Parameter manual

Language	**English**
	Translation
Document No.	5.04013.04
Part No.	381653
Status	14.02.2018

be in motion be in motion

BAUMÜLLER

BM4-O-SER-01

(SERCOS slave module)

E	5.04013.04

Read the Operating Manual before starting any work!

Preliminary information

Warning Insofar as this document is identified as being preliminary information, the following applies:
this version is regarded as providing advance technical information to users of the described devices and their functions at an early enough time in order to adapt to any possible changes or expanded functionality.
This information must be regarded as being preliminary, as it has not yet passed through Baumüller's internal review process. In particular, this information is still subject to changes, thus no legal liability can be derived from this preliminary information. Baumüller assumes no liability for damages that might arise from this possibly faulty or incomplete version.
If you detect or suspect any content errors and/or major form errors in this preliminary information, we request that you notify the Baumüller support specialist responsible for you. Please provide us, via this employee, with your insights and comments so that we can take them into account and include them when transitioning from the preliminary information to the final information (as reviewed by Baumüller).
The conditions stipulated in the following section under "Obligatory" are invalid in case of preliminary information.

Obligatory

These Parameter manual are a part of the equipment/machine. These Parameter manual must be available to the operator at all times and must be in legible condition. If the equipment/machine is sold or moved another location, these Parameter manual must be passed on by the owner together with the equipment/machine.
After any sale of the equipment/machine, this original and all copies must be handed over to the buyer. After disposal or any other end use, this original and all copies must be destroyed.

When the present Parameter manual are handed over, corresponding sets of operating instructions of a previous version are automatically invalidated.
Please note that the specifications/data/information **are current values according to the printing date**. These statements are **not legally binding** with regard to measurements, computation or calculations.
Baumüller Nürnberg GmbH reserves the right, in developing its products further, to change the technical specifications and handling of it products concerned without prior notice.

No liability can be accepted concerning the correctness of these Parameter manual unless otherwise specified in the General Conditions of Sale and Delivery.

© **Baumüller Nürnberg GmbH**

Ostendstr. 80 - 90
90482 Nuremberg
Germany

Tel. +49 9 11 54 32 - 0
Fax: +49 9 11 54 32 - 1 30

Email : mail@baumueller.de
Internet: www.baumueller.de

Table of contents

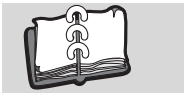


Table of contents

1

INTRODUCTION

The program manual is an important part of your b maXX® 4400 device. Therefore please, completely read this manual, before starting operation, last but not least on behalf of your own security. In this manual you will learn, how Baumüller Nürnberg GmbH has implemented the SERCOS interface on the module **BM4-O-SER-01 (SERCOS slave module)** and the EtherCAT-connection on the module **BM4-O-ECT-01** (EtherCAT slave module with servo profile according to IEC 61491).

The introduction contains general information to both of the field bus slave modules.

Information according option-and function modules for the device series b maXX® 4400 are to be found in the b maXX® 4400 manual 5.04043.

Information according the programming of the b maXX® 4400 controller are to be found in the b maXX® 4400 parameter manual 5.03039.

1.1 Used terms

In this documentation the terms „module“, „plug-in module“ or „option module“ are used for the Baumüller products „**BM4-O-SER-01**“ and „**BM4-O-ECT-01**“.

The option module **BM4-O-ECT-01** is available in three designs. They can be differed by the type key. Therefore the descriptions **BM4-O-ECT-01-00-00**, **BM4-ECT-01-01-00** and **BM4-ECT-01-01-04** are also used.

If the modules are not mentioned explicitly in the manual, the particular text refers to all three option modules. Are some parts of the manual valid for only one module, these parts are separated to option module specific chapters or the module is mentioned explicitly.

1.2 General information

1.2.1 BM4-O-SER-01 SERCOS slave module

The module **BM4-O-SER-01** connects the b maXX® 4400 via the SERCOS ring with other participants (e. g. CNC, other b maXX® 4400).

The b maXX® 4400 communicates with the SERCOS slave module over the internal dual port RAM.The communication time depends on the cycle time, which is set via the SERCOS master at initialization of the ring.The shortest permitted cycle time in connection with the b maXX® 4400 controller is 1 ms and then can be enlarged in 1 ms steps.

All cyclic data as well as the control word and the status word are transmitted in a communication cycle between the SERCOS slave module and the b maXX® 4400. The service channel communication is executed in the remaining time.

The SERCOS slave module supports two data transmission speeds:
2 Mbit/s and 4 Mbit/s.

Information for the installation and commissioning of the SERCOS slave module are to be found in the manual according to **BM4-O-SER-01** (SERCOS slave module) 5.04012.

1.2.2 BM4-O-ECT-01 EtherCAT slave module with servo profile acc. to IEC 61491 (SoE)

The module **BM4-O-ECT-01**connects the b maXX® 4400 over the EtherCAT infrastructure with other participants (e. g. CNC, other b maXX® 4400).

The b maXX® 4400 communicates with the Ethercat slave module over the internal dual port RAM.The communication time depends on the cycle time, which was set by the EtherCAT master at initialization of the option module. The shortest permitted cycle time in connection with the b maXX® 4400 is dependent on the used variant of the EtherCAT slave module (see table).

All cyclic data as well as the control word and the status word are transmitted in a communication cycle between the EtherCAT slave module and the b maXX® 4400. The service channel communication is executed in the remaining time.

The EtherCAT slave module supports EtherCAT-typical transmission speed: 100 Mbit/s.

Differences between the module variants

	BM4-O-ECT-01-00	**BM4-O-ECT-01-01**
Shortest cycle time	1 ms	250 µs
Synchronization [1)]	Telegram	Telegram / Distributed clocks
Ethernet over EtherCAT (EoE) [2)]	-	yes

[1)] See chapter „Synchronization procedure for EtherCAT“

[2)] See chapter „Ethernet over EtherCAT“

Information according the installation and commissioning of the EtherCAT slave module are to be found in the manual according **BM4-O-ECT-01** (EtherCAT slave module) 5.06003.

1.3 Software version

This edition of the programming manual describes the functionality and the supported parameters according to the software versions listed below.

The software version can be read out with IDN S0030 via the master.

Option module	Described software version
BM4-O-SER-01	1.09
BM4-O-ECT-01-00-00 [1)]	1.04
BM4-O-ECT-01-01-00	1.02
BM4-O-ECT-01-01-04	2.02

[1)] Last status of this hardware, not recommended for new design!

1.4 Mounting and installation

Mounting and installation of the **BM4-O-SER-01** (SERCOS slave module) is described in manual 5.04012.

Mounting and installation of the **BM4-O-ECT-01** (EtherCAT slave module) is described in manual 5.06003.

1.5 Address setting

The address configuration of the **BM4-O-SER-01 (SERCOS slave module)** we describe in manual 5.04012.

For the option module **BM4-O-ECT-01-00-00** (EtherCAT slave module, old hardware) an address setting is not necessary, only switch 1 of S500 must be set to „ON“.

For the option modules **BM4-O-ECT-01-01-00** and **BM4-O-ECT-01-01-04** (EtherCAT slave module, new hardware) no address setting is necessary.

1.6 Ethernet over EtherCAT (EoE) - TCP/IP- Tunneling via EtherCAT

For the Ethernet communication to the EtherCAT slaves (e.g. to the b maXX®-controller with EtherCAT slave, here particularly PROPROG-communication for the service console ProDrive) the TCP-packages are transmitted within the EtherCAT packages (tunneling). In this case for each EtherCAT slave an own IP address must be set. The EtherCAT slave is activated as Ethernet user via this IP address.

The setting of the IP adress is:

192.168.1.XXX

192.168.1 is definitely assigned.

XXX menas setting of DIP switch (SW 13100 on the hardware) + 1

e. g. if address 192.168.1.5 is wanted, the DIP switch 4 must be set.

An EtherCAT master also has the possibility to change the IP address (if this is supported by the master). Thereby the IP address can be selected user-defined.

The port number for the communication to ProDrive is 5043_{hex} (= 20547_{dez}).

As the EoE communication is made via the mailboxes of the EtherCAT, the mailbox shall be checked several times (between 5 ms and 50 ms).

1.7 Copyright and trade mark

2

FUNDAMENTAL SAFETY INSTRUCTIONS

In this chapter we prescribe the dangers, which arise during parametrization of the Baumüller b maXX® 4400-controller unit and of the slave module, which we use and we explain the meaning of the information sign.

2.1 Safety notes and instructions

WARNING

The following **can occur**, if you disregard this warning instruction:

- serious personal injury • death

The danger is: **mechanical and electrical cause.** *The modification of parameters affects the action of the Baumüller unit and consequently the action of the installation and its components. If you change the adjustments of the parameters, you may cause dangerous actions to the construction and/or of its components.*

After each modification of the parameter settings, execute a commissioning with consideration to all safety instructions and safety regulations.

2.2 Information sign

NOTE

This note is a very important information.

2.2 Information sign

3

FUNDAMENTALS SERCOS

3.1 Interface

3.1.1 SERCOS

For the integration of the b maXX® 4400 in a SERCOS ring the option module „BM4-O-SER-01“ is used. Instead, the SERCOS option module has two terminals for fiber-optic cable. An input and an output.

3.1.1.1 Communication cycle

All cyclic data is exchanged between the master and all its drives during a single communication cycle (e.g. 1 ms).

The master begins the communication cycle with the sending of a synchronization telegram (MST) to all devices. Simultanously all drives receive this message. Based on this MST each drive must synchronize its transmit time slot and the feedback acquisition capture point. Additionally it should synchronize its internal processing - especially its control - to this.This kind of synchronization minimizes the dead time and keeps it constant. Compared to controls without synchronization, therewith an improved dynamic action is reached.

Short cycle times allow only few users and mainly are used for the operating mode „Torque control“. Longer communication cycle times allow the connection of several users and are taken for the operating mode „Position control“.

3.1.1.2 Non-cyclic data transmission

The non-cyclic data transmission is initiated and controlled by the master. The entire control of the non-cyclic data transmission is executed by the master. A slave cannot start a non-cyclic data transfer, it can only respond thereupon.

In each case there are two bytes (CNM/CNA) reserved in the master data telegram and in the drive telegram for the necessary non-cyclic data exchange. If data, longer than two bytes are to be transferred (e.g. a name or a parameter number list), the transmission is distributed over several communication cycles.

3.1.1.3 Literature with reference to SERCOS

On behalf of basic information with reference to SERCOS the following literature is recommended :

SERCOS interface (2004) ISBN 3-8259-1926-9

3.1.2 EtherCAT SoE

For the integration of the b maXX® 4400 in an EtherCAT network, the option module **BM4-O-ECT-01** is used. The EtherCAT-SoE-module has two RJ45 connectors. An input and an output.

3.1.2.1 Communication cycle

All cyclic data is exchanged between the master and all its drives during a single communication cycle (e.g. 1 ms).

Synchronization to the receipt of telegram (setpoints)

In this implementation the option module **BM4-O-ECT-01** synchronizes to the receipt of the setpoint telegram. Based on this, the drive sets the feedback acquisition capture point and the acceptance time of the setpoint values. Additionally it synchronizes its internal processing to this, especially its control.

The precision of this synchronization, momentary depends on the capability of the master to transmit the setpoint telegram with the smallest possible jitter in constant time intervals.

Synchronization with Distributed Clocks

This method is supported only by the option modules **BM4-O-ECT-01-01-00** and **BM4-O-ECT-01-01-04**. Thereby the option module generates a synchronization signal self-actuating. This signal is adjusted by a time stamp telegram to the other slaves and the master. The drive assignes his points of time for the takeover (set and actual values) by this signal.

The synchronization is thereby independent on the accuracy of the master. The jitter is about 10 ns (Clock frequency of the signal generator) and the synchronism among the slaves depends on the occurrence of the sent time stamp telegrams.

3.1.2.2 Non-cyclic data transmission

The non-cyclic data transmission is enabled and controlled by the master. The entire control of the non-cyclic data transmission is executed by the master. A slave cannot start a non-cyclic data transfer, it can only respond thereupon.

There are two defined mailboxes in the slave, which are used to transmit the service data. A mailbox serves the purpose of placing the master's requests. The second mailbox is used by the slave to file its reply. The data transmission from or to the mailboxes takes place exclusively by the master.

The present implementation makes use of the possibilities, which EtherCAT has with respect to SERCOS and permits a transmission of more than two bytes per access. At request of service data by means of SoE the total size of the mailbox is taken advantage of. Therewith great data volume can be transferred via EtherCAT with less accesses as if using SERCOS.

3.1.2.3 Literature concerning EtherCAT

Further information can be obtained from the EtherCAT organization. The EtherCAT organization can be reached via www.EtherCAT.org.

EtherCAT is standardised as IEC 61158. The used SERCOS profile is defined in the standards IEC 61800-7 and IEC 61491.

3.2 SERCOS profile

3.2.1 Survey

The SERCOS interface specification standardizes the formats and scalings for the exchange of the operating data between the controls and the drives.

Due to the cyclic data exchange for setpoints and actual values with exact time equidistance and synchronization for measuring times and setpoint use the entire synchronization for the total of the connected drives is achieved with the control.

Additionally, over a non-cyclical service channel, with means of determined data fields the display and the input of all drive-internal data, parameters and diagnosis information can take place over the operating control panel. Service data (e.g. parameters, diagnostics texts) is transmitted with the individual action by the control.

Setpoints and actual values can be transmitted in words or double words between the control and the drives in both directions. In the case of an error the setpoints and the actual values are automatically adjusted by the cyclic communication. It is operated with the last valid setpoints and actual values until to the next cycle. The drives are shut down, if there are two incorrect transfers, taking place one after the other.

NOTE

In SERCOS a singular failure of setpoints is not defined as an error. Therefore it is necessary to clear such a failure by the controller. For this purpose the controller has to be parameterized for extrapolation at setpoint failure (see parameter manual of the controller, **P1050**).

3.2.2 Communication phases / phase ramp-up

After switching on the supply voltage the system passes through several statuses (i.e. communication phases), before the standard operating status (= communication phase 4) can be achieved.

In the following the function and the possibilities of the different communication phases are described. In the descriptions the SERCOS terms (CPn) as well as the according EtherCAT designations are named.

Initialization phase (CP0 / Init)

After switching on the supply voltage the option module begins with the self diagnosis. All internal memory areas are tested. If the tests are successful, the internal communication to the controller is build up. If communication runs with the controller then the configuration- as well as further parameters for internal purposes are read out by the controller.

BM4-O-ECT-01

The EtherCAT-SoE-module changes into the communication phase 2 directly after reading the controller parameters, because there is no address setting on the module and no display existing. An individual baudrate sensing is not necessary.

BM4-O-SER-01

Then the SERCOS-module displays the set address of the rotary switch in hexadecimal on its 7-segment display for about a second. After that baudrate sensing takes place.If the option module recognized a valid baudrate, communication phase is switched to 0.

After applying operating voltage to the electronic of the master and the successful completion of the device-internal preparations and checkings the master begins with the sending of the MST. In the MST „Communication phase 0" is signaled.

After applying operating voltage to the electronic of a slave this one works as 'Repeater'. This means that the slave passes the received telegrams on to the next station in the ring. If all slaves in the ring are operating as repeater, the MST is passed on to the master input.

After the master has received its own MST 10 times without interruption, it switches to communication phase 1.

Communication phase 1 (CP1 / -)

This phase is passed through by the SERCOS-module only.

The SERCOS-master issues „Communication phase 1" in the MST and begins the Master Data Telegram (MDT) of communication phase 1. Each drive is addressed individually by the master. The MDT contains only one data record.

The information which is being transmitted by the MDT mentioned above is given by the address 'xx'. If a drive in the communication phase 1 receives a MDT it replies with the rudimentary drive telegram of the communication phase 1.Therewith it displays that it is present and ready for the communication phase 2.

The master will attempt multiple times to get a reply from a drive. When all drives have replied, the master switches to communication phase 2.

Communication phase 2 (CP2 / preOperational)

BM4-O-SER-01

The MDT in communication phase 2 has the following structure:

- the address of a defined drive,
- only one data record,
- the data record has no container for cyclic transfer.

From communication phase 2 onwards the protocol for 'non-cyclic transfer' is operating. However, during one cycle, data exchange can take place with a single drive only.

In communication phase 2 the following must be exchanged:

- communication parameters
- the parameters that define the cyclic transmission configuration

Finally the master sends the command „CP3 transition check“ to all drives. During the processing of this procedure command, each drive checks internally, if error free operation in communication phase 3 is possible (i.e. if the drive has received the necessary parameters for communication phase 3). After each drive has replied to this procedure command with „command correctly executed“ the master can issue a CP3 in the MST.

BM4-O-ECT-01

From preOperational on the mailboxes for the service data communication between master and slave are configured.

In this communication phase the information about the synchronization-time (cycle period) and -mode (Distributed Clocks or telegram receipt) has to be sent to the slave.

After it has configured the necessary parameters, the EtherCAT-master requests the slave to change in status „Safe Operational“. Thereupon the drive checks, if this is possible.

If this check was successful the drive changes in state „Safe Operational“.

Communication phase 3 (CP3 / safeOperational)

In this communication phase the total communication cycle including all telegrams has been completely configured. The drive synchronizes on the specified cycle.

BM4-O-SER-01

The timeslots which were defined in communication phase 2 from now on must be complied with. Merely the contents of the containers for cyclic transfer are meaningless.

As of this communication phase, the master can exchange data with all drives by simultaneous, non-cyclic transfer. Thus, the data for the selection and parametrization of drive characteristics can be transmitted to the drives in a more time-efficient manner in communication phase 3.

Finally the master sends the command „CP4 transition check“ to each drive. At this point each drive checks internally whether error-free operation in CP4 is possible.

After each drive has replied to this command with „Command correctly executed“, the master can issue CP4 in the MST (i.e. normal operation). This completes the initialization.

BM4-O-ECT-01

In case of synchronization to telegram receipt, the EtherCAT master now must transfer the setpoint telegram with the required accuracy.

In opposite to EtherCAT the actual values from the drive in „safeOperational“ are valid. However, in this status the setpoints are not accepted by the drive. In this phase the EtherCAT Master now can generate a mapping of the actual drive status.

The master now can initiate the switch-over to „Operational“. Now the slave checks if an error-free operation is possible and changes to state „Operational“.

Communication phase 4 (CP4 / operational)

In this phase the cyclic communication is running according to configuration. The drive is synchronous, because otherwise there would have been no change to this state.

BM4-O-SER-01

At SERCOS the setpoints and the actual values are valid from the second cycle of the CP4 on.

BM4-O-ECT-01

At EtherCAT the setpoints are accepted from the first telegram, after the state „Operational“ was accepted by the drive.

3.2.3 Error- and status messages

In the status word of each drive grouped messages of the classes 1, 2, and 3 diagnostic (C1D, C2D, C3D) are defined. The according bit is either set if there is an error(C1D) or if something changes in the according diagnostic class (C2D and C3D).

C1D

An error message of class 1 diagnostic (C1D) means that in the drive an error status was determined, which leads to a shutdown with subsequent Md = 0 after the speed is less than n_{min}. This process is executed by the drive itself.

If bit 15 is set, there is a manufacturer-specific error message.The number of the b maXX®-controller error then is saved in ▹S0129◃.

Additional information on resetting and evaluation of errors is to be found in ▹Error handling◃ from page 147.

C2D

A message of diagnostic class 2 diagnostic (C2D) means a warning indicating a possible shutdown .

The C2D bit in status word is reset when reading out the ▹S0012◃.

If bit 15 is set, there is a manufacturer-specific warning.The number of the b maXX®-controller warning then is saved in the ▹S0181◃.

C3D

Messages of class 3 diagnostic (C3D) are pure status messages (e. g. $|n_{actual}| < |n_x|$.

The C3D bit in the status word is reset, when reading out the ▹S0013◃.

3.2.4 Service channel

The service channel is used for the acyclical service data communication. Communication is made via parameters. Each parameter has 7 elements:

1 Identification code IDN (mandatory)
2 Name (option)
3 Attribute (mandatory)
4 Unit (option)
5 Minimum value (option)
6 Maximum value (option)
7 Operating data (mandatory)

Only element 7 (operating data) of a parameter can be transmitted, with exception of write-protected parameters. All other elements (number, name, attribute, unit, min.-value, max.-value) can only be read.

3.2.4.1 Identification code (IDN)

There are two types of SERCOS identification codes (IDNs). The so-called target parameters. These are parameters, which are defined in the SERCOS standard IEC61491 and the manufacturer-specific P-parameters.

The IDN is specified as follows:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	
|	|	|	|	X	X	X	X	X	X	X	X	X	X	X	X	IDN 0 to 4096
|	|	|	|													
|	X	X	X	Data set number (is not supported by b maXX®-controller)												
|																

0: S-parameter
1: P-parameter

Figure 1: Identification code

3.2.4.2 Name

The parameter name must not be longer than 60 bytes. The description language can be selected via the parameter ▹S0265◃. Via ▹S0266◃ you can check, which languages are supported.

3.2.4.3 Attribute

The attribute contains information, which is necessary to clearly show the operating data.

3.2.4.4 Unit

The unit is stored as a character string. There is no unit at the operating data, if the data type is either a binary number, a character string or an IDN.

3.2.4.5 Minimum value

The minimum input value is the smallest numerical value of the operating data, which can be processed by the drive.

There is not a minimum value at the operating data, if it is a binary number, a character string or an operating data of variable length.

3.2.4.6 Maximum value

The maximum input value is the greatest numerical value for the operating data which can be processed by the drive.

There is not a maximum value at an operating data, if it is a binary number, a character string or an operating data of variable length.

3.2.4.7 Operating data

There are three operating data categories:

- fixed length 2 bytes
- fixed length 4 bytes
- variable length up to 65532 bytes

3.2.4.8 Data status

The content of „Data status“ is related to the entire data block. „Data status“ contains conditions which change dynamically.

BM4-O-SER-01

When opening the service channel via a parameter number the active data status is transferred to the master automatically.

BM4-O-ECT-01

In EtherCAT the data status is transmitted with the regular response telegram by the slave. At write / read activity to common IDNs the data status is written to the „Error“-field.

When executing commands a separate telegram (Notify SCC Command Execution) is sent by the slave when the command processing is completed. It contains the data status of the command in a separate field „Data Status“.

- **Status value at service data**

Error group bits 15 ... 12	Error type Bits 3 ... 0	
0000		**General error**
	0000	No error in the service channel
	0001	Service channel is not opened
	1001	Invalid closing of the service channel
0001		**Element 1**
	0001	Identification code nonexistent
	1001	Invalid access to element 1
0010		**Element 2**
	0001	Name is not existent
	0010	Name transmission too short
	0011	Name transmission too long
	0100	Name cannot be changed (read only)
	0101	Name is write-protected at the moment
0011		**Element 3**
	0010	Attribute cannot be transmitted
	0011	Attribute transmission too long
	0100	Attribute cannot be changed (read only)
	0101	Attributes are write-protected at the moment

Error group bits 15 ... 12	Error type Bits 3 ... 0	
0100		**Element 4**
	0001	Unit is not existent
	0010	Unit transmission too short
	0011	Unit transmission too long
	0100	Unit cannot be changed (read only)
	0101	Unit is write-protected at the moment
0101		**Element 5**
	0001	Minimum input value not existent
	0010	Minimum input value transmission too short
	0011	Minimum input value transmission too long
	0100	Minimum input value cannot be changed (read only)
	0101	Minimum input value is write-protected at the moment
0110		**Element 6**
	0001	Maximum input value is not existent
	0010	Maximum input value transmission too short
	0011	Maximum input value transmission too long
	0100	Maximum input value cannot be changed
	0101	Maximum input value is write-protected at the moment
0111		**Element 7**
	0010	Operation data transmission too short
	0011	Operation data transmission too long
	0100	Operation data cannot be changed (read only)
	0101	Operation data is write-protected in this communication phase
	0110	Operation data is less than the minimum input value
	0111	Operation data is greater than the maximum input value
	1000	Invalid operating data (for example invalid bit combination for this parameter number)

- **Status values at commands**

Die bits 0 to 3 are only extent at commands (command acknowledgement) changes in the command acknowledgement at

- Bit 2: Command properly executed (1 ⇒ 0 positive acknowledgement) or
- Bit 3: Execution of command not possible (0 ⇒ 1) negative acknowledge) leads to a setting of the command changing bit in the status word of the drive.

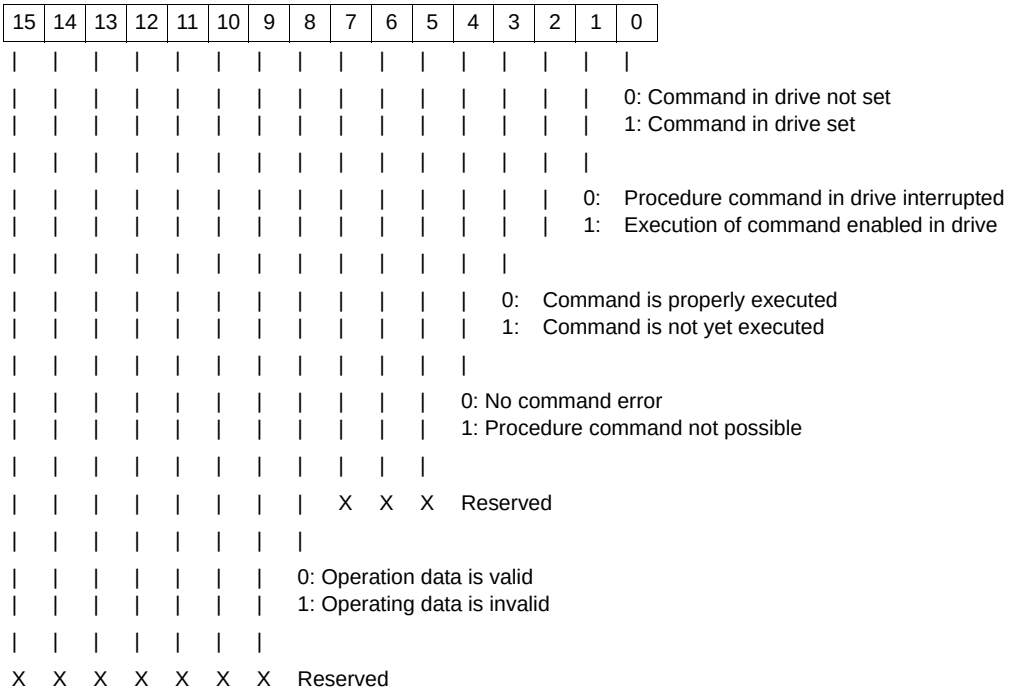


Figure 2: Status values at commands

3.2.5 Commands

The master can transmit commands to the drives. According to the command type the drive is able to initiate long and complex functions.

Examples for these functions are:

- NC-controlled homing
- Touch probe cycle

Commands have the same structure as acyclic data. The marking as command operates with means of the attribute. In such a case the operating data is replaced by the procedure command.

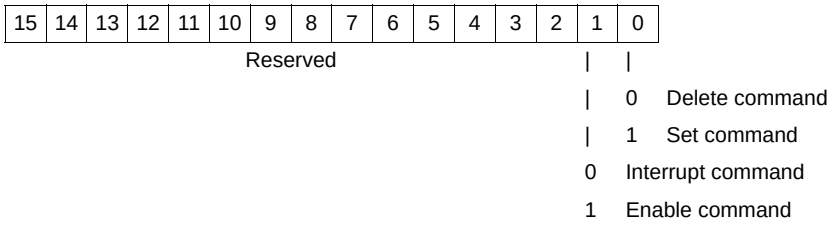


Figure 3: Command specification

Over the procedure command a command in the slave can be set or be activated by the master, in order to enable the execution, to interrupt or to delete. If an error arises in the slave a defined error message is send to the master.

Contrary to standard acyclical data transmission, at which the transfer completed with the last data block, the end of a command after a longer execution time is transferred to the control separately. This is made with the SERCOS option module by signaling in the bit 5 of the status word. At the EtherCAT option module this is signaled by a separate message telegram (Notify SCC Command Execution) via the service data mailbox.

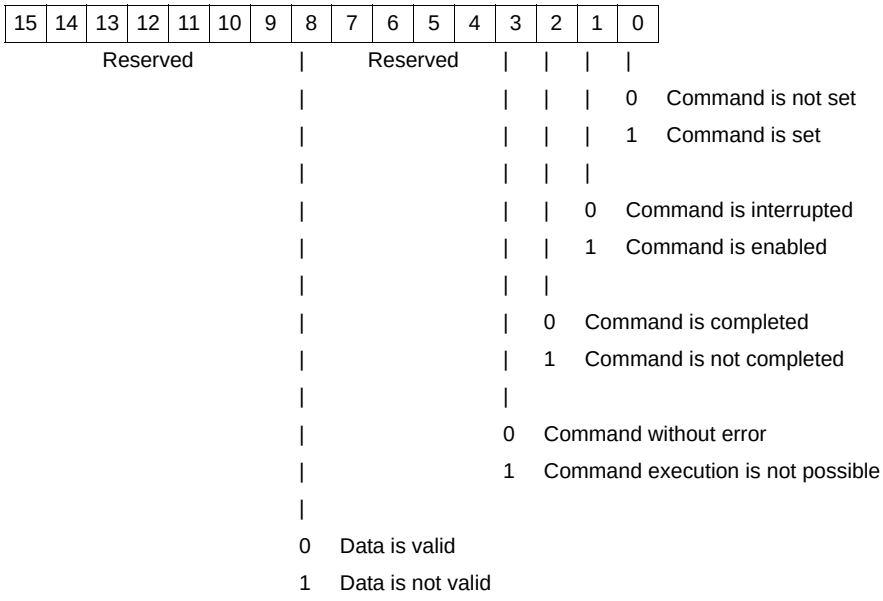


Figure 4: Command reply

The master can interrupt the execution of a command, which is not possible with normal service data.

NOTE

At each term only one active command is permitted. It is not permitted, that two commands are enabled simultaneously. If the command status has been changed, bit 5 of the SERCOS status word is immediately set in order to indicate the new status to the master.

4

COMMUNICATION TO THE B MAXX® CONTROLLER

In this chapter the connection of the b maXX®-controller is described.

4.1 Service data communication

Service data communication to the controller is made via the service channel of SERCOS or SoE.

4.1.1 S-parameter

S-parameters are standard parameters, which are defined by SERCOS. The conversion between SERCOS-representation and of the b maXX®-controller interpretation is made on the option module.

With the service data communication also SERCOS-specified commands are started and completed.

4.1.2 P-parameter

P-parameters are manufacturer-specific parameters. Herewith the internal parameters of the b maXX®-controller are activated directly and without an conversion. P-parameters are inquired for with their parameter No. and the set bit 15 (e. g. **P0053** = 32821, 8035_{hex}). If a parameter is not implemented the drive replies with the suitable message (IDN not existing) via SERCOS or SoE.

4.2 State machine

4.2.1 b maXX®-controller

- Status 1
  There are no error messages. The drive reaches state 1, if the 24 V supply voltage is switched on and the option module parameters were correctly set in the b maXX®-controller.
- State 1 ⇒ state 2
  The option module puts the drives in state 2 if the following conditions predominate:
  - Drive is error-free
  - DC-link is loaded
  - SERCOS control word bit 14 and 15 are deleted
- State 2 ⇒ state 1
  For this transition the value of the parameter **P0484** (actual value of DC-link voltage) must be less than the value of parameter **P0020** for at least 3 seconds (set value of the DC-link voltage).
- All the other transitions of the state machine are controlled by the SERCOS control word of the MDT (see survey below):

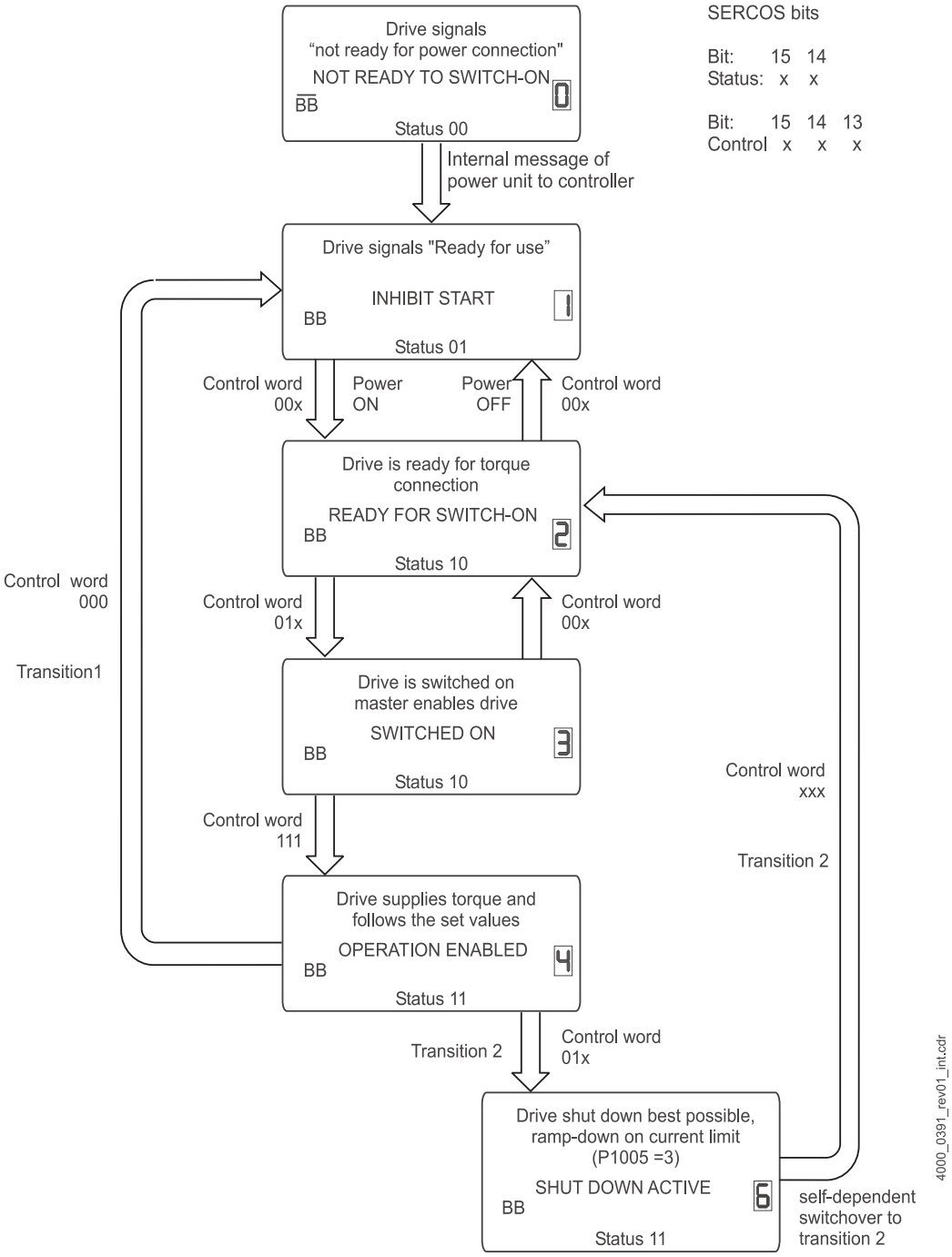


Figure 5: State machine

4.2.2 SERCOS

The drive signals via the bits 14 and 15 in the SERCOS status word the following states:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
|	|														

0	0	Not ready for power connection (state 0)
0	1	Not ready for power connection (state 1)
1	0	Drive is torque-free and power stage inhibited (state 2)
1	1	Drive is ready-to-operate (state 4)

Figure 6: SERCOS status word

The transitions and the conditions for this are as follows:

- State 0 ⇒ state 1
  This transition is made if the drive is error-free.

- State 1 ⇒ state 2
  This transition is made if the following conditions are complied with:
  - power is connected
  - the drive is error-free (C1D = 0)
  - the bits 14 and 15 in the control word are deleted

The effects of the bit 14 on the state change can be configured via the controller.The selection can be set via the parameter „Configuration Slot G/H“ in the controller (**P0832** or **P0842** according to the slot of the option module).

The following actions can be selected (bit 0 of the parameter):

- Standard: Bits 14 and 15 are evaluated (bit 0 reset), action accords to IEC61491 second edition 2002-10
- Special case: Only bit 15 is evaluated and must be reset, before transition is possible (bit 0 is set). Action corresponds to preliminary information IEC61491 from 2004-08-26

- State 2 ⇒ state 3

This transition is made after the master has set the bits 14 (drive enable) and 15 (drive on) in the SERCOS control word.

NOTE

The parameters „Configuration BACI Slot G/H“ are only evaluated at power up of the option module. Therefore, this setting must be saved in the b maXX®-controller.

Additional information can be found in the chapter ▹Configuration parameters of the controller◃ from page 44.

4.3 Scaling

The format of the SERCOS parameters differs from the format of the b maXX® controller parameters. That is why on the option card of the SERCOS slave module a conversion is necessary.

The option card SERCOS slave module supports the conversion of position data, speed data and torque data.

Moreover you can select between a scaling of the preferred values and a scaling of random values with means of a freely-adjustable scaling parameter.

The fixing of the method of scaling operates by the setting of the scaling type definition bits in the scaling-method parameters.

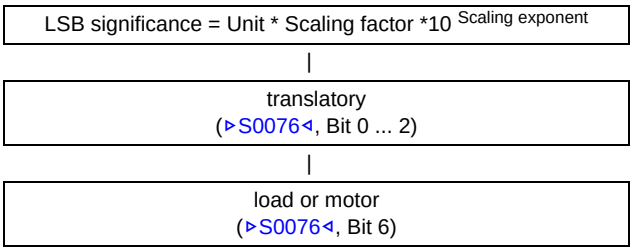
4.3.1 Position data

Non-scaled position data

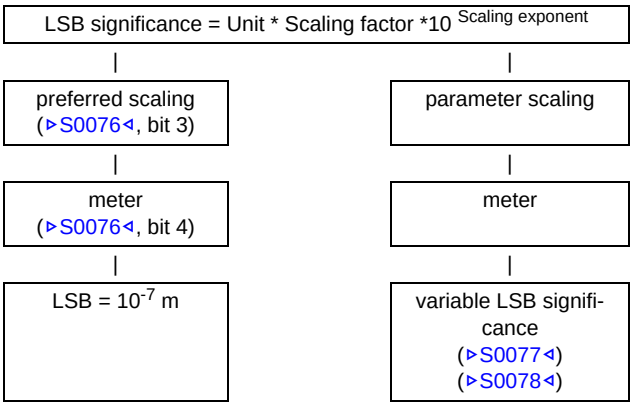
The position data, which was recorded by the drive and calculated by the control is transmitted in a non-scaled way between the controller and the drives (and converse)(▷S0076◁). It is in the responsibility of the user to take into account the given significance at use of the position data.

Scaling of translatory position data (from SERCOS version 1.07 onwards)

The translatory scaling is determined with the scaling method (see ▷S0076◁). The scaling parameters ▷S0007◁ and ▷S0078◁ are valid for all translatory position data.



The significance of the LSB of the translatory position data is defined by the scaling factor (▷S0077◁) and the scaling exponent(▷S0078◁).



Scaling of rotary position data

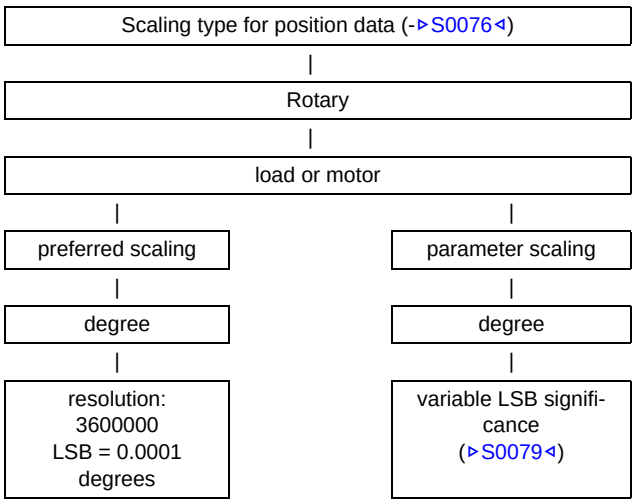
The rotary scaling is determined with the scaling method (see ▷S0076◁). The rotary position resolution (▷S0079◁) is for all rotary position data.

The significance of the LSB of the rotary position data is determined by the rotation position resolution.

$$\text{LSB weight} = \frac{1 \text{ revolution}}{\text{rotary position data}}$$

Preferred scaling for rotary position data

At rotary preferred scaling (see ▷S0076◁ the rotation position resolution ▷S0079◁) is determined to 3600000. The LSB significance for all rotary position data therewith is 0.0001° (10^{-4} degree).



The relevant SERCOS parameters are ▷S0076◁, ▷S0077◁, ▷S0078◁, ▷S0079◁ and ▷S0103◁.

S0076

Method of scaling for position data (also see parameters ▷page 92◁)

With this parameter the method of scaling for position data is selected. It is defined, which format master and drive have to use for data exchange.

The b maXX® controller supports incremental scaling and rotary scaling.

From SERCOS version 1.07 onwards the translatory scaling (linear scaling) also is supported.

S0077

Scaling factor of translatory position data (also see parameters ▷page 92◁)

In this parameter the scaling factor for all position data in this drive is set.

S0078

Scaling exponent of translatory position data (also see parameters ▷page 93◁)

In this parameter the scaling exponent for all position data in this drive is determined.

S0079

Rotary position resolution (also see parameters ▷page 93◁)

This parameter contains the value of the rotary position resolution and determines the LSB value of the rotary scaling. If preferred scaling has been selected the value is 3600000. This means a LSB value of 0.0001 degrees.

S0103

Modulo value (also see parameters ▹page 100◃)

If in ▹S0076◃ the modulo format has been selected, this parameter determines, when the position data are 0.

If telegram type 4 writes on the position set value on the b maXX® controller parameter P0370, the value range of this parameter is from 0 to 2^{32}.The SERCOS slave module must convert the format between SERCOS and internal processing format.

If the modulo calculation is used, in this parameter it is to be entered with integer multiples of the rotation position resolution ▹S0079◃.

4.3.2 Velocity data

Non-scaled velocity data

The velocity data, which was recorded by the drive and which was calculated by the control is transmitted in a non-scaled way between the controller and the drives (and converse).It is in the responsibility of the user to take into account the given significance at use of the velocity data.

Scaling of translatory velocity data

Translatory scaling is not supported.

Scaling of rotary velocity data

The rotary scaling is determined with the scaling method (see ▹S0044◃). The scaling parameters (▹S0046◃ and ▹S0047◃) are for all rotary velocity data.

The significance of the LSB of the rotary velocity data is determined by the product of scaling factor and scaling exponent (basis 10).

$$\text{LSB weight} = \frac{\text{unit}}{\text{time unit}} \cdot \text{factor} \cdot 10^{\text{exponent}}$$

There are two preferred scalings defined for rotary velocity data. For both the scaling factor (▹S0045◃) is 1, the scaling exponent (▹S0046◃) depends on the used time unit.

- Preferred scaling (minute)

$$1 \cdot 10^{-4}\,\text{min}^{-1}$$

| |
| Scaling exponent (▹S0046◃)
|
Scaling factor (▹S0045◃))

- Preferred scaling (second)

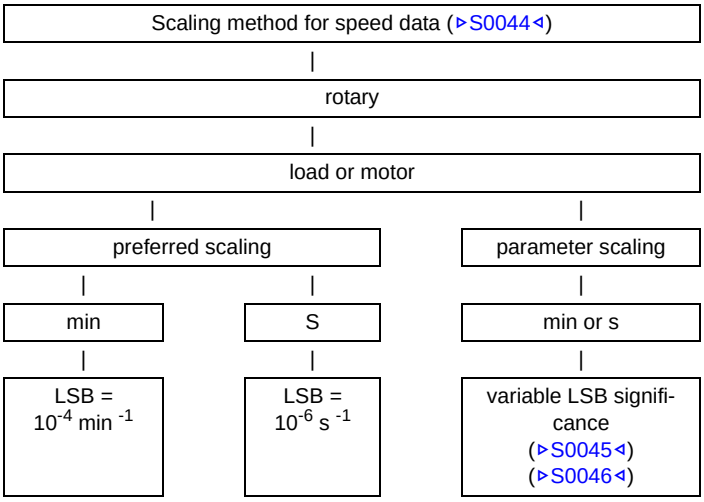
$1 \cdot 10^{-6} s^{-1}$

| |

| Scaling exponent (▹S0046◃)

|

Scaling factor (▹S0045◃)



The relevant SERCOS parameters are ▹S0044◃, ▹S0045◃ and ▹S0046◃.

S0044

Scaling method for speed data (also see parameters ▹page 87◃)

With these parameters the method of scaling for speed data is selected. It is defined, which format master and drive have to use for data exchange.

The b maXX®controller supports incremental scaling and rotary scaling.

S0045

Scaling factor speed data (also see parameters ▹page 87◃)

With this parameter the scaling factor for speed data is determined.

In case of preferred scaling the parameter is set to 1.

S0046

Scaling exponent speed data (also see parameter ▹page 88◃)

This parameter determines the scaling exponent for speed data.

In case of preferred scaling in revolutions/min ▹S0046◃ is set to -4.

In case of preferred scaling in revolutions/s ▹S0046◃ is set to -6.

For this parameter only values from -8 to 2 are allowed.

The resulting resolution of the preferred scaling (rev./min.) is 1 x 10 $^{-4}$ rev./min.

Telegram type 3 e. g. writes the speed set value to parameter **P1171** of the b maXX®-controller. The range of this parameter is between -100.00 % and +100.00 %. The option card SERCOS slave module must make all conversions between SERCOS- and the internal b maXX® controller format.

4.3.3 Acceleration data

Non-scaled acceleration data

The acceleration data, which have been recorded by the drive and have been calculated by the control are transmitted non-scaled between the control and the drives (and converse). It is in the responsibility of the participant to take into account the given significance when using the acceleration data.

Scaling of translatory acceleration data

The translatory scaling is not supported.

Scaling of rotary acceleration data

The rotary scaling is determined with the scaling method (see ▹S0160◃). The scaling parameter (▹S0161◃ and ▹S0162◃) is valid for all rotary acceleration data.

The significance of the LSB of rotary speed data is determined by the product of scaling factor and scaling exponent (basis 10).

$$\text{LSB weight} = \frac{\text{unit}}{\text{time unit}^2} \cdot \text{factor} \cdot 10^{\text{exponent}}$$

Two preferred scalings are defined for the rotary speed data. For both the scaling factor (▹S0045◃) is 1, the scaling exponent (▹S0046◃) is dependent on the unit of time.

Preferred scaling rotary acceleration data

Only one preferred scaling for rotary acceleration data predefined

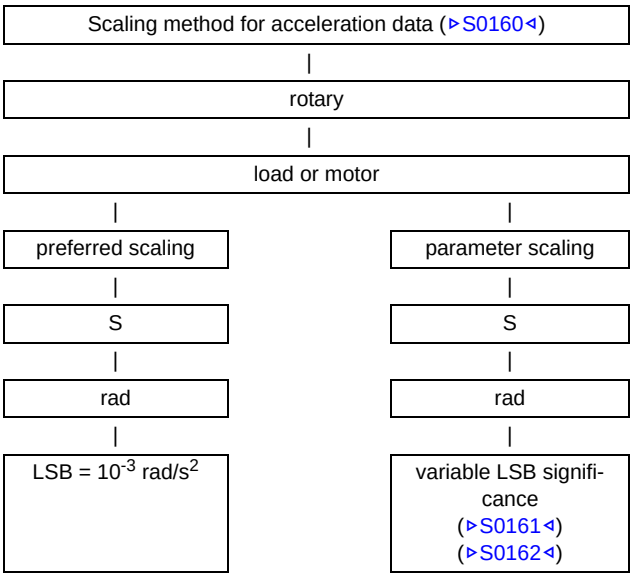
$1 \cdot 10^{-4} \frac{\text{rad}}{\text{s}^2}$

| |

| Scaling exponent (▹S0162◃)

|

Scaling factor (▹S0161◃))



The relevant SERCOS parameters are ▹S0160◃, ▹S0161◃ and ▹S0162◃.

S0160

Scaling method for acceleration data (also see parameters ▹page 112◃)

With this parameter the method of scaling for acceleration data is selected. It is defined, which format master and drive have to use for data exchange.

B maXX® controller supports the rotary scaling. The data always refers to the motor shaft.

S0161

Scaling factor for acceleration data (also see parameters ▹page 112◃)

With this parameter the scaling factor for the acceleration data is determined.

In case of preferred scaling the parameter is set to 1.

S0162

Scaling exponent for acceleration data (also see parameters ▹page 113◃)

With this parameter the scaling factor for the acceleration data is determined.

4.3.4 Torque data

The scaling data is determined with the scaling method (▷S0086◁). The scaling parameter (▷S0093◁ and ▷S0094◁) are valid for all torque data.

The significance of the LSB of the torque data is determined by the product of scaling factor and scaling exponent (basis 10).

$$\text{LSB significance} = \text{unit} \cdot \text{factor} \cdot 10^{\text{exponent}}$$

Scaling of translatory torque data

The translatory scaling is not supported.

Scaling of rotary torque data

For the rotary speed data there are two preferred scalings and one procental scaling defined. For both the scaling factor (▷S0093◁) is valid, the scaling exponent (▷S0094◁) is dependent on the unit, which is used.

- Preferred scaling (Nm)

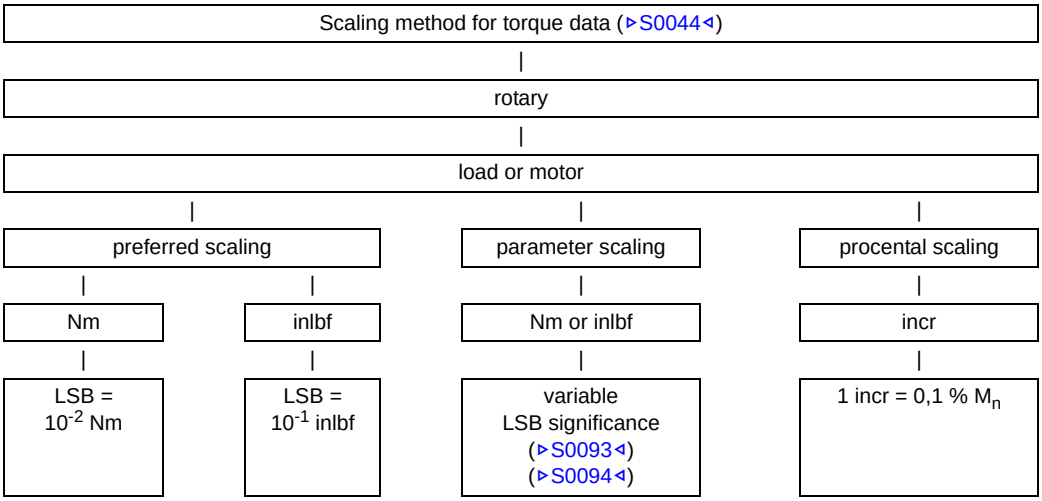
$$1 \cdot 10^{-2}\text{Nm}$$

	Scaling exponent (▷S0093◁)
Scaling factor ()▷S0094◁)	

- Preferred scaling (inlbf)

$$1 \cdot 10^{-1}\text{Nm}$$

	Scaling exponent (▷S0093◁)
Scaling factor ()▷S0094◁)	



The relevant SERCOS parameters are ▷S0086◁, ▷S0093◁ and ▷S0094◁.

S0086

Scaling method for torque data (also see parameters ▷page 96◁)

With this parameter the method of scaling for acceleration data is selected. It is defined, which format master and drive have to use for data exchange.

B maXX® controller supports the rotary scaling. The data always refers to the motor shaft.

S0093

Scaling factor torque data (also see parameters ▷page 97◁)

With this parameter the scaling factor for the torque data is determined.

In case of preferred scaling the parameter is set to 1.

S0094

Scaling exponent torque data (also see parameter ▷page 98◁)

With this parameter the scaling factor for the torque data is determined.

5

DATA EXCHANGE AND PARAMETERIZATION

5.1 Data contents

The following terms are used:

- Operation data
  All data which is used is to be provided with parameter numbers (IDN) and is to be referred to as operating data.
- Parameters
  Parameters are used for the setting of drives and for the control, in order to guarantee an error-free operation of the system.
- Commands
  The commands are used, in order to activate functions in the drives or between the control and the drives.
- Set values and actual values
  Set and actual values normally are integrated as cyclic data into the telegrams.

5.1.1 Data terms

- **Service data**
  Service data are exchanged on request over the service channel between the control and the drives. Such a service case is for example the display or input of certain data to the control terminal.
  So that, if required, all data is to be displayed or is to be set in any kind of way at the control terminal, basically all data can be read as service data and is able to be written as the same.
  For commissioning or service the taking over of cyclic data should be inhibited. Therewith the data which have been normally transferred cyclically can be written as service data.

- **Cyclic data**
  Data are designated as cyclic data if they are in a configurable data record of the telegrams and therewith are transmitted anew in each communication cycle.
  In this communication phase 2 it is determined, which data is transmitted cyclic from the control to each single drive and which data the control receives from each single drive.
  Set and actual values in general are defined as cyclic data.
- **Initialization data**
  This data initializes the communication system and determine all drive parameters of the control and of the drives.

5.2 Communication parameters

The communication parameters are used for the coordination between the master and the slave. The temporal action of communication is determined with these. Communication parameters must be transmitted during communication phase 2 (CP2) and activated during communication phase 3 (CP3) in both the master and the slave (also see ▹Standard parameters◃ from page 73).

5.2.1 Transmission starting times at SERCOS

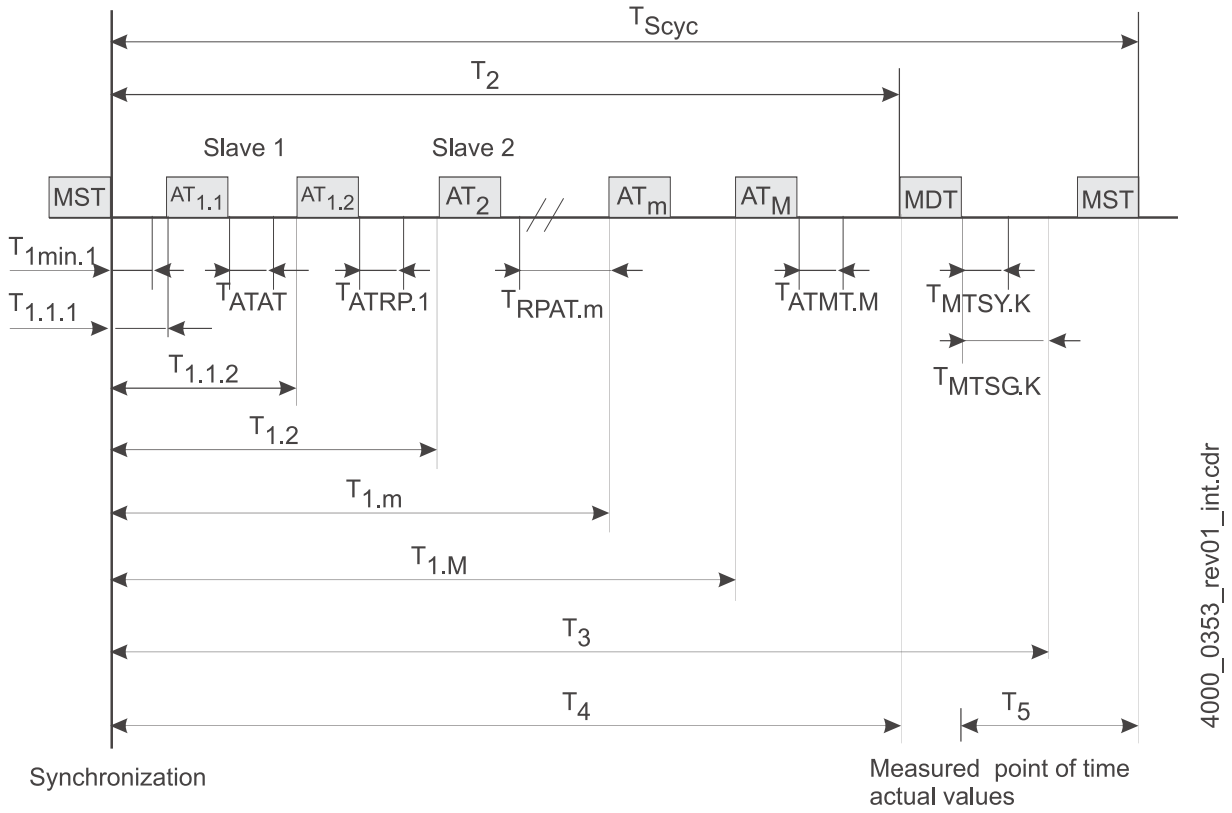


Figure 7: Transmission starting times

Description		Parameter number
Slave timing:		
• Transmission starting time AT	T_{1min}	▷S0003◁
• Transmit/receive transition time	T_{ATMT}	▷S0004◁
The parameters T_{ATAT}, T_{ATRP} and T_{RPAT} have no parameter numbers!		
• Receive to receive recovery time	T_{MTSY}	▷S0088◁
• Proceeding time set values	T_{MTSG}	▷S0090◁
Time in drive:		
Minimum feedback processing time	T_5	▷S0005◁
Times calculated by the master:		
• Transmission starting time AT ($T_1 \geq T_{1min}$)	T_1	▷S0006◁
• Feedback sensing capture point ($T_4 \geq T_{Scyc} - T_5$)	T_4	▷S0007◁
• MDT transmission starting time	T_2	▷S0089◁
• Set value valid time	T_3	▷S0008◁

5.2.2 EtherCAT SoE

EtherCAT has no telegram for the SERCOS MST. The drive synchronization with the option module **BM4-O-ECT-01** is made in the active implementation to the set value telegram receipt (see also Distributed Clocks and ▷Communication cycle◁ on page 13). In order to reach a synchronization of the single drives, the parameter Feedback sensing capture point (▷S0007◁) as well as set value valid time are supported (▷S0008◁).

Due to the different physics the following parameters from the SERCOS standard at an EtherCAT connection are obsolete and therewith are not supported by the EtherCAT option module:

▷S0003◁, ▷S0004◁, ▷S0005◁, ▷S0009◁, ▷S0010◁, ▷S0014◁, ▷S0088◁, ▷S0090◁, ▷S0127◁, ▷S0128◁

Due to the modified physics the following parameters also have a modified meaning compared with the SERCOS standard.

IDN	EtherCAT	SERCOS
▷S0006◁	Indicates the time as offset to the EtherCAT synchronization, at which the drive must provide the actual values (not implemented yet)	Transmission starting time AT (t1)
▷S0028◁	Counts the failed telegrams in the cyclical operation	MST error counter
▷S0089◁	Specifies time as offset to EtherCAT synchronization, were the drive shall start to evaluate the set values (not implemented yet)	MDT transmission starting time (T2)

5.3 Telegram

SERCOS describes a data set as telegram, which cyclical is transferred between master and slave.This meaning is also used when using SoE via EtherCAT.

MDT	Control word	Service data	Configurable data set
	16 bit	16 bit	xx Bit

Figure 8: General form of a master data telegram (MDT)

AT	Status word	Service data	Configurable data set
	16 bit	16 bit	yy bit

Figure 9: General form of a response telegram (AT)

The telegram contents of the configurable data sets are determined either by predefined (standard) or freely configurable telegrams.This determination operates via the telegram type.

All actual values, which are contained in the drive telegram must be updated in each cycle during communication phase 4 by the drive. In the MDT the set values to be transmitted cyclically must remain valid in CP4 depending on the operation mode.

NOTE

The option card **BM4-O-SER-01** of Baumüller supports the standard telegrams 3 and 4, as well as the freely configured telegram 7.

5.3.1 Standard telegram 3

This telegram operates the b maXX®-controller in the speed control (**P1000** = -3). The master transmits cyclic speed set values to the b maXX®-controller. The b maXX®-controller transmits the position actual values cyclical to the master.The possibly necessary calculations for position control thereby must be executed in the master.

Telegram format

The master data telegram MDT has the following format:

MDT	Control word	Service data	Cyclic speed set value **S0036**
	16 bit	16 bit	32 bit

Figure 10: MDT standard telegram 3

The appropriate drive telegram AT has the following format:

AT	Status word	Service data	Cyclic position actual value **S0051**
	16 bit	16 bit	32 bit

Figure 11: AT standard telegram 3

5.3.2 Standard telegram 4

This telegram operates the b maXX®-controller in the synchronous control (**P1000** = -4). The master transmits cyclical position set values to the b maXX®-controller. The b maXX®-controller transmits cyclical position actual values to the master. The calculation for position control thereby are executed from the b maXX®-controller.

Telegram format

The master data telegram MDT has the following format:

MDT	Control word	Service data	Cyclic position set value **S0049**
	16 bit	16 bit	32 bit

Figure 12: MDT standard telegram 4

The accordant AT has the following format:

AT	Status word	Service data	Cyclic position actual value **S0051**
	16 bit	16 bit	32 bit

Figure 13: AT standard telegram 4

5.3.3 Application telegram 7

Selection of the parameters via ▷S0024◁ (set values) and ▷S0018◁ (actual values).

5.4 Configuration parameters of the controller

Specific settings of the option modules can be stored in the controller data set. These are configuration settings, which could not be set by IDN, or have to be valid when switching on the device (before any fieldbus communication).

The service software for the b maXX®-controller offers a page for setting these parameters („Config G/H“).

The meaning of the adjustable parameters is different, depending on the option module.

BM4-O-SER-01:

- P0830/P0840 Option module G/H configuration 1 - SERCOS address offset:
  This offset is added, as superior bits, to the SERCOS address which is set by the switch of the option module.

  SERCOS address = 16*(adress offset) + address switch

- **P0831**/**P0841** Option module G/H configuration 2 - SERCOS cable length:
  In this parameter the length of the fiber optic cable is named in meters, to calculate the optimal trigger of the diode current.

cable length [m]	trigger current [mA]
< 5	**8**
5 ... 20	**16**
20 ... 40	**24**
> 40	**32**

- **P0832**/**P0842** Option module G/H configuration 3 - drive enable:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
reserved															|

0 drive enable (SERCOS control word bits 14 and 15 are analyzed, behavior meets IEC61491 second edition 2002-10

1 drive enable (SERCOS control word bit 14) is ignored, behavior meets preliminary version IEC61491 as from 2004-08-26

BM4-O-ECT-01:

- **P0830/P0840** Option module G/H configuration 1:

Decimal places

Bit 1 **0**: normal weighting according to parameter list

1: divergent weighting (no decimal places at position data, speed data and torque data; change of scaling S-0-0046 = -3, S-0-0078 = -1)

Modulo calculation / gear factors

Bit 3 **0**: absolute modulo calculation; integer gear factors only possible

1: relative modulo calculation; odd gear factors possible

Output of the SERCOS phase change to parameter S-0-0095

Bit 4 **0**: Output SERCOS phase change to parameter S-0-0095; no setting of the mask status class 2 (S-0-0097 = 0x0000)

1: No output SERCOS phase change to parameter S-0-0095; setting of the mask status class 2 (S-0-0097 = 0xFFFF)

Transfer of the Sync signal (at DC only)

Bit 6 **0**: Sync signal directly to the controller

1: Sync signal via FPGA with DLL

Start of the PLL

Bit 8 **0**: Start of the PLL in FPGA

1: No start of the PLL in FPGA

Synchronization settings

Bit 9 **0**: Automatic Sync setting (source for the Sync signal, Sync offset, Sync tolerance)

1: No automatic Sync setting

BACI communication settings

Bit 10 **0**: Automatic configuration of the BACI communication times (BACI module selection, BAC cycle time, set value BACI offset, actual value BACI offset)

1: No configuration of the BACI communication times by option card

Time of copying of the set values

Bit 11 **0**: Copying of the set values to BACI-IRQ

1: Copying of the set values to EtherCAT-IRQ (Attention:
This may lead to set value failures when offset setting is wrong)

Display of warnings at ramp up

Bit 12 **0**: No display of warnings during ramp up

1: Display of warnings during ramp up

Time of copying of the actual values

Bit 13 **0**: Copying of the actual values to EtherCAT-IRQ

1: Copying of the actual values to BACI-IRQ (Attention:
This may lead to actual value failures when offset setting is wrong)

5.5 Synchronization

5.5.1 BM4-O-SER-01

The synchronization is made via a master synchronization telegram (MST) from the master.

5.5.2 BM4-O-ECT-01-00

The synchronization is effected exclusively on the set value receipt date, optimized via PLL to minimize the transmit jitter from the master.

5.5.3 BM4-O-ECT-01-01

Set value receipt date

The synchronization is effected exclusively on the set value receipt date, optimized via PLL to minimize the transmit jitter from the master.

Distributed Clocks

Settings from the master for Distributed Clocks (DC).

In order to activate DC in the option module BM4-O-ECT-01-01, the register with the address 981_{hex} has to be written from the master in the slave as follows:

- Bit 0 $\Rightarrow$ 1 activate cyclic operation
- Bit 1 $\Rightarrow$ 1 activate Sync0

The verification is done during the changeover from PreOperational to SafeOperational in the EtherCAT state machine.

The master sets the desired type of synchronization by the register **980**$_{hex}$:

- Value 0_{hex} ⇒ freerun, not synchronized
  (only possible up to PreOperational)
- Value 2_{hex} ⇒ DC Sync0, synchronized with DC IRQ Sync0
- Value 22_{hex} ⇒ SM2, synchronized by Sync-Manager SM IRQ of SM2

All other types of synchronization are not supported. Is it tried to write values anyway, the synchronization will be done to the Sync Manager 2 (SM2).

The cycle time is written by the master into the register $9A0_{hex}$ of the slave (DWORD in ns). If there is no cycle time set via the field bus, the cycle time is taken from the controller parameter (**P0532**) (see page „Synchronization“ of the service tool).

NOTE

There can be set another cycle time as requested.

During the changeover to Safe-Operational it is verified whether the register 981_{hex} was written by the master. If it was not, the synchronization is set to default (Synchronization to SM2).

6

OPERATING MODES

6.1 General information

How to control the drive is determined via the operating mode. The slave module for the b maXX® controller supports a main operating mode (▷S0032◁) and 3 additional operating modes (▷S0033◁, ▷S0034◁, ▷S0035◁).

The specification of a operating mode is made via bits 8 and 9 of the SERCOS control word. The display of the active operating mode is made via the bits 8 and 9 of the SERCOS status word.

6.2 Operating mode parameters

The operating mode parameters are configured in identical form. The following table provides a survey of the operating modes, which are supported by SERCOS:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Description
0	is not supported	Reserved									0	0	0	0	0	No operating mode
0											0	0	0	0	1	Torque control (**P1000** = -2)
0											0	0	0	1	0	Speed control (**P1000** = -3)
0											0	X	0	1	1	Position control with encoder 1 (**P1000** = -4)
0											0	X	1	0	0	Position control with encoder 2 (**P1000** = -4)
0											0	X	1	0	1	Position control with encoder 1 and 2 (**P1000** = -4)
0											1	0	0	1	1	Drive-internal interpolation, encoder 1
																Manufacturer-specific (bit 15 = 1)
1											0	0	0	0	0	invalid
1											0	0	0	0	1	Synchronous operation (**P1000** = -5)
1											0	0	0	1	0	Find notch position (**P1000** = -1)
1											0	0	0	1	1	Position target input (**P1000** = 1)
1											0	0	1	0	0	Speed default 1 (**P1000** = 2)
1											0	0	1	1	1	Homing drive-controlled (**P1000** = 6)

Bit 3 only has a meaning in the operating modes with position control.

7

COMMANDS

A command is always activated by the writing of the accordant command parameter.

7.1 General information

The command parameter only uses bit 0 and bit 1.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Bits 15 to 2: Reserved

Bit 0:
- 0 Delete command
- 1 Set command

Bit 1:
- 0 Interrupt command
- 1 Enable command

The command reply via the SERCOS service channel is shown below (only bit 0 to 3 and bit 8 are evaluated).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Bits 15 to 9: Reserved

Bits 7 to 4: Reserved

Bit 0:
- 0 Command is not set
- 1 Command is set

Bit 1:
- 0 Command is interrupted
- 1 Command is enabled

Bit 2:
- 0 Command is completed
- 1 Command is not completed

Bit 3:
- 0 Command without error
- 1 Command execution is not possible

Bit 8:
- 0 Data is valid
- 1 Data is not valid

At each term only one active command is permitted. It is not permitted, that two commands are enabled simultaneously. If the command status has been changed, bit 5 of the SERCOS status word is immediately set in order to indicate the new status to the master.

7.2 Supported commands

The following commands are supported:
▹S0099◃, ▹S0127◃, ▹S0128◃, ▹S0146◃, ▹S0148◃, ▹S0170◃, ▹S0171◃ and ▹S0172◃ (also see ▹Parameters◃ from page 71).

S0099

Reset class 1 diagnostic

If this command is received from the drive via the service channel and if there is no error, the interface status, the drive shutdown error (drive status bit 13) and the drive shutdown mechanism is reset in the drive.

S0127

Transition check to comm. phase 3

With this command the master informs the slave about the transmission of all necessary communication parameters for communication phase 3. With this command the slave checks if from its perspective an error-free operation in the communication phase 3 is possible.

S0128

Transition check to comm. phase 4

With this command the master informs the slave about the transmission of all necessary communication parameters for communication phase 4. With this command the slave checks if from its perspective an error-free operation in the communication phase 4 is possible.

S0139

Command parking axis

Also see ▹S0139◃. Supports from version 1.08 for SERCOS on and 1.02 for SoE.

S0146

Command NC-controlled homing

The NC-controlled homing is enabled and checked by the control (see ▹Homing◃ from page 57).

S0148

Command drive controlled homing

The drive controlled homing is enabled from the master but is completely controlled by the drive (see ▹Homing◃ from page 57).

S0152

Command spindle positioning

Also see ▹S0152◃. Supports from version 1.08 for SERCOS and 1.02 for SoE.

S0170

Command probing cycle

The Baumüller drive system supports in the current version two probes (see manual b maXX®-controller and ▹Probe◃ from page 63).

S0171

Command calculate displacement

The drive calculates the displacement between the old and new (referenced) set-/actual system (also see parameters ▹Page 115◃).

S0172

Displacement to the referenced system

The drive switches to the new (referenced) set-/actual system (also see parameters ▹Page 115◃).

S0197

Set command system coordinates

The drive accepts the value from ▹S0198◃ as active coordinate point (also see ▹S0197◃). Supports from version 1.06 for SERCOS on and all versions for SoE.

S0262

Command load defaults

Also see ▹S0262◃. Supports from SERCOS version 1.07 on and all versions for SoE.

S0263

Command load working memory

Also see ▹S0263◃. Supports from SERCOS version 1.07 on and all versions for SoE.

S0264

Command backup working memory

Also see ▹S0264◃. Supports from SERCOS version 1.07 on and all versions for SoE.

7.3 Allocation of real-time bits

As commands use the non-cyclic data exchange (service channel communication) it needs a non-predictable time until the master is informed via the command procedure. Similar is valid for the enable of actions in the slave.

That is why two real-time status bits can be used for the binary status information.

Bit 6 of the SERCOS status word is the real-time status bit 1.

Bit 7 of the SERCOS status word is the real-time status bit 2.

For the enable of actions in the drive two real-time control bits can be used.

Bit 6 of the SERCOS control word is real-time control bit 1.

Bit 7 of the SERCOS control word is real-time control bit 2.

The real-time bits are cyclically transmitted.

Four S-parameter numbers are defined, to which one of the real-time bits individually are assigned.

▷S0301◁ Allocation of real-time control bit 1

▷S0303◁ Allocation of real-time control bit 2

▷S0305◁ Allocation of real-time status bit 1

▷S0307◁ Allocation of real-time status bit 2

These S-parameters contain a S-parameter number of a binary signal. This makes an assignment of the real-time bits to the binary signals possible.

Below the permitted S-parameter numbers for the real-time bit assignment are listed:

▷S0401◁ Probe 1

▷S0402◁ Probe 2

▷S0403◁ Status position actual value

▷S0409◁ Probe 1 positive latched

▷S0410◁ Probe 1 negative latched

▷S0411◁ Probe 2 positive latched

▷S0412◁ Probe 2 negative latched

▷S0405◁ Probe 1 enable

▷S0406◁ Probe 2 enable

Case 1

Allocation of a parameter number not equal 0 according to a real-time bit, if according to this real-time bit there is no other allocation active.

The status of the real-time control bits must at the latest be defined, if the element 7 of ▷S0301◁/▷S0303◁ is written.

It is ensured, that a valid status is provided from the option module, if the busy bit is deleted.

must be initiated in the drive before the resetting of the busy bit. On the other hand the evaluation of the real-time status bit may not be initiated in the master, before the drive has reset the busy bit.

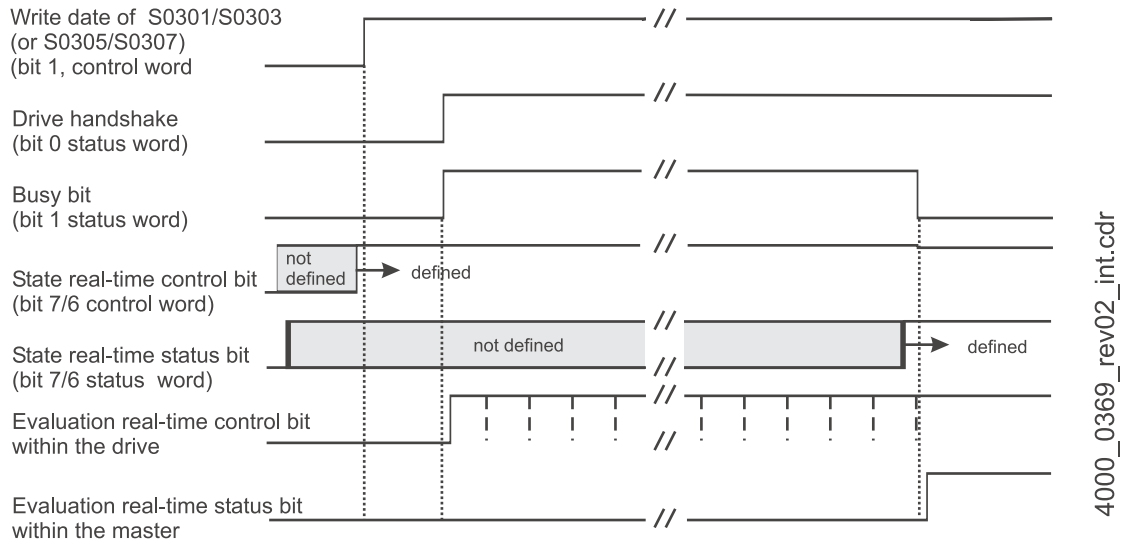


Figure 14: Allocation of a parameter number $\neq 0$ to a real-time bit (without previous allocation)

Case 2

Allocation of parameter number 0 to a real-time bit, if according this real-time bit another allocation is active.

The status of the real-time control bit must remain defined, until the drive has reset the busy bit. The status of real-time status bit must remain defined at least until the setting of the busy bit of the drive.

The evaluation of the real-time control bits must be completed before the drive resets the busy bit. The evaluation of the real-time status bit must be completed in the control if the element 7 is written.

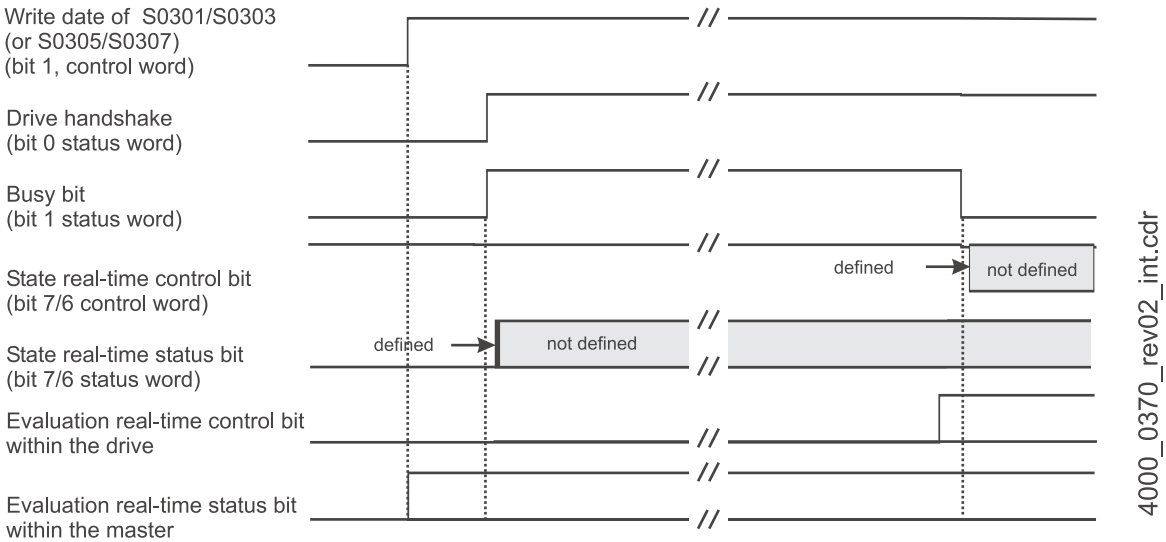


Figure 15: Allocation of a parameter number = 0 to a real-time bit (with previous allocation)

Case 3

Allocation of a parameter number not equal 0 to a real-time bit if another allocation is active regarding this real-time bit.

The status of the old real-time control bits must remain defined from the control, until the writing request for the element 7 has been send. After setting of the busy bits by the drive the new real-time control bit must be send. The evaluation of the old real-time control bits is executed in the drive at most until the resetting of the busy bits.

The switching from an active real-time control bit to another proceeds only then safe, if the allocation of parameter number 0 is used (case 1, case 2). The controller must execute the switchover according to these rules.

At an error the old allocations remain valid. In this case an evaluation is permissible again, as soon as the busy bit has been reset.

In the control, the evaluation of the real-time status bit may be made for the former allocation only up to the transmission of the write request for the element 7. On the other hand the evaluation of the real-time status bit may not be initiated in the master, before the drive has reset the busy bit.

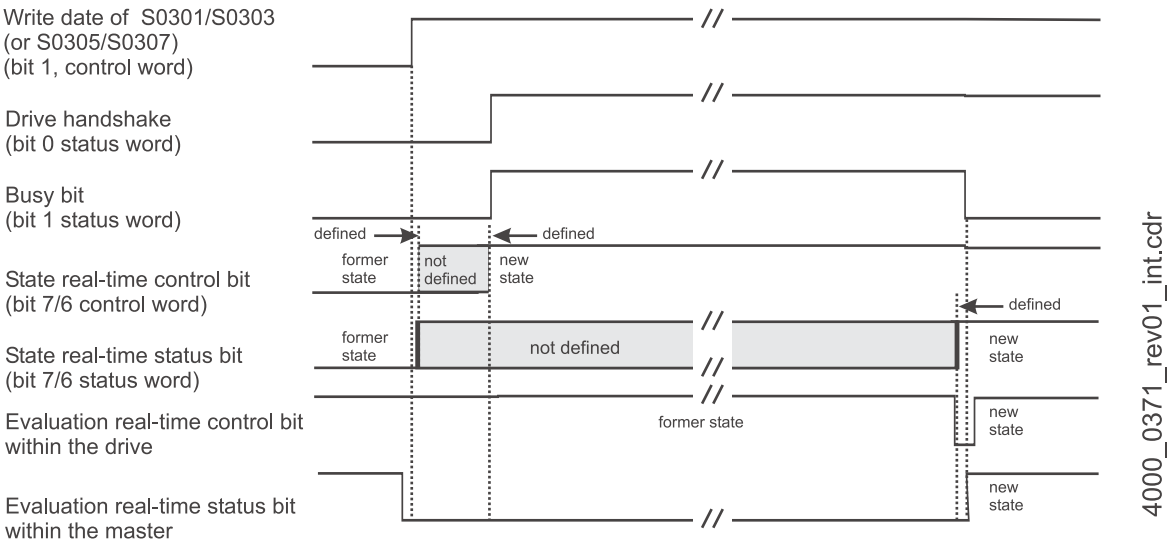


Figure 16: Allocation of a parameter number ≠ 0 to a real-time bit (with previous allocation)

7.4 Homing

Homing can either be started by the control or by the drive. There are commands for both possibilities.

7.4.1 Command „Drive controlled homing“

The following requirements are valid:

- The position measuring system is connected to the drive, the position actual value processing is operated by the drive.
- The reference switch is directly connected to the drive.

Before the control initiates the 'drive controlled homing' by setting and enabling of the commands (▹S0148◃), it must allocate the necessary control- and status signals via the service channel to the real-time bits.

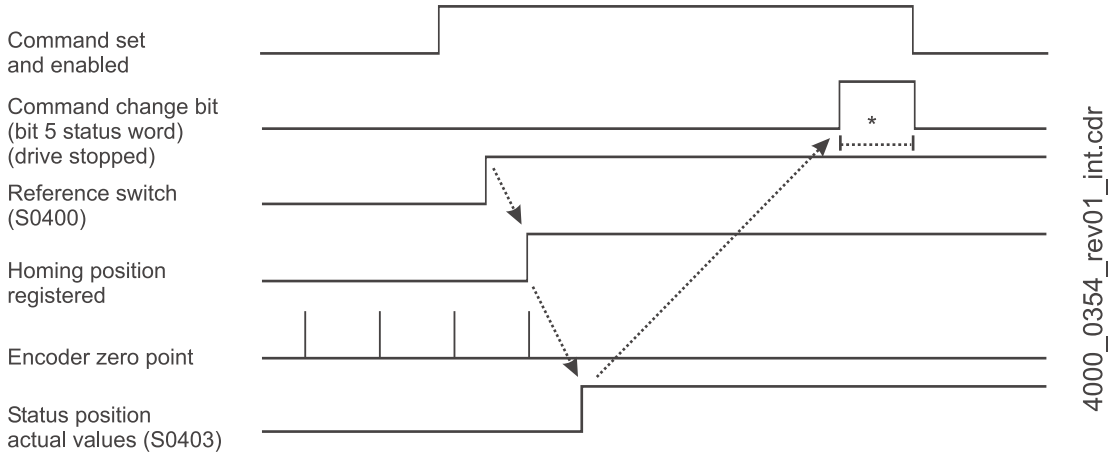


Figure 17: Bit string

* During this time the control must take over the position set value (▹S0047◃) from the drive.

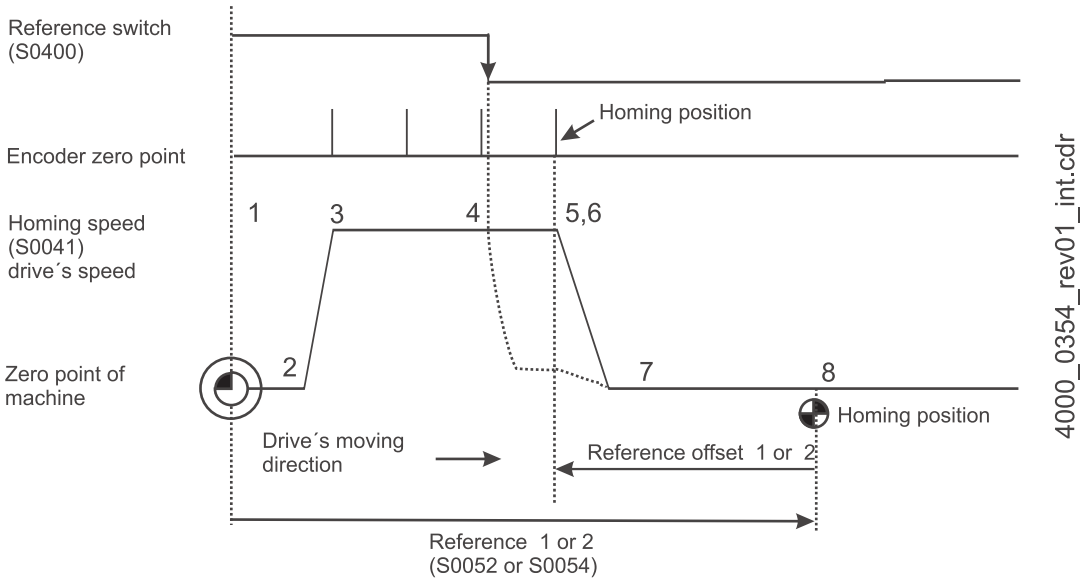


Figure 18: Drive controlled homing

1 The command „Drive controlled homing“ (▹S0148◃) is set and enabled.

2 Starting position of the drive, which doesn’t refer to the machine zero point. The drive switches over to the internal position control and deletes the bit ’Status position actual values’ (▹S0403◃).

3 With regard to the starting direction which is determined by the homing parameter (▹S0147◃) the drive accelerates by complying with the homing acceleration (▹S0042◃) to the homing speed (▹S0041◃).

4 With identification of the programmed signal changes at the reference switch (programmed via the homing parameter ▹S0147◃) the drive finds the homing position with the next marker pulse encoder.The drive can decelerate via an internal function the speed after recognizing the signal change at the reference switch (dash-lined).

5 The drive decelerates with the homing acceleration to a standstill.

6 The detection of the reference marker in the drive leads to the setting of the position actual value 1 or 2. The position data signs must be regarded.
Position actual value 1 = reference distance 1 + reference offset 1 + distance to the reference marker
Position actual value 2 = reference distance 2 + reference offset 2 + distance to the reference marker
As soon as the position actual value 1 or 2, which refers to the machine zero point was written into the drive telegram, the drive sets the command-change bit (bit 5 in the status word, which then displays the proper execution of the drive-led homing).
The drive calculates a set value position, which is equal to the referenced position actual value 1 or 2. The control reads this position set value (▹S0047◃) from the drive and sets its own position set value on this position.

7 After that the control deletes the command and the drive follows the set values of the control.
The control doesn’t generate new position set values (this means the axis remains near the position encoder homing position), later the control starts from this point.

8 Reference position of the axis. The control uses the same procedure for all further drives.

7.4.2 Homing by the control

At the NC controlled homing there are three commands available:

- NC-controlled homing (▷S0146◁)
- Calculate displacement (▷S0171◁)
- Displacement into reference system (▷S0172◁)

These commands partly also can be used if for example the control calculates the displacement and then writes it into the drive.

7.4.2.1 Command „NC controlled homing“

For a proper sequence of the commands (▷S0146◁) the following allocations according the real-time control- or status bits are necessary:

- Real-time control bit: Homing enable (▷S0407◁)
- Real-time status bit: Reference marker recorded (▷S0408◁)

If the reference switch is connected to the drive additionally the following allocation is necessary:

- Real-time status bit: Reference switch (▷S0400◁)

The allocations must be done before starting the command and can be checked by the drive.

At NC controlled homing it is distinguished between three cases:

Case 1 The reference switch is connected to the control, the drive only evaluates the signal ’Homing enable’.

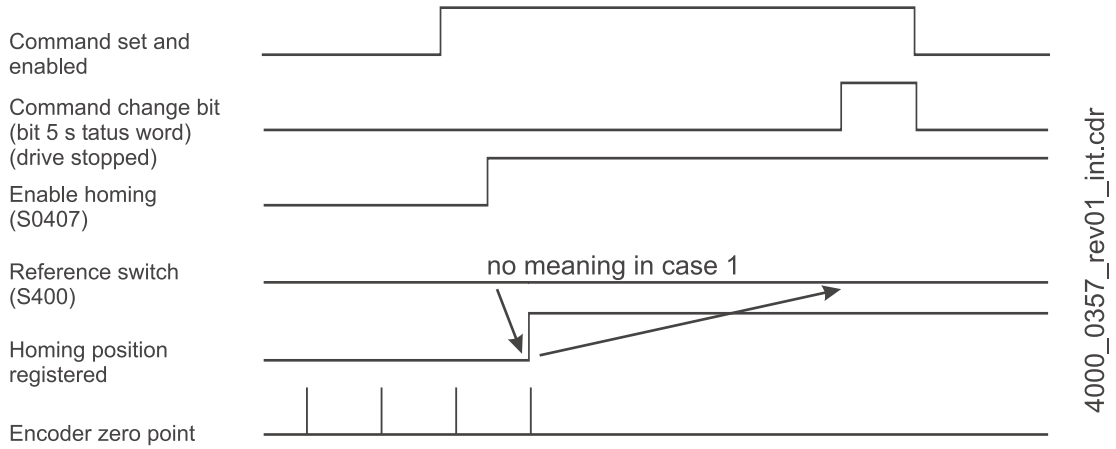


Figure 19: Bit sequence at NC controlled homing (case 1)

Case 2 The reference switch is connected to the drive.

Case 2.1 The drive signals the control the reference switch (▹S0400◃) via the real-time status bit 2.

The control sets the homing enable (▹S0407◃) via the real-time control bit. The drive evaluates only the homing enable (▹S0407◃).

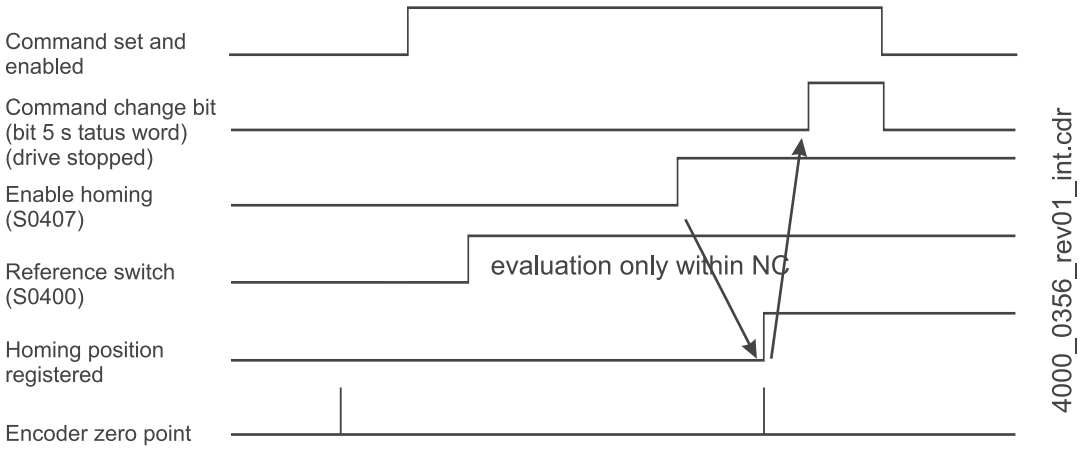


Figure 20: Bit sequence at NC controlled homing (case 2.1)

Case 2.2 The drive signals the control the reference switch (▹S0400◃) via the real-time status bit 2.

The control sets the homing enable (▹S0407◃) via the real-time control bit. The drive evaluates the homing enable (▹S0407◃) via the reference switch (▹S0400◃).

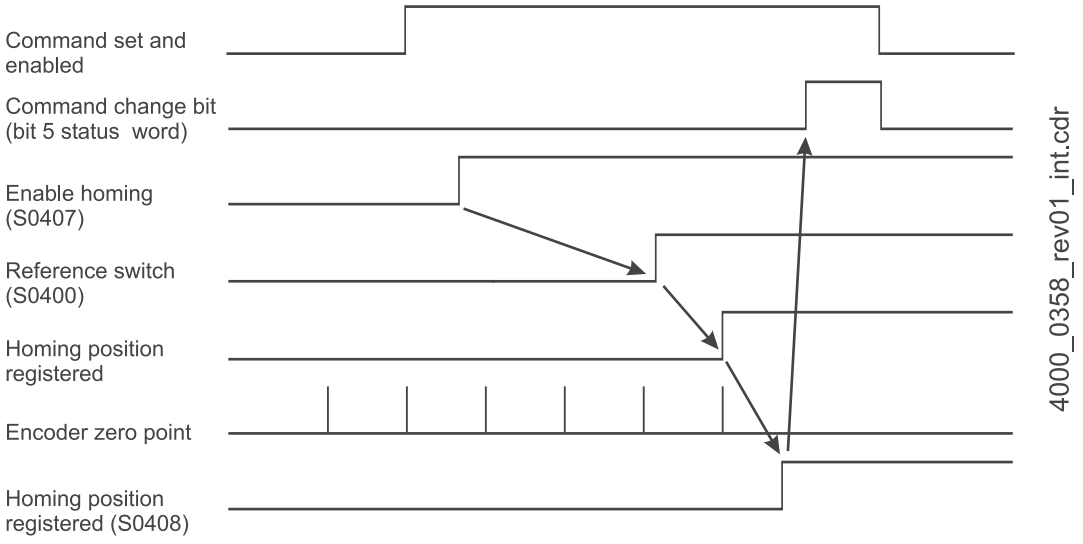


Figure 21: Bit sequence at NC-controlled homing (case 2.2)

7.4.2.2 Command „Calculate displacement“

In order to calculate the displacement of old and new measuring system (which refers to the machine zero point), two procedures are available:

- The drive calculates the displacement via the command „Calculate displacement“ (▹S0171◃).
  - The drive calculates the distance to the machine zero point
    - At an incremental measuring system:
      Distance from machine zero point = reference marker 1 (▹S0052◃) + reference offset 1 (▹S0150◃)
      Distance from machine zero point = reference marker 2 (▹S0054◃) + reference offset 2 (▹S0151◃)
      The signs depend on the configuration of the machine.
    - At distance-coded measuring system:
      The distance of the machine zero point is calculated from the marker position A (▹S0173◃), the marker position B (▹S0174◃) and the absolute offset 1/2 (▹S0177◃ or ▹S0178◃)
  - The drive calculates displacement between the machine zero point and the zero point of the non-referenced drive according to the following formula (under consideration of signs):
    Displacement value 1 or 2 = distance to the machine zero point - marker position A (▹S0173◃).
    The result is saved in the displacement parameter 1 or 2 (▹S0175◃ or ▹S0176◃) and is valid only for incremental and distance-encoded encoder systems.
  - The drive accepts the command positive as soon as the displacement has been calculated and saved.
  - The master control reads the displacement parameter 1 or 2 (▹S0175◃ or ▹S0176◃) from the drive and sets the position set value on the referenced system.
  - The master control deletes the command ’Calculate displacement’.

- The control calculates displacement.
  - The control reads the data, which is required for the calculation from the drive.
  - The control calculates displacement:
    Displacement 1 or 2 = distance to the machine zero point - marker position A (▹S0173◃)
  - The master control programs the displacement parameter 1 or 2 (▹S0175◃ or ▹S0176◃) in the drive.

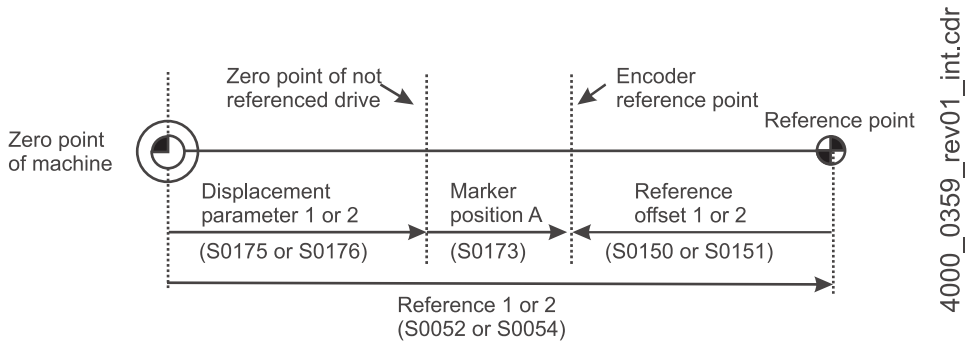


Figure 22: Incremental measuring system

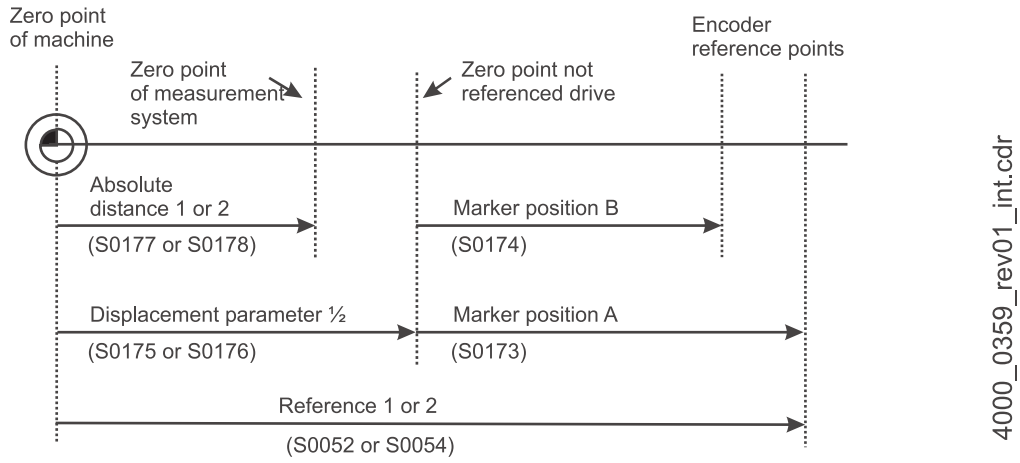


Figure 23: Distance-coded measuring system

7.4.2.3 Command „Displacement in reference system“

For the correct function of the command 'Displacement in reference system' (▹S0172◃) the following allocations of the real-time bits are required:

- Real-time control bit: Status position set value (▹S0404◃)
- Real-time status bit: Status position actual value (▹S0403◃)

Simultaneously, the position set values are switched over to the referenced system with the setting of real-time control bits „Status position set values“. Simultaneously, with the entering of the referenced position actual value 1 or 2 in the AT, the real-time status bit „Status position actual value" (▹S0403◃) is set (the position actual values refer to the home position).
After both bits were set, the drive accepts the command as positive. The correct order, in which the bits must be set, is not determined.

The bit status position set values must be set by the control independently from the operation mode.

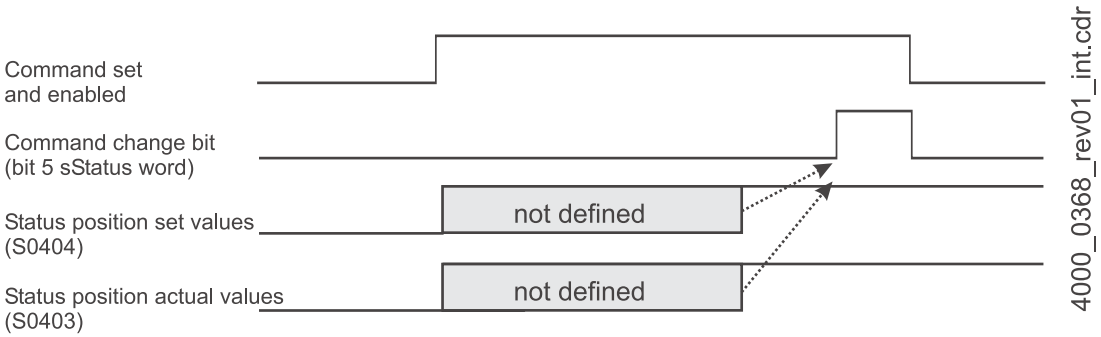


Figure 24: Bit sequence during execution of displacement

7.5 Probe

The command „Probe cycle“ acts as a function in order to activate the function „Measurement with probe“ (▹S0170◃). With this command not only a single measurement but also a multiple measurement (usage of real-time bits) is possible.

The setting and enable of a command activates the function „Measure“ in the drive. The drive signals this by the setting of the acknowledgment command (data status) „set, enabled, not executed yet“. An acknowledge „Execute command properly“ isn’t made. This means, that the command change bit is only set in the error case.

Using the ’Probe control parameter’ (▹S0169◃) specific edges of probe 1 and 2 can be selected.

Due to the signals „Probe-1 or -2-enable“ (▹S0405◃ or ▹S0406◃) measuring is enabled.

With the occurring of the selected edge at the probe the drive saves the position actual value in the according parameter ▹S0130◃ to ▹S0133◃ (probe value 1 or 2, positive or negative edge) and sets the according bit in the probe status (▹S0179◃).The status bits in the probe status are addressed via the parameter number ▹S0409◃ to ▹S0412◃ and therewith can, at quick measurements, be allocated to the real-time status bits.

If an active measurement edge occurs, the effects of a equal edge are inhibited.This inhibit is deleted by reset of „Probe-1 or 2-enable“ (▹S0405◃ or ▹S0406◃) again. Then, by the setting of „Probe-1 or 2-enable“ measurement is enabled again.

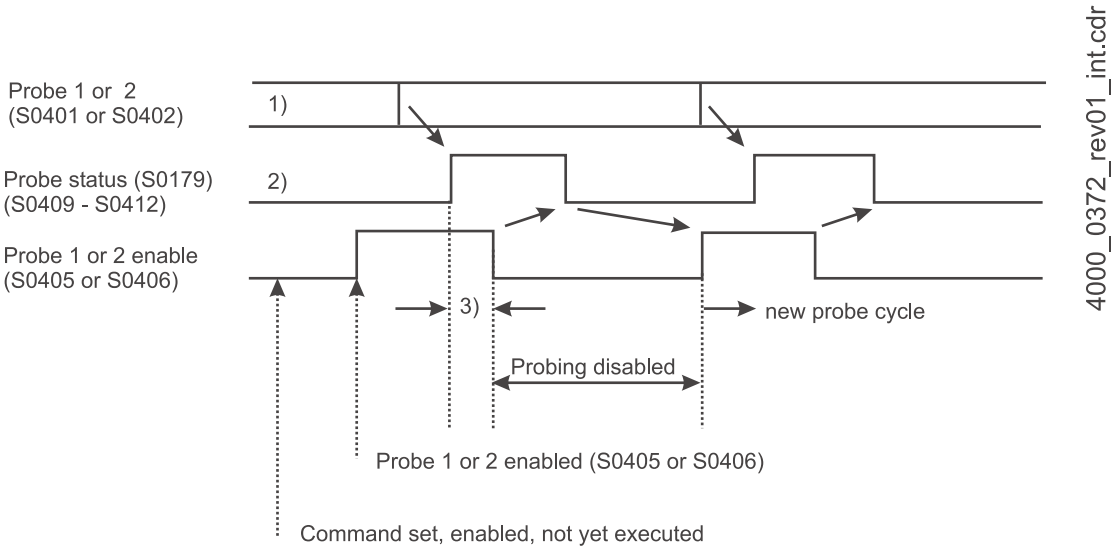


Figure 25: Bit sequence for command probe

1) Selection of probe 1 or 2 and the active edge is set via the probe control parameter (▹S0169◃).

2) The bits probe value 1 or 2, positive/negative latched, are included in the parameter number ▹S0179◃. These bits have the parameter numbers ▹S0409◃ to ▹S0412◃.

3) In this time sequence normally the probe value 1 or 2 positive/negative (▹S0130◃ to ▹S0133◃) is read.

7.5.1 Command Probe cycle in the b maXX®-controller

For example probe 1 is activated:

- At first the real-time status bits must be allocated:
  e. g. ▷S0305◁ is set to 409 (value latched to positive edge of the probe) and ▷S0307◁ is set to 410 (value latched to negative edge of the probe).
  This way it is possible to monitor the status of the probe with the real-time status bits, without checking the parameter **P0580** and without identifying the probe activation.
  Then it must be determined, which edge of the probe signal is used in order to read the values.This is determined in ▷S0169◁ with the bits 0 to 3.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

			0	Probe 1 pos. edge inactive
			1	Probe 1 pos. edge active
		0		Probe 1 neg. edge inactive
		1		Probe 1 neg. edge active
	0			Probe 2 pos. edge inactive
	1			Probe 2 pos. edge active
0				Probe 2 neg. edge inactive
1				Probe 2 neg. edge active

  In the previous case (▷S0169◁ = 0003_{hex}) it can be checked ,if for the first measuring a positive or a negative edge is active.
  This function is not accessible via SERCOS and can only be set via the bits 5 to 8 of the parameter **P1310**:

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved											Reserved				

1	0	0	0	first value by positive edge second value by negative edge
1	0	0	1	first value by negative edge second value by positive edge

- The probe must be activated by setting ▷S0405◁ = 1 (probe 1 is enabled).
- At the end the command 'Probe enabled' must be set, by which 0 and 1 are set by ▷S0170◁(▷S0170◁= 0003_{hex}).

If a value once has been read during a probe cycle a new measuring is prevented until ▷S0405◁ has been reset and set again.

Probe values of the positive edges are written to ▷S0130◁ and probe values of negative edges are written to ▷S0131◁.

The probe command is completed with ▷S0170◁= 0000_{hex}.

7.6 Parking axis

The following operating sequence is determined for the command ▹S0139◃ Parking axis:

The command ▹S0139◃ is set by the control via the service channel and is enabled.

In the drive the monitoring of the encoder system is switched off.

Then the bit „Status position actual value is reset and the change of command bit is set by the drive. Therewith the controller detects, that the command was executed.

The command is deleted. Therewith monitoring is reactivated.

7.7 Command Spindle positioning

The command Spindle positioning (▹S0152◃) positions a spindle on an absolute angle or turn a spindle for a relative angle.

The function is activated in the drive by the setting and enabling of the command. The drive accepts the activation by the setting of command status to „Command set, activated and not executed yet“. There is no confirmation „Command executed“.

The positioning mode of the spindle is set in the positioning parameter (▹S0154◃). At positioning, this parameter defines, whether the spindle is positioned clockwise or counterclockwise or on the quickest path. With this parameter it is furthermore determined, whether the positioning is executed with absolute or relative positioning.

7.7.1 Speed value > positioning speed

If the actual speed of the drive at activation of the command „Spindle positioning“ greater than the positioning speed (▹S0222◃), then the drive brakes to positioning speed.

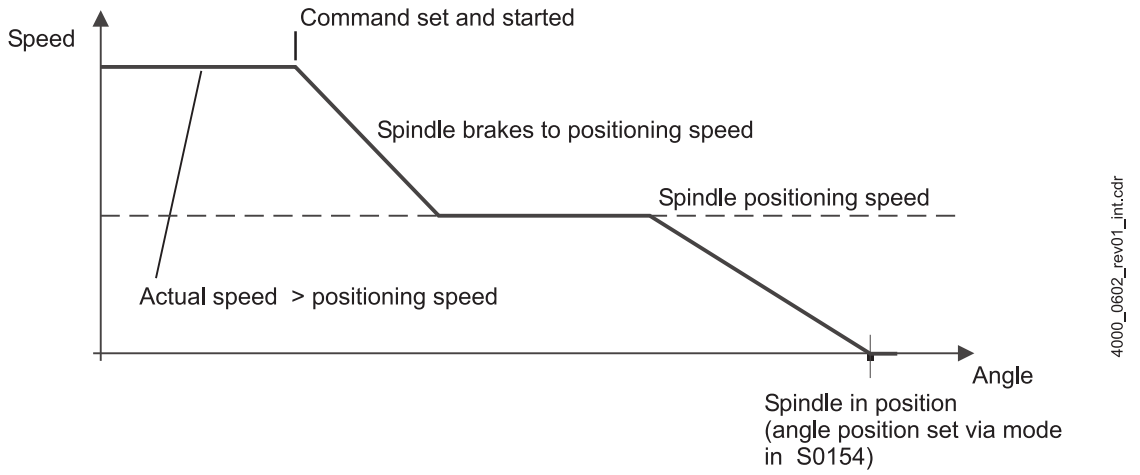


Figure 26: Speed diagram for spindle positioning (1)

7.7.2 Actual speed ≤ positioning speed

If the actual speed is smaller or equal the positioning speed (▷S0222◁), the drive changes into the internal positioning mode and positions the spindle on the ▷S0153◁ predetermined absolute angle with consideration to the settings in the positioning parameter (▷S0154◁).

NOTE

At ▷7.7.1◁ and ▷7.7.2◁ the covered distance is undefined, because the starting position of movement is not defined. Bit 2 of ▷S0154◁ can be 0 only.

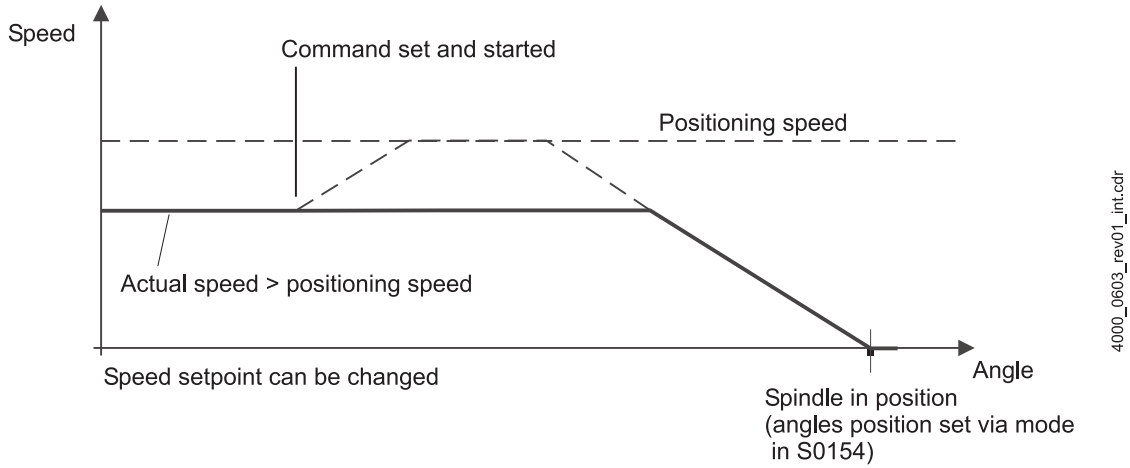


Figure 27: Speed diagram for spindle positioning (2)

7.7.3 Actual speed = 0

If the command spindle positioning is activated, when the drive is at standstill, then the drive positions the spindle to the spindle angle position (▹S0153◃) with consideration to the positioning parameter (▹S0154◃), of the acceleration parameters and of the maximum positioning speed (▹S0222◃) or the drive positions to a relative spindle travel (▹S0180◃) also with consideration to the positioning parameter.

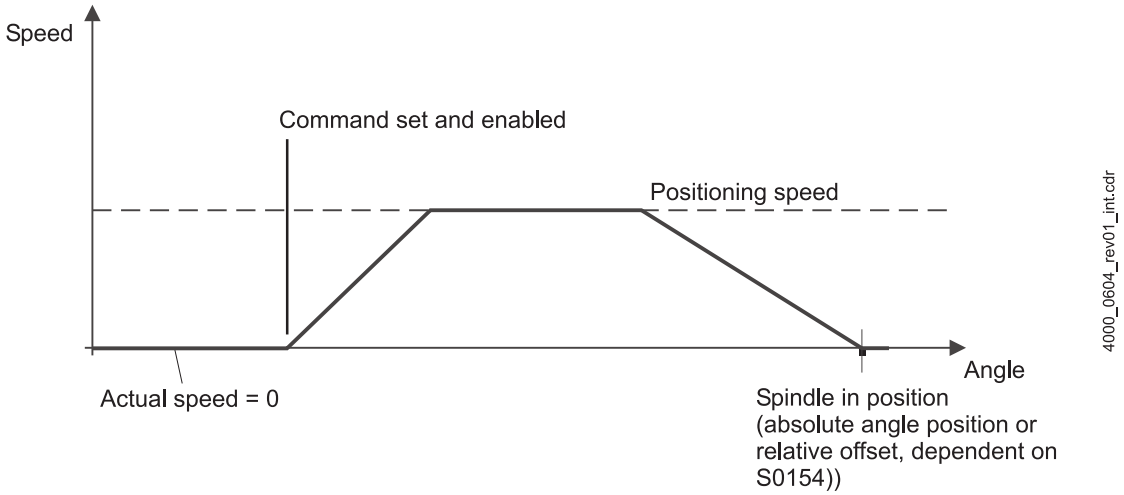


Figure 28: Speed diagram for spindle positioning (3)

7.7.4 New positioning values during the command is active

Whereas the command „Spindle positioning“ (▹S0152◃) was activated by the control, the drive remains in the positioning operation mode internally and approaches each new (absolute) spindle angle position (▹S0153◃) or moves to each new (relative) spindle travel (▹S0180◃), as long as you do not change between the modes absolute angle and relative offset, by writing of the positioning parameter(▹S0154◃).

The values for relative offset positioning are summed up when writing a new value to ▹S0180◃.

If a new target position was taken over and was accepted, by deleting the „busy“-bits, the status „in position“ (▹S0336◃) is valid or in the C3D (▹S0013◃) for the new position.

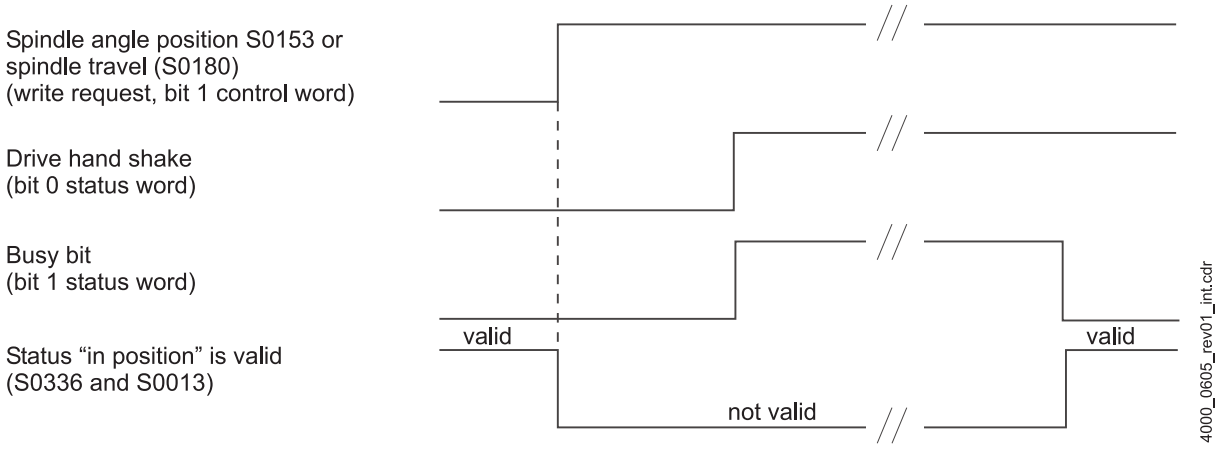


Figure 29: Bit-operating sequence during the writing of a new angle position (▹S0153◃ or ▹S0180◃)

7.7.5 Change of the spindle positioning mode, during an active command spindle pos.

The switchover between the absolute spindle angle position (▷S0153◁) and the setting of a relative spindle travel (▷S0180◁) during the command spindle positioning (▷S0152◁) being active, starts with the writing of the positioning parameter (▷S0154◁) and is not valid until a new target position was written. The original „in position“ status is valid until the write request of a new target position is requested.

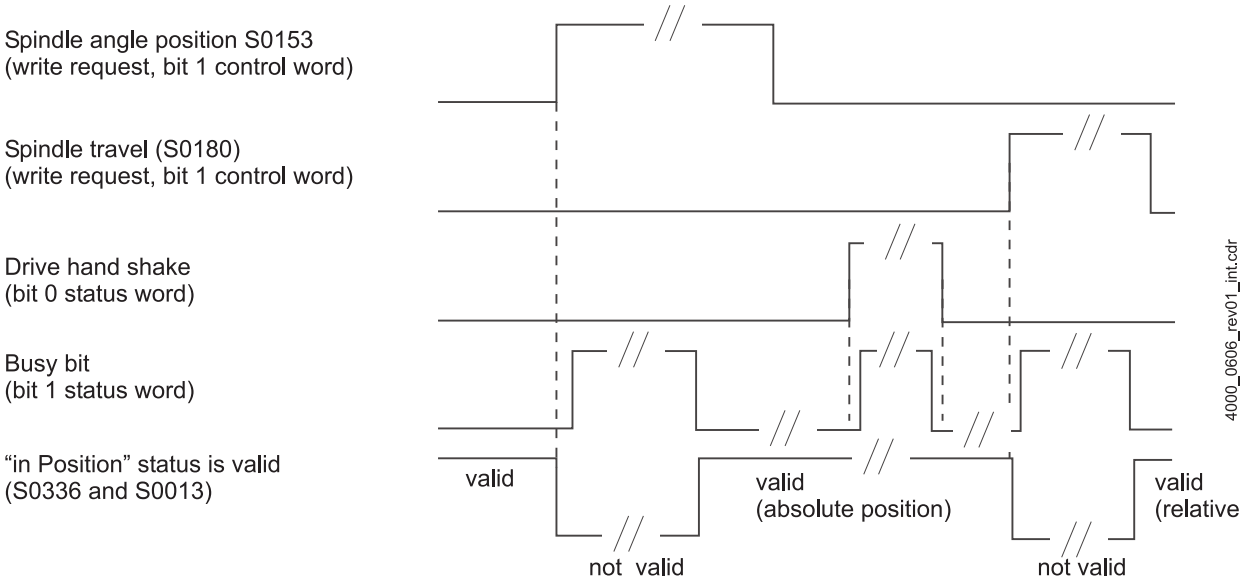


Figure 30: Bit sequence for switching over the positioning mode

8

PARAMETERS

In this chapter we describe the parameters which are available, sorted by numbers.

All S-parameters which are assigned to a b maXX® parameters contain the corresponding b maXX® parameter values, that means they do not have any own default values. The values of these S-parameters accord to the b maXX® parameter values, which where set.

S-parameters, which do not correspond with a b maXX® parameter contain default values. However these kind of parameters only exist on the SERCOS slave module and generally are meant for the generation of SERCOS communication or are auxiliary factors for conversions and scalings.

NOTE

Parameters, which are perhaps signaled by the drive, but are not specified, are not supported. The use of this parameter can lead to undefined behavior of the drive.

8.1 Structure of the parameters

Every parameter has

- a name,
- an unique number,
- a data type,
- and fixed attributes or characteristics.

8.1.1 Structure of the parameter description

All parameter descriptions are based on the following scheme:

S0036	**Speed set value**		-2^{31} to $2^{31} - 1$
	CW	-	4 bytes
	G	P1171	0

Description of the function of the parameter.

The different branches of the scheme are described below:

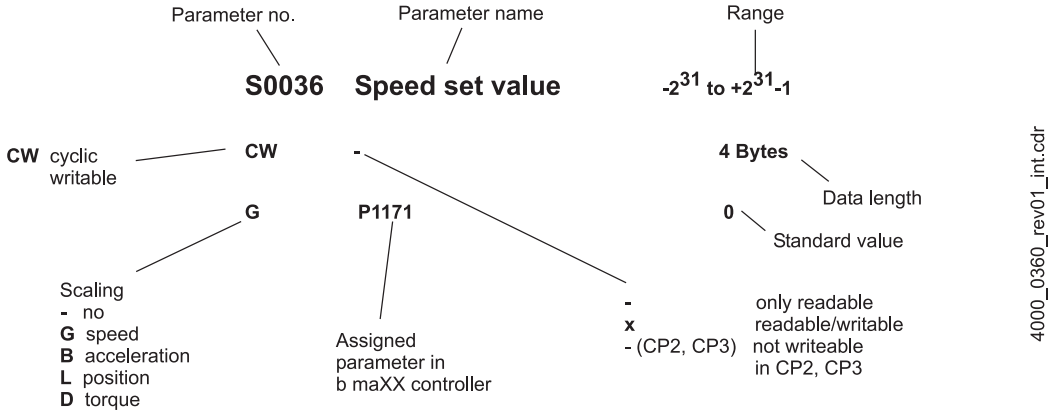


Figure 31: Parameter description scheme

8.2 Standard parameters

S0001

-	**NC-cycle time (T_{Ncyc})**	250 to 65000 µs
-	- (CP3, CP4)	2 bytes
1:1	-	1000 µs

The NC-cycle time defines the cyclic intervals during which the NC makes new set values available. The NC-cycle time must be transferred from the master to the slave during CP2 and becomes active in the slave during CP3. The NC cycle time must an integer multiple of the ▹S0002◃ SERCOS cycle time T_{Scyc}.

Also see ▹Transmission starting times at SERCOS◃ from page 40.

S0002

-	**SERCOS cycle time (T_{Scyc})**	250 to 65000 µs
-	- (CP3, CP4)	2 bytes
1:1	P0532	1000 µs

The cycle time of the interface defines the intervals during which the cyclic data are transferred. The SERCOS cycle time is determined to 62 µs, 125 µs, 250 µs ... , to 65000 µs in steps of 250 µs. The SERCOS cycle time is transferred from the master in the communication phase 2 to the slave and is activated in both of these from communication phase 3 on. ▹S0002◃ specifies the time between two successive MSTs.

At b maXX® minimum time: 1 ms.

Also see ▹Transmission starting times at SERCOS◃ from page 40.

S0003

-	**Transmit reaction time AT ($T_{1\ min}$)**	- to -
-	-	2 bytes
1:1	-	80 µs

Supported only in **BM-O-SER-01**.

Displays the time, which the slave needs, between the receiving end of the MST and the beginning of the transfer of the AT. This time required by the slave is dependent of the accordant telegram type (see ▹Telegram◃ from page 42), which was selected. The time $T_{1\ min}$ is read from the master in the communication phase 2, in order to calculate the sending time AT T_1 (▹S0009◃).

Also see ▹Transmission starting times at SERCOS◃ from page 40.

S0004

-	**Transmit/receive transition time (t_{ATMT})**	- to -
-	-	2 bytes
1:1	-	50 µs

Supported only in **BM-O-SER-01**.

Displays the time, which is required from the slave, to switch over to the receiving of the MDT, after sending its drive telegram. The switch-over time transmit/receive is read from the master in the communication phase 2, in order to calculate transmission time MDT T_2 (▹S0089◃) correctly.

Also see ▹Transmission starting times at SERCOS◃ from page 40.

S0005

Minimum feedback processing time (T_{4min})

-	-	- to -
-	-	2 bytes
1:1	-	10 µs

Supported only in **BM-O-SER-01**.

Minimum required time of the slave between the starting of the actual value processing and of the end of the next MST. This value must be specified from the drive in such a way, that in the next AT the present actual values are transmitted to the control. The master reads this value in the communication phase 2, in order to set the feedback acquisition capture point, T_4 (▹S0007◃) for all drives accordingly.

Also see ▹Transmission starting times at SERCOS◃ from page 40.

S0006

Transmit time drive telegram (T_1)

-	- (CP3, CP4)	T_{1min} to T_{Scyc}
-	-	2 bytes
1:1	-	80 µs

BM-O-SER-01
Determines the sending time, at which the slave after the end of the MST must send its AT during the communication phase 3 and 4. This parameter is transferred in the communication phase 2 from the master to the slave. The transmission time AT must be equal or greater than the transmission reaction time AT ($T_{1\ min}$)(▹S0003◃).
Also see ▹Transmission starting times at SERCOS◃ from page 40.

BM-O-ECT-01
T_1 specifies a time as offset to the EtherCAT synchronization signal, where the drive must provide new actual values.

S0007

Feedback acquisition capture point (T_4)

-	- (CP3, CP4)	0 to T_{Scyc}
-	-	2 bytes
1:1	-	50 µs

From the master specified feedback acquisition capture point after completion of the MST. Therewith the master can specify the same feedback acquisition capture point for all drives, which operate coordinately among one another. Therewith the synchronization of the actual value processing is reached at the drives, which are concerned. The master sets the feedback acquisition capture point smaller or equal to the difference of the SERCOS cycle time (T_{Scyc}) **(**▹S0002◃**)** and of the checked minimum times of actual value processing (T_{4min}) **(**▹S0005◃**)**. From communication phase 3 onwards the drive activates the feedback acquisition capture point.

To be set at b maXX® in the grid of 125 µs.

Also see ▹Transmission starting times at SERCOS◃ from page 40.

S0008

Set value valid time (T_3)

-	- (CP3, CP4)	2 bytes
1:1	-	510 µs

0 to T_{Scyc}

Determines the point of time, after the drive allows access to the new set values (from communication phase 3 onwards). Therewith, the master can specify the same set value validity time for all drives, which operate coordinately among one another. The drive activates the set value validity time form communication phase 3 onwards.

To be set at b maXX® in the grid of 125 µs.

Also see ▹Transmission starting times at SERCOS◃ from page 40.

S0009

Position of data record in MDT

-	- (CP3, CP4)	2 bytes
1:1	-	1

1 to 65534

Supported only in **BM-O-SER-01**.

It determines the position of a data record of the drive in a MDT. It begins with 01_{hex} for the first data byte. Every drive is informed by the master during CP2 of the beginning address of the data record of the MDT. The position of a data record in the MT becomes active during CP3 in the master and slave.

S0010

Length MDT

-	- (CP3, CP4)	2 bytes
-	-	4

4 to 65531

4 ▸ 1 drive 65531 ▸ 254 drives

The length of the MDT expressed in bytes contains the data records of all drives. Each drive is informed from the master in CP2 about the length of the MDT. It becomes active in the master and slave during CP3.

S0011

Class 1 diagnostic

-	-	- to -
-	-	2 bytes
-	-	0

The recognition of fatal errors leads to a best possible shutdown of the drive.

The bit 13 of the SERCOS status word for class 1 diagnostic is set to 1.

The error bit is set to 0 from the drive, if there are no errors of class 1 anymore and the command 'Reset class 1 diagnostic' (▹S0099◃) has been received from the drive via the service channel.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	
|	|	|	|	|	|	|	|	|	|	|	|	|	|	X	Overload switch (▹S0114◃)
|	|	|	|	|	|	|	|	|	|	|	|	|	X		Overtemperature switch (▹S0203◃)
|	|	|	|	|	|	|	|	|	|	|	|	X			Motor overtemperature switch off (▹S0204◃)
|	|	|	|	|	|	|	|	|	|	|	X				Cooling error switch off (▹S0205◃)
|	|	|	|	|	|	|	|	|	|	X					Control voltage error
|	|	|	|	|	|	|	|	|	X						Feedback error
|	|	|	|	|	|	|	|	X							Error in commutation system
|	|	|	|	|	|	|	X								Overcurrent
|	|	|	|	|	|	X									Overvoltage
|	|	|	|	|	X										Undervoltage error
|	|	|	|	X											Phase error in power supply
|	|	|	X													Excessive control deviation (▹S0157◃)
|	|	X														Communication error (▹S0014◃)
|	X															Position limit value is exceeded (switch off) (▹S0049◃, ▹S0050◃)
|	X															Reserved
X																Manufacturer-specific error (▹S0129◃)

Bit = 0 no error
Bit = 1 error

Also see ▹Error handling◃ from page 147.

S0012

Class 2 diagnostic

-	-	- to -
-	-	2 bytes
-	-	0

Shutdown warning, bit for class 2 (bit 12) is set in the SERCOS status word.

If the class 2 diagnostic is read via the service channel the change bit of class 2 diagnostic in the SERCOS status word is reset again.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
|	|	|	|	|	|	|	|	|	|	|	|	|	|	X Overload warning (▹S0310◃)
|	|	|	|	|	|	|	|	|	|	|	|	|	X Ixt warning (▹S0311◃)
|	|	|	|	|	|	|	|	|	|	|	|	X Motor overtemperature warning (▹S0312◃)
|	|	|	|	|	|	|	|	|	|	|	|	X Cooling error warning (▹S0313◃)
|	|	|	|	|	|	|	|	|	|	|	X Reserved		
|	|	|	|	|	|	|	|	|	|	X Reserved			
|	|	|	|	|	|	|	|	|	X Reserved				
|	|	|	|	|	|	|	|	X Reserved					
|	|	|	|	|	|	|	X Reserved						
|	|	|	|	|	|	X Reserved							
|	|	|	|	|	X Reserved								
|	|	|	|	X Reserved									
|	|	|	X Reserved											
|	|	X Reserved												
|	X Reserved														
X Manufacturer-specific warning (▹S0181◃)															

Bit = 0 no warning
Bit = 1 warning is available

See error parameter ▹Error handling◃ from page 147.

S0013

Class 3 diagnostic

-	-	- to -
-	-	2 bytes
-	-	0

Messages of operation statuses. If a status in the drive accordantly changes then also the corresponding bit in the class 3 diagnostic changes and the changing bit for class 3 diagnostic (bit 11) in the SERCOS status word is set to 1.

If the class 3 diagnostic is read via the service channel the change bit of class 3 diagnostic in the Sercos status word is reset again.

See error parameter ▹Error handling◃ from page 147.

									P0360 bit 12	P0350 bit 5	P0350 bit 13			P0390 bit 10 P400 bit 10	P0350 bit 12	assigned b maXX parameter
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Reserved									|	|	|	|	|	|	|	
									|	|	|	|	|	|	X	$n_{actual} = n_{set}$(-▹S0330◃-)
									|	|	|	|	|	|		
									|	|	|	|	|	X		$n_{actual} = 0$ (▹S0331◃)
									|	|	|	|	|	|		
									|	|	|	|	X			$\|n_{actual}\| < \|n_x\|$ (▹S0332◃)
									|	|	|	|	|			
									|	|	|	x				Reserved
									|	|	|	|				
									|	|	X					$\|M_d\| \geq \|Md_{limit}\|$ (▹S0334◃)
									|	|						
									|	X						$\|n_{set} > n_{limit}\|$ (▹S0335◃)
									|							
									X							in position (▹S0336◃)

Bit = 0 no message
Bit = 1 message exists

S0014

Interface status

-	-	- to -
-	-	2 bytes
-	-	0

Supported only in **BM-O-SER-01**.

If a communication error arises the bit 12 in parameter class 1 diagnostic (▹S0011◃) is set. The drive resets the communication error only then if there is no interface error anymore and the command „Reset class 1 diagnostic“ (▹S0099◃) has been received from the drive via the service channel.

The setting of the bits 2 - means no error. If there is no communication error, the interface status contains the current communication phase. If there is a communication error the error and the communication phase are saved.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Reserved					|	|	|	|	|	|	|	|	|	|	
					|	|	|	|	|	|	|	X	X	X	Communication phase
					|	|	|	|	|	|	|				
					|	|	|	|	|	|	X	MST failure			
					|	|	|	|	|	|					
					|	|	|	|	|	X	MDT failure				
					|	|	|	|	|						
					|	|	|	|	X	Invalid communication phase (CP > 4)				
					|	|	|	|							
					|	|	|	X	Error during phase upshift (invalid sequence)						
					|	|	|								
					|	|	X	Error during phase downshift (not to phase 0)						
					|	|									
					|	X	Phase switching without read-for-use message								
					|											
					|	X	Switching to uninitialized operation mode								
					|											
					X	Drive with same drive address in the ring										

Bit = 0 no error
Bit = 1 error is existing

Also see ▹Error handling◃ from page 147.

S0015

Telegram type

-	- (CP3, CP4)	- to -
-	-	2 bytes
		3

In the telegram type parameter it can be selected between standard telegrams and application telegrams.

Also see ▹Telegram◃ from page 42 for supported telegrams.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

|	|	|	|	
|	0	0	0	Standard telegram 0
|	0	0	1	Standard telegram 1
|	0	1	0	Standard telegram 2
|	0	1	1	Standard telegram 3 b maXX®
|	1	0	0	Standard telegram 4 b maXX®
|	1	0	1	Standard telegram 5
|	1	1	0	Standard telegram 6
|	1	1	1	Configured telegram b maXX®
|				(see ▹S0016◃, ▹S0024◃)
|				

0	Position actual value 1 (motor encoder)
1	Position actual value 2 (external encoder)

S0016

Configuration list AT

-	- (CP3, CP4)	- to -
-	-	2 bytes, variable
		*

* Standard value: 0, 20, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0

In case that in the parameter telegram type (▹S0015◃0015) the application telegram is determined via this list the configurable data record in the AT is configured user-specific. Only operation data which are present in the 'IDN list of configurable data in the AT' (▹S0187◃) are allowed as cyclic data.

S0017

IDN list of all operation data

-	-	- to -
-	-	2 bytes, variable
		-

All parameter numbers of the existing operating data in the drive are saved in this IDN list.

S0018

IDN list of all operating data comm. phase 2

-	-	- to -
-	-	2 bytes, variable
		*

* Standard value: 46, 46, S1, S2, S6-S10, S15, S16, S24, S32-S35, S43, S55, S85, S89, S91, S91, S96, S99, S127

All parameter numbers which must be transmitted in communication phase 2 are saved in this IDN list. The processing of this IDN list must have been taken place before switching to communication phase 3.

S0019

IDN list of operation data comm. phase 3

-	-	- to -
-	-	2 bytes, variable
-	-	*

* Standard value: 2, 2, S128

All parameter numbers which must be transmitted in communication phase 3 are saved in this IDN list. The processing of this IDN list must have been taken place before switching to communication phase 4.

S0020

IDN list of all operation mode comm. phase 4

-	-	- to -
-	-	2 bytes, variable
-	-	*

* Standard value: 4, 4, 0, 0

All parameter numbers which can be changed in communication phase 4 are saved in this IDN list.

S0021

IDN list operation data comm. phase 2

-	-	- to -
-	-	2 bytes, variable
-	-	*

* Standard value: 0, 20, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0

Before the drive executes the phase upshift from phase 2 to 3, which is accordant to the command „Transition check phase 2 to 3“ (▹S0127◃) it checks if all communication parameters are complete and correct.

In case the drive recognizes one or several parameter numbers as invalid it writes the still remaining or invalid operating data into this IDN list.

If the command has been correctly executed the IDN list is empty.

S0022

IDN list invalid operation data comm. phase 3

-	-	- to -
-	-	2 bytes, variable
-	-	*

* Standard value: 0, 20, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0

Before the drive executes the phase upshift from phase 3 to 4, which is accordant to the command 'Transition check phase 3 to 4' (▹S0128◃), it checks if all communication parameters are complete and correct.

In case the drive recognizes one or several parameter numbers as invalid it writes the still remaining or invalid operating data into this IDN list.

If the command has been correctly executed the IDN list is empty.

S0023

IDN list invalid operation data comm. phase 4

-	-	- to -
-	-	2 bytes, variable
		*

* Standard value: 0, 20, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0

The parameter numbers in the operation data which has been recognized in communication phase 4 from the drive as invalid is saved in this IDN list.

S0024

Configuration list MDT

-	- (CP3, CP4)	2 bytes, variable
-	-	*

- to -

* Standard value: 0, 20, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0

The configuration list MDT contains the parameter numbers whose operation data will be transmitted cyclically in the MDT in an application telegram. The drive needs to support this list only when it allows the application telegram in its telegram type parameter (▹S0015◃).

Only operation data which are present in the „IDN list of configurable data in the MDT“ (▹S0188◃) are allowed as cyclic data.

S0025

IDN list of all commands

-	-	2 bytes, variable
-	-	*

- to -

* Standard value:
S99, **S**127, **S**128, **S**139, **S**146, **S**148, **S**152, **S**170, **S**171, **S**172, **S**197, **S**262, **S**263, **S**264

All parameter numbers of existing drive commands are saved in this IDN list.

S0026

Configuration list signal-status word

-	- (CP3, CP4)	2 bytes, variable
-	-	*

- to -

* Standard value:

(From SERCOS-version 1.07 onwards and all versions for SoE)

The application list contains all IDNs, which are part of the message status word (see ▹S0144◃). The correct order of IDNs in the application list is determined by the bit numbering diagram in the message status word. The first IDN of the application list defines bit 0. The last IDN defines bit 15 of the message status word.If S0328 is not supported (like the case here), bit 0 of the IDN is automatically configured.

S0027

Configuration list signal control word

-	- (CP3, CP4)	2 bytes, variable
-	-	*

- to -

* Standard value:

(From SERCOS-version 1.07 onwards and all versions for SoE)

The application list contains all IDNs, which are part of the signal control word (see ▹S0145◃). The correct order of IDNs in the application list is determined by the bit numbering diagram in the signal control word. The first IDN of the application list defines bit 0. The last IDN defines bit 15 of the signal control word.If S0329 is not supported (like the case here), bit 0 of the IDN is automatically configured.

S0028

-	**MST error counter**	0 to 65535
-	-	2 bytes
1:1	-	0

BM-O-SER-01
The parameter counts all invalid MSTs in the communication phase 3 and 4 (also see ▹Error handling◃ from page 147). In cases where more than two consecutive MSTs are invalid, the invalid MSTs over two are not counted. The error counter counts to a maximum of 2^{16}-1. That means that if a value of 65535 is set in the counter, there may have been a noisy transmission over a long period of time.

BM-O-ECT-01
The parameter signals at the EtherCAT option module the failure of set value telegrams.

S0029

-	**MDT error counter**	0 to 65535
-	-	2 bytes
1:1	-	0

The MDT error counter counts all invalid MDTs in communication phase 4 (also see ▹Error handling◃ from page 147). In cases where more than two consecutive MDTs are invalid, the invalid MDTs over two are not counted. The error counter counts to a maximum of 2^{16}-1. This means that if a value of 65535 is set in the counter, there may have been a noisy transmission over a long period of time.

S0030

-	**Manufacturer version**	- to -
	-	2 bytes
	-	*

From this parameter the current version is able to be read out as text, in this case „b maXX SER-01-00-00 V1.10“

S0032

-	**Primary operation mode**	- to -
-	- (CP4)	2 bytes
1:1	-	2

The operation mode determined in this parameter is activated in the drive, if in the control word of the MDT the primary operation mode has been selected.

Also see ▹Operating mode parameters◃ on page 49.

S0033

-	**Secondary operation mode 1**	- to -
-	- (CP4)	2 bytes
1:1	-	2

The operating mode determined in this parameter is activated in the drive if in the control word of the MDT the secondary operation mode 1 has been selected.

Bit 3 only has a meaning at position control.

Also see ▹Operating mode parameters◃ on page 49.

S0034

	Secondary operation mode 2	- to -
-	- (CP4)	2 bytes
1:1	-	2

The operating mode determined in this parameter is activated in the drive if in the control word of the MDT the secondary operation mode 2 has been selected.

Bit 3 only has a meaning at position control.

Also see ▹Operating mode parameters◃ on page 49.

S0035

	Secondary operation mode 3	- to -
-	- (CP4)	2 bytes
1:1	-	2

The operating mode determined in this parameter is activated in the drive if in the control word of the MDT the secondary operation mode 3 has been selected.

Bit 3 only has a meaning at position control.

Also see ▹Operating mode parameters◃ on page 49.

S0036

	Speed set value	-2^{31} to $+2^{31}-1$
CW	x	4 bytes
G	P1171 / P1179	0

In speed control this speed set value together with the „speed set value additive (▹S0037◃)“ generates an effective speed set value of the drive.

In position control operation types this parameter shows the output size of the position control.

Scaling must be considered
(also see scaling ▹Velocity data◃ from page 32).

From SoE version 2.00 is, dependent on the setting in the ramp function generator mode P1170 bit 8, the 16-bit or the 32-bit ramp function generator used.

S0037

	Speed set value additive	-2^{31} to $+2^{31}-1$
CW	x	4 bytes
G	P1040	0

In speed control this speed set value is added to the ’speed set value (▹S0036◃)’.

Scaling must be considered
(also see scaling ▹Velocity data◃ from page 32).

S0038

-	**Speed limit value positive**	0 to $+2^{31}$-1
-	x	4 bytes
G	P1041	0

The speed limit value positive describes the maximum permissible speed in positive direction. If the speed limit value was exceeded, the drive responds by setting the status „$n_{set} > n_{limit}$“ in class 3 diagnostic (▹S0013◃).

Scaling must be considered
(also see scaling ▹Velocity data◃ from page 32).

S0039

-	**Speed limit value negative**	-2^{31} to 0
-	x	4 bytes
G	P1042	0

The speed limit value positive describes the maximum permissible speed in positive direction. If the speed limit value is exceeded, the drive responds by setting the message $n_{set} > n_{limit}$ in class 3 diagnostic (▹S0013◃).

Scaling must be considered
(also see scaling ▹Velocity data◃ from page 32).

S0040

-	**Speed actual value**	-2^{31} to $+2^{31}$-1
-	-	4 bytes
G	P0353	0

The speed actual value is transmitted from the drive to the control in order to allow speed display if necessary.

Scaling must be considered
(also see scaling ▹Velocity data◃ from page 32).

S0041

CW	**Homing speed**	-2^{31} to $+2^{31}$-1
-	x	4 bytes
G	P1201	0

Homing speed is necessary in the drive, if the command ’Drive controlled homing’ is active. The drive independently executes homing.

Scaling must be considered
(also see scaling ▹Velocity data◃ from page 32).

S0042

CW	**Homing acceleration**	0 to $+2^{31}$ -1
-	x	4 bytes
B	P1203	0

Homing acceleration is necessary in the drive, if the command ’Drive controlled homing’ is active. The drive independently executes homing.

Scaling must be considered
(also see scaling ▹Acceleration data◃ from page 34).

S0043

	Speed polarities	- to -
-	- (CP4)	2 bytes
-	-	0

In this parameter the polarities of the specified speed data can be accordant to the application switched over. The polarities are not switched over within, but outside of a controlled system (at input and output). At positive speed set value difference and at not-inverted polarity, there is clockwise rotation facing the motor shaft.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

Bit 2:
- 0 Speed set value non-inverted
- 1 Speed set value polarity inverted

Bit 1:
- 0 Speed set value additive non-inverted
- 1 Speed set value additive polarity inverted

Bit 0:
- 0 Speed actual value non-inverted
- 1 Speed actual value polarity inverted

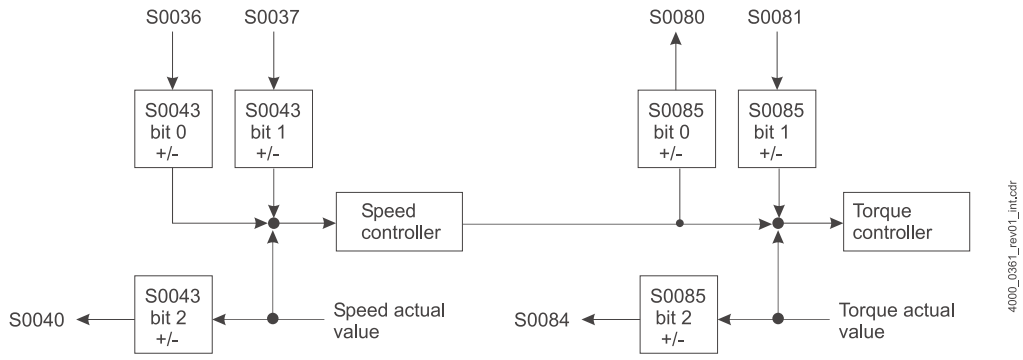


Figure 32: Speed polarities

S0044

Scaling method for speed data

-	- (CP4)	2 bytes
-	-	A_{hex}

- to -

With these parameters the method of scaling for speed data is selected. It is defined, which format master and drive have to use for data exchange.

See scaling ▹Velocity data◃ from page 32.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

				0	0	0	Incremental scaling
				0	1	0	Rotary scaling
			0	Preferred scaling			
			1	Parameter scaling			
		0	At rotary scaling: revolutions				
		1	At rotary scaling: reserved				
	0	Time unit minutes					
	1	Time unit seconds					
0	Data referring to motor shaft						
1	Data referring to load						

S0045

Scaling factor for speed data

-	- (CP4)	2 bytes
-	-	1

1 to $+2^{16}-1$

With this parameter the scaling factor for speed data is determined.

In case of preferred scaling the parameter is set to 1.

See scaling ▹Velocity data◃ from page 32.

S0046

	Scaling exponent speed data	-9 to 3
-	- (CP4)	2 bytes
-	-	-4

With this parameter the scaling exponent for speed data is determined.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	
|	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Exponent
|																

0 Signs of exponent positive

1 Signs of exponent negative

See scaling ▹Velocity data◃ from page 32.

S0047

	Position set value	-2^{31} to $+2^{31}$ -1
CW	x	4 bytes
L	P0370	0

In position control this is the set value for the drive.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0048

	Position set value additive	-2^{31} to $+2^{31}$ -1
CW	x	4 bytes
L	-	0

This parameter is used if an additional position offset at position control in the drive is necessary. The position set value additive is added to the position set value (▹S0047◃).

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0049

	Positive position limit value	-2^{31} to $+2^{31}$ -1
-	x	4 Bytes
L	P1196	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

The positive position limit value specifies the maximum admitted path in the positive direction. The positive position limit value is only active, if all position data of the machine are based on a zero point. The parameter position polarities (▹S0055◃) can deactivate the position limit values. If the positive position limit value is exceeded, the drive sets the error bit in C1D (▹S0011◃).

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0050

	Negative position limit value	-2^{31} to $+2^{31}$ -1
-	x	4 Bytes
L	P1197	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

The negative position limit value describes the maximum allowed distance in the negative direction. The negative position limit value is only enabled when all position data are based on the machine zero point. Position polarity parameter (▹S0055◃) can be used to disable the position limit values. When the negative position limit value is exceeded, the drive sets an error bit in C1D (▹S0011◃).

S0051

	Position actual value 1 (motor encoder)	-2^{31} to $+2^{31}$ -1
-	-	4 bytes
L	P0391, P0392	0

This parameter provides the position actual value. Scaling must be considered.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0052

	Reference distance 1	-2^{31} to $+2^{31}$ -1
-	x	4 bytes
L	P1200	0

This parameter describes the distance between the machine zero point and the reference point related to the motor measuring system. After homing the position actual value 1 is calculated from the

- Reference distance 1 (▹S0052◃)
- Reference offset 1 (▹S0150◃)
- Marker position A/B (▹S0173◃, ▹S0174◃)

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0053

	Position actual value 2 (external encoder)	-2^{31} to $+2^{31}$ -1
-	-	4 bytes
L	P0401, P0402	0

This parameter provides the position actual value of the optional encoder.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0054

-	**Reference distance 2**	-2^{31} to $+2^{31}$ -1
-	x	4 bytes
L	P1200	0

This parameter describes the distance between the machine zero point and the reference point related to the motor feedback. After homing the position actual value 2 is calculated from the

- Reference distance 2 (▹S0054◃)
- Reference offset 2 (▹S0151◃)
- Marker position A/B (▹S0173◃, ▹S0174◃)

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0055

-	**Position polarities**	- to -
-	- (CP4)	2 bytes
-	-	0

With this parameter the polarities of the specified position data can be inverted.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

- Bit 0: 0 = Position set value non-inverted; 1 = Position set value polarity inverted
- Bit 1: 0 = Position set value additive non-inverted; 1 = Position set value additive polarity inverted
- Bit 2: 0 = Position actual value 1 non-inverted; 1 = Position actual value 1 polarity inverted
- Bit 3: 0 = Position actual value 2 non-inverted; 1 = Position actual value 2 polarity inverted

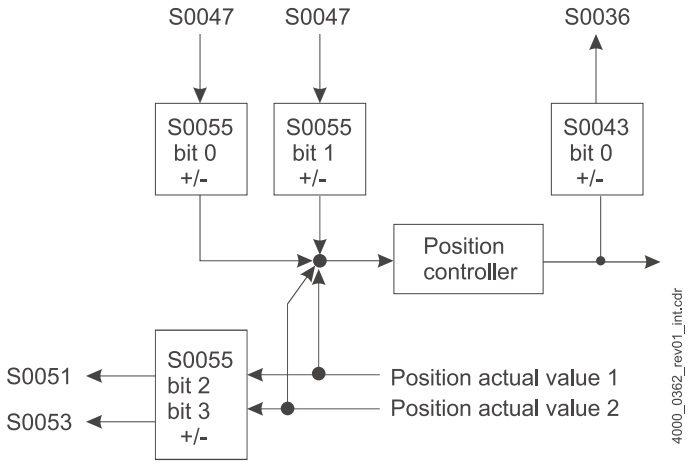


Figure 33: Position polarities

S0057

	Position window	0 to $+2^{31}$ -1
-	x	4 bytes
L	P1194	0

When the difference between the accumulated position set value and the position actual value is is smaller than the position window, then the drive sets the status 'In position' (▹S0336◃). In case of requirement the status 'In position' is allocated to a real-time status bit (▹S0305◃) and is transmitted in the drive status for further processing to the control.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0058

	Reversal clearance	0 to $+2^{31}$ -1
-	x	4 bytes
L	P1194	0

The reversal clearance describes the amount of backlash between motor and load during reversal, relative to the position data.

S0076

Method of scaling for position data

-	- (CP4)	2 bytes
-	-	A_{hex}

- to -

With this parameter the method of scaling for position data is selected. It is defined, which format master and drive have to use for data exchange.

See scaling ▹Position data◃ from page 29.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

- 0 0 0 Incremental scaling
- 0 0 1 Translatory scaling
- 0 1 0 Rotary scaling
- 0 Preferred scaling
- 1 Parameter scaling
- 0 At rotary scaling: angle degree
- 1 At rotary scaling: reserved
- X reserved
- 0 Data referring to motor shaft
- 1 Data referring to load
- 0 Absolute format
- 1 Modulo format

S0077

Scaling factor translatory position data

-	- (CP4)	2 bytes
-	-	1

1 to $+2^{31}-1$

(From SERCOS-version 1.07 onwards and all versions for SoE)

In this parameter the scaling factor for all position data in this drive is determined.

See scaling ▹Position data◃ from page 29.

S0078

	Scaling exponent translatory position data	-9 to +3
-	- (CP4)	2 bytes
-	-	-7

(From SERCOS-version 1.07 onwards and all versions for SoE)

In this parameter the scaling exponent for all position data in this drive is determined.

See scaling ▹Position data◃ from page 29.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	
|	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Exponent
|																

0 Signs of exponent positive

1 Signs of exponent negative

S0079

	Rotational position resolution	1 to $+2^{31}-1$
-	- (CP4)	4 bytes
-	-	$36*10^5$

This parameter contains the value of rotational position resolution and determines the LSB value of the rational scaling. If preferred scaling has been selected the value 3600000. This means a LSB value of 0.0001 degrees.

S0080

	Torque set value	-2^{15} to $+2^{15}-1$
CW	x	2 bytes
D	P0331	0

In operation mode torque control this torque set value together with the torque set value additive generates (▹S0081◃S0081) the effective torque set value of the drive.

Scaling must be considered
(also see scaling ▹Torque data◃ from page 36).

S0081

	Torque set value additive	-2^{15} to $+2^{15}-1$
CW	x	2 bytes
D	P1022	0

In torque control this set value is added to torque set value (▹S0080◃).

Scaling must be considered
(also see scaling ▹Torque data◃ from page 36).

S0082

	Torque limit value positive	0 to $+2^{15}$ -1
CW	x	2 bytes
D	P3309	$7FFF_{hex}$

The positive torque limit value describes the maximum permissible torque in positive direction. If the torque limit value is exceeded the drive puts the status „M_d >M_{dLimit}“ into class 3 diagnostic (▹S0013◃).

Scaling must be considered
(also see scaling ▹Torque data◃ from page 36).

S0083

	Torque limit value negative	-2^{15} to 0
CW	x	2 bytes
D	P3310	4096_{hex}

Torque limit value negative describes the maximum permissible torque in negative direction. If the torque limit value is exceeded the drive puts the status „M_d >M_{dLimit}“ into class 3 diagnostic (▹S0013◃).

Scaling must be considered
(also see scaling ▹Torque data◃ from page 36).

S0084

	Torque actual value	- to -
-	-	2 bytes
D	P0344	0

The torque actual value is transmitted from the drive to the control in order to allow a torque display in the control if necessary.

Scaling must be considered
(also see scaling ▹Torque data◃ from page 36).

S0085

	Torque polarities	- to -
-	- (CP4)	2 bytes
-	-	0

With this parameter the polarities of the specified torque data can be inverted.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

0		Torque set value Non-inverted
1		Torque set value Polarity inverted
	0	Torque set value additive Non-inverted
	1	Torque set value additive Polarity inverted
0		Torque actual value Non-inverted
1		Torque actual value Polarity inverted

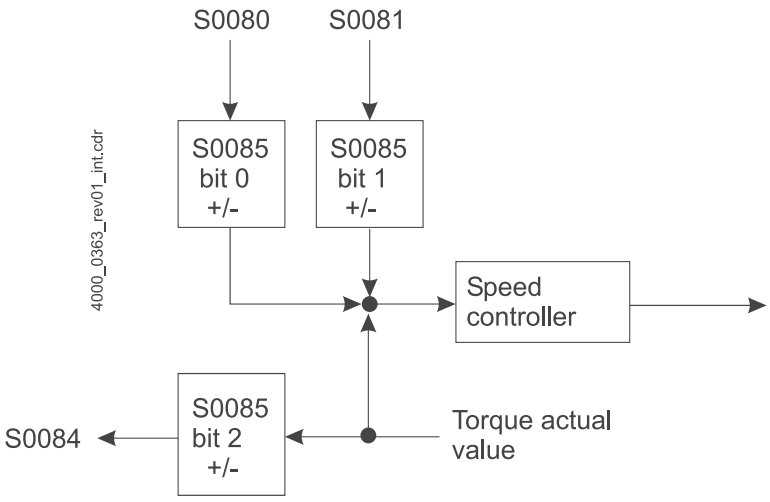


Figure 34: Torque polarities

S0086

Scaling method for torque data

- to -
- (CP4)
2 bytes
-
A_{hex}

By means of the scaling method the different scaling methods can be set, also see ▹Scaling◃ from page 29.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

							Scaling method
				0	0	0	Procental scaling
				0	0	1	Translatory scaling (force)
				0	1	0	Rotatory scaling (torque)

			0 Preferred scaling
			1 Parameter scaling

		0 Unit at force (Newton N)
		0 Unit at torque (Newtonmeter Nm)
		1 Reserved

	X Reserved

0 Data reference at the motor shaft

1 Data reference at the load

S0087

Transmit to transmit recovery time (t_{ATAT})

- to -
-
2 bytes
-
0

Supported only in **BM-O-SER-01**.

The time required between two ATs when sent by the same slave. This parameter is not used for slaves with a single drive. It is implemented in the BM-O-SER-01 only for compatibility reasons. Also see ▹Transmission starting times at SERCOS◃ from page 40.

S0088

Receive to receive recovery time (T_{MTSY})

- to -
-
2 bytes
-
80

Supported only in **BM-O-SER-01**.

The time which the slave requires between the receiving of a MDT and the readiness for receiving a MST. The master reads this this time in communication phase 2 in order to ensure that the time between end of the MDT and the beginning of the MST is sufficiently. Also see ▹Transmission starting times at SERCOS◃ from page 40.

S0089

-	**MDT transmission starting time (T_2)**	0 to T_{scyc}
-	- (CP3, CP4)	2 bytes
1:1	-	0

BM-O-SER-01
MDT transmission starting time after ending of MST in communication phase 3 and 4. This parameter is transmitted in communication phase 2 from the master to the slave and is activated from communication phase 3 onwards. Also see ▹Transmission starting times at SERCOS◃ from page 40.

BM-O-ECT-01
T_2 specifies a point of time as offset to the EtherCAT synchronization signal, at which new set values shall be taken over by the drive.

S0090

-	**Proceeding time set values (T_{MTSG})**	- to -
-	-	2 bytes
1:1	-	80

The time required in order to make set values available for a drive after receipt of a MDT. This time is read by the master in communication phase 2 in order to correctly calculate the set value valid time T_3 (▹S0008◃). The parameter proceeding time set values is dependent on the telegram type. Also see ▹Transmission starting times at SERCOS◃ from page 40.

S0091

CW	**Bipolar speed limit value**	0 to 2^{31} -1
G	x	4 bytes
	P1042, P1041	0

This parameter describes the maximum allowable speed in both directions. If the speed limit value is exceeded, the drive responds by setting the status $n_{set} > n_{limit}$ in class 3 diagnostic (▹S0013◃).

Scaling must be considered
(also see scaling ▹Velocity data◃ from page 32).

S0092

CW	**Bipolar torque limit value**	0 to 2000
D	x	2 bytes
	P0357	0

This parameter limits the maximum torque in both directions.

If the torque limit value is exceeded, the drive sets the status $M_d \geq Md_{limit}$ in the class 3 diagnostic (▹S0013◃).

Scaling must be considered
(also see scaling ▹Torque data◃ from page 36).

S0093

-	**Scaling factor torque data**	1 to $+2^{16}$-1
-	- (CP4)	2 bytes
-	-	1

In this parameter the scaling factor for all torque data in this drive is determined.

See scaling ▹Torque data◃ from page 36.

S0094

	Scaling exponent torque data	-9 to +3
-	- (CP4)	2 bytes
-	-	-2

In this parameter the scaling exponent for all position data in this drive is determined.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	
|	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Exponent
|																

0 Signs of exponent positive

1 Signs of exponent negative

See scaling ▹Torque data◃ from page 36.

S0095

	Diagnostic message	- to -
-	-	1 byte, variable
-	-	0

This parameter shows the current operation status of the drive in accordance with b maXX®- controller status machine as text message (also see parameter manual b maXX®). Therewith the b maXX® controller status word is evaluated.

S0096

	Slave arrangement (SLKN)	- to -
-	-	2 bytes
-	-	0 *

* dependent on the settings of the rotary switch

This parameter shows the slave arrangement in the ring, existing of the intrinsic drive address and the next possible address.

High byte: Intrinsic address	Low byte: Several slaves: Next address Only one slave: Intrinsic address

S0097

Mask class 2 diagnostic - to -
- x 2 bytes
- - 0

Using this mask, warnings in class 2 diagnostic can be masked with respect to their effect on the change bit in drive status. When changing masked warnings the change bit in the drive status is not set. The mask does not effect the operation data of class 2 diagnostic (▹S0012◃).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

0 Warning masked

1 Warning not masked

S0098

Mask class 3 diagnostic - to -
- x 2 bytes
- - 0

Using this mask, condition flags in class 3 diagnostic can be masked with respect to their effect on the change bit in drive status. When changing masked warnings the change bit in the drive status is not set. The mask does not effect the operation data of class 3 diagnostic (▹S0013◃).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

0 Warning masked

1 Warning not masked

S0099

Reset class 1 diagnostic - to -
- x 2 bytes
- - 0

If this command has been received from the drive and there are no errors existent anymore all error bits of class 1 diagnostic and of manufacturer class 1 diagnostic interface status are reset.

Also see ▹Error reset◃ on page 151.

S0100

Speed controller proportional gain 0 to $0FFFF_{hex}$
- x 2 bytes
- P1032 1

Defines the P-gain of the speed controller in the b maXX® controller.

S0101

	Speed controller integral action time	0 to 20000_{hex}
-	x	2 bytes
10:1	P1033	1000

Defines integral action time of the speed controller in the b maXX® controller.

Example scaling:
105 (SERCOS) ⇒ 10.5 (b maXX® controller)

S0103

	Modulo value	1 to $+2^{31}$ -1
-	- (CP4)	4 bytes
L	-	$36*10^5$

If it has been ▹S0076◃ selected in the modulo format, this parameter determines, if the position data are 0. The parameter defines multiples of whole rotations.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0104

	Position controller Kv factor	0 to $0FFFF_{hex}$
-	x	2 bytes
100:1	P1051	1000

Defines the gain of the position controller in the b maXX® controller.

Example scaling:
1050 (SERCOS) ⇒ 10.50 (b maXX® controller)

S0106

	Current controller proportional gain 1	1 to $0FFFF_{hex}$
-	x	2 bytes
1:1	P1020	1000

This parameter has influence on the current controller.

S0107

	Current controller integral action time 1	0 to $0FFFF_{hex}$
-	x	2 bytes
1:1	P1021	1000

This parameter has influence on the current controller.

S0108

	Feedrate override	0 to $0FFFF_{hex}$
CW	-	2 bytes
100:1	P1219	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

The ’Feedrate override’ is activated only with drive controlled procedure commands. In such a case the speed set values are calculated by the drive internally. The ’Feedrate override’ has multiplying effects on the speed set values.

S0109

-	**Motor peak current**	0 to 2^{32}-1
-	- (CP4)	4 bytes
1000:1	P0069	0

If the motor peak current is less than that of the amplifier, the amplifier is automatically limited to the level of the motor peak current.

Example scaling:
1500 (SERCOS) ⇒ 1.500 (b maXX® controller)

S0110

-	**Amplifier peak current**	0 to 2^{32}-1
-	-	4 bytes
1000:1	P0011, P0013	0

The amplifier peak current is limited by the hardware, which means that the current for the maximum attainable torque limit value is fixed as well.

Example scaling:
1500 (SERCOS) ⇒ 1.500 (b maXX® controller)

S0112

-	**Nominal current amplifier**	0 to 2^{32}-1
-	-	4 bytes
1000:1	P0010, P0012	0

The nominal current of the amplifier is equal to the allowable continuous current of the drive unit.

Example scaling:
1500 (SERCOS) ⇒ 1.500 (b maXX® controller)

S0113

-	**Maximum motor speed**	0 to 2^{31}-1
-	- (CP4)	4 bytes
$1*10^4$:1	P1031	$3*10^7$

This parameter contains the maximum motor speed according to data sheet.

Example scaling:
15000 (SERCOS) ⇒ 15.000 (b maXX® controller)

S0114

-	**Load limit of the motor**	0 to 25395
-	-	2 bytes
-	P0092	0

If the I2t-value is exceeded, the drive sets the overload warning bit in class 2 diagnostic (▹S0310◃). After a time period specified by the manufacturer, the overload shutdown is set in class 1 diagnostic (▹S0011◃).

S0121

	Input speed gear	1 to 2^{32}-1
-	(CP4)	4 bytes
-	-	1

(From SERCOS-version 1.07 onwards and all versions for SoE)

The input speed must be entered as integer.

S0122

	Output speed gear	1 to 2^{32}-1
-	(CP4)	4 bytes
-	-	1

(From SERCOS-version 1.07 onwards and all versions for SoE)

The output speed must be entered as integer.

S0123

	Feed constant	1 to 2^{32}-1
-	(CP4)	4 bytes
-	-	10000

(From SERCOS-version 1.9 onwards and all versions for SoE)

The feed constant describes the machine element which converts a rotatory motion into a translatory motion. The feed constant indicates the translatory distance during one revolution of the machine element.

S0124

	Standstill window	0 to 2^{31}-1
-	x	4 bytes
G	P1073, P1083	0

The standstill window describes the amount of the deviation of the speed from 0. If the speed actual value is within the standstill window, the drive sets the status $n_{actual} = 0$ (▹S0331◃).

Scaling must be considered
(also see scaling ▹Velocity data◃ from page 32).

S0125

	Speed threshold n_x	0 to 2^{31}-1
-	x	4 bytes
G	P1074, P1084	0

If the speed actual value n_X exceeds the speed threshold n_{actual} the drive sets status $n_{actual} < n_x$ (▹S0332◃) into class 3 diagnostic (▹S0013◃).

Scaling must be considered
(also see scaling ▹Velocity data◃ from page 32).

S0127

	CP3 transition check	- to -
-	- (CP3, CP4)	2 bytes
-	-	0

Supported only in **BM-O-SER-01**.

The master uses this procedure command to instruct the slave to check that all necessary parameters have been transferred for CP3. The command has been performed correctly if the drive is ready to observe the specification of DP3 in the MST and to adhere to the telegram structure. In case checking is negative, the command ends with an error (see ▹S0021◃). After correct execution of the command the control must reset the command. After that the control can specify CP3 in the MST.

S0128

	CP4 transition check	- to -
-	- (CP2, CP3, CP4)	2 bytes
-	-	0

Supported only in **BM-O-SER-01**.

The master uses this procedure command to instruct the slave to check that all necessary parameters have been transferred for CP4. The command has been performed correctly if the drive is ready to observe the specification of DP4 in the MST and to adhere to the telegram structure. In case checking is negative the command ends with an error (see ▹S0022◃). After correct execution of the command the control must reset the command. The control unit can then activate CP4 in the MST.

S0129

	Manufacturer class 1 diagnostic	- to -
-	-	2 bytes
-	-	0

This parameter contains the b maXX® controller error code (see parameter manual b maXX® and the parameters manufacturer class ▹Page 76◃). In ▹S0129◃ only the chronologically first error code of the controller is shown.

S0130

	Probe value 1 positive edge	-2^{31} to $+2^{31}$ -1
-	-	4 bytes
L	P0581, P0582	0

The probe values of the positive edge of the probe cycle are written to this parameter.

Also see command ▹Probe◃ from page 63.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0131

-	**Probe value 1 negative**	-2^{31} to $+2^{31}$ -1
-	-	4 bytes
L	P0582, P0583	0

The probe values of the negative edge of the probe cycle are written to this parameter.

Also see command ▹Probe◃ from page 63.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0132

-	**Probe value 2 positive edge**	-2^{31} to $+2^{31}$ -1
-	-	4 bytes
L	P0585, P0586	0

The probe values of the positive edge of the probe cycle are written to this parameter.

Also see command ▹Probe◃ from page 63.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0133

-	**Probe value 2 negative**	-2^{31} to $+2^{31}$ -1
-	-	4 bytes
L	P0587, P0588	0

The probe values of the negative edge of the probe cycle are written to this parameter.

Also see command ▹Probe◃ from page 63.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0134

-	**Master control word**	- to -
-	-	2 bytes
-	-	0

Therewith it is possible to show the master control word via the service channel on the monitor of the control (useful help at commissioning and troubleshooting).

S0135

-	**Drive status**	- to -
-	-	2 bytes
-	-	0

Therewith it is possible to show the drive status via the service channel on the monitor of the control (useful help at commissioning and troubleshooting).

S0139

Parking axis command

	- (CP2, CP3)	-to - 2 bytes
-	-	0

(from SERCOS version 1.08 and 1.02 for SoE onwards)

If the command parking axis is set and is enabled, the monitoring of the actual value processing is switched off. This concerns the position control, the encoder monitoring (feedback hardware) and the monitoring of the positioning window(▹S0057◃). If the command is activated, the drive does not generate a C1D error ▹S0011◃). The status of the position actual values (▹S0403◃) is reset by the drive.

The command is positively accepted, if the monitoring was switched off (as mentioned above). If the command is reset, all mentioned monitorings are switched on again. In order to synchronize the home position again, the control must execute homing.

S0140

Controller type

-	-	- to - 1 byte, variable
-	-	-

The operation data of the controller type contains the company's name and the controller type of the manufacturer, in this case 'Baumueller b maXX'.

S0141

Motor type

-	- x	- to - 1 byte, variable
-	- P0050	-

The operation data of the motor type contains the company's name and the motor type of the manufacturer in this case 'Baumueller ...'.

S0142

Application type

-	-	- to - 1 byte, variable
-	-	-

The operation data contains the name of the module, in this case 'Baumueller SERCOS slave'.

S0143

SERCOS interface version

-	-	- to - 1 byte, variable
-	-	-

SERCOS interface version which is supported by the slave 'V01.02'.

S0144

	Status word message	- to -
-	-	2 bytes, variable
-	-	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

Messages can be transmitted in real-time from the drive to the control via the message status word. For these purposes the message status word must be inserted in the AT as cyclical data.The bits in the message status word are defined via the configuration list of the message status word (▹S0026◃).

S0145

	Message control word	- to -
CW	x	2 bytes, variable
-	-	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

Messages can be transmitted in real-time from the drive to the control via the signal control word. For this purpose the signal control word must be inserted in the MDT as cyclical data.The bits in the signal control word (▹S0027◃)are defined via the configuration list of the signal control word.

S0146

	Command NC controlled homing	- to -
-	- (CP2, CP3)	2 bytes
-	-	0

If the command NC-controlled homing is set and enabled by the master the drive must react to the programmed or allocated signals (▹S0407◃homing enable ▹S0400◃, reference switch, reference marker of the encoder system).

When it reaches the appropriate marker pulse of the encoder system the drive saves the momentary position actual value of the according marker position (▹S0173◃, ▹S0174◃).Furthermore the drive sets the bit 'reference marker latched' (▹S0408◃) and acknowledges the command as performed correctly.

When an error of C1D occurs, the command results in an error.

Also see command ▹Homing◃ from page 57.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved														|	|

|	0	Reset command in drive
|	1	Set command in drive
|		
0		Interrupt command execution
1		Execute command execution

S0147

Homing parameter

-	x	2 bytes
-	-	0

- to -

This parameter determines the requirements for drive-controlled homing.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

0 Positive: motor shaft turns clockwise

1 Negative: motor shaft turns counter-clockwise

0 First marker pulse after the positive edge of the reference switch (**S0400**)

1 First marker pulse after the negative edge of the reference switch (**S0400**)

0 Reference switch (**S0400**) is connected to control

1 Reference switch (**S0400**) is connected to control

0 Homing with motor encoder

1 Homing with external encoder

X NC-controlled homing

0 Reference switch is evaluated

1 Reference switch is not evaluated

0 Reference marker is evaluated

1 Reference marker is not evaluated

Also see command ▹Homing◃ from page 57.

S0148

	Command drive-controlled homing	- to -
-	- (CP2, CP3)	2 bytes
-	-	0

When the master sets and enables the drive controlled homing procedure command, the drive automatically activates the drive internal position control and accelerates to the homing speed (▹S0042◃) taking the homing speed (▹S0041◃) into account). The drive resets the bit 'status position actual values' (▹S0403◃). Further options for the homing procedure are programmed in the homing parameter (▹S0147◃). All changes of the cyclic set values are ignored as long as the command is active.

After passing over the reference marker, the drive decelerates to standstill. The command drive-controlled homing is successfully completed when the drive has stopped and the position actual value is referred to the reference point of the machine. The drive shows this by setting the bit 'position actual values status' (▹S0403◃).

The drive internally calculates position set value (▹S0047◃) relationship to the position encoder reference marker. The control reads the position set value via the service channel and sets its position set value system to this position set value. After that the control deletes the command and the drive follows the set values of the control.

An interruption of this command effectuates that the position actual value is not being referenced to the reference marker. The bit „Status position actual values“ is not set. When an error of C1D occurs, the command results in an error.

Also see command ▹Homing◃ from page 57.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

1 | 0 = Reset command in drive
1 | 1 = Set command in drive
0 = Interrupt command execution
1 = Execute command execution

S0150

	Reference offset 1	-2^{31} to $+2^{31}-1$
-	x	4 bytes
L	-	0

This parameter describes the distance between the reference marker of position encoder 1 and the reference point.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0151

	Reference offset 2	-2^{31} to $+2^{31}$ -1
-	x	4 bytes
L	-	0

This parameter describes the distance between the reference marker of position encoder 2 and the reference point.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0152

	Spindle positioning command	- to -
	(CP2, CP3)	2 bytes
-	-	0

(From SERCOS version 1.08 and 1.02 for SoE onwards)

Also see ▹Command Spindle positioning◃ from page 65.

This command switches the drive to the internal position control with spindle positioning speed (▹S0222◃) and, if necessary, references the spindle. If the command is activated, all changes of the cyclical set value are ignored.

Dependent of spindle positioning parameter (▹S0154◃) the drive positions the spindle with spindle positioning speed (▹S0222◃) absolutely to the position, which was set (▹S0153◃) or turns the spindle relatively (increments) (▹S0180◃). If the drive controller reaches the selected set value, the drive sets the status „Target position reached“ (▹S0342◃). The status „In position“ (▹S0336◃) is updated by the drive.

While the command is active, the drive rotates towards position control and follows each new set value (▹S0153◃ or ▹S0180◃), which is transmitted via the service channel. If the controller withdraws the command, the drive switches into the operating mode, which was set in the control word, again.

S0153

	Spindle angle position	-2^{31} bis $2^{31}-1$
-	x	4 bytes
L	P1426	0

(From SERCOS version 1.08 and 1.02 for SoE onwards)

Also see ▹Command Spindle positioning◃ from page 65.

This parameter shows the absolute spindle angle position relative to home position. The parameter is only active in connection with the command spindle positioning (▹S0152◃).

Scaling must be considered unconditionally
(also see scaling ▹Position data◃ from page 29).

S0154

	Spindle positioning parameter	- to -
-	x	2 bytes
L	-	0

(From SERCOS version 1.08 and 1.02 for SoE onwards)

Also see ▹Command Spindle positioning◃ from page 65.

If the speed set value is equal to 0 and the command spindle positioning is activated, the speed direction can be selected here in order to reach the target angle. If speed set value is not equal 0 ist, the speed direction is is retained, in order to reach the target angle.

When the speed set value is equal to zero and the position spindle procedure command is active, the turning direction for reaching the spindle angle position can be given here. If the speed set value is not equal to zero, the current turning direction is maintained in order to reach the spindle angle position.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

- 0 0 Speed direction clockwise
- 0 1 Speed direction counterclockwise
- 1 0 Shortest path
- 1 1 Previous active speed direction

- 0 Spindle target angle ▹S0153◃
- 1 Spindle relative offset ▹S0180◃

- 0 Motor control
- 1 External guide

0 Homing is activated once by a spindle, which was not referenced.At each further start of command spindle positioning the spindle is positioned to the target angle ▹S0153◃.

1 At each starting of spindle positioning homing is executed (with reference switch or encoder reference).Then the spindle is positioned on the target angle.

S0155

	Friction torque compensation	0 to 2^{15} -1
-	x	2 bytes
D	P3384	0

(From SERCOS version 1.08 and 1.02 for SoE onwards)

The friction torque compensation is overlaid additively to the torque command value. During addition, the friction torque compensation and torque command value need to have the same sign. The inclusion of friction torque compensation helps compensate for the frictional grip during acceleration from standstill, and during reversals.

S0157

	Speed window	0 to +2^{31} -1
CW	x	4 bytes
G	P1043	0

All speed-dependent messages are set from the drive if the according speed comparison value is exceeded or falls below and if the speed value is within the speed window.

Scaling must be considered
(also see scaling ▹Velocity data◃ from page 32).

Example:

Speed comparison value = 100 min^{-1}

Speed window = 10 min^{-1}

The message (▹S0330◃) is set by the drive, if the speed actual value is between 90 min^{-1} and 110 min^{-1}.

S0159

	Monitoring window	0 to +2^{31} -1
CW	x	4 bytes
L	P1054, P1055	0

By means of the monitoring window the maximum position deviation from the position actual value is able to be set. If position deviation is exceeded by the monitoring window, the drive sets the error 'excessive control deviation' into class 1 diagnostic (▹S0011◃).

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0160

Scaling type for acceleration data

-	- (CP4)	- to -
-	-	2 bytes
		A_{hex}

By means of the scaling type different scaling types can be set.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

				0	0	0	Not scaled
				0	0	1	Translatory scaling
				0	1	0	Rotary scaling

			0	Preferred scaling
			1	Parameter scaling

		0	Unit at translatory scaling ’meter’ Unit at rotary scaling ’radiant’
		1	Reserved

	0	Time unit second
	1	Reserved

0	Data reference at the motor shaft
1	Data reference at the load

See scaling ▹Acceleration data◃ on page 34.

S0161

Acceleration data scaling factor

-	- (CP4)	1 to 2^{16}-1
-	-	2 bytes
		1

In this parameter the scaling factor for all acceleration data in this drive is determined.

See scaling ▹Acceleration data◃ on page 34.

S0162

	Acceleration data scaling exponent	-9 to 3
-	- (CP4)	2 bytes
-	-	-3

In this parameter the scaling factor for all acceleration data in this drive is determined.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	|	
|	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Exponent
|																

0 Sign of the exponent positive

1 Sign of the exponent negative

See scaling ▹Acceleration data◃ on page 34.

S0167

	Frequency limit of encoder 1	1 to 2^{32}-1
-	x	4 bytes
1:1	-	0

The frequency limit of encoder 1 specifies the maximum frequency of motor encoder signals or the maximum working frequency which the electronics can output in pulses per second.

If this frequency are exceeded, the drive looses its reference to the machine zero point and the bit 0 is reset in the status position actual values (▹S0403◃).

S0168

	Frequency limit of encoder 2	1 to 2^{32}-1
-	x	4 bytes
1:1	-	0

The frequency limit of encoder 2 specifies the maximum frequency of the motor encoder signals or the maximum working frequency which the electronics can output in pulses per second.

If this frequency are exceeded, the drive looses its reference to the machine zero point and the bit 0 is reset in the status position actual values (▹S0403◃).

S0169

Probe control parameter

-	x	2 bytes
-	-	0

- to -

This parameter determines which edges and probes are activated for the probe cycle procedure (also see ▹Probe◃ from page 63).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved												|	|	|	|

|	|	| 0 Probe 1 pos. edge inactive
|	|	| 1 Probe 1 pos. edge active
|	|	|
|	|	0 Probe 1 neg. edge inactive
|	|	1 Probe 1 neg. edge active
|	|	
|	0	Probe 2 pos. edge inactive
|	1	Probe 2 pos. edge active
|		
0		Probe 2 neg. edge inactive
1		Probe 2 neg. edge active

S0170

Probe cycle procedure command

-	- (CP2)	2 bytes
-	-	0

- to -

When the master sets and enables the probe cycle procedure command, the drive reacts on the following parameters:

- Probe 1/2 enable (▹S0405◃, ▹S0406◃)
- Probe 1/2 (▹S0401◃, ▹S0402◃)
- Probe control parameters (▹S0169◃) are programmed.

While the command is active the control can start multiple measurements. The command is reset by the control if no further measurements are desired (also see ▹Probe◃ from page 63).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved														|	|

|	| 0	Reset command in drive
|	| 1	Set command in drive
|		
0		Interrupt command execution
1		Execute command execution

S0171

Calculate displacement procedure command - to -

- - (CP2, CP3) 2 bytes
- - 0

When the master sets and enables the procedure command 'calculate displacement' the drive determines from the parameters.

- Reference distance 1 or 2 (▹S0052◃, ▹S0054◃)
- Reference offset 1 or 2 (▹S0150◃, ▹S0151◃)
- Marker position A and B (▹S0173◃, ▹S0174◃)

The displacement between old and new (referenced) set-/actual system.

The calculated displacement is saved in the parameters

- displacement parameter 1 (▹S0175◃ motor encoder) and
- displacement parameter 2 (▹S0175◃, external encoder).

The encoder, for which the displacement has to be calculated is selected in the homing parameter (▹S0147◃, bit 3).

When the drive recognizes the displacement as invalid, the command results in an error (also see ▹Supported commands◃ from page 52).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved														|	|

|	0	Reset command in drive
|	1	Set command in drive
|		
0		Interrupt command execution
1		Execute command execution

S0172

Displacement to the referenced system command - to -

- - (CP2, CP3) 2 bytes
- - 0

When the master sets and enables the command 'calculate displacement' the encoder switches to the referenced position actual value system and marks this by simultaneously setting of the bit „status position actual values" (▹S0403◃). To inform the drive about the switching in real-time, the bit „status position actual values" has to be assigned to a real control bit.

During the active command the control switches to the control of the referenced position set value system and marks this by simultaneously setting of the bit 'status position set values' (▹S0404◃). To inform the drive about the switching in real-time, the bit „status position set values" has to be assigned to a real-time control bit.

The command has been correctly performed if the bits 'status position actual values' and 'status position set values' have been set. The correct order, in which the bits are to be set is not determined (also see ▹Supported commands◃ from page 52).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

1 0 Reset command in drive
1 1 Set command in drive

0 Interrupt command execution
1 Execute command execution

S0173 Marker position A

-	-	-2^{31} to $2^{31}-1$
-	-	4 bytes
L	-	0

If the drive recognizes the reference marker of the position encoder 1 or 2 during homing, it saves the present position actual value 1 or 2, which is not referenced, into the marker position A.

There are groups of two reference markers with a distance coded feedback system. If, during homing, the drive recognizes the first reference marker of the distance-coded measuring system 1 or 2, it then saves the present position actual value 1 or 2, which is not referenced, into the marker position A.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0174 Marker position B

-	-	-2^{31} to $2^{31}-1$
-	-	4 bytes
L	-	0

The marker position B is used additionally for distance coded feedback to be able to calculate the absolute position referred to the zero point of the feedback system.

There are groups of two reference markers with a distance coded feedback system. If the drive recognizes the first reference marker during homing of the distance-coded measuring system 1 or 2, then it saves the present position actual value 1 or 2, which is not referenced in the marker position B.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0175 Displacement parameter 1

-	-	-2^{31} to $2^{31}-1$
-	-	4 bytes
L	-	0

If the command calculate displacement (▹S0171◃) is active, the drive calculates the difference between the old position actual value and the new position actual value. The drive saves the difference as the 'displacement parameter 1' if motor encoder is selected.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0176

-	**Displacement parameter 2**	-2^{31} to $2^{31}-1$
-	-	4 bytes
L	-	0

If the command calculate displacement (▹S0171◃) is active, the drive calculates the difference between the old position actual value and the new position actual value. The drive saves the difference as the 'displacement parameter 2' if motor encoder is selected.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0177

-	**Absolute offset 1**	-2^{31} to $2^{31}-1$
-	-	4 bytes
L	-	0

This parameter describes the distance between the machine zero point and the zero point of the absolute measurement system at the motor.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0178

-	**Absolute offset 2**	-2^{31} to $2^{31}-1$
-	-	4 bytes
L	-	0

This parameter describes the distance between the machine zero point and the zero point of an absolute feedback system at the machine (external encoder).

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0179

-	**Probe status**	- to -
-	-	2 bytes
-	-	0

If the drive saves one or more measured values while the command probe cycle is active (▹S0170◃) it simultaneously sets the assigned bit in the probe status.

If „probe 1 enable“ (▹S0405◃) is reset by the control unit, the drive resets bit 0 and bit 1 of probe status.

If „probe 2 enable“ (▹S0406◃) is reset by the control unit, the drive resets bit 2 and bit 3 of probe status.

The drive resets all bits in the probe status when the control unit resets the „probe cycle procedure command“ (▹S0170◃).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

- Bit 0: 0 = Probe 1 positive (▹S0409◃) not latched; 1 = Probe 1 positive (▹S0409◃) latched
- Bit 1: 0 = Probe 1 negative (▹S0410◃) not latched; 1 = Probe 1 negative (▹S0410◃) latched
- Bit 2: 0 = Probe 2 positive (▹S0411◃) not latched; 1 = Probe 2 positive (▹S0411◃) latched
- Bit 3: Probe 2 negative (▹S0412◃) not latched / Probe 2 negative (▹S0412◃) latched

S0180

Spindle positioning relative offset

-	x	-2^{31} to $2^{31}-1$
L	P1430	4 bytes
		0

(from SERCOS version 1.08 and 1.02 for SoE onwards)

Also see ▹Command Spindle positioning◃ from page 65.

The parameter is only active in connection with the spindle positioning command ▹S0152◃. The relative offset spindle positioning is added to the absolute positioning value. The parameter is used to drive the spindle a certain number of revolutions.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0181

Manufacturer class 2 diagnostic

-	-	- to -
-	-	2 bytes
		0

Value accords to warning number of b maXX parameters P0261 to P0265. Also see parameter manual b maXX.

S0182

Manufacturer class 3 diagnostic

-	-	- to -
-	-	2 bytes
		0

Value accords to state information of b maXX parameters P350, P360, P390, P400. Also see parameter manual b maXX.

S0185

	Length of the configurable data record in the AT	- to -
-	-	2 bytes
-	-	20

In the operation data of this IDN the drive displays the maximum length in bytes which can be processed in the configurable data record of the AT.

S0186

	Length of the configurable data in the MDT	- to -
-	-	2 bytes
-	-	20

The drive indicates the maximum length in bytes which can be processed in the configurable data record of the MDT in the operation data of this IDN.

S0187

	IDN list of the configurable data in the AT	- to -
-	-	2 bytes, variable
-	-	*

* Standard value: 28, 28, **S**0011, **S**0012, **S**0013, **S**0036, **S**0037, **S**0040, **S**0047, **S**0051, **S**0053, **S**0080, **S**0081, **S**0084, **S**0108, **S**0130, **S**0131, **S**0132, **S**0133, **S**0144, **S**0179, **S**0189, **S**0258, **S**0259, **S**0260, **S**0344, **S**0359, **S**0413, **S**0462, **S**0484

This list consists of the IDNs of operation data which can be processed by the drive cyclical as actual values.

S0188

	IDN list of the configurable data in the MDT	- to -
-	-	2 bytes, variable
-	-	*

* Standard value: 20, 20, **S**0036, **S**0037, **S**0041, **S**0042, **S**0047, **S**0048, **S**0080, **S**0081, **S**0082, **S**0083, **S**0091, **S**0092, **S**0108, **S**0145, **S**0258, **S**0259, **S**0260, **S**0359, **S**0405, **S**0406

This list consists of the IDNs of operation data which can be processed by the drive cyclical as set values.

S0189

	Following error	-2^{31} to $2^{31}-1$
-	-	4 bytes
L	P0367	0

In this parameter the drive saves the present difference between the position set value and the position actual value, which is relevant for the control.

Calculation of the following error:

Following error = Position set value - Position actual value 1 or 2

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0192

	IDN list of backup operation data	- to -
-	- (CP3, CP4)	2 bytes, variable
-	-	*

* Standard value: 5, 32, **S**0015, **S**0016, **S**0024, **S**0032, **S**0079

(From SERCOS-version 1.07 onwards and all versions for SoE)

The parameter list contains all parameter numbers of the drive data, which is loaded in the drive, in order to guarantee a correct operation.The master uses this list in order to generate a backup copy of the drive parameters (e. g. on floppy disk).

The IDN list stores IDNs of all drive data that have to be loaded in the drive in order to guarantee correct operation. The master uses this list to generate a backup copy of the drive parameters (e.g., on a floppy disk).

S0193

	Positioning jerk	0 to 2^{32}-1
-	x	4 bytes
-	P605	0

„Positioning jerk“ is the maximum rate of change of acceleration in the operation modes „interpolation“ and „positioning“. The input value 0 deactivates the jerk limit.

„Positioning jerk” is the maximum rate of change of acceleration in the operation modes „interpolation“, „position target setting“ and „positioning“. Programming a value of zero will cause jerk limiting to be deactivated.

Scaling must be considered
(also see scaling ▹Acceleration data◃ on page 34).

S0196

	Nominal current motor	0 to +2^{31}-1
-	x	4 bytes
1000:1	P0054	0

The nominal current motor is the current at which the motor produces the nominal torque according to the motor data sheet. For all asynchronous motors this parameter is used as a reference for all torque data and for determining motor related current values.

S0197

	Set coordinate system procedure command	- to -
-	- (CP2, CP3)	2 bytes
-	-	0

After activation of the command set coordinate system, the drive ignores the position set value and instead transfers the programmed initial coordinate value ▹S0198◃ into the position internal set value. Furthermore the drive calculates all absolute values (position limts, a. s. o.) again, regarding the initial coordinate value.

The position actual value status ▹S0403◃ and the position set values ▹S0404◃ are not affected by this command.

The command is successfully completed by the drive, when all necessary calculations are executed, and the drive has based its coordinate system on the initial coordinate value ▹S0198◃.

Before the control clears the command, it must also set its coordinate system to the same value the drive used. After clearing of the command the drive will once again act upon the position set value.

The command will terminate an error, when the drive detects an error during command specific calculations.

S0198

	Initial coordinate value	-2^{31} to $+2^{31}-1$
-	x	4 bytes
L	-	0

The drives coordinate system will be set to the value programmed as the initial coordinate value during the 'set coordinate system' command ▹S0197◃ of the drive.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0200

	Amplifier warning temperature	0 to 150
-	x	2 bytes
1:1	-	0

This parameter is implemented only for compatibility reasons, because there is no adequate allocation in the b maXX 4400 controller.

S0201

	Motor warning temperature	80 to 250
-	x	2 bytes
1:1	P0088	125

If motor temperature exceeds the specified value the drive sets the bit motor temperature warning in class 2 diagnostic ▹S0012◃).

S0202

	Cooling error warning temperature	0 to 125
-	x	2 bytes
1:1	P0016	75

When an error occurs in the cooling system (e. g. the temperature in the control cabinet is higher than the cooling error warning temperature) the drive sets the bit cooling error warning into class 2 diagnostic ▹S0012◃).

S0203

	Amplifier shutdown temperature	0 to 150
-	x	2 bytes
1:1	-	0

This parameter is implemented only for compatibility reasons, because there is no adequate allocation in the b maXX 4400 controller.

S0204

	Motor shutdown temperature	80 to 250
-	x	2 bytes
1:1	P0090	150

If motor temperature exceeds the specified value the drive sets the bit motor temperature shutdown in class 1 diagnostic (▹S0011◃).

S0205

	Cooling error shutdown temperature	0 to 125
-	x	2 bytes
1:1	P0017	(dependent on the power unit)

If an error is determined in the cooling system (e. g. the temperature in the control cabinet is higher than the cooling error shutdown temperature), the drive sets the bit cooling error shutdown in class 1 diagnostic (▹S0011◃).

S0206

	Drive on delay	0 to 6553.5
-	x	2 bytes
0.1 ms	1406	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

After the torque was activated (bit 14 is set in the status) the drive on delay is started. The drive follows the set values if delay time has expired.

S0207

	Drive off delay	0 to 6553,5
-	x	2 bytes
0.1 ms	1405	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

After „drive off“ (bit 15 in the master control word) was reset and n_{min} was reached, the delay time was started and the interlock of the brake is initiated. The torque remains activated in the drive until this drive off delay time is elapsed.

Example: Used as break delay time (clamping or release).

S0208

Temperature data scaling type

-	- (CP4)	- to -
1:1	-	2 bytes
		0

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Entry in 0.1 °C

1 Entry in 0.1 F

This parameter is implemented only for compatibility reasons. The b maXX option modules only support the temperature scaling °C. Internal decimal places are not supported, too.

S0217

Parameter set preselection

-	-	- to -
1:1	-	2 bytes
		0

By parameter set preselection the parameter set is selected, to which is switched.

S0219

IDN–list of parameter set

-	-	- to -
1:1	-	2 bytes
		0

IDN-list contains the numbers off all the parameters existing in the drive, which are switched in the particular parameter set.

S0222

Spindle positioning speed

-		x	0 to $+2^{31}-1$
10^{-4} min^{-1}	1:10000	P1427	4 bytes
			0

(from SERCOS version 1.08 and 1.02 for SoE onwards)

Also see ▹Command Spindle positioning◃ from page 65.

When the command spindle positioning (▹S0152◃) was received, the drive accelerates or brakes the speed, dependent on the present spindle positioning speed.

S0254

	Actual parameter set	- to -
-	-	2 bytes
-	-	0

This parameter saves the current active parameter set in the drive. In the b maXX controller only parameter set 0 is generated.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved													|	|	|
													0	0	0

Parameter set 0 active

S0258

	Target position	-2^{31} to $2^{31}-1$
CW	x	4 bytes
L	P0600	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

In the operating mode „interpolation“ the controller transmits „target position“ as command to the drive. The drive travels to the target position, taking into account the positioning speed (▹S0259◃), the positioning acceleration (▹S0260◃) and the positioning jerk (▹S0193◃).

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0259

	Positioning speed	-2^{31} to $2^{31}-1$
CW	x	4 bytes
G	P0602	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

Positioning speed is used in the operation modes „interpolation“ and „positioning“ as speed to travel to the „active target position“ (▹S0430◃).

The “positioning speed” is used in the operation modes “interpolation” and „positioning“ as the speed to travel to the “active target position” (S-0-0430).

Scaling must be considered
(also see scaling ▹Velocity data◃ from page 32).

S0260

	Positioning acceleration	0 to 2^{32}-1
CW	x	4 bytes
B	P0603	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

The positioning acceleration is used in the operation modes „interpolation“ and positioning“ as the rate to accelerate to and decelerate from the positioning speed ▹S0259◃.

If the drive supports the positioning deceleration (▹S0359◃), then a separate deceleration can be adjusted.

Scaling must be considered
(also see scaling ▹Acceleration data◃ on page 34).

S0261

	Coarse positioning window	0 to 2^{32}-1
-	x	4 bytes
L	P1194	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

If the difference is between the set position set value and the position value within the „coarse positioning“ window, the drive sets the status „in coarse position“ (▹S0341◃). If necessary, the status „in coarse position“ with the real time status bit within the drive is linked and this way are transmitted to the control (▹S0305◃).

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0262

	Load default values command	- to -
-	- (CP3, CP4)	2 bytes
-	-	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

If the master sets and enables the command „load default values“, the default parameters (basic parameter set) are activated. The scope and contents of the default parameters (e. g. limit values, speed values etc.) are determined by the drive supplier. The default parameters are not optimized for the respective application, rather they permit a problem free interoperation between the power unit and the motor.

NOTE!
Optimized parameters can be overwritten with the command load default values.

S0263

	Load working memory command	- to -
-	- (CP3, CP4)	2 bytes
-	-	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

When the master sets and enables the command „Load working memory“, all necessary operation data ((see ▹S0192◃) are loaded from the non-volatile memory into the drive’s working memory. After switch on the drive automatically transfers the data from the non-volatile memory into the working memory.

NOTE!
Active parameters can be overwritten with the command.

S0264

-	**Backup working memory command**	- to -
-	- (CP3, CP4)	2 bytes
-	-	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

When the master sets and enables the command „backup working memory “ all necessary data for the operation (see ▷S0192◁) are loaded from the drive working memory into the non-volatile drive memory.

NOTE!
Previously saved parameter values are overwritten with the command.

S0265

-	**Language selection**	- to -
-	x	2 bytes
-	-	0

German and English language only are supported.

This parameter influences the operation data of ▷S0095◁. The names and parameter unit descriptions are changed.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 German

1 English

S0266

-	**List of available languages**	- to -
-	-	2 bytes, variable
-	-	0

German and English language only are supported.

S0272

CW	**Speed window percentage**	0 to 65535
100:1	x	2 bytes
	P1043	0

If the speed control deviation is within this range the status ’set value reached’ is generated in the b maXX® controller.

S0274

-	**Received drive addresses**	- to -
-	-	2 bytes, variable
-	-	0, 254, 0, 0

The drive cumulates during initialization the addresses of the physically in front of it lying slaves. These can be read by the master as a list of 2 bytes of variable length. The addresses of the found slaves are stored in the bits 0-7 and the bits 8-15 are deleted.

S0300

Real-time control bit 1

-	x	2 bytes
-	-	-

- to -

This parameter defines a parameter number for the real-time control bit 1 in the SERCOS control word. That way it is possible to read the status of the real-time control bit 1 via the service channel. Only bit 0 is defined.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Bit reset

1 Bit set

S0301

Allocation of real-time control bit 1

-	x	2 bytes
-	-	-

0 to 65535

In order to assign a signal to the real-time control bit 1 the parameter number of the signal is written in ▹S0301◃. After allocation the assigned signal appears in the real-time control bit 1.

S0302

Real-time control bit 2

-	x	2 bytes
-	-	-

- to -

This parameter defines a parameter number for the real-time control bit 2 in the SERCOS control word. That way it is possible to read the status of the real-time control bit 2 via the service channel. Only bit 0 is defined.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Bit reset

1 Bit set

S0303

Allocation of real-time control bit 2

-	x	2 bytes
-	-	-

0 to 65535

In order to assign a signal to the real-time control bit 2 the parameter number of the signal is written in ▹S0303◃. After allocation the assigned signal appears in the real-time control bit 1.

S0304

-	**Real-time status bit 1**	- to -
-	-	2 bytes
-	-	-

The parameter number for the real-time status bit 1 is defined in the SERCOS status word. Therewith it is possible to read the status of the real-time status bit 1 via the service channel. Only bit 0 is defined.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Bit reset

1 Bit set

S0305

-	**Allocation of real-time status bit 1**	0 to 65535
-	x	2 bytes
-	-	-

In order to assign a signal to the real-time status bit 1 the parameter number of the signal is written in ▹S0305◃.

S0306

-	**Real-time status bit 2**	- to -
-	-	2 bytes
-	-	-

The parameter number for the real-time status bit 2 is defined in the SERCOS status word. Therewith it is possible to read the status of the real-time status bit 2 via the service channel. Only bit 0 is defined.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
reserved															|

0 Bit reset

1 Bit set

S0307

-	**Allocation of real-time status bit 2**	0 to 65535
-	x	2 bytes
-	-	-

In order to assign a signal to the real-time status bit 2 the parameter number of the signal is written in ▹S0307◃.

S0310

Overload warning

-	-	- to -
-	-	2 bytes
-	-	-

With this parameter a parameter number is determined for overload warning. Therewith the overload warning can be assigned to a real-time status bit (see ▹S0305◃). The overload warning is defined as a C2D bit (▹S0012◃) and is set in dependence of the I2t (▹S0114◃) accordingly. Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 No overload warning

1 Overload warning

S0311

Amplifier overtemperature warning

-	-	- to -
-	-	2 bytes
-	-	-

As no amplifier temperature is detected in the b maXX controller this value is used to indicate the overload of the input stage (Ixt).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 No overload warning

1 Overload warning

S0312

Motor overtemperature warning

-	-	- to -
-	-	2 bytes
-	-	-

With this parameter the parameter number for the motor overtemperature warning is determined. Therewith the motor overtemperature warning can be assigned to a real-time status bit (see ▹S0305◃). The motor overtemperature warning is defined as C2D bit (▹S0012◃) and is accordingly set depending on the motor warning temperature (▹S0201◃). Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 No overload warning

1 Overload warning

S0313

Cooling error warning

-	-	- to -
-	-	2 bytes
-	-	-

This parameter is used to define a parameter number for the cooling error warning. Therewith the cooling error warning can be assigned to a real-time status bit (see ▹S0305◃). The cooling error warning is defined as a C2D bit (▹S0012◃) and is set in dependence of cooling error warning temperature (▹S0202◃) accordingly. Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 No overload warning

1 Overload warning

S0315

Positioning velocity > n $_{Limit}$

-	-	- to -
-	-	2 bytes
	-	-

This parameter is used to define a parameter number for the Positioning velocity > n $_{Limit}$. Therewith the Positioning velocity > n $_{Limit}$ can be assigned to a real-time status bit (see ▹S0305◃). The Positioning velocity > n $_{Limit}$ is defined as a C3D bit (▹S0013◃) and is set if the Positioning speed (▹S0259◃) is higher than the Speed limit value (▹S0038◃, ▹S0039◃). Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Bit reseted

1 Bit set

S0323

Target position outside the travel range

-	-	- to -
-	-	2 bytes
-	-	-

(From SERCOS-version 1.07 onwards and all versions for SoE)

This parameter is used to define the parameter number of the warning for the target position outside the travel range.This allows e. g. the assigning of the warning to a real-time status bit (e. g. ▹S0305◃). The warning target position outside the travel range is defined as a C2D bit (▹S0012◃) and is set, when the active target position (▹S0430◃) is outside the position limit values (positive or negative, ▹S0049◃, ▹S0050◃).

NOTE

If the position actual value exceeds a position limit value, the bit „position limit value exceeded (shut-down)“, drive status bit 13 is set in C1D (▹S0011◃).

Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Target position within the position limits

1 Target position outside the position limits

S0330

Status $n_{actual} = n_{set}$

-	-	- to -
-	-	2 bytes
	-	-

This parameter is used to define a parameter for the status $n_{actual\ value} = n_{set\ value}$. This allows that the status $n_{actual} = n_{set}$ is assigned to a real-time status bit (see ▹S0305◃). The status $n_{actual} = n_{set}$ is defined as a C3D bit (▹S0013◃) and is set when the speed actual value (▹S0040◃) is) within the programmed speed window (▹S0155◃) of the speed set value (▹S0036◃). Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 $|n_{actual}| \neq |n_{set}|$

1 $|n_{actual}| = |n_{set}|$

S0331

Status n_{actual} = 0

- to -
-
2 bytes
-
-

This parameter is used to define a parameter number for the status n_{actual} = 0. This allows that the status n_{actual} = 0 is assigned to a real-time status bit (see ▷S0305◁). The status n_{ist} = 0 is defined as bit in the C3D (▷S0013◁) and is set, if the speed actual value (▷S0040◁) is within the standstill (▷S0124◁). Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 $|n_{actual}| \neq 0$

1 $|n_{actual}| = 0$

S0332

Status $n_{actual} < n_x$

- to -
-
2 bytes
-
-

This parameter is used to define a parameter number for the status $n_{actual} < n_x$. This allows the status $n_{actual} < n_x$ to be assigned to a real-time status bit (▷S0305◁). The status $n_{actual} < n_x$ is defined as a C3D bit (▷S0013◁) and is set if the speed actual value (▷S0040◁) is less than the speed threshold n_x (▷S0125◁). Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 $|n_{actual}| \geq |n_x|$

1 $|n_{actual}| < |n_x|$

S0334

Status Md ≥ Md_{limit}

\- to -
2 bytes
-

\-
\-
\-

With this parameter a parameter number is defined for the status Md ≥ Md_{limit}. Therewith status Md ≥ Md_{limit} can be assigned to a real-time status bit (▷S0305◁). Status Md ≥ Md_{limit} is defined as a bit in C3D (▷S0013◁) and is set if the torque actual value (▷S0084◁) is outside the programmed torque limits (▷S0082◁, ▷S0083◁, ▷S0092◁). Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

0	$\|Md\| < \|Md_{limit}\|$
1	$\|Md\| \geq \|Md_{limit}\|$

S0335

Status $n_{soll} \geq n_{limit}$

\- to -
2 bytes
--

\-
\-
\-

This parameter is used to define a parameter number for status $n_{set} \geq n_{limit}$. Therewith status $n_{set} \geq n_{limit}$ can be assigned to a real-time status bit (▷S0305◁). The status $n_{set} \geq n_{limit}$ is defined as a bit in C3D (▷S0013◁)) and is set when the speed set value (▷S0036◁) is greater than the speed limit value (▷S0038◁, ▷S0039◁, ▷S0091◁). Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

0	$\|n_{set}\| < \|n_{limit}\|$
1	$\|n_{set}\| \geq \|n_{limit}\|$

S0336

Status In position

\- to -
2 bytes
-

\-
\-
\-

With this parameter a parameter number is defined for the status In position. Therewith the status In position is assigned to a real-time status (▷S0305◁). The status In position is defined as a bit in C3D (▷S0013◁) and is set if the position actual value is within the position window (▷S0057◁) referring to the position set value (▷S0047◁). Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

0	Outside of the position window
1	Within the position window

S0341

Status In coarse position

-	-	- to -
-	-	2 bytes
-	-	-

With this parameter the parameter number for status In coarse position is defined. Therewith the status In coarse position can be assigned to a real-time status bit (▹S0305◃).The status 'in coarse position' is defined as bit of C3D (▹S0013◃) and is set when the position actual value is within the position window (▹S0057◃) relative to the position set value (▹S0047◃). Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Outside of the position window

1 Within the position window

S0342

Target position reached

-	-	- to -
-	-	2 bytes
		-

From SERCOS-version 1.07 onwards and all versions for SoE)

With this parameter a parameter number is defined for the status target position. Therewith the status target position reached can be assigned to a real-time status bit (▹S0305◃).The status target position reached is defined as bit in C3D (▹S0013◃) and is set when the position actual value is within the position window (▹S0057◃) relative to the position set value (▹S0047◃). Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Target position not reached

1 Target position reached

S0346

Control word positioning

-	x	2 bytes
-	-	-

(From SERCOS-version 1.07 onwards and all versions for SoE)

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															

- 0 ⇒ 1 / 1 ⇒ 0: Start positioning; Bit change leads to a taking over of target position
- 0 0: Reserved
- 0: Absolute positioning
- 1: Relative positioning
- Only at relative positioning
  - 0: Relative to the target position
  - 1: Relative to the actual position

S0359

Positioning deceleration

CW	x	0 to 2^{31}-1
-	P0604	4 bytes
		0

(From SERCOS-version 1.07 onwards and all versions for SoE)

With the positioning delay the positioning speed (▹S0259◃) is reduced in the operating modes „interpolation“ and „positioning“.

Scaling must be considered
(also see scaling ▹Acceleration data◃ on page 34).

S0373

List of service channel error

-	-	- to -
-	-	4 bytes, variable
		-

With every service channel error the drive saves the parameter number and the error code in this list. The list is organized as a ring buffer. When the list is read via the service channel the last error recorded will be positioned as the first element of the list. The display format of the list elements is hexadecimal.
Bits 31-16 : Error code (SERCOS)
Bits 15-0 : Parameter number, at which this error has occurred.

S0374

List command error

-	-	- to -
-	-	4 bytes, variable
-	-	-

With every command error the drive saves the parameter number and a manufacturer-specific error code in this list. The list is organized as a ring buffer. When the list is read via the service channel the last error recorded will be positioned as the first element of the list. The display format of the list elements is hexadecimal.
Bits 31-16 : Error code (SERCOS)
Bits 15-0 : Parameter number, at which this error has occurred.

S0375

List diagnostic number

-	-	- to -
-	-	4 bytes, variable
-	-	-

The drive saves every change of the diagnostic numbers in this list. The list is organized as a ring buffer. If the list is read via the service channel the last diagnostic number is displayed as first element of the list. The display format of the list elements is hexadecimal.
Bits 31-16 : Error code (SERCOS)
Bits 15-0 : Phase number.

S0376

Baud rate

-	-	- to -
-	-	2 bytes
-	-	$010F_{hex}$

The controller places the supported transmission rates in this parameter.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved								Reserved							

0	0	0 - 2 1 Mbit/s not available
0	1	1 - 2 1 Mbit/s available
1	0	0 - 4 1 Mbit/s not available
1	1	1 - 4 1 Mbit/s available
0	0	0 - 8 1 Mbit/s not available
0	1	1 - 8 1 Mbit/s available
1	0	0 - 16 1 Mbit/s not available
1	1	1 - 16 1 Mbit/s available

0	Automatic baud rate recognition is not supported
1	Automatic baud rate recognition is supported

S0383

	Motor temperature	-30 to 250
-	-	2 bytes
1:1	P0503	0

Display of the active measured motor temperature.

S0384

	Amplifier temperature	0 to 250
-	-	2 bytes
1:1	P0481	0

Display of the active measured amplifier temperature.

S0393

	Set value setting mode	- to -
-	x	2 bytes
-	-	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

If the function is active the interpretation of position set values is dependent upon the set value setting. In operation modes „interpolation“ and „positioning“ active only.

When the function is active, the interpretation of position set values is dependent upon the set value setting.In operation modes „interpolation“ and „positioning“ active only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved														|	|

0	0	Clockwise, positive direction
0	1	Counterclockwise, negative direction
1	0	Shortest path
1	1	Reserved

S0400

	Home switch	- to -
-	-	2 bytes
-	-	0

This parameter is used to assign a parameter number with the home switch (external signal). Therewith the home switch is assigned to a real-time status bit (▹S0305◃).

At active command ’NC controlled homing’ (▹S0146◃) the home switch only is valid if ’homing enable’ (▹S0407◃) was set. Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0	Inactive switch
1	Switch active

S0401

Probe 1

-	-	- to -
-	-	2 bytes
-	-	0

With this parameter a parameter number is assigned to probe 1 (external signal). Therewith probe 1 can be assigned to a real-time status bit (▹S0305◃). Additional parameters are ▹S0130◃ and ▹S0131◃.

The signal 'probe 1' is checked and updated by the drive only, if the command probe cycle (▹S0170◃) is active and the signal probe 1 enable (▹S0405◃) is set. Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Probe inactive

1 Probe active

S0402

Probe 2

-	-	- to -
-	-	2 bytes
-	-	0

With this parameter a parameter number is assigned to probe 2 (external signal). Therewith probe 2 can be assigned to a real-time status bit (▹S0305◃). Additional parameters are ▹S0130◃ and ▹S0131◃.

The signal 'probe 2' is checked and updated by the drive only, if the command probe cycle (▹S0170◃) is active and the signal probe 2 enable (▹S0406◃) is set. Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Probe inactive

1 Probe active

S0403

Status position actual values

-	-	- to -
-	-	2 bytes
-	-	0

When the drive switches the position actual values to the coordinates referred to the machine zero point the bit 0 is set in this parameter. Therewith the control is shown, that the drive refers all position actual values to the zero point of the machine starting from this point of time.

Bit 0 is reset when either the commands 'displacement in homing system' (▹S0172◃) or 'drive controlled homing' (▹S0148◃) is started or when the drive has lost its reference to the zero point of the machine. The status position actual value can be assigned to a real-time status bit (▹S0305◃) and therewith it can permanently signal to the control in the drive status. Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Position actual values are not referred to in the zero point of the machine

1 Position actual values are referred to in the zero point of the machine

S0404

Status position set values

-	-	- to -
-	-	2 bytes
-	-	0

When the position set values are switched to the coordinates referred to the machine zero point the bit 0 is set from the drive in this parameter. Therewith the control is shown, that the drive refers all position set values to the zero point of the machine starting from this point of time. At the same time the controller inputs the new position set value in the cyclical data.

Bit 0 is reset, if the command 'displacement in reference system' (▹S0172◃) is activated. The status position set values can be assigned to a real-time control bit (▹S0301◃) and therefore it can be permanently signaled to the drive status of the control. Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Position set values are not referred to in the zero point of the machine

1 Position set values are referred to in the zero point of the machine

S0405

	Probe 1 enable	- to -
CW	x	2 bytes
-	-	0

With this parameter a parameter number is assigned to the probe 1 enable. Therewith a real-time control bit (▹S0301◃) can be assigned to the probe 1 enable.

Probe 1 enable is checked by the drive only as long as the command 'probe cycle' (▹S0170◃) is active. For a new probe cycle with the same edge of probe 2 the control has to reset probe 2 enable to '0' and set it to '1'. Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Probe not enabled

1 Probe enabled

S0406

	Probe 2 enable	- to -
CW	x	2 bytes
-	-	0

With this parameter a parameter number is assigned to the probe 1 enable. Therewith a real-time control bit (▹S0301◃) can be assigned to the probe 1 enable.

Probe 1 enable is checked by the drive only as long as the command 'probe cycle' (▹S0170◃) is active. For a new probe cycle with the same edge of probe 2 the control has to reset probe 2 enable to '0' and set it to '1'. Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Probe not enabled

1 Probe enabled

S0407

	Homing enable	- to -
-	x	2 bytes
-	-	0

This parameter is used to assign a parameter number to homing enable. This allows the status 'homing enable' to be assigned to a real-time control bit (▹S0301◃**)**.

The drive interprets the homing enable only while the command 'NC controlled homing' (▹S0146◃) is active. Bit 0 is defined for operation data only.

S0408

Reference marker latched

-	-	- to -
-	-	2 bytes
-	-	0

The parameter is used to latch a parameter number to a reference marker. This allows the 'reference marker latched' to be assigned to a real-time status bit (▹S0305◃**)**.

The drive sets this bit to '1' if the command 'NC controlled homing' (▹S0146◃) is active, if the homing is enabled (▹S0407◃) and the marker pulse of the encoder system (external signal) is registered.

Simultaneously the drive saves the referenced position actual value into the according marker position (▹S0173◃ or ▹S0174◃). The drive resets this bit to '0', if the control activates the command „NC controlled homing". The „reference marker latched" is only then valid as long as the command „NC controlled homing" is active. This bit is not changed by the command „drive controlled homing" (▹S0148◃). Bit 0 is defined for operation data only.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Reference marker not latched

1 Reference marker latched

S0409

Probe 1 positive latched

-	-	- to -
-	-	2 bytes
		0

This parameter is used to assign a parameter number to probe 1 positive latched. This allows the status 'probe 1 positive latched' to be assigned to a real-time status (▹S0305◃.

The bit 0 in this parameter is only set by the drive when the command probe cycle (▹S0170◃) is active, if the signal probe 1 enable▹S0405◃ is set to '1' and the positive edge of probe 1 (▹S0401◃) is registered. Simultaneously the drive saves the position actual value into probe 1 positive (▹S0130◃).

The drive resets this bit, if the control resets the command probe cycle or sets the probe 1 enable to '0' (also see ▹S0179◃).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Measured value 1 positive, not latched

1 Probe value 1 positive latched

S0410

Probe 1 negative latched

-	-	- to -
-	-	2 bytes
-	-	0

This parameter is used to latch a parameter number with probe value 1 negative. This allows the status 'probe 1 negative latched' to be assigned a real-time status bit (▹S0305◃**)**.

Bit 0 of this parameter is set by the drive only if the procedure command 'probe cycle '(▹S0170◃) is active, the signal 'probe 1 enable' (▹S0405◃) is set to 1 and the negative edge of probe 1 (▹S0401◃) is registered. Simultaneously the drive saves the position actual value into the probe 1 negative (▹S0130◃).

The drive resets this bit, if the control resets the command probe cycle or sets the probe 1 enable to '0' (also see ▹S0179◃).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Probe 1 negative not latched

1 Probe 1 negative latched

S0411

Probe 2 positive latched

-	-	- to -
-	-	2 bytes
-	-	0

This parameter is used to assign a parameter number to probe 2 positive latched. This allows the status 'probe 1 positive latched' to be assigned to a real-time status (▹S0305◃.

The bit 0 in this parameter is only set by the drive when the command probe cycle (▹S0170◃) is active, if the signal probe 2 enable▹S0406◃ is set to '1' and the positive edge of probe 2 (▹S0402◃) is registered. Simultaneously the drive saves the position actual value into probe 2 positive (▹S0132◃).

The drive resets this bit, if the control resets the command probe cycle or sets the probe 1 enable to '0' (also see ▹S0179◃).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Measured value 2 positive, not latched

1 Probe value 2 positive latched

S0412

Probe 2 negative latched

-	-	- to -
-	-	2 bytes
-	-	0

This parameter is used to assign a parameter number with probe value 2 negative. This allows the status 'probe 1 negative latched' to be assigned a real-time status bit (▹S0305◃**)**.

Bit 0 of this parameter is set by the drive only, if the procedure command 'probe cycle '(▹S0170◃) is active, the signal 'probe 2 enable' (▹S0406◃) is set to 1 and the negative edge of probe 2 (▹S0402◃) is registered. Simultaneously the drive saves the position actual value into the probe 2 negative (▹S0130◃).

The drive resets this bit, if the control resets the command probe cycle or sets the probe 2 enable to '0' (also see ▹S0179◃).

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 Probe 2 negative not latched

1 Probe 2 negative latched

S0419

Positioning acknowledgment

-	-	- to -
-	-	2 bytes
-	-	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

The drive acknowledges the takeover of the positioning set value by setting bit 0 to „1". The bit is reset by activating the operation mode or by setting the control in the control word positioning (▹S0346◃) the bit 0 to „0".

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved															|

0 ⇒ 1 Positioning set value acknowledged

1 ⇒ 0 Positioning set value acknowledged

S0430

	Active target position	-2^{31} to $+2^{31}-1$
-	-	4 bytes
-	-	-

(From SERCOS-version 1.07 onwards and all versions for SoE)

In the operation mode interpolation the drive writes the target position (▹S0258◃) into the active target position. The actual target position is only a buffer memory in the drive and therefore cannot be configured in the MDT and can only be read via the service channel.

Scaling must be considered
(also see scaling ▹Position data◃ from page 29).

S0437

	Positioning status	- to -
-	-	2 bytes
-	-	0

(From SERCOS-version 1.07 onwards and all versions for SoE)

In this parameter all messages of the operating modes „interpolation“ and „positioning“ are summarized.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Reserved

Status „Target position reached (▹S0342◃)
- 0 Target position not reached
- 1 Target position reached

Reserved

- 0 No constant speed
- 1 Constant speed

- 0 Drive acceleration
- 1 No drive acceleration

- 0 Drive brakes
- 1 Drive does not brake

Warning target position outside the traveling range (▹S0323◃)
- 0 Target position within traveling range
- 1 Target position outside the traveling range

Reserved

S0438

	Vendor name	- to -
-	-	-
-	-	*

(From SERCOS-version 2.00 onwards)

This parameter contains the vendor name of the device.
In this case ’Baumueller Nuernberg GmbH’.

S0439

	Vendor code	- to -
-	-	4 bytes
-	-	346

(From SERCOS-version 2.00 onwards)

This parameter contains the vendor code of the device. The Vendor code is allocated by the IGS on request.

9

ERROR HANDLING

It must be differed between errors in the option module and errors in the controller when handling errors.

9.1 Errors in the option modules

9.1.1 Fatal errors

Fatal errors of the option modules results in the field bus connection not functioning.A return is only possible by switching off/on. Within this state the error information is displayed on the **BM4-O-SER-01** by blinking on the 7-segment display of the module (cyclic: 1 second „E“, 1 second tens digit bit number, 1 second ones digit bit number). Error numbers, which are shown on the display can be found in the manual for **BM4-O-SER-01** (5.04012 chapter 8.3 error codes 7-segment display).

The option module **BM4-O-ECT-01** only has LEDs. The errors are shown with blinking codes.

9.1.2 Configuration errors

The second error category, which occur when using option modules are configuration errors, which lead to the controller not being able to be taken into operation. These errors have an effect, when the basic communication operates via the field bus. In order to signalize these errors, therewith also the mechanisms of the field bus are used (C1D, C2D, C3D and S0014).

9.2 Controller errors

Errors, which are signaled from the controller are transferred via the mechanism of the field bus. As long as the errors cannot be displayed on standard errors, -warnings or -messages, they are transmitted as manufacturer-specific errors, warnings or messages.

The controller errors are also visualized at the device on the 7-segment display of the basic unit.

9.3 Error parameters

S0011

Class 1 diagnostic

The recognition of fatal errors leads to the best possible shutdown of the drive.

The bit 13 (class 1 diagnostic) is set in the status word.

Also see chapter parameter ▹S0011◃ on page 76.

S0012

Class 2 diagnostic

Shutdown pre-warning, bit for class 2 diagnostic (bit 12) is set in the status word.

Also see chapter parameter ▹S0012◃ on page 77.

S0013

Class 3 diagnostic

Drive operation status flags. When a condition changes in the drive, the corresponding bit changes in the C3D, this sets the change bit for C3D in the drive status (bit 11) to a binary '1'.

Also see chapter parameter ▹S0013◃ on page 78.

S0014

Interface status

If a communication error has occurred, bit 12 in the parameter C1D (▹S0011◃) is set. The drive cancels a communication error only if the error at the interface has been eliminated and on receiving the command 'reset class 1 diagnostic' (▹S0099◃) via the service channel (also see chapter parameter description ▹S0014◃ on page 79).

S0129

Manufacturer class 1 diagnosis

This parameter contains the b maXX ® controller error code (see parameter manual bmaXX ® and parameters manufacturer class).In ▷S0129◁ only the first error code of the controller is displayed. Error numbers, which occure in the option module always have set the bit 15 ($8xxx_{hex}$).

	▷S0129◁
ERR_RAM_AD	8000_{hex}
ERR_RAM_DB	8001_{hex}
ERR_RAM_CHIP	8002_{hex}
ERR_FPGA_CONF	8003_{hex}
ERR_FPGA_REG	8004_{hex}
ERR_FPGA_DPRAM	8005_{hex}
ERR_NO_SERCON	8006_{hex}
ERR_SERCON_DPRAM	8007_{hex}
ERR_SERCON_REG	8008_{hex}
ERR_ATADR	8009_{hex}
ERR_MEM_ALLOC	$800A_{hex}$
ERR_ACYC_READ	$800B_{hex}$
ERR_ACYC_WRITE	$800C_{hex}$
ERR_CYC_READ	$800D_{hex}$
ERR_CYC_WRITE	$800E_{hex}$
ERR_COMMAND	$800F_{hex}$
ERR_ILL_BUS	8010_{hex}
ERR_ILL_INA	8011_{hex}
ERR_ILL_OPA	8012_{hex}
ERR_PRT_FLT	8013_{hex}
ERR_STK_UN	8014_{hex}
ERR_STK_OV	8015_{hex}
ERR_NMI	8016_{hex}
ERR_UND_OPC	8017_{hex}
ERR_WDT_INTERN	8018_{hex}
ERR_WDT_EXTERN	8019_{hex}
ERR_BACI_CRITICAL	$801A_{hex}$
ERR_NIT_CRITICAL	$801B_{hex}$
ERR_BACI_NOT_ALIVE	$801C_{hex}$
ERR_UNKNOWN_LCSOFT	$801D_{hex}$
ERR_SYNC_MPC_BACI	$801E_{hex}$
ERR_SERCON_FIBR	$801F_{hex}$
BACI_ERR_PAR_OUT_OF_RANGE	8020_{hex}
BACI_ERR_STARTUP_MASTER_ERROR	8021_{hex}
BACI_ERR_STARTUP_NO_MASTER_ACK	8022_{hex}
BACI_ERR_CYCLIC_COLLISION_DETECTED	8024_{hex}
BACI_ERR_CYCLIC_PARA_NUMBERS_INVALID	8025_{hex}
BACI_ERR_SERVICE_SLAVE_NO_MASTER_ACK	8028_{hex}

	▷S0129◁
BACI_ERR_SERVICE_MASTER_ERROR_FOUND	8029_{hex}
BACI_ERR_COMMAND_ACK_NOT_EXPECTED	$802C_{hex}$
BACI_ERR_COMMAND_REQ_NOT_EXPECTED	$802D_{hex}$
BACI_ERR_COMMAND_INTERFACE_BUSY	$802E_{hex}$
BACI_ERR_COMMAND_ERROR_FROM_MASTER	$802F_{hex}$
BACI_ERR_COMMAND_LATCH_OVERFLOW	8030_{hex}
BACI_ERR_COMMAND_PROVIDED_BUFFER_TOO_SMALL	8031_{hex}
BACI_ERR_COMMAND_RECEIVE_LATCH_BUSY	8032_{hex}
BACI_ERR_COMMAND_CHECKSUM_MISMATCH	8033_{hex}
BACI_ERR_COMMAND_TYPE_ILLEGAL	8034_{hex}
BACI_ERR_COMMAND_PAKET_TOO_LONG	8035_{hex}
BACI_ERR_COMMAND_TOO_LONG	8036_{hex}
BACI_ERR_COMMAND_NUMBER_UNEXPECTED	8037_{hex}
BACI_ERR_COMMAND_UNEXPECTED_PAKET_NO	8038_{hex}
BACI_ERR_COMMAND_MISSING_PAKET_DATA	8039_{hex}
BACI_ERR_COMMAND_UNEXPECTED_PAKET_DATA	$803A_{hex}$
BACI_ERR_COMMAND_PAKET_TOO_SHORT	$803B_{hex}$
ERR_NIT_GENERAL	8040_{hex}
ERR_NIT_INIT_FAILED	8041_{hex}
ERR_NIT_NO_SUCH_OID	8042_{hex}
ERR_NIT_NO_OID_SIX_ENTRY	8043_{hex}
ERR_NIT_SIX_OUT_OF_RANGE	8044_{hex}
ERR_NIT_FBVALUE_LOW	8045_{hex}
ERR_NIT_FBVALUE_HIGH	8046_{hex}
ERR_NIT_PARAMVAL_LOW	8047_{hex}
ERR_NIT_PARAMVAL_HIGH	8048_{hex}
ERR_NIT_TO_MUCH_KPARAMS	8049_{hex}
ERR_NIT_ILLEGAL_KPARAM_DATATYPE	$804A_{hex}$

S0181 Manufacturer class 2 diagnosis

Display of error number of the b maXX®-controller (see parameter manual b maXX® basic unit, parameter **P0260** to **P0264**).

9.4 Error reset

In order to enable an controller, which was inhibited by an error message, the following must be executed via SERCOS:

- Read out status 1 diagnostic (▹S0011◃ and ▹S0129◃)
- Execute command for error acknowledge (CMD 0099)
- Inhibit and enable drive via SERCOS control word bits 14 and 15 (also see ▹Page 28◃)

9.5 Clearing the warnung bit

The warning bit (bit 12) in the drive status is set by changing the warning message class 2 diagnostic (▹S0012◃). After reading class 2 diagnostic (▹S0012◃) the status bit is cleared.

9.6 Clearing the message bit

The message bit (Bit 11) in the drive status is set by changing the warning message class 3 diagnostic (▹S0013◃). After reading class 3 diagnostic (▹S0013◃) the status bit is cleared.

APPENDIX A - DEFINITIONS AND ABBREVIATIONS

A.1 Definitions

The following definitions are valid for the programming manual:

- **Access procedure**:
  Procedure by which one station gains access to the network and transmits data.
- **Actual values**
  Measured process values.
- **Attenuation**:
  Fact that the optical power at the receiver is less than at the transmitter.
- **Bit stuffing**:
  Procedure by which after five logical 1s, the transmitter automatically inserts a zero which is then removed again by the receiver. This zero causes a change in signal edges which makes it possible for the receiver to retrieve a receiving clock (see ISO/IEC 3309).
- **Broadcast**:
  Transmission to all devices in a network without any acknowledgement by the receiver.
- **Coded character set**:
  Set of unambiguous rules that establish a character set and one-to-one relationship between the characters of the set and their representation by one or more bit combinations.
- **Communication cycle**:
  Accumulation of all telegrams between two master synchronization telegrams.
- **Control word**:
  Two adjacent bytes inside the master data telegram containing commands for the addressed drive.
- **Cycle time**:
  Time span between two consecutive cyclically recurring events.
- **Cyclic communication**:
  The periodic exchange of telegrams

- **Cyclic data**:
  The part of the telegram which does not change its meaning during cyclic operation.
- **Cyclic operation**:
  Devices in the communication network are addressed and queried one after the other at fixed, constant time intervals.
- **Data exchange - non cyclic (service channel)**:
  Transmission of information after a request was sent by the master.
- **Digital phase locked loop (DPLL)**:
  Circuit which retrieves the receiving clock from the received data stream.
- **Drive enable**:
  Command to close the control loop.
- **Drive On**:
  Command that the power stage can be activated.
- **Drive telegram (AT)**:
  Telegram send by the drive (slave).
- **Feedforward**:
  Setpoint used to compensate the lag in the control loop.
- **Fiber-optic cable**:
  Transmission medium for the serial data transmission of optical signals.
- **Fill signals**:
  Sequence of seven 1s followed by a 0.
- **F-SMA-connector**:
  Connector meeting the F-SMA standard in accordance with IEC 60874-2.
- **ISO/OSI-reference model**:
  Communication layers which are architecture guidelines for defining communication protocols (see ISO/IEC 7498)
- **Machine zero point**:
  Machine related point (in each axis) to which all position data are referred to.
- **Master data telegram (MDT)**:
  Telegram transmitted by the master sending data to the slaves in a single ring.
- **Master synchronization telegram (MST)**:
  Telegram transmitted by the master which sends a time synchronization signal to the slaves in a single ring.
- **Master**:
  Station which assigns the other stations in the ring (i. e. slaves) the right to transmit.
- **Non-cyclic transmission**:
  Non-cyclic data exchange of data at the request of the master.
- **NRZI** (No return to zero inverted) (**data coding**):
  Signal exchanges taking place only at regular, fixed points in time in synchronization with the transmitting clock pulse of the bit rate. A signal edge change is assigned to a logical 0 only.
- **Operating cycle**:
  Period of the control loop within the drive or the control unit.

- **Physical layer (bit transmission layer)**:
  First layer of the ISO-OSI reference model layers in which the bit transmission is defined.
- **Protocol**:
  Convention about the data formats , time sequences, and error correction in the data exchange of communication system.
- **Recovery of clock**:
  Sufficiently frequent alternation of the signal, which makes it possible for the receiver to retrieve the receiving clock from the data stream with the help of the phase locked loop.
- **Reference point**:
  Actual-system related point (in each axis) to which the actual values and setpoints are referred to after a homing procedure.
- **Repeater function**:
  Telegram that has been received is passed on cycle synchronous and logically unchanged to the next station on the ring.
- **Ring structure**:
  Network topology in which the transmission medium is routed from station to station in the form of a ring. The information is transmitted only in one direction.
- **Scaling parameters**:
  Scaling determines the significance of the transferred operation data.
- **Slave**
  Device in the ring which is assigned the right to transmit by the master.
- **Status word**:
  Two adjacent bytes inside the drive telegram containing status information.
- **System interface**:
  - Physical features of interface.
  - Protocol and access method.
  - Applications.
- **Telegram address field**:
  Address field (eight bits containing the address of the device.
- **Telegram delimiter**:
  Beginning- and ending identifiers of a telegram (eight bits: 01111110).
- **Telegram**
  Message
- **Topology**:
  Physical network architecture with respect to the connection between the stations of the communication system.
- **Transmission medium**:
  Collective term for the connection between the stations of a communication network (e. g. fiber optic cable).
- **Zero bit stream**:
  Consists exclusively of logical zeros which, in NRZI coding, results in a regular signal edge change on the transmission line (only used in test mode).

A.2 Abbreviations

In this programming manual the following abbreviations are used. Further abbreviations see manual **BM4-O-SER-01**- **(SERCOS slave module)** 5.04012 as well as in the manual according bmaXX® 4400.

AT	Drive telegram
BA	Operating mode
BACI	System-internal Baumüller interface
C1D	Error message of class 1 diagnostic
C2D	Message of class 2 diagnostic
C3D	Message of class 3 diagnostic
CP0	Communication phase 0
CP1	Communication phase 1
CP2	Communication phase 2
CP3	Communication phase 3
IDN	Parameter number
LSB	Least significant bit
MDT	Master data telegram
MST	Master send telegram
NC	Numerical control (also control unit or control)
T_1	Transmission time drive telegram
T_{1min}	Transmission starting time AT
T_3	Term valid for setpoint
T_4	Measuring time actual values
T_{4min}	Minimum actual value sensing time
T_{ATAT}	Transmit to transmit recovery time
T_{ATMT}	Transmit/receive transition time
T_{ATMT}	Transmit/receive transition time
T_{MTSG}	Set values processing time
T_{MTSY}	Receive to receive recovery time
T_{Ncyc}	Control unit cycle time
T_{Scyc}	SERCOS cycle time

B

APPENDIX B - LIST OF PARAMETERS

Also refer to ▹Structure of the parameters◃ on page 71.

Parameter		Range		Write-able	Lenght	Signifi-cance	b maXX®	Standard value	Page
S0001	NC-cycle time (T_{Ncyc})	250 to 65000 µs	-	- (CP3, CP4)	2 bytes	1:1	-	1000 µs	71
S0002	SERCOS cycle time (T_{Scyc})	250 to 65000 µs	-	- (CP3, CP4)	2 bytes	1:1	P0532	1000 µs	71
S0003	Transmit reaction time AT ($T_{1\ min}$)	- to -	-	-	2 bytes	1:1	-	80 µs	71
S0004	Transmit/receive transition time (t_{ATMT})	- to -	-	-	2 bytes	1:1	-	50 µs	71
S0005	Minimum feedback processing time (T_{4min})	- to -	-	-	2 bytes	1:1	-	10 µs	72
S0006	Transmit time drive telegram (T_1)	T_{1min} to T_{Scyc}	-	- (CP3, CP4)	2 bytes	1:1	-	80 µs	72
S0007	Feedback acquisition capture point (T4)	0 to T_{Scyc}	-	- (CP3, CP4)	2 bytes	1:1	-	50 µs	72
S0008	Setpoint valid time (T_3)	0 to T_{Scyc}	-	- (CP3, CP4)	2 bytes	1:1	-	510 µs	73
S0009	Position of data record in MDT	1 to 65534	-	- (CP3, CP4)	2 bytes	1:1	-	1	73
S0010	Length MDT	4 to 65531	-	- (CP3, CP4)	2 bytes	-	-	4	73
S0011	Class 1 diagnostic	- to -	-	-	2 bytes	-	-	0	74
S0012	Class 2 diagnostic	- to -	-	-	2 bytes	-	-	0	75
S0013	Class 3 diagnostic	- to -	-	-	2 bytes	-	-	0	76
S0014	Interface status	- to -	-	-	2 bytes	-	-	0	77
S0015	Telegram type	- to -	-	- (CP3, CP4)	2 bytes	-	-	3	78
S0016	Configuration list AT	- to -	-	- (CP3, CP4)	2 bytes, variable	-	-	*	78
S0017	IDN list of all operation data	- to -	-	-	2 bytes, variable	-	-	-	78
S0018	IDN list of all operating data comm. phase 2	- to -	-	-	2 bytes, variable	-	-	*	78
S0019	IDN list of operation data comm. phase 3	- to -	-	-	2 bytes, variable	-	-	*	79

Parameter		Range		Write-able	Lenght	Signifi-cance	b maXX®	Standard value	Page
S0020	IDN list of all operation mode comm. phase 4	- to -	-	-	2 bytes, variable	-	-	*	79
S0021	IDN list operation data comm. phase 2	- to -	-	-	2 bytes, variable	-	-	*	79
S0022	IDN list invalid operation data comm. phase 3	- to -	-	-	2 bytes, variable	-	-	*	79
S0023	IDN list invalid operation data comm. phase 4	- to -	-	-	2 bytes, variable	-	-	*	79
S0024	Configuration list MDT	- to -	-	- (CP3, CP4)	2 bytes, variable	-	-	*	80
S0025	IDN list of all commands	- to -	-	-	2 bytes, variable	-	-	*	80
S0026	Configuration list signal-status word	- to -	-	- (CP3, CP4)	2 bytes, variable	-	-	*	80
S0027	Configuration list signal control word	- to -	-	- (CP3, CP4)	2 bytes, variable	-	-	*	80
S0028	MST error counter	0 to 65535	-	-	2 bytes	1:1	-	0	81
S0029	MDT error counter	0 to 65535	-	-	2 bytes	1:1	-	0	81
S0030	Manufacturer version	- to -	-	-	2 bytes		-	*	81
S0032	Primary operation mode	- to -	-	- (CP4)	2 bytes	1:1	-	2	81
S0033	Secondary operation mode 1	- to -	-	- (CP4)	2 bytes	1:1	-	2	81
S0034	Secondary operation mode 2	- to -	-	- (CP4)	2 bytes	1:1	-	2	82
S0035	Secondary operation mode 3	- to -	-	- (CP4)	2 bytes	1:1	-	2	82
S0036	Speed setpoint	-2^{31} to $+2^{31}$ -1	CW	x	4 bytes	G	P1171 / P1179	0	82
S0037	Speed setpoint additive	-2^{31} to $+2^{31}$-1	CW	x	4 bytes	G	P1040	0	82
S0038	Speed limit value positive	0 to $+2^{31}$-1	-	x	4 bytes	G	P1041	0	83
S0039	Speed limit value negative	-2^{31} to 0	-	x	4 bytes	G	P1042	0	83
S0040	Speed actual value	-2^{31} to $+2^{31}$-1	-	-	4 bytes	G	P0353	0	83
S0041	Homing speed	-2^{31} to $+2^{31}$-1	CW	x	4 bytes	G	P1201	0	83
S0042	Homing acceleration	0 to $+2^{31}$ -1	CW	x	4 bytes	B	P1203	0	83
S0043	Speed polarities	- to -	-	- (CP4)	2 bytes	-	-	0	84
S0044	Scaling method for speed data	- to -	-	- (CP4)	2 bytes	-	-	A_{hex}	85
S0045	Scaling factor for speed data	1 to $+2^{16}$-1	-	- (CP4)	2 bytes	-	-	1	85
S0046	Scaling exponent speed data	-9 to 3	-	- (CP4)	2 bytes	-	-	-4	86
S0047	Position setpoint	-2^{31} to $+2^{31}$ -1	CW	x	4 bytes	L	P0370	0	86
S0048	Position setpoint additive	-2^{31} to $+2^{31}$ -1	CW	x	4 bytes	L	-	0	86
S0049	Positive position limit value	-2^{31} to $+2^{31}$ -1	-	x	4 Bytes	L	P1196	0	86
S0050	Negative position limit value	-2^{31} to $+2^{31}$ -1	-	x	4 Bytes	L	P1197	0	87
S0051	Position actual value 1 (motor encoder)	-2^{31} to $+2^{31}$ -1	-	-	4 bytes	L	P0391, P0392	0	87
S0052	Reference distance 1	-2^{31} to $+2^{31}$ -1	-	x	4 bytes	L	P1200	0	87
S0053	Position actual value 2 (external encoder)	-2^{31} to $+2^{31}$ -1	-	-	4 bytes	L	P0401, P0402	0	87
S0054	Reference distance 2	-2^{31} to $+2^{31}$ -1	-	x	4 bytes	L	P1200	0	88
S0055	Position polarities	- to -	-	- (CP4)	2 bytes	-	-	0	88
S0057	Position window	0 to $+2^{31}$ -1	-	x	4 bytes	L	P1194	0	89
S0058	Reversal clearance	0 to $+2^{31}$ -1	-	x	4 bytes	L	P1194	0	89

Parameter		Range		Write-able	Lenght	Signifi-cance	b maXX®	Standard value	Page
S0076	Method of scaling for position data	- to -	-	- (CP4)	2 bytes	-	-	A_{hex}	90
S0077	Scaling factor translatory position data	1 to $+2^{31}$-1	-	- (CP4)	2 bytes	-	-	1	90
S0078	Scaling exponent translatory position data	-9 to +3	-	- (CP4)	2 bytes	-	-	-7	91
S0079	Rotational position resolution	1 to $+2^{31}$-1	-	- (CP4)	4 bytes	-	-	$36*10^5$	91
S0080	Torque setpoint	-2^{15} to $+2^{15}$-1	CW	x	2 bytes	D	P0331	0	91
S0081	Torque setpoint additive	-2^{15} to $+2^{15}$-1	CW	x	2 bytes	D	P1022	0	91
S0082	Torque limit value positive	0 to $+2^{15}$ -1	CW	x	2 bytes	D	P3309	$7FFF_{hex}$	92
S0083	Torque limit value negative	-2^{15} to 0	CW	x	2 bytes	D	P3310	4096_{hex}	92
S0084	Torque actual value	- to -	-	-	2 bytes	D	P0344	0	92
S0085	Torque polarities	- to -	-	- (CP4)	2 bytes	-	-	0	93
S0086	Scaling method for torque data	- to -	-	- (CP4)	2 bytes	-	-	A_{hex}	94
S0087	Transmit to transmit recovery time (t_{ATAT})	- to -	-	-	2 bytes	-	-	0	94
S0088	Receive to receive recovery time (T_{MTSY})	- to -	-	-	2 bytes	-	-	80	94
S0089	MDT transmission starting time (T_2)	0 to T_{scyc}	-	- (CP3, CP4)	2 bytes	1:1	-	0	95
S0090	Proceeding time setpoints (T_{MTSG})	- to -	-	-	2 bytes	1:1	-	80	95
S0091	Bipolar speed limit value	0 to 2^{31} -1	CW	x	4 bytes	G	P1042, P1041	0	95
S0092	Bipolar torque limit value	0 to 2000	CW	x	2 bytes	D	P0357	0	95
S0093	Scaling factor torque data	1 to $+2^{16}$-1	-	- (CP4)	2 bytes	-	-	1	95
S0094	Scaling exponent torque data	-9 to +3	-	- (CP4)	2 bytes	-	-	-2	96
S0095	Diagnostic message	- to -	-	-	1 byte, variable	-	-	0	96
S0096	Slave arrangement (SLKN)	- to -	-	-	2 bytes	-	-	0 *	96
S0097	Mask class 2 diagnostic	- to -	-	x	2 bytes	-	-	0	97
S0098	Mask class 3 diagnostic	- to -	-	x	2 bytes	-	-	0	97
S0099	Reset class 1 diagnostic	- to -	-	x	2 bytes	-	-	0	97
S0100	Speed controller proportional gain	0 to $0FFFF_{hex}$	-	x	2 bytes	-	P1032	1	97
S0101	Speed controller integral action time	0 to 20000_{hex}	-	x	2 bytes	10:1	P1033	1000	98
S0103	Modulo value	1 to $+2^{31}$ -1	-	- (CP4)	4 bytes	L	-	$36*10^5$	98
S0104	Position controller Kv factor	0 to $0FFFF_{hex}$	-	x	2 bytes	100:1	P1051	1000	98
S0106	Current controller proportional gain 1	1 to $0FFFF_{hex}$	-	x	2 bytes	1:1	P1020	1000	98
S0107	Current controller integral action time 1	0 to $0FFFF_{hex}$	-	x	2 bytes	1:1	P1021	1000	98
S0108	Feedrate override	0 to $0FFFF_{hex}$	CW	-	2 bytes	100:1	P1219	0	98
S0109	Motor peak current	0 to 2^{32}-1	-	- (CP4)	4 bytes	1000:1	P0069	0	99
S0110	Amplifier peak current	0 to 2^{32}-1	-	-	4 bytes	1000:1	P0011, P0013	0	99
S0112	Nominal current amplifier	0 to 2^{32}-1	-	-	4 bytes	1000:1	P0010, P0012	0	99
S0113	Maximum motor speed	0 to 2^{31}-1	-	- (CP4)	4 bytes	$1*10^4$:1	P1031	$3*10^7$	99
S0114	Load limit of the motor	0 to 25395	-	-	2 bytes	-	P0092	0	99
S0121	Input speed gear	1 to 2^{32}-1	-	(CP4)	4 bytes	-	-	1	100

Parameter		Range		Write-able	Lenght	Signifi-cance	b maXX®	Standard value	Page
S0122	Output speed gear	1 to 2^{32}-1	-	(CP4)	4 bytes	-	-	1	100
S0123	Feed constant	1 to 2^{32}-1	-	(CP4)	4 bytes	-	-	10000	100
S0124	Standstill window	0 to 2^{31}-1	-	x	4 bytes	G	P1073, P1083	0	100
S0125	Speed threshold n_x	0 to 2^{31}-1	-	x	4 bytes	G	P1074, P1084	0	100
S0127	CP3 transition check	- to -	-	- (CP3, CP4)	2 bytes	-	-	0	101
S0128	CP4 transition check	- to -	-	- (CP2, CP3, CP4)	2 bytes	-	-	0	101
S0129	Manufacturer class 1 diagnostic	- to -	-	-	2 bytes	-	-	0	101
S0130	Probe value 1 positive edge	-2^{31} to $+2^{31}$ -1	-	-	4 bytes	L	P0581, P0582	0	101
S0131	Probe value 1 negative	-2^{31} to $+2^{31}$ -1	-	-	4 bytes	L	P0582, P0583	0	102
S0132	Probe value 2 positive edge	-2^{31} to $+2^{31}$ -1	-	-	4 bytes	L	P0585, P0586	0	102
S0133	Probe value 2 negative	-2^{31} to $+2^{31}$ -1	-	-	4 bytes	L	P0587, P0588	0	102
S0134	Master control word	- to -	-	-	2 bytes	-	-	0	102
S0135	Drive status	- to -	-	-	2 bytes	-	-	0	102
S0139	Parking axis command	-to -		- (CP2, CP3)	2 bytes	-	-	0	103
S0140	Controller type	- to -	-	-	1 byte, variable	-	-	-	103
S0141	Motor type	- to -	-	- x	1 byte, variable	-	- P0050	-	103
S0142	Application type	- to -	-	-	1 byte, variable	-	-	-	103
S0143	SERCOS interface version	- to -	-	-	1 byte, variable	-	-	-	103
S0144	Status word message	- to -	-	-	2 bytes, variable	-	-	0	104
S0145	Message control word	- to -	CW	x	2 bytes, variable	-	-	0	104
S0146	Command NC controlled homing	- to -	-	- (CP2, CP3)	2 bytes	-	-	0	104
S0147	Homing parameter	- to -	-	x	2 bytes	-	-	0	105
S0148	Command drive-controlled homing	- to -	-	- (CP2, CP3)	2 bytes	-	-	0	106
S0150	Reference offset 1	-2^{31} to $+2^{31}$ -1	-	x	4 bytes	L	-	0	106
S0151	Reference offset 2	-2^{31} to $+2^{31}$ -1	-	x	4 bytes	L	-	0	107
S0152	Spindle positioning command	- to -		(CP2, CP3)	2 bytes	-	-	0	107
S0153	Spindle angle position	-2^{31} bis 2^{31}-1	-	x	4 bytes	L	P1426	0	108
S0154	Spindle positioning parameter	- to -	-	x	2 bytes	L	-	0	108
S0155	Friction torque compensation	0 to 2^{15} -1	-	x	2 bytes	D	P3384	0	109
S0157	Speed window	0 to $+2^{31}$ -1	CW	x	4 bytes	G	P1043	0	109

Parameter		Range		Write-able	Lenght	Signifi-cance	b maXX®	Standard value	Page
S0159	Monitoring window	0 to $+2^{31}$ -1	CW	x	4 bytes	L	P1054, P1055	0	109
S0160	Scaling type for acceleration data	- to -	-	- (CP4)	2 bytes	-	-	A_{hex}	110
S0161	Acceleration data scaling factor	1 to 2^{16}-1	-	- (CP4)	2 bytes	-	-	1	110
S0162	Acceleration data scaling exponent	-9 to 3	-	- (CP4)	2 bytes	-	-	-3	111
S0167	Frequency limit of encoder 1	1 to 2^{32}-1	-	x	4 bytes	1:1	-	0	111
S0168	Frequency limit of encoder 2	1 to 2^{32}-1	-	x	4 bytes	1:1	-	0	111
S0169	Probe control parameter	- to -	-	x	2 bytes	-	-	0	112
S0170	Probe cycle procedure command	- to -	-	- (CP2)	2 bytes	-	-	0	112
S0171	Calculate displacement procedure command	- to -	-	- (CP2, CP3)	2 bytes	-	-	0	113
S0172	Displacement to the referenced system command	- to -	-	- (CP2, CP3)	2 bytes	-	-	0	113
S0173	Marker position A	-2^{31} to 2^{31}-1	-	-	4 bytes	L	-	0	114
S0174	Marker position B	-2^{31} to 2^{31}-1	-	-	4 bytes	L	-	0	114
S0175	Displacement parameter 1	-2^{31} to 2^{31}-1	-	-	4 bytes	L	-	0	114
S0176	Displacement parameter 2	-2^{31} to 2^{31}-1	-	-	4 bytes	L	-	0	115
S0177	Absolute offset 1	-2^{31} to 2^{31}-1	-	-	4 bytes	L	-	0	115
S0178	Absolute offset 2	-2^{31} to 2^{31}-1	-	-	4 bytes	L	-	0	115
S0179	Probe status	- to -	-	-	2 bytes	-	-	0	115
S0180	Spindle positioning relative offset	-2^{31} to 2^{31}-1	-	x	4 bytes	L	P1430	0	116
S0181	Manufacturer class 2 diagnostic	- to -	-	-	2 bytes	-	-	0	116
S0182	Manufacturer class 3 diagnostic	- to -	-	-	2 bytes	-	-	0	116
S0185	Length of the configurable data record in the AT	- to -	-	-	2 bytes	-	-	20	117
S0186	Length of the configurable data in the MDT	- to -	-	-	2 bytes	-	-	20	117
S0187	IDN list of the configurable data in the AT	- to -	-	-	2 bytes, variable	-	-	*	117
S0188	IDN list of the configurable data in the MDT	- to -	-	-	2 bytes, variable	-	-	*	117
S0189	Following error	-2^{31} to 2^{31}-1	-	-	4 bytes	L	P0367	0	117
S0192	IDN list of backup operation data	- to -	-	- (CP3, CP4)	2 bytes, variable	-	-	*	118
S0193	Positioning jerk	0 to 232-1	-	x	4 bytes	-	P605	0	118
S0196	Nominal current motor	0 to $+2^{31}$-1	-	x	4 bytes	1000:1	P0054	0	118
S0197	Set coordinate system procedure command	- to -	-	- (CP2, CP3)	2 bytes	-	-	0	119
S0198	Initial coordinate value	-2^{31} to $+2^{31}$-1	-	x	4 bytes	L	-	0	119
S0200	Amplifier warning temperature	0 to 150	-	x	2 bytes	1:1	-	0	119
S0201	Motor warning temperature	80 to 250	-	x	2 bytes	1:1	P0088	125	119
S0202	Cooling error warning temperature	0 to 125	-	x	2 bytes	1:1	P0016	75	120
S0203	Amplifier shutdown temperature	0 to 150	-	x	2 bytes	1:1	-	0	120
S0204	Motor shutdown temperature	80 to 250	-	x	2 bytes	1:1	P0090	150	120
S0205	Cooling error shutdown temperature	0 to 125	-	x	2 bytes	1:1	P0017	(dependent on the power unit)	120

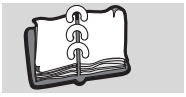
Parameter		Range		Write-able	Lenght	Signifi-cance	b maXX®	Standard value	Page
S0206	Drive on delay	0 to 6553.5	-	x	2 bytes	0.1 ms	1406	0	120
S0207	Drive off delay	0 to 6553,5	-	x	2 bytes	0.1 ms	1405	0	120
S0208	Temperature data scaling type	- to -	-	- (CP4)	2 bytes	1:1	-	0	121
S0217	Parameter set preselection	- to -	-	-	2 bytes	1:1	-	0	121
S0219	IDN–list of parameter set	- to -	-	-	2 bytes	1:1	-	0	121
S0222	Spindle positioning speed	0 to +231-1	-	x	4 bytes	10^{-4} min^{-1} 1:10000	P1427	0	121
S0254	Actual parameter set	- to -	-	-	2 bytes	-	-	0	122
S0258	Target position	-231 to 231-1	CW	x	4 bytes	L	P0600	0	122
S0259	Positioning speed	-231 to 231-1	CW	x	4 bytes	G	P0602	0	122
S0260	Positioning acceleration	0 to 232-1	CW	x	4 bytes	B	P0603	0	123
S0261	Coarse positioning window	0 to 232-1	-	x	4 bytes	L	P1194	0	123
S0262	Load default values command	- to -	-	- (CP3, CP4)	2 bytes	-	-	0	123
S0263	Load working memory command	- to -	-	- (CP3, CP4)	2 bytes	-	-	0	123
S0264	Backup working memory command	- to -	-	- (CP3, CP4)	2 bytes	-	-	0	124
S0265	Language selection	- to -	-	x	2 bytes	-	-	0	124
S0266	List of available languages	- to -	-	-	2 bytes, variable	-	-	0	124
S0272	Speed window percentage	0 to 65535	CW	x	2 bytes	100:1	P1043	0	124
S0274	Received drive addresses	- to -	-	-	2 bytes, variable	-	-	0, 254, 0, 0	124
S0300	Real-time control bit 1	- to -	-	x	2 bytes	-	-	-	125
S0301	Allocation of real-time control bit 1	0 to 65535	-	x	2 bytes	-	-	-	125
S0302	Real-time control bit 2	- to -	-	x	2 bytes	-	-	-	125
S0303	Allocation of real-time control bit 2	0 to 65535	-	x	2 bytes	-	-	-	125
S0304	Real-time status bit 1	- to -	-	-	2 bytes	-	-	-	126
S0305	Allocation of real-time status bit 1	0 to 65535	-	x	2 bytes	-	-	-	126
S0306	Real-time status bit 2	- to -	-	-	2 bytes	-	-	-	126
S0307	Allocation of real-time status bit 2	0 to 65535	-	x	2 bytes	-	-	-	126
S0310	Overload warning	- to -	-	-	2 bytes	-	-	-	127
S0311	Amplifier overtemperature warning	- to -	-	-	2 bytes	-	-	-	127
S0312	Motor overtemperature warning	- to -	-	-	2 bytes	-	-	-	127
S0313	Cooling error warning	- to -	-	-	2 bytes	-	-	-	128
S0315	Positioning velocity > n_{Limit}	- to -	-	-	2 bytes	-	-	-	128
S0323	Target position outside the travel range	- to -	-	-	2 bytes	-	-	-	129
S0330	Status $n_{actual} = n_{set}$	- to -	-	-	2 bytes	-	-	-	129
S0331	Status $n_{actual} = 0$	- to -	-	-	2 bytes	-	-	-	130
S0332	Status $n_{actual} < n_x$	- to -	-	-	2 bytes	-	-	-	130
S0334	Status $Md \geq Md_{limit}$	- to -	-	-	2 bytes	-	-	-	131
S0335	Status $n_{soll} \geq n_{limit}$	- to -	-	-	2 bytes	-	-	--	131
S0336	Status In position	- to -	-	-	2 bytes	-	-	-	131
S0341	Status In coarse position	- to -	-	-	2 bytes	-	-	-	132

Parameter		Range		Write-able	Lenght	Signifi-cance	b maXX®	Standard value	Page
S0342	Target position reached	- to -	-	-	2 bytes	-	-	-	132
S0346	Control word positioning	- to -	-	x	2 bytes	-	-	-	133
S0359	Positioning deceleration	0 to 231-1	CW	x	4 bytes	-	P0604	0	133
S0373	List of service channel error	- to -	-	-	4 bytes, variable	-	-	-	133
S0374	List command error	- to -	-	-	4 bytes, variable	-	-	-	134
S0375	List diagnostic number	- to -	-	-	4 bytes, variable	-	-	-	134
S0376	Baud rate	- to -	-	-	2 bytes	-	-	$010F_{hex}$	134
S0383	Motor temperature	-30 to 250	-	-	2 bytes	1:1	P0503	0	135
S0384	Amplifier temperature	0 to 250	-	-	2 bytes	1:1	P0481	0	135
S0393	Setpoint setting mode	- to -	-	x	2 bytes	-	-	0	135
S0400	Home switch	- to -	-	-	2 bytes	-	-	0	135
S0401	Probe 1	- to -	-	-	2 bytes	-	-	0	136
S0402	Probe 2	- to -	-	-	2 bytes	-	-	0	136
S0403	Status position actual values	- to -	-	-	2 bytes	-	-	0	137
S0404	Status position setpoints	- to -	-	-	2 bytes	-	-	0	137
S0405	Probe 1 enable	- to -	CW	x	2 bytes	-	-	0	138
S0406	Probe 2 enable	- to -	CW	x	2 bytes	-	-	0	138
S0407	Homing enable	- to -	-	x	2 bytes	-	-	0	138
S0408	Reference marker latched	- to -	-	-	2 bytes	-	-	0	139
S0409	Probe 1 positive latched	- to -	-	-	2 bytes	-	-	0	139
S0410	Probe 1 negative latched	- to -	-	-	2 bytes	-	-	0	140
S0411	Probe 2 positive latched	- to -	-	-	2 bytes	-	-	0	140
S0412	Probe 2 negative latched	- to -	-	-	2 bytes	-	-	0	141
S0419	Positioning acknowledgment	- to -	-	-	2 bytes	-	-	0	141
S0430	Active target position	-231 to +231-1	-	-	4 bytes	-	-	-	142
S0437	Positioning status	- to -	-	-	2 bytes	-	-	0	142
S0438	Vendor name	- to -	-	-	-	-	-	*	143
S0439	Vendor code	- to -	-	-	4 bytes	-	-	346	143

Table of figures

Table of figures

Index



Index

Revision survey

Version	Status	Changes
5.04013.03	08.02.2011	BM4-O-ECT-01-01-xx added.
5.04013.04	13.01.2017	Amendments to chapter 5.4: Configuration parameter in the controller

Notes:

be in motion

Baumüller Nürnberg GmbH Ostendstraße 80-90 90482 Nürnberg T: +49(0)911-5432-0 F: +49(0)911-5432-130 **www.baumueller.de**