# AG25, AG26

## Actuator with ETHERNET POWERLINK interface

User manual

305/15

## Table of contents

# 1 General Information

## 1.1 Documentation

The following documents are associated with this product:

¶ Product data sheet; describes the technical data, the dimensions, the pin assignment, the accessories and the order key.

¶ Installation instructions, describe the mechanical and electrical installation with all safety-relevant conditions and the associated technical specifications.

¶ User manual describing the migration of the actuator into an Industrial Ethernet network and its commissioning.

These documents can also be found at *http://www.siko-global.com/de-de/service-downloads*.

# 2 Display and operating elements

## 2.1 General Information

The drive has various LEDs that indicate the statuses of the drive and of the Ethernet module. The operating elements are located below the cover.

## 2.2 Displays

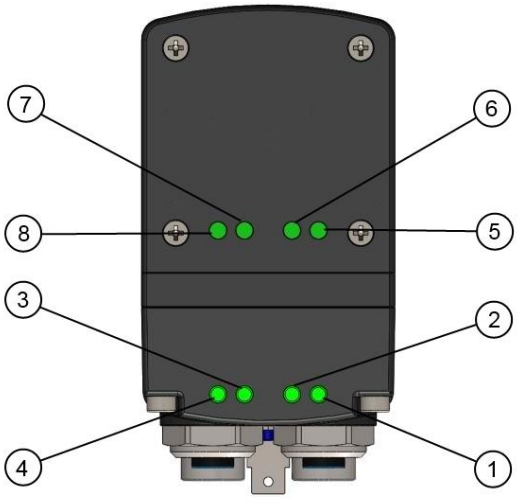


*Fig. 1: Displays*

### 2.2.1 Ethernet module statuses

The ¡, ¢, £, ¤ LEDs inform about the status of the Ethernet module. The Ethernet module LEDs' function are permanently defined and cannot be changed.

| LED | Description |
|---|---|
| 1 | ERROR LED |
| 2 | Link/Activity LED Port 2 |
| 3 | Link/Activity LED Port 1 |
| 4 | STATUS LED |

#### 2.2.1.1 ERROR LED 1

| LED state | Description |
|---|---|
| Off | No error or No operating voltage |
| Red | A Non-fatal error has occurred if the STATUS LED is Not red.<br>A fatal error has occurred if the STATUS LED is red. |

#### 2.2.1.2 Link/Activity LED 2, 3

| LED state | Description |
|---|---|
| Off | No connection or No operating voltage |
| Green | Connection detected, No activity |
| Green, flickering | Connection detected, activity |

#### 2.2.1.3 STATUS LED 4

| LED state | Description |
|---|---|
| Off | No error or No operating voltage |
| Green, quickly flashing[a] | No Powerlink traffic detected |
| Green, flashing 1x | NMT_CS_PRE_OPERATIONAL_1<br>Only asynchronous data |
| Green, flashing 2x | NMT_CS_PRE_OPERTIOANL_2<br>Asynchronous and synchronous data<br>No PDO data |
| Green, flashing 3x | NMT_CS_READY_TO_OPERATE<br>Ready to operate |
| Green | NMT_CS_OPERATIONAL<br>In operation<br>PDO data is sent and received. |
| Green, slowly flashing[b] | Module stopped (e.g. for controlled shutdown)<br>No PDO data |
| Red | A fatal event has occurred if the ERROR LED is also red |

a. 50 ms On, 50 ms Off
b. 200 ms On, 200 ms Off

### 2.2.2 Drive status

In factory setting, the ¥, ¦, §, ¨ LEDs inform about the drive's status.
The function of the drive status LEDs can be configured.

#### 2.2.2.1 Status LED 5

LED statuses valid with factory setting.

| LED state | Description |
|---|---|
| Green | Operating voltage applied to control, No fault |
| Red, flashing | Operating voltage applied to control, active fault |
| Off | Operating voltage of control missing |

#### 2.2.2.2 Status LEDs 6, 7

LED statuses valid with factory setting.

| LED state | Description |
|---|---|
| Off | No function |

### 2.2.2.3 Status LED 8

| | |
|---|---|
| **NOTICE** | If the actual value is unequal 0 after switching on the module and if it is outside the programmed positioning window, then the LED status is “red” or “red, flashing” due to volatile storage of the setpoint. The setpoint is initialized with the value 0 after switching on. |

LED statuses valid with factory setting.

| LED state | Description |
|---|---|
| Green | Actuator is within the programmed positioning window.<br>Operating voltage of the output stage is applied. |
| Green, flashing | Actuator is within the programmed positioning window.<br>Operating voltage of output stage is missing |
| Red | Actuator is outside the programmed positioning window.<br>Operating voltage of the output stage is applied. |
| Red, flashing | Actuator is outside the programmed positioning window.<br>Operating voltage of output stage is missing |
| Off | Operating voltage of control missing |

## 2.3 Operating elements

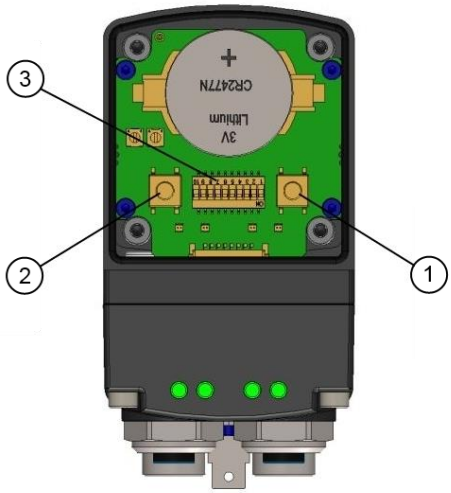


*Fig. 2: Operating elements*

### 2.3.1 Operating keys

| | |
|---|---|
| **NOTICE** | Manual setup operation is only available if there is No process data exchange |

Manual setup mode (corresponding to inching mode 2) can be started by means of the operator keys. This makes it possible to move the actuator without a superordinate control.

Key ¡ : Inching mode 2 in e direction

Key ¢: Inching mode 2 in i direction

### 2.3.2 DIP switch:

| | |
|---|---|
| **NOTICE** | The DIP switch is only read while the control's operating voltage is switched on. Therefore, any change takes effect only after power-on reset of the control's operating voltage. |

| Switch 4 | Assignment |
|---|---|
| SW1-SW8 | Setting of Powerlink Node ID in binary format,<br>admissible Node IDs for controlled Nodes (CN) 1 … 239 |
| SW9-SW10 | No function, always off |

| SW1 | SW2 | SW3 | SW4 | SW5 | SW6 | SW7 | SW8 | Powerlink Node ID |
|---|---|---|---|---|---|---|---|---|
| OFF | OFF | OFF | OFF | OFF | OFF | OFF | OFF | 0 |
| ON | OFF | OFF | OFF | OFF | OFF | OFF | OFF | 1 |
| OFF | ON | OFF | OFF | OFF | OFF | OFF | OFF | 2 |
| … | … | … | … | … | … | … | … | … |
| OFF | ON | ON | ON | ON | ON | ON | ON | 254 |
| ON | ON | ON | ON | ON | ON | ON | ON | 255 |

## 3 Digital inputs and outputs

The actuator has four configurable digital inputs and one configurable digital output.

Function and switching behavior can be set.

No function has been assigned to the digital inputs in the factory setting.

The logical status of the digital inputs is mapped in the process data independent of the assigned function.

If a function was assigned to the digital input, the function's conditions of the digital inputs can be read in the register Digital Input Functionalities State (Object 2405h).

With factory settings, the digital output can be actuated via the process data.

If a function is assigned to the digital output, it is actuated via register Digital Output Functionalities State (Object 2302h).

## 3.1 Examples of digital input configurations

The following configuration deviates from the factory setting and requires parameterization by the user.

¶ Digital input 1: Limit switch 1 (low-active) proximity switch DC PNP NC

¶ Digital input 2: Limit switch 2 (low-active) proximity switch DC PNP NC

¶ Digital input 3: Inching mode 2 positive travel direction (high-active) pushbutton

¶ Digital input 4: Inching mode 2 negative travel direction (high-active) pushbutton

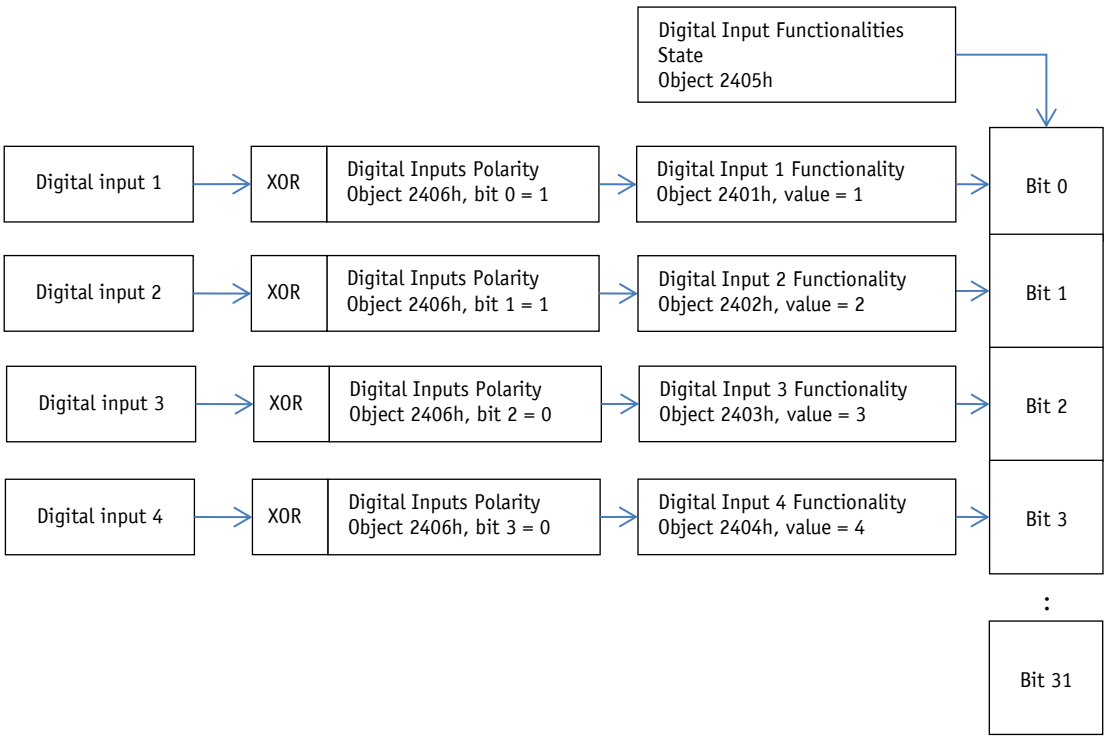


*Fig. 3: Examples of digital input configurations*

## 3.2 Example of digital output configuration

¶ Digital output 1: Inpos (high-active)

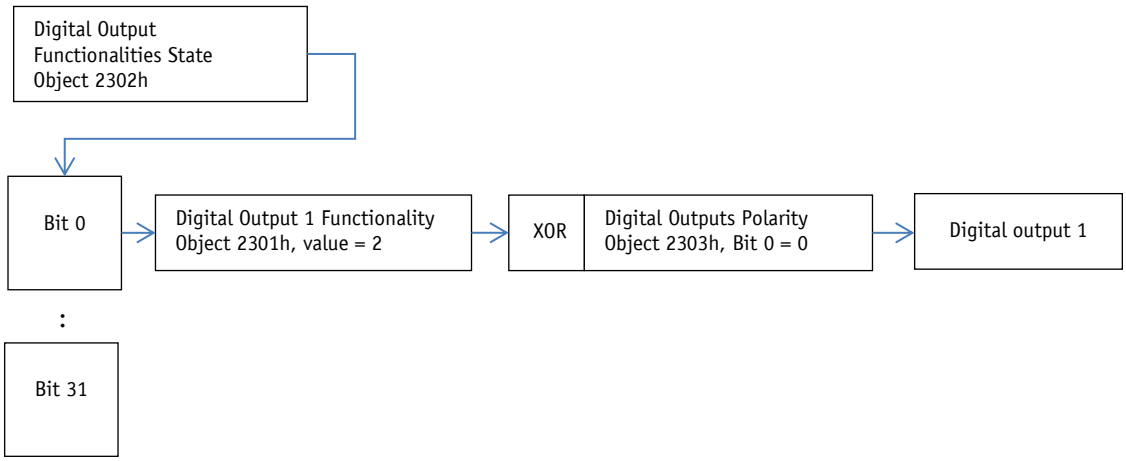


*Fig. 4: Example of digital output configuration*

# 4 Functional description

## 4.1 Control of the drive

The drive can be moved manually via the keys or digital inputs without upstream control. The drive can be controlled and configured in the bus mode and via the service interface.

### 4.1.1 Operating modes

The following operating modes are distinguished: positioning mode and speed mode. In the positioning mode there is the additional option of traveling in the inching mode. The position control mode can be started via the digital inputs independent of the operating mode chosen.

#### 4.1.1.1 Positioning mode

In the positioning mode, positioning to the specified set point is executed by means of a ramp function (*see* Fig. 5: Ramp travel, direct positioning mode) calculated on the basis of the actual position as well as the programmed controller parameters P (proportional factor), I (integral factor), D (differential factor), acceleration and velocity.

Upon activation of the travel order, the actuator accelerates to the specified speed with the acceleration programmed. The measure of delay to the setpoint is defined by the parameter A-Pos (Object 2604h) as well.

Alternately, a value deviating from acceleration can be chosen for delay by means of parameter D-Pos (Object 2606h).

Changing controller parameters during a positioning process does not influence the current positioning operation.

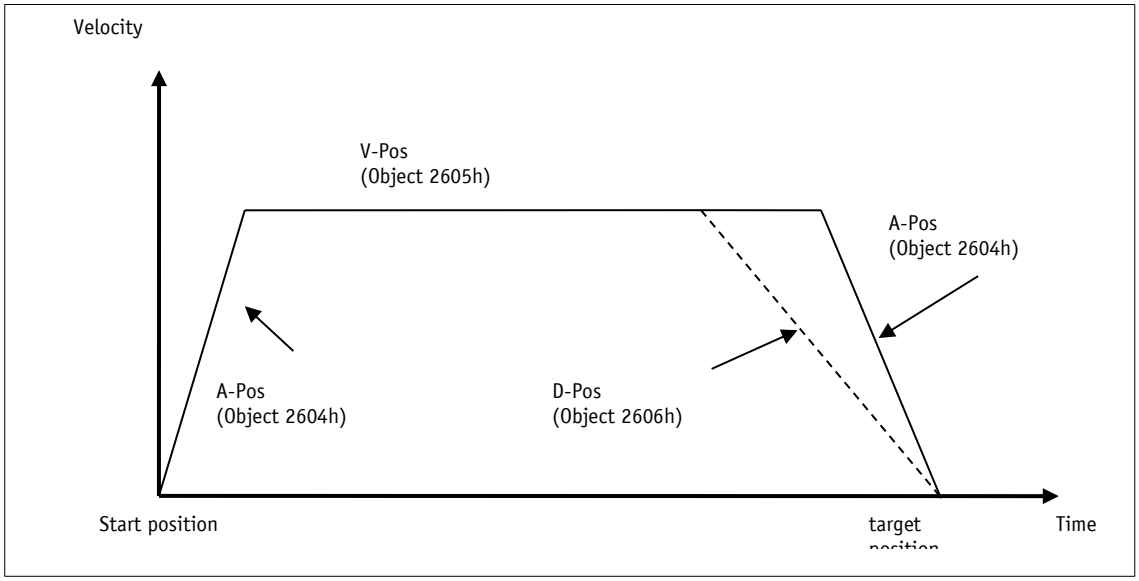


*Fig. 5: Ramp travel, direct positioning mode*

The status word indicates whether the actual position is within the window defined by parameter Pos Window (Object 260Ah). You can define the behavior of the actuator upon reaching the programmed window via parameter Inpos Mode (Object 2616h).

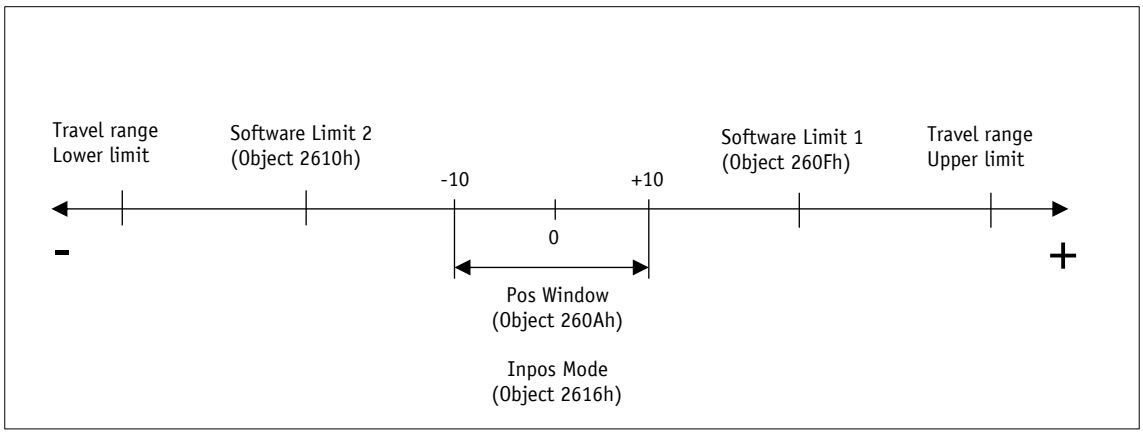


*Fig. 6: Positioning mode*

The max. travel range depends on gear and scaling. The number of revolutions specified in the product data sheet must not be exceeded.

#### 4.1.1.1.1 Loop positioning

| | |
|---|---|
| **NOTICE** | A travel order will Not be executed if a loop positioning would exceed the limiting values specified by parameters Software Limit 1 (Object 260Fh) and Software Limit 2 (Object 2610h) although the setpoint is within the limiting values. |

If the actuator is operated on a spindle or an additional gear, the spindle or external gear backlash can be compensated by means of loop positioning. In this case, traveling to the target value is always from the same direction. This travel direction can be determined via parameter Pos Type (Object 2613h). The loop length is set via parameter Loop Length (Object 2617h).

Example:

The direction from which every target position shall be driven to is positive.

Case 1 Ý new position is greater than actual position:

Direct travel to target position

Case 2 Ý new position is smaller than actual position:

The actuator drives beyond the target position by the loop length; afterwards, the set point is approached in positive direction.

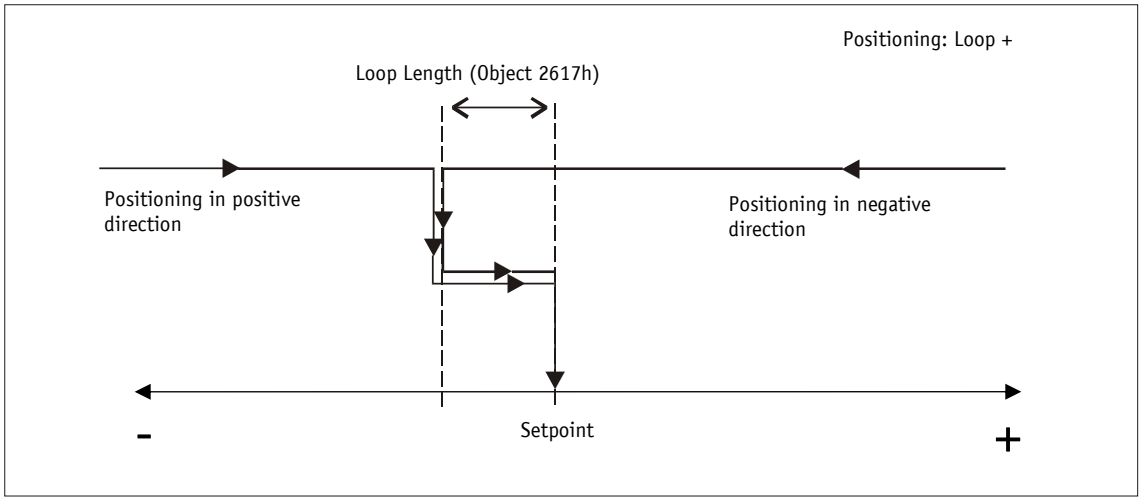


*Fig. 7: Loop+ positioning*

#### 4.1.1.2 Inching mode

| | |
|---|---|
| NOTICE | There is No compensation for spindle backlash (loop positioning) in this operating mode. |

Inching mode is enabled in the positioning mode only. You can program acceleration as well as speed in the inching mode via parameters.

##### 4.1.1.2.1 Inching mode 1

| | |
|---|---|
| NOTICE | If the Spindle pitch parameter is programmed to zero, then the traveling distance occurs by increments. If Spindle pitch is unequal zero, then the information of the Delta Tipp parameter refers to the travel distance in 1/100 mm. |

| | |
|---|---|
| NOTICE | If the actual position is outside the programmed limiting values, then traveling from this position in the respective direction must be performed by means of inching mode 1 or 2! |

The drive travels once from the current actual position by the value Delta Inch (Object 2611h) depending on the mathematical sign of the value entered.

Delta Inch < 0: negative travel direction

Delta Inch > 0: positive travel direction

Reaching of the target position will be signaled accordingly.

A digital input can be configured for starting inching mode 1.

The following conditions must be met for enabling the start of inching modes 1 and 2:

¶ Supply voltage of the output stage is applied.

¶ Operation enabled

¶ Drive stands still

##### 4.1.1.2.2 Inching mode 2

The actuator travels from the actual position as long as the relevant command is active. You can influence the inching speed via two parameters and it will be calculated in the actuator as illustrated in the example below:

V-Inch (Object 2609h) = 10 rpm (can only be changed in the idle state)

Inching 2 Offset = 85 % (can be changed during inching operation)

The resulting inching speed in this example will be:

Inching speed= v - Tipp * Offset inching 2 = 10 rpm * 85 % = 9 rpm

The results are always rounded to integers.
The minimum speed is 1 rpm.

#### 4.1.1.3 Rotational speed mode

| | |
|---|---|
| **NOTICE** | Limits 1 + 2 are inactivated in this operational mode. |

| | |
|---|---|
| **NOTICE** | Exceeding the resolution of the absolute encoder results in a jump of the actual position. |

With the set point enabled, the actuator when in the rotational speed mode accelerates to the target speed and maintains this speed until the set point is disabled or a different target speed specified. Speed is adjusted immediately to the new value when the rotational target speed is changed.

The arithmetical sign of the set point determines the travel direction in the rotational speed mode.

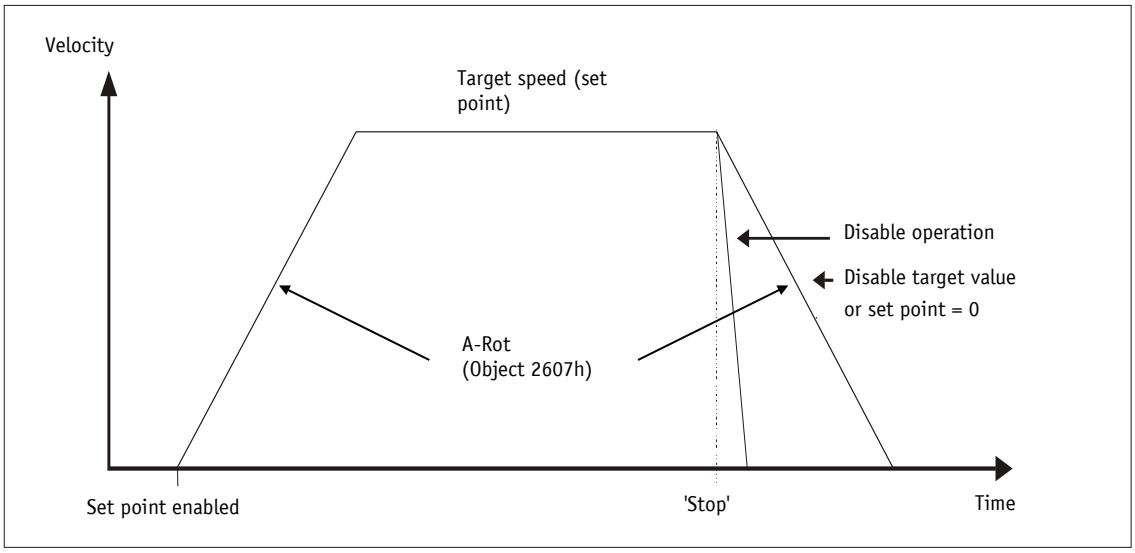


*Fig. 8: Ramp speed mode*

The following conditions must be met for enabling the start of the speed mode:

¶ Supply voltage of the output stage is applied.

¶ Operation enabled

¶ Drive stands still

### 4.1.1.4 Position Control Mode

| | |
|---|---|
| **NOTICE** | Via the control word in the process data, the superordinate control can cancel travel orders started by the position control mode.<br>For this purpose, a negative slope must be created on bits OFF1, OFF2, or OFF3 in the control word.<br>Conversely, the PCM mode cannot cancel a travel order initiated via the superordinate control. |

The position control mode enables travel data sets to be called via the digital inputs. A total of 7 travel data sets can be saved.

The use of the position control mode requires previous configuration of the digital inputs.

The desired travel data set can be selected via inputs PCM, input 1 to 3 in binary addressing. Travel data set 0 does not exist.

#### 4.1.1.4.1 Examples of configuration of the digital inputs for the PCM

- Digital input 1: PCM Start (high-active)
- Digital input 2: PCM input 1 (high-active)
- Digital input 3: PCM input 2 (high-active)
- Digital input 4: PCM input 3 (high-active)

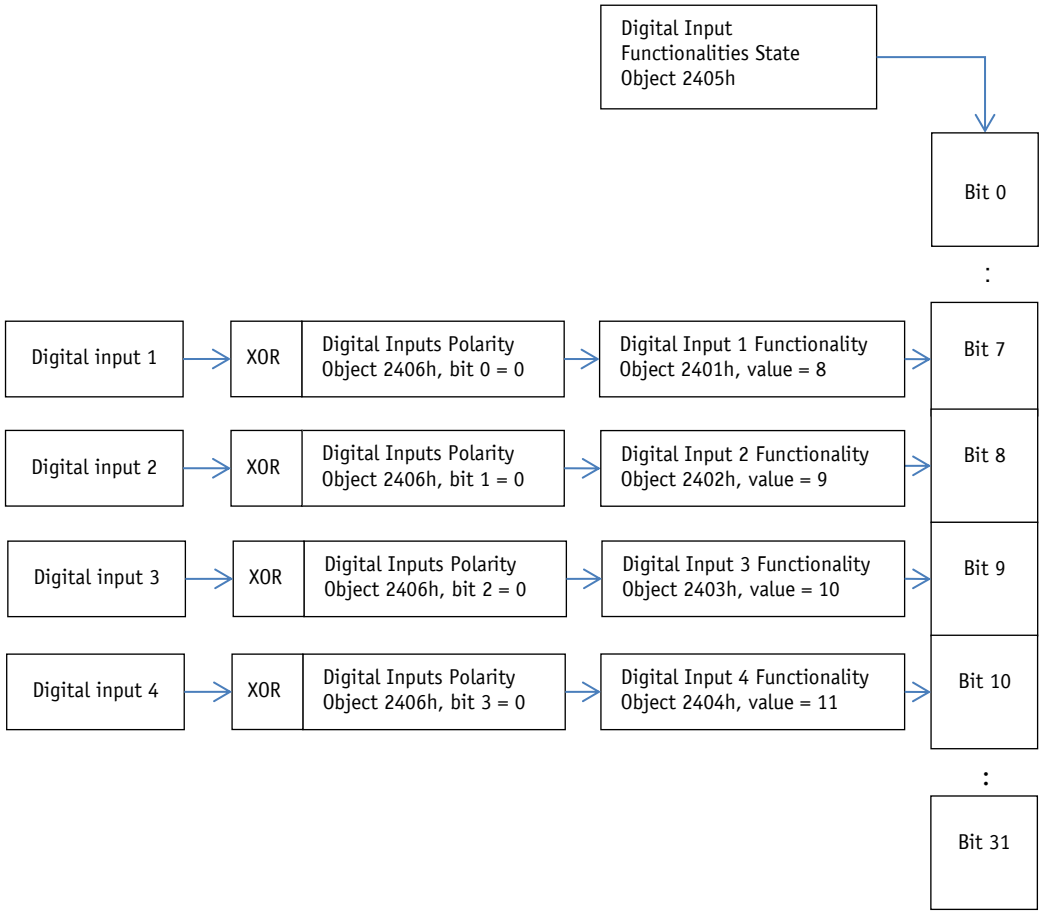


*Fig. 9: Examples of configuration of the digital inputs for the PCM*

Example of the parameter set of travel data set No. 3

| Parameter | Object |
|---|---|
| PCM Position 3 | 2924h |
| PCM Acceleration 3 | 2944h |
| PCM Velocity 3 | 2964h |
| PCM Deceleration 3 | 2984h |

After applying the coding to the inputs, the desired travel job can be started by a positive slope on the PCM Start input.

Resetting the PCM Start input during an active positioning process will result in cancelation of the travel job but the drive will continue to be controlled.

An example of calling travel data set No. 3 is shown below

Step 1: Create number of travel data set

| Input | State |
|---|---|
| PCM Start | 0 |
| PCM input 1 | 1 |
| PCM input 2 | 1 |
| PCM input 3 | 0 |

Step 2: Start the positioning job

| Input | State |
|---|---|
| PCM Start | 0/1 |
| PCM input 1 | 1 |
| PCM input 2 | 1 |
| PCM input 3 | 0 |

### 4.1.2 Current limiting

| | |
|---|---|
| **NOTICE** | Measuring the supply current cannot indicate the actual motor current. With cycled output stages, the supply current does Not correspond to the motor current. Actual motor current can be read via the interface. |

The current limit is set via Parameter Current Limiting (Object 2619h), which serves primarily for protecting the drive against overload.

With the default set, the Nominal torque indicated on the product data sheet is achieved.

Drive overload results in limiting the motor current to the set value.

As a consequence, the actuator cannot maintain the speed set, the contouring error increases. The actuator changes to the error status if the contouring error exceeds the contouring error limit defined by the parameter Contouring Error Limit (Object 2618h): contouring error.

### 4.1.3 Limit switch

Two digital inputs must be configured correspondingly if the limit switch function is to be used.

### 4.1.3.1 Example of limit switch configuration

Exemplary configuration for the connection of proximity switches DC PNP NC.

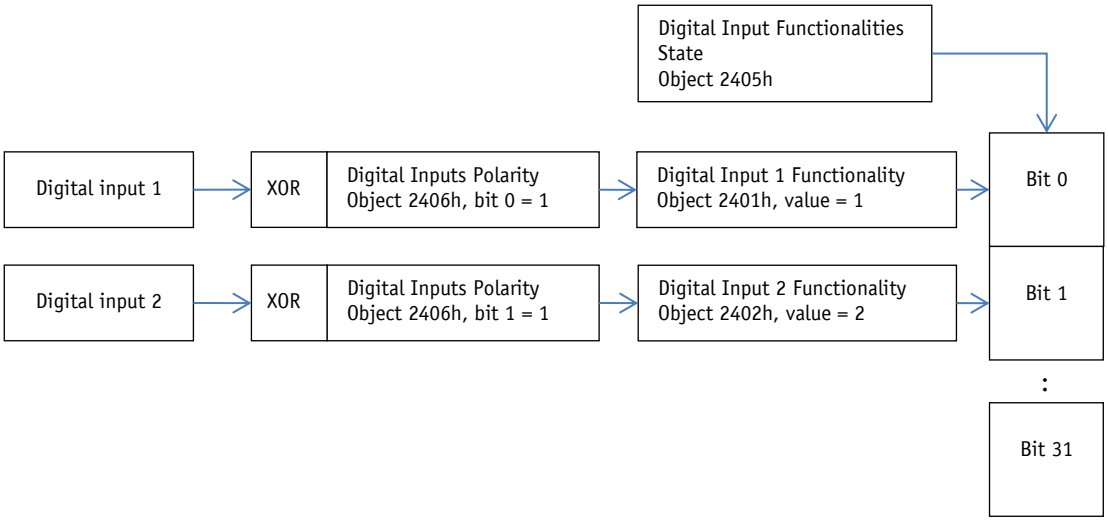


*Fig. 10: Example of limit switch configuration*

### 4.1.3.2 Arrangement of the limit switches

The limit switches are arranged according to the following pattern independent of the configured sense of rotation:

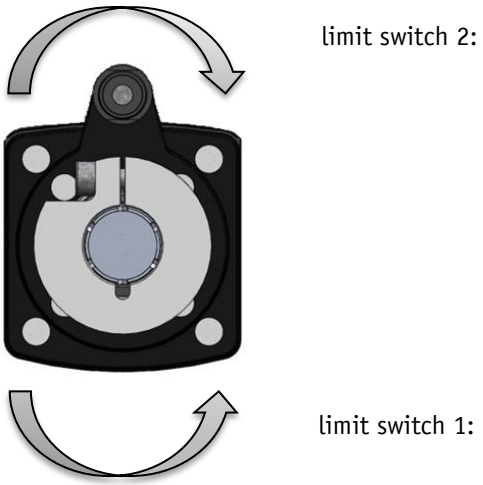


*Fig. 11: Arrangement of the limit switches*

## 5 Calibration

| NOTICE | Calibration is only possible when No travel job is active! |
|---|---|

Two steps are required for executing calibration:

Write calibration value: see Calibration Value (Object 260Eh)

Execute calibration (software command or calibration input)

Calibration can be initiated by writing the value 7 to parameter S-Command (Object 2C01h). Alternately, a digital input can be configured as calibration input as well.

Since the measuring system is an absolute system, calibration is necessary only once with commissioning. With calibration, the calibration value is adopted for calculation of the position value. The following equation is applied in case of calibration:

Position value = 0 + Calibration Value (Object 260Eh) + Offset Value (Object 261Ch)

## 6 External gear

If an external gear is used, a factor can be programmed via the parameters Gear Ratio Numerator (Object 260Bh) and Gear Ratio Denominator (Object 260Ch) in order to include the gear ratio in position sensing.

Example (see Fig. 12: external ):

The actuator is operated on a gear with transmission reduction of 5:1. For this purpose, the Gear Ratio Numerator and Gear Ratio Denominator parameters must be programmed as follows:

Parameter Gear Ratio Numerator = 5

Parameter Gear Ratio Denominator = 1

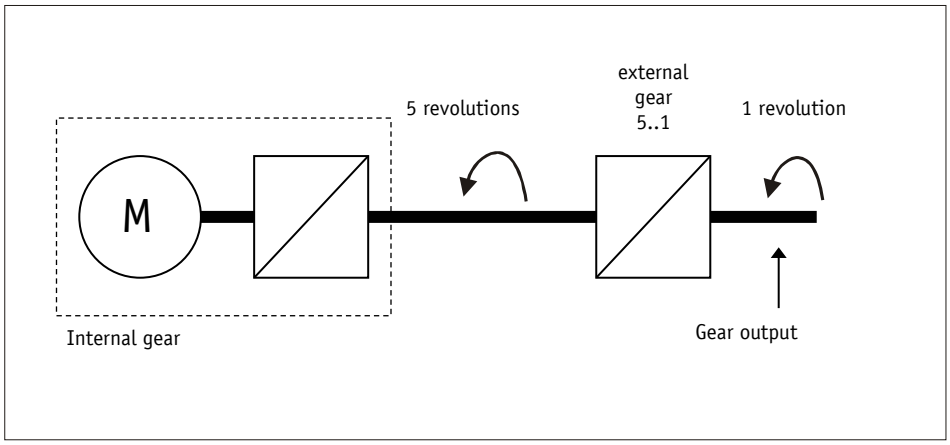


*Fig. 12: external gear*

Input of an odd transmission reduction value is possible according to the following example:

Transmission reduction = 3.78

¶ Parameter Gear Ratio Numerator = 378

¶ Parameter Gear Ratio Denominator = 100

# 7 Warnings / Errors

## 7.1 Warnings

Warnings do not influence the operation of the actuator.
Warnings disappear after removing the cause.

Possible warnings:

¶ Battery voltage for absolute encoder is below limit Ý exchange battery within the next 6 months.

¶ Current limiting active

## 7.2 Errors

Errors cause an immediate stop of drive movement.

Errors are indicated via the drive status LEDs.

The error bit is set in the status word.

The error messages are entered in the error memory in the order of their detection. The last 10 error messages are displayed when the error memory is full.

The cause of error can be tracked down with the help of the error codes.

### 7.2.1 Error codes

| | |
|---|---|
| **NOTICE** | If the error cannot be acknowledged after removal of the cause of error and the error persists after power-on reset, then the drive must be inspected in the factory. |

| Error code | Fault |
|---|---|
| 0x00 | No error |
| 0x06 | Low battery voltage<br>Ą Empty battery, replace battery<br>Ą Bonding error, check battery bonding<br>Ą Wrong battery type inserted, insert correct battery type |
| 0x07 | Low voltage of control electronic system<br>Ą Check control operating voltage |
| 0x08 | Overvoltage of control electronic system<br>Ą Check control operating voltage |
| 0x09 | Overvoltage of power electronic system<br>Ą Check output stage operating voltage |
| 0x0A | Output stage excess temperature<br>Ą Reduce ambient temperature<br>Ą Reduce load |
| 0x0B | Contouring error<br>Ą Reduce load<br>Ą Reduce acceleration<br>Ą Reduce velocity |
| 0x0C | Output shaft blocked<br>Ą Disengage shaft |
| 0x0D | Power electronic system Not supplied<br>Ą Check output stage operating voltage |
| 0x0F | SIN COS monitoring<br>Ą Shield from stray magnetic fields<br>Ą Check EMC measures |
| 0x10 | EEPROM queue overrun<br>Ą Internal error |
| 0x13 | EEPROM check sum<br>Ą Reset parameters to factory settings |
| 0x14 | Ethernet module watchdog<br>Ą Internal error |
| 0x15 | Ethernet module in the ERROR status while travel job is active<br>Ą Internal error |
| 0x16 | Ethernet module in the EXCEPTION status<br>Ą Internal error, power-on reset necessary |

*Table 1: Error codes*

# 8 Ethernet Powerlink

## 8.1 Description

The actuator is an Ethernet Powerlink Controlled Node (CN). The Ethernet Powerlink communication profile is based on the DS301 and DS302 CANopen communication profiles.

### 8.1.1 Cyclic data exchange

Cyclic process data is exchanged via PDO. The actuator supports 1 TPDO and 1 RPDO. Mapping is static and cannot be changed.

### 8.1.2 Acyclic data exchange

Acyclic data is exchanged via SDO frames.

### 8.1.3 Operating modes and synchronization

The actuator is not synchronized.

## 8.2 Directory of objects

The actuator uses the following object areas:

1000h - 1FFFh standard objects according to DS301

2000h - 5FFFh manufacturer-specific objects

| Index | Parameter name | Page |
|---|---|---|
| 1000h | NMT_DeviceType_U32 | 77 |
| 1001h | ERR_ErrorRegister_U8 | 77 |
| 1006h | NMT_CycleLen_U32 | 78 |
| 1008h | NMT_ManufactDevName_VS | 78 |
| 1009h | NMT_ManufactHwVers_VS | 78 |
| 100Ah | NMT_ManufactSwVers_VS | 79 |
| 1018h | NMT_IdentityObject_REC | 79 |
| 1020h | CFM_VerifyConfiguration_REC | 80 |
| 1030h | NMT_InterfaceGroup_00h_REC | 81 |
| 1300h | SDO_SequLayerTimeout_U32 | 83 |
| 1400h | PDO_RxCommParam_00h_REC | 83 |
| 1600h | PDO_RxMappParam_00h_AU64 | 83 |
| 1800h | PDO_TxCommParam_00h_REC | 84 |
| 1A00h | PDO_TxMappParam_00h_AU64 | 85 |
| 1C0Bh | DLL_CNLossSoC_REC | 85 |

### 8.2.1 Parameter description of manufacturer-specific objects

#### 8.2.1.1 Digital Outputs Control

| | |
|---|---|
| Object | 2001h |
| Description | Digital output control byte |
| Access | rw (component of process data) |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | No |
| Value range | UNSIGNED8 |

| Bit | Description |
|---|---|
| 0 | Digital output 1: |
| 1 … 7 | Reserved, always 0 |

#### 8.2.1.2 Control Word

| | |
|---|---|
| Object | 2002h |
| Description | Control word |
| Access | rw (component of process data) |
| Data type | UNSIGNED16 |
| Default | No |
| EEPROM | No |
| Value range | UNSIGNED16 |

#### 8.2.1.2.1 Control word Operating mode: Positioning mode (master Ý slave)

| Bit | Description |
|---|---|
| Bit 0<br>OFF1 (enable ) | 0 = OFF1 active<br>Current travel job is canceled.<br>The actuator is enabled. |
| | 1 = OFF1 inactive |
| Bit 1<br>OFF2 (max. delay) | 0 = OFF2 active<br>Current travel job is canceled.<br>The actuator is decelerated with max. delay, the actuator continues to be controlled. |
| | 1 = OFF2 inactive |
| Bit 2<br>OFF3 (progr. delay) | 0 = OFF3 active<br>Current travel job is canceled.<br>The actuator is decelerated with prog. delay, the actuator continues to be controlled. |
| | 1 = OFF3 inactive |
| Bit 3<br>Intermediate stop | 0 = No intermediate stop |
| | 1 = intermediate stop active |
| Bit 4<br>Start travel job | Positive slope starts a travel job |
| Bit 5<br>Acknowledge error | Positive slope acknowledges an error<br>Afterwards, the actuator changes to the switch-lock state. |
| Bit 6<br>Inching mode 1 | 0 = No inching mode1<br>If the travel job is Not completed yet it will be canceled. |
| | 1 = inching operation 1<br>As long as this bit is set, the actuator travels over the distance specified in parameter Delta Tipp. |
| Bit 7<br>Inching mode 2 positive | 0 = No inching mode 2 positive |
| | 1 = inching mode 2 positive<br>The actuator travels in positive direction |
| Bit 8<br>Inching mode 2 negative | 0 = No inching mode 2 negative |
| | 1 = inching mode 2 negative<br>The actuator travels in negative direction |
| Bit 9 | Reserved, always 0 |
| Bit 10<br>Relative positioning | 0 = absolute positioning |
| | 1 = relative positioning |
| Bit 11 … 15 | Reserved, always 0 |

*Table 2: Control word of positioning mode*

### 8.2.1.2.2 Flow chart: Operating mode: Positioning mode

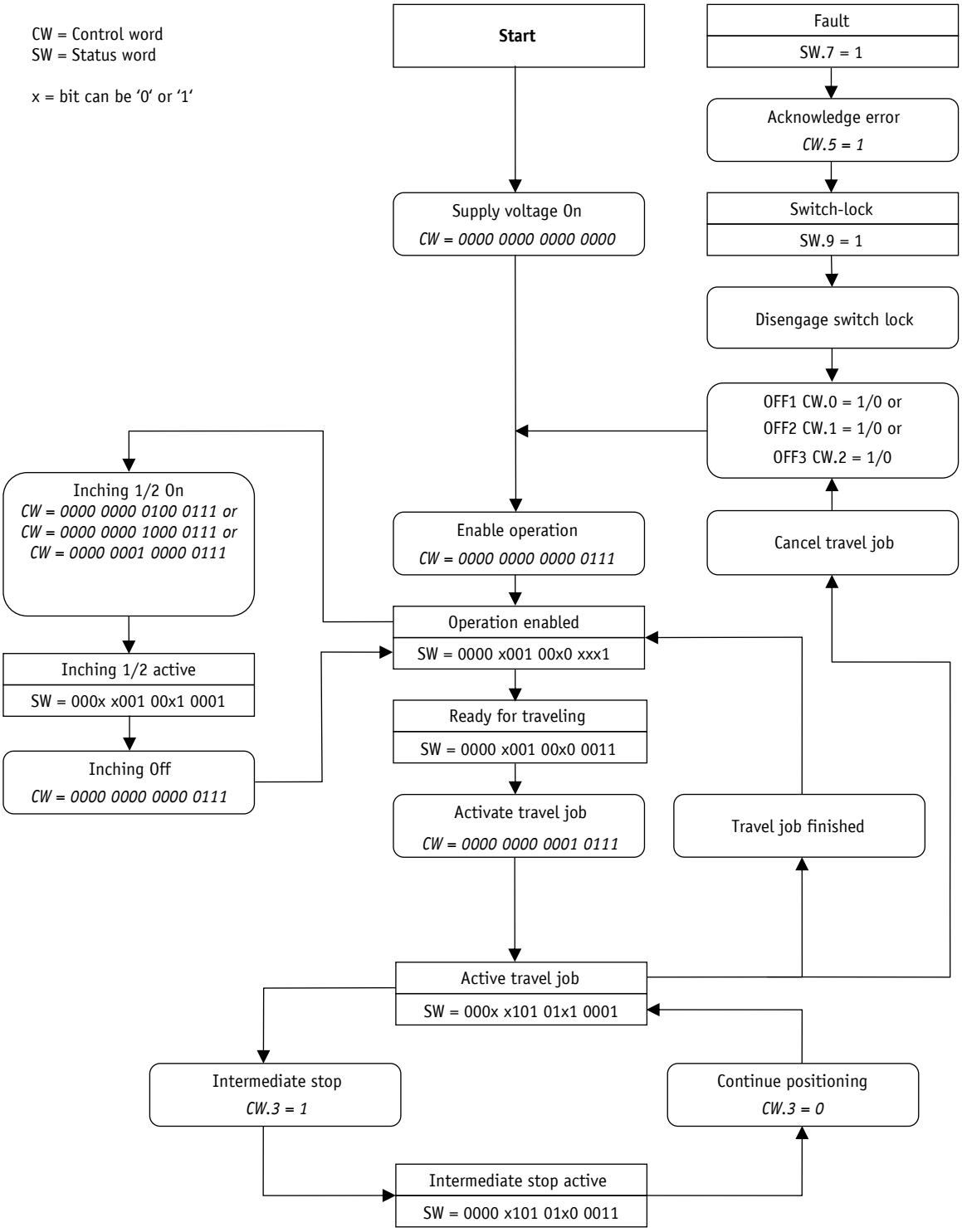


*Fig. 13: Flow chart of positioning mode of Ethernet Powerlink*

#### 8.2.1.2.3 Control word: Speed mode

| Bit | Description |
|---|---|
| Bit 0<br>OFF1 (enable ) | 0 = OFF1 active<br>Current travel job is canceled.<br>The actuator is enabled. |
| | 1 = OFF1 inactive |
| Bit 1<br>OFF2 (max. delay) | 0 = OFF2 active<br>Current travel job is canceled.<br>The actuator is decelerated with max. delay, the actuator continues to be controlled. |
| | 1 = OFF2 inactive |
| Bit 2<br>OFF3 (progr. delay) | 0 = OFF3 active<br>Current travel job is canceled.<br>The actuator is decelerated with prog. delay, the actuator continues to be controlled. |
| | 1 = OFF3 inactive |
| Bit 3 | Reserved, always 0 |
| Bit 4<br>Start travel job | Positive slope starts a travel job |
| Bit 5<br>Acknowledge error | Positive slope acknowledges an error<br>Afterwards, the actuator changes to the switch-lock state. |
| Bit 6 … 15 | Reserved, always 0 |

*Table 3: Control word of speed mode*

### 8.2.1.2.4 Flow chart: Speed mode

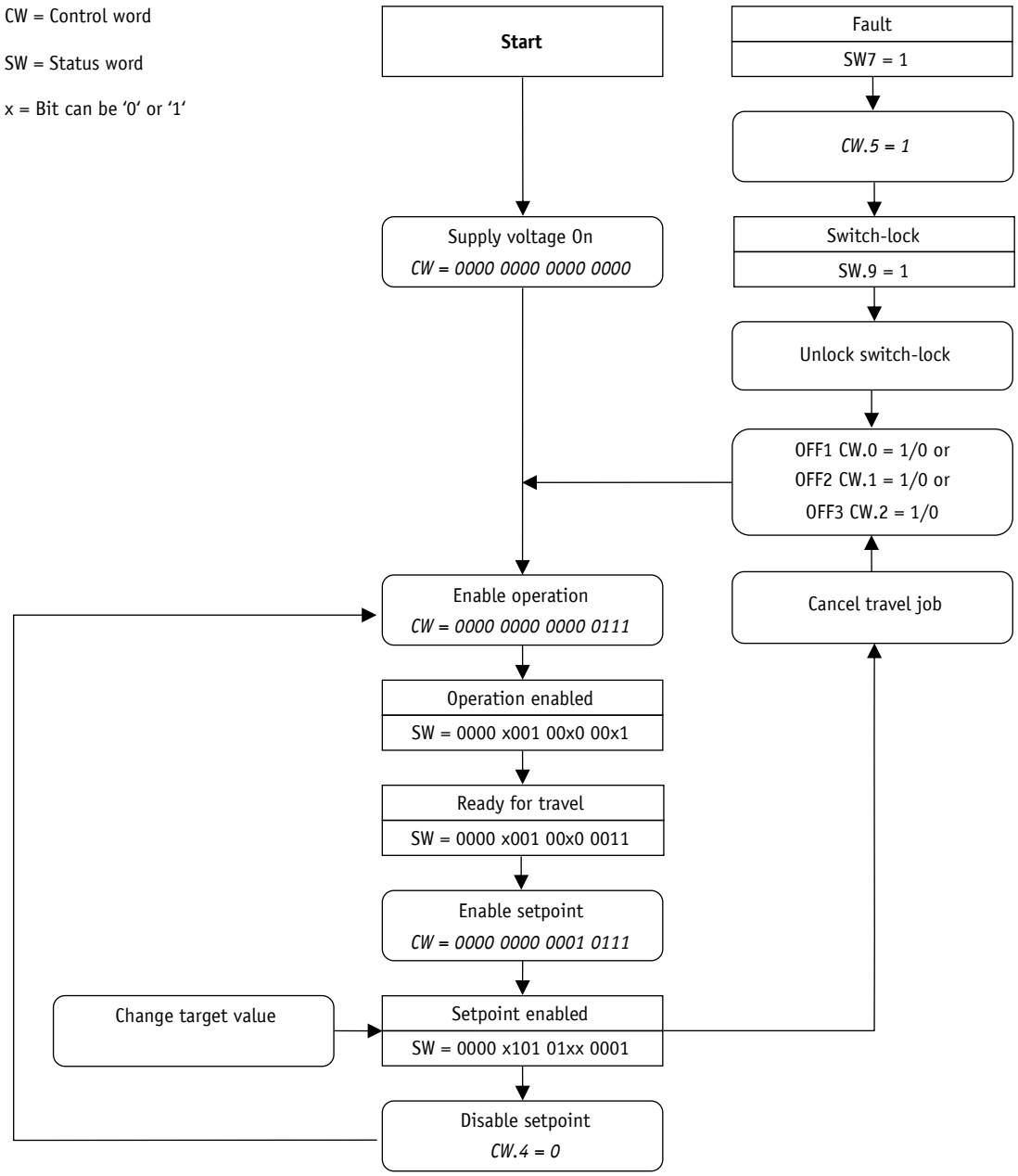


*Fig. 14: Flow chart of speed mode Ethernet Powerlink*

#### 8.2.1.3 Target Value

Positioning mode: Target position (volatile)
with spindle pitch = 0: Indicated as increments
with spindle pitch > 0: Indicated as 1/100 mm

Speed mode: Target speed (volatile)
indicated as $min^{-1}$

| | |
|---|---|
| Object | 2003h |
| Description | Setpoint |
| Access | rw (component of process data) |
| Data type | INTEGER32 |
| Default | No |
| EEPROM | No |
| Value range | INTEGER32 |

#### 8.2.1.4 Digital Inputs State

| | |
|---|---|
| Object | 2101h |
| Description | States of the digital inputs |
| Access | ro (component of process data) |
| Data type | UNSIGEND8 |
| Default | No |
| EEPROM | No |

| Bit | Description |
|---|---|
| 0 | State of digital input 1 |
| 1 | State of digital input 2 |
| 2 | State of digital input 3 |
| 3 | State of digital input 4 |

#### 8.2.1.5 Status Word

| | |
|---|---|
| Object | 2102h |
| Description | Status word: |
| Access | ro (component of process data) |
| Data type | UNSIGNED16 |
| Default | No |
| EEPROM | No |

#### 8.2.1.5.1 Status word: Positioning mode (slave Ý master)

| Bit | Description |
|---|---|
| Bit 0<br>Supply | 0 = output stage supply voltage missing |
| | 1 = supply voltage of the output stage is applied |
| Bit 1<br>Readiness to travel | 0 = Not ready to travel |
| | 1 = ready to travel |
| Bit 2<br>upper limit | 0 = No violation of limit |
| | 1 = upper limit exceeded |
| Bit 3<br>lower limit: | 0 = No violation of limit |
| | 1 = lower limit undercut |
| Bit 4<br>Actuator travels/stands still | 0 = actuator stands still |
| | 1 = actuator travels |
| Bit 5<br>Inpos | 0 = actuator is outside the position window. |
| | 1 = actuator is inside the position window. |
| Bit 6<br>Active travel job | 0 = No active travel job |
| | 1 = active travel job |
| Bit 7<br>Fault | 0 = No error |
| | 1 = error<br>Acknowledgment with positive slope on control word bit 5 |
| Bit 8<br>Operation enabled | 0 = operation Not enabled |
| | 1 = operation enabled |
| Bit 9<br>Switch-lock | 0 = No switch-lock |
| | 1 = switch-lock |
| Bit 10<br>Travel job acknowledgment | 0 = No acknowledgment |
| | 1 = acknowledgment<br>The bit is set when the travel job was adopted. If bit 4 is reset in the control word, this bit will be reset as well. |
| Bit 11<br>Battery warning | 0 = No warning, battery loading state is OK |
| | 1 = battery warning<br>Battery voltage is below 2.6 V.<br>Battery change is required. |
| Bit 12<br>Current limiting | 0 = current limiting inactive |
| | 1 = current limiting active<br>Motor current exceeds the value set under parameter Current Limiting (Object 2619h). |

*Table 4: Status word of positioning mode*

#### 8.2.1.5.2 Status word: Speed mode

| Bit | Description |
|---|---|
| Bit 0<br>Supply | 0 = output stage supply voltage missing |
| | 1 = supply voltage of the output stage is applied |
| Bit 1<br>Readiness to travel | 0 = Not ready to travel |
| | 1 = ready to travel |
| Bit 2 | No function |
| Bit 3 | No function |
| Bit 4<br>Actuator travels/stands still | 0 = actuator stands still |
| | 1 = actuator travels |
| Bit 5<br>Inpos | 0 = actuator is outside the position window. |
| | 1 = actuator is inside the position window. |
| Bit 6<br>Active travel job | 0 = No active travel job |
| | 1 = active travel job |
| Bit 7<br>Fault | 0 = No error |
| | 1 = error<br>Acknowledgment with positive slope on control word bit 5 |
| Bit 8<br>Operation enabled | 0 = operation Not enabled |
| | 1 = operation enabled |
| Bit 9<br>Switch-lock | 0 = No switch-lock |
| | 1 = switch-lock |
| Bit 10<br>Travel job acknowledgment | 0 = No acknowledgment |
| | 1 = acknowledgment<br>The bit is set when the travel job was adopted. If bit 4 is reset in the control word, this bit will be reset as well. |
| Bit 11<br>Battery warning | 0 = No warning, battery loading state is OK |
| | 1 = battery warning<br>Battery voltage is below 2.6 V.<br>Battery change is required. |
| Bit 12<br>Current limiting | 0 = current limiting inactive |
| | 1 = current limiting active<br>Motor current exceeds the value set under parameter Current Limiting (Object 2619h). |

*Table 5: Status word of speed mode*

#### 8.2.1.6 Actual Value

Positioning mode: Actual position
with spindle pitch = 0: Indicated as increments
with spindle pitch > 0: Indicated as 1/100 mm

Speed mode: Actual speed
indicated as $min^{-1}$

| | |
|---|---|
| Object | 2103h |
| Description | Actual value |
| Access | ro (component of process data) |
| Data type | INTEGER32 |
| Default | No |
| EEPROM | No |

#### 8.2.1.7 LED Functionality

This parameter determines the functions of the four system LEDs. With factory settings, the four LEDs indicate the operational states of the drive. Alternately, the LEDs can represent the states of the digital inputs.

| | |
|---|---|
| Object | 2201h |
| Description | Functionality of the system LEDs |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 1 |

*Description, see chapter Table 6: Functionality of the system LEDs*

| Value | LED | State | Description |
|---|---|---|---|
| 0 | LED5 | Green | Operating voltage applied to control.<br>No error |
| | | Red, flashing | Operating voltage applied to control.<br>Error is active |
| | | Off | Operating voltage of control missing |
| | LED6 | Off | No function |
| | LED7 | Off | No function |
| | LED8 | Green | Actuator is within the programmed positioning window.<br>Operating voltage of the output stage is applied. |
| | | Green, flashing | Actuator is within the programmed positioning window.<br>Operating voltage of the output stage missing. |
| | | Red | Actuator is outside the programmed positioning window.<br>Operating voltage of the output stage is applied. |
| | | Red, flashing | Actuator is outside the programmed positioning window.<br>Operating voltage of the output stage missing. |
| | | Off | Operating voltage of control missing |
| 1 | LED5 | Red | Digital input 1 inactive |
| | | Red, flashing | Error is active |
| | | Green | Digital input 1 active |
| | | Off | Operating voltage of control missing |
| | LED6 | Red | Digital input 2 inactive |
| | | Red, flashing | Error is active |
| | | Green | Digital input 2 active: |
| | | Off | Operating voltage of control missing |
| | LED7 | Red | Digital input 3 inactive |
| | | Red, flashing | Error is active |
| | | Green | Digital input 3 active |
| | | Off | Operating voltage of control missing |
| | LED8 | Red | Digital input 4 inactive |
| | | Red, flashing | Error is active |
| | | Green | Digital input 4 active |
| | | Off | Operating voltage of control missing |

*Table 6: Functionality of the system LEDs*

#### 8.2.1.8 Service Interface Baud Rate

| | |
|---|---|
| Object | 2221h |
| Description | Baud rate of the service interface. |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 1 |
| EEPROM | Yes |
| Value range | 0 … 3<br>0 = 19.2 Kbit/s<br>1 = 57.6 Kbit/s<br>2 = 115.2 Kbit/s<br>3 = 9.6 Kbit/s |

#### 8.2.1.9 Digital Output 1 Functionality

This parameter determines the function of digital output 1.

This setting determines the bit position in the Digital Outputs Status register, which governs the state of the digital output.

| | |
|---|---|
| Object | 2301h |
| Description | Digital output 1 functionality |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 3 |

| Value | Description |
|---|---|
| 0 | General use<br>Control of the digital output is directly via BIT DO1 in the process data. |
| 1 | Fault<br>The output is switched active in case of fault. |
| 2 | Inpos<br>The state of bit Inpos in the status word defines the state of the digital output. |
| 3 | Output on<br>The output is switched on permanently. |

### 8.2.1.10 Digital Output Functionalities State

The functional states that can be assigned to the digital output can be read from this register.

| | |
|---|---|
| Object | 2302h |
| Description | Status of the digital output functionalities |
| Access | ro |
| Data type | UNSIGNED32 |
| Default | No |
| EEPROM | No |

| Bit | Description |
|---|---|
| 0 | Error<br>0 = No error<br>1 = Error active |
| 1 | Inpos<br>0 = actual value outside the positioning window<br>1 = actual value inside the positioning window |
| 2 | Output on<br>The bit is permanently set |
| 3 … 31 | Not assigned |

### 8.2.1.11 Digital Outputs Polarity

This parameter determines the switching behavior individually for every digital output.
A bit that defines the switching logics is assigned to every digital output.

| | |
|---|---|
| Object | 2303h |
| Description | Polarity of the digital output |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 15 |

Value of the assigned bits:
0 = positive logics (high-active)
1 = negative logics (low-active)

| Bit | Description |
|---|---|
| 0 | Digital output 1 polarity |
| 1 … 15 | Not assigned |

#### 8.2.1.12 Digital Input 1 Functionality

This parameter determines the functionality of digital input 1.
With a value greater than 0 set, a function is assigned to the digital input.

The functional state can be read from the Digital Input Functionalities State register.

| | |
|---|---|
| Object | 2401h |
| Description | Input 1 functionality |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 11 |

| Value | Description |
|---|---|
| 0 | General use<br>No function is assigned to the digital input. |
| 1 | Limit switch 1: |
| 2 | Limit switch 2: |
| 3 | Inching operation 2 positive direction |
| 4 | Inching operation 2 negative direction |
| 5 | Calibrate |
| 6 | Acknowledge error |
| 7 | Inching mode 1 |
| 8 | PCM Start |
| 9 | PCM input 1 |
| 10 | PCM input 2 |
| 11 | PCM input 3 |

*Table 7: Configuration of digital inputs*

#### 8.2.1.13 Digital Input 2 Functionality

This parameter determines the functionality of digital input 2.
With a value greater than 0 set, a function is assigned to the digital input.

The functional state can be read from the Digital Input Functionalities State register.

| | |
|---|---|
| Object | 2402h |
| Description | Input 2 functionality |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 11 |

*Description, see Table 7: Configuration of digital inputs.*

#### 8.2.1.14 Digital Input 3 Functionality

This parameter determines the functionality of digital input 3.
With a value greater than 0 set, a function is assigned to the digital input.

The functional state can be read from the Digital Input Functionalities State register.

| | |
|---|---|
| Object | 2403h |
| Description | Input 3 functionality |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 11 |

*Description, see Table 7: Configuration of digital inputs.*

#### 8.2.1.15 Digital Input 4 Functionality

This parameter determines the functionality of digital input 1.
With a value greater than 0 set, a function is assigned to the digital input.

The functional state can be read from the Digital Input Functionalities State register.

| | |
|---|---|
| Object | 2404h |
| Description | Input 4 functionality |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 11 |

*Description, see Table 7: Configuration of digital inputs.*

#### 8.2.1.16 Digital Input Functionalities State

The states of the digital inputs are mapped in this register according to the functionalities set. A bit is assigned to every function.

| | |
|---|---|
| Object | 2405h |
| Description | Status of the digital input functionalities |
| Access | ro |
| Data type | UNSIGNED32 |
| Default | No |
| EEPROM | No |

| Bit | Description |
|---|---|
| 0 | Limit switch 1: |
| 1 | Limit switch 2: |
| 2 | Inching operation 2 positive direction |
| 3 | Inching operation 2 negative direction |
| 4 | Calibrate |
| 5 | Acknowledge error |
| 6 | Inching mode 1 |
| 7 | PCM Start |
| 8 | PCM input 1 |
| 9 | PCM input 2 |
| 10 | PCM input 3 |
| 11 … 31 | Not assigned |

*Table 8: States of the digital inputs*

### 8.2.1.17 Digital Inputs Polarity

This parameter determines the switching behavior individually for every digital input.
A bit that defines the switching logics is assigned to every digital input.

| | |
|---|---|
| Object | 2406h |
| Description | Polarity of the digital output |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 15 |

Value of the assigned bit
0 = positive logics (high-active)
1 = negative logics (low-active)

| Bit | Description |
|---|---|
| 0 | Digital input 1 polarity |
| 1 | Digital input 2 polarity |
| 2 | Digital input 3 polarity |
| 3 | Digital input 4 polarity |
| 4 … 15 | Not assigned |

### 8.2.1.18 Controller Parameter P

This setting applies to all operating modes.

| | |
|---|---|
| Object | 2601h |
| Description | P gain of controller |
| Access | rw |
| Data type | INTEGER16 |
| Default | 300 |
| EEPROM | Yes |
| Value range | 1 … 500 |

### 8.2.1.19 Controller Parameter I

This setting applies to all operating modes.

| | |
|---|---|
| Object | 2602h |
| Description | I gain of controller |
| Access | rw |
| Data type | INTEGER16 |
| Default | 2 |
| EEPROM | Yes |
| Value range | 0 … 500 |

### 8.2.1.20 Controller Parameter D

This setting applies to all operating modes.

| | |
|---|---|
| Object | 2603h |
| Description | D gain of controller |
| Access | rw |
| Data type | INTEGER16 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 500 |

### 8.2.1.21 A-Pos

| | |
|---|---|
| Object | 2604h |
| Description | Acceleration in the positioning mode |
| Access | rw |
| Data type | INTEGER16 |
| Default | 50 |
| EEPROM | Yes |
| Value range | 1 … 100 %<br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.22 V-Pos

| | |
|---|---|
| Object | 2605h |
| Description | Maximum speed in the positioning mode |
| Access | rw |
| Data type | INTEGER16 |
| Default | 10 |
| EEPROM | Yes |
| Value range | Transmission 66:1 Ý max. 75 rpm<br>Transmission 98:1 Ý max. 50 rpm<br>Transmission 188:1 Ý max. 30 rpm<br>Transmission 368:1 Ý max. 15 rpm |

### 8.2.1.23 D-Pos

| | |
|---|---|
| Object | 2606h |
| Description | Delay in the positioning mode |
| Access | rw |
| Data type | INTEGER16 |
| Default | 101 |
| EEPROM | Yes |
| Value range | 1 … 101 %<br>101 % = the delay is determined by the A-Pos parameter<br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.24 A-Rot

| | |
|---|---|
| Object | 2607h |
| Description | Acceleration in speed mode |
| Access | rw |
| Data type | INTEGER16 |
| Default | 50 |
| EEPROM | Yes |
| Value range | 1 … 100 %100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.25 A-Inch

| | |
|---|---|
| Object | 2608h |
| Description | Acceleration in inching mode 1 /2 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 50 |
| EEPROM | Yes |
| Value range | 1 … 100 %<br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.26 V-Inch

| | |
|---|---|
| Object | 2609h |
| Description | Maximum speed in inching mode 1/2 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 10 |
| EEPROM | Yes |
| Value range | Transmission 66:1 Ý max. 75 rpm<br>Transmission 98:1 Ý max. 50 rpm<br>Transmission 188:1 Ý max. 30 rpm<br>Transmission 368:1 Ý max. 15 rpm |

### 8.2.1.27 Pos Window

Operating mode: Positioning mode

If the actual position of the drive is within the programmed set point ± this window, setting bit 5 in the status word of the drive signals this.

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 Values refer to travel distance in 1/100 mm

Operating mode: Speed mode:

If the actual rotational speed is within the target rotational speed ± this window, setting bit 5 in the drive's system status word signals this.

| | |
|---|---|
| Object | 260Ah |
| Description | Positioning window |
| Access | rw |
| Data type | INTEGER16 |
| Default | 10 |
| EEPROM | Yes |
| Value range | 0 … 1000 |

### 8.2.1.28 Gear Ratio Numerator

A transmission factor can be programmed here when an external gear unit is used.

| | |
|---|---|
| Object | 260Bh |
| Description | Numerator transmission ratio |
| Access | rw |
| Data type | INTEGER16 |
| Default | 1 |
| EEPROM | Yes |
| Value range | 1 … 10000 |

### 8.2.1.29 Gear Ratio Denominator

A transmission factor can be programmed here when an external gear unit is used.

| | |
|---|---|
| Object | 260Ch |
| Description | Denominator gear ratio |
| Access | rw |
| Data type | INTEGER16 |
| Default | 1 |
| EEPROM | Yes |
| Value range | 1 … 10000 |

### 8.2.1.30 Spindle Pitch

Spindle pitch = 0:

The position value is output in increments (720 increments per revolution of the output shaft).

Spindle pitch parameter > 0 (when operating the actuator on a spindle):

Position value is output as traveling distance in 1/100 mm rather than in increments. Input of the target position is now in 1/100 mm as well.
e.g., spindle with a pitch of 2 mm Ý spindle pitch parameter = 200.

| | |
|---|---|
| Object | 260Dh |
| Description | Spindle pitch |
| Access | rw |
| Data type | INTEGER32 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 1000000 |

### 8.2.1.31 Calibration Value

Changes to the calibration value are adopted for calculation of the position value only after calibration via S command

Position value = 0 + calibration value + offset value

| | |
|---|---|
| Object | 260Eh |
| Description | Calibration value |
| Access | rw |
| Data type | INTEGER32 |
| Default | 0 |
| EEPROM | Yes |
| Value range | -999999 … 999999 |

### 8.2.1.32 Software Limit 1

| | |
|---|---|
| NOTICE | Operating mode: Positioning mode<br>Software limit value monitoring is deactivated if Software Limit 1 is equal Software Limit 2. Exceeding the resolution of the absolute encoder results in a jump of the actual position.<br>Operating mode: Speed mode:<br>Irrelevant |

Operating mode: Positioning mode

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 values refer to travel distance in 1/100 mm

If the drive's position is beyond the range defined by Software Limit 1 and Software Limit 2 (travel range), traveling will only be possible in inching mode in the direction of the travel range.

| | |
|---|---|
| Object | 260Fh |
| Description | Limit 1 |
| Access | rw |
| Data type | INTEGER32 |
| Default | 99999 |
| EEPROM | Yes |
| Value range | -9999999 ... 9999999 |

### 8.2.1.33 Software Limit 2

| | |
|---|---|
| NOTICE | Operating mode: Positioning mode<br>Software limit value monitoring is deactivated if Software Limit 1 is equal Software Limit 2. Exceeding the resolution of the absolute encoder results in a jump of the actual position.<br>Operating mode: Speed mode:<br>Irrelevant |

Operating mode: Positioning mode

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 values refer to travel distance in 1/100 mm

If the drive's position is beyond the range defined by Software Limit 1 and Software Limit 2 (travel range), traveling will only be possible in inching mode in the direction of the travel range.

| | |
|---|---|
| Object | 2610h |
| Description | Limit 2 |
| Access | rw |
| Data type | INTEGER32 |
| Default | -19999 |
| EEPROM | Yes |
| Value range | -9999999 ... 9999999 |

### 8.2.1.34 Delta Inch

indicates the relative traveling distance.

Positive value Ý positive travel direction
Negative value Ý negative travel direction

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 values refer to travel distance in 1/100 mm

| | |
|---|---|
| Object | 2611h |
| Description | Travel distance inching mode 1 |
| Access | rw |
| Data type | INTEGER32 |
| Default | 720 |
| EEPROM | Yes |
| Value range | -1000000 ... 1000000 |

### 8.2.1.35 Sense of Rotation

With shaft rotating counter-clockwise (view on the output shaft)

i sense of rotation: positive counting direction
e sense of rotation: negative counting direction

| | |
|---|---|
| Object | 2612h |
| Description | Sense of rotation |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 = i sense of rotation (cw)<br>1 = e sense of rotation (ccw) |

### 8.2.1.36 Pos Type

| NOTICE | Loop positioning is executed in the positioning mode only. |
|---|---|

Operating mode: Speed mode:

Irrelevant

Operating mode: Positioning mode

| Type of positioning | Description |
|---|---|
| Direct | Direct traveling from actual position to target value |
| Loop + | Traveling to the target value occurs always in positive direction to compensate for spindle play |
| Loop - | Traveling to the target value occurs always in negative direction to compensate for spindle play |

| | |
|---|---|
| Object | 2613h |
| Description | Positioning type |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 = direct<br>1 = loop +<br>2 = loop - |

### 8.2.1.37 Operating Mode

| | |
|---|---|
| Object | 2614h |
| Description | Operating mode |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 = positioning mode<br>1 = speed mode |

### 8.2.1.38 Inching 2 Stop Mode

The delay ramp in Inching operation 2 can be influenced via this parameter.

| | |
|---|---|
| Object | 2615h |
| Description | Stop mode inching 2 |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 = stop with maximum delay<br>1 = stop with programmed delay |

### 8.2.1.39 Inpos Mode

This parameter determines the drive's behavior after reaching the positioning window.

| | |
|---|---|
| Object | 2616h |
| Description | Inpos mode |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 2 |

Operating mode: Speed mode:

Irrelevant

Operating mode: Positioning mode

| Value | Description |
|---|---|
| 0 | Permanent positioning regulation to setpoint. |
| 1 | Position control Off and short circuit of the motor windings |
| 2 | Position control Off and drive enable |

### 8.2.1.40 Loop Length

This parameter determines the loop length for the loop + and loop - positioning types.

Operating mode: Positioning mode

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 values refer to travel distance in 1/100 mm

Operating mode: Speed mode:

Irrelevant

| | |
|---|---|
| Object | 2617h |
| Description | Loop length |
| Access | rw |
| Data type | INTEGER16 |
| Default | 360 |
| EEPROM | Yes |
| Value range | 0 … 30000 |

### 8.2.1.41 Contouring Error Limit

Upon starting a travel job, the ramp generator generates target position values in order to reach the target position with the desired speed profile (A-Pos, V-Pos, D-Pos).

Position regulation attempts to readjust the drive's actual position and to keep the regulation deviation as small as possible.

Disturbance variables such as load or friction can disable the drive's following the position values.

The control deviation (contouring error) will increase steadily. If the control deviation exceeds the value of the contouring error limit, this will result in the contouring error fault.

The maximum admissible contouring error is indicated in increments.

| | |
|---|---|
| Object | 2618h |
| Description | Contouring error limit |
| Access | rw |
| Data type | INTEGER16 |
| Default | 400 |
| EEPROM | Yes |
| Value range | 1 … 30000 |

### 8.2.1.42 Current Limiting

This parameter determines the setting for limiting the motor current.

The values are indicated as percentage of Nominal current.

| | |
|---|---|
| Object | 2619h |
| Description | Current limiting |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 110 |
| EEPROM | Yes |
| Value range | 25 … 110 % |

### 8.2.1.43 Inching 2 Offset

The inching speed in Inching operation 2 can be influenced via this parameter
The values are indicated as percentage of parameter V-Inch, Object 2609h.

| | |
|---|---|
| Object | 261Ah |
| Description | Inching 2 Offset |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 100 |
| EEPROM | No |
| Value range | 10 … 100 % |

### 8.2.1.44 Inching 2 Acceleration Type

The acceleration type in Inching operation 2 can be influenced via this parameter.

| | |
|---|---|
| Object | 261Bh |
| Description | Inching mode 2 acceleration type |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| EEPROM | Yes |
| Value range | 0 … 1 |

| Value | Description |
|---|---|
| 0 | Static acceleration<br>Acceleration occurs to final speed as defined under parameter A-Inch (Object 2608h) |
| 1 | Incremental acceleration<br>Acceleration occurs to final speed as defined under parameter A-Inch (Object 2608h), with the following increments:<br>4 s to 20 % of final speed<br>2 s to 50 % of final speed<br>1 s to 100 % of final speed |

### 8.2.1.45 Offset Value

Changes to the offset value are immediately considered in the calculation of the position value.

The following equation is applied in case of calibration:
Position value = 0 + calibration value + offset value

| | |
|---|---|
| Object | 261Ch |
| Description | Offset value |
| Access | rw |
| Data type | INTEGER32 |
| Default | 0 |
| EEPROM | Yes |
| Value range | -999999 … 999999 |

### 8.2.1.46 PCM Position 1

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 values refer to travel distance in 1/100 mm

| | |
|---|---|
| Object | 2922h |
| Description | Positioning mode via digital inputs: Position 1 |
| Access | rw |
| Data type | INTEGER32 |
| Default | 0 |
| EEPROM | Yes |
| Value range | INTEGER32 |

### 8.2.1.47 PCM Position 2

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 values refer to travel distance in 1/100 mm

| | |
|---|---|
| Object | 2923h |
| Description | Positioning mode via digital inputs: Position 2 |
| Access | rw |
| Data type | INTEGER32 |
| Default | 0 |
| EEPROM | Yes |
| Value range | INTEGER32 |

### 8.2.1.48 PCM Position 3

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 values refer to travel distance in 1/100 mm

| | |
|---|---|
| Object | 2924h |
| Description | Positioning mode via digital inputs: Position 3 |
| Access | rw |
| Data type | INTEGER32 |
| Default | 0 |
| EEPROM | Yes |
| Value range | INTEGER32 |

### 8.2.1.49 PCM Position 4

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 values refer to travel distance in 1/100 mm

| | |
|---|---|
| Object | 2925h |
| Description | Positioning mode via digital inputs: Position 4 |
| Access | rw |
| Data type | INTEGER32 |
| Default | 0 |
| EEPROM | Yes |
| Value range | INTEGER32 |

### 8.2.1.50 PCM Position 5

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 values refer to travel distance in 1/100 mm

| | |
|---|---|
| Object | 2926h |
| Description | Positioning mode via digital inputs: Position 5 |
| Access | rw |
| Data type | INTEGER32 |
| Default | 0 |
| EEPROM | Yes |
| Value range | INTEGER32 |

### 8.2.1.51 PCM Position 6

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 values refer to travel distance in 1/100 mm

| | |
|---|---|
| Object | 2927h |
| Description | Positioning mode via digital inputs: Position 6 |
| Access | rw |
| Data type | INTEGER32 |
| Default | 0 |
| EEPROM | Yes |
| Value range | INTEGER32 |

### 8.2.1.52 PCM Position 7

Spindle pitch = 0: Values refer to increments
Spindle pitch > 0 values refer to travel distance in 1/100 mm

| | |
|---|---|
| Object | 2928h |
| Description | Positioning mode via digital inputs: Position 7 |
| Access | rw |
| Data type | INTEGER32 |
| Default | 0 |
| EEPROM | Yes |
| Value range | INTEGER32 |

### 8.2.1.53 PCM Acceleration 1

| | |
|---|---|
| Object | 2942h |
| Description | Positioning mode via digital inputs: Acceleration 1 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 50 |
| EEPROM | Yes |
| Value range | 1 … 100 %<br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.54 PCM Acceleration 2

| | |
|---|---|
| Object | 2943h |
| Description | Positioning mode via digital inputs: Acceleration 2 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 50 |
| EEPROM | Yes |
| Value range | 1 … 100 %<br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.55 PCM Acceleration 3

| | |
|---|---|
| Object | 2944h |
| Description | Positioning mode via digital inputs: Acceleration 3 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 50 |
| EEPROM | Yes |
| Value range | 1 … 100 %<br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.56 PCM Acceleration 4

| | |
|---|---|
| Object | 2945h |
| Description | Positioning mode via digital inputs: Acceleration 4 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 50 |
| EEPROM | Yes |
| Value range | 1 … 100 %<br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.57 PCM Acceleration 5

| | |
|---|---|
| Object | 2946h |
| Description | Positioning mode via digital inputs: Acceleration 5 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 50 |
| EEPROM | Yes |
| Value range | 1 … 100 %<br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.58 PCM Acceleration 6

| | |
|---|---|
| Object | 2947h |
| Description | Positioning mode via digital inputs: Acceleration 6 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 50 |
| EEPROM | Yes |
| Value range | 1 … 100 %<br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.59 PCM Acceleration 7

| | |
|---|---|
| Object | 2948h |
| Description | Positioning mode via digital inputs: Acceleration 7 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 50 |
| EEPROM | Yes |
| Value range | 1 … 100 %<br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.60 PCM Velocity 1

| | |
|---|---|
| Object | 2962h |
| Description | Positioning mode via digital inputs: Velocity 1 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 10 |
| EEPROM | Yes |
| Value range | Transmission 66:1 Ý max. 75 rpm<br>Transmission 98:1 Ý max. 50 rpm<br>Transmission 188:1 Ý max. 30 rpm<br>Transmission 368:1 Ý max. 15 rpm |

### 8.2.1.61 PCM Velocity 2

| | |
|---|---|
| Object | 2963h |
| Description | Positioning mode via digital inputs: Velocity 2 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 10 |
| EEPROM | Yes |
| Value range | Transmission 66:1 Ý max. 75 rpm<br>Transmission 98:1 Ý max. 50 rpm<br>Transmission 188:1 Ý max. 30 rpm<br>Transmission 368:1 Ý max. 15 rpm |

### 8.2.1.62 PCM Velocity 3

| | |
|---|---|
| Object | 2964h |
| Description | Positioning mode via digital inputs: Velocity 3 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 10 |
| EEPROM | Yes |
| Value range | Transmission 66:1 Ý max. 75 rpm<br>Transmission 98:1 Ý max. 50 rpm<br>Transmission 188:1 Ý max. 30 rpm<br>Transmission 368:1 Ý max. 15 rpm |

### 8.2.1.63 PCM Velocity 4

| | |
|---|---|
| Object | 2965h |
| Description | Positioning mode via digital inputs: Velocity 4 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 10 |
| EEPROM | Yes |
| Value range | Transmission 66:1 Ý max. 75 rpm<br>Transmission 98:1 Ý max. 50 rpm<br>Transmission 188:1 Ý max. 30 rpm<br>Transmission 368:1 Ý max. 15 rpm |

### 8.2.1.64 PCM Velocity 5

| | |
|---|---|
| Object | 2966h |
| Description | Positioning mode via digital inputs: Velocity 5 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 10 |
| EEPROM | Yes |
| Value range | Transmission 66:1 Ý max. 75 rpm<br>Transmission 98:1 Ý max. 50 rpm<br>Transmission 188:1 Ý max. 30 rpm<br>Transmission 368:1 Ý max. 15 rpm |

### 8.2.1.65 PCM Velocity 6

| | |
|---|---|
| Object | 2967h |
| Description | Positioning mode via digital inputs: Velocity 6 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 10 |
| EEPROM | Yes |
| Value range | Transmission 66:1 Ý max. 75 rpm<br>Transmission 98:1 Ý max. 50 rpm<br>Transmission 188:1 Ý max. 30 rpm<br>Transmission 368:1 Ý max. 15 rpm |

### 8.2.1.66 PCM Velocity 7

| | |
|---|---|
| Object | 2968h |
| Description | Positioning mode via digital inputs: Velocity 7 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 10 |
| EEPROM | Yes |
| Value range | Transmission 66:1 Ý max. 75 rpm<br>Transmission 98:1 Ý max. 50 rpm<br>Transmission 188:1 Ý max. 30 rpm<br>Transmission 368:1 Ý max. 15 rpm |

### 8.2.1.67 PCM Deceleration 1

| | |
|---|---|
| Object | 2982h |
| Description | Positioning mode via digital inputs: Deceleration 1 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 101 |
| EEPROM | Yes |
| Value range | 1 … 101 %<br><br>101 % = the delay is determined by the PCM Acceleration 1 parameter.<br><br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.68 PCM Deceleration 2

| | |
|---|---|
| Object | 2983h |
| Description | Positioning mode via digital inputs: Deceleration 2 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 101 |
| EEPROM | Yes |
| Value range | 1 … 101 %<br><br>101 % = the delay is determined by the PCM Acceleration 2 parameter.<br><br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.69 PCM Deceleration 3

| | |
|---|---|
| Object | 2984h |
| Description | Positioning mode via digital inputs: Deceleration 3 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 101 |
| EEPROM | Yes |
| Value range | 1 … 101 %<br><br>101 % = the delay is determined by the PCM Acceleration 3 parameter.<br><br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.70 PCM Deceleration 4

| | |
|---|---|
| Object | 2985h |
| Description | Positioning mode via digital inputs: Deceleration 4 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 101 |
| EEPROM | Yes |
| Value range | 1 … 101 %<br><br>101 % = the delay is determined by the PCM Acceleration 4 parameter.<br><br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.71 PCM Deceleration 5

| | |
|---|---|
| Object | 2986h |
| Description | Positioning mode via digital inputs: Deceleration 5 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 101 |
| EEPROM | Yes |
| Value range | 1 … 101 %<br><br>101 % = the delay is determined by the PCM Acceleration 5 parameter.<br><br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.72 PCM Deceleration 6

| | |
|---|---|
| Object | 2987h |
| Description | Positioning mode via digital inputs: Deceleration 6 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 101 |
| EEPROM | Yes |
| Value range | 1 … 101 %<br><br>101 % = the delay is determined by the PCM Acceleration 6 parameter.<br><br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.73 PCM Deceleration 7

| | |
|---|---|
| Object | 2988h |
| Description | Positioning mode via digital inputs: Deceleration 7 |
| Access | rw |
| Data type | INTEGER16 |
| Default | 101 |
| EEPROM | Yes |
| Value range | 1 … 101 %<br><br>101 % = the delay is determined by the PCM Acceleration 7 parameter.<br><br>100 % correspond to:<br>Transmission 66:1 Ý 3.04 rps²<br>Transmission 98:1 Ý 2.05 rps²<br>Transmission 188:1 Ý 1.06 rps²<br>Transmission 368:1 Ý 0.54 rps² |

### 8.2.1.74 Output Stage Temperature

| | |
|---|---|
| Object | 2A01h |
| Description | Output stage temperature |
| Unit | 1/10 °C |
| Access | ro |
| Data type | INTEGER16 |
| Default | No |
| EEPROM | No |

### 8.2.1.75 Voltage of Control

| | |
|---|---|
| Object | 2A02h |
| Description | Operating voltage of control |
| Unit | 1/10 V |
| Access | ro |
| Data type | INTEGER16 |
| Default | No |
| EEPROM | No |

### 8.2.1.76 Voltage of Output Stage

| | |
|---|---|
| Object | 2A03h |
| Description | Operating voltage of output stage |
| Unit | 1/10 V |
| Access | ro |
| Data type | INTEGER16 |
| Default | No |
| EEPROM | No |

### 8.2.1.77 Voltage of Battery

| | |
|---|---|
| Object | 2A04h |
| Description | Battery voltage |
| Unit | 1/100 V |
| Access | ro |
| Data type | INTEGER16 |
| Default | No |
| EEPROM | No |

### 8.2.1.78 Motor Current

| | |
|---|---|
| Object | 2A05h |
| Description | Motor current |
| Unit | mA |
| Access | ro |
| Data type | INTEGER16 |
| Default | No |
| EEPROM | No |

### 8.2.1.79 Actual Position

| | |
|---|---|
| Object | 2A06h |
| Description | Actual position |
| Unit | Spindle pitch = 0: Increments<br>Spindle pitch > 0: 1/100 mm |
| Access | ro |
| Data type | INTEGER32 |
| Default | No |
| EEPROM | No |

### 8.2.1.80 Actual Rotational Speed

| | |
|---|---|
| Object | 2A07h |
| Description | Actual speed |
| Unit | rpm |
| Access | ro |
| Data type | INTEGER16 |
| Default | No |
| EEPROM | No |

### 8.2.1.81 Serial Number

| | |
|---|---|
| Object | 2A08h |
| Description | Serial number |
| Unit | - |
| Access | ro |
| Data type | INTEGER32 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.82 Production Date

| | |
|---|---|
| Object | 2A09h |
| Description | Production date |
| Unit | DDMMYYYY |
| Access | ro |
| Data type | INTEGER32 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.83 SW Motor Controller

| | |
|---|---|
| Object | 2A0Ah |
| Description | Motor Controller software version |
| Unit | - |
| Access | ro |
| Data type | INTEGER32 |
| Default | No |
| EEPROM | No |

#### 8.2.1.84 Gear Reduction

| | |
|---|---|
| Object | 2A0Bh |
| Description | Gear reduction |
| Unit | - |
| Access | ro |
| Data type | INTEGER16 |
| Default | No |
| EEPROM | Yes |

#### 8.2.1.85 System Status Word

The system status word consists of 2 bytes and reflects the state of the actuator.

| High Byte | | | | | | | | Low Byte | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bit number | | | | | | | | | | | | | | | |
| 15 | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 |
| 2 | | | | 9 | | | | 4 | | | | 8 | | | |

*Fig. 15: Structure of the system status word*

Example (gray background):

binary: Ý 0010 1001 0100 1000

hex: Ý 2 9 4 8

| | |
|---|---|
| Object | 2A0Ch |
| Description | System status word |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED16 |
| Default | No |
| EEPROM | No |

*Description of the bits, see Table 9: System status word*

The table below informs about the meaning of the individual bits of the system status word:

| Bit | State | Description |
|---|---|---|
| Bit 0 | ‘0‘ | Irrelevant |
| Bit 1 | ‘0‘ | Irrelevant |
| Bit 2 | ‘0‘ | Irrelevant |
| Bit 3 | | Positioning mode: In Position |
| | ‘1‘ | Actual position is within the positioning window of the programmed target value. |
| | ‘0‘ | Actual position is outside the positioning window of the programmed target value. |
| | | Speed mode: In Position |
| | ‘1‘ | Actual speed is inside the specified tolerance window of target speed |
| | ‘0‘ | Actual speed is outside the specified tolerance window. |
| Bit 4 | | Actuator travels: |
| | ‘1‘ | Actuator travels |
| | ‘0‘ | Drive stands still (rotational speed < 2 rpm) |
| Bit 5 | | Positioning mode: upper limit |
| | ‘1‘ | Actual position is above the programmed limiting value. Traveling is possible only in negative direction in inching mode. |
| | ‘0‘ | Actual position is below the programmed limiting value. |
| | ‘0‘ | Operating mode: Positioning mode: irrelevant |
| Bit 6 | | Positioning mode: lower limit |
| | ‘1‘ | Actual position is below the programmed limiting value. Traveling is possible only in positive direction in inching mode. |
| | ‘0‘ | Actual position is above the programmed limiting value. |
| | ‘0‘ | Positioning mode: irrelevant |
| Bit 7 | | Driver state |
| | ‘1‘ | Motor is enabled |
| | ‘0‘ | Motor in control |
| Bit 8 | | Error: |
| | ‘1‘ | Actuator has switched to error. The cause of the error must be removed and acknowledged. |
| | ‘0‘ | No error present |
| Bit 9 | | Positioning mode: Loop travel |
| | ‘1‘ | If travel direction unequal start direction (with loop travel ) |
| | ‘0‘ | If travel direction equal start direction |
| | ‘0‘ | Positioning mode: irrelevant |
| Bit 10 | | Output stage supply voltage |
| | ‘1‘ | No voltage, no traveling possible |
| | ‘0‘ | Voltage applied |
| Bit 11 | | Ready for travel: |
| | ‘1‘ | Not ready for travel |
| | ‘0‘ | Ready for travel: |
| | | Actuator not in error state |
| | | No active positioning |
| | | Supply voltage of the output stage is applied |
| | | Actual position within limits (only positioning mode) |

| Bit | State | Description |
|---|---|---|
| Bit 12 | ‘1‘<br>‘0‘ | Battery voltage:<br>Battery voltage < 2.6 V<br>Battery voltage OK |
| Bit 13 | ‘1‘<br>‘0‘ | Current limiting<br>Current limiting active<br>Current limiting not active |
| Bit 14 | ‘1‘<br>‘0‘ | Positioning mode: Status<br>Positioning active in positioning mode.<br>Positioning inactive. |
| | ‘1‘<br>‘0‘ | Speed mode: Status<br>Enable target speed<br>Target speed disabled |
| Bit 15 | ‘1‘<br><br><br><br>‘0‘ | Contouring error:<br>Contouring error Ý the actuator cannot reach the preset speed due to too high load.<br>The actuator switches the contouring error fault.<br>Remedy: reduce programmed speed!<br>No contouring error Ý actual speed corresponds with required speed. |

*Table 9: System status word*

### 8.2.1.86 Encoder Resolution

| | |
|---|---|
| Object | 2A0Dh |
| Description | Encoder resolution |
| Unit | Increments per revolution of the output shaft |
| Access | ro |
| Data type | INTEGER16 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.87 Device ID

| | |
|---|---|
| Object | 2A0Eh |
| Description | Device identification |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | Yes |

1 = AG25
2 = AG26

### 8.2.1.88 Number of Errors

| | |
|---|---|
| Object | 2B01h |
| Description | Number of errors |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | No |

### 8.2.1.89 Error Number 1

| | |
|---|---|
| Object | 2B02h |
| Description | Error 1 |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.90 Error Number 2

| | |
|---|---|
| Object | 2B03h |
| Description | Error 2 |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.91 Error Number 3

| | |
|---|---|
| Object | 2B04h |
| Description | Error 3 |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.92 Error Number 4

| | |
|---|---|
| Object | 2B05h |
| Description | Error 4 |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.93 Error Number 5

| | |
|---|---|
| Object | 2B06h |
| Description | Error 5 |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.94 Error Number 6

| | |
|---|---|
| Object | 2B07h |
| Description | Error 6 |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.95 Error Number 7

| | |
|---|---|
| Object | 2B08h |
| Description | Error 7 |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.96 Error Number 8

| | |
|---|---|
| Object | 2B09h |
| Description | Error 8 |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.97 Error Number 9

| | |
|---|---|
| Object | 2B0Ah |
| Description | Error 9 |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | Yes |

### 8.2.1.98 Error Number 10

| | |
|---|---|
| Object | 2B0Bh |
| Description | Error 10 |
| Unit | - |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | Yes |

#### 8.2.1.99 S-Command

| | |
|---|---|
| Object | 2C01h |
| Description | S command |
| Unit | - |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | No |
| EEPROM | No |

| Value | Description |
|---|---|
| 1 | All parameters to default |
| 2 | Only standard parameters to default |
| 3 | Controller parameters to default |
| 6 | Reset error |
| 7 | Calibrate |
| 8 | Delete error memory |

### 8.2.2 Standard objects parameter description

#### 8.2.2.1 NMT_DeviceType_U32

| | |
|---|---|
| Object | 1000h |
| Sub-index | 00h |
| Description | Device profile |
| Access | ro |
| Data type | UNSIGNED32 |
| Default | 0000 0000h (no profile) |

#### 8.2.2.2 ERR_ErrorRegister_U8

| | |
|---|---|
| Object | 1001h |
| Sub-index | 00h |
| Description | Error register |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | 00h |

#### 8.2.2.3 NMT_CycleLen_U32

| | |
|---|---|
| Object | 1006h |
| Sub-index | 00h |
| Description | Cycle time in µs |
| Access | rw |
| Data type | UNSIGNED32 |
| Default | 200 |
| Value range | 200 … 2147483 (µs) |

#### 8.2.2.4 NMT_ManufactDevName_VS

| | |
|---|---|
| Object | 1008h |
| Sub-index | 00h |
| Description | Device name |
| Access | const |
| Data type | VISIBLE_STRING |
| Default | "SIKO DriveLine AG2x EPL" |

#### 8.2.2.5 NMT_ManufactHwVers_VS

| | |
|---|---|
| Object | 1009h |
| Sub-index | 00h |
| Description | Hardware version |
| Access | const |
| Data type | VISIBLE_STRING |
| Default | Current hardware version format: "HW_1.00" |

#### 8.2.2.6 NMT_ManufactSwVers_VS

| | |
|---|---|
| Object | 100Ah |
| Sub-index | 00h |
| Description | Software version |
| Access | const |
| Data type | VISIBLE_STRING |
| Default | Current software version “SW_1.00” |

#### 8.2.2.7 NMT_IdentityObject_REC

| | |
|---|---|
| Object | 1018h |
| Sub-index | 00h |
| Description | Number of entries |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 04h |

| | |
|---|---|
| Object | 1018h |
| Sub-index | 01h |
| Description | Vendor ID |
| Access | const |
| Data type | UNSIGNED32 |
| Default | 0000 0195h |

| | |
|---|---|
| Object | 1018h |
| Sub-index | 02h |
| Description | Product code |
| Access | const |
| Data type | UNSIGNED32 |
| Default | 0000 0101h |

| | |
|---|---|
| Object | 1018h |
| Sub-index | 03h |
| Description | Revision number |
| Access | const |
| Data type | UNSIGNED32 |
| Default | Current revision number |

| | |
|---|---|
| Object | 1018h |
| Sub-index | 04h |
| Description | Serial number |
| Access | const |
| Data type | UNSIGNED32 |
| Default | Serial number of the device |

#### 8.2.2.8 CFM_VerifyConfiguration_REC

| | |
|---|---|
| Object | 1020h |
| Sub-index | 00h |
| Description | Verify configuration, number of entries |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 02h |

| | |
|---|---|
| Object | 1020h |
| Sub-index | 01h |
| Description | Date of configuration |
| Access | rw |
| Data type | UNSIGNED32 |
| Default | 0 |
| Value range | 0 … FFFF FFFFh |

| | |
|---|---|
| Object | 1020h |
| Sub-index | 02h |
| Description | Time of configuration |
| Access | rw |
| Data type | UNSIGNED32 |
| Default | 0 |
| Value range | 0 … FFFF FFFFh |

#### 8.2.2.9 NMT_InterfaceGroup_00h_REC

| | |
|---|---|
| Object | 1030h |
| Sub-index | 00h |
| Description | Interface group, number of entries |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 09h |

| | |
|---|---|
| Object | 1030h |
| Sub-index | 01h |
| Description | InterfaceIndex_U16 |
| Access | ro |
| Data type | UNSIGNED16 |
| Default | 0001h |

| | |
|---|---|
| Object | 1030h |
| Sub-index | 02h |
| Description | InterfaceDescription_VSTR |
| Access | const |
| Data type | VISIBLE_STRING194 |
| Default | Depending on the current hardware version |

| | |
|---|---|
| Object | 1030h |
| Sub-index | 03h |
| Description | InterfaceType_U8 |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 06h |

| | |
|---|---|
| Object | 1030h |
| Sub-index | 04h |
| Description | InterfaceMtu_U16 |
| Access | const |
| Data type | UNSIGNED16 |
| Default | 1500 bytes |

| | |
|---|---|
| Object | 1030h |
| Sub-index | 05h |
| Description | InterfacePhysAddress_OSTR |
| Access | const |
| Data type | OCTET_STRING6 |
| Default | MAC address |

| | |
|---|---|
| Object | 1030h |
| Sub-index | 06h |
| Description | InterfaceName_VSTR |
| Access | ro |
| Data type | VISIBLE_STRING11 |
| Default | "Interface 1" |

| | |
|---|---|
| Object | 1030h |
| Sub-index | 07h |
| Description | InterfaceOperStatus_U8 |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | 01h |

| | |
|---|---|
| Object | 1030h |
| Sub-index | 08h |
| Description | InterfaceAdminState_U8 |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 01h |
| Value range | 0 … 1 |

| | |
|---|---|
| Object | 1030h |
| Sub-index | 09h |
| Description | Valid_BOOL |
| Access | rw |
| Data type | BOOLEAN |
| Default | 01h |
| Value range | 0 … 1 |

#### 8.2.2.10 SDO_SequLayerTimeout_U32

| | |
|---|---|
| Object | 1300h |
| Sub-index | 00h |
| Description | Timeout for detection of disconnection of the SDO sequence |
| Access | rw |
| Data type | UNSIGNED32 |
| Default | 15000 |
| Value range | 100 … FFFF FFFFh |

#### 8.2.2.11 PDO_RxCommParam_00h_REC

| | |
|---|---|
| Object | 1400h |
| Sub-index | 00h |
| Description | Communication parameters for the Rx PDOs, number of entries |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 02h |

| | |
|---|---|
| Object | 1400h |
| Sub-index | 01h |
| Description | NodeID_U8 |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 00h |

| | |
|---|---|
| Object | 1400h |
| Sub-index | 02h |
| Description | MappingVersion_U8 |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | 00h |

#### 8.2.2.12 PDO_RXMappParam_00h_AU64

| | |
|---|---|
| Object | 1600h |
| Sub-index | 00h |
| Description | Mapping parameters of Rx PDOs, number of entries |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 3 |

| | |
|---|---|
| Object | 1600h |
| Sub-index | 01h |
| Description | Mapped Object 001 |
| Access | ro |
| Data type | UNSIGNED64 |
| Default | 0010 0000 0000 2002h |

| | |
|---|---|
| Object | 1600h |
| Sub-index | 02h |
| Description | Mapped Object 002 |
| Access | ro |
| Data type | UNSIGNED64 |
| Default | 0020 0010 0000 2003h |

| | |
|---|---|
| Object | 1600h |
| Sub-index | 03h |
| Description | Mapped Object 003 |
| Access | ro |
| Data type | UNSIGNED64 |
| Default | 0008 0030 0000 2001h |

#### 8.2.2.13 PDO_TxCommParam_00h_REC

| | |
|---|---|
| Object | 1800h |
| Sub-index | 00h |
| Description | Communication parameters of Tx PDOs, number of entries |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 02h |

| | |
|---|---|
| Object | 1800h |
| Sub-index | 01h |
| Description | NodeID_U8 |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 00h |

| | |
|---|---|
| Object | 1800h |
| Sub-index | 02h |
| Description | MappingVersion_U8 |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | 00h |

#### 8.2.2.14 PDO_TxMappParam_00h_AU64

| | |
|---|---|
| Object | 1A00h |
| Sub-index | 00h |
| Description | Mapping parameters of TX PDOs, number of entries |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 03h |

| | |
|---|---|
| Object | 1A00h |
| Sub-index | 01h |
| Description | Mapped Object 001 |
| Access | ro |
| Data type | UNSIGNED64 |
| Default | 0010 0000 0000 2102h |

| | |
|---|---|
| Object | 1A00h |
| Sub-index | 02h |
| Description | Mapped Object 002 |
| Access | ro |
| Data type | UNSIGNED64 |
| Default | 0020 0010 0000 2103h |

| | |
|---|---|
| Object | 1A00h |
| Sub-index | 03h |
| Description | Mapped Object 003 |
| Access | ro |
| Data type | UNSIGNED64 |
| Default | 0008 0030 0000 2101h |

### 8.2.2.15 DLL_CNLossSoC_REC

| | |
|---|---|
| Object | 1C0Bh |
| Sub-index | 00h |
| Description | “Loss of Soc” error counter, number of entries |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 03h |

| | |
|---|---|
| Object | 1C0Bh |
| Sub-index | 01h |
| Description | CumulativeCnt_U32 |
| Access | rw |
| Data type | UNSIGNED32 |
| Default | 0 |
| Value range | 0 … FFFF FFFFh |

| | |
|---|---|
| Object | 1C0Bh |
| Sub-index | 02h |
| Description | ThresholdCnt_U32 |
| Access | ro |
| Data type | UNSIGNED32 |
| Default | 0 |

| | |
|---|---|
| Object | 1C0Bh |
| Sub-index | 03h |
| Description | Threshold_U32 |
| Access | rw |
| Data type | UNSIGNED32 |
| Default | 15 |
| Value range | 0 … FFFF FFFFh |

### 8.2.2.16 DLL_CNCRCError_REC

| | |
|---|---|
| Object | 1C0Fh |
| Sub-index | 00h |
| Description | CRC error counter |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 03h |

| | |
|---|---|
| Object | 1C0Fh |
| Sub-index | 01h |
| Description | CumulativeCnt_U32 |
| Access | rw |
| Data type | UNSIGNED32 |
| Default | 0 |
| Value range | 0 … FFFF FFFFh |

| | |
|---|---|
| Object | 1C0Fh |
| Sub-index | 02h |
| Description | ThresholdCnt_U32 |
| Access | ro |
| Data type | UNSIGNED32 |
| Default | 0 |

| | |
|---|---|
| Object | 1C0Fh |
| Sub-index | 03h |
| Description | Threshold_U32 |
| Access | rw |
| Data type | UNSIGNED32 |
| Default | 15 |
| Value range | 0 … FFFF FFFFh |

#### 8.2.2.17 DLL_CNLossOfSocTolerance_U32

| | |
|---|---|
| Object | 1C14h |
| Sub-index | 00h |
| Description | “Loss of Soc” tolerance interval |
| Access | rw |
| Data type | UNSIGNED32 |
| Default | 100 000 (ns) |
| Value range | 0 … 2147483000 |

#### 8.2.2.18 PDL_DownloadProgData_ADOM

| | |
|---|---|
| Object | 1F50h |
| Sub-index | 00h |
| Description | Number of entries |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | 01h |

| | |
|---|---|
| Object | 1F50h |
| Sub-index | 01h |
| Description | Program |
| Access | ro |
| Data type | DOMAIN |
| Default | - |

#### 8.2.2.19 PDL_ProgCtrl_AU8

| | |
|---|---|
| Object | 1F51h |
| Sub-index | 00h |
| Description | Number of entries |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | 01h |

| | |
|---|---|
| Object | 1F51h |
| Sub-index | 01h |
| Description | ProgCtrl |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 01h |

#### 8.2.2.20 PDL_LocVerApplSw_REC

| | |
|---|---|
| Object | 1F52h |
| Sub-index | 00h |
| Description | Number of entries |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 02h |

| | |
|---|---|
| Object | 1F52h |
| Sub-index | 01h |
| Description | ApplSwDate_U32 |
| Access | ro |
| Data type | UNSIGNED32 |
| Default | - |

| | |
|---|---|
| Object | 1F52h |
| Sub-index | 02h |
| Description | ApplSwTime_U32 |
| Access | ro |
| Data type | UNSIGNED32 |
| Default | - |

#### 8.2.2.21 NMT_NodeAssignment_AU32

| | |
|---|---|
| Object | 1F81h |
| Sub-index | 00h |
| Description | List of all nodes |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | FEh |
| Value range | 01h … FEh |

| | |
|---|---|
| Object | 1F81h |
| Sub-index | 01h - FEh |
| Description | NodeAssignment |
| Access | rw |
| Data type | UNSIGNED32 |
| Default | 0 |

#### 8.2.2.22 NMT_FeatureFlags_U32

| | |
|---|---|
| Object | 1F82h |
| Sub-index | 00h |
| Description | Device properties |
| Access | const |
| Data type | UNSIGNED32 |
| Default | 0004 8205h |

#### 8.2.2.23 NMT_EPLVersion_U8

| | |
|---|---|
| Object | 1F83h |
| Sub-index | 00h |
| Description | Supported Ethernet Powerlink version |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 20h |

#### 8.2.2.24 NMT_CurrNMTState_U8

| | |
|---|---|
| Object | 1F8Ch |
| Sub-index | 00h |
| Description | Status of the NMT State Machine |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | No |

#### 8.2.2.25 NMT_PresPayloadLimitList_AU16

| | |
|---|---|
| Object | 1F8Dh |
| Sub-index | 00h |
| Description | List of all maximum service loads, number of entries |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 254 |

| | |
|---|---|
| Object | 1F8Dh |
| Sub-index | 01h - FEh |
| Description | PresPayloadLimit |
| Access | rw |
| Data type | UNSIGNED16 |
| Default | 36 |

### 8.2.2.26 NMT_EPLNodeID_REC

| | |
|---|---|
| Object | 1F93h |
| Sub-index | 00h |
| Description | Node ID |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 02h |

| | |
|---|---|
| Object | 1F93h |
| Sub-index | 01h |
| Description | NodeID_U8 |
| Access | ro |
| Data type | UNSIGNED8 |
| Default | the configured Node ID |

| | |
|---|---|
| Object | 1F93h |
| Sub-index | 02h |
| Description | NodeIDByHW_BOOL |
| Access | ro |
| Data type | BOOLEAN |
| Default | 01h |

### 8.2.2.27 NMT_CycleTiming_REC

| | |
|---|---|
| Object | 1F98h |
| Sub-index | 00h |
| Description | Time response of the node, number of entries |
| Access | const |
| Data type | UNSIGNED8 |
| Default | 08h |

| | |
|---|---|
| Object | 1F98h |
| Sub-index | 01h |
| Description | IsochrTxMaxPayload_U16 |
| Access | const |
| Data type | UNSIGNED16 |
| Default | 1490 |

| | |
|---|---|
| Object | 1F98h |
| Sub-index | 02h |
| Description | IsochrRxMaxPayload_U16 |
| Access | const |
| Data type | UNSIGNED16 |
| Default | 1490 |

| | |
|---|---|
| Object | 1F98h |
| Sub-index | 03h |
| Description | PresMaxLatency_U32 |
| Access | const |
| Data type | UNSIGNED32 |
| Default | 1000 |

| | |
|---|---|
| Object | 1F98h |
| Sub-index | 04h |
| Description | PreqActPayloadLimit_U16 |
| Access | rw |
| Data type | UNSIGNED16 |
| Default | 36 |
| Value range | 36 … 1490 |

| | |
|---|---|
| Object | 1F98h |
| Sub-index | 05h |
| Description | PresActPayloadLimit_U16 |
| Access | rw |
| Data type | UNSIGNED16 |
| Default | 36 |
| Value range | 36 … 1490 |

| | |
|---|---|
| Object | 1F98h |
| Sub-index | 06h |
| Description | AsndMaxLatency_U32 |
| Access | const |
| Data type | UNSIGNED32 |
| Default | 1000 |

| | |
|---|---|
| Object | 1F98h |
| Sub-index | 07h |
| Description | MultiplCycleCnt_U8 |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| Value range | 0 … 255 |

| | |
|---|---|
| Object | 1F98h |
| Sub-index | 08h |
| Description | AsyncMTU_U16 |
| Access | rw |
| Data type | UNSIGNED16 |
| Default | 300 |
| Value range | 0 … 1500 |

#### 8.2.2.28 NMT_CNBasicEthernetTimeout_U32

| | |
|---|---|
| Object | 1F99h |
| Sub-index | 00h |
| Description | Timeout period for the Basic Ethernet mode |
| Access | rw |
| Data type | UNSIGNED32 |
| Default | 5000000 |

#### 8.2.2.29 NMT_MultiplCycleAssign_AU8

| | |
|---|---|
| Object | 1F9Bh |
| Sub-index | 00h |
| Description | Configuration setting for multiplexed slot transfer, number of entries |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 254 |
| Value range | 1 … 254 |

| | |
|---|---|
| Object | 1F9Bh |
| Sub-index | 01h |
| Description | CycleNo |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 0 |
| Value range | 0 … 255 |

#### 8.2.2.30 NMT_ResetCmd_U8

| | |
|---|---|
| Object | 1F9Eh |
| Sub-index | 00h |
| Description | Reset of a node |
| Access | rw |
| Data type | UNSIGNED8 |
| Default | 255 |

# 9 Service protocol

| | |
|---|---|
| **NOTICE** | If there is process data exchange with a network master, writing of parameters and execution of commands via the service protocol is disabled. In this case, the drive replies with the error code “?03”, No operating authorization |

## 9.1 General Information

The service protocol enables parameterization and control of the drive by ASCII commands via an ASCII terminal.

### 9.1.1 Communication

### 9.1.2 Settings

Available baud rates: 9.6 Kbit/s / 19.2 Kbit/s / 57.6 Kbit/s (factory setting), 115.2 Kbit/s

Additional settings: No parity, 8 data bits, 1 stop bit, no handshake

### 9.1.3 ASCII commands

An ASCII command consists of an ASCII character and additional arguments such as parameter address, mathematical sign and value.

Length and format of an ASCII command are defined unchangeably.

### 9.1.4 Responses

Except for a few cases, the actuator responds to ASCII commands with a terminating string (ASCII-character ">" + Carriage Return "<CR>"). The responses to read commands contain return values in addition. Length and format of the response are defined unchangeably.

## 9.2 Overview of parameters

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## 9.3 Parameters

### 9.3.1 Positioning

#### 9.3.1.1 Target Value

| | | |
|---|---|---|
| Read command | E0 | see chapter 9.8 ASCII command structure |
| Write command | F0±xxxxxxx | |
| Description | see chapter 8.2.1.3 Target Value | |

#### 9.3.1.2 Actual Position

| | | |
|---|---|---|
| Read command | Z | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | Decimal format<br>see chapter 8.2.1.79 Actual Position | |

| | | |
|---|---|---|
| Read command | W | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | Binary format<br>see chapter 8.2.1.79 Actual Position | |

#### 9.3.1.3 Actual Rotational Speed

| | | |
|---|---|---|
| Read command | V | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.80 Actual Rotational Speed | |

#### 9.3.1.4 Calibration Value

| | | |
|---|---|---|
| Read command | E3 | see chapter 9.8 ASCII command structure |
| Write command | F3±xxxxxxx | |
| Description | see chapter 8.2.1.31 Calibration Value | |

#### 9.3.1.5 Loop Length

| | | |
|---|---|---|
| Read command | G17 | see chapter 9.8 ASCII command structure |
| Write command | H17xxxxx | |
| Description | see chapter 8.2.1.40 Loop Length | |

#### 9.3.1.6 Offset Value

| | | |
|---|---|---|
| Read command | E5 | see chapter 9.8 ASCII command structure |
| Write command | F5±xxxxxxx | |
| Description | see chapter 8.2.1.45 Offset Value | |

#### 9.3.1.7 Pos Type

| | | |
|---|---|---|
| Read command | Q | see chapter 9.8 ASCII command structure |
| Write command | Lx | |
| Description | see chapter 8.2.1.36 Pos Type | |
| Info | Reading of the positioning type is via the flag register<br>(see chapter 9.3.6.6: Flag Register).<br>x = 0: positioning direct<br>x = 1: positioning with loop positive<br>x = 2: positioning with loop negative | |

#### 9.3.1.8 Pos Window

| | | |
|---|---|---|
| Read command | G09 | see chapter 9.8 ASCII command structure |
| Write command | H09xxxxx | |
| Description | see chapter 8.2.1.27 Pos Window | |

#### 9.3.1.9 Sense of Rotation

| | | |
|---|---|---|
| Read command | Q | see chapter 9.8 ASCII command structure |
| Write command | Tx | |
| Description | see chapter 8.2.1.35 Sense of Rotation | |
| Info | Reading of the sense of rotation is via the flag register<br>(see chapter 9.3.6.6: Flag Register).<br>x = 0: i sense of rotation (cw)<br>x = 1: e sense of rotation | |

#### 9.3.1.10 Spindle Pitch

| | | |
|---|---|---|
| Read command | G13 | see chapter 9.8 ASCII command structure |
| Write command | H13xxxxx | |
| Description | see chapter 8.2.1.30 Spindle Pitch | |

### 9.3.2 Actuator

#### 9.3.2.1 A-Pos

| | | |
|---|---|---|
| Read command | G03 | see chapter 9.8 ASCII command structure |
| Write command | H03xxxxx | |
| Description | see chapter 8.2.1.21 A-Pos | |

#### 9.3.2.2 V-Pos

| | | |
|---|---|---|
| Read command | G04 | see chapter 9.8 ASCII command structure |
| Write command | H04xxxxx | |
| Description | see chapter 8.2.1.22 V-Pos | |

#### 9.3.2.3 D-Pos

| | | |
|---|---|---|
| Read command | G44 | see chapter 9.8 ASCII command structure |
| Write command | H44xxxxx | |
| Description | see chapter 8.2.1.23 D-Pos | |

#### 9.3.2.4 A-Rot

| | | |
|---|---|---|
| Read command | G05 | see chapter 9.8 ASCII command structure |
| Write command | H05xxxxx | |
| Description | see chapter 8.2.1.24 A-Rot | |

#### 9.3.2.5 A-Inch

| | | |
|---|---|---|
| Read command | G07 | see chapter 9.8 ASCII command structure |
| Write command | H07xxxxx | |
| Description | see chapter 8.2.1.25 A-Inch | |

#### 9.3.2.6 V-Inch

| | | |
|---|---|---|
| Read command | G08 | see chapter 9.8 ASCII command structure |
| Write command | H08xxxxx | |
| Description | see chapter 8.2.1.26 V-Inch | |

#### 9.3.2.7 Gear Ratio Denominator

| | | |
|---|---|---|
| Read command | G11 | see chapter 9.8 ASCII command structure |
| Write command | H11xxxxx | |
| Description | see chapter 8.2.1.29 Gear Ratio Denominator | |

#### 9.3.2.8 Gear Ratio Numerator

| | | |
|---|---|---|
| Read command | G10 | see chapter 9.8 ASCII command structure |
| Write command | H10xxxxx | |
| Description | see chapter 8.2.1.28 Gear Ratio Numerator | |

### 9.3.3 Limiting values

#### 9.3.3.1 Software Limit 1

| | | |
|---|---|---|
| Read command | E1 | see chapter 9.8 ASCII command structure |
| Write command | F1±xxxxxxx | |
| Description | see chapter 8.2.1.32 Software Limit 1 | |

#### 9.3.3.2 Software Limit 2

| | | |
|---|---|---|
| Read command | E2 | see chapter 9.8 ASCII command structure |
| Write command | F2±xxxxxxx | |
| Description | see chapter 8.2.1.33 Software Limit 2 | |

#### 9.3.3.3 Current Limiting

| | | |
|---|---|---|
| Read command | G24 | see chapter 9.8 ASCII command structure |
| Write command | H24xxxxx | |
| Description | see chapter 8.2.1.42 Current Limiting | |

#### 9.3.3.4 Contouring Error Limit

| | | |
|---|---|---|
| Read command | G18 | see chapter 9.8 ASCII command structure |
| Write command | H18xxxxx | |
| Description | see chapter 8.2.1.41 Contouring Error Limit | |

### 9.3.4 Options

#### 9.3.4.1 Operating Mode

| | | |
|---|---|---|
| Read command | Q | see chapter 9.8 ASCII command structure |
| Write command | Xy | |
| Description | see chapter 8.2.1.37 Operating Mode | |
| Info | Reading of the operating mode is via the flag register<br>(see chapter 9.3.6.6: Flag Register).<br>y = 0: Positioning mode<br>y = 1: Rotational speed mode | |

#### 9.3.4.2 Inpos Mode

| | | |
|---|---|---|
| Read command | G16 | see chapter 9.8 ASCII command structure |
| Write command | H16xxxxx | |
| Description | see chapter 8.2.1.39 Inpos Mode | |

#### 9.3.4.3 Delta Inch

| | | |
|---|---|---|
| Read command | E4 | see chapter 9.8 ASCII command structure |
| Write command | F4±xxxxxxx | |
| Description | see chapter 8.2.1.34 Delta Inch | |

#### 9.3.4.4 Inching 2 Acceleration Type

| | | |
|---|---|---|
| Read command | G39 | see chapter 9.8 ASCII command structure |
| Write command | H39xxxxx | |
| Description | see chapter 8.2.1.44 Inching 2 Acceleration Type | |

#### 9.3.4.5 Inching 2 Offset

| | | |
|---|---|---|
| Read command | G27 | see chapter 9.8 ASCII command structure |
| Write command | H27xxxxx | |
| Description | see chapter 8.2.1.43 Inching 2 Offset | |

#### 9.3.4.6 Inching 2 Stop Mode

| | | |
|---|---|---|
| Read command | G15 | see chapter 9.8 ASCII command structure |
| Write command | H15xxxxx | |
| Description | see chapter 8.2.1.38 Inching 2 Stop Mode | |

#### 9.3.4.7 LED Functionality

| | | |
|---|---|---|
| Read command | G45 | see chapter 9.8 ASCII command structure |
| Write command | H45xxxxx | |
| Description | see chapter 8.2.1.7 LED Functionality | |

#### 9.3.4.8 Service Interface Baud Rate

| | | |
|---|---|---|
| Read command | G25 | see chapter 9.8 ASCII command structure |
| Write command | H25xxxxx | |
| Description | see chapter 8.2.1.8 Service Interface Baud Rate | |

### 9.3.5 Controller parameters

#### 9.3.5.1 Controller Parameter P

| | | |
|---|---|---|
| Read command | G00 | see chapter 9.8 ASCII command structure |
| Write command | H00xxxxx | |
| Description | see chapter 8.2.1.18 Controller Parameter P | |

#### 9.3.5.2 Controller Parameter I

| | | |
|---|---|---|
| Read command | G01 | see chapter 9.8 ASCII command structure |
| Write command | H01xxxxx | |
| Description | see chapter 8.2.1.19 Controller Parameter I | |

#### 9.3.5.3 Controller Parameter D

| | | |
|---|---|---|
| Read command | G02 | see chapter 9.8 ASCII command structure |
| Write command | H02xxxxx | |
| Description | see chapter 8.2.1.20 Controller Parameter D | |

### 9.3.6 Device information

#### 9.3.6.1 Motor Current

| | | |
|---|---|---|
| Read command | B04 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.78 Motor Current | |

#### 9.3.6.2 Output Stage Temperature

| | | |
|---|---|---|
| Read command | B00 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.74 Output Stage Temperature | |

#### 9.3.6.3 Voltage of Control

| | | |
|---|---|---|
| Read command | B01 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.75 Voltage of Control | |

#### 9.3.6.4 Voltage of Output Stage

| | | |
|---|---|---|
| Read command | B02 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.76 Voltage of Output Stage | |

#### 9.3.6.5 Voltage of Battery

| | | |
|---|---|---|
| Read command | B03 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.77 Voltage of Battery | |

#### 9.3.6.6 Flag Register

| | | |
|---|---|---|
| Read command | Q | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | x x x x x x x x = binary representation of the flag register<br>7 6 5 4 3 2 1 0 Bit<br>Bit 0: Sense of rotation: '0' = i (cw)<br>'1' = e (ccw)<br><br>Bit 1+2: Type of positioning: '00' = direct<br>'01' = loop +<br>'10' = loop –<br>Bit 3: Not assigned<br><br>Bit 4: Operating mode: '0' = positioning mode<br>'1' = speed mode<br><br>Bit 5+6+7: Not assigned | |

#### 9.3.6.7 System Status Word

| | | |
|---|---|---|
| Read command | R | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.85 System Status Word | |

#### 9.3.6.8 Device Type

| | | |
|---|---|---|
| Read command | A0 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | Response format: "AG25 >" | |

#### 9.3.6.9 Gear Reduction

| | | |
|---|---|---|
| Read command | A4 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | Response format: "98 >" | |

#### 9.3.6.10 Motor Type

| | | |
|---|---|---|
| Read command | A7 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | Response format: "50W >" | |

#### 9.3.6.11 Network Type

| | | |
|---|---|---|
| Read command | A3 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | Response format: "ECT  >" | |

#### 9.3.6.12 Production Date

| | | |
|---|---|---|
| Read command | A6 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | Response format: "DDMMYYYY>" | |

#### 9.3.6.13 Serial Number

| | | |
|---|---|---|
| Read command | A5 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | Response format: "12345678>" | |

#### 9.3.6.14 SW Ethernet Module

| | | |
|---|---|---|
| Read command | A2 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | Response format: "01:02:63>" | |

#### 9.3.6.15 SW Motor Controller

| | | |
|---|---|---|
| Read command | A1 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | Response format: "V1.00  >" | |

### 9.3.7 Digital input/output

#### 9.3.7.1 Digital Input 1 Functionality

| | | |
|---|---|---|
| Read command | G49 | see chapter 9.8 ASCII command structure |
| Write command | H49xxxxx | |
| Description | see chapter 8.2.1.12 Digital Input 1 Functionality | |

#### 9.3.7.2 Digital Input 2 Functionality

| | | |
|---|---|---|
| Read command | G50 | see chapter 9.8 ASCII command structure |
| Write command | H50xxxxx | |
| Description | see chapter 8.2.1.13 Digital Input 2 Functionality | |

#### 9.3.7.3 Digital Input 3 Functionality

| | | |
|---|---|---|
| Read command | G51 | see chapter 9.8 ASCII command structure |
| Write command | H51xxxxx | |
| Description | see chapter 8.2.1.14 Digital Input 3 Functionality | |

#### 9.3.7.4 Digital Input 4 Functionality

| | | |
|---|---|---|
| Read command | G52 | see chapter 9.8 ASCII command structure |
| Write command | H52xxxxx | |
| Description | see chapter 8.2.1.15 Digital Input 4 Functionality | |

#### 9.3.7.5 Digital Input Functionalities State

| | | |
|---|---|---|
| Read command | U1029 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.16 Digital Input Functionalities State | |

#### 9.3.7.6 Digital Inputs Polarity

| | | |
|---|---|---|
| Read command | G54 | see chapter 9.8 ASCII command structure |
| Write command | H54xxxxx | |
| Description | see chapter 8.2.1.17 Digital Inputs Polarity | |

#### 9.3.7.7 Digital Inputs State

| | | |
|---|---|---|
| Read command | B05 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.4 Digital Inputs State | |

#### 9.3.7.8 Digital Output 1 Functionality

| | | |
|---|---|---|
| Read command | G46 | see chapter 9.8 ASCII command structure |
| Write command | H46xxxxx | |
| Description | see chapter 8.2.1.9 Digital Output 1 Functionality | |

#### 9.3.7.9 Digital Outputs Control

| | | |
|---|---|---|
| Read command | G60 | see chapter 9.8 ASCII command structure |
| Write command | H60xxxxx | |
| Description | see chapter 8.2.1.1 Digital Outputs Control | |

#### 9.3.7.10 Digital Output Functionalities State

| | | |
|---|---|---|
| Read command | U0770 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.10 Digital Output Functionalities State | |

#### 9.3.7.11 Digital Outputs Polarity

| | | |
|---|---|---|
| Read command | G48 | see chapter 9.8 ASCII command structure |
| Write command | H48xxxxx | |
| Description | see chapter 8.2.1.11 Digital Outputs Polarity | |

### 9.3.8 Error memory

#### 9.3.8.1 Number of Errors

| | | |
|---|---|---|
| Read command | J00 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.88 Number of Errors | |

#### 9.3.8.2 Error Number 1

| | | |
|---|---|---|
| Read command | J01 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.89 Error Number 1 | |

#### 9.3.8.3 Error Number 2

| | | |
|---|---|---|
| Read command | J02 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.90 Error Number 2 | |

#### 9.3.8.4 Error Number 3

| | | |
|---|---|---|
| Read command | J03 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.91 Error Number 3 | |

#### 9.3.8.5 Error Number 4

| | | |
|---|---|---|
| Read command | J04 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.92 Error Number 4 | |

#### 9.3.8.6 Error Number 5

| | | |
|---|---|---|
| Read command | J05 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.93 Error Number 5 | |

#### 9.3.8.7 Error Number 6

| | | |
|---|---|---|
| Read command | J06 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.94 Error Number 6 | |

#### 9.3.8.8 Error Number 7

| | | |
|---|---|---|
| Read command | J07 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.95 Error Number 7 | |

#### 9.3.8.9 Error Number 8

| | | |
|---|---|---|
| Read command | J08 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.96 Error Number 8 | |

#### 9.3.8.10 Error Number 9

| | | |
|---|---|---|
| Read command | J09 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.97 Error Number 9 | |

#### 9.3.8.11 Error Number 10

| | | |
|---|---|---|
| Read command | J10 | see chapter 9.8 ASCII command structure |
| Write command | read-only | |
| Description | see chapter 8.2.1.98 Error Number 10 | |

## 9.4 Commands

### 9.4.1 Start travel job

| | | |
|---|---|---|
| Command | M | see chapter 9.8 ASCII command structure |
| Description | Positioning mode:<br>– start of positioning process to programmed set point<br>Speed mode:<br>– start of speed mode | |

### 9.4.2 Start inching mode 1

| | | |
|---|---|---|
| Command | Y | see chapter 9.8 ASCII command structure |
| Description | only in positioning mode | |

### 9.4.3 Start inching mode 2 positive travel direction

| | | |
|---|---|---|
| Command | , ($2C_{hex}$) | see chapter 9.8 ASCII command structure |
| Description | Drive travels in positive direction as long as the "," ASCII character is permanently sent (only in positioning mode). | |

### 9.4.4 Start inching mode 2 negative travel direction

| | | |
|---|---|---|
| Command | . ($2E_{hex}$) | see chapter 9.8 ASCII command structure |
| Description | Drive travels in negative direction as long as the "." ASCII character is permanently sent (only in positioning mode). | |

### 9.4.5 Cancel travel job in positioning mode

| | | |
|---|---|---|
| Command | I ($49_{hex}$) | see chapter 9.8 ASCII command structure |
| Description | Motor remains in control state | |

### 9.4.6 Motor stop fast

| | |
|---|---|
| NOTICE | If a contouring error is pending at the time of the 'N' command, the motor will be enabled |

| | | |
|---|---|---|
| Command | N | see chapter 9.8 ASCII command structure |
| Description | Motor decelerates with maximum delay. Motor remains in control state! | |

### 9.4.7 Motor stop

| | |
|---|---|
| NOTICE | If a contouring error is pending at the time of the "O" command, the motor will be enabled. |

| | | |
|---|---|---|
| Command | O | see chapter 9.8 ASCII command structure |
| Description | Motor decelerates with programmed delay. Motor remains in control state! | |

### 9.4.8 enable motor

| | | |
|---|---|---|
| Command | P | see chapter 9.8 ASCII command structure |
| Description | Motor is enabled | |

### 9.4.9 Factory setting: all parameters

| | | |
|---|---|---|
| Command | S11100 | see chapter 9.8 ASCII command structure |
| Description | Reset all parameters to factory settings | |

### 9.4.10 Factory setting: Standard parameters

| | | |
|---|---|---|
| Command | S11101 | see chapter 9.8 ASCII command structure |
| Description | Reset only standard parameters to factory settings | |

### 9.4.11 Factory setting: Controller parameters

| | | |
|---|---|---|
| Command | S11102 | see chapter 9.8 ASCII command structure |
| Description | Reset only controller parameters to factory settings | |

### 9.4.12 Acknowledge error

| | | |
|---|---|---|
| Command | S11103 | see chapter 9.8 ASCII command structure |
| Description | Acknowledge error | |

### 9.4.13 Calibrate

| | | |
|---|---|---|
| Command | S11104 | see chapter 9.8 ASCII command structure |
| Description | Calibrate actuator | |

### 9.4.14 Delete error memory

| | | |
|---|---|---|
| Command | S11105 | see chapter 9.8 ASCII command structure |
| Description | Deleting of the error memory | |

### 9.4.15 Software Reset

| | | |
|---|---|---|
| Command | K | see chapter 9.8 ASCII command structure |
| Description | Execute software reset | |

## 9.5 Flow charts

### 9.5.1 Flow chart: Operating mode: Positioning mode

The flow chart below shows the control of positioning in the positioning mode via service protocol (see chapter 9: Service protocol).

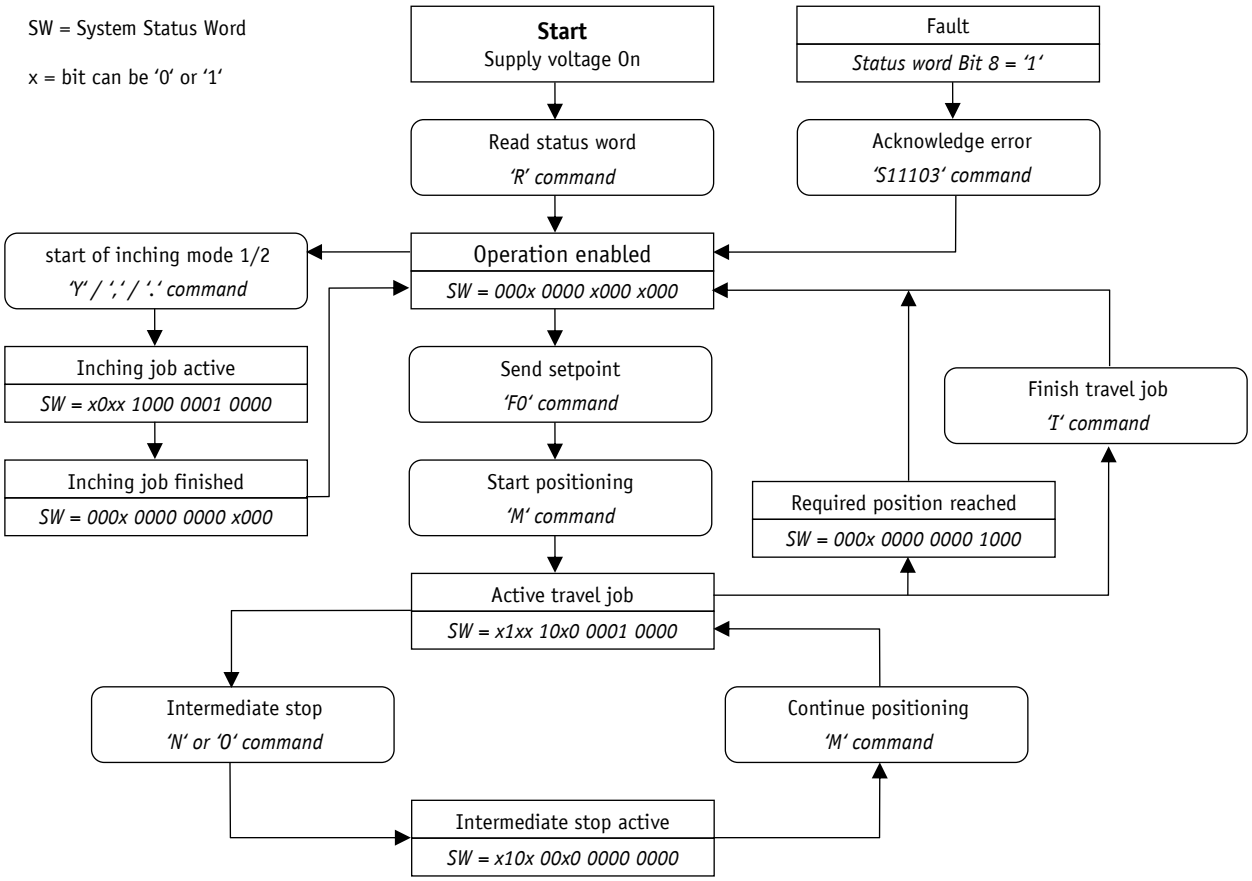


*Fig. 16: Flowchart positioning mode service protocol*

### 9.5.2 Flow chart: Operating mode: Speed mode

The flow chart below illustrates the control in the rotational speed mode via service protocol (see chapter 9: Service protocol).

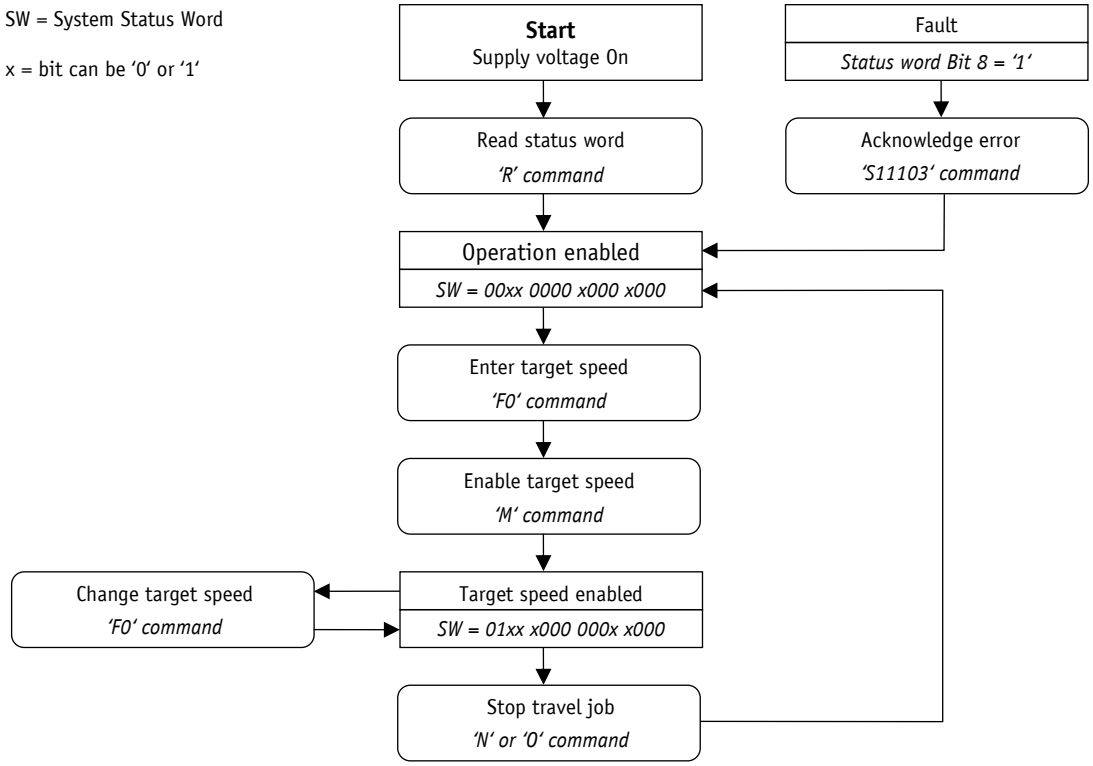


*Fig. 17: Flow chart speed mode service protocol*

## 9.6 Error number encoding

Faulty inputs are acknowledged with an error message. An error message is always prefixed by a question mark, followed by a two-digit error code. The error message ends with a carriage return "<CR>".

| Code | Description |
|---|---|
| ?01 | Input of illegal parameter number |
| ?02 | Illegal value range: |
| ?03 | No operating authorization (active process data exchange with network master) |
| ?04 | Input disabled due to operating state |
| ?05 | Limit switch 1 active |
| ?06 | Limit switch 2 active |
| ?07 | Actual or target value > upper software limit |
| ?08 | Actual or target value < lower software limit |
| ?09 | Setpoint entered exceeds limiting value |
| ?10 | Fault |
| ?11 | Active EEPROM write access |
| ?12 | Actual or target value < lower area limit |
| ?13 | Actual or target value > upper area limit |
| ?14 | Operating voltage of control missing |

## 9.7 Examples

### 9.7.1 Write and read setpoint +500

Write command: F0+0000500 (10 characters)

Reply: ><CR> (2 characters)

Read command: E0 (2 characters)

Reply: +0000500><CR> (10 characters)

### 9.7.2 Start travel job

Command M (1 character)

Reply: ><CR> (2 characters)

## 9.8 ASCII command structure

| Command | Length | Access | Reply | CR | Length | Description |
|---|---|---|---|---|---|---|
| Ay | 2 | read | xxxxxxxx> | x | 10 | Device information (constants)<br>y = address<br>xxxxxxxx = string |
| Byy | 3 | read | ±xxxxxxx> | x | 10 | Device information (actual values)<br>yy = address<br>±xxxxxxx = decimal value |
| Ey | 2 | read | ±xxxxxxx> | x | 10 | Read parameter (3-byte)<br>y = address<br>±xxxxxxx = decimal value |
| Fy±xxxxxxx | 10 | write | > | x | 2 | Write parameter (3-byte)<br>y = address<br>±xxxxxxx = decimal value |
| Gyy | 3 | read | "xxxxx>" | x | 7 | Read parameter (2-byte)<br>yy = address<br>xxxxx = decimal value |
| Hyyxxxxx | 8 | write | > | x | 2 | Write parameter (2-byte)<br>yy = address<br>xxxxx = decimal value |
| I | 1 | write | > | x | 2 | Cancel travel job in positioning mode |
| Jyy | 3 | read | 0xhh> | x | 6 | Error memory<br>yy = address<br>hh = hexadecimal value |
| K | 1 | write | > | x | 2 | Software reset |
| Lx | 2 | write | > | x | 2 | Type of positioning<br>x = decimal value |
| M | 1 | write | > | x | 2 | Start travel job |

| Command | Length | Access | Reply | CR | Length | Description |
|---|---|---|---|---|---|---|
| N | 1 | write | > | x | 2 | Motor stop fast |
| O | 1 | write | > | x | 2 | Motor stop |
| P | 1 | write | > | x | 2 | Enable motor |
| Q | 1 | read | 0xhh> | x | 6 | Flag Register<br>hh = hexadecimal value |
| R | 1 | read | 0xhhll> | x | 8 | System status word<br>hh = hexadecimal value<br>High byte<br>ll = hexadecimal value<br>Low byte |
| Sxxxxx | 6 | write | > | x | 2 | System command<br>xxxxx = code |
| Tx | 2 | write | > | x | 2 | Sense of rotation<br>x = decimal value |
| Uxxxx | 5 | read | bbbb | | 4 | Read parameter (4-byte)<br>bbbb = binary value in the Big-Endian format |
| V | 1 | read | ±xxxx> | x | 7 | Actual rotational speed<br>±xxxx = decimal value<br>with arithmetical sign |
| W | 1 | read | bbbb | | 4 | Position value in binary format<br>bbbb = binary value in the Big-Endian format |
| Xy | 2 | write | > | x | 2 | Operating mode<br>y = decimal value |
| Y | 1 | write | > | x | 2 | Start of inching mode 1 |
| Z | 1 | read | ±xxxxxxx> | x | 10 | Position value<br>±xxxxxxx decimal value |
| , ($2C_{hex}$) | 1 | write | | | 0 | Start of inching mode 2<br>positive travel direction |
| . ($2E_{hex}$) | 1 | write | | | 0 | Start of inching mode 2<br>negative travel direction |

# 10 Block diagram

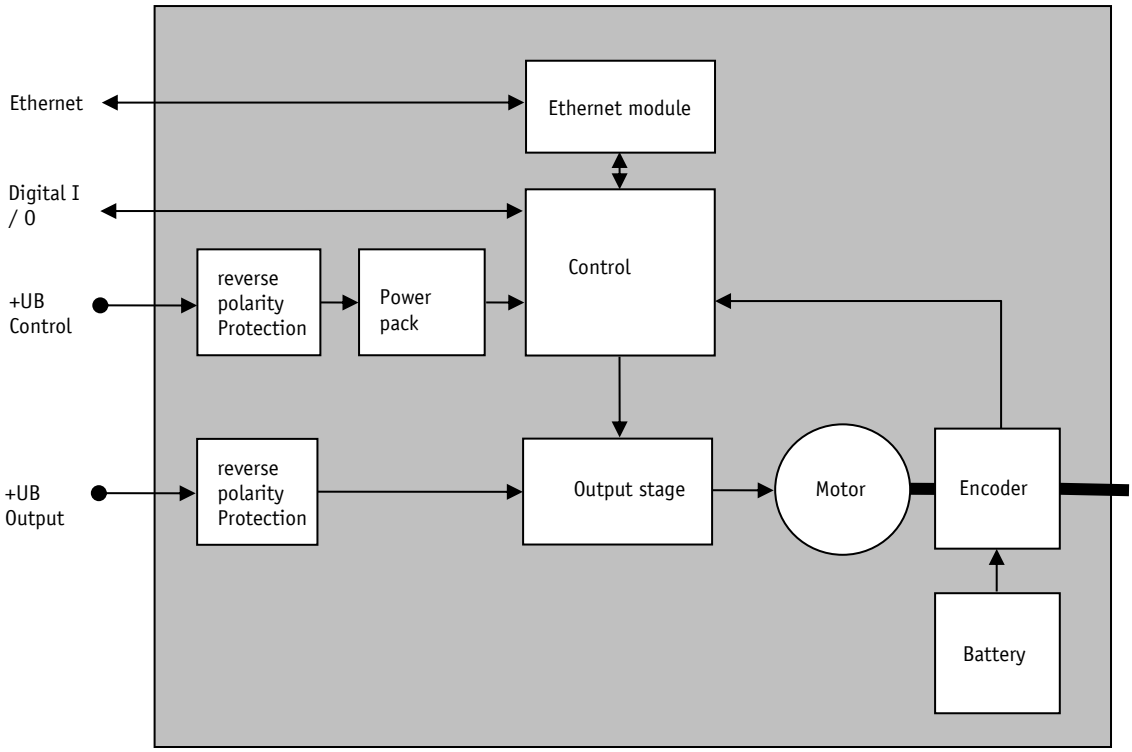


*Fig. 18: Block diagram*