maxon motor

maxon motor control	EPOS P Positioning Controller
Firmware Specification	**Edition June 2007**

EPOS P

Programmable Positioning Controller

Documentation

Firmware Specification

1 Table of contents

2 Table of figures

3 Table of tables

4 Introduction

This documentation "EPOS P Firmware Specification" provides the firmware details of the EPOS P 24/5 programmable positioning controller. It contains descriptions of the architecture, error handling and object dictionary.

The maxon motor control EPOS P 24/5 is a small-sized, full digital and free programmable positioning control unit. Due to the flexible and high efficient power stage, the EPOS P 24/5 drives brushed DC motors with digital encoder as well as brushless EC motors with digital Hall sensors and encoder.

The sinusoidal current commutation by space vector control offers to drive brushless EC motors with minimal torque ripple and low noise. The integrated position-, velocity- and current control functionality allows sophisticated positioning applications. The EPOS P 24/5 is programmable with a very efficient software tool. The programming languages are according to IEC 61131-3 standard. The built-in CANopen interface allows the design of an easy-to-use standalone multiple axis system, particularly with standard maxon EPOS controllers. In addition, the unit can be operated through any RS-232 communication port.

The latest edition of this "Firmware Specification", additional documentation and software to the EPOS P positioning controller may also be found on the internet in www.maxonmotor.com category
<Service & Downloads>.

5 How to use this guide

Setup

Installation   **Configuration**   **Programming**   **Application**

Cable Starting Set   EPOS Studio   EPOS Studio   Application Notes
Application Samples

Hardware Reference   Programming Reference

Firmware Specificaton
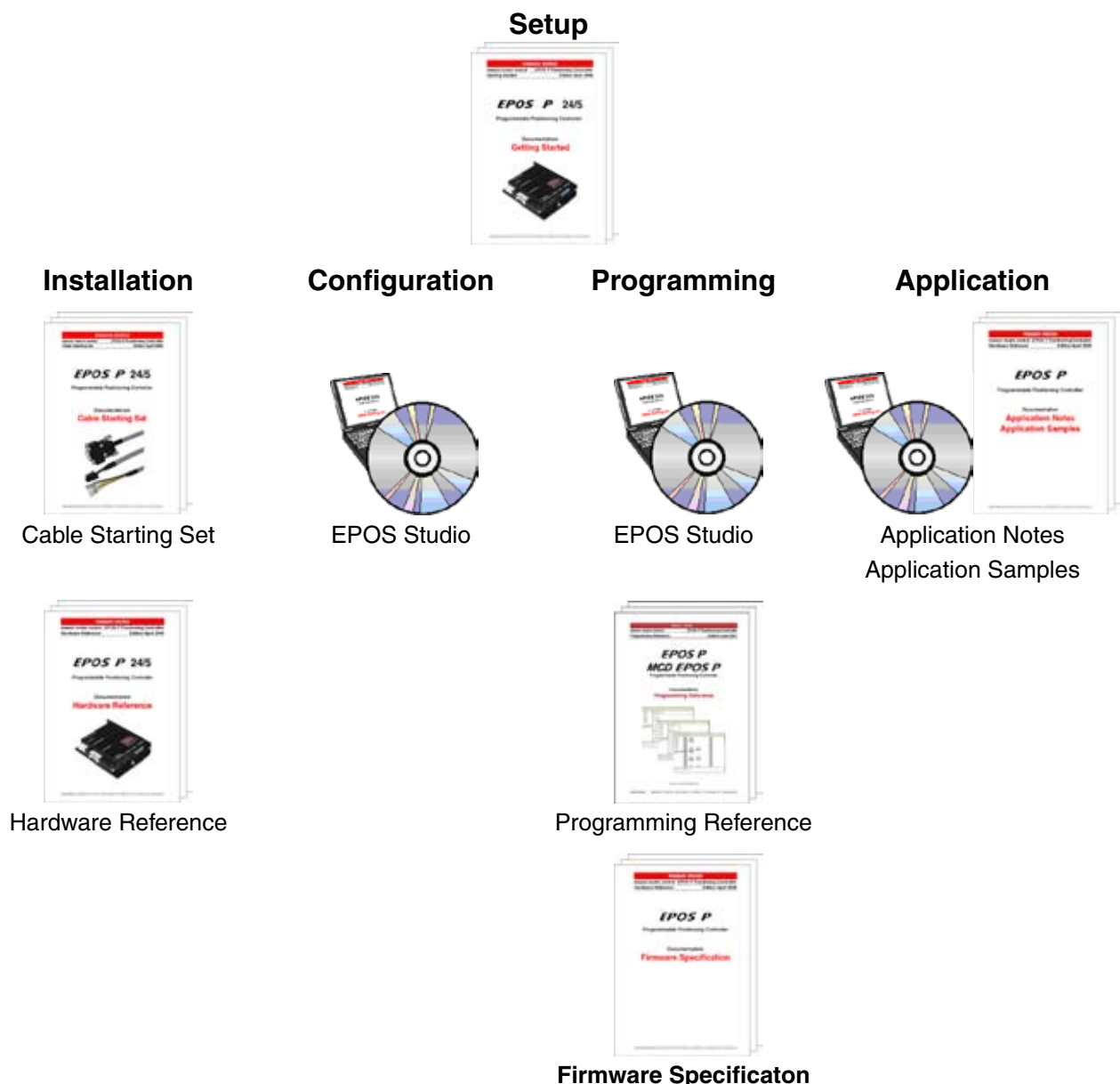
Figure 1: EPOS P documentation hierarchy

6 Additional documentations

[1]	CiA DS-301 Communication Profile for Industrial Systems	www.can-cia.org
[2]	CiA DSP-302 Framework for CANopen Managers and Programmable CANopen Devices	www.can-cia.org (for CiA members only)
[3]	CiA DS-405 Interface and Device Profile for IEC 61131-3 Programmable Devices	www.can-cia.org
[4]	DS-306 Electronic Data Sheet Specification	www.can-cia.org
[5]	Konrad Etschberger: Controller Area Network (ISBN 3-446-21776-2)	
[6]	maxon motor: EPOS Firmware Specification (Document #798675)	EPOS P CD-ROM or www.maxonmotor.com

7 Overview

7.1 Architecture of the device

The communication interface of the EPOS P follows the CiA CANopen specifications:

   - DS-301 V4.02 Application Layer and Communication Profile [1]
   - DSP-302 V3.3 Framework for CANopen Managers and Programmable CANopen Devices [2]
   - DS-405 V2.0 Interface and Device Profile for IEC 61131-3 Programmable Devices [3]
   - DS-306 V1.3 Electronic Data Sheet Specification [4]

The communication interface and the behaviour of the EPOS [Internal] is described in "EPOS Firmware Specification" [6] (Edition July 2006 or newer) .
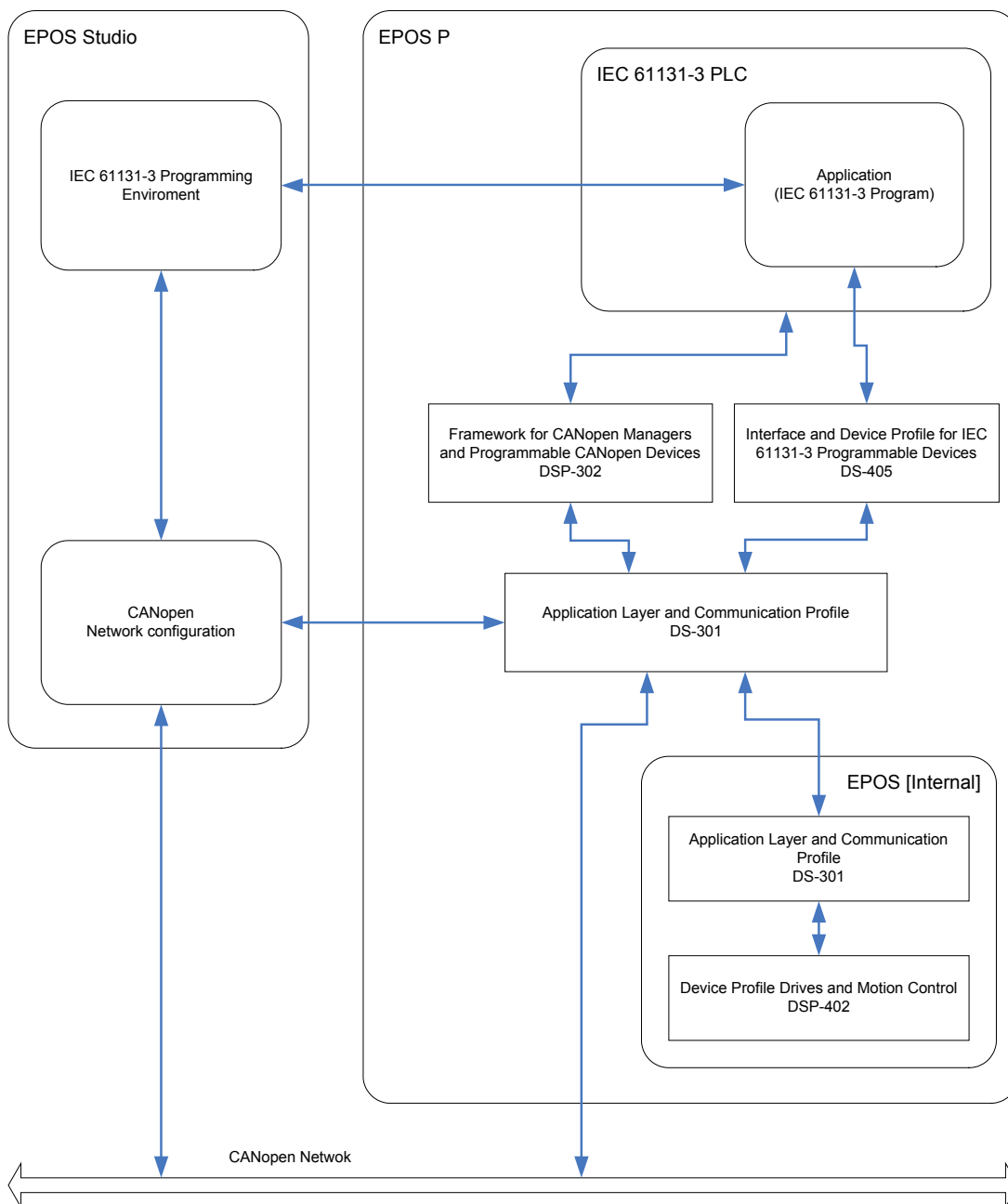
Figure 2: Communication architecture

8 System architecture

The EPOS P is designed as a CANopen manager. The following functionalities are implemented therefore:

Configuration Manager

The Configuration Manager is the functionality that provides mechanisms for checking the configuration of nodes in a system during boot-up.

Nmt Master

The network management (Nmt) provides services for controlling the network behaviour of the nodes as defined in DS-301.

SYNC Producer

The SYNC Producer is a functionality that is responsible for transmitting the SYNC object.

8.1 Boot-Up Procedure

The Configuration Manager has the task of booting all assigned slaves and checking their configuration. At each cold- or warm-start of the application program, the CANopen boot-up procedure will be executed before the EPOS P switches the state from Pre-Operational to Operational. The main flow resumes in figure below.
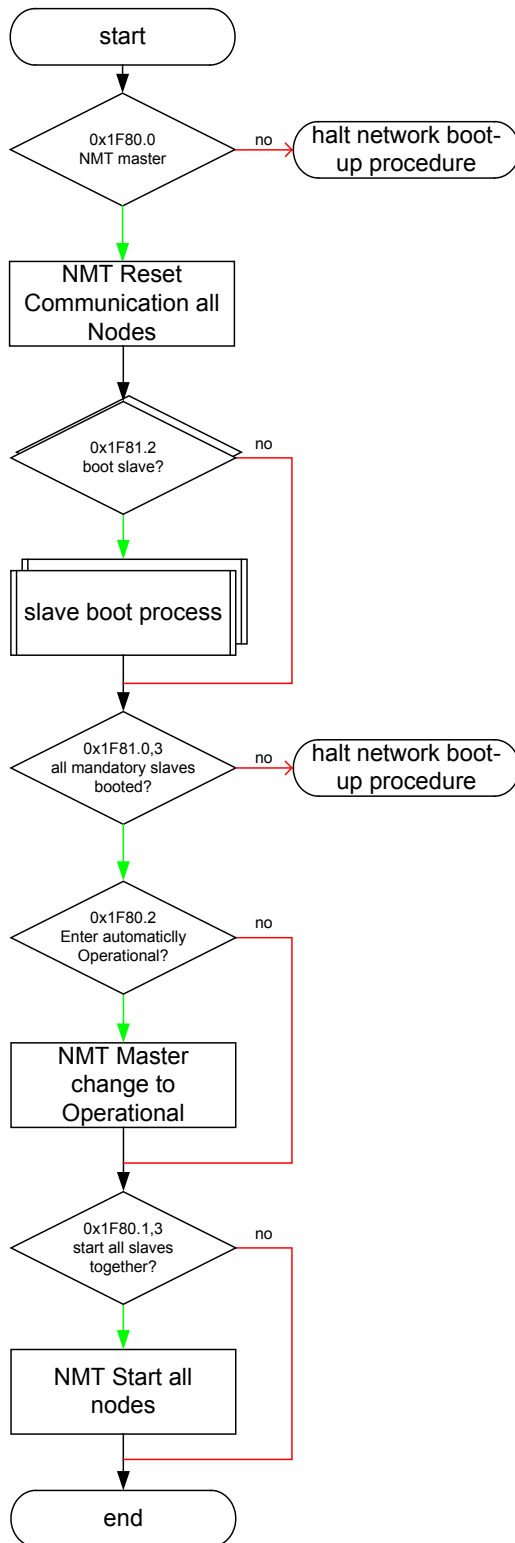
Figure 3: CANopen boot-up procedure main flow

The slave boot process is given by figure below. Checks the stored slave configurations in the objects 0x1F84 to 0x1F89, 0x1F26 and 0x1F27 and produces an error if a mandatory slave does not match.

Figure 4: CANopen boot-up procedure slave boot process

9 Error Handling

9.1 CAN Master Error Codes

The error detected by the CAN master due to controlling the CAN ports will be stored in the
Error history.

Error Code	Description	Comment
0x5530	Eeprom Error	Hardware error by accessing nonvolatile memory
0x6181	Interpreter Error	Error occurred at interpreting code
0x6182	Native Code Error	Error occurred at executing native code
0x6183	Timer Task Error	Error occurred at starting a timer task
0x6184	Interrupt Task Error	Error occurred at starting a interrupt / event task
0x6185	Data Access Error	Data or program access exception detected
0x6310	Retain Variable Error	Error occurred at saving or restoring retain variables
0x6381	Device Type Error	Failed network bootup! Bad device type detected
0x6382	Vendor-Id Error	Failed network bootup! Bad vendor-Id detected
0x6383	Product Code Error	Failed network bootup! Bad product code detected
0x6384	Revision Number Error	Failed network bootup! Bad revision number detected
0x6385	Serial Number Error	Failed network bootup! Bad serial number detected
0x6386	Configuration Time and Date Error	Failed network bootup! Bad configuration date or time detected
0x6387	Error Control Error	Failed network bootup! No heartbeat received
0x6388	Node is not Slave Error	Failed network bootup! Mandatory Node is not defined as slave
0x8110	CAN Overrun Error	CAN frames lost
0x8120	CAN Passive Error	Port changed to state passive
0x8130	CAN Lifeguard Error	Life guarding (heartbeat) timeout
0x8181	CAN Controller Error	Error occurred at configuring of embedded CAN controller
0x8182	CAN No Answer Error	Configured Node does not answer / is not present
0x81FC	CAN Warning	Frame error warning level detected
0x81FD	CAN Bus Off Error	Port changed to state bus off
0x8210	CAN PDO Length Error	Too short PDO received

Table 1: CAN Master Error Codes

10 Object Dictionary

10.1 Device type

Name	Device Type	
Index	0x1000	
Sub-index	0x00	
Type	UNSIGNED32	
Access	RO	
Default Value	0x00000195	
Value range	-	-

Description

This object describes the device type. The lower word of the device type stands for the supported device profile number. The value 0x0195 (405) mean that device follows the CiA Draft Standard 405, Interface and Device Profile for IEC 61131-3 Programmable Devices.

10.2 Error Register

Name	Error Register	
Index	0x1001	
Sub-index	0x00	
Type	UNSIGNED8	
Access	RO	
Default Value	0	
Value range	-	-

Description

This object is an error register for the device. The device maps internal errors in this register.

Bit	Description
0	Generic
1	Current (not used)
2	Voltage (not used)
3	Temperature (not used)
4	Communication
5	Device Profile Specific (not used)
6	reserved (not used)
7	Manufacturer Specific

Table 2: Description of Error Register

10.3 Manufacturer Status Register

Name	Manufacturer Status Register	
Index	0x1002	
Sub-index	0x00	
Type	UNSIGNED32	
Access	RO	
Default Value	0	
Value range	-	-

Description

This object is an overview of all Error Register Flags of the connected slaves and the Master Errors and Warnings. A set bit means error/warning.

Bit	Description
0	one of the connected slaves signals a Generic Error Bit in Error Register
1	one of the connected slaves signals a Current Error Bit in Error Register
2	one of the connected slaves signals a Voltage Error Bit in Error Register
3	one of the connected slaves signals a Temperature Error Bit in Error Register
4	one of the connected slaves signals a Communication Error Bit in Error Register
5	one of the connected slaves signals a Device Profile Specific Error Bit in Error Register
6	reserved
7	one of the connected slaves signals a Manufacturer Specific Error Bit in Error Register
8 - 15	copy of Error Register
16	Master Generic Warning
17 - 19	not used
20	Master Communication Warning
21 - 22	not used
23	Master Manufacturer Specific Warning
24 - 31	not used

Table 3: Description of Manufacturer Status Register

10.4 Error History

Name	Error History
Index	0x1003
number of entries	0x10

Description

This object holds the errors that have been occurred on the device.

Name	Number of Errors
Index	0x1003
Sub-index	0x00
Type	UNSIGNED8
Access	RW
Default Value	0
Value range	-	-

Description

This entry contains the number of actual errors that are recorded in the array starting at sub-index 1. Writing a "0" deletes the error history (empties the array). Writing a value higher then zero is not allowed.

Name	Error History (1) to (16)
Index	0x1003
Sub-index	0x01 to 0x10
Type	UNSIGNED32
Access	RO
Default Value	0
Value range	-	-

Description

Every new error code is stored at sub-index 1, the older ones move down the list. The error entry contains the CAN error code of the detected error (or warning), the port number and the node-id if it is identifiable.

Bit 31	Bit 30 – 28	Bit 27 – 24	Bit 23 – 16	Bit 15 – 0
warning	reserved	port code	node-Id	error code

Table 4: Structure of Error History

Bits	Value	Description
warning	0 1	Error Warning only
port code	1 2	CAN port number 1 (internal) CAN port number 2
node-Id	0 1 .. 127	Unknown / master Slave node identification
error code		CAN Master Error Codes

Table 5: Description of Error History

10.5 COB-ID SYNC

Name	COB-ID SYNC Message	
Index	0x1005	
Sub-index	0x00	
Type	UNSIGNED32	
Access	RW	
Default Value	0x00000080	
Value range	see table below	-

Description

Communication Object Identifier of synchronization object. SYNC messages will be produced in the interval defined by Communication Cycle Time if the generate flag (bit 30) is set.

Bit 31	Bit 30	Bit 29 – 11	Bit 10 – 0
do not care	generate	0 (CAN base frame)	11-bit CAN-ID = 0x80

Table 6: Structure of COB-ID SYNC

10.6 Communication Cycle Time

Name	Communication Cycle Time	
Index	0x1006	
Sub-index	0x00	
Type	UNSIGNED32	
Access	RW	
Default Value	0x00000000	
Value range	1000	MAX_UINT32

Description

This object provides the communication cycle period, which defines the SYNC interval. The value is given in multiple of microseconds (µs). The value 0 disables the SYNC messages.

Remarks

It is in the responsibility of the system or network designer to choose a communication cycle time, which allows transmitting all cyclic datas together with the communication base load. The communication cycle period should be balanced to the cycle time used by the application software.

For the correlation of Communication Cycle Time and Synchronous Window Length see figure below.

### Related Objects

COB-ID SYNC, Synchronous Window Length
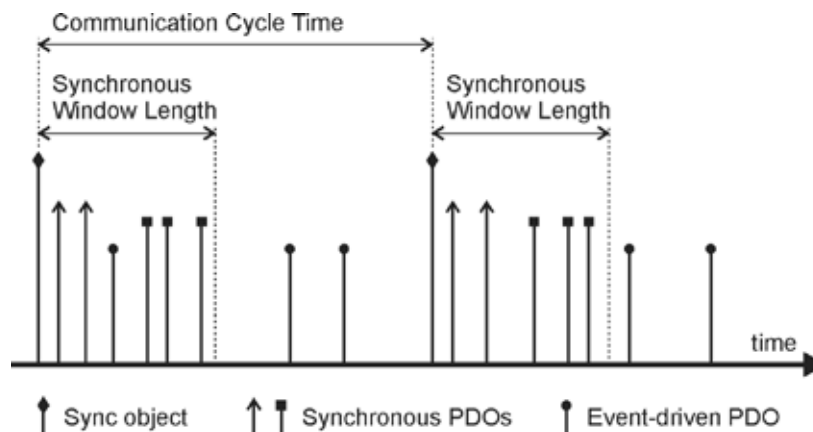
Figure 5: Synchronous Communication Cycle

10.7 Synchronous Window Length

Name	Synchronous Window Length	
Index	0x1007	
Sub-index	0x00	
Type	UNSIGNED32	
Access	RW	
Default Value	0x00000000	
Value range	500	MAX_UINT32

Description
This object indicates the configured length of the time window for the synchronous PDOs. The value is given in multiple of microseconds (µs).

Remark
For the correlation of Synchronous Window Length and Communication Cycle Time see figure Synchronous Communication Cycle.

Related Objects
COB-ID SYNC, Communication Cycle Time

10.8 Device Name

Name	Device Name	
Index	0x1008	
Sub-index	0x00	
Type	VISIBLE_STRING	
Access	CONST	
Default Value	"EPOS P"	
Value range	-	-

Description
The name of the device is "EPOS P".

10.9 Store parameters

Name	Store Parameters
Index	0x1010
number of entries	0x01

Name	Save All Parameters	
Index	0x1010	
Sub-index	0x01	
Type	UNSIGNED32	
Access	RW	
Default Value	-	
Value range	-	-

Description
All parameters of the device will be stored in non-volatile memory, if the signature "save" is written to this object.

Byte	MSB			LSB
Character	'e'	'v'	'a'	's'
Hex value	0x65	0x76	0x61	0x73

Table 7: Storage write access signature

10.10 Restore Default Parameters

Name	Restore Default Parameters
Index	0x1011
number of entries	0x02

Name	Restore All Default Parameters	
Index	0x1011	
Sub-index	0x01	
Type	UNSIGNED32	
Access	RW	
Default Value	-	
Value range	-	-

Description
All parameters of the device will be restored with default values, if the signature "load" is written to this object.

Byte	MSB			LSB
Character	'd'	'a'	'o'	'l'
Hex value	0x64	0x61	0x6F	0x6C

Table 8: Restore default write access signature

Name	Erase Application Program	
Index	0x1011	
Sub-index	0x02	
Type	UNSIGNED32	
Access	RW	
Default Value	-	
Value range	-	-

Description
The application program will be deleted by writing the signature "eras" to this object.

Byte	MSB			LSB
Character	's'	'a'	'r'	'e'
Hex value	0x73	0x61	0x72	0x65

Table 9: Erase application program write access signature

10.11 Consumer Heartbeat Time

Name	Consumer Heartbeat Time
Index	0x1016
number of entries	0x80

Name	Consumer Heartbeat Time Node 1 to 128	
Index	0x1016	
Sub-index	0x01 to 0x80	
Type	UNSIGNED32	
Access	RW	
Default Value	0x00000000	
Value range	see table below	-

Description
The consumer heartbeat time provides the expected heartbeat cycle times. They are higher than the corresponding producer heartbeat times configured on the CAN device producing this heartbeat.

The heartbeat time is given in milliseconds (ms).

If the heartbeat time is zero or the node-Id is zero the corresponding object entry is not used.

Remarks
Sub-indexes 1 to 127 are used for the devices with Node-Id 1 to 127 connected to the (external accessible) CAN port number 2. Sub-index 128 (0x80) is used for the EPOS [Internal] with node-Id 1.

Bit 31 - 24	Bit 23 - 16	Bit 15 - 0
port code	node-Id	heartbeat time

Table 10: Structure of Consumer heartbeat time

Bits	Value	Description
port code	01 02	CAN port number 1 (internal) CAN port number 2
node-Id	1 .. 127	producer node-Id
heartbeat time		maximal expected heartbeat time [ms]

Table 11: Description of Consumer heartbeat time

10.12 Producer Heartbeat Time

Name	Producer Heartbeat Time
Index	0x1017
number of entries	0x01

Name	Producer Heartbeat Time	
Index	0x1017	
Sub-index	0x00	
Type	UNSIGNED16	
Access	RW	
Default Value	0x0000	
Value range	-	-

Description
The producer heartbeat time shall indicate the configured cycle time of the heartbeat. The value is given in multiples of 1 ms. The value 0 disables the heartbeat producer.

10.13 Identity Object

Name	Identity Object
Index	0x1018
number of entries	0x04

Name	Vendor ID	
Index	0x1018	
Sub-index	0x01	
Type	UNSIGNED32	
Access	RO	
Default Value	0x000000FB	
Value range	-	-

Description

The CANopen vendor identification of "maxon motor ag" defined by CiA is 0x000000FB.

Name	Product Code	
Index	0x1018	
Sub-index	0x02	
Type	UNSIGNED32	
Access	RO	
Default Value	-	
Value range	-	-

Description

This object contains the hardware specific type of the CANopen device.

Related Objects

EPOS P Version

Name	Revision Number	
Index	0x1018	
Sub-index	0x03	
Type	UNSIGNED32	
Access	RO	
Default Value	-	
Value range	-	-

Description

This object contains the software specific revision number.

Related Objects

EPOS P Version

Name	Serial Number	
Index	0x1018	
Sub-index	0x04	
Type	UNSIGNED32	
Access	RO	
Default Value	-	
Value range	-	-

Description

This object contains a (unique) serial number.

10.14 Synchronous counter

Name	Synchronous Counter	
Index	0x1019	
Sub-index	0x00	
Type	UNSIGNED32	
Access	RW	
Default Value	0x00	
Value range	see table below	-

Description

This object indicates the configured highest value the counter supports. The synchronous counter is mapped into the SYNC message. The value of the counter will be incremented by one with any request of the service SYNC write. When the highest value is reached the counter starts counting from one.

Related Objects

COB-ID SYNC, Communication Cycle Time

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

Table 12: Synchronous counter code

10.15 SDO Client parameter

Name	SDO client parameter
Index	0x1280 to 0x12FF
number of entries	0x03

Description

These objects contain the parameters for the SDO servers for which the EPOS P is the SDO client.

Name	COB-ID client to server (internal, 1...127)	
Index	0x1280 to 0x12FF	
Sub-index	0x01	
Type	UNSIGNED32	
Access	RW	
Default Value	0x600 + server node-Id	
Value range	-	-

Description

This object specifies the COB-ID for the communication from the EPOS P as client to the associated SDO server.

Name	COB-ID server to client (internal, 1...127)	
Index	0x1280 to 0x12FF	
Sub-index	0x02	
Type	UNSIGNED32	
Access	RW	
Default Value	0x580 + server node-Id	
Value range	-	-

Description

This object specifies the COB-ID for the communication from the associated SDO server to the EPOS P.

Name	Server Node-ID (internal, 1...127)	
Index	0x1280 to 0x12FF	
Sub-index	0x03	
Type	UNSIGNED8	
Access	RW	
Default Value	0x1280: 0x01 (Internal Port) 0x1281: 0x01 (CAN Port) 0x1282: 0x02 (CAN Port) ‖ ‖ 0x12FF: 0x7F (CAN Port)	
Value range	-	-

Description

This object specifies the node-Id of the associated server.

Remarks

Not changeable

10.16 Receive PDO parameter

Name	Receive PDO parameter
Index	0x1400 to 0x141F, 0x1500 to 0x1503
number of entries	0x02

Description

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

There are 32 receive PDOs (Index 0x1400 – 0x141F) for the external accessible CAN bus and 4 receive PDOs (Index 0x1500 – 0x1503) for internal use.

Related Objects

Receive PDO mapping

Name	COB-ID used by RxPDO 1 to 32, 1 internal to 4 internal	
Index	0x1400 to 0x141F, 0x1500 to 0x1503	
Sub-index	0x01	
Type	UNSIGNED32	
Access	RW	
Default Value	0x1500: 0x00000181 all others: 0xC0000000	
Value range	see table below	-

Description

Communication Object Identifier of receive process data object.

Remarks

Changes in mapping are only possible in **Nmt state Pre-Operational**.

Bit 31	Bit 30	Bit 29 - 11	Bit 10 - 0
valid	RTR	0 (CAN base frame)	11-bit CAN-ID

Table 13: Structure of COB-ID RxPDO

Bits		Description
valid	0b 1b	PDO exists / is valid PDO does not exist / is not valid
RTR	0b 1b	RTR allowed on this PDO no RTR allowed on this PDO
11-bit CAN-ID		11-bit CAN-ID of the CAN base frame Value range: 0x181 .. 0x57F; 0x000 (if valid = 1)

Table 14: Description of COB-ID RxPDO

Name	Transmission Type RxPDO 1 to 32, 1 internal to 4 internal	
Index	0x1400 to 0x141F, 0x1500 to 0x1503	
Sub-index	0x02	
Type	UNSIGNED8	
Access	RW	
Default Value	255	
Value range	see table below	-

Description

The transmission type describes how PDO communication works.

Remarks

Changes in mapping are only possible in **Nmt state Pre-Operational**.

Value	Description
1	synchron
255	asynchron

Table 15: Receive PDO transmission type

10.17 Receive PDO mapping

Name	Receive PDO mapping
Index	0x1600 to 0x161F, 0x1700 to 0x1703
Number of entries	8

Name	Number of Mapped Application Objects in RxPDO 1 to 32, 1 internal to 4 internal	
Index	0x1600 to 0x161F, 0x1700 to 0x1703	
Sub-index	0x00	
Type	UNSIGNED8	
Access	RW	
Default Value	0x1700: 0x01 all others: 0x00	
Value range	see table below	-

Description

This object contains the number of valid object entries within the mapping record.

Remarks

Changes in mapping are only possible in **Nmt state Pre-Operational**.

Value	Description
0	PDO is disabled
1 - 8	one to eight objects are mapped

Table 16: Number of mapped receive PDO objects

Name	1st to 8th Mapped Object in RxPDO 1 to 32, 1 internal to 4 internal	
Index	0x1600 to 0x161F, 0x1700 to 0x1703	
Sub-index	0x01 to 0x08	
Type	UNSIGNED32	
Access	RW	
Default Value	0x1700: 0x52800210 all other: 0x00000000	
Value range	see value definition	-

Description

The objects in the next table are supported to map.

Remarks

Changes in mapping are only possible in **Nmt state Pre-Operational**.

To change a mapped object it is necessary to disable PDO by writing 0 to the number of mapped PDO objects.

The maximal length of a process data object (PDO) is 64 bit.

Though the grey coloured entries in table below are mappable, it does not make really sense to map them.

Bit 31 -16	Bit 15 - 8	Bit 7 - 0	
Index	**Sub-index**	**Length (in bit)**	
0x5280 to 0x529F	0x01	0x10	Axis 0 to 31 Controlword
0x5280 to 0x529F	0x02	0x10	Axis 0 to 31 Statusword
0xA000	0x01 to 0x10	0x08	Process Image Input Integer 8
0xA040	0x01 to 0x10	0x08	Process Image Input Unsigned 8
0xA0C0	0x01 to 0x10	0x10	Process Image Input Integer 16
0xA100	0x01 to 0x10	0x10	Process Image Input Unsigned 16
0xA1C0	0x01 to 0x10	0x20	Process Image Input Integer 32
0xA200	0x01 to 0x10	0x20	Process Image Input Unsigned 32
0xA480	0x01 to 0x10	0x08	Process Image Output Integer 8
0xA4C0	0x01 to 0x10	0x08	Process Image Output Unsigned 8
0xA540	0x01 to 0x10	0x10	Process Image Output Integer 16
0xA580	0x01 to 0x10	0x10	Process Image Output Unsigned 16
0xA640	0x01 to 0x10	0x20	Process Image Output Integer 32
0xA680	0x01 to 0x10	0x20	Process Image Output Unsigned 32

Table 17: Receive PDO mapping objects

10.18 Transmit PDO parameter

Name	Transmit PDO Parameter
Index	0x1800 to 0x181F, 0x1900 to 0x1903
number of entries	0x03

Description

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

There are 32 transmit PDOs for the external accessible CAN bus (Index 0x1800 – 0x181F) and 4 transmit PDOs for internal use (Index 0x1900 – 0x1903)

Name	COB-ID used by TxPDO 1 to 32, 1 internal to 4 internal	
Index	0x1800 to 0x181F, 0x1900 to 0x1903	
Sub-index	0x01	
Type	UNSIGNED32	
Access	RW	
Default Value	0xC0000000	
Value range	see table below	-

Description

Communication Object Identifier of transmit process data object 1.

Bit 31	Bit 30	Bit 29 - 11	Bit 10 - 0
valid	RTR	0 (CAN base frame)	11-bit CAN-ID

Table 18: Structure of COB-ID TxPDO

Bits		Description
valid	0b 1b	PDO exists / is valid PDO does not exist / is not valid
RTR	0b 1b	RTR allowed on this PDO no RTR allowed on this PDO
11-bit CAN-ID		11-bit CAN-ID of the CAN base frame Value range: 0x181 .. 0x57F; 0x000 (if valid = 1)

Table 19: Description of COB-ID TxPDO

Name	Transmission Type TxPDO 1 to 32, 1 internal to 4 internal	
Index	0x1800 to 0x181F, 0x1900 to 0x1903	
Sub-index	0x02	
Type	UNSIGNED8	
Access	RW	
Default Value	255	
Value range	see table below	-

Description

The transmission type describes how PDO communication works.

Remarks

The transmission type 253 means that the PDO is only transmitted on remote transmission request (RTR). If transmission type 255 is selected the PDO is transmitted if the data's change its values. The inhibit time defines a minimum interval therefore.

Changes in mapping are only possible in **Nmt state Pre-Operational**.

Value	Description
1	synchron
253	asynchron on RTR only
255	asynchron on change

Table 20: Transmit PDO transmission type

Name	Inhibit Time TxPDO 1 to 32, 1 internal to 4 internal	
Index	0x1800 to 0x181F, 0x1900 to 0x1903	
Sub-index	0x03	
Type	UNSIGNED16	
Access	RW	
Default Value	10	
Value range	0	65535

Description

This time is the minimum interval for event triggered PDO transmission. The value is defined as multiple of 100μs.

Remarks

Event triggered PDOs can generate a huge CAN bus load and device load also, especially if the inhibit time of different PDOs are set to a small value.

Name	Event Timer TxPDO 1 to 32, 1 internal to 4 internal	
Index	0x1800 to 0x181F, 0x1900 to 0x1903	
Sub-index	0x05	
Type	UNSIGNED16	
Access	RW	
Default Value	0	
Value range	0	65535

Description

This time is the maximum interval for event triggered PDO transmission if the Transmission Type is set to 255. The value is defined as multiple of 1 ms. The value of 0 disables the Event Timer.

10.19 Transmit PDO mapping

Name	Transmit PDO Mapping	
Index	0x1A00 to 0x1A1F, 0x1B00 to 0x1B03	
number of entries	-	

Name	Number of Mapped Application Objects in TxPDO 1 to 32, 1 internal to 4 internal	
Index	0x1A00 to 0x1A1F, 0x1B00 to 0x1B03	
Sub-index	0x00	
Type	UNSIGNED8	
Access	RW	
Default Value	0	
Value range	see table below	-

Description
This object contains the number of valid object entries within the mapping record.
Remarks
Changes in mapping are only possible in **Nmt state Pre-Operational**.

Value	Description
0	PDO is disabled
1-8	one to eight objects are mapped

Table 21: Number of mapped transmit PDO objects

Name	1st to 8th Mapped Object in TxPDO 1 to 32, 1 internal to 4 internal	
Index	0x1A00 to 0x1A1F, 0x1B00 to 0x1B03	
Sub-index	0x01 to 0x08	
Type	UNSIGNED32	
Access	RW	
Default Value	0x00000000	
Value range	see next table	-

Description
The objects in next table are supported to map.
Remarks
Changes in mapping are only possible in **Nmt state Pre-Operational**.

To change a mapped object it is necessary to disable PDO by writing 0 to the number of mapped PDO objects.

The maximal length of a process data object (PDO) is 64 bit.

Though the grey coloured entries in the next table are mappable, it does not make really sense to map them.

Bit 31 -16	Bit 15 - 8	Bit 7 - 0	
Index	**Sub-index**	**Length (in bit)**	
0x5280 to 0x529F	0x01	0x10	Axis 0 to 31 Controlword
0x5280 to 0x529F	0x02	0x10	Axis 0 to 31 Statusword
0xA000	0x01 to 0x10	0x08	Process Image Input Integer 8
0xA040	0x01 to 0x10	0x08	Process Image Input Unsigned 8
0xA0C0	0x01 to 0x10	0x10	Process Image Input Integer 16
0xA100	0x01 to 0x10	0x10	Process Image Input Unsigned 16
0xA1C0	0x01 to 0x10	0x20	Process Image Input Integer 32
0xA200	0x01 to 0x10	0x20	Process Image Input Unsigned 32
0xA480	0x01 to 0x10	0x08	Process Image Output Integer 8
0xA4C0	0x01 to 0x10	0x08	Process Image Output Unsigned 8
0xA540	0x01 to 0x10	0x10	Process Image Output Integer 16
0xA580	0x01 to 0x10	0x10	Process Image Output Unsigned 16
0xA640	0x01 to 0x10	0x20	Process Image Output Integer 32
0xA680	0x01 to 0x10	0x20	Process Image Output Unsigned 32

Table 22: Transmit PDO mapping objects

10.20 Expected Configuration Date

Name	Expected Configuration Date
Index	0x1F26
number of entries	128

Name	Expected Configuration Date Node 1 to 128	
Index	0x1F26	
Sub-index	0x01 to 0x80	
Type	UNSIGNED32	
Access	RW	
Default Value	0	
Value range	-	-

Description

This object should contain the value of the Verify Configuration object (0x1020sub1) of the corresponding slave. This allows verifying the correct configuration of the connected slave at boot-up. A value of zero disables the check.

Remarks

Sub-indexes 1 to 127 are used for the devices with node-Id 1 to 127 connected to the (external accessible) CAN port number 2. Sub-index 128 (0x80) is used for the EPOS [Internal].

10.21 Expected Configuration Time

Name	Expected Configuration Time
Index	0x1F27
number of entries	128

Name	Expected Configuration Time Node 1 to 128	
Index	0x1F27	
Sub-index	0x01 to 0x80	
Type	UNSIGNED32	
Access	RW	
Default Value	0	
Value range	-	-

Description

This object should contain the value of the Verify Configuration object (0x1020sub2) of the corresponding slave. This allows verifying the correct configuration of the connected slave at boot-up. A value of zero disables the check.

Remarks

Sub-indexes 1 to 127 are used for the devices with node-Id 1 to 127 connected to the (external accessible) CAN port number 2. Sub-index 128 (0x80) is used for the EPOS [Internal].

10.22 Nmt Start-up

Name	Nmt Start-up	
Index	0x1F80	
Sub-index	0x00	
Type	UNSIGNED32	
Access	RW	
Default Value	0x00000007	
Value range	-	-

Description

This object configures the start-up behaviour of the device that is able to perform the Nmt.

Bit 31 – 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved 0x0000 00	reserved 0	Stop all nodes	Flying master	Reset all nodes	Start node	Self starting	Start all nodes	Nmt master

Table 23: Structure of Nmt Start-up

Bits		Description
Nmt master	0	not supported
	1	EPOS P is in Nmt master mode
Start all nodes	0	Nmt service 'start remote node' for each Node-ID
	1	Nmt service 'start remote node' with Node-ID = 0
Self starting	0	EPOS P switches into Nmt state Operational in boot-up procedure
	1	EPOS P does not switch itself to Nmt state Operational automatically
Start node	0	EPOS P starts the slaves
	1	EPOS P does not start the slaves and the application may start them
Reset all slaves	0	node reset on error of mandatory slave **not implemented**
Flying master	0	Nmt flying master **not implemented**
Stop all nodes	0	node stop on error of mandatory slave **not implemented**

Table 24: Definition of Nmt Start-up bits

10.23 Slave Assignment

Name	Slave Assignment
Index	0x1F81
number of entries	128

Name	Slave Assignment Node 1 to 128	
Index	0x1F81	
Sub-index	0x01 to 0x80	
Type	UNSIGNED32	
Access	RW	
Default Value	0	
Value range	-	-

Description

This object is part of the network list. It assigns slaves to the Nmt Master.

Remarks

Sub-indexes 1 to 127 are used for the devices with node-Id 1 to 127 connected to the (external accessible) CAN port number 2. Sub-index 128 (0x80) is used for the EPOS [Internal].

Bit 31 – 16	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
reserved 0x0000 00	reserved 0	Software update	Software version	Reset communi- cation	Mandatory	Nmt boot slave	Restore	Nmt slave

Table 25: Structure of Nmt Start-up

Bits		Description
Nmt slave	0 1	CANopen device in Nmt master mode or not available in network CANopen device in Nmt slave mode and available in network
Restore	0	CANopen device may be used without prior resetting
Nmt boot slave	0 1	Configuration and Nmt service 'Start remote node' not allowed Configuration and Nmt service 'Start remote node' allowed
Mandatory	0 1	CANopen device may be present prior to network start-up (optional) CANopen device shall be present prior to network start-up (mandatory)
Reset communication	0	no Reset Communication check implemented
Software version	0	no software verification implemented
Software update	0	no automatic software update implemented

Table 26: Definition of Nmt Start-up bits

10.24 Request Nmt

Name	Request Nmt
Index	0x1F82
number of entries	128

Name	Request Nmt 1 to 128	
Index	0x1F82	
Sub-index	0x01 to 0x80	
Type	UNSIGNED32	
Access	RW	
Default Value	-	
Value range	see table	

Description

The Request Nmt represents the current Nmt State of the connected CANopen Slaves when reading the objects (heartbeat must be active) and make possible to send nmt commands to the connected CANopen Slaves when writing the Object.

Value	OnReadAccess	Value	OnWriteAccess
0x00	Nmt state unknown		
0x04	Nmt state stopped	0x04	Request Nmt Stop Command
0x05	Nmt state operational	0x05	Request Nmt Start Command
		0x06	Request Nmt Reset Command
		0x07	Request Nmt Reset Communication Command
0x7F	Nmt state pre-operational	0x7F	Request Enter pre-operational Command

Table 27: Request Nmt commands and state information

10.25 Device Type Identification

Name	Device Type Identification
Index	0x1F84
number of entries	128

Name	Device Type Identification Node 1 to 128	
Index	0x1F84	
Sub-index	0x01 to 0x80	
Type	UNSIGNED32	
Access	RW	
Default Value	0	
Value range	-	-

Description

This object is part of the network list. It allows entering values for expected device types (object 0x1000 sub-index 0x00 of the corresponding slave).

Remarks

Sub-indexes 1 to 127 are used for the devices with node-Id 1 to 127 connected to the (external accessible) CAN port number 2. Sub-index 128 (0x80) is used for the EPOS [Internal].

10.26 Vendor Identification

Name	Vendor Identification
Index	0x1F85
number of entries	128

Name	Vendor Identification Node 1 to 128	
Index	0x1F85	
Sub-index	0x01 to 0x80	
Type	UNSIGNED32	
Access	RW	
Default Value	0	
Value range	-	-

Description

This object is part of the network list. It allows entering values for expected Vendor identification (object 0x1018 sub-index 0x01 of the corresponding slave).

Remarks

Sub-indexes 1 to 127 are used for the devices with node-Id 1 to 127 connected to the (external accessible) CAN port number 2. Sub-index 128 (0x80) is used for the EPOS [Internal].

10.27 Product Code

Name	Product Code
Index	0x1F86
number of entries	128

Name	Product Code Node 1 to 128	
Index	0x1F86	
Sub-index	0x01 to 0x80	
Type	UNSIGNED32	
Access	RW	
Default Value	0	
Value range	-	-

Description

This object is part of the network list. It allows entering values for expected Product Code (object 0x1018 sub-index 0x02 of the corresponding slave).

Remarks

Sub-indexes 1 to 127 are used for the devices with node-Id 1 to 127 connected to the (external accessible) CAN port number 2. Sub-index 128 (0x80) is used for the EPOS [Internal].

10.28 Revision Number

Name	Revision Number
Index	0x1F87
number of entries	128

Name	Revision Number Node 1 to 128	
Index	0x1F87	
Sub-index	0x01 to 0x80	
Type	UNSIGNED32	
Access	RW	
Default Value	0	
Value range	-	-

Description

This object is part of the network list. It allows entering values for expected Vendor identification (object 0x1018 sub-index 0x03 of the corresponding slave).

Remarks

Sub-indexes 1 to 127 are used for the devices with node-Id 1 to 127 connected to the (external accessible) CAN port number 2. Sub-index 128 (0x80) is used for the EPOS [Internal].

10.29 Serial Number

Name	Serial Number
Index	0x1F88
number of entries	128

Name	Serial Number Node 1 to 128	
Index	0x1F88	
Sub-index	0x01 to 0x80	
Type	UNSIGNED32	
Access	RW	
Default Value	0	
Value range	-	-

Description

This object is part of the network list. It allows entering values for expected Serial Number (object 0x1018 sub-index 0x04 of the corresponding slave).

Remarks

Sub-indexes 1 to 127 are used for the devices with node-Id 1 to 127 connected to the (external accessible) CAN port number 2. Sub-index 128 (0x80) is used for the EPOS [Internal].

10.30 Boot Time

Name	Boot Time	
Index	0x1F89	
Sub-index	0x00	
Type	UNSIGNED32	
Access	RW	
Default Value	500	
Value range	200	30000

Description

This object defines the time that will be elapse before the boot-up procedure accesses the slaves. The boot time is given in milliseconds (ms).

10.31 Node Id

Name	Node Id	
Index	0x5000	
Sub-index	0x00	
Type	UNSIGNED8	
Access	RW	
Default Value	-	
Value range	-	

Description

EPOS P CAN Node Id.

Remarks

Changes to this object take only affect after restart. Therefore it is necessary to store all parameters after changing and set DIP-Switches to 0 before restart.

10.32 CAN Bitrate

Name	CAN Bitrate	
Index	0x5001	
Sub-index	0x00	
Type	UNSIGNED16	
Access	RW	
Default Value	0	
Value range	see table below	

Description

The bit rate of the CAN interface can be changed with the *CAN bitrate* parameter.

Remarks

Changes to this object take only effect after restart. Therefore, it is necessary to store all parameters after changing and then restart.

Value	Bit rate
0	1 Mbit/s
1	800 kbit/s
2	500 kbit/s
3	250 kbit/s
4	125 kbit/s
5	reserved
6	50 kbit/s
7	20 kbit/s
8	reserved
9	(auto detection)

Table 28: CAN bit rate codes

10.33 EPOS P Version

Name	Version Numbers
Index	0x5003
number of entries	0x04

Name	EPOS P Software Version	
Index	0x5003	
Sub-index	0x01	
Type	UNSIGNED16	
Access	RO	
Default Value	-	
Value range	-	-

Description

This object contains the software version of the EPOS P (see Firmware Version History).

Name	EPOS P Hardware Version	
Index	0x5003	
Sub-index	0x02	
Type	UNSIGNED16	
Access	RO	
Default Value	-	
Value range	-	-

Description

This object contains the hardware version.

Value	Description
0x7300	EPOS P 24/5
0x7700	MCD EPOS P 60 W

Table 29: EPOS P Hardware versions

Name	EPOS P Application Number	
Index	0x5003	
Sub-index	0x03	
Type	UNSIGNED16	
Access	RO	
Default Value	-	
Value range	-	-

Description

If the value of this object is not zero an application specific firmware is installed on this EPOS P.

Name	EPOS P Application Version	
Index	0x5003	
Sub-index	0x04	
Type	UNSIGNED16	
Access	RO	
Default Value	-	
Value range	-	-

Description

The *application version* is used as version number of an application or as internal revision number.

10.34 Modul Version

Name	Version Numbers
Index	0x5004
number of entries	0x04

Name	Modul Software Version	
Index	0x5004	
Sub-index	0x01	
Type	UNSIGNED16	
Access	RO	
Default Value	-	
Value range	-	-

Description
This object contains the software version of the internal module.

Name	Modul Hardware Version	
Index	0x5004	
Sub-index	0x02	
Type	UNSIGNED16	
Access	RO	
Default Value	-	
Value range	-	-

Description
This object contains the hardware version of the internal module.

Name	Modul Application Number	
Index	0x5004	
Sub-index	0x03	
Type	UNSIGNED16	
Access	RO	
Default Value	-	
Value range	-	-

Description
If the value of this object is not zero an application specific firmware is installed on the internal module.

Name	Modul Application Version
Index	0x5004
Sub-index	0x04
Type	UNSIGNED16
Access	RO
Default Value	-

Description
The *application version* is used as version number of an application or as internal revision number.

10.35 Serial Communication Frame Timeout

Name	Serial Communication Frame Timeout	
Index	0x5005	
Sub-index	0x00	
Type	UNSIGNED16	
Access	RW	
Default Value	500	
Value range	-	-

Description

This parameter defines the timeout over a RS-232 communication frame. It is scaled in milliseconds [ms].

10.36 Axis Control- and Statusword, Slave Number

Name	Axis 0 to 31 Control- and Statusword
Index	0x5280 to 0x529F
number of entries	0x03

Name	Axis 0 to 31 Slave Number	
Index	0x5280 to 0x529F	
Sub-index	0x01	
Type	UNSIGNED8	
Access	RW	
Default Value	-	
Value range	see table below	

Description

This object defines the assignment between the logical Axis number and the physical Slave device number.

Remarks

Value	Slave Device
0	internal slave (with node-Id 1 on internal port)
1	slave with node-Id 1 on CAN Port
2	slave with node-Id 2 on CAN Port
...	...
127	slave with node-Id 127 on CAN Port
255	no assignment

Table 30: Slave Number

Name	Axis 0 to 31 Statusword	
Index	0x5280 to 0x529F	
Sub-index	0x02	
Type	UNSIGNED16	
Access	RW	
Default Value	-	
Value range	-	-

Description
Internal used.

Remarks
The EPOS P internal processing of the motion control function blocks needs the status of the connected axis. Therefore, the statusword of the associated axis should be transferred to this object by PDOs.

Name	Axis 0 to 31 Controlword	
Index	0x5280 to 0x529F	
Sub-index	0x03	
Type	UNSIGNED16	
Access	RW	
Default Value	-	
Value range	-	-

Description
Not used yet (hidden)

10.37 Program Control

Name	Program control	
Index	0x5F51	
Sub-index	0x00	
Type	UNSIGNED16	
Access	RW	
Default Value	0	
Value range	see table below	-

Description
This object controls the start of a stored application program.

Value	Boot-up State	Meaning
0	Stopped	no application execution
1	Coldstart	retain variables will be initialized
2	Warmstart	retain variables contain same value as before power down
3	Hotstart	same as Warmstart

Table 31: Program control code

10.38 Process Input Integer 8

Name	Process Input Integer 8	
Index	0xA000	
number of entries	16	

Name	Process Input INT8 - 1 to 16	
Index	0xA000	
Sub-index	0x01 to 0x10	
Type	INTEGER8	
Access	RW	
Default Value	-	
Value range	-	-

Description

Process input channel for 8-bit integer variables.

10.39 Process Input Unsigned 8

Name	Process Input Unsigned 8	
Index	0xA040	
number of entries	16	

Name	Process Input UINT8 - 1 to 16	
Index	0xA040	
Sub-index	0x01 to 0x10	
Type	UNSIGNED8	
Access	RW	
Default Value	-	
Value range	-	-

Description

Process input channel for unsigned 8-bit integer variables.

10.40 Process Input Integer 16

Name	Process Input Integer 16	
Index	0xA0C0	
number of entries	16	

Name	Process Input INT16 - 1 to 16	
Index	0xA0C0	
Sub-index	0x01 to 0x10	
Type	INTEGER16	
Access	RW	
Default Value	-	
Value range	-	-

Description

Process input channel for 16-bit integer variables.

10.41 Process Input Unsigned 16

Name	Process Input Unsigned 16	
Index	0xA100	
number of entries	16	

Name	Process Input UINT16 - 1 to 16	
Index	0xA100	
Sub-index	0x01 to 0x10	
Type	UNSIGNED16	
Access	RW	
Default Value	-	
Value range	-	-

Description
Process input channel for unsigned 16-bit integer variables.

10.42 Process Input Integer 32

Name	Process Input Integer 32	
Index	0xA1C0	
number of entries	16	

Name	Process Input INT32 - 1 to 16	
Index	0xA1C0	
Sub-index	0x01 to 0x10	
Type	INTEGER32	
Access	RW	
Default Value	-	
Value range	-	-

Description
Process input channel for 32-bit integer variables.

10.43 Process Input Unsigned 32

Name	Process Input Unsigned 32	
Index	0xA200	
number of entries	16	

Name	Process Input UINT32 - 1 to 16	
Index	0xA200	
Sub-index	0x01 to 0x10	
Type	UNSIGNED32	
Access	RW	
Default Value	-	
Value range	-	-

Description
Process input channel for unsigned 32-bit integer variables.

10.44 Process Output Integer 8

Name	Process Output Integer 8
Index	0xA400
number of entries	16

Name	Process Output INT8 - 1 to 16	
Index	0xA400	
Sub-index	0x01 to 0x10	
Type	INTEGER8	
Access	RW	
Default Value	-	
Value range	-	-

Description

Process output channel for 8-bit integer variables.

10.45 Process Output Unsigned 8

Name	Process Output Unsigned 8
Index	0xA4C0
number of entries	16

Name	Process Output UINT8 - 1 to 16	
Index	0xA4C0	
Sub-index	0x01 to 0x10	
Type	UNSIGNED8	
Access	RW	
Default Value	-	
Value range	-	-

Description

Process output channel for unsigned 8-bit integer variables.

10.46 Process Output Integer 16

Name	Process Output Integer 16
Index	0xA540
number of entries	16

Name	Process Output INT16 - 1 to 16	
Index	0xA540	
Sub-index	0x01 to 0x10	
Type	INTEGER16	
Access	RW	
Default Value	-	
Value range	-	-

Description

Process output channel for 16-bit integer variables.

10.47 Process Output Unsigned 16

Name	Process Output Unsigned 16	
Index	0xA580	
number of entries	16	

Name	Process Output UINT16 - 1 to 16	
Index	0xA580	
Sub-index	0x01 to 0x10	
Type	UNSIGNED16	
Access	RW	
Default Value	-	
Value range	-	-

Description

Process output channel for unsigned 16-bit integer variables.

10.48 Process Output Integer 32

Name	Process Output Integer 32	
Index	0xA640	
number of entries	16	

Name	Process Output INT32 - 1 to 16	
Index	0xA640	
Sub-index	0x01 to 0x10	
Type	INTEGER32	
Access	RW	
Default Value	-	
Value range	-	-

Description

Process output channel for 32-bit integer variables.

10.49 Process Output Unsigned 32

Name	Process Output Unsigned 32	
Index	0xA680	
number of entries	16	

Name	Process Output UINT32 - 1 to 16	
Index	0xA680	
Sub-index	0x01 to 0x10	
Type	UNSIGNED32	
Access	RW	
Default Value	-	
Value range	-	-

Description

Process output channel for unsigned 32-bit integer variables.

10.50 Object dictionary overview

Index	Name	Type	Attribute	defined in
0x1000	Device type	UNSIGNED32	RO	DS-301
0x1002	Manufacturer Status Register	UNSIGNED32	RO	DS-301
0x1001	Error register	UNSIGNED8	RO	DS-301
0x1003	Error history	RECORD	RW	DS-301
0x1005	COB-ID SYNC	UNSIGNED32	RW	DS-301
0x1006	Communication Cycle Time	UNSIGNED32	RW	DS-301
0x1007	Synchronous Window Length	UNSIGNED32	RW	DS-301
0x1008	Device name	VISIBLE_STRING	CONST	DS-301
0x1010	Store Parameters	UNSIGNED32	RW	DS-301
0x1011	Restore Default Parameters	UNSIGNED32	RW	DS-301
0x1016	Consumer Heartbeat Time	ARRAY	RW	DS-301
0x1017	Producer Heartbeat Time	UNSIGNED16	RW	DS-301
0x1018	Identity object	ARRAY	RO	DS-301
0x1019	Synchronous counter	UNSIGNED8	RW	DS-301
0x1280 - 0x12FF	SDO Client parameter	RECORD	RW	(DS-301)
0x1400 - 0x141F	Receive PDO parameter	RECORD	RW	DS-301
0x1500 - 0x1503	Receive PDO parameter	RECORD	RW	DS-301
0x1600 - 0x161F	Receive PDO mapping	RECORD	RW	DS-301
0x1700 - 0x1703	Receive PDO mapping	RECORD	RW	DS-301
0x1800 - 0x181F	Transmit PDO parameter	RECORD	RW	DS-301
0x1900 - 0x1903	Transmit PDO parameter	RECORD	RW	DS-301
0x1A00 - 0x1A1F	Transmit PDO mapping	RECORD	RW	DS-301
0x1B00 - 0x1B03	Transmit PDO mapping	RECORD	RW	DS-301
0x1F26	Expected Configuration Date	ARRAY	RW	DSP-302
0x1F27	Expected Configuration Time	ARRAY	RW	DSP-302
0x1F80	Nmt Start-up	UNSIGNED32	RW	DSP-302
0x1F81	Slave Assignment	ARRAY	RW	DSP-302
0x1F82	Request Nmt	ARRAY	RW	DSP-302
0x1F84	Device Type Identification	ARRAY	RW	DSP-302
0x1F85	Vendor Identification	ARRAY	RW	DSP-302

Index	Name	Type	Attribute	defined in
0x1F86	Product Code	ARRAY	RW	DSP-302
0x1F87	Revision Number	ARRAY	RW	DSP-302
0x1F88	Serial Number	ARRAY	RW	DSP-302
0x1F89	Boot Time	UNSIGNED32	RW	DSP-302
0x5000	Node Id	UNSIGNED8	RW	-
0x5001	CAN Bitrate	UNSIGNED16	RW	-
0x5003	EPOS P Version	ARRAY	RO	-
0x5004	Modul Version	ARRAY	RO	-
0x5005	Serial communication frame timeout	UNSIGNED16	RW	-
0x5280 - 0x529F	Axis Control- and Statusword	RECORD	RW	-
0x5F51	Program Control	UNSIGNED16	RW	-
0xA000	Process Input Integer 8	ARRAY	RW	DS-405
0xA040	Process Input Unsigned 8	ARRAY	RW	DS-405
0xA0C0	Process Input Integer 16	ARRAY	RW	DS-405
0xA100	Process Input Unsigned 16	ARRAY	RW	DS-405
0xA1C0	Process Input Integer 32	ARRAY	RW	DS-405
0xA200	Process Input Unsigned 32	ARRAY	RW	DS-405
0xA400	Process Output Integer 8	ARRAY	RW	DS-405
0xA4C0	Process Output Unsigned 8	ARRAY	RW	DS-405
0xA540	Process Output Integer 16	ARRAY	RW	DS-405
0xA580	Process Output Unsigned 16	ARRAY	RW	DS-405
0xA640	Process Output Integer 32	ARRAY	RW	DS-405
0xA680	Process Output Unsigned 32	ARRAY	RW	DS-405

Table 32: Object dictionary overview

Type	Description	Size [Bits]	Range
INTEGER8	Signed Integer	8	-128 .. 127
INTEGER16	Signed Integer	16	-32 768 .. 32 767
INTEGER32	Signed Integer	32	-2 147 483 648 .. 2 147 483 647
UNSIGNED8	Unsigned Integer	8	0 .. 255
UNSIGNED16	Unsigned Integer	16	0 .. 65 535
UNSIGNED32	Unsigned Integer	32	0 .. 4 294 967 295
UNSIGNED64	Unsigned Integer	64	0 .. 18 446 744 073 709 551 615
VISIBLE_STRING	Array of (8-bit) characters	n * 8	-
ARRAY	Array of other type	n * size	Range of type
RECORD	Structure of other types	-	-

Table 33: Object data types

Attribute	Description
RW	read and write access
RO	read only access
CONST	read only access, value is constant

Table 34: Object attributes

11 Firmware Version History

11.1 Firmware Version Overview

Date	Software Version	Hardware Version	Application Number	Application Version	Description
26.04.2006	0100h	7300h	0000h	0000h	First Firmware Release
21.07.2006	0101h	7300h, 7700h	0000h	0000h	Bug fixing, new product
24.08.2006	0102h	7300h, 7700h	0000h	0000h	Bug fixing
07.11.2006	0103h	7300h, 7700h	0000h	0000h	Bug fixing
13.06.2007	0110h	7300h, 7700h	0000h	0000h	Bug fixing, new features

Table 35: Firmware Versions Overview

11.2 Software Version 0100h

Binary Files

Hardware	Firmware Filename
EPOS P 24/5	Epos_P_0100h_7300h_0000h_0000h.bin

Description Changes

Change	Description
No Change	This version is the base version

Description New Features

New Feature	Description
No New Feature	This version is the base version

11.3 Software Version 0101h

Binary Files

Hardware	Firmware Filename
EPOS P 24/5	Epos_P_0101h_7300h_0000h_0000h.bin
MCD EPOS P 60 W	Epos_P_0101h_7700h_0000h_0000h.bin

Description Changes

Change	Description
Program Control	default value of Program Control changed to Stopped (0)
Consumer Heartbeat	the port code for CAN port number 2 in Consumer Heartbeat Time is changed
Bugfix	launching of eventtriggerd PDOs corrected
Bugfix	writing of Transmit PDO parameter Inhibit Time corrected
Bugfix	writing of Synchronous counter (Object 0x1019) corrected
Bugfix	detection of reinitialized CAN Nodes improved
Bugfix	calculation of used PLC memory corrected
Bugfix	Nmt commands to all Nodes will be executed correct

11.4 Software Version 0102h

Binary Files

Hardware	Firmware Filename
EPOS P 24/5	Epos_P_0102h_7300h_0000h_0000h.bin
MCD EPOS P 60 W	Epos_P_0102h_7700h_0000h_0000h.bin

Description Changes

Change	Description
Bugfix	MCD EPOS P 60 W: Retain Variables space corrected to 512 bytes
Bugfix	initialize CAN network at boot-up even though the application will not be started
Bugfix	Error History will be cleared at CAN network initialization
Bugfix	watchdog reset enabled
Bugfix	reset node command enabled
Error history	manufacturer specific part of the Error history extended (additional warning flag and node-id)
Error history	configuration errors while Nmt boot-up will be reported to the Error history also
Electronic Datasheet	minor corrections in eds-file

11.5 Software Version 0103h

Binary Files

Hardware	Firmware Filename
EPOS P 24/5	Epos_P_0103h_7300h_0000h_0000h.bin
MCD EPOS P 60 W	Epos_P_0103h_7700h_0000h_0000h.bin

Description Changes

Change	Description
EPOS	new Slave Firmware Version 2032

11.6 Software Version 0110h

Binary Files

Hardware	Firmware Filename
EPOS P 24/5	Epos_P_0110h_7300h_0000h_0000h.bin
MCD EPOS P 60 W	Epos_P_0110h_7700h_0000h_0000h.bin

Description Changes

Change	Description
Bugfix	Unsupported datatypes REAL and POINTER removed
Bugfix	Unsupported functionblocks and functions removed (all REAL based, MC_WriteBoolParameter, CAN_ReadSlaveError)
Bugfix	Unsupported tasktype 'shutdown' removed
Bugfix	Firmware download erases automatically the obsolete application program
Bugfix	Debugging of Ladder diagrams activated (functionblocks, powerflow)
Bugfix	MC_MoveVelocity functionblock behaviour on calling with 0 velocity corrected
Bugfix	Operator MOD added in native code (speed only)
Bugfix	Command Restore Default Parameters no longer allowed during running
Bugfix	cTypecasts corrected (DINT_TO_TIME, ...)
Communication	Handling of internal CAN SDO communication and service interface improved
NMT Master	'NMT reset' and 'NMT reset communication' sequence improved
Axis assignment	Axis to slave assignment can be done by objects 0x5280 - 0x529F now (meaning and data type of objects 0x1280 - 0x129F SDO Client Parameter adapted also)
PLCopen	Adaptations according PLCopen standard 1.1 (MC_ReadAxisState, axis state machine, …)
Error Information	Advanced error information system (new error on timer or interrupt task execution overrun)

Description New Features

New Feature	Description
Marker area	New Marker area %M (with general purpose and error information sub-area)
Function Block	New Function Block 'Etrc'
Communication	New communication objects: 0x1017 & 0x5017: Heartbeat Producer, 0x1F82: Request Nmt, 0x1002: Manufacturer State, 0x1011-02: Erase Application Program, 0x12A0 - 0x12FF: SDO Client Parameter, 0x5000: Node Id