
Description	Gateway
Entry Category	Mandatory
Access	rw-NV
PDO Mapping	None
Value Range	unsigned32
Default Value	0.0.0.0

Enable DHCP:
 IF TRUE, enable DHCP function
 Change is taken after drive restart

IP Address:
 Configure the IP Address of the device.
 Format is coded like Following:
 192.168.1.1 -> 0xC0 A8 01 01
 !! Specific value. If last Byte is 255 (0xFF) this is not 255 taken, but SMD nodeID (Set by DIPs)
 Change is taken after drive restart

SubNet Mask
 Configure the SubNet mask of the device.
 Format is coded like Following:
 255.255.255.0 -> 0xFF FF FF 00
 Change is taken after drive restart

Gateway:
 Configure the Gateway of the device.
 Format is coded like Following:
 192.168.1.1 -> 0xC0 A8 01 01
 Change is taken after drive restart

II.3 Modbus

II.3.1 Services

Below is listed all Modbus services. In grey are the not supported services.

				Function Codes		
				Code (Dec)	Sub code	Code (Hex)
Data Access	Bit access	Physical Discrete Inputs	Read discrete Inputs	2		02
		Internal Bits Or Physical coils	Read Coils	1		01
			Write Single Coil	5		05
			Write Multiple Coils	15		0F
	16 bits access	Physical Input Registers	Read Input Register	4		04
			Read Holding Registers	3		03
		Internal Registers Or Physical Output Registers	Write Single Register	6		06
			Write Multiple Registers	16		10
			Read/Write Multiple Registers	23		17
			Mask Write Register	22		16
			Read FIFO Queue	24		18
	File record access	Read File record		20	6	14
		Write File record		21	6	15
	Diagnostics	Read Exception status		7		07
Diagnostic		8	0, 1, 2, 4, 10, 11, 12, 13, 14, 15, 16, 17, 18, 20	08		
Get Com event counter		11		0B		
Get Com Event Log		12		0C		
Report Slave ID		17		11		
Read device identification		43	14	2B		
Other		Encapsulated interface Transport	43		2B	

II.3.2 RTU (Serial / USB)

Some dictionary objects are also accessible via the serial port or USB link (Serial emulation).

The used protocol is the Modbus RTU. The access via USB or Serial port are strictly identical. The USB is seen by computer as an emulated serial port. The only difference is the SlaveID field. USB is always 0x01. Serial is the node ID selected by the dips switch.

The Baud rate is also selectable via dips switch, please refer to Installation Guide.

With this protocol, all communications on Serial/USB are initiated by the Master (Computer). Then the drive response can be positive or negative.

	Slave ID	ServiceID	StartAddr		NB Words		NB Bytes	Word(n)		CRC (2 Bytes)
SingleWriteRequest	0x01	0x06	MSB	LSB				MSB	LSB	CRC
SingleWriteResponse	0x01	0x06	MSB	LSB				MSB	LSB	CRC
SingleWriteNegResponse	0x01	0x86	Error code (1byte)							CRC
WriteRequest	0x01	0x10	MSB	LSB	MSB	LSB	LSB	MSB	LSB	CRC
WriteResponse	0x01	0x10	MSB	LSB	MSB	LSB				CRC
WriteNegResponse	0x01	0x90	Error code (1byte)							CRC
ReadRequest	0x01	0x03	MSB	LSB	MSB	LSB				CRC
ReadResponse	0x01	0x03					LSB	MSB	LSB	CRC
ReadNegResponse	0x01	0x83	Error code (1byte)							CRC
Other Neg Response	Req	Req 0x80	Error code (1byte)							CRC

If 32 bits data are read, by default the **little endian** is configured (16bits LSB first). This can be changed via “Gateway COM parameters 0x2200 object”

The error code on Modbus RTU level could be following:

0x01	Service not supported	The filed "Service ID" not correspond to a supported service by the drive.
0x02	Unknown Address	The StartAddr + NbWord overflow the maximal supported address
0x03	Incorrect data	The frame is not correct (Length consistency...)
0x04	Drive not ready	In case of specific command (OS / PGM update) the drive is not in a good state
0xF7	Write default	During programming OS/Drive Basic if write fail.
0xF8	Buffer too small	Modbus request need larger buffer response. Try with smaller request.
0xF9	Memory Allocation	Internal system memory allocation fails. Please contact manufacturer

The error code on Object dictionary level could be following:

Code	Correspondence with CANOpen Abort code	Detail
0x05	0x6010001	Unsupported Access
0x06	0x6010001	Write Only entry: Try to read an object with Write Only attribute
0x07	0x6010002	Read Only entry: Try to write an object with Read Only attribute
0x08	0x6010003	Entry cannot be written because Subindex0 is not 0
0x09	0x6010004	The object cannot be accessed via complete access
0x0A	0x6020000	Object not existing
0x0B	0x6040041	Object cannot be mapped to PDO
0x0C	0x6040042	Mapped Object exceeds PDO
0x0D	0x6040043	Parameter is incompatible
0x0E	0x6040047	Device incompatibility
0x0F	0x6060000	Hardware error
0x10	0x6070010	Parameter length error
0x11	0x6070012	Parameter is too long
0x12	0x6070013	Parameter is too short
0x13	0x6090011	SubIndex (Entry) not exists
0x14	0x6090030	Value exceeds
0x15	0x6090031	Value is too great
0x16	0x6090032	Value is too small
0x17	0x6060033	Unequal Module Id list
0x18	0x6090036	Value is less than minimum value
0x19	0x8000000	General error
0x1A	0x8000020	Data cannot be read or written
0x1B	0x8000021	Data cannot be accessed because of local control
0x1C	0x8000022	Data cannot be read or written in the current state
0x1D	0x8000023	Object is not in the object dictionary
0x1E	0x8000024	No data available



The error code 0x6010002 (Read Only entry) is generated only when try to write ONE object. If the read only object is accessed in writing when Modbus frame access to many objects, all other object will be written, excepted the Read Only object, without return the error code.

II.3.3 Modbus TCP

The object access (mapping) is exactly the same than Modbus RTU.

	Transaction identifier		Protocol identifier		Length		Unit Identifier	ServiceID	StartAddr		NB Words		NB Bytes	Word(n)		
	MSB	LSB	0x00	0x00	MSB	LSB	0xFF	0x10	MSB	LSB	MSB	LSB	LSB	MSB	LSB	
WriteRequest	MSB	LSB	0x00	0x00	MSB	LSB	0xFF	0x10	MSB	LSB	MSB	LSB	LSB	MSB	LSB	
WriteResponse	MSB	LSB	0x00	0x00	MSB	LSB	0xFF	0x10	MSB	LSB	MSB	LSB				
WriteNegResponse	MSB	LSB	0x00	0x00	MSB	LSB	0xFF	0x90	Error code (1byte)							
ReadRequest	MSB	LSB	0x00	0x00	MSB	LSB	0xFF	0x03	MSB	LSB	MSB	LSB				
ReadResponse	MSB	LSB	0x00	0x00	MSB	LSB	0xFF	0x03					LSB	MSB	LSB	
ReadNegResponse	MSB	LSB	0x00	0x00	MSB	LSB	0xFF	0x83	Error code (1byte)							
Other Response	Neg Req	Req	Req	Req	Req	Req	Req	Req	Req	Error code (1byte)						
								0x80								

Fields	Length	Description -	Client	Server
Transaction Identifier	2 Bytes	Identification of a MODBUS Request / Response transaction.	Initialized by the client	Recopied by the server from the received request
Protocol Identifier	2 Bytes	0 = MODBUS protocol	Initialized by the client	Recopied by the server from the received request
Length	2 Bytes	Number of following bytes	Initialized by the client (request)	Initialized by the server (Response)
Unit Identifier	1 Byte	Identification of a remote slave connected on a serial line or on other buses.	Initialized by the client	Recopied by the server from the received request

The header is 7 bytes long:

- **Transaction Identifier:** It is used for transaction pairing; the MODBUS server copies in the response the transaction identifier of the request.
- **Protocol Identifier:** It is used for intra-system multiplexing. The MODBUS protocol is identified by the value 0.
- **Length:** The length field is a byte count of the following fields, including the Unit Identifier and data fields.
- **Unit Identifier:** This field is used for intra-system routing purpose. It is typically used to communicate to a MODBUS or a MODBUS+ serial line slave through a gateway between an Ethernet TCP-IP network and a MODBUS serial line. This field is set by the MODBUS Client in the request and must be returned with the same value in the response by the server. The SMD has not a gateway;
 - 0x00 => Broadcast: all slave receives the request. No response is done
 - 0xFF => Server is addressed
 - Other => To the gateway (not used)

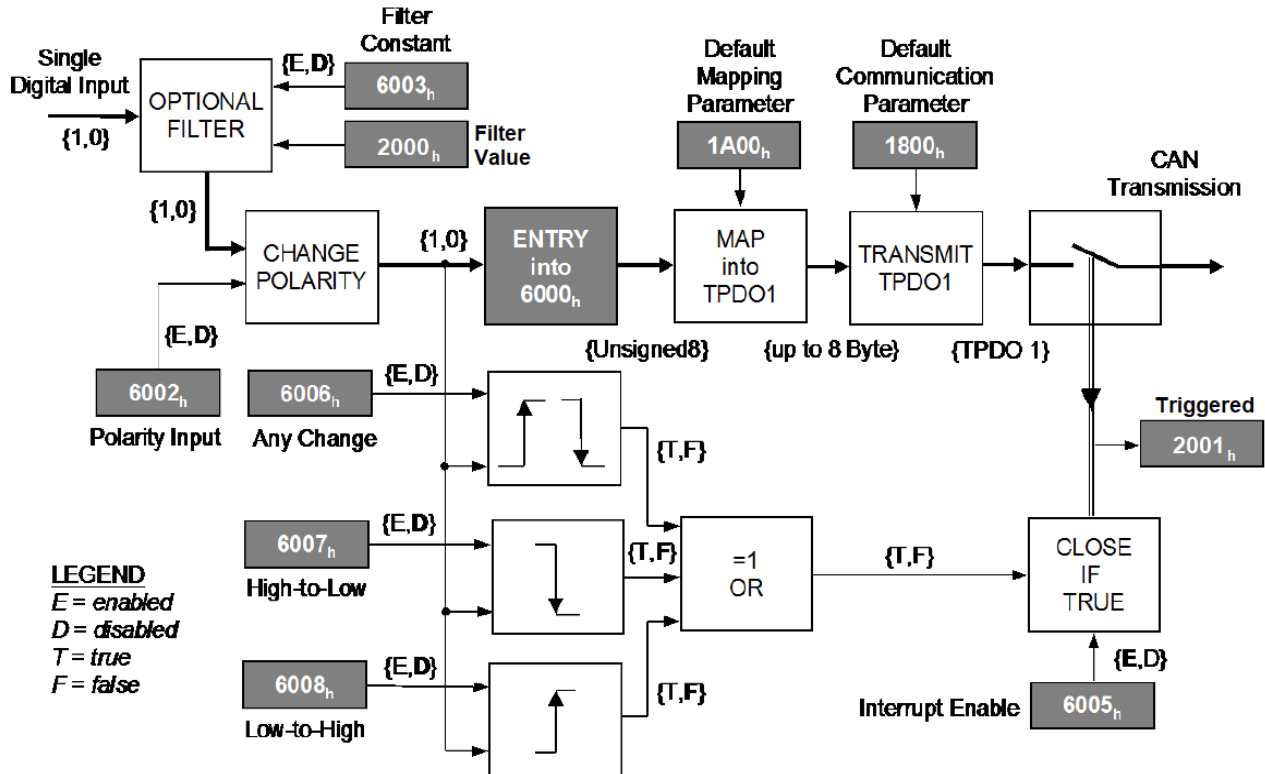
All MODBUS/TCP ADU are sent via TCP on registered port 502. With this port, the Endianness for 32 bits value is configurable (Refer to RS232 port Endianness which is the same parameter) If port 10502 is used, Little Endian is always applied.

Remark: the different fields are encoded in Big-endian.

III. Profile application

III.1 Digital input

Digital input has the following block diagram



There are different access methods defined. By default, 8-bit access is configured. 16-bit and 32-bit access is possible.

For each input, you can define a polarity which allow to invert the logical level of the read input. Optional filter can be activated and then configured via manufacturer specific object 0x2000.

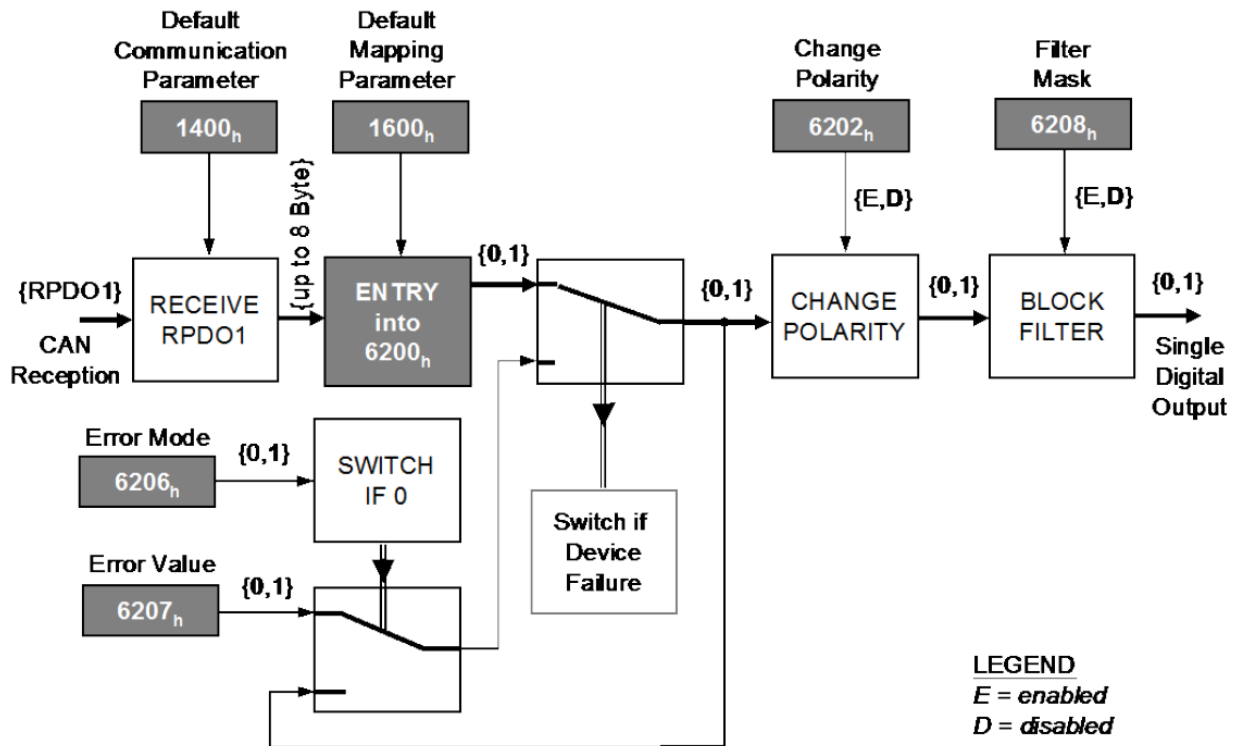
Different option allows to trig the transmission of the input into a PDO.

	8 bits	16 bits (+ 0x100)	32 bits (+ 0x120)
Entry Input	0x6000	0x6100	0x6120
Polarity	0x6002	0x6102	0x6122
Filter constant	0x6003	0x6103	0x6123
Filter Value	0x2000	0x2000	0x2000
Any Change	0x6006	0x6106	0x6126
High-to-Low	0x6007	0x6107	0x6127
Low-to-High	0x6008	0x6108	0x6128
Inputs Triggered	0x2001	0x2001	0x2001



Interrupt sources (Any change, High-to-Low, Low-to-High) are evaluated every 100µs

III.2 Digital outputs



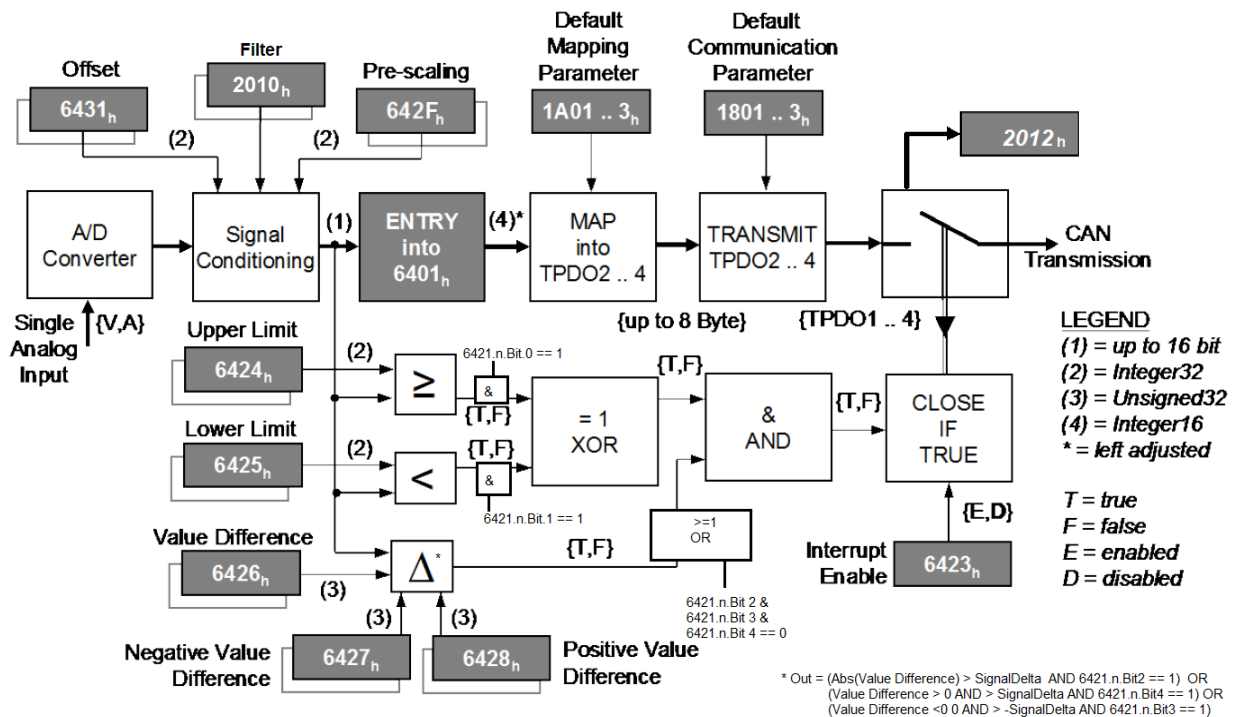
There are different access methods defined. By default, 8-bit access is configured. 16-bit and 32-bit access are possible.

For each output, you can define a polarity which allow to invert the logical level of the written output.
 For 8/16/32 bits access, you can define a mask which allow to modify only the selected output.

You can define for each output, if an error value must be applied to the output in case of error detected on the module (Communication error, short circuit error...). Normal values are restored as soon as error disappears.

	8 bits	16 bits (+ 0x100)	32 bits (+ 0x120)
Entry Output	0x6200	0x6300	0x6320
Polarity	0x6202	0x6302	0x6322
Error Mode	0x6206	0x6306	0x6326
Error Value	0x6207	0x6307	0x6327
Filter Mask	0x6208	0x6308	0x6328

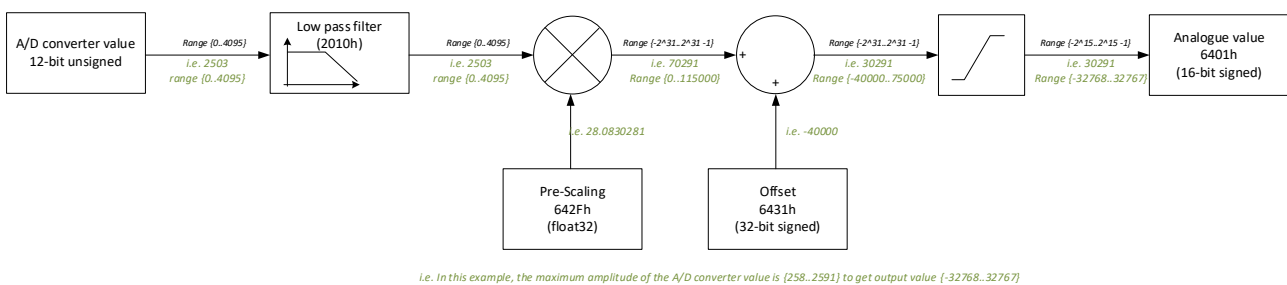
III.3 Analogue input



Analogue input value returned by the A/D converter is a 12-bits unsigned value. #0 correspond to the lower physical value. #4095 correspond to the higher physical value:

Input Type	Input Physical value range	input numerical value range
Differential +/-10V	{-10V ... +10V}	{0 ... 4095}
Single 0/10V	{0V ... +10V}	{0 ... 4095}
0-20mA	{0mA ... 20mA}	{0 ... 4095}

Accordinging your application, you can scale and set an offset to the returned value which is a 16-bit signed value.
 Signed_16_bits_value = (AD_Unsigned_12_bits_value x Pre-scaling) + Offset



Interrupt sources (Upper, lower, difference) are only evaluated on each Read data (Entry 6401) when mapped into a PDO. In other word, interrupt source is evaluated on each PDO cycle:

- EtherCAT version: Master cycle task
- CAN version: PDO minimum interval or 100µs if no minimum defined according transmission type

Example: A thermometer return -5V to +10V for a temperature variation {-20°C ... +50°C}.

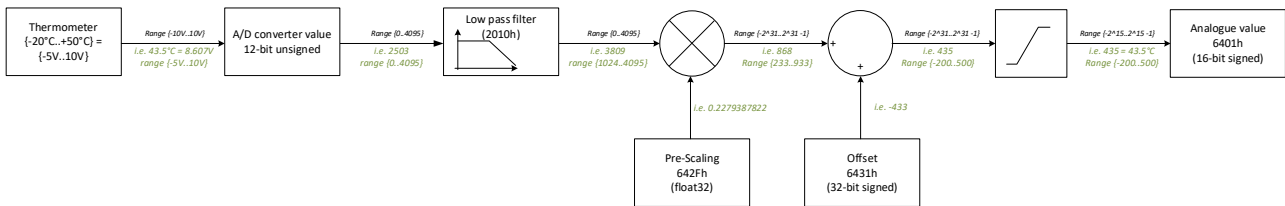
So, the unsigned 12-bit value will be into the range {1024...4095} => delta of #3071

You want get an integer value with 0.1°C accuracy, then {-200...+500} => delta of 700

Then the scale to apply is $700/3071 = 0.2279387822$. This is the value to write to the Pre-Scaling object 642Fh which is a float value.

So, the range of the result (AD_Unsigned_12_bits_value x Pre-scaling) will be :
 {1024...4095} x 0.2279387822 = {233 ... 933}

The offset should be set to pass from {233 ... 933} to {-200 ... 500} $-233 - 200 = -433$

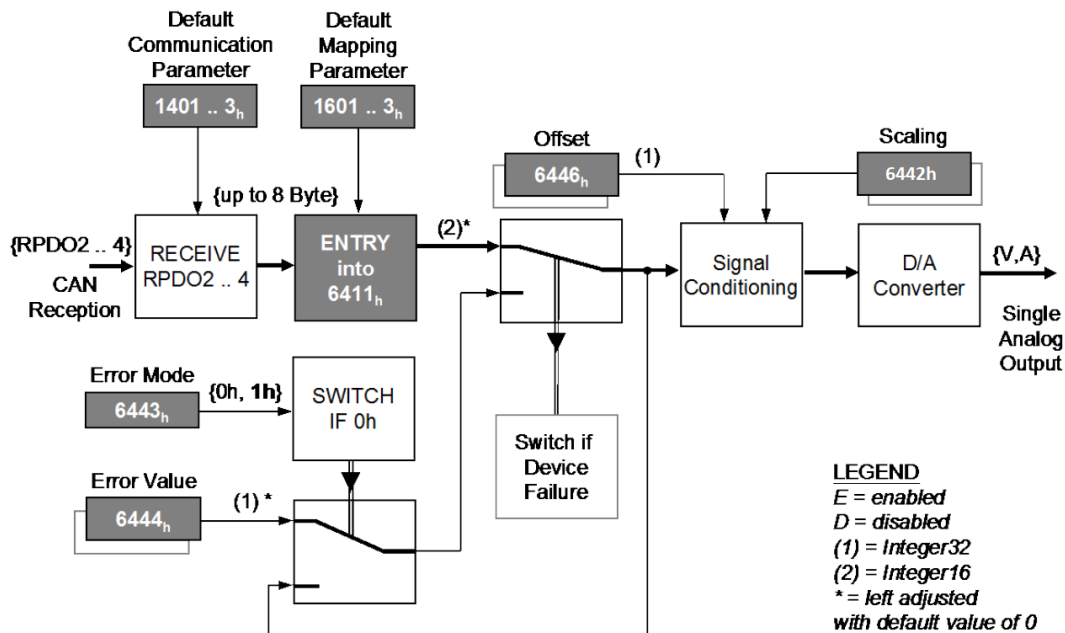


You can set different possibility to trig the send of the analogue value:

First you can set a value difference since the last transmitted PDO to trig the send on the new one. To inhibit this parameter, set the difference to 0.

After that, you can define an upper and/or lower limit which will trig a new send.

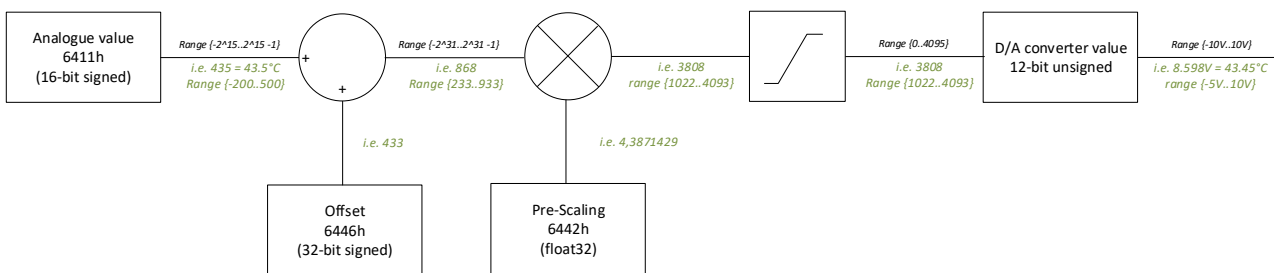
III.4 Analogue Output



The analogue output value (6411h) is a 16-bit signed value. The physical D/A value to apply is a 12-bit unsigned value. #0 will set the output to the lower value, #4095 will set the output to the higher value:

Output Type	Output numerical value range	Output Physical value range
+/-10V	{0 ... 4095}	{-10V ... +10V}
0/10V	{0 ... 4095}	{0V ... +10V}
0-20mA	{0 ... 4095}	{0mA ... 20mA}

According your application, you can scale and set an offset to applied 12-bit unsigned value.
 $DA_Unsigned_12_bits_value = (Signed_16_bits_value + Offset) * Pre-scaling$



Example:

We want an analogue output which represent a temperature with the following range: $\{-5V...10V\} = \{-20^{\circ}C...50^{\circ}C\}$ from a 16-bit signed value $\{-200...500\}$
 Then D/A converter must be set into the range $\{1024...4095\}$ to have an output range $\{-5V..10V\}$

Input Delta (6411h) = $500 - (-200) = 700$.
 D/A converter Delta = $4095 - 1024 = 3071$
 Then the pre-scaling value should be $3071 / 700 = 4.387$

Then de offset should be
 $(D/A\ converter\ Min\ Value / Pre-Scaling) - Input\ Delta\ Min\ value\ (6411h) = (1024 / 4.387) - (-200) = 433$.

You can define for each output, if an error value must be applied to the output in case of error detected on the module (Communication error, short circuit error...). Normal value is restored as soon as error disappears.

IV. Object dictionary description

IV.1 Communication profile specific objects

IV.1.1 Object 1000_h: Device type

This object shall provide information about the device type. The object describes the type of the logical device and its functionality.

VALUE DEFINITION

Fixed value: 0x0002 1389.

This value indicates the Profile 5001 (5001 = 0x1389) and additional information is 0x008F

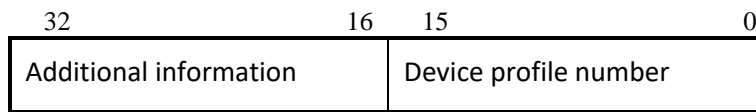


Figure: Structure of the device type parameter

OBJECT DESCRIPTION

Index	1000 _h
Name	Device type
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00 _h
Access	ro
PDO mapping	No
Value range	See value definition
Default value	Profile- or manufacturer-specific

IV.1.2 Object 1001_h: Error register

This object shall provide error information. The CANopen device maps internal errors into this object. It is a part of an emergency object.

VALUE DEFINITION

Table: Structure of the error register

Bit	M/O	Meaning
0	M	Generic error
1	O	Current
2	O	Voltage
3	O	Temperature
4	O	Communication error (overrun, error state)
5	O	Device profile specific
6	O	reserved (always 0 _b)
7	O	manufacturer-specific

If a specific error occurs the corresponding bit shall be set to 1_b.

OBJECT DESCRIPTION

Index	1001 _h
Name	Error register
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

ENTRY DESCRIPTION

Sub-index	00 _h
Access	ro
PDO mapping	Optional
Value range	See value definition
Default value	No

IV.1.3 Object 1003_h: Pre-defined error field

This object shall provide the errors that occurred on the CANopen device and were signalled via the emergency object. In doing so it provides an error history.

VALUE DEFINITION

- The object entry at sub-index 00_h shall contain the number of actual errors that are recorded in the array starting at sub-index 01_h.
NOTE: If no error is present the value of sub-index 00_h is 00_h and a read access to sub-index 01_h is responded with an SDO abort message (abort code: 0800 0024_h or 0800 0000_h).
- Every new error is stored at sub-index 01_h; older errors is moved to the next higher sub-index.
- Writing 00_h to sub-index 00_h delete the entire error history (empties the array). Other values than 00_h are not allowed and lead to an abort message (error code: 0609 0030_h).

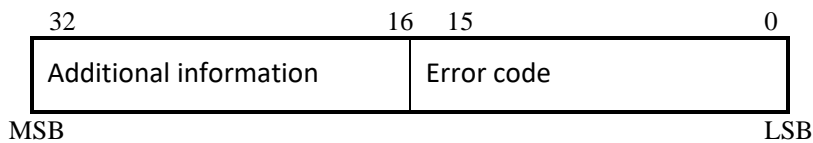


Figure: Structure of the pre-defined error field

OBJECT DESCRIPTION

Index	1003 _h
Name	Pre-defined error field
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

ENTRY DESCRIPTION

Sub-index	00 _h
Description	Number of errors
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	00 _h to FE _h
Default value	00 _h

Sub-index	01 _h
Description	Standard error field
Entry category	Mandatory
Access	ro

PDO mapping	No
Value range	UNSIGNED32
Default value	No

Sub-index	02 _h to FE _h
Description	Standard error field
Entry category	Optional
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

ENTRY DESCRIPTION

Sub-index	00 _h
Access	rw-NV
PDO mapping	No
Value range	See value definition
Default value	0000 0080 _h or 8000 0080 _h

IV.1.5 Object 1006_h: Communication cycle period

This object shall provide the communication cycle period. This period defines the SYNC interval.

VALUE DEFINITION

The value is given in multiple of μs . If the value is set to 0000 0000_h the transmission of SYNC messages is disabled. By changing the value from 0000 0000_h and the synchronous counter overflow value is greater than 0 the first SYNC message start with the counter value reset to 1.

The transmission of SYNC messages starts within one communication cycle period as given by the value after it is set to the new value.

OBJECT DESCRIPTION

Index	1006 _h
Name	Communication cycle period
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; Mandatory for SYNC producers

ENTRY DESCRIPTION

Sub-index	00 _h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 0000 _h

IV.1.6 Object 1007_h: Synchronous window length

This object indicates the configured the length of the time window for synchronous PDOs. If the synchronous window length expires all synchronous TPDOs is discarded and an EMCY message is transmitted; all synchronous RPDOs is discarded until the next SYNC message is received. Synchronous RPDO processing is resumed with the next SYNC message.

VALUE DEFINITION

The value is given in multiple of μ s. If the value is set to 0000 0000_h the synchronous window shall be disabled.

OBJECT DESCRIPTION

Index	1007 _h
Name	Synchronous window length
Object code	VAR
Data type	UNSIGNED32
Category	Optional

ENTRY DESCRIPTION

Sub-index	00 _h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 0000 _h

IV.1.7 Object 1008_h: Manufacturer device name

This object provides the name of the device as given by the manufacturer.

OBJECT DESCRIPTION

Index	1008 _h
Name	Manufacturer device name
Object code	VAR
Data type	VISIBLE_STRING
Category	Optional

ENTRY DESCRIPTION

Sub-index	00 _h
Access	const
PDO mapping	No
Value range	VISIBLE_STRING
Default value	Manufacturer-specific

IV.1.8 Object 1009_h: Manufacturer hardware version

This object provides the manufacturer hardware version description.

OBJECT DESCRIPTION

Index	1009 _h
Name	Manufacturer hardware version
Object code	VAR
Data type	VISIBLE_STRING
Category	Optional

ENTRY DESCRIPTION

Sub-index	00 _h
Access	const
PDO mapping	No
Value range	VISIBLE_STRING
Default value	Manufacturer-specific

IV.1.9 Object 100A_h: Manufacturer software version

This object provides the manufacturer software version description.

OBJECT DESCRIPTION

Index	100A _h
Name	Manufacturer software version
Object code	VAR
Data type	VISIBLE_STRING
Category	Optional

ENTRY DESCRIPTION

Sub-index	00 _h
Access	const
PDO mapping	No
Value range	VISIBLE_STRING
Default value	Manufacturer-specific

IV.1.10 Object 100C_h: Guard time

The objects at index 100C_h and 100D_h indicate the configured guard time respectively the life time factor. The life time factor multiplied with the guard time gives the life time for the life guarding protocol.

VALUE DEFINITION

The value is given in multiple of milliseconds. The value of 0000h disable the life guarding.

OBJECT DESCRIPTION

Index	100C _h
Name	Guard time
Object code	VAR
Data type	UNSIGNED16
Category	Conditional; Mandatory, if node guarding is supported

ENTRY DESCRIPTION

Sub-index	00 _h
Access	rw-NV;
PDO mapping	No
Value range	UNSIGNED16
Default value	0000 _h

IV.1.11 Object 100D_h: Life time factor

The life time factor multiplied with the guard time gives the life time for the life guarding protocol.

VALUE DEFINITION

The value of 00_h disable the life guarding.

OBJECT DESCRIPTION

Index	100D _h
Name	Life time factor
Object code	VAR
Data type	UNSIGNED8
Category	Conditional; Mandatory, if node guarding is supported

ENTRY DESCRIPTION

Sub-index	00 _h
Access	rw-NV;
PDO mapping	No
Value range	UNSIGNED8
Default value	00 _h

IV.1.12 Object 1010_h: Store parameters

This object controls the saving of parameters in non-volatile memory.

VALUE DEFINITION

By read access the CANopen device shall provide information about its saving capabilities. Several parameter groups are distinguished:

- Sub-index 00_h contains the highest sub-index that is supported.
- Sub-index 01_h refers to all parameters that may be stored on the CANopen device:

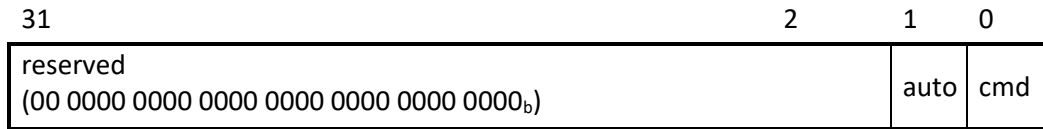


Figure: Storage read access structure

Table: Structure of read access

Bit	Value	Description
auto	0 _b	CANopen device does not save parameters autonomously
	1 _b	CANopen device saves parameters autonomously
cmd	0 _b	CANopen device does not save parameters on command
	1 _b	CANopen device saves parameters on command

Autonomous saving means that a CANopen device stores the storable parameters in a nonvolatile manner without user request.

OBJECT DESCRIPTION

Index	1010 _h
Name	store parameters
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

ENTRY DESCRIPTION

Sub-index	00 _h
Description	highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	01 _h to 7F _h
Default value	profile- or manufacturer-specific

Sub-index	01 _h
Description	save all parameters
Entry category	Mandatory
Access	ro, autonomous storing
PDO mapping	No
Value range	see value definition
Default value	0x02

IV.1.13 Object 1011_h: Restore default parameters

With this object the default values of parameters according to the communication profile, device profile, and application profile are restored.

VALUE DEFINITION

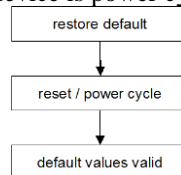
- By read access the CANopen device shall provide information about its capabilities to restore these values. Several parameter groups are distinguished:
- Sub-index 00_h contains the highest sub-index that is supported.
- Sub-index 01_h refers to all parameters that may be restored.

In order to avoid the restoring of default parameters by mistake, restoring shall be only executed when a specific signature is written to the appropriate sub-index. The signature that shall be written is "load":

d	a	o	l
64 _h	61 _h	6F _h	6C _h

On reception of the correct signature in the appropriate sub-index the CANopen device restore the default parameters and then it confirm the SDO transmission (SDO download initiate response). If the restoring failed, the CANopen device respond with the SDO abort transfer service (abort code: 0606 0000_h). If a wrong signature is written, the CANopen device refuse to restore the defaults and respond with the SDO abort transfer service (abort code: 0800 002x_h).

The default values is set valid after the CANopen device is power cycled.



On read access to the appropriate sub-index the CANopen device provide information about its default parameter restoring capability with the following format:

31	1	0
reserved (000 0000 0000 0000 0000 0000 0000 0000 _b)	cmd	

Bit	Value	Description
cmd	0 _b	CANopen device does not restore default parameters
	1 _b	CANopen device restores parameters

OBJECT DESCRIPTION

Index	1011 _h
Name	restore default parameters
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

ENTRY DESCRIPTION

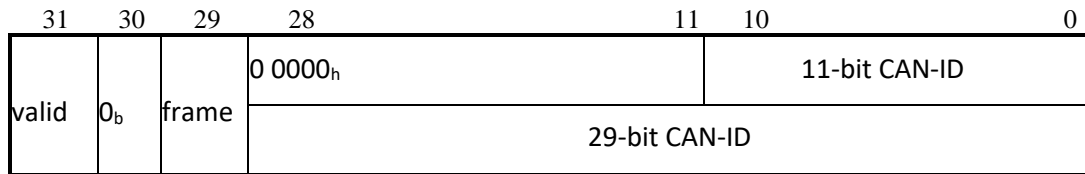
Sub-index	00 _h
Description	highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	01 _h to 7F _h
Default value	profile- or manufacturer-specific

Sub-index	01 _h
Description	restore all default parameters
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	see value definition
Default value	0x01

IV.1.14 Object 1014_h: COB-ID EMCY

This object shall indicate the configured COB-ID for the EMCY write service.

VALUE DEFINITION



Bit(s)	Value	Description
valid	0 _b	EMCY exists / is valid
	1 _b	EMCY does not exist / is not valid
30	0 _b	reserved (always 0 _b)
frame	0 _b	11-bit CAN-ID valid (CAN base frame)
	1 _b	29-bit CAN-ID valid (CAN extended frame)
29-bit CAN-ID	x	29-bit CAN-ID of the CAN extended frame
11-bit CAN-ID	x	11-bit CAN-ID of the CAN base frame

The bits 0 to 29 shall not be changed, while the object exists and is valid (bit 31 = 0_b).

OBJECT DESCRIPTION

Index	1014 _h
Name	COB-ID emergency message
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; Mandatory, if Emergency is supported

ENTRY DESCRIPTION

Sub-index	00 _h
Access	rw; const, if COB-ID is not changeable
PDO mapping	No
Value range	UNSIGNED32

Default value	CAN-ID: 80 _h + Node-ID frame: 0 _b valid: profile- or manufacturer-specific
---------------	--

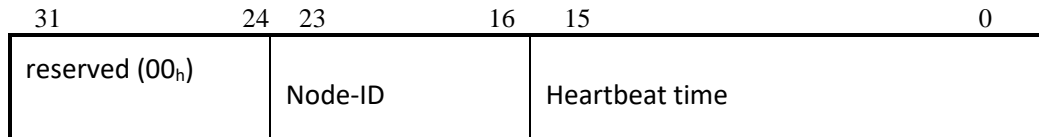
IV.1.15 Object 1016_h: Consumer heartbeat time

The consumer heartbeat time object indicates the expected heartbeat cycle times. Monitoring of the heartbeat producer start after the reception of the first heartbeat.

NOTE: The consumer heartbeat time should be higher than the corresponding producer heartbeat time.

NOTE: Before the reception of the first heartbeat the status of the heartbeat producer is unknown.

VALUE DEFINITION



If the heartbeat time is 0 or the node-ID is 0 or greater than 127 the corresponding object entry shall be not used. The heartbeat time is be given in multiples of 1ms.

An attempt to configure several heartbeat times unequal 0 for the same node-ID the CANopen device is responded with the SDO abort transfer service (abort code: 0604 0043_h).

OBJECT DESCRIPTION

Index	1016 _h
Name	Consumer heartbeat time
Object code	ARRAY
Data type	UNSIGNED32
Category	Optional

ENTRY DESCRIPTION

Sub-index	00 _h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	01 _h to 7F _h
Default value	profile- or manufacturer-specific

Sub-index	01 _h
Description	Consumer heartbeat time
Entry category	Mandatory
Access	rw
PDO mapping	No

Value range	UNSIGNED32 (Figure 62)
Default value	0000 0000 _h

Sub-index	02 _h to 7F _h
Description	Consumer heartbeat time
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED32 (Figure 62)
Default value	0000 0000 _h

IV.1.16 Object 1017_h: Producer heartbeat time

The producer heartbeat time indicate the configured cycle time of the heartbeat.

VALUE DEFINITION

The value is given in multiples of 1 ms. The value 0 shall disable the producer heartbeat.

OBJECT DESCRIPTION

Index	1017 _h
Name	Producer heartbeat time
Object code	VAR
Data type	UNSIGNED16
Category	Conditional; Mandatory, if guarding not supported

ENTRY DESCRIPTION

Sub-index	00 _h
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	0 or profile-specific

IV.1.17 Object 1019_h: Synchronous counter overflow value

This object indicates the configured highest value the synchronous counter supports. This object is implemented by the producer and the consumer, if the synchronous counter is supported by the CANopen device. If the value is greater than 1, the SYNC message has a data length of 1 byte. The SYNC consumer shall ignore the value itself. An EMCY message (error code: 8240_h – unexpected SYNC data length) may be transmitted by a SYNC consumer in the case the configured data length of the SYNC message does not meet the data length of a received SYNC message.

VALUE DEFINITION

Value	Description
0	The SYNC message shall be transmitted as a CAN message of data length 0.
1	reserved
2 to 240	The SYNC message shall be transmitted as a CAN message of data length 1. The first data byte contains the counter.
241 to 255	reserved

The value used shall be the least common multiple of all the TPDO transmission types ($1 < n \leq 240$) used. This ensures that periodic SYNC events always happen in the SYNC cycles with the same counter value.

A change of the value shall be responded with a SDO abort (abort code: 0800 0022_h or 0800 0000_h) in case the sync cycle period is unequal to 0.

OBJECT DESCRIPTION

Index	1019 _h
Name	Synchronous counter overflow value
Object code	VAR
Data type	UNSIGNED8
Category	Optional

ENTRY DESCRIPTION

Sub-index	00 _h
Access	Rw-NV;
PDO mapping	No
Value range	UNSIGNED8
Default value	0 or profile-specific

IV.1.18 Object 1029_h: Error behaviour object

If a serious CANopen device failure is detected in NMT state Operational, the CANopen device shall enter by default autonomously the NMT state Pre-operational. The CANopen device is configurable to enter alternatively the NMT state Stopped or remain in the current NMT state. CANopen device failures shall include the following communication errors:

- Bus-off conditions of the CAN interface
- Life guarding event with the state 'occurred' and the reason 'time out'
- Heartbeat event with state 'occurred' and the reason 'time out'

Severe CANopen device errors also may be caused by CANopen device internal failures.

VALUE DEFINITION

Table: Error class values

Value	Description
00 _h	Change to NMT state Pre-operational (only if currently in NMT state Operational)
01 _h	No change of the NMT state
02 _h	Change to NMT state Stopped
03 _h	reserved
.....
7F _h	reserved
80 _h	Manufacturer-specific
.....
FF _h	Manufacturer-specific

OBJECT DESCRIPTION

Index	1029 _h
Name	Error behavior
Object code	ARRAY
Data type	UNSIGNED8
Category	Optional

ENTRY DESCRIPTION

Sub-index	00 _h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const

PDO mapping	No
Value range	01 _h to FE _h
Default value	profile- or manufacturer-specific

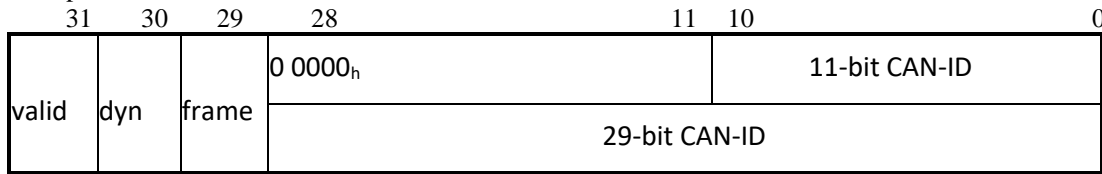
Sub-index	01 _h
Description	Communication error
Entry category	Mandatory
Access	Rw-NV
PDO mapping	No
Value range	UNSIGNED8
Default value	00 _h

IV.1.19 Object 1200_h: SDO server parameter

In order to describe the SDOs used on a CANopen device the data type SDO Parameter is introduced. The data type has the index 22_h in the object dictionary.

VALUE DEFINITION

The number of supported object entries in the SDO object record is specified at sub-index 00_h. The values at sub-index 01_h and sub-index 02_h specify the COB-ID for this SDO. Sub-index 03_h is the node-ID of the SDO client associated to this CANopen device.



Bit(s)	Value	Description
valid	0 _b	SDO exists / is valid
	1 _b	SDO does not exist / is not valid
dyn	0 _b	Value is assigned statically
	1 _b	Value is assigned dynamically
frame	0 _b	11-bit CAN-ID valid (CAN base frame)
	1 _b	29-bit CAN-ID valid (CAN extended frame)
29-bit CAN-ID	x	29-bit CAN-ID of the CAN extended frame
11-bit CAN-ID	x	11-bit CAN-ID of the CAN base frame

An SDO exists only if at both sub-index 01_h and sub-index 02_h the bit valid (bit 31) is set to 0_b. CANopen devices supporting the CAN base frame type only, an attempt to set bit 29 (frame) to 1_b is responded with the SDO abort transfer service (abort code: 0609 0030_h). It is not allowed to change bits 0 to 29 while the object exists and is valid (bit 31 = 0_b).

OBJECT DESCRIPTION

Index	1200 _h
Name	SDO server parameter
Object code	RECORD
Data type	SDO parameter record
Category	Conditional Index 1200 _h : Optional

ENTRY DESCRIPTION

Sub-index	00 _h
-----------	-----------------

Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	Index 1200 _h : 02 _h
Default value	profile or manufacturer-specific

Sub-index	01 _h
Description	COB-ID client -> server (rx)
Entry category	Mandatory
Access	Index 1200 _h : const
PDO mapping	Optional
Value range	see value definition
Default value	Index 1200 _h : CAN-ID: 600 _h + Node-ID frame: 0 _b dyn: 0 _b valid: 0 _b

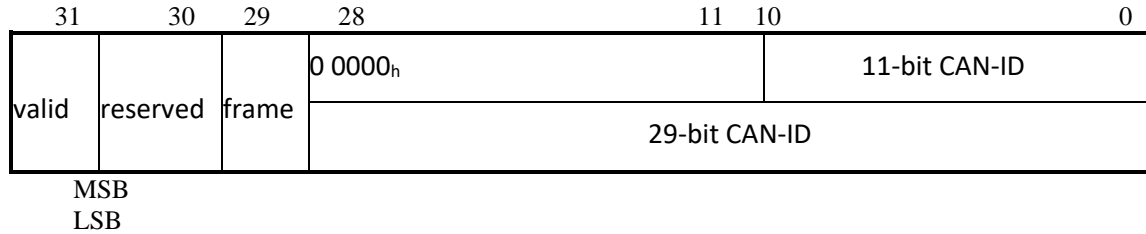
Sub-index	02 _h
Description	COB-ID server -> client (tx)
Entry category	Mandatory
Access	Index 1200 _h : ro
OPDO mapping	Optional
Value range	see value definition
Default value	Index 1200 _h : CAN-ID: 580 _h + Node-ID frame: 0 _b dyn: 0 _b valid: 0 _b

IV.1.20 Object 1400_h to 1407_h: RPDO communication parameter

This object contains the communication parameters for the PDOs the CANopen device is able to receive.

VALUE DEFINITION

Sub-index 00_h contains the number of valid object entries within the record. Its value is at least 02_h. If inhibit time supported the value is 03_h and if event timer is supported the value is 05_h. Sub-index 01_h contains the COB-ID of the RPDO.



Bit(s)	Value	Description
valid	0 _b	PDO exists / is valid
	1 _b	PDO does not exist / is not valid
reserved	x	do not care
frame	0 _b	11-bit CAN-ID valid (CAN base frame)
	1 _b	29-bit CAN-ID valid (CAN extended frame)
29-bit CAN-ID	x	29-bit CAN-ID of the CAN extended frame
11-bit CAN-ID	x	11-bit CAN-ID of the CAN base frame

The bit valid (bit 31) allows selecting which RPDOs are used in the NMT state Operational. There may be PDOs fully configured (e.g. by default) but not used, and therefore set to "not valid" (deleted). CANopen devices supporting the CAN base frame type only an attempt to set bit 29 (frame) to 1_b is responded with the SDO abort transfer service (abort code: 0609 0030_h). It is not allowed to change bit 0 to 29 while the PDO exists and is valid (bit 31 = 0_b). CANopen devices supporting the enabling (bit 31 = 0_b) and disabling (bit 31 = 1_b) of an RPDO only shall respond with the SDO abort transfer service (abort code: 0609 0030_h or 0800 000_h) on an attempt to change the values from bit 0 to bit 30.

If the CANopen device has implemented one or more device profiles the generic pre-defined connection set shall apply.

Index	Default value
1400 _h	CAN-ID: 200 _h + Node-ID frame: 0 _b reserved: manufacturer-specific valid: profile or manufacturer-specific
1401 _h	CAN-ID: 300 _h + Node-ID 29-bit: 0 _b reserved: manufacturer-specific valid: profile or manufacturer-specific
1402 _h	CAN-ID: 400 _h + Node-ID frame: 0 _b reserved: manufacturer-specific valid: profile- or manufacturer-specific

1403 _h	CAN-ID: 500 _h + Node-ID frame: 0 _b reserved: manufacturer-specific valid: profile- or manufacturer-specific
Index	Default value
1404 _h to 1407 _h	CAN-ID: profile- or manufacturer-specific (see clause 7.3.5) frame: profile- or manufacturer-specific reserved: manufacturer-specific valid: 1 _b or defined by application profile

If the CANopen device has implemented an application profile the specific pre-defined connection set of that application profile shall apply.

Sub-index 02_h defines the reception character of the RPDO (see Table 68). An attempt to change the value of the transmission type to any not supported value shall be responded with the SDO abort transfer service (abort code: 0609 0030_h).

Value	Description
00 _h	synchronous
.....
F0 _h	synchronous
F1 _h	reserved
.....
FD _h	reserved
FE _h	event-driven (device profile and application profile specific) Receive-PDOs will be evaluated immediately after receipt
FF _h	event-driven (device profile and application profile specific) Receive-PDOs will be evaluated immediately after receipt only if inhibit time is elapsed, else R-Pdo is discarded!

- Synchronous means that the CANopen device shall actuate the received data with the reception of the next SYNC (see Figure 68).
- Event-driven means that the PDO may be received at any time. The CANopen device will actualize the data immediately.

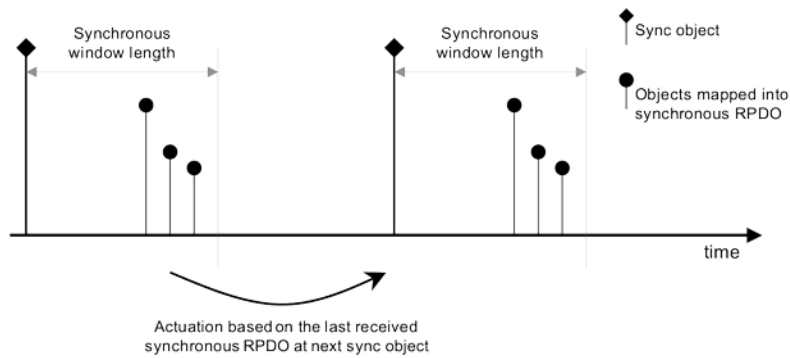


Figure: Bus synchronization and actuation

Sub-index 03_h contains the inhibit time. The value is defined as multiple of 100 μs. The value of 0 shall disable the inhibit time. It is not allowed to change the value while the PDO exists (bit 31 of sub-index 01_h is set to 0_b). The RPDO may use the time implementation specific.

Sub-index 04_h is reserved. It shall not be implemented; in this case read or write access leads to the SDO abort transfer service (abort code: 0609 0011_h).

Sub-index 05_h contains the event-timer. The value is defined as multiple of 1 ms. The value of 0 shall disable the event-timer. The RPDO may use the time for deadline monitoring. The deadline monitoring is activated within the next reception of an RPDO after configuring the event-timer. A timeout results in an indication to the local application.

Sub-index 06_h contains the SYNC start value. This is not used by RPDOs. It shall not be implemented; in this case read or write access shall lead to the SDO abort transfer service (abort code: 0609 0011_h).

OBJECT DESCRIPTION

Index	1400 _h to 1407 _h
Name	RPDO communication parameter
Object code	RECORD
Data type	PDO communication parameter record
Category	Conditional; Mandatory for each supported RPDO

ENTRY DESCRIPTION

Sub-index	00 _h
Description	highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	02 _h to 06 _h
Default value	No

Sub-index	01 _h
-----------	-----------------

Description	COB-ID used by RPDO
Entry category	Mandatory
Access	rw; const, if COB-ID is not changeable
PDO mapping	No
Value range	see value definition
Default value	see value definition

Sub-index	02 _h
Description	transmission type
Entry category	Mandatory
Access	rw; const, if transmission type is not changeable
PDO mapping	No
Value range	see value definition
Default value	Profile- or manufacturer specific

Sub-index	03 _h
Description	inhibit time
Entry category	Optional
Access	rw; const, if inhibit time is not changeable
PDO mapping	No
Value range	see value definition
Default value	Profile- or manufacturer specific

Sub-index	04 _h
Description	compatibility entry
Entry category	Optional
Access	rw

PDO mapping	No
Value range	UNSIGNED8
Default value	Manufacturer specific

Sub-index	05 _h
Description	event-timer
Entry category	Optional
Access	rw; const, if event timer is not changeable
PDO mapping	No
Value range	see value definition
Default value	Profile- or manufacturer specific

Sub-index	06 _h
Description	SYNC start value
Entry category	Optional
Access	rw const, if SYNC start value is not changeable
PDO mapping	No
Value range	UNSIGNED8
Default value	Profile- or manufacturer specific

IV.1.21 Object 1600_h to 1607_h: RPDO mapping parameter

This object contains the mapping parameters for the PDOs the CANopen device is able to receive.

VALUE DEFINITION

Sub-index 00_h contains the number of valid object entries within the mapping record or a specific value (see Table 69), e.g. if MPDO is supported. The number of valid object entries shall be the number of the application objects that shall be received with the corresponding RPDO.

Table: RPDO mapping values

Value	Description
00 _h	Mapping disabled
01 _h	Sub-index 01 _h valid
02 _h	Sub-index 01 _h and 02 _h valid
03 _h	Sub-index from 01 _h to 03 _h valid
04 _h	Sub-index from 01 _h to 04 _h valid
.....
40 _h	Sub-index from 01 _h to 40 _h valid
41 _h	reserved
.....
FD _h	reserved
FE _h	SAM-MPDO
FF _h	DAM-MPDO

Sub-index from 01_h to 40_h contains the information of the mapped application objects. The object describes the content of the PDO by their index, sub-index and length. The length contains the length of the application object in bit. This may be used to verify the mapping.

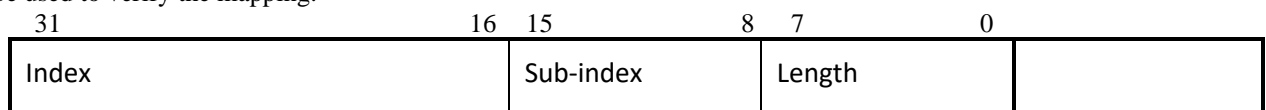


Figure: Structure of RPDO mapping

An attempt to change the value of an object entry to any value that is not supported shall be responded with the SDO abort transfer service. The cause for a not supported value could be the mapping (index and sub-index) of a non-existing application object, a wrong length for the mapped application object, or a wrong length for the PDO at all. The index and sub-index may reference a simple data type (see Table 44) for the so-called dummy mapping. This may be used if no appropriate application object is available and to fill up the length of the RPDO to fit the length to the according TPDO.

The following procedure shall be used for re-mapping, which may take place during the NMT state Pre-operational and during the NMT state Operational, if supported:

1. Destroy RPDO by setting bit *valid* to 1_b of sub-index 01_h of the according RPDO communication parameter.
2. Disable mapping by setting sub-index 00_h to 00_h.
3. Modify mapping by changing the values of the corresponding sub-indices.
4. Enable mapping by setting sub-index 00_h to the number of mapped objects.
5. Create RPDO by setting bit *valid* to 0_b of sub-index 01_h of the according RPDO communication parameter.

If during step 3 the CANopen device detects that index and sub-index of the mapped object does not exist or the object cannot be mapped the CANopen device shall respond with the SDO abort transfer service (abort code: 0602 0000_h or 0604 0041_h).

If during step 4 the CANopen device detects that the RPDO mapping is not valid or not possible the CANopen device shall respond with the SDO abort transfer service (abort code: 0602 0000_h or 0604 0042_h).

If the CANopen device receives a PDO that is having more data bytes than the number of mapped data bytes is (length), then the CANopen device shall use the first data bytes up to the length and may be initiate the EMCY write service, if supported.

If a CANopen device receives a PDO that is having less data bytes than the number of mapped data bytes (length), then the CANopen device shall initiate the EMCY write service, if supported, with the error code 8210_h.

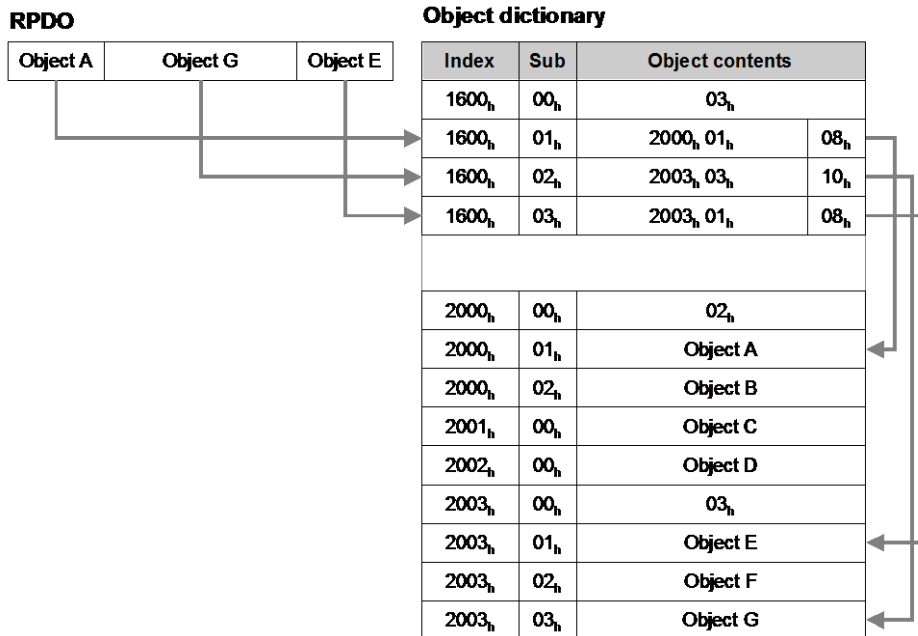


Figure: Principle of RPDO mapping

OBJECT DESCRIPTION

Index	1600 _h to 1607 _h
Name	RPDO mapping parameter
Object code	RECORD
Data type	PDO mapping parameter record
Category	Conditional; Mandatory for each supported PDO

ENTRY DESCRIPTION

Sub-index	00 _h
Description	number of mapped application objects in PDO
Entry category	Mandatory
Access	rw; const, if mapping is not changeable
PDO mapping	No
Value range	see value definition

Default value	profile- or manufacturer-specific
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Sub-index	01 _h
Description	1 st application object
Entry category	Mandatory
Access	rw; const, if mapping entry is not changeable
PDO mapping	No
Value range	see value definition
Default value	profile- or manufacturer-specific

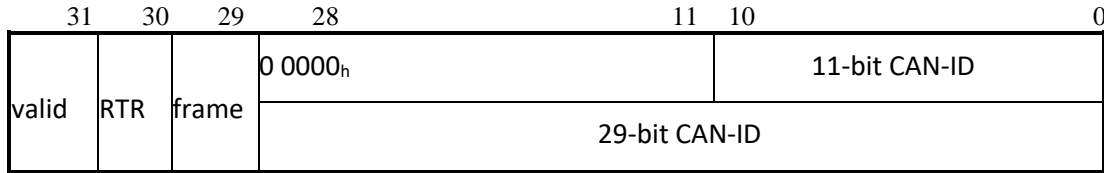
Sub-index	02 _h to 08 _h
Description	2 nd application object to 8 th application object
Entry category	Optional
Access	rw; const, if mapping entry is not changeable
PDO mapping	No
Value range	see value definition
Default value	profile- or manufacturer-specific

IV.1.22 Object 1800_h to 1807_h TPDO communication parameter

This object contains the communication parameters for the PDOs the CANopen device is able to transmit.

VALUE DEFINITION

Sub-index 00_h contains the number of valid object entries within the record. Its value is at least 02_h. If inhibit time supported the value is 03_h and if event timer is supported the value is 05_h. Sub-index 01_h contains the COB-ID of the TPDO.



Bit(s)	Value	Description
valid	0 _b	PDO exists / is valid
	1 _b	PDO does not exist / is not valid
RTR	0 _b	RTR allowed on this PDO
	1 _b	no RTR allowed on this PDO
frame	0 _b	11-bit CAN-ID valid (CAN base frame)
	1 _b	29-bit CAN-ID valid (CAN extended frame)
29-bit CAN-ID	x	29-bit CAN-ID of the CAN extended frame
11-bit CAN-ID	x	11-bit CAN-ID of the CAN base frame

The bit valid (bit 31) allows selecting which TPDOs are used in the NMT state Operational. There may be PDOs fully configured (e.g. by default) but not used, and therefore set to "not valid" (deleted). The feature is necessary for CANopen devices supporting more than 4 TPDOs, because each CANopen device has only default CAN-IDs for the first four TPDOs in the generic pre-defined connection set. CANopen devices supporting the CAN base frame type only or do not support RTRs, an attempt to set bit 29 (frame) to 1_b or bit 30 (RTR) to 0_b is responded with the SDO abort transfer service (abort code: 0609 0030_h). It is not allowed to change bit from 0 to 29 while the PDO exists and is valid (bit 31 = 0_b). CANopen devices supporting the enabling (bit 31 = 0_b) and disabling (bit 31 = 1_b) of a TPDO only shall respond with the SDO abort transfer service (abort code: 0609 0030_h or 0800 000_h) on an attempt to change the values from bit 0 to bit 30.

If the CANopen device has implemented one or more device profiles the generic pre-defined connection set shall apply.

Table: Generic pre-defined connection set for TPDO

Index	Default value
1800 _h	CAN-ID: 180 _h + Node-ID frame: 0 _b RTR: profile- or manufacturer-specific valid: profile- or manufacturer-specific
1801 _h	CAN-ID: 280 _h + Node-ID frame: 0 _b RTR: profile- or manufacturer-specific valid: profile- or manufacturer-specific

1802 _h	CAN-ID: 380 _h + Node-ID frame: 0 _b RTR: profile- or manufacturer-specific valid: profile- or manufacturer-specific
Index	Default value
1803 _h	CAN-ID: 480 _h + Node-ID frame: 0 _b RTR: profile- or manufacturer-specific valid: profile- or manufacturer-specific
1804 _h to 1807 _h	CAN-ID: profile- or manufacturer-specific (see clause 7.3.5) to frame: profile- or manufacturer-specific RTR: profile- or manufacturer-specific valid: 1 _b or defined by application profile

If the CANopen device has implemented an application profile the specific pre-defined connection set of that application profile shall apply.

Sub-index 02_h defines the transmission character of the TPDO (see Table 72). An attempt to change the value of the transmission type to any not supported value shall be responded with the SDO abort transfer service (abort code: 0609 0030_h).

Table: Description of TPDO transmission type

Value	Description
00 _h	synchronous (acyclic)
01 _h	synchronous (cyclic every sync)
02 _h	synchronous (cyclic every 2 nd SYNC)
03 _h	synchronous (cyclic every 3 rd SYNC)
04 _h	synchronous (cyclic every 4 th SYNC)
.....
F0 _h	synchronous (cyclic every 240 th SYNC)
F1 _h	reserved
.....
FB _h	reserved
FC _h	RTR-only (synchronous)
FD _h	RTR-only (event-driven)
FE _h	Always (if inhibit time elapsed)
FF _h	On data change (if inhibit time elapsed)

- Synchronous means that the PDO is transmitted after the SYNC. The CANopen device will start sampling of the data with the reception of the SYNC (see Figure 72). In case it is acyclic the CANopen device internal event is given and with the next SYNC the sampling is started and the PDO is transmitted afterwards. In case it

is cyclic the sampling is started with the reception of every SYNC, every 2nd SYNC, every 3rd SYNC, and s.o. depending on the given value and the PDO is transmitted afterwards.

- RTR-only means that the PDO is not transmitted normally it shall be requested via RTR. In case it is synchronous the CANopen device will start sampling with the reception of every SYNC and then will buffer the PDO (see Figure 72). In case it is event-driven the CANopen device will start sampling with the reception of the RTR and will transmit the PDO immediately.
- Event-driven means that the PDO may be transmitted at any time based on the occurrence of a CANopen device internal event. The definition of the event does not fall into the scope of this specification and may be specified in device profiles and application profiles.

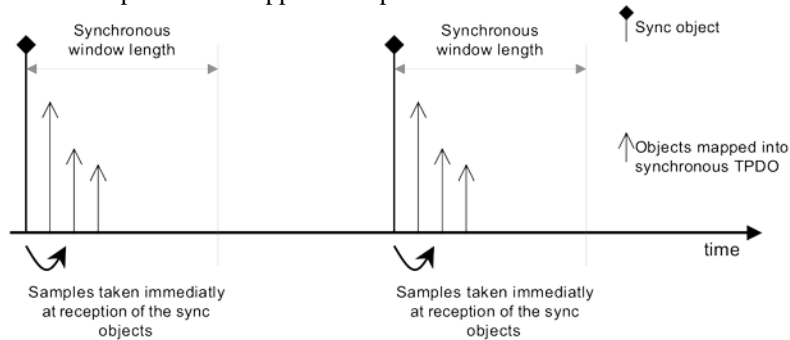


Figure: Bus synchronization and sampling

Sub-index 03_h contains the inhibit time. The time is the minimum interval for PDO transmission if the transmission type is set to FE_h and FF_h. The value is defined as multiple of 100 μs. The value of 0 shall disable the inhibit time. The value shall not be changed while the PDO exists (bit 31 of sub-index 01_h is set to 0_b).

Sub-index 04_h is reserved. It does shall not be implemented; in this case read or write access leads to the SDO abort transfer service (abort code: 0609 0011_h).

Sub-index 05_h contains the event-timer. The time is the maximum interval for PDO transmission if the transmission type is set to FE_h and FF_h. The value is defined as multiple of 1 ms. The value of 0 shall disable the event-timer.

Sub-index 06_h contains the SYNC start value. The SYNC start value of 0 shall indicate that the counter of the SYNC message shall not be processed for this PDO. The SYNC start value 1 to 240 shall indicate that the counter of the SYNC message shall be processed for this PDO. In case the counter of the SYNC message is not enabled sub-index 06_h shall be ignored. The SYNC message of which the counter value equals the SYNC start value shall be regarded as the first received SYNC message. The value shall not be changed while the PDO exists (bit 31 of sub-index 01_h is set to 0_b).

NOTE if the CANopen device detects on switch into the NMT state operational that the SYNC counter value received is higher than the SYNC start value, then the CANopen device has to wait a full cycle until the correct SYNC counter is received.

OBJECT DESCRIPTION

Index	1800 _h to 1807 _h
Name	TPDO communication parameter
Object code	RECORD
Data type	PDO communication parameter record
Category	Conditional; Mandatory for each supported TPDO

ENTRY DESCRIPTION

Sub-index	00 _h
Description	highest sub-index supported

Entry category	Mandatory
Access	const
PDO mapping	No
Value range	02 _h to 05 _h

Sub-index	01 _h
Description	COB-ID used by TPDO
Entry category	Mandatory
Access	rw; const, if COB-ID is not changeable
PDO mapping	No
Value range	see value definition
Default value	see value definition

Sub-index	02 _h
Description	transmission type
Entry category	Mandatory
Access	rw; const, if transmission type is not changeable
PDO mapping	No
Value range	see value definition
Default value	profile- or manufacturer-specific

Sub-index	03 _h
Description	inhibit time
Entry category	Optional
Access	rw; const, if inhibit time is not changeable
PDO mapping	No
Value range	see value definition

Default value	profile- or manufacturer-specific
---------------	-----------------------------------

Sub-index	04 _h
Description	reserved
Entry category	Optional
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	manufacturer-specific

Sub-index	05 _h
Description	event timer
Entry category	Optional
Access	rw; const, if event timer is not changeable
PDO mapping	No
Value range	see value definition
Default value	profile- or manufacturer-specific

Sub-index	06 _h
Description	SYNC start value
Entry category	Optional
Access	rw; const, if SYNC start value is not changeable
PDO mapping	No
Value range	UNSIGNED8
Default value	profile- or manufacturer-specific

IV.1.23 Object 1A00_h to 1A07_h TPDO mapping parameter

This object contains the mapping for the PDOs the device is able to transmit.

VALUE DEFINITION

Sub-index 00_h contains the number of valid object entries within the mapping record or a specific value, e.g. if MPDO is supported. The number of valid object entries shall be the number of the application objects that shall be transmitted with the corresponding TPDO.

Table: TPDO mapping values

Value	Description
00 _h	Mapping disabled
01 _h	Sub-index 01 _h valid
02 _h	Sub-index 01 _h and 02 _h valid
03 _h	Sub-index from 01 _h to 03 _h valid
Value	Description
04 _h	Sub-index from 01 _h to 04 _h valid
.....
40 _h	Sub-index from 01 _h to 40 _h valid
41 _h	reserved
.....
FD _h	reserved
FE _h	SAM-MPDO
FF _h	DAM-MPDO

Sub-index from 01_h to 40_h contains the information of the mapped application objects. The object describes the content of the PDO by their index, sub-index and length. The length contains the length of the application object in bit. This may be used to verify the mapping.

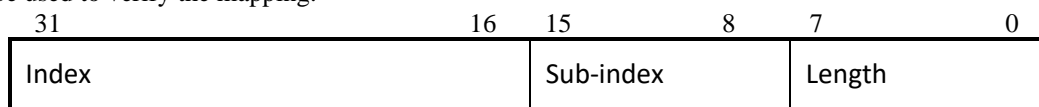


Figure: Structure of TPDO mapping

An attempt to change the value of an object entry to any value that is not supported shall be responded with the SDO abort transfer service. The cause for a not supported value could be the mapping (index and sub-index) of a non-existing application object, a wrong length for the mapped application object, or a wrong length for the PDO at all.

The following procedure shall be used for re-mapping, which may take place during the NMT state Pre-operational and during the NMT state Operational, if supported:

1. Destroy TPDO by setting bit *valid* to 1_b of sub-index 01_h of the according TPDO communication parameter.
2. Disable mapping by setting sub-index 00_h to 00_h.
3. Modify mapping by changing the values of the corresponding sub-indices.
4. Enable mapping by setting sub-index 00_h to the number mapped objects.
5. Create TPDO by setting bit *valid* to 0_b of sub-index 01_h of the according TPDO communication parameter.

If during step 3 the CANopen device detects that index and sub-index of the mapped object does not exist or the object cannot be mapped the CANopen device shall respond with the SDO abort transfer service (abort code: 0602 0000_h or 0604 0041_h).

If during step 4 the CANopen device detects that the RPDO mapping is not valid or not possible the CANopen device shall respond with the SDO abort transfer service (abort code: 0602 0000_h or 0604 0042_h).

Object dictionary

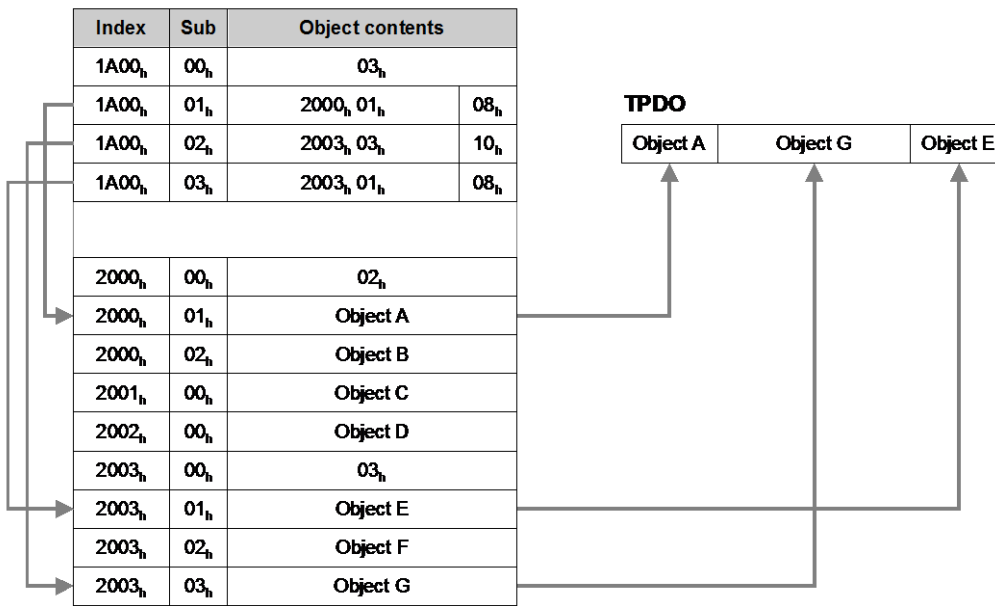


Figure: Principle of TPDO mapping

OBJECT DESCRIPTION

Index	1A00 _h to 1A07 _h
Name	TPDO mapping
Object code	RECORD
Data type	PDO mapping parameter record
Category	Conditional; Mandatory for each supported PDO

ENTRY DESCRIPTION

Sub-index	00 _h
Description	number of mapped application objects in TPDO
Entry category	Mandatory
Access	rw; const, if PDO mapping is not changeable
PDO mapping	No
Value range	see value definition
Default value	profile- or manufacturer-specific

Sub-index	01 _h
-----------	-----------------

Description	1 st application object
Entry category	Mandatory
Access	rw; const, if PDO mapping entry is not changeable
PDO mapping	No
Value range	see value definition
Default value	profile- or manufacturer-specific

Sub-index	02 _h to 08 _h
Description	2 nd application object to 08 th application object
Entry category	Optional
Access	rw; const, if PDO mapping entry is not changeable
PDO mapping	No
Value range	see value definition
Default value	profile- or manufacturer-specific

IV.1.24 Object 6000_h: Read input 8-bit

This object read groups of 8 input lines as 8-bit information.

Object description

Attribute	Value
Index	6000 _h
Name	Read input 8 bit
Object Code	Array
Data Type	Unsigned8
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 8-bit
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Read input 1 to 8
Access	ro
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	02 _h
Description	Read input 9 to 16
Access	ro
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	03 _h
Description	Read input 17 to 24
Access	ro
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No

IV.1.25 Object 6002_h: Polarity input 8-bit

This object defines the polarity of a groups of 8 input lines. Input polarity can be inverted individually.
 1 = input inverted, 0 = input not inverted

Object description

Attribute	Value
Index	6002 _h
Name	Polarity input 8 bit
Object Code	Array
Data Type	Unsigned8
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 8-bit
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Polarity input 1 to 8
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	00 _h
Sub-Index	02 _h
Description	Polarity input 9 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	00 _h
Sub-Index	03 _h
Description	Polarity input 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	00 _h

IV.1.26 Object 6003_h: Filter constant input 8-bit

This object enables and disable an additional configurable filter constant. The filter constant is defined with the object 2000_h

1 = enabled, 0 = disabled

Object description

Attribute	Value
Index	6003 _h
Name	Filter constant input 8 bit
Object Code	Array
Data Type	Unsigned8
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 8-bit
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Filter constant input 1 to 8
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	00 _h
Sub-Index	02 _h
Description	Filter constant input 9 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	00 _h
Sub-Index	03 _h
Description	Filter constant input 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	00 _h

IV.1.27 Object 6005_h: Global interrupt enable

This object enables and disable globally the interrupt behaviour without changing the interrupt masks. In event-driven mode the device transmits the input value depending on the interrupt masks in objects 6006_h, 6007_h, 6008_h and the PDO transmission type (0xFF/ 0xFE)

1 = global interrupt enabled, 0 = global interrupt disabled

Object description

Attribute	Value
Index	6005 _h
Name	Global interrupt enable
Object Code	Array
Data Type	Boolean
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Access	rw
PDO Mapping	No
Value Range	Boolean
Default Value	TRUE

IV.1.28 Object 6006_h: Interrupt mask any change 8-bit

This object determines, which input port lines shall activate an interrupt by positive or/and negative edge detection.
 1 = enabled, 0 = disabled

Object description

Attribute	Value
Index	6006 _h
Name	Interrupt mask any change 8 bit
Object Code	Array
Data Type	Unsigned8
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 8-bit
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Interrupt any change 1 to 8
Access	rw
PDO Mapping	No
Value Range	Unsigned8
Default Value	FF _h
Sub-Index	02 _h
Description	Interrupt any change 9 to 16
Access	rw
PDO Mapping	No
Value Range	Unsigned8
Default Value	FF _h
Sub-Index	03 _h
Description	Interrupt any change 17 to 24
Access	rw
PDO Mapping	No
Value Range	Unsigned8
Default Value	FF _h

IV.1.29 Object 6007_h: Interrupt mask low-to-high 8-bit

This object determines, which input port lines shall activate an interrupt by positive edge detection. Done for groups of 8 lines. The value is in an “OR” connection to the values of 6006_h Object (Interrupt mask any change 8-bit). If inputs are inverted by 6002_h Object (polarity input 8-bit), the positive logical edge correspond to the negative physical edge.

1 = interrupt enabled, 0 = interrupt disabled

Object description

Attribute	Value
Index	6007 _h
Name	Interrupt mask low-to-high 8 bit
Object Code	Array
Data Type	Unsigned8
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 8-bit
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Interrupt low-to-high 1 to 8
Access	rw
PDO Mapping	No
Value Range	Unsigned8
Default Value	00 _h
Sub-Index	02 _h
Description	Interrupt low-to-high 9 to 16
Access	rw
PDO Mapping	No
Value Range	Unsigned8
Default Value	00 _h
Sub-Index	03 _h
Description	Interrupt low-to-high 17 to 24
Access	rw
PDO Mapping	No
Value Range	Unsigned8
Default Value	00 _h

IV.1.30 Object 6008_h: Interrupt mask high-to-low 8-bit

This object determines, which input port lines shall activate an interrupt by negative edge detection. Done for groups of 8 lines. The value is in an “OR” connection to the values of 6006_h Object (Interrupt mask any change 8-bit). If inputs are inverted by 6002_h Object (polarity input 8-bit), the negative logical edge correspond to the positive physical edge.

1 = interrupt enabled, 0 = interrupt disabled

Object description

Attribute	Value
Index	6008 _h
Name	Interrupt mask high-to-low 8 bit
Object Code	Array
Data Type	Unsigned8
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 8-bit
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Interrupt mask high-to-low 1 to 8
Access	rw
PDO Mapping	No
Value Range	Unsigned8
Default Value	00 _h
Sub-Index	02 _h
Description	Interrupt mask high-to-low 9 to 16
Access	rw
PDO Mapping	No
Value Range	Unsigned8
Default Value	00 _h
Sub-Index	03 _h
Description	Interrupt mask high-to-low 17 to 24
Access	rw
PDO Mapping	No
Value Range	Unsigned8
Default Value	00 _h

IV.1.31 Object 6100_h: Read input 16-bit

This object read groups of 16 input lines as 16-bit information.
The modification of 16 bits objects also impacts the 8 bits objects and vice-versa.

Object description

Attribute	Value
Index	6100 _h
Name	Read input 16 bit
Object Code	Array
Data Type	Unsigned16
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Read input 1 to 16
Access	ro
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No
Sub-Index	02 _h
Description	Read input 17 to 24 (LSB)
Access	ro
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No

IV.1.32 Object 6102_h: Polarity input 16-bit

This object defines the polarity of a groups of 16 input lines. Input polarity can be inverted individually. The modification of 16 bits objects also impacts the 8 bits objects and vice-versa.

1 = input inverted, 0 = input not inverted

Object description

Attribute	Value
Index	6102 _h
Name	Polarity input 16 bit
Object Code	Array
Data Type	Unsigned16
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Polarity input 1 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	00 _h
Sub-Index	02 _h
Description	Polarity input 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	00 _h

IV.1.33 Object 6103_h: Filter constant input 16-bit

This object enables and disable an additional configurable filter constant. The filter constant is defined with the object 2000_h

The modification of 16 bits objects also impacts the 8 bits objects and vice-versa.

1 = enabled, 0 = disabled

Object description

Attribute	Value
Index	6103 _h
Name	Filter constant input 16 bit
Object Code	Array
Data Type	Unsigned16
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Filter constant input 1 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	00 _h
Sub-Index	02 _h
Description	Filter constant input 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	00 _h

IV.1.34 Object 6106_h: Interrupt mask any change 16-bit

This object determines, which input port lines shall activate an interrupt by positive or/and negative edge detection. The modification of 16 bits objects also impacts the 8 bits objects and vice-versa.

1 = enabled, 0 = disabled

Object description

Attribute	Value
Index	6106 _h
Name	Interrupt mask any change 16 bit
Object Code	Array
Data Type	Unsigned16
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Interrupt any change 1 to 16
Access	rw
PDO Mapping	No
Value Range	Unsigned16
Default Value	FF _h
Sub-Index	02 _h
Description	Interrupt any change 17 to 24
Access	rw
PDO Mapping	No
Value Range	Unsigned16
Default Value	FF _h

IV.1.35 Object 6107_h: Interrupt mask low-to-high 16-bit

This object determines, which input port lines shall activate an interrupt by positive edge detection. Done for groups of 16 lines. The value is in an “OR” connection to the values of 6106_h Object (Interrupt mask any change 16-bit). If inputs are inverted by 6102_h Object (polarity input 16-bit), the positive logical edge correspond to the negative physical edge. The modification of 16 bits objects also impacts the 8 bits objects and vice-versa.

1 = interrupt enabled, 0 = interrupt disabled

Object description

Attribute	Value
Index	6107 _h
Name	Interrupt mask low-to-high 16 bit
Object Code	Array
Data Type	Unsigned16
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Interrupt low-to-high 1 to 16
Access	rw
PDO Mapping	No
Value Range	Unsigned16
Default Value	00 _h
Sub-Index	02 _h
Description	Interrupt low-to-high 17 to 24
Access	rw
PDO Mapping	No
Value Range	Unsigned16
Default Value	00 _h

IV.1.36 Object 6108_h: Interrupt mask high-to-low 16-bit

This object determines, which input port lines shall activate an interrupt by negative edge detection. Done for groups of 16 lines. The value is in an “OR” connection to the values of 6106_h Object (Interrupt mask any change 16-bit). If inputs are inverted by 6102_h Object (polarity input 16-bit), the negative logical edge correspond to the positive physical edge. The modification of 16 bits objects also impacts the 8 bits objects and vice-versa.

1 = interrupt enabled, 0 = interrupt disabled

Object description

Attribute	Value
Index	6108 _h
Name	Interrupt mask high-to-low 16 bit
Object Code	Array
Data Type	Unsigned16
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Interrupt mask high-to-low 1 to 16
Access	rw
PDO Mapping	No
Value Range	Unsigned16
Default Value	00 _h
Sub-Index	02 _h
Description	Interrupt mask high-to-low 17 to 24
Access	rw
PDO Mapping	No
Value Range	Unsigned16
Default Value	00 _h

IV.1.37 Object 6120_h: Read input 32-bit

This object read groups of 32 input lines as 32-bit information.
The modification of 32 bits objects also impacts the 8 bits objects and vice-versa.

Object description

Attribute	Value
Index	6120 _h
Name	Read input 32 bit
Object Code	Array
Data Type	Unsigned32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 32-bit
Access	ro
PDO Mapping	No
Value Range	1
Default Value	1
Sub-Index	01 _h
Description	Read input 1 to 24
Access	ro
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	No

IV.1.38 Object 6122_h: Polarity input 32-bit

This object defines the polarity of a groups of 32 input lines. Input polarity can be inverted individually. The modification of 32 bits objects also impacts the 8 bits objects and vice-versa.

1 = input inverted, 0 = input not inverted

Object description

Attribute	Value
Index	6122 _h
Name	Polarity input 32 bit
Object Code	Array
Data Type	Unsigned32
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 32-bit
Access	ro
PDO Mapping	No
Value Range	1
Default Value	1
Sub-Index	01 _h
Description	Polarity input 1 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	00 _h

IV.1.39 Object 6123_h: Filter constant input 32-bit

This object enables and disable an additional configurable filter constant. The filter constant is defined with the object 2000_h

The modification of 32 bits objects also impacts the 8 bits objects and vice-versa.

1 = enabled, 0 = disabled

Object description

Attribute	Value
Index	6123 _h
Name	Filter constant input 32 bit
Object Code	Array
Data Type	Unsigned32
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 32-bit
Access	ro
PDO Mapping	No
Value Range	1
Default Value	1
Sub-Index	01 _h
Description	Filter constant input 1 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	00 _h

IV.1.40 Object 6126_h: Interrupt mask any change 32-bit

This object determines, which input port lines shall activate an interrupt by positive or/and negative edge detection. The modification of 32 bits objects also impacts the 8 bits objects and vice-versa.

1 = enabled, 0 = disabled

Object description

Attribute	Value
Index	6126 _h
Name	Interrupt mask any change 32 bit
Object Code	Array
Data Type	Unsigned32
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 32-bit
Access	ro
PDO Mapping	No
Value Range	1
Default Value	1
Sub-Index	01 _h
Description	Interrupt any change 1 to 24
Access	rw
PDO Mapping	No
Value Range	Unsigned32
Default Value	FF _h

IV.1.41 Object 6127_h: Interrupt mask low-to-high 32-bit

This object determines, which input port lines shall activate an interrupt by positive edge detection. Done for groups of 32 lines. The value is in an “OR” connection to the values of 6126_h Object (Interrupt mask any change 32-bit). If inputs are inverted by 6122_h Object (polarity input 32-bit), the positive logical edge correspond to the negative physical edge. The modification of 32 bits objects also impacts the 8 bits objects and vice-versa.

1 = interrupt enabled, 0 = interrupt disabled

Object description

Attribute	Value
Index	6127 _h
Name	Interrupt mask low-to-high 32 bit
Object Code	Array
Data Type	Unsigned32
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 32-bit
Access	ro
PDO Mapping	No
Value Range	1
Default Value	1
Sub-Index	01 _h
Description	Interrupt low-to-high 1 to 24
Access	rw
PDO Mapping	No
Value Range	Unsigned32
Default Value	00 _h

IV.1.42 Object 6128_h: Interrupt mask high-to-low 32-bit

This object determines, which input port lines shall activate an interrupt by negative edge detection. Done for groups of 32 lines. The value is in an “OR” connection to the values of 6126_h Object (Interrupt mask any change 32-bit). If inputs are inverted by 6122_h Object (polarity input 32-bit), the negative logical edge correspond to the positive physical edge. The modification of 32 bits objects also impacts the 8 bits objects and vice-versa.

1 = interrupt enabled, 0 = interrupt disabled

Object description

Attribute	Value
Index	6128 _h
Name	Interrupt mask high-to-low 32 bit
Object Code	Array
Data Type	Unsigned32
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 32-bit
Access	ro
PDO Mapping	No
Value Range	1
Default Value	1
Sub-Index	01 _h
Description	Interrupt mask high-to-low 1 to 24
Access	rw
PDO Mapping	No
Value Range	Unsigned32
Default Value	00 _h

IV.1.43 Object 6200_h: Write output 8-bit

This object set a group of 8 output lines as 8-bit information.

Object description

Attribute	Value
Index	6200 _h
Name	Write output 8 bit
Object Code	Array
Data Type	Unsigned8
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 8-bit
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Write output 1 to 8
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	02 _h
Description	Write output 9 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	03 _h
Description	Write output 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No

IV.1.44 Object 6202_h: Change polarity output 8-bit

This object defines the polarity of a group of 8 output lines as 8-bit information. Output polarity can be inverted individually.

1 = output inverted 0 = output not inverted

Object description

Attribute	Value
Index	6202 _h
Name	Change polarity output 8 bit
Object Code	Array
Data Type	Unsigned8
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 8-bit
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Change polarity output 1 to 8
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	02 _h
Description	Change polarity output 9 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	03 _h
Description	Change polarity output 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No

IV.1.45 Object 6206_h: Error mode output 8-bit

This object indicates, whether an output is set to a pre-defined error value (see 6207_h object) in case of an internal device failure or a “Stop Remote Node” indication.

1 = output value takes the pre-defined condition specified in 6207_h object.

0 = output value is kept if an error occurs.

Object description

Attribute	Value
Index	6206 _h
Name	Error mode output 8 bit
Object Code	Array
Data Type	Unsigned8
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 8-bit
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Error mode output 1 to 8
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	02 _h
Description	Error mode output 9 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	03 _h
Description	Error mode output 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No

IV.1.46 Object 6207_h: Error value output 8-bit

On condition that corresponding Error mode is active, devices failures set the outputs to the value configured by this object.

0 = output is set to '0' in case of fault, if 6206_h object is enabled

1 = output is set to '1' in case of fault, if 6206_h object is enabled

Object description

Attribute	Value
Index	6207 _h
Name	Error value output 8 bit
Object Code	Array
Data Type	Unsigned8
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 8-bit
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Error value output 1 to 8
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	02 _h
Description	Error value output 9 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	03 _h
Description	Error value output 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No

IV.1.47 Object 6208_h: Filter mask output 8-bit

This object defines an additional configurable output filter mask for a group of 8 outputs.

1 = output shall be set to the received output value

0 = don't care, the received output value is neglected for the appropriated output channel, the old output value shall be kept.

Object description

Attribute	Value
Index	6208 _h
Name	Filter mask output 8 bit
Object Code	Array
Data Type	Unsigned8
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 8-bit
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Filter mask output 1 to 8
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	02 _h
Description	Filter mask output 9 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No
Sub-Index	03 _h
Description	Filter mask output 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	No

IV.1.48 Object 6300_h: Write output 16-bit

This object set a group of 16 output lines as 16-bit information.
The modification of 16 bits objects also impacts the 8 bits objects and vice-versa.

Object description

Attribute	Value
Index	6300 _h
Name	Write output 16 bit
Object Code	Array
Data Type	Unsigned16
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Write output 1 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No
Sub-Index	02 _h
Description	Write output 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No

IV.1.49 Object 6302_h: Change polarity output 16-bit

This object defines the polarity of a group of 16 output lines as 16-bit information. Output polarity can be inverted individually.

The modification of 16 bits objects also impacts the 8 bits objects and vice-versa.

1 = output inverted 0 = output not inverted

Object description

Attribute	Value
Index	6302 _h
Name	Change polarity output 16 bit
Object Code	Array
Data Type	Unsigned16
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Change polarity output 1 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No
Sub-Index	02 _h
Description	Change polarity output 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No

IV.1.50 Object 6306_h: Error mode output 16-bit

This object indicates, whether an output is set to a pre-defined error value (see 6307_h object) in case of an internal device failure or a “Stop Remote Node” indication.

The modification of 16 bits objects also impacts the 8 bits objects and vice-versa.

1 = output value takes the pre-defined condition specified in 6307_h object.

0 = output value is kept if an error occurs.

Object description

Attribute	Value
Index	6306 _h
Name	Error mode output 16 bit
Object Code	Array
Data Type	Unsigned8
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Error mode output 1 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No
Sub-Index	02 _h
Description	Error mode output 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No

IV.1.51 Object 6307_h: Error value output 16-bit

On condition that corresponding Error mode is active, devices failures set the outputs to the value configured by this object.

The modification of 16 bits objects also impacts the 8 bits objects and vice-versa.

0 = output is set to '0' in case of fault, if 6306_h object is enabled

1 = output is set to '1' in case of fault, if 6306_h object is enabled

Object description

Attribute	Value
Index	6307 _h
Name	Error value output 16 bit
Object Code	Array
Data Type	Unsigned16
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Error value output 1 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No
Sub-Index	02 _h
Description	Error value output 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No

IV.1.52 Object 6308_h: Filter mask output 16-bit

This object defines an additional configurable output filter mask for a group of 16 outputs. The modification of 16 bits objects also impacts the 8 bits objects and vice-versa.

1 = output shall be set to the received output value

0 = don't care, the received output value is neglected for the appropriated output channel, the old output value shall be kept.

Object description

Attribute	Value
Index	6308 _h
Name	Filter mask output 16 bit
Object Code	Array
Data Type	Unsigned16
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Filter mask output 1 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No
Sub-Index	02 _h
Description	Filter mask output 17 to 24
Access	rw
PDO Mapping	Yes
Value Range	Unsigned16
Default Value	No

IV.1.53 Object 6320_h: Write output 32-bit

This object set a group of 32 output lines as 32-bit information.
The modification of 32 bits objects also impacts the 8 bits objects and vice-versa.

Object description

Attribute	Value
Index	6320 _h
Name	Write output 32 bit
Object Code	Array
Data Type	Unsigned32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 32-bit
Access	ro
PDO Mapping	No
Value Range	1
Default Value	1
Sub-Index	01 _h
Description	Write output 1 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	No

IV.1.54 Object 6322_h: Change polarity output 32-bit

This object defines the polarity of a group of 32 output lines as 32-bit information. Output polarity can be inverted individually.

The modification of 32 bits objects also impacts the 8 bits objects and vice-versa.

1 = output inverted 0 = output not inverted

Object description

Attribute	Value
Index	6322 _h
Name	Change polarity output 16 bit
Object Code	Array
Data Type	Unsigned32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 32-bit
Access	ro
PDO Mapping	No
Value Range	1
Default Value	1
Sub-Index	01 _h
Description	Change polarity output 1 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	No

IV.1.55 Object 6326_h: Error mode output 32-bit

This object indicates, whether an output is set to a pre-defined error value (see 6327_h object) in case of an internal device failure or a “Stop Remote Node” indication.

The modification of 32 bits objects also impacts the 8 bits objects and vice-versa.

1 = output value takes the pre-defined condition specified in 6327_h object.

0 = output value is kept if an error occurs.

Object description

Attribute	Value
Index	6326 _h
Name	Error mode output 32 bit
Object Code	Array
Data Type	Unsigned32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 32-bit
Access	ro
PDO Mapping	No
Value Range	1
Default Value	1
Sub-Index	01 _h
Description	Error mode output 1 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	No

IV.1.56 Object 6327_h: Error value output 32-bit

On condition that corresponding Error mode is active, devices failures set the outputs to the value configured by this object.

The modification of 32 bits objects also impacts the 8 bits objects and vice-versa.

0 = output is set to '0' in case of fault, if 6326_h object is enabled

1 = output is set to '1' in case of fault, if 6326_h object is enabled

Object description

Attribute	Value
Index	6327 _h
Name	Error value output 32 bit
Object Code	Array
Data Type	Unsigned32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 32-bit
Access	ro
PDO Mapping	No
Value Range	1
Default Value	1
Sub-Index	01 _h
Description	Error value output 1 to 16
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	No

IV.1.57 Object 6328_h: Filter mask output 32-bit

This object defines an additional configurable output filter mask for a group of 32 outputs.
 The modification of 32 bits objects also impacts the 8 bits objects and vice-versa.

1 = output shall be set to the received output value

0 = don't care, the received output value us neglected for the appropriated output channel, the old output value shall be kept.

Object description

Attribute	Value
Index	6328 _h
Name	Filter mask output 32 bit
Object Code	Array
Data Type	Unsigned16
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of inputs 32-bit
Access	ro
PDO Mapping	No
Value Range	1
Default Value	1
Sub-Index	01 _h
Description	Filter mask output 1 to 32
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	No

IV.1.58 Object 6401_h: Read analogue input 16-bit

This object read the value of the input channel 'n'. Value is 16-bit wide.

Object description

Attribute	Value
Index	6401 _h
Name	Read analogue input 16-bit
Object Code	Array
Data Type	Integer16
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue inputs 16-bit
Access	ro
PDO Mapping	No
Value Range	4
Default Value	4
Sub-Index	01 _h
Description	Analogue input 1
Access	ro
PDO Mapping	Yes
Value Range	Integer16
Default Value	No
Sub-Index	02 _h
Description	Analogue input 2
Access	ro
PDO Mapping	Yes
Value Range	Integer16
Default Value	No
Sub-Index	03 _h
Description	Analogue input 3
Access	ro
PDO Mapping	Yes
Value Range	Integer16
Default Value	No
Sub-Index	04 _h
Description	Analogue input 4
Access	ro
PDO Mapping	Yes
Value Range	Integer16
Default Value	No

IV.1.59 Object 6411_h: Write analogue output 16-bit

This object writes an integer16 value to the output channel 'n'.

Object description

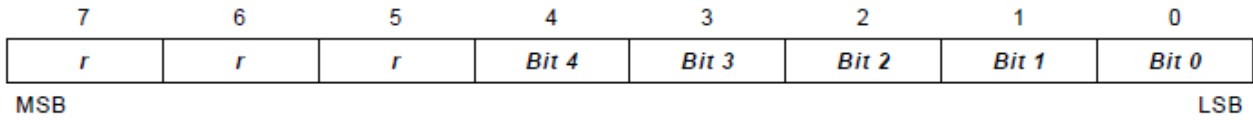
Attribute	Value
Index	6411 _h
Name	Write analogue output 16-bit
Object Code	Array
Data Type	Integer16
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue outputs 16-bit
Access	ro
PDO Mapping	No
Value Range	2
Default Value	2
Sub-Index	01 _h
Description	Analogue output 1
Access	rw
PDO Mapping	Yes
Value Range	Integer16
Default Value	No
Sub-Index	02 _h
Description	Analogue output 2
Access	rw
PDO Mapping	Yes
Value Range	Integer16
Default Value	No

IV.1.60 Object 6421_h: Analogue input interrupt trigger selection

This object determines, which events shall cause an interrupt for a specific channel. All bits set to 1b shall trigger the corresponding analogue input. If the object is not supported, the device shall behave accordingly to the default value.



Field	Value	Definition
<i>Bit 0</i>	0 _b 1 _b	Upper limit not exceeded Upper limit exceeded
<i>Bit 1</i>	0 _b 1 _b	Input not below lower limit Input below lower limit
<i>Bit 2</i>	0 _b 1 _b	Input not changed by more than delta Input changed by more than delta
<i>Bit 3</i>	0 _b 1 _b	Input not reduced by more than negative delta Input reduced by more than negative delta
<i>Bit 4</i>	0 _b 1 _b	Input not increased by more than positive delta Input increased by more than positive delta
<i>r</i>	0 _b	Reserved for future use

Object description

Attribute	Value
Index	6421 _h
Name	Interrupt trigger selection
Object Code	Array
Data Type	Unsigned8
Category	Optional

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue inputs
Access	ro
PDO Mapping	No
Value Range	4
Default Value	4
...	
Sub-Index	01 _h
Description	Analogue input 1
Access	rw
PDO Mapping	No
Value Range	Unsigned8
Default Value	0
...	
Sub-Index	04 _h
Description	Analogue Input 4
Access	rw
PDO Mapping	No
Value Range	Unsigned8
Default Value	0
...	

IV.1.61 Object 6423_h: Analogue input global interrupt enable

This object enables and disable globally the interrupt behaviour without changing the interrupt mask. By default, no analogue input activates an interrupt.

1 = global interrupt enabled 0 = global interrupt disabled

Object description


Attribute	Value
Index	6423 _h
Name	Analogue input global interrupt enable
Object Code	Array
Data Type	boolean
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Access	rw
PDO Mapping	No
Value Range	boolean
Default Value	FALSE

IV.1.62 Object 6424_h: Analogue input interrupt upper limit integer

If enabled (see 6423_h object), an interrupt is triggered when the analogue input is equal or rises above the given value. As long as the trigger condition is met, every change of the analogue input data generates a new interrupt, if there is no additional trigger condition, e.g., an input interrupt delta (6426_h).

 Contrary to what the standard requires, the value of this object is well scaled and also offset.

Object description


Attribute	Value
Index	6424 _h
Name	Analogue input interrupt upper limit integer
Object Code	Array
Data Type	Integer32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue inputs
Access	ro
PDO Mapping	No
Value Range	4
Default Value	4
Sub-Index	01 _h
Description	Analogue input 1
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	02 _h
Description	Analogue input 2
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	03 _h
Description	Analogue input 3
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	04 _h
Description	Analogue input 4
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0

IV.1.63 Object 6425_h: Analogue input interrupt lower limit integer

If enabled (see 6423_h object), an interrupt is triggered when the analogue input falls below the given value. As long as the trigger condition is met, every change of the analogue input data generates a new interrupt, if there is no additional trigger condition, e.g., an input interrupt delta (6426_h).

 Contrary to what the standard requires, the value of this object is well scaled and also offset.

Object description


Attribute	Value
Index	6425 _h
Name	Analogue input interrupt lower limit integer
Object Code	Array
Data Type	Integer32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue inputs
Access	ro
PDO Mapping	No
Value Range	4
Default Value	4
Sub-Index	01 _h
Description	Analogue input 1
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	02 _h
Description	Analogue input 2
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	03 _h
Description	Analogue input 3
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	04 _h
Description	Analogue input 4
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0

IV.1.64 Object 6426_h: Analogue input interrupt delta unsigned

This object set the delta value (rising or falling above or below the last communicated value) for interrupt-enabled analogue inputs (see 6423_h object).

 Contrary to what the standard requires, the value of this object is well scaled and also offset.

Object description


Attribute	Value
Index	6426 _h
Name	Analogue input interrupt delta unsigned
Object Code	Array
Data Type	Unsigned32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue inputs
Access	ro
PDO Mapping	No
Value Range	4
Default Value	4
Sub-Index	01 _h
Description	Analogue input 1
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0
Sub-Index	02 _h
Description	Analogue input 2
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0
Sub-Index	03 _h
Description	Analogue output 3
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0
Sub-Index	04 _h
Description	Analogue output 4
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0

IV.1.65 Object 6427_h: Analogue input interrupt negative delta unsigned

This object set the negative delta value (falling below the last communicated value) for interrupt-enabled analogue inputs (see 6423_h object).

 Contrary to what the standard requires, the value of this object is well scaled and also offset.

Object description


Attribute	Value
Index	6427 _h
Name	Analogue input interrupt negative delta unsigned
Object Code	Array
Data Type	Unsigned32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue inputs
Access	ro
PDO Mapping	No
Value Range	4
Default Value	4
Sub-Index	01 _h
Description	Analogue input 1
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0
Sub-Index	02 _h
Description	Analogue input 2
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0
Sub-Index	03 _h
Description	Analogue output 3
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0
Sub-Index	04 _h
Description	Analogue output 4
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0

IV.1.66 Object 6428_h: Analogue input interrupt positive delta unsigned

This object set the positive delta value (rising above the last communicated value) for interrupt-enabled analogue inputs (see 6423_h object).

 Contrary to what the standard requires, the value of this object is well scaled and also offset.

Object description

Attribute	Value
Index	6428 _h
Name	Analogue input interrupt positive delta unsigned
Object Code	Array
Data Type	Unsigned32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue inputs
Access	ro
PDO Mapping	No
Value Range	4
Default Value	4
Sub-Index	01 _h
Description	Analogue input 1
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0
Sub-Index	02 _h
Description	Analogue input 2
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0
Sub-Index	03 _h
Description	Analogue output 3
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0
Sub-Index	04 _h
Description	Analogue output 4
Access	rw
PDO Mapping	Yes
Value Range	Unsigned32
Default Value	0

IV.1.67 Object 642F_h: Analogue input pre-scaling float

This object set the pre-scaling in float format for input data (6403_h object).

Object description

Attribute	Value
Index	642F _h
Name	Analogue input pre-scaling float
Object Code	Array
Data Type	Real32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue inputs
Access	ro
PDO Mapping	No
Value Range	4
Default Value	4
Sub-Index	01 _h
Description	Analogue input 1
Access	rw
PDO Mapping	Yes
Value Range	Real32
Default Value	1.0
Sub-Index	02 _h
Description	Analogue input 2
Access	rw
PDO Mapping	Yes
Value Range	Real32
Default Value	1.0
Sub-Index	03 _h
Description	Analogue output 3
Access	rw
PDO Mapping	Yes
Value Range	Real32
Default Value	1.0
Sub-Index	04 _h
Description	Analogue output 4
Access	rw
PDO Mapping	Yes
Value Range	Real32
Default Value	1.0

IV.1.68 Object 6431_h: Analogue input offset integer

This object set the offset in integer format for input data (6403_h object).

Object description

Attribute	Value
Index	6431 _h
Name	Analogue input offset integer
Object Code	Array
Data Type	Integer32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue inputs
Access	ro
PDO Mapping	No
Value Range	4
Default Value	4
Sub-Index	01 _h
Description	Analogue input 1
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	02 _h
Description	Analogue input 2
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	03 _h
Description	Analogue output 3
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	04 _h
Description	Analogue output 4
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0

IV.1.69 Object 6442_h: Analogue output scaling float

This object set the scaling in float format for output data (6411_h object).

Object description

Attribute	Value
Index	6442 _h
Name	Analogue output scaling float
Object Code	Array
Data Type	Real32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue outputs
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Analogue output 1 (+/-10V)
Access	rw
PDO Mapping	Yes
Value Range	Real32
Default Value	1.0
Sub-Index	02 _h
Description	Analogue output 2 (0/10V)
Access	rw
PDO Mapping	Yes
Value Range	Real32
Default Value	1.0
Sub-Index	03 _h
Description	Analogue output 3 (4-20mA)
Access	rw
PDO Mapping	Yes
Value Range	Real32
Default Value	1.0

IV.1.70 6443_h: Analogue output error mode

This object set the offset in integer format for input data (6403_h object).

This object defines, whether an output is set to a pre-defined error value (see 6444_h object) in case of an internal device failure or a 'Stop remote node' indication.

0 = actual value rest

1 = reverts to error value integer (6444_h)

Object description


Attribute	Value
Index	6443 _h
Name	Analogue output error mode
Object Code	Array
Data Type	Unsigned8
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue outputs
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Error mode analogue output 1 (+/-10V)
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	1
Sub-Index	02 _h
Description	Error mode analogue output 2 (0-10V)
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	1
Sub-Index	03 _h
Description	Error mode analogue output 3 (4-20mA)
Access	rw
PDO Mapping	Yes
Value Range	Unsigned8
Default Value	1

IV.1.71 Object 6444_h: Analogue output error value integer

On condition that the corresponding Error mode is active, device, set the outputs to the value configured by this object.

 Contrary to what the standard requires, the value of this object is well scaled and also offset.

Object description


Attribute	Value
Index	6444 _h
Name	Analogue output error value integer
Object Code	Array
Data Type	Integer32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue outputs
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Analogue output 1 (+/-10V)
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	800 _h
Sub-Index	02 _h
Description	Analogue output 2 (0-10V)
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	03 _h
Description	Analogue output 3 (4-20mA)
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0

IV.1.72 Object 6446_h: Analogue output offset integer

This object set the offset in integer format for output data (6413_h object).

 Contrary to what the standard requires, the value of this object is well scaled and also offset.

Object description

Attribute	Value
Index	6446 _h
Name	Analogue output offset integer
Object Code	Array
Data Type	Integer32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	00 _h
Description	Number of analogue outputs
Access	ro
PDO Mapping	No
Value Range	3
Default Value	3
Sub-Index	01 _h
Description	Analogue output 1 (+/-10V)
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	02 _h
Description	Analogue output 2 (0-10V)
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0
Sub-Index	03 _h
Description	Analogue output 3 (4-20mA)
Access	rw
PDO Mapping	Yes
Value Range	Integer32
Default Value	0

IV.2 Manufacturer specific object

IV.2.1 0x2000 – Digital inputs control

Allow to configure the digital input filter constant

Object description

Attribute	Value
Index	0x2000
Name	Digital Inputs Filter
Object Code	Record
Data Type	Input value
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	0x00
Description	Highest sub-index supported
Entry Category	Mandatory
Access	c
PDO Mapping	Tx
Value Range	32
Default Value	32
Sub-Index	0x01
Description	Input 1 Filter constant value
Entry Category	Mandatory
Access	rw
PDO Mapping	No
Value Range	Unsigned16
Default Value	100
...	...
Sub-Index	0x20
Description	Input 32 Filter constant value
Entry Category	Mandatory
Access	rw
PDO Mapping	No
Value Range	Unsigned16
Default Value	100

Input 1 filter constant value:
 Define the time constant of the input 1 filter.
 Time is given in x100µs.
 Ex. #10 = 1ms.

Input 32 filter constant value:
 Define the time constant of the input 32 filter.
 Time is given in x100µs.
 Ex. #10 = 1ms.

IV.2.2 0x2001 – Digital inputs triggered

Reflect the status of the Triggering information. Return TRUE if the PDO will be triggered according AnyChange/HighToLow, or LowToHigh configuration. To be used only with ECAT version to detect change of input.

Note: After the read, flag is reset until the next change.

Object description

Attribute	Value
Index	0x2001
Name	Digital Inputs Triggered
Object Code	VAR
Data Type	Unsigned32
Category	Mandatory

Entry description

Attribute	Value
Sub-Index	0x00
Description	Digital Inputs Triggered
Entry Category	Mandatory
Access	ro
PDO Mapping	Tx
Value Range	Unsigned32
Default Value	0

Bit 0 correspond to Input 1 etc..
 If bit is set, this means Input change like configured thanks to 0x6006, 0x6007, 0x6008 and 0x6005 register
 If 0x6005 is set to false, this register will always return 0.
 Register is reset to zero after each read.

IV.2.3 0x2010 – Analog Inputs filter set

Allow to configure a filter on analogue inputs. The filter is configured by its “Tau” which is the constant time. St Tau to 0 disable the filter.

Note: Analogue input have hardware filter.

$f_c = 5\text{kHz}$ for voltage inputs.

$f_c = 400\text{Hz}$ for current inputs.

Object description	
Attribute	Value
Index	0x2010
Name	Analog Inputs Filter Set
Object Code	Record
Data Type	Input value
Category	Mandatory

Entry description	
Attribute	Value
Sub-Index	0x00
Description	Highest sub-index supported
Entry Category	Mandatory
Access	c
PDO Mapping	Tx
Value Range	15
Default Value	15
Sub-Index	0x01
Description	Input 1 Filter Tau constant
Entry Category	Mandatory
Access	rw
PDO Mapping	None
Value Range	unsigned16
Default Value	0
...	...
Sub-Index	0x0F
Description	Input 15 Filter Tau constant
Entry Category	Mandatory
Access	rw
PDO Mapping	None
Value Range	unsigned16
Default Value	0

analog Input 1 Filter Tau constant
 Define the time constant of the filter in milliseconds
 Tau = 0 => No filter
 Filter $F_c = 10\text{kHz}$.
 If $\text{Tau} \gg T_c$, $F_c = 1/(2 * \pi * \text{Tau})$
 F_c must be $\leq F_c/2$

Note: Analog input have a hardware filter. $F_c = 5\text{kHz}$ for +/-10V and 0/10V inputs. 400Hz for 0-20mA inputs

analog Input 15 Filter Tau constant
 Define the time constant of the filter in milliseconds
 Tau = 0 => No filter
 Filter $F_c = 10\text{kHz}$.
 If $\text{Tau} \gg T_c$, $F_c = 1/(2 * \pi * \text{Tau})$
 F_c must be $\leq F_c/2$

IV.2.4 0x2011 - Analog inputs filter F_c

Allow to read the deduced filter cut frequency according configured constant Tau.

Attribute	Value
Index	0x2011
Name	Analog filter Inputs F_c
Object Code	Record
Data Type	Input value
Category	Mandatory

Entry description	
Attribute	Value
Sub-Index	0x00
Description	Highest sub-index supported
Entry Category	Mandatory
Access	c
PDO Mapping	Tx
Value Range	15
Default Value	15
Sub-Index	0x01
Description	Input 1 Filter F_c
Entry Category	Mandatory
Access	ro
PDO Mapping	None
Value Range	Real32
Default Value	inf
...	...
Sub-Index	0x0F
Description	Input 15 Filter F_c
Entry Category	Mandatory
Access	ro
PDO Mapping	None
Value Range	Real32
Default Value	inf

Analog Input 1 Filter F_c
 Give the cut frequency of input filter in Hz

Analog Input 15 Filter F_c
 Give the cut frequency of input filter in Hz

IV.2.5 0x2012 - Analog inputs Triggered

Memorize if trigger was done. Return TRUE if the PDO have been triggered according AnyChange/HighToLow, or LowToHigh configuration.

Note: After the read, flag is reset.

Object description	
Attribute	Value
Index	0x2001
Name	Digital Inputs Triggered
Object Code	VAR
Data Type	Unsigned32
Category	Mandatory

Entry description	
Attribute	Value
Sub-Index	0x00
Description	Digital Inputs Triggered
Entry Category	Mandatory
Access	ro
PDO Mapping	Tx
Value Range	Unsigned32
Default Value	0

Bit 0 correspond to Input 1 etc..
 If bit is set, this means Input change like configured thanks to 0x6006, 0x6007, 0x6008 and 0x6005 register.
 If 0x6005 is set to false, this register will always return 0.
 Register is reset to zero after each read.

IV.2.6 0x2100 – Error Acknowledge

Allow to acknowledge internal error, this leads to clear Error Register 0x1001 and Error Led Status. If error is still present, Led and Error register will return to error state.

Object description	
Attribute	Value
Index	0x2100
Name	Error Ack
Object Code	VAR
Data Type	Unsigned16
Category	Mandatory

Entry description	
Attribute	Value
Sub-Index	0x00
Description	Error ACK
Entry Category	Mandatory
Access	wo
PDO Mapping	Tx
Value Range	Unsigned16
Default Value	0

Allowing to acknowledge error.
 Will clear 0x1001 register and Error Led Status.
 If error not resolved, the error wil appears again.

V. Error Code (EMCY frame)

Error code (MS)[SMD ErrorCode]	Meaning
5100 _h	Supply
5110 _h	Supply low voltage
5112 _h – E01	U2 = supply +24 V
5410 _h – E02	Output stages
8100 _h - E03	COM: ECAT : State changed from OP to other. CAN State changed to STOP
8101 _h - E04	COM: ECAT hardware problem
8130 _h - E05	CAN: Life guard
8140 _h - E06	CAN: Bus Off
8210 _h - E07	PDO not processed due to length error
8220 _h - E08	PDO length exceeded
8240 _h - E09	Unexpected SYNC data length
8250 _h – E10	RPDO timeout
FF01 _h - E05	Impossible to communicate with ET1100 via SPI
FF02 _h (02 _h) - E06	Impossible to Read Eeprom of ESC (I ² C) (For EtherCAT version): Read was failed
FF02 _h (03 _h) - E06	Impossible to Write Eeprom of ESC (I ² C) (For EtherCAT version): Write was failed
FF02 _h (10 _h) - E06	Impossible to Read Eeprom of ESC (I ² C) (For EtherCAT version): Eeprom loaded signal not received under 2ms.
FF08 _h – E11	Internal system error: XX _h give indication on the source of allocation (Not erasable error) Contact manufacturer

VI. Revision

R2015	Original version