LinMot®

Motion Control SW

Documentation of the Motion Control SW

- E1100 Servo Controllers

Motion Control SW

User Manual V3.6

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System Overview

This user Manual describes the Motion Control SW functionality of the LinMot E1100 servo controller.

1.1 References

Ref	Title	Source
1	Installation Guide Servo Controllers E1100	www.linmot.com

The documentation is distributed with the LinMot-Talk1100 configuration SW.

1.2 Definitions, Items, Shortcuts

Shortcut	Meaning
LM	LinMot linear motor
OS	Operating system SW
MC (SW)	Motion Control SW
VAI	VA-Interpolator (Max velocity limited acceleration position interpolator)
Pos	Position
Vel	Velocity
Acc	Acceleration
Dec	Deceleration
UPID	Unique Parameter ID (16 bit)

1.3 Data types

Type	Range/Format	Num of bytes
Bool	Boolean, False/True	1/8
Byte	0..255	1
Char	ASCII	1
String	Array of char last char=0x00	X
SInt16	-32768..32767	2
UInt16	0..65535	2
SInt32	-2147483648..2147483647	4
UInt32	0..4294967295	4

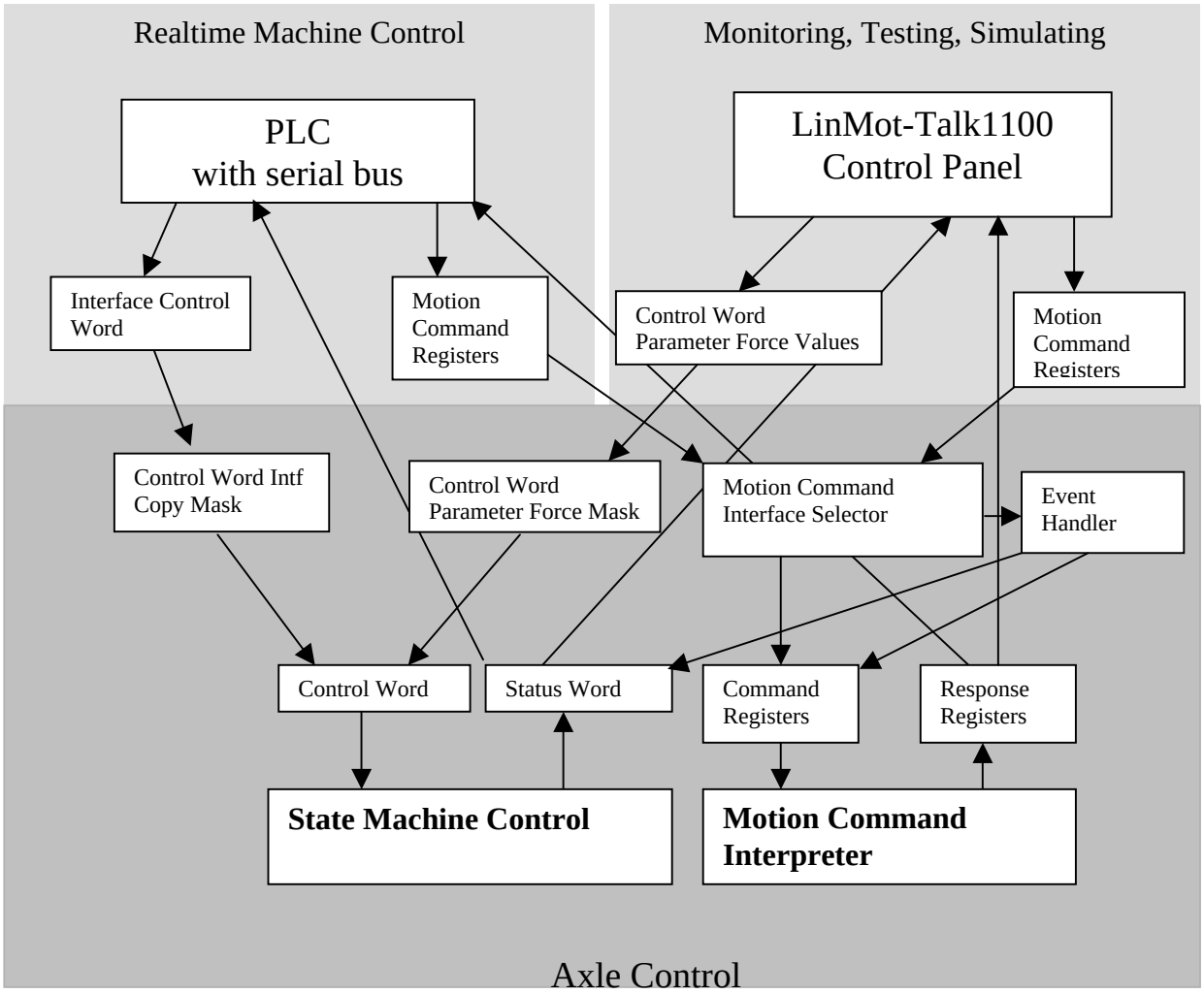
2 Motion Control Interfaces

For controlling the behavior of the motion control SW, two different Interfaces are available. For controlling the main state machine, a bit coded **Control Word** can be used. For controlling the motion functionality a memory mapped **Motion Command Interface** can be used. These two instances are mapped via an interface SW to an upper control system (PLC, IPC, PC, ..). The interfacing is done with digital IO's or a serial link like Profibus DP, CAN bus (DeviceNet, CANopen), RS485, RS422 or RS232 (LinRS protocol).

With LinMot-Talk1100 the control over the Control Word could be taken bit by bit, for testing and debugging. Unused Control Word bits could be forced by parameter value.

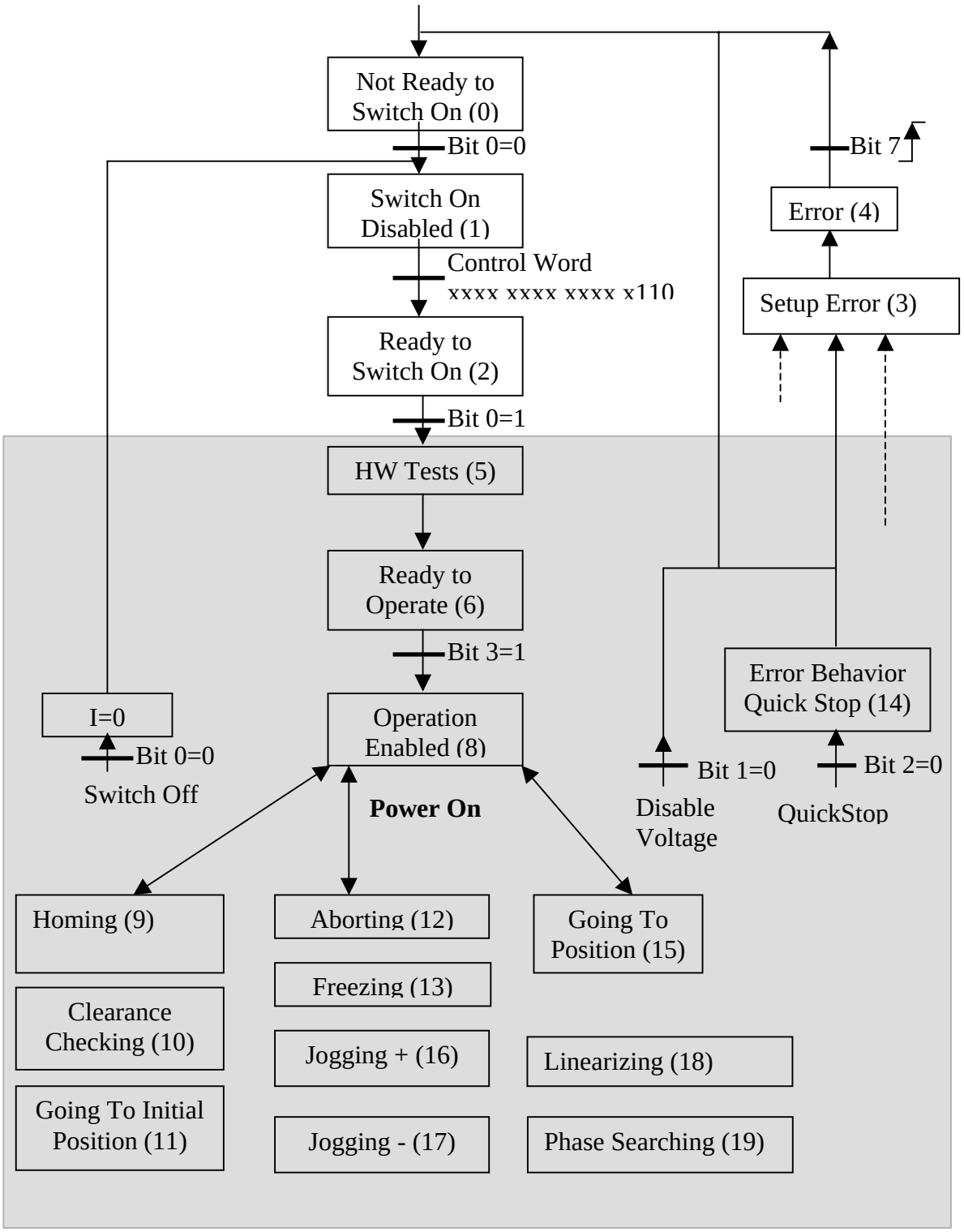
Also the control of the Motion Command Interpreter could be switched to Control Panel of the LinMot-Talk1100 SW, for testing.

All this could be done, with the running system, so be careful using this features on a running machine!



3 State Machine

The main behavior of the axles is controlled with the Control Word, it is shown in the following state diagram.



The state machine could be followed in the PLC's with fieldbus over the StateVar this response word could be configured in the response of any supported fieldbus.

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

The State Var is divided into two sections: the Main State section (high byte) contains directly the number of the State machine, the content of the Sub State (low byte) is state depending.

State Var	
Main State	Sub State
00: Not Ready To Switch On	0
01: Switch On Disabled	0
02: Ready To Switch On	0
03: Setup Error	**Error Code which will be logged**
04: Error	**Logged Error Code**
05: HW Tests	0 (Not yet defined)
06: Ready To Operate	0 (Not yet defined)
07: -	
08: Operation Enabled	**Bits 0..3: Motion Command Count** **Bit 4: Event Handler Active** **Bit 5: Motion Active** **Bit 6: In Target Position** **Bit 7: Homed**
09: Homing	**0Fh: Homing Finished**
10: Clearance Check	**0Fh: Clearance Check Finished**
11: Going To Initial Position	**0Fh: Going To Initial Position Finished**
12: Aborting	Not yet defined
13: Freezing	Not yet defined
14: Quick Stop (Error Behaviour)	Not yet defined
15: Going To Position	**0Fh: Going To Position Finished**
16: Jogging +	**01h: Moving positive** **0Fh: Jogging +Finished**
17: Jogging -	**01h: Moving negative** **0Fh: Jogging -Finished**
18: Linearizing	Not yet defined
19: Phase Search	Not yet defined

3.1 State 0: Not Ready To Switch On

In this state the release of control word bit 0 *switch on* is awaited. As soon as this bit is cleared a change to state 1 is performed. This behavior avoids self starting if all necessary bits for a start are set correctly in the control word.

3.2 State 1: Switch On Disabled

The state machine rests in this state as long as the bits 1 or 2 of the control word are cleared.

3.3 State 2: Ready To Switch On

The state machine rests in this state as long as the bit 0 is cleared.

3.4 State 3: Setup Error State

The state machine rests in this state as long the bits 0 is cleared.

3.5 State 4: Error State

The error state can be acknowledged with a rising edge of the control word bit 7 ‘Error Acknowledge’. If the error is fatal, bit 12 ‘Fatal Error’ in the status word is set, no error acknowledgment is possible.

In the case of a fatal error, the error has to be checked, and the problem has to be solved before a reset or power cycle is done for resetting the error.

3.6 State 5: HW Test

The HW Test state is an intermediate state before turning on the power stage of the servo controller. If everything seems to be ok the servo changes to state 6 without any user action. The test takes about 300ms.

3.7 State 6: Ready to Operate

In this state the motor is position controlled and under voltage, but no motion commands are accepted. Sending motion commands in this state will generate the error ‘Motion command sent in wrong state’ and a state change to the Error State will be performed.

Clearing the Control Word bit 3 ‘Enable Operation’ in state 8 or higher will stop immediately the set point generation and a state transition to 6 is performed. Clearing the bit while a motion is in execution a following error might be generated.

3.8 State 8: Operation Enabled

This is the state of the normal operation in which the motion commands are executed. It is strongly recommended to use the State Var for the motion command synchronisation with any fieldbus system.

State Var															
Main State = 8								Homed	In Target Position	Motion Active	Event Handler	Motion Command Count			
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

In the high byte stands the number of the main state = 8. In the low byte stands in the lowest 4 bits the actual interpreted 'Motion Command Count', bit 4 indicates if the event handler is active, in bit 5 stands the Status Word bit 'Motion Active', in bit 6 the Status Word bit 'In Target Position' and in bit 7 the Status Word bit 'Homed'. Because the 'Motion Command Count' echo and this Status Word bits are located in the same byte no data consistency problem is possible with any fieldbus.

A new motion command could be setup when the Motion Command Count has changed to the last sent **and** the 'Motion Active' bit is 0 or the 'In Target Position' bit is 1 if an exact positioning is required.

3.9 State 9: Homing

The homing state is used to define the position of the system according a mechanical reference, a home switch or an index.

For LinMot motors the slider home position at this home position is taken to compensate edge effects.

In the home sequence a position check of two positions and the motion to an initial position can be added.

Hint: If a mechanical stop homing mode is chosen, the initial position should be a little apart from this mechanical stop to avoid overheating of the motor.

3.10 State 10: Clearance Check

Setting the Clearance Check bit in the Control Word, two positions are moved to, to check if the whole motion range is free. Normally this action is added to the homing sequence to ensure that the homing was done correctly.

3.11 State 11: Going To Initial Position

Setting the Go To Initial Position bit in the Control, the Serve moves to the initial position, normally used to move away from the mechanical stop after homing, to protect the motor from overheating at the mechanical stop after the homing. Also good, for example, after an error, to move to a defined position again.

3.12 State 12: Aborting

Clearing the /Abort bit in the Control Word, starts a quick stop. After the motion is stopped the servo rests position controlled. Setting the bit again the servo controller rests in position until a new motion command is executed.

3.13 State 13: Freezing

Clearing the /Freeze bit in the Control Word, starts a quick stop. After the motion is stopped the servo rests position controlled. Setting the bit again the servo controller again, and the frozen motion was a VAI motion, this motion will be finished. Curve motion could be frozen but not restarted by releasing this bit, setting the bit again the motor moves at the target position of the last VAI command, if never used this will be the initial position.

3.14 State 14: Error Behaviour Quick Stop

Most of the errors that could occur during an active motion, causes a Quick Stop behaviour to save stop the motion. After the Quick stop is finished the motor is no longer position controlled.

3.15 State 15: Going To Position

Setting the Go To Position bit in the Control Word, the Serve moves to the defined position, good for example, after an error, to move to a defined position again.

3.16 State 16: Jogging +

Setting the Jog Move + bit in the Control Word, the Serve moves either a defined position increment or to the maximal position. Releasing the bit will stop the motion

3.17 State 17: Jogging -

Setting the Jog Move - bit in the Control Word, the Serve moves either a defined position decrement or to the minimal position. Releasing the bit will stop the motion

3.18 State 18: Linearizing

The Linearizing State is used to correct position feedback parameters, to improve the linearity of the position feedback.

3.19 State 19: Phase Searching

The phase search is only defined for three phase EC motors with hall switches and ABZ-Sensors to find the commutation offset for to the sensor. It could not be guaranteed that this feature will work for all kinds of EC motors. The found offset could be found in the variable section Calculated Commutation Offset (UPID: 1C1Bh), and has to be manually set to he parameter Phase Angle (UPID 11F2h).

3.20 Building the Control Word

The Control Word could be accessed bit by bit from different sources with different priorities. The highest priorities have the bits that are forced by parameters. The second highest priority has the Control Panel of the LinMot-Talk1100 SW, if logged in with the SW. The next lower priorities have the bits that are defined on the X4 IO's as Control Word input bits. The lowest priority have bits which are set over the Interface (normally a serial fieldbus connection), so in the Ctrl Word Interface Copy mask all bits could be selected, without causing any problems, but bits which should not be accessed through the interface could be masked out.

3.21 Control Word

With the Control Word (16Bit) the main state machine of the servo controller could be accessed. Following table shows the meaning of each bit:

Bit Name	Val	Meaning	Remark
0 Switch On	0	OFF1	A-Stop, -> Current = 0, power switches disabled
	1	ON	State change from switch on disabled to ready to switch on
1 Voltage Enable	0	OFF2	Power switches disabled without microcontroller action
	1	Operation	
2 /Quick Stop	0	OFF3	Quick Stop -> Current = 0 -> H-Bridges disabled
	1	Operation	
3 Enable Operation	0	Operation disabled	Position controller active Motion Commands disabled
	1	Operation enable	Position controller active Motion Commands enabled
4 /Abort	0	Abort	Quick Stop position control rests active, motion command is cleared.
	1	Operation	
5 /Freeze	0	Freeze motion	Quick Stop position control rests active, Target position not cleared, curves motions are aborted
	1	Operation	Rising edge will reactivate motion command
6 Go To Position	0		
	1	Go To Position	Go to fixed parameterized Position. Wait for release of signal.
7 Error Acknowledge	0		
	1	Error Acknowledge	Rising edge of signal acknowledges error
8 Jog Move +	0		
	1		Jog Move +
9 Jog Move -	0		
	1		Jog Move -
10 Reserved	0		
	1		Reserved
11 Home	0	Stop Homing	
	1	Homing	At startup bit 11 Status word is cleared, until procedure is finished.
12 Clearance Check	0	Stop Clearance Check	
	1	Clearance Check	Enable Clearance Check Movements
13 Go To Initial Position	0		
	1	Go To initial Position	Rising edge will start go to initial position
14 Reserved	0		
	1		Reserved
15 Phase Search	0	Stop Phase Search	
	1	Phase Search	Enable Phase Search Movements

3.22 Status Word

Following table shows detailed meaning of the single bits:¬

Bit Name	Val	Meaning	Remark
0 Operation Enabled	0		State Nr < 8
	1	Operation Enabled	State Nr 8 or higher (copied to Controller EN LED)
1 Switch On Active	0	Switch On Disabled	Control Word Bit 0
	1	Switch On Enabled	
2 Enable Operation	0	Operation Disabled	Control Word Bit 3
	1	Operation	
3 Error	0	No Error	
	1	Error	Acknowledge with Control word Bit 7 (Reset Error)
4 Voltage Enable	0	Power Bridge Off	Control Word Bit 1
	1	Operation	
5 /Quick Stop	0	Active	Control Word Bit 2
	1	Operation	
6 Switch On Locked	0	Not Locked	
	1	Switch On Locked	Release with 0 of Control word bit 0 (Switch On)
7 Warning	0	Warning not active	No bit is set in the Warn Word
	1	Warning active	One or more bits in the Warn Word are set
8 Event Handler Active	0	Event Handler Inactive	Event Handler cleared or disabled
	1	Event Handler Active	Event Handler setup
9 Special Motion Active	0	Normal Operation	
	1	Special Command runs	Special motion commands (Homing, ..) runs
10 In Target Position	0	Not In Pos	Motion active or actual position out of window
	1	In Pos	Actual position after motion in window
11 Homed	0	Motor not homed	Incremental sensor not homed (referenced)
	1	Motor homed	Position sensor system valid
12 Fatal Error	0		
	1	Fatal Error	A fatal error could not be acknowledged!
13 Motion Active	0	No Motion	Setpoint generation inactive
	1	Motion active	Setpoint generation (VAI, curve) active
14 Position Band 1	0	Not In Position Band 1	Actual Position Not In Position Band 1
	1	In Position Band1	Actual Position Is In Position Band 1
15 Position Band 2	0	Not In Position Band 1	Actual Position Not In Position Band 2
	1	In Position Band2	Actual Position Is In Position Band 2

3.23 Warn Word

Following table shows detailed meaning of the single bits of the Warn Word:

Bit Name	Val	Meaning
0 Motor Hot Sensor	0	Normal Operation
	1	Motor Temperature Sensor On
1 Motor Short Time Overload I^2t	0	Normal Operation
	1	Calculated Motor Temperature Reached Warn Limit
2 Motor Supply Voltage Low	0	Normal Operation
	1	Motor Supply Voltage Reached Low Warn Limit
3 Motor Supply Voltage High	0	Normal Operation
	1	Motor Supply Voltage Reached High Warn Limit
4 Position Lag Always	0	Normal Operation
	1	Position Error during Moving Reached Warn Limit
5 Position Lag Standing	0	Normal Operation
	1	Position Error During Standing Reached Warn Limit
6 Controller Hot	0	Normal Operation
	1	Position Error During Standing Reached Warn Limit
7 Motor Not Homed	0	Normal Operation
	1	Warning Motor Not Homed Yet
8 PTC Sensor 1 Hot	0	Normal Operation
	1	PTC Temperature Sensor 1 On
9 Reserved PTC 2	0	Normal Operation
	1	PTC Temperature Sensor 2 On
10 RR Hot Calculated	0	Normal Operation
	1	Regenerative Resistor Temperature Hot Calculated
11 Reserved	0	
	1	
12 Reserved	0	
	1	
13 Reserved	0	
	1	
14 Interface Warn Flag	0	Normal Operation
	1	Warn Flag Of Interface SW layer
15 Application Warn Flag	0	Normal Operation
	1	Warn Flag Of Application SW layer

Normally the warn word bits are used to react in conditions before the controller goes into the error state. E.g. a typical reaction on the Warning '*Motor Temperature Sensor*' would be a stop of the machine, before the controller goes into the error state and the motor goes out of control to avoid crashes.

4 Motion Command Interface

4.1 Motion Command Interface

The motion command interface consists of one word that contains the command ID, and up to 16 command parameter words. Example: 'VA-Interpolator 16 bit Go To Absolute Position'

Word	Description	Example of command
1.	Command Header with ID	Go To Absolute Position Immediate
2.	1. Command Parameter	Position
3.	2. Command Parameter	Maximal Speed
4.	3. Command Parameter	Acceleration
5.	4. Command Parameter	Deceleration
6.-16.	5. - Command Parameter	Not used

4.1.1 Command Header

Master ID								Sub ID				Command Count			
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

The header of the Motion command is split into three parts:

- Master ID
- Sub ID
- Command Count

4.1.1.1 Master ID

The master ID specifies the command group.

4.1.1.2 Sub ID

The sub ID is used to identify different commands from the same command group.

4.1.1.3 Command Count

A new command will only be executed, if the value of the command count has changed. In the easiest way bit 0 can be toggled.

4.2 Overview Motion Commands

Master ID	Sub ID	Description
00h	0h	No Operation
	1h	Write Interface Control Word
	2h	Write Live Parameter
	3h	Write X4 Intf Outputs with Mask
	8h	Clear Event Evaluation
01h	0h	VAI Go To Pos
	1h	VAI Increment Dem Pos
	2h	VAI Increment Target Pos
	3h	VAI Go To Pos From Act Pos And Act Vel
	4h	VAI Go To Pos From Act Pos Starting With Dem Vel = 0
	5h	VAI Increment Act Pos
	6h	VAI Increment Act Pos Starting with Dem Vel = 0
	7h	VAI Stop
	8h	VAI Go To Pos After Actual Command
	9h	VAI Go To Analog Pos
	Ah	VAI Go To Pos On Rising Trigger Event
	Bh	VAI Increment Target Pos On Rising Trigger Event
	Ch	VAI Go To Pos On Falling Trigger Event
	Dh	VAI Increment Target Pos On Falling Trigger Event
	Eh	VAI Change Motion Parameters On Positive Position Transition
	Fh	VAI Change Motion Parameters On Negative Position Transition
02h	0h	Predef VAI Go To Pos
	1h	Predef VAI Increment Dem Pos
	2h	Predef VAI Increment Target Pos
	3h	Predef VAI Go To Pos From Act Pos And Act Vel
	4h	Predef VAI Go To Pos From Act Pos Starting With Dem Vel = 0
	7h	Predef VAI Stop With Quick Stop Deceleration
	8h	Predef VAI Go To Pos After Actual Command
	Ah	Predef VAI Go To Pos On Rising Trigger Event
	Bh	Predef VAI Increment Target Pos On Rising Trigger Event
	Ch	Predef VAI Go To Pos On Falling Trigger Event
	Dh	Predef VAI Increment Target Pos On Falling Trigger Event
03h	0h	P Stream With Slave Generated Time Stamp
	1h	PV Stream With Slave Generated Time Stamp
	2h	P Stream With Slave Generated Time Stamp and Configured Period Time
	Fh	Stop Streaming
04h	0h	Time Curve With Default Parameters
	1h	Time Curve With Default Parameters From Act Pos
	2h	Time Curve To Pos With Default Speed
	3h	Time Curve To Pos With Adjustable Time
	4h	Time Curve With Adjustable Offset, Time Scale & Amplitude Scale
	5h	Time Curve With Adjustable Offset, Time & Amplitude Scale
	6h	Time Curve With Adjustable Offset, Time & Amplitude Scale On Rising Trigger Event
	7h	Time Curve With Adjustable Offset, Time & Amplitude Scale On Falling Trigger Event
	Ah	Time Curve To Pos With Default Speed On Rising Trigger Event
	Ch	Time Curve To Pos With Default Speed On Falling Trigger Event

	Eh	Time Curve To Pos With Adjustable Time On Rising Trigger Event
	Fh	Time Curve To Pos With Adjustable Time On Falling Trigger Event
06h	9h	Start Encoder CAM On Rise Trigger Event With Delay Counts
	Bh	Start Encoder CAM On Fall Trigger Event With Delay Counts
07h	0h	Start VAI Encoder Position Indexing
	1h	Start Predef VAI Encoder Position Indexing
	Eh	Stop Position Indexing And VAI Go To Pos
	Fh	Stop Position Indexing And Predefined VAI Go To Pos
09h	0h	VAI 16 Bit Go To Pos
	1h	VAI 16 Bit Increment Dem Pos
	2h	VAI 16 Bit Increment Target Pos
	3h	VAI 16 Bit Go To Pos From Act Pos And Act Vel
	4h	VAI 16 Bit Go To Pos From Act Pos Starting With Dem Vel = 0
	5h	VAI 16Bit Increment Act Pos
	6h	VAI Increment Act Pos Starting with Dem Vel = 0
	7h	VAI 16 Bit Stop
	8h	VAI 16 Bit Go To Pos After Actual Command
	Ah	VAI 16 Bit Go To Pos On Rising Trigger Event
	Bh	VAI 16 Bit Increment Target Pos On Rising Trigger Event
	Ch	VAI 16 Bit Go To Pos On Falling Trigger Event
	Dh	VAI 16 Bit Increment Target Pos On Falling Trigger Event
	Eh	VAI 16 Bit Change Motion Parameters On Positive Position Transition
	Fh	VAI 16 Bit Change Motion Parameters On Negative Position Transition
0Ah	0h	Predef VAI 16 Bit Go To Pos
	1h	Predef VAI 16 Bit Increment Dem Pos
	2h	Predef VAI 16 Bit Increment Target Pos
	3h	Predef VAI 16 Bit Go To Pos From Act Pos And Act Vel
	4h	Predef VAI 16 Bit Go To Pos From Act Pos Starting With Dem Vel = 0
	7h	Predef VAI 16 Bit Stop With Quick Stop Deceleration
	8h	Predef VAI 16 Bit Go To Pos After Actual Command
	Ah	Predef VAI 16 Bit Go To Pos On Rising Trigger Event
	Bh	Predef VAI 16 Bit Increment Target Pos On Rising Trigger Event
	Ch	Predef VAI 16 Bit Go To Pos On Falling Trigger Event
	Dh	Predef VAI 16 Bit Increment Target Pos On Falling Trigger Event
0Bh	0h	VAI Predef Acc Go To Pos
	1h	VAI Predef Acc Increment Dem Pos
	2h	VAI Predef Acc Increment Target Pos
	3h	VAI Predef Acc Go To Pos From Act Pos And Act Vel
	4h	VAI Predef Acc Go To Pos From Act Pos Starting With Dem Vel = 0
	8h	VAI Predef Acc Go To Pos After Actual Command
	Ah	VAI Predef Acc Go To Pos On Rising Trigger Event
	Bh	VAI Predef Acc Increment Target Pos On Rising Trigger Event
	Ch	VAI Predef Acc Go To Pos On Falling Trigger Event
	Dh	VAI Predef Acc Increment Target Pos On Falling Trigger Event
0Ch	0h	VAI Dec=Acc Go To Pos
	1h	VAI Dec=Acc Increment Dem Pos
	2h	VAI Dec=Acc Increment Target Pos
	3h	VAI Dec=Acc Go To Pos From Act Pos And Act Vel
	4h	VAI Dec=Acc Go To Pos From Act Pos Starting With Dem Vel = 0
	8h	VAI Dec=Acc Go To Pos After Actual Command
	Ah	VAI Dec=Acc Go To Pos On Rising Trigger Event
	Bh	VAI Dec=Acc Increment Target Pos On Rising Trigger Event

	Ch	VAI Dec=Acc Go To Pos On Falling Trigger Event
	Dh	VAI Dec=Acc Increment Target Pos On Falling Trigger Event
0Dh	0h	VAI Go Relative To Captured Pos
	4h	VAI Go To Cmd Table Var 1 Pos
	5h	VAI Go To Cmd Table Var 2 Pos
10h	0h	Encoder CAM Enable
	1h	Encoder CAM Disable
	2h	Encoder CAM Go To Sync Pos
	4h	Encoder CAM Set Value
11h	0h	Encoder CAM 1 Define Curve With Default Parameters
	1h	Encoder CAM 1 Define Curve From Act Pos
	2h	Encoder CAM 1 Define Curve To Pos
	4h	Encoder CAM 1 Define Curve To Pos In Counts
	5h	Encoder CAM 1 Define Curve with Amplitude Scale In Counts
	6h	Encoder CAM 1 Enable
	7h	Encoder CAM 1 Disable
	8h	Encoder CAM 1 Change Amplitude Scale and Length
12h	0h	Encoder CAM 2 Define Curve With Default Parameters
	1h	Encoder CAM 2 Define Curve From Act Pos
	2h	Encoder CAM 2 Define Curve To Pos
	4h	Encoder CAM 2 Define Curve To Pos In Counts
	5h	Encoder CAM 2 Define Curve with Amplitude Scale In Counts
	6h	Encoder CAM 2 Enable
	7h	Encoder CAM 2 Disable
	8h	Encoder CAM 2 Change Amplitude Scale and Length
20h	0h	Start Command Table Command
	1h	Start Command Table Command On Rising Trigger Event
	2h	Start Command Table Command On Falling Trigger Event
	8h	Modify Command Table 16 bit Parameter in RAM
	9h	Modify Command Table 32 bit Parameter in RAM
21h	0h	Wait Time
	1h	Wait Until Motion Finished
	2h	Wait Until In Target Position
	3h	Wait Until Rising Trigger Edge
	4h	Wait Until Falling Trigger Edge
22h	0h	Wait Until Demand Position Greater Than
	1h	Wait Until Demand Position Less Than
	2h	Wait Until Actual Position Greater Than
	3h	Wait Until Actual Position Less Than
	4h	Wait Until Difference Position Greater Than
	5h	Wait Until Difference Position Less Than
	6h	Wait Until Difference Position Unsigned Greater Than
	7h	Wait Until Difference Position Unsigned Less Than
	8h	Wait Until Demand Velocity Greater Than
	9h	Wait Until Demand Velocity Less Than
	Ah	Wait Until Actual Velocity Greater Than
	Bh	Wait Until Actual Velocity Less Than
	Eh	Wait Until Current Greater Than
	Fh	Wait Until Current Less Than
24h	0h	Set Cmd Table Var 1 To
	1h	Add To Cmd Table Var 1
	2h	Set Cmd Table Var 2 To

	3h	Add To Cmd Table Var 2
25h	0h	IF Cmd Table Var 1 Less Than
	1h	IF Cmd Table Var 1 Greater Than
	2h	IF Cmd Table Var 2 Less Than
	3h	IF Cmd Table Var 2 Greater Than
	8h	IF Demand Position Less Than
	9h	IF Demand Greater Than
	Ah	IF Actual Position Less Than
	Bh	IF Actual Greater Than
	Ch	IF Difference Position Less Than
	Dh	IF Difference Greater Than
	Eh	IF Current Less Than
	Fh	IF Current Greater Than
30h	0h	Encoder Winding Start With Default Parameters
	1h	Encoder Winding Start With Default Parameters At Revolutions
	4h	Encoder Winding Stop Adaptation Of Left, Right Position And Disturbance
	5h	Encoder Winding Restart Adaptation Of Left, Right Position And Disturbance
31h	0h	Encoder Curve Winding Start With Default Parameters
	1h	Encoder Curve Winding Start With Default Parameters At Revolutions
38h	0h	VAI Go To Pos With Force Ctrl Limit
	1h	VAI Go To Pos From Act Pos And Reset Force Control
	2h	Force Ctrl Change Target Force
	3h	VAI Go To Pos With Force Ctrl Limit and Target Force

4.3 Detailed Motion Command Description

4.3.1 No Operation (000xh)

Name	Byte Offset	Description	Type	Unit
Header	0	No Operation (000xh)	UInt16	-

This command doesn't do anything. It can be sent in any operational state.

4.3.2 Write Interface Control Word (001xh)

Name	Byte Offset	Description	Type	Unit
Header	0	001xh : Write Interface Control Word	UInt16	-
1. Par	2	Interface Control Word	UInt16	-

This command allows writing the Control Word through the Motion Command Interface. The fieldbus interfaces (CANOpen, DeviceNet, Profibus, LinRS) offer other ways to access the Control Word directly. Mostly that direct access is more comfortable than the way over the Motion Command Interface.

4.3.3 Write Live Parameter (002xh)

Name	Byte Offset	Description	Type	Unit
Header	0	002xh: Write Live Parameter	UInt16	-
1. Par	2	UPID (Unique Parameter ID)	UInt16	-
2. Par	4	Parameter Value, the Unit depends on Parameter	Div	Div

This command allows writing any live parameter's ram value through the Motion Command Interface. The parameter has to be specified by its UPID (Unique Parameter ID). In order to keep the interface as simple as possible any parameter can be accessed as 32bit integer value. The controller's operating system will filter out the relevant number of bits for parameters with smaller data size (e.g. only the lowest bit is considered for boolean parameters).
The fieldbus interfaces (CANOpen, DeviceNet, Profibus, LinRS) offer other ways to read and write parameter values directly. Mostly that direct access is more comfortable than the way over the Motion Command Interface.

4.3.4 Clear Event Evaluation (008xh)

Name	Byte Offset	Description	Type	Unit
Header	0	008xh: Clear Event Evaluation	UInt16	-

This command resets the Event Handler. The Event Handler becomes active, if a motion command has been sent, that does not immediately start, but waits with its execution until other conditions are fulfilled (e.g. command 'VAI Go To Pos On Rising Trigger Event'). The Bit 8 of the Status Word shows, if the Event Handler is active.
Once the Event Handler became active, it remains active, until it is deactivated by using this clear command. As long the Event Handler is active, the command to be executed on the event situation will be restarted each time, when the event condition is fulfilled.

4.3.5 VAI Go To Pos (010xh)

Name	Byte Offset	Description	Type	Unit
Header	0	010xh: VAI Go To Pos	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

4.3.6 VAI Increment Dem Pos (011xh)

Name	Byte Offset	Description	Type	Unit
Header	0	011xh:VAI Increment Dem Pos	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

This command sets a new Target Position and defines the maximal velocity, acceleration and deceleration for going there. The new Target Position value will be determined by the firmware. It is calculated by adding the Position Increment argument to the Demand Position value. The Demand Position is the actual position setpoint on which the motor is controlled. The Demand Position value moves towards the Target Position value while a motion command is in execution.

4.3.7 VAI Increment Target Pos (012xh)

Name	Byte Offset	Description	Type	Unit
Header	0	012xh: VAI Increment Target Pos	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

This command sets a new Target Position and defines the maximal velocity, acceleration and deceleration for going there. The new Target Position value will be determined by the firmware. It is calculated by adding the Position Increment argument to the (former) Target Position. The Target Position is the motion's end position and doesn't change during the execution of a motion command.

4.3.8 VAI Go To Pos From Act Pos And Act Vel (013xh)

Name	Byte Offset	Description	Type	Unit
Header	0	013xh: VAI Go To Pos From Act Pos And Act Vel	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

This command starts the new VAI-Setpoint generation from the actual position and actual velocity. Could be used after a press command.

4.3.9 VAI Go To Pos From Act Pos Starting With Dem Vel = 0 (014xh)

Name	Byte Offset	Description	Type	Unit
Header	0	014xh: VAI Go To Pos From Act Pos Starting With Dem Vel =0	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

This command starts the new VAI-Setpoint generation from the actual position and the start velocity is forced to zero. Could be used after a press command.

4.3.10 VAI Increment Act Pos (015xh)

Name	Byte Offset	Description	Type	Unit
Header	0	015xh: VAI Increment Act Pos	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

This command sets a new Target Position and defines the maximal velocity, acceleration and deceleration for going there. The new Target Position value will be determined by the firmware. It is calculated by adding the Position Increment argument to the Actual Position. The Actual Position is the effective motor position. This command could be used to perform a retraction move after a press command. If the Position Increment argument is zero, then this command defines the actual motor position as new setpoint.

4.3.11 VAI Increment Act Pos Starting With Dem Vel = 0 (016xh)

Name	Byte Offset	Description	Type	Unit
Header	0	016xh: VAI Increment Act Pos Starting With Dem Vel = 0	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

This command starts the new VAI-Setpoint generation from the actual position and the start velocity is forced to zero. This command defines the maximal velocity, acceleration and deceleration for going to the Target Position. The new Target Position value will be determined by the firmware. It is calculated by adding the Position Increment argument to the Actual Position. The Actual Position is the effective motor position. This command could be used to perform a retraction move after a press command. If the Position Increment argument is zero, then this command defines the actual motor position as new setpoint.

4.3.12 VAI Stop (017xh)

Name	Byte Offset	Description	Type	Unit
Header	0	017xh: VAI Stop	UInt16	-
1. Par	2	Deceleration	UInt32	1E-5 m/s^2

4.3.13 VAI Go To Pos After Actual Command (018xh)

Name	Byte Offset	Description	Type	Unit
Header	0	018xh: VAI Go To Pos After Actual Command	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

This command waits until the actual motion setpoint generation has finished, then starts the new defined VAI motion.

4.3.14 VAI Go To Analog Pos (019xh)

Name	Byte Offset	Description	Type	Unit
Header	0	019xh: VAI Go To Analog Pos	UInt16	-
1. Par	2	Maximal Velocity	UInt32	1E-6 m/s
2. Par	6	Acceleration	UInt32	1E-5 m/s^2
3. Par	10	Deceleration	UInt32	1E-5 m/s^2

4.3.15 VAI Go To Pos On Rising Trigger Event (01Axh)

Name	Byte Offset	Description	Type	Unit
Header	0	01Axh: VAI Go To Pos On Rising Trigger Event	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

4.3.16 VAI Increment Target Pos On Rising Trigger Event (01Bxh)

Name	Byte Offset	Description	Type	Unit
Header	0	01Bxh: VAI Increment Target Pos On Rising Trigger Event	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

4.3.17 VAI Go To Pos On Falling Trigger Event (01Cxh)

Name	Byte Offset	Description	Type	Unit
Header	0	01Cxh: VAI Go To Pos On Falling Trigger Event	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

4.3.18 VAI Increment Target Pos On Falling Trigger Event (01Dxh)

Name	Byte Offset	Description	Type	Unit
Header	0	01Dxh: VAI Increment Target Pos On Falling Trigger Event	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

4.3.19 VAI Change Motion Parameters On Positive Position Transition (01Exh)

Name	Byte Offset	Description	Type	Unit
Header	0	01Exh: VAI Change Motion Parameters On Positive Position Transition	UInt16	-
1. Par	2	Transition Event Position	SInt32	0.1 um
2. Par	6	Max Velocity After Event	UInt32	1E-6 m/s
3. Par	10	Acceleration After Event	UInt32	1E-5 m/s^2
4. Par	14	Deceleration After Event	UInt32	1E-5 m/s^2

This Motion Command moves an event change position, an event maximal speed, an event acceleration and an event deceleration to the event instance, and starts the event evaluation. As soon as the demand position crosses the event change position in the positive direction the VAI is changed with event values, the target position rests unchanged.

4.3.20 VAI Change Motion Parameters On Negative Position Transition (01Fxh)

Name	Byte Offset	Description	Type	Unit
Header	0	01Fxh: VAI Change Motion Parameters On Negative Position Transition	UInt16	-
1. Par	2	Transition Event Position	SInt32	0.1 um
2. Par	6	Max Velocity After Event	UInt32	1E-6 m/s
3. Par	10	Acceleration After Event	UInt32	1E-5 m/s^2
4. Par	14	Deceleration After Event	UInt32	1E-5 m/s^2

This Motion Command moves an event change position, an event maximal speed, an event acceleration and an event deceleration to the event instance, and starts the event evaluation. As soon as the demand position crosses the event change position in the negative direction the VAI is changed with event values, the target position rests unchanged.

4.3.21 Predef VAI Go To Pos (020xh)

Name	Byte Offset	Description	Type	Unit
Header	0	020xh: Predef VAI Go To Pos	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um

4.3.22 Predef VAI Increment Dem Pos (021xh)

Name	Byte Offset	Description	Type	Unit
Header	0	021xh: Predef VAI Increment Dem Pos	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um

4.3.23 Predef VAI Increment Target Pos (022xh)

Name	Byte Offset	Description	Type	Unit
Header	0	022xh: Predef VAI Increment Target Pos	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um

4.3.24 Predef VAI Go To Pos From Act Pos and Act Vel (023xh)

Name	Byte Offset	Description	Type	Unit
Header	0	023xh: Predef VAI Go To Pos From Act Pos And Act Vel	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um

This command starts the new VAI-Setpoint generation from the actual position, can be used after a press command.

4.3.25 Predef VAI Go To Pos From Act Pos Starting With Dem Vel = 0 (024xh)

Name	Byte Offset	Description	Type	Unit
Header	0	024xh: Predef VAI Go To Pos From Act Pos With Dem Vel = 0	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um

This command starts the new VAI-Setpoint generation from the actual position and the start velocity is forced to zero can be used after a press command.

4.3.26 Predef VAI Stop (027xh)

Name	Byte Offset	Description	Type	Unit
Header	0	017xh: Predef VAI Stop With Quick Stop Deceleration	UInt16	-

4.3.27 Predef VAI Go To Pos After Actual Command (028xh)

Name	Byte Offset	Description	Type	Unit
Header	0	028xh: Predef VAI Go To Pos After Actual Command	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um

This command waits until the actual motion setpoint generation has finished, then starts the new defined VAI motion.

4.3.28 Predef VAI Go To Pos On Rising Trigger Event (02Axh)

Name	Byte Offset	Description	Type	Unit
Header	0	02Axh: Predef VAI Go To Pos On Rising Trigger Event	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um

4.3.29 Predef VAI Increment Target Pos On Rising Trigger Event (02Bxh)

Name	Byte Offset	Description	Type	Unit
Header	0	02Bxh: Predef VAI Increment Target Pos On Rising Trigger Event	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um

4.3.30 Predef VAI Go To Pos On Falling Trigger Event (02Cxh)

Name	Byte Offset	Description	Type	Unit
Header	0	02Cxh: Predef VAI Go To Pos On Falling Trigger Event	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um

4.3.31 Predef VAI Increment Target Pos On Falling Trigger Event (02Dxh)

Name	Byte Offset	Description	Type	Unit
Header	0	02Dxh: Predef VAI Increment Target Pos On Falling Trigger Event	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um

4.3.32 P Stream With Slave Generated Time Stamp (030xh)

Name	Byte Offset	Description	Type	Unit
Header	0	030xh: P Stream With Slave Generated Time Stamp	UInt16	-
1. Par	2	Position	SInt32	0.1 um

Position streaming mode. The time stamp is generated by the interface (receive time stamp of T0), the streaming period has to be in the time range 2..5ms. For good results the streaming period has to be as constant as possible.

4.3.33 PV Stream With Slave Generated Time Stamp (031xh)

Name	Byte Offset	Description	Type	Unit
Header	0	031xh: PVA Stream With Slave Generated Time Stamp	UInt16	-
1. Par	2	Position	SInt32	0.1 um
2. Par	6	Velocity	SInt32	1 um/s

Position and Velocity streaming mode: Preferred streaming mode. The time stamp is generated by the interface (receive time stamp of T0), the streaming period has to be in the time range 2..5ms. Less sensitive to deviations of the streaming period.

4.3.34 P Stream With Slave Generated Time Stamp and Configured Period Time (032xh)

Name	Byte Offset	Description	Type	Unit
Header	0	032xh: P Stream With Slave Generated Time Stamp and Configured Period Time	UInt16	-
1. Par	2	Position	SInt32	0.1 um

Position streaming mode. The time stamp is generated by the interface (receive time stamp of T0), the streaming period has to be in the time range 2..5ms. For good results the streaming period has to be as constant as possible. For the derivation of the velocity and the acceleration the configured streaming period time 14E6h$ is taken to minimize communication time jittering.

4.3.35 Stop Streaming (03Fxh)

Name	Byte Offset	Description	Type	Unit
Header	0	03Fxh: Stop Streaming	UInt16	-

This command is used to leave the streaming mode.

4.3.36 Time Curve With Default Parameters (040xh)

Name	Byte Offset	Description	Type	Unit
Header	0	040xh: Time Curve With Default Parameters	UInt16	-
1. Par	2	Curve ID	UInt16	1..100

4.3.37 Time Curve With Default Parameters From Act Pos (041xh)

Name	Byte Offset	Description	Type	Unit
Header	0	41xh: Time Curve With Default Parameters From Act Pos	UInt16	-
1. Par	2	Curve ID	UInt16	1..100

This command sets the curve offset to the actual position set point then starts the specified time curve with the default parameters (curve time scaling and curve amplitude scaling).

4.3.38 Time Curve To Pos With Default Speed (042xh)

Name	Byte Offset	Description	Type	Unit
Header	0	042xh: Time Curve To Pos With Default Speed	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Target Position	SInt32	0.1 um

This command sets the curve offset to the actual demand position and scales the curve the way that the target position is reached at the end (the scaling range is –2000%..2000%, if this range is exceeded an error will be generated) then starts the specified time curve with the default curve speed parameter.

4.3.39 Time Curve To Pos With Adjustable Time (043xh)

Name	Byte Offset	Description	Type	Unit
Header	0	043xh: Time Curve To Pos With Adjustable Time	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Target Position	SInt32	0.1 um
3. Par	8	Curve Time	SInt32	10us

This command sets the curve offset to the demand position and scales the curve the way that the target position is reached at the end (the scaling range is –2000%..2000%, if this range is exceeded an error will be generated). The curve time is taken from the motion command.

4.3.40 Time Curve With Adjustable Offset, Time Scale & Amplitude Scale (044xh)

Name	Byte Offset	Description	Type	Unit
Header	0	044xh: Time Curve With Adjustable Offset, Time Scale & Amplitude Scale	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Curve Offset	SInt32	0.1 um
3. Par	8	Time Scale	UInt16	0.01%
4. Par	10	Amplitude Scale	SInt16	0.1%

With this command all the curve parameters are defined.

4.3.41 Time Curve With Adjustable Offset, Time & Amplitude Scale (045xh)

Name	Byte Offset	Description	Type	Unit
Header	0	045xh: Time Curve With Adjustable Offset, Time & Amplitude Scale	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Curve Offset	SInt32	0.1 um
3. Par	8	Curve Time	SInt32	10us
4. Par	12	Amplitude Scale	SInt16	0.1%

With this command all the curve parameters are defined, unlike command 44xh this command defines the absolute curve time.

4.3.42 Time Curve With Adjustable Offset, Time & Amplitude Scale On Rising Trigger Event (046xh)

Name	Byte Offset	Description	Type	Unit
Header	0	046xh: Time Curve With Adjustable Offset, Time & Amplitude Scale On Rise Trigger Event	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Curve Offset	SInt32	0.1 um
3. Par	8	Curve Time	SInt32	10us
4. Par	12	Amplitude Scale	SInt16	0.1%

On a rise trigger event start command 0x45xh.

4.3.43 Time Curve With Adjustable Offset, Time & Amplitude Scale On Falling Trigger Event (047xh)

Name	Byte Offset	Description	Type	Unit
Header	0	047xh: Time Curve With Adjustable Offset, Time & Amplitude Scale On Falling Trigger Event	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Curve Offset	SInt32	0.1 um
3. Par	8	Curve Time	SInt32	10us
4. Par	12	Amplitude Scale	SInt16	0.1%

On a fall trigger event start command 0x45xh.

4.3.44 Time Curve To Pos With Default Speed On Rising Trigger Event (04Axh)

Name	Byte Offset	Description	Type	Unit
Header	0	04Axh: Time Curve To Pos With Default Speed On Rising Trigger Event	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Target Position	SInt32	0.1 um

On a rise trigger event start command 0x42xh.

4.3.45 Time Curve To Pos With Default Speed On Falling Trigger Event (04Cxh)

Name	Byte Offset	Description	Type	Unit
Header	0	04Cxh: Time Curve To Pos With Default Speed On Falling Trigger Event	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Target Position	SInt32	0.1 um

On a fall trigger event start command 0x42xh.

4.3.46 Time Curve To Pos With Adjustable Time On Rising Trigger Event (04Exh)

Name	Byte Offset	Description	Type	Unit
Header	0	04Exh: Time Curve Go To Absolute Position With Adjustable Time On Rising Trigger Event	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Target Position	SInt32	0.1 um
3 Par	8	Curve Time	SInt32	10us

On a rise trigger event start command 0x43xh.

4.3.47 Time Curve To Pos With Adjustable Time On Falling Trigger Event (04Fxh)

Name	Byte Offset	Description	Type	Unit
Header	0	04Fxh: Time Curve To Pos With Adjustable Time On Falling Trigger Event	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Target Position	SInt32	0.1 um
3 Par	8	Curve Time	SInt32	10us

On a fall trigger event start command 0x43xh.

4.3.48 Start Encoder Cam On Rise Trigger Event With Delay Counts (069xh)

Name	Byte Offset	Description	Type	Unit
Header	0	04Exh: Time Curve Go To Absolute Position With Adjustable Time On Rising Trigger Event	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Curve Start Delay Count	UInt32	1 Incr

Setup in the Event Handler to start a CAM curve on the rise trigger Event with the specified curve ID and the specified delay counts. The specified curve ID is written to the Ram value of UPID 154Ah, and the specified CAM start delay is written to the RAM value of UPID 154Ch. Use the infinite CAM Length (UPID1527h) for triggered CAM motions.

4.3.49 Start Encoder Cam On Fall Trigger Event With Delay Counts (06Bxh)

Name	Byte Offset	Description	Type	Unit
Header	0	04Fxh: Time Curve To Pos With Adjustable Time On Falling Trigger Event	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Curve Start Delay Count	UInt32	1 Incr

Setup in the Event Handler to start a CAM curve on the fall trigger Event with the specified curve ID and the specified delay counts. The specified curve ID is written to the Ram value of UPID 154Bh, and the specified CAM start delay is written to the RAM value of UPID 154Dh. Use the infinite CAM Length (UPID1527h) for triggered CAM motions.

4.3.50 Start VAI Encoder Position Indexing (070xh)

Name	Byte Offset	Description	Type	Unit
Header	0	070xh: Start VAI Encoder Position Indexing	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

Changes to the VAI encoder position indexing mode, the actual encoder count is to the target position. To stop the indexing mode use one of the commands (008xh) , (07Exh) or (07Fxh).

4.3.51 Start Predef VAI Encoder Position Indexing (071xh)

Name	Byte Offset	Description	Type	Unit
Header	0	071xh: Start Predef VAI Encoder Position Indexing	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um

Changes to the VAI encoder position indexing mode, the actual encoder count is to the target position. The VAI parameters Maximal Velocity, Acceleration and Decceleration are ones taken at calling time from the Predefined VAI parameter Set(UPIDs: 14BEh, 14BF and 14C0h). To stop the indexing mode use one of the commands (008xh) , (07Exh) or (07Fxh).

4.3.52 Stop Position Indexing And VAI Go To Pos (07Exh)

Name	Byte Offset	Description	Type	Unit
Header	0	07Exh: Stop Position Indexing And VAI Go To Pos	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

This command stops the position indexing mode and moves to the defined Target position with a VAI command.

4.3.53 Stop Position Indexing And VAI Go To Pos (07Fxh)

Name	Byte Offset	Description	Type	Unit
Header	0	07Vxh: Stop Position Indexing And VAI Go To Pos	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um

This command clears the position indexing mode and moves to the defined Target position with a Predefined VAI command.

VAI 16 Bit Go To Pos (090xh)

Name	Byte Offset	Description	Type	Unit
Header	0	090xh: VAI 16 Bit Go To Pos	UInt16	-
1. Par	2	Target Position	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

This command is similar to the 010xh command, but the parameters are only 16 bit and scaled. The scaling is according the parameter settings under \Motion Control SW\ Motion Interface\ 16 Bit Interface Scaling\.

4.3.54 VAI 16 Bit Increment Dem Pos (091xh)

Name	Byte Offset	Description	Type	Unit
Header	0	091xh: VAI 16 Bit Go To Relative Position	UInt16	-
1. Par	2	Position Increment	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

4.3.55 VAI 16 Bit Increment Target Pos (092xh)

Name	Byte Offset	Description	Type	Unit
Header	0	092xh: VAI 16 Bit Increment Target Pos	UInt16	-
1. Par	2	Position Increment	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

4.3.56 VAI 16 Bit Go To Pos From Act Pos And Act Vel (093xh)

Name	Byte Offset	Description	Type	Unit
Header	0	093xh: VAI 16 Bit Go To Pos From Act Pos And Act Vel	UInt16	-
1. Par	2	Target Position	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

This command starts the new VAI-Setpoint generation from the actual position, could be used after a press command.

4.3.57 VAI 16 Bit Go To Pos From Act Pos Starting With Dem Vel = 0 (094xh)

Name	Byte Offset	Description	Type	Unit
Header	0	094xh: VAI 16 Bit Go To Pos From Act Pos Starting With Dem Vel = 0	UInt16	-
1. Par	2	Target Position	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

This command starts the new VAI-Setpoint generation from the actual position and the start velocity is forced to zero. Could be used after a press command.

4.3.58 VAI 16 Bit Increment Act Pos (095xh)

Name	Byte Offset	Description	Type	Unit
Header	0	095xh: VAI 16 Bit Increment Act Pos	UInt16	-
1. Par	2	Position Increment	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

4.3.59 VAI 16 Bit Increment Act Pos Starting With Dem Vel = 0 (096xh)

Name	Byte Offset	Description	Type	Unit
Header	0	096xh: VAI 16 Bit Increment Act Pos	UInt16	-
1. Par	2	Position Increment	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

4.3.60 VAI 16 Bit Stop (097xh)

Name	Byte Offset	Description	Type	Unit
Header	0	097xh: VAI 16 Bit Stop	UInt16	-
1. Par	2	Deceleration	UInt16	Scaled

4.3.61 VAI 16 Bit Go To Pos After Actual Command (098xh)

Name	Byte Offset	Description	Type	Unit
Header	0	098xh: VAI 16 Bit Go To Pos After Actual Command	UInt16	-
1. Par	2	Target Position	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

This command waits until the actual motion setpoint generation has finished, then starts the new defined VAI motion.

4.3.62 VAI 16 Bit Go To Pos On Rising Trigger Event (09Axh)

Name	Byte Offset	Description	Type	Unit
Header	0	9Axh: VAI 16 Bit Go To Pos On Rising Trigger Event	UInt16	-
1. Par	2	Target Position	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

4.3.63 VAI 16 Bit Increment Target Pos On Rising Trigger Event (09Bxh)

Name	Byte Offset	Description	Type	Unit
Header	0	9Bxh: VAI 16 Bit Increment Target Pos On Rising Trigger Event	UInt16	-
1. Par	2	Position Increment	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

4.3.64 VAI 16 Bit Go To Pos On Falling Trigger Event (09Cxh)

Name	Byte Offset	Description	Type	Unit
Header	0	09Cxh: VAI 16 Bit Go To Pos On Falling Trigger Event	UInt16	-
1. Par	2	Target Position	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

4.3.65 VAI 16 Bit Increment Target Pos On Falling Trigger Event (09Dxh)

Name	Byte Offset	Description	Type	Unit
Header	0	09Dxh: VAI 16 Bit Increment Target Pos On Falling Trigger Event	UInt16	-
1. Par	2	Position Increment	SInt16	Scaled
2. Par	4	Maximal Velocity	UInt16	Scaled
3. Par	6	Acceleration	UInt16	Scaled
4. Par	8	Deceleration	UInt16	Scaled

4.3.66 VAI 16 Bit Change Motion Parameters On Positive Position Transition (09Exh)

Name	Byte Offset	Description	Type	Unit
Header	0	09Exh: VAI 16 Bit Change Motion Parameters On Positive Position Transition	UInt16	-
1. Par	2	Transition Event Position	SInt16	Scaled
2. Par	4	Max Velocity After Event	UInt16	Scaled
3. Par	6	Acceleration After Event	UInt16	Scaled
4. Par	8	Deceleration After Event	UInt16	Scaled

As soon the demand position crosses the event change position in positive direction the parameters for velocity, acceleration and deceleration will be changed to the values defined in the command.

4.3.67 VAI 16 Bit Change Motion Parameters On Negative Position Transition (09Fxh)

Name	Byte Offset	Description	Type	Unit
Header	0	09Exh: VAI Change Motion Parameters on Negative Position Transition	UInt16	-
1. Par	2	Transition Event Position	SInt16	Scaled
2. Par	4	Max Velocity After Event	UInt16	Scaled
3. Par	6	Acceleration After Event	UInt16	Scaled
4. Par	8	Deceleration After Event	UInt16	Scaled

As soon the demand position crosses the event change position in negative direction the parameters for velocity, acceleration and deceleration will be changed to the values defined in the command.

4.3.68 Predef VAI 16 Bit Go To Pos (0A0xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0A0xh: Predef VAI 16 Bit Go To Pos	UInt16	-
1. Par	2	Target Position	SInt16	Scaled

4.3.69 Predef VAI 16 Bit Increment Dem Pos (0A1xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0A1xh: Predef VAI 16 Bit Increment Dem Pos	UInt16	-
1. Par	2	Position Increment	SInt16	Scaled

4.3.70 Predef VAI 16 Bit Increment Target Pos (0A2xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0A2xh: Predef VAI 16 Bit Increment Target Pos	UInt16	-
1. Par	2	Position Increment	SInt16	Scaled

4.3.71 Predef VAI 16 Bit Go To Pos From Act Pos And Act Vel (0A3xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0A3xh: VAI 16 Bit Go To Pos From Act Pos And Act Vel	UInt16	-
1. Par	2	Target Position	SInt16	Scaled

This command starts the new VAI-Setpoint generation from the actual position, could be used after a press command.

4.3.72 Predef VAI 16 Bit Go To Pos From Act Pos Starting With Dem Vel = 0 (0A4xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0A4xh: Predef VAI 16 Bit Go To Pos From Act Pos Starting With Dem Vel = 0	UInt16	-
1. Par	2	Target Position	SInt16	Scaled

This command starts the new VAI-Setpoint generation from the actual position and the start velocity is forced to zero could be used after a press command.

4.3.73 Predef VAI 16 Bit Stop (0A7xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0A7xh: Predef VAI Stop With Quick Stop Deceleration	UInt16	-

4.3.74 Predef VAI 16 Bit Go To Pos After Actual Command (0A8xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0A8xh: Predef VAI 16 Bit Go To Pos After Actual Command	UInt16	-
1. Par	2	Target Position	SInt16	Scaled

This command waits until the actual motion setpoint generation has finished, then starts the new defined VAI motion.

4.3.75 Predef VAI 16 Bit Go To Pos On Rising Trigger Event (0AAxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0AAxh: Predef VAI 16 Bit Go To Pos On Rising Trigger Event	UInt16	-
1. Par	2	Target Position	SInt16	Scaled

4.3.76 Predef VAI 16 Bit Increment Target Pos On Rising Trigger Event (0ABxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0ABxh: Predef VAI 16 Bit Increment Target Pos On Rising Trigger Event	UInt16	-
1. Par	2	Position Increment	SInt16	Scaled

4.3.77 Predef VAI 16 Bit Go To Pos On Falling Trigger Event (0ACxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0ACxh: VAI 16 Bit Go To Pos On Falling Trigger Event	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um

4.3.78 Predef VAI 16 Bit Increment Target Pos On Falling Trigger Event (0ADxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0ADxh: Predef VAI 16 Bit Increment Target Pos On Falling Trigger Event	UInt16	-
1. Par	2	Target Position	SInt16	Scaled

4.3.79 VAI Predef Acc Go To Pos (0B0xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0B0xh: VAI Predef Acc Go To Pos	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s

4.3.80 VAI Predef Acc Increment Dem Pos (0B1xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0B1xh:VAI Predef Acc Increment Dem Pos	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s

4.3.81 VAI Predef Acc Increment Target Pos (0B2xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0B2xh: VAI Predef Acc Increment Target Pos	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s

4.3.82 VAI Predef Acc Go To Pos From Act Pos And Act Vel (0B3xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0B3xh: VAI Predef Acc Go To Pos From Act Pos And Act Vel	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s

This command starts the new VAI-Setpoint generation from the actual position and actual velocity. Could be used after a press command.

4.3.83 VAI Predef Acc Go To Pos From Act Pos Starting With Dem Vel = 0 (0B4xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0B4xh: VAI Predef Acc Go To Pos From Act Pos Starting With Dem Vel =0	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s

This command starts the new VAI-Setpoint generation from the actual position and the start velocity is forced to zero. Could be used after a press command.

4.3.84 VAI Predef Acc Go To Pos After Actual Command (0B8xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0B8xh: VAI Predef Acc Go To Pos After Actual Command	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s

This command waits until the actual motion setpoint generation has finished, then starts the new defined VAI motion.

4.3.85 VAI Predef Acc Go To Pos On Rising Trigger Event (0BAxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0BAxh: VAI Predef Acc Go To Pos On Rising Trigger Event	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s

4.3.86 VAI Predef Acc Increment Target Pos On Rising Trigger Event (0BBxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0BBxh: VAI Predef Acc Increment Target Pos On Rising Trigger Event	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s

4.3.87 VAI Predef Acc Go To Pos On Falling Trigger Event (0BCxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0BCxh: VAI Predef Acc Go To Pos On Falling Trigger Event	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s

4.3.88 VAI Predef Acc Increment Target Pos On Falling Trigger Event (0BDxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0BDxh: VAI Predef Acc Increment Target Pos On Falling Trigger Event	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s

4.3.89 VAI Dec=Acc Go To Pos (0C0xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0C0xh: VAI Dec=Acc Go To Pos	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration = Deceleration	UInt32	1E-5 m/s^2

4.3.90 VAI Dec=Acc Increment Dem Pos (0C1xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0C1xh:VAI Dec=Acc Increment Dem Pos	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration = Deceleration	UInt32	1E-5 m/s^2

4.3.91 VAI Dec=Acc Increment Target Pos (0C2xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0C2xh: VAI Dec=Acc Increment Target Pos	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration = Deceleration	UInt32	1E-5 m/s^2

4.3.92 VAI Dec=Acc Go To Pos From Act Pos And Act Vel (0C3xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0C3xh: VAI Dec=Acc Go To Pos From Act Pos And Act Vel	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration = Deceleration	UInt32	1E-5 m/s^2

This command starts the new VAI-Setpoint generation from the actual position and actual velocity. Could be used after a press command.

4.3.93 VAI Dec=Acc Go To Pos From Act Pos Starting With Dem Vel = 0 (0C4xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0C4xh: VAI Dec=Acc Go To Pos From Act Pos Starting With Dem Vel =0	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration = Deceleration	UInt32	1E-5 m/s^2

This command starts the new VAI-Setpoint generation from the actual position and the start velocity is forced to zero. Could be used after a press command.

4.3.94 VAI Dec=Acc Go To Pos After Actual Command (0C8xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0C8xh: VAI Dec=Acc Go To Pos After Actual Command	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration = Deceleration	UInt32	1E-5 m/s^2

This command waits until the actual motion setpoint generation has finished, then starts the new defined VAI motion.

4.3.95 VAI Dec=Acc Go To Pos On Rising Trigger Event (0CAxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0CAxh: VAI Dec=Acc Go To Pos On Rising Trigger Event	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration = Deceleration	UInt32	1E-5 m/s^2

4.3.96 VAI Dec=Acc Increment Target Pos On Rising Trigger Event (0CBxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0CBxh: VAI Dec=Acc Increment Target Pos On Rising Trigger Event	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration = Deceleration	UInt32	1E-5 m/s^2

4.3.97 VAI Dec=Acc Go To Pos On Falling Trigger Event (0CCxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0CCxh: VAI Dec=Acc Go To Pos On Falling Trigger Event	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration = Deceleration	UInt32	1E-5 m/s^2

4.3.98 VAI Dec=Acc Increment Target Pos On Falling Trigger Event (0CDxh)

Name	Byte Offset	Description	Type	Unit
Header	0	0CDxh: VAI Dec=Acc Increment Target Pos On Falling Trigger Event	UInt16	-
1. Par	2	Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration = Deceleration	UInt32	1E-5 m/s^2

4.3.99 VAI Increment Captured Pos (0D0xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0D0xh: VAI Increment Captured Pos	UInt16	-
1. Par	2	Captured Position Increment	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

Go to the target position (Captured Pos + Captured Increment Position).

4.3.100 VAI Go To Cmd Tab Var1 Pos (0D4xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0D4xh: VAI Go To Cmd Tab Var1 Pos	UInt16	-
1. Par	2	Maximal Velocity	UInt32	1E-6 m/s
2. Par	6	Acceleration	UInt32	1E-5 m/s^2
3. Par	10	Deceleration	UInt32	1E-5 m/s^2

Go to the target position defined with the Command Table Variable 1 (UPID 0x1E72h).

4.3.101 VAI Go To Cmd Tab Var2 Pos (0D5xh)

Name	Byte Offset	Description	Type	Unit
Header	0	0D5xh: VAI Go To Cmd Tab Var2 Pos	UInt16	-
1. Par	2	Maximal Velocity	UInt32	1E-6 m/s
2. Par	6	Acceleration	UInt32	1E-5 m/s^2
3. Par	10	Deceleration	UInt32	1E-5 m/s^2

Go to the target position defined with the Command Table Variable 2 (UPID 0x1E73h).

4.3.102 Encoder CAM Enable (100xh)

Name	Byte Offset	Description	Type	Unit
Header	0	100xh: Encoder CAM Enable	UInt16	-

4.3.103 Encoder CAM Disable (101xh)

Name	Byte Offset	Description	Type	Unit
Header	0	101xh: Encoder CAM Disable	UInt16	-

4.3.104 Encoder CAM Go To Sync Pos (102xh)

Name	Byte Offset	Description	Type	Unit
Header	0	102xh: Encoder CAM Go To Sync Pos	UInt16	-

4.3.105 Encoder CAM Set Value (104xh)

Name	Byte Offset	Description	Type	Unit
Header	0	104xh: Encoder CAM Set Value	UInt16	-
1. Par	2	Counter Value	SInt32	1 Incr

4.3.106 Encoder CAM y Define Curve With Default Parameters(1y0xh)

At the moment two CAM can be defined. In the following y=1 stands for CAM 1 and y=2 stands for CAM 2.

Name	Byte Offset	Description	Type	Unit
Header	0	1y0xh: Encoder CAM y Define Curve With Default Parameters (y=1..2)	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Curve Start Count	SInt32	1 Incr

4.3.107 Encoder CAM y Define Curve From Act Pos (1y1xh)

Name	Byte Offset	Description	Type	Unit
Header	0	1y1xh: Encoder CAM y Define Curve From Act Pos (y=1..2)	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Curve Start Count	SInt32	1 Incr

If the encoder value is in the range of CAM y, the motor has to be at the start position of the CAM y during command setup, to set the position start point correctly of CAM y.

4.3.108 Encoder CAM y Define Curve To Pos (1y2xh)

Name	Byte Offset	Description	Type	Unit
Header	0	1y2xh: Encoder CAM y Define Curve To Pos (y=1..2)	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Curve Start Count	SInt32	1 Incr

3. Par	8	Target Position	SInt32	0.1 um

If the encoder value is in the range of CAM y, the motor has to be at the start position of the CAM y during command setup, to set the position start point correctly of CAM y.

4.3.109 Encoder CAM y Define Curve To Pos In Counts (1y4xh)

Name	Byte Offset	Description	Type	Unit
Header	0	1y4xh: Encoder CAM y Define Curve To Pos (y=1..2)	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Curve Start Count	SInt32	1 Incr
3. Par	8	Target Position	SInt32	0.1 um
4. Par	12	CAM Length In Counts	SInt32	1 Incr

If the encoder value is in the range of CAM y, the motor has to be at the start position of the CAM y during command setup, to set the position start point correctly of CAM y.

4.3.110 Encoder CAM y Define Curve With Amplitude Scale In Counts (1y5xh)

Name	Byte Offset	Description	Type	Unit
Header	0	1y5xh: Encoder CAM y Define Curve To Pos (y=1..2)	Uint16	-
1. Par	2	Curve ID	Uint16	1..100
2. Par	4	Curve Start Count	Sint32	1 Incr
3. Par	8	Amplitude Scale	Sint16	0.1%
4. Par	10	CAM Length In Counts	Sint32	1 Incr

The values for the amplitude scale and CAM length are updated immediate, for this reason only outside CAM 1 (old and new) definition. For changing amplitude scale and/or length during CAM y active use command 1y8xh instead.

4.3.111 Encoder CAM y Enable (1y6xh)

Name	Byte Offset	Description	Type	Unit
Header	0	1y6xh Encoder CAM y Enable; (y=1..2)	Uint16	-

4.3.112 Encoder CAM y Disable (1y7xh)

Name	Byte Offset	Description	Type	Unit
Header	0	1y7xh Encoder CAM y Disable; (y=1..2)	Uint16	-

4.3.113 Encoder CAM y Change Amplitude Scale and Length (1y8xh)

Name	Byte Offset	Description	Type	Unit
Header	0	1y8xh: Encoder CAM y Define Curve To Pos (y=1..2)	Uint16	-
1. Par	2	Amplitude Scale	Sint16	0.1%
2. Par	4	CAM Length In Counts	Sint32	1 Incr

The new values for the amplitude scale and CAM length are updated at next CAM y start event.

4.3.114 Encoder Winding Start With Default Parameters (300xh)

Name	Byte Offset	Description	Type	Unit
Header	0	300xh: Encoder Winding Start With Default Parameters	Uint16	-

4.3.115 Encoder Winding Start With Default Parameters At Revolutions (301xh)

Name	Byte Offset	Description	Type	Unit
Header	0	301xh: Encoder Winding Start With Default Parameters At Revolutions	UInt16	-
1. Par	2	Revolution Counts To Start	SInt32	1 Rev

4.3.116 Start Command Table Command (200xh)

Name	Byte Offset	Description	Type	Unit
Header	0	200xh: Start Command Table Command	UInt16	-
1. Par	2	Command Table ID	UInt16	1..255

4.3.117 Start Command Table Command On Rising Trigger Event (201xh)

Name	Byte Offset	Description	Type	Unit
Header	0	201xh: Start Command Table Command On Rising Trigger Event	UInt16	-
1. Par	2	Command Table ID	UInt16	1..255

4.3.118 Start Command Table Command On Falling Trigger Event (202xh)

Name	Byte Offset	Description	Type	Unit
Header	0	202xh: Start Command Table Command On Falling Trigger Event	UInt16	-
1. Par	2	Command Table ID	UInt16	1..255

4.3.119 Modify Command Table 16 bit Parameter in RAM (208xh)

Name	Byte Offset	Description	Type	Unit
Header	0	208xh: Modify Command Table 16 bit Parameter in RAM	UInt16	-
1. Par	2	Command Table ID	UInt16	1..255
2. Par	4	Parameter Offset	Uint16	0..3Eh
3. Par	6	Parameter Value	Sint16	-

Modify a single 16 bit parameter of the specified Command Table Entry with the specified offset to specified value. The link ID has offset = 2 the motion Command Header has offset = 4 and the first motion command parameter has offset = 6.

4.3.120 Modify Command Table 32 bit Parameter in RAM (209xh)

Name	Byte Offset	Description	Type	Unit
Header	0	209xh: Modify Command Table 32 bit Parameter in RAM	UInt16	-
1. Par	2	Command Table ID	UInt16	1..255
2. Par	4	Parameter Offset	Uint16	0..3Eh
3. Par	6	Parameter Value	Sint16	-

Modify a single 32 bit parameter of the specified Command Table Entry with the specified offset to specified value. The link ID has offset = 2 the motion Command Header has offset = 4 and the first motion command parameter has offset = 6.

4.3.121 Wait Time (210xh)

Name	Byte Offset	Description	Type	Unit
Header	0	210xh: Wait Time	UInt16	-
1. Par	2	Time	UInt32	100us

Could be used in a linked command table sequence.

4.3.122 Wait Until Motion Finished (211xh)

Name	Byte Offset	Description	Type	Unit
Header	0	211xh: Wait Until Motion Finished	UInt16	-

Could be used in a linked command table sequence.

4.3.123 Wait Until In Target Position (212xh)

Name	Byte Offset	Description	Type	Unit
Header	0	212xh: Wait Until Motion Finished	UInt16	-

Could be used in a linked command table sequence.

4.3.124 Wait Until Rising Trigger Event (213xh)

Name	Byte Offset	Description	Type	Unit
Header	0	213xh: Wait Until Rising Trigger	UInt16	-

Could be used in a linked command table sequence.

4.3.125 Wait Until Falling Trigger Event (214xh)

Name	Byte Offset	Description	Type	Unit
Header	0	214xh: Wait Until Falling Trigger	UInt16	-

Could be used in a linked command table sequence.

4.3.126 Wait Until Demand Position Greater Than (220xh)

Name	Byte Offset	Description	Type	Unit
Header	0	220xh: Wait Until Demand Position Greater Than	UInt16	-
1. Par	2	Dem Pos Trig Level	SInt32	0.1 um

Could be used in a linked command table sequence.

4.3.127 Wait Until Demand Position Less Than (221xh)

Name	Byte Offset	Description	Type	Unit
Header	0	221xh: Wait Until Demand Position Less Than	UInt16	-
1. Par	2	Dem Pos Trig Level	SInt32	0.1 um

Could be used in a linked command table sequence.

4.3.128 Wait Until Actual Position Greater Than (222xh)

Name	Byte Offset	Description	Type	Unit
Header	0	222xh: Wait Until Actual Position Greater Than	UInt16	-
1. Par	2	Act Pos Trig Level	SInt32	0.1 um

Could be used in a linked command table sequence.

4.3.129 Wait Until Actual Position Less Than (223xh)

Name	Byte Offset	Description	Type	Unit
Header	0	223xh: Wait Until Actual Position Less Than	UInt16	-
1. Par	2	Act Pos Trig Level	SInt32	0.1 um

Could be used in a linked command table sequence.

4.3.130 Wait Until Difference Position Greater Than (224xh)

Name	Byte Offset	Description	Type	Unit
Header	0	224xh: Wait Until Difference Position Greater Than	UInt16	-
1. Par	2	Diff Pos Trig Level	SInt32	0.1 um

Could be used in a linked command table sequence.

4.3.131 Wait Until Difference Position Less Than (225xh)

Name	Byte Offset	Description	Type	Unit
Header	0	225xh: Wait Until Difference Position Less Than	UInt16	-
1. Par	2	Diff Pos Trig Level	SInt32	0.1 um

Could be used in a linked command table sequence.

4.3.132 Wait Until Difference Position Unsigned Greater Than (226xh)

Name	Byte Offset	Description	Type	Unit
Header	0	226xh: Wait Until Difference Position Unsigned Greater Than	UInt16	-
1. Par	2	Diff Pos Trig Level	SInt32	0.1 um

Could be used in a linked command table sequence.

4.3.133 Wait Until Difference Position Unsigned Less Than (227xh)

Name	Byte Offset	Description	Type	Unit
Header	0	227xh: Wait Until Difference Position Unsigned Less Than	UInt16	-
1. Par	2	Diff Pos Trig Level	SInt32	0.1 um

Could be used in a linked command table sequence.

4.3.134 Wait Until Demand Velocity Greater Than (228xh)

Name	Byte Offset	Description	Type	Unit
Header	0	228xh: Wait Until Demand Velocity Greater Than	UInt16	-
1. Par	2	Dem Vel Trig Level	SInt32	1E-6 m/s

Could be used in a linked command table sequence.

4.3.135 Wait Until Demand Velocity Less Than (229xh)

Name	Byte Offset	Description	Type	Unit
Header	0	229xh: Wait Until Demand Velocity Less Than	UInt16	-
1. Par	2	Dem Vel Trig Level	SInt32	1E-6 m/s

Could be used in a linked command table sequence.

4.3.136 Wait Until Actual Velocity Greater Than (22Axh)

Name	Byte Offset	Description	Type	Unit
Header	0	22Axh: Wait Until Actual Velocity Greater Than	UInt16	-
1. Par	2	Act Vel Trig Level	SInt32	1E-6 m/s

Could be used in linked command table sequence.

4.3.137 Wait Until Actual Velocity Less Than (22Bxh)

Name	Byte Offset	Description	Type	Unit
Header	0	22Bxh: Wait Until Actual Velocity Less Than	UInt16	-
1. Par	2	Act Vel Trig Level	SInt32	1E-6 m/s

Could be used in a linked command table sequence.

4.3.138 Wait Until Current Greater Than (22Exh)

Name	Byte Offset	Description	Type	Unit
Header	0	22Exh: Wait Until Current Greater Than	UInt16	-
1. Par	2	Dem Curr Vel Trig Level	Sint16	1mA

Could be used in linked command table sequence.

4.3.139 Wait Until Current Less Than (22Fxh)

Name	Byte Offset	Description	Type	Unit
Header	0	22Fxh: Wait Until Current Less Than	UInt16	-
1. Par	2	Dem Curr Trig Level	Sint16	1mA

Could be used in a linked command table sequence.

4.3.140 Set Cmd Table Var 1 To (240xh)

Name	Byte Offset	Description	Type	Unit
Header	0	240xh: Set Cmd Table Var 1 To	UInt16	-
1. Par	2	Set value	Sint32	-

4.3.141 Add To Cmd Table Var 1 (241xh)

Name	Byte Offset	Description	Type	Unit
Header	0	241xh: Add To Cmd Table Var 1	UInt16	-
1. Par	2	Add value	Sint32	-

4.3.142 Set Cmd Table Var 2 To (242xh)

Name	Byte Offset	Description	Type	Unit
Header	0	242xh: Set Cmd Table Var 2 To	UInt16	-
1. Par	2	Set value	Sint32	-

4.3.143 Add To Cmd Table Var 2 (243xh)

Name	Byte Offset	Description	Type	Unit
Header	0	243xh: Add To Cmd Table Var 2	UInt16	-
1. Par	2	Add value	Sint32	-

4.3.144 IF Cmd Table Var 1 Less Than (250xh)

Name	Byte Offset	Description	Type	Unit
Header	0	250xh: IF Cmd Table Var 1 Less Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.145 IF Cmd Table Var 1 Greater Than (251xh)

Name	Byte Offset	Description	Type	Unit
Header	0	251xh: IF Cmd Table Var 1 Greater Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.146 IF Cmd Table Var 1 Less Than (252xh)

Name	Byte Offset	Description	Type	Unit
Header	0	252xh: IF Cmd Table Var 1 Less Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.147 IF Cmd Table Var 1 Greater Than (253xh)

Name	Byte Offset	Description	Type	Unit
Header	0	253xh: IF Cmd Table Var 1 Greater Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.148 IF Demand Position Less Than (258xh)

Name	Byte Offset	Description	Type	Unit
Header	0	258xh: IF Demand Position Less Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.149 IF Demand Position Greater Than (259xh)

Name	Byte Offset	Description	Type	Unit
Header	0	259xh: IF Demand Position Greater Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.150 IF Actual Position Less Than (25Axh)

Name	Byte Offset	Description	Type	Unit
Header	0	25Axh: IF Actual Position Less Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.151 IF Actual Position Greater Than (25Bxh)

Name	Byte Offset	Description	Type	Unit
Header	0	25Bxh: IF Actual Position Greater Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.152 IF Difference Position Less Than (25Cxh)

Name	Byte Offset	Description	Type	Unit
Header	0	25Cxh: IF Difference Position Less Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.153 IF Difference Position Greater Than (25Dxh)

Name	Byte Offset	Description	Type	Unit
Header	0	25Dxh: IF Difference Position Greater Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.154 IF Current Less Than (25Exh)

Name	Byte Offset	Description	Type	Unit
Header	0	25Cxh: IF Current Less Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.155 IF Current Greater Than (25Fxh)

Name	Byte Offset	Description	Type	Unit
Header	0	25Fxh: IF Current Greater Than	UInt16	-
1. Par	2	Condition Value	Sint32	-
2. Par	6	Command Table ID IF TRUE	Uint16	1..255
3. Par	8	Command Table ID IF FALSE	Uint16	1..255

4.3.156 Encoder Winding Stop Adaptation Of Left/Right Position and Disturbance (304xh)

Name	Byte Offset	Description	Type	Unit
Header	0	304xh: Encoder Winding Stop Adaptation Of Left/Right Position And Disturbance.	UInt16	-

4.3.157 Encoder Winding Restart Adaptation Of Left/Right Position and Disturbance (305xh)

Name	Byte Offset	Description	Type	Unit
Header	0	305xh: Encoder Winding Restart Adaptation Of Left/Right Position And Disturbance	UInt16	-

4.3.158 Encoder Curve Winding Start With Default Parameters (310xh)

Name	Byte Offset	Description	Type	Unit
Header	0	310xh: Encoder Curve Winding Start With Default Parameters	UInt16	-
1. Par	2	Curve ID	UInt16	1..100

4.3.159 Encoder Curve Winding Start With Default Parameters At Revolutions (311xh)

Name	Byte Offset	Description	Type	Unit
Header	0	311xh: Encoder Curve Winding Start With Default Parameters At Revolutions	UInt16	-
1. Par	2	Curve ID	UInt16	1..100
2. Par	4	Revolution Counts To Start	SInt32	1 Rev

4.3.160 VAI Go To Pos With Force Ctrl Limit (380xh)

Name	Byte Offset	Description	Type	Unit
Header	0	380xh: VAI Go To Pos With Force Ctrl Limit	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Force Limit	Uint16	0.1 N

Moves to the defined target position, if the measured force reaches the defined value the controller switches to the force control mode with Target Force = Force Limit.
To change back to position control mode use motion command VAI Go To Pos From Act Pos And Reset Force Control (381xh)!

4.3.161 VAI Go To Pos From Act Pos And Reset Force Control (381xh)

Name	Byte Offset	Description	Type	Unit
Header	0	381xh: VAI Go To Pos From Act Pos And Reset Force Control	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Deceleration	UInt32	1E-5 m/s^2

Reinstalls the position control mode and moves to the defined target position.

4.3.162 Force Ctrl Change Target Force (382xh)

Name	Byte Offset	Description	Type	Unit
Header	0	382xh: Force Ctrl Change Target Force	UInt16	-
1. Par	2	Target Force	Uint16	0.1 N

This command could be used to change the Target Force during the force control mode.

4.3.163 VAI Go To Pos With Force Ctrl Limit and target Force (383xh)

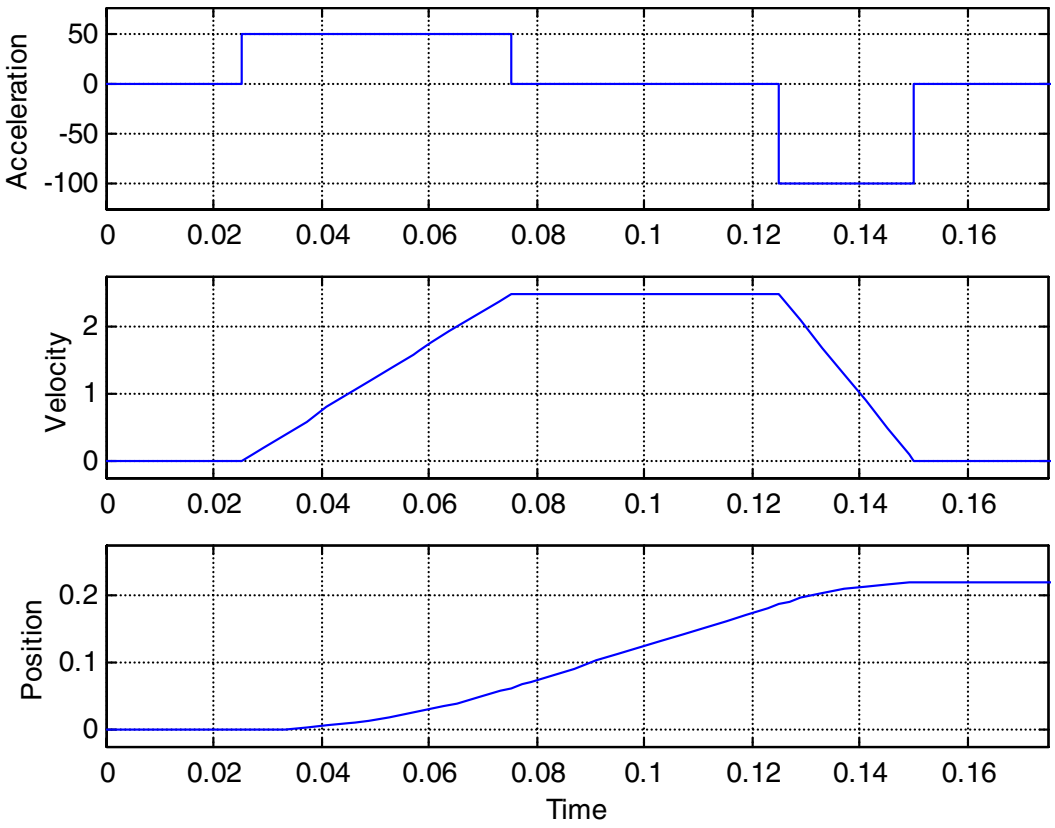
Name	Byte Offset	Description	Type	Unit
Header	0	383xh: VAI Go To Pos With Force Ctrl Limit and Target Force	UInt16	-
1. Par	2	Target Position	SInt32	0.1 um
2. Par	6	Maximal Velocity	UInt32	1E-6 m/s
3. Par	10	Acceleration	UInt32	1E-5 m/s^2
4. Par	14	Force Limit	Uint16	0.1 N
5. Par	16	Target Force	Uint16	0.1 N

Moves to the defined target position, if the measured force reaches Force Limit the controller switches to the force control mode with Target Force = Target Force.
To change back to position control mode use motion command VAI Go To Pos From Act Pos And Reset Force Control (381xh)!

5 Setpoint Generation

5.1 VA-Interpolator

The VA-Interpolator generates a position curve from one position to an other due to the parameter values of acceleration deceleration and a maximal speed. A new target position could be set even if the old target position was not reached.



5.1.1.1 Parameters and Output

The VA-Interpolator is defined by following parameters:

- Target Position [SInt32; 0.1um/s]
- Maximal Speed [UInt32; 1E-6 m/s]
- Acceleration [UInt32; 1E-5 m/s^2]
- Deceleration [UInt32; 1E-5 m/s^2]

As Output the VA-Interpolator generates:

- Position [SInt32; 0.1um]
- Velocity [SInt32; 1E-6 m/s]
- Acceleration [SInt32; 1E-5 m/s^2]

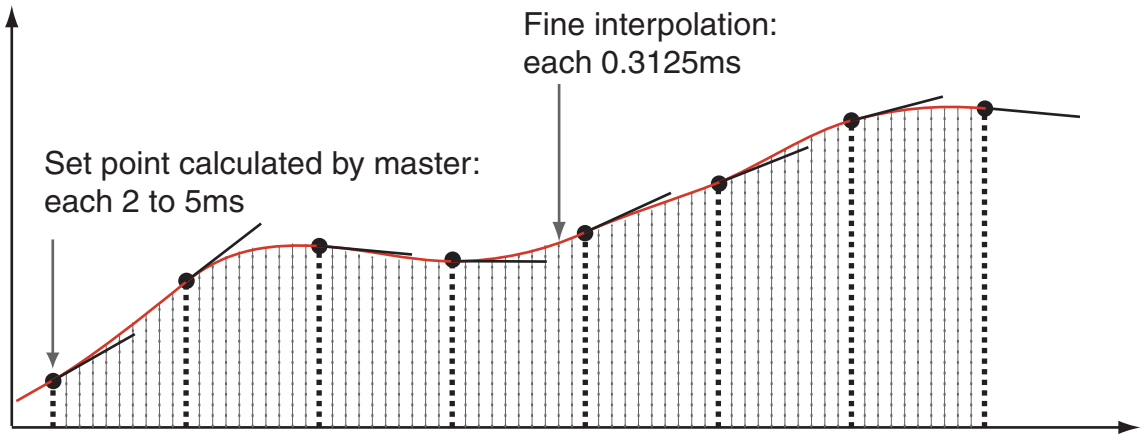
5.2 P(V)-Stream

For masters with NC (Numerical Control) capabilities, the software supports cyclic streaming modes of the position and velocity or position only. The streaming has to be strictly cyclic in the period range 2ms..5ms. The feature is supported with all fieldbus variants like Profibus DP, CAN Open, ..

Different modes are supported: in the first mode (Motion command: 030xh) the master only streams the position. In the second mode (Motion command: 031xh) the master streams position and velocity, whenever possible use the PV-streaming mode, because the acceleration derivation is less sensitive to bus jitters than in the Position only stream mode.

The third mode (Motion command: 032xh) is like the first mode, but for the derivation of the velocity and the acceleration a configured period time (UPID 14E6h) is taken, instead the slave receive time stamp, with this the bad influence of transmission jitter is minimized.

The position setpoint generation in these modes is delayed 1.5 times the streaming cycle time, eg. with 2ms streaming period time the delay is 3ms.



5.3 CAM Motions

For high speed synchronization different modes of CAM motions are supported. The motions are defined with CAM curves which could be defined with Curve Tool inside the LinMot-Talk1100 SW.

5.3.1 Triggered CAM Motions

For triggered CAM motions setup the Master Encoder and then set CAM Mode (UPID1527h) to Infinite Length. Then use the Motion Commands 069xh or 06bxh to setup the CAM curves which should be started at the trigger event, or use the Triggered CAM curve Run Mode.

5.3.2 Repeated CAM Motions with the Modulo CAM Mode

For repeated CAM motions setup the Master Encoder and then set CAM Mode (UPID1527h) to Modulo CAM Length. The CAM length could be defined independently to the Master Encoder Length! So with a 8’000 counts ABZ Master Encoder also 16’000 counts or 4’000 counts CAM length are possible.

With the following sequence a startup or resynchronization to a standing Master encoder is possible:

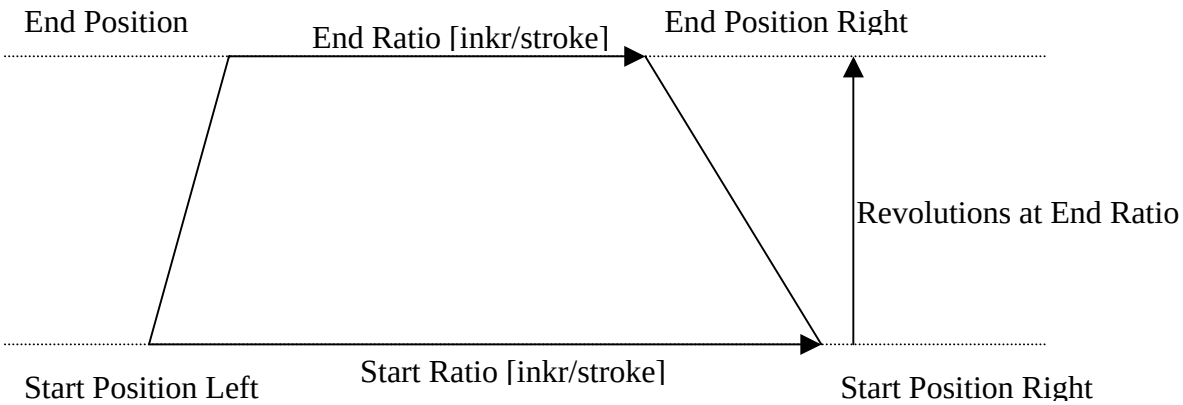
- Move to start position of CAM 1 motion e.g. VAI GoTo Pos (010xh)
- Define CAM 1 motion e.g. Encoder CAM 1 Define Curve To Pos (112xh)
- Move to start position of CAM 2 motion e.g. VAI GoTo Pos (010xh)
- Define CAM 2 motion e.g. Encoder CAM 2 Define Curve To Pos (112xh)
- Go to synchronized CAM position with (102xh)
- After synchronized CAM position is reached enable CAM motion with (100xh)
- Start turning encoder

With the following sequence a (re)synchronization to a moving Master encoder is possible:

- Disable CAM Start enable (UPID 1528h) and wait until CAM enabled vanishes, or clear also CAM enabled (1BA9h)
- Move to start position of CAM 1 motion e.g. VAI GoTo Pos (010xh)
- Define CAM 1 motion e.g. Encoder CAM 1 Define Curve To Pos (112xh)
- Define CAM 2 motion e.g. Encoder CAM 2 Define Curve To Pos (112xh)
- After synchronized CAM position is reached enable CAM motion with (100xh)
- Enable CAM Start enable (UPID 1528h)

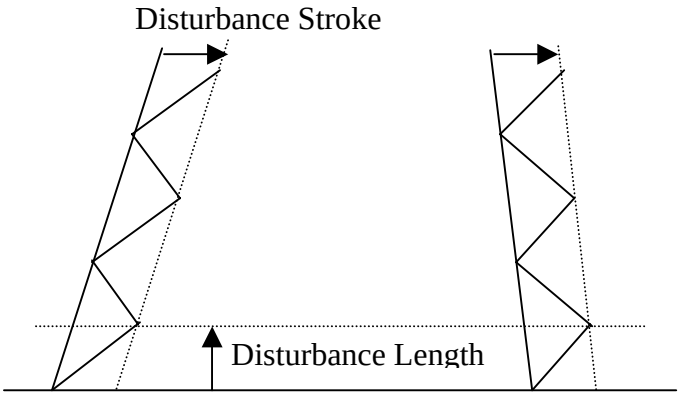
5.4 Winding

Winding applications are supported with a specific position setpoint functionality. Several parameters defines the behavior of the setpoint generation and the shape of the resulting bobbin. The encoder has to be set to AB Modulo mode (ABZ mode planned, but not implemented yet).

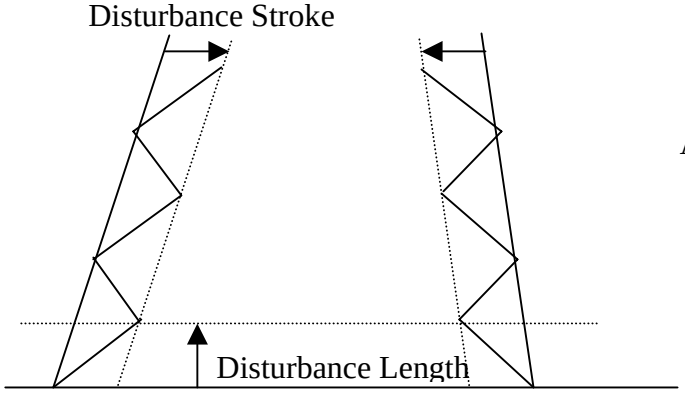


5.4.1 Winding disturbance

To avoid 'dog bones' bobbins and additional disturbance could be added. This disturbance is added to the left and the right end position of the stroke.



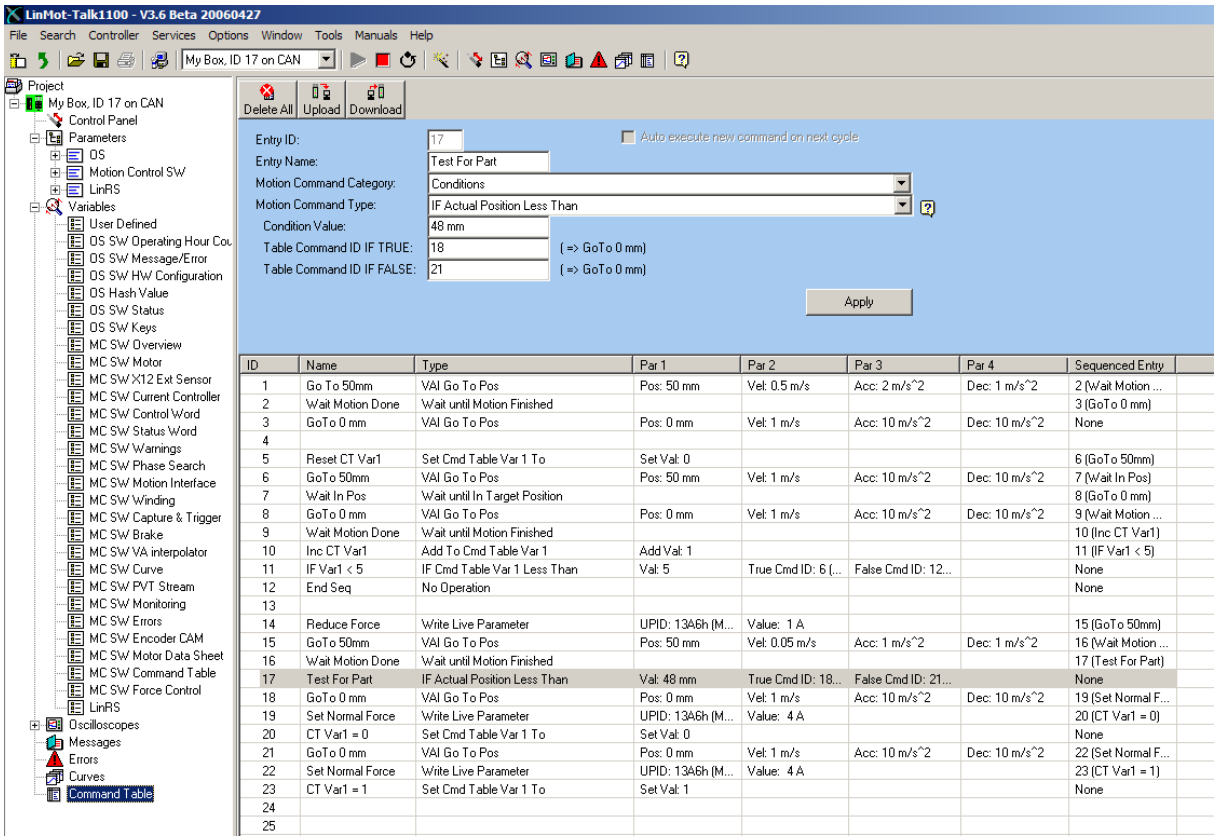
Parallel Disturbance



Antiparallel Disturbace

6 Command Table

The Command Table functionality could be used for programming sequences directly in the controller. The following examples illustrate the possibilities of the command table functionality. These Command Table could be loaded from the Defaults 'CT_Example.lmc'.



The first sequence ID1, ID2 and ID3 shows a simple sequence GoTo 50mm wait until motion is completed and then go back to 50mm.

The second sequence ID5..12 repeats 5 times the Sequence GoTo 50mm GoTo 0mm

1. ID 5: Set Command Table To Var 1= 0
2. ID 6: GoTo 50mm
3. ID 7: Wait Until In Target Position
4. ID 8: GoTo 0mm
5. ID 9: Wait until Motion Done
6. ID 10: Increment Command Table Var 1
7. ID 11: If Command Table To Var 1< 5 Then GoTo ID 5 Else GoTo ID 12
8. ID 12: No Operetaion End of Sequence

The third sequence ID14..23 changes the maximal Current of Position Controller Set A (UPID 13A6) Goes to 50mm wait until motion completed test if part present (Act Pos < 48) go back to 0mm, Set Normal Force (Current) and set CT Var 1 = 0 if part was present else set CT Var1 = 1.

7 Controller Configuration

7.1 Power Bridge

The E1100 servo controllers are split in two different power classes. The normal controllers have a maximal current of 4A. The high power variant has a maximal current of 15A.

7.2 X4 I/O Definitions

The functionality of most IO's could be programmed as a Control Word input bit or Status Word output bit, or they can be used as interface IO and be read out or written over a serial bus interface. Apart from this general functionality a few IO's have special functionality.

Descriptor	General Purpose IO	Special Functions
X4.3	Yes	Brake (Output)
X4.4	Yes	Analog In
X4.5	Yes	Capture Input
X4.6	Yes	Trigger (Input)
X4.7	Yes	Home Switch (Input)
X4.8	Yes	Limit IN (Input)
X4.9	Yes	Limit OUT (Input) / 24V Step (Input)
X4.10	Yes	PTC 1 (Input) / 24V Direction (Input)
X4.11	Yes	PTC 2 (Input)
X4.12	No	SVE Safety Voltage Enable (Input)

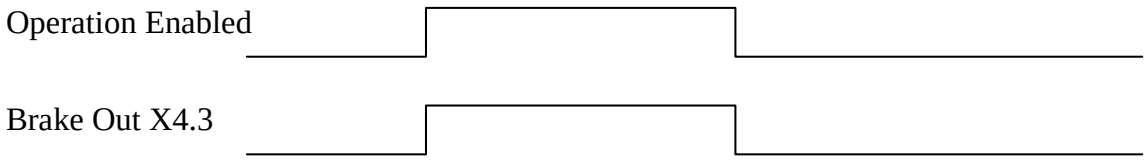
7.2.1 X4.3 Brake

The X4.3 Output can drive up to 1A, so it can be used to control directly a valve of a pneumatic brake module, for this reason this output can be configured as brake output. The cases in which the brake has to be applied or released can be configured over the brake mode parameters. The brake output is controlled from the state machine.

Parameter Name	UPID	Description
Status Word: Operation Enabled	1717h	The brake is released (X4.3 = 24V), when bit 0 of the status word (Operation Enabled) is set. Otherwise the brake is applied.
Ctrl Word: /Abort	1718h	The brake is applied (X4.3 = 0V) when entering the Aborting State (12) and released (X4.3 = 24V) when going to Operation Enabled State (8) again.
Quick Stop	1716h	Special brake behavior with Quick Stop (Brake Mode Status Word: Operation Enabled has also to be set)

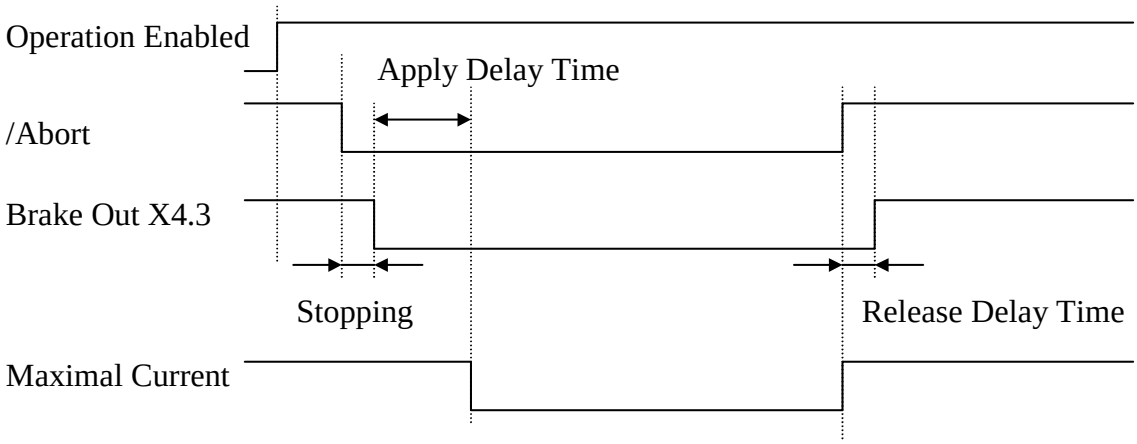
7.2.1.1 X4.3 Brake Operation Enabled Behavior

The following figure shows the behavior with only the Status Word: Operation Enabled is selected. If only this switch with UPID 1717h is activated, no apply or release delay time is regarded.



7.2.1.2 X4.3 Brake Operation /Abort Behavior

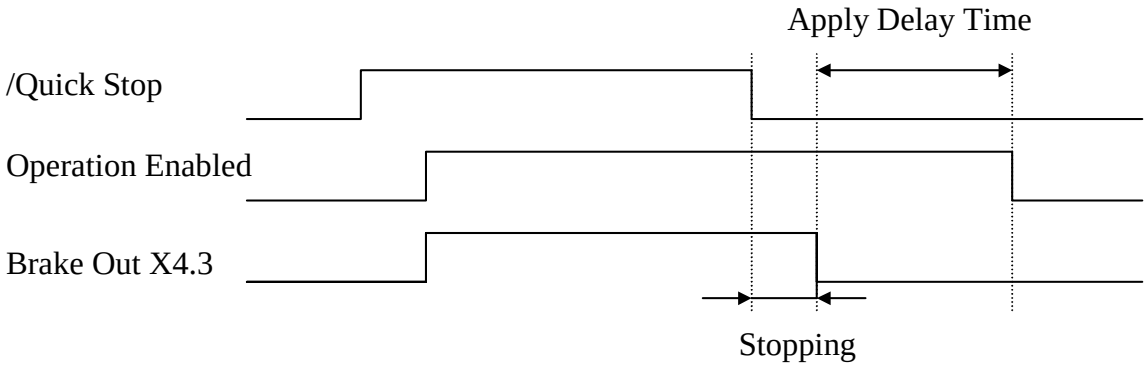
When set the brake mode to Control Word /Abort, the brake is applied in state Aborting (12) and the maximal current of the motor is set to 0A. If using this behavior ensure that the maximal current (UPID 13A6h and 13BAh) is not set over a serial bus during the state Aborting (12)!



Parameter Name	UPID	Description
Apply Delay Time	171Bh	Delay time after brake output goes to 0V until the maximal current of the motor is set to 0A (UPID 13A6h and 13BAh).
Release Delay Time	171Ch	Delay time of the Status Word bit: Operation Enabled after the motion has stopped.

7.2.1.3 X4.3 Brake Operation Quick Stop Behavior

If also the Quick Stop brake behavior is selected the brake is applied (X4.3 = 0V) as soon as the motion has stopped, then the reset of the Operation Enabled bit is delayed by the apply delay time, which then also powers off the motor.



Parameter Name	UPID	Description
Apply Delay Time	171Bh	Delay time of the Status Word bit: Operation Enabled after the motion has stopped.

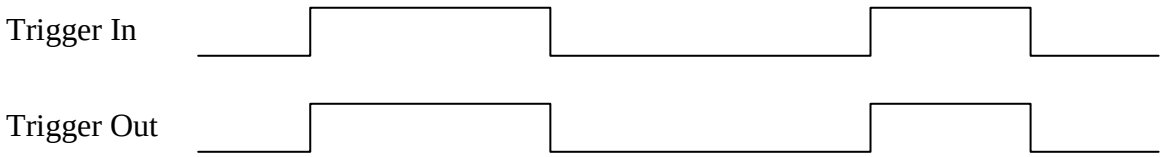
7.2.2 X4.6 Trigger

For the trigger input, which is evaluated in the motion control task different evaluation modes are supported.

Parameter Name	UPID	Description
Trigger Modes	170Ch	Trigger mode selection: • 0: None • 1: Direct • 2: Inhibited • 3: Delayed • 4: Inhibited & Delayed

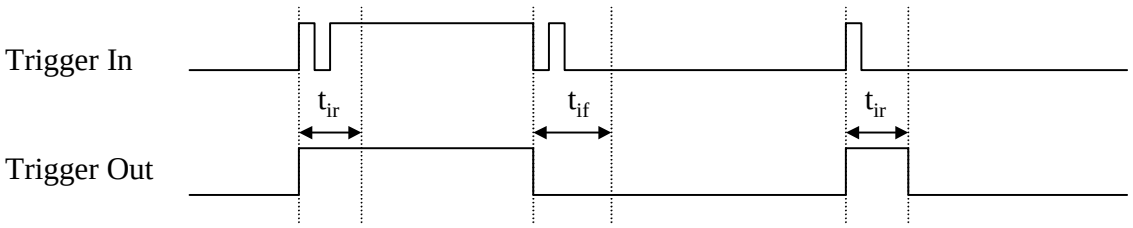
7.2.2.1 Direct Trigger Mode

In the Direct Trigger Mode the trigger input is directly copied to the trigger output which is used by the MC-SW. No parameter configuration is needed for this mode.



7.2.2.2 Inhibited Trigger Mode

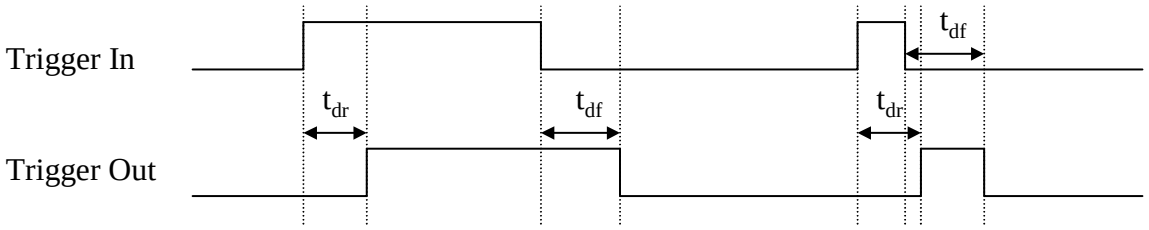
The Inhibit Trigger Mode could be used to debounce a jittering trigger input during state changes without delay. This method doesn't increase noise immunity!



Parameter Name	UPID	Description
Rise Inhibit Time	170Dh	Inhibit Time after rising edge of Trigger In signal (t_{ir})
Fall Inhibit Time	170Eh	Inhibit Time after falling edge of Trigger In signal (t_{if})

7.2.2.3 Delayed Trigger Mode

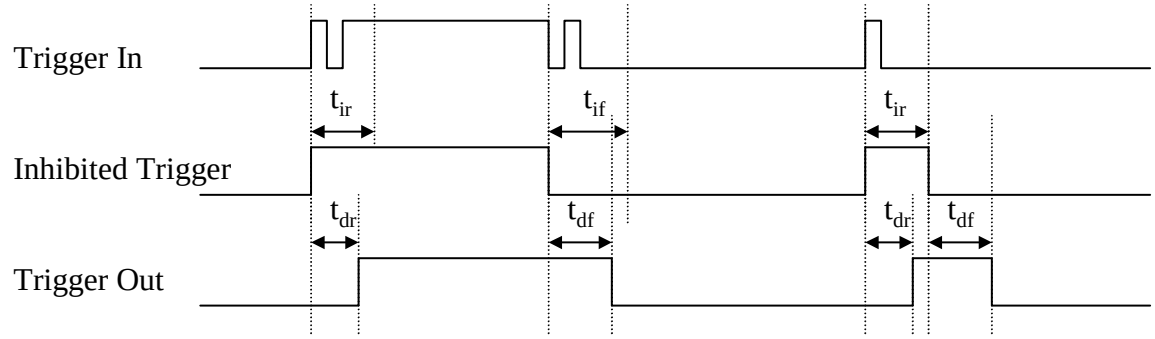
The Delayed Trigger Mode could be used to delay an action following the rising or falling trigger event.



Parameter Name	UPID	Description
Rise Delay Time	170Fh	Trigger Out Delay Time after rising edge of Trigger In signal (t_{dr})
Fall Delay Time	1710h	Trigger Out Delay Time after falling edge of Trigger In signal (t_{df})

7.2.2.4 Inhibited & Delayed Trigger Mode

The Inhibited & Delayed Trigger Mode first debounce filters the trigger input signal with the inhibit time, the inhibited Trigger signal then is delayed with the rise/fall Delay time and then copied to the Trigger Out signal.



Parameter Name	UPID	Description
Rise Inhibit Time	170Dh	Inhibit Time after rising edge of Trigger In signal (t_{ir})
Fall Inhibit Time	170Eh	Inhibit Time after falling edge of Trigger In signal (t_{if})
Rise Delay Time	170Fh	Trigger Out Delay Time after rising edge of Trigger In signal (t_{dr})
Fall Delay Time	1710h	Trigger Out Delay Time after falling edge of Trigger In signal (t_{df})

7.2.3 X4.8 and X4.9 Limit Switches

If on IO pin X4.8 and or on X4.9 a Limit Switch is defined the error behavior in case of an active Limit switch could be defined. The error is only generated on a powered motor that is homed, so it is possible to get out the error state with a new homing request. For that reason also the homed bit in the status word is cleared f moving into a limit switch.

Parameter Name	UPID	Description
Error Behavior	121Bh	Error behavior of the configured limit switches: • 0: No Error (Maybe only used for homing) • 1: Power Off • 2: Quick Stop

7.2.4 X4.10 and X4.11 PTC 1 and PTC 2

On Io pins X4.10 and X4.11 a PTC Sensor could be connected to supervise an over temperature of a motor and/or the transformer supply. The other side of the PTC has to be connected to 24V. If the resistance is below 2kOhm the input is high if it rises above 15kOhm the output is low. Typically the transition low to high is between 5kOhm and 7kOhm. If the Input rises, after the PTC Warn Time the corresponding bit in the warn word is set, after the PTC Error time The corresponding Error is generated. The error only can be acknowledged if the corresponding PTC Warn Bit has vanished.

7.2.5 X4.12 SVE (Safety Voltage Enable)

The input only on X4.12 is especially, if this input goes low the PWM generation of the power stage is disabled by HW. Additional this bit is fixed mapped to the Control Word bit 1. If not needed this feature, this input could be wired hard to 24V logic supply.

7.3 Master Encoder

The master encoder could be used for applications where high speed synchronization is needed, winding application, indexing positioning mode, etc

With the parameter Encoder Source it could be defined if the master encoder is connected the RJ45 Connector X10 which is looped through to the master encoder connecter RJ45 X11, which simplifies the loop through cabling of the encoder signals. Or if the master encoder is connected to the DSUB 9 connector X12.

Parameter Name	UPID	Description
Encoder Source	172Ah	Defines the source of the Master Encoder: • 0: None • 1: Encoder Input X10 • 2: Ext Sensor Input X12

The parameter Encoder type defines the signals type of the master encoder. In every case the signals have to be differential RS422 signals. When you have SD(Z) master encoder, connect the step signal to A, /A and Dir signal to to B/B and the Zero to Z, /Z.

Parameter Name	UPID	Description
Encoder Type	128Eh	Defines the Master Encoder Type: • 0: None • 1: ABZ • 2: AB • 4: Step Dir (SD) • 5: Step Dir Zero (SDZ)

The decoding parameter defines how many edges of the signals are evaluated. For AB(Z) encoder types 1x, 2x, 4x decoding is valid; for SD(Z) encoder types only 1x, 2x decoding is valid if 4x decoding is selected a 2x decoding is forced without error generation.

Parameter Name	UPID	Description
Decoding	128Fh	Defines the Master Encoder decoding: • 0: 1x • 1: 2x • 2: 4x

With the Direction parameter the count direction of the encoder evaluation could be defined or changed.

Parameter Name	UPID	Description
Direction	1290h	Defines the Master Encoder direction: • 0: Positive • 1: Negative

The parameter Counts/Revolution defines the number of counts per revolution for ABZ or SDZ Master encoders.

Parameter Name	UPID	Description
Counts/ Revolution	1291h	Only used for ABZ or SDZ encoders, to define the counts per revolution.

The parameter Speed Filter Time defines the time over which the Master Encoder speed is generated. Bigger values generates a smother Master Encoder speed but generates a bigger delay time of the speed, which may be a problem if the master encoder speed varies quickly.

Parameter Name	UPID	Description
Speed Filter Time	1293h	Time over which the Master Encoder speed is generated.

7.4 Monitoring

The E1100 servo controller series support enhanced monitoring functionalities of the supply voltages and the board temperatures.

7.4.1 Logic Supply Voltage

The Logic Supply Voltage should be in the range 20V.. 28V with the default parameterization, if the supply voltage goes out of this range an error will be generated. If the supply voltage goes below ca. 18V the servo controller shuts down.

Parameter Name	UPID	Description
Logic Supply Voltage Too Low	100Eh	If the logic supply voltage sinks below this limit the error 01h will be generated.

Parameter Name	UPID	Description
Logic Supply Voltage Too High	1010h	If the logic supply voltage rises above this limit the error 02h will be generated.

7.4.2 Motor Supply Voltage

The Motor Supply Voltage could be monitored with different warn and error levels.

Parameter Name	UPID	Description
Motor Supply Voltage Low	1018h	If the motor supply voltage sinks below this limit the warn bit Motor Supply Voltage Low (bit 2) is set.
Motor Supply Voltage High	1019h	If the logic supply voltage rises above this limit the warn bit Motor Supply Voltage High (bit 3) is set.

Parameter Name	UPID	Description
Motor Supply Voltage Too Low	101Ah	If the logic supply voltage sinks below this limit the error 03h will be generated.
Motor Supply Voltage Too High	101Bh	If the logic supply voltage rises above this limit the error 04h will be generated.

7.4.2.1 Phase Switch On Test

The Parameters in the Phase Switch On Test section, are used In the HW Tests State (State 5) before really enabling the power stage. If Motor Power supply is on and there is no ground path in the motor or cabling the phase voltage is in the power off state about 6.5V. If moving the motor the induced voltage may lead to HW test error.

Parameter Name	UPID	Description
Phase Voltage Low Level	102Ch	If one of the phase voltages is below this limit before powering up an error will be generated.
Phase Voltage High Level	102Dh	If one of the phase voltages is above this limit before powering up an error will be generated.

Then a single end of a phase is set to half motor supply voltage, in this phase the current into the servo controller have to be under the Phase Test Max Incurrent, otherwise an error will be generated.

Parameter Name	UPID	Description
Phase Test Max Incurrent	102Eh	If the current rises above this limit if one edge of a phase is set to a voltage en error will be generated.

7.4.3 Regeneration Resistor

The regeneration resister terminals on X1 can be used for energy dissipation, when the motor is decelerating.

Parameter Name	UPID	Description
Enable	101Dh	The regeneration resistor output could be activated with this parameter: • 0: Disable • 1: Enable

In the Config section the turn on and torn off voltages could be defined, the Turn On voltage has to be at minimum 0.5V higher than the turn off voltage. Ensure that the Normal motor supply voltage is lower than the turn off voltage!

Parameter Name	UPID	Description
Turn On Voltage	101Eh	If the Motor Supply Voltage rises above this limit the low side switch of the regeneration output is activated.
Turn Off Voltage	101Fh	If the Motor Supply Voltage sinks below this limit the low side switch of the regeneration output is turned off.

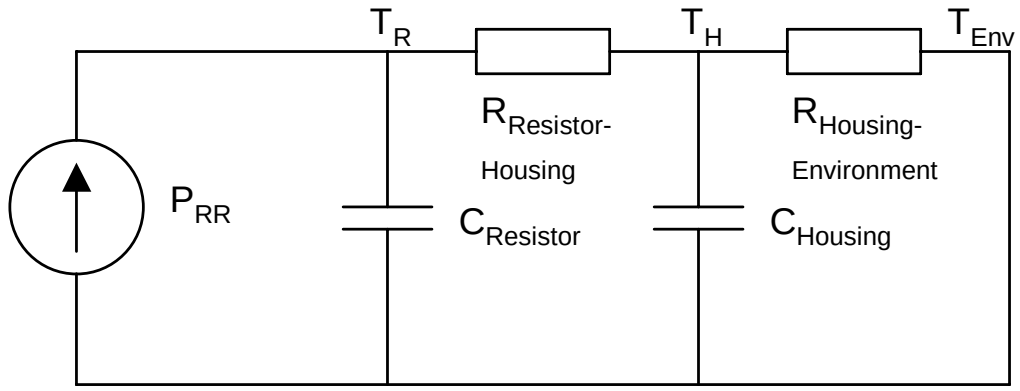
In the RR Temp Calculated section a temperature model of the regeneration resistor could be defined to avoid a damage of the regeneration resistor if the energy dissipation needed rises above the resistor capabilities.

Parameter Name	UPID	Description
RR Resistance	1022h	Resistance value of the regeneration resistor. This value is used for calculating how much heat energy is generated in the resistor at the current DC link voltage.
Warning Temp	1024h	If Calc Temp RR Winding (UPID1C0Dh) of the calculated temperature model rises above this value, bit 10 of the Warn Word is set.
Error Temp	1025h	If Calc Temp RR Winding (UPID1C0Dh) of the calculated temperature model rises above this value, the controller goes to error state with the error 15h.

In the Temp Model Parameters section the parameters of the temperature model are defined.

Parameter Name	UPID	Description
C Resistor	1026h	Heat capacity of the resistor winding itself.
R Winding Housing	1027h	Thermal resistance value between resistor winding and its housing.
C Housing	1028h	Heat capacity of the resistor housing.
R Housing Environment	1029h	Thermal resistance value between resistor housing and environment.
Environment Temperature	102Ah	Environmental temperature of the regeneration resistor.

The figure below shows the used temperature model for the regeneration resistor.



7.4.4 Temperature Monitoring

On the E1100 servo controllers has 8 built in absolute temperature sensors for thermal protection.

Parameter Name	UPID	Description
Temp Sens Warn Level	1040h	If the maximal board temperature rises above this level, a warning is generated (bit 6 in Warn Word is set).
Temp Sens Error Level	1041h	If the maximal board temperature rises above this level, the error is generated (error codes 10h..17h).

The table below shows the mapped variables of the temperature monitoring.

Variable Name	UPID	Description
Power Bridge Temp Ph1+	1BC6h	Temperature of power driver Phase 1+
Power Bridge Temp Ph1-	1BC7h	Temperature of power driver Phase 1-
Power Bridge Temp Ph2+	1BC8h	Temperature of power driver Phase 2+
Power Bridge Temp Ph2-	1BC9h	Temperature of power driver Phase 2-

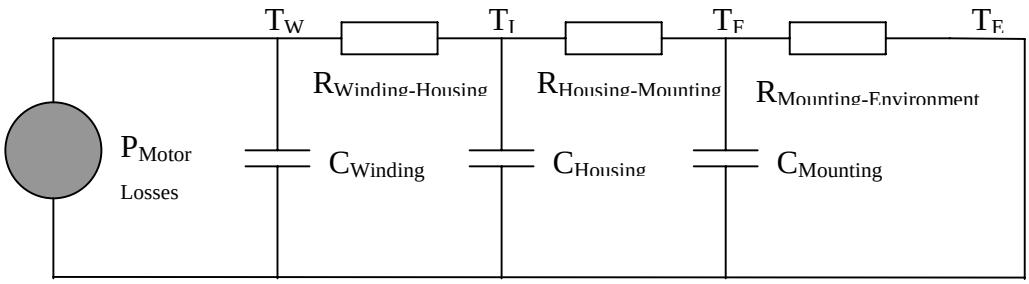
Power Bridge Temp Ph2+	1BC9h	Temperature of power driver Phase 2+
Power Bridge Temp DCLV+	1BCAh	Temperature of power drivers DC link voltage
Temp RR Driver	1BCBh	Temperature of Regeneration Resistor low side driver
Connector Temp X3	1BCCh	Temperature of motor connector X3
Temp Core	1BCDh	Temperature near microcontroller core
Max Controller Temp	1BCEh	Maximal temperature of above variables

8 Motor Configuration

The motor normally is defined with the motor wizard, which setup all needed parameters, therefore a detailed description of the parameters follows in future.

8.1 Generic Motor Temperature Calculated

For third parties motors a generic calculated motor temperature model is used to adapt the winding resistance and to detect overheat.



C Winding:	UPID 120Ch
R Winding-Housing:	UPID 1210h
C Housing:	UPID 1211h
R Housing-Mounting:	UPID 1212h
C Mounting:	UPID 1213h
R Mounting-Environment:	UPID 1214h

The sum of all R defines the static power losses with the capacitance the thermal time constant could be influenced. The bigger the thermal capacitance the slower the temp will rise.

9 State Machine Setup

In the state machine setup sections the parameters to influence the behavior of the single states could be defined.

10 Error Code List

Code	Description	Actions to take
0000h	No Error	No error is pending.
0001h	Err: X4 Logic Supply Too Low	The logic supply voltage has been too low. The minimal logic supply voltage level is defined through parameter 100Eh. Recommended actions: check your 24V logic power supply.
0002h	Err: X4 Logic Supply Too High	The logic supply voltage has been too high. The maximal logic supply voltage level is defined through parameter 1010h. Recommended actions: check your 24V logic power supply.
0003h	Err: X1 Pwr Voltage Too Low	The motor power supply voltage has been too low. The minimal motor supply voltage level is defined through parameter 101Ah. Recommended actions: check your motor power supply, check the wiring, check the sizing of the power supply, add a capacitor too enforce your DC link.
0004h	Err: X1 Pwr Voltage Too High	The motor power supply voltage has been too high. The maximal motor supply voltage level is defined through parameter 101Bh. Back EMF effects may boost the DC link voltage. Recommended actions: check your motor power supply, check the wiring, check the sizing of the power supply, use a regeneration resistor for power dissipation, add a capacitor too enforce your DC link.
0005h	Err: X1 RR Not Connected	A regeneration resistor is configured (see parameter 101Dh) but not connected. Recommended actions: connect the regeneration resistor to X1.
0006h	Err: PTC 1 Sensor Too Hot	The PTC 1 sensor on X4.10 is hot or not connected. Recommended actions: check the temperature, check the wiring
0007h	Err: Min Pos Undershot	The motor position has been below the minimal position (see parameter 146Eh). Recommended actions: check the configuration, check the PLC program
0008h	Err: Max Pos Overshot	The motor position has been above the maximal position (see parameter 146Fh). Recommended actions: check the configuration, check the PLC program
0009h	Err: Ext-Int Sensor Diff Err	The position difference between sensor feedback on X3 and sensor feedback on X12 has been too big. Recommended actions: check sensor wiring, check sensor configuration (count direction, etc.), check parameter 1266h
000Ah	Fatal Err: X12 Signals Missing	The external sensor is not connected to X12 or the wiring is not ok. Recommended actions: check the wiring

000Bh	Err: Pos Lag Always Too Big	The motor was not able to follow the demand position. The maximal allowed position difference is defined through parameter 1473h. Recommended actions: check the motor load, check the motor stroke range for possible collisions, check the position controller setup, check the setpoint generation (unreachable speed/acceleration values?), check the motor sizing.
000Ch	Err: Pos Lag Standing Too Big	The motor was not able to reach the target position or was not able to stay at the target position. The maximal allowed position difference is defined through parameter 1475h. Recommended actions: check the motor load, check the motor stroke range for possible collisions, check the position controller setup, check the motor sizing
000Dh	Fatal Err: X1 Pwr Over Current	Over current on X1 detected. Recommended actions: check motor wiring, check motor configuration, for P01-48 type motors: set parameter 11F4h to value 0001h
000Eh	Err: Supply Dig Out Missing	Controller board defective. Recommended actions: contact support for repair
000Fh	Err: PTC 2 Sensor Too Hot	The PTC 2 sensor on X4.11 is hot or not connected. Recommended actions: check the temperature, check the wiring
0010h	Err: Controller Ph1+ Too Hot	Servo controller power bridge phase 1+ too hot. Recommended actions: check motor wiring
0011h	Err: Controller Ph1- Too Hot	Servo controller power bridge phase 1- too hot. Recommended actions: check motor wiring
0012h	Err: Controller Ph2+ Too Hot	Servo controller power bridge phase 2+ too hot. Recommended actions: check motor wiring
0013h	Err: Controller Ph2- Too Hot	Servo controller power bridge phase 2- too hot. Recommended actions: check motor wiring
0014h	Err: Controller Pwr Too Hot	DC link temp sensor has detected over temperature. Recommended actions: check wiring
0015h	Err: Controller RR Hot Calc	Regeneration resistor switch hot: Recommended actions: check RR configuration (Turn On level, Resistance, etc.), check RR sizing
0016h	Err: Controller X3 Too Hot	Temp sensor on X3 has detected over temperature. Recommended actions: check motor wiring
0017h	Err: Controller Core Too Hot	Temp sensor on controller's PCB board reports core being hot.
0018h	Err: Power Bridge Ph1+ Defective	Servo controller power bridge phase 1+ may be defective. Recommended actions: contact support

0019h	Err: Power Bridge Ph1- Defective	Servo controller power bridge phase 1- may be defective. Recommended actions: contact support
001Ah	Err: Power Bridge Ph2+ Defective	Servo controller power bridge phase 2+ may be defective. Recommended actions: contact support
001Bh	Err: Power Bridge Ph2- Defective	Servo controller power bridge phase 2- may be defective. Recommended actions: contact support
001Ch	Err: Supply DigOut X6 Fuse Blown	Supply fuse for digital outputs on X6 blown. Recommended actions: check X6 wiring, contact support for repair
001Dh	Err: Supply X3.3 5V Fuse Blown	Supply X3.3 5V fuse blown. Motor or and/or wiring defective. Recommended actions: contact support for controller repair, check motor and wiring, replace motor and motor cables
001Eh	Err: Supply X3.8 AGND Fuse Blown	Supply X3.8 analog ground fuse blown. Recommended actions: contact support for controller repair, check motor and wiring, replace motor and motor cables
0020h	Err: Motor Hot Sensor	Temp sensor reports hot motor. Recommended actions: wait until motor has cooled down (until corresponding warning disappears, check load, check the motor configuration, check the setpoint generation (unreachable speed/acceleration values?), check the motor sizing
0021h	Fatal Err: X3 Hall Sig Missing	Motor hall signals not connected to X3 or motor defective: Recommended actions: Power down the controller and all power supplies, then reconnect motor, check motor and wiring, check parameter 1221h.
0022h	Fatal Err: Motor Slider Missing	Motor hall sensors could not see magnetic field of the slider. The motor position was outside the allowed range defined through the motors ZP and Max Stroke data (see data sheet). Recommended actions: check stroke range, check slider orientation.
0023h	Err: Motor Short Time Overload	Short time motor overload detected. Recommended actions: check if motor is blocked, check motor sizing
0024h	Err: RR Hot Calculated	Regeneration resistor hot calculated. Recommended actions: check RR configuration (Turn On level, Resistance, etc.), check RR sizing
0025h	Err: Sensor Alarm	Sensor Alarm On X12 Occurred. Recommended actions: Check sensor mounting, band contamination or motion speed

0028h	Err: Ph1+ Short Circuit To GND	Short circuit between phase 1+ and ground detected. Recommended actions: check motor wiring, check motor
0029h	Err: Ph1- Short Circuit To GND	Short circuit between phase 1- and ground detected. Recommended actions: check motor wiring, check motor
002Ah	Err: Ph2+ Short Circuit To GND	Short circuit between phase 2+ and ground detected. Recommended actions: check motor wiring, check motor
002Bh	Err: Ph2- Short Circuit To GND	Short circuit between phase 2- and ground detected. Recommended actions: check motor wiring, check motor
002Ch	Err: Ph1 Short Circuit To Ph2	Short circuit between motor phase 1 and phase 2 detected. Recommended actions: check motor wiring, check motor
0030h	Err: Ph1+ Wired To Ph2+	Motor phase 1+ has contact to phase 2+. Recommended actions: check motor wiring, check motor
0031h	Err: Ph1+ Wired To Ph2-	Motor phase 1+ has contact to phase 2-. Recommended actions: check motor wiring, check motor
0032h	Err: Ph1+ Not Wired To Ph1-	Motor phase 1+ has no connection to phase 1-. Recommended actions: check motor wiring, check motor
0033h	Err: Ph2+ Wired To Ph1+	Motor phase 2+ has contact to phase 1+. Recommended actions: check motor wiring, check motor
0034h	Err: Ph2+ Wired To Ph1-	Motor phase 2+ has contact to phase 1-. Recommended actions: check motor wiring, check motor
0035h	Err: Ph2+ Not Wired To Ph2-	Motor phase 2+ has no connection to phase 2-. Recommended actions: check motor wiring, check motor
0036h	Err: Ph1 Short Circuit To Ph2+	Short circuit between motor phase 1 and phase 2+ detected. Recommended actions: check motor wiring, check motor
0037h	Err: Ph1 Short Circuit To Ph2-	Short circuit between motor phase 1 and phase 2- detected. Recommended actions: check motor wiring, check motor
0038h	Err: Ph2 Short Circuit To Ph1+	Short circuit between motor phase 2 and phase 1+ detected. Recommended actions: check motor wiring, check motor
0039h	Err: Ph2 Short Circuit To Ph1-	Short circuit between motor phase 2 and phase 1- detected. Recommended actions: check motor wiring, check motor

003Ah	Err: Phase U Broken	Motor phase U broken. Recommended actions: check motor wiring, check motor
003Bh	Err: Phase V Broken	Motor phase V broken. Recommended actions: check motor wiring, check motor
003Ch	Err: Phase W Broken	Motor phase W broken. Recommended actions: check motor wiring, check motor
0040h	Err: X4.3 Brake Driver Error	X4.3 brake driver reports error. Recommended actions: check for short circuit on X4.3
0041h	Err: Dig Out X4.4..X4.11 Status	X4.3..X4.11 output driver reports error. Recommended actions: check for short circuit on outputs X4.4..X4.11 or output configurations.
0042h	Err: Dig Out X6 Status	X6 output driver reports error. Recommended actions: check for short circuit on outputs X6.
0044h	Err: X4 Dig Out GND Fuse Blown	Ground fuse for digital outputs on X4 blown. Recommended actions: check X4 wiring, contact support for repair
0045h	Fatal Err: Motor Comm Lost	Motor communication lost. Recommended actions: Power down and check motor wiring and motor, replace cable and/or motor.
0046h	Err: PTC 1 Broken	PTC 1 on X4.10 broken or not connected. Recommended actions: Power down and check PTC 1 wiring and resistance.
0047h	Err: PTC 1 Short To 24V	PTC 1 on X4.10 short to 24V. Recommended actions: Power down and check PTC 1 wiring and resistance.
0050h	Setup Err: HW Not Supported	Setup error, hardware is not supported by the software. Recommended actions: download correct firmware, contact support
0051h	Setup Err: SW Key Missing	Software key and access code for special functionality is missing. Recommended actions: Order the SW key with your support together with the serial number of your HW.
0058h	Runtime Err: ROM write error	Runtime error, MC SW was not able to change parameter value in ROM. Recommended actions: verify PLC is not configuring during this action, contact support
0060h	Cfg Err: RR Voltage Set Too Low	Configuration error: regeneration resistor turn on/off voltage parameter value is too low. Recommended actions: check parameters 101Eh and 101Fh
0061h	Cfg Err: RR Hysteresis < 0.5V	Configuration error: regeneration resistor turn on/off voltage parameter values too close to each other. Recommended actions: check parameters 101Eh and 101Fh

0062h	Cfg Err: Curve Not Defined	Configuration error. Software tried to start a curve that is not defined yet. Action to take: define the curve using the curves service, check if curves were downloaded to controller, check the curve IDs, check the configuration, check the PLC program
0063h	Cfg Err: Pos Ctrl Max Curr High	Configuration error: Invalid max current setting in control parameters. Recommended actions: check parameters 13A6h and 13BAh, check PLC program
0064h	Cfg Err (Fatal): No Motor Defined	Configuration error: No motor has been configured yet. Recommended actions: use the motor wizard to configure the motor
0065h	Cfg Err (Fatal): No Trigger Mode Defined	Configuration error: Digital input X4.6 is configured for trigger input function, but the trigger mode is not defined yet. Recommended actions: configure parameter 170Ch
0067h	Cfg Err (Fatal): Wrong Stator Type	Configuration error: The configured motor type does not match with the connected motor. Recommended actions: configure correct motor type by using the motor wizard, connect an appropriate motor

0068h	Cfg Err (Fatal): No Motor Communication	Configuration error: The controller was not able to establish the communication to the microcontroller on the motor. Older P01 motors don't support motor communication. Recommended actions: check motor wiring, check motor, check the motor configuration, disable communication by using parameter 11FBh if you have an old P01 motor.
0069h	Cfg Err: Wrong Slider	Configuration error: A wrong slider has been configured or slider home position has an invalid value. Recommended actions: reconfigure the motor by using the motor wizard
0080h	User Err: Lin: Not Homed	User error: The PLC program tried to start an action that requires the motor to be already homed, but the motor was not homed. Recommended actions: check the PLC program, do a homing of the motor first
0081h	User Err: Unknown Motion Cmd	User error: The PLC program sent an unknown motion command ID. Recommended actions: check PLC program, check firmware version
0082h	User Err: PVT Buffer Overflow	User error: The PLC program has sent the stream position commands too fast, the buffer had an overflow. Streaming has to be strictly cyclic! Recommended actions: check PLC program, check the fieldbus by using bus monitor tools
0083h	User Err: PVT Buffer Underflow	User error: The PLC program has sent the stream position commands too slowly, the buffer had an underflow. Streaming has to be strictly cyclic! Recommended actions: check PLC program, check the fieldbus by using bus monitor tools
0084h	User Err: PVT Master Too Fast	User error: The PLC program has begun to send PVT streaming command. The commands were too close to each other. The servo controller expects new streaming commands every 2ms .. 5ms. Recommended actions: check PLC program, check the fieldbus by using bus monitor tools
0085h	User Err: PVT Master Too Slow	User error: The PLC program has begun to send PVT streaming command. The cycle time between the streaming commands has been too long. The servo controller expects new streaming commands every 2ms .. 5ms. Recommended actions: check PLC program, check the fieldbus by using bus monitor tools
0086h	User Err: Motion Cmd In Wrong St	User error: The PLC program has sent a motion command while the controller was not in an appropriate operational state. Most of the motion commands are accepted only in operational state 8 (Operation Enabled). Recommended actions: check the PLC program

0087h	User Err: Limit Switch In High	User error: The motor moved into the Limit Switch In while it was still in the stroke range. Recommended actions: check the PLC program or check homing
0088h	User Err: Limit Switch Out High	User error: The motor moved into the Limit Switch Out while it was still in the stroke range. Recommended actions: check the PLC program or check homing
0089h	User Err: Curve Amp Scale Error	User error: The automatic calculated amplitude scale is out of range -2000percent to 2000percent. Recommended actions: check the PLC program or use other curve
008Ah	User Err: Cmd Tab Entry Not Def	Called command Table entry is not defined. Recommended actions: check the PLC program or define Command Table Entry.