AMKmotion Feldbus Interface AFI for CODESYS V3

Version: 2023/25
Part no.: 207106
Translation of the "Original Dokumentation"

AMKmotion
MEMBER OF THE ARBURG FAMILY

Imprint

Name: PDK_207106_AFI

Version:

Version: 2023/25		
Chapter / Topic	**Change**	**Letter symbol**
	AMKmotion Design	LeS

Previous version: 2019/08

Product status:

Product (part no.)	Firmware Version (part no.)	Hardware version (part no.)
SW AFI	V 1.0.0.0 2018/17 (207184)	-

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For fast and reliable troubleshooting, you can help us by informing our Customer Service about the following:

- Type plate data for each unit
- Software version
- Device configuration and application
- Type of fault/problem and suspected cause
- Diagnostic messages (error messages)

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Content

1 About this documentation

1.1 Display conventions

Display	Meaning
	This symbol points to parts of the text to which particular attention should be paid!
'Names'	Names are represented with apostrophes e. g. parameters, variables, etc.
See 'chapter name' on page x	Executable cross-reference in electronic output media
Blue text	Executable link in electronic output media
Index 1234	Application parameter

2 For your safety

2.1 Basic notes for your safety

- At electrical drive systems, hazards are present in principle that can result in death or fatal injuries:
  - Electrical hazard (e. g. electric shock due to touch on electrical connections)
  - Mechanical hazard (e. g. crush, retract due to the rotation of the motor shaft)
  - Thermal hazard (e. g. burns due to touch on hot surfaces)
- These hazards are present while starting up and operating the unit, and also during servicing or maintenance work.
- Safety instructions in the documentation and on the product warn about the hazards.
- Personnel must have read and understood the safety instructions before installing and operating the product. In the documentation about the product the usage warnings pertain to direct hazards and must therefore be followed directly when operating or handling the product by the operator.
- AMKmotion products must be kept in their original order, that means it is not allowed to do a significant constructional change on hardware side and software is not allowed to be decompiled and change the source code.
- Damaged or faulty products are not allowed to be integrated or put into operation.
- Do not start the system in which the AMKmotion products are installed (begin of intended use) until you can determine that all relevant standards, laws, and directives have been complied with, e. g. low voltage directive, EMC directive, and the machinery directive, and possible further product standards. The plant manufacturer is responsible for the compliance with the laws, directives, and standards.
- The devices must be installed, electrically connected and operated as shown in the device description documentation. The technical data and the required environmental conditions must be observed at all times.

3 Product description

The 'AMK Fieldbus Interface' (AFI) ensures easy and standardized access to the AMK drive functionality. Customer control systems can use the AFI interface in the AMK controller (Motion Controller), independent of the bus system used. The AMK controller recognizes the AFI commands received from the customer control system and carries out complete processing of the command with the respective drive. The AMK controller and AFI monitor the correct execution in the drive and transmit the status of each drive back to the customer control system.

The AFI interface relieves the load on the customer control system by controlling the drive via real-time communication and carrying out monitoring fully automatically. Data on the current status are transmitted to the customer control system cyclically.

The AFI interface defines a data structure of 32 bytes of data in transmit and receive direction per drive. A maximum of 16 drives, corresponding to a bandwidth of 512 bytes in transmit and receive direction, is currently supported.

AFI is designed to allow the transfer of 2 commands in parallel. For example, the drive can carry out positioning while simultaneously, there is read or write access to parameter values.

AFI guarantees the consistency of the transferred data.

The commands are supplemented by application parameters in which values for the various commands are configured, e. g. ramp times, limit switches, scaling factors, times, jerk, position window etc.

Siehe 'Overview of commands' auf Seite 17.

Siehe 'Overview of application parameters (Index)' auf Seite 36.

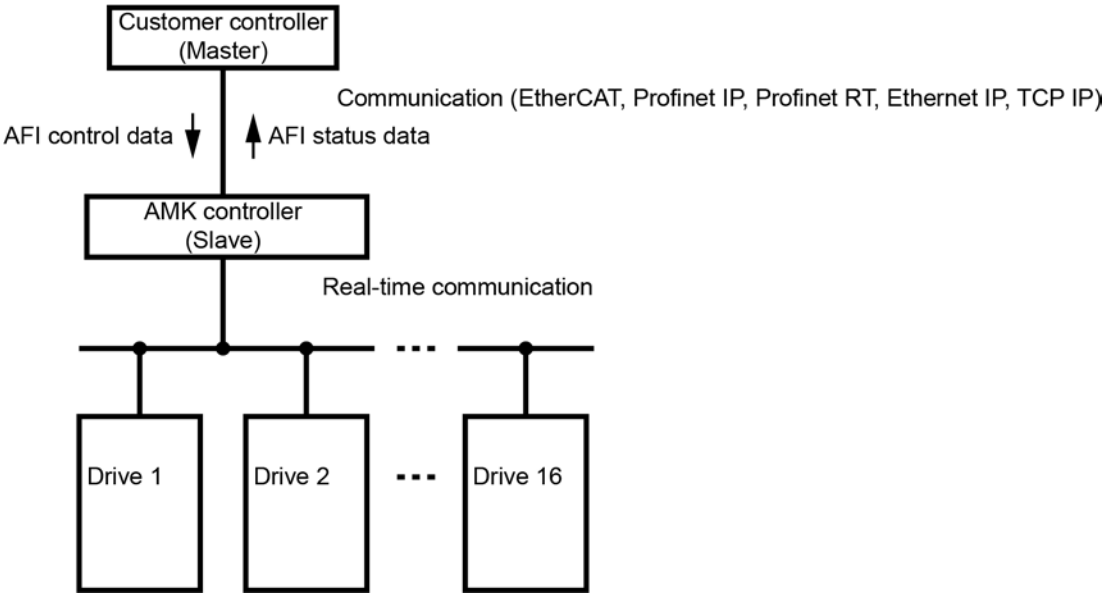
AFI offers immediate access to the following functions:

- Movement functions
  - speed control
  - torque control
  - position control
  - homing cycle (with / without evaluation of cam and / or zero pulse)
  - homing to fixed stop
  - relative / absolute positioning
  - positive / negative positioning to fixed stop
  - endless continuous positioning
  - positioning with switching values positive / negative
  - positioning with override function
  - Stop / Continue / Cancel commands
  - ...
- Access to data repository in the drive
  - read / delete diagnostic message
  - read application message
  - configurable actual value channels
  - read / write parameter ID
  - read / write temporary parameter ID
  - read / write application parameter
  - ...
- Global system access
  - trigger system booting
  - set actual position value

3.1 Requirement

- Software AIPEX PRO V3.04
- Software CODESYS V3.3.5.10.4
- Hardware AMKAMAC controller with firmware Ax V4.21

4 Data structure



For Ethernet/IP, a maximum of 15 drives is possible, because 4 bytes of the 512 bytes are used for the Ethernet/IP Header.

Input address range

AFI (control data)	Drive 1	Drive 2	Drive 3	...	Drive 15	Drive 16
Input byte	0...31	32...63	64...95	...	448...479	480...511
Input word	0...15	16...31	32...47		224...239	240...255
Input double word	0...7	8...15	16...23		112...119	120...127

Output address range

AFI (status data)	Drive 1	Drive 2	Drive 3	...	Drive 15	Drive 16
Output byte	0...31	32...63	64...95	...	448...479	480...511
Output word	0...15	16...31	32...47		224...239	240...255
Output double word	0...7	8...15	16...23		112...119	120...127

All data must be configured in double word format.

Data per drive

Drive n

Control data (Input)

Byte	Word	Double word (inDW)	Content
0..3	0, 1	inDW0 [1)]	Global control bits
4..7	2, 3	inDW1 [2)]	Channel 1: command + control bits
8..11	4, 5	inDW2	Channel 1: data 1 [3)]
12..15	6, 7	inDW3	Channel 1: data 2 [3)]
16..19	8, 9	inDW4 [2)]	Channel 2: command + control bits
20..23	10, 11	inDW5	Channel 2: data 1 [3)]
24..27	12, 13	inDW6	Channel 2: data 2 [3)]
28..31	14, 15	inDW7	Reserved

Status data (Output)

Byte	Word	Double word (outDW)	Content
0..3	0, 1	outDW0 [4)]	Global status bits
4..7	2, 3	outDW1 [5)]	Channel 1: acknowledgment command + acknowledgment control bits
8..11	4, 5	outDW2	Channel 1: data 1 [6)]
12..15	6, 7	outDW3	Actual position value [7)]
16..19	8, 9	outDW4 [5)]	Channel 2: acknowledgment command + acknowledgment control bits
20..23	10, 11	outDW5	Channel 2: data 2 [6)]
24..27	12, 13	outDW6	Actual speed value [7)]
28..31	14, 15	outDW7	Actual torque value (~actual current value) [7)]

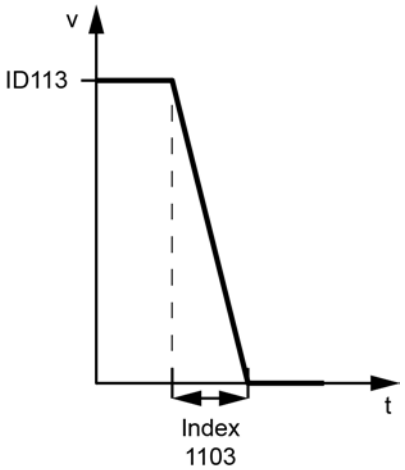
1) Siehe 'Input Double Word 0 (inDW0)' auf Seite 10.
2) Siehe 'Input Double Word 1 + 4 (inDW1 + inDW4)' auf Seite 11.
3) The input data are dependent on the Code command. Siehe 'Overview of commands' auf Seite 17.
4) Siehe 'Output Double Word 0 (outDW0)' auf Seite 12.
5) Siehe 'Output Double Word 1 + 4 (outDW1 + outDW4)' auf Seite 13.
6) The output data are dependent on the Code command Siehe 'Overview of commands' auf Seite 17.
7) The actual values can be changed with command 1007 ‘Configure actual values’. Siehe '1007 ‘Configure actual values'' auf Seite 21.

4.1 Input Double Word 0 (inDW0)

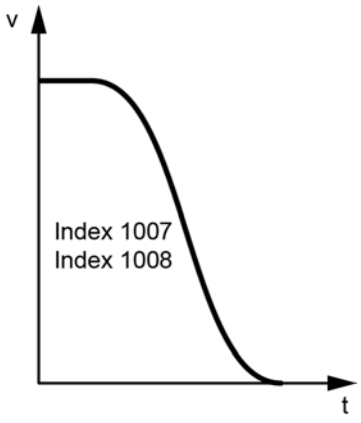
Bit no.	Word	Bit no.	State	Meaning
0 (LSB)	LW	0	0	Emergency Stop inactive
			1	Emergency Stop active [1)] The Emergency Stop ramp depends on the current operating mode and is set via the application parameters. [2)] Siehe 'Overview of application parameters (Index)' auf Seite 36.
1		1	0	Controller enable inactive: In the case of controller enable RF revocation, the active command is canceled. The drive brakes to a standstill (<0.5 rpm), then RF is revoked. The braking process depends on the current operating mode [2)].
			1	Controller enable active: The motor is supplied with current and is controlled in the current operating mode.
2 - 8		2 - 8		Reserved
9		9	0	Software limit switch active (Index 1001 and 1002) [3)]
			1	Software limit switch inactive
10		10		Reserved
11		11	0	inactive
			1	Cycle counter active The cycle counter is increased by the value 1 with every valid command.
12 - 15		12 - 15		Reserved
16 - 23	HW	0 - 7		Reserved
24		8	0	Life bit (Toggle bit) The life bit does not trigger a function; it is acknowledged in output double word 1 'outDW1' Bit 24 and can be used for communication monitoring.
			1	
25		9	0	Block AFI data No command is executed.
			1	Enable AFI data Customer control unit (AFI master) enables AFI data. Commands are executed.
26 - 27		10 - 11		Reserved
28		12	0	Monitoring of scaling active
			1	Monitoring of scaling inactive
29 - 31 (MSB)		13 - 15		Reserved

1) The Emergency Stop is not a certified safety function.

2) Speed control



Position control



3) The software limit switches are effective with all positioning commands and define the valid positioning range. If a position setpoint outside the permissible positioning range is defined, an error is generated and the drive does not carry out the positioning.

   Command 3006 ‘Continuous positioning’ is executed until a software limit switch is reached; the drive then stops.

   If the drive is located outside the permissible positioning range (for example, because the software limits were changed), the drive can always be moved in the direction of the permissible range.

4.2 Input Double Word 1 + 4 (inDW1 + inDW4)

Bit no.	Word	Bit no.	State	Meaning
0 - 15 (LSB)	LW	0 - 15		Command Siehe 'Overview of commands' auf Seite 17.
16 - 23	HW	0 - 7		Reserved
24 [1)]		8[1)]	0	Data 1 are active
			1	Data 1 are ignored
25 [1)]		9[1)]	0	Data 2 are active
			1	Data 2 are ignored
26		10	0	Command with override function inactive
			1	Command with override function active Siehe 'Command with override function' auf Seite 35.
27 - 28		11 - 12		Reserved
29		13	0	Continue command
			1	Stop current command
30		14	0	inactive
			1	Cancel current command
31 (MSB)		15	0	Command toggle bit (BTG)
			1	(with edge change, a new command is detected)

1) Bit 24 and Bit 25 can be used, for example, to transmit only a new speed setpoint with command 3001 and ignore the position setpoint, i.e. no new position is transmitted.

Example:

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
3001	‘Positioning (absolute)’	Position setpoint	Speed setpoint		3000	xx

Code	Command	Data 1	Data 2	Bit 24	Bit 25	Meaning
3001	‘Positioning (absolute)’	500	4000000	0	0	Start command with position setpoint (500 increments) and speed setpoint (400 rpm)
3001	‘Positioning (absolute)’	150	6000000	1	0	Command transfers new speed setpoint (600 rpm), new position setpoint is ignored (Bit 24 = 1), the position setpoint (500 increments) remains valid
1001	‘Read AFI version’	xx	xx	xx	xx	Bit 24 and Bit 25 are not relevant for this command.

4.3 Output Double Word 0 (outDW0)

Bit no.	Word	Bit no.	State	Meaning
0 (LSB)	LW	0	0	inactive
			1	System ready message (SBM)
1		1	0	inactive
			1	Acknowledgment controller enable (QRF)
2		2	0	inactive
			1	Acknowledgment DC converter ON (QUE)
3		3	0	inactive
			1	Acknowledgment output stage enable (QEF) / STO inactive
4		4	0	inactive
			1	Homing point known (RFP)
5		5	0	inactive
			1	Drive warning: Read warning with command 1005 Siehe 'Overview of commands' auf Seite 17.
6		6	0	inactive
			1	Drive error: Read error with command 1005
7		7	0	inactive
			1	Application-specific warning Read warning with command 1006
8		8	0	inactive
			1	Application-specific error Read error with command 1006
9		9	0	Acknowledgment software limit switch active (Index 1001 and 1002) Siehe 'Overview of application parameters (Index)' auf Seite 36.
			1	Acknowledgment software limit switch inactive
10		10	0	inactive An error is generated when the power supply is switched on.
			1	Ready for switch-on (power supply e.g. iSA 400 VAC)
11		11	0	inactive
			1	Acknowledgment cycle counter active
12 - 15		12 - 15		Reserved

Bit no.	Word	Bit no.	State	Meaning
16	HW	0	0	inactive
			1	Drive in position window (Index 1013 and 1014)
17		1	0	inactive
			1	Drive in speed window ($\|n_{set} - n_{actual}\|$ < 1108 'Speed window')
18 - 23		2 - 7		Reserved
24		8	0	Acknowledgment life bit
			1	
25		9	0	Acknowledgment AFI data blocked
			1	Acknowledgment AFI data enabled
26 - 27		10 - 11		Reserved
28		12	0	Acknowledgment monitoring of scaling active
			1	Acknowledgment monitoring of scaling inactive
29		13	0	Scaling not valid (plausibility monitoring)
			1	Scaling valid (plausibility monitoring)
30		14		Reserved
31 (MSB)		15	0	No drive detected on bus
			1	Drive detected on bus

4.4 Output Double Word 1 + 4 (outDW1 + outDW4)

Bit no.	Word	Bit no.	State	Meaning
0 - 15 (LSB)	LW	0 - 15		Acknowledgment of command number Siehe 'Overview of commands' auf Seite 17.
16	HW	0	0	inactive
			1	(CMD) command active [1)]
17		1	0	inactive
			1	Warning with active command Warning with 1006 ‘Read application error’
18		2	0	inactive
			1	Error with active command Error with 1006 ‘Read application error’
19		3	0	inactive
			1	Command is interrupted and drive is stopped
20 - 23		4 - 7	0	Reserved
			1	Reserved
24		8	0	Acknowledgment Data 1 are active
			1	Acknowledgment Data 1 are ignored
25		9	0	Acknowledgment Data 2 are active
			1	Acknowledgment Data 2 are ignored
26		10	0	Acknowledgment command with override function inactive
			1	Acknowledgment command with override function active
27 - 28		11 - 12	0	Reserved
			1	Reserved
29		13	0	inactive
			1	Acknowledgment current command is interrupted, see also Bit 19 = 1
30		14	0	inactive
			1	Acknowledgment current command is canceled
31 (MSB)		15	0	Acknowledgment command toggle bit (QBTG)
			1	

1)  The signal 'CMD command active' comes one cycle later than the QBTG signal.

4.5 Data format

The data are transmitted automatically, depending on the communication interface, in little-endian (Intel) or big-endian (Motorola) format. The consistency of the transmitted data is guaranteed at all times.

Communication interface	Transmission format
EtherCAT	Intel
Ethernet IP	Intel
TCP/IP	Intel
ProfiNet	Motorola

4.6 Cycle time and maximum number of drives

The cycle time depends on the AMK controller and the number of drives:

Controllers	Fieldbus	min. cycle time with ≤ 8 drives	min. cycle time with ≤ 16 drives
A4 and iSA	EtherCAT, ProfiNet, Ethernet/IP[1)], TCP/IP	2 ms	4 ms
A6		1 ms	1 ms

1) For Ethernet/IP, a maximum of 15 drives is possible, because 4 bytes of the 512 bytes are used for the Ethernet/IP Header.

5 Scaling

5.1 Default scaling

All data in the AFI are scaled as standard in the default scaling.

Variables	Default Scaling	Default unit
Position	1	Increments
Speed	0.0001	rpm
Torque	0.1	$\%M_N$
Acceleration	0.001	rev/s^2
Jerk	0.001	rev/s^3
Time	0.001	s

5.2 Calculation basis for scaling

AFI calculates all values in the default scaling. If the customer control system needs to specify values that deviate from the default scaling, the scaling parameters must be adjusted to the desired scaling using the formula below.

Equation 1

$$Value\ (Default\ scaling) = \frac{Value\ (scaled)}{\text{feed constant (1403)}} \times \frac{\text{Gear MUL (1401)}}{\text{Gear DIV (1402)}} \times \frac{\text{Scaling MUL}}{\text{Scaling DIV}}$$

AFI converts the value to the desired scaling for the customer control unit with the changed formula before the data are transmitted.

Equation 2

$$Value\ (scaled) = \text{Value } (Default\ scaling) \times \text{feed constant (1403)} \times \frac{\text{Gear DIV (1402)}}{\text{Gear MUL (1401)}} \times \frac{\text{Scaling DIV}}{\text{Scaling MUL}}$$

The application parameters that are to be scaled must be used for the variables “Scaling MUL’ and ‘Scaling DIV’:

Scaling for	Application parameter (Index)		
	1403 ‘Feed constant’	Scaling MUL	Scaling DIV
Position	$\frac{\frac{Unit}{Rev.}}{ID116\ \frac{Incr}{Rev.}}$	1406 ‘Position scaling multiplier’	1407 ‘Position scaling divisor’
Speed	$\frac{Unit}{Rev.}$	1404 ‘Speed scaling multiplier’	1405 ‘Speed scaling divisor’
Torque		1408 ‘Torque scaling multiplier’	1409 ‘Torque scaling divisor’
Acceleration		1410 ‘Acceleration scaling multiplier’	1411 ‘Acceleration scaling divisor’
Jerk		1412 ‘Jerk scaling multiplier’	1413 ‘Jerk scaling divisor’

Example 1:

The customer control unit is to process speed values in rpm instead of in 0.0001 rpm.

If the application parameters are entered in equation 2, it becomes clear that the equation is satisfied if the value 10000 is entered for the variable 'Scaling DIV.' In the speed control, 'Scaling DIV' corresponds to application parameter 1405 ‘Speed scaling divisor’.

$$\textit{Value [rpm]} = \textit{Value [0.0001 rpm]} \times \text{ID116 [Incr]} \times \frac{1}{1} \times \frac{10000}{\text{ID116 [Incr]}}$$

Example 2:

As example 1, but with a gear reduction of 7:1.

$$\textit{Value [rpm]} = \textit{Value [0.0001 rpm]} \times \text{ID116 [Incr]} \times \frac{1}{7} \times \frac{10000}{\text{ID116 [Incr]}}$$

The gear ratio is taken into account when the value 7 is written into application parameter 1401 ‘Gear(box) multiplier’.

Example 3:

The customer control unit is to define position values in 0.01 mm instead of increments. The feed constant is 5 mm/rev.

$$\textit{Value [0.01 mm]} = \text{Value } \textit{[Incr]} \times \frac{\frac{5\ [\text{mm}]}{[\text{Rev.}]}}{\text{ID116}\frac{[\text{Incr}]}{[\text{Rev.}]}} \times \frac{1}{1} \times \frac{1}{100}$$

If the application parameters are entered in equation 2, it becomes clear that the equation is satisfied if the value 100 is entered for the variable 'Scaling MUL.' In the position control, 'Scaling MUL' corresponds to application parameter 1406 ‘Position scaling multiplier’.

5.3 Parameterization

The scaling parameters are monitored for changes. Change monitoring is active if inDW0 Bit 28 = 0. If a change in the scaling parameters is detected, relevant application parameters are automatically converted internally to the new scaling factor.

In order to set the scaling parameters for the first time, it is advisable to set inDW0 Bit 28 = 1 to deactivate the monitoring function. The status of the scaling monitoring is acknowledged in outDW0 Bit 28.

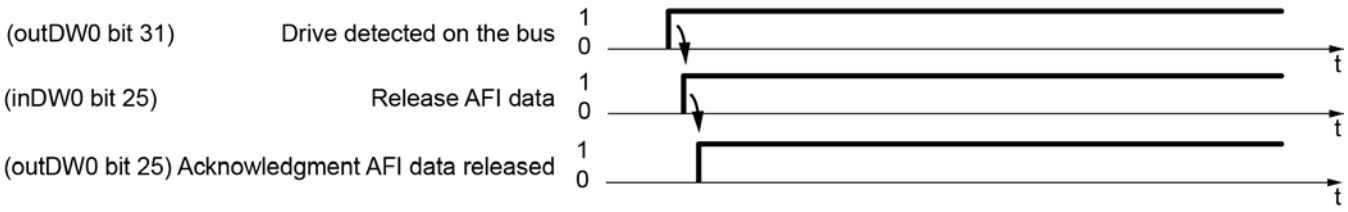
When the monitoring function is deactivated, application parameters are not converted if scaling parameters are changed. When all scaling parameters were set, the monitoring function can be activated in inDW0 Bit 28 = 0, and the active status of the monitoring function is acknowledged via outDW0 Bit 28 = 0.

The plausibility bit outDW0 Bit 29 = 1 indicates whether the scaling settings are plausible (valid).

6 Commanding

6.1 Switch-on diagram

AFI protocols can only be exchanged after release.



6.2 Command groups and rules

When commanding, the following rules must be followed:

Command group (Code)	Rule
1 (1000-1999)	A Group 1 command may be placed in parallel with a Group 3 command.
2 (2000-2999)	A Group 2 command may not be placed until no other command is active or activated.
3 (3000-3999)	A Group 3 command may be placed in parallel with a Group 1 command.
4 (4000-4999)	A Group 4 command may not be placed until no other command is active or activated.

No 2 commands from the same group may be active at the same time.

Example:

Time	Command channel 1 (Code)	Data 1	Data 2		Command channel 2 (Code)	Data 1	Data 2
T1	'Read error (drive and control system error)'(1005)	Event 2	Info 1		'Positioning (absolute) to fixed stop positive direction of rotation' (3003)	Position setpoint 500000	Speed setpoint 1000000
T2	'System booting' (2000)	xx	xx		xx	xx	xx
T3	'Read ID' (1008)	ID number	xx		'Speed control' (3000)	Speed setpoint 4000000	xx

.

6.3 Overview of commands

Control data to drive					Status data from drive	
Code	Command	Data 1	Data 2		Acknowledgment of command	Data
1000	'Zero'	xx	xx		1000	xx
1001	'Read AFI version'	xx	xx		1001	Version
1004	'Clear error'	xx	xx		1004	xx

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1005	‘Read error (drive and control system error)’	Event	Info		1005	Error number, additional info
1006	‘Read application error’	Event	Info		1006	Error number additional info
1007	‘Configure actual values’	outDWx	Code for actual value		1007	xx
1008	‘Read ID’	ID number	Mode		1008	Value
1009	‘Write ID’	ID number	Setpoint		1009	xx
1010	‘Read temporary ID’	ID number	Mode		1010	Value
1011	‘Write temporary ID’	ID number	Setpoint		1011	xx
1012	‘Write application parameter’	Index	Value		1012	xx
1013	‘Read application parameter’	Index	xx		1013	Value
2000	‘System booting’	xx	xx		2000	xx
2001	‘Set actual position value’	Value	xx		2001	xx
2005	'Write scaling parameter'	Index	Value		2005	xx
3000	‘Speed control’	Speed setpoint	xx		3000	xx
3001	‘Positioning (absolute)’	Position setpoint	Speed setpoint		3001	xx
3002	‘Positioning (relative)’	Position setpoint	Speed setpoint		3002	xx
3003	'Positioning (absolute) to fixed stop positive direction of rotation'	Position setpoint	Speed setpoint		3003	xx
3004	'Positioning (absolute) to fixed stop negative direction of rotation'	Position setpoint	Speed setpoint		3004	xx
3005	‘Torque control’	Torque setpoint	xx		3005	xx
3006	‘Continuous positioning’	Speed setpoint	xx		3006	xx
3008	'Positioning (absolute) with switching values positive direction of rotation'	Position setpoint	Speed setpoint		3008	xx
3009	'Positioning (absolute) with switching values negative direction of rotation'	Position setpoint	Speed setpoint		3009	xx
4000	‘Homing cycle’	xx	xx		4000	xx
4001	‘Homing cycle to fixed stop’	Speed setpoint	Torque threshold		4001	xx

6.4 Description of the command

1000 ‘Zero’

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1000	‘Zero’	xx	xx		1000	xx

This command can be used to transmit the command toggle bit and the life bit without triggering a function.

6.4.1 1001 ‘Read AFI version’

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1000	‘Read AFI version’	xx	xx		1001	Version

e. g: 0x 01 00 00 00
1 0 0 0 → V 1.0.0.0

1004 ‘Clear error’

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1004	‘Clear error’	xx	xx		1004	xx

With command 1004, application errors (warnings) and drive errors (warnings) are cleared and the following status bits reset:

- outDW0 Bit 5,6,7,8
- outDW1 and outDW4 Bit 17 and 18

1005 ‘Read error (drive and control system error)’

The output double word outDW0 and 4 Bit 17 + 18 indicate whether there is an error or warning status pending in the drive.

Up to 10 diagnostic messages (elements 1 to 10) are stored in a diagnosis list for each drive. Each diagnostic message can contain from 1 to 4 additional infos. The first diagnostic message is element 1, any subsequent messages element 2, 3, etc.

The command ‘Clear error’ clears the entries in the diagnosis list.

The following data must be added to the command in order to read out a diagnostic message:

Drive error

Data	Values	Meaning
Data 1:	0 to 9	Stored diagnostic message 1 to 10
Data 2:	0	Diagnostic number
	1	Additional info 1
	2	Additional info 2
	3	Additional info 3
	4	Additional info 4

Control system error

Data	Values	Meaning
Data 1:	100 to 109	Stored diagnostic message 1 to 10
Data 2:	0	Diagnostic number
	1	Additional info 1
	2	Additional info 2
	3	Additional info 3
	4	Additional info 4

Example:

The following diagnostic messages are generated due to an encoder error.

Element	Diagnostic number	Info 1	Info 2	Info 3	Info 4
2	2311	101	0	0	0

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1005	'Read error (drive and control system error)'	Element 2: 1	Info: 0		1005	Error number, additional info: 2311
1005	'Read error (drive and control system error)'	Element 2: 1	Info: 1		1005	Error number, additional info: 101

Siehe 'Application error' auf Seite 39.

1006 'Read application error'

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1006	'Read application error'	Value for Element	Info		1006	Error number, additional info

Up to 10 application errors (elements 1 to 10) are stored in a diagnosis list for each drive. Each application error has additional info. The first application error is element 1, any subsequent messages from element 2.

The following data must be added to the command in order to read out a diagnostic message:

Data	Values	Meaning
Data 1:	0 to 9	Stored application error 1 to 10
	-1	Read latest error number
Data 2:	0	Error number
	1	Additional info 1

Example:

System booting is aborted due to an EtherCAT configuration error and the following error numbers are generated.

Element	Error number	Additional info
1	1001	1009
2	7052	3003

The application errors are read one after the other with the following commands:

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1006	'Read application error'	Element 1: 0	Info: 0		1006	Error number, additional info: 1001
1006	'Read application error'	Element 1: 0	Info: 1		1006	Error number, additional info: 1009

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1006	‘Read application error’	Element 2: 1	Info: 0		1006	Error number, additional info: 7052
1006	‘Read application error’	Element 2: 1	Info: 1		1006	Error number, additional info: 3003

The message can be cleared with command ‘Clear error’.

1007 ‘Configure actual values’

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1007	‘Configure actual values’	Channel [1)]	Code for actual value		1007	Configured actual value

1)

Channel	Output double word	Default setting actual value
1	outDW3	Actual position value (Code 11)
2	outDW6	Actual speed value (Code 10)
3	outDW7	Actual torque value (Code 12)

Code for actual value

Code	Meaning [2)]	Unit [1)]	Parameter
10	‘Actual speed value’	0.0001 rpm	ID40
11	‘Actual position value’	Incr	ID51
12	‘Actual torque value’	0.1% M_N	ID84
13	‘Following error’	Incr	ID189
14	‘Internal temperature’	0.1 °C	ID33116
15	‘External temperature’	0.1 °C	ID33117
16	‘Converter overload display’	0.1 %	ID33101
21	‘DC bus voltage’	VDC	ID32836

1) The scaling of the units is valid for the default scaling.
2) The available actual values depend on the device or the controller module.

1008 ‘Read ID’

Read parameter values are output in the default scaling; the scaling parameters have no influence.

Mode (Data 2) Bit no.	State	Meaning
0 (LSB) not changeable	0	Remanent (fixed setting)
	1	Temporarily
1 not changeable	0	Read (fixed setting)
	1	Write
2	0	Do not read
	1	Name
3	0	Do not read
	1	Attribute
4	0	Do not read
	1	Unit
5	0	Do not read
	1	Minimum
6	0	Do not read
	1	Maximum
7 (MSB)	0	Do not read
	1	Value

Example:

Read parameter ID32768 'Nominal motor voltage'.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1008	‘Read ID’	ID number: 32768	Mode: 0		1008	Value: 3500

The mode 0 reads the remanent parameter value. The read parameter value 3500 corresponds to 350 V with a parameter scaling of 0.1 V.

1009 ‘Write ID’

With this command, values can be written remanently to parameters. The changes only become effective after RF change or system booting.

Example:

The value 8 ms is to be written to ID34236 'Time motor brake on'.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1009	‘Write ID’	ID number: 34236	Value: 8		1009	xx

1010 ‘Read temporary ID’

With this command ‘Read temporary ID’, values written temporarily (command 1011) ‘Write temporary ID’ can be read.

Mode (Data 2) Bit no.	State	Meaning
0 (LSB) not changeable	0	Remanent
	1	Temporarily (fixed setting)
1 not changeable	0	Read (fixed setting)
	1	Write
2	0	Do not read
	1	Name
3	0	Do not read
	1	Attribute
4	0	Do not read
	1	Unit
5	0	Do not read
	1	Minimum
6	0	Do not read
	1	Maximum
7 (MSB)	0	Do not read
	1	Value

Example:

The value 120 was written temporarily to ID100 'Speed control proportional gain KP'.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1010	‘Read temporary ID’	ID number: 100	Mode		1010	Value: 120

The temporary value 120 is read from ID100 .

1011 ‘Write temporary ID’

The command writes values temporarily to temporarily editable parameters. All temporarily editable parameters of a device are listed in ID270 'Temporary parameter list'. Temporary parameter modifications are lost with power supply off or system booting.

Example:

The value 120 is to be written temporarily to ID100 'Speed control proportional gain KP'.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1011	‘Write temporary ID’	ID number: 100	Setpoint: 120		1011	xx

1012 ‘Write application parameter’

Application parameters adjust the drive system to the application.

Example:
Index 1003 ‘Acceleration’ is to be parameterized to the value 50 rev/s^2.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1012	‘Write application parameter’	Index: 1003	Value: 50000		1012	xx

Siehe 'Overview of application parameters (Index)' auf Seite 36.

1013 ‘Read application parameter’

This command reads out the value of an application parameter.

Example:
To read Index 1003 ‘Acceleration’:

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
1013	‘Read application parameter’	Index: 1003	xx		1013	Value: 10000

As an example, the value 10000 is listed in Index 1003.

2000 ‘System booting’

This command triggers system booting in the drive if the controller enable is not set.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
2000	‘System booting’	xx	xx		2000	xx

2001 ‘Set actual position value’

This command sets the current actual position value in the drive to the value added to the command in Data 1. The actual position value can only be set when the controller enable is inactive.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
2001	‘Set actual position value’	Value	xx		2001	xx

2005 'Write scaling parameter'

Scaling parameters adjust the drive system to the application.

Example:

Index 1003 ‘Acceleration’ is to be parameterized to the value 50 rev/s^2.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
2005	'Write scaling parameter'	Index: 1003	Value: 50000		2005	xx

Siehe 'Overview of application parameters (Index)' auf Seite 36.

3000 ‘Speed control’

The drive switches to operating mode digital speed control and accelerates with the set ramp to the speed setpoint.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
3000	‘Speed control’	Speed setpoint	xx		3000	xx

3001 ‘Positioning (absolute)’

In absolute positioning, the position setpoint is based on the homing point. The homing point must be known (outDW0 Bit 4 = 1) before an absolute positioning is started. The position setpoint and the positioning velocity are transmitted with the command. The application parameters for acceleration, deceleration and jerk are effective.

Siehe 'Retrigger command positioning (3001 and 3002)' auf Seite 26.

Example:

The drive is to carry out absolute positioning to position 500 increments at a positioning velocity of 200 rpm. The homing point is valid.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
3001	‘Positioning (absolute)’	Position setpoint: 500	Speed setpoint: 2000000		3001	xx

3002 ‘Positioning (relative)’

In relative positioning, the position setpoint is based on the current actual position value at the time of the command call. The drive moves forward from the current position by the position setpoint. The position setpoint and the positioning velocity are transmitted with the command. The application parameters for acceleration, deceleration and jerk are effective.

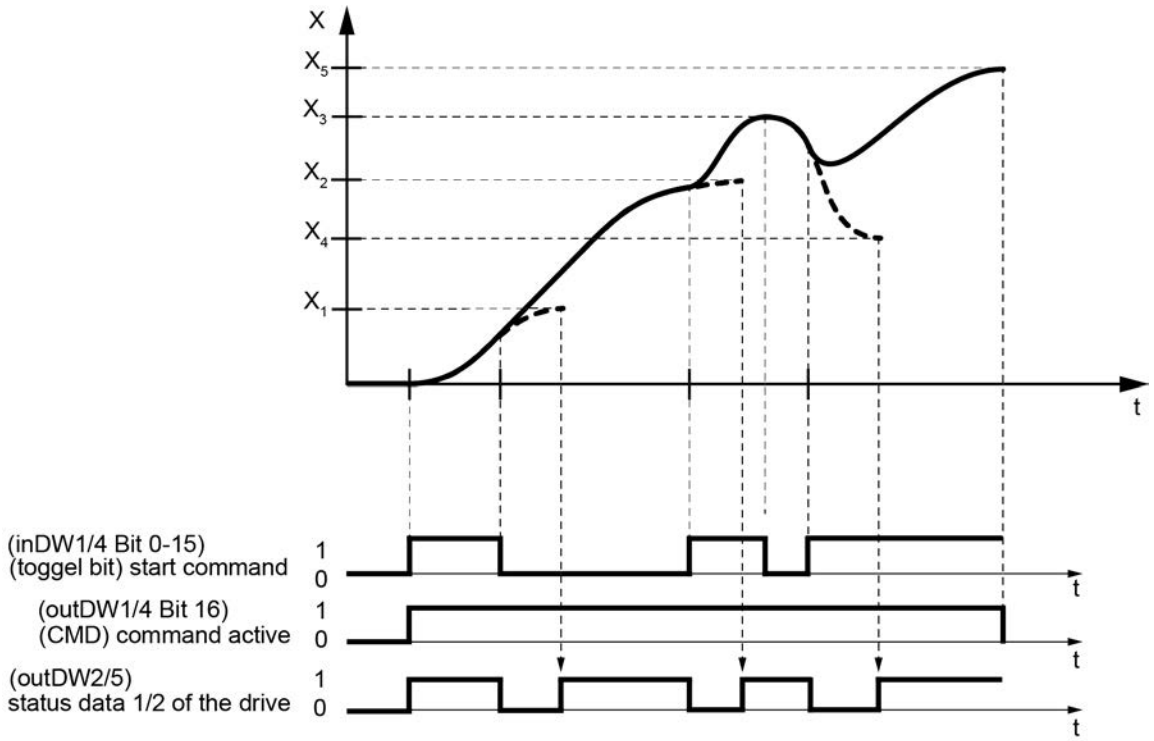
Example:

The drive is to carry out relative positioning by 500 increments at a positioning velocity of 200 rpm.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
3002	‘Positioning (relative)’	Position setpoint: 500	Speed setpoint: 2000000		3002	xx

6.4.1.1 Retrigger command positioning (3001 and 3002)

The command positioning absolute or relative can be retriggered before the positioning process is completed. During retriggering, the position and speed setpoint can be changed. When positioning absolute, the previous position setpoint is replaced, while positioning relative, the new position setpoint is added to the previous one. Modified speed setpoints have an immediate effect on the movement that is still in progress. Retriggering is possible if the current positioning in status data outDW2 or outDW5 returns the value 1. If the status data outDW2 or outDW5 returns the value 0 it can not be retriggered yet. For retriggering the command must be restarted.



3003 'Positioning (absolute) to fixed stop positive direction of rotation'

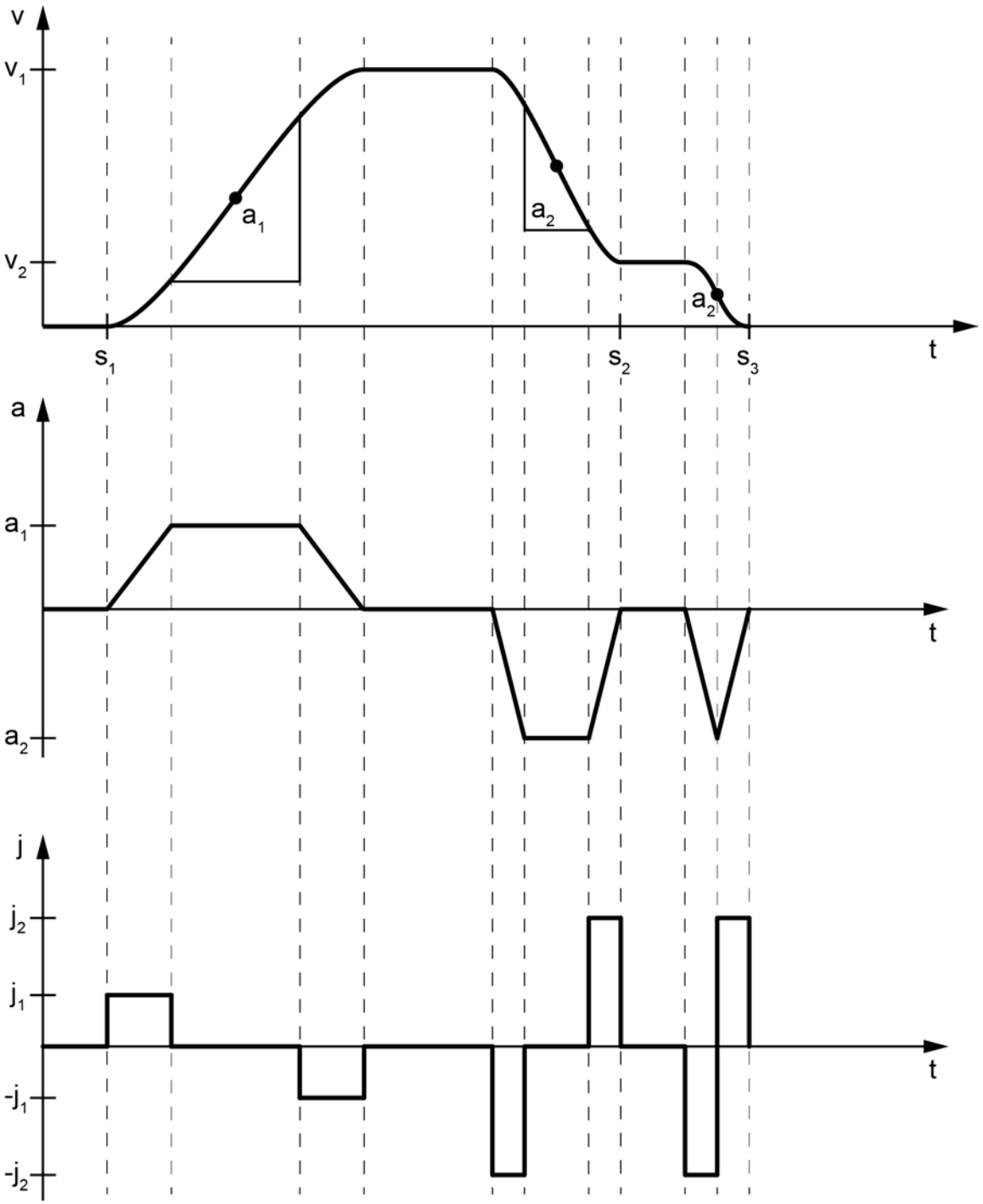
With the command ‘Positioning to fixed stop,’ the absolute position of the fixed stop and the positioning velocity are added to the command data. In absolute positioning, the position setpoint is based on the homing point. The homing point must be known (outDW0 Bit 4 = 1) before an absolute positioning is started. The application parameters for acceleration, deceleration and jerk are effective. Near the fixed stop, the fixed stop can be approached at reduced velocity. Before the switching position is reached, the drive adjusts the positioning velocity so that the switching velocity is reached at the switching position. Movement continues at switching velocity to the fixed stop. The switching position is defined relative to the absolute position of the fixed stop.

From the switching point onward, the current torque is monitored. The fixed stop is reached when the following conditions are met:

- The current torque has reached or exceeded the torque threshold Index 1009
- The actual position value of the drive no longer changes
- The drive has reached the position of the fixed stop and is located within the position window

When the fixed stop is reached, the torque is maintained for the ‘Time to fixed stop’, after which the command is terminated.

Control data to drive					**Status data from drive**	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
3003	'Positioning (absolute) to fixed stop positive direction of rotation'	Position setpoint (position of fixed stop)	Speed setpoint		3003	xx



Legend:

		Index
s_1	Start position	
s_2	'Switching position (positioning to fixed stop)'	1011
s_3	Expected position of the fixed stop (Data 1)	
v_1	Positioning velocity (Data 2)	
v_2	'Switching velocity (positioning to fixed stop)'	1012
a_1	‘Acceleration’	1003
a_2	‘Deceleration’	1004
j_1	‘Acceleration jerk’	1005
j_2	‘Deceleration jerk’	1006
	'Torque threshold (positioning to fixed stop)'	1009

Siehe 'Overview of application parameters (Index)' auf Seite 36.

3004 'Positioning (absolute) to fixed stop negative direction of rotation'

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
3004	'Positioning (absolute) to fixed stop negative direction of rotation'	Position setpoint (position of fixed stop)	Speed setpoint		3004	xx

The command runs identically to command 3003 with negative direction of rotation.

3005 ‘Torque control’

With the command torque control, the drive switches to the operating mode torque control and the transmitted torque setpoint becomes effective.

Example:

The drive is to generate a torque of 40 % of the nominal motor torque with torque control. The nominal motor torque is proportional to ID111 'Motor nominal current IN'.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
3005	‘Torque control’	Torque setpoint: 400	xx		3005	xx

3006 ‘Continuous positioning’

In the case of continuous positioning, the drive is moved endlessly in position-controlled manner by converting the speed setpoint internally to cyclical position increases which are commanded as position setpoints. The application parameters for acceleration, deceleration and jerk are effective.

Example:

The drive is to turn continuously, with position control, at a velocity of 200 rpm.

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
3006	‘Continuous positioning’	Speed setpoint: 2000000	xx		3006	xx

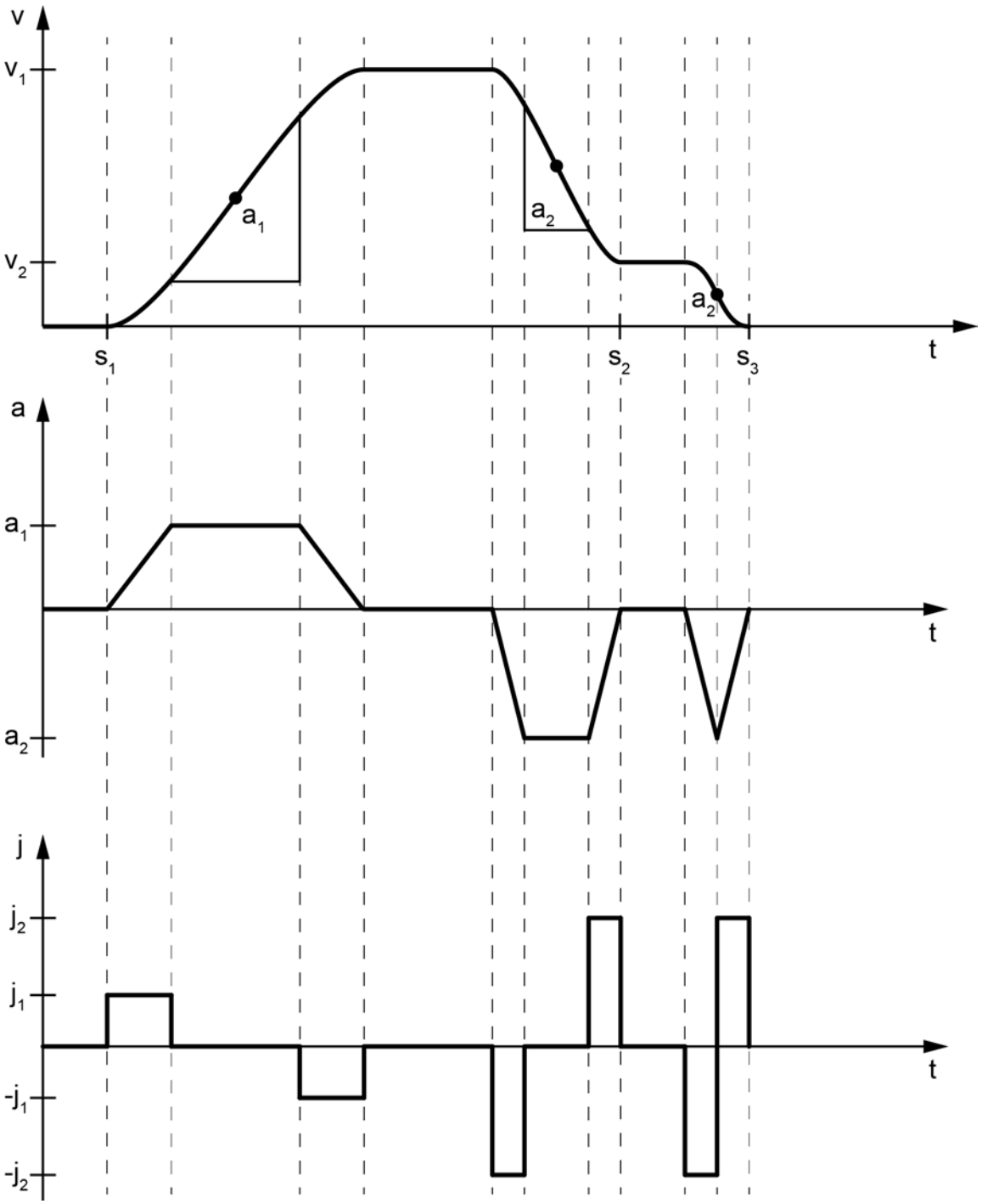
3008 'Positioning (absolute) with switching values positive direction of rotation'

With the command ‘Positioning with switching values,’ the position setpoint (target position) as an absolute position and the positioning velocity are added to the command data. In absolute positioning, the position setpoint is based on the homing point. The homing point must be known (outDW0 Bit 4 = 1) before an absolute positioning is started. The application parameters for acceleration, deceleration and jerk are effective. Near the target position, the target position can be approached at reduced velocity. Before the switching position is reached, the drive adjusts the positioning velocity so that the switching velocity is reached at the switching position. Movement continues at switching velocity to the target position. The switching position is defined relative to the target position.

The fixed stop is reached when the following conditions are met:

- The actual position value of the drive no longer changes
- The drive has reached the target position and is located within the position window

Control data to drive					**Status data from drive**	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
3008	'Positioning (absolute) with switching values positive direction of rotation'	Position setpoint (target position)	Speed setpoint		3008	xx



Legend:

		Index
s_1	Start position	
s_2	'Switching position (positioning to fixed stop)'	1011
s_3	Target position (Data 1)	
v_1	Positioning velocity (Data 2)	
v_2	'Switching velocity (positioning to fixed stop)'	1012
a_1	‘Acceleration’	1003
a_2	‘Deceleration’	1004
j_1	‘Acceleration jerk’	1005
j_2	‘Deceleration jerk’	1006

Siehe 'Overview of application parameters (Index)' auf Seite 36.

3009 'Positioning (absolute) with switching values negative direction of rotation'

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
3009	'Positioning (absolute) with switching values negative direction of rotation'	Position setpoint (target position)	Speed setpoint		3009	xx

The command runs identically to command 3008 with negative direction of rotation.

4000 ‘Homing cycle’

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
4000	‘Homing cycle’	xx	xx		4000	xx

The settings in accordance with ID147 'Homing parameter' and 32926 'AMK homing cycle parameter' are effective for the homing cycle.

4001 ‘Homing cycle to fixed stop’

Control data to drive					Status data from drive	
Code	**Command**	**Data 1**	**Data 2**		**Acknowledgment of command**	**Data**
4001	‘Homing cycle to fixed stop’	Speed setpoint (homing run velocity)	Torque threshold		4001	xx

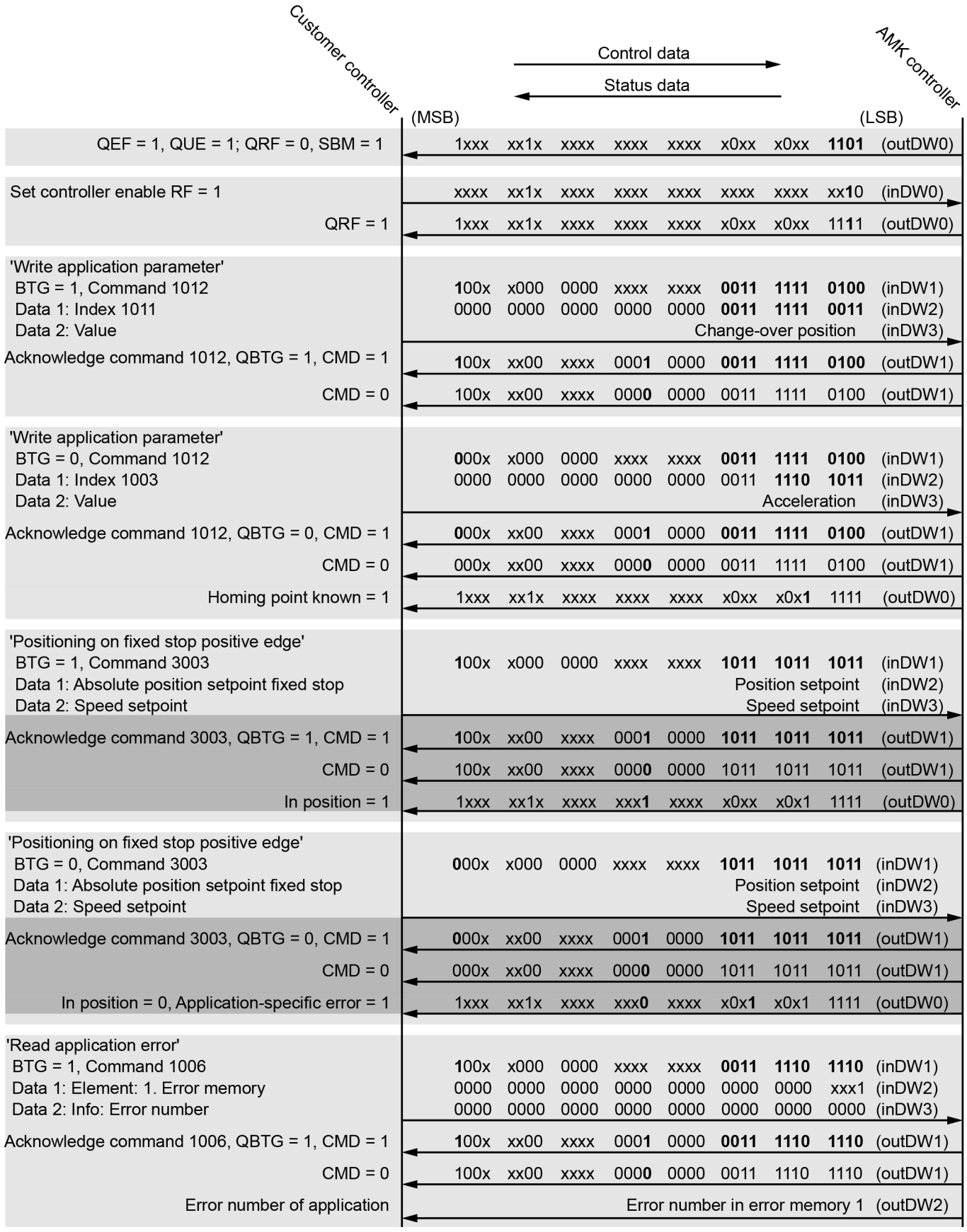
The torque threshold (Data 2) defines the torque from which the drive detects the fixed stop and sets the homing point. The direction of rotation is defined via the prefix of the homing run velocity (Data 1).

The settings in accordance with ID147 'Homing parameter' and 32926 'AMK homing cycle parameter' are not effective for command 4001.

‘Homing cycle to fixed stop’ is only available for multiturn absolute encoders (F-, Q-, T- and V-encoders)

6.5 Example of commanding

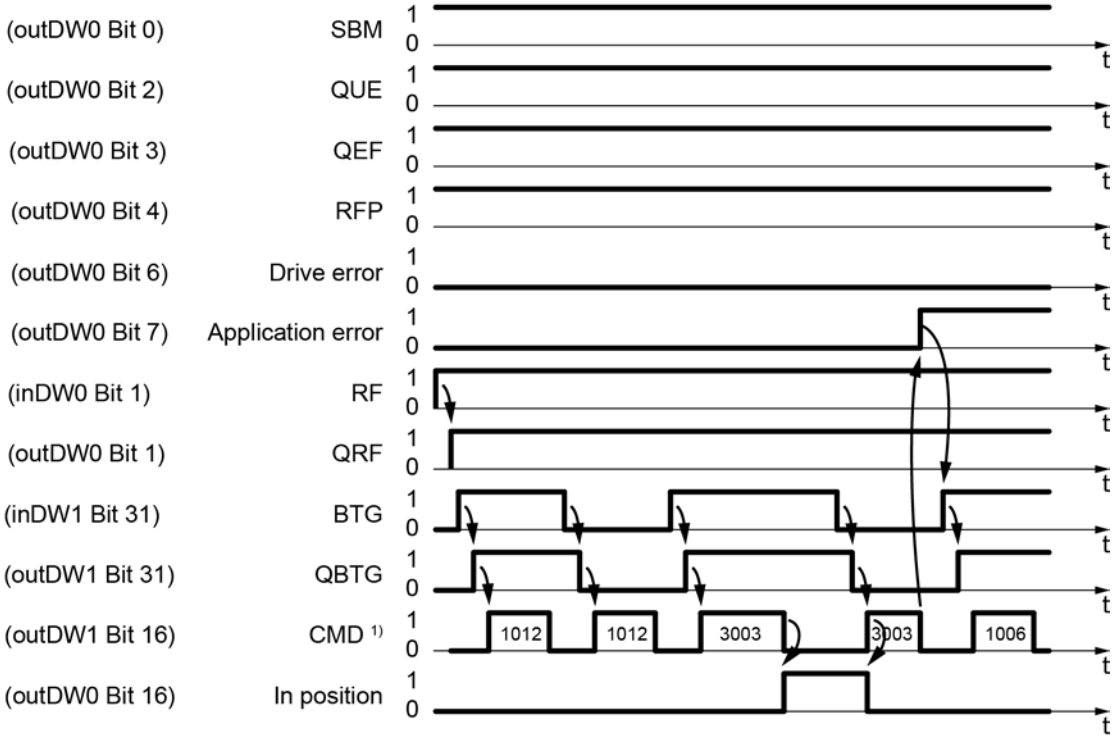
6.5.1 Data exchange



Legend:

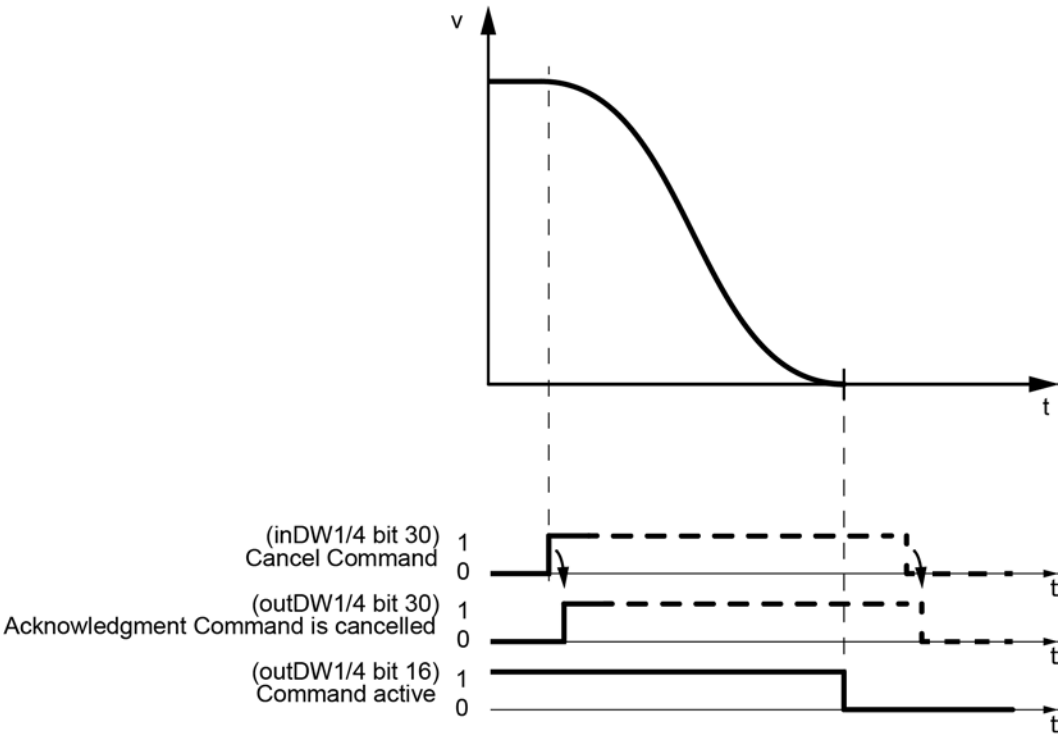
x The bit is not relevant for this status or this command.
0 Bit status “not set.”
1 Bit status “set.”
Optical differentiation of the commands.
Drive carries out a movement.

6.5.2 Signal diagram



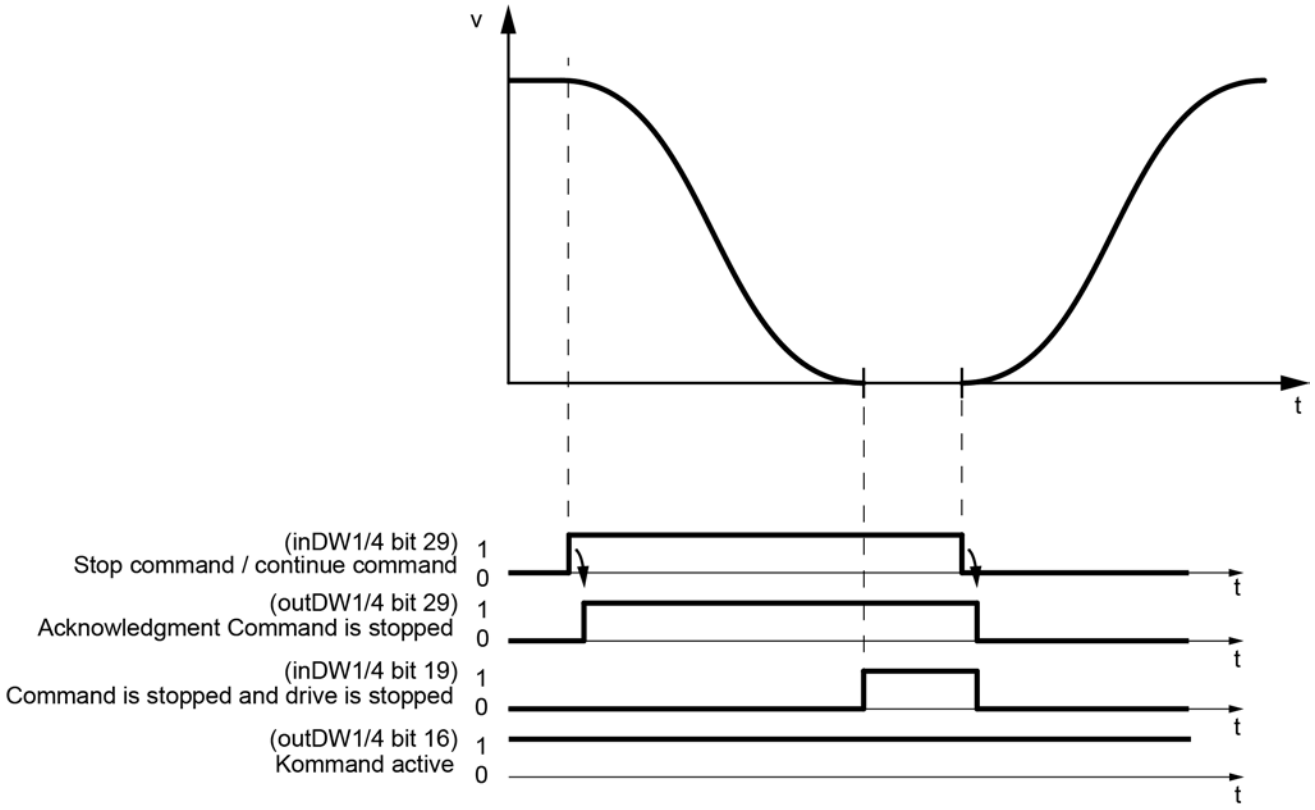
1) The signal 'CMD command active' comes one cycle later than the QBTG signal.

6.6 Cancel command

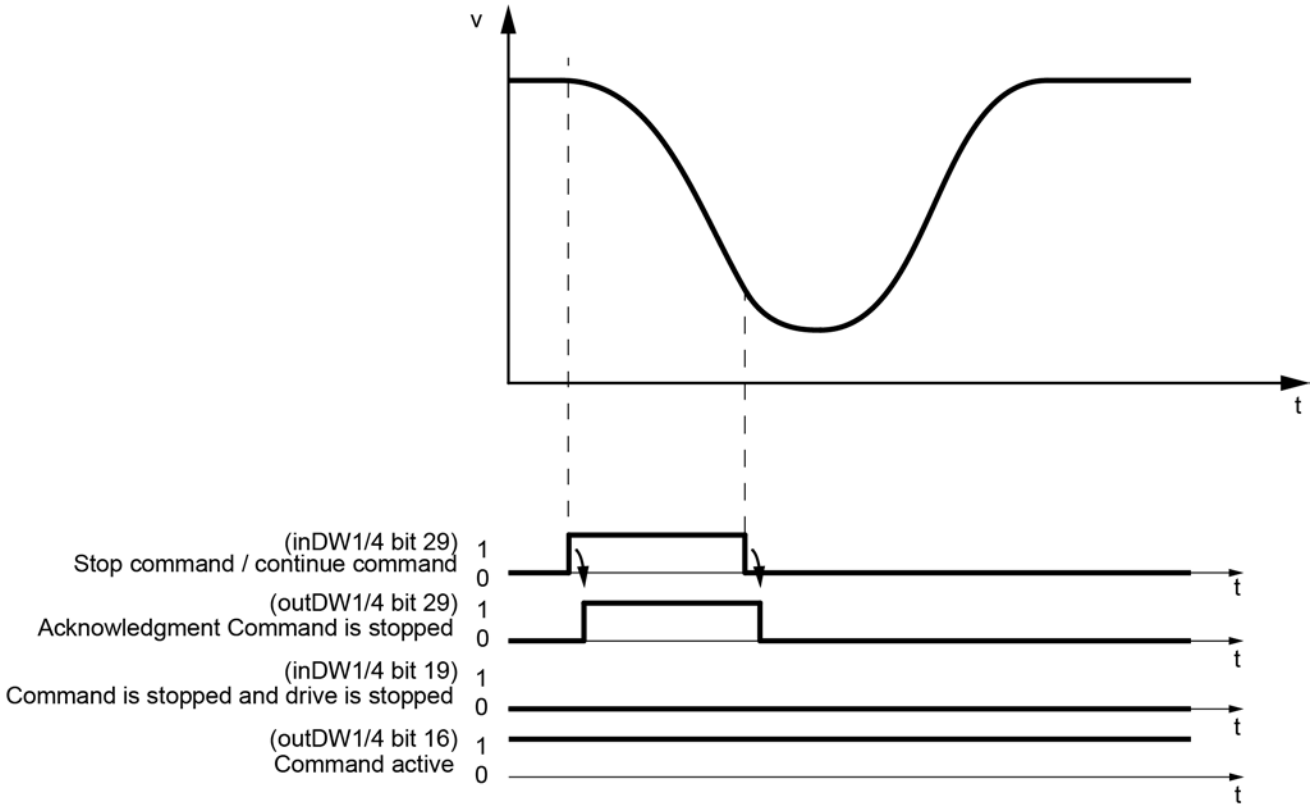


6.7 Stop command

Variant 1: A movement command is stopped, the axis comes to a standstill and the movement is continued after a certain time.



Variant 2: A movement command is stopped, and continued before the axis comes to a standstill.



6.8 Command with override function

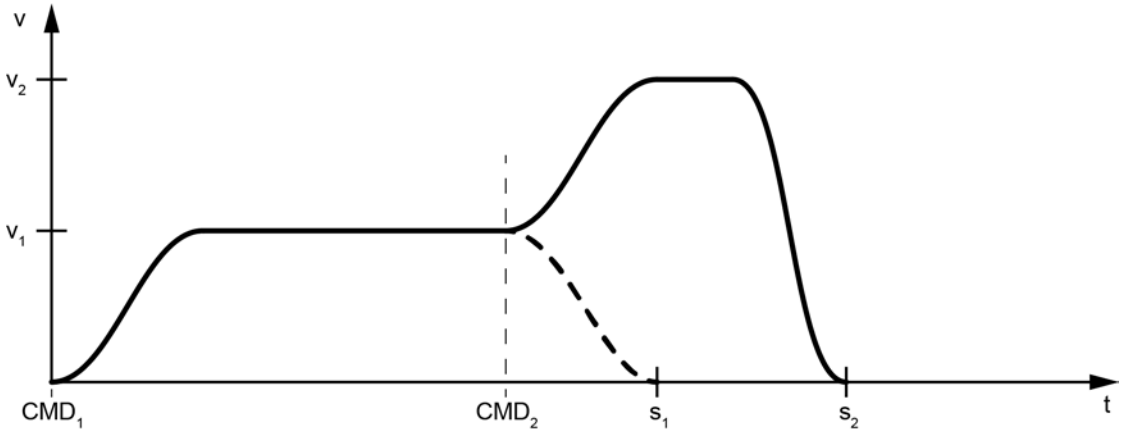
A command with override function replaces an existing movement command with a new movement command without stopping the drive.

The existing movement command can only be overridden if it is not ‘stopped’ (Bit 29) or ‘canceled’ (Bit 30).
Siehe 'Input Double Word 1 + 4 (inDW1 + inDW4)' auf Seite 11.

Example:

Command 3006 ‘Continuous positioning’ (CMD_1) is active and is to be overridden by command 3002 ‘Positioning (relative)’ (CMD_2). The new command starts at the current velocity and positions the drive relatively at the position setpoint, taking into account the application parameters for acceleration, deceleration and jerk.

The overridden command is automatically stopped and terminated without effect on the currently active command.



Legend:

s_1	Target position of the overridden command (CMD_1)
s_2	Target position of the command with override function (CMD_2)
v_1	Velocity of the overridden command
v_2	Velocity of the command with override function

7 Application parameters

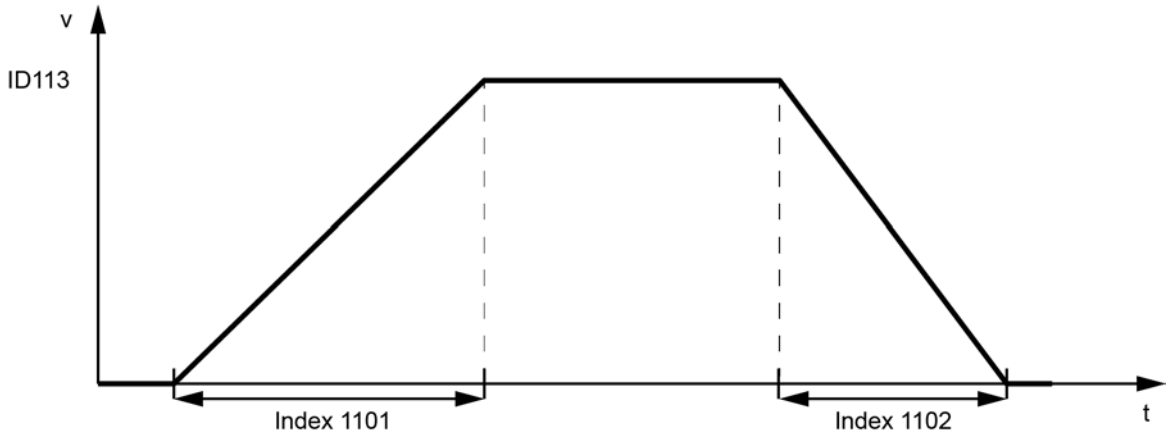
7.1 Overview of application parameters (Index)

Index	Designation	Effective in operating mode	Default value	Unit [2]	Data type (no. of bytes)	Meaning
1001	‘Software limit switch position positive’	Position	0	Incr	LREAL (8)	
1002	‘Software limit switch position negative’	Position	0	Incr	LREAL (8)	
1003	‘Acceleration’	Position	16666,66667	0.001 rev/s^2	LREAL (8)	
1004	‘Deceleration’	Position	16666,66667	0.001 rev/s^2	LREAL (8)	
1005	‘Acceleration jerk’	Position	166666,6667	0.001 rev/s^3	LREAL (8)	
1006	‘Deceleration jerk’	Position	166666,6667	0.001 rev/s^3	LREAL (8)	
1007	‘Emergency Stop ramp deceleration’	Position	0	0.001 rev/s^2	LREAL (8)	
1008	‘Emergency Stop ramp deceleration jerk’	Position	0	0.001 rev/s^3	LREAL (8)	
1009	'Torque threshold (positioning to fixed stop)'	Position	1000	0.1% M_N	INT (2)	
1010	‘Time to fixed stop’	Position	10	0.001 s	DINT (4)	
1011	'Switching position (positioning to fixed stop)'	Position	0	Incr	DINT (4)	Switching position is relative to target position
1012	'Switching velocity (positioning to fixed stop)'	Position	0	0.0001 rpm	LREAL (8)	Velocity from the switching position
1013	‘Window in position positive’	Position	1000	Incr	DINT (4)	
1014	‘Window in position negative’	Position	1000	Incr	DINT (4)	
1100	‘Speed ramp active’	Speed	1	-	BOOL (1)	0: inactive 1: active
1101	‘Speed ramp positive’	Speed	1000	0.001 s	DINT (4)	[3]
1102	‘Speed ramp negative’	Speed	1000	0.001 s	DINT (4)	[3]
1103	‘Speed ramp emergency stop’	Speed	100	0.001 s	DINT (4)	
1104	‘Speed ramp type’	Speed	2	-	DINT (4)	0: linear [3] 1: S ramp [4] 2: trapezoidal [5]
1105	'Jerk acceleration'	Speed	100	0.001 rev/s^3	LREAL (8)	
1106	'Jerk decelleration'	Speed	100	0.001 rev/s^3	LREAL (8)	
1107	'Jerk Emergency Stop'	Speed	10	0.001 rev/s^3	LREAL (8)	
1108	'Speed window'	Speed	50000,0	0.0001 rpm	LREAL (8)	
1200	‘Activate timeout’	Global	0	-	BOOL (1)	0: inactive 1: active
1201	‘Timeout time’	Global	1000	0.001 s	DINT (4)	
1300	‘Minimum command time’	Global	1	0.001 s	DINT (4)	

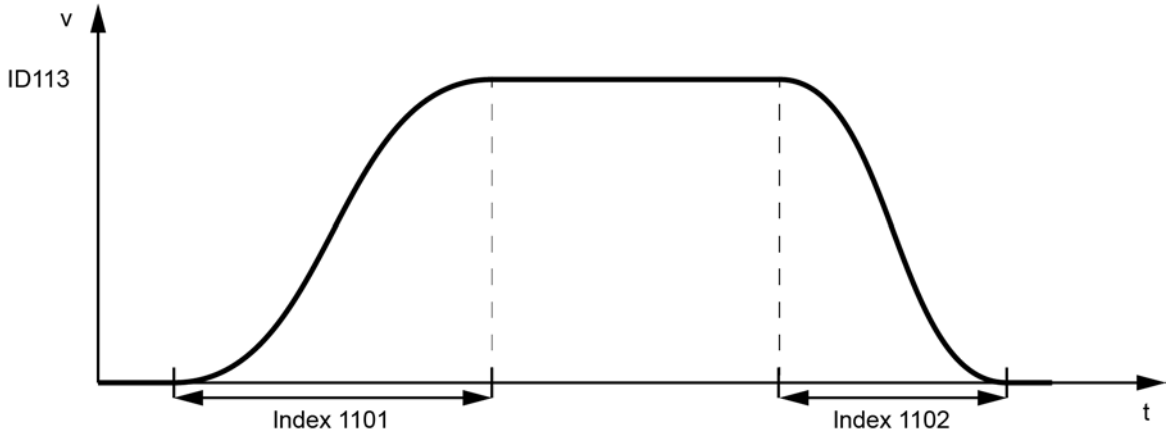
Index	Designation	Effective in operating mode	Default value	Unit [2]	Data type (no. of bytes)	Meaning
1400	'Reversal of direction of rotation'	Scaling	0	-	BOOL (1)	0: direction of rotation clockwise, looking at the motor shaft 1: direction of rotation counterclockwise, looking at the motor shaft
1401	'Gear(box) multiplier'	Scaling	1.0	-	LREAL (8)	
1402	'Gear(box) divisor'	Scaling	1.0	-	LREAL (8)	
1403	'Feed constant'	Scaling	ID116[1]	-	LREAL (8)	
1404	'Speed scaling multiplier'	Scaling	ID116[1]	-	LREAL (8)	
1405	'Speed scaling divisor'	Scaling	1.0	-	LREAL (8)	
1406	'Position scaling multiplier'	Scaling	1.0	-	LREAL (8)	
1407	'Position scaling divisor'	Scaling	1.0	-	LREAL (8)	
1408	'Torque scaling multiplier'	Scaling	1.0	-	LREAL (8)	
1409	'Torque scaling divisor'	Scaling	1.0	-	LREAL (8)	
1410	'Acceleration scaling multiplier'	Scaling	ID116[1]	-	LREAL (8)	
1411	'Acceleration scaling divisor'	Scaling	1.0	-	LREAL (8)	
1412	'Jerk scaling multiplier'	Scaling	ID116[1]	-	LREAL (8)	
1413	'Jerk scaling divisor'	Scaling	1.0	-	LREAL (8)	
1500	'Cycle counter'	Global	0		DINT (4)	
1501	'Motor serial number configured'	Global	0		DINT (4)	
1502	'Device serial number configured'	Global	0		DINT (4)	
1503	'Motor serial number monitoring'	Global	0		BOOL (1)	0: inactive 1: active
1504	'Device serial number monitoring'	Global	0		BOOL (1)	0: inactive 1: active
1550	'Torque limit positve'	Global	Value from ID82	0,1 $\%M_N$	LREAL (8)	
1551	'Torque limit negative'	Global	Value from ID83	0,1 $\%M_N$	LREAL (8)	
1552	'Speed limit positive'	Global	Value from ID38	0.0001 rpm	LREAL (8)	
1553	'Speed limit negative'	Global	Value from ID39	0.0001 rpm	LREAL (8)	

1) If no value is defined, AFI uses the value from ID116 in the basic system.
2) Scaling is valid for the default setting of the scaling parameters.

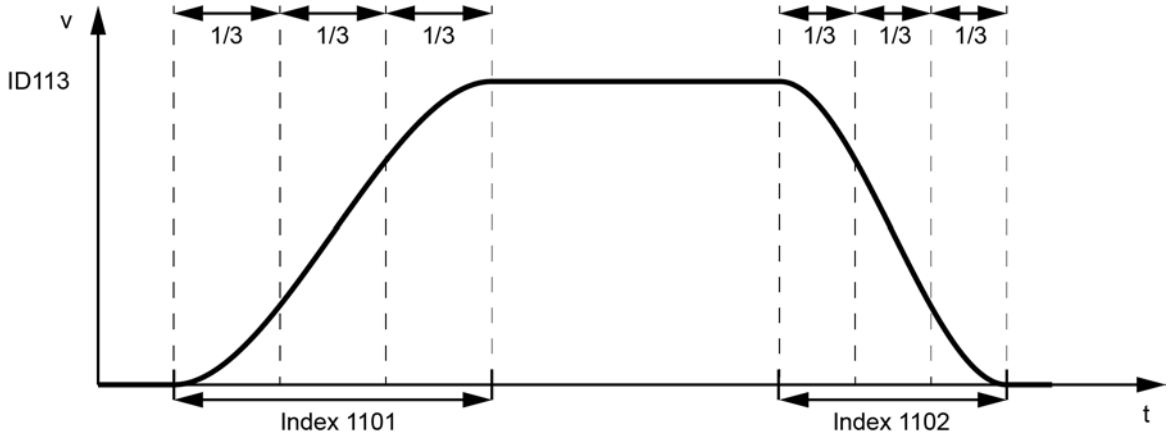
3)


v
ID113
Index 1101
Index 1102
t

4)


v
ID113
Index 1101
Index 1102
t

5)


v
ID113
1/3
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Index 1101
Index 1102
t

8 Application error

The application error number comprises the error range number and the error number. The error number indicates the error type, while the error range number provides information on the command or the cause leading to generation of the error.

Application error number = error range number + error number

Error range number

Error range number	Command
-	1000
100	RF status machine
1000	1001
2000	1002
3000	1003
4000	1004
5000	1005
6000	1006
7000	1007
8000	1008
9000	1009
10000	1010
11000	1011
12000	1012
13000	1013
14000	1014
25000	2000
18000	2001
35000	3000
36000	3001
37000	3002
38000	3003
39000	3004
40000	3005
43000	3006
44000	3007
47000	3008
48000	3009
29000	4000
46000	4001

Error number for error range number ≠ 0

Error number	Meaning
1	'Drive is not ready (SBM = 0)'
2	'DC bus not active (QUE = 0)'
3	'Drive is not in closed loop control (QRF = 0)'
4	'Output stage enable missing (QEF = 0) / STO active (STO = 1) '
5	'Setpoint greater than software limit switch'
6	'Setpoint smaller than software limit switch'
7	'Target position greater than software limit switch'
8	'Target position smaller than software limit switch'
9	‘Positioning velocity too high’

Error number	Meaning
10	‘Acceleration too low’
11	‘Acceleration too high’
12	‘Positioning velocity too low’
13	'No start position'
14	‘Torque limit too low’
15	'No value defined’
16	'Direction of rotation is turned during movement'
17	'Timeout in command'
18	'Timeout during switch-on of controller enable (RF)'
19	'Timeout during change of operating mode'
20	'Controller enable was not set (RF = 0)'
21	'Data 1 are outside the permissible range'
22	'Data 2 are outside the permissible range'
23	‘Data must not be ignored’
24	‘Fixed stop found too soon’
25	‘Fixed stop found too late’
26	‘Drive not in position’
27	‘Speed setpoint too high’
28	‘Invalid application parameter’
29	'Input software limit switch position positive < software limit switch position negative'
30	'Input software limit switch position negative < software limit switch position positive'
31	‘Invalid speed ramp type’
32	‘Invalid scaling parameters’
33	‘Homing cycle to fixed stop with single turn absolute encoder’
34	'Basic system acknowledgment QRF missing'
35	'Software limit switch position reached'
36	'Torque threshold for command 4001:' Reference point approach to fixed stop 'too large'

Example:
Command 3000 ‘Speed control’ generates the message 'Drive is not ready (SBM = 0)':
Error range number: Command 3000 has the error range number 35000.
Error number: 'Drive is not ready (SBM = 0)' has the error number 1.

Application error number = 35000 + 1 = 35001

Error number for error range number = 0

Error number	Meaning
1	'No valid command'
2	‘No valid command group’
3	'Impermissible command group, e. g. an 1xxx command was commanded on both channels'
4	'The current commanding may not be issued on another channel at the same time as the already active command'
5	'Channel is occupied'
6	‘No command with override function active’
7	'Command cannot be issued as command with override function'
8	'The maximum number of commands is exceeded (internal PLC software error)'
9	'Current "Stop" or "Cancel" is active at Start command'

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With our documentation we want to offer you the highest quality support in handling the AMKmotion products.
That is why we are now working on optimizing our documentation.
Your comments or suggestions are always of interest to us.
We would be grateful if you take a bit of time and answer our questions. Please return a copy of this page to us.

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or
fax no.: +49 7021/50 05-199

Thank you for your assistance.
Your AMKmotion documentation team

1. How would you rate the layout of our AMKmotion documentation?

   (1) very good (2) good (3) satisfactory (4) less than satisfactory (5) poor

2. Is the content structured well?

   (1) very good (2) good (3) moderate (4) hardly (5) not at all

3. How easy is it to understand the documentation?

   (1) very easy (2) easy (3) moderately easy (4) difficult (5) extremely difficult

4. Did you miss any topics in the documentation?

   (1) no (2) if yes, which ones:

5. How would you rate the overall service at AMKmotion?

   (1) very good (2) good (3) satisfactory (4) less than satisfactory (5) poor

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