AMK

AMKASYN

VARIABLE SPEED DRIVES

AMKASYN

Digital inverters in modular construction

Parameters AZ

Software up to
AZ 2.08 and AW 2.11

0329.E

Part No.: 26248

AMK

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Content

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K: Number of digits behind decimal point for parameter entry via AZB panel or via PC with parametrization software AIPAR.

Example: **ID No. 00036, Speed setpoint value**
Editing of this ID No. is only possible in whole RPM (K = 0) although internally the system is processing the speed with a resolution of 0,0001 RPM.

ID No. 32774, Rotor time constant TR
Input of the rotor time constant value must be in [ms] (K = 3), the internal time resolution however is [0,1 ms].

ID-No.	Designation	K	Default	Minimum	Maximum	Unit	Page
00115	Position feedback type	0	0000h	0000h	000Fh		54
00116	Resol. mot. encoder	0	20000	200	1280000	Incr.	28
00117	Resol. ext.pos.feedb.	0	100	0	4294967295	Incr.	54
00121	Load gear input rev.	0	10	1	30000	Rev.	55
00122	Load gear output rev.	0	10	1	30000	Rev.	55
00123	Feed constant	4	10.0000	0.0000	429496.7295	mm/rev	55
00124	Zero velocity window	0	50.0000	0.0000	60000.0000	min^{-1}	45
00125	Velocity Threshold Nx	0	1000.0000	0.0000	100000.0000	min^{-1}	45
00126	Torque Threshold Mdx	0	100.0	0.0	1000.0	% MN	40
00130	Probe val. p. edge	0	0			Incr.	104
00131	Probe val. n. edge	0	0			Incr.	104
00136	Positive acceleration	0	100.000	1.000	60000.000	Rev/ss	58
00137	Negative acceleration	0	-100.000	-60000.000	-1.000	Rev/ss	58
00147	Homing par.	0	8000h	0000h	FFFFh		60
00150	Reference offset 1	0	0	-2147483648	2147483647	Incr.	61
00153	Spindle angle position	0	0	-2147483648	2147483647	Incr.	62
00154	Spindle posit. par.	0	8000h	0000h	FFFFh		63
00157	Velocity window	0	100.0000	1.0000	60000.0000	min^{-1}	45
00158	Power threshold Px	0	100	1	100000	VA	91
00159	Excess Error	0	10000	0	32767	Incr.	55
00179	Probe status	0	0			-	104
00180	Spindle rel. offset	0	10000	-2147483648	2147483647	Incr.	63
00209	Lower adaption limit	0	0.0000	0.0000	100000.0000	min^{-1}	46
00210	Upper adaption limit	0	0.0000	0.0000	100000.0000	min^{-1}	46
00211	Prop. gain adaptation	0	100.0	0.0	500.0	%	47
00212	Integ.action time adap.	0	100.0	0.0	500.0	%	47
00222	Spindle pos. speed	0	300.0000	1.0000	100000.0000	min^{-1}	65
00225	Synchr. contr.par.	0	8003h	0000h	FFFFh		66
00228	Synchr. pos. window	0	1000	0	65535	Incr.	68
00230	Synchr. position offset	0	0	-2147483648	2147483647	Incr.	69
00265	Language	0	0			-	21
00268	Synchr. angle position	0	0	-2147483648	2147483647	Incr.	70
00270	Temp. par. list						102
00278	Synchr.add.angle posit.	0	1000	-2147483648	2147483647	Incr.	70
32768	Nom. motor voltage	1	350.0	0.0	1000.0	V	33
32769	Magnet. current IM	1	2.000	0.000	200.000	A	29
32770	Magnet. current IM1	1	1.000	0.000	200.000	A	29
32771	Nom. torque	1	2.0	0.0	2000.0	Nm	29
32772	Nom. velocity	0	3000.0000	10.0000	100000.0000	min^{-1}	30
32773	Service bits	0	00000007h	00000000h	FFFFFFFFh		104
32774	Rotor time constant	3	0.1000	0.0100	1.5000	s	30
32775	Pole number motor	0	4	2	16		30
32776	Motor enc.periods p.rev	0	50	50	5000		30
32777	Torque rel.to 10V at A1	0	10.0	0.0	1000.0	% MN	40
32778	Speed rel. to 10V at A1	0	3000.0000	0.0000	100000.0000	min^{-1}	47
32779	Speed offset for A1	4	0.0000	-100.0000	100.0000	min^{-1}	48
32780	Accel. ramp	0	100.0	1.0	1200000.0	ms	48
32781	Decel. ramp	0	100.0	1.0	1200000.0	ms	48
32782	Decel.ramp RF inactive	0	100.0	1.0	100000.0	ms	49
32785	Config.16 bit AW mess.	0	0	0	65535		91
32786	Config.32 bit AW mess.	0	40	0	65535		91
32787	Source analog chann. 1	1	32786.1	0.0	429496729.5		88
32788	Final analog val. ch. 1	0	20000000	-2147483648	2147483647		89
32789	Source analog chann. 2	1	0.0	0.0	429496729.5		88
32790	Final analog val. ch. 2	0	0	-2147483648	2147483647		89
32791	Source analog chann. 3	1	0.0	0.0	429496729.5		88
32792	Final analog val. ch. 3	0	0	-2147483648	2147483647		89
32793	Source analog chann. 4	1	0.0	0.0	429496729.5		88
32794	Final analog val. ch. 4	0	0	-2147483648	2147483647		89
32795	Source UE	0	0	0	65535		21
32796	Source RF	0	0	0	65535		21

ID-No.	Designation	K	Default	Minimum	Maximum	Unit	Page
32798	User list 1						96
32799	Conf. Stand. periph.	0	00000000h	00000000h	FFFFFFFFh		22
32800	AMK main op. mode	0	00010043h	00000000h	FFFFFFFFh		34
32801	AMK second op. mode 1	0	00010043h	00000000h	FFFFFFFFh		38
32802	AMK second op. mode 2	0	00010043h	00000000h	FFFFFFFFh		38
32803	AMK second op. mode 3	0	00010043h	00000000h	FFFFFFFFh		38
32804	AMK second op. mode 4	0	00010043h	00000000h	FFFFFFFFh		38
32805	AMK second op. mode 5	0	00010043h	00000000h	FFFFFFFFh		38
32811	Ext. pos. feedb. source	0	0	0	65535		56
32812	Active drives	0	0000h	0000h	00FFh		22
32813	Par.set assignm. AW1	0	FFFFFF01h	00000000h	FFFFFFFFh		23
32814	Par.set assignm. AW2	0	FFFFFF02h	00000000h	FFFFFFFFh		23
32815	Par.set assignm. AW3	0	FFFFFF03h	00000000h	FFFFFFFFh		23
32816	Par.set assignm. AW4	0	FFFFFF04h	00000000h	FFFFFFFFh		23
32817	Par.set assignm. AW5	0	FFFFFF05h	00000000h	FFFFFFFFh		23
32818	Par.set assignm. AW6	0	FFFFFF06h	00000000h	FFFFFFFFh		23
32819	Par.set assignm. AW7	0	FFFFFF07h	00000000h	FFFFFFFFh		23
32820	Par.set assignm. AW8	0	FFFFFF08h	00000000h	FFFFFFFFh		23
32821	Password	0	0	0	4294967295		24
32846	Output port 1	0	0	0	65535		80
32847	Port 1 bit 0	1	0.0	0.0	429496729.5		80
32848	Port 1 bit 1	1	0.0	0.0	429496729.5		80
32849	Port 1 bit 2	1	0.0	0.0	429496729.5		80
32850	Port 1 bit 3	1	0.0	0.0	429496729.5		80
32851	Port 1 bit 4	1	0.0	0.0	429496729.5		80
32852	Port 1 bit 5	1	0.0	0.0	429496729.5		80
32853	Port 1 bit 6	1	0.0	0.0	429496729.5		80
32854	Port 1 bit 7	1	0.0	0.0	429496729.5		80
32855	Output port 2	0	0	0	65535		80
32856	Port 2 bit 0	1	0.0	0.0	429496729.5		81
32857	Port 2 bit 1	1	0.0	0.0	429496729.5		81
32858	Port 2 bit 2	1	0.0	0.0	429496729.5		81
32859	Port 2 bit 3	1	0.0	0.0	429496729.5		81
32860	Port 2 bit 4	1	0.0	0.0	429496729.5		81
32861	Port 2 bit 5	1	0.0	0.0	429496729.5		81
32862	Port 2 bit 6	1	0.0	0.0	429496729.5		81
32863	Port 2 bit 7	1	0.0	0.0	429496729.5		81
32864	Output port 3	0	0	0	65535		80
32865	Port 3 bit 0	1	0.0	0.0	429496729.5		81
32866	Port 3 bit 1	1	0.0	0.0	429496729.5		81
32867	Port 3 bit 2	1	0.0	0.0	429496729.5		81
32868	Port 3 bit 3	1	0.0	0.0	429496729.5		81
32869	Port 3 bit 4	1	0.0	0.0	429496729.5		81
32870	Port 3 bit 5	1	0.0	0.0	429496729.5		81
32871	Port 3 bit 6	1	0.0	0.0	429496729.5		81
32872	Port 3 bit 7	1	0.0	0.0	429496729.5		81
32873	Input port 1	0	0	0	65535		74
32874	Port 1 bit 0	1	0.0	0.0	429496729.5		75
32875	Port 1 bit 1	1	0.0	0.0	429496729.5		75
32876	Port 1 bit 2	1	0.0	0.0	429496729.5		75
32877	Port 1 bit 3	1	0.0	0.0	429496729.5		75
32878	Port 1 bit 4	1	0.0	0.0	429496729.5		75
32879	Port 1 bit 5	1	0.0	0.0	429496729.5		75
32880	Port 1 bit 6	1	0.0	0.0	429496729.5		75
32881	Port 1 bit 7	1	0.0	0.0	429496729.5		75
32882	Slot assignment	0	00000000h	00000000h	FFFFFFFFh		24
32883	Config. slot 1	0	00000000h	00000000h	FFFFFFFFh		73
32884	Config. slot 2	0	00000000h	00000000h	FFFFFFFFh		73
32885	Config. slot 3	0	00000000h	00000000h	FFFFFFFFh		73
32886	Config. slot 4	0	00000000h	00000000h	FFFFFFFFh		73
32890	AWIW puls multiplier	0	1	1	10		94

ID-No.	Designation	K	Default	Minimum	Maximum	Unit	Page
32892	Sync.set.pulses divider	0	655360	65536	2147483647		70
32893	Sync.set.pulses multipl	0	655360	-2147483648	2147483647		70
32901	Global service bits	0	00000818h	00000000h	FFFFFFFFh		25
32922	Resid.dist.erase wind.	0	20000	0	65535	Incr.	57
32924	Op.mode change par.	0	0001h	0000h	FFFFh		108
32925	AMK spindle posit.par.	0	0000h	0000h	FFFFh		64
32926	AMK homing cycle par.	0	0000h	0000h	FFFFh		61
32927	AMK synchronous par.	0	0000h	0000h	FFFFh		67
32928	Time filter 1	1	0.0	0.0	6553.5	ms	50
32929	Time filter 2	1	0.0	0.0	6553.5	ms	50
32935	Voltage standstill	1	0.0	0.0	1000.0	V	33
32940	High homing velocity	0	1000.0000	0.0000	100000.0000	min^{-1}	65
32941	SERCOS service	0	00000000h	00000000h	FFFFFFFFh		112
32948	Config. AZ message	0	00000000h	00000000h	FFFFFFFFh		26
32952	At sync. speed window	0	1000	0	65535	Incr.	72
32953	Motor enc. type	0	0001h	0000h	FFFFh		31
32954	Time ramp down monitor	2	0.50	0.00	655.35	s	109
32955	Delay time	2	1.00	0.00	655.35	s	109
32956	Add. acceleration value	0	10	4	255		58
32958	Cycle time 16 bit pos. setp.	3	0,500			ms	57
32960	Input M.enc. gear	0	1	1	65535	Rev.	33
32961	Output M.enc. gear	0	1	1	65535	Rev.	33
32964	Source SIWL	0	0	0	15		94
32965	Pitch SIWL	0	0	0	16384		94
32966	IVH Multiplier	0	1	-32768	+32767		95
32967	IVH Divider		1	1	+8191		95
32968	Input port 2	0	0	0	65535		74
32969	Port 2 bit 0	1	0.0	0.0	429496729.5		75
32970	Port 2 bit 1	1	0.0	0.0	429496729.5		75
32971	Port 2 bit 2	1	0.0	0.0	429496729.5		75
32972	Port 2 bit 3	1	0.0	0.0	429496729.5		75
32973	Port 2 bit 4	1	0.0	0.0	429496729.5		75
32974	Port 2 bit 5	1	0.0	0.0	429496729.5		75
32975	Port 2 bit 6	1	0.0	0.0	429496729.5		75
32976	Port 2 bit 7	1	0.0	0.0	429496729.5		75
32977	Input port 3	0	0	0	65535		74
32978	Port 3 bit 0	1	0.0	0.0	429496729.5		76
32979	Port 3 bit 1	1	0.0	0.0	429496729.5		76
32980	Port 3 bit 2	1	0.0	0.0	429496729.5		76
32981	Port 3 bit 3	1	0.0	0.0	429496729.5		76
32982	Port 3 bit 4	1	0.0	0.0	429496729.5		76
32983	Port 3 bit 5	1	0.0	0.0	429496729.5		76
32984	Port 3 bit 6	1	0.0	0.0	429496729.5		76
32985	Port 3 bit 7	1	0.0	0.0	429496729.5		76

Diagrams

Formula

Abbreviations

AIPAR	AMKASYN start-up parameter software
AW	AMKASYN inverter module
AWMON	AW monitor
AZ	AZ computer (central processor)
AZB	AZ-panel
AZ-EA8	Option: 8 inputs / 8 outputs card
AZ-EA24	Option: 24 inputs / 16 outputs card
AZ-MC1	Option: Multi control CNC card
AZ-PSx	Option: Programmable controller card
AZ-R01	AZ central processor card
AZSSINT	AZ system internal interface for user such as AZ-PSx, AZ-MC1, ...
BA	Operation mode
BAV	Operation mode administration
DA	Digital output
DEALLOC	Memory enable
DTH	Data base
DZR	Speed control
ES1, ES2	Interruption main contactor
FL	Error reset
HW	Hardware
IN	Nominal current
IM	Magnetizing current
IMAX	Inverter maximum current
IPO	Interpolator
KMD	Commanding
KMD-SS	Commanding interface
LR	Closed loop position control
LT	Logical user
MN	Nominal torque
MNU	Menu at AZ / KU panel
n	Speed
nN	Nominal speed
nist	Actual speed
nsoll	Setpoint speed
OPT	Optional slot
PEEP	Parallel EEPROM
PS	Programmable controller
PTC	PTC resistor
QRF	Handshake Inverter ON
QUE	Handshake DC BUS enable
RF	Inverter ON
RFP	Reference point
SBM	System ready output
SBUS	AMK specific protocol for serial interface
SEEP	Serial EEPROM
SWG	Valid setpoint value
T	Temperature or virtual time
t	Time
UA1	Analog setpoint value voltage for AW analog input A1
ub_basync	Bit bar for setpoint value synchronism control in drive
UE	DC BUS enable
VA	Voltampère
xi	Actual position value
xs	Position setpoint value
03h	3 hexadecimal

1 Overview

1.1 Parameter ID numbers

The following documentation describes the content and effect of the parameters necessary for operation of the AMKASYN system.

Each parameter is characterised by an ID number. The SERCOS interface® standard is the basis of the parameter definition. For a better overview, AMK has summarised the parameters into parameter groups.

With the delivery of the system (and after the INITIAL LOADING service function), the parameters contain basic data selected by the AMK company (default values). During start-up the drive system has to be parameterised newly by the user to fulfil the required functions.

All parameters supported by the AMKASYN system are listed under ID 17 "List of all operating data".

Parameter changes only become effective after installation of the system. The "Inverters on" RF must be switched on and off.
After change of global parameters (e.g. system parameters, assignment of binary inputs/outputs and analogue outputs, ...) and also after downloading a parameter set via AIPAR, POWER must be switched OFF/ON. After initialisation, the main operation mode is always effective according to ID 32800 in the corresponding main parameter set.

System booting takes about 2 s for each parameter set to be initialised. Parameters with the note "Online changeable" become directly effective after the change, e.g. on the control panel after selection of the "Temp. Par." menu item.

The system recognises and signals parameter incompatibilities on parameterisation either directly on entry or during system booting. Each message consists of a number and a plain text display. The separate description "AMKASYN diagnostic messages" delivers additional information and explanations for the error codes.

1.2 Structure of parameters

A data block belongs to each ID number. Each data block is structured and contains absolutely necessary (marked dark) and optional parameter elements.

Structure of a parameter :

Element	Contents	Example
1	Ident-number (ID)	00001
2	Name	"NC cycle time"
3	Attribute	1)
4	Unit	"ms"
5	Maximum input value	65.535
6	Minimum input value	0.500
7	Operating datum (default value)	10.000

1) In the attribute, all information is stored in a coded way for the comprehensible representation of the operating datum as bit information. Thus, for example, the data length, data type, display format, number of places after the decimal point etc. are defined. The operating datum is of primary importance for the application.

The minimum, maximum and default value of the following parameters serve for information and are permanently optimised within the course of technical improvements. After a successful system parameterisation, all parameters remain stored in the parallel EEPROM of the computer card.

For further information concerning parameter elements refer to the SERCOS interface® standard. Apart from the operating datum, none of the parameter elements in the AMKASYN system can be changed by the user.

The parameter can be entered/changed on the integrated control panel or by means of the AT-compatible PC with the AMK parameterisation software AIPAR.

1.3 Parameter groups

The parameters are classified into the following parameter groups. They influence the AMKASYN system in different effect levels.

System parameters
are of global character, i.e. the parameters are stored only once in the AMKASYN system and act centrally. The user must allocate the required system parameters with the corresponding contents depending upon his task.

Motor parameters (axis specific)
must absolutely be input during the start of the AMKASYN system according to the name plate (or data sheet) of the motor. Correct motor data are a basic condition for the proper function of the whole system. Wrong input data lead to malfunction!

Operation modes (axis specific)
The parameter group "Operation modes" offers for each drive one main operation mode and five secondary operation modes which can be freely selected. The main operation mode must be defined in any event by the user. After the system has been switched on, all active drives are in the main operation mode.
The following characteristics are determined by the operation mode parameters:

- Controller type of the drive (speed control, closed loop position control, ...)
- Type of torque limitation
- Speed setpoint filter
- Fine Interpolation in the inverter
- Following error compensation in the inverter module
- Source of the actual position (internal or external)
- Setpoint value source

Torque parameters (axis specific)
characterise the variables relevant for torque control/generation (e.g. torque limits).

Speed parameters (axis specific)
characterise the variables relevant for speed control including speed filter. The speed control parameters must be optimised for every drive at start-up!

Closed loop position control parameters (axis specific)
describe the basic properties of the position control closed loop. The speed gain KV-ID 104 must be optimised for each drive at start-up.

Positioning parameters (axis specific)
serve for pre-setting positioning processes (angular/linear motion control). They influence essentially the interpolator.

Synchronous control parameters (axis specific)
influence drives in which the motor follows setpoint pulses, e.g. in synchronous operation or in stepping motor simulation.

Configuration option cards (global)
The option cards AZ-IG1 that can be used in the AMKASYN system for option slots 1...4 are specified more precisely by this parameter group.

Binary inputs assignment (global)
Certain functions are assigned to the binary inputs of the option cards, e.g.: AZ-EAx (e.g. drive commandings, operation mode change,...).

Binary outputs assignment (global)
Single, internal bit information from the system (e.g. $n_{act} = n_{set}$, In position, ...) are assigned to the binary outputs of the option cards, e.g.: AZ-EAx. These are generated in real time. The evaluation takes place in the operation process of the higher ranking control.

Analogue outputs assignment (global)
Setting the source and the final value of digital/analogue converters (AZ plug X29 output AA1 to AA4) for outputting system-internal variables. The output is updated each 1 ms.

Inverter parameters (axis specific)
characterise variables which describe the characteristics of the inverter module in more detail. The inverter-specific data cannot be changed by the user. They are stored in the EEPROM on the inverter module and are read internally from there. Furthermore, inverter-internal variables can be defined for external display (inverter messages ID 32785, ID 32786).

Special applications (global)
This parameter group is presently formed only by the parameter ID 32798 "User list 1".

SERCOS interface® global
Globally effective parameters in connection with NC, PLC or SERCOS interface® applications.

SERCOS interface®- drive specific
Primarily SERCOS interface®-specific parameters for operation of the AMKASYN system in a SERCOS interface® ring.

General per inverter
designates parameters which cannot be assigned clearly to any of the above mentioned parameter groups.

Selection of system internal parameters
"System internal" parameters are data that cannot be changed by the user. On the one hand they serve for checking and controlling system internal functionality, on the other hand they describe, for example, central definitions (weighting of closed loop position or speed data) for the AMKASYN system. The selection of system internal parameters serves exclusively for information. All "system internal parameters" are assigned to the above mentioned groups and cannot be read out using the control panel.

1.4 Cyclical display of system values

By entering in ID 32786 it is possible to display selected system values using the control panel, menu item "ACT. VALUE". The menu item is part of the main menu and is reached by scrolling upwards.

The output of cyclical actual values or setpoint values using the control panel refers exclusively to the entry in the ID32786. If a value not displayed in the following table is filed in ID32786, then this is displayed in the menu with the message "ID32786 invalid value".

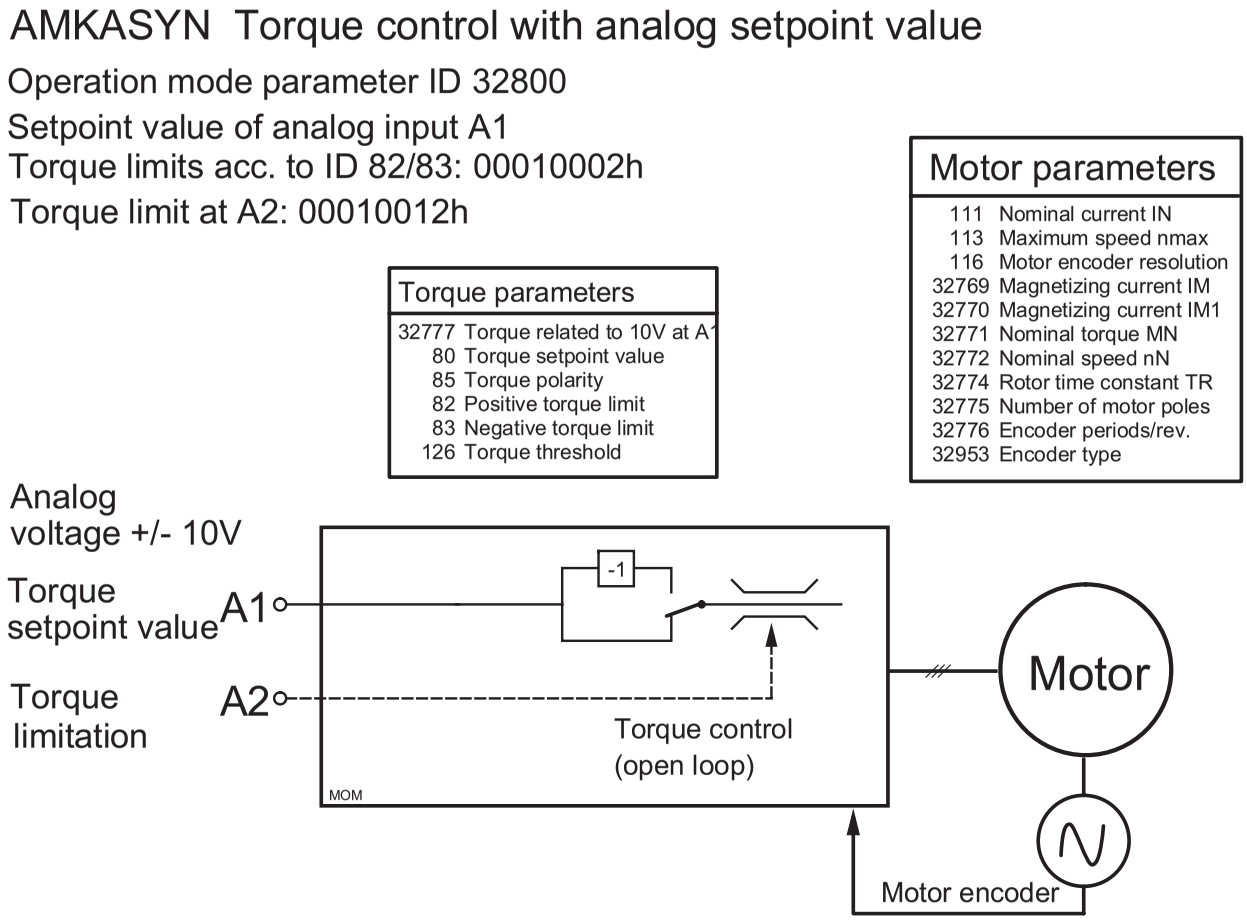
Some values are filtered before the display (F = arithmetical mean value over 8 sampling values with asynchronous signal sampling). All display values are without offset and permanently scaled. Speed values refer directly to the motor encoder.

Permissible codes for the inverter messages with regard to display

Code	Contents	Value display
84	Actual torque value related to nominal torque Mn	F, 1 %MN
32827	Flux-generating current (isd)	F, 0,1 A
32834	Torque-generating current (isq)	F, 0.1 A
32836	DC-bus voltage	1 V
32897	Inverter analogue input voltage A1	0.01 V
32898	Inverter analogue input voltage A2	0.01 V
33100	Actual power value related to nominal power Pn	F, 1 %Pn
36	Speed setpoint value	F, 0.1 rpm
40	Actual speed value	F, 0.1 rpm
47	Position setpoint value 2, absolute	1 incr.
51	Actual position value, absolute	1 incr.
32823	Speed setpoint value after ramp	F, 0.1 rpm
32824	Following error without SAK	1 incr.
32826	SAK	1 incr.
32899	Actual position value Xi_2PI	1 incr.
32900	Position setpoint value Xs_2PI	1 incr.

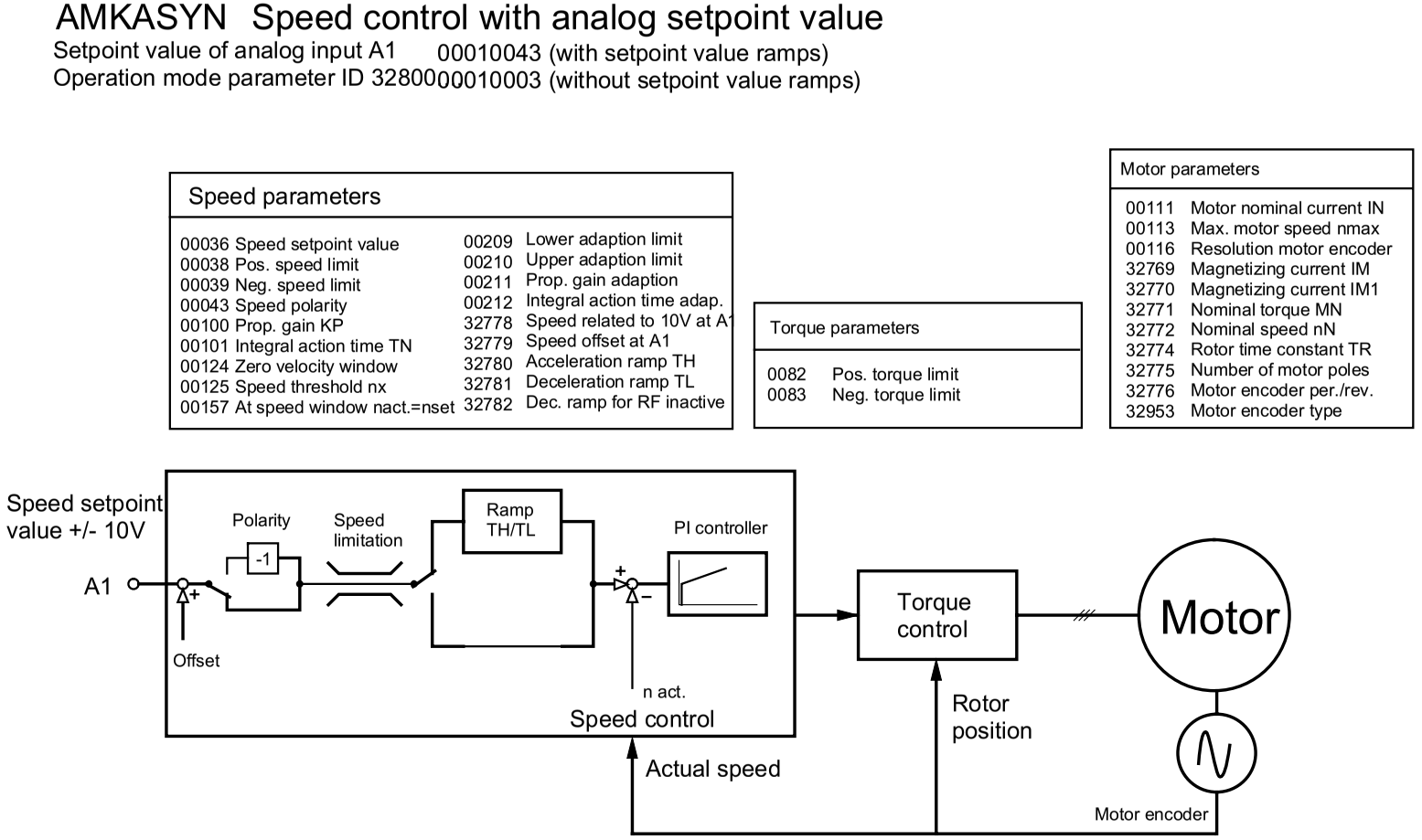
1.5 Examples of application

Diagram 1-1: Torque control with analogue setpoint value



Speed limitation through ID 113 "Max. motor speed"

Diagram 1-2: Speed control with analogue setpoint value



Speed parameters dependencies: ID 113 >= ID 32778, ID 38, ID 39

Diagram 1-3: Closed loop position control with motor encoder as position feedback

AMKASYN CLOSED LOOP POSITION CONTROL (STEPPER MOTOR OPERATION)

POSITION FEEDBACK THROUGH MOTOR ENCODER

Operation mode parameter ID 32800...: Setpoint source AZ square wave input or optional card AZ - IG1
With / without following error compensation

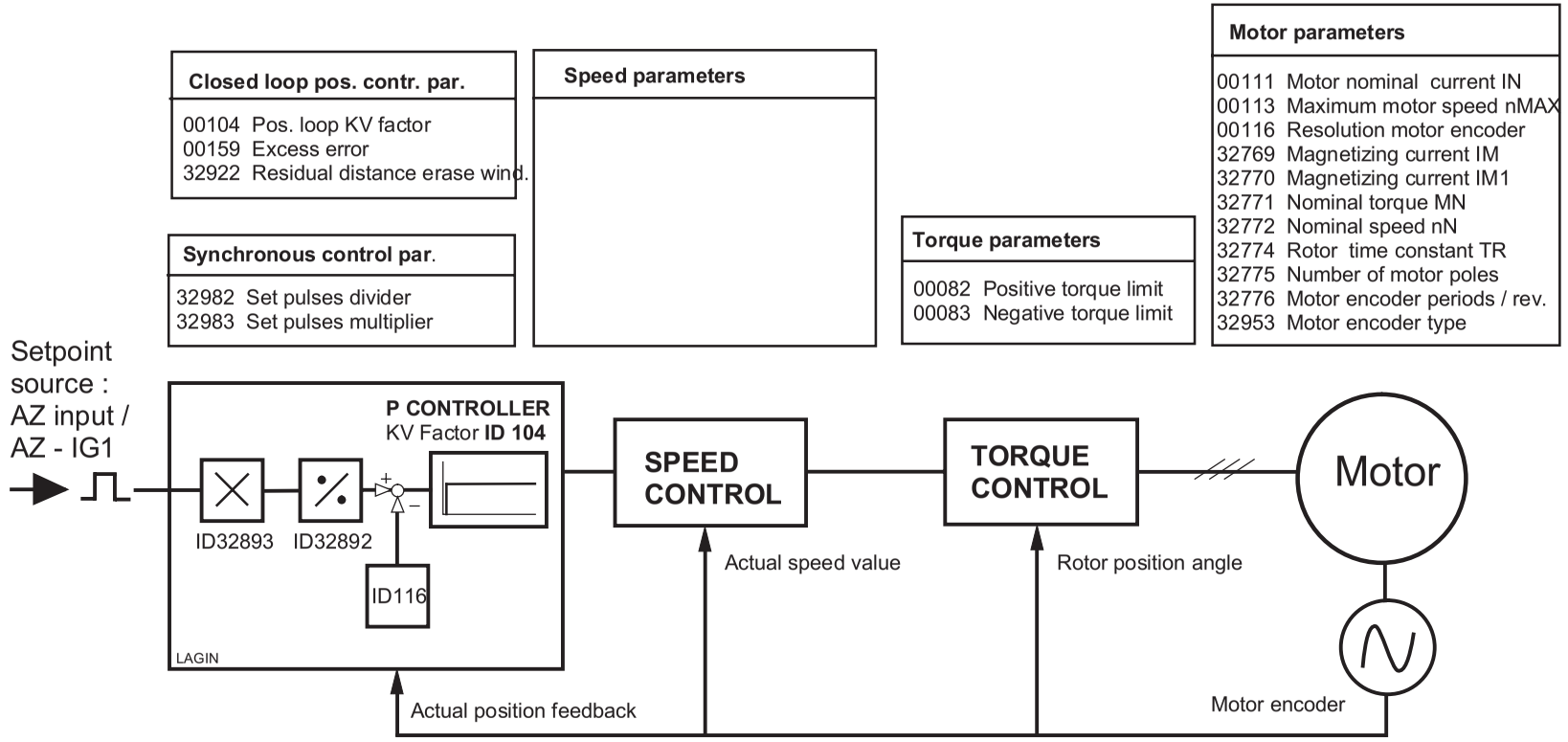
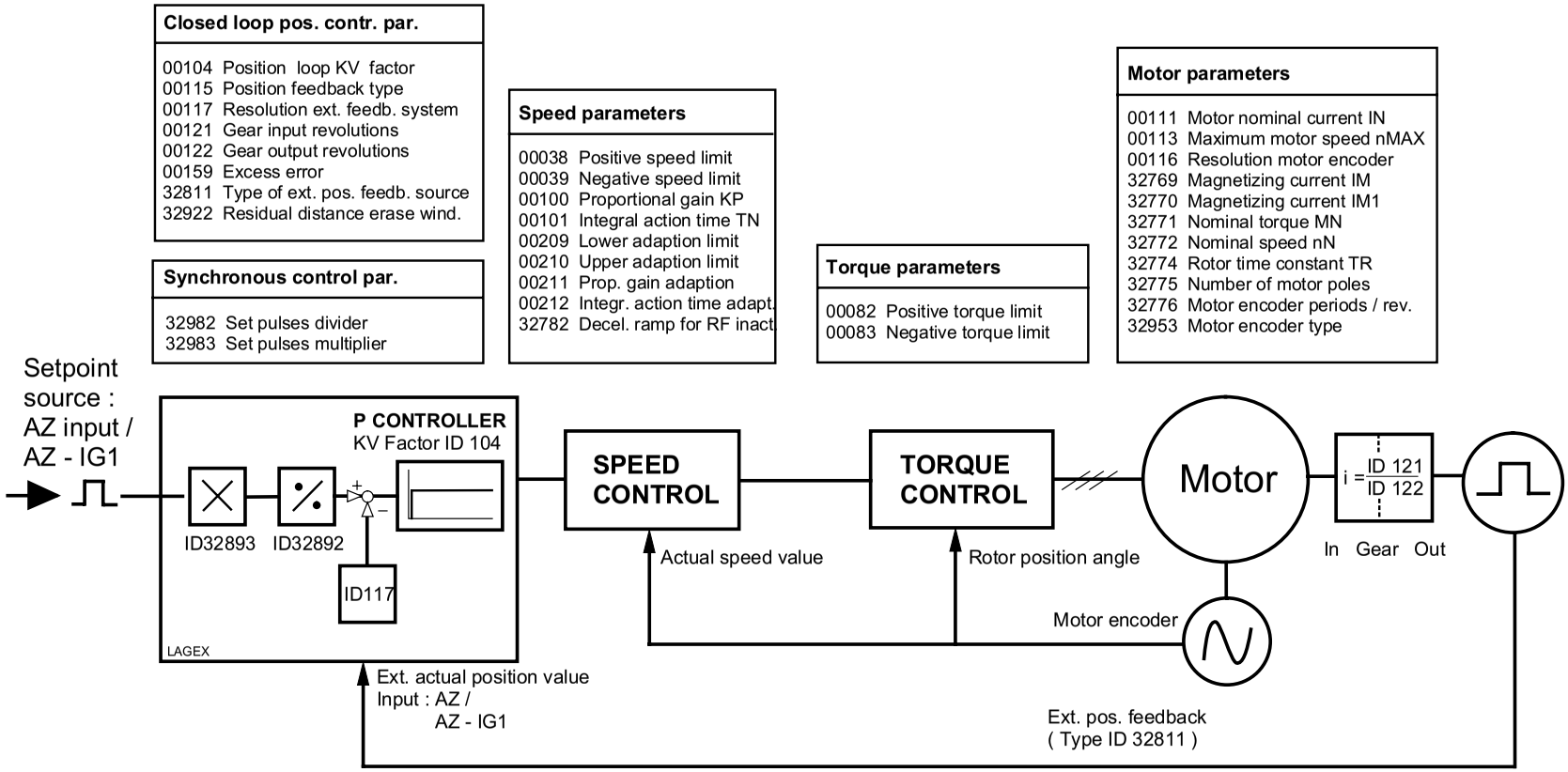


Diagram 1-4: Closed loop position control with external position feedback

AMKASYN CLOSED LOOP POSITION CONTROL (STEPPER MOTOR OPERATION)
POSITION FEEDBACK THROUGH EXTERNAL MEASURING SYSTEM

Operation mode parameter ID 32800...: Setpoint source AZ square wave input or optional card AZ - IG1
With / without follwing error compensation



2 System parameters

After changing of "System parameters" power must be switched OFF and ON again.

ID00265 Language (only with AZ-R02 !)

The languages available in the drive system are selected by entering the language code in this ID-No. The texts, e. g. name of an ID or diagnostic information are displayed in the selected language.

Available languages:
Code 0: German (Default)
Code 1: English
Code 2: French

ID32795 Source UE (DC-BUS enable)

Definition of the source for the DC bus enable signal UE.

Sources	Par. value
Binary input UE at the AZ module X30	0
AMK-SBUS	2
AZ-PSx (Prog. controller)	3
AZ-MC1 (CNC control)	4
AZ-K02 (SERCOS interface®)	5

ID32796 Source RF (Inverters on)

Definition of the source for the "Inverters on" signal RF. After changing the "Source RF", the system has to be activated via power ON/OFF. Influencing the error behaviour for inverter errors is possible by selecting between standard and special function parameter values.

Standard - Shut down (inactive RF) all drives
Special function - Shut down (inactive RF) only the faulty drive

The following source overview applies in the AZ operation system:

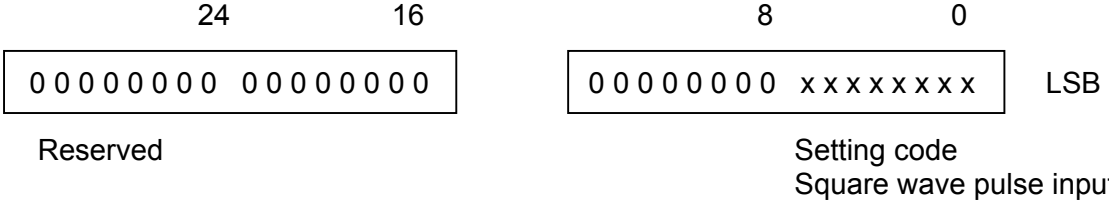
	Parameter value	
Sources	**Standard**	**Special function**
Binary input RF at the AZ module, plug X30	0	10
Single Inverters on RF1...RF8 input port address 0 (ID 32873) and AZ EA option card at slot 1 **1)**	1	11
AMK-SBUS	2	12
AZ-PSx (program controller)	3	13
AZ-MC1 (CNC control)	4	14
AZ-K02 (SERCOS interface®)	5	15

The output of the handshakes of the Inverters on/inverter QRF1...QRF8 can be freely configured as bit output, see ID 32846 ff.

1) If single Inverters on is selected, the used input signals may not be assigned other functions (see ID 32873 ff.).

ID32799 Configuration standard peripherie

The parameter defines the setting of the square wave pulse input on AZ module (X32).



Setting code for square wave pulse inputs :

Entry	Meaning
0	2 square wave pulses in quadrature (90° offset)
1	Counting pulses track 1, direction signal track 2
2	Forwards pulses track 1, reverse pulses track 2

Example: ID 32799 = 0000 0002 h
Square wave pulse input configured for forwards pulses on track 1,
Reverse pulses on track 2.

Caution: All square wave pulse inputs must lie at defined levels,
otherwise the displayed functions are not guaranteed.

ID32812 Active drives

Selection of the inverter modules for which Inverters on is effective. The assignment between inverter module and inverter number is made through the rotary coding switch AWN attached to the inverter module and can be freely selected in the range from 1 to 8.

After initial loading of a system, no drive is active. The required active drives must be parameterised by the user. Then after POWER OFF/ON the new parameters become effective.

Example: In a system with 8 drives, only the AWs with the number
AWN 1, 2, 7, and 8 should be active.

AW numbers 1, 2, 7 and 8 are active
AW numbers 3, 4, 5 and 6 are not activated (masked out)

AW No.	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
binary	1	1	0	0	0	0	1	1
hex	**C**				**3**			

Entry ID 32812 = C3 h

ID32813 Parameter set assignment AW1

A main parameter set and optionally up to three further alternative parameter sets are assigned to the inverter module 1 by means of the parameter "Par. set assignment AW1". The low byte always contains the main parameter set and must be occupied with a data record number (00h ...09h) for the activated drive. All not used parameter sets must be occupied with the data record identifier FFh. Data record numbers may not be used multiply and must be assigned from the LSB to the MSB.

After power on, always main parameter set is effective. After a parameter set change the new parameter set remains active until power off.

Example: ID 32813 = FF09 0001h

Main parameter set: Data record number → 01h
1st alternative parameter set: Data record number → 00h
2nd alternative parameter set: Data record number → 09h
3rd alternative parameter set: Data record identifier → FFh (not used)

3rd alternative parameter set		**2nd alternative parameter set**		**1st alternative parameter set**		**Main parameter set**	
F	F	0	9	0	0	0	1

MSB LSB

Each byte may contain a data record number (00h to 09h) or the identifier for the not activated data record (FFh).

Note: 10 data records (parameter sets) are available in the AMKASYN system. At least 1 main parameter set must be assigned to each activated AW module. If needed, the remaining free data records can be assigned to the activated AW modules as alternative parameter sets.

ID32814 Parameter set assignment AW2

ID32815 Parameter set assignment AW3

ID32816 Parameter set assignment AW4

ID32817 Parameter set assignment AW5

ID32818 Parameter set assignment AW6

ID32819 Parameter set assignment AW7

ID32820 Parameter set assignment AW8

The effect of the IDs "Par.set assignment AW2 ... AW8" corresponds to the function of the "Par. set assignment AW1" (ID 32813) and has to be programmed like this.

ID32821 Password

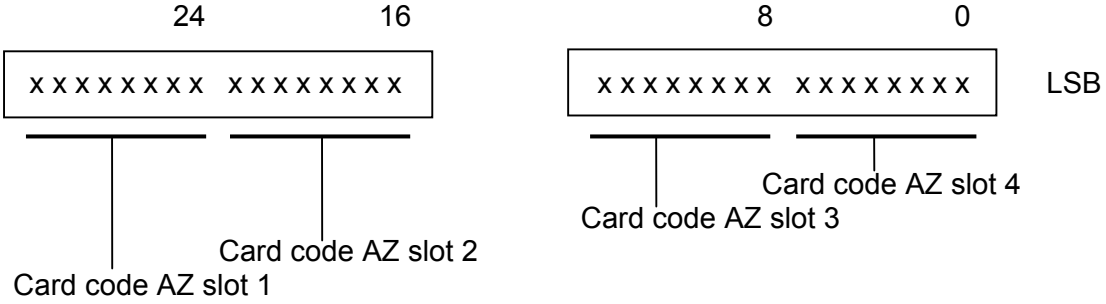
The "START-UP" menu item in the control panel is freely accessible with ID 32821=0.
If ID 32821 is assigned as a value unequal to 0, the "START-UP" menu item cannot be activated until this value is entered as "Password".
The machine manufacturer defines the password and states it in ID 32821. Any number between 0 and 4294967295 can be selected.

Note: **The password must be archived by the manufacturer.**
Passing on the password to the final customer is the responsibility of the machine manufacturer. **Access to the parameters is impossible without knowledge of the password**.

ID32882 Slot assignment

The assignment of the option slots is defined in 4 bytes. The assignment is checked during system booting and the option cards are initialised with evaluation of the ID numbers ID 32883..32886 (conf. slot 1..4).

AZ option slots



List of the valid card codes for ID 32882:

Code	Meaning
00h	Option slot not assigned
	Passive option cards
01h	AZ card slot assigned with AZ-IG1
02h	AZ card slot assigned with AZ-EA8
03h	AZ card slot assigned with AZ-EA24
	Active option cards
80h	AZ card slot assigned with AZ-MC1
81h	AZ card slot assigned with AZ-PSx
82h	AZ card slot assigned with AZ-K02

Example AZ: ID 32882 = 0002 0001 h

AZ-EA8 card at slot 2 and AZ-IG1 card at slot 4 in the AZ.

ID32901 Global service switch

This parameter makes it possible to switch on and off globally effective functions primarily by AMK service staff (supervision, special applications or compatibility). The meaning of the individual bits is shown in the following table.

Display example with following objective:

- Activation of serial EEPROM monitor
- Activation of parallel EEPROM monitor
- Activation of square wave pulse inputs monitor
- Control panel can be plugged IN / OUT during operation

Bit No.	28	24	20	16	12	8	4	0
binary	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 1 0	0 0 0 1	1 0 0 1
hex.	0	0	0	0	0	2	1	9

ID32901 = 219h

Overview

Bit No.	Value	Meaning according to ID 32901	Effectiveness
0	0	**Serial EEPROM (S) monitor inactive**	as from AW 207 2496 as from AZ 208 4096
	1	**active:** On the AZ / AW, the checksum is checked over a certain data range in the serial EEPROM at every system boot.	
1	0	Reserved	
	1	Reserved	
2	0	Reserved	
	1	Reserved	
3	0	**Parallel EEPROM (S) monitor: Inactive**	as from AZ 206
	1	**Active:** In the AZ, all drive parameters that can be changed by the user are filed permanently in a data-base. The checksum is checked over the entire data range in the parallel EEPROM at every system boot	
4	0	**Square wave pulse inputs monitor: Not active**	as from AZ 206
	1	**Active:** All square wave pulse input signals are checked by means of comparator for phase in opposition.	
5	0	Reserved	
	1	Reserved	
6	0	Reserved	
	1	Reserved	
7	0	**RF signal central action inactive**	as from AZ 206
	1	active In addition to the source RF (ID32796), the RF signal acts centrally for all axes at the AZ - X30 (e.g. in connection with single RF per AW, ...)	
8	0	Reserved	
	1	Reserved	
9	0	**Control panel change (AZB):** AZB can be plugged in / unplugged only with system switched off	as from AZ 208 1996
	1	AZB can be plugged in/unplugged in operation. The main menu must be activated before every control panel change.	

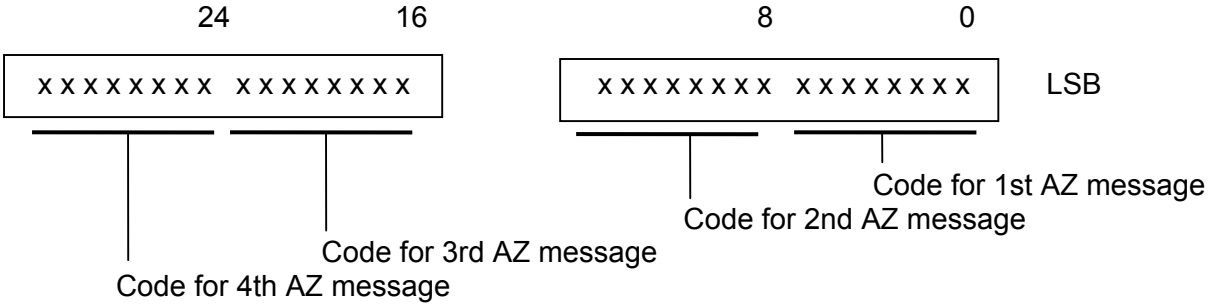
Bit No.	Value	Meaning according to ID 32901	Effectiveness
10	0	Regenerative braking active in AZ module	
	1	Regenerative braking disabled in AZ module	
11	0	Reserved	
	1	Reserved	
12	0	Monitoring active AZ option cards inactive	as from AZ 208 1996
	1	active Function monitoring (DPRAM handshake) of active AZ option cards (AZ-PSx, AZ-MCx, AZ-K0x, AZ-RCx...)	
13	0	Power failurel: Reset SBM, Maincontactor OFF, Err. „1066“	
	1	Fast Reaction on Power failure (≤ 10ms) **)	
14	0	from AZ-R02: Line undervoltage → Error	only with AZ-R02, from 3.09 2002/21
	1	from AZ-R02: No error evaluation with line undervoltage	

(S) Function must be activated only by AMK service staff.

**)Reaction on Power Failure depending on ID32773, bit 11
Bit 11 = 0: RF remains active. If DC BUS energy is discharged → Motor is coasting
Bit 11 = 1: RF is reset, motor is decelerated according to ID 32782
With code “33077.0 the warning bit „Power failure“ can be assigned to a binary output or the bit can be interrogated via the internal interface by an active option card.

ID32948 Configuration AZ message

This parameter defines up to four 32-bit transfer values in the AZSSINT interface and has no effect on the basic functioning of the AMKASYN system.
The parameter is expedient only in combination with intelligent option cards (AZ-PSx, SERCOS interface(,...). For instance, AZ internal setpoint value sources can be configured in the AZSSINT interface between AZ and option card.



Permissible codes for 32-bit AZ messages :
Code Source

0h Source not defined
3h Square wave pulse input AZ (terminal X32)

				Only for AZ-R02, from AZ 3.08 3000 (for SERCOS Measuring cycle, Touch probe input via AZ-IG2)	
4h	AZ-IG1	Channel 1	Slot 1	14h	AZ-IG2
5h	AZ-IG1	Channel 2	Slot 1	15h	AZ-IG2
6h	AZ-IG1	Channel 3	Slot 1	16h	AZ-IG2
7h	AZ-IG1	Channel 4	Slot 1	17h	AZ-IG2
8h	AZ-IG1	Channel 1	Slot 2	18h	AZ-IG2
9h	AZ-IG1	Channel 2	Slot 2	19h	AZ-IG2
Ah	AZ-IG1	Channel 3	Slot 2	1Ah	AZ-IG2
Bh	AZ-IG1	Channel 4	Slot 2	1Bh	AZ-IG2
Ch	AZ-IG1	Channel 1	Slot 3	1Ch	AZ-IG2
Dh	AZ-IG1	Channel 2	Slot 3	1Dh	AZ-IG2
Eh	AZ-IG1	Channel 3	Slot 3	1Eh	AZ-IG2
Fh	AZ-IG1	Channel 4	Slot 3	1Fh	AZ-IG2
10h	AZ-IG1	Channel 1	Slot 4	20h	AZ-IG2
11h	AZ-IG1	Channel 2	Slot 4	21h	AZ-IG2
12h	AZ-IG1	Channel 3	Slot 4	22h	AZ-IG2
13h	AZ-IG1	Channel 4	Slot 4	23h	AZ-IG2

Allocation of the 16 bit encoder input informationen to the 32 bit AZ message:

Determination for 32 bit message with code 03h to 13h

LOW WORD : Reference counter content (once per revolution)
HIGH WORD : actual counter content (cyclic with TDR)

Data updating rate TDR in the AZSSINT interface
AZ software < 0206 : TDR = 500 µs
AZ software (0206 : TDR = SERCOS interface® cycle time according to ID 2

Determination for 32 bit message with code 14h to 23h
(only for AZ-R02, from AZ 3.08 3000)**:**

LOW WORT : Touch probe counter content
HIGH WORT : actual counter content Actual position

3 Motor parameters

ID00111 Motor nominal current IN [A]

The motor nominal current is the maximum permissible continuous motor current and is used as reference variable for all torque data. The motor nominal current must be smaller than or equal to 80% of the maximum current of the inverter module used (see ID 110). The data value is taken from the name plate of the motor.

Condition: ID 111 ≤ ID 110 x 80%

ID00113 Maximum motor speed [min^{-1}]

Caution: ID 113 defines the maximum permissible process speed !
All further speeds values for this drive must be less than or equal to ID 113 !

If the actual speed value exceeds the maximum speed of the motor by a factor of 1.25, then the output stage of the system is disabled and the motor coasts. The parameter value is defined by the user depending on the process. It must be smaller than or equal to the value stated on the name plate or in the motor data sheet. It must be considered that the frequency limit of 100 kHz of the sine encoder input on the inverter module is not exceeded (guaranteed when AMK A-type encoders are used).

Formula 3-1: Determination of n_{max} with regard to the inverters sine encoder input

$$n_{\max}\left[rpm\right]=\frac{6000000}{ID32776}$$

Example: Motor encoder periods/rev. ID 32776 = 1024 ("I" type encoder)

$$n\max = ID113 = \frac{6000000}{1024} = 5859\,rpm$$

ID00116 Motor encoder resolution [Incr.]

Definition of the resolution of actual position value acquisition making use of the motor encoder as active actual position feedback. The resolution required for the process (increments per motor revolution) determines the value for ID 116. The parameter influences the operation mode closed loop position control.

Formula 3-2: Determination of the motor encoder resolution

ID116 = 4 · ID32776 · PV
PV - Pos. refining = (permis. fact. 1 ... 128, only integer numbers!)
ID 32776 - Motor encoder periods/rev.

Example: ID 32776 = 50 (name plate), PV = 100 selected
ID 116 = 20000 incr./motor revolution

ID32769 Magnetizing current IM [A]

The magnetising current represents the flux-generating component of the motor current. The magnetising current is constant up to the nominal speed and is reduced automatically for speeds greater than nominal speed (field weakening). The characteristic of the magnetising current IM can be seen from the following graphical display "Correction of the magnetising current characteristic".
For synchronous motors (type "DS...") ID32769 must be set to "0".

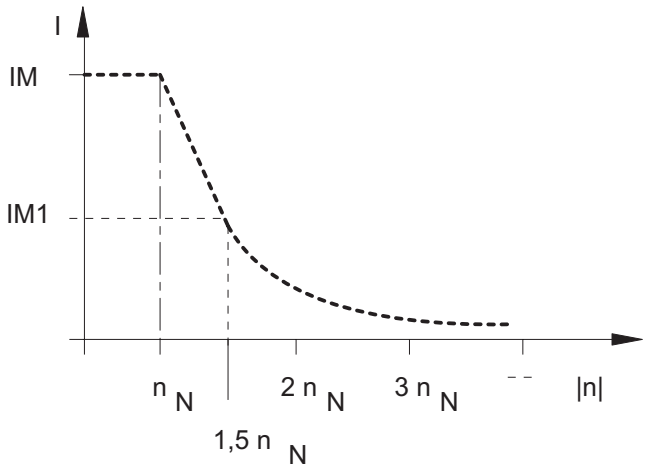
ID32770 Magnetising current IM1 [A]

The parameter value can be taken from the name plate (or data sheet) of the motor. If no value is available, use a value of 50 % x IM.

A correction of the magnetising current characteristic is made in the field weakening range. Between nN and 1.5 nN, the magnetising current is initially reduced linearly from IM to IM1. For speeds nN > 1.5 nN, the magnetising current is reduced proportionally to 1/n.

If IM1=IM or IM1=0 is set, then the correction does not apply and the magnetising current is reduced proportionally to 1/n for speeds > nN.
For synchronous motors (type "DS..") ID32770 must be set to "0".

Diagram 3-1: Correction of the magnetising current characteristic



ID32771 Nominal torque M_N [Nm]

The parameter value can be taken from the name plate (or data sheet) of the motor. The nominal torque of the motor serves exclusively for calculation of the messages $P \geq P_x$ (ID337) or $M_D \geq M_{dx}$ (ID 333).

Note: The motor nominal current according to ID 111 is the central reference for torque data.

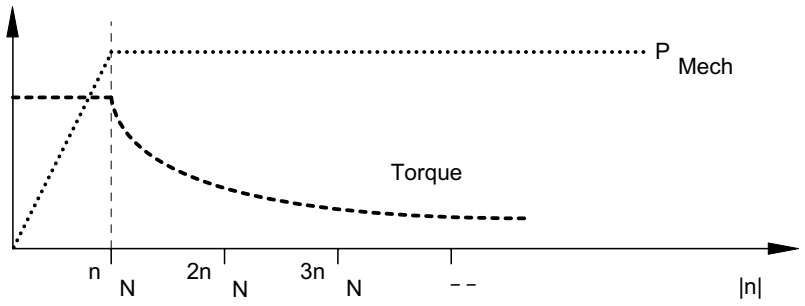
Formula 3-3: Torque calculation from a measured motor current

$$Torque = M_N \cdot \frac{\sqrt{\left(Act.motor\ current\ I^2 - Magnetizing\ current\ I_M{}^2\right)}}{\sqrt{\left(No\ \min al\ motor\ current\ I_N{}^2 - Magnetizing\ current\ I_M{}^2\right)}}$$

ID32772 Nominal speed n_N [min^{-1}]

The parameter value can be taken from the name plate (or data sheet) of the motor and describes the boundary between the basic speed range and the field weakening range. Motor torque and delivered mechanical power P_{Mech} are shown in the following diagram as functions of speed:

Formula 3-4: Correlation of motor torque and power



ID32774 Rotor time constant T_R [s]

The parameter value can be taken from the name plate (or data sheet) of the motor.
The rotor time constant T_R is the electrical time constant of the rotor.

For synchronous motors (type "DS...") ID32774 must be set to "0,1".

ID32775 Number of motor poles

The parameter value can be taken from the name plate (or data sheet) of the motor.
The number of poles of an AMKASYN motor can be obtained from its type designation.

Example: Motor type: DH-10-45-4-ABF-2000

Number of poles

ID32776 Motor encoder periods/rev.

The parameter value can be taken from the name plate (or data sheet) of the motor.
The "Motor encoder periods/rev." state the number of sine periods of the motor encoder per motor revolution.

ID32953 Motor encoder type

The „Motor encoder type“ parameter determines the motor type and the used encoder type. ID 32953 is coded and composed of four half bytes (nibbles) with numerical hex code.

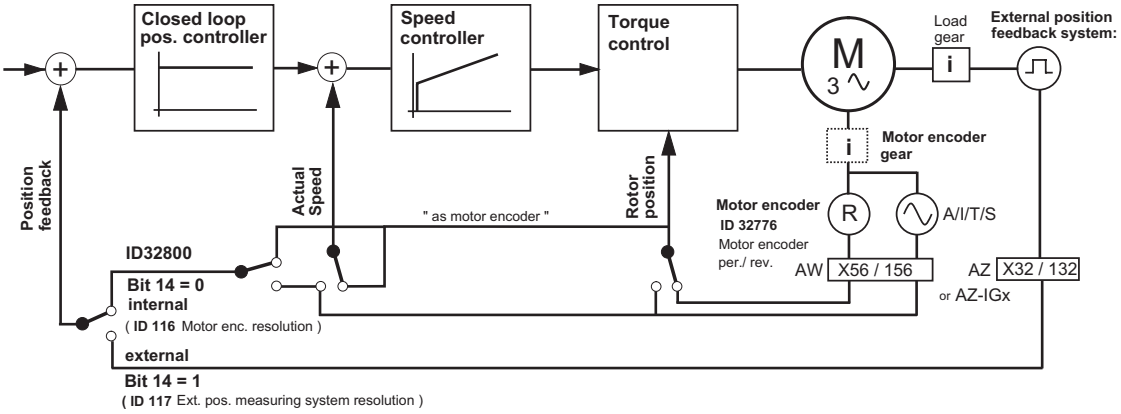
Motor encoder	(Nibble 0):	Motor encoder, used for commutation)
Motor type	(Nibble 1)	Asynchronous / Synchronous motor, U/f operation
Encoder for speed:	(Nibble 2)	Encoder used for actual velocity feedback
Encoder for position:	(Nibble 3)	Encoder used for actual position feedback

Value „5“ (I type encoder) in nibble 2 and 3 is promoted only from AZ Version ≥ AZ 2.08 40099 associated only with inverter modules AW xx/yy –2 and AZ 05/AW ..

Undependent of the motor encoder for commutation the encoder for actual speed and actual position feedback can be selected by entry of the appropriate HEX code in nibble 2 and 3 (with restrictions!).
Beside the actual position feedback from the motor encoder (internal resolution according to ID116) the actual position also can come from an external position measuring system (internal resolution according to ID117).
Bit 14=1 in ID32800 (main operating mode) changes to external position measuring system.

Configuration possibilities of motor, speed and position encoders

Encoder Configuration (from AZ Version ≥ AZ 2.08 4099, only for AW xx/yy - 2 and AZ 05 / AW ..)



ID 32953 :
" Encoder type " hex value per nibble

Pos. feedback enc. Nibble 3	Speed feedback enc. Nibble 2	Motor model Nibble 1	Motor encoder Nibble 0
0 : as Motor encoder	**0 : as Motor encoder**	**0 : Asynchronous motor**	**0 : I - type encoder** (default)
1 : reserved	1 : reserved	**1 : Synchronous motor**	**1 : A-type encoder**
2 / 3 : reserved	2 / 3 : reserved	**2 : U / f Control**	2 / 3 : reserved
4 : reserved	4 : reserved		**4 : T-type encoder** (multi turn)
5 : I-type encoder	**5 : I-type encoder**		**5 : I-type encoder**
6 : reserved	6 : reserved		6 : Special code *
7 : reserved	7 : reserved		**7 : S-type encoder** (single turn)
8 : reserved	8 : reserved		**8 : Resolver**

* for special application :
A-type motor encoder, additional T type encoder

The setting „As Motor encoder“ in nibble 2 and 3 is not permissible if external position measuring system is selected (ID32800, Bit14 = 1). In this case the actual position feedback always comes from the measuring system connected to the square wave input on the AZ module.

In the **Motor model** (Nibble 2) a differentiation is made between an asynchronous and a synchronous motor. In addition V/f operation can be selected here.

A type encoder (magnetic encoder) with sine / cosine output.
On first commissioning and after replacement of the motor or the inverter module the basic encoder adjustment must be activated.
During operation the encoder correction in the AW compensates temperature effects induced by the principle.

I-Geber (optical encoder) with sine- / cosine output
Basic encoder adjustment / encoder correction are not effective.

V/f operation
Voltage / frequency control (open loop speed control for an encoder-less motor).
Partially the parameters of the „Speed controller" group are effective (e. g. limits, setpoints). The speed controller parameters (e. g. K_P, $T_{N,}$) are not effective.
The contents of nibble 0, 2, 3 are not evaluated.

Note: The settings for acceleration / deceleration (ID32780, 32781, 32782) must be adapted to the physiscal acceleration / decelaration capabilities of the drive system!
An overcurrent error can be generated if the selected ramps are too steep.

Extended capabilities for inverter modules AW xx/yy –2 and AZ 05/AW ..:

Resolver
Absolute encoder related to one motor turn, e. g. for synchronous motors (accuracy class up to a few arc minutes).

S type encoder (Single turn absolute encoder SINCOS, with RS485 interface)
For commutation of synchronous motors (DS...) the absolute value related to one motor turn is required. The absolute value automatically is read via RS485 after Power On. Additionally the S type encoder provides sine and cosine signals for operation.

T type encoder (Multi turn absolute encoder SINCOS, with RS485 interface)
At standstill after call of the function „Homing cycle" the absolute position value is read via RS485 (the "Actual position_2π" value - code32899 - is set to „0" at the home position).
Additionally the T type encoder provides sine and cosine signals for operation.

Examples for encoder configuration:

Application	ID32953 [hex]
Asynchronous motor with motor encoder type I	0 0 0 0 h
Asynchronous motor with motor encoder type A	0 0 0 1 h
Synchronous motor with motor encoder Resolver	0 0 1 8 h
Linear motor (synchronous) , with resolver for commutation, measuring scale with sinusoidal output for actual speed and actual position.	5 5 1 8 h

ID32935 Zero speed voltage [V]

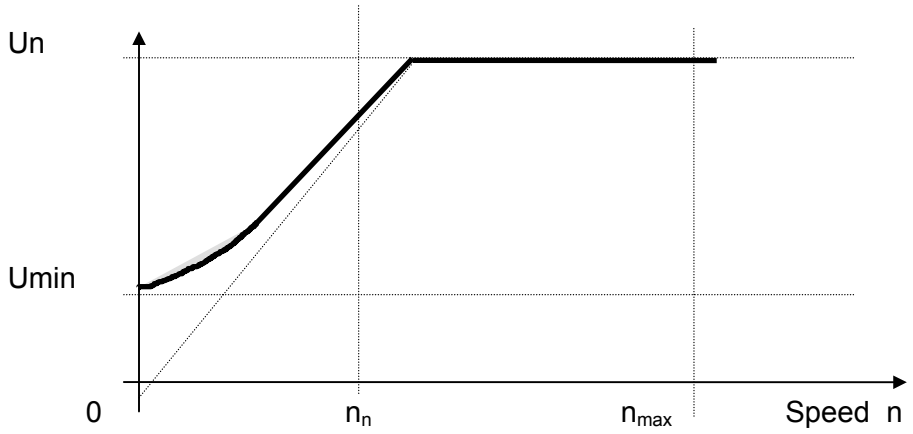
This parameter describes the motor voltage at speed n=0 in the voltage/frequency control operation mode. This operation mode can be activated through ID32953 as from AZ 0208 4096. The parameter influences the operation mode voltage/frequency control as from AW 2.12 software.

ID32768 Motor nominal voltage [V]

This parameter describes the motor voltage at speed n ≥ nominal speed in the voltage/frequency control operation mode. This operation mode can be activated through ID32953 as from AZ 0208 4096. The parameter influences the operation mode voltage/frequency control as from AW 2.12 software.

Representation: n = f(U) in voltage/frequency control

Motor voltage U



U_n Motor nominal voltage, ID32768
U_{min} Zero speed voltage, ID32935
n_n Motor nominal speed, ID32772
n_{max} Maximum speed, ID113

ID32960 Motor encoder gear input [Rev.]

ID32961 Motor encoder gear output [Rev.]

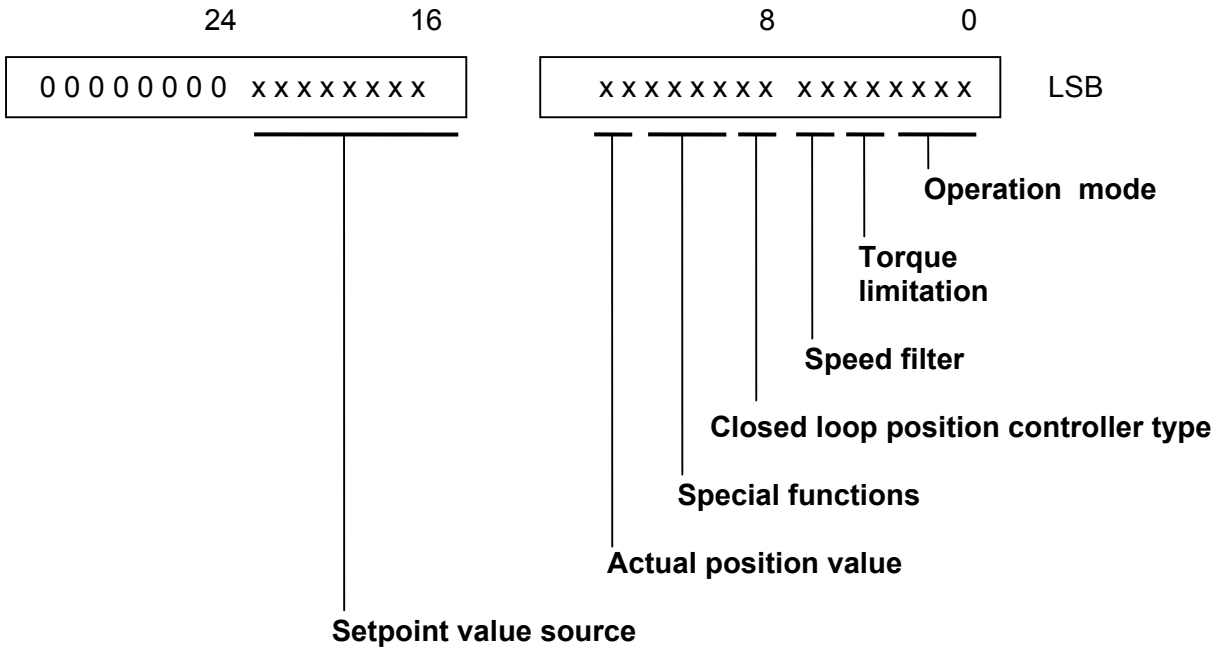
The parameters determine the transmission ratio of a gear between the motor and the associated motor encoder. Thus the effect of the parameters lies directly in the corresponding motor control algorithms. For input/output revolutions only integer values are permissible.

Caution: The drive can be controlled only conditionally if the parameters are input incorrectly !

4 Operation modes

ID32800 AMK main operation mode

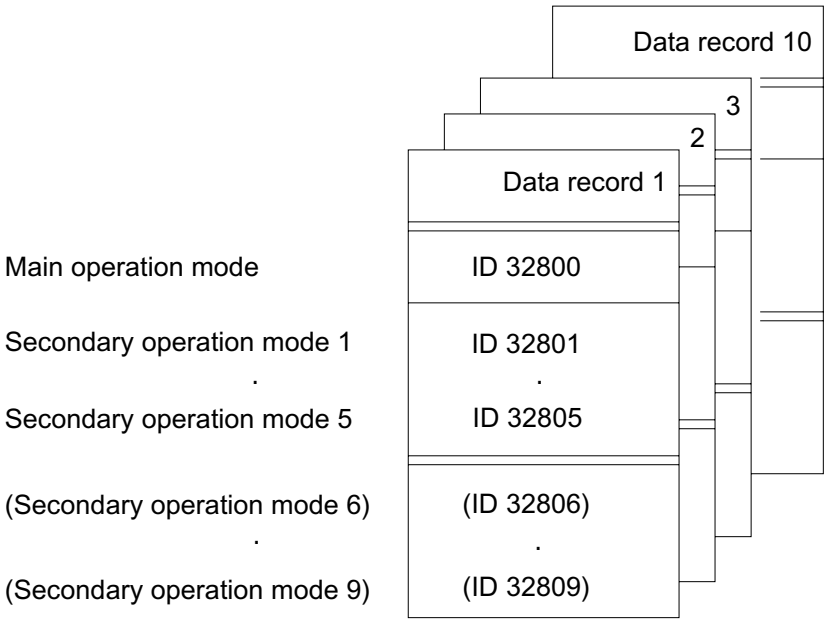
Configuration of the drive axis, determination of the operation mode, of the setpoint value source and overlaying or masking out further options.



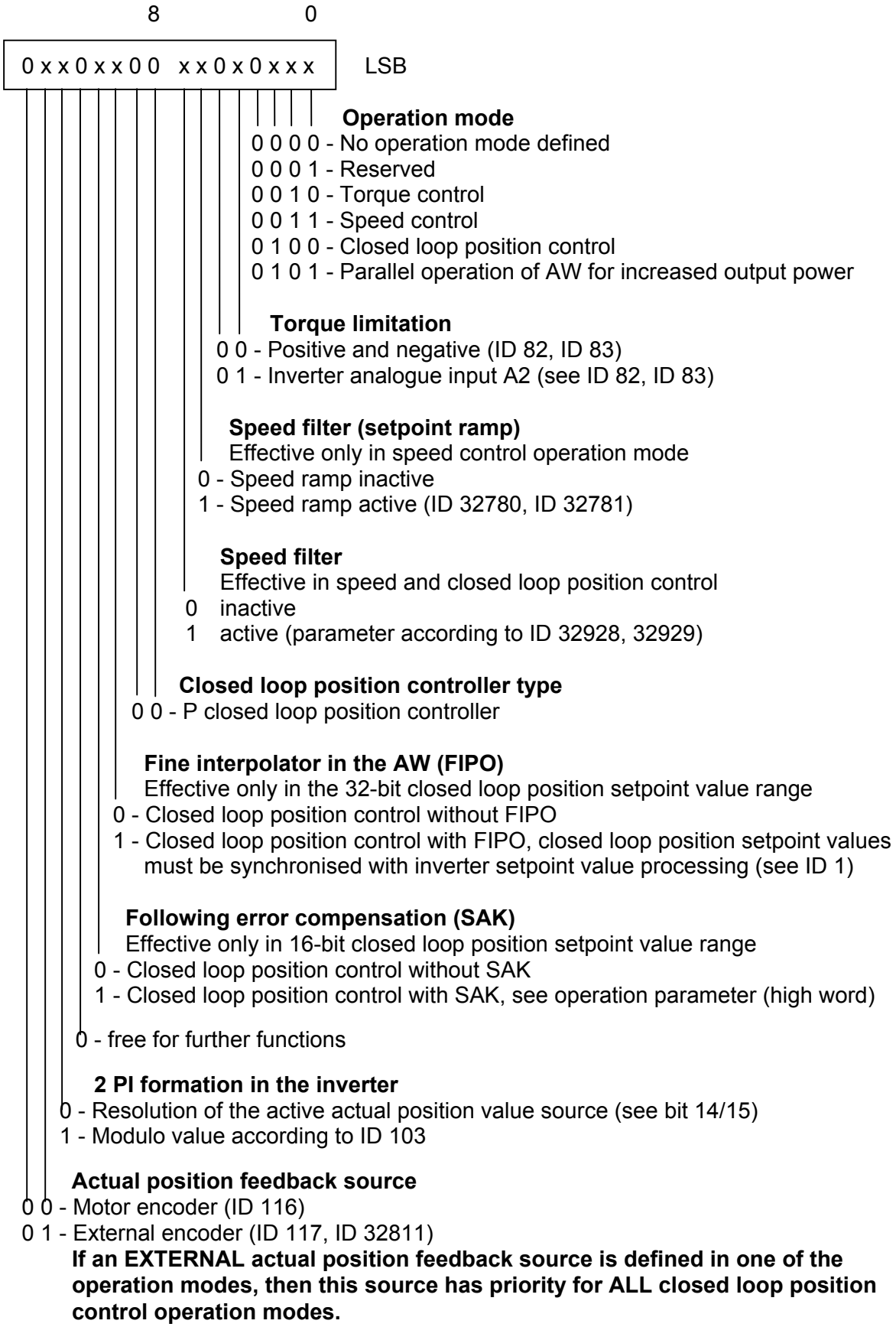
Example: ID 32800 = 0001 0043h Speed control with active setpoint value ramps, analogue setpoint value at the inverter analogue input A1.

- **10 data records** are available **per AMKASYN** system.
  These data records can be distributed freely over the active drives.
  Max. 4 data records can be assigned per drive (main parameter set, 1st...3rd alternative parameter set).
- The **main operation mode** ID 32800 **must be defined by the user** in the main parameter set per drive (see ID 32813). It is **automatically activated** after each system booting.
- In each data record, up to **5 secondary operation modes ID 32801 ... ID 32805** can be defined **optionally**.
- The secondary operation modes ID 32806 ...ID 32809 are **not** available for the user and serve for internal processes.
- Operation of the system in voltage/frequency (U/f) control is selected through ID 32953 "Motor encoder type" (= 20h → without encoder feedback).

Diagram 4-1: Parameter organisation in data records

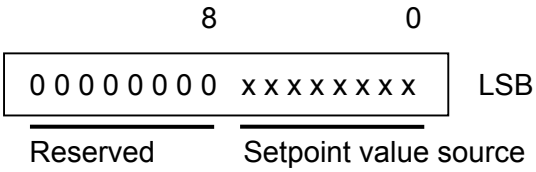


Structure of the operation mode parameter (low word)



If an EXTERNAL actual position feedback source is defined in one of the operation modes, then this source has priority for ALL closed loop position control operation modes.

Structure of the operation mode parameter (high word)



Code	Oper.mode	Setpoint value source
0h		No setpoint value source activated
1h	M,D	Inverter analogue input A1 (A1I, A1N)
2h		Reserved
3h	D,L,S	Square wave pulse input AZ (terminal X32)
4h	D,L,S	AZ-IG1 channel 1, AZ slot 1
5h	D,L,S	AZ-IG1 channel 2 ,AZ slot 1
6h	D,L,S	AZ-IG1 channel 3 ,AZ slot 1
7h	D,L,S	AZ-IG1 channel 4 ,AZ slot 1
8h	D,L,S	AZ-IG1 channel 1 ,AZ slot 2
9h	D,L,S	AZ-IG1 channel 2 ,AZ slot 2
Ah	D,L,S	AZ-IG1 channel 3 ,AZ slot 2
Bh	D,L,S	AZ-IG1 channel 4 ,AZ slot 2
Ch	D,L,S	AZ-IG1 channel 1 ,AZ slot 3
Dh	D,L,S	AZ-IG1 channel 2 ,AZ slot 3
Eh	D,L,S	AZ-IG1 channel 3 ,AZ slot 3
Fh	D,L,S	AZ-IG1 channel 4 ,AZ slot 3
10h	D,L,S	AZ-IG1 channel 1 ,AZ slot 4
11h	D,L,S	AZ-IG1 channel 2 ,AZ slot 4
12h	D,L,S	AZ-IG1 channel 3 ,AZ slot 4
13h	D,L,S	AZ-IG1 channel 4 ,AZ slot 4
24h	D,L,S	Actual position value of AW 1
25h	D,L,S	Actual position value of AW 2
26h	D,L,S	Actual position value of AW 3
27h	D,L,S	Actual position value of AW 4
28h	D,L,S	Actual position value of AW 5
29h	D,L,S	Actual position value of AW 6
2Ah	D,L,S	Actual position value of AW 7
2Bh	D,L,S	Actual position value of AW 8
3Ch	M,D,L,S	Commanding interface (AZ-PSx)
3Dh	M,D,L,S	SERCOS interface®
3Eh	M,D,L,S	AZ-MC1 (CNC control)

M Torque control
D Speed control
L Closed loop position control
S Synchronous control

ID32801 AMK secondary operation mode 1

ID32802 AMK secondary operation mode 2

ID32803 AMK secondary operation mode 3

ID32804 AMK secondary operation mode 4

ID32805 AMK secondary operation mode 5

The AMK secondary operation modes 1...5 are structured like the AMK main operation mode. During operation, switching over between the displayed operation modes is possible. **The current actual position value source must not** be changed when switching over the operation mode.

The secondary operation modes 6...9 are used internally by AMK. They cannot be changed by the user. The following drive functions are assigned to the AMK operation modes:

ID 32806	AMK Reserved	(secondary operation mode 6)
ID 32807	AMK torque control	(secondary operation mode 7)
ID 32808	AMK closed loop position control	(secondary operation mode 8)
ID 32809	AMK speed control	(secondary operation mode 9)

AMK secondary operation mode 8 is used for all positioning through internal AZ interpolator or for operation through setpoint pulses.

Secondary operation mode 9 is switched over to internally if manual jog, digital speed control or basic encoder adjustment are selected on the control panel.

After termination of an internal AMK function, the drive remains in the last used secondary operation mode (7 or 8 or 9). For the following user function an operation mode change must be commanded to main operation mode or the defined secondary operation mode 1...5.

5 Torque parameters

ID00080 Torque setpoint value [% M_N]

Fixed torque setpoint value, can be called via binary input after assignment of code 1022.x.

ID00082 Positive torque limit (on-line changeable) [% M_N]

ID00083 Negative torque limit (on-line changeable) [% M_N]

Definition of the positive/negative limit of the torque setpoint values. The entry is made in % related to the nominal torque of the motor, which is derived internally in the system from the nominal current of the motor (ID 111).
If torque setpoint values exceed the limits, the message bit Md ≥ Md_{limit} is set in ID 334. It must be possible for the drive to realise the entered value, i.e. the following condition must be complied with:

Formula 5-1: Calculation of the torque limits

$$IDxx \le \frac{100\% \cdot ID110}{\sqrt{\left(ID111^2 - ID32769^2\right)}}$$

IDxx =	**ID 82, or | ID 83 |**
ID 110 =	Inverter module maximum current
ID 111 =	Motor nominal current
ID 32769 =	Magnetising current

Attention: If "Torque limitation through inverter analog input A2" is defined in the operation mode parameter, the higher absolute value of ID 82 or ID 83 limits the peak torque if 10V are applied to the analogue input A2. The analogue input voltage at A2 is processed by the system as an absolute value.

ID00085 Torque polarity

Definition of the polarity of torque data. With positive torque setpoint value and positive polarity, the motor rotates clockwise when viewed onto the motor shaft (A bearing end)

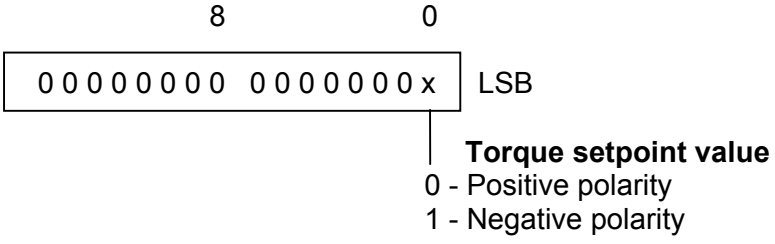
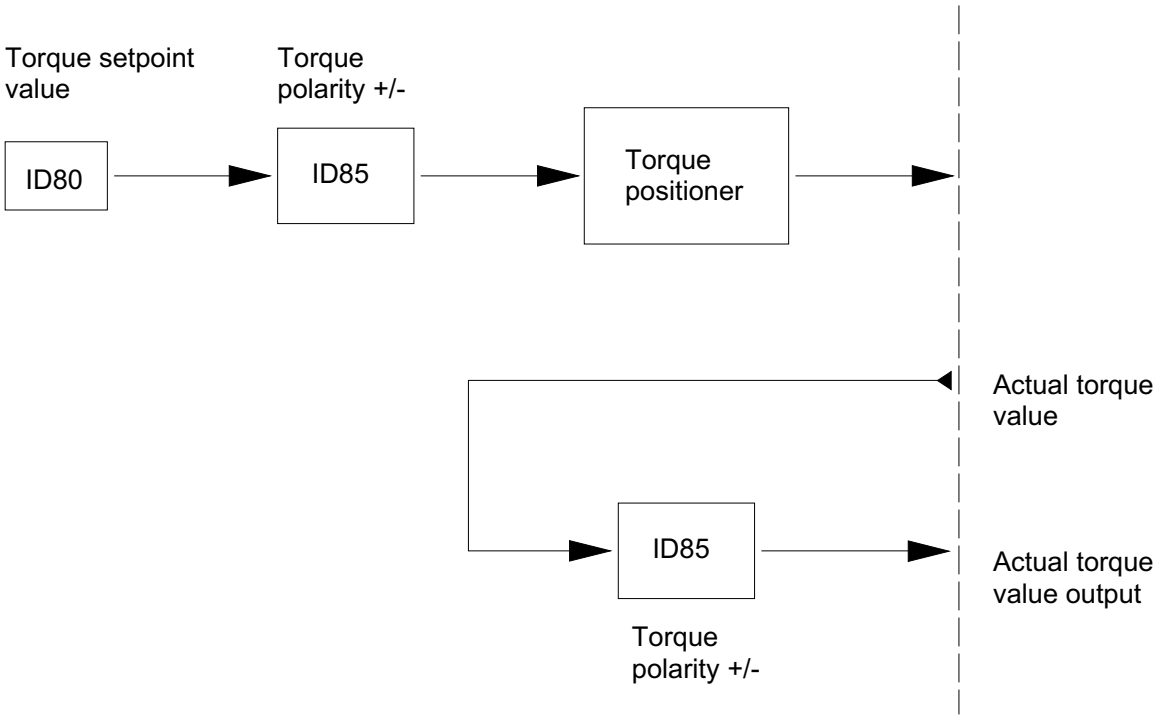


Diagram 5-1: Effect of the torque polarity



ID00126 Torque threshold Mdx [% M_N] (on-line changeable)

If the actual torque value exceeds the **torque threshold Mdx**, then the message bit Md ≥ Mdx is set (code "333").

ID32777 Torque at 10V at A1 [% M_N]

Scaling of the torque setpoint values at the analogue input A1 of the inverter module in the torque control operation mode. The entry refers to the nominal torque. The scaling has an accuracy of approx. (10% and applies for the basic speed range up to nominal speed. Above nominal speed, the real torque decreases inversely proportionally to the speed. The setpoint value voltage (10V is digitised with a resolution of 12 bits.

Formula 5-2: Torque at 10V control voltage at inverter input A1

$$ID32777 \leq \frac{\sqrt{\left(ID110^2 - ID32769^2\right)}}{\sqrt{\left(ID111^2 - ID32769^2\right)}} \cdot 100\%$$

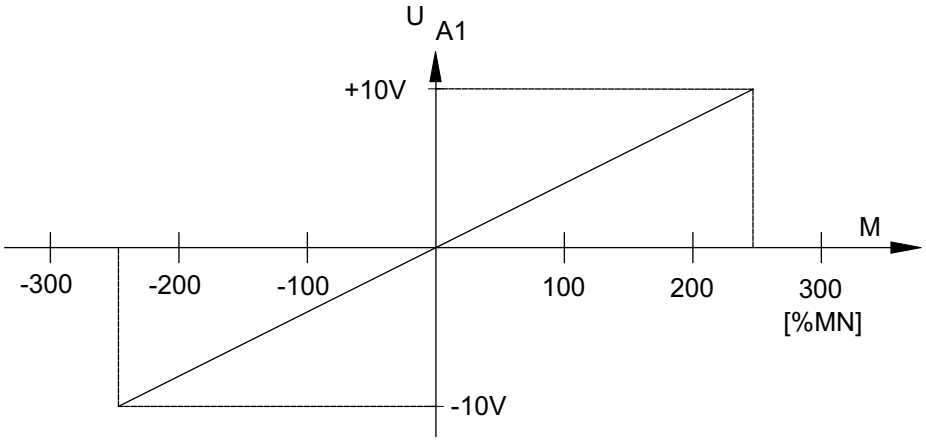
ID 110 = Inverter module maximum current
ID 32769 = Magnetising current IM
ID 111 = Motor nominal current IN

Example: ID 32777 = 250% MN, at 10V input voltage at A1

Formula 5-3: Calculation example for torque determination

$$M_{Soll} = 250\%\, MN \cdot \frac{U_{A1}}{10V}$$

Diagram 5-2: Torque as a function of the input voltage at A1



6 Speed parameters

ID00036 Speed setpoint value [min^{-1}]

Speed setpoint value. Can be activated through binary input after assignment of code 1010.x.

ID00038 Positive speed limit [min^{-1}] (on-line changeable)

ID00039 Negative speed limit [min^{-1}] (on-line changeable)

The parameters influence the operation modes speed/closed loop position control.

Positive and negative limitation of the speed setpoint values. If the speed setpoint values exceed these limits, the message bit $n_{set} > n_{limit}$ is set in (Code 335). The accuracy is limited to | 1 rpm | due to the value processing internal to the system.

Condition: ID 38, | ID 39 | ≤ ID 113 (motor maximum speed)

ID00043 Speed polarity

Definition of the polarity of speed data. Positive speed setpoint value and positive polarity result in clockwise rotation of the motor viewed onto the motor shaft (A bearing end).

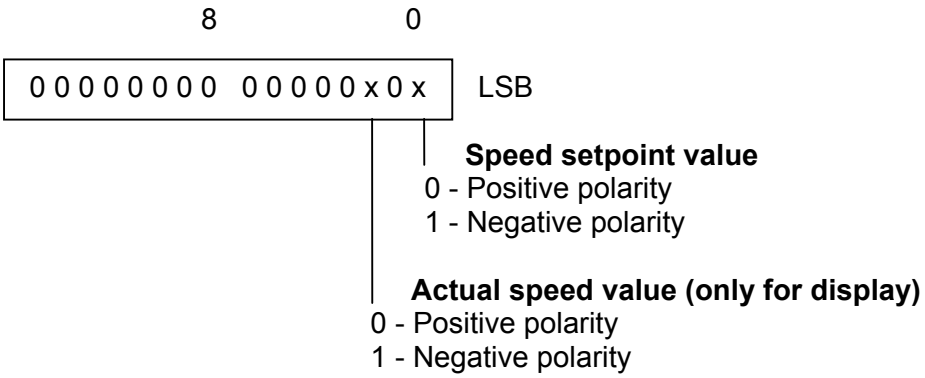
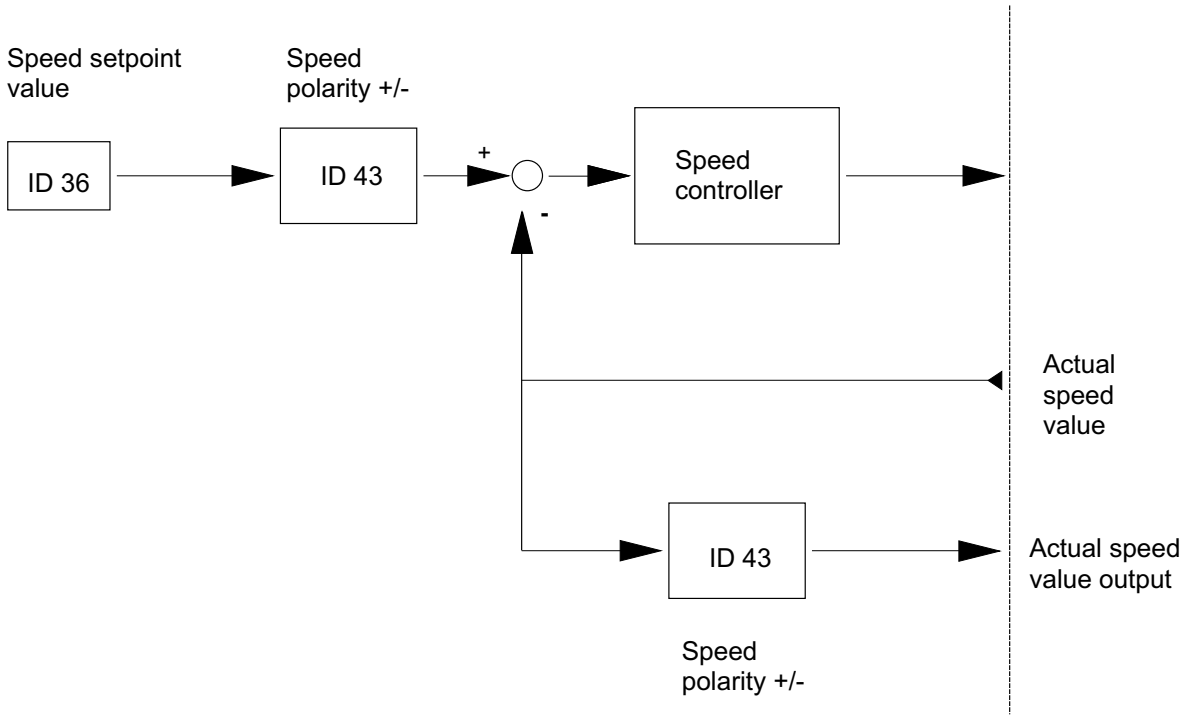


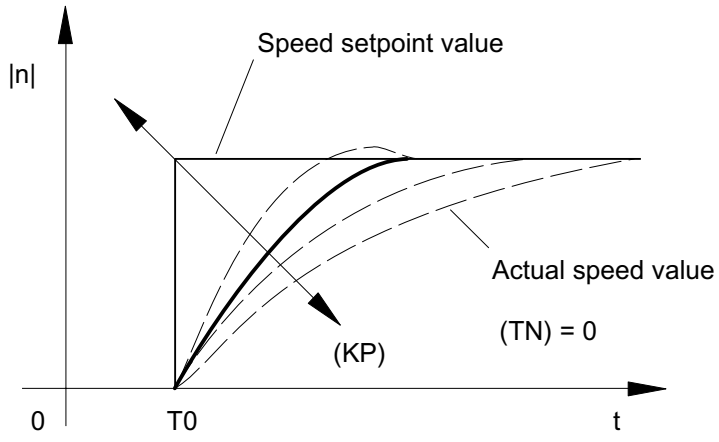
Diagram 6-1: Effect of the speed polarity



ID00100 Proportional gain speed control KP (on-line changeable)

Proportional gain KP of the speed controller, must be optimised by the user.

Diagram 6-2: Step response of the speed control circuit, effect of KP (ID100)



Characteristic of the actual speed of the speed control circuit at a speed setpoint step, depending on KP (ID 100).

Formula 6-1: Parameter dependencies ID100

$$kpdzl = ID100 \cdot \frac{4 \cdot \sqrt{\left(ID111^2 - ID32769^2\right)}}{ID110}$$

Condition: $1 \leq kpdzl \leq 32767$

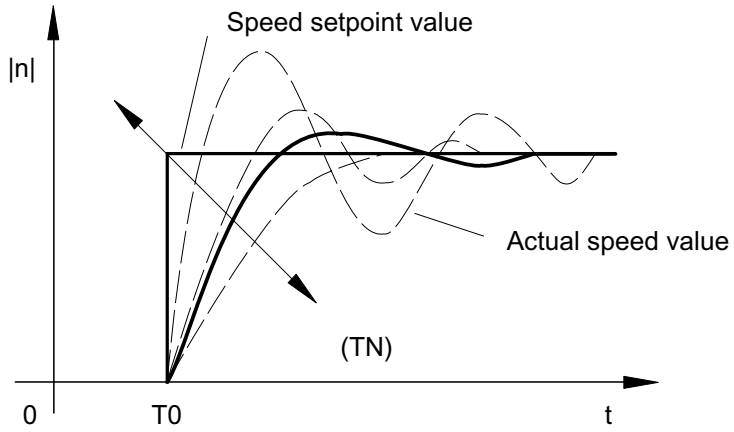
kpdzl	System-internal KP factor
ID 100	Prop. gain speed control KP
ID 110	Inverter module maximum current
ID 111	Motor nominal current IN
ID 32769	Magnetising current IM

ID00101 Integral action time speed control TN [ms/4] (on-line changeable)

The integral action time TN (integral component) of the PI speed controller, must be optimized by the user.

With TN = 0 ms, the integral action time, i.e. the integral component of the PI speed controller is ineffective. The speed controller then works as pure P controller.

Diagram 6-3: Step response of the speed control circuit, effect of T_N (ID101)



Characteristic of the actual speed of the speed control circuit at a speed setpoint step, depending on TN (ID 101).

Formula 6-2: Parameter dependencies ID101

$$kidzl = \frac{ID100}{ID101} \cdot \frac{4 \cdot \sqrt{\left(ID111^2 - ID32769^2\right)}}{ID110}$$

Condition: 1 (kidzl (32767

kidzl = System-internal factor
ID 100 = Prop. gain speed control K_P
ID 101 = Integral action time speed control T_N
ID 110 = Inverter module maximum current
ID 111 = Motor nominal current I_N
ID 32769 = Magnetizing current I_M

ID00124 Zero speed window [min^{-1}] (on-line changeable)

If the actual speed value is within the zero speed window (| n_{act} | < ID 124), then the message bit "Code 331" is set.

ID00125 Speed threshold nx [min^{-1}] (on-line changeable)

If the actual speed value is less than the speed threshold nx (| n_{act} | < ID 125), then the message bit "Code 332" is set.

ID00157 Speed window [min^{-1}] (on-line changeable)

As long as the difference between the speed setpoint value and actual speed value is less than the speed window (| nset - nact | (ID 157), the message bit nact = nset "Code 330" is set.

ID 00209 Speed control: Lower adaptation limit [min^{-1}]

ID 00210 Speed control: Upper adaptation limit [min^{-1}]

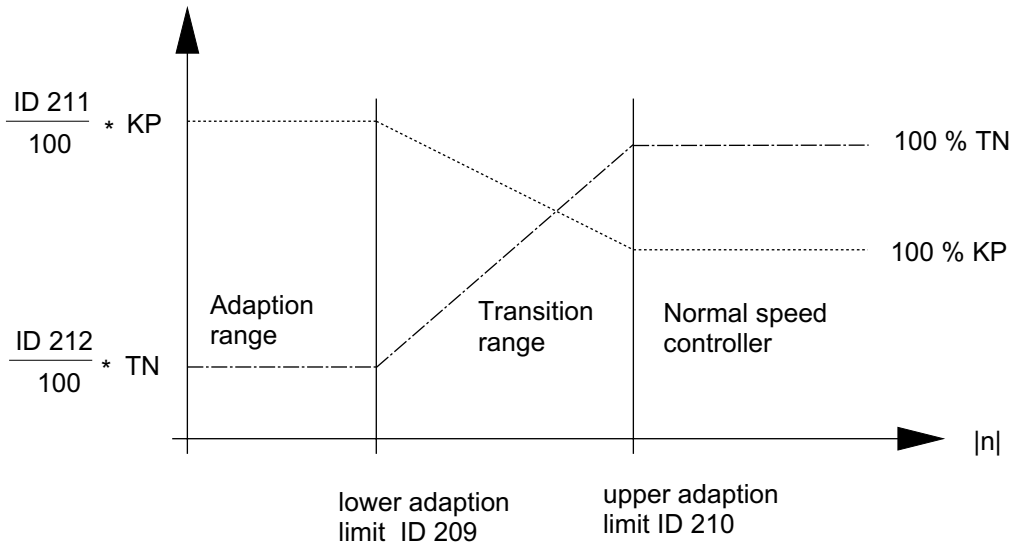
Speed limits for the adaptation of KP and TN.

K_P and T_N act according to ID211 and ID212 **below the lower adaptation limit**.
K_P and T_N act unchanged according to ID100 and ID101 **above the upper adaptation limit**.

In the range between the **lower and upper adaptation limit**, KP and TN change linearly, i.e. the control behaviour changes depending upon the actual speed value (see following diagrams).

Conditions: ID 209 < ID 210, Adaptation
ID 209 = ID 210, No adaptation
ID 209, ID 210 (ID 113 (motor maximum speed)

Diagram 6-4: Adaption of the speed controller parameters K_P and T_N



ID00211 Speed control: Proportional gain adaptation [%]

The adaptive proportional gain states below the lower adaptation limit the percentage value related to the speed controller proportional gain KP (ID 100).

Formula 6-3: Proportional gain adaptation

$$KP_{Adaptionsbereich} = ID100 \cdot \frac{ID211}{100\%}$$

ID00212 Speed control: Integral action time adaptation [%]

The adaptive integral action time states below the lower adaptation limit the percentage value related to the speed controller integral action time T_N (ID101).

Formula 6-4: Integral action time adaptation

$$TN_{Adaptionsbereich} = ID101 \cdot \frac{ID212}{100\%}$$

In the range between the lower and the upper adaptation limit, the speed controller proportional gain and integral action time change linearly, i.e. the control behaviour changes depending upon the actual speed value (see ID 209, ID 210).

ID32778 Speed at 10V at A1 [min-1] (on-line changeable)

Absolute amount of the speed final value at 10V input voltage at the analogue input A1 of the inverter module. The setpoint value voltage +/- 10V is processed with an **internal resolution of 12 bits.**

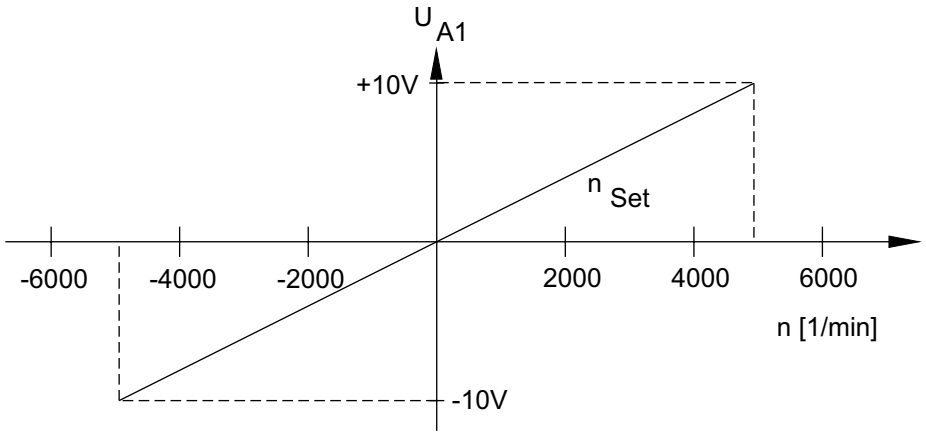
Condition: ID 32778 ≤ ID 38, | ID 39 | ≤ ID 113
Example: At a setpoint value of 10V, the motor speed shall be 5000 rpm. ID 32778: 5000

Formula 6-5: Calculation example of the speed at 10V at A1, ID32778

$$10V = 5000\,\mathrm{min}^{-1} \rightarrow n_{Soll} = 5000\,\mathrm{min}^{-1} \cdot \frac{U_{A1}}{10V}$$

Diagram 6-5: Speed depending on input voltage at A1

Diagram 7-5: Speed depending on input voltage at A1



ID32779 Speed offset for A1 [min-1] (on-line changeable)

The **"Speed offset for A1"** parameter offers the possibility of adding a **constant speed setpoint value** to the relevant analogue setpoint value (ID32778) in order to compensate for a drift of the analogue setpoint value input. Permanent compensation to zero speed is not possible!

It must be considered with correction values of | ID32779 | ≥ 1 rpm that the final value according to ID32778 also changes additively by the value of ID32779. The change of the offset produces a shift of the straight line on the voltage axis (U_{A1}) and no change of the slope of the straight line (see diagram of speed depending on the input voltage at A1).

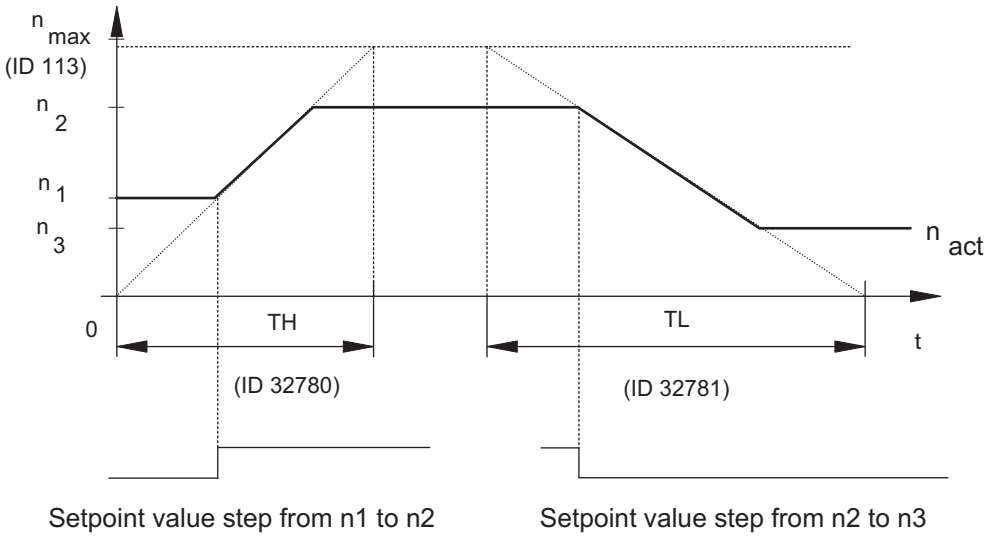
ID32780 Acceleration ramp TH [ms] (on-line changeable)

ID32781 Deceleration ramp TL [ms] (on-line changeable)

A ramp generator (acceleration/deceleration) becomes effective at the speed controller input by setting bit 6 = 1 in the operation mode parameter ID32800. The entered times apply for acceleration from 0 up to reaching the maximum speed according to ID113, for deceleration from maximum speed (ID113) to speed 0.

Example: In the following diagram, the effect of the acceleration and deceleration ramp parameters is displayed after speed setpoint value steps.
- Step $n_1 \rightarrow n_2$ leads to the acceleration ramp
- Step $n_2 \rightarrow n_3$ leads to the deceleration ramp

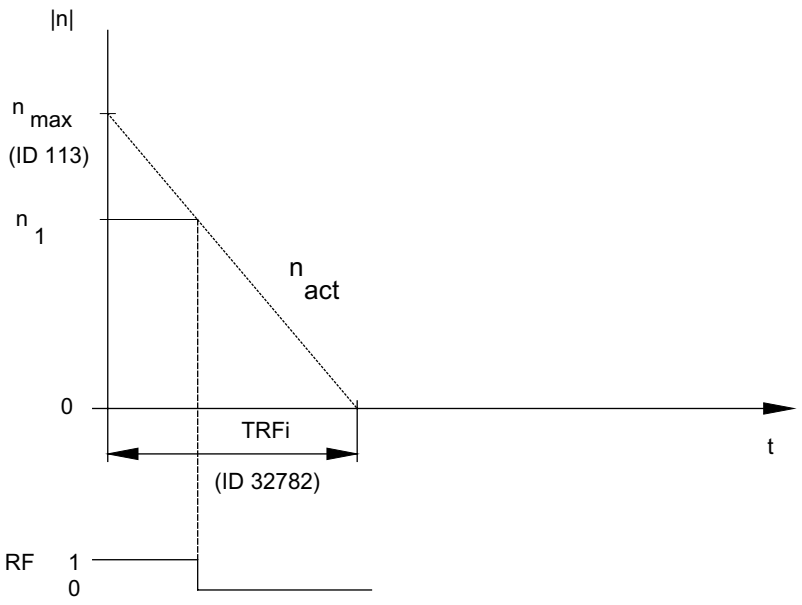
Diagram 6-6: Acceleration and deceleration ramp



ID32782 Deceleration ramp for RF inactive [ms]

On inactivation of Inverters on, the motor is braked according to the "Deceleration ramp RF inactive" ID32782. The entered time applies for the deceleration from maximum speed according to ID113 to speed 0.

Diagram 6-7: Deceleration ramp for RF inactive



ID32928 Time filter 1 [ms]

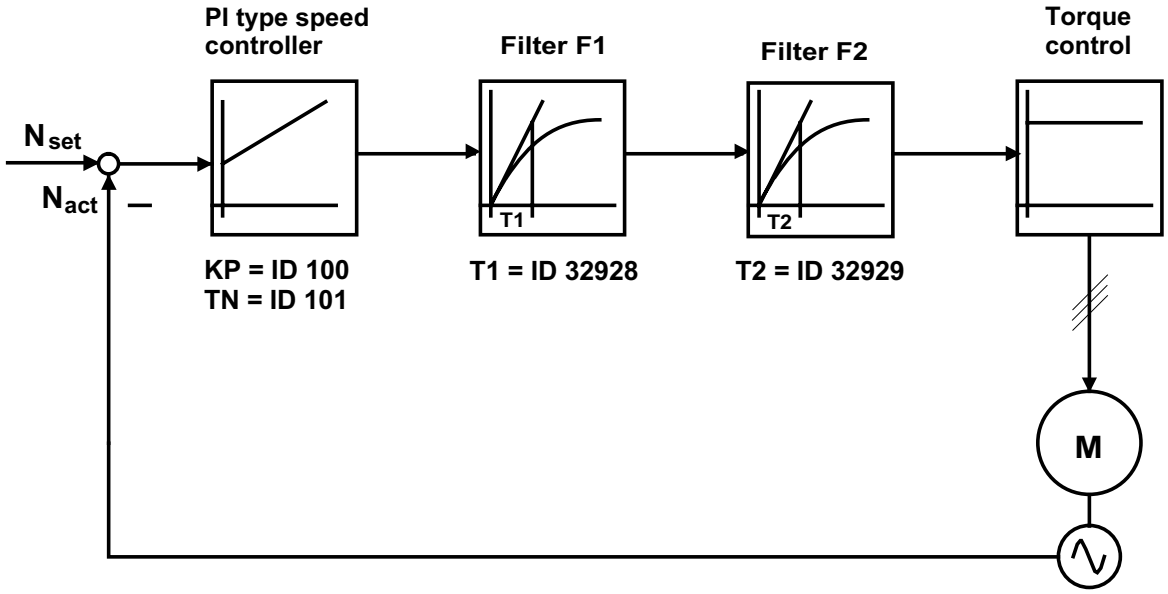
ID32929 Time filter 2 [ms]

These parameters define the filter time constants for two programmable P-T1 filters. The filters are arranged sequentially at at the output of the speed controller. They come into effect when the operating mode is in speed control or closed loop position control (from software version AW 0212).

The filters are activated by setting bit 7 = 1 in the operation mode parameter (ID32800...ID32805).

ID32928 and ID32929 contain the time constant values for filters F1 and F2 respectively. A value of "0" will neutralise the filters.

(Note: With special software version AW 020F, the filters cannot be neutralised!)



The 3 dB corner frequencies are:

$$f1 = \frac{1}{2\pi T1} \; and \; f2 = \frac{1}{2\pi T2}$$

The loop gain of the control loop is decreasing by 6dB/octave from frequency f1 and by 12dB/octave from frequency f2 (with f1 < f2).

7 Closed loop position control parameters

ID00049 Positive position limit [Incr.] (on-line changeable)

ID00050 Negative position limit [Incr.] (on-line changeable)

The position limits monitor the movement of the axis in positive and negative direction. A homing cycle must be performed before the message bits are evaluated.

When the limit is reached, in each case a message bit (code 33015/33012 positive, code 33013/3308 negative), which can be assigned to a binary output, is set. The message bits do not stop the axial movement!

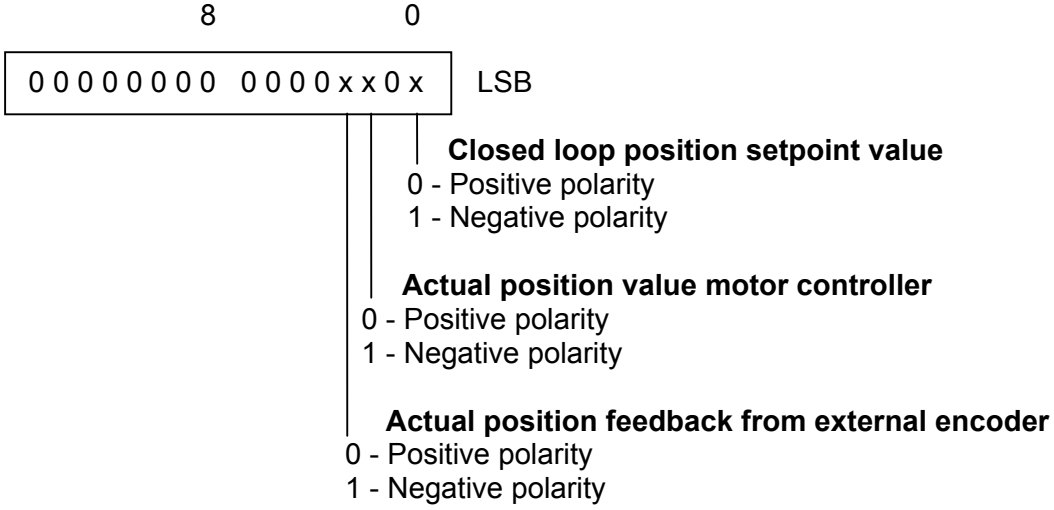
The higher ranking controller must stop the axis by evaluation of the binary outputs.

If the axis is controlled through the 16-bit position setpoint value channel, then an automatic stop of axial movement can be parameterised via ID32773 (setpoint value limitation in the 16-bit setpoint value channel) on exceeding the limits.

ID00055 Closed loop position control polarity

The polarity of the position data can be defined with this parameter. The direction of shaft rotation changes with unchanged sign of the setpoint value. Positive polarity = rotation clockwise viewed onto the motor shaft.

Caution: With external actual position encoders, the direction of rotation can be influenced additionally by ID 115. The control direction of the position controller remains unchanged, the position setpoint values and the actual position display are switched according to the diagram.

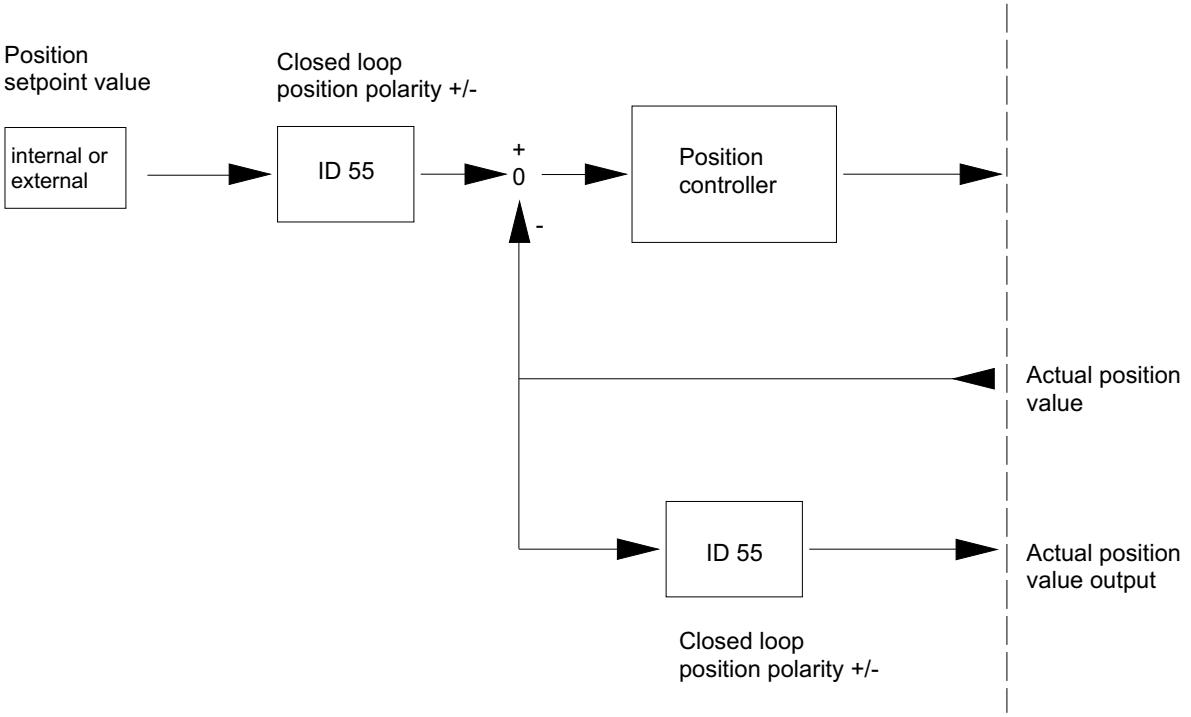


The setpoint and actual position values must always be defined equally as a pair.

Only the following bit combinations are permissible:

0000h	Positive polarity, independent of the actual position value encoder
0005h	Negative polarity, actual position value encoder = motor encoder
0009h	Negative polarity, actual position value encoder = external encoder

Diagram 7-1: Effect to the closed loop position polarity



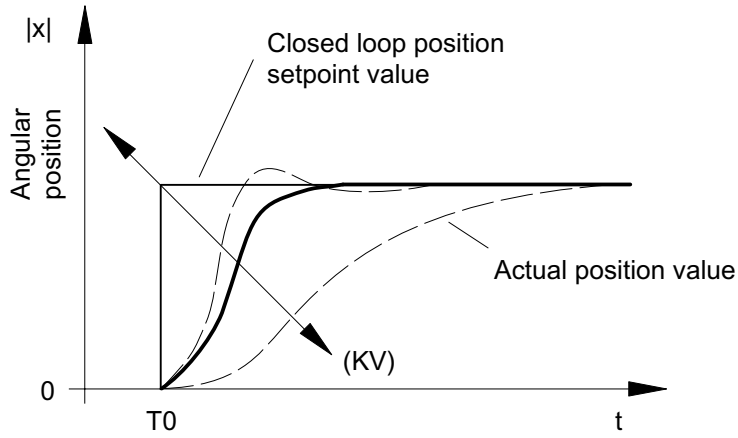
ID00103 Modulo value [Incr.]

Defines the size of the 32-bit actual modulo value or modulo setpoint value held in the inverter as a number of increments related to one revolution of the load or of the motor shaft. The parameter can be activated through the operation mode see ID32800... . The parameter is effective in positioning processes in connection with the "Synchronous control, flying cutter" drive functions.

ID00104 Position loop KV factor [min^{-1}] (on-line changeable)

Proportional gain KV of the P-type position controller.

Diagram 7-2: Step response of the closed loop position controller, effect of KV (ID104)



Characteristic of the actual position value with a position setpoint value step.

The following conditions must be complied with:

Formula 7-1: System internal limitation of the position loop KV factor

$$0{,}0555 \leq \frac{KV}{0{,}0001 \cdot LA} \leq 32767$$

LA = Closed loop position resolution factor (encoder dependent)

Motor encoder as actual position value encoder:

LA = ID 116 ID 116 = Motor encoder resolution

Rotational external encoder:

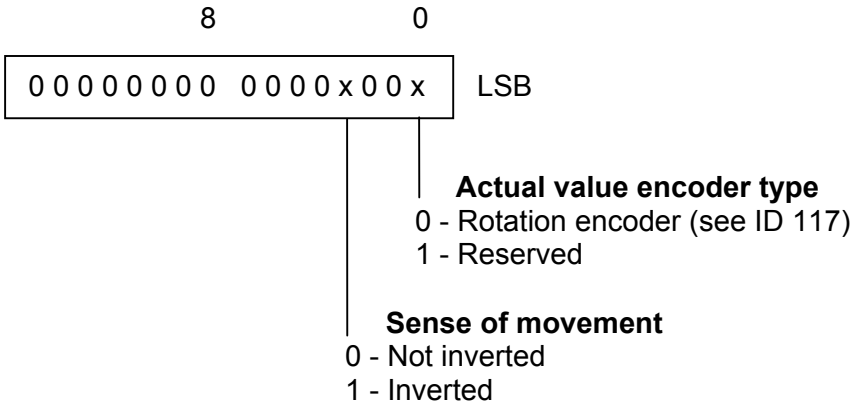
Formula 7-2: Closed loop position resolution factor for external encoder

$$LA = \frac{ID117 \cdot ID122}{ID121}$$

ID 117 = Ext. act. position value encoder resolution (4 x pulses per revolution at gearing output)
ID 122 = Gear output revolutions
ID 121 = Gear input revolutions

ID00115 Position feedback type

The properties of the external encoder for actual position are defined in the position feedback type parameter. The parameter is effective only with active external position feedback encoders.



Caution: If the sense of movement of the external actual position value encoder is wrongly defined, then the closed loop position controller is switched over from normal "negative feedback" to "positive feedback" and the shaft is accelerated to the defined speed limit according to ID 38, ID 39. Furthermore, the selected closed loop position polarity according to ID 55 must be observed.

ID00117 Resolution external encoder [Incr.]

The parameter is effective only if an external actual position feedback system is activated. The pulses/rev. can be taken from the data sheet of the external encoder. The parameter value is used for calculating the kV factor effective in the P-type closed loop position controller. In the case of incremental encoders (two square wave signals phase-shifted by 90 degrees), the following resolution results:

ID 117 = Pulses/rev. · 4 (pulses per revolution at gearing output)

The use of an external position feedback system must be stated in the operation mode parameter (ID 32800 ... 32805).

Caution: **If o n e operation mode with external position feedback system is defined, then every closed loop position control operation mode will be performed with this external position feedback system.**

The source of the pulse input for the external position feedback system must be defined in ID 32811.

ID00121 Load gear input revolutions [U]

ID00122 Load gear output revolutions [U]

These parameters are effective only with external actual position feedback systems. The parameter values can be taken from the name plate (or data sheet) of the gear. The gear ratio i is used for calculating the KV factor effective in the P-type position controller.

Formula 7-3: Gear ratio with external actual position value acquisition

$$Gear\ ratio\ i = \frac{Input\ revolutions}{Output\ revolutions}$$

The input revolutions and the output revolutions must be entered as integer numbers. As from AZ software 0206, the gear ratio is taken into account additionally in the drive functions of "Spindle positioning" and "Synchronous control" for calculating setpoint speeds in the area of speed adaptation, for instance.

ID00123 Feed constant [mm/U]

The parameter is effective only in connection with an external linear position measuring system. The feed constant states the movement of the slide for one revolution of the feed spindle. 1)

1) in preparation

ID00159 Excess error [Incr.]

If the difference between the position setpoint value and actual position value (following error) is larger than the internal "Excess error", then the Inverters On RF is withdrawn from all drives and the drives coast. At the same time, the System Ready message is reset and a diagnosis message (No. 2318) is output.

Caution: The value in ID 00159 must be an integer number. Internally it is multiplied by a factor:

AW software < 0206 : Factor = 256
AW software from 0206 : Factor = 16384

(The software version can be displayed off on the control panel AZB).

The calculated maximum following error SA (linear axis) results from:

$$SA[mm] = \frac{\text{Maximum speed}[mm/min]}{\text{Position loop KV}[1/min]}$$

The following error must be converted from [mm] into [incr.] through the "Distance per motor revolution" and the "Encoder resolution" (ID 116 or ID 117):

$$SA[\text{Incr.}] = \frac{SA[mm] \cdot ID116[\text{Incr}]}{\text{Distance / Motor revolution}[mm]}$$

Formula 7-4: Calculation of ID159, Excess error

$$ID159 = \frac{\text{Max. permissible following error}[\text{Incr}]}{16384\,(\text{or } 256)}$$

→ round up to the next integer number, if too close add "1"

ID32811 Type of external position feedback source

The parameter is effective only with active external actual position feedback system (activation by active operation mode, see ID 32800...). Definition of the interface which acts as external position feedback source in the closed loop position controller. The resolution of this external position feedback source is determined by means of ID 117.

Code	Interface
00	inactive
03	Square wave pulse input
04	Option AZ-IG1, channel 01, AZ slot 1
05	Option AZ-IG1, channel 02
06	Option AZ-IG1, channel 03
07	Option AZ-IG1, channel 04
08	Option AZ-IG1, channel 01, AZ slot 2
09	Option AZ-IG1, channel 02
10	Option AZ-IG1, channel 03
11	Option AZ-IG1, channel 04
12	Option AZ-IG1, channel 01, AZ slot 3
13	Option AZ-IG1, channel 02
14	Option AZ-IG1, channel 03
15	Option AZ-IG1, channel 04
16	Option AZ-IG1, channel 01, AZ slot 4
17	Option AZ-IG1, channel 02
18	Option AZ-IG1, channel 03
19	Option AZ-IG1, channel 04
45	SERCOS interface(
46	AZ-MC1 (CNC control)

ID32922 Residual distance erase window [Incr.]

This parameter influences the behaviour of the axis on activation of Inverters on RF, after the axis has been moved at RF = 0 by external influences. Due to this intervention, a following error dx is generated, which is compensated in the normal case after RF Inverters On by moving the axis back to its original position. With a large following error dx, this can lead to a dangerous axis movement. Depending upon the value entered in ID 32922, the system decides whether the following error dx is compensated (position setpoint value is set to actual position) by an axis movement or by internal residual distance erase. The following criterion applies:

| dx | ≤ ID 32922 - Following error dx is compensated by axis movement

| dx | > ID 32922 - Following error dx is cancelled by residual distance erase (without axis movement). At the same time, a bit message (code 33048) which can be assigned to a binary output is generated internally. In this way the higher ranking controller is signalled that a residual distance has been erased.

Caution: For drives with stepper motor operation, the higher ranking controller must then absolutely perform a homing cycle before the start of automatic operation is released. Depending on the application, this can also become necessary for systems in synchronous operation.

ID32958 16 bit position setpoint cycle time

(from AW Software version AW-VE V 2.13 4401)

An integer multiple of the time value in ID2 must be selected to define the sampling rate for the 16 bit position setpoint value.

Important:
If 16 bit position setpoint values are output (e. g. via table interpolation through SF FIPW on the AZ-PS card) ID32958 must contain the same time value as for ID2 „SERCOS cycle time“. Only then the closed loop position controller sampling rate is adapted to the SERCOS cycle time. Following error compensation now can be executed on the inverter module AW.

8 Positioning parameters

ID00041 Homing cycle speed [min^{-1}]

This parameter defines the speed for the homing cycle. The minimum value which can be realised by the drive also depends upon the selected accelerations ID136 or ID137 and is proportional to them (depending on interpolator).

ID00057 In position window [Incr.]

If the absolute difference value between the position setpoint value and actual position value is smaller than the In position window | xset - xact | < ID57, the message bit "In position" (code 336) is set. The message bit is generated only in positioning processes (homing cycle, spindle positioning, point-to-point/angular control) and refers to the specified final position,after the AZ interpolator internally has reached its setpoint. It can be assigned to a binary output for the "In position" message.

ID00136 Positive acceleration [U/s2]

ID00137 Negative acceleration [U/s2]

The parameters are input variables of the internal interpolator and define the linear part of the positive and negative acceleration during positioning. Both acceleration values must be assigned the same absolute value and in general may **NOT exceed** the maximum possible physical acceleration of the drive (current limitation in the inverter and unfavourable quantification in the interpolator).
The acceleration coefficient according to ID 32956 also acts as further parameter on the acceleration.

ID32956 Acceleration coefficient

The acceleration coefficient describes the number of the interpolator cycles up to reaching the nominal acceleration defined by the user according to ID136 or ID137. The realized interpolator cycle time (Ti) is 10 ms. Thus the following time (T1) up to transition to nominal acceleration results:

Formula 8-1: Interpolator setting time to nominal acceleration

$T1 = Ti \cdot ID\ 32956 = 10\ ms \cdot ID\ 32956$

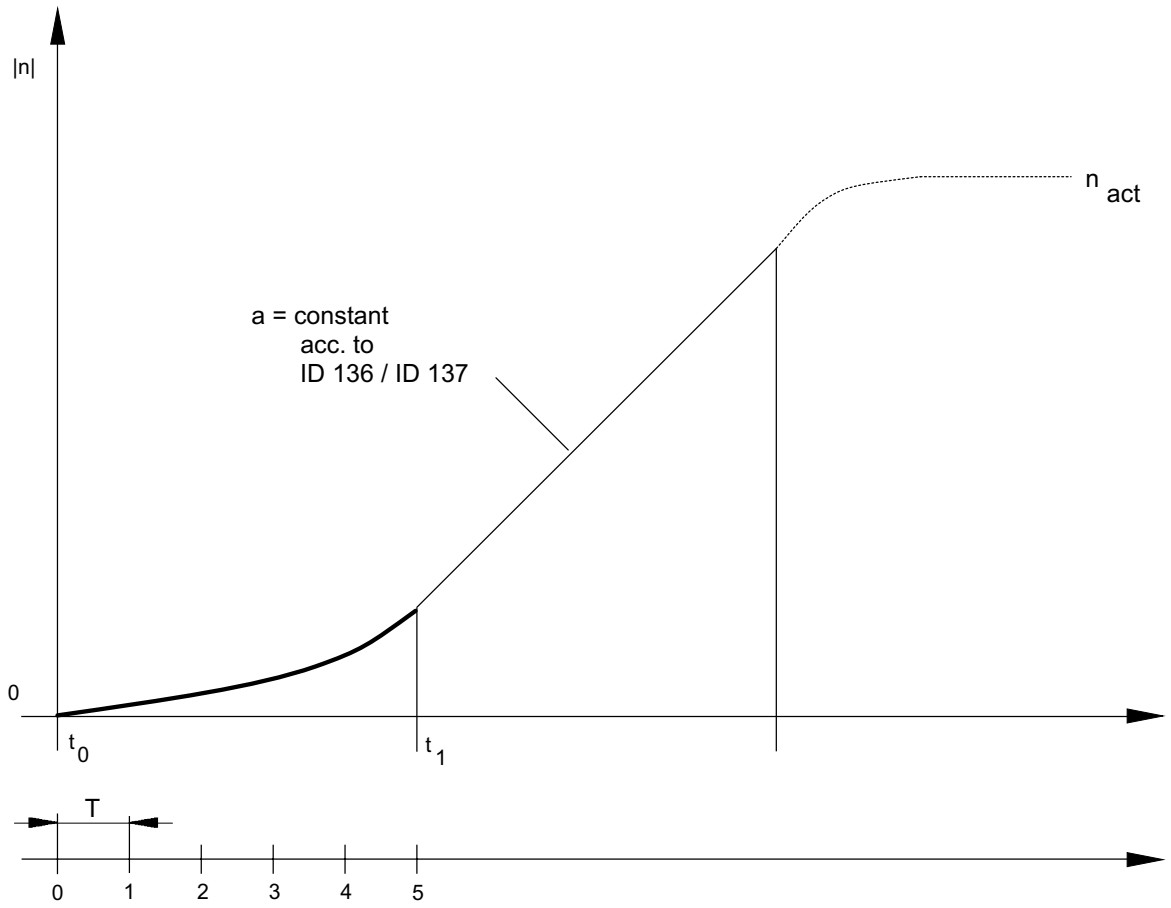
The following parameters influence the course of positioning by means of interpolator:

ID 116,117	Encoder resolution G	[1 increment]	200 ≤ G ≤ 320 000
ID 136,137	Acceleration A	[0.001 U/ss]	1 ≤ | A | ≤ 60 000
ID 32956	Acceleration coefficient		4 ≤ BB ≤ 255
ID 222,41	Speed V	[0.0001 rpm]	0 ≤ V ≤ 100 000

The acceleration that can be realized by the interpolator according to ID 136, ID 137 depends directly upon the acceleration coefficient (BB):

$4/BB \leq (ID\ 136 / |\ ID\ 137\ |) \leq BB/4$

Diagram 8-1: Speed characteristic, acceleration coefficient

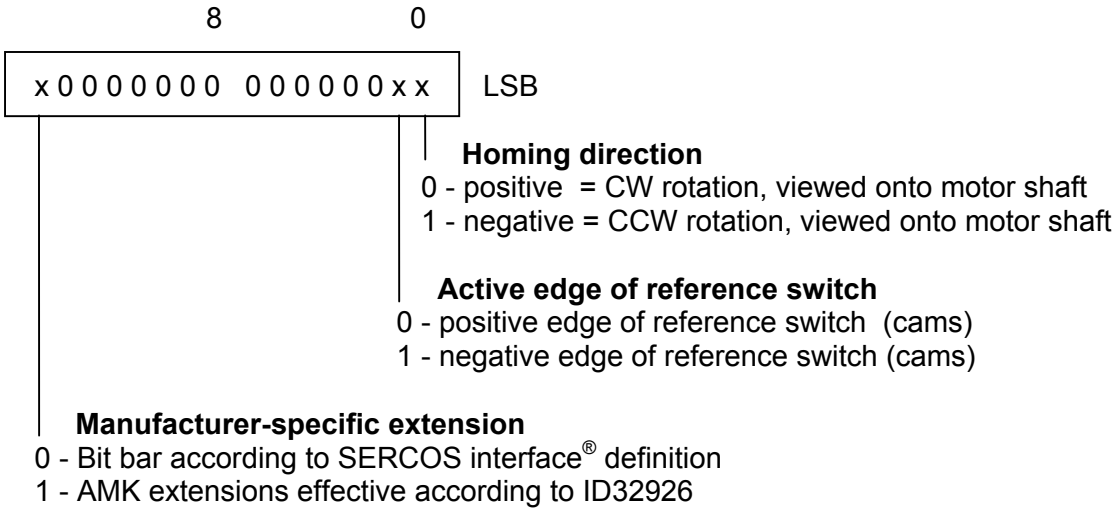


a Acceleration
BB Accleration coefficient

Phase $t_1 - t_0$: "Soft" settling to nominal acceleration
The time is determined by the acceleration coefficient.
Phase $t_2 - t_1$: Constant acceleration according to ID 136 (or ID 137 for deceleration)

ID00147 Homing parameter

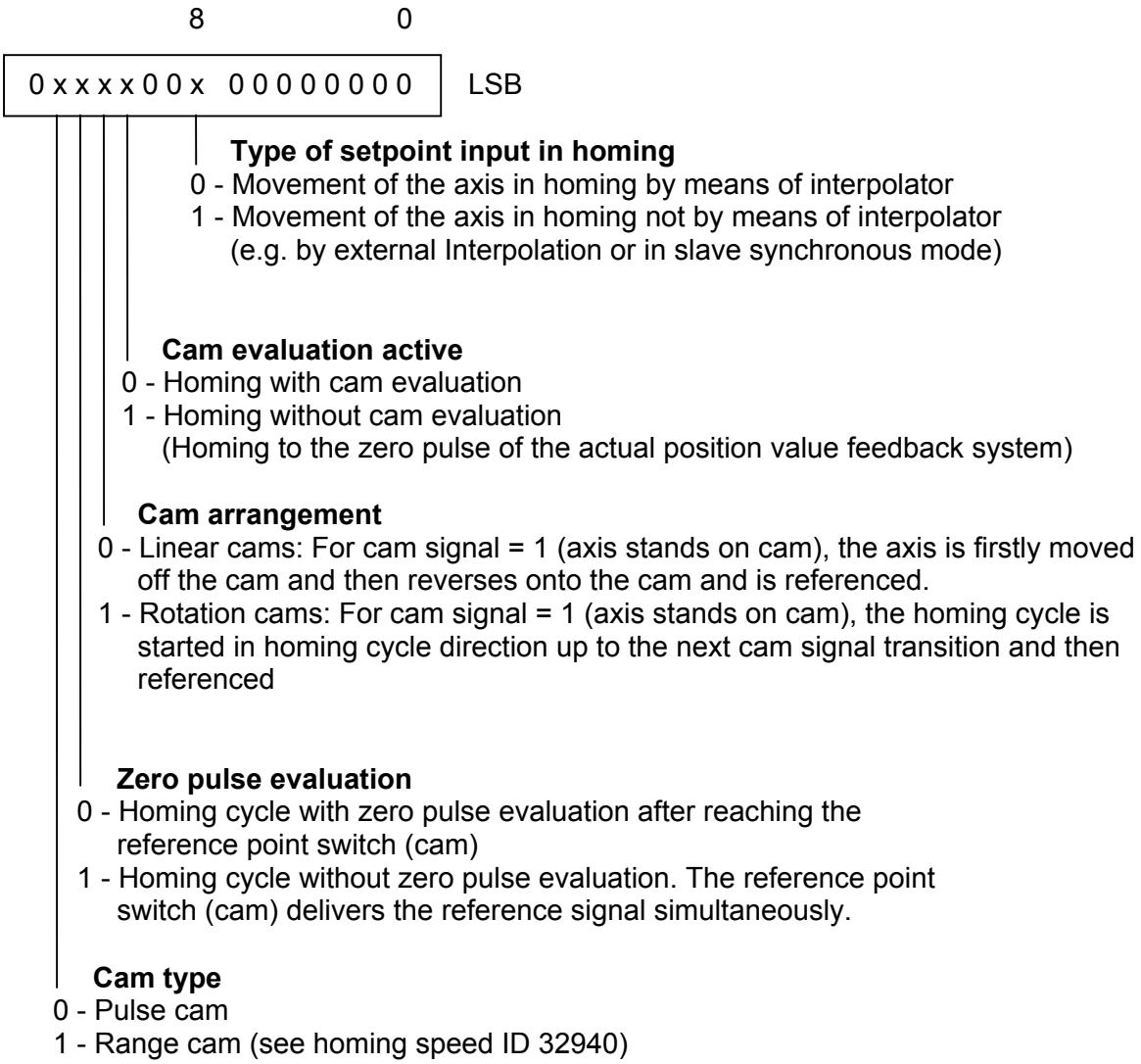
The homing parameter defines control instructions for the homing cycle drive function (manufacturer-specific extensions see ID 32926).



If reference is not made to ID32926, active cam evaluation in connection with the following zero pulse evaluation applies as standard setting (see ID32926).

ID 32926 AMK homing parameter

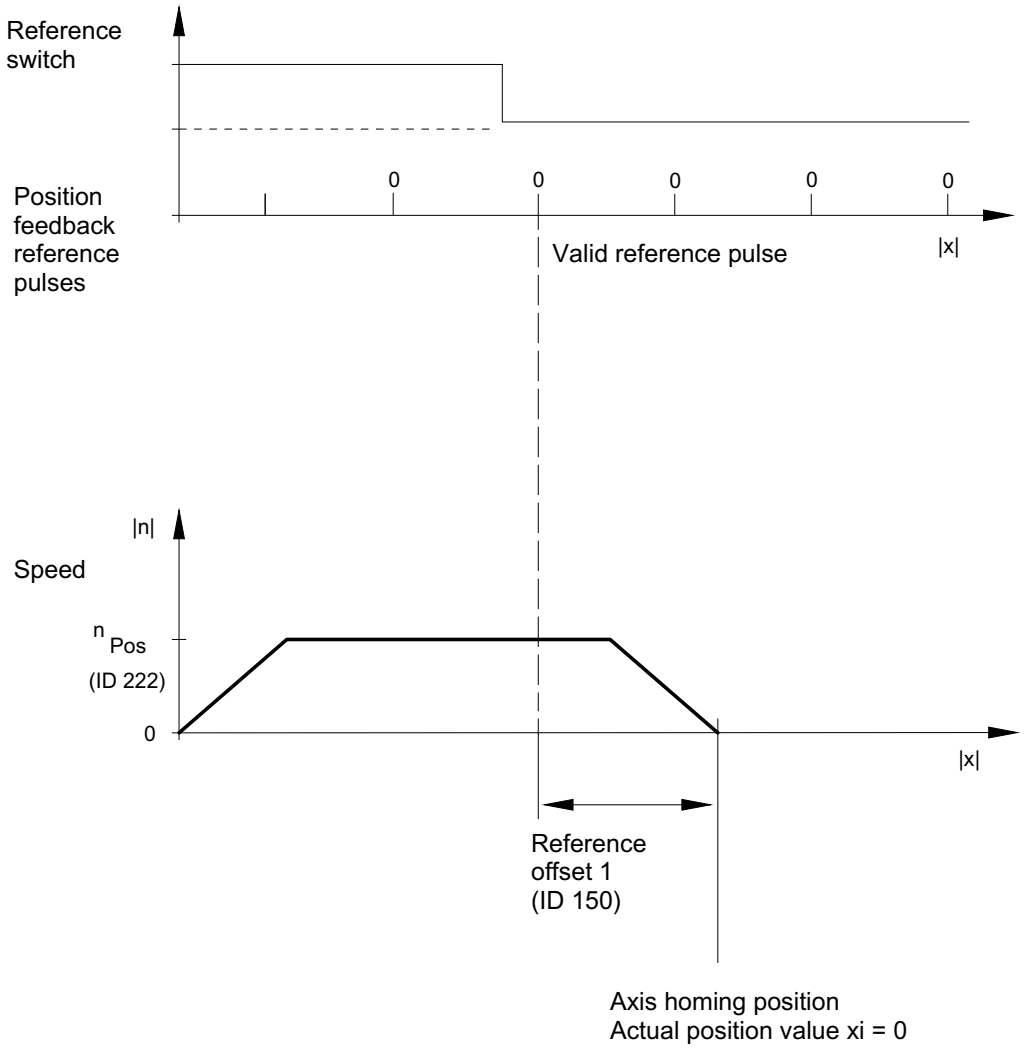
The **AMK homing parameter** defines manufacturer-specific control instructions for the homing cycle drive function (see also ID 147).



ID00150 Reference offset 1 [Incr.] (on-line changeable)

Entry of an offset between position encoder reference pulse and home position of the axis in the homing cycle. This parameter is taken over during the homing cycle only in drive functions with homing cycle (spindle positioning, homing cycle, synchronous control with alignment to reference pulses).

Diagram 8-2: Reference offset and angular position during homing



ID00153 Absolute angle position [Incr.]

The parameter is effective in drive functions with positioning processes and describes the specification of the absolute angle position related to the home position of the axis. The position is determined taking account of the resolution of the actual position feedback encoder. (Position feedback from motor encoder resolution ID116 or position feedback from external measuring system resolution ID117)

Example: Angle shift = 72 degrees
Motor feedback resolution ID116 = 20000 incr.

Formula 8-2: Calculation of the absolute angle position

$$ID153 = \frac{72°}{360°} \cdot 20000 = 4000\text{incr.}$$

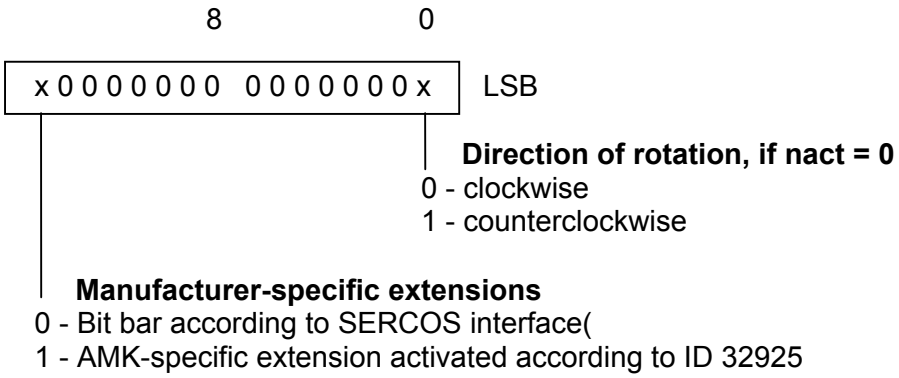
ID00180 Spindle relative offset [Incr.]

The parameter is effective for drive functions with relative positioning and describes commanding of the additive angle shift related to the currently valid actual position value.

Applies only up to software AZ 0206 (3594):
Commanding "Spindle relative offset" is also accepted by the drive during a not yet completed positioning process. In this way the original setpoint value is overwritten by the new additive position setpoint value. This is related internally to the currently valid actual position value at the time of commanding! As from AZ software 0206 (36/94), renewed commanding of the position during a still running positioning process is no longer accepted.

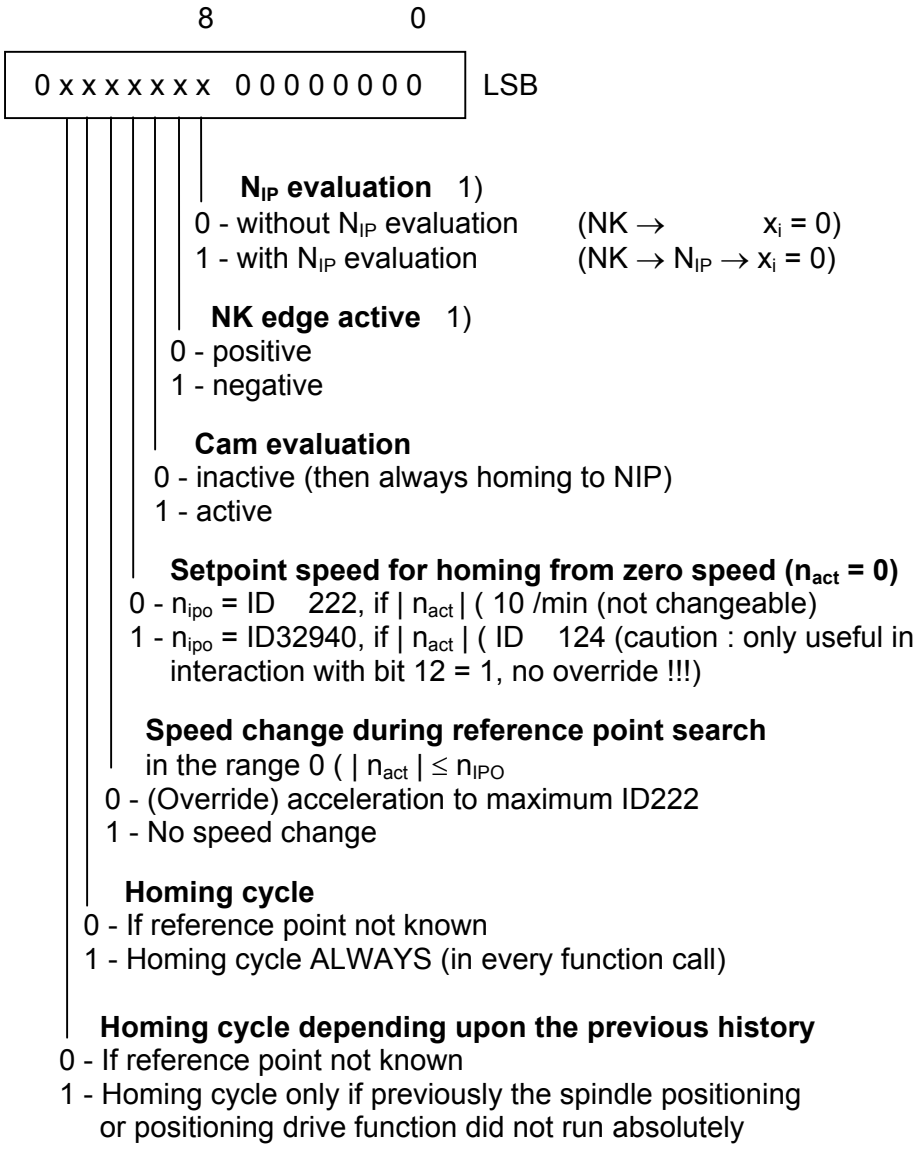
ID00154 Spindle positioning parameter

The parameter is effective for the drive functions of spindle positioning and absolute positioning. The spindle positioning parameter defines control instructions for the spindle positioning function. If the actual speed n_{act} in a homing cycle is not equal to zero, then the direction of rotation of the spindle is generally retained during homing to the zero pulse (bit 0 of ID154 then has no effect!). Speed characteristics, type of cam evaluation and reference pulse evaluation etc. are defined in the manufacturer-specific extension according to ID32925.



ID32925 AMK spindle positioning parameter

The parameter is effective additionally to ID 154 "Spindle positioning parameter" in the spindle positioning drive function. The AMK spindle positioning parameter defines manufacturer-specific control instructions for the axis homing cycle. A detailed reference to cams, zero pulse as well as signal edges to be evaluated is produced.



1) Bits are effective only in connection with active cam evaluation (bit A)
N_{IP} Zero pulse
NK Cam signal (reference point switch)
n_{IPO} Interpolator command speed
n_{act} Actual speed of the axis at the start of the spindle positioning drive function

Example:
The homing cycle should be performed each time the spindle positioning function is called.
ID32925 = 2000h (always homing to encoder zero pulse)

ID00222 Spindle positioning speed [min^{-1}]

The parameter is effective during the spindle positioning and absolute / relative positioning. It describes the absolute amount of the reference speed for the interpolator during positioning. The minimum realisable value depends additionally upon the selected acceleration, see ID136, ID137 and is proportional to this (interpolator-induced quantification).

ID32940 Homing speed [min^{-1}]

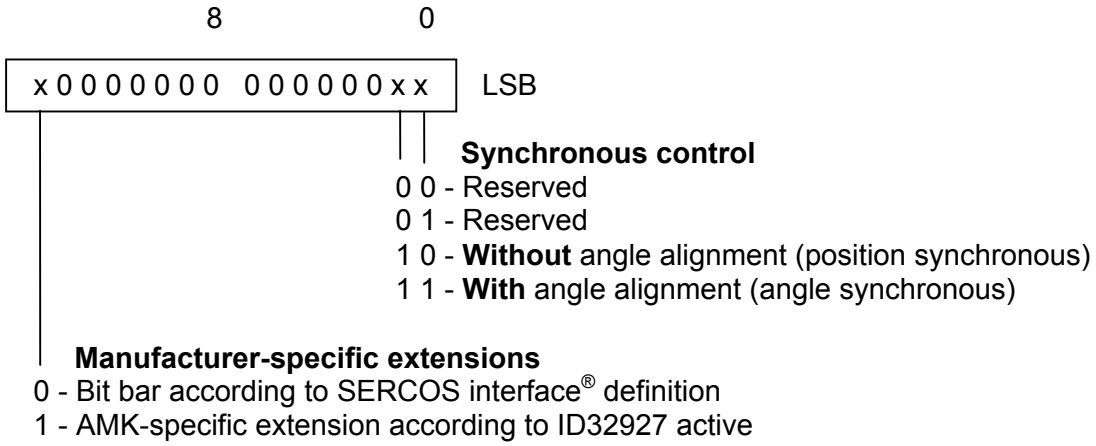
The parameter is effective in the homing cycle drive function. This parameter defines the speed for performing the homing cycle drive function with range cam. If the range cam is defined and if the homing cycle has been started on this, then ID32940 is the effective reference speed for the interpolator down from the range cam. The homing cycle is performed outside the range cam with the homing cycle speed according to ID41 (parameterisation see ID32926).

The spindle positioning drive function allows according to ID32925 the use of this parameter as reference speed of the axis for the case that the axis is stationary at the time of commanding the function.

9 Synchronous control parameters

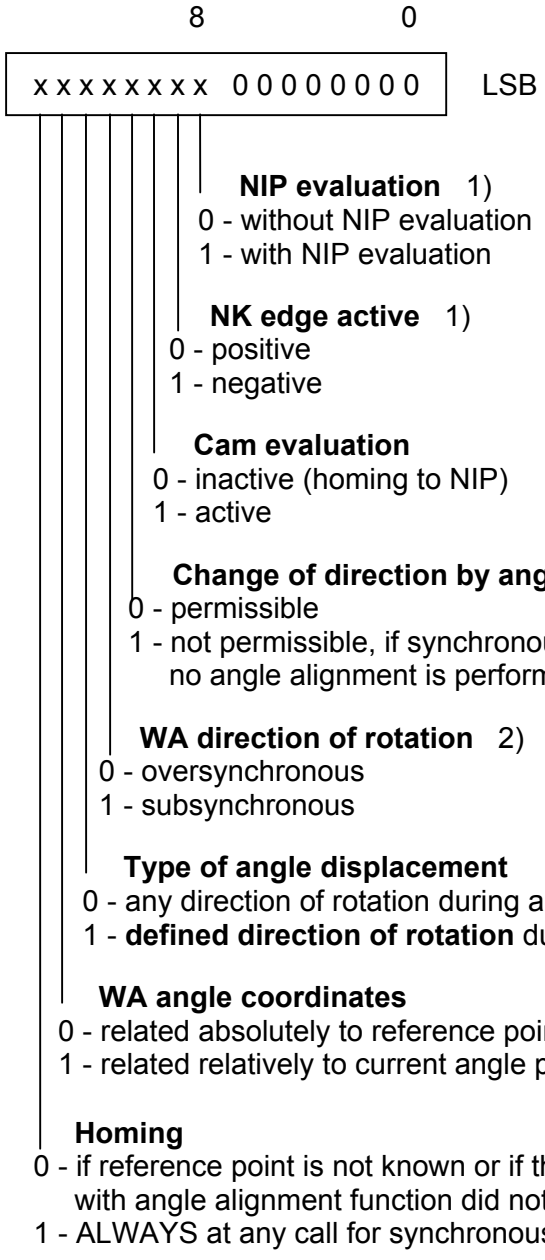
ID00225 Synchronous control parameter

The parameter is effective in the synchronous control drive function. The synchronous control parameter defines control instructions for the synchronous control drive function and differentiates essentially the type of synchronous axis coupling with or without angle alignment of the SLAVE to the MASTER (manufacturer-specific extensions see ID32927).



ID32927 AMK synchronous parameter

Defines the characteristics of the synchronous control drive function additionally to ID225 "Synchronous control parameter". Differentiation of zero pulse and cam evaluation during the homing cycle of the slave axis as well as variation of the characteristic during the angle alignment.



1) Bits are effective only in connection with active NK evaluation
2) Bits are effective only in connection with defined direction of rotation for angle displacement

NIP Reference pulse
NK Cam signal
RFP Reference point of the axis
WA Angle alignment of the SLAVE related to the MASTER

ID00228 Synchronous position window [Incr.] (on-line changeable)

The parameter is effective in the synchronous control drive function with angle alignment. If in synchronous control in the course of the synchronous control with angle alignment drive function the difference between modulo position setpoint (Xsm) of the master axis and the modulo actual position value (Xim) of the synchronous axis (SLAVE) becomes smaller than the synchronous position window, then the message bit "IN SYNCHRONISM" is set (code 308/33009).

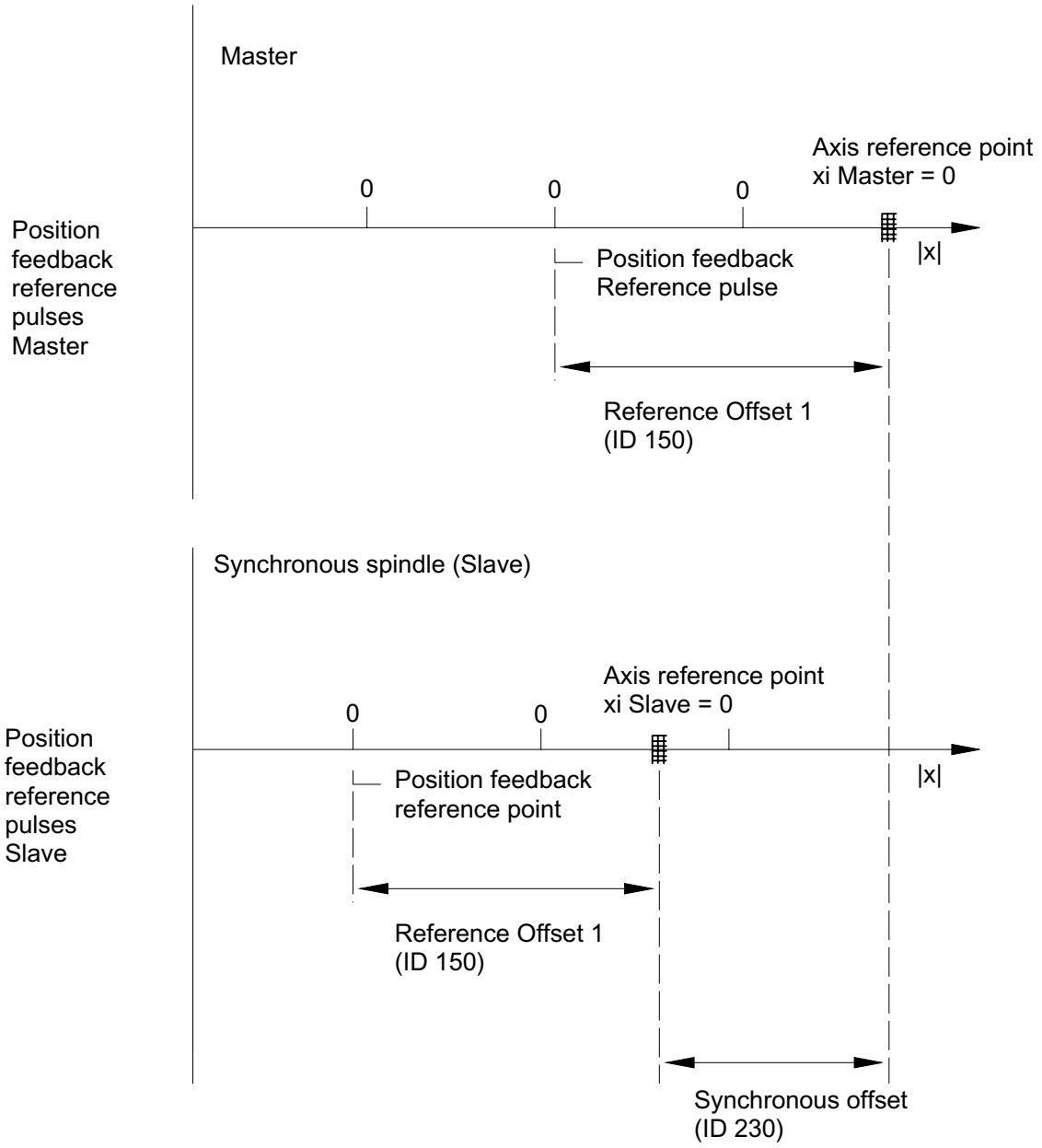
$$| Xsm - Xim | \leq ID\ 228 \rightarrow \text{IN SYNCHRONISM message}$$

The message bit is not generated until the angle positions of master and slave drives have been referenced with the synchronous control with angle alignment function. The current modulo value for message bit generation can be optionally ID103, ID116 or ID117 (actual modulo value see ID32800...).

ID00230 Synchronous offset [Incr.]

Angle offset between the reference points of master and slave axis. The parameter is effective only in the synchronous control with angle alignment drive function during the homing cycle of the slave.

Diagram 9-1: Synchronous offset between master and slave axis



ID00268 Synchronous angle position [Incr.]

The parameter is effective in the "Synchronous control" and "Flying cutter" drive functions. It describes the absolute angle position between master and slave axis related to the synchronous offset ID 230 in the "Synchronous control" drive function.
In the "Flying cutter" drive function, the parameter acts as final position for synchronous operation.

ID00278 Additional synchronous angle position [Incr.]

The parameter is effective for the "Synchronous control" and "Flying cutter" drive functions. The parameter produces an additive angle displacement between master and slave axis during "Synchronous control".
In the "Flying cutter" drive function, the parameter acts as "Waiting distance". This may as a maximum correspond to the actual modulo value according to ID116, ID117 or ID103 (modulo value configuration see ID32800).

ID32892 Synchronous control set pulses divider (on-line changeable)

ID32893 Synchronous control set pulses multiplier (on-line changeable)

The synchronous ratio SVH between setpoint value source (master) and synchronous drive (slave) is formed by the synchronous control set pulses divider and synchronous control set pulses multiplier parameters. The setpoint value source is defined by the operation mode see ID32800 ff. The synchronous control set pulses divider ID32892 may be only an integer multiple of 65536 (216). If this condition is not complied with, a configuration error is displayed by the system. The effect of the synchronous control set pulses divider and synchronous control set pulses multiplier is displayed in the following diagram.

Example: **Master**
The selected setpoint source delivers 2000 increments/revolution (A_{master}=2000).
Slave drive
The resolution of the actual position value source is 10000 increments/ revolution (A_{slave} = 10000). The synchronous ratio between master and slave revolutions shall be SVH= 3.3333.

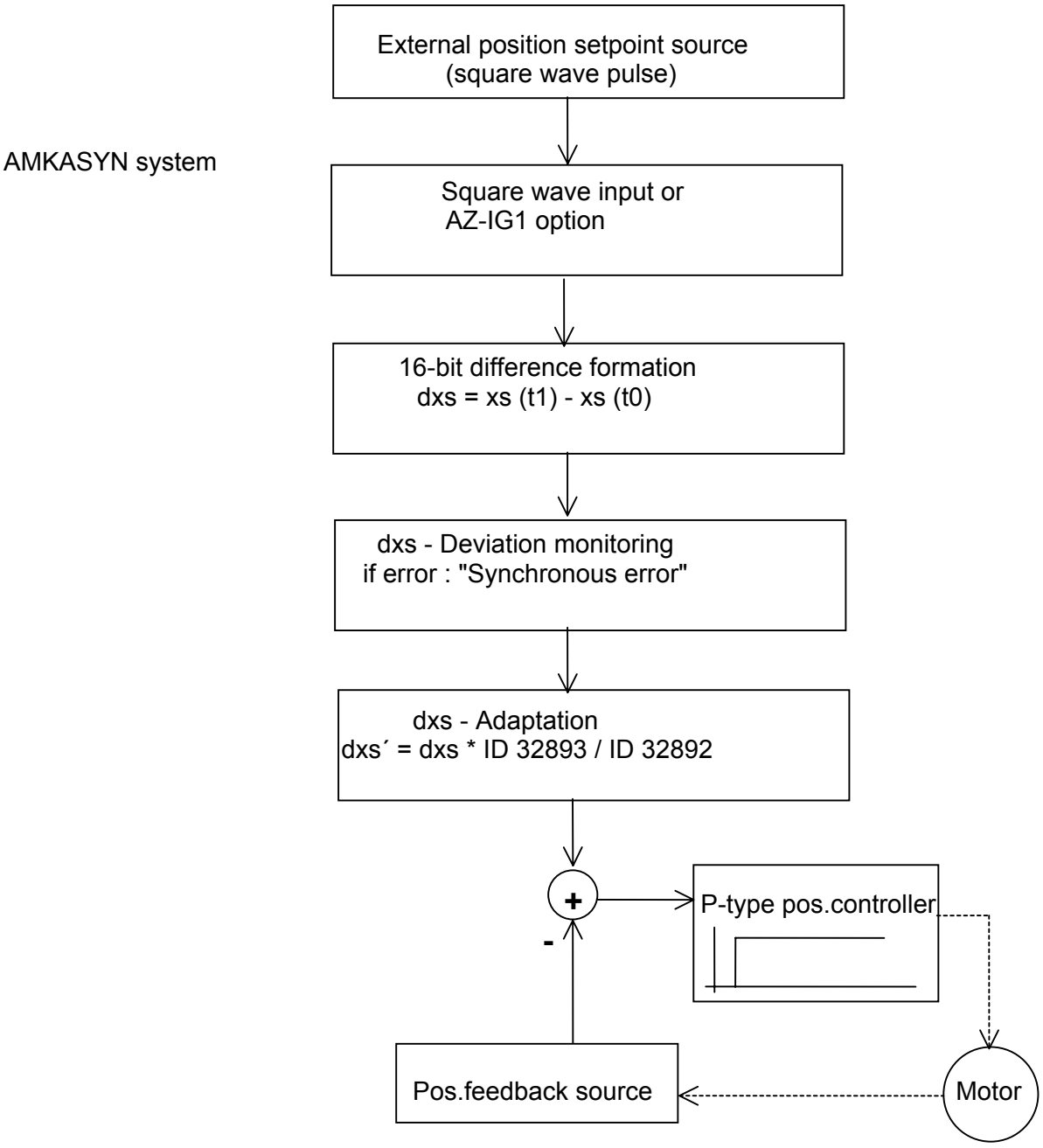
Formula 9-1: Determination of the values for synchronous control set pulses divider and multiplier

$$\frac{ID32893}{ID32982} = \frac{A_{Slave}}{A_{Master}} \cdot SVH = 16{,}6665$$

In view of the condition that the contents of ID 32892 may only be an integral multiple of $2^{16} \cdot n$ (n = 1, 2, 3, ...), the following value assignment for n=125 results:
ID32892 = 8 192 000 , ID32893 = 136 531 968

If for example the synchronous control set pulses multiplier is changed by +1 to ID32893 = 136 531 969,
then the effective synchronous ratio in this example is SVH = 3.333 300 024 .

Diagram 9-2: Effect of synchronous control set pulses divider and multiplier



dxs Difference of the position setpoint values (16-bit channel)
xs (t0) Position setpoint value at the previous sampling instant t0, t0 = (k -1) . T
xs (t1) Position setpoint value at sampling instant t1, t1 = k . T
k Sampling counter, k = 1, 2, 3 ...
T Sampling time of position setpoint values, T = 0.5 ms

ID32952 At synchronous speed window [Incr.]

If during synchronous control (without alignment) the absolute value of the position control difference in the drive becomes smaller than or equal to the window according to ID32952, then the message bit SPEED SYNCHRONISM (code 33014/33010) of the drive is set. This can be assigned to a binary output.

SPEED SYNCHRONISM means that the slave drive (in closed loop position control) follows the setpoint values of the master within the defined window.

10 Configuration of AZ-IG1 option card

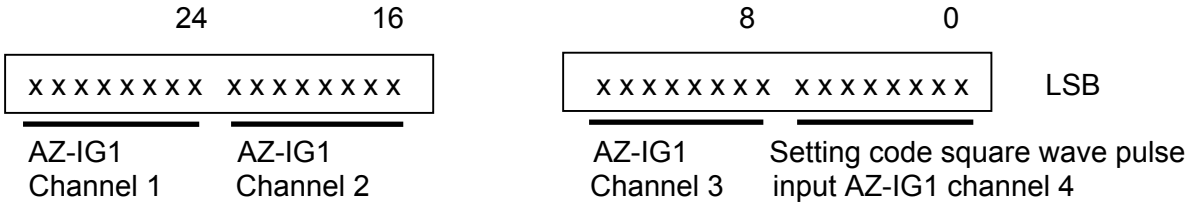
ID32883 Configuration of slot 1

ID32884 Configuration of slot 2

ID32885 Configuration of slot 3

ID32886 Configuration of slot 4

These parameters define for every slot (1 ... 4) the mode in which the square wave pulses fed there are evaluated by the AZ-IG1 option card.



Code	Mode
0	2 square wave pulses offset by 90 degrees
1	Counting pulses track 1, direction signal track 2
2	Forward pulses track 1, reverse pulses track 2

Example: ID 32884 = 02 02 02 02 h

The AZ-IG1 card at option slot 2 is set on all four channels in the mode: Forward pulses track 1, reverse pulses track 2.

Caution: All square wave pulse inputs must lie at defined levels, otherwise the displayed functions are not guaranteed.

11 Binary inputs assignment

ID32873 Input port 1 address

ID32968 Input port 2 address

ID32977 Input port 3 address

Each parameter describes the code of the addressing of one arbitrary 8-bit input port each. This must be assigned to the corresponding option slots. The ports are provided by the option cards AZ-EA8 and AZ-EA24.

ID32873 ID32968 ID32977 Address code	**Option cards at**
0 / 1* / 2*	AZ slot 1
8 / 9* / 10*	AZ slot 2
16 / 17* / 18*	AZ slot 3
24 / 25* / 26*	AZ slot 4

* only possible with AZ-EA24

If **Single Inverters On** is defined in ID32796, the inputs E1 ... E8 (RF1 ... RF8) on the option card AZ-EAx are evaluated **only on slot 1** for this internally. In this configuration, free bits can also be used additionally for input functions.

All input bits can be configured freely according to the following table (drive commanding, cam signal , ...).

For this purpose the corresponding code No./inverter No. are assigned to the input bits. For instance, drive commanding is triggered by setting the binary input.

A binary output for pulse-shaped handshake of the input bit can be assigned to every binary input. The handshake time is at least 1 sampling time T_{samp} long. The sampling time of the binary inputs is described in more detail in ID 32901 and is normally 10 ms.

Binary inputs for input port 1

ID32874 Port1 Bit0

ID32875 Port1 Bit1

ID32876 Port1 Bit2

ID32877 Port1 Bit3

ID32878 Port1 Bit4

ID32879 Port1 Bit5

ID32880 Port1 Bit6

ID32881 Port1 Bit7

Binary inputs for input port 2

ID32969 Port2 Bit0

ID32970 Port2 Bit1

ID32971 Port2 Bit2

ID32972 Port2 Bit3

ID32973 Port2 Bit4

ID32974 Port2 Bit5

ID32975 Port2 Bit6

ID32976 Port2 Bit7

Binary inputs for input port 3

ID32978 Port3 Bit0

ID32979 Port3 Bit1

ID32980 Port3 Bit2

ID32981 Port3 Bit3

ID32982 Port3 Bit4

ID32983 Port3 Bit5

ID32984 Port3 Bit6

ID32985 Port3 Bit7

Functions (according to the following table) can be assigned to the binary inputs with these parameters. If the parameter value is 0.0, then the binary input is not active.

Structure : **ddddd . x**

Sink (target):
0 = AZ module
1 ... 8 = AW1 ... AW8

Code according to table

11.1 Function overview: Binary inputs assignment

Code ddddd.z	Function	Effect/Note
0.0	None	Binary input not active
1.x	Cam signal (reference switch)	Binary input on option card acts instead of cam input
32912.x	RESET RFP	Erase reference point known RFP
33056.x	SET BASYNC	External synchronisation signal for BAW
1000.x	Operation mode change BAW 0	Switching over to main operation mode according to ID32800
1001.x	Operation mode change BAW 1	Switching over to secondary operation mode 1 according to ID32801
1002.x	Operation mode change BAW 2	Switching over to secondary operation mode 2 according to ID32802
1003.x	Operation mode change BAW 3	Switching over to secondary operation mode 3 according to ID32803
1004.x	Operation mode change BAW 4	Switching over to secondary operation mode 4 according to ID32804
1005.x	Operation mode change BAW 5	Switching over to secondary operation mode 5 according to ID32805
1006.x	Interpolator (IPO) HOLD	Interruption of a movement controlled by the interpolator (IPO)
1007.x	Interpolator (IPO) CONTINUE	Continuation of a movement controlled by the IPO **after HOLD**
1008.x	Drive STOP	Abortion (dig.speed control , n=0) of the commanded drive function
1009.x	Dig. speed control	Speed setpoint value n = 0, ramp active
1010.x	Dig. speed control	Speed setpoint value n = ID36, ramp active
1011.x	Homing cycle to ref. Position x_i = 0 (position counter is set to "0")	Homing cycle with/without cam evaluation according to ID147, ID32926, reference speed = ID41
1012.x	Spindle positioning to ref. Position x_i = 0 (positon counter is set to "0")	Speed substitutional positioning with/without cam evaluation to NIP, characteristics according to ID154, ID32925, positioning speed = ID222
1013.x	Absolute positioning (with IPO)	Position final value = ID153, positioning speed = ID222
1014.x	Relative positioning (with IPO)	Spindle relative offset = ID180, positioning speed = ID222
1017.x	Parameter set change (main)	Switching over to main parameter set 1, effective after RF change of ALL inverters
1018.x	Parameter set change (1st alt.)	Switching over to 1st alt. Parameter set, effective after RF change of ALL inverters
1019.x	Parameter set change (2nd alt.)	Switching over to 2nd alt. parameter set, effective after RF change of ALL inverters
1020.x	Parameter set change (3rd alt.)	Switching over to 3rd alt. Parameter set, effective after RF change of ALL inverters
1021.x	Dig. torque control	Torque setpoint value M = 0
1022.x	Dig. torque control	Torque setpoint value M = ID80

Code ddddd.z	Function	Effect/Note
1023.x	RFH (lift axis)	ID32800 = analogue speed control
1024.x	Synchronous control NBA4	according to **ID32804**, ID225, ID32927
1025.x	Synchronous control NBA5	according to **ID32805**, ID225, ID32927
1026.x	Flying cutter NBA5	according to **ID32805**, ID268, ID278
1027.x	Special function	Call of a special drive function
1028.x	Reserved	
1029.x	Reserved	
1030.x	Reserved	
33057.x	Basic encoder adjustment	Drive must move

NIP Motor encoder or external actual position encoder zero pulse
NK Cam **(cam signal is evaluated in the 1 ms sampling time)**
BAW Operation mode change
x_i 32-bit actual position value
T_{samp} Sampling time of the binary inputs

For the inputs, the low-high transition of an input signal at least "Tsamp" long is evaluated dynamically. The direct reaction of the drive occurs at the earliest after two sampling times T_{samp}.

Exception: Inputs as reference position switch signals (NK) are evaluated in the 1 ms time cycle.

(AZ software < V0206 : T_{samp} = 100 ms)
AZ software from V0206: T_{samp} = 10 ms

All codes are processed in the T_{samp} cycle and can be acknowledged via configurable bit messages. The handshake time is at least T_{samp} long. (See table ID32847 ff, ID32901).

Caution: **After a call for a parameter set change, Inverter On of ALL connected inverter modules must be reset!**
The change of Inverter On (single Inverter On) of only one inverter module is forbidden and can lead to system errors!

Example: Drive 2 has to execute a homing cycle with cam evaluation.
The control signals are fed to binary inputs.
ID32874 = 1011.2 (input bit 0, homing cycle drive function)
ID32875 = 1.2 (input bit 1, cam signal)

Input bit 0: **0 → 1 transition:**

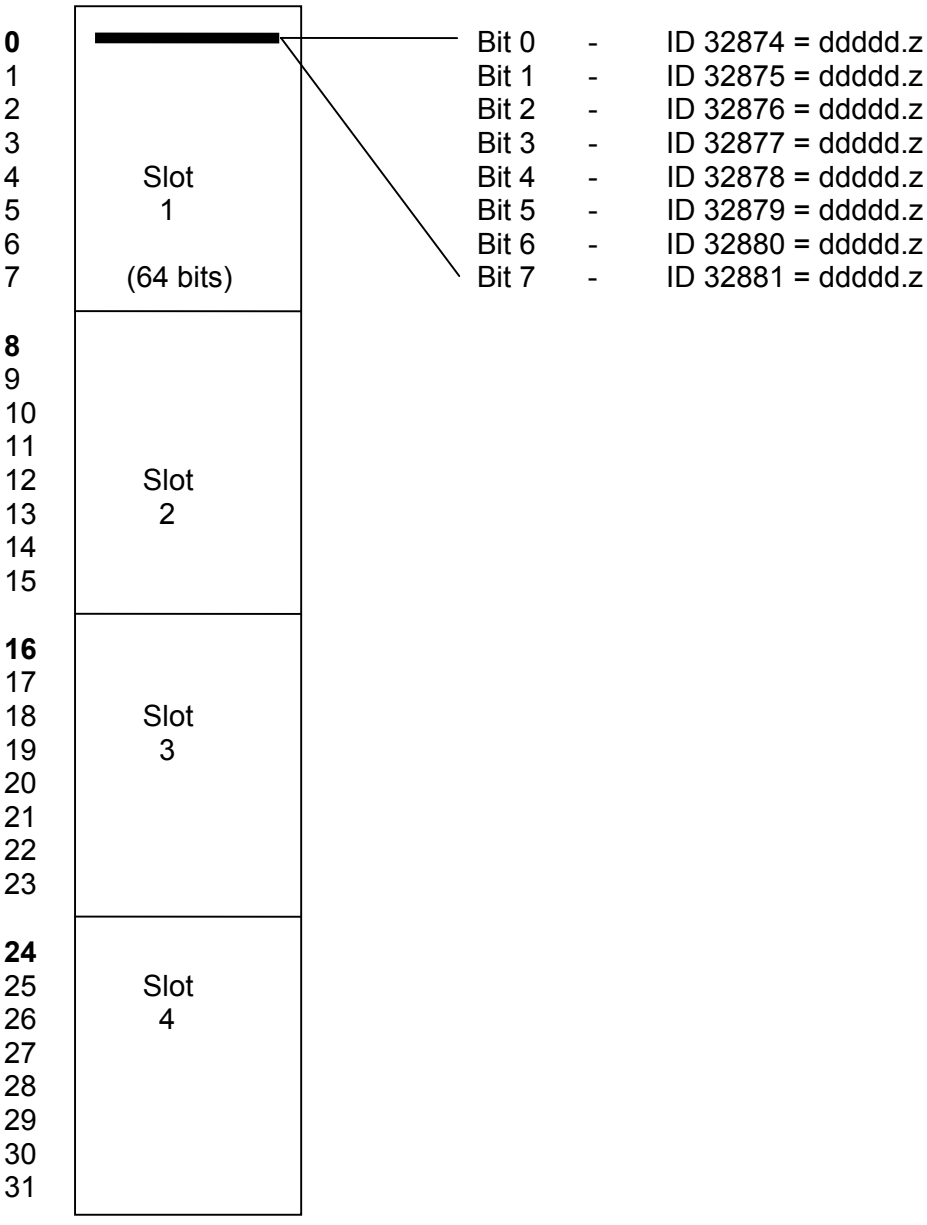
Drive AW2 starts the homing cycle drive function according to ID147 / ID32926 with the homing speed stated in ID41 and waits for a cam edge.

Input bit 1: **0 → 1 transition:**

The reference switch is connected to input bit 1. The cam signal has the effect that the drive AW2 ends the homing cycle started by means of input bit 0 after evaluation of the reference pulse. The actual position value is set to "0" after the homing cycle is terminated.

Diagram 11-1: Complete binary inputs address space

Example: Configuration of the option card AZ-EA8 at slot 1, assignment of the input address 0, of the input port 1.



For instance, if the option card AZ-EA 24 is configured at slot 1, then the assignments 0, 1 or 2 are permissible for the address of input port 1.

12 Binary outputs assignment

ID32846 Output port 1 address

ID32855 Output port 2 address

ID32864 Output port 3 address

The parameters describe the addressing of freely selectable output ports. The AMKASYN system has three different output ports for outputting bit messages. Then can be assigned to binary outputs on option cards AZ-EA8 / AZ-EA24 in option slots 1...4 or to the data outputs DA1...DA4 on AZ module (terminal X31).

Port 1 ID 32846 **Port 2 ID 32855** **Port 3 ID 32864**	**Output**
512 / 513*	AZ slot 1
520 / 521*	AZ slot 2
528 / 529*	AZ slot 3
536 / 537*	AZ slot 4
544	AZ - DA1...DA4

* only possible with AZ-EA 24

For the communication with a higher ranking controller (NC, PLC), bit messages from the drives can be assigned to the binary outputs via code No. and inverter No. (see "Overview: Assignment of bit information to binary outputs).

Assignment of bit information to binary outputs

ID32847 Output port1 source bit0

ID32848 Output port1 source bit1

ID32849 Output port1 source bit2

ID32850 Output port1 source bit3

ID32851 Output port1 source bit4

ID32852 Output port1 source bit5

ID32853 Output port1 source bit6

ID32854 Output port1 source bit7

ID32856 Output port2 source bit0

ID32857 Output port2 source bit1

ID32858 Output port2 source bit2

ID32859 Output port2 source bit3

ID32860 Output port2 source bit4

ID32861 Output port2 source bit5

ID32862 Output port2 source bit6

ID32863 Output port2 source bit7

ID32865 Output port3 source bit0

ID32866 Output port3 source bit1

ID32867 Output port3 source bit2

ID32868 Output port3 source bit3

ID32869 Output port3 source bit4

ID32870 Output port3 source bit5

ID32871 Output port3 source bit6

ID32872 Output port3 source bit7

The parameter describes the definition of the bit source (message) per output bit:

Structure: **ddddd . z**

Source:
0 = AZ module
1 ... 8 = AW1 ... AW8

Code according to "Overview: Assignment of bit information to binary outputs"

12.1 Overview: Assignment of bit information to binary outputs

Code ddddd.z	Designation	Associated parameters	
	Inverter real time bits (high active)		
330.x	nact = nset	ID157	Speed window
331.x	nact < nmin	ID124	Zero speed window
332.x	nact < nx	ID125	Speed threshold nx
333.x	Md ≥ Mdx	ID126	Torque threshold Mdx
334.x	Mset ≥ Mlimit	ID82/83	pos./neg. torque limit
335.x	nset ≥ nlimit	ID38/39	pos./neg. speed limit
336.x	"In position"	ID57	In position window
337.x	P ≥ Px	ID158	Power threshold Px
33013.x	xi ≤ -Soft limit	ID50	neg. software limit switch
308.x	Angle synchronism	ID228	Position sync. control window (only in synchronous control drive functions with angle alignment)
409.x	Measured value. pos. edge stored		Touch probe function, actual position stored in ID 130
(410.x	Measured value, neg. edge stored		Touch probe function, actual position stored in ID 131 **Neg. edge is not evaluated!**
33014.x	Speed synchronism	ID32952	Speed sync. control window
33050.x	Reserve		
33048.x	RESET resid. dist.	ID32922	Residual distance erase window
310.x	Utilization 50%		Inverter module limit load integral
33015.x	xi ≥ +Soft limit	ID49	pos. software limit switch
	Inverter real time bits negated (low active)		
33000.x	nact = nset	ID157	Speed window
33001.x	nact < nmin	ID124	Zero speed window
33002.x	nact < nx	ID125	Speed threshold nx
33003.x	Md ≥ Mdx	ID126	Torque threshold Mdx
33004.x	Mset ≥ Mlimit	ID82/83	pos./neg. torque limit
33005.x	nset ≥ nlimit	ID38/39	pos./neg. speed limit
33006.x	"In position"	ID57	In position window
33007.x	P ≥ Px	ID158	Power threshold Px
33008.x	xi ≤ -Soft limit	ID50	neg. software limit switch
33009.x	Angle synchronism	ID228	Position synchronous window (only in synchronous control drive functions with angle alignment)
33010.x	Speed synchronism	ID32952	Speed synchronous window
33051.x	Reserve		
33049.x	RESET resid. dist.	ID32922	Residual distance erase window
33011.x	Utilization 50%		Inverter module 50% I2t monitor
33012.x	xi ≤ +Soft limit	ID49	pos. software limit switch
	Warning bits		
33016.x	Inverter overcurrent warning		
33017.x	Inverter overtemperature warning		
33018.x	Motor overtemperature warning		
33021.0	Cooling air overtemperature warning		
33022.0	External component overtemperature warning (ext. braking resistor)		
33023.0	Power supply overtemperature warning		
33024.0	Supply/regenerative braking overtemperature warning		
33025.0	Power overvoltage warning (with signal filter 30s)		
33026.0	Power undervoltage warning (with signal filter 30s)		

Code ddddd.z	Designation	Associated parameters
	Messages	
33029.0	SBM / SBT System ready	
33030.0	QUE Inverter handshake on	
33031.x	QRF Inverter On handshake (axis specific)	
33032.x	RF Inverters On set (axis specific)	
33033.x	SWG Setpoint value is valid in the inverter (axis specific)	
33034.x	KMD Drive function is active (axis specific)	
33035.x	IPO Interpolator active (axis specific)	
33036.x	RFP Reference point known (axis specific)	
(S) 33037.x	Monitor 1 output bit 1...8 according to ID 32921	
(S) 33038.x	Monitor 2 output bit 1...8 according to ID 32942	
33039.x	RF for slave, AW parallel operation **(not for new AW modules with PWM!)**	
33052.x	Unlock brake (special functions axis specific)	
	State of the AZ binary inputs function	
33040.0	INPUT-BIT0 active according to ID 32874	
33041.0	INPUT-BIT1 active according to ID 32875	
33042.0	INPUT-BIT2 active according to ID 32876	
33043.0	INPUT-BIT3 active according to ID 32877	
33044.0	INPUT-BIT4 active according to ID 32878	
33045.0	INPUT-BIT5 active according to ID 32879	
33046.0	INPUT-BIT6 active according to ID 32880	
33047.0	INPUT-BIT7 active according to ID 32881	
33050.x	Direction of rotation bit as from AW 0210, 1-pos.-, 0-neg. direction of rotation	
	Selected parameter set per inverter (see ID32813)	
33058.x	Main parameter set activated	(from message QRF)
33059.x	1st alternative parameter set activated	(from message QRF)
33060.x	2nd alternative parameter set activated	(from message QRF)
33061.x	3rd alternative parameter set activated	(from message QRF)
	Selected operation mode per inverter (active from valid setpoint)	
33062.x	Main operation mode	active according to ID 32800
33063.x	Secondary operation mode 1	active according to ID 32801
33064.x	Secondary operation mode 2	active according to ID 32802
33065.x	Secondary operation mode 3	active according to ID 32803
33066.x	Secondary operation mode 4	active according to ID 32804
33067.x	Secondary operation mode 5	active according to ID 32805
33068.x	Secondary operation mode 6	active according to ID 32806
33069.x	Secondary operation mode 7	active according to ID 32807
33070.x	Secondary operation mode 8	active according to ID 32808
33071.x	Secondary operation mode 9	active according to ID 32809
33072.x	Reserved (special function lift motor contactor)	
33073.x	Reserved (special function lift safety contactor)	
33074.0	Output warning active (1-level)	
33075.x	Reserved (special function lift fan control)	
33077.0	Power failure according to ID32901 bit 13 (SBM reset, interrupt main contactor)	
33078.x	Reserved	
33079.x	Reserved	

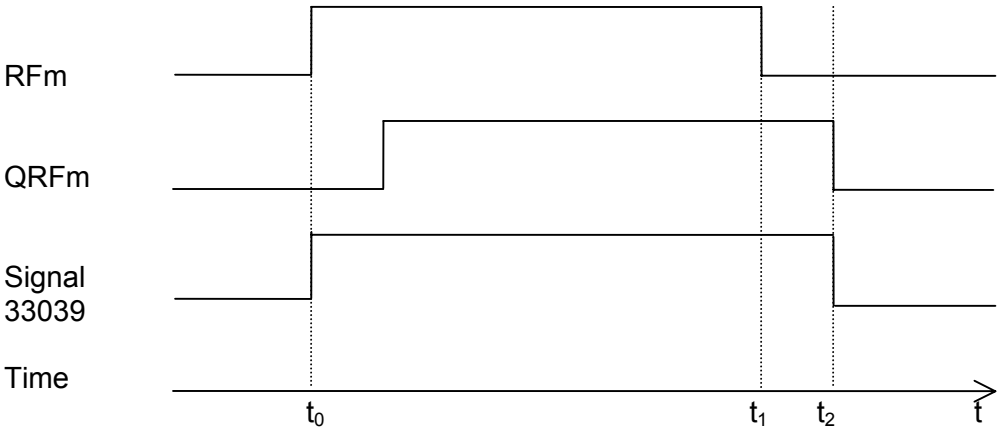
Except for the "Inverter real time bits negated", all output information is high-active.

ID32846 ff. Address output port 1...
Apart from the AZ system ready message (code 33029.0), the possibility of outputting a warn bit (code 33077.0) exists in addition. The warn bit is generated in the system for every warning and remains active up to error erase by the user. Warnings can be erased at any time.

Note on the signal code 33039 (not for new AW modules with PWM!)

The binary signal (code = 33039 AW parallel operation, RF for slave/AWn) is intended for handling the RF Inverter On of slave AW modules in parallel connections. The signal is formed by the master inverter according to the following regulation:

Diagram 12-1: Signal RF slave in parallel operation



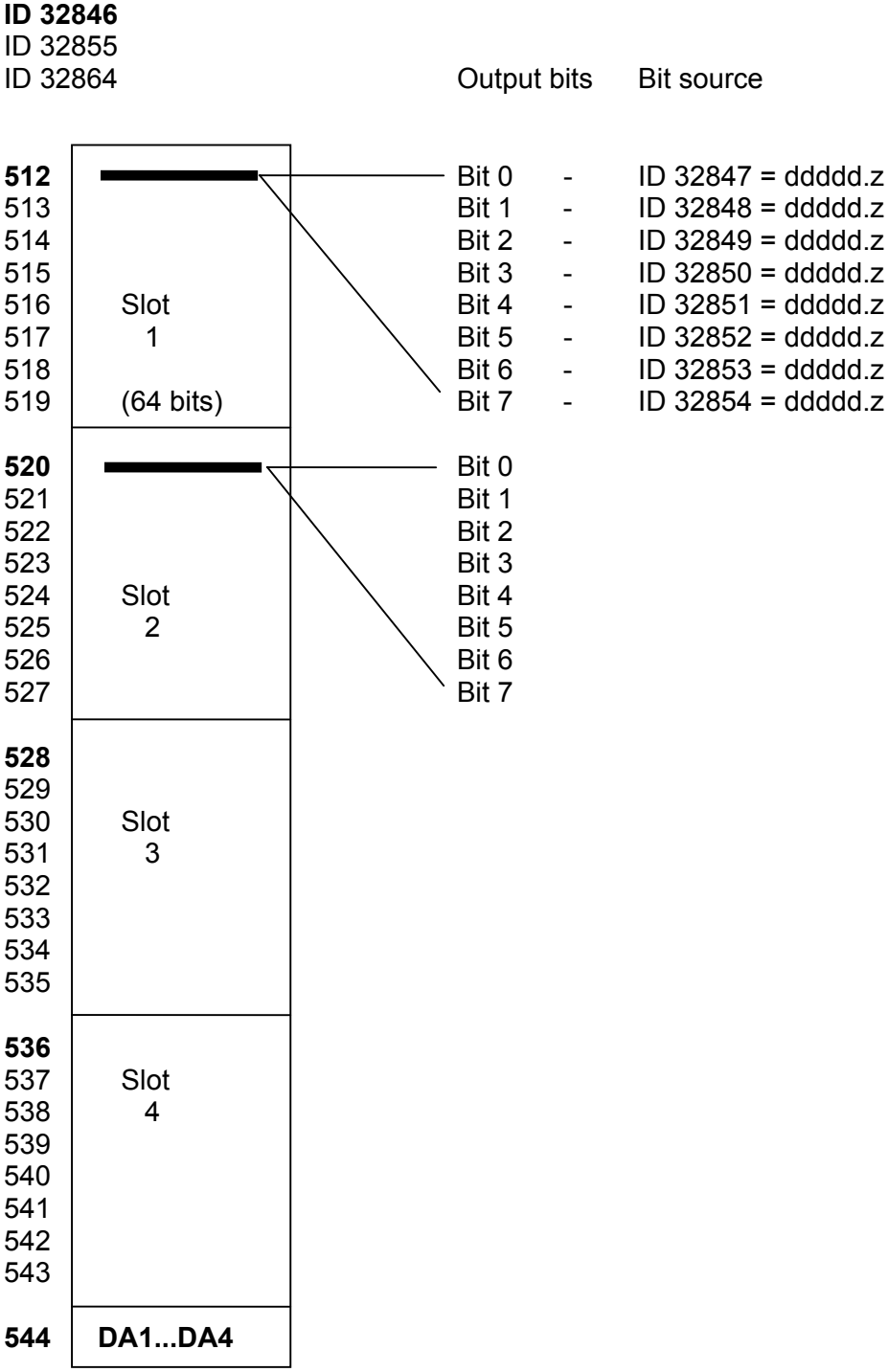
t_0 Signal 33039 is set simultaneously with RFm.
t_1 RFm is reset, signal 33039 remains on until t2
t_2 Inverter has ended deceleration and resets QRFm, signal 33039 is reset simultaneously.

RFm Inverter On master
QRFm Inverter On master handshake

The output signal 33039 of a master inverter can be connected directly to Inverter On RF of all slave inverter modules.

Diagram 12-2: Complete binary outputs address space

Representation of address and bit reference taking the option card AZ-EA8 at slot 1 as an example, configuration of the ID 32846



Example 1: The option AZ-EA8 is plugged in at AZ slot 2.
Wanted assignment of the binary outputs:

Bit 0 (ID 32847) - Message "I_n position"	from drive 1
Bit 1 (ID 32848) - Message "$M_{set} \geq Md_{limit}$"	from drive 1
Bit 2 (ID 32849) - Message "$n_{act} = n_{set}$"	from drive 3
Bit 3 (ID 32850) - Message "$n_{set} > n_{limit}$"	from drive 7

1. **ID32882 Slot assignment = 00 02 00 00 h**
   (option card AZ-EA8, code 02, slot 2)

2. **ID32846 Address output port 1 = 520**
   (output port 1 is arbitrarily selected,
   output port 2 or 3 are also possible)

3. Definition of the information per bit source
   ID32847 = 336.1
   ID32848 = 334.1
   ID32849 = 330.3
   ID32850 = 335.7

Example 2: The option AZ-EA24 is plugged in at AZ slot 1.
Wanted assignment of the binary outputs:

Bit 0 (ID32865) - Message "Angle synchronism"	from drive 2
Bit 1 (ID32866) - Message "Speed synchronism"	from drive 2
Bit 2 (ID32867) - Message "Reference point known"	from drive 2

1. **ID32882 Slot assignment = 03 00 00 00 h**
   (option card AZ-EA24, code 03, slot 1, see ID32882)

2. **ID32864 Address output port 3 = 512**
   (output port 3 is arbitrarily selected,
   output port 1 or 2 are also possible)

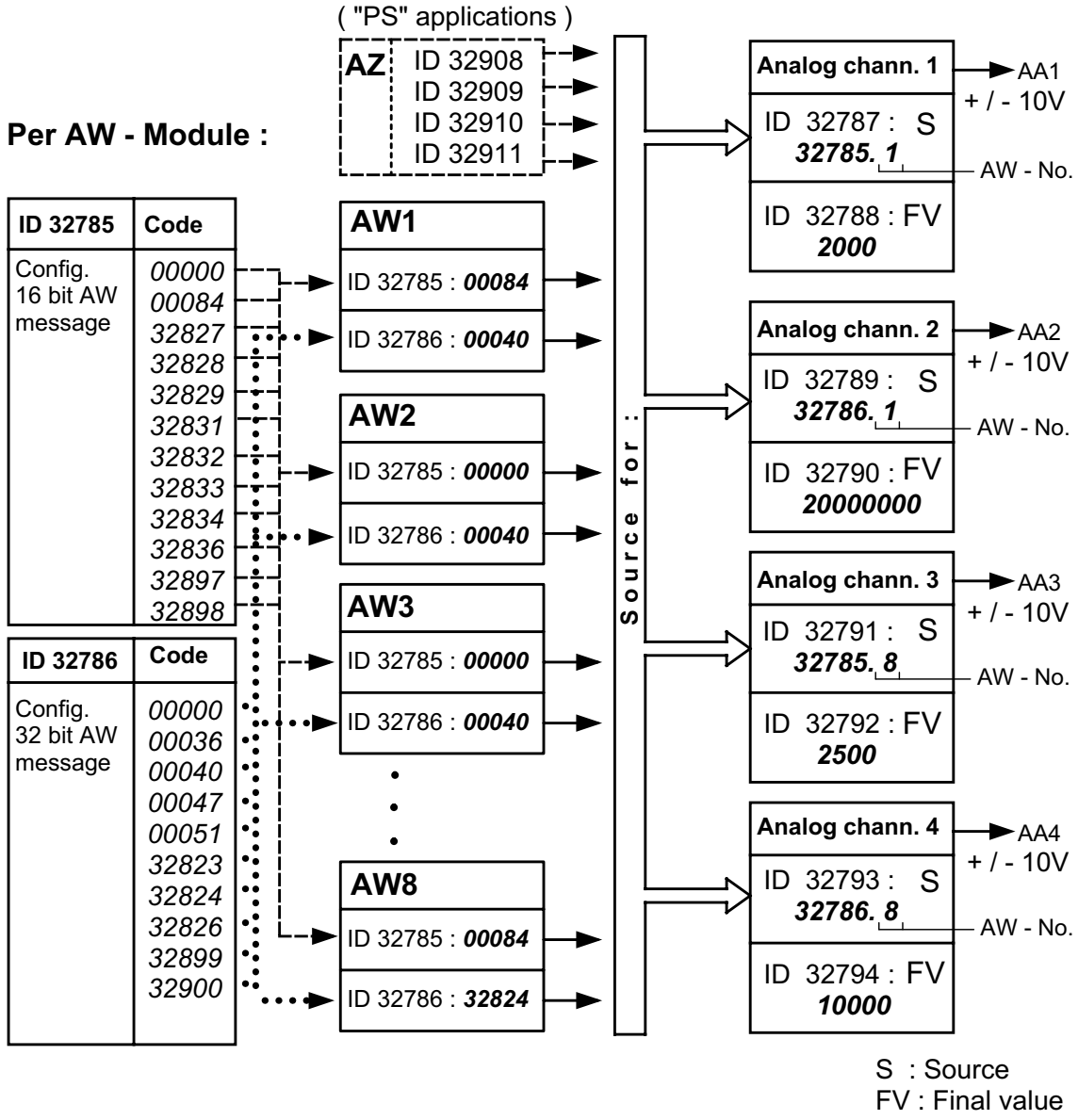
3. Definition of the information per bit source
   ID32865 = 308.2
   ID32866 = 33014.2
   ID32867 = 33036.2

13 Analogue outputs assignment

Diagram 13-1: Signal and parameter assignment of the analogue value output

Example of the values entered in the ID No.:

Analog channel 1 (AA1):	Actual torque value (000 84) of AW1 10V correspond to 200.0 % of the nominal motor torque
Analog channel 2 (AA2):	Actual speed value (40) of AW1 10V correspond to 2000 rpm
Analog channel 3 (AA3):	Actual torque value (84) of AW8 10 V correspond to 250.0 % of the nominal motor torque
Analog channel 4 (AA4):	Following error (32824) of AW8 10V correspond to a following error of 10000 incr.



ID32787 Source analog channel 1

ID32789 Source analog channel 2

ID32791 Source analog channel 3

ID32793 Source analog channel 4

Definition of the signal source per analog output, output of the information in the 1 ms cycle. If the signal source intended for display is an inverter variable, this must have been defined previously in the ID32785 (config. inverter message 16) or in the ID32786 (config. inverter message 32).

Structure : **ddddd . z**

Signal source:
0 = AZ module
1 ... 8 = AW1 ... AW8

Code according to table

Permissible codes for source analog channel 1...4 :

ddddd.z	Contents	Source	int. scaling
0.0	No analog output		
32908.0	AZ analog value 1, 16 bits	AZ	1
32909.0	AZ analog value 2, 16 bits	AZ	1
32910.0	AZ analog value 3, 16 bits	AZ	1
32911.0	AZ analog value 4, 16 bits	AZ	1
32785.x	Inverter message 16, 16 bits	AW → AZ	see ID 32785
32786.x	Inverter message 32, 32 bits	AW → AZ	see ID 32786
33053.x	Position increment AZ-IPO, 32 bits	AZ	1
33054.x	AZ main setpoint value HSW, 32 bits	AZ	1)
33055.x	AZ companion setpoint value BSW, 16 bits	AZ	1

1) The scaling depends upon the selected operation mode and thus on the type of the main setpoint value.
- Closed loop position control [1 increment]
- Speed control [0.0001 /min-1]
- Torque control [0.1 %Mn]

Code 32908 ...32911 are for example RAM data areas that can be written by active option cards. These data are D/A converted and output as an analog signal.

ID32788 Final value analog channel 1

ID32790 Final value analog channel 2

ID32792 Final value analog channel 3

ID32794 Final value analog channel 4

Final value definition (EW) of the system variable to be output analog. Related to the internal representation of the selected system variable, this numerical value corresponds to 10V at the output of the analog channel.
The input of a negative final value leads to formation of the absolute value of the analog output. The scaling factors SK can be seen from the corresponding tables (see ID32785, ID32786). The final value to be determined is calculated as follows:

EW = ZW / SK + Offset

EW - Analog channel final value, e.g. value according to ID 32788
ZW - Target value, e.g. actual speed n = 2000 rpm
SK - Scaling factor according to table

Please refer to the tables for a possibly present offset. If no offset is stated, then this must be allocated with 0.

Example 1:

It is required that the actual speed of drive 5 is displayed at the analog output 3 of the AZ module. Here 10V output voltage should correspond to 3000 rpm.

1. Configure data to be output (config. inverter message 32)
   ID32786/AW5 = 40 (actual speed value)
   The AW module 5 is now caused to transmit the actual speed value cylically every 0.5 ms to the AZ module.

2. Define source of the analog output
   ID32791 = 32786.5 (analog output source 3)
   The actual speed value of AW5 is transferred from the AZ to the analog output AA3.

3. Calculate final value
   Formula 14-1: Actual speed value, final value definition analog output

Formula 13-1: Actual speed value, final value definition analog output

$$\text{ID32792} = \frac{\text{ZW}}{\text{SK}} = \frac{3000\,\text{rpm}}{0{,}0001\,\text{rpm}} = 30000000$$

3000 rpm correspond to 10V output voltage

Example 2:

The actual torque value of drive 1 shall be displayed at the analog output 2. Here 200% of the nominal torque should lead to 10V output voltage.

1. Configure data to be output
   ID32785 AW1 = 84 (config. inverter message 16)
   The AW module 1 is caused to transmit the actual torque value cylically every 0.5 ms to the AZ module

2. Define source of the analog output
   ID32789 = 32785.1 (analog output source)
   The actual torque value of AW1 is transferred from the AZ to the analog output AA2.

3. Specify final value

   Formula 13-2: Actual torque value, final value definition analog output

$$ID32790 = \frac{ZW}{SK} = \frac{200\% \cdot M_N}{0{,}1\% \cdot M_N} = 2000$$

   200% * MN correspond to 10V output voltage

Example 3:

The flux-generating current of drive 4 shall be displayed at the analog output 1. Here a current of 5 A should lead to 10V output voltage.

1. Configure data to be output
   ID32785 AW4 = 32827 (config. inverter message 16)
   The AW module 4 is caused to transmit the flux-generating current cylically every 0.5 ms to the AZ module

2. Define source of the analog output
   ID32787 = 32785.4 (analog output source)
   The flux-generating current of AW4 is transferred from the AZ to analog output AA1.

3. Specify final value
   Assumption: AW 4 is a module AW 3/6, ID 110 = 10A

   Formula 13-3: Flux-generating current, final value definition analog output

$$ID32788 = \frac{ZW}{SK} = \frac{5A}{10A / 16384} = 8192$$

   5 A correspond to 10V output voltage

14 Inverter parameters

ID00110 Inverter peak current [A]

The peak current of the inverter module is set in the factory and is processed at the first system booting. The value can only be read, any entry remains without effect. The parameter value is transferred into the ID00110 from the serial EEPROM of the inverter module.

ID00112 Inverter nominal current [A]

The inverter nominal current is the permissible continuous current of the inverter, this is processed at the first system booting. The value can only be read, any entry remains without effect. The parameter value is transferred into the ID00112 from the serial EEPROM of the inverter module.

ID00158 Power threshold Px [VA] (on-line changeable)

If the power output of the inverter module exceeds the value stated in ID158, then the message bit (code 337) is set.

ID32785 Config. 16 bit AW message (on-line changeable)

ID32786 Config. 32 bit AW message (on-line changeable)

The wanted 16-bit or 32-bit system variable is transfered from the inverter cylically every 500 µs by stating the code. As from AZ software 0206, it is also possible to parameterize the low word of a 32-bit system variable according to ID32785, or to transfer a 16-bit system variable into the low word of the AW message 32 (ID32786). (No sign processing in the High Word!)

The system variable according to AW message 32 (ID32786) can also be output cylically on the control panel, see "Cyclical display of system values".

Permissible codes for the inverter messages:

Code	Contents	Source	Scaling SK
0	No output		
	16-bit system variables (ID32785)		
84	Actual torque value 1)	AW,	0.1% * M_N
32827	Flux-generating current (isd)	AW	ID 110/16384
32828	Actual current value phase W 2)	AW	5)
32829	Actual current value phase V 2)	AW	5)
32831	Current setpoint value phase V inverted 2)	AW	6)
32832	Encoder signal S2	AW	5V/2048 5)
32833	Encoder signal S1	AW	5V/2048 5)
32834	Torque-generating current (isq) 3)	AW	ID 110/16384
32836	DC Bus voltage	AW	752,5V/2048 5)
32897	Inverter analog input voltage A1	AW	10V/2048 5)
32898	Inverter analog input voltage A2	AW	10V/2048 5)
33100	Actual power value 4)	AW	0.05% * P_N
33099	16-bit increment per 0.5 ms sampling	AW	1 incr.
	32-bit system variables (ID32786)		
36	Speed setpoint value	AW	0.0001 rpm
40	Actual speed value	AW	0.0001 rpm
47	Position setpoint value 2, absolute 7)	AW	1 incr.
51	Actual position value, absolute	AW	1 incr.
32823	Speed setpoint value after ramp	AW	0.0001 rpm
32824	Following error without SAK	AW	1 incr.
32826	SAK	AW	1 incr.
32899	Actual position value $X_i\_2\pi$	AW	1 incr. 9)
32900	Position setpoint value $X_s\_2\pi$ 8)	AW	1 incr. 9)
33098	32-bit position setpoint increment per NC cycle time (see ID1)	as from AW 0210	1 incr.

SAK = Following error compensation

1):
The actual torque value is a variable calculated in the inverter which is based on a computer model of the motor. The value refers to the nominal torque (ID 32771) of the motor and varies with the motor type and the motor temperature.

2):
The scaling of these values depends upon the type and hardware status of the inverter module and is thus not stated.

3):
The torque-generating current isq is proportional to the torque in the basic speed range (up to nominal speed).

Formula 14-1: isqnom at nominal torque

$$\text{isqnom} = \frac{16384 \cdot \sqrt{\left(\text{ID111}^2 - \text{ID32769}^2\right)}}{\text{ID110}}$$

ID110: Inverter module maximum current
ID111: Motor nominal current IN
ID32769: Magnetizing current IM

4):
The **actual power value** is a variable **calculated** in the inverter from **actual torque value** and actual speed value which is based on a computer model of the motor. The value is related to the nominal torque (ID32771) of the motor and varies with the motor type and motor temperature.

Formula 14-2: Nominal power PN of the motor

$$\text{PN}[\text{VA}] = \frac{2 \cdot \pi \cdot \text{ID32771} \cdot \text{ID32772}}{60}$$

ID32771: Motor nominal torque [Nm]
ID32772: Motor nominal speed [rpm]

5):
Offset 2048. This offset must be taken into account for the analog output.

6):
Offset -2048. This offset must be taken into account for the analog output.

7):
The position setpoint value is composed internally in the inverter additively from the 32-bit position setpoint value 2 (e.g. interpolator) and the 16-bit position setpoint value 1 (e.g. pulse input). The position setpoint value 1 corresponds to the setpoint value source in the operation mode parameters according to ID 32800.

8) (only for AMK service):
The range limits of the 2π formation vary with the position control difference, therefore the position setpoint 2π serves only for information. The position setpoint value 2π is composed internally in the inverter additively from the 32-bit position setpoint value 1 (e.g. interpolator) and the 16-bit position setpoint value 2 (e.g. pulse input) and is correlated to the actual position value 2π.

9):
If a 2π value (code 32899, 32900) is configured, it must be taken into account that this value contains additionally the information about direction of rotation.

positive direction of rotation : $0 \leq$ Xi_2π, Xs_2π $<$ Xe_2π final value
negative direction of rotation : $0 \geq$ Xi_2π, Xs_2π $>$ Xe_2π final value

Xe_2π final value : Resolution of the actual position value source or module value according to ID 103 (see ID 32800)
When the direction of rotation changes, a transitional range exists from which the direction of rotation can be seen from dx/dt.

ID32890 AW-IW pulse multiplier

This parameter contains the factor by which the motor encoder signals (periods/revolution) are multiplied before they are output as square wave pulses via the option cards (e.g. AW-IW1, AW-IW2).

The permissible factors are 1, 2, 5 and 10. The factor must be defined by the user and input in ID32890.

Caution :

The ID32890 is ineffective for resolver applications. When a **resolver** is used as motor encoder, the **fixed resolution of 1024** pulses/revolution/track is generated. If the tracks are processed as quadrature signal, then the resolution of 4096 pulses/revolution is effective for following systems.

Soft pulse transmission SIWL

(available from AZ-Software ≥ AZ 3.08 3000 associated with AW-VE ≥ V02.13.3000)

The function „Pulse transmission“ was expande to „Soft pulse transmission SIWL“.
From different sources square wave pulses can be derived and output via option card AW-Iwx. Apart from the motor encoder e. g. also the Fast Function „SF FGEN“ on option card AZ-PSx can be used as signal input source(“VIRTUAL MASTER”).
The number of output pulses can be defined and also the pitch can be specified for the cyclic output of a reference pulse.

ID32964 Source SIWL

Definition of the source for generating the output pulses.

ID 32964	**Source SIWL**
0000	SIWL Off
0001	A type motor encoder
(0004	T type motor encoder) **not released**
0005	I type motor encoder
0007	S type motor encoder
0008	Resolver
000F	Commanding interface (AZ-PSx)

ID32965 SIWL pitch

In ID 32965 the number of output pulses per „turn“ generated via the commanding interface must be specified. With this pitch the cyclic reference pulse is generated.

ID32966 IVH Multiplier

ID32967 IVH Divider

The pulse ratio IVH between motor encoder sine periods (ID 32776) and the pitch of the soft pulse transmission SIWL (ID 32965) is defined by IVH Multiplier and IVH Divider.
Depending on the selected motor encoder type in ID 32964 Source SIWL the related encoder resolution (per. / turn) must be entered into ID 32967.
By a negative value for IVH multiplier the count direction of the output signals is inverted.
Value range:

ID 32966: $\pm 2^{15}$ (-32768 ... +32767)
ID 32967: $2^{15} - 1$ (1 ... +8191)

ID 32966 / 32967 relation:

$$\frac{ID32966}{ID32967} = \frac{Output\ pulses}{Input\ pulses\ (Encoder\ periods\ /\ turn)}$$

Examples:

4000 pulses / turn are required via the SIWL from a motor with resolver.
ID 32966 = 4000
ID 32967 = 128 (from ID 32776)

1000 pulses / turn are required via the SIWL from a motor with I type encoder, 1024 per./rev.
ID 32966 = 1000
ID 32967 = 1024 (from ID 32776)

Restrictions

On synchronization to the encoder reference pulse the firstb dtected reference pulse is not output, it is used internally for identification.
If a sine wave motor encoder is used as SIWL source the SIWL reference impulse can deviate by ± 3 increments.
An external square wave measuring system for actual position feedback may not be used simultaneously with SIWL source “Commanding interface”.
The time distance between two reference pulses must be > 5ms (→ n_{max} = 12000 min^{-1}).

Compatibility
With ID 32964 = 0 the soft pulse transmission SIWL is not activated!
With ID 32964 = 0 and if the motor encoder is not „Resolver“, then the usual hardware pulse transmission for sinusoidal motor encoders is active and parameter ID 32890 „Pulse multiplier“ is effective.
1024 pulses / rev. are output via AW-IWR by the settings:
ID 32966 = 8 and ID 32967 = 1.

15 Special applications

ID32798 User list 1

Data record freely available for the user in the remanent memory area, e.g. for AZ-PSx applications.

Overall length as from AZ software version 0206: 512 bytes
(to software version 0206: 260 bytes)

Structure of the data record:

2 words head information
current and maximum length of the list in bytes.

+xxx words user data
Input of signed decimal numbers Z
in the range $-32768 \leq Z \leq 32767$

Example:

ID32798 = { 16, 16, (Head) -10, 200, 2000, 10, 10, 0,...} (User data)

Caution: If the head information is set to 0, access to the user list 1 is no longer possible (initial loading of the system necessary).

16 SERCOS interface® global parameters

ID00001 NC cycle time

The NC cycle time defines the time grid of the setpoint value entry. The setpoints can be made available, for example, by the following active options cards:

- AZ-K02 SERCOS interface®
- AZ-PSx Programmable control
- AZ-MC1 NC control

In the inverter, this time base serves for quantification of the inverter fine interpolation (see ID32800...) of the specified 32-bit position setpoint values possible in the closed loop position control operation mode.

ID00002 SERCOS cycle time

The SERCOS interface® cycle time defines the time intervals in which cyclic data are transferred (e.g. cyclic data in the SERCOS interface® ring) and serves for the cycle synchronization between the option cards and the drive computer. Furthermore, the SERCOS interface® cycled time determines the data updating rate of the parameter ID 32948 Config. AZ message.

ID00017 List of all operating data

List of all ID numbers defined in the system. Classifies all ID numbers defined in the system into four classes. All ID-related data accesses to the internal database take place on the basis of the ID 17. The list of all operating data cannot be changed by the user, it can only be read.

ID classes

GLOBAL
The parameter acts centrally for all drives and is filed once in the database. After change of Inverters on, a parameter change produces a complete system booting of all active inverter modules.

DRIVE-SPECIFIC
The parameter acts only in the corresponding drive and is filed per data record in the database. After change of the Inverters on, a parameter change produces a system booting of only the changed active inverter module.

Global parameters

00001	NC cycle time	00265	Language
00002	SERCOS cycle time	00270	Temp. par. list
00003	Drive transm.react.time	32787	Source analog chann. 1
00004	Transm/rec. trans.time	32788	Final analog val. ch. 1
00005	Min.feedb.acquis.time	32789	Source analog chann. 2
00010	Length of MDT	32790	Final analog val. ch. 2
00017	ID-No.list all op.data	32791	Source analog chann. 3
00018	Op.datalist com.ph.2	32792	Final analog val. ch. 3
00019	Op.datalist com.ph.3	32793	Source analog chann. 4
00020	Op.datalist com.ph.4	32794	Final analog val. ch. 4
00025	All command data list	32795	Source UE
00026	Config.l.sign.stat.word	32796	Source RF
00027	Config.l.sign.ctrl.word	32798	User list 1
00028	MST Error Counter	32799	Conf. Stand. periph.
00029	MDT Error Counter	32812	Active drives
00030	Manufacturer Version	32813	Par.set assignm. AW1
00087	Recovery transm.-transm	32814	Par.set assignm. AW2
00088	Recovery receive-rece.	32815	Par.set assignm. AW3
00089	Transmit time MDT (T2)	32816	Par.set assignm. AW4
00090	Com. val. transm. time	32817	Par.set assignm. AW5
00139	Park axis command	32818	Par.set assignm. AW6
00143	SERCOS interface vers.	32819	Par.set assignm. AW7
00146	NC homing cycle commd.	32820	Par.set assignm. AW8
00148	Drive hom.cycle commd.	32821	Password
00149	Go to dead stop command	32846	Output port 1
00152	Spindle posit. command	32847	Port 1 bit 0
00197	Set coordinate system	32848	Port 1 bit 1
00199	Coord. lower range val.	32849	Port 1 bit 2
00216	Switch par. set comm.	32850	Port 1 bit 3
00223	Drive synchr.contr.comm	32851	Port 1 bit 4
00231	Drive electr.gear comm.	32852	Port 1 bit 5
00262	Init.prog.load.comm.	32853	Port 1 bit 6

32854	Port 1 bit 7
32855	Output port 2
32856	Port 2 bit 0
32857	Port 2 bit 1
32858	Port 2 bit 2
32859	Port 2 bit 3
32860	Port 2 bit 4
32861	Port 2 bit 5
32862	Port 2 bit 6
32863	Port 2 bit 7
32864	Output port 3
32865	Port 3 bit 0
32866	Port 3 bit 1
32867	Port 3 bit 2
32868	Port 3 bit 3
32869	Port 3 bit 4
32870	Port 3 bit 5
32871	Port 3 bit 6
32872	Port 3 bit 7
32873	Input port 1
32874	Port 1 bit 0
32875	Port 1 bit 1
32876	Port 1 bit 2
32877	Port 1 bit 3
32878	Port 1 bit 4
32879	Port 1 bit 5
32880	Port 1 bit 6
32881	Port 1 bit 7
32882	Slot assignment
32883	Config. slot 1
32884	Config. slot 2
32885	Config. slot 3
32886	Config. slot 4
32889	UE (DC-BUS enable)
32901	Global service bits
32921	Address AZ-monitor 1
32941	SERCOS service
32942	Service control
32943	Reserve
32944	Reserve
32945	Reserve
32946	Reserve
32947	Speed window comm.
32948	Config. AZ message
32949	SBUS user address
32950	Reserve
32951	Reserve
32962	List of error codes
32963	PSP read
32968	Input port 2
32969	Port 2 bit 0
32970	Port 2 bit 1
32971	Port 2 bit 2
32972	Port 2 bit 3
32973	Port 2 bit 4
32974	Port 2 bit 5
32975	Port 2 bit 6
32976	Port 2 bit 7
32977	Input port 3
32978	Port 3 bit 0
32979	Port 3 bit 1
32980	Port 3 bit 2
32981	Port 3 bit 3
32982	Port 3 bit 4
32983	Port 3 bit 5
32984	Port 3 bit 6
32985	Port 3 bit 7
32986	Reserve
32987	Reserve
32988	Reserve
32999	Version
33000	Reserve

Drive specific parameters

00006	Drive telegr.start.time
00007	Feedb.acquis.start.time
00008	Command valid time (T3)
00009	Begin. address in MDT
00011	Status class 1-errors
00012	Status class 2-warnings
00013	Status class 3-messages
00014	Interface status
00015	Telegr. type par.
00016	Config. list DT
00021	Inval.datalist com.ph.2
00022	Inval.datalist com.ph.3
00023	Inval.datalist com.ph.4
00024	Config. list MDT
00032	Primary operat. mode
00033	Second. operat. mode1
00034	Second. operat. mode2
00035	Second. operat. mode3
00036	Velocity command value
00038	Pos. velocity limit
00039	Neg. velocity limit
00041	Homing velocity
00042	Homing acceleration
00043	Velocity polarity
00044	Scaling of veloc. data
00047	Position command value
00048	Added pos. command val.
00049	Positive position limit
00050	Negative position limit
00052	Home ref. position 1
00055	Closed loop polar. par.
00057	In position window
00076	Position data scaling
00077	Translat.pos.scal.fact.

32805	AMK second op. mode 5
32806	AMK second op. mode 6
32807	AMK second op. mode 7
32808	AMK second op. mode 8
32809	AMK second op. mode 9
32811	Ext. pos. feedb. source
32890	AWIW puls multiplier
32892	Sync.set.pulses divider
32893	Sync.set.pulses multipl
32912	Homing cycle performed
32920	Reserve
32922	Resid.dist.erase wind.
32923	Bahavior at RF ON/OFF
32924	Op.mode change par.
32925	AMK spindle posit.par.
32926	AMK homing cycle par.
32927	AMK synchronous par.
32928	Time filter 1
32929	Time filter 2
32930	Reserve
32931	Reserve
32932	Reserve
32933	Reserve
32934	Reserve
32935	Voltage standstill
32936	Reserve
32937	Reserve
32938	Reserve
32939	Reserve
32940	High homing velocity
32952	At sync. speed window
32953	Motor enc. type
32954	Time ramp down monitor
32955	Delay time
32956	Add. acceleration value
32957	TAD
32958	Cycle time 16 bit position setpoint
32959	Offset resolver
32960	Input M.enc. gear
32961	Output M.enc. gear
32964	Source SIWL
32965	Pitch SIWL
32966	IVH Multiplier
32967	IVH Divider
32989	Reserve
32990	Reserve
32991	Reserve
32992	Reserve
32993	Reserve
32994	Reserve
32995	Reserve
32996	Reserve
32997	Reserve
32998	Reserve
ID-No.	Designation

ID00030 Software version

(only with AZ-R02, from AZ software version 3.09 2002/21)

ID30 “Software version” represents an ASCII list with 20 bytes user data.
Via ID30 the software version can be identified.

Number [bytes]	3	1	3	1	2	2	1	6	1
Content	**Module**	Sp	**Version**	Sp	**Year**	**Week**	Sp	**Part No.**	0

Sp = Space

Example: ID30 = {24,24, KW 200 0140 23988}

Header User data

ID00270 List of temporary parameters

Designates all on-line changeable ID numbers in the AMKASYN system. The parameters that are on-line changeable act exclusively in the volatile memory (RAM). They are transferred to the permanent database only after confirmation. The stated times are average times and refer to the commanding in the DPRAM AMKASYN (AZSSINT) up to acknowledgement of execution by the drive computer.

List of all temporarily changeable parameters :

Parameters	Designation	Int. representation	Effect after
ID 38	Positive speed limit	[0.0001 rpm]	approx. 40 ms
ID 39	Negative speed limit	[0.0001 rpm]	approx. 40 ms
ID 49	Positive position limit	[1 incr.]	approx. 40 ms
ID 50	Negative position limit	[1 incr.]	approx. 40 ms
ID 82	Positive torque limit	[0.1 % Mn]	approx. 40 ms
ID 83	Negative torque limit	[0.1 % Mn]	approx. 40 ms
ID 100	Prop.gain speed control KP	[1]	approx. 40 ms
ID 101	Integral action time TN	[0.1 ms]	approx. 40 ms
ID 104	Position loop KV factor	[rpm]	approx. 40 ms 3)
ID 124	Zero speed window	[0.0001 rpm]	approx. 40 ms
ID 125	Speed threshold nx	[0.0001 rpm]	approx. 40 ms
ID 126	Torque threshold Mdx	[0.1 % Mn]	approx. 40 ms
ID 136	Pos. accel. interpolator	[0.001 U/s2]	approx. 40 ms 1)
ID 137	Neg. accel. interpolator	[0.001 U/s2]	approx. 40 ms 1)
ID 150	Reference offset 1	[1 incr.]	approx. 40 ms 2)
ID 157	Speed window	[0.0001 rpm]	approx. 40 ms
ID 158	Power threshold Px	[1VA]	approx. 40 ms
ID 228	Sync. position window	[1 incr.]	approx. 40 ms
ID32778	Speed at 10V at A1	[0.0001 rpm]	approx. 40 ms
ID32779	Speed offset at A1	[0.0001 rpm]	approx. 40 ms
ID32780	Acceleration ramp TH	[0.1 ms]	approx. 40 ms
ID32781	Deceleration ramp TL	[0.1 ms]	approx. 40 ms
ID32785	Config. AW message 16		approx. 40 ms
ID32786	Config. AW message 32		approx. 40 ms
ID32892	Synchronous control set pulses divider	[1]	approx. 50 ms 4)
ID32893	Syn. contr.l set pulses mult.	[1]	approx. 50 ms 4)

1) The acceleration changes must be completed before positioning. They act in every following positioning operation.

2) The change of the reference offset must be completed before a homing cycle.

3) The change of the speed gain is permissible only with inactive Inverters on.

4) The change of the synchronous ratio may take place only in small steps by means of synchronous control set pulses multiplier with active Inverters on, since the effect directly influences the setpoint value channel and there are small setpoint value steps.

17 SERCOS interface® drive-specific parameters

ID00096 Slave identification SLKN

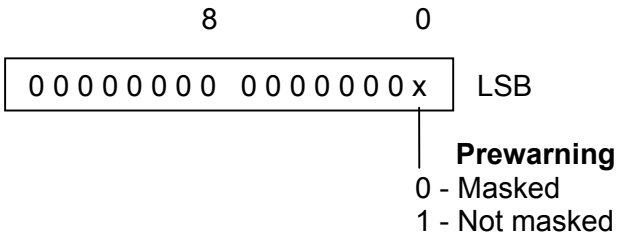
Definition of the linkage of valid drive addresses in the SERCOS interface® ring

HIGH BYTE : "Own drive address"
LOW BYTE : "Next drive address"

For further information refer to the SERCOS interface® standard.

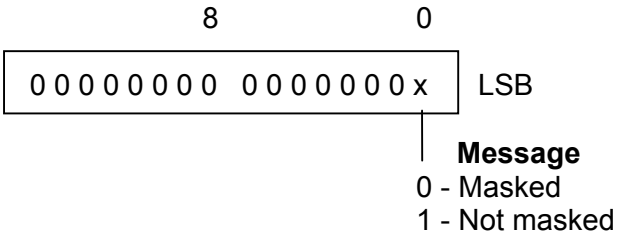
ID00097 Mask class 2 diagnostics

Prewarnings of the state class 2, such as overload warning (ID 310) or motor overtemperature warning (ID 312) can be masked in their effect on the change bit of state class 2 in the drive status with the mask. The masked prewarnings have no effect on the change bit of the state class 2. The mask has no effect on the operating datum of the state class 2 (ID 12).



ID00098 Mask class 3 diagnostics

Messages of the state class 3, such as message $n_{act} = n_{set}$ (ID 330) or message Md ≥ Mdx (ID 333) can be masked in their effect on the change bit of class 3 in the drive status with the mask. The masked messages have no effect on the change bit of the state class 3. The mask has no effect on the operating datum of the state class 3 (ID 13).



18 General per inverter

ID-00130 Measured value (positive edge)

This parameter is effective in drive function „Touch probe“.
By detecting the positive edge of the touch probe input the related actual position value is stored in in ID130.
Handshaking of this actual position capture is possible by assigning code „409“ to a binary output.

ID-00131 Measured value (negative edge) **(not evaluated!)**

This parameter is effective in drive function „Touch probe“.
By detecting the negative edge of the touch probe input the related actual position value is stored in in ID131.
Handshaking of this actual position capture is possible by assigning code „410“ to a binary output.

ID-00179 Measured value status

This parameter provides status information for the Touch probe function.
It indicates that the positive or negative edge of the touch probe input was detected
(the negative edge is not evaluated!).
The actual position on detection of the positive or negative edge of the touch probe input is provided in ID130 / ID131.

Important: The touch probe trigger does not stop the axis automatically.

ID32773 Drive-specific service switch

This parameter enables drive-specific functions to be switched on and off with priority by AMK service personnel (monitorings, special applications or compatibility). The meaning of the individual bits is shown in the following table.

Representation example with following target:

- Activating monitoring of motor encoder signals
- Activating AMK A encoder adjustment
- Activating motor deceleration control

Bit No.	28	24	20	16	12	8	4	0
binary	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 1 1 1
hex.	0	0	0	0	0	0	0	7

ID32773 = 7h

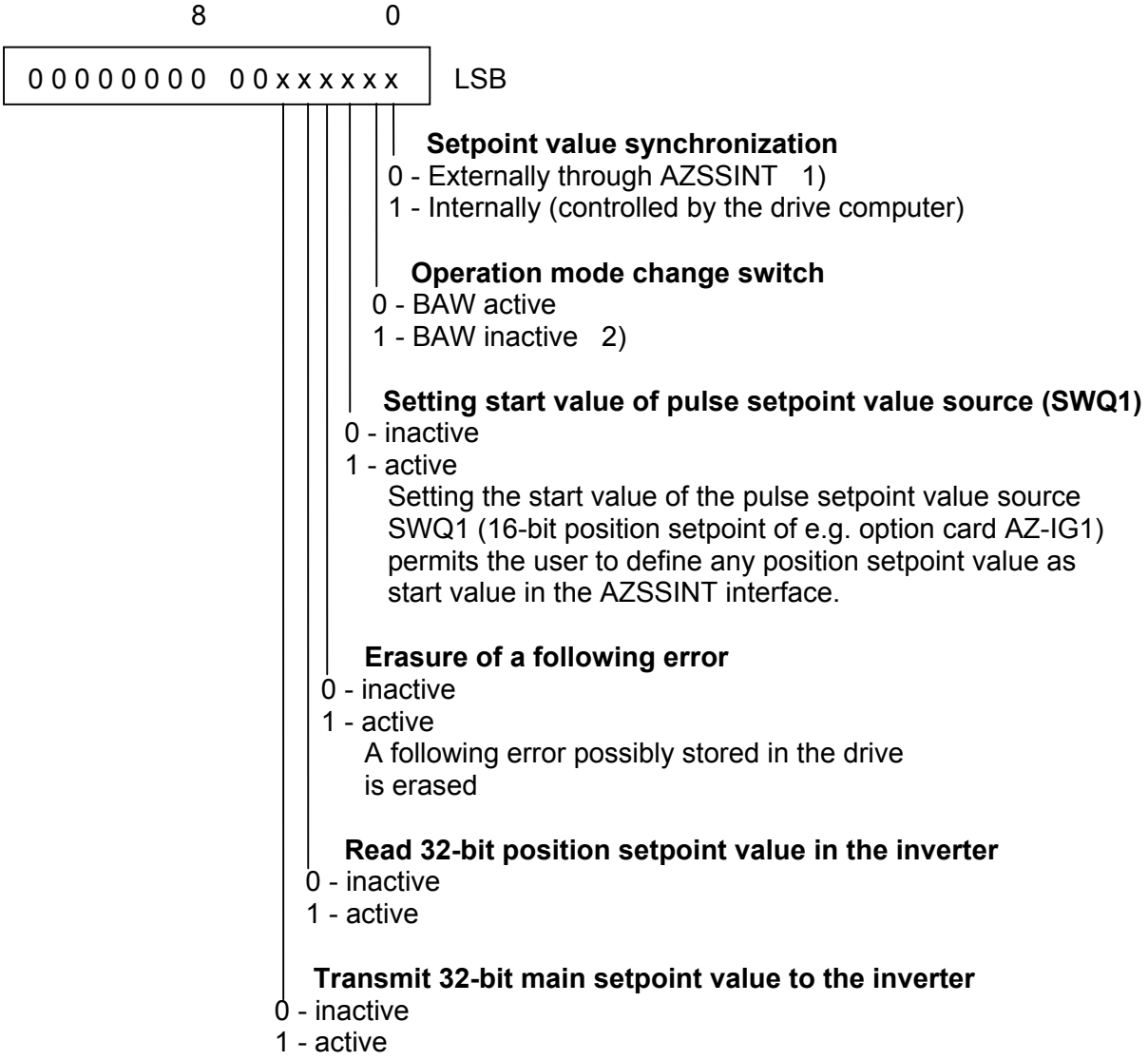
Overview

Bit No.	Value	Meaning according to ID32773	Effectiveness
0	0	**Monitoring motor encoder signals** (see ID32953 encoder type) inactive	as from AW 204 as from AZ 204
	1	active Static monitoring of the sine/cosine tracks, encoder wire break is detected (AMK-A /AMK-I /AMK-T encoders as well as resolver). As from AW 211 3896, there is additional amplitude monitoring of the internally standardized signals.	
1	0	**AMK A - encoder adjustment** inactive	as from AW 204 as from AZ 204
	1	active AMK A encoders are adjusted online regarding their optimum working point.	
2	0	**Motor deceleration control** inactive	as from AZ 206
	1	active When the axis is braked, no axis acceleration may be detected by the system, otherwise deceleration error message.	
3	0	**Monitoring of position limit according to ID49/50 in the 16-bit position setpoint value channel** inactive only monitoring (message) of the position limits	as from AZ 206 as from AW 206
	1	active Setpoint value limitation and monitoring (message) of the position limits, see binary output of bit messages according to ID49/50 for the **16-bit setpoint value channel** in the 10ms time grid (AZ implementation, unsharp limitation) **as from AW software >= AW 2.10** Setpoint limitation and monitoring (message) of the position limits **in the 500us** time grid	
4	0	Reserved	
	1	Reserved	
5	0	**Operation mode of the axis after RF reset** On renewed activation of RF, the axis remains in the current operation mode with current setpoint value channel (operation mode before RF reset, position control, speed control, torque control,...).	as from AZ 208
	1	On renewed activation of RF, the axis is always in digital speed control with setpoint value 0. (System-internal automatic operation mode change) These statements apply only for the case that in the meantime no system booting is initiated by the user. Error Reset with missing SBM / SBT or parameter change in the AZ database result in system booting and thus initiate the system generally in the main operation mode according to ID 32800.	

Bit No.	Value	Meaning according to ID32773	Effectiveness
6	0	Reserved	
	1	Reserved	
7	0	Reserved	
	1	Reserved	
8	0	**Switching off the position setpoint value sources on RF reset** inactive The position setpoint sources remain active on RF reset	as from AZ 208 1996
	1	active On reset of Inverter On, the internal processing of the position setpoint value pulses is blocked. Thus an external control can be initialized, for instance, without the drive system detecting possible setpoint value steps.	
9	0	**Monitoring position encoder interface signals** (see ID32953) inactive	as from AW 211 3896 as from AZ 208 4096
	1	active Static monitoring of the sine/cosine tracks, encoder wire break is detected (AMK-A /AMK-I /AMK-T encoders as well as resolver). As from AW 211 3896, there is an additional amplitude monitoring of the internally standardized signals.	
10	0 1	Reserved Reserved	
11	0	Reserved	
	1	Reserved	
12	0	Warning delay time: 4s	
	1	Warning delay time: 30s **(only after consultation of AMK)**	
13	0	Normal motor rotation direction	
	1	Motor rotation direction generally inverted	
14	0	Line undervoltage is generating an error	
	1	No error evaluation with line undervoltage	
15	0	New AWs (PWM): TN rating 1/16 ms	
	1	New AWs (PWM): TN rating 1/4 ms (compatible with former AWs)	from AZ/AW ...2598

ID32924 Operation mode change parameter

Acts only in the operation mode change (BAW) drive function and defines its characteristic. The parameter bits serve for information in connection with applications with active option cards. ID 32924 is ineffective in an operation mode change through binary inputs.



1) AZSSINT drive interface, setting the synchronization bit in the bit bar ub_basync after setpoint value entry by the user, control of the entries possible only through option cards AZ-PSx, AZ-MC1, ...

2) The operation mode change drive function additionally permits the simultaneous changing of two temporary parameters according to list ID 270. The change of the operation mode can be masked out in this connection.

ID32954 Deceleration monitoring time

The deceleration monitoring time parameter acts in the lift axis drive function. If after a stop command, the axis cannot be stopped within this time to the speed nact = 0, then the external brake is activated and an error signal is displayed.

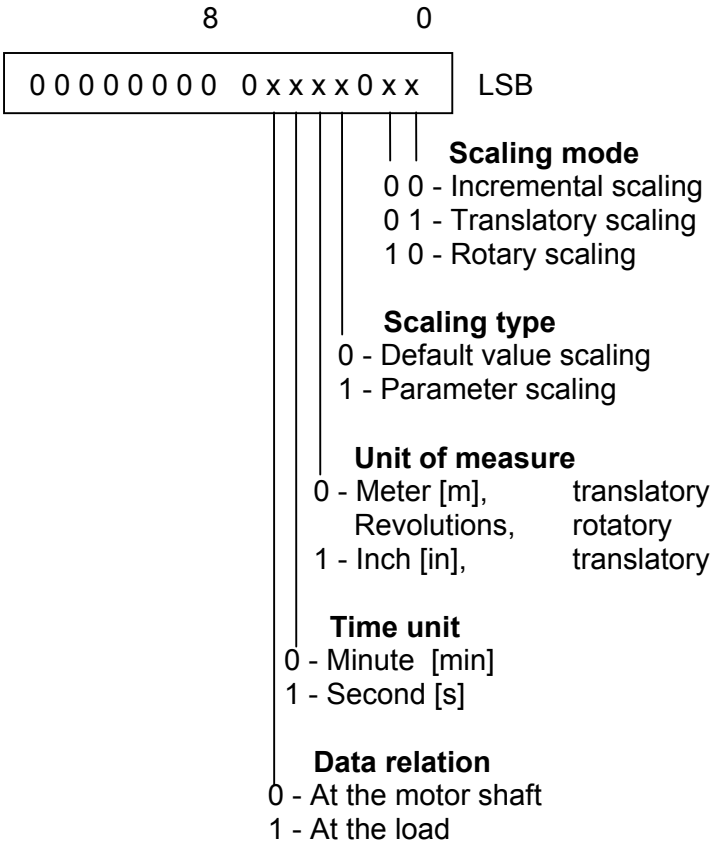
ID32955 Delay time

The delay time parameter acts in the lift axis drive function. After activation of the external brake, the delay time is waited for until Inverters on is reset in the lift axis drive function. The axis is held in its position by the external brake, the motor is without torque.

19 Selection of system-internal parameters

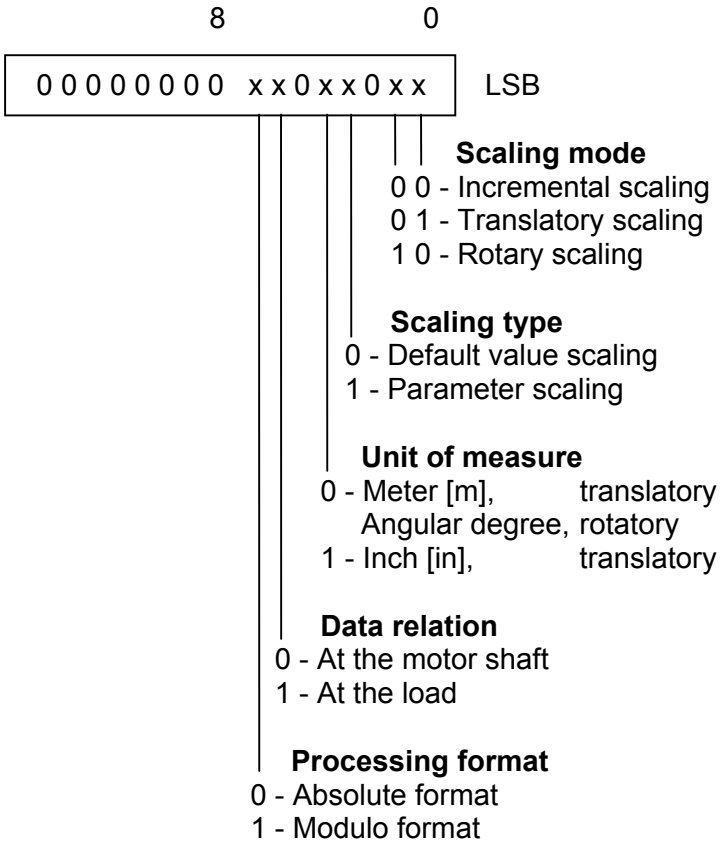
ID00044 Speed scaling mode

The parameter is defined by AMK and cannot be changed by the user. The scaling mode describes the selected scaling of the speed data.



ID00076 Position data scaling mode

The parameter is defined by AMK and cannot be changed by the user. The scaling mode describes the selected scaling of the position data.



ID00269 ID memory mode

Formal parameter which defines the write property of the following transmitted ID numbers as temporarily or not temporarily effective in the current process (switch for temporary parameters). Reading accesses to ID numbers are not influenced by ID 269, these always take place at the resident database.

ID 269 = 0 , Following data refer to the database, are resident and become effective only after RF change.

ID 269 = 1 , Following data act immediately in the control or regulating process and are not filed in the database.

The effect of the ID 269 is self-holding, i.e. after transmission once, the wanted status applies up to renewed transmission of the ID. The ID 270 list of temporary parameters identifies IDs which support the status of ID 269 = 1.

ID32912 Reference point known

Functional parameter which permits the reading and erasure of "Reference point known information" of the drive in the SERCOS interface® operation. With entry of ID32912 = 1, an unreferenced status of the drive is caused, this means that at the next call of the spindle positioning drive function, a new homing cycle is performed (if the SERCOS interface(is used). If binary inputs are parameterized by AZ-EAx option cards, code 32912 can be assigned to a binary input and thus the system-internal flag "Reference point known" is erased for the corresponding drive.

ID32941 SERCOS®-Service

Through this parameter functions related to SERCOS interface® can be activated/ deactivated. More detailed information is given in the separate "AMK SERCOS interface®" documentation.

There also the ID Nos.: 00003, 00004, 00005, 00006, 00007, 00008, 00009, 00010, 00015, 00087, 00088, 00089 und 00090, listed in the index table, are described.

ID32962 List of all error codes

This parameter serves external components for the display of internal diagnostic messages in the ASCII format (selection on the AZ-/KU control panel is not permissible). When the parameter is called, the internally stored diagnostic information is combined to form an ASCII string. Data record legible only for the user in the ASCII format, which is formed only when the ident number is called.

Structure of the data record:

2 words head information
current and maximum length of the list in bytes

+ multiple of user data of following structure

4 bytes error number
2 bytes error source
26 bytes error text

The error sources are displayed as numbers and have the following meaning :

0	AZ	1	AW1	2	AW2	3	AW3
4	AW4	5	AW5	6	AW6	7	AW7
8	AW8	9	option card				

Example: ID32962 = { 36, 324, (Head) 1324, 00, ID 32772 nN too large\0... ,} (User data)

The list is limited to maximum 324 bytes.

20 Your notes

ID. No.	Name	Parameter value	Purpose	Device
Example: 113	Maximum motor speed	4000 rpm	Limitation of the maximum process speed because of mechanical system	AW 3

21 Impressum

Title **AMKASYN Parameters AZ**

Objective Description of the parameters AZ

Part-Number 26248

History

Date
1997/11
2003/29

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To assure a fast and accurate response to solve customer problems we ask for your cooperation in providing us with the following information:

- Nameplate data
- Software version
- System configuration and application
- Description of problem and presumed cause of failure
- Diagnostic message (error code)

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