AG25, AG26

Actuator with EtherNet/IP™ interface

User manual

225/18

Table of contents

1 General Information

1.1 Documentation

The following documents are associated with this document:

- 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/p/AG25*.

2 Display and controls

2.1 General Information

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

2.2 Displays

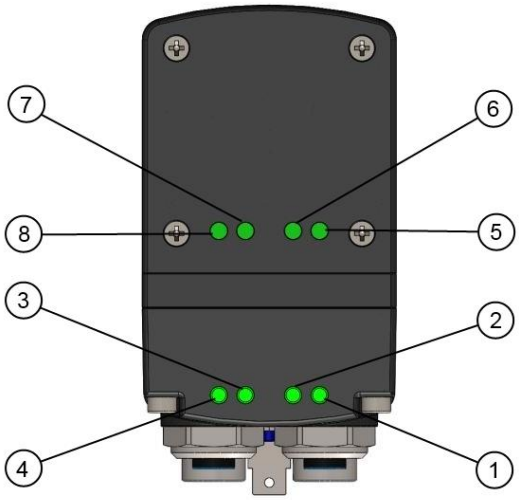


Fig.. 1: Displays

2.2.1 Ethernet module statuses

The ①, ②, ③, ④ LEDs inform about the statuses of the Ethernet module. The Ethernet module LEDs' functions are permanently defined and cannot be changed.

LED	Description
1	Module status LED
2	Link/Activity LED
3	Link/Activity LED
4	Network status LED

2.2.1.1 Module status LED 1

NOTICE	A test sequence is executed on this LED after switching on the device.

LED state	Description
Off	No operating voltage
Green	Control via scanner
Green, flashing	Not configured or scanner inactive
Red	Serious error
Red, flashing	Correctable error. The module has been configured but the stored parameters differ from the parameters presently used.

2.2.1.2 Link/Activity LED 2, 3

LED state	Description
Off	No connection, no activity
Green	Connection (100 Mbit/s) established
Green, flashing	Activity (100 Mbit/s)
Yellow	Connection (10 Mbit/s) established
Yellow, flashing	Activity (10 Mbit/s)

2.2.1.3 Network status LED 4

NOTICE	A test sequence is executed on this LED after switching on the device.

LED state	Description
Off	No operating voltage or no IP address
Green	On-line, one or multiple connections established (CIP Class 1 or 3)
Green, flashing	On-line, no connection established
Red	Double IP address, fatal error
Red, flashing	On-line, one or multiple connections timeout (CIP Class 1 or 3)

2.2.2 Drive status

With factory setting, the ⑤, ⑥, ⑦, ⑧ inform about the drive's status.
The functions 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
Red/green, flashing	Operating voltage applied to control, switch lock active
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 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. Operating voltage of the output stage is applied.
green, flashing	Actuator is within the programmed position window. Operating voltage of the output stage missing.
red	Actuator is outside the programmed positioning window. Operating voltage of the output stage is applied.
red, flashing	Actuator is outside the programmed positioning window. Operating voltage of the output stage missing.
off	Operating voltage of control missing.

2.3 Controls

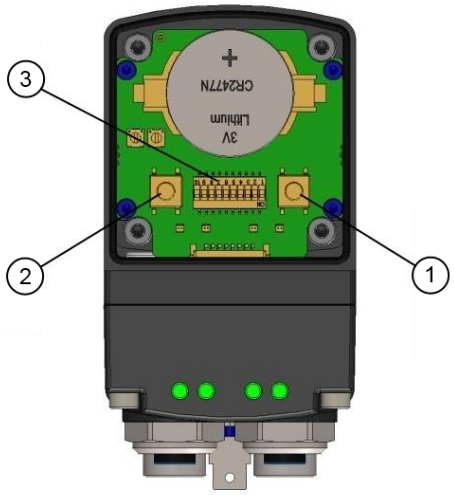


Fig. 2: Controls

2.3.1 Control keys

NOTICE	Manual setup operation is only available if there is no process data exchange going on.

Manual setup mode (corresponding to inching mode 2) can be started by means of the control keys. This enables actuator movement without a superordinate control.

Key ①: Inching mode 2 in e direction

Key ②: Inching mode 2 in i direction

2.3.2 DIP switch:

NOTICE	The DIP switch is only read when 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	Assignment
SW1-SW8	Setting of the IP address in binary format. 0 = DHCP/BOOTP 1 = Don't use 2 ... 254 = setting of the last byte of the IP address 192.168.1.XXX 255 = DHCP/BOOTP
SW9-SW10	No function, always off

If required, you can use DIP switches SW1-SW8 to set the last byte of the IP address in binary format. With the value zero set, the settings for IP address, subnet mask, and standard gateway can be obtained from a DHCP server.

The following applies to a value set between 2 and 254:

IP address	Range from 192.168.1.2 to 192.168.1.254
Subnet mask	255.255.255.0
Standard gateway	192.168.1.1
DHCP	Deactivated

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	IP
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	DHCP/BOOTP
ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	192.168.1.1 Don´t use, address is occupied by standard gateway.
OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	192.168.1.2
...	...	...	...	...	...	...	...	...
OFF	ON	ON	ON	ON	ON	ON	ON	192.168.1.254
ON	ON	ON	ON	ON	ON	ON	ON	DHCP/BOOTP

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 functions' conditions of the digital inputs can be read in the register Digital Input Functionalities State (instance 1029).

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 (instance 770).

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

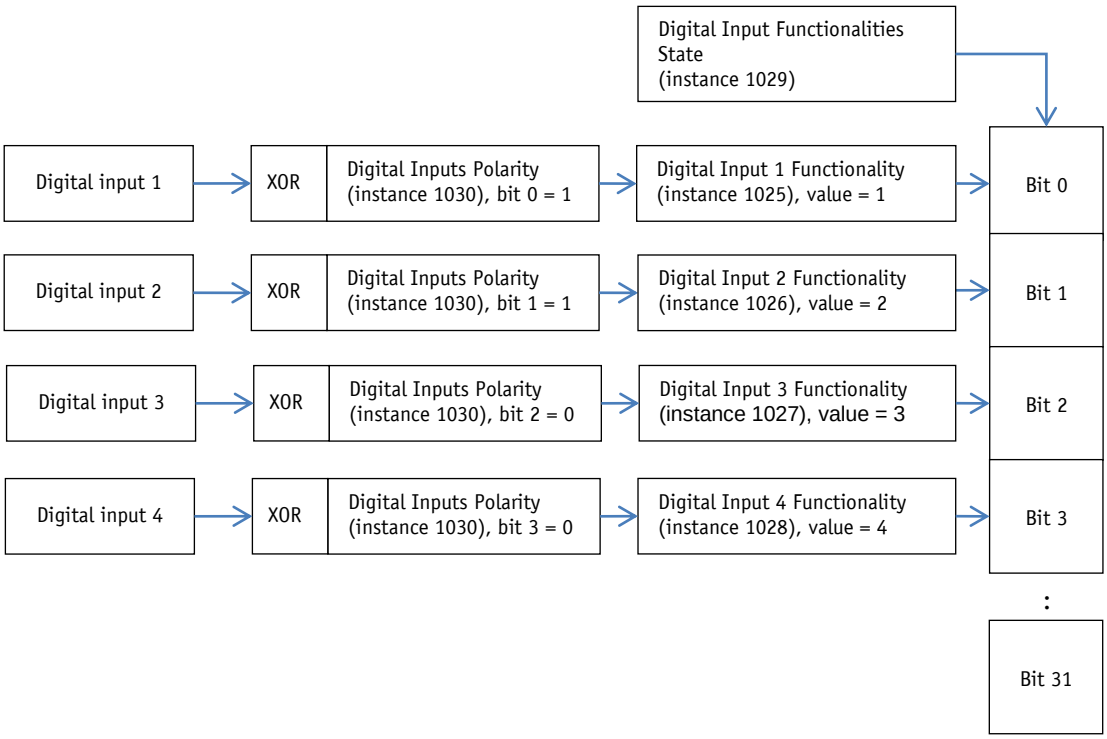


Fig. 3: Examples of digital input configurations

3.2 Example of digital output configuration

- Digital output 1: Inpos (high-active)

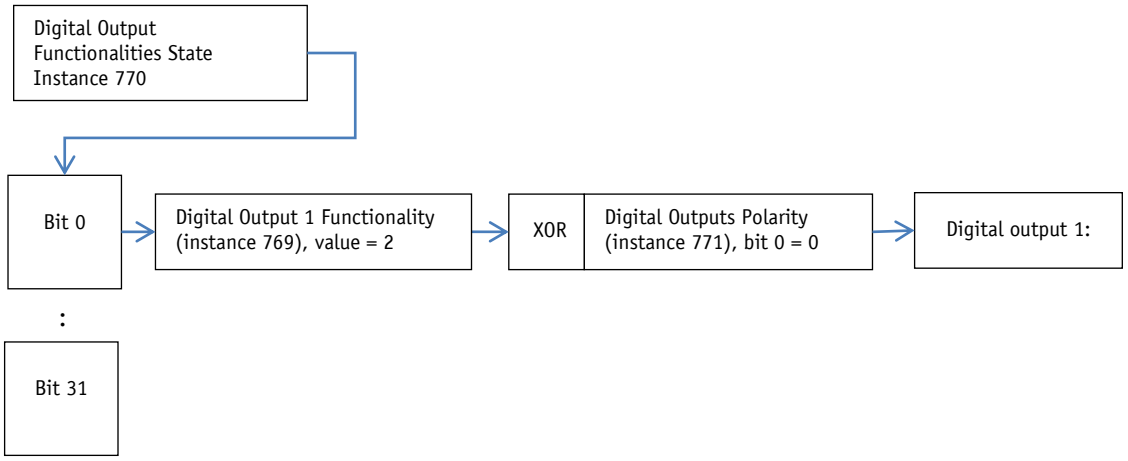


Fig. 4: Example of digital output configuration

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 operating 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 chosen operating mode.

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 speed.

Upon activation of the travel job, 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 (instance 1540) as well.

Alternately, a value deviating from acceleration can be chosen for delay by means of parameter D-Pos (instance 1542).

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

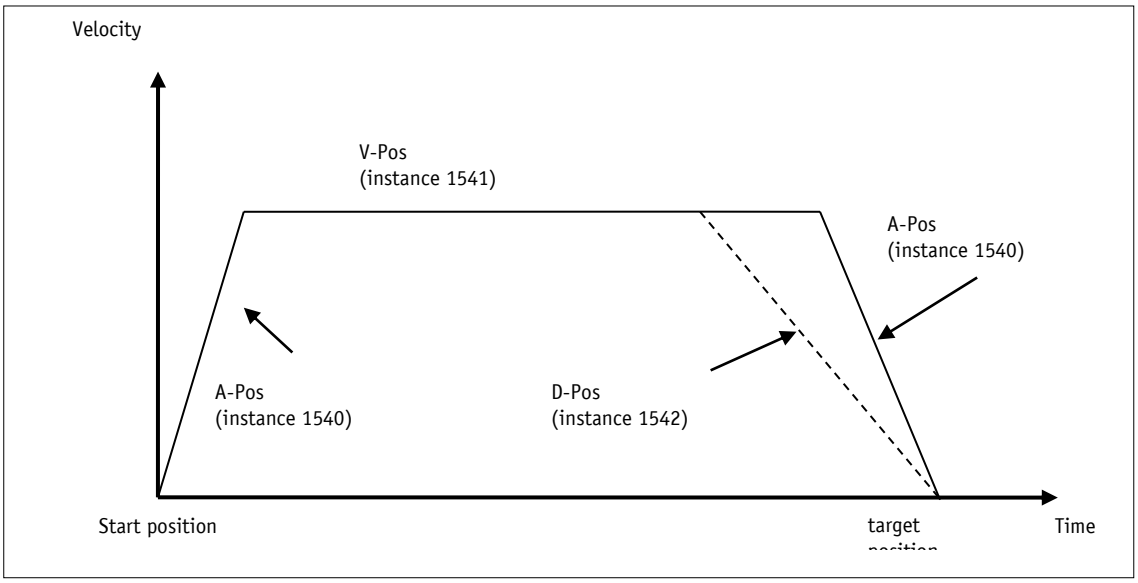


Fig. 5: Ramp travel, direct positioning mode

The status word indicates whether the actual position is within the window defined by parameter Pos Window (instance 1546). Upon reaching the programmed window via parameter Inpos Mode (instance 1558), you can define the behavior of the actuator.

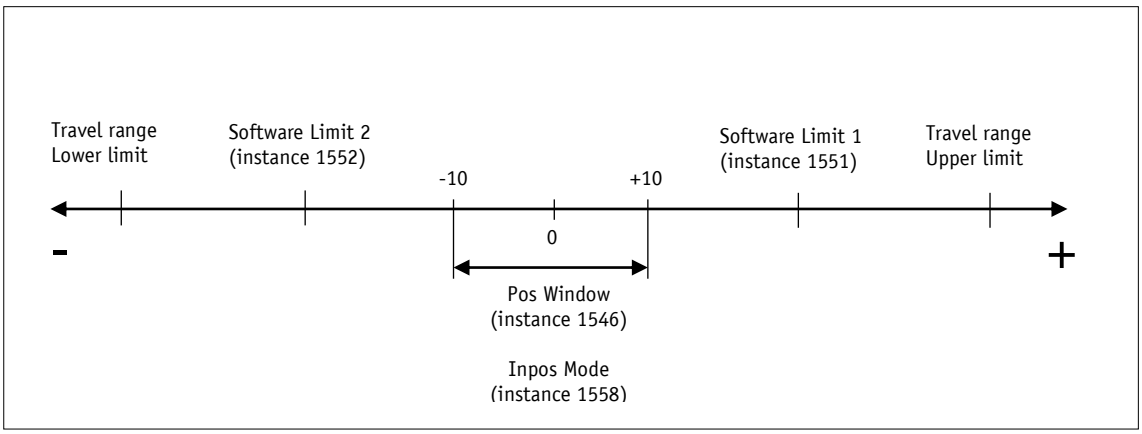


Fig. 6: Positioning mode

The max. travel range depends on transmission 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 loop positioning would exceed the limiting values specified by parameters Software Limit 1 (instance 1551) and Software Limit 2 (instance 1552) although the setpoint is within the limiting values.

If the actuator is operated on a spindle or an additional transmission, the spindle or external transmission 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 (instance 1555). Loop length is set via parameter Loop Length (instance 1559).

Example:

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

Case 1 ⇒ new position is greater than actual position:

Direct travel to required position

Case 2 ⇒ 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.

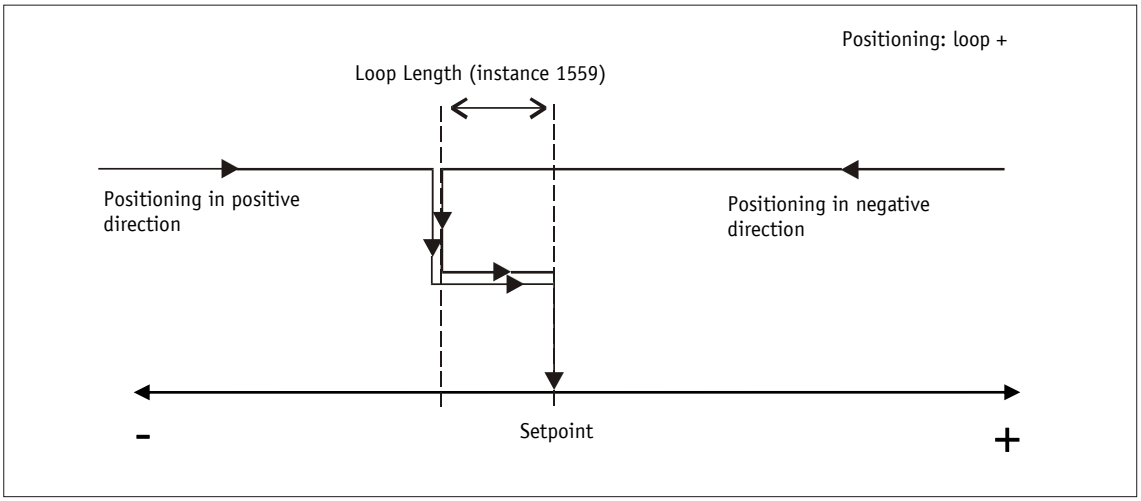


Fig. 7: Loop+ positioning

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 via parameters acceleration as well as speed in the inching mode.

4.1.1.2.1 Inching mode 1

NOTICE	If the Spindle pitch parameter is programmed to zero, then the traveling distance occurs by steps. 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 (instance 1553) 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.

The 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 current 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 (instance 1545) = 10 rpm (can only be changed in the idle state)

Inching 2 Offset (instance 1562) = 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

Results are always rounded to integers.
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.

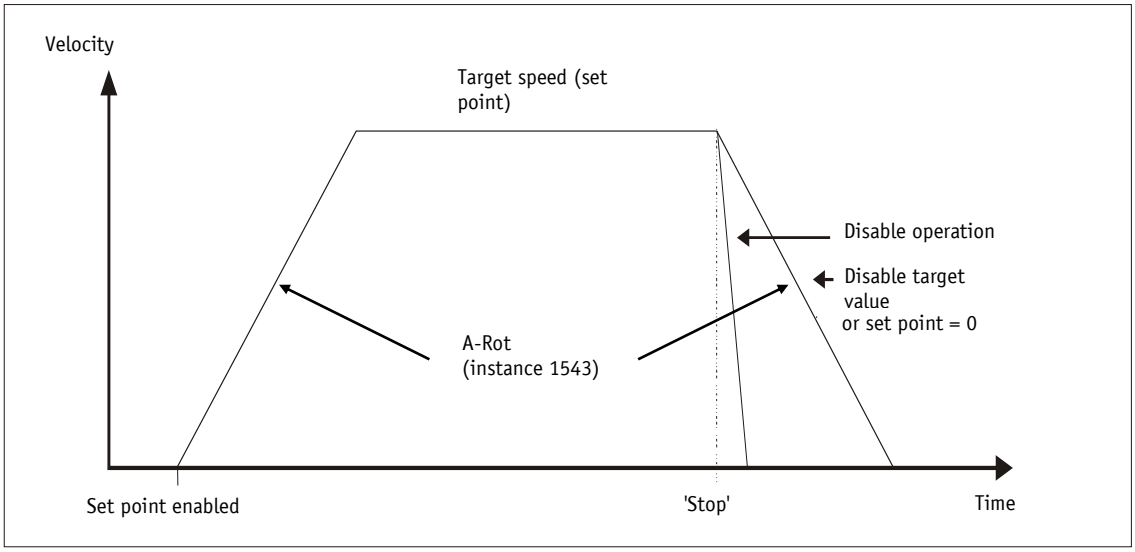


Fig. 8: Ramp speed mode

The following conditions must be met for enabling the start of the rotational 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 jobs started by the position control mode. For this purpose, a negative flank must be created on bits OFF1, OFF2, or OFF3 in the control word. 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 PCM inputs 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)

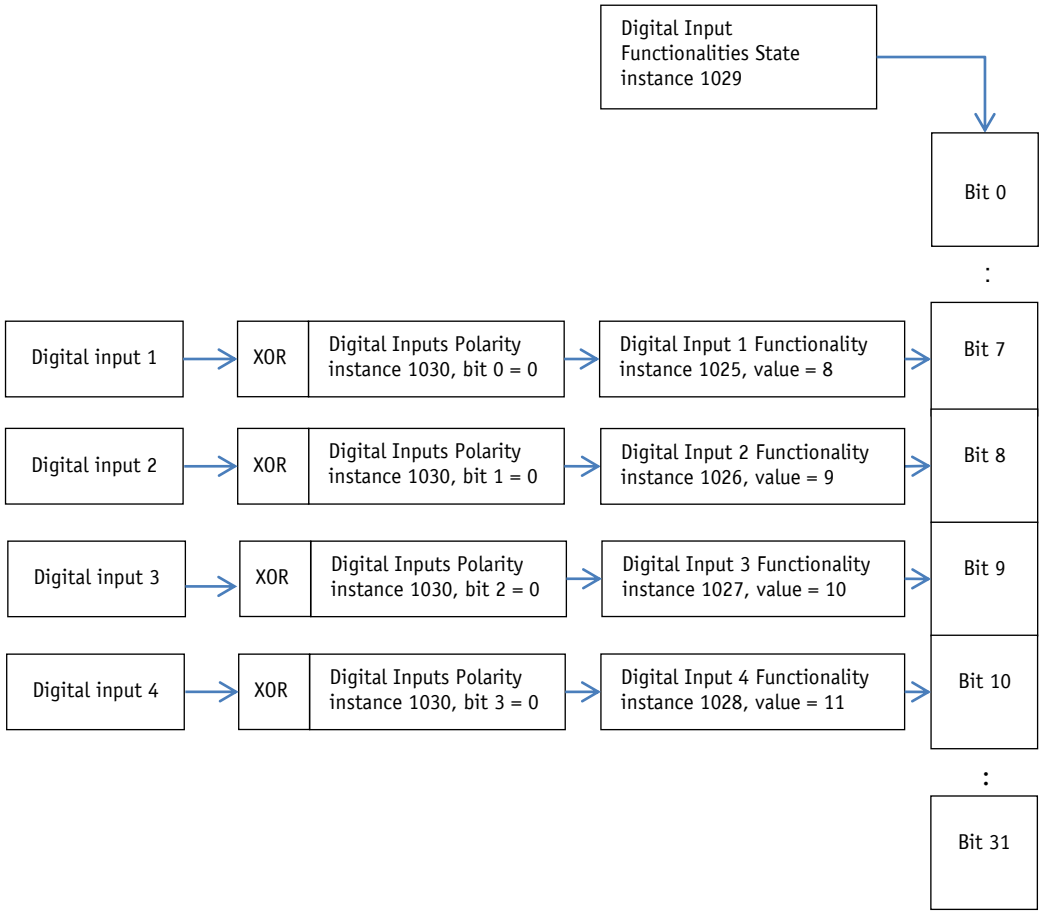


Fig. 9: Examples of configuration of the digital inputs for the PCM

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

Parameter	Instance
PCM Position 3	2340
PCM Acceleration 3	2372
PCM Velocity 3	2404
PCM Deceleration 3	2436

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

Resetting the PCM Start input during an active positioning process will result in cancellation 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	The actual motor current cannot be indicated by measuring the supply 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 (instance 1561), which serves primarily for protecting the drive against overload.

With default set, nominal speed indicated on the product data sheet is achieved.

Actuator 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 Contouring Error Limit parameter (instance 1560): 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.

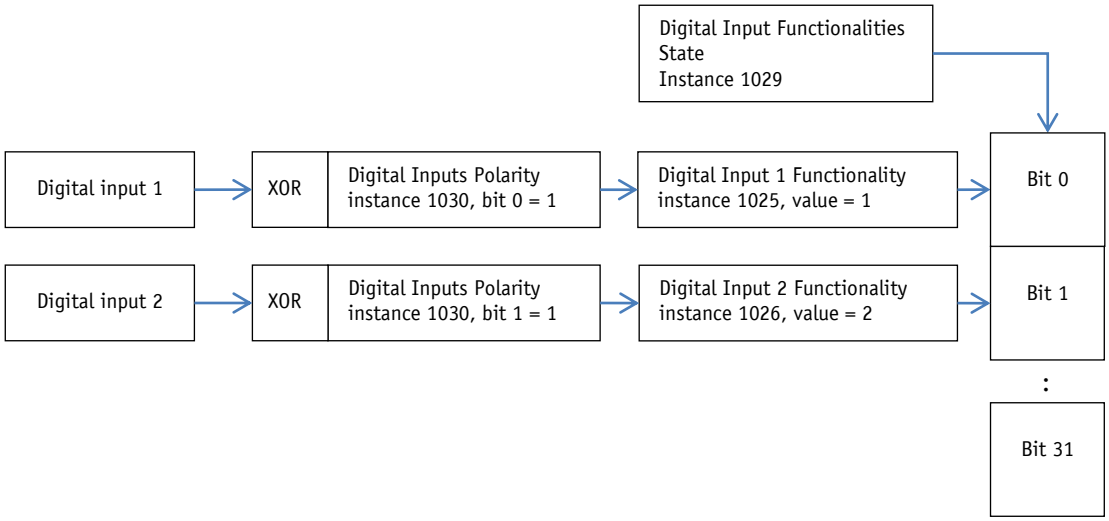


Fig. 10: Example of limit switch configuration

4.1.3.2 Arrangement of the limit switches

The arrangement of the limit switches is independent of the configured sense of rotation according to the following pattern:

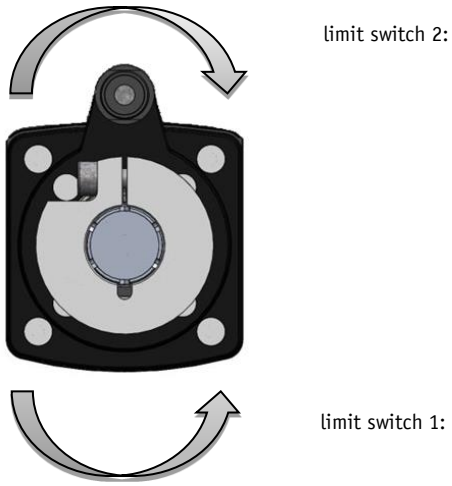


Fig. 11: Arrangement of the limit switches

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 performed by a positive edge at control word bit 15, or 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 transmission

If external transmission is used, a factor can be programmed via the parameters Gear Ratio Numerator (instance 1547) and Gear Ratio Denominator (instance 1548) in order to include the transmission ratio in position sensing.

Example (see Fig. 12: External transmission):

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

Parameter Gear Ratio Numerator = 5

Parameter Gear Ratio Denominator = 1

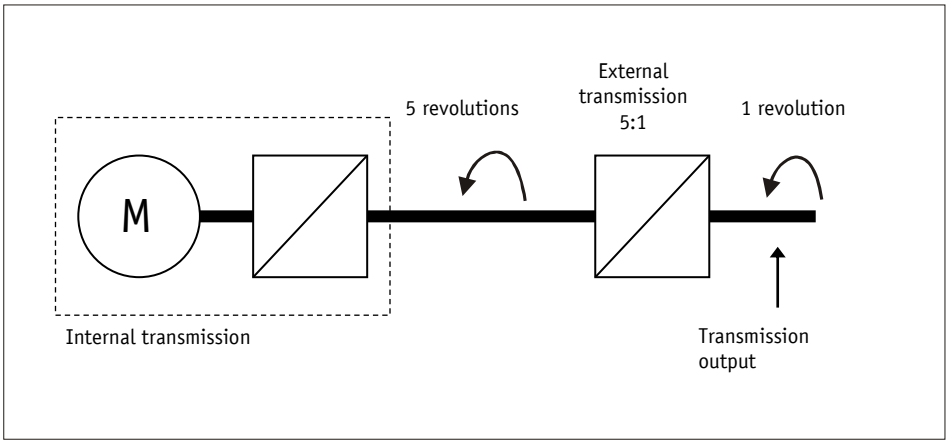


Fig. 12: External transmission

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 ⇒ 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: → empty battery, replace battery → bonding error, check battery bonding → wrong battery type inserted, insert correct battery type
0x07	Low control electronics voltage → check control operating voltage
0x08	Control electronics overvoltage → check control operating voltage
0x09	Power electronics overvoltage → check output stage operating voltage
0x0A	Output stage excess temperature → reduce ambient temperature → reduce load
0x0B	Contouring error → reduce load → reduce acceleration → reduce speed
0x0C	Output shaft blocked → disengage shaft
0x0D	Power electronics not supplied → check output stage operating voltage
0x0F	SIN COS monitoring → shield from stray magnetic fields → check EMC measures
0x10	EEPROM queue overrun → internal error
0x13	EEPROM check sum → reset parameters to factory settings
0x14	Ethernet module watchdog → internal error
0x15	Ethernet module in the ERROR status while travel job is active → internal error
0x16	Ethernet module in the EXCEPTION status → internal error The behavior of the drive when this fault occurs can be set with the parameter configuration, bit 6 (see chapter 8.2.1.99).

Table 1: Error codes

8 EtherNet/IP™

8.1 Description

The drive has been designed as CIP Generic Device (Type 2Bh).

8.1.1 I/O Messages

Cyclic process data exchange is via I/O messages (class-1 connection). Two assemblies are available, which contain a collection of parameters required for the control of the drive.

Connection: Exclusive Owner

Target (drive) → Origin (master)

Assembly Object (04h), instance 64h

Instance	Description	Type
258	Status word	UNIT
259	Actual value	DINT
257	Digital inputs state	USINT

Origin (master) → Target (drive)

Assembly Object (04h), instance 96h

Instance	Description	Type
2	Control word	UNIT
3	Target value	DINT
1	Digital outputs control	USINT

8.1.2 Explicit Messages

Acyclic exchange of parameter data is via explicit messages (class-3 connection).

The parameter values of the individual instances are accessed via class A2h, attribute 5.

8.1.3 ADI Object (Class A2h)

All drive parameters are contained in the Application Data Instance object. Every parameter corresponds to an instance in this class. Access to the parameters is via explicit messages.

Class attributes of the ADI object

Number	Access	Name	Description	Data type
1	Get	Revision	Object revision index	UINT
2	Get	Max instances	Maximum number of object instances in this class	UINT
3	Get	Number of instances	Number of object instances in this class	UINT

Instance attributes of the ADI object

Number	Access	Name	Description	Data type
1	Get	Name	Parameter name (including length)	SHORT_STRING
2	Get	Data type	Data type of the instance value	USINT
3	Get	Number of elements	Number of elements of the specified Data type	USINT
4	Get		Bit field describing the access authorization for this instance Bit Meaning: 0 set= Get access 1 set= Set access	USINT
5	Get/Set	Value	Instance value	defined by attribute 2
6	Get	Max. value	The maximum admissible parameter value	
7	Get	Min. value	The minimum admissible parameter value	
8	Get	Default value	Standard value	

Access to the parameter values is via Get/Set Attribute Single, Attribute 5.

8.2 Overview of parameters

8.2.1 Parameter description

8.2.1.1 Digital Outputs Control

Instance	1 dec /1 hex
Description	Digital output control byte
Access	Get/Set (Component of process data)
Data type	USINT
Default	No
EEPROM	No
Value range	USINT

Bit	Description
0	Digital output 1
1 ... 7	Reserved, always 0

8.2.1.2 Control Word

Instance	2 dec /2 hex
Description	Control word
Access	Get/Set (Component of process data)
Data type	UINT
Default	No
EEPROM	No
Value range	UINT

8.2.1.2.1 Control word: Positioning mode (master ⇒ slave)

Bit	Description
Bit 0 OFF1 (enable)	0 = OFF1 active Current travel job is canceled. The actuator is activated.
	1 = OFF1 inactive
Bit 1 OFF2 (max. delay)	0 = OFF2 active Current travel job is canceled. The actuator is decelerated with max. delay, the actuator continues to be controlled.
	1 = OFF2 inactive
Bit 2 OFF3 (progr. delay)	0 = OFF3 active Current travel job is canceled. The actuator is decelerated with programmed delay, the actuator continues to be controlled.
	1 = OFF3 inactive
Bit 3 Intermediate stop	0 = no intermediate stop
	1 = intermediate stop active
Bit 4 Start travel job	Positive flank starts a travel job
Bit 5 Acknowledge error	Positive flank acknowledges an error Afterwards, the actuator changes to the switch-lock state.
Bit 6 Inching mode 1	0 = no inching mode 1 If the travel job is not completed yet it will be canceled.
	1 = inching operation 1 As long as this bit is set, the actuator travels the distance specified in parameter Delta Tipp.
Bit 7 Inching mode 2 positive	0 = no inching mode 2 positive
	1 = inching mode 2 positive The actuator travels in positive direction
Bit 8 Inching mode 2 negative	0 = no inching mode 2 negative
	1 = inching mode 2 negative The actuator travels in negative direction
Bit 9	Reserved, always 0
Bit 10 Relative positioning	0 = absolute positioning
	1 = relative positioning
Bit 11 … 14	Reserved, always 0
Bit 15 Calibration	Positive edge calibrates the drive (see chapter 5).

Table 2: Positioning mode control word

8.2.1.2.2 Flow chart: Operating mode: Positioning mode

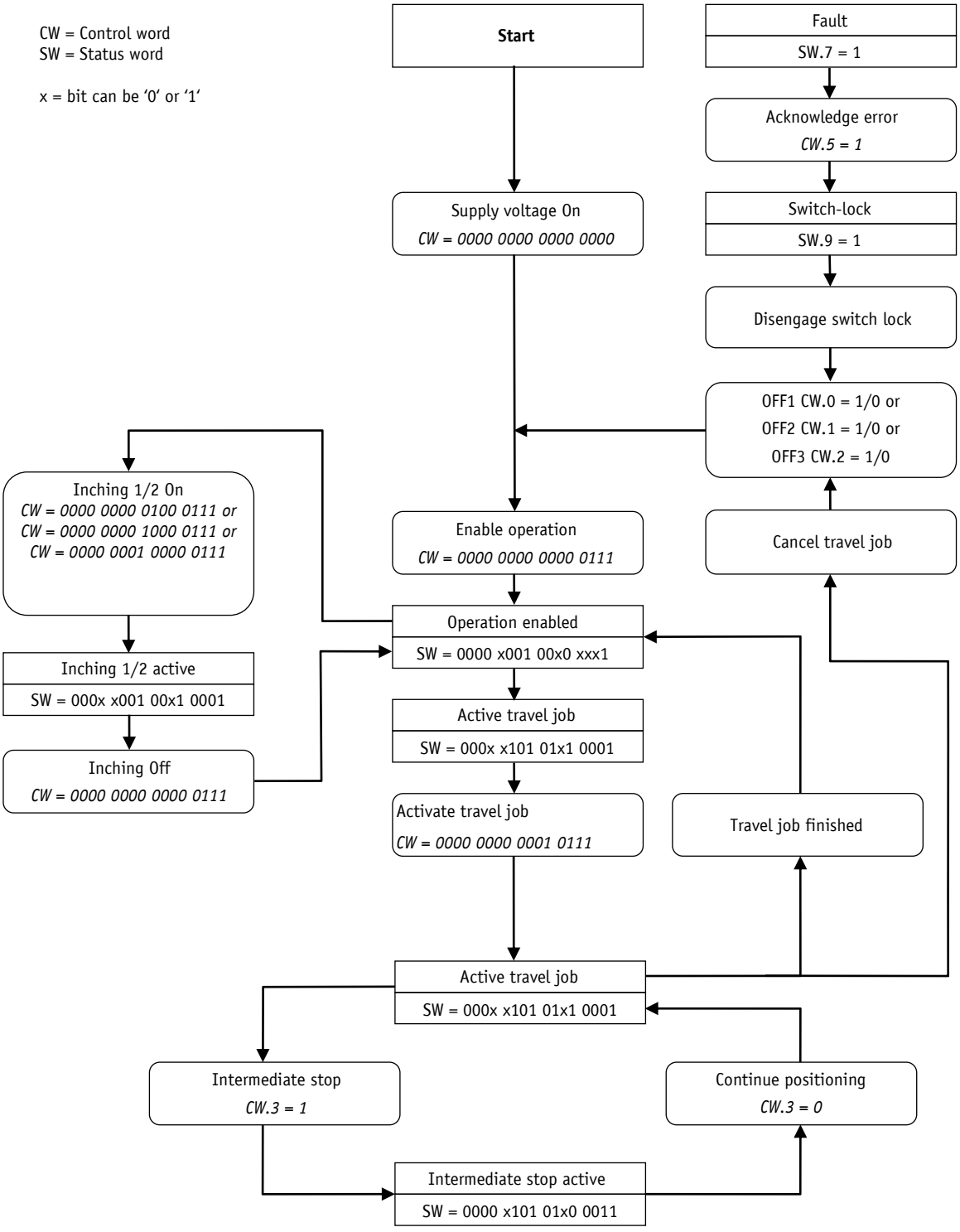


Fig. 13: Flow chart of EtherNet/IP™ positioning mode

8.2.1.2.3 Control word Operating mode: Speed mode

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

Table 3: Control word speed mode SIKONETZ5

8.2.1.2.4 Flow chart: Speed mode

SW = 0000 x001 00x0 0011

CW = Control word

SW = Status word

x = Bit can be '0' or '1'

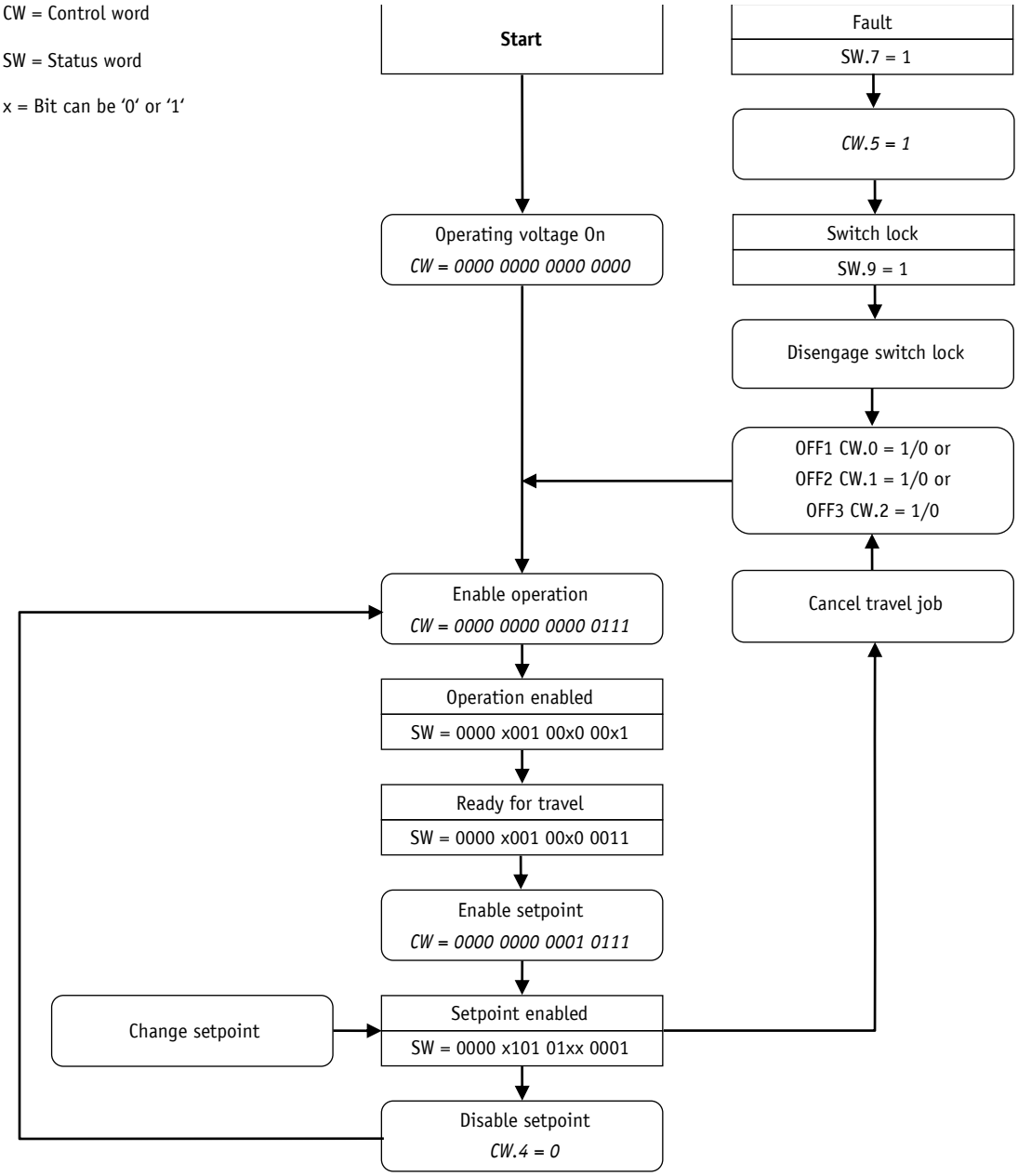


Fig. 14: Flow chart of EtherNet/IP™ speed mode

8.2.1.3 Target Value

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

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

Instance	3 dec /3 hex
Description	Setpoint
Access	Get/Set (component of process data)
Data type	DINT
Default	No
EEPROM	No
Value range	DINT

8.2.1.4 Digital Inputs State

Instance	257 dec /101 hex
Description	States of the digital inputs
Access	Get (component of process data)
Data type	USINT
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

Instance	258 dec /102 hex
Description	Status word
Access	Get (component of process data)
Data type	UINT
Default	No
EEPROM	No

8.2.1.5.1 Status word: Positioning mode (slave ⇒ master)

Bit	Description
Bit 0 Supply	0 = output stage supply voltage missing
	1 = supply voltage of the output stage is applied
Bit 1 Readiness to travel	0 = not ready to travel
	1 = ready to travel
Bit 2 Upper limit	0 = no violation of limit
	1 = upper limit exceeded
Bit 3 Lower limit:	0 = no violation of limit
	1 = lower limit undercut
Bit 4 Actuator travels/stands still	0 = actuator stands still
	1 = actuator travels:
Bit 5 Inpos	0 = actuator is outside the position window.
	1 = actuator is inside the position window.
Bit 6 Active travel job	0 = no active travel job
	1 = active travel job
Bit 7 Fault	0 = no error
	1 = Error Acknowledgment with positive flank on Control word bit 5
Bit 8 Operation enabled	0 = operation not enabled
	1 = operation enabled
Bit 9 Switch-lock	0 = no switch-lock
	1 = switch-lock
Bit 10 Travel job acknowledgment	0 = no acknowledgment
	1 = acknowledgment 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 Battery warning	0 = no warning, battery loading state is OK
	1 = battery warning Battery voltage is below 2.6 V. Battery change is required.
Bit 12 Current limiting	0 = current limiting inactive
	1 = current limiting active Motor current exceeds the value set under parameter Current Limiting (instance 1561d).
Bit 13 Limit switch 1	0 = Limit switch not active
	1 = Limit switch active (configuration of a digital input required, see chapter 4.1.3)
Bit 14 Limit switch 2	0 = Limit switch not active
	1 = Limit switch active (configuration of a digital input required, see chapter 4.1.3)
Bit 15 Calibration acknowledgment	0 = No acknowledgment
	1 = Acknowledgment The bit is set when the calibration has been performed successfully. If bit 15 is reset in the control parameter, this bit is also reset.

Table 4: Status word of positioning mode

8.2.1.5.2 Status word: Speed mode

Bit	Description
Bit 0 Supply	0 = output stage supply voltage missing
	1 = supply voltage of the output stage is applied
Bit 1 Readiness to travel	0 = not ready to travel
	1 = ready to travel
Bit 2	no function
Bit 3	no function
Bit 4 Actuator travels/stands still	0 = actuator stands still
	1 = actuator travels:
Bit 5 Inpos	0 = actuator is outside the position window.
	1 = actuator is inside the position window.
Bit 6 Active travel job	0 = no active travel job
	1 = active travel job
Bit 7 Fault	0 = no error
	1 = Error Acknowledgment with positive flank on control word bit 5
Bit 8 Operation enabled	0 = operation not enabled
	1 = operation enabled
Bit 9 Switch-lock	0 = no switch-lock
	1 = switch-lock
Bit 10 Travel job acknowledgment	0 = no acknowledgment
	1 = acknowledgment 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 Battery warning	0 = no warning, battery loading state is OK
	1 = battery warning Battery voltage is below 2.6 V. Battery change is required.
Bit 12 Current limiting	0 = current limiting inactive
	1 = current limiting active Motor current exceeds the value set under parameter Current Limiting (instance 1561d).

Table 5: Status word of speed mode

8.2.1.6 Actual Value

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

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

Instance	259 dec /103 hex
Description	Actual value
Access	Get (component of process data)
Data type	DINT
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 state of the drive. Alternately, the LEDs can represent the states of the digital inputs.

Instance	513 dec /201 hex
Description	Functionality of the system LEDs
Access	Get/Set
Data type	USINT
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. No fault
		Red, flashing	Operating voltage applied to control. Active error
		Off	Operating voltage of control missing
	LED6	Off	No function
	LED7	Off	No function
	LED8	Green	Actuator is within the programmed positioning window. Operating voltage of the output stage is applied.
		Green, flashing	Actuator is within the programmed positioning window. Operating voltage of the output stage missing.
		Red	Actuator is outside the programmed positioning window. Operating voltage of the output stage is applied.
		Red, flashing	Actuator is outside the programmed positioning window. Operating voltage of the output stage missing.
		Off	Operating voltage of control missing
1	LED5	Red	Digital input 1 inactive
		Red, flashing	Active error
		Green	Digital input 1 active:
		Off	Operating voltage of control missing
	LED6	Red	Digital input 2 inactive
		Red, flashing	Active error
		Green	Digital input 2 active:
		Off	Operating voltage of control missing
	LED7	Red	Digital input 3 inactive
		Red, flashing	Active error
		Green	Digital input 3 active:
		Off	Operating voltage of control missing
	LED8	Red	Digital input 4 inactive
		Red, flashing	Active error
		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

Instance	545 dec /221 hex
Description	Baud rate of the service interface.
Access	Get/Set
Data type	USINT
Default	1
EEPROM	Yes
Value range	0 ... 3 0 = 19.2 Kbit/s 1 = 57.6 Kbit/s 2 = 115.2 Kbit/s 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.

Instance	769 dec /301 hex
Description	Digital output 1 functionality
Access	Get/Set
Data type	USINT
Default	0
EEPROM	Yes
Value range	0 ... 3

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

Instance	770 dec /302 hex
Description	Status of the digital output functionalities
Access	Get
Data type	UDINT
Default	No
EEPROM	No

Bit	Description
0	Fault 0 = no error 1 = fault active
1	Inpos 0 = actual value outside the positioning window 1 = actual value inside the positioning window
2	Output on 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.

Instance	771 dec /303 hex
Description	Polarity of the digital output
Access	Get/Set
Data type	USINT
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 ... 7	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.

Instance	1025 dec /401 hex
Description	Input 1 functionality
Access	Get/Set
Data type	USINT
Default	0
EEPROM	Yes
Value range	0 … 11

Value	Description
0	General use 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.

Instance	1026 dec /402 hex
Description	Input 2 functionality
Access	Get/Set
Data type	USINT
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.

Instance	1027 dec /403 hex
Description	Input 3 functionality
Access	Get/Set
Data type	USINT
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.

Instance	1028 dec /404 hex
Description	input 4 functionality
Access	Get/Set
Data type	USINT
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.

Instance	1029 dec /405 hex
Description	Status of the digital input functionalities
Access	Get
Data type	UDINT
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.

Instance	1030 dec /406 hex
Description	Polarity of the digital output
Access	Get/Set
Data type	USINT
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 ... 7	Not assigned

8.2.1.18 Controller Parameter P

This setting applies to all operating modes.

Instance	1537 dec /601 hex
Description	P gain of controller
Access	Get/Set
Data type	INT
Default	300
EEPROM	Yes
Value range	1 ... 500

8.2.1.19 Controller Parameter I

This setting applies to all operating modes.

Instance	1538 dec /602 hex
Description	I gain of controller
Access	Get/Set
Data type	INT
Default	2
EEPROM	Yes
Value range	0 ... 500

8.2.1.20 Controller Parameter D

This setting applies to all operating modes.

Instance	1539 dec /603 hex
Description	D gain of controller
Access	Get/Set
Data type	INT
Default	0
EEPROM	Yes
Value range	0 … 500

8.2.1.21 A-Pos

Instance	1540 dec /604 hex
Description	Acceleration in the positioning mode
Access	Get/Set
Data type	INT
Default	50
EEPROM	Yes
Value range	1 … 100 % 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.22 V-Pos

Instance	1541 dec /605 hex
Description	Maximum speed in the positioning mode
Access	Get/Set
Data type	INT
Default	10
EEPROM	Yes
Value range	Transmission 66:1 ⇒ max. 75 rpm Transmission 98:1 ⇒ max. 50 rpm Transmission 188:1 ⇒ max. 30 rpm Transmission 368:1 ⇒ max. 15 rpm

8.2.1.23 D-Pos

Instance	1542 dec /606 hex
Description	Delay in the positioning mode
Access	Get/Set
Data type	INT
Default	101
EEPROM	Yes
Value range	1 … 101 % 101 % = the delay is determined by the A-Pos parameter 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.24 A-Rot

Instance	1543 dec /607 hex
Description	Acceleration in speed mode
Access	Get/Set
Data type	INT
Default	50
EEPROM	Yes
Value range	1 … 100 %100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.25 A-Inch

Instance	1544 dec /608 hex
Description	Acceleration in inching mode 1 /2
Access	Get/Set
Data type	INT
Default	50
EEPROM	Yes
Value range	1 … 100 % 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.26 V-Inch

Instance	1545 dec /609 hex
Description	Maximum speed in inching mode 1/2
Access	Get/Set
Data type	INT
Default	10
EEPROM	Yes
Value range	Transmission 66:1 ⇒ max. 75 rpm Transmission 98:1 ⇒ max. 50 rpm Transmission 188:1 ⇒ max. 30 rpm Transmission 368:1 ⇒ 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 steps
Spindle pitch > 0: Values refer to travel distance as 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.

Instance	1546 dec / 60A hex
Description	Positioning window
Access	Get/Set
Data type	INT
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.

Instance	1547 dec / 60B hex
Description	Numerator transmission ratio
Access	Get/Set
Data type	INT
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.

Instance	1548 dec / 60C hex
Description	Denominator gear ratio
Access	Get/Set
Data type	INT
Default	1
EEPROM	yes
Value range	1 ... 10000

8.2.1.30 Spindle Pitch

Spindle pitch parameter = 0:

Position value is output in steps (720 steps 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 steps. Input of the target position is now in 1/100 mm as well, e.g., spindle with a pitch of 2 mm ⇒ spindle pitch parameter = 200.

Instance	1549 dec / 60D hex
Description	Spindle pitch
Access	Get/Set
Data type	DINT
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

Instance	1550 dec / 60E hex
Description	Calibration value
Access	Get/Set
Data type	DINT
Default	0
EEPROM	Yes
Value range	-999999 ... 999999

8.2.1.32 Software Limit 1

NOTICE	Positioning mode: 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. Speed mode: Irrelevant

Positioning mode:

Spindle pitch = 0: Values refer to steps
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.

Instance	1551 dec / 60F hex
Description	Limit 1
Access	Get/Set
Data type	DINT
Default	99999
EEPROM	Yes
Value range	-9999999 ... 9999999

8.2.1.33 Software Limit 2

NOTICE	Positioning mode: 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. Speed mode: Irrelevant

Positioning mode:

Spindle pitch = 0: Values refer to steps
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.

Instance	1552 dec /610 hex
Description	Limit 2
Access	Get/Set
Data type	DINT
Default	-19999
EEPROM	Yes
Value range	-9999999 ... 9999999

8.2.1.34 Delta Inch

Indicates the relative traveling distance.

Positive value ⇒ positive travel direction
Negative value ⇒ negative travel direction

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

Instance	1553 dec /611 hex
Description	Travel distance jog mode 1
Access	Get/Set
Data type	DINT
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

Instance	1554 dec /612 hex
Description	Sense of rotation
Access	Get/Set
Data type	USINT
Default	0
EEPROM	Yes
Value range	0 = i sense of rotation (cw): 1 = e sense of rotation (ccw)

8.2.1.36 Pos Type

NOTICE	Loop positioning is executed in the positioning mode only.

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 is always in positive direction to compensate for spindle play.
Loop -	Traveling to the target value is always in negative direction to compensate for spindle play

Instance	1555 dec /613 hex
Description	Positioning type
Access	Get/Set
Data type	USINT
Default	0
EEPROM	Yes
Value range	0 = direct 1 = loop + 2 = loop -

8.2.1.37 Operating Mode

Instance	1556 dec /614 hex
Description	Operating mode
Access	Get/Set
Data type	USINT
Default	0
EEPROM	Yes
Value range	0 = positioning mode 1 = speed mode

8.2.1.38 Inching 2 Stop Mode

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

Instance	1557 dec /615 hex
Description	Stop mode inching 2
Access	Get/Set
Data type	USINT
Default	0
EEPROM	Yes
Value range	0 = stop with maximum delay 1 = stop with programmed delay

8.2.1.39 Inpos Mode

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

Instance	1558 dec /616 hex
Description	Inpos mode
Access	Get/Set
Data type	USINT
Default	0
EEPROM	Yes
Value range	0 ... 2

Speed mode:

Irrelevant

Positioning mode:

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

8.2.1.40 Loop Length

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

Positioning mode

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

Speed mode:

Irrelevant

Instance	1559 dec /617 hex
Description	Loop length
Access	Get/Set
Data type	INT
Default	360
EEPROM	yes
Value range	0 ... 30000

8.2.1.41 Contouring Error Limit

Upon starting a travel job, the ramp generator generates position setpoints 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 control deviation as small as possible.

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

Control deviation (contouring error) will increase steadily. If 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 as steps.

Instance	1560 dec /618 hex
Description	Contouring error limit
Access	Get/Set
Data type	INT
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 % of nominal current.

Instance	1561 dec /619 hex
Description	Current limiting
Access	Get/Set
Data type	USINT
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
Values are entered in percentage of parameter V-Inch, instance 1545

Instance	1562 dec / 61A hex
Description	Inching 2 Offset
Access	Get/Set
Data type	USINT
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.

Instance	1563 dec / 61B hex
Description	Inching mode 2 acceleration type
Access	Get/Set
Data type	USINT
Default	0
EEPROM	Yes
Value range	0 ... 1

Value	Description
0	Static acceleration Acceleration occurs to final speed as defined under parameter A-Inch, instance 1544:
1	Incremental acceleration Acceleration occurs to final speed as defined under parameter A-Inch, instance 1544 with the following steps: 4 s to 20 % of final speed 2 s to 50 % of final speed 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

Instance	1564 dec / 61C hex
Description	Offset value
Access	Get/Set
Data type	DINT
Default	0
EEPROM	Yes
Value range	-999999 ... 999999

8.2.1.46 PCM Position 1

Spindle pitch = 0: values refer to steps
Spindle pitch > 0: values refer to travel distance as 1/100 mm

Instance	2338 dec /922 hex
Description	Positioning mode via digital inputs: Position 1
Access	Get/Set
Data type	DINT
Default	0
EEPROM	Yes
Value range	DINT

8.2.1.47 PCM Position 2

Spindle pitch = 0: values refer to steps
Spindle pitch > 0: values refer to travel distance as 1/100 mm

Instance	2339 dec /923 hex
Description	Positioning mode via digital inputs: Position 2
Access	Get/Set
Data type	DINT
Default	0
EEPROM	Yes
Value range	DINT

8.2.1.48 PCM Position 3

Spindle pitch = 0: values refer to steps
Spindle pitch > 0: values refer to travel distance as 1/100 mm

Instance	2340 dec /924 hex
Description	Positioning mode via digital inputs: Position 3
Access	Get/Set
Data type	DINT
Default	0
EEPROM	Yes
Value range	DINT

8.2.1.49 PCM Position 4

Spindle pitch = 0: values refer to steps
Spindle pitch > 0: values refer to travel distance as 1/100 mm

Instance	2341 dec /925 hex
Description	Positioning mode via digital inputs: Position 4
Access	Get/Set
Data type	DINT
Default	0
EEPROM	Yes
Value range	DINT

8.2.1.50 PCM Position 5

Spindle pitch = 0: values refer to steps
Spindle pitch > 0: values refer to travel distance as 1/100 mm

Instance	2342 dec /926 hex
Description	Positioning mode via digital inputs: Position 5
Access	Get/Set
Data type	DINT
Default	0
EEPROM	Yes
Value range	DINT

8.2.1.51 PCM Position 6

Spindle pitch = 0: values refer to steps
Spindle pitch > 0: values refer to travel distance as 1/100 mm

Instance	2343 dec /927 hex
Description	Positioning mode via digital inputs: Position 6
Access	Get/Set
Data type	DINT
Default	0
EEPROM	Yes
Value range	DINT

8.2.1.52 PCM Position 7

Spindle pitch = 0: values refer to steps
Spindle pitch > 0: values refer to travel distance as 1/100 mm

Instance	2344 dec /928 hex
Description	Positioning mode via digital inputs: Position 7
Access	Get/Set
Data type	DINT
Default	0
EEPROM	Yes
Value range	DINT

8.2.1.53 PCM Acceleration 1

Instance	2370 dec /942 hex
Description	Positioning mode via digital inputs: Acceleration 1
Access	Get/Set
Data type	INT
Default	50
EEPROM	Yes
Value range	1 … 100 % 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.54 PCM Acceleration 2

Instance	2371 dec /943 hex
Description	Positioning mode via digital inputs: Acceleration 2
Access	Get/Set
Data type	INT
Default	50
EEPROM	Yes
Value range	1 … 100 % 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.55 PCM Acceleration 3

Instance	2372 dec /944 hex
Description	Positioning mode via digital inputs: Acceleration 3
Access	Get/Set
Data type	INT
Default	50
EEPROM	Yes
Value range	1 … 100 % 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.56 PCM Acceleration 4

Instance	2373 dec /945 hex
Description	Positioning mode via digital inputs: Acceleration 4
Access	Get/Set
Data type	INT
Default	50
EEPROM	Yes
Value range	1 … 100 % 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.57 PCM Acceleration 5

Instance	2374 dec /946 hex
Description	Positioning mode via digital inputs: Acceleration 5
Access	Get/Set
Data type	INT
Default	50
EEPROM	Yes
Value range	1 … 100 % 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.58 PCM Acceleration 6

Instance	2375 dec /947 hex
Description	Positioning mode via digital inputs: Acceleration 6
Access	Get/Set
Data type	INT
Default	50
EEPROM	Yes
Value range	1 … 100 % 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.59 PCM Acceleration 7

Instance	2376 dec /948 hex
Description	Positioning mode via digital inputs: Acceleration 7
Access	Get/Set
Data type	INT
Default	50
EEPROM	Yes
Value range	1 … 100 % 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.60 PCM Velocity 1

Instance	2402 dec /962 hex
Description	Positioning mode via digital inputs: Velocity 1
Access	Get/Set
Data type	INT
Default	10
EEPROM	Yes
Value range	Transmission 66:1 ⇒ max. 75 rpm Transmission 98:1 ⇒ max. 50 rpm Transmission 188:1 ⇒ max. 30 rpm Transmission 368:1 ⇒ max. 15 rpm

8.2.1.61 PCM Velocity 2

Instance	2403 dec /963 hex
Description	Positioning mode via digital inputs: Velocity 2
Access	Get/Set
Data type	INT
Default	10
EEPROM	Yes
Value range	Transmission 66:1 ⇒ max. 75 rpm Transmission 98:1 ⇒ max. 50 rpm Transmission 188:1 ⇒ max. 30 rpm Transmission 368:1 ⇒ max. 15 rpm

8.2.1.62 PCM Velocity 3

Instance	2404 dec /964 hex
Description	Positioning mode via digital inputs: Velocity 3
Access	Get/Set
Data type	INT
Default	10
EEPROM	Yes
Value range	Transmission 66:1 ⇒ max. 75 rpm Transmission 98:1 ⇒ max. 50 rpm Transmission 188:1 ⇒ max. 30 rpm Transmission 368:1 ⇒ max. 15 rpm

8.2.1.63 PCM Velocity 4

Instance	2405 dec /965 hex
Description	Positioning mode via digital inputs: Velocity 4
Access	Get/Set
Data type	INT
Default	10
EEPROM	Yes
Value range	Transmission 66:1 ⇒ max. 75 rpm Transmission 98:1 ⇒ max. 50 rpm Transmission 188:1 ⇒ max. 30 rpm Transmission 368:1 ⇒ max. 15 rpm

8.2.1.64 PCM Velocity 5

Instance	2406 dec /966 hex
Description	Positioning mode via digital inputs: Velocity 5
Access	Get/Set
Data type	INT
Default	10
EEPROM	Yes
Value range	Transmission 66:1 ⇒ max. 75 rpm Transmission 98:1 ⇒ max. 50 rpm Transmission 188:1 ⇒ max. 30 rpm Transmission 368:1 ⇒ max. 15 rpm

8.2.1.65 PCM Velocity 6

Instance	2407 dec /967 hex
Description	Positioning mode via digital inputs: Velocity 6
Access	Get/Set
Data type	INT
Default	10
EEPROM	Yes
Value range	Transmission 66:1 ⇒ max. 75 rpm Transmission 98:1 ⇒ max. 50 rpm Transmission 188:1 ⇒ max. 30 rpm Transmission 368:1 ⇒ max. 15 rpm

8.2.1.66 PCM Velocity 7

Instance	2408 dec /968 hex
Description	Positioning mode via digital inputs: Velocity 7
Access	Get/Set
Data type	INT
Default	10
EEPROM	Yes
Value range	Transmission 66:1 ⇒ max. 75 rpm Transmission 98:1 ⇒ max. 50 rpm Transmission 188:1 ⇒ max. 30 rpm Transmission 368:1 ⇒ max. 15 rpm

8.2.1.67 PCM Deceleration 1

Instance	2434 dec /982 hex
Description	Positioning mode via digital inputs: Delay 1
Access	Get/Set
Data type	INT
Default	101
EEPROM	Yes
Value range	1 ... 101 % 101 % = the delay is determined by the PCM Acceleration 1 parameter. 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.68 PCM Deceleration 2

Instance	2435 dec /983 hex
Description	Positioning mode via digital inputs: Delay 2
Access	Get/Set
Data type	INT
Default	101
EEPROM	Yes
Value range	1 ... 101 % 101 % = the delay is determined by the PCM Acceleration 2 parameter. 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.69 PCM Deceleration 3

Instance	2436 dec /984 hex
Description	Positioning mode via digital inputs: Delay 3
Access	Get/Set
Data type	INT
Default	101
EEPROM	Yes
Value range	1 ... 101 % 101 % = the delay is determined by the PCM Acceleration 3 parameter. 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.70 PCM Deceleration 4

Instance	2437 dec /985 hex
Description	Positioning mode via digital inputs: Delay 4
Access	Get/Set
Data type	INT
Default	101
EEPROM	Yes
Value range	1 ... 101 % 101 % = the delay is determined by the PCM Acceleration 4 parameter. 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.71 PCM Deceleration 5

Instance	2438 dec /986 hex
Description	Positioning mode via digital inputs: Delay 5
Access	Get/Set
Data type	INT
Default	101
EEPROM	Yes
Value range	1 ... 101 % 101 % = the delay is determined by the PCM Acceleration 5 parameter. 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.72 PCM Deceleration 6

Instance	2439 dec /987 hex
Description	Positioning mode via digital inputs: Delay 6
Access	Get/Set
Data type	INT
Default	101
EEPROM	Yes
Value range	1 ... 101 % 101 % = the delay is determined by the PCM Acceleration 6 parameter. 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.73 PCM Deceleration 7

Instance	2440 dec /988 hex
Description	Positioning mode via digital inputs: Delay 7
Access	Get/Set
Data type	INT
Default	101
EEPROM	Yes
Value range	1 ... 101 % 101 % = the delay is determined by the PCM Acceleration 7 parameter. 100 % correspond to: Transmission 66:1 ⇒ 3.04 rps² Transmission 98:1 ⇒ 2.05 rps² Transmission 188:1 ⇒ 1.06 rps² Transmission 368:1 ⇒ 0.54 rps²

8.2.1.74 Output Stage Temperature

Instance	2561 dec / A01 hex
Description	Output stage temperature
Unit	1/10 °C
Access	Get
Data type	INT
Default	No
EEPROM	No

8.2.1.75 Voltage of Control

Instance	2562 dec / A02 hex
Description	Operating voltage of control
Unit	1/10 V
Access	Get
Data type	INT
Default	No
EEPROM	No

8.2.1.76 Voltage of Output Stage

Instance	2563 dec / A03 hex
Description	Operating voltage of output stage
Unit	1/10 V
Access	Get
Data type	INT
Default	No
EEPROM	No

8.2.1.77 Voltage of Battery

Instance	2564 dec / A04 hex
Description	Battery voltage
Unit	1/100 V
Access	Get
Data type	INT
Default	No
EEPROM	No

8.2.1.78 Motor Current

Instance	2565 dec / A05 hex
Description	Motor current
Unit	mA
Access	Get
Data type	INT
Default	No
EEPROM	No

8.2.1.79 Actual Position

Instance	2566 dec / A06 hex
Description	Current position
Unit	Spindle pitch = 0: Steps Spindle pitch > 0: 1/100 mm
Access	Get
Sata type	INT
Default	No
EEPROM	No

8.2.1.80 Actual Rotational Speed

Instance	2567 dec / A07 hex
Description	Current speed
Unit	rpm
Access	Get
Data type	INT
Default	No
EEPROM	No

8.2.1.81 Serial Number

Instance	2568 dec / A08 hex
Description	Serial number
Unit	-
Access	Get
Data type	DINT
Default	No
EEPROM	Yes

8.2.1.82 Production Date

Instance	2569 dec / A09 hex
Description	Production date
Unit	DDMMYYYY
Access	Get
Data type	DINT
Default	No
EEPROM	Yes

8.2.1.83 SW Motor Controller

Instance	2570 dec / A0A hex
Description	Motor Controller software version
Unit	-
Access	Get
Data type	DINT
Default	No
EEPROM	No

8.2.1.84 Gear Reduction

Instance	2571 dec / A0B hex
Description	Transmission ratio reduction
Unit	-
Access	Get
Data type	INT
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 drive.

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: ⇒ 0010 1001 0100 1000

hex: ⇒ 2 9 4 8

Instance	2572 dec / A0C hex
Description	System status word
Unit	-
Access	Get
Data type	UINT
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	‘1‘ ‘0‘	Positioning mode In Position Actual position is within the positioning window of the programmed target value. Actual position is outside the positioning window of the programmed target value.
	‘1‘ ‘0‘	Speed mode: In Position Actual speed is inside the specified tolerance window of target speed. Actual speed is outside the specified tolerance window.
Bit 4	‘1‘ ‘0‘	Actuator travels: Actuator travels Actuator stands still (rotational speed < 2 rpm)
Bit 5	‘1‘ ‘0‘	Positioning mode: Upper limit Actual position is above the programmed limiting value. Traveling is possible only in negative direction in inching mode. Actual position is below the programmed limiting value.
	‘0‘	Positioning mode: Irrelevant
Bit 6	‘1‘ ‘0‘	Positioning mode: Lower limit Actual position is below the programmed limiting value. Traveling is possible only in positive direction in inching mode. Actual position is above the programmed limiting value.
	‘0‘	Positioning mode: Irrelevant
Bit 7	‘1‘ ‘0‘	Driver state: Motor is enabled Motor in control
Bit 8	‘1‘ ‘0‘	Error: Actuator has switched to error. The cause of the error must be removed and acknowledged. No error present
Bit 9	‘1‘ ‘0‘	Positioning mode: Loop travel If travel direction unequal start direction (with loop travel) If travel direction equal start direction
	‘0‘	Positioning mode: Irrelevant
Bit 10	‘1‘ ‘0‘	Output stage supply voltage No voltage, no travelling possible Voltage applied
Bit 11	‘1‘ ‘0‘	Ready for travel: Not ready for travel 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‘ ‘0‘	Battery voltage: Battery voltage < 2.6 V Battery voltage OK
Bit 13	‘1‘ ‘0‘	Current limiting Current limiting active Current limiting not active
Bit 14	‘1‘ ‘0‘	Positioning mode: Status Positioning active in positioning mode. Positioning inactive.
	‘1‘ ‘0‘	Speed mode: Status Enable target speed Target speed disabled:
Bit 15	‘1‘ ‘0‘	Contouring error: Contouring error ⇒ the actuator cannot reach the preset speed due to too high load. The actuator switches the contouring error fault. Remedy: reduce programmed speed! No contouring error ⇒ actual speed corresponds with required speed.

Table 9: System Status Word

8.2.1.86 Encoder Resolution

Instance	2573 dec / A0D hex
Description	Encoder resolution
Unit	Steps per revolution of the output shaft
Access	Get
Data type	INT
Default	No
EEPROM	Yes

8.2.1.87 Device ID

1 = AG25
2 = AG26

Instance	2574 dec / A0E hex
Description	Device identification
Unit	-
Access	Get
Data type	USINT
Default	No
EEPROM	Yes

8.2.1.88 Number of Errors

Instance	2817 dec / B01 hex
Description	Number of errors
Unit	-
Access	Get
Data type	USINT
Default	No
EEPROM	No

8.2.1.89 Error Number 1

Instance	2818 dec / B02 hex
Description	Error 1
Unit	-
Access	Get
Data type	USINT
Default	No
EEPROM	Yes

8.2.1.90 Error Number 2

Instance	2819 dec / B03 hex
Description	Error 2
Unit	-
Access	Get
Data type	USINT
Default	No
EEPROM	Yes

8.2.1.91 Error Number 3

Instance	2820 dec / B04 hex
Description	Error 3
Unit	-
Access	Get
Data type	USINT
Default	No
EEPROM	Yes

8.2.1.92 Error Number 4

Instance	2821 dec / B05 hex
Description	Error 4
Unit	-
Access	Get
Data type	USINT
Default	No
EEPROM	Yes

8.2.1.93 Error Number 5

Instance	2822 dec / B06 hex
Description	Error 5
Unit	-
Access	Get
Data type	USINT
Default	No
EEPROM	Yes

8.2.1.94 Error Number 6

Instance	2823 dec / B07 hex
Description	Error 6
Unit	-
Access	Get
Data type	USINT
Default	No
EEPROM	Yes

8.2.1.95 Error Number 7

Instance	2824 dec / B08 hex
Description	Error 7
Unit	-
Access	Get
Data type	USINT
Default	no
EEPROM	Yes

8.2.1.96 Error Number 8

Instance	2825 dec / B09 hex
Description	Error 8
Unit	-
Access	Get
Data type	USINT
Default	No
EEPROM	Yes

8.2.1.97 Error Number 9

Instance	2826 dec / B0A hex
Description	Error 9
Unit	-
Access	Get
Data type	USINT
Default	No
EEPROM	Yes

8.2.1.98 Error Number 10

Instance	2827 dec / B0B hex
Description	Error 10
Unit	-
Access	Get
Data type	USINT
Default	No
EEPROM	Yes

8.2.1.99 Configuration

Various performance of the actuator can be configured via this parameter.

Instance	2849 dez / B21 hex
Description	Configuration oft the actuator
Access	Get/Set
Data type	UINT
Default	15
EEPROM	yes
Valuation	0 ... 65535

Bit	Description
0	SHICP (Secure Host IP Configuration Protocol) 0 = off 1 = on (factory setting) Changes are only undone after a reset.
1	Webserver 0 = off 1 = on (factory setting) Changes are only undone after a reset.
2	Parameterzugriff über Webserver 0 = off 1 = on (factory setting) Changes are only undone after a reset.
3	FTP Server 0 = off 1 = on (factory setting) Changes are only undone after a reset.
4	FTP Server Administratorrechte 0 = no (factory setting) 1 = yes Changes are only undone after a reset.
5	reserved, always 0
6	Auto reset in the EXCEPTION state 0 = switched off (factory setting): In the EXCEPTION state, the drive stops participating in network traffic and can no longer be addressed. To exit this state, a Power On Reset is required. 1 = switched on: In the EXCEPTION state, the drive automatically performs a reset. After the restart, the EXCEPTION fault is triggered.
7 ... 15	reserved, always 0

8.2.1.100 S-Command

Instance	3073 dec / C01 hex
Description	S command
Unit	-
Access	Get/Set
Data type	USINT
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

8.3 CIP objects

The following CIP objects are integrated in the actuator:

Class	Name	Description
01h	Identity Object	Contains device-specific data
02h	Message Router	
04h	Assembly Object	The Assembly Object enables access to process data
06h	Connection Manager	
0Fh	Parameter Object	Contains the available ports, port names and node addresses
47h	DLR Object	Contains status information of the DLR protocol
48h	QoS Object	Contains mechanisms for handling data streams with different priorities
53h	Power Management Object	
A2h	ADI Object	Enables access to the parameters of the actuator
F5h	TCP/IP Interface Object	Enables configuration of the TCP/IP interface
F6h	Ethernet Link Object	Contains connections-specific counters and status information

8.3.1 Identity Object (Class 01h)

The Identity Object contains device-specific data.

Services supported:

Class:

- Get_Attribute_Single
- Get_Attributes_All

Instance:

- Get_Attribute_Single
- Set_Attribute_Single
- Get_Attributes_All
- Reset

8.3.1.1 Class attributes of the Identity Object

Number	Access	Description	Data type	Default value
1	Get	Object revision index	UINT	0001h
2	Get	Maximum number of object instances in this class	UINT	
3	Get	Number of object instances in this class	UINT	

8.3.1.2 Instance attributes of the Identity Object

Number	Access	Name	Data type	Default value
1	Get	Vendor ID	UINT	053Eh
2	Get	Device Type	UINT	002Bh
3	Get	Product Code	UINT	0101h
4	Get	Revision Major Revision Minor Revision	Struct of: USINT USINT	 01h 02h
5	Get	Status	WORD	
6	Get	Serial Number	UDINT	
7 (AG25)	Get	Product Name	SHORT_STRING	SIKO DriveLine AG25
7 (AG26)	Get	Product Name	SHORT_STRING	SIKO DriveLine AG26
11	SETTL:	Active Language	Struct of: USINT USINT USINT	
12	Get	Supported Language List	Array of: Struct of: USINT USINT USINT	

8.3.1.3 Status

Bit(s)	Name	Description
0	Owned	0 = no connection to master 1 = connection to master established
1		Reserved
2	Configured	0 = device with standard configuration 1 = no standard configuration
3		Reserved
4 ... 7	Extended Device Status	Manufacturer-specific status bits Value description 0000b Unknown 0010b At least one faulty I/O connection 0011b No I/O connection established 0100b Non-volatile configuration (EEPROM) faulty 0101b Serious error, bit 10 or bit 11 = 1 0110b At least one I/O connection in the "Run" mode 0111b At least one I/O connection established, all in the "Idle" operating mode Others reserved
8	Minor Recoverable Fault	0 = no error 1 = resettable error
9	Minor Unrecoverable Fault	0 = no error 1 = non-resettable error
10	Major Recoverable Fault	0 = no serious error 1 = resettable serious error
11	Major Unrecoverable Fault	0 = no serious error 1 = non-resettable serious error
12 ... 15		Reserved

8.3.1.4 Reset service of the Identity Object

Type 0: Power Cycling Reset

The device carries out reset

Type 1: Out of Box Reset

All parameters to factory settings; afterwards, the device carries out reset

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 are 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

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 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 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 (see chapter 9.3.6.6: Flag Register). x = 0: Positioning direct x = 1: positioning with loop positive 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 (see chapter 9.3.6.6: Flag Register). x = 0: i sense of rotation (cw) 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 (see chapter 9.3.6.6: Flag Register). y = 0: Positioning mode 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	

9.3.4.9 Configuration

Read command	G61	see chapter 9.8 ASCII command structure
Write command	H61xxxxx	
Description	see chapter 8.2.1.99 Configuration	

9.3.5 Controller parameter

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 7 6 5 4 3 2 1 0 Bit Bit 0: Sense of rotation: '0' = i (cw) ‘1’ = e (ccw) Bit 1+2: Type of positioning: ‘00’ = direct ‘01’ = loop + ‘10’ = loop – Bit 3: not assigned Bit 4: Operating mode: ‘0’ = positioning mode ‘1’ = speed mode 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: "EIP >"	

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: – start of positioning process to programmed set point Speed mode: –start of speed mode	

9.4.2 start of 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 current 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 parameter

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

9.4.11 Factory setting: Controller parameter

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 mermory	

9.4.15 Software Reset

Command	C	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).

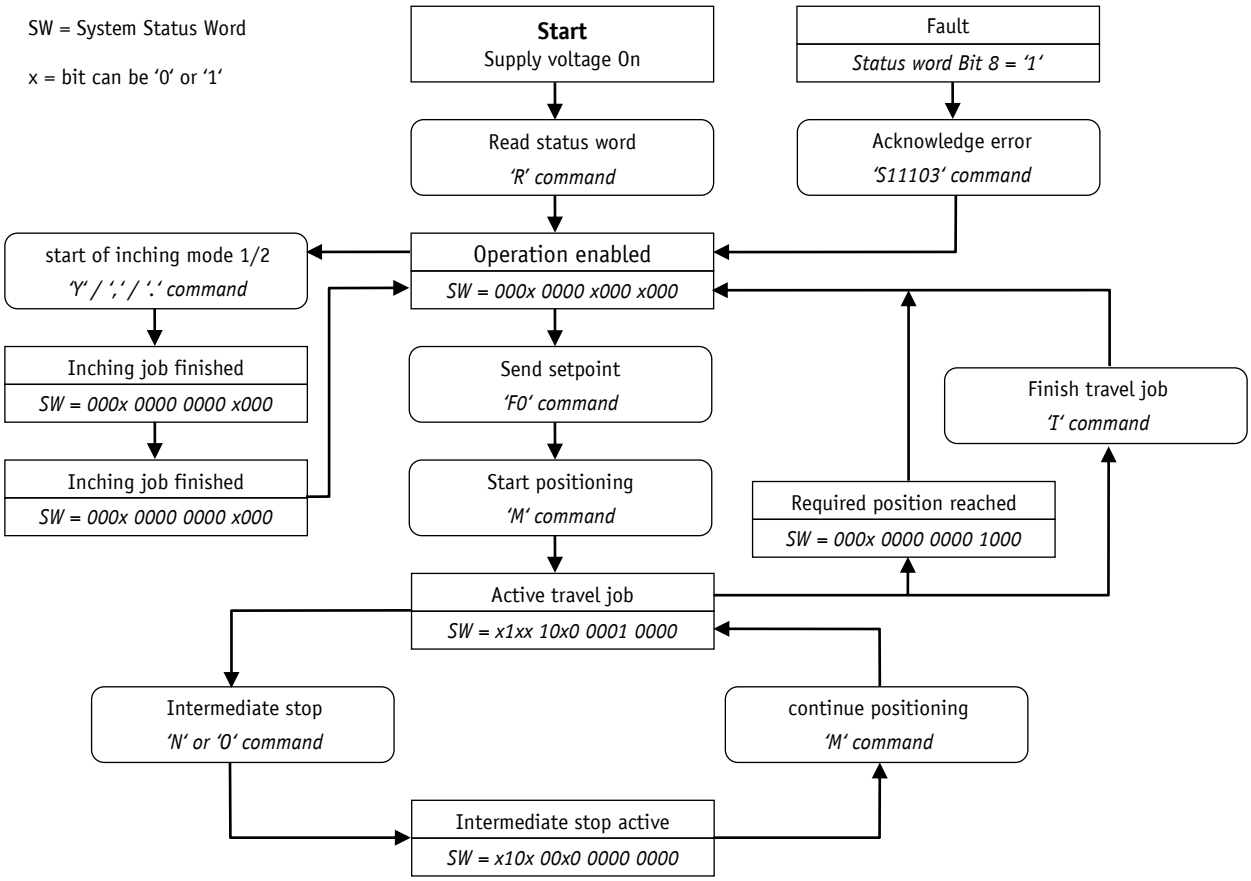


Fig. 16: Flowchart positioning mode SIKONETZ5

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).

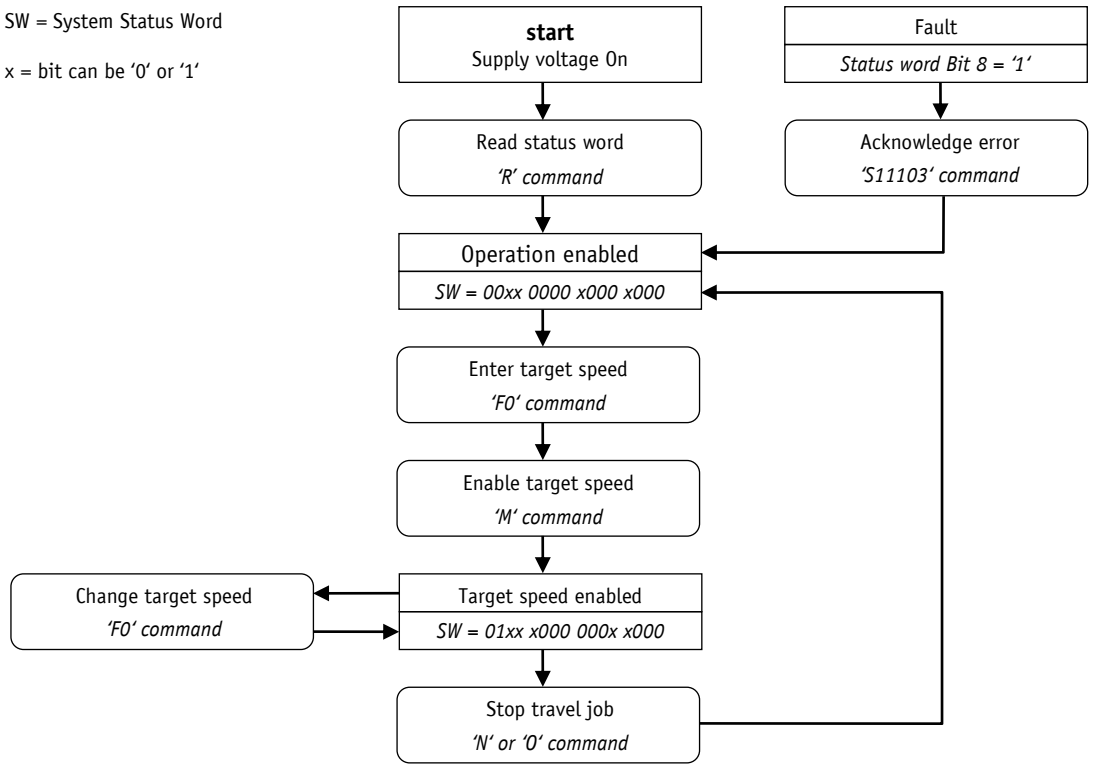


Fig. 17: Flow chart speed mode service protocol

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) y = address xxxxxxxx = string
Byy	3	read	±xxxxxxx>	x	10	Device information (actual values) yy = address ±xxxxxxx = decimal value
Ey	2	read	±xxxxxxx>	x	10	Read parameter (3-byte) y = address ±xxxxxxx = decimal value
Fy±xxxxxxx	10	write	>	x	2	Write parameter (3-byte) y = address ±xxxxxxx = decimal value
Gyy	3	read	"xxxxx>"	x	7	Read parameter (2-byte) yy = address xxxxx = decimal value
Hyyxxxxx	8	write	>	x	2	Write parameter (2-byte) yy = address xxxxx = decimal value
I	1	write	>	x	2	Cancel current travel job in positioning mode
Jyy	3	read	0xhh>	x	6	Error memory yy = address hh = hexadecimal value
K	1	write	>	x	2	Software Reset
Lx	2	write	>	x	2	Type of positioning x = decimal value
M	1	write	>	x	2	Start travel job
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 hh = hexadecimal value
R	1	read	0xhhll>	x	8	System status word hh = hexadecimal value High byte II = hexadecimal value Low byte
Sxxxxx	6	write	>	x	2	System command xxxxx = code
Tx	2	write	>	x	2	Sense of rotation x = decimal value
Uxxxx	5	read	bbbb		4	Read parameter (4-byte) bbbb = binary value in the Big-Endian format

Command	Length	Access	Reply	CR	Length	Description
V	1	read	±xxxx>	x	7	Actual rotational speed ±xxxx = decimal value with arithmetical sign
W	1	read	bbbb		4	Position value in binary format bbbb = binary value in the Big-Endian format
Xy	2	write	>	x	2	Operating mode y = decimal value
Y	1	write	>	x	2	start of inching mode 1
Z	1	read	±xxxxxxx>	x	10	Position value ±xxxxxxx decimal value
, ($2C_{hex}$)	1	write			0	Start inching mode 2 positive travel direction
. ($2E_{hex}$)	1	write			0	Start inching mode 2 negative travel direction

10 Block diagram

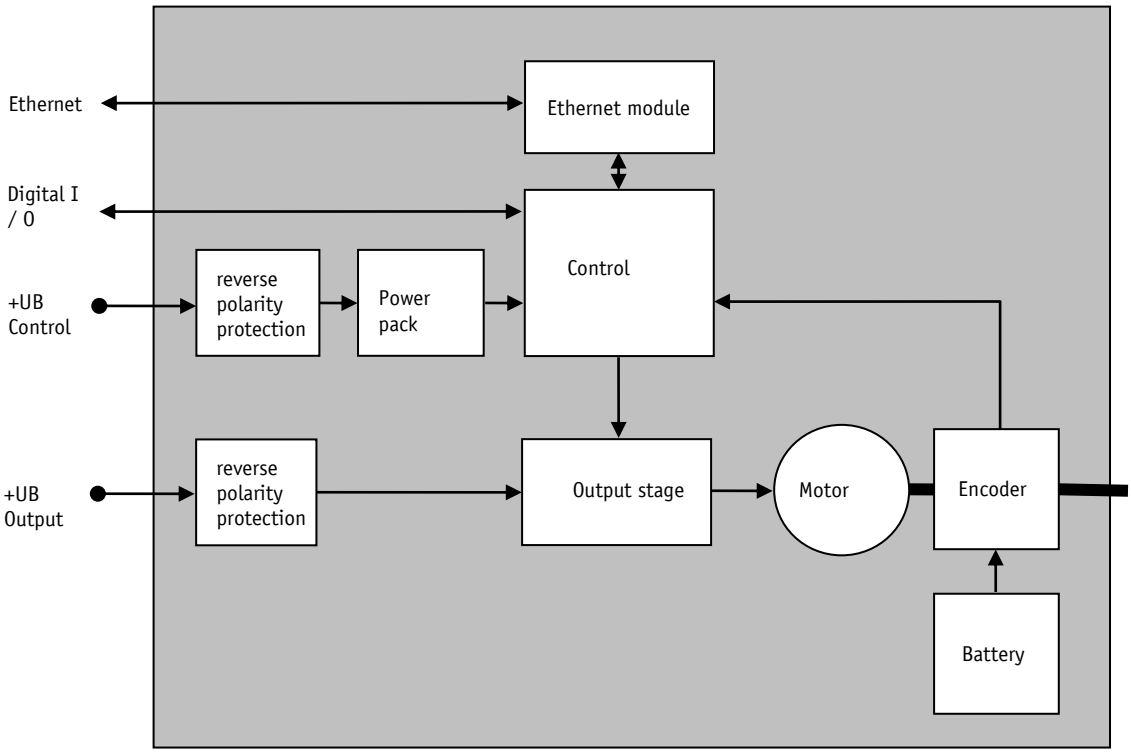


Fig. 18: Block diagram

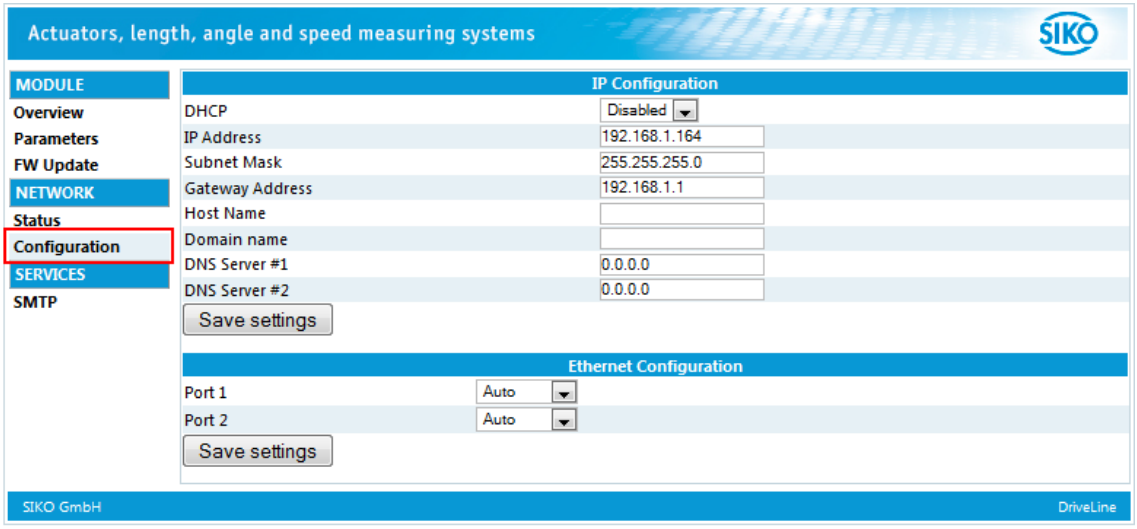
11 Web server

NOTICE	No parameters that are components of process data can be changed. Drive control via web server is not possible. Only an authorized network master can access the process data via the network.

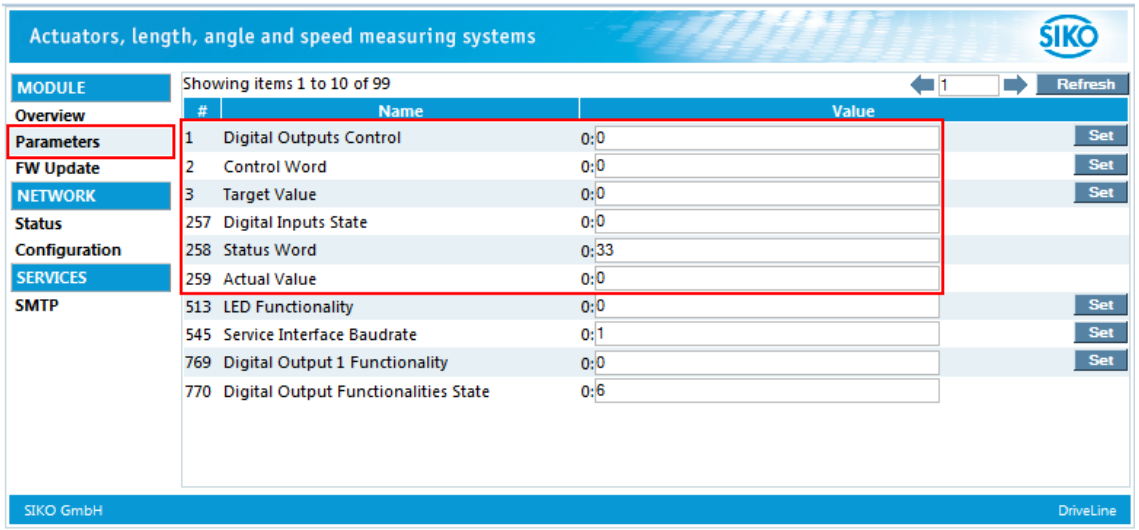
The inbuilt web server enables configuration and parameterization without network master via the Ethernet interface.

The web server can be accessed via the set IP address.

Settings for IP and Ethernet can be made via the Configuration menu.



Below, the parameter menu is shown. The process data is within the red mark.



The web server can be activated or deactivated via the parameter Configuration (instance 2849).
The web server is activated in the factory setting.

12 FTPsteps-Server

The integrated FTP server provides access to the file system of the Ethernet module via an FTP client. This allows a firmware update of the Ethernet module via the network.
The following port numbers are used for FTP communication:
TCP, port 20 (FTP data transfer)
TCP, port 21 (FTP control)
The FTP server can be activated or deactivated via the parameter Configuration (instance 2849).
The protocol is activated in the factory setting.

13 Secure Host IP Configuration Protocol (Secure HICP)

The drive supports the Secure HICP protocol used by the Anybus IPconfig application to change the IP address, subnet mask, and DHCP settings over the network.
The protocol can be activated or deactivated via the parameter Configuration (instance 2849).
The protocol is activated in the factory setting.