



## TSP10-CBE Feldbus Appendix

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## Table of changes

Edition	Notes
15.07.2021	First edition
15.09.2023	Revised version
18.06.2024	Revised version

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## 1 CANopen adjustments

This appendix describes the implementation of the CANopen standard profile DS402 for the TSP10-CBE stepper motor drives. For this reason, some terms have been left in English to make it easier to establish the reference to the template.

### 1.1 Connector

The TSP10 uses the 9-pin Sub-D connector X5 to connect to the CAN bus. The pin assignment is the same as in the standard (DS102).

### 1.2 CAN-address

The two rotary switches on the TSP10-CBE are used to set the Canbus address. The motor current and the microstep factor are specified via the objects 6075 Motor Rated Current (section 4.3) and 6092 Feed Constant (section 4.3).



The address is set in hexadecimal format. For an address up to 15, the left-hand rotary switch remains at zero. For higher addresses, the left-hand rotary switch position is multiplied by 16 and added to the right-hand value.

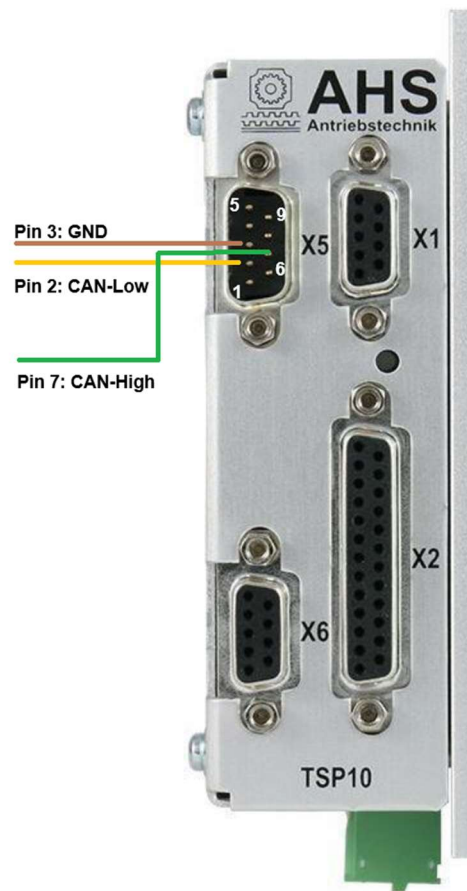
### 1.3 Baud rate

Following Baud rates are supported:

Baud rate [kBaud]	Maximum bus length [m]
1000	30
800	40
<b>500</b>	80
250	180
125	350
100	450
50	900

The default baud rate is 500 kBaud. The baud rate can be changed using the TopSuite program.

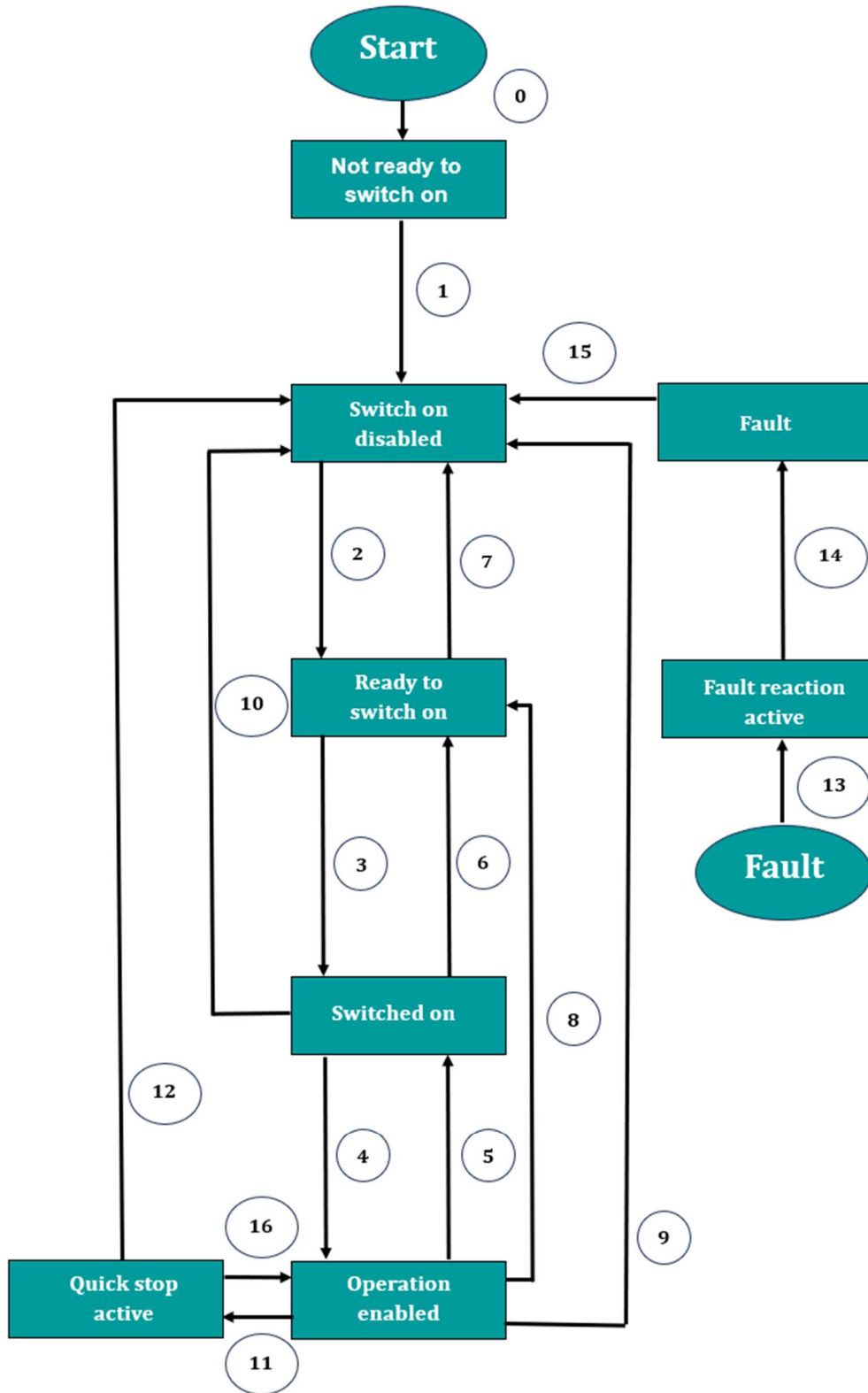
## 1.4 Pin assignment



To ensure secure communication between the TSP10-CBE stepper motor driver and a controller or a control system via CAN, a 120 Ohm resistor must be connected between the lines CAN-High and CAN-Low..

## 2 State machine

The implementation of the state machine corresponds to the state machine of the CANopen standard profile DS402.





## 2.1 State transitions

Triggered state transition		Control command	Bit 7...0 of the control word				
			7	3	2	1	0
0	After switching on the appliance	Automatic transition	–	–	–	–	–
1	“Not ready to switch on” to “Switch on disabled”	Automatic transition	–	–	–	–	–
2	“Switch on disabled” to “Ready to switch on”	Shutdown	0	x	1	1	0
3	“Ready to switch on” to “Switched on”	Switch on	0	0	1	1	1
4	„Switched on“ to „Operation enabled“ (output voltage is enabled)	Enable operation	0	1	1	1	1
5	„Operation enabled“ to „Switched on“ (output voltage is disabled)	Disable operation	0	0	1	1	1
6	“Switched on” to “Ready to switch on”	Shutdown	0	x	1	1	0
7	“Ready to switch on” to “Switch on disabled”	Disable voltage	0	x	x	0	x
		Quick stop	0	x	0	1	x
8	“Operation enabled” to “Ready to switch on”	Shutdown	0	x	1	1	0
9	“Operation enabled” to “Switch on disabled”	Disable voltage	0	x	x	0	x
10	“Switched on” to “Swich on disabled”	Disable voltage	0	x	x	0	x
		Quick stop	0	x	0	1	x
11	“Operation enabled” to “Quick stop active” (output voltage remains enabled)	Quick stop	0	x	0	1	x
12	“Quick stop active” to “Switch on disabled” (output voltage is disabled)	Disable voltage	0	x	x	0	x
13	If a fault occurs in any state	Automatic transition	–	–	–	–	–
14	After completed fault reaction (Fault reaction active)	Automatic transition	–	–	–	–	–
15	Fault reset	Fault reset	⏏	x	x	x	x
16	“Quick stop” to “Operation enabled”	Enable operation	0	1	1	1	1

X = Means don't care. Reaching a certain state is independent of the current state of the respective bit marked with X.

⏏ = Means change of state of a bit from state 0 to state 1.

## 2.2 Coded states of the stepper motor drive

Status	Status bits 0...6 of the status word						
	6	5	4	3	2	1	0
Not ready to switch on	0	x	x	0	0	0	0
Switch on disabled	1	x	x	0	0	0	0
Ready to switch on	0	1	x	0	0	0	1
Switched on	0	1	x	0	0	1	1
Operation enabled	0	1	x	0	1	1	1
Quickstop active	0	0	x	0	1	1	1
Fault reaction active	0	x	x	1	1	1	1
Fault	0	x	x	1	0	0	0

### 3 Communication

Index	Object	Name	Type	Access	Category
1000h	VAR	Device Type	UNSIGNED32	const	M
1001h	VAR	Error Register	UNSIGNED8	ro	M
1002h	VAR	Manufacturer Status Register	UNSIGNED32	ro	O
1008h	VAR	Manufacturer Device Name	VISIBLE STRING	const	O
1009h	VAR	Manufacturer Hardware Version	VISIBLE STRING	const	O
100Ah	VAR	Manufacturer Software Version	VISIBLE STRING	const	O
1018h	RECORD	Identity Object	UNSIGNED32	const	M
1400h	RECORD	Receive PDO parameter 0		ro	C
1401h	RECORD	Receive PDO parameter 1		ro	C
1600h	RECORD	Receive PDO mapping		Const	C
1601h	RECORD	Receive PDO mapping		Const	C
1800h	RECORD	Transmit PDO parameter 0		ro	C
1801h	RECORD	Transmit PDO parameter 1		ro	C
1A00h	RECORD	Transmit PDO mapping		Const	C
1A01h	RECORD	Transmit PDO mapping		Const	C

### 3.1 Object 1000h: Device Type

Object description:		Data:	
INDEX	1000h	Access	const
Name	Device Type	PDO Mapping	no
Object-Type	VAR	Value Range	
Data-Type	UNSIGNED32	Value	0004 0192h

0004h: Step motor drive

0192h: DS402-Profil

### 3.2 Object 1001h: Error Register

Object description:		Data:	
INDEX	1001h	Access	ro
Name	Error Register	PDO Mapping	no
Object-Type	VAR	Value Range	UNSIGNED8
Data-Type	UNSIGNED8	Default Value	-

Bit	Meaning
0	General error
1	Current
2	Voltage
3	Temperature
4	Communication
5	Profile-specific
6	Reserved
7	Manufacturer-specific

### 3.3 Object 1002h: Manufacturer Status Register

Object description:		Data:	
INDEX	1002h	Access	ro
Name	Manufacturer Status Register	PDO Mapping	no
Object-Type	VAR	Value Range	
Data-Type	UNSIGNED32	Default Value	-

Bit	28	18..27	17	13..16	12	11	10	9	8	4..7	0..3
	Inputs		Outputs			Functions				Rotary switch	
Profile position	Release input	DE1...DE10	Activated-output	DA1...DA4	Stop switch	Reference switch	ES top	ES bottom	Referenced	S2	S1

### 3.4 Object 1008h: Manufacturer Device Name

Object description:		Data:	
INDEX	1008h	Access	const
Name	Manufacturer Device Name	PDO Mapping	no
Object-Type	VAR	Value Range	
Data-Type	VISIBLE STRING	Value	„TSP“

Device name as a character string with 3 characters.

### 3.5 Object 1009h: Manufacturer Hardware Version

Object description:		Data:	
INDEX	1009h	Access	const
Name	Manufacturer Hardware Version	PDO Mapping	no
Object-Type	VAR	Value Range	
Data-Type	VISIBLE STRING	Value	513

Example: 513 => 5 = Board-Revision; 1 = CAN; 3 = Encoder

### 3.6 Object 100Ah: Manufacturer Software Version

Object description:		Data:	
INDEX	100Ah	Access	const
Name	Manufacturer Software Version	PDO Mapping	no
Object-Type	VAR	Value Range	
Data-Type	VISIBLE STRING	Value	

Software version as a character string with 3 characters. Example: "060"

### 3.7 Object 1018h: Identity Object

Object description:	
INDEX	1018h
Name	Identity Object
Object-Type	RECORD
Data-Type	Identity

General information about the appliance.

Object description:		Data:	
<b>SUB-INDEX</b>	<b>1</b>	Access	const
Name	Vendor ID	PDO Mapping	no
Data-Type	UNSIGNED32	Value	414853h

The vendor ID consists of the three characters: "AHS"

Object description:		Data:	
<b>SUB-INDEX</b>	<b>2</b>	Access	const
Name	Product code	PDO Mapping	no
Data-Type	UNSIGNED32	Value	21 (CBE)

Object description:		Data:	
<b>SUB-INDEX</b>	<b>3</b>	Access	const
Name	Revision number	PDO Mapping	nein
Data-Type	UNSIGNED32	Value	to DS301

The upper 16 bits of subindex 3 only change when the CANopen behaviour changes

Object description:		Data:	
<b>SUB-INDEX</b>	<b>4</b>	Access	const
Name	Serial number	PDO Mapping	no
Data-Type	UNSIGNED32	Value	Serial number

**3.8 Object 1400h: Receive PDO Parameter**

<b>Object description:</b>	
<b>INDEX</b>	<b>1400h</b>
Name	Receive PDO parameter
Object-Type	RECORD
Data-Type	PDO CommPar

Communication parameters for PDO:

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>1</b>	Access	ro
Name	COB ID	PDO Mapping	no
Data-Type	UNSIGNED32	Value	200h + Node-Id

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>2</b>	Access	ro
Name	Transmission type	PDO Mapping	no
Data-Type	UNSIGNED8	Value	255 (asynchronised)



**3.9 Object 1401h: Receive PDO Parameter**

<b>Object description:</b>	
<b>INDEX</b>	<b>1401h</b>
Name	Receive PDO parameter
Object-Type	RECORD
Data-Type	PDO CommPar

Communication parameters for PDO:

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>1</b>	Access	ro
Name	COB ID	PDO Mapping	no
Data-Type	UNSIGNED32	Value	300h + Node-Id

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>2</b>	Access	ro
Name	Transmission type	PDO Mapping	no
Data-Type	UNSIGNED8	Value	255 (asynchronised)

**3.10 Object 1600h: Receive PDO Mapping**

<b>Object description:</b>	
<b>INDEX</b>	<b>1600h</b>
Name	Receive PDO mapping
Object-Type	RECORD
Data-Type	PDO Mapping

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>1</b>	Access	const
Name	Entry 1	PDO Mapping	no
Data-Type	UNSIGNED32	Value	60400010h (Controlword)

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>2</b>	Access	const
Name	Entry 2	PDO Mapping	no
Data-Type	UNSIGNED32	Value	607A0020h (Target Position)

**3.11 Objekt 1601h: Receive PDO Mapping**

<b>Object description:</b>	
<b>INDEX</b>	<b>1601h</b>
Name	Receive PDO mapping
Object-Type	RECORD
Data-Type	PDO Mapping

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>1</b>	Access	const
Name	Entry 1	PDO Mapping	no
Data-Type	UNSIGNED32	Value	60400010h (Controlword)

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>2</b>	Access	const
Name	Entry 2	PDO Mapping	no
Data-Type	UNSIGNED32	Value	60FF0020h (Target Velocity)

### 3.12 Objekt 1800h: Transmit PDO Parameter

Object description:	
<b>INDEX</b>	<b>1800h</b>
Name	Transmit PDO parameter
Object-Type	RECORD
Data-Type	PDO CommPar

Communication parameters for PDO:

Object description:		Data:	
<b>SUB-INDEX</b>	<b>1</b>	Access	ro
Name	COB ID	PDO Mapping	no
Data-Type	UNSIGNED32	Value	40000180h + Node-Id

Object description:		Data:	
<b>SUB-INDEX</b>	<b>2</b>	Access	ro
Name	Transmission type	PDO Mapping	no
Data-Type	UNSIGNED8	Value	255 (asynchron)

### 3.13 Objekt 1801h: Transmit PDO Parameter

Object description:	
<b>INDEX</b>	<b>1801h</b>
Name	Transmit PDO parameter
Object-Type	RECORD
Data-Type	PDO CommPar

Communication parameters for PDO:

Object description:		Data:	
<b>SUB-INDEX</b>	<b>1</b>	Access	ro
Name	COB ID	PDO Mapping	no
Data-Type	UNSIGNED32	Value	40000280h + Node-Id

Object description:		Data:	
<b>SUB-INDEX</b>	<b>2</b>	Access	ro
Name	Transmission type	PDO Mapping	no
Data-Type	UNSIGNED8	Value	255 (asynchron)

**3.14 Objekt 1A00h: Transmit PDO Mapping**

<b>Object description:</b>	
<b>INDEX</b>	<b>1A00h</b>
Name	Transmit PDO mapping
Object-Type	RECORD
Data-Type	PDO Mapping

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>1</b>	Access	const
Name	Entry 1	PDO Mapping	no
Data-Type	UNSIGNED32	Value	60410010h (Statusword)

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>2</b>	Access	const
Name	Entry 2	PDO Mapping	no
Data-Type	UNSIGNED32	Value	60640020h (Position Actual)

**3.15 Objekt 1A01h: Transmit PDO Mapping**

<b>Object description:</b>	
<b>INDEX</b>	<b>1A01h</b>
Name	Transmit PDO mapping
Object-Type	RECORD
Data-Type	PDO Mapping

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>1</b>	Access	const
Name	Entry 1	PDO Mapping	no
Data-Type	UNSIGNED32	Value	60410010h (Statusword)

<b>Object description:</b>		<b>Data:</b>	
<b>SUB-INDEX</b>	<b>2</b>	Access	const
Name	Entry 2	PDO Mapping	no
Data-Type	UNSIGNED32	Value	606C0020h (Velocity Actual Val)

## 4 Device settings

### NOTICE

The objects for the device settings should be set after switching on and then remain unchanged. Changing the values during operation can lead to non-optimal behaviour of the device

Index	Object	Name	Type	Access	Category
6075h	VAR	Motor rated current	UNSIGNED32	rw	O
6092h	ARRAY	Feed constant	UNSIGNED32	rw	O
608Fh	ARRAY	Position encoder resolution	UNSIGNED32	rw	O
60A8h	VAR	SI unit position	UNSIGNED32	rw	O
2001h	ARRAY	Standby current	UNSIGNED16	rw	
2002h	VAR	Common settings	UNSIGNED16		
2003h	ARRAY	Digital input settings	INTEGER16	rw	

### 4.1 Object 6075h: Motor Rated Current

Object description:		Data:	
INDEX	6075h	Access	rw
Name	Motor rated current	PDO Mapping	no
Object-Type	VAR	Value Range	400 – 7000 mA <sub>eff</sub>
Data-Type	UNSIGNED32	Default Value	400 mA <sub>eff</sub>

### NOTICE

If the rated motor current is exceeded, this can lead to the destruction of the motor due to demagnetisation or thermal overload



## 4.2 Object 608Fh: Position Encoder Resolution

Object description:	
<b>INDEX</b>	<b>608Fh</b>
Name	Position encoder resolution
Object-Type	ARRAY
Data-Type	UNSIGNED32

Setting the step resolution per rotation

Object description:		Data:	
<b>SUB-INDEX</b>	<b>1</b>	Access	rw
Name	Encoder increments	PDO Mapping	no
Data-Type	UNSIGNED32	Value Range	UNSIGNED32
		Default Value	0

Object description:		Data:	
<b>SUB-INDEX</b>	<b>2</b>	Access	const
Name	Motor revolutions	PDO Mapping	no
Data-Type	UNSIGNED32	Value Range	UNSIGNED32
		Default Value	1

The encoder increments must be set to 4 times the number of encoder increments. If no encoder is used, the value zero must be specified.

### 4.3 Object 6092h: Feed Constant

Object description:	
INDEX	6092h
Name	Feed constant
Object-Type	ARRAY
Data-Type	UNSIGNED32

Setting the step resolution per revolution. **Changing these parameters requires a new specification of all positions, speeds and accelerations**, so this value should be set at the beginning of the parameterisation.

Object description:		Data:	
SUB-INDEX	1	Access	rw
Name	Feed	PDO Mapping	no
Data-Type	UNSIGNED32	Value Range	UNSIGNED32
		Default Value	10000 steps

Object description:		Data:	
SUB-INDEX	2	Access	rw
Name	Shaft Revolutions	PDO Mapping	no
Data-Type	UNSIGNED32	Value Range	UNSIGNED32
		Default Value	1 revolution

The position resolution results from the feed per revolution.

Example:

Feed = 10000 steps per revolution.

#### 4.4 Object 60A8h: SI Unit Position

Object description:		Data:	
INDEX	60A8h	Access	rw
Name	SI unit position	PDO Mapping	no
Object-Type	VAR	Value Range	
Data-Type	UNSIGNED32	Default Value	AC0000h

The unit used for all position values is entered here. The standard unit is "step" according to DS402.

#### 4.5 Object 2001h: Standby Current

If the motor has come to a standstill, after the delay the current will be reduced and idle current is active.

Object description:	
<b>INDEX</b>	<b>2001h</b>
Name	Standby Current
Object-Type	ARRAY
Data-Type	UNSIGNED16

The idle current is specified in thousandths of the rated current. The unit of the delay time is milliseconds.

Object description:		Data:	
<b>SUB-INDEX</b>	<b>1</b>	Access	rw
Name	Standby current value	PDO Mapping	no
Data-Type	UNSIGNED16	Value Range	0 .. 100
		Default Value	50 %

Object description:		Data:	
<b>SUB-INDEX</b>	<b>2</b>	Access	rw
Name	Standby Delay	PDO Mapping	no
Data-Type	UNSIGNED16	Value Range	0 ... 1500
		Default Value	100

## 4.6 Objekt 2002h: Common Settings

The motor direction of rotation and the smoothing function can be set here.

Object description:		Data:	
INDEX	2002h	Access	rw
Name	Common Settings	PDO Mapping	no
Object-Type	VAR	Value Range	see table
Data-Type	UNSIGNED16	Default Value	0

Bit	Meaning	Value
0	Direction of rotation	0 = clockwise (view of the shaft)
1	Smoothing	1 = active

#### 4.7 Object 2003h: Digital Input Settings

Object description:	
<b>INDEX</b>	<b>2003h</b>
Name	Digital Input Settings
Object-Type	ARRAY
Data-Type	INTEGER16

All 10 sub-index objects are defined as follows. The value for x is in range 1...10

Object description:		Data:	
<b>SUB-INDEX</b>	<b>x</b>	Access	rw
Name	DEx	PDO Mapping	no
Data-Type	UNSIGNED32	Value Range	0..14
		Default Value	see table

Value	Function	Default logic
0	No function	
1	Lower limit switch (default: DE2)	Low
2	Upper limit switch (default: DE3)	Low
3	Reference switch (default: DE4)	High
4	Stop switch (default: DE5)	High
5	Start drive (edge)	High
6		High
7		High
8		High
9	Start homing	High
10	Enable	High
11	Jogmode	High
12		High
13		High
14		High

The logic can be inverted by negating the value.

Example: DE2 = -1 => The DE2 input acts as a lower limit switch with high level logic.

## 5 System drive

Index	Object	Name	Type	Access	Category
6040h	VAR	Controlword	UNSIGNED16	rw	M
6041h	VAR	Statusword	UNSIGNED16	ro	M
6060h	VAR	Modes of operation	INTEGER8	rw	M
6061h	VAR	Modes of operation display	INTEGER8	ro	M

## 5.1 Object 6040h: Controlword

Object description:		Data:	
INDEX	6040h	Access	rw
Name	Controlword	PDO Mapping	yes
Object-Type	VAR	Value Range	UNSIGNED16
Data-Type	UNSIGNED16	Default Value	-

Bit	15 ... 10	9	8	7	6	5	4	3	2	1	0
Profile Position	reserved		stop	fault res	abs/rel		New setpoint	eo	qs	ev	so
Profile Velocity											

eo = enable operation; qs = quick stop; ev = enable voltage; so = switch on

## 5.2 Object 6041h: Statusword

Object description:		Data:	
INDEX	6041h	Access	ro
Name	Statusword	PDO Mapping	yes
Object-Type	VAR	Value Range	UNSIGNED16
Data-Type	UNSIGNED16	Default Value	-

Bit	15, 14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Profile Position		Following error	Set-point acknowledge	Internal limit active	Target reached	remote		w	sod	qs	ve	f	oe	so	rtso
Profile Velocity															

rtso = ready to switch on; so = switched on; oe = enable operation; f = fault; ve = motor voltage enabled; qs = quick stop; sod = switch on disabled; w = warning



### 5.3 Object 6060h: Modes Of Operation

Object description:		Data:	
INDEX	6060h	Access	rw
Name	Modes of operation	PDO Mapping	no
Object-Type	VAR	Value Range	1, 3, 6
Data-Type	INTEGER8	Default Value	1

Value	Operating mode
1	Profile Position Mode
3	Profile Velocity Mode
6	Homing Mode

### 5.4 Object 6061h: Modes Of Operation Display

Object description:		Data:	
INDEX	6060h	Access	ro
Name	Modes of operation display	PDO Mapping	no
Object-Type	VAR	Value Range	1, 3, 6
Data-Type	INTEGER8	Default Value	-

## 6 Profile Position Mode

Index	Object	Name	Type	Access	Category
6062h	VAR	Position demand value	INTEGER32	ro	O
6064h	VAR	Position actual value	INTEGER32	ro	M
607Ah	VAR	Target position	INTEGER32	rw	M
6081h	VAR	Profile Velocity	UNSIGNED32	rw	M
6083h	VAR	Profile Acceleration	UNSIGNED32	rw	M
6084h	VAR	Profile Deceleration	UNSIGNED32	rw	O
6085h	VAR	Quick stop deceleration	UNSIGNED32	rw	O

### 6.1 Object 6062h: Position Demand Value

Object description:		Data:	
INDEX	6062h	Access	ro
Name	Position demand value	PDO Mapping	no
Object-Type	VAR	Value Range	INTEGER32
Data-Type	INTEGER32	Default Value	-

The unit of the position is defined by object 6092h (Feed Constant).

## 6.2 Object 6064h: Position Actual Value

Object description:		Data:	
<b>INDEX</b>	<b>6064h</b>	Access	ro
Name	Position actual value	PDO Mapping	yes
Object-Type	VAR	Value Range	INTEGER32
Data-Type	INTEGER32	Default Value	-

The unit of the position is defined by object 6092h (Feed Constant). If no encoder is used and the value of object 608Fh (Encoder Increments) is zero, then the two objects 6062h (Position Demand Value) and 6064h (Position Actual Value) are identical.

## 6.3 Object 607Ah: Target Position

Object description:		Data:	
<b>INDEX</b>	<b>607Ah</b>	Access	rw
Name	Target position	PDO Mapping	yes
Object-Type	VAR	Value Range	INTEGER32
Data-Type	INTEGER32	Default Value	-

The unit of the position is defined by object 6092h (Feed Constant).

## 6.4 Object 6081h: Profile Velocity

Object description:		Data:	
INDEX	6081h	Access	rw
Name	Profile velocity	PDO Mapping	no
Object-Type	VAR	Value Range	1..UNSIGNED32
Data-Type	UNSIGNED32	Default Value	1 Step/s

The speed depends on object 6092h (Feed Constant). If a feed rate is set in mm/revolution, the speed is specified in mm/s.

## 6.5 Object 6083h: Profile Acceleration

Object description:		Data:	
INDEX	6083h	Access	rw
Name	Profile acceleration	PDO Mapping	no
Object-Type	VAR	Value Range	23..UNSIGNED32
Data-Type	UNSIGNED32	Default Value	23 Steps/s <sup>2</sup>

All accelerations are dependent on object 6092h (Feed Constant). If a feed rate is set in mm/revolution, the accelerations are specified in mm/s<sup>2</sup>.

## 6.6 Object 6084h: Profile Deceleration

Object description:		Data:	
INDEX	6084h	Access	rw
Name	Profile deceleration	PDO Mapping	no
Object-Type	VAR	Value Range	23..UNSIGNED32
Data-Type	UNSIGNED32	Default Value	23 Steps/s <sup>2</sup>


All accelerations are dependent on object 6092h (Feed Constant). If a feed rate is set in mm/revolution, the accelerations are specified in mm/s<sup>2</sup>.

## 6.7 Object 6085h: Quick Stop Deceleration

Object description:		Data:	
INDEX	6085h	Access	rw
Name	Quick stop deceleration	PDO Mapping	no
Object-Type	VAR	Value Range	UNSIGNED32
Data-Type	UNSIGNED32	Default Value	-

All accelerations are dependent on object 6092h (Feed Constant). If a feed rate is set in mm/revolution, the accelerations are specified in mm/s<sup>2</sup>.

## 6.8 Meaning of bits in the control word

Bit	Description	Value	Command
4	Start driving task		Rising edge starts driving task
6	Position absolute/relative	0	Target positioning absolute
		1	Target positioning relative

## 6.9 Meaning of bits in the status word

Bit	Description	Value	Feedback
10	Target position reached	0	Target position not reached
		1	Target position reached and the motor stopped

## 7 Profile Velocity Mode

Index	Object	Name	Type	Access	Category
606Ch	VAR	Velocity Actual Value	INTEGER32	ro	O
60FFh	VAR	Target Velocity	INTEGER32	rw	M
6083h	VAR	Profile Acceleration	UNSIGNED32	rw	M
6084h	VAR	Profile Deceleration	UNSIGNED32	rw	O
6085h	VAR	Quick stop deceleration	UNSIGNED32	rw	O

### 7.1 Object 606C Velocity Actual Value

Object description:		Data:	
INDEX	606Ch	Access	ro
Name	Velocity Actual Value	PDO Mapping	yes
Object-Type	VAR	Value Range	INTEGER32
Data-Type	INTEGER32	Default Value	-

### 7.2 Object 60FF Target Velocity

Object description:		Data:	
INDEX	60FF	Access	rw
Name	Target Velocity	PDO Mapping	yes
Object-Type	VAR	Value Range	INTEGER32
Data-Type	INTEGER32	Default Value	-

### 7.3 Object 6083h: Profile Acceleration

Object description:		Data:	
INDEX	6083h	Access	rw
Name	Profile acceleration	PDO Mapping	nnoein
Object-Type	VAR	Value Range	23..UNSIGNED32
Data-Type	UNSIGNED32	Default Value	23 steps/s <sup>2</sup>

All accelerations are dependent on object 6092h (Feed Constant). If a feed rate is set in mm/revolution, the accelerations are specified in mm/s<sup>2</sup>.

### 7.4 Object 6084h: Profile Deceleration

Object description:		Data:	
INDEX	6084h	Access	rw
Name	Profile deceleration	PDO Mapping	no
Object-Type	VAR	Value Range	23..UNSIGNED32
Data-Type	UNSIGNED32	Default Value	23 steps/s <sup>2</sup>

All accelerations are dependent on object 6092h (Feed Constant). If a feed rate is set in mm/revolution, the accelerations are specified in mm/s<sup>2</sup>.

## 7.5 Object 6085h: Quick Stop Deceleration

Object description:		Data:	
INDEX	6085h	Access	rw
Name	Quick stop deceleration	PDO Mapping	no
Object-Type	VAR	Value Range	UNSIGNED32
Data-Type	UNSIGNED32	Default Value	-

All accelerations are dependent on object 6092h (Feed Constant). If a feed rate is set in mm/revolution, the accelerations are specified in mm/s<sup>2</sup>.

## 7.6 Meaning of bits in the control word

Bit	Description	Value	Command
8	Stop	0	The motor is accelerated to the target speed with the set acceleration ramp
		1	The motor is braked with the set braking ramp and stops

## 8 Homing Mode

Index	Object	Name	Type	Access	Category
607Ch	VAR	Home offset	INTEGER32	rw	O
6098h	VAR	Homing method	INTEGER8	rw	M
6099h	ARRAY	Homing speeds	UNSIGNED32	rw	M
609Ah	VAR	Homing acceleration	UNSIGNED32	rw	O

### 8.1 Object 607Ch: Home Offset

Object description:		Data:	
INDEX	607Ch	Access	rw
Name	Home offset	PDO Mapping	no
Object-Type	VAR	Value Range	INTEGER32
Data-Type	INTEGER32	Default Value	0

The unit of the position is defined by object 6092h (Feed Constant).



## 8.2 Object 6098h: Homing Method

Object description:		Data:	
INDEX	6098h	Access	rw
Name	Home offset	PDO Mapping	no
Object-Type	VAR	Value Range	17, 18, 24, 25, 28, 29, 35, 37
Data-Type	INTEGER8	Default Value	35

Value	Homing Method
17	Homing on lower limit switch
18	Homing on upper limit switch
24	Homing on home switch lower edge (initial direction to the right)
25	Homing on home switch upper edge (initial direction to the right)
28	Homing on home switch upper edge (initial direction to the left)
29	Homing on home switch lower edge (initial direction to the left)
35	Homing on current position (obsolete)
37	Homing on current position

### 8.3 Object 6099h: Homing Speeds

Object description:	
INDEX	6099h
Name	Homing speeds
Object-Type	ARRAY
Data-Type	UNSIGNED32

All accelerations are dependent on object 6092h (Feed Constant). If a feed rate is set in mm/revolution, the accelerations are specified in mm/s<sup>2</sup>.

Object description:		Data:	
SUB-INDEX	1	Access	rw
Name	Fast homing speed	PDO Mapping	no
Data-Type	UNSIGNED32	Value Range	1..UNSIGNED32
		Default Value	1 step/s

Object description:		Data:	
SUB-INDEX	2	Access	ro (corresponds to the value of fast homing speed)
Name	Slow homing speed	PDO Mapping	no
Data-Type	UNSIGNED32	Value Range	1..UNSIGNED32

## 8.4 Object 609Ah: Homing Acceleration

Object description:		Data:	
INDEX	609Ah	Access	rw
Name	Homing acceleration	PDO Mapping	no
Object-Type	VAR	Value Range	23..UNSIGNED32
Data-Type	UNSIGNED32	Default Value	23 Steps/s <sup>2</sup>

All accelerations are dependent on object 6092h (Feed Constant). If a feed rate is set in mm/revolution, the accelerations are specified in mm/s<sup>2</sup>.

## 8.5 Meaning of bits in the control word

Bit	Description	Value	Command
4	Start homing	0	Stop homing
		1	Start homing
8	Stop	0	The motor is accelerated to the target speed with the set acceleration ramp.
		1	The motor is braked with the set braking ramp and stops.

## 8.6 Homing

The homing run is a special feature of the commands to the stepper motor. The homing run is always started by setting command bit 4.

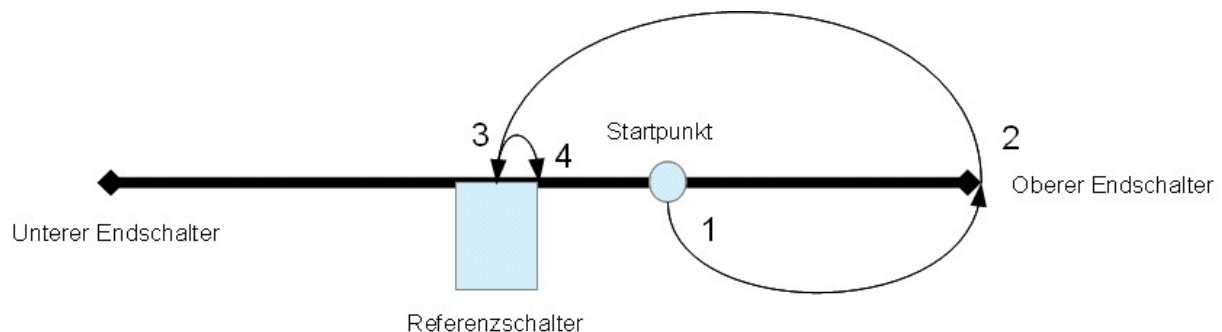
There are various ways to perform the homing. The homing methods are listed in the parameter data. The acceleration and speed of the homing run are transferred in objects 6099 Homing Speeds and 609A Homing Acceleration.

After a successful homing run, the drive is exactly at the reference point and the position counter is set to the value given in object 607C Homing Offset. If the Homing Offset is set to 5000 for example the actual position after a homing is 5000.. The status word signals that the position counter data is valid. A further homing run is not performed.

The stepper motor drive is now ready to accept absolute and relative position commands. The homing run is interrupted by the stop switch and when the second limit switch is reached, as the reference switch has not been found. When the lower limit switch is reached, the alarm status is assumed; if the stop switch is triggered during the reference run, only the drive is stopped, and the homing run is therefore cancelled. All statuses can be recognised by the control system via the status data and appropriate steps can be initiated.

### 8.6.1 Homing sequence:

1	Start: Position counter increments, velocity as choosed
2	Upper limit switch responds. Direction of traversing changes, position counter decrements. Velocity as choosed. Reference point is below the starting position.
3	Reference switch responds. Direction of traversing changes. Position counter value increases. Reference switch hit from above, back until reference switch edge is reached.
4	The reference point is verified by leaving and retriggering the reference switch. Set the position counter to value of object 607C Homing Offset. The motor is at the reference point.



Example: Upper reference switch (direction pos.), axis between reference point and upper limit switch