

General

The connection to the CAN network is implemented via a 4-pin connector from the XH series from the manufacturer JST. The operating voltage is also supplied via this connector. The CANopen interface works according to DS301 and DS401. All common baud rates up to 1 Mbit/s are supported.

Features

- Various default settings can be selected via DIP switches
- CANopen node ID and baud rate adjustable via DIP switch

CANopen features

- CAN baud rates up to 1 Mbit/s
- CAN bus ISO11898 with transceiver TJA1050
- 4 transmit and 4 receive PDOs
- Dynamic PDO mapping
- Variable PDO identifier
- CANopen PDO transmission modes: synchronous, asynchronous, event-controlled, cyclic, acyclic and RTR
- Event Timer and Inhibit Timer for all transmit PDOs
- Node guarding, lifeguarding and heartbeat
- Emergency messages
- Minimum boot up

Technical Data

System	Min.	Norm.	Max.
Supply voltage	+4.75VDC	+24VDC	+28VDC
Overvoltage spikes max.			+32V (< 100 msec)
Power consumption system/bus			
operating temperature	-25°C		+55°C
Declaration of Conformity			

CAN bus interface	
CAN bus standard	ISO11898
galvanic decoupling	no
CiA draft standards	DS301 version 4.0 and DS401 version 2.0
termination resistor	120 Ohm switchable via DIP switch

contacts and dimensions	
connector Type X1	Manufacturer: JST Connector Series / Type: XH / B4B-XH-A

Pin assignment connector X1

Connector X1 is located on the underside of the joystick.

Pin no.	Name	function
1	UB	operating voltage
2	GND	Ground / ground
3	CANH	CAN high signal
4	CANL	CAN low

Configuration switch

Node number, baud rate and termination of the CAN can be selected using dip switches. The switches can be found inside the case (open the cover).

DIP switch								function
1	2	3	4	5	6	7	8th	
rt								termination resistor for CAN bus
ON								120 Ohm terminating resistor active
OFF								No termination resistor
	BD1	BD0						Baud rate CAN bus
	OFF	OFF						125 kbit
	OFF	ON						250 kbit
	ON	OFF						500 kbit
	ON	ON						1 Mbit
			CF1	CF0				Configuration and default settings
			OFF	OFF				Default 16-bit data transmission
			OFF	ON				Default 8-bit data transmission
			ON	OFF				Default 16-bit data transmission with autostart *1)
			ON	ON				Default 8-bit data transmission with autostart *1)
					ID2	ID1	ID0	CANopen node ID (node number)
					OFF	OFF	OFF	Node ID = 3
					OFF	OFF	ON	Node ID = 4
					OFF	ON	OFF	Node ID = 0x13
					OFF	ON	ON	Node ID = 0x14
					ON	OFF	OFF	Node ID = 0x43
					ON	OFF	ON	Node ID = 0x44
					ON	ON	OFF	Node ID = 0x53
					ON	ON	ON	Node ID = 0x54

*1) A TPDI event time of 25 msec is entered for operating modes in which autostart is activated. After being switched on, the node automatically goes into OPERATIONAL mode.

CAN signal LEDs

The NMT states and errors are given according to DRP303-3.

LEDs	colour	function
R RUN LED	green	From flicker short flash flashing On (95% Duty)
E Error LED	red	Out of 1x short flash 2x short flash on (95% Duty)

Operating voltage missing or defect
CAN not yet started
Stopped
Preoperational
Operational

No mistake
CAN module is in error warning state
Node guarding error
Node bus off state

CANopen object dictionary

DS301: global objects

index	sub index	Name	access
0005	-	dummy 8	r/o
0006	-	dummy 16	r/o
0007	-	dummy 32	r/o
1000	-	device type	r/o
1001	-	error register	r/o
1002	-	Manufacturer status register	r/o
1005	-	COB ID SYNC	r/o
1008	-	device name	r/o
1009	-	hardware version	r/o
100A	-	software version	r/o
100C	-	guard time	r/w
100D	-	lifetime factor	r/w
100E	-	COB ID Guard	-
1014	-	COBID Emergency	r/w
1015	-	Inhibit Time Emergency	r/w
1016	0	Consumer heartbeat time	r/o
	1	Consumer heartbeat time 1	r/w
	2	Consumer heartbeat time 2	r/w
	3	Consumer heartbeat time 3	r/w
	4	Consumer heartbeat time 4	r/w
1017	-	Producer Heartbeat Time	r/w
1018	0	identity object	r/o
	1	Vendor ID	r/o
	2	product code	r/o
	3	Revision Number	r/o
	4	Serial number	r/o
1029	0	Error Behavior Object	r/o
	1	Communication error	r/w
	2	Application error	r/w

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

r/o read only/ only 5ft he
 w/o write write only
 / w read and write

All "visible string" data types are limited to a maximum of 20 characters.

DS301: PDO parameter objects

Description of the PDO parameters. With these indices, dynamic PDO mapping, free assignment of identifiers, selection of the transfer mode, definition of inhibit and event time is possible. These settings can be made both in the "operational" and "pre- operational" operating status.

index	sub index	name	access
1400	0	Receive PDO1 Communication Parameter	r/o
	1	COB ID	r/w
	2	transmission type	r/w
1401...1403		Receive-PDO2 to RPDO4 Communication Parameter same as 1400	r/w
1600	0	Receive PDO1 parameter mapping	r/w
	1 ton	Mapped objects (max. 8 objects mappable)	r/w
1601...1603		Receive-PDO2 to RPDO4 parameter mapping same as 1600	r/w
1800	0	Transmit PDO1 Communication Parameter	r/o
	1	COB ID	r/w
	2	transmission type	r/w
	3	Inhibit Time	r/w
	4	Reserved	r/w
	5	event time	r/w
1801...1803		Transmit PDO2 to TPDO4 Communication Parameter same as 1800	r/w
1A00	0	Transmit PDO1 parameter mapping	r/w
	1 ton	Mapped objects (max. 8 objects mappable)	r/w
1A01...1A03		Transmit PDO2 to TPDO4 parameter mapping same as 1A00	r/w

specific objects

index	sub index	Name	access
2000	-	Device Manufacturer	r/o
2009	0	Serial number 64 bits	r/o
	1	Serial number 64-bit LSDW	r/o
	2	Serial number 64-bit MSDW	r/o
2101	-	System Configuration	r/o
2102	-	Remapping Enabled Info	r/o
2103	-	Enable Guarding Warning	r/w
2105	-	Internal API State	r/o
2110	0	Conformance test object	r/o
	1	Range check object	r/w
2180	-	CAN restart time	r/w

DS401: analogue Inputs / SpaceMouse axes

index	sub index	Name	access
5410		Dead Band 8 Bit	r/w
54F0		Set Zero Command	r/w
6400	0 to 6	Analog input 16 bits	red
6401	0 to 6	Analog input 16 bits	red
6421	0 to 6	Analog input trigger selection	r/w
6423	-	Analog Interrupt Enable	r/w
6424	0 to 6	Analog Input Interrupt Upper Limit	r/w
6425	0 to 6	Analog Input Interrupt Lower Limit	r/w
6426	0 to 6	Analog input interrupt delta	r/w
6427	0 to 6	Analog Input Interrupt Negative Delta	r/w
6428	0 to 6	Analog input interrupt positive delta	r/w

Object dictionary (Description)

Below is a brief description of each directory entry.

DS301: Global Objects

Index 0005

If this index is included in a PDO, it is equivalent to a placeholder for regular data (8-bit data length). It can be used multiple times.

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

Index 0006

If this index is included in a PDO, it is equivalent to a placeholder for regular data (16-bit data length). It can be used several times.

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

Index 0007

If this index is included in a PDO, it is equivalent to a placeholder for regular data (32-bit data length). It can be used several times.

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

Index 1000: device type

This index contains a description of the device type. This description contains the CiA profile identifier and additional information about other functions of the device.

Index	1000
Name	Device Type
Description	-
Data Type	Unsigned 32
Access	r/o
PDO Mapping	No
Value Range	-
Default Value	0x0084 0191

Index 1001: Error Register

This index contains the internal error code of the device in case of an error.

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

The error register has the following structure. If several errors occur at the same time, the values of the individual affected bits are logically linked with OR.

Bit	Meaning
0	General Error, this bit
1	0
2	0
3	0
4	CAN Bus or communication error
5	0
6	0
7	Device Error

Index 1002: Status Register

This index contains additional status information about the device.

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

Index 1005: COB ID SYNC

COB-ID for the synchronization telegrams is determined with this index.

This unit operates in SYNC receive mode only. It is not possible to create a SYNC telegram.

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

Index 1008: Device name

In this index, the device name is represented as a visible character string.

Index	1008
Name	Device Name
Description	-
Data Type	Visible String
Access	r/o
PDO Mapping	No
Value Range	The maximum string length is 20 characters
Default Value	"MEG-SpaceMouse-CO"

Index 1009: hardware version

In this index, the revision of the hardware is represented as a visible character string.

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

Index 100A: software version

In this index, the version of the software is represented as a visible string.

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

Index 100C: Guard Time

Together with index 100D, this index represents the life guarding protocol. Entered values are in milliseconds.

Guard time multiplied With Lifetime Factor gives the Lifetime.

Write 0 (zero) to disable.

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

Index 100D: Lifetime Factor

Together with index 100c, this index represents the life guarding protocol. Entered values are factors.

Guard time multiplied with Lifetime Factor gives the Lifetime.

Write 0 (zero) to disable.

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

Index 100E: COB ID Guard

This index contains the identifier for the guarding protocol.

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

Index 1014: COB ID Emergency

The identifier for the emergency telegrams is generated in this index.

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

Index 1015: Inhibit Time Emergency

The delay time for sending the emergency telegrams is defined here. This device provides a time delay in increments of one millisecond.

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

Index 1016: Consumer Heartbeat Time

Index 1016 is used to define heartbeat consumer monitoring for up to 4 nodes.

Index	1016
Name	Consumer Heartbeat Time
Description	-
Data Type	Structure

Danger:

Heartbeat monitoring begins when the first heartbeat is received.

Before receiving the first heartbeat, the status of the producer is unknown.

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

Structure of the consumer heartbeat time

MSB		LSB	
byte3	byte2	byte1	byte0
reserved	node ID	Heartbeat time	

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

Index 1017: Producer Heartbeat Time

The cycle time of the heartbeat is set in this index.
The time is a multiple of 1 ms.
Write 0 (zero) to disable.

Danger:

Use either Heartbeat or Node Guarding. Both at the same time are not allowed.

Index	1017
Name	Producer Heartbeat Time
Description	-
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	-
Default Value	1000

Index 1018: Identity Object

This index contains general information about the device and the manufacturer.
The object cannot be modified.

Index	1018
Name	Identity Object
Description	-
Data Type	Structure

index	1018.00
Name	Number of indexes supported
Description	-
Data Type	Unsigned char
Access	r/o
PDO mapping	No
value range	-
Default value	4

Manufacturer registration code at CiA

Index	1018.01
Name	Vendor ID
Description	
Data Type	Unsigned 32
Access	r/o
PDO Mapping	No
Value Range	-
Default Value	0x4F9

Internal product code of the product .

Index	1018.02
Name	Product Code
Description	
Data Type	Unsigned 32
Access	r/o
PDO Mapping	No
Value Range	-
Default Value	0xFF40 102F

index	1018.03
Name	revision code
Description	
Data Type	unsigned 32
Access	r/o
PDO mapping	No
value range	-
Default value	Revision of the device

index	1018.04
Name	Serial number
Description	
Data Type	unsigned 32
Access	r/o
PDO mapping	No
value range	-
Default value	0

Index 1029: Error Behavior

This index is used to determine whether the device should change the operating state in the event of an error. It is possible to change to the pre- operational or stopped state, but it is also possible that nothing happens, and the device retains the current state.

The communication errors include bus off errors, heartbeat, guarding, internal errors of the device.

Index	1029
Name	Error Behavior Object
Description	-
Data Type	Structure

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

The values of each state are as follows:

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

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

index	1029.02
Name	ApplicationError
Description	NMT state change in case of internal error due to hardware malfunction
DataType	unsigned 8
Access	r/w
PDO mapping	No
value range	-
Default value	0

DS301: PDO parameter objects

communication parameter objects

The transmission mode for send and receive telegrams is defined in sub-index 2.

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

The synchronous transmission modes 0...240 and 252 are linked to the SYNC signal. Asynchronous means that the transmission is not SYNC-coupled.

Type 0 is triggered by the SYNC telegram, but transmission is only carried out if there have been changes in the PDO data.

A value between 1 and 240 means that the transmission takes place synchronously and cyclically. The mode specifies the number of SYNC signals required for triggering.

Type 252 will only trigger a transmission through the SYNC telegram if the PDO defined with it has previously been requested and released by a remote query.

Type 253 transmits the PDO only after a remote request has been made, but immediately after the request.

With types 254 and 255, the manufacturer or the device profile define the condition.

A delay time can be set in sub-index 3. As a result, the PDOs are triggered by their corresponding events, but are only sent after this delay time has elapsed. This time is a multiple of 100 µs, a specification of 0 deactivates this function.

In mode 254/255, an event time can also be specified for the TPDO. The expiry of this time is evaluated as an event. This time is a multiple of 1 ms. This event causes the TPDO to be transmitted in addition to possible other events.

Subindices are described and explained using the example of index 1400 for the receive PDO and index 1800 for the transmit PDO.

Index	PDO
1400...14xx	Receive-PDO1...Receive-PDOxx
1800...18xx	Transmit-PDO1...Transmit-PDOxx
index	14xx/18xx
Name	Receive/Transmit PDOx communication parameters
Description	-
DataType	Structure

index	14xx.00/18xx.00
Name	Number of indexes supported
Description	-
DataType	unsigned 8
Access	r/o
PDO mapping	No

value range	-
Default value	2/5

The table shows the default PDO ID.
An identifier of 8xxxxxxx means the PDO is deactivated. The CAN master must assign a valid PDO ID for activation.

The configuration of the transmit PDOs depends on the configuration that is set on the DIP switches.

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

Default assignment for the transmit PDOs with 8-bit transmission modes

object	default value
1800.01	ID+0x180
1801.01	ID+0x80000280
1802.01	ID+0x80000380
1803.01	ID+0x80000480

Default assignment for the transmit PDOs with 16-bit transmission modes

object	default value
1800.01	ID+0x80000180
1801.01	ID+0x280
1802.01	ID+0x380
1803.01	ID+0x80000480

Default assignment for the receive PDOs

object	default value
1800.01	ID+0x80000200
1801.01	ID+0x80000300
1802.01	ID+0x80000400
1803.01	ID+0x80000500

Please refer table at the beginning of the chapter.

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

multiple of 1 μ s.

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

index	18xx.04
Name	Reserved
Description	-
DataType	-
Access	-
PDO mapping	No
value range	-
Default value	-

Time with which a TPDO is sent cyclically in transmission type 0xFF, even if the data has not changed.
multiple of 1 ms.

Depending on the configuration, other default values can be set. (See chapter Configuration)

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

PDO mapping objects

The following table shows the PDO mapping entries. This principle is the same for all PDOs. The mapping table is a cross-reference from the entry in the object directory (e.g., data of the digital outputs) to the data field in the PDO.

Sub-index 0 determines the number of valid entries. The hipecs-CIO50 allows a maximum of 8 entries per PDO. To change the mapping, sub-index 0 must first be set to 0 (zero) (deactivated). Then the entries can be edited. As soon as a new entry is mapped into one of the 8 places, the hipecs-CIO50 checks whether this index/sub-index is valid. If the values are invalid, the process is aborted.

The eight sub-indices are 32-bit pointers to the entries. A value of 0 (zero) means no entry. These pointers are constructed as follows:

MSB		LSB	
byte3	byte2	byte1	byte0
mapped index		sub index	length

Index and sub-index are the pointer, length is the data length of the target in bits.

index	160x/1A0x
Name	Receive/Transmit PDO mapping parameters
Description	-
DataType	array

index	160x/1A0x.00
Name	Number of indexes supported
Description	Number of mapped objects
DataType	unsigned 8
Access	r/w
PDO mapping	No
value range	-
Default value	See table below

index	160x/1A0x.01...160x/1A0x.08
Name	mapped object
Description	
DataType	unsigned 32
Access	r/w
PDO mapping	No
value range	-
Default value	See table below

Receive PDO

The module uses the following standard configuration for receive PDO.

Index	Entry	
Receive-PDO1		
1600.00	0	
Receive-PDO2		
1601.00	0	
Receive-PDO3		
1602.00	0	
Receive-PDO4		
1603.00	0	

Send PDO

The module uses the following standard configuration for transmit PDO.

Index	Entry	
Transmit-PDO1		
1A00.00	8	
1A00.01	64000108	SpaceMouse Axis 1 8 Bit
1A00.02	64000208	SpaceMouse Axis 2 8 Bit
1A00.03	64000308	SpaceMouse Axis 3 8 Bit
1A00.04	64000408	SpaceMouse Axis 4 8 Bit
1A00.05	64000508	SpaceMouse Axis 5 8 Bit
1A00.06	64000608	SpaceMouse Axis 6 8 Bit
Transmit-PDO2 *1)		
1A01.00	4	
1A01.01	64010110	SpaceMouse Axis 1 16 Bit
1A01.02	64010210	SpaceMouse Axis 2 16 Bit
1A01.03	64010310	SpaceMouse Axis 3 16 Bit
1A01.04	64010410	SpaceMouse Axis 4 16 Bit
Transmit-PDO3 *1)		
1A02.00	0	
1A02.01	64010510	SpaceMouse Axis 5 16 Bit
1A02.02	64010610	SpaceMouse Axis 6 16 Bit
Transmit-PDO4		
1A03.00	0	

specific objects

Index 2000: Device Manufacturers

index	2000
Name	Device Manufacturer
Description	-
DataType	visible String
Access	r/o
PDO mapping	No
value range	The maximum string length is 20 characters
Default value	"MEGATRON"

Index 2009: Serial Number 64 bits

This index contains the serial number of the device.

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

index	2009.00
Name	Number of indexes supported
Description	-
DataType	unsigned 8
Access	r/o
PDO mapping	No
value range	-
Default value	2

index	2009.01
Name	Serial number low double word
Description	Bits 0...31 of the serial number
DataType	unsigned 32
Access	r/o
PDO mapping	No
value range	-
Default value	-

index	2009.02
Name	Serial number high double word
Description	Bits 32...63 of the serial number
DataType	unsigned 32
Access	r/o
PDO mapping	No
value range	-
Default value	-

Index 2101: System Configuration

This index shows the operating mode of the device.

Index	2101
Name	System Configuration
Description	-
Data Type	Unsigned 32
Access	r/o
PDO Mapping	No
Value Range	-
Default Value	

Index 2102: Remapping Enabled Info

index indicates whether remapping of the PDO is permitted.

0 = remapping denied 1 =
remapping allowed

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

Index 2103: Enabled Guarding Warning

This index unlocks an additional warning for node guarding.

This gives the CAN master an early notification that a node guarding error is imminent.

The warning is triggered when the guard time (index 100C) is exceeded.

The NMT status is not changed.

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

Index 2105: Internal Error Code

Internal error information of the CANopen controller.

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

Index 2110: Test Object

This index is for testing purposes only. It has no function and should therefore not be used.

Index	2110
Name	Test Object 01
Description	-
Data Type	Structure

index	2110.00
Name	Number of indexes supported
Description	-
Data Type	Unsigned char
Access	r/o
PDO mapping	No
value range	-
Default value	1

index	2110.01
Name	Range check object
Description	-
Data Type	unsigned 16
Access	r/w
PDO mapping	No
value range	100...1000
Default value	500

Index 2180: CAN restart time

The time until the CAN communication is restarted in the event of a bus-off error is specified in this index. The specification is in milliseconds. A value of 0 (zero) disables this feature.

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

DS401: analog inputs / axis positions

Index 5410: Dead Band 8 bits

An extension of the joystick's dead zone can be set in this index. The dead zone is only taken into account when evaluating the 8-bit axis values.

The specification is in percent.

The larger the value, the further the joystick must be moved in the axis directions before a non-zero axis value is transmitted.

Index	5410
Name	Dead Band 8 Bit
Description	-
Data Type	Unsigned 16
Access	r/w
PDO Mapping	No
Value Range	0...50
Default Value	20

Index 54F0: Set Zero Command

This object can be used to set the joystick to zero.

If the signature 0x5A746573 == " setZ "

Is written to the object, the process for initializing the zero point is started.

All other values written to the object have no function.

After executing the command, the object is set to the result:

0: Error setting to zero

1: Zeroing successfully completed.

Index	54F0
Name	Set Zero Command
Description	-
Data Type	Unsigned 32
Access	r/w
PDO Mapping	No
Value Range	
Default Value	

Index 6400: Read analogue input 8 bits

This index contains the analog input values, in which the position values of the SpaceMouse axes are stored, as 8-bit values

SpaceMouse are entered as percentage values of the maximum control range in the 8-bit object for the analog inputs.

Index	6400
Name	Read Analog Input 8 Bit
Description	-
Data Type	Array

index	6400.00
Name	Number of indexes supported
Description	
Data Type	unsigned 8
Access	ro
PDO mapping	No
value range	-
Default value	6

Index	6400.01...6400.06
Name	Read analog Input 8 Bit
Description	Axis positions a 8 bit values
Data Type	Signed 8
Access	ro
PDO Mapping	Yes
Value Range	-100 .. 0 .. +100
Default Value	-

Index 6401: Read analog input 16 bits

This index contains the analog input values, in which the position values of the SpaceMouse axes are stored, as 16-bit values

Index	6401
Name	Read Analog Input 16 Bit
Description	-
Data Type	Array

index	6401.00
Name	Number of indexes supported
Description	
Data Type	unsigned 8
Access	r/o
PDO mapping	No
value range	-
Default value	-

The axis position values of the SpaceMouse are stored in the 16-bit object for the analog inputs unchanged as entered from the SpaceMouse be read out.

Index	6401.01...6401.06
Name	Read analog Input 16 Bit
Description	Axis positions as 16 bit values
Data Type	Signed 16
Access	r/o
PDO Mapping	Yes
Value Range	-
Default Value	-

Index 6421: Analog Input Interrupt Trigger

This index defines the trigger conditions for the TPOS in which analog data are mapped.

Index	6421
Name	Analog Input Interrupt Trigger
Description	-
Data Type	Array
index	6421.00
Name	Number of indexes supported
Description	
Data Type	unsigned 8
Access	r/o
PDO mapping	No
value range	-
Default value	-

- Bit 0: Input voltage greater than upper limit
- Bit 1: Input voltage less than lower limit
- Bit 2: Input changes more than delta
- Bit 3: input decreases more than neg. delta
- Bit 4: input increases more than pos. delta
- Bit 5...7: reserved (must be set to 0 (zero))

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

Index 6423: Analog Input Interrupt Enable

This index enables/disables the global interrupt for the analog values.

Disabled by default to avoid overloading the bus with analog values.

1 (true): released

0 (false): locked

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

Index 6424: Analog Input Upper Limit

The upper threshold for an analog interrupt is defined here (signal >= limit).

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

index	6424.00
Name	Number of indexes supported
Description	
DataType	unsigned 8
Access	r/o
PDO mapping	No
value range	-
Default value	-

index	6424.01...6424.xx
Name	Analog input upper limit
Description	
DataType	integer 32
Access	r/w
PDO mapping	No
value range	-
Default value	0

Index 6425: Analog Input Lower Limit

The lower threshold for an analog interrupt is defined here (signal < limit).

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

index	6425.00
Name	Number of indexes supported
Description	
DataType	unsigned 8
Access	r/o
PDO mapping	No
value range	-
Default value	-

index	6425.01...6425.xx
Name	Analog Input Lower Limit
Description	
DataType	integer 32
Access	r/w
PDO mapping	No
value range	-
Default value	0

Index 6426: Analog Input Interrupt Delta

A change interval (delta) for an analog interrupt is specified here (any change, whether positive or negative).

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

index	6426.00
Name	Number of indexes supported
Description	
DataType	unsigned 8
Access	r/o
PDO mapping	No
value range	-
Default value	-

index	6426.01...6426.xx
Name	Analog input interrupt delta
Description	
DataType	integer 32
Access	r/w
PDO mapping	No
value range	-
Default value	0

Index 6427: Analog Input Negative Delta

This index defines a negative delta (reduction interval) for an analog interrupt.

Index	6427
Name	Analog Input Negative Delta
Description	-
Data Type	Array
index	6427.00
Name	Number of indexes supported
Description	
Data Type	unsigned 8
Access	r/o
PDO mapping	No
value range	-
Default value	-

index	6427.01...6427.xx
Name	Analog input negative delta
Description	
Data Type	integer 32
Access	r/w
PDO mapping	No
value range	-
Default value	0

Index 6428: analog input positive delta

This index defines a positive delta (increase interval) for an analog interrupt.

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

index	6428.00
Name	Number of indexes supported
Description	
Data Type	unsigned 8
Access	r/o
PDO mapping	No
value range	-
Default value	-

index	6428.01...6428.xx
Name	Analog input positive delta
Description	
Data Type	integer 32
Access	r/w
PDO mapping	No
value range	-
Default value	0

error messages

The possible error messages of this device have the following structure:

byte							
0	1	2	3	4	5	6	7
EMY code		1001	0	ERR code			

EMY code: error code according to

DS 301 1001: content of index 1001

ERR code: Error code as an unsigned 32-bit value

ERR code (hex)	modification		description
	NMT	I/O	
1000 0000	X	X	Heartbeat consumer error
2000 0000			Node guarding warning
3000 0000	X	X	Lifeguard error
4000 0000			CAN is in error warning mode
8000 0000	X	X	Device was bus off
0000 0010		X	No connection to the SpaceMouse
0000 0020			TimeOut on Set Zero command

The node guarding warning must be activated with index 2103.

If more than error is active, the error messages are linked logically.

Some errors cause the NMT state to change and/or cause the current output states to change. This behavior depends on the index 1029 settings.

The ID for error messages is fixed to 0x80 + node ID.

List of error messages:

A specified heartbeat producer could not send the heartbeat message.

Heartbeat Consumer Error							
30	81	01	00	00	00	00	10

The master is unable to send the remote query to the node in time.

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

Lifeguarding time has expired.

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

The internal CAN module is in error warning mode.

CAN is in error warning mode							
00	81	01	00	00	00	00	40

A successful return from the Bus-Off state.

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

Axis position data can be read from the SpaceMouse.

No connection to the SpaceMouse							
00	10	01	00	10	00	00	00

The command to set the zero position via object 0x54F0 was not completed correctly.

Fehler beim Ausführen von Set Zero							
00	10	02	00	20	00	00	00

I/O Mapping (Quick Reference)

quick reference	
Mapping to the object dictionary	
index	mapped Data
6400.01	Analog input 1: SpaceMouse axis position 1 as an 8-bit value
6400.02	Analog input 2: SpaceMouse axis position 2 as an 8-bit value
6400.03	Analog input 3: SpaceMouse axis position 3 as an 8-bit value
6400.04	Analog input 4: SpaceMouse axis position 4 as an 8-bit value
6400.05	Analog input 5: SpaceMouse axis position 5 as an 8-bit value
6400.06	Analog input 6: SpaceMouse axis position 6 as an 8-bit value
6401.01	Analog input 1: SpaceMouse axis position 1 as a 16-bit value
6401.02	Analog input 2: SpaceMouse axis position 2 as a 16-bit value
6401.03	Analog input 3: SpaceMouse axis position 3 as a 16-bit value
6401.04	Analog input 4: SpaceMouse axis position 4 as a 16-bit value
6401.05	Analog input 5: SpaceMouse axis position 5 as a 16-bit value
6401.06	Analog input 6: SpaceMouse axis position 6 as a 16-bit value

quick reference		
PDO mapping (default)		
index	Entry	
Transmit PDO1		
1A00.00	8th	
1A00.01	64000108	SpaceMouse axis 1 8 bits
1A00.02	64000208	SpaceMouse Axis 2 8 bits
1A00.03	64000308	SpaceMouse Axis 3 8 bits
1A00.04	64000408	SpaceMouse Axis 4 8 bits
1A00.05	64000508	SpaceMouse Axis 5 8 bits
1A00.06	64000608	SpaceMouse Axis 6 8 bits
Transmit PDO 2 * 1)		
1A01.00	4	
1A01.01	64010110	SpaceMouse Axis 1 16 bits
1A01.02	64010210	SpaceMouse Axis 2 16 bits
1A01.03	64010310	SpaceMouse Axis 3 16 bits
1A01.04	64010410	SpaceMouse Axis 4 16 bits
Transmit PDO 3 * 1)		
1A02.00	0	
1A02.01	64010510	SpaceMouse Axis 5 16 bits
1A02.02	64010610	SpaceMouse Axis 6 16 bits
Transmit PDO4		
1A03.00	0	