AMKASYN
AMKmotion Field Bus Protocol AFP for KU and KE/KW drive systems (from Kx-R02)

Version: 2023/25
Part no.: 27872

Translation of the "Original Dokumentation"

AMKmotion

MEMBER OF THE ARBURG FAMILY

Notes on this document

Name: PDK_027872_KUKW_AFP_en

Actual version: 2023/25

Firmware Version	Hardware Version	Letter symbol

What has changed:

Version	Change	Letter symbol
2009/19	Command overview, service commands marked	Bls
2019/04	Correction of the designation Control word to Status word in Data structure AFP output data	STL
2023/25	AMKmotion design	LeS

Reservation: We reserve the right to modify the content of the documentation as well as the delivery options for the product.

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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 Abbreviations

AB	Output byte
AFP	AMK field bus protocol
ARCNET	Communication network
AW	AMKASYN inverter module
AZ-PSx	AMKASYN option card for implementing the PS functions
B / W / D	Byte / word / double word
BA	Operating mode
BTG	AFP signal: Command toggle bit
CAN	Communication Area Network
Datum16i	AFP signal: 16-bit input value
Datum16o	AFP signal: 16-bit output value
Datum32i	AFP signal: 32-bit input value
Datum32o	AFP signal: 32-bit output value
DB	Data block
dez/udez	Decimal (with sign) / decimal (without sign)
DR/DL	Data word right/left byte
DTH	Data management
DW	Data word
E / A / M	Input/output flag
EEPROM	Electrical erasable programmable read only memory
FB	Function block
FBUS	Internal field bus interface
FFFFh	Hexadecimal notation for 65535
Fkt.	Function
I/O	Input/Output
ID	Ident number: Parameter of the basic system
Inkr	Increment
INTERBUS-S	Field bus system
IW16 / IW32	AMKASYN 16/32 bit actual value
KMD	Commanding
KU / KW	Compact converter
lb / hb	Less significant / more significant byte
lw / hw	Less significant / more significant word
LON	Bus system
lw / hw	Less significant/more significant word
MB	Flag byte
n	Speed, AFP channel number
OB	Organization block
PROFIBUS	Field bus system
PS	Programmable control
Q_BTG	AFP signal: Command toggle acknowledgement
Q_CODE	AFP signal: Command code acknowledgement
Q_ERR	AFP signal: Error acknowledgement
Q_RF	AFP signal: Controller enable acknowledgement
Q_SELECT	AFP signal: Channel select acknowledgement (Q_SEL0, .., Q_SEL3)
Q_SELx	AFP signal: Channel select0 acknowledgement, channel select3 acknowledgement

RD	Read
RF	Controller enable
SBT/SBM	Ready to collect
SELECT	Channel select (Q_SEL0, .., Q_SEL3)
SELx	Channel select0, .., channel select3
SERCOS	Serial data link for real-time communication between controls and drives
SF	Fast function
WR	Write

2 Overview

2.1 Functions

The AFP interface guarantees simple and standardized access to the AMKASYN drive functionality. Typical functions such as the following can be implemented with the AFP interface:

- Inverter On RF control,
- Diagnostics and error handling,
- Observing real-time bits for process control,
- cyclic setpoint setting [t ≥ 5ms],
- cyclic actual value analyses [t ≥ 1ms],
- Reading and writing parameters,
- temp. data change
- Drive commanding
  - Operating mode change
  - Speed control
  - Homing cycle
  - Positioning,
  - Synchronization of coupled axes,
  - Value changes in the process, ...

As common reference between the different bus systems:

- PROFIBUS,
- CAN

the AFP interface defines a data structure of 8 bytes useful data in the transmission and also in reception direction.

Transmitted AFP commands are aquired on the n x 5ms time base (for PROFIBUS n=1).

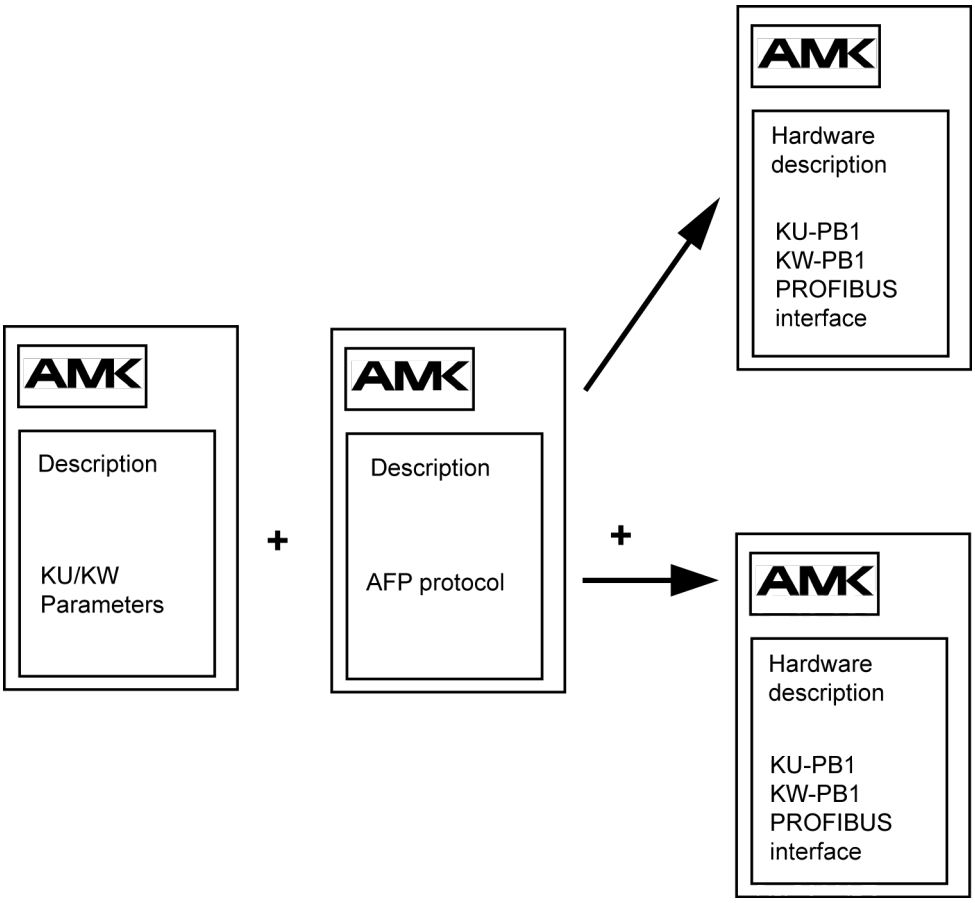
Higher level control systems can be coupled simply and inexpensively with the same user program through the different bus systems to AMKASYN.

The AFP handshake mechanisms guarantee data-consistent transmission in both directions.

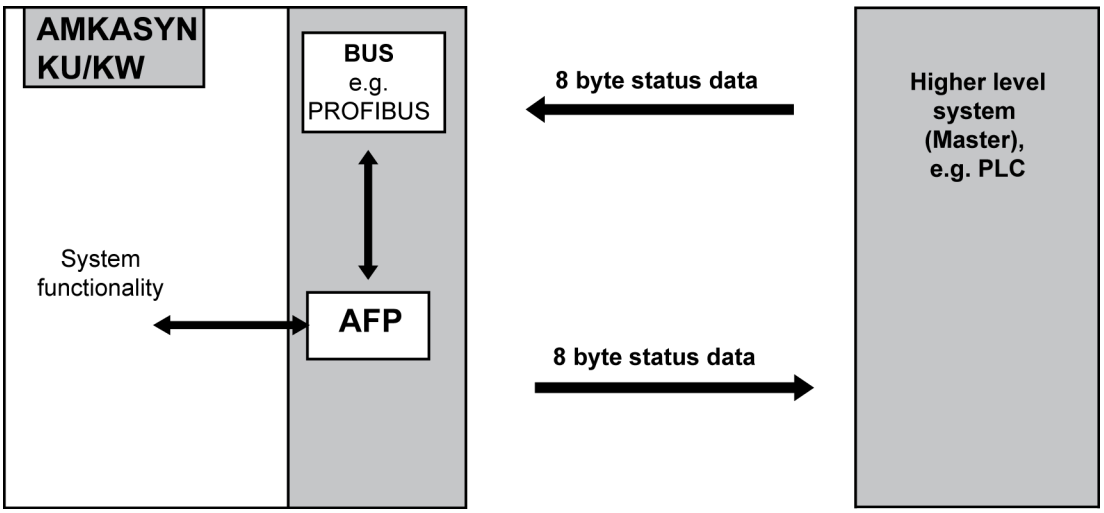
2.2 Documentation

The description of the interface comprises the structure of the transmitted data, their information contents and the exchange protocol. The physical specification is described in the hardware description of the relevant option card and is enclosed with the delivery.

The documentation necessary for commissioning and for complete parameterization is apparent from the following diagram.



2.3 AFP Communication structure



Communication interface through AFP

2.4 Time response

The time required by the user for recognition of the acknowledgement signals depends essentially upon the physics and the topology of the bus system as well as on the cycle time of the bus master.

The execution time of the commands in the AMKASYN system is different in principle.
The commands from the master via the 8 byte control data are processed in the system after they are acquired there (detection of the command toggle bit BTG change) on the T = n x 5ms time base (for PROFIBUS n=1).
The input data present at this time are then taken over by the drive.
It is the task of the master to ensure consistent data transmission.

A command which is active in the drive system (process) is acknowledged at the latest 5 ms after command transfer by the acknowledgement bit Q_CODE = 1 and thus indicates the current action. The end of the process initiated by the command is indicated by Q_CODE=0.

The 8 bytes status and control data must be absolutely transmitted bidirectionally with data consistency per transmission cycle between AFP transmitter and AFP receiver.

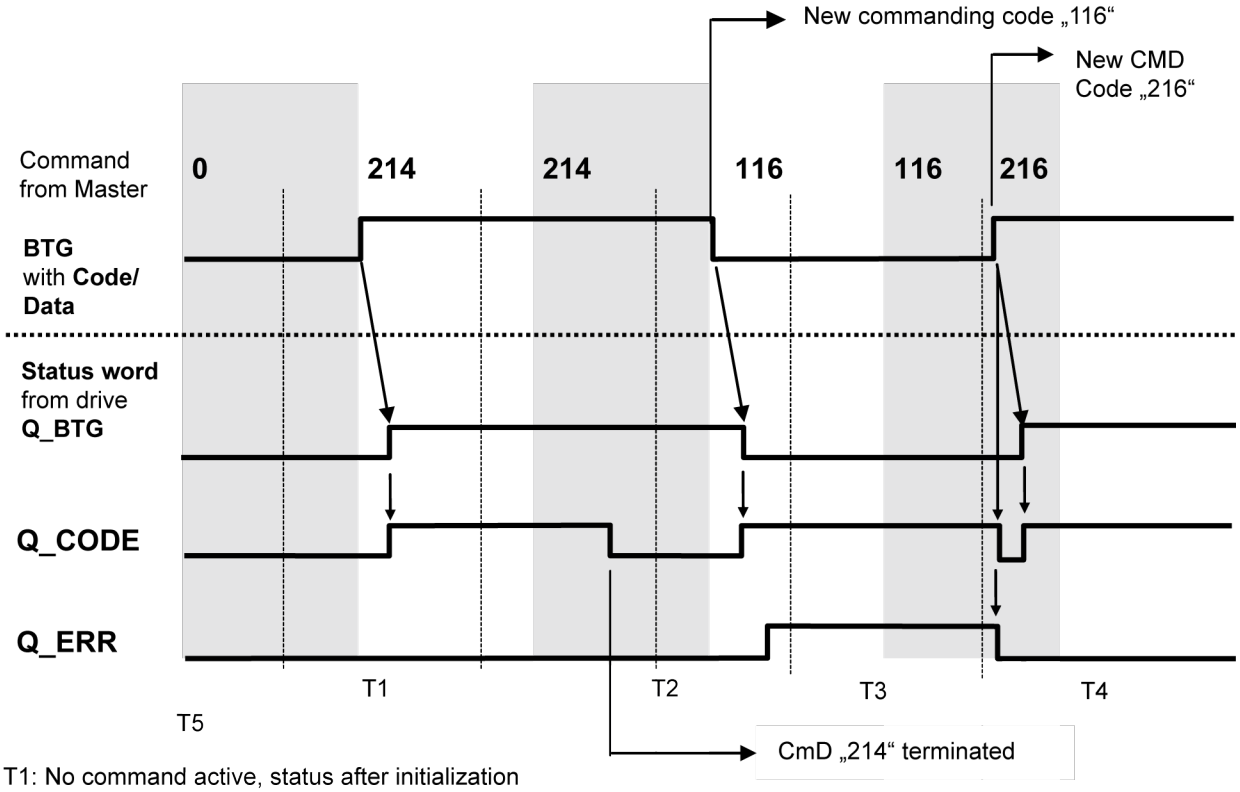
The time of the real command execution in the drive (e.g. spindle positioning) can be controlled additionally by the control system through the field bus status channel by means of real-time bit messages correlating to the function (e.g. "IN POSITION" or "Drive function active").

3 Data transmission

3.1 Master → Slave data transfer

The correct processing of the command sequences and the evaluation of the command acknowledgement absolutely necessary for a correct process is prerequisite for trouble-free operation.
Each command change by the master (e.g. 0 → “214”) must be identified by the change of the command toggle bit BTG and causes the command to be executed in the drive. The clear command assignment to the last transmitted command is always possible from the viewpoint of the master by reading the acknowledgement Q_BTG. The transmission of each COMMAND is thus described at any arbitrary time in the master by means of Q_BTG. Protocol time shifts and incorrect status interpretations are thus excluded. The master must note the last valid command and in addition monitor the execution possibly by means of timeouts.

Example for Data Master/Slave

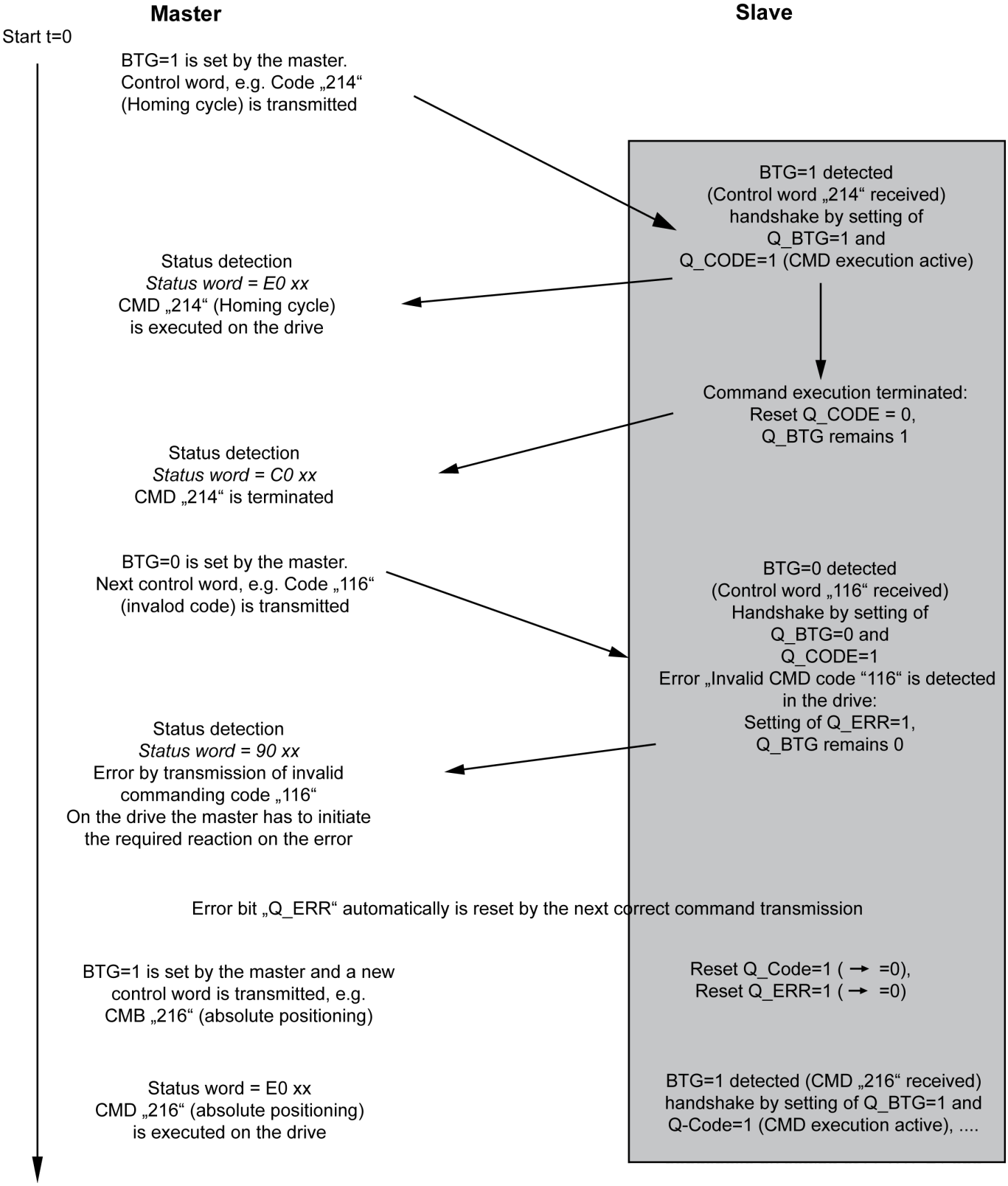


T1: No command active, status after initialization
T2: Command „214“ active
T3: No error, Command „214“ terminated and acknowledged by Q_CODE = 0
T4: Invalid command „116“ detedted, error bit is set: Q_ERR = 1
T5: New command „216“

The following apply basically:

- A change of the command toggle bit "BTG" is permissible only if Q_BTG = BTG.
- The input data must be completely available before "BTG" is toggled.
- The output data are valid with the corresponding toggling of Q_BTG.
- Every valid command resets the error status bit Q_ERR to Q_ERR = 0. The user is responsible for evaluating the cause of an error with Q_ERR = 1.
- The command is executed with Q_CODE = 0 (e.g.: switching over to speed control).

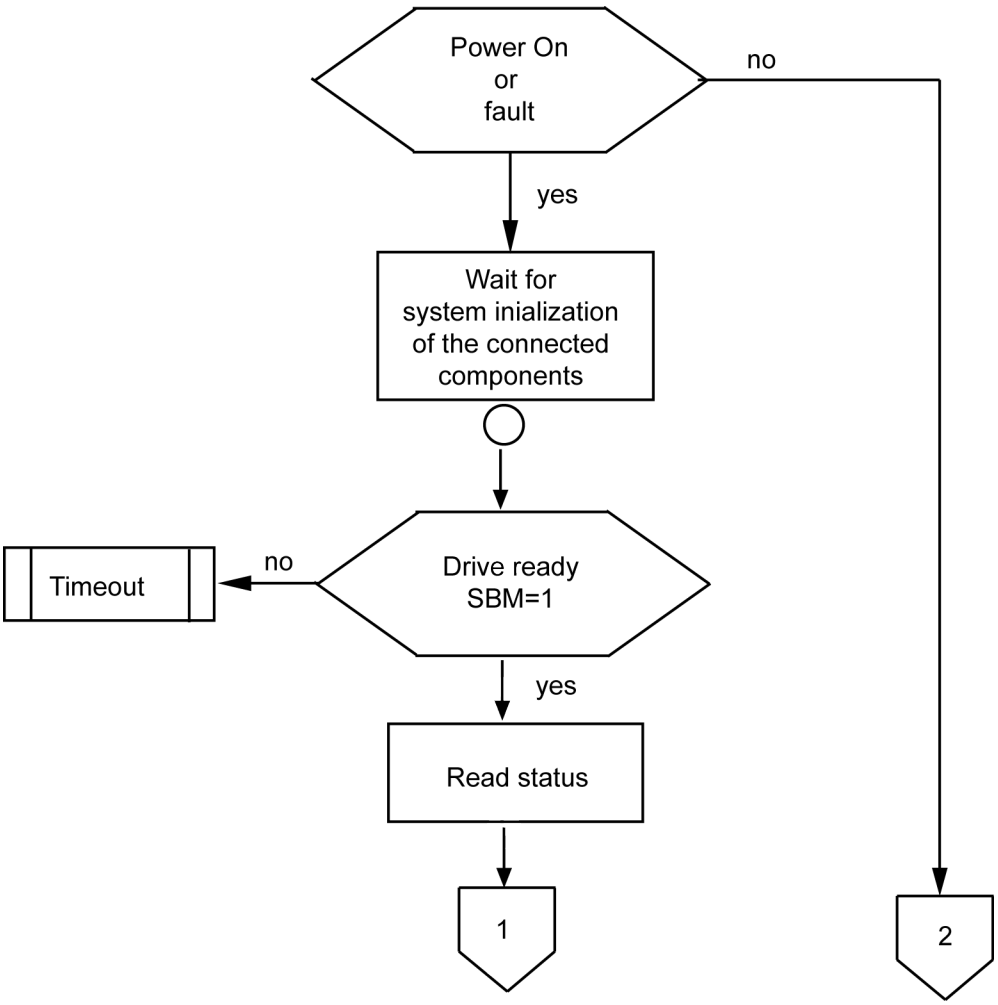
3.2 Master/Slave process sequence



3.3 Task control from viewpoint of the master

3.3.1 Synchronization

Before a first commanding after Power On or after faults, the status must be enquired by the master. Thus the first command can be sent with negated command toggle bit BTG. The following flow diagram shows the basic sequence:

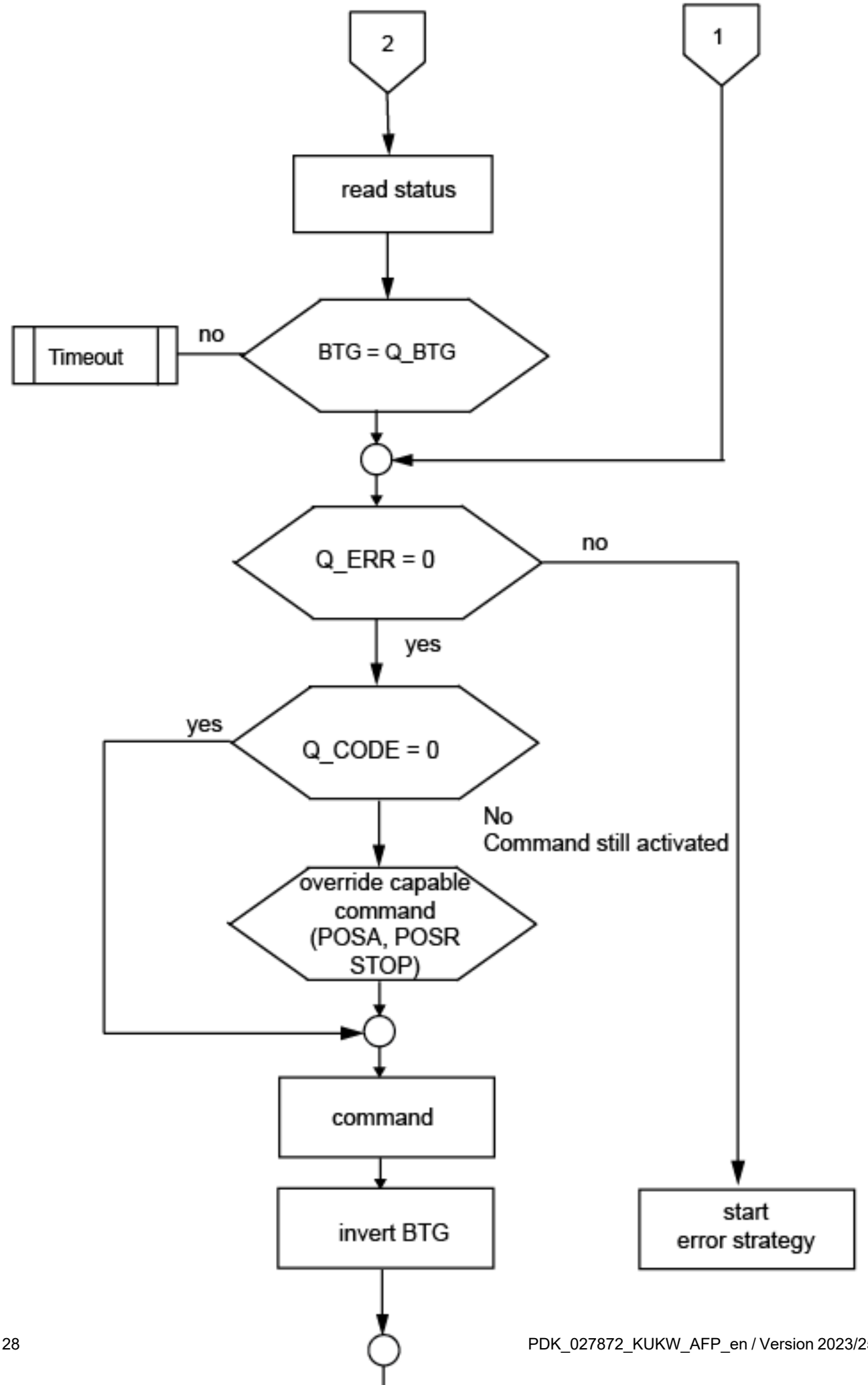


3.3.2 Command execution and monitoring

Before each new command, the master must check the system status in the form of a status check. A new command may be initiated and the command toggle bit changed only after command confirmation by:

- BTG = Q_BTG and (Confirmation of the received command by the slave)
- Q_CODE = 0 and (no command active)
  The commands “NULL”, “BREAK”; “POSA”, “POSR”, “STOP”, “IPOHALT” also can be transmitted with Q_CODE = 1
- Q_ERR = 0 (no error). With Q_ERR = 1 a new command transmission is also permissible. Q_ERR then automatically is reset.

The following simple sequence (poll status) is suitable from the viewpoint of the master:


2
1
read status
Timeout
no
BTG = Q_BTG
Q_ERR = 0
no
yes
yes
Q_CODE = 0
No
Command still activated
override capable command (POSA, POSR STOP)
command
invert BTG
start error strategy

4 Data structure

The statement "Input or output" refers to the AMKASYN system.

! The least significant word is word 1, the most significant word is word 4.

4.1 AFP input data

- Control word	(word 1)	low Byte:	**command byte**
		high Byte:	**control bits**
- Datum16i	(word 2)		**e.g. setpoint**
- Datum32i	(word 3/4)		**e.g. setpoint**

Control word (high byte) control bits								Control word (low byte) command byte
RF	BTG	D32	D16	res				
15	14	13	12	11	10	9	8	0...7
Datum16i e.g. 16 bit-setpoint								
Datum32i (low word)								
Datum32i (high word) e.g. 32 bit-setpoint								

4.1.1 Control word

The real-time control bits bit 15 (RF controller enable) and bit 14 (command toggle bit BTG) are permanently assigned in the high byte of the control word, the control bits 11..8 are reserved. They serve for checking the data flow and as periodized process control variables. Acknowledgement to control bits takes place through the corresponding status bits in the status word (bit 15 controller enable acknowledgement, bit 14 command toggle bit acknowledgement).

Bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Meaning	RF	BTG	D32	D16	res	res	res	res

RF RFInverter On signal
edge-selective 0->1 RF switch-on, must always be reset on error deletion. If the controller enable (RF=1) is activated, then the drive is energized. The Inverter On acknowledgement signal (Q_RF=1) indicates that the drive is under control. The field bus can be configured as source for the Inverter On signal by means of the parameter ID32796 "Inverter On source".

BTG Command toggle bit
identifies a new command by changing the signal level: 0 → 1 or 1 → 0. The command toggle bit acknowledgement in the status confirms to the user the acceptance of the transmitted command. At each new command, the BTG must be changed necessarily by the higher ranking controller (e. g. PLC) and the system reaction in the status (Q_BTG) must be assessed related to the command.

D32 32 bit setpoint setting
0: 32 bit setpoint must also be sent through AFP.
1: 32 bit setpoint is taken from the relevant parameters in the unit.

D16 16 bit setpoint setting
0: 16 bit setpoint must also be sent through AFP.
1: 16 bit setpoint is taken from the relevant parameters in the unit.

res **reserved = 0**

4.1.2 Command byte

In the low byte of the control word (command byte), up to 255 commands (functions) excluding one another in time can be handled very simply.

- Cancellation and start of functions
- Read parameters
- Write parameters

- Read errors
- Delete errors
- Drive commanding
- Operating mode change
- Speed control
- Homing cycle
- Positioning
- Synchronization of coupled axes
- Value changes in the process (override), ...
- (Cyclical setpoint setting, only for processes with low dynamic demands [t >= 5ms])
- Cyclical actual value analysis
- System modification (online)
- Change of the actual value channels
- Change of the setpoint channels
- Temporary parameter change
- etc.

Drive commanding is triggered for instance internally by changing the command toggle bit BTG. The current command execution must be monitored by the master by means of the command code acknowledgement Q_CODE. The execution of the command becomes unequivocal by:

Command active	Q_CODE=1
Command inactive	Q_CODE=0 (command executed)

Each still active command (Q_CODE = 1) can always be interrupted by means of the high priority BREAK command. Within the drive all processes are ended individually with regard to the current command setting and a defined basic state is attained.

List data (e.g. read / write parameters) are block data. The transmission of a data block may not be interrupted by other commands, since otherwise the data block is identified as invalid. Writing list data must be concluded by the end identifier "Element No. = ffffh" (activation of the data as block).

4.2 AFP output data

- Status word (word 1) low Byte: **freely configurable status bits**
  high Byte: **fixed status bits**
- Datum16o (word 2) **e.g. actual value**
- Datum32o (word 3/4) **e.g. actual value**

Status word (high byte)								Status word (low byte)							
Q_	Q_	Q_	Q_					(user configurable, s. ID34029)							
RF	BTG	CODE	ERR	res	res	res	res								
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Datum16o e.g. 16-bit actual value															
Datum32o (low word)															
Datum32o (high word) e.g. 32-bit actual value															

4.2.1 Status word

The acknowledgement bits of the individual processes are transmitted in the 16 bit status word. The user can thus monitor actively the processes he has initiated. The current status always refers to the last command and can be assigned clearly through the command toggle bit.

Fixed and user configurable status bits are available in the status word of the AFP interface.

Structure of the fixed status bits in the high byte of the status word

Bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**
Meaning	Q_RF	Q_BTG	Q_CODE	Q_ERR	res.	res.	res	res

Q_RF Inverter On acknowledgement (Q_RF=1, drive under control).

Q_BTG	Command toggle acknowledgement, if the command is recognized by the system, Q_BTG is set = BTG inside the system (command toggle echo)
Q_CODE	State of the command execution:
Q_CODE=1	Command is active (in execution),
Q_CODE=0	Command execution is completed.
Q_ERR	Commanding error bit: Q_ERR=0 the command is permissible, Q_ERR=1 the command can't be executed (e.g. command timing error,/invalid commanding code, …)

The status bits 15...12 are fixed by the system and are always transmitted. They must be evaluated mandatorily by the higher ranking control system for clear process control.

The status bits 11...8. are reserved and not configurable.

System variables such as "$N_{act} = N_{set}$" or "IN POSITION" can be evaluated by the user for additional analyses. The user configurable status bits 7...0 are defined in the AMKASYN inverter by ID34029.

Each new command is acknowledged by the system by the status bit „Q_BTG“ (command toggle acknowledgement).

The error bit "Q_ERR" is set in the case of an error e.g. on an inadmissible order.

In the case of value change to current processes (override, e.g. absolute positioning with change of the reference speed), a clear command assignment is always possible by means of BTG / Q_BTG. Q_CODE remains active until the drive has reached its position.

General system error states (SBM=0, System Ready message missing) must be monitored by the master through a user configurable status bit in ID34029 or directly through the SBM binary output on the basic unit.

If command sequences using acknowledgement data in the status area are used (e.g. "Read error", error No. is transferred in the Datum16o channel), then the previously defined areas for cyclic display variables , for instance, are overwritten.

Automatic switching back to previously transferred actual values "16 bit actual value” or “32 bit actual value" does not take place.

The “ANZ” command without transmission of new parameters (16 bit actual value 16i = 0 and
32 bit actual value 32i = 0) reactivates the last settings made by parameters e.g. for transmission of the actual speed or actual torque value.

4.2.2 Acknowledgement bits

8 user configurable status bits (process acknowledgement bits) can be assigned to the status word by means of list ID 34029 "BUS status bits" (8 words). Status bit 0 corresponds to the first useful data entry in ID34029. The contents of ID 34029 correspond to the codes of the "Binary outputs assignment" corresponding to the valid parameter description. The list elements 0 and 1 are internally used by the system. They define the length of the list in bytes and may not be written by the user.

Example: Configuration ID34029, (useful data as from list element 2)

List element	0	1	**2**	**3**	**4**	5	6	7	8	9
Contents	20	20	**33029**	**330**	**336**	...				
Meaning	Length	Length	**SBM**	**N_{act} =N_{set}**	**In Position**	...				
Status bit			**0**	**1**	**2**	3	4	5	6	7

Starting from list element 2, 8 bit messages can be entered in ID 34029 corresponding to the following list. It is recommended that element 2 is always occupied with SBM = Code 33029.

Some process acknowledgement bits are shown as excerpts for a better overview.

Code	Bit message	Remarks
308	angle synchronous	ID228 Angle synchronous window
310	Utilization	50% Load limit integral
330	$n_{act} = n_{set}$	ID157 Speed window
331	$n_{act} < n_{min}$	ID124 Standstill window
332	$n_{act} < n_x$	ID125 Speed threshold n_x
333	$M_d \geq M_{dx}$	ID126 Speed threshold M_{dx}
334	$M_{set} \geq M_{limit}$	ID82/83 pos./neg. torque limit
335	$n_{set} \geq n_{limit}$	ID38/39 pos./neg. limit speed
336	"In Position"	ID57 Position window

Code	Bit message	Remarks
337	$P_{act} \geq P_x$	ID158 Power threshold P_x
33014	speed synchronous	ID32952 At synchronous speed window
33015	x i ≥ +Soft-End	ID49 positive software limit
33016	Warning inverter overcurrent	
33018	Warning motor overtemperature	
33022	Warn. overtemperature ext. comp.	External component, brake resistor
33029	SBM, SBT	System ready message
33030	QUE	Inverter on acknowledgement
33031	QRF	Inverter On acknowledgement
33032	RF	Inverter On
33034	KMD active	Drive function in execution
33035	IPO active	Interpolation is active
33036	RFP known	Axis referenced
33048	Residual distance was deleted	ID32922 Residual distance delete window
33074	Warning active	Drive in warning state, RF remains active

4.2.3 Access to instanced parameters

AMKASYN units which support simultaneously different field bus interfaces must facilitate interface-related parameter setting. Each interface represents an instance and is described by the instanceable parameters of the “Communication parameters” group.

Instance-related parameters are always GLOBAL and thus valid for all parameter sets.

Parameter accesses through AFP facilitate e.g. the “Read DTH” (Code 6) and “Write DTH” (Code 7) commands. The ID number to be read or written is provided in the 16 bit setpoint.

According to SERCOS standard the 16 bit ID No. is composed as follows:

zyyy xxxx xxxx xxxx		LSB
x:	SERCOS Standard-ID-No. ID1 ... ID4095 Manufacturer specific ID-No. from ID32768 ...	(for z = 0) (for z = 1)
y:	Parameter set number or Instance 0...7	

„yyy“ according to SERCOS standard can be used to address a parameter set or an Instance.

Selection of an Instance via the direct AFP command „Read / Write Parameters”:

- The “Instance value yyy” must be taken over into the desired ID-No.
- Commanding of the AFP code for „Read / Write Parameters“ with the newly calculated value for the ID-No. as 16 bit setpoint,

Example:

ID34026 „BUSMODUS-Attribute“ in Instance 1 shall be accessed.

	LSB	
	z y y y x x x x x x x x x x x x	
34026 →	1 0 0 0 0 1 0 0 1 1 1 0 1 0 1 0	
Instance 1	+ 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0	
	1 0 0 1 0 1 0 0 1 1 1 0 1 0 1 0	→ 94EA hex→ 38122

By commanding of the AFP code for „Read / Write Parameters“ with value „38122“ as 16 bit setpoint ID34026 in Instance 1 is addressed.

General information on parameter changes in different parameter sets:

Beside the present procedure that the alternative parameter set first had to be activated before a parameter there could be changed now the possibility exists to take over the parameter set number (“yyy”) into the desired ID-No. (see above).
The desired ID-No. in the alternative parameter set then is addressed by calling up an ID-No. under the newly calculated value.

5 Commands

The type of commands is basically classified into the following code groups for the purpose of a better overview:

Code	Type of commands
0...63	General functions for use in the time uncritical demand data channel, e.g. read/write parameters, ...
64...195	reserved
196...255	Movement-oriented functions such as spindle positioning, homing cycle...

5.1 Command overview

Abbreviations used:

B_	Command
*	Command is described in more detail in the "Further information" chapter
DTH	Data management (parameters)
XX	is not used, must be initialized with 0 !
Attribute	SERCOS attribute high word, serves for interpretation of the data (e.g. with or without sign, 16 or 32bit, ...)
Element	Number of the current data element in a block transfer, 0...n

Control data to the drive (commands and setpoints)				Status data from the drive (resulting acknowledgement bits and actual values)			
Code	**Command**	**Datum16i**	**Datum32i**	**Acknowl.**	**Datum16o**	**Datum32o**	**Remarks**
0	**NULL**	XX	XX	Q_CODE	XX	XX	The command influences control bits without triggering an active function, e.g. for RF change or life monitoring
1	**BREAK**	XX	XX	Q_CODE	XX	XX	Breaks off a running AFP command (identified by Q_CODE=1) and restores the basic status for new authorization of the system. A running command (e.g. absolute positioning) is transformed automatically into the STOP function and the axis is stopped in the speed control mode with n=0.
2	**LOGIN**	XX	XX	Q_CODE	XX	XX	With the LOGIN command the field bus acquires the unrestricted use of the system through the one-dimensional commanding interface. I.e. the interface is blocked for all further users (KMD through operator panel or SBUS). Attempts of not authorized subscribers to use the interface are acknowledged with error.
3	**LOGOUT**	XX	XX	Q_CODE	XX	XX	LOGOUT releases the commanding interface for all users again, BUS transfers the system control

Control data to the drive (commands and setpoints)				Status data from the drive (resulting acknowledgement bits and actual values)			
Code	**Command**	**Datum16i**	**Datum32i**	**Acknowl.**	**Datum16o**	**Datum32o**	**Remarks**
4	**CLRERR**	XX	XX	Q_CODE SBM	XX	XX	Delete errors
5	**RDERR**	Element (Event No.)	XX	Q_CODE	Error No. e.g. 2311	lw: additional info hw: error code	Read error number Event No.: 0…9
6	**RDDATA**	ID No.	XX	Q_CODE	Attribute according to SERCOS	Value	Read parameters from the system data management
7	**WRDATA**	ID No.	Datum	Q_CODE	XX	XX	Write parameters into the system data management
8	**RDBLK**	ID No	lw: Element hw: xx	Q_CODE	Attribute according to SERCOS	Value	Read list parameters from the data management
9	**WRBLK**	ID No (List)	lw: Element (Element = ffffh, data transf. to the par. EEPROM) hw value	Q_CODE	XX	XX	Write list parameters into the data management (write permanently into parallel EEPROM) Element 0 = current list length Element 1 = maximum list length Element x = ffffh, data acceptance, complete function
10 ah	**WRBLKT**	ID No (List)	lw: Element Element = ffffh, data transf. into the active control hw: value	Q_CODE	XX	XX	Temporarily write list in the data management (data only in the RAM) Element 0 and 1 = list head Element x =ffffh transfer of the data into the active control
11 bh	**TMP**	ID No according to list ID270	Value	Q_CODE	XX	XX	Tmp. (online) data change, possible for parameters of the list ID270

Control data to the drive (commands and setpoints)				Status data from the drive (resulting acknowledgement bits and actual values)			
Code	**Command**	**Datum16i**	**Datum32i**	**Acknowl.**	**Datum16o**	**Datum32o**	**Remarks**
12 ch	**ANZ**	xx	lw= 0 or Code s. ID32785, ID32786 hw: allocation	Q_CODE	Actual value 16 IW16	Actual value 32 IW32 or lw: IW16_2 hw: IW16_3	Allocation of feedback magnitudes (e.g. actual values). The source of the return according to ID32785 or ID32786 is selected in the low word (Datum32i). The feedback is in the Datum16o and Datum32o and is updated by status freshening. Theme: Extended functions Allocation: 0 – old allocation IW16, IW32 1 – new IW16 2 – new IW16_2 3 – new IW16_3 4 – new IW32 128 – special IW dancer controller
12 ch	ANZ Example updated display dancer controller	xx	lw = 0 hw =128	Q_CODE	IW16	IW16_2	Theme: Extended functions Example: Updating the dancer controller display IW16: Dancer actual value ± 10V [0.1V] Source: filtered analog value from PID controller Istdzl (actual speed) [rpm] IW16_2: M_{ist} [0.1%M_N] Code 84 must stand in ID32785) IW16_3:
13 dh	**RDSINCOS**	Encoder code (E-code)	XX	Q_CODE	XX	Absolute value of the encoder position coordinates [incr]	Read absolute encoder value from E-code 0: Actual position encoder T type encoder E-code 2: S type encoder E-code 7: Resolver E-code 8:E/F type encoder (EnDat) E-code A: → Encder code E-code
14 eh	**WRSINCOS**	XX	Absolute value of the encoder position coordinates [incr.]	Q_CODE	XX	XX	Write absolute value of the encoder (SINCOS)
15 fh	**SOLL16**	Setpoint 1	XX	Q_CODE	XX	XX	Theme: Extended functions 16bit field bus setpoint source (SW16_1)

Control data to the drive (commands and setpoints)				Status data from the drive (resulting acknowledgement bits and actual values)			
Code	**Command**	**Datum16i**	**Datum32i**	**Acknowl.**	**Datum16o**	**Datum32o**	**Remarks**
1610h	**SOLL32**	XX	Setpoint 2	Q_CODE	XX	XX	Theme: Extended functions 32bit field bus setpoint source (SW32)
17 11h	**SOLL2**	Setpoint 1	Setpoint 2	Q_CODE	XX	XX	Theme: Extended functions 16bit setpoint +32bit field bus setpoint source (SW16_1 and SW32)
18 12h	**SOLL3**	SW16_1	lw: SW16_2 hw: SW16_3	Q_CODE	XX	XX	Theme: Extended functions Three 16bit field bus setpoint sources
19 13h	**SOLLT**	SW16_1 Dancer setp. +-10V, [0.1V]	SW16_2 lw: Solldrz [rpm] SW16_3 hw: Mset [0.1%Mn]	Q_CODE	XX	XX	Theme: Extended functions Three 16bit dancer controller setpoints (field bus source) SW16_1: Dancer setpoint ±10V [0.1V] Set speed [rpm] SW16_2:M_{sol} [0.1%M_N] SW16_3:
20 14h	**SWQ1**	16 Bit Position setpoint	XX	Q_CODE	XX	XX	The standard setpoint source 16bit SWQ1, The 16bit setpoint [Incr.] is entered in the internal position setpoint interface. (Only in position control!)
21 15h	**SWQ2**	XX	32 Bit Main setpoint according to ID32800... torque, speed, position	Q_CODE	XX	XX	Standard setpoint source 32bit SWQ2, setpoint interpretation according to operating mode 32800... (torque, speed or position setpoint) The 32bit setpoint is entered in the internal 32bit setpoint interface, e.g. speeds [0.0001 rpm] for speed control absolute position setpoints [incr.] for position control
22 16h	**UE**	0: UE OFF 1: UE ON	XX	Q_CODE QUE	XX	XX	UE (DC BUS enable) for KU units with main contactor / KE
23 17h	**XIADD**	XX	Value to add to the current position feedback value	Q_CODE	XX	XX	Shift position feedback coordinates
25 19h	**RDSOFT**	XX	XX	Q_CODE	Code e.g. current value	lw: week/ year hw: version e.g. 5104	Read operating system software version

Control data to the drive (commands and setpoints)				Status data from the drive (resulting acknowledgement bits and actual values)			
Code	**Command**	**Datum16i**	**Datum32i**	**Acknowl.**	**Datum16o**	**Datum32o**	**Remarks**
26 1ah	**RDIO**	Port address according to parameter document. see ID32846	XX	Q_CODE	lb: Contents byte hb: 0	XX	Reading binary input/output ports according to port address, refer to parameter documentation ID32846...
27 1bh	**WRIO**	Port address according to parameter document. see ID32846.	lb: output byte	Q_CODE	XX	XX	Writing binary input/output ports according to port address, refer to parameter documentation ID32846...
28 1ch	**RDTMP**	ID-No. from list ID270	XX	Q_CODE	Attribute according to SERCOS	Value	Read temporary parameter value (data from RAM)
29 1dh	**RDBLKT**	ID-No.	lw: Element	Q_CODE	Attribute acc. to SERCOS	16bit value	Read element from temporary parameter list (data from RAM)
...	**res**						
196 c4h	**RDXSOLL**	XX	XX	Q_CODE	XX	Current position setpoint [increment]	Reading current position setpoint
197 c5h	**res**	XX	XX	Q_CODE	XX	XX	
198 c6h	**SYSHL**	XX	XX	Q_CODE	XX	XX	System booting (only if Inverter On RF is not active)
199 c7h	**res**	XX	XX	Q_CODE	XX	XX	
200 c8h	**BAW0**	D16 [2)]ID32924	Main setpoint	Q_CODE	XX	XX	Operating mode change to main op. mode according to ID32800. The interpretation of the main setpoint depends upon the selected operating mode: Position control [Incr.] Speed control [0.0001 rpm] Torque control [0.1%M_N].
201 c9h	**BAW1**	D16 [2)]	Main setpoint	Q_CODE	XX	XX	Operating mode change according to secondary operating mode 1 ID32801 See also BAW0
202	**BAW2**	D16 [2)]	Main setpoint	Q_CODE	XX	XX	Operating mode change according to secondary operating mode 2 ID32802 See also BAW0
203	**BAW3**	D16 [2)]	Main setpoint	Q_CODE	XX	XX	Operating mode change according to secondary operating mode 3 ID32803 See also BAW0
204	**BAW4**	D16 [2)]	Main setpoint	Q_CODE	XX	XX	Operating mode change according to secondary operating mode 4 ID32804 See also BAW0

Control data to the drive (commands and setpoints)				Status data from the drive (resulting acknowledgement bits and actual values)			
Code	**Command**	**Datum16i**	**Datum32i**	**Acknowl.**	**Datum16o**	**Datum32o**	**Remarks**
205	**BAW5**	D16 [2)]	Main setpoint	Q_CODE	XX	XX	Operating mode change according to secondary operating mode 5 ID32805 See also BAW0
206.. 210	reserved						
211 d3h	**PARSW**	Parameter set 0...3	XX	Q_CODE	XX	XX	Parameter set change coded according to ID32813, becomes effective only after RF OFF / ON
212 d4h	**MOM**	Setpoint [0.1% M_N] 1000=100% D16: ID80	XX	Q_CODE	XX	XX	Torque control M limitation according to ID82/ ID83
213 d5h	**DZR**	XX	Setpoint [0.0001 rpm] 1000-> 1 rpm D32: ID36	Q_CODE $n_{ist}=n_{soll}$	XX	XX	Speed control Speed ramps according to ID32780/ ID32781 Speed limits according to ID38/ ID39
214 d6h	**REF**	Parameters according to ID147, ID32926 D16	Target position [Incr.] D32: ID153	Q_CODE IN POS. REF.BEK	XX	XX	Homing cycle Datum16i : low Byte from ID 147 + high Byte from ID32926
215 d7h	**SPOS**	Parameters acc. to ID154, ID32925 D16	arget position [Incr.] D32: ID153	Q_CODE IN POS. REF.BEK	XX	XX	Spindle positioning Datum16i: low Byte from ID 154 + high Byte from ID32925
216 d8h	**POSA**	Reference speed [rpm] D16: ID222	Position setpoint [Incr.] D32: ID180	Q_CODE IN POS.	XX	XX	Absolute positioning Caution: ID222 is scaled in 0.0001 rpm
217 d9h	POSR KMD positioning relative	Reference speed [rpm] D16, ID222	Position setpoint [Incr.] D32: ID180	Q_CODE IN POS.	XX	XX	Relative positioning Caution: ID222 is scaled in 0.0001 rpm
218 dah	**SYNC4**	Parameters according to ID225, 32927 D16	Displace-ment value [Incr] D32: ID268, ID278	Q_CODE LAGESYNC. REF.BEK.	XX	XX	Synchronous control in secondary operating mode 4 Datum16i: low Byte from ID225 + high Byte from ID32927
219 dbh	**SYNC5**	Parameters according to ID225, ID32927 D16	Displace-ment value [Incr] D32: ID268, ID278	Q_CODE LAGESYNC. REF.BEK.	XX	XX	Synchronous control in secondary operating mode 5 Datum16i: low Byte from ID225 + high Byte from ID32927

Control data to the drive (commands and setpoints)				Status data from the drive (resulting acknowledgement bits and actual values)			
Code	**Command**	**Datum16i**	**Datum32i**	**Acknowl.**	**Datum16o**	**Datum32o**	**Remarks**
220 dch	**STOP**	XX	XX	Q_CODE $n_{ist} \leq n_{min}$	XX	XX	Drive STOP Transition to speed control with digital setpoint “0” Stops a moving axis immediately, remains under control (subset of BREAK command)
221 ddh	**IPOHALT**	XX	XX	Q_CODE $n_{ist} \leq n_{min}$	XX	XX	Interpolator stop dx/dt =0
222 deh	**IPOWEIT**	XX	XX	Q_CODE $n_{ist} = n_{soll}$	XX	XX	Continue interpolation
225 e1h	**MESS_ START**	Value	XX	Q_QODE	XX	XX	Start of the measuring function Datum16: 0- Touch probe Start and Release by AFP MESS_START 1- Touch probe Start and Release by bit 7 of API variable wDeviceContro l- (CAN index 0x2049 or ID405 probe 1 enable Status: See measuring function ID179 2-Start function pulse-width measuring and release with Bit5 of API Variable wDeviceControl (CAN Index 0x2049) on rather PLC variable stAxis.stAxisOut.wSysInf.5
226 e2h	**MESS_ STOP**	XX	XX	Q_CODE	XX	XX	Stop of the measuring function See measuring function ID179
…	Res	XX	XX	XX	XX	XX	XX

Control data to the drive (commands and setpoints)				Status data from the drive (resulting acknowledgement bits and actual values)			
Code	**Command**	**Datum16i**	**Datum32i**	**Acknowl.**	**Datum16o**	**Datum32o**	**Remarks**
252 FC 3)	RDADRTAB	XX	Table 0...n	Q_CODE	Address corresponds to table place in ADRTAB	XX	Reading the address table of the system e.g. arbitrary internal variables can be determined through ID32950 and analysed by means of analog output (cyclic) or as snapshot (oscilloscope function) Table: 0 – Adr. oscilloscope 1 – Adr. API (AZSSINT) 2 – Adr. KMD-SS 3 – Adr. AFP-SS 4 – Adr. data set CMD 5 – Adr. Data set interpolator 6 – Adr. Data set position data 7 – Adr. XX reserved 8 – Adr. according to ID32950 9 – Adr. according to ID32951
253 fdh 3)	B_RDADR	xx	Address	Q_CODE	Content address	lw: content (Addr. +2) hw: content (Addr. +4)	Reading of a memory location (max. 3 words)
254 feh 3)	B_WRADR	Value	Address	Q_CODE	xx	xx	Writing a word in the memory

1) ID-No. of the active parameter set or ID-No. with calculated parameter set no. (Siehe 'Access to instanced parameters' auf Seite 16.)

2) AMK Service: The contents of the operating mode change parameter ID32924 can also be sent depending upon D 16.

3) The commands only used by AMK-Service.

5.2 Acknowledgements

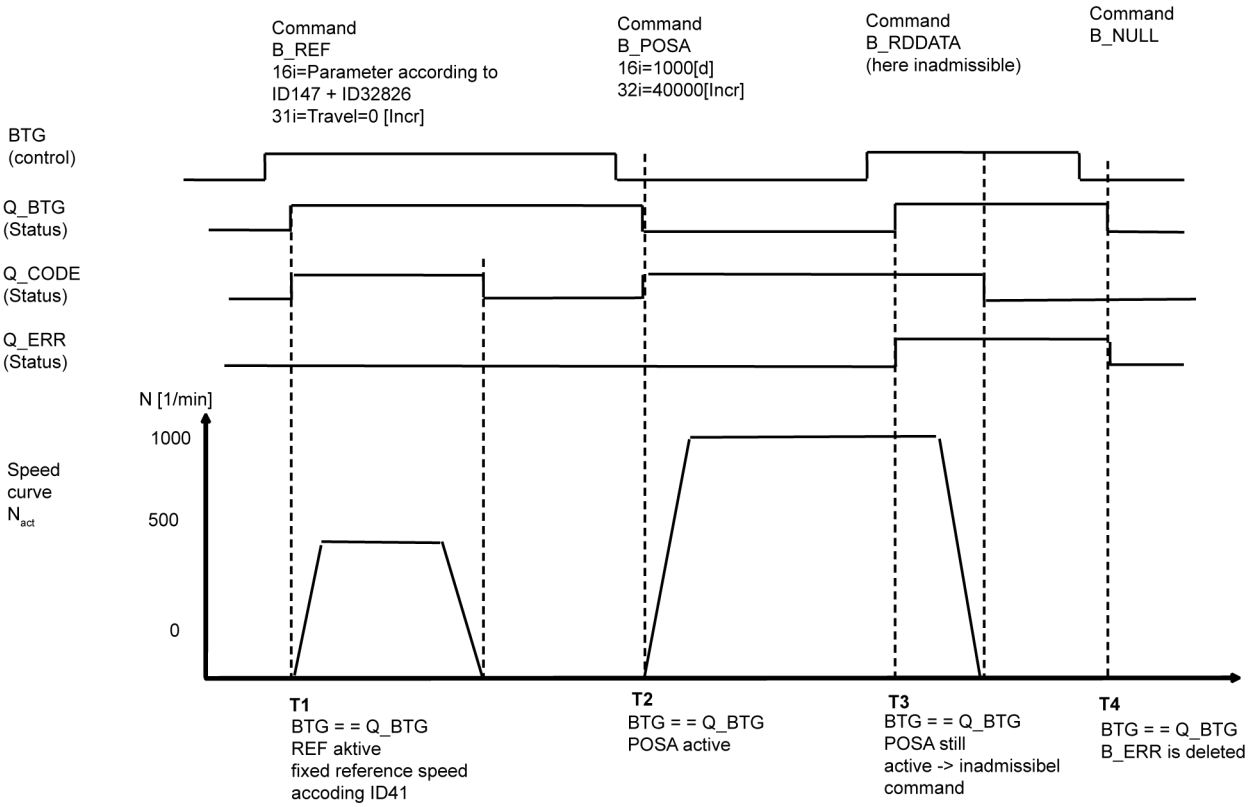
If commands which use acknowledgement data in the status area are used (e.g. “Read errors”, error No. is transferred in the IW16 channel) then the areas possibly previously defined for e.g. cyclic display magnitudes are overwritten. There is no automatic switching back to previously transmitted actual values “16 bit actual value or 32 bit actual value”.

The current status always refers to the last command and can be assigned clearly by the command toggle.

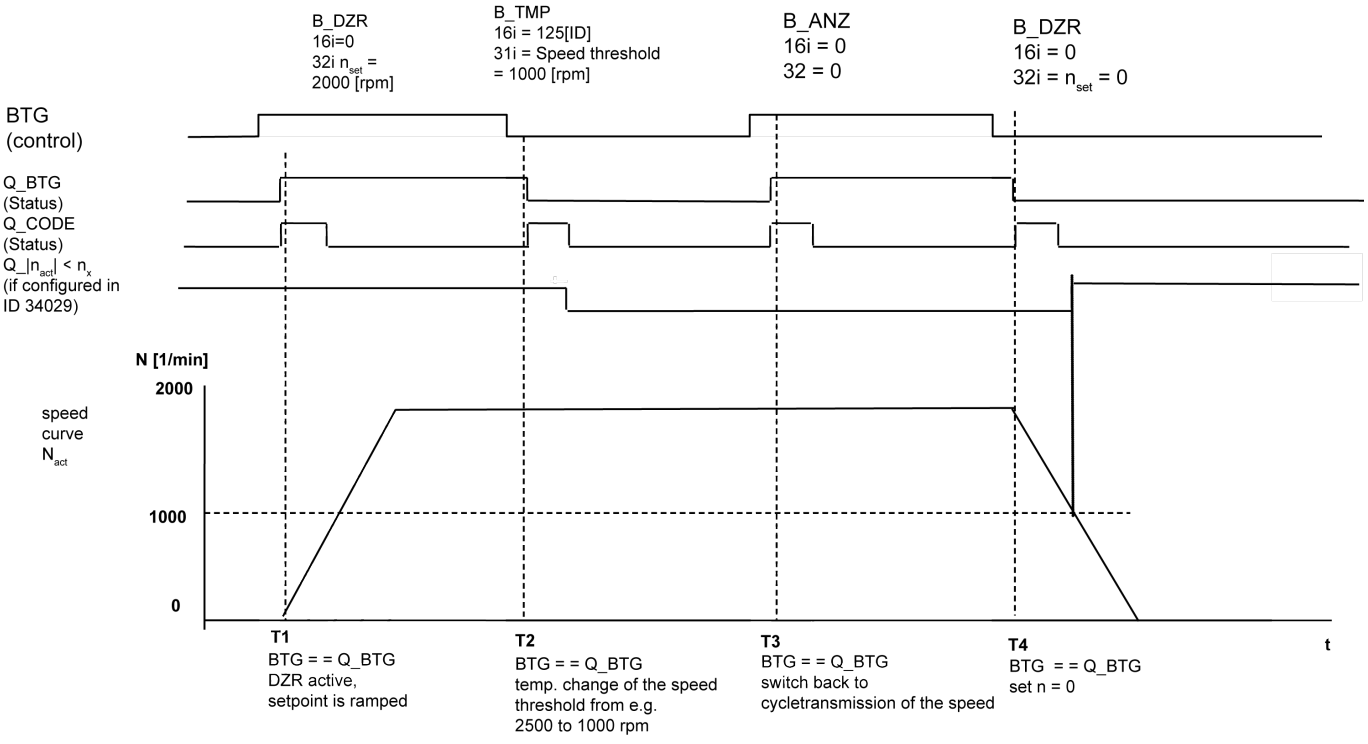
The command ANZ without sending new parameters (SW16 = SW32 = 0) reactivates the last parametrically made settings e.g. for transmitting the speed or torque feedback value.

6 Examples

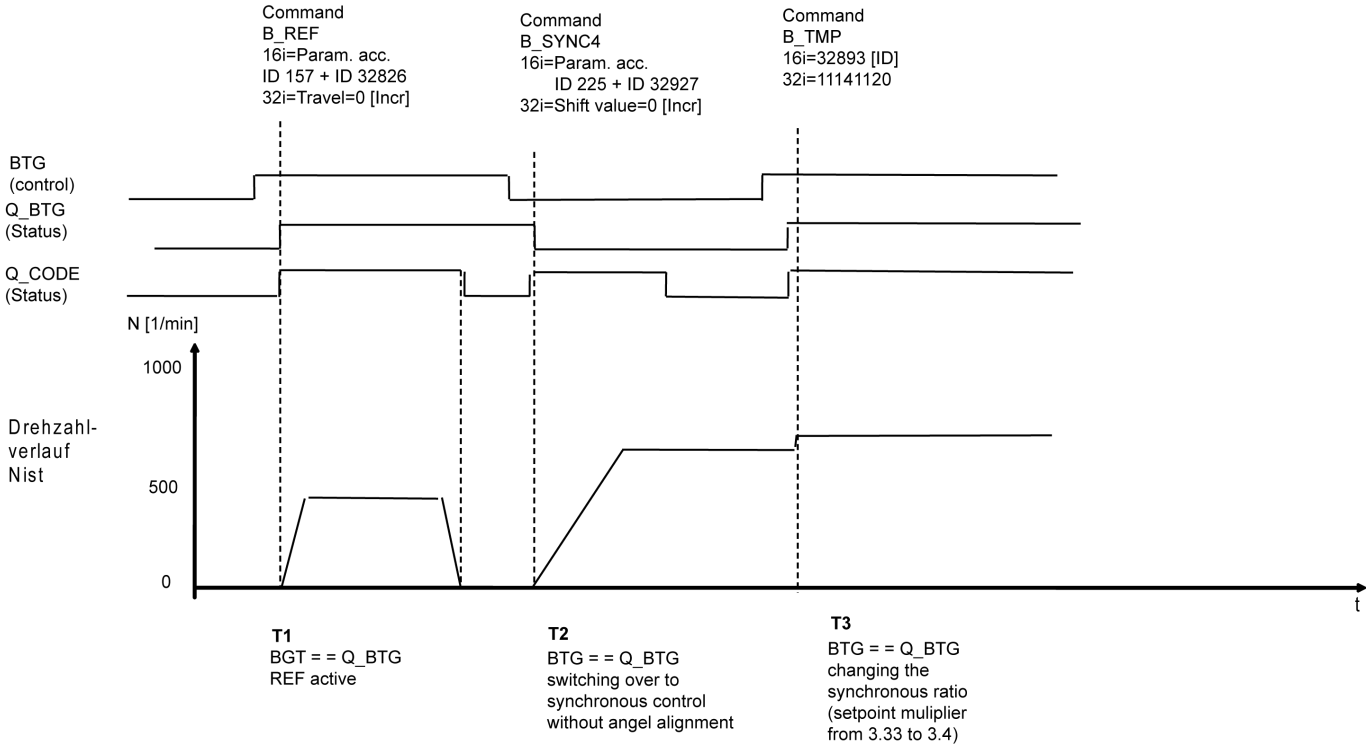
6.1 Homing cycle with positioning



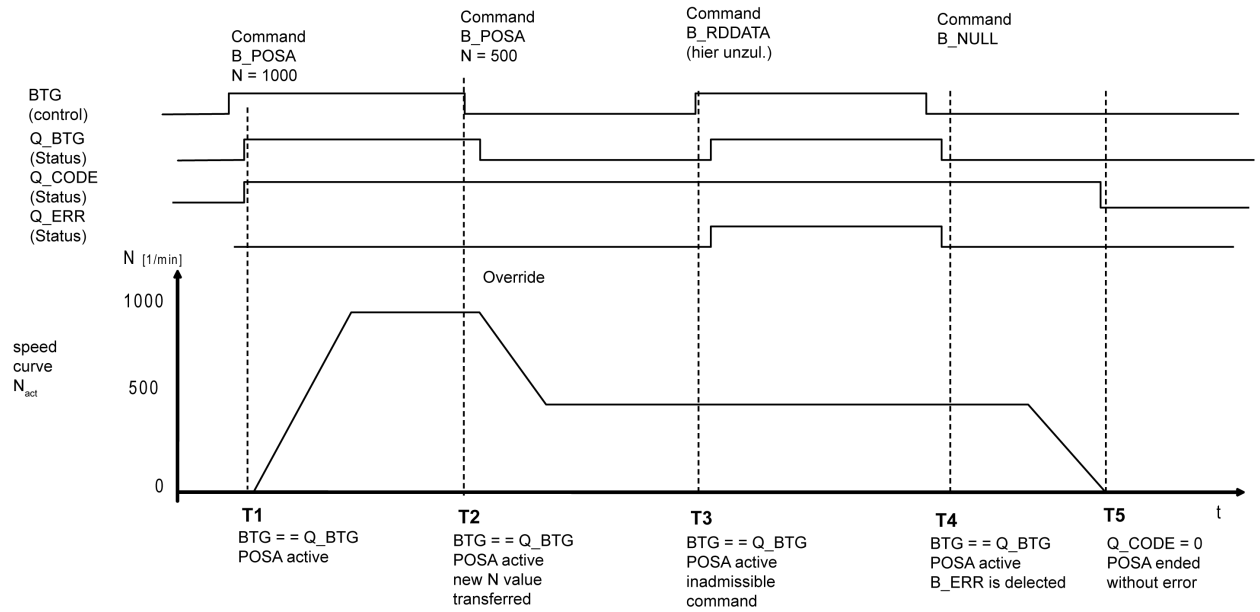
6.2 Temporary data change (speed threshold ID 125)



6.3 Synchronous control command and temporary change of the synchronous ratio



6.4 Positioning with change of the reference speed



7 Further information

7.1 Communication parameters

User specific parameters are filed in the "Communication parameters" parameter group for the operation of the different field bus systems. The parameters describe the field bus type and the supported scope of functions (see parameter description).

ID No.	Name
34023	BUS subscriber address
34024	BUS transmission rate
34025	BUS mode
34026	BUS mode attributes
34027	BUS failure behaviour
34028	BUS output rate
34029	BUS status bits

7.2 Error handling

7.2.1 Recognition of BUS failure by master

The bus master must recognize a failure of the bus system and, according to the application, introduce an error strategy. Life monitoring can be achieved by cyclic transmission of the COMMAND_NULL with subsequent status check and evaluation of Q_BTG.

7.2.2 Reaction of the slave on BUS failure

On bus failure the slave reacts corresponding to the reaction set under ID 34027. If 0 is set, the just running action is continued. According to bus system, different error numbers are activated and can be read by the user on the AMKASYN control panel.

7.2.3 Error numbers

The error areas below are assigned to the different bus types. The meaning is described more closely in the diagnostic description.

Bus type	Error number area
PROFIBUS DP	2600.....2619
ARCNET	2620.....2639
LON	2640.....2659
Interbus	2660.....2679
CAN	2680.....2699

7.2.4 Error evaluation

Wrong or not permissible commands of the master to the drive are indicated in the status message with Q_ERR=1. The running process in the drive is not influenced by this.

Since each new command resets the acknowledgement bit Q_ERR, the master must always firstly check the status for error evaluation before sending new commands.

Your opinion is important!

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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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?

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