AMKASYN
Servo inverters KE/KW and KU
Parameter description

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1 Abbreviations

03h	3 hexadecimal
AA	Analog output
ACC-Bus	AMKASYN CAN Communication
AE	**A**MKASYN **E**xtension (general use for option card board)
AFP	**A**MK **F**ieldbus **P**rotocol
API	**AP**plication **I**nterface, user interface
ASC	**A**MK **S**ystem **C**ommunication
BA	Operation mode
CC	**C**ross **C**ommunication
DA	Digital outputs
DTH	Database
DZR	Closed loop speed control
ES1, ES2	Disconnection main contactor
FL	Clear error
F_N	Rated force
HW	Hardware
I_M	Magnetizing current
I_{max}	KU maximum current
I_N	Rated current
in	inch
IPO	Interpolator
KE	Compact power supply module
KMD	Command
KMD-SS	Command interface
KUB	KU user panel
KW	Compact inverter module
lbf	pound-force (1 lbf = 4,44822 N)
lbf in	pound-force inch (1 lbf in = 0,112985 Nm)
LC	**L**eading **C**ommunication
LR	Closed loop positioning control
LSB	**L**east **S**ignificant **B**it
LT	Logical participant
M_N	Rated torque
n	Speed value
n_{ist}	Actual speed value
n_N	Rated speed value
n_{soll}	Speed setpoint
OPT	Option card slot
PEEP	**P**arallel **EEP**ROM

PLC	**P**rogrammable **L**ogic **C**ontroller (e.g. KW-PLC option card)
PTC	PTC thermistor
QRF	Controller enable (RF) acknowledgement
QUE	Inverter ON acknowledgement
RF	controller enable
RFP	Homing point
RM	Inverter integrated motor
SBM/SBT	System Ready Message
SBUS	AMK-specific protocol for serial interface
SEEP	**S**erial **EEP**ROM
SIWL	Software pulse transmission
T	Temperature
UA1	Analog setpoint voltage for analog input A1
UE	Inverter ON, DC Bus enable
VA	Apparent power
x_i	Actual position value
x_s	Setpoint position value

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K: Number of the decimal places for the parameter entry by means control panel or Programming Software.

Example: ID-No. 00038, positive velocity limit
The velocity can be edited only in the rpm scaling (K = 0),
although a significantly higher velocity resolution is used inside the system.
ID-No. 32774, rotor time constant TR
The rotor time constant can be edited in the 1 ms scaling (K = 3),
although 0.1 ms time resolution is used inside the system.

ID-No.	Designation	K	Default	Unit	Parameter	Page
1	NC cycle time	3	1000	ms	GLOB	151
2	SERCOS cycle	3	100	ms	GLOB	151
17	List all op. data	0	0	-	GLOB	151
26	Status word	0	0	-	GLOB	152
30	Softwareversion	0	0	-	INST 1)	152
36	Veloc. cmd. value	1	1000.0	1/min	ANTR	72
38	Pos. veloc limit	0	5000	1/min	ANTR	72
39	Neg. veloc. limit	0	-5000	1/min	ANTR	72
40	Veloc. feedb. val.	1	0.0	1/min	ANTR	72
41	Homing velocity	0	100	1/min	ANTR	94
43	Veloc. polarity	0	0	-	ANTR	72
44	Scaling of veloc	0	2	-	ANTR	177
45	Veloc.scal.fact.	0	1	-	ANTR	179
46	Veloc.scal.expo.	0	-4	-	ANTR	179
49	Pos. posit. limit	0	2147483647	Incr	ANTR	87
50	Neg.posit. limit	0	2147483648	Incr	ANTR	87
51	Posit.feedb.val	0	0	Incr.	ANTR	94
55	Posit. polarity	0	0	-	ANTR	87
57	In posit. window	0	1000	Incr.	ANTR	94
76	Posit. scaling	0	0	-	ANTR	180
77	Posit.scal.fact.	0	1	-	ANTR	183
78	Posit.scal.expo	0	-7	-	ANTR	183
79	Rotat. resolution	0	3600000	Incr.	ANTR	184
80	Torque cmd. vlaue	1	10	% MN	ANTR	69
82	Pos. torque limit	0	120	% MN	ANTR	69
83	Neg. torque limit	0	-120	% MN	ANTR	69
84	Torque feedb.val.	1	0	% MN	ANTR	69
85	Torque polarity	0	0	-	ANTR	70
86	Torque scaling	0	0	-	ANTR	175
93	Torque scal. fact.	0	1	-	ANTR	176
94	Torque scal. expo	0	-2	-	ANTR	176
96	Slave identifier	0	0101h	-	ANTR	153
100	Veloc. gain KP	0	200	-	ANTR	75
101	Init.time veloc.	1	50.0 1)	ms/x 1)	ANTR	76
102	Diff.time veloc.	0	0	ms	ANTR	77
103	Modulo value	0	20000	Incr.	ANTR	88
104	Posiiton loop KV	0	100	1/min	ANTR	89
109	Motor peak curr.	2	5.00	A	ANTR	39
110	Invert.peak.curr.	2	20.00 1)	A	ANTR	140
111	Mot. nom. curr.	2	2.50 1)	A	ANTR	39

ID-No.	Designation	K	Default		Unit	Parameter		Page
112	Invert.nom.curr.	2	2.50	1)	A	ANTR		140
113	Maximum speed	0	6000	1)	1/min	ANTR		39
114	Overl.limit.mot.	1	500		%	ANTR		40
115	Posit.feedb.type	0	0		-	ANTR		90
116	Resol.mot.encod.	0	20000	1)	Incr.	ANTR		40
117	Resol.ext.encod	0	100		Incr.	ANTR		90
121	Gear input rev.	0	10		rev.	ANTR		91
122	Gear output rev.	0	10		rev.	ANTR		91
123	Feed constant	4	10.0000		mm/rev	ANTR		92
124	Zero veloc.wind.	0	50		1/min	ANTR		77
125	Veloc.Thresh. nx	0	1000		1/min	ANTR		78
126	Torq.thresh. Mdx	0	100		% MN	ANTR		70
130	Probe val.p.edge	0	0		Incr.	ANTR		153
131	Probe val.n.edge	0	0		Incr.	ANTR		153
136	Positive accel.	0	100		U/ss	ANTR		94
137	negative accel.	0	-100		U/ss	ANTR		94
141	Motor type	0	0		-	ANTR		40
144	Conf.sstatus bits	0	0		-	ANTR		153
147	Homing par.	0	800h		-	ANTR		96
150	Reference offs. 1	0	0		Incr.	ANTR		98
153	Angle position	0	0		Incr.	ANTR		99
154	Spindle pos.par.	0	800h		-	ANTR		105
157	Velocity window	0	100		1/min	ANTR		78
158	Power thresh. Px	0	100		WATT	ANTR		140
159	Excess Error	0	10000	1)	Incr.	ANTR		92
160	Scal.accel.data	0	2		-	ANTR		186
161	Accel.scal.fact.	0	1		-	ANTR		187
162	Accel.scal.expo.	0	-3		-	ANTR		187
169	Probe ctrl. par.	0	0		-	ANTR		104
173	Marker posit. A	0	0		Incr.	ANTR		103
179	Probe status	0	0		-	ANTR		154
180	Spindle pos.rel.	0	10000		Incr.	ANTR		105
182	Manufact.status	0	0		-	GLOB	1)	154
206	Drive on delay	1	0.0		ms	ANTR		140
207	Drive off delay	1	0.0		ms	ANTR		140
209	Low adapt.limit	0	0		1/min	ANTR		78
210	Upp. adapt.limit	0	0		1/min	ANTR		78
211	Gain adaption	0	100		%	ANTR		79
212	Integr. adaption	0	100		%	ANTR		79
222	Spindl.pos.speed	0	300		1/min	ANTR		107
225	Synchron par.	0	8003h		-	ANTR		109
228	Angle syn.window	0	1000		Incr.	ANTR		110
230	Syn. pos. offset	0	0		Incr.	ANTR		111
265	Language	0	0		-	GLOB		33
268	Syn.angle posit.	0	0		Incr.	ANTR		111
269	ID memory mode	0	0		-	GLOB		154
270	List temp. par	0	0		-	GLOB		155
278	Syn. add. posit.	0	1000		Incr.	ANTR		112
390	Diag. number	0	0		-	GLOB		157
32768	Nom.motor volt.	1	350.0	1)	V	ANTR		53
32769	Magnet curr. IM	1	1.500	1)	A	ANTR		41
32770	Magnet.curr. IM1	1	1.000	1)	A	ANTR		41
32771	Nom. torque	1	2.0	1)	MN	ANTR		42

ID-No.	Designation	K	Default	Unit	Parameter	Page
32772	Nom. velocity	0	3000 1)	1/min	ANTR	43
32773	Service switch	0	1005h 1)	-	ANTR	157
32774	Rotor const. TR	3	0.360 1)	s	ANTR	43
32775	Pole number mot.	0	4	-	ANTR	43
32776	Sinus enc.period	0	1000 1)	-	ANTR	44
32777	Torque 10V [Va]	0	10	% MN	ANTR	71
32778	Speed 10V [Va]	0	3000	1/min	ANTR	79
32779	Speed offs. [Va]	4	0.0000	1/min	ANTR	80
32780	Accel. ramp	0	100 1)	ms	ANTR	80
32781	Decel. ramp	0	100 1)	ms	ANTR	80
32782	RAMP RF inactive	0	100 1)	ms	ANTR	81
32785	Message 16	0	84	-	ANTR	141
32786	Message 32	0	40	-	ANTR	141
32787	Source analog 1	0	32786	-	GLOB	134
32788	Final analog 1	0	20000000	-	GLOB	136
32789	Source analog 1	0	32785	-	GLOB	134
32790	Final analog 2	0	1000	-	GLOB	136
32791	Source analog 3	0	0	-	GLOB	134
32792	Final analog 3	0	0	-	GLOB	136
32795	Source UE	0	0	-	GLOB	33
32796	Source RF	0	0	-	GLOB	34
32798	User list 1	0	0	-	GLOB	198
32799	Conf. peripherie	0	0	-	GLOB	35
32800	AMK main op.mode	0	03c0043h	-	ANTR	61
32801	AMK op. mode 1	0	0010043h	-	ANTR	68
32802	AMK op. mode 2	0	0010043h	-	ANTR	68
32803	AMK op. mode 3	0	0010043h	-	ANTR	68
32804	AMK op. mode 4	0	0010043h	-	ANTR	68
32805	AMK op. mode 5	0	0010043h	-	ANTR	68
32811	Encoder type opt.	0	0	-	ANTR	92
32813	Par.set 1	0	03020100h 1)	-	GLOB	36
32821	Password	0	0	-	GLOB	36
32824	Follow.distance	0	0	Incr.	ANTR	143
32827	Magn.curr.feedb.	1	0.0	A	ANTR	44
32834	Torq. curr.feedb.	1	0.0	A	ANTR	44
32836	DC-bus voltage	0	0	V	GLOB	144
32837	DC-bus monitor	1	0.0	V	GLOB	144
32838	List setpoint	0	0	-	GLOB	160
32839	List act. value	0	0	-	GLOB	162
32841	Motor encoder list	0	-	-	GLOB	45
32842	User encoder list	0	-	-	GLOB	46
32843	Service command	0	0	-	GLOB	47
32846	Output port 1	0	0 1)	-	GLOB	126
32847	Port 1 bit 0	0	0 1)	-	GLOB	128
32848	Port 1 bit 1	0	0 1)	-	GLOB	128
32849	Port 1 bit 2	0	0	-	GLOB	128
32850	Port 1 bit 3	0	0	-	GLOB	128
32851	Port 1 bit 4	0	0	-	GLOB	128
32852	Port 1 bit 5	0	0	-	GLOB	128
32853	Port 1 bit 6	0	0	-	GLOB	128
32854	Port 1 bit 7	0	0	-	GLOB	128
32855	Output port 2	0	0	-	GLOB	126
32856	Port 2 bit 0	0	0	-	GLOB	128

ID-No.	Designation	K	Default	Unit	Parameter	Page
32857	Port 2 bit 1	0	0	-	GLOB	128
32858	Port 2 bit 2	0	0	-	GLOB	128
32859	Port 2 bit 3	0	0	-	GLOB	128
32860	Port 2 bit 4	0	0	-	GLOB	129
32861	Port 2 bit 5	0	0	-	GLOB	129
32862	Port 2 bit 6	0	0	-	GLOB	129
32863	Port 2 bit 7	0	0	-	GLOB	129
32864	Output port 3	0	544	-	GLOB	126
32865	Port 3 bit 0	0	33031 1)	-	GLOB	129
32866	Port 3 bit 1	0	33029 1)	-	GLOB	129
32867	Port 3 bit 2	0	0 1)	-	GLOB	129
32868	Port 3 bit 3	0	0 1)	-	GLOB	129
32873	Input port 1	0	0	-	GLOB	116
32874	Port 1 bit 0	0	0	-	GLOB	118
32875	Port 1 bit 1	0	0	-	GLOB	118
32876	Port 1 bit 2	0	0	-	GLOB	118
32877	Port 1 bit 3	0	0	-	GLOB	118
32878	Port 1 bit 4	0	0	-	GLOB	118
32879	Port 1 bit 5	0	0	-	GLOB	118
32880	Port 1 bit 6	0	0	-	GLOB	118
32881	Port 1 bit 7	0	0	-	GLOB	118
32890	Pulse multiplier	0	1	-	ANTR	144
32892	Pulse divider	0	655360	-	ANTR	112
32893	Pulse multipl	0	655360	-	ANTR	112
32897	Analog input A1	2	0.00	V	GLOB	142
32898	Analog input A2	2	0.00	V	GLOB	142
32903	DC-Bus enable	0	0	-	GLOB	37
32904	Inverter on	0	0	-	GLOB	37
32913	Clear error	0	0	-	GLOB	37
32920	o.load time mot.	1	2	s	ANTR	48
32922	Resid.dist.wind.	0	20000	incr.	ANTR	93
32925	AMK posit. par.	0	0	-	ANTR	106
32926	AMK homing par.	0	0800h	-	ANTR	97
32927	AMK syn. par.	0	0	-	ANTR	109
32928	Time filter 1	1	0.0	ms	ANTR	82
32929	Time filter 2	1	0.0	ms	ANTR	82
32932	Barrier frequ.	0	0	Hz	ANTR	83
32933	Band width	0	0	Hz	ANTR	83
32934	Pulse enc. period	0	1000	-	ANTR	49
32935	Volt. standstill	1	0.0	V	ANTR	52
32936	Window	0	1000	incr.	ANTR	98
32938	Customer var. 1	0	0	-	ANTR	163
32940	High hom. veloc.	0	1000	1/min	ANTR	107
32942	Service control	0	0	-	ANTR	38
32948	Message 4x32	0	0	-	GLOB	163
32949	Sbus user addr.	0	0	-	GLOB	188
32952	Posit.syn.window	0	1000	incr.	ANTR	114
32953	Encoder type	0	0000h 1)	-	ANTR	49
32956	Add. accel.value	0	10	-	ANTR	94
32958	cmd. val 1 cycle	3	0.500 1)	ms	ANTR	93
32959	Offset resolver	0	0	-	ANTR	53
32960	Input M.enc.gear	0	1	rpm.	ANTR	54
32961	Outp. M.enc.gear	0	1	rpm.	ANTR	54

ID-No.	Designation	K	Default	Unit	Parameter	Page
32964	Source SIWL	0	0	-	ANTR	145
32965	SIWL Nip dist.	0	0	incr.	ANTR	148
32966	SIWL outp. resol.	0	8	incr.	ANTR	148
32967	SIWL inp. resol.	0	1	incr.	ANTR	148
32968	Input port 2	0	0	-	GLOB	116
32969	Port 2 bit 0	0	0	-	GLOB	119
32970	Port 2 bit 1	0	0	-	GLOB	119
32971	Port 2 bit 2	0	0	-	GLOB	119
32972	Port 2 bit 3	0	0	-	GLOB	119
32973	Port 2 bit 4	0	0	-	GLOB	119
32974	Port 2 bit 5	0	0	-	GLOB	119
32975	Port 2 bit 6	0	0	-	GLOB	119
32976	Port 2 bit 7	0	0	-	GLOB	119
32977	Input port 3	0	32	-	GLOB	116
32978	Port 3 bit 0	0	32904 1)	-	GLOB	119
32979	Port 3 bit 1	0	32913 1)		GLOB	119
32980	Port 3 bit 2	0	0	-	GLOB	119
32981	Port 3 bit 3	0	0	-	GLOB	119
32989	Torque filt.time	0	0	ms	GLOB	71
32990	NK-shift	0	0	incr.	ANTR	100
32991	U/f start up	0	0	%	ANTR	84
32992	Dead time comp. 1	3	0.000	ms	ANTR	164
32993	Dead time comp. 2	3	0.0000	ms	ANTR	164
32994	Modulo synchron Master	0	20000	Inkr	ANTR	114
32995	Operation mode SWQ1	0	0	-	ANTR	115
32997	SIWL max. frequ.	1	1000	kHz	ANTR	148
32998	Setpoint switch	0	0	-	ANTR	165
32999	overl.limit inv	1	500	0.1%	ANTR	149
33100	Act.power.value	0	0	WATT	ANTR	149
33101	Diso.overl.inv	1	500	0.1%	ANTR	149
33102	Disp.overl.mot	1	5000.0	0.1%	ANTR	54
33116	Temp. internal	1	0.0	GRAD_C	GLOB	149
33117	Temp. external	1	0	GRAD_C	GLOB	149
33730	System booting	0	0	-	GLOB	37
34000	Variable 0	0	0	-	ANTR	165
34001	Variable 1	0	0	-	ANTR	165
34002	Variable 2	0	0	-	ANTR	165
34003	Variable 3	0	0	-	ANTR	165
34004	Variable 4	0	0	-	ANTR	165
34005	Variable 5	0	0	-	ANTR	165
34006	Variable 6	0	0	-	ANTR	165
34007	Variable 7	0	0	-	ANTR	165
34008	Variable 8	0	0	-	ANTR	165
34009	Variable 9	0	0	-	ANTR	166
34010	Variable 10	0	0	-	ANTR	166
34011	Variable 11	0	0	-	ANTR	166
34012	Variable 12	0	0	-	ANTR	166
34013	Variable 13	0	0	-	ANTR	166
34014	Variable 14	0	0	-	ANTR	166
34015	Variable 15	0	0	-	ANTR	166
34016	Variable 16	0	0	-	ANTR	166
34017	Variable 17	0	0	-	ANTR	166
34018	Variable 18	0	0	-	ANTR	166

ID-No.	Designation	K	Default	Unit	Parameter		Page
34019	Variable 19	0	0	-	ANTR		166
34020	List function	0	0	-	GLOB		200
34021	PID controller 1	0	0		GLOB		202
34022	Ramp 1	0	0	--	GLOB		205
34023	BUS. part.	0	1	-	INST	1)	188
34024	BUS transm. rate	2	0.00		INST	1)	189
34025	BUS mode	0	0001h	-	INST		189
34026	BUS mode attrib	0	0	-	INST		189
34027	BUS fail.charac	0	2	-	INST	1)	189
34028	BUS output rate	0	0	-	INST		190
34029	AFP status bits	0	0	-	GLOB		190
34030	Transformation 1	0	0	-	GLOB		206
34031	Transformation 2	0	0	-	GLOB		206
34032	Transformation 3	0	0	-	GLOB		206
34033	Transformation 4	0	0	-	GLOB		206
34034	PIDA contr 1	0	0	-	GLOB		206
34035	Ramp	0	0	-	GLOB		205
34037	Offs.analoginp. 1	2	0	0.01V	GLOB		139
34038	Offs.analoginp. 2	2	0	0.01V	GLOB		139
34045	Inductance LQ	0	0	-	ANTR		55
34046	Inductance LD	0	0	-	ANTR		55
34047	Dead time meas.	3	0	0.001 ms	ANTR		166
34048	PWM frequency	0	8	kHz	GLOB		150
34049	KP current Q	1	0	0.1 V/A	ANTR		55
34050	TN current Q	1	0	0.1ms	ANTR		55
34051	KP current D	1	0	0.1 V/A	ANTR		55
34052	TN current D	1	0	0.1 ms	ANTR		55
34058	Line output	0	0	W	GLOB		167
34059	Time filter line	0	10	ms	GLOB		167
34070	Hom.sign.dist.	0	0	incr.	ANTR		99
34071	Data set name	0	0	-	GLOB		167
34072	Data set name	0	0	-	GLOB		167
34074	Homing counter 1	0	0	incr.	GLOB		108
34075	Act. counter 1	0	0	incr.	GLOB		108
34076	Homing counter 2	0	0	incr.	GLOB		108
34077	Act. counter 2	0	0	incr.	GLOB		108
34078	Homing counter 3	0	0	incr.	GLOB		108
34079	Act. counter 3	0	0	incr.	GLOB		108
34080	Homing counter 4	0	0	incr.	GLOB		108
34081	Act. counter 4	0	0	incr.	GLOB		108
34090	User list 2	0	0	-	GLOB		198
34091	User list 3	0	0	-	GLOB		198
34094	Rise time SWC	3	0.000	A/s	ANTR		56
34095	Final value SWC	1	0.0	A	ANTR		56
34096	Standstill current	2	0.00	A	ANTR		57
34100	Bin. Inp. Word	0	0	-	GLOB		124
34101	Bin. Inp. Word 1	0	0	-	GLOB		124
34102	Bin. Inp. Word 2	0	0	-	GLOB		124
34103	Bin. Inp. Word 3	0	0	-	GLOB		124
34104	Bin. Inp. Word 4	0	0	-	GLOB		124
34105	Bin. Inp. Word 5	0	0	-	GLOB		124
34106	Bin. Inp. Word 6	0	0	-	GLOB		124
34107	Bin. Inp. Word 7	0	0	-	GLOB		124

ID-No.	Designation	K	Default	Unit	Parameter	Page
34108	Bin. Inp. Word 8	0	0	-	GLOB	124
34109	Bin. Inp. Word 9	0	0	-	GLOB	124
34110	Bin. Inp. Word 10	0	0	-	GLOB	124
34111	Bin. Inp. Word 11	0	0	-	GLOB	124
34112	Bin. Inp. Word 12	0	0	-	GLOB	124
34113	Bin. Inp. Word 13	0	0	-	GLOB	124
34114	Bin. Inp. Word 14	0	0	-	GLOB	124
34115	Bin. Inp. Word 15	0	0	-	GLOB	124
34116	Bin. Inp. Word 16	0	0	-	GLOB	125
34120	Bin. Out. Word	0	0	-	GLOB	132
34121	Bin. Out Word 1	0	0	-	GLOB	132
34122	Bin. Out Word 2	0	0	-	GLOB	132
34123	Bin. Out Word 3	0	0	-	GLOB	132
34124	Bin. Out Word 4	0	0	-	GLOB	132
34125	Bin. Out Word 5	0	0	-	GLOB	132
34126	Bin. Out Word 6	0	0	-	GLOB	132
34127	Bin. Out Word 7	0	0	-	GLOB	132
34128	Bin. Out Word 8	0	0	-	GLOB	132
34129	Bin. Out Word 9	0	0	-	GLOB	132
34130	Bin. Out Word 10	0	0	-	GLOB	132
34131	Bin. Out Word 11	0	0	-	GLOB	132
34132	Bin. Out Word 12	0	0	-	GLOB	132
34133	Bin. Out Word 13	0	0	-	GLOB	132
34134	Bin. Out Word 14	0	0	-	GLOB	133
34135	Bin. Out Word 15	0	0	-	GLOB	133
34136	Bin. Out Word 16	0	0	-	GLOB	133
34142	Node list	0	0	-	INST	191
34144	Nom. Voltage eff.	1	0.0	V	GLOB	167
34145	Line curr. Eff.	1	0.0	A	GLOB	167
34148	V contr. Gain	0	500	-	ANTR	150
34149	V contr.int.time	1	5.0	ms	ANTR	150
34151	Kp current Q	2	0.00	V/A	ANTR	57
34152	Kp current D	2	0.00	V/A	ANTR	57
34153	Maximum speed motor	0	100000	rpm.	ANTR	57
34154	Start marker	0	0	incr.	ANTR	168
34155	Marker window	0	0	incr.	ANTR	168
34157	Dead time comp.	3	0.000	ms	GLOB	168
34158	Soft breaking	0	0	%	ANTR	86
34160	Part number motor	0	0	-	ANTR	57
34161	Prod. date motor	0	0	-	ANTR	57
34162	Serial num. motor	0	0	-	ANTR	58
34164	Resistance Rtt	2	0.00	Ω	ANTR	58
34165	Hold. torque brake	1	0.0	Nm	ANTR	58
34166	Temperature sensor mot	0	0	-	ANTR	58
34167	Inductance Ktt	1	0.0	mH	ANTR	59
34168	Time Imax motor	1	0.0	sec.	ANTR	59
34171	Ereignisfilter	0	0	-	GLOB	168
34172	PLC Project info	0	0	-	ANTR	169
34176	Ext sin enc period	0	1024	-	ANTR	59
34177	Low. thresh. cur. adapt.	0	0	%	ANTR	59
34178	Upper thresh. cur. adapt	0	0	%	ANTR	59
34179	Gradient KpQ	0	0	%	ANTR	59
34180	Gradient TnQ	0	0	%	ANTR	59

1) On this parameters device specific differences are possible. The characteristics are shown on the PC or on the operation panel

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6 Overview

Parameter – ID numbers

The present documentation describes the contents and effect of the parameters necessary for operating the AMKASYN system. Each parameter is identified by an ID number. The base of the parameter definition is the SERCOS interface® standard. To offer a better overview, the parameters of AMK have been grouped into parameter groups.

In the system delivery, the parameters contain factory-set basic data (default values). The drive system must be reparameterized at startup in such a way that the required task is fulfilled.

All parameters supported by the AMKASYN system are listed under ID17 "List of all operating data".

Parameters differ in "global-", "drive specific-" and "instance-" parameter groups. The Index list of parameters assign every parameter to one group.

Changes on the drive specific parameters (e.g. operation mode parameters, motor parameters, …) become active after next system initialization. For this it is required to switch off and on the controller enable signal RF.

Parameter changes become effective only after system initialization. For this purpose the controller enable must be switched off an back on.

After changing globally acting parameters (e.g. system parameters, assignment of binary inputs/outputs and analogue outputs, …) and also after loading an operating data record produced via the AMK programming software, mains OFF/ON must be switched. After mains ON, the main operation mode according to ID32800 always acts in the relevant main parameter set

The system ramp time for each parameter set to be newly initialized is approx. 1 s. Parameters with the reference "can be changed online" become effective directly, i.e. through the control panel, selection of the "Temp. Par." menu item. temporarily changed parameters are overwritten again with the standard values by system booting.

The system recognizes and reports parameter incompatibilities during parameter setting either directly on entry or during system booting. Each message consists of a number and a plain language note. The separate "AMAKSYN Diagnostic messages" description moreover provides additional information and explanations regarding the error codes.

Instanced parameters

AMKASYN devices which provide the same type of optional slots allow, for example, several different field bus interfaces. In the case of field bus interfaces the communication parameters are to be parameterized for each interface. Each optional slot is referred to as an instance. The parameter group "Communication Parameters" is thus instance-related. In this way the ID34024 "bus transmission rate", for example, can be set differently for each slot.

In the parameter menu of the control panel instanced parameters are identified by an "I" instead of a "P". The selection of the instance is performed using the "Shift P" key.

Interfaces for AMKASYN inverter modules:

Instance	Addressed hardware
0	Basic unit ACC-Bus
1	Option slot 1
2	Option slot 2

Parameter structure

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

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

1) All information for the understandable display of the operating date is filed coded as bit information in the attribute. Thus for the data length, the data type, the display format, the number of places after the decimal point etc. are determined. The operating date is primarily of importance for the application.

   The minimum, maximum and default value of the following parameters serve for information and are constantly optimized in the course of technical improvements. After successful system parameterization, all parameters remain stored in the permanent memory of the controller card.

   Refer to the SERCOS interface® standard for further information on the parameter elements. Apart from the operating date, all parameter elements in the AMKASYN system cannot be changed by the user.

   The parameter can be entered/changed using the integrated control panel or by means of AT-compatible PC with AMK Programming software. Using field bus interfaces read and write access to parameters is also possible via the field bus (PROFIBUS, CAN, SERCOS, etc.)

Scaling

Scaling (parameter scaling) is the determination of the finest resolution of numerical values (drive parameters) which are sent to the drive or parameterized at the drive. The resolution of the programmed numerical value is determined by the scaling. A command value, for instance must be set corresponding to this resolution.
AMK products are delivered fully operational to the customer on the AMK scaling base.

Example:
Speed values should be entered and displayed in 1/10 revolutions/min. For this purpose the scaling of the velocity data must be set to 10^{-1} rpm. A velocity command value of $n_{command}$ = 1 results in a speed of 0.1 rpm. To obtain s speed of 0.1 rpm, the command value $n_{command}$ = 10 must be commanded.

The finest resolution of a number is called LSB significance (LSB: Least significant Bit)

Scaling can be made application-specifically through the scaling parameters. Scaling can be performed for position data, velocity data, torque data and acceleration data. The scaling is supported by all interfaces except for the control panel, i.e. no change in the display is visible on the control panel despite effective scaling. The processing accuracy of the drive system is not impaired by the scaling.
The scaling is permanently set and cannot be changed up to and including KU software version 3099. Previously the following settings applied:

AMK scaling base (setting ex works):

Scaling for position data:	Internal resolution of the position encoder in [incr.]
Scaling for velocity data:	10^{-4} rpm
Scaling for torque data:	10^{-1} %MN
Scaling for acceleration data:	10^{-3} U/S²

The AMK scaling base is defined as default setting for Kx operating system 1.10 and higher and corresponds to the previous standard settings.

In the scaling type parameters	ID160	for acceleration data
	ID86	for torque data
	ID44	for velocity data
	ID76	for position data

The scaling can either be related to a **rotational** of **linear (translational)** load movement. In addition you can choose either scaling without default values **(preference scaling)** or scaling with freely definable scaling parameters **(parameter scaling)**. Further information can be found in the chapter Scaling Parameters.

Parameter groups

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

System parameters (global)

have global character, i.e. the parameters are filed only once in the AMKASYN system and act centrally.

Motor parameters (axis-specific)

must absolutely be entered on startup of the AMKASYN system corresponding to the name plate (or datasheet) of the motor, correct motor data are a basic perquisite for perfect operation of the total system.

Operation modes (axis-specific)

The "Operation modes" parameter group offers per drive parameter set one main operation mode and five secondary operation modes. The main operation mode must be defined by the user in any event. The drive is in the main operation mode after the system is switched on.

The following features are determined by the operation mode parameters:

- Controller type of the drive (speed control, position control, …)
- Type of torque limitation
- Velocity command value filter
- Fine interpolation
- Following error compensation
- Standard/extended functionality
- Position feedback value source (internal or external taking account of a gear ratio)
- Command value source

Torque parameters (axis-specific)

identify the variables relevant or torque control/generation (e.g. torque limits).

Velocity parameters (axis-specific)

identify the variables relevant for the speed control including speed filters. The speed controller parameters, especially gain K_P and integral time T_N must be optimized for each drive on start-up!

Position parameters (axis-specific)

describe the basic properties of the position control circuit. The velocity gain KV ID104 must be optimized for each drive on start-up.

Positioning parameters (axis-specific)

serve for presetting positioning processes (angle/point-to-point control). The influence essentially the interpolator.

Synchronous running parameters (axis-specific)

influence drives in which the motor follows command pulses/position growths, e.g. in synchronous control or stepping motor simulation.

Assignment of binary inputs (global)

Certain functions are assigned to binary inputs of the option cards, e.g.: Kx-EA1 (e.g. drive command, …).

Assignment of binary outputs (global)

Individual internal bit information from the system is assigned to binary outputs of the option cards, e.g.: Kx-EA1 (e.g. $n_{feedback} = n_{command}$, in position, …). These are generated in real time. The evaluation takes place in the running process of the higher level control system.

Assignment of analogue outputs (global)

Setting the source and final value of digital/analogue converters (AA1 to AA3, KU connector X32) for output system-internal variables. The output is in the 1 ms cycle.

Inverter parameters (axis-specific)

identify variables which describe more close properties of the inverter. The Kx-specific data cannot be changed by the user. They are stored in the EEPROM of the inverter and are read internally from there. Furthermore, internal variables in the inverter can be defined for the purpose of external display (inverter messages ID32785, ID32786).

Special applications

This parameter group is sometimes formed by the parameter ID32798 "User list 1". Furthermore there is a module library in this parameter group. Signal paths and process sequences can be freely defined by parameters. AMK provides the user for this purpose a module library growing corresponding to the requirements. The module library consists of simple blocks which can be assembled to structures of arbitrary large size corresponding to requirements. The use of the modules verified by AMK requires no programming knowledge or tools whatsoever and is summarized under the term "Extended functionality".

General parameters

The parameter group of general parameters provides the user with Ident numbers such as parameter set designation and system name, in which user information can be filled. These can be read out and further processed through field buses.

Scaling parameters

Position data, velocity data, acceleration data and torque data can be scaled application-specifically using the scaling parameters. The application related scaling is designated parameter scaling. The unist can be freely scaled both for rotational and for linear movements. The AMK scaling base serves as standard setting.

Communication parameters

Parameters for operating different field bus systems (Profibus DP, CAN, ARCNET, SERCOS, LON, InterBus…) are defined in this parameter group. The parameters describe the field bus type and the supported scope of functions. The communication parameters must be parameterized bus-specifically for use on field bus systems. The inverter can be addressed through the field bus using the corresponding field bus option card in slot 2. The communication hardware (interfaces, option card) is recognized and initialized by the inverter automatically after "Power ON".

Selection of system-internal parameters

"System –internal" parameters are data which are not to be changed by the user. They serve on one hand for checking and controlling system-internal functionality and describe on the other hand, for instance, central definitions for the inverter. The selection made of system-internal parameters has exclusively informative character. All "system-internal parameters" are assigned to the above groups and cannot be read out through the control panel.
One obtains access to the system-internal parameters only through the service menu by entering the service password.

Cyclical display of system values

by entry in ID32786 it is possible to display selected system values using the control panel. "ACTUAL VALUES" menu item. The menu item is part of the main menu and is reached by scrolling (up or down):

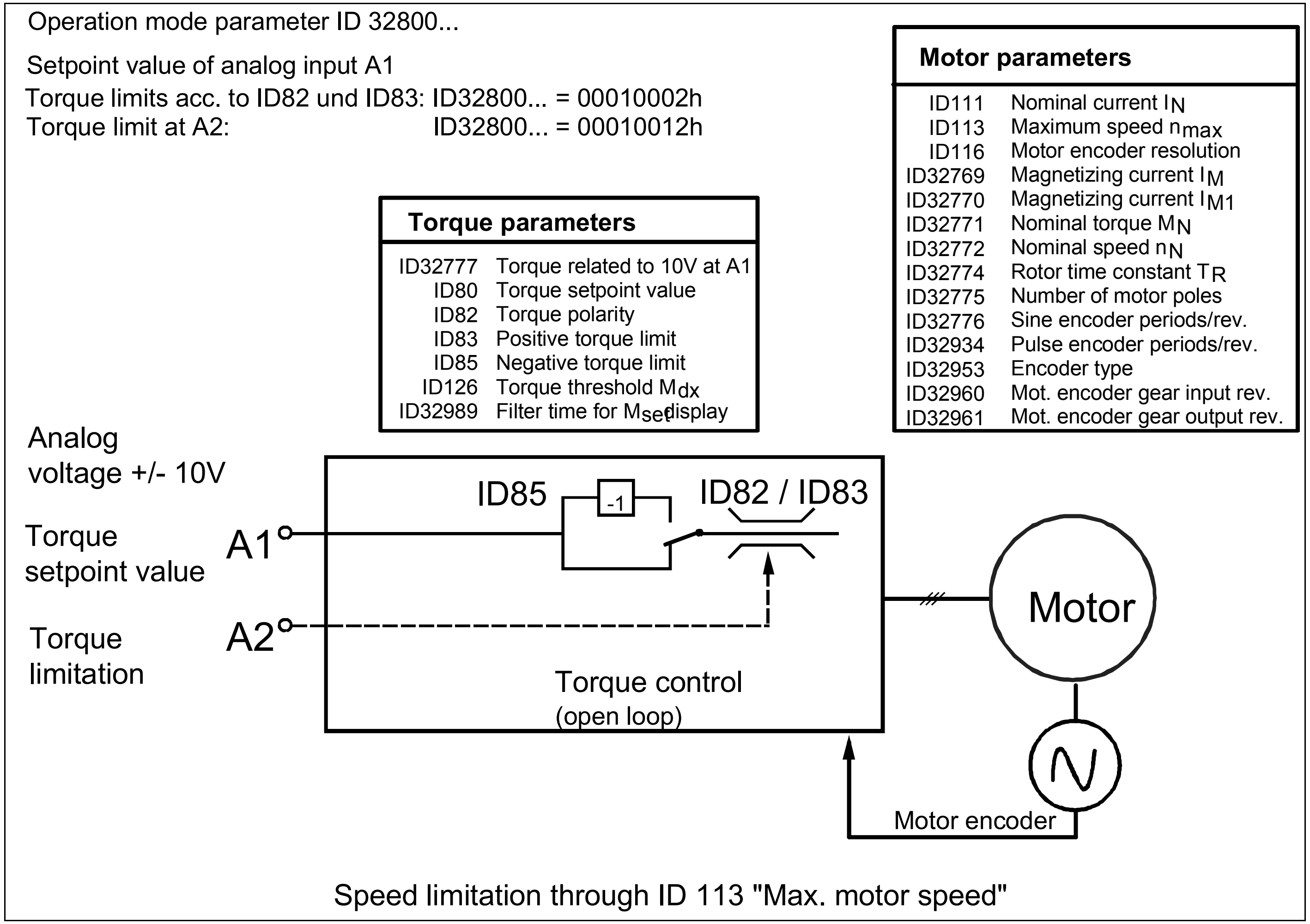
The output of cyclic feedback values or command values through the control panel refers exclusively to the entry in the ID32786. If a value not displayed in the following table is filed in ID32786, then this is displayed in the menu with the message "ID32786 illegal value".

Permissible codes for the inverter messages regarding display

Code	Contents	Value display
84	Torque feedback value related to nominal torque Mn	%MN
32827	Flux-generating current (isd)	A
32834	Torque-generating current (isq)	A
32836	DC bus voltage	V
32897	AW-analogue input voltage A1	V
32898	AW-analogue input voltage A2	V
33100	Actual power value related to nominal power P_N	VA
36	Velocity command value	rpm
40	Velocity feedback value	rpm
47	Position command value 2, absolute	incr.
51	Position feedback value, absolute	incr.
32823	Velocity command value after ramp	rpm
32824	Position control difference without SAK	incr.
32826	SAK	incr.
32899	Position feedback value x_i_2PI	incr.
32900	Position feedback value x_s_2PI	incr.

Application examples

Figure 1: Torque control with analogue command value setting



Parameter_Momentsteuerung

Figure 2: Speed control with analogue command value setting

Setpoint value of analog input A1
Operation mode parameter ID 32800 = 00010043h (with setpoint value ramps)
00010003h (without setpoint value ramps)

Speed parameters

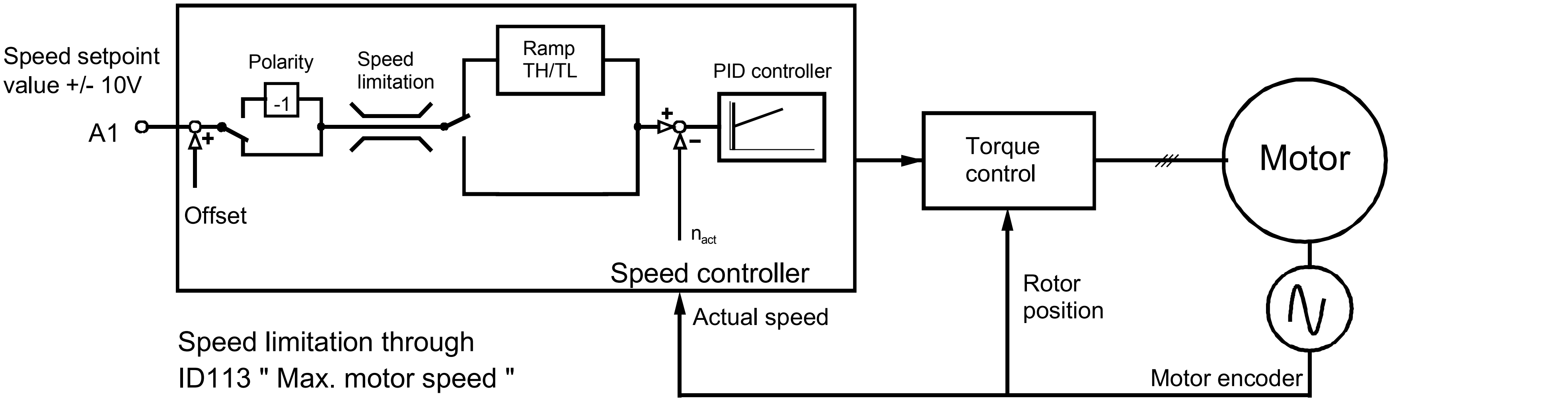
ID36	Speed setpoint value	ID212	Adaptive integral action time
ID38	Pos. speed limit	ID32778	Speed related to 10V at A1
ID39	Neg. speed limit	ID32779	Speed offset at A1
ID43	Speed polarity	ID32780	Acceleration ramp T_H
ID100	Prop. gain KP	ID32781	Deceleration ramp T_L
ID101	Integral action time T_N	ID32782	Dec. ramp for RF inactive
ID102	Derivative action time T_D	ID32928	Time filter 1
ID124	Zero velocity window	ID32929	Time filter 2
ID125	Speed threshold nx	ID32932	Rejector frequency
ID157	At speed window $n_{act} = n_{set}$	ID32933	Bandwidth
ID209	Lower adaption limit		
ID210	Upper adaption limit		
ID211	Adaptive proportional gain		

Torque parameters

ID82	Pos. torque limit
ID83	Neg. torque limit
ID126	Torque threshold M_{dx}

Motor parameters

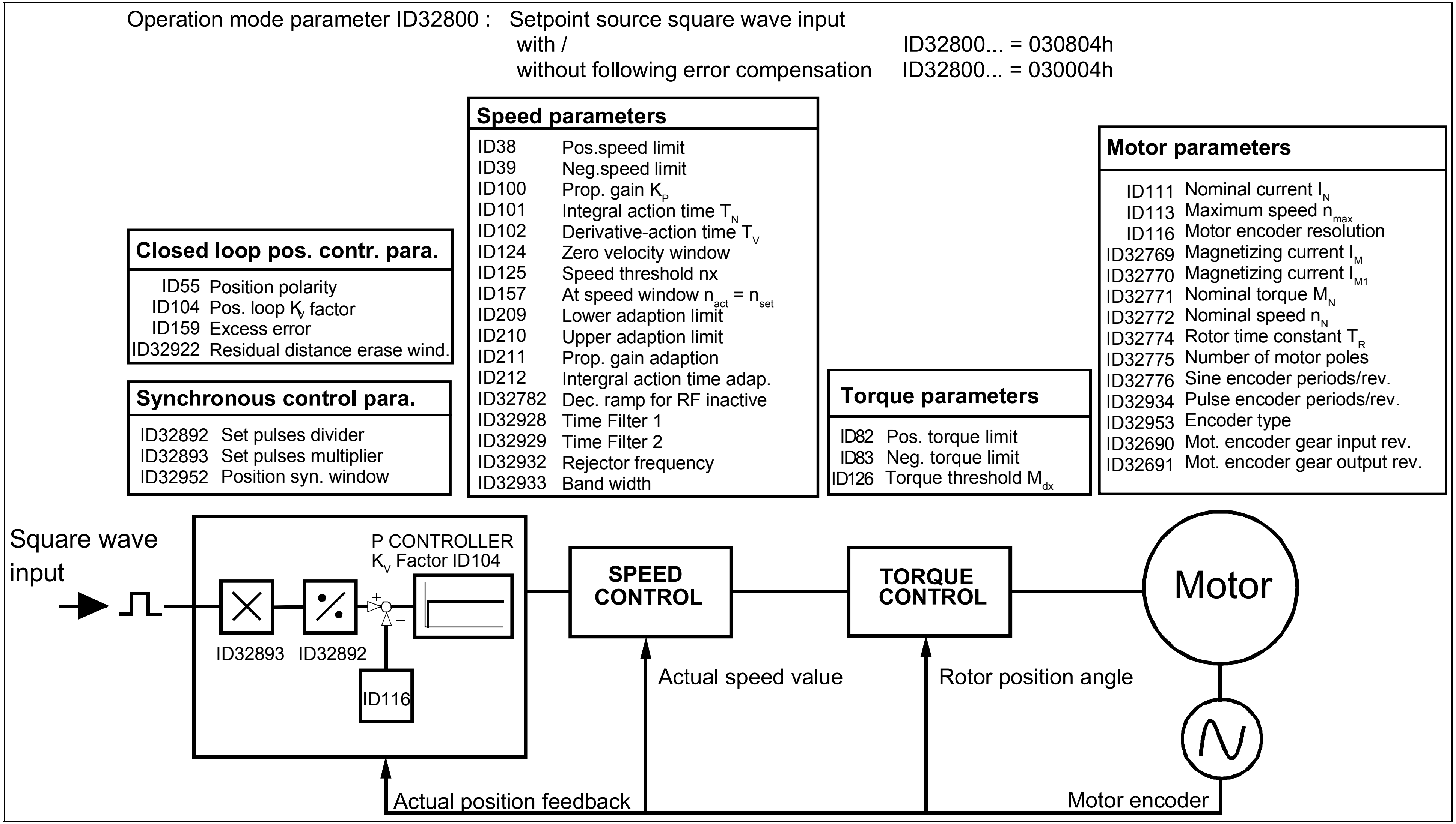
ID111	Nominal current I_N
ID113	Maximum speed n_{max}
ID116	Motor encoder resolution
ID32769	Magnetizing current I_M
ID32770	Magnetizing current I_{M1}
ID32771	Nominal torque M_N
ID32772	Nominal speed n_N
ID32774	Rotor time constant T_R
ID32775	Number of motor poles
ID32776	Sine encoder periods/rev.
ID32934	Pulse encoder periods/rev.
ID32953	Encoder type
ID32690	Mot. encoder gear input rev.
ID32691	Mot. encoder gear output rev.



Speed limitation through
ID113 " Max. motor speed "

Parameter_Drehzahlregelung

Figure 3: Position control with motor encoder as position feedback value encoder



Parameter_Lageregelung_Motorgeber

Figure 4: Position control with external position feedback value encoder

AMK secondary operation mode 9 (ID 32809): closed loop positioning control with fine interpolator
Operation mode ID32800...= 3C8004h external actual position feedback source is active for ALL operation modes

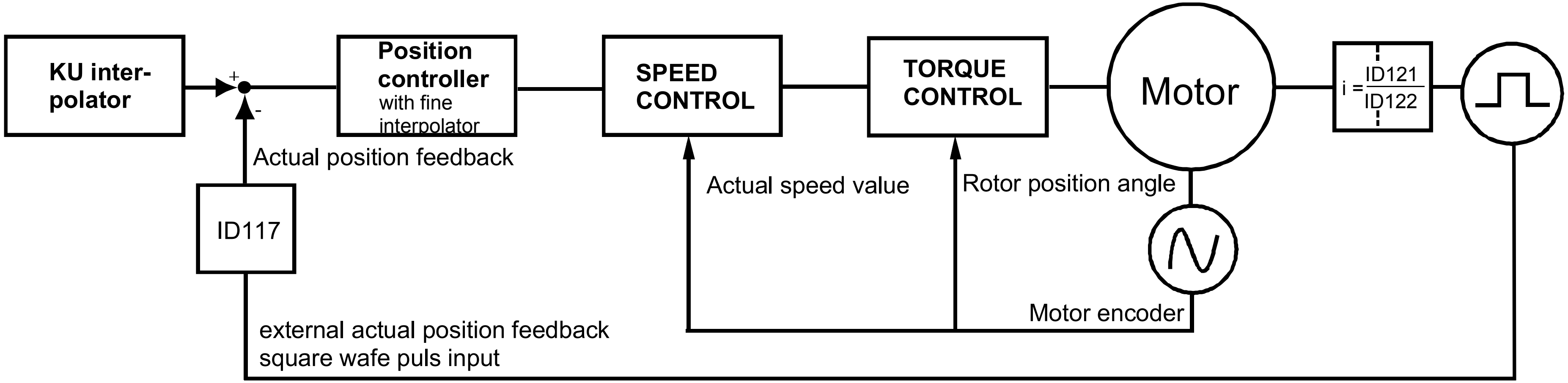
Closed loop pos. control para.	
ID49/50	Pos. / neg. position limit
ID55	Position polarity
ID104	Position loop gain K_V
ID117	External position feedback resolution
ID121	Gear input revolutions
ID122	Gear output revolutions
ID159	Excessive following error
ID32922	Residuale distance erase window

Positioning parameters	
ID41	Homing velocity
ID57	In position window (INPOS)
ID136	Positive acceleration
ID137	Negative acceleration
ID147	Homing parameter
ID32926	AMK homing parameter
ID150	Reference offset 1
ID153	Absolute angle position
ID180	Relative spindle position
ID222	Spindle positioning speed
ID32956	Additional acceleration value

Speed parameters	
ID38	Pos.speed limit
ID39	Neg.speed limit
ID100	Prop. gain K_P
ID101	Integral action time T_N
ID102	Derivative-action time T_V
ID124	Zero velocity window
ID125	Speed threshold n_x
ID157	At speed window $n_{act} = n_{set}$
ID209	Lower adaption limit
ID210	Upper adaption limit
ID211	Prop. gain adaption
ID212	Intergral action time adap.
ID32782	Dec. ramp for RF inactive
ID32928	Time Filter 1
ID32929	Time Filter 2
ID32932	Rejector frequency
ID32933	Band width

Torque parameters	
ID82	Pos. torque limit
ID83	Neg. torque limit
ID126	Torque threshold M_{dx}

Motor parameters	
ID111	Nominal current I_N
ID113	Maximum speed n_{max}
ID116	Motor encoder resolution
ID32769	Magnetizing current I_M
ID32770	Magnetizing current I_{M1}
ID32771	Nominal torque M_N
ID32772	Nominal speed n_N
ID32774	Rotor time constant T_R
ID32775	Number of motor poles
ID32776	Sine encoder periods/rev.
ID32934	Pulse encoder periods/rev.
ID32953	Encoder type
ID32690	Mot. encoder gear input rev.
ID32691	Mot. encoder gear output rev.



Parameter_Lageregelung_Extern

7 System Parameters

Note:	Power must be switched OFF after changing values in parameters of this group. The minimum shutdown time specified by the unit must be observed before switching back ON (approx. 30 s).

ID00265 Language

The languages available in the drive are selected by entering the language code in this parameter. The texts, e.g. name of an ID or diagnostic information, are displayed in the selected language.

Available languages:

Code 0: German
Code 1: English
Code 2: French

ID32795 Source UE

UE control for KU with external main contactor (from KU 25). The source of the inverter ON signal must be parameterized in KU with external main contactor through parameter ID32795 "Source UE". The following sources are possible in this case:

KU	KE	Code	Source for UE inverte ON
✓	✓	0	DEFAULT, UE via binary input on the basic unit
✓		1	UE can be parameterized via binary inputs on option cards
✓		2	AMK SBUS
✓		5	Optional (e.g. PLC, SERCOS, …)
✓		7	AMK field bus "AFP"
	✓	8	UE derived automatically from SBM signal (SBM → UE)
	✓	9	UE via parameter ID32903 (e.g. per ACC)
	✓	28	UE automatically from SBM ANDed with binary input UE
	✓	29	UE via parameter ID32903 ANDed with binary inpu UE

ID32796 Source RF

Determining in the source for the "controller enable" RF signal. After changing the "controller enable source" the system must be activated by power OFF/ON.

Standard code	Special code 1)	Meaning, sources
0	-	Binary input RF at connector X33
1	-	RF can be parameterized via binary inputs on optional cards
2	22	AMK-SBUS
5	25	ACC-Bus (CANopen / mapping: wDeviceControl), local PLC at the drive (R03P/PLC2)
7	27	AMK field bus "AFP"
9	29	RF via parameter ID32904 (e.g. per ACC)

1) If the special code is selected , then the displayed source is logically AND combined by the system with the hardware binary input, RF at connector X33. Thus the user can simultaneously control the "inverter ON RF" function of the drive through AMK field bus "AFP" and through the external RF signal at X33.

The "Controller enable" handshake signal "QRF" is assigned as a standard to the binary output BA1 (X33).

ID32799 Configuration of peripherals

This parameter determines:
- Square wave pulses input X34
- Activation / deactivation of PLC functionality (option card KW-PLCx)
- Activation / deactivation of CAN Bus functionality on KW-PLCx

ID32799 = 00**ab**00**cc hex**

Bit-No.	Value (hex)	Meaning according to ID32799
0 - 1	0	**Setting code for square wave pulses input (X34)** 2 square wave pulses in quadrature (90° offset between track 1 and 2)
	1	Counting pulses track 1, direction signal track 2
	2	Forward pulses track 1, backward pulses track 2
2 - 15		Reserved
16 – 19	0	**PLC function on the PLC option card** PLC function deactivated (default) if the PLC option card is plugged in, error message 1376 is generated, hint to activate or deactivate the plc function
	1	PLC on the PLC option card KW-PLCx is active
	2 – E	Reserved
	F	PLC on the KW-PLCx is deactivated, no error message will be generated
20 – 23	0	CAN-S Bus on the PLC option card CAN-S bus on the PLC option card is deactivated (default). If the PLC option card is plugged in, error message 1376 is generated, hint to activate or deactivate the CAN-S bus on the PLC option card
	1	CAN-S bus on the PLC option card active
	2 – E	Reserved
	F	CAN-S bus on the PLC option card is deactivated, no error message will be generated
24 – 31		Reserved

Example:

ID32799 = 0x 00 11 00 00

- Square wave pulses in quadrature (90° offset between track 1 and 2)
- CAN-S active
- PLC active

Caution: All pulse encoder inputs must be at defined levels, otherwise the described functions are not guaranteed.

ID32813 Parameter set allocation

One main parameter set and three alternative parameter sets are assigned to the inverter by means of the **"Parameter set allocation"** parameter. The low byte always contains the main parameter set and **must** be occupied with **a data set number (00h…09h)**.

Default setting: ID32813 = 03020100h

Main parameter set:	Data set number → 00h
1st alternative parameter set:	Data set number → 01h
2nd alternative parameter set:	Data set number → 02h
3rd alternative parameter set:	Data set number → 03h

3rd alternative parameter set		2nd alternative parameter set		1st alternative parameter set		Main parameter set	
0	3	0	2	0	1	0	0

MSB LSB

Note on operation:
After Power ON and activating the controller enable, the system is always in the main parameter set. If data are changed or if a drive error is deleted, the system remains in the momentary active parameter set after changing the controller enable.

ID32821 Password

The "Start-up" menu item in the control panel is freely accessible with ID32821 = 0.

If ID32821 is assigned a value not equal to 0, the "Start-up" menu item can be activated only after entering this value as "Password".

The machine manufacturer determines the password and enters it in ID32821. An arbitrary number between 0 and 4294967295 can be selected.

Note: **The password must be archived by the manufacturer**. The password is forwarded to the final customer under the responsibility of the machine manufacturer. **Access to the parameters is not possible without knowledge of the password**.

Command via Parameter

The following parameters can be used to initiate commands in the system which are not time critical. ID access is possible via ID writing (send command) and ID reading (current state of the command).

ID32903 DC-Bus enable (UE)

With the control signal DC-Bus enable (UE) the DC-Bus capacitors will be changed. Following the main contactor will link the DC-Bus capacitors directly to the power supply.

ID32904 Controller enable (RF)

With the control signal controller enable (RF) the clock signal of the inverter is enabled. The motor is current-carrying and the servo-control is active.

ID32913 Clear error (FL)

ID33730 System booting

The command system booting causes the new calculation of all parameters.

ID33732 System reset

The system reset causes a new start-up of the system comparable if the 24 V power supply is switched OFF and ON. If the system reset is released at the ACC-Bus master, a system reset will also be executed automatically to al slaves. The command system reset can also be executed by a binary input.

Attention:
The option card PLC with CAN-S slave interface can't execute the system reset to the local axis.

ID-No.	ID writing	ID reading
32903	• [1] DC-bus enable ON (UE) • [0] DC-bus enable OFF (UE)	Show state: [0] Basic state [3] Command ready [7] Command currently active [F] Command completed with errors(s)
32904	• [1] Controller enable ON (RF) • [0] Controller enable OFF (RF)	
32913	• [1] Clear error (FL)	
33730	• [1] System booting	
337232	• [1] System reset	

The system booting command is permissible only with inactive controller enable. With controller enable signal set, the warning 1843 "CMD only without RF" is generated.

ID32942 Service control

The command 0x14 "read position absolute" for ID32843 "service command" writes the actual position value into ID32942 "Service control" after successful execution. After that a higher ranking controller can read the actual position value by using command "read parameter".

Note: The absolute position is only allowed to read at axis standstill.

With the command 0x12 (ID32843 „service command“) the entered value at the parameter D32942 „Service control“ will be taken as actual position of the encoder.
The commutation offset is compensated self-acting in the encoder (for E- / F- / S- / T-type encoder).

Note: Error correction curve values and memory cells are changed in the encoder. If extraneous motors are used please talk back with AMK service department.

See also the description of ID32843 „service command“

8 Motor Parameters

Motor parameters must absolutely be entered on start-up of the AMKASYN system corresponding to the name plate (or datasheet) of the motor, correct motor data are a basic prerequisite for perfect operation of the total system.

ID00109 Maximum current

Only enter the maximum current if it is indicated in the AMK motor's data sheet. This is only pertains to synchronous motors. ID109 is only effective where the ID34167 terminal inductance is Ltt≠0.

ID00111 Motor nominal current

The motor nominal current is used as reference variable for all torque data. The motor nominal current may be as maximum 80% of the peak current of the inverter (see ID110). The data value is taken from the name plate of the motor.

Condition: $\mathrm{ID111} \leq \mathrm{ID110} \cdot 80\%$

ID00113 Maximum speed

Caution: ID113 defines the maximum permissible process speed!
If the velocity feedback value exceeds the stated **maximum speed ID113** by the factor of 1.25, then the output stage of the system is blocked and the motor coasts. The parameter value is determined by the user depending on the process.
It must be observed that the maximum speed of the motor (name plate) is not exceed. Here it must be considered that the limit frequency of 100kHz of the sine encoder input is not exceeded (is assured on use of AMK A-type encoders).

Formula 1: Determining n_{max} for sine encoder input

$$n_{max}\,[\mathrm{rpm}] = \frac{6000000}{\mathrm{ID32776}}$$

Example: Encoder pitch ID32776 = 1024 (Encoder type "I")

$$n_{max} = \mathrm{ID113} = \frac{6000000}{1024} = 5856\ \mathrm{rpm}$$

ID00114 Motor overload threshold

This parameter determines when the warning 2359 "Motor overload warning" is output. If the I^2t monitoring reaches an overload value of 100% ID33102 "Motor overload indication", then the error message 2360 "Motor overload error" is output and the drive will be ramped down (ramp according ID32782 RF inactive) and RF becomes inactive.

A bit message (code 310) is generated at the same time as the warning. If the value is again less than the value in parameter ID114, the warning bit is reset until the value is exceeded again.

Motor I^2t monitoring is effective only if it has been activated through ID32773 bit 14 = 1.

ID00116 Motor encoder resolution

Determining the resolution of the position feedback value acquisition using the motor encoder as active position feedback value source. The resolution required for the process (increments per motor revolution) determines the value for ID116. The parameter acts as characteristic of the position control operation mode.

Formula 2: Determining the motor encoder resolution for sine encoders

ID116 = 4 · ID32776 · PV
PV - Position refinement = (1 … 128, integer!)
ID32776 - Sine encoder period

Example: ID32776 = 50 (name plate), PV = 100 selected
ID116 = 20000 incr./motor revolution

Formula 3: Determining the motor encoder resolution for resolvers

ID116 = 512 · PV
PV - Position refinement = (1… 128, integer!)

Formula 4: Determining the motor encoder resolution for resolvers

ID116 = 4 · ID32943 (Pulse encoder period)

Motor encoder resolution on use of absolute value encoders (S and T encoders)

ID116 = 32 · ID32776 (Sine encoder period)

ID00141 Motor type

This parameter makes it possible to store a string variable with the name of the motor. AIPEX tool can store the name of the AMK motor out of a data based motor library.

ID32769 Magnetizing current

The values of the magnetizing current are motor-dependent and can be found on the rating plate of the respective motor. The motor used is to be defined in ID32953 Encoder type.

Asynchronous motor

The magnetizing current represents the flux-generating component of the motor current in asynchronous motors. The magnetizing current is constant up to the nominal speed and is automatically reduced for speeds higher than the nominal speed (field weakening). The curve of the magnetizing current I_M can be seen in the diagram "Correction of the magnetizing current characteristic" below. For asynchronous motors ID32953 must be set to XX0X.

Synchronous motor with field weakening

Synchronous motors without filed weakening can only be operated up to nominal speed. ID32769 has no effect for synchronous motors. For synchronous motors ID32953 must be set to XX1X.

Synchronous motor with a field weakening capability

Synchronous motors with a field weakening capability can also be operated far above the nominal speed. In the case of synchronous motors with a field weakening capability ID32769 specifies the maximum field-weakening current above the nominal speed. For synchronous motors with a field weakening capability the voltage controller must also be configured via ID34148 and ID34149. For synchronous motors with a field weakening capability ID32953 must be set to XX3X.

Note: A synchronous motor **may not be operated without a protection device** in the field weakening range! There is a risk of dangerous overvoltages in the case of incorrect action.

ID32770 Magnetizing current

The values of the magnetizing current are motor-dependent and can be found on the rating plate of the respective motor. The motor used is to be defined in ID32953 Encoder type.

Asynchronous motors

The parameter value can be found on the rating plate (or in the data sheet) of the motor. If no information is available a value of 50 % of I_M is to be used.

In the field weakening range a correction of the magnetizing current characteristics is performed. Between n_N and 1.5 n_N the magnetizing current is first reduced linearly from I_M to I_{M1}. For speeds n > 1.5 n_N the magnetizing current is reduced in proportion to 1/n.

If I_{M1} is set to I_M or 0 there is no correction and the magnetizing current is reduced in proportion to 1/n for speeds > n_N. For asynchronous motors ID32953 must be set to XX0X.

Synchronous motor without field weakening

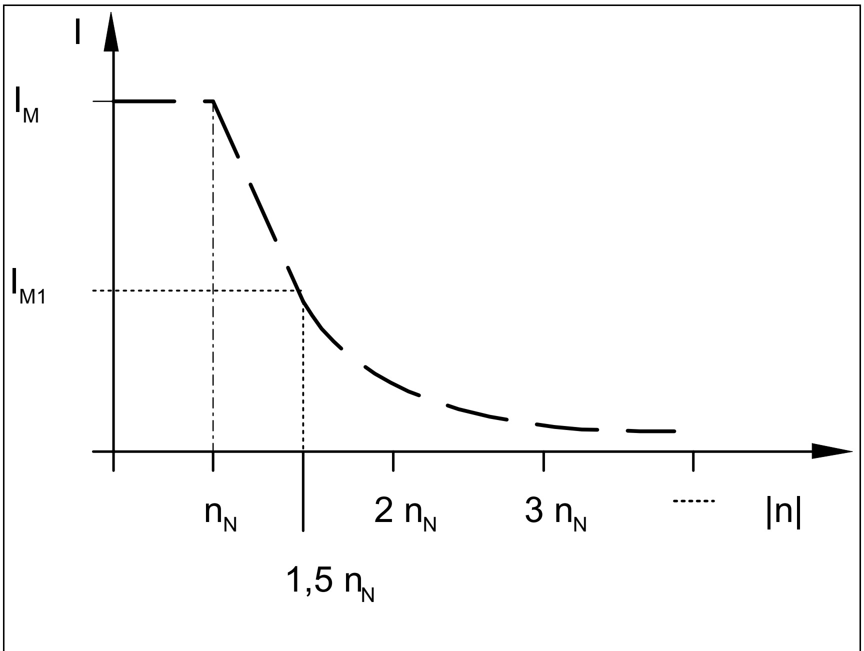
Synchronous motors without field weakening can only be operated up to the nominal speed. ID32770 has no effect for synchronous motors. For synchronous motors ID32953 must be set to XX1X.

Synchronous motor with a field weakening capability

Synchronous motors with a field weakening capability can also be operated far above the nominal speed. In the case of synchronous motors with a field weakening capability ID32770 specifies the minimum field-weakening current which has an effect in the basic speed range up to the nominal speed. For synchronous motors with a field weakening capability the voltage controller must also be configured via ID34148 and ID34149. For synchronous motors with a field weakening capability ID32953 must be set to XX3X.

Note:	A synchronous **may not be operated without a protection device** in the field weakening range! There is a risk of dangerous overvoltages in the case of incorrect action.

Figure 5: Correction of the magnetizing current characteristic



Parameter_Kennlinie_Magnetisierungsstrom

ID32771 Nominal torque

The parameter value must be taken from the name plate (or datasheet) of the motor.

Note:	The central reference for torque data is the motor nominal current according to ID111. For further information on data reference see ID86 Torque scaling parameter

Formula 5: Torque calculation

$$M_{actual} = M_N \cdot \frac{\sqrt{\left(I_{actual}{}^2 - I_M{}^2\right)}}{\sqrt{\left(I_N{}^2 - I_M{}^2\right)}}$$

M_{actual}: Actual motor torque
I_{actual}: Actual motor current
I_M: Magnetizing current

ID32772 Nominal speed n_N

The parameter value must be taken from the name plate (or datasheet) of the motor and describes the limit between basic speed range and field weakening range.

ID32774 Rotor time constant TR

The parameter value must be taken from the name plate (or datasheet) of the motor. The rotor time constant TR is the electrical time constant of the rotor. For synchronous motors (motor type "DS…") the value 0.01 must be entered in ID32774.

ID32775 Motor pole number

The parameter value must be taken from the name plate (or datasheet) of the motor. The pole number of an AMKASYN motor is contained in the type designation.

Example	**Main spindle motor**	**Synchronous motor**
Motor type	DH 10-45-4-ABF-2000	DS 5-3-6-IOO-4000
	Pole number	Pole number
	DV 10-19-4-R00-3000	DT 5-5-10-FBO-5000
	Pole number	Pole number

Caution: Faulty entry of number of motor poles results in maloperation of the drive!

ID32776 Sine encoder periods

The parameter value must be taken from the name plate (or datasheet) of the motor or of the encoder. The "sine encoder periods" state the number of sine periods per revolution of the motor encoder connected at the sine encoder input X31. For linear motors the value in ID32776 defines the number of sine periods per pole period..

Caution: Faulty entry of number of sine encoder periods results in maloperation of the drive!

EnDat Encoder:

1. **Linear encoder Type: LC181 or comparable:**
For EnDat linear encoder ID32776 is calculated out of the signal period of the encoder and ID123 and filled in automatically according the following calculation:

$$ID32776 = \frac{ID123[mm] \cdot 1000}{Signal\ period[\mu m]}$$

Example:

ID123 Pole period linear motor		= 24 mm (Datasheet for the linear motor)
Signal period		= 16µm (Datasheet EnDat linear encoder)
PV (Position refinement)		= 100 (see ID116 / ID117)
→	ID32776	= 1500 Signal periods / Pole period
	ID116	= 600000 Increments / Pole period

2. **Rotary encoder type ECN1313-512 or comparable:**
The number of sine periods per revolution is automatically read out of the EnDat rotary encoder and filled in ID32776.

ID32827 Flux-generating current feedback value

The flux-generating current feedback value can be evaluated by reading this Ident number. Only reading access to this parameter is possible. The display is permanently scaled: $i_{sd} = ID32827 \cdot \frac{ID110}{16384}$

ID32834 Torque-generating current feedback value

The torque-generating current feedback value can be evaluated by reading this ident number. Only reading access to this parameter is possible. The display is permanently scaled: $i_{sq} = ID32834 \frac{ID110}{16384}$

ID32841 Motor encoder list

EnDat encoders offer the possibility of storing data in the encoder. Data storage in the encoder (currently possible only for EnDat) must be switched on or off (default value) through the service parameter ID32901 "Global service switch".

The motor encoder list states which motor parameter are stored in the EnDat encoder. The list contents are fixed in the operating software of the AMKASYN unit and cannot be edited.

ID-No.	Meaning
100	Proportional gain speed control K_P
101	Integral actual time speed control T_n
102	Differentiation time speed controller T_d
104	Position loop KV-factor, K_V
109	Motor peak current
111	Motor nominal current
32768	Nominal motor voltage
32769	Magnetizing current I_M
32770	Magnetizing current I_{M1}
32771	Nominal current M_N
32772	Nominal velocity N_N
32774	Rotor time constant T_R
32775	Pole number motor
32776	Sinus encoder period
32953	Encoder type
34045	Inductance L_q
34046	Inductance L_d
34050	TN current Q T_{nq}
34052	TN current D T_{nd}
34096	Standstill current
34148	Voltage regulator proportional component K_{pu}
34149	Voltage regulator integral action time T_{nu}
34151	KP current Q K_{pq}
34152	KP current D K_{pd}
34153	Maximum speed motor
34160	Part number motor (ASCII-List)
34161	Production date motor
34162	Serial number motor
34164	Resistance R_{tt}
34165	Holding torque brake
34166	Temperature sensor motor
34167	Inductance L_{tt}
34168	Time I_{max} motor I_{max}
34177	Lower threshold SR-Adaption
34178	Upper threshold SR-Adaption
34179	Gradient KpQ
34180	Gradient TnQ

ID32842 User data encoder list

The list states which parameter values of the user are stored in the EnDat encoder database. The list can be configured freely, whereby only those parameters may be entered the values of which can be changed. The entry of ident numbers with fixed values leads to an error message when saving in the system.
The memory size of the encoders is 64 words. The total of all data out of the "User data encoder list" must be equal or less, otherwise the error message 2310 encoder communication info 15 will be generated. (There are also motors with S- or T-type encoder which have a memory size of 13 words).

Example:

Data to be stored:

ID-No.	Name	Parameter	Subject	Size
111	Motor nominal current	0	5.50 A	doubleword
116	Motor encoder resolution	3	65536	doubleword
82	Positive torque limit	2	100 %MN	word
83	Negative torque limit	1	100 %MN	word
32780	Acceleration ramp	1	2000 ms	doubleword
32781	Deceleration ramp	3	1000 ms	doubleword

ID32842 "User data encoder list" → Encoder storage:

Element	Subject	
0	28 Length	← 2 x 14 Elements
1	132 Length max.	
2	111	← ID-No.
3	0	← Parameter
4	116	
5	3	
6	82	
7	2	
8	83	
9	1	
10	32780	
11	1	
12	32781	
13	3	
14	not used	
15	…	
…	…	
…	…	

Storage location	Subject
1	ID111 + Parameter set 0
2 + 3	5.500
4	ID116 + Parameter set 3
5 + 6	65536
7	ID82 + Parameter set 2
8	100
9	ID83 + Parameter set 1
10	100
11	ID32780 + Parameter set 1
12 + 13	2000
14	ID32781 + Parameter set 3
15	1000
16	not used
17	not used
…	…
…	…

The data of this example can only be stored in an E- or F-type encoder.
If a S- or T-type encoder is used the ID32781 can't be stored because the storage capacity of 13 words is exceeded.

Handling:

Via command codes in ID32843 "Service command" the parameters are taken into the encoder or in the unit.

Command [hex]	Description
[1]	The via "User data encoder list" defined data are taken into the encoder
[20]	The via "Motor encoder list" defined data are transferred from the encoder into the unit
[21]	The via "User data encoder list" defined data are transferred from the encoder into the unit

ID32843 Service command

With this parameter current data can be copied from the user database (DTH) into the encoder database. The data to be copied are configured through ID32842 "User encoder list". The writing process is started by writing the value "1" in the ID32843 "Service command". The current state of the function can be determined by reading the parameter.

ID32843 Writing (order)		ID32843 Reading (state)	
[0]	No function	[0]	Basic state
[1]	Store "user encoder list" in the encoder	[3]	Function finished
[10]*1	Store the actual encoder position as centre (medium) position to the encoder	[7]	Function just active
[11]*1	The actual encoder position is set to zero. The commutation offset is compensated self-acting in the encoder (E- / F- / S- / T- type encoder)	[F]	Function concluded with error
[12]*1	The actual encoder position is set to a defined value. The commutation offset is compensated self-acting in the encoder (for E- / F- / S- / T-type encoder). The new position value will be defined with ID32942 "Service control"		
[14]*2	„Read absolute position“. The actual position in increments related to ID116 „motor encoder resolution“ / ID117 „external encoder resolution“ will be write into the parameter ID32942 “Service help.”		
[20]	"Encoder list motor ID32841" is copied from encoder into the drive		
[21]	"Encoder list user" is copied from encoder into the drive		

*1 Error correction curve values and memory cells are changed in the encoder. If extraneous motors are used please talk back with AMK service department.

*2 The absolute position is only allowed to read if the motor is standstill.

ID32920 Motor overload time

The overload time can be adapted to the thermal time constant of he motor with this parameter. The parameter acts on the I²t monitoring of the motor. Please refer to the name plate or data sheet of the motor for the thermal time constant.

The motor I²t monitoring is adapted to the thermal time constant of the motor with the parameter ID32920. Monitoring can be activated with ID32773 bit 14 = 1.

The parameter ID32920 "Motor overload time" describes the maximum time "t" in seconds with which the motor may be operated with **2 times nominal current.** The time to be entered must refer to operation with 2 times nominal current.

If the motor overload time in the data sheet is not related to 2 times nominal current, then the setting value for ID32920 is calculated as follows:

Formula 6: Setting value for ID32920

$$\mathrm{ID32920} = \frac{\left[\left(\frac{i}{I_N}\right)^2 - 1\right] \cdot t}{3}$$

Example 1:
The motor may be operated for 20s with 1.5 times nominal current. How must ID32920 be set?

Formula 7: Setting at 1.5 times nominal current for 20 s

$$\mathrm{ID32920} = \frac{\left(1.5^2 - 1\right) \cdot 20\ \mathrm{s}}{3} = 8.3\ \mathrm{s}$$

If the setting value for ID32920 has been determined, then the permissible operating time of the motor can be calculated with an arbitrary overcurrent ratio according to Formula 8.

The following relation applies for the permissible operating time "t" of the motor for $i > I_N$

Formula 8: Permissible operating time of the motor with arbitrary overcurrent

$$t = \frac{3 \cdot \mathrm{ID32920}}{\left(\frac{i}{I_N}\right)^2 - 1}$$

t: Permissible operating time
i: Actual current (overcurrent)
I_N: Motor nominal current

Example 2:
ID32920 = 2 s. how long may the motor be operated with 1.2 times nominal current?

Formula 9: Permissible operating time for 1.2 times nominal current

$$t = \frac{3 \cdot 2\ \text{s}}{(1.2)^2 - 1} 13.6\ \text{s}$$

The motor may therefore be operated for 13.6 s with 1.2 times nominal current.

In the case of an overload a warning is generated as soon as the motor overload time ID32920 has expires.

as long as this warning in present the user has the possibility of reacting to the overload.

After the end of the warning time according to ID32943, the drive is shut down with the error message 2353 "Motor overload".

from Software release Controller card Kx-R03(P) V3.01 2003/12:
After the time "Motor overload time" ID32920 is over the ID33102 "Motor overload indication" shows the value 100 % and the error message 2360 "Motor overload error" is generated.

Before the warning message 2359 "Warning overload motor" is generated after the ID114 "Overload limit motor" is reached.

Older software versions:
After the warning time ID32943 is over, the motor will be ramped down according to ID32782 "Ramp RF inactive" and the error message 2353 "Overload motor" is generated.

ID32934 Pulse encoder periods

The parameter value must be taken from the name plate (or datasheet) of the motor or of the encoder. The "Pulse encoder periods" state the number of the divisions per revolution of the pulse encoder connected at the pulse encoder input X34. When linear motors are used, ID32934 is defined as number of divisions per pole period.

Caution: Faulty entry of number of pulse encoder periods results in maloperation of the drive!

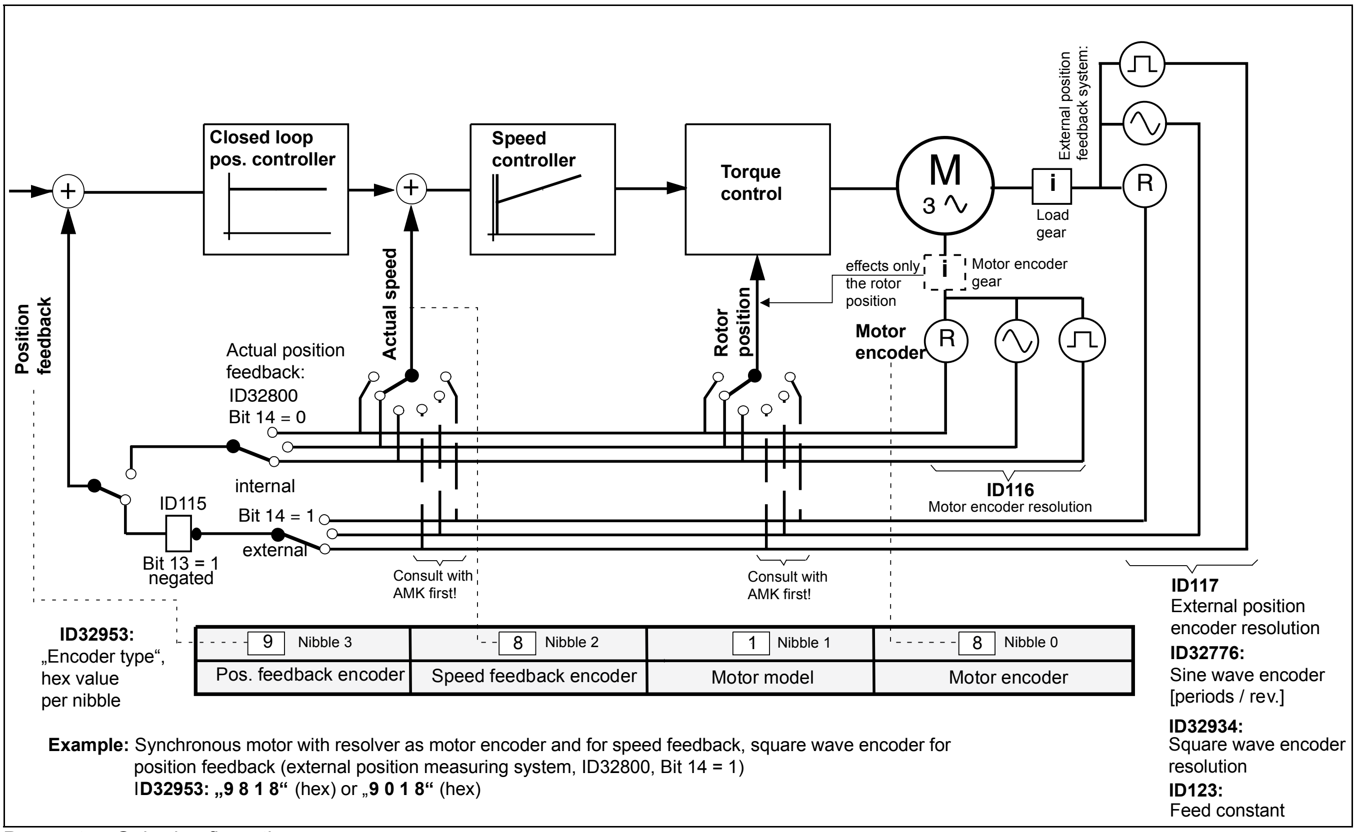
ID32953 Encoder type

The "Motor encoder type" parameter determines the motor type and the used encoder type. The ID32953 is coded and is composed of the four displayed half-bytes (nibbles) with numerical hex code.

Motor encoder	(Nibble 0):	Motor encoder (is used for commutation)
Motor type	(Nibble 1):	Asynchronous motor, synchronous motor, U/f operation, …
Speed encoder	(Nibble 2):	Speed encoder (generation velocity feedback value)
Position encoder	(Nibble 3):	Position encoder (generation position feedback value)

By entering the appropriate HEX code the position encoder and the speed encoder can be freely defined, independent of the motor encoder. In the case of the position encoder you can also choose between an internal encoder (with ID116 as the motor encoder resolution) or an external encoder (with ID117 as the resolution of an external displacement measurement system).
In case of an external displacement measurement system the translation ratio of the drive between the motor an the load is considered. ID117 must be set to 4 x the number of pulses per output revolution of the load drive.
In the main operating mode (ID32800) it is defined whether operation is performed with an internal or external load position encoder.
The encoder period is defined in the parameters sine encoder period (ID32776) and pulse encoder period (ID32934).

Figure 6: Configuration possibilities of motor, speed and position encoders



Parameter_Geberkonfiguration

ID32953 Encoder type

Nibble3 **Position feedback encoder**	Nibble 2 **Speed feedback encoder**	Nibble 1 **Motor model**	Nibble 0 **Motor encoder**
0: as motor encoder 1: A / H type encoder 2: T type encoder 3: - 4: - 5: I type encoder 6: - 7: S type encoder 8: Resolver 9: Square wave encoder A: E / F type encoder B: external encoder option KU-/KW-EN1	0: as motor encoder 1: A / H type encoder 2: T type encoder 3: - 4: - 5: I type encoder 6: - 7: S type encoder 8: Resolver 9: Square wave encoder A: E / F type encoder	0: Asynchronous motor 1: Synchronous motor without field weakening 2: U / f control 3: Synchronous motor with field weakening *2)	0: I type encoder (default) 1: A / H type encoder 2: T type encoder *1) 3: - 4: - 5: I type encoder 6: - 7: S type encoder 8: Resolver 9: Square wave encoder A: E / F type encoder

*1) Is also valid for the "LinCoder L230" of company Stick / Stegmann with hiperface interface

Attention:
If external position encoder is chosen (ID32880, Bit14 = 1) it is not allowed to set "as motor encoder". In the column Pos. feedback encoder must be configured the type of the external encoder which is used.

***2) The field weakening operation for synchronous motors is restricted to the following models:**
DS13-110-6-R00-200 Mod. No. D469AD
DS28-450-40-SB0-300 Mod. No. D647AD
DS28-650-40-SB0-300 Mod. No. D722AD
Please refer to the AMK motor's data sheet for the values of the following parameters.

The following motor parameters have to be set:
ID109, ID111, ID32768, ID32769, ID32770, ID32771, ID32775, ID32776, ID32934, ID32953, ID32959, ID32960, ID32961, ID34164 and ID34167

The controller is set using the following parameters:
ID34151, ID34050, ID34151, ID34052, ID34148, ID34149

A type encoder (magnetic encoder)
After the encoder basic adjustment (first startup) the adjustment values are activated at every system booting. An online encoder correction see ID32773 compensates temperature effects induced by the principle.

E type encoder (absolute value encoder, single turn, EnDat)
In the case of synchronous motors (DS… / DT…) the absolute value related to one motor revolution is required for the communication. The absolute value is read automatically via the EnDat interface following mains ON. In addition the E type encoder also offers a sine and a cosine track for the operation.

F type encoder (absolute value encoder, multi-turn, EnDat)
The absolute value is read when axis is at a standstill following a call of the reference point travel function via the EnDat interface. In addition the F type encoder also offers a sine and a cosine track for the operation.

I type encoder (optical encoder)
Encoder basic adjustment, correction cannot be activated

Resolver
Encoder basic adjustment, correction cannot be activated. Absolute angle encoder in accuracy classes up to a few arc minutes.

S type encoder (SINCOS absolute value encoder, single-turn)
Encoder basic adjustment, correction cannot be activated. For synchronous motors (DS..) the absolute value of the S type encoder is used for the communication.

T type encoder (SINCOS absolute value encoder, multiturn)
Encoder basic adjustment, correction cannot be activated. The absolute value can be determined at standstill of the axis serially using the homing cycle drive function. The position feedback value_2π (Code 32899) is zeroed at the reference point.

H type encoder (encoder with "Hall" sensor)
The "Hall"-type encoder has one sine / Cosine period per revolution or rather per pole pair of linear motors.

U/f operation
Voltage / frequency control (encoder-less motor control) with functionality of the parameters such as speed controller (limitations, command values, without encoder feedback, i.e. K_P, T_N, … ineffective). The stated motor (Nibble 0) and speed encoder type (Nibble 2) are not taken into account.
It must be observed that the ramp times ID32780, ID32781, ID32782 may not be less than the physically achievable speed ramps of the system (too steep ramps can lead to overcurrent messages).

Example of encoder configuration:

Application	ID32953 [hex]
Asynchronous motor with AMK-I type encoder (motor encoder)	0 0 0 0 h
Asynchronous motor with AMK A type encoder (motor encoder)	0 0 0 1 h
Synchronous motor with resolver (motor encoder)	0 0 1 8 h
Synchronous motor with resolver as motor encoder (for commutation) and speed encoder and external square pulse encoder for position feedback value acquisition	9 0 1 8 h or 9 8 1 8 h

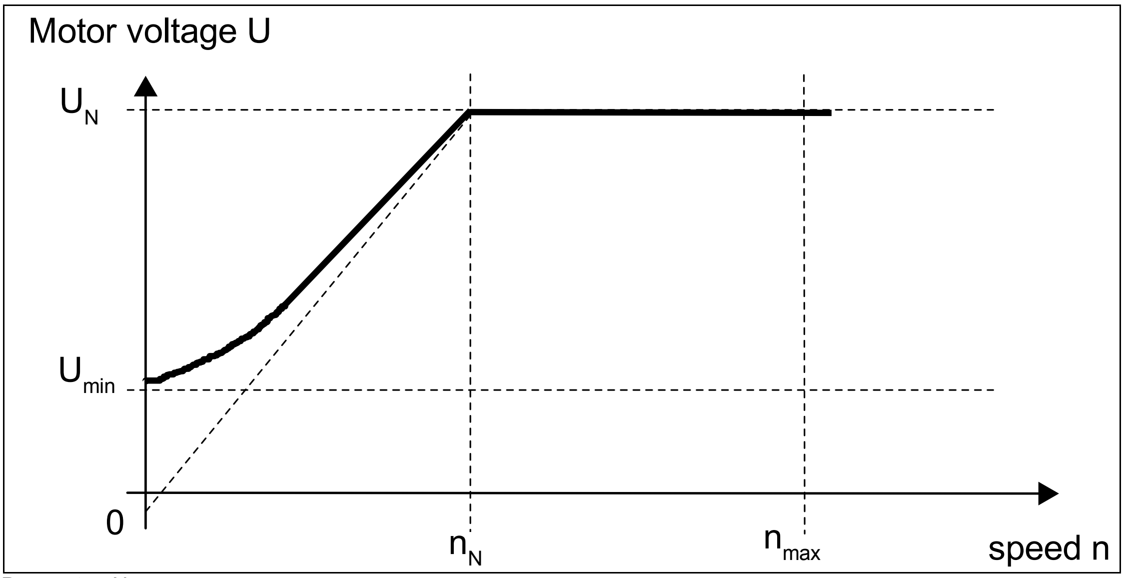
ID32935 Standstill voltage

This parameter describes the motor voltage at speed n = 0 (standstill) in the voltage / frequency control operation mode. This operation mode can be activated through ID32953 as from KU 1.03 3897. It must be observed that the ramp times ID32780, ID32781, ID32782 may not be less than the physically achievable speed ramps of the system. Further setting possibilities see ID32991 U/f startup.

ID32768 Nominal motor voltage

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 KU 1.03 3897. It must be observed that the ramp times ID32780, ID32781, ID32782 may not be less than the physically achievable speed ramps of the system. Further setting possibilities see ID32991 U/f startup.

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



Parameter_Nennspannung

U_N Nominal motor voltage, ID32768
U_{min} Standstill voltage, ID32935
n_N Nominal motor speed, ID32772
n_{max} Maximum speed, ID113

ID32959 Resolver offset

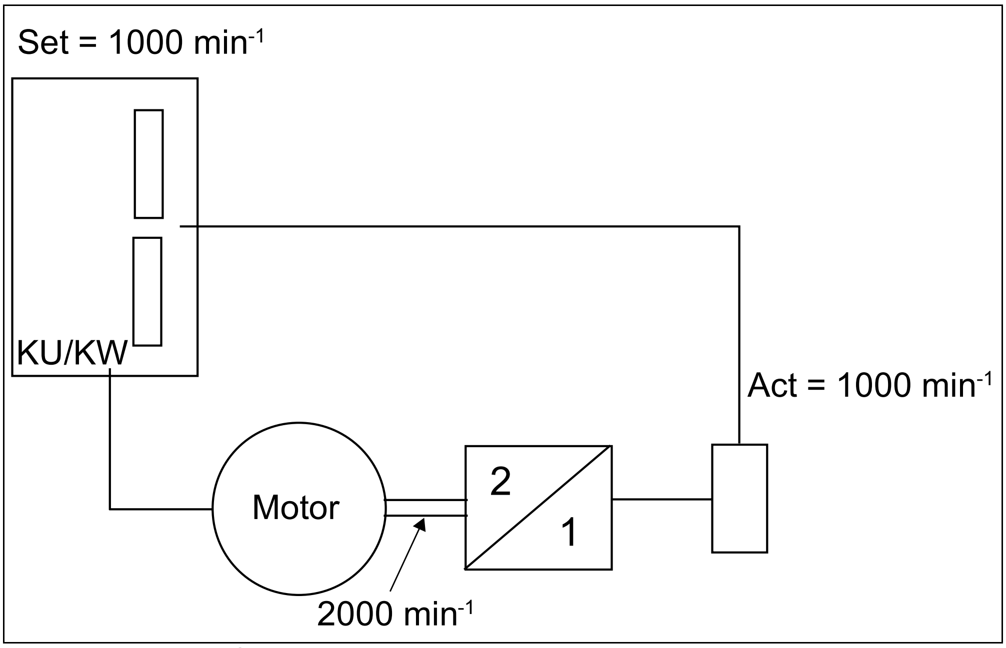
With this parameter the zero position of the resolver is adapted related to a constructively determined field position of a synchronous motor. AMK rotation synchronous motors with resolvers are adjusted so that no resolver offset has to be entered (ID32959 = 0).
The value range 0 to 65536 corresponds to an angle of 0 to 360 degrees or one pole period for linear motors.

In the case of linear motors it is not possible to install the resolver in a defined position in relation to the pole period, therefore the offset must be determined through the resolver adjustment function. The "Resolver Adjustment" function can be started on the control panel in the "Service" menu. Please contact the AMK service department about this.

ID32960 Motor encoder gear input

ID32961 Motor encoder gear output

The parameter determines the gear ratio of a gear between the motor and associated motor encoder.



Parameter_Motorgeber-Getriebe

when a synchronous motor is used the result from the ID32776 sine encoder resolution $\cdot \frac{\text{ID32961}}{\text{ID32960}}$ has to be a whole number; if not, an error message is generated.
On asynchronous motors decimal places are possible.

Caution: With incorrect parameter entry, the drive can be controlled only conditionally.

ID33102 Motor overload indication

This parameter indicates the current overload of the motor according to the I²t monitoring. It can also be configured as 16-bit message.

ID33102 = 0: Nominal mode or below nominal mode
ID33102 > 0: Overload mode, shutdown at 100%

the motor overload indication is effective only if the I²t monitoring of the motor is activated through ID32773 bit 14 = 1. The I²t can be adapted to the thermal time constant of the motor with the parameter ID32920.

ID34045 Inductance LQ

This parameter is used for the current controller adjustment and is motor specific. The values are listed in the motor data sheets and have to be entered at start-up the system.

ID34046 Inductance LD

This parameter is used for the current controller adjustment and is motor specific. The values are listed in the motor data sheets and have to be entered at start-up the system.

ID34049 K_P current Q

With software version 2004/18 and higher, this parameter is only accessible using the AMK service menu and is replaced by ID34151. In new applications, the parameter ID34151 is used in place of ID34049.

ID34050 T_N current Q

This parameter is used to adjust the current regulator, and depends on the motor in use. The values are indicated in the motor's datasheet, and should be entered at start-up.

ID34051 K_P current D

With software version 2004/18 and higher, this parameter is only accessible using the AMK service menu and is replaced by ID34152. In new applications, the parameter ID34152 is used in place of ID34151.

ID34052 T_N current D

This parameter is used for the current controller adjustment and is motor specific. The values are listed in the motor data sheets and have to be entered at start-up the system.

ID34094 Rise time Software commutation

Set the slope of current rise at software commutation.

ID34095 Final software commutation

Set the final value of current at software commutation.

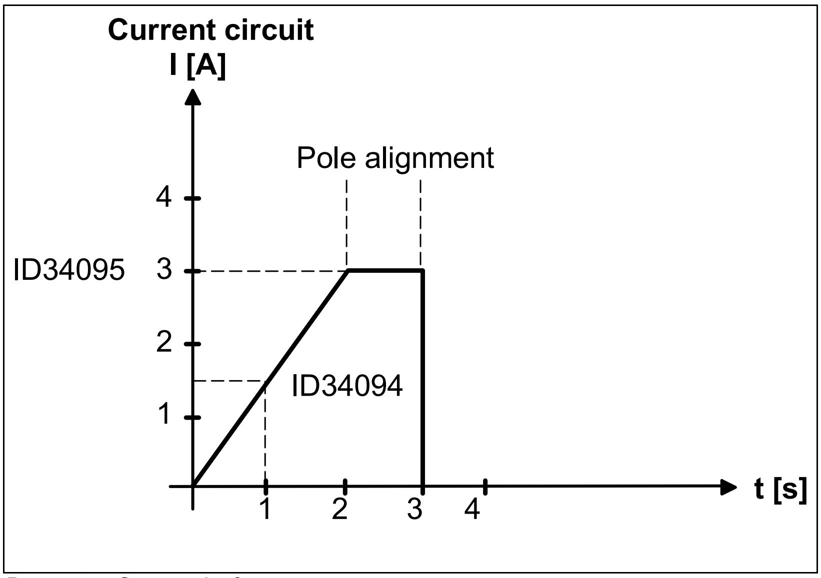
ID34095 positive value:	SW commutation according ID34094 and ID34095
ID34095 negative value:	After current rise time the angle of the current phase will be shifted + 45°. With this ironless linear motors will move if they are located between two poles. This process needs 2.5 sec. additional to the commutation time.

Software commutation is used depending on the motor encoder type in linear motor applications. For linear position encoder feedback without absolute value it is not possible to calculate the right current of the motor phase to the right time. Because of this software commutation is used.

For software commutation the current rise slope and the final value of the commutation current is important. For strong linear motors in high dynamic applications mostly a flat current rise slope is required. Also for the first start-up the commutation current should be changeable to smaller value. The rise slope of the current is set with parameter ID34094 and the final value in ID34095.

Special case:

If ID34094 = 0 and ID34095 = 0 the final value of commutation current is set to the rated current of the motor. The current rise is fixed to I_N / 128 per 100 ms. After reaching the final value a current peak of 2 x I_N is generated for 50 ms.



Parameter_Stromverlauf

ID34096 Standstill current motor

This parameter shows the limiting value at with value the I²t monitoring starts to work.
The value is indicated in the motor's data sheet, and should be entered at start-up.
The I²t monitoring must be activated at the ID32773 „Service switch“ Bit14 = 1.

ID34151 Q current regulator K_P

This parameter is used to adjust the current regulator and depends on the motor in use. The values are indicated in the motor's data sheet, and should be entered at start-up.

ID34152 D current regulator K_P

This parameter is used to adjust the current regulator and depends on the monitor in use. The values are indicated in the motor's data sheet and should be entered at start-up.

ID34153 Maximum speed motor

This parameter shows automatically the mechanically maximum speed of the motor. (Only if you use a encoder with integrated encoder list)

ID34160 Part number motor

The part number of the motor is taken from the motor database.

ID34161 Production date motor

If an EnDat encoder is used the production date of the motor is written automatically in the encoder database.
When other encoders are used the value can be written manual.

ID34162 Serial number motor

If an EnDat encoder is used the serial number of the motor is written automatically in the encoder database.
When other encoders are used the value can be written manual.

ID34164 Terminal resistance Rtt

Only enter the terminal resistance Rtt if it is indicated in the AMK motor's data sheet. This only pertains to synchronous motors.

ID34165 Hold. torque brake

This parameter belongs to the encoder list motor and shows the torque of the motor holding brake. Value 0 is a motor without holding brake.

ID34166 Temperature sensor motor

This parameter belongs to the encoder list and shows the type and the properties of the temperature sensor.

Code sheet: T T T A X

Code	Meaning	Value
T	Temperature	0 ... 654 °C
A	Number of sensors	0 ... 9
X	Sensor type	0 = without 1 = THW 2 = reserve 3 = PTC 4 = reserve 5 = NTC 6 = KTY 7 = PT100 8 = Type J

ID34167 Terminal inductance Ltt

Only enter the terminal inductance Ltt if it is indicated in the AMK motor's data sheet. This only pertains to synchronous motors. If the ID34167 terminal inductance is Ltt ≠ 0, the parameter ID109 applies max. current to the motor.

ID34168 Time Imax motor

ID34168 "Time Imax motor" defines how long the motor can operate with the maximum current defined in Id109. If the values in ID34168 and ID109 are unequal to zero "overload time motor" becomes inactive. The overload time will be calculated by the system according to ID109 and ID34168

ID34176 External sine encoder period

This parameter is only active when an external position feedback value encoder with the option card KU- / KW-EN1 is used. The sine encoder period can be taken out of the datasheet of the external encoder.

ID34177 Lower threshold current adaptation

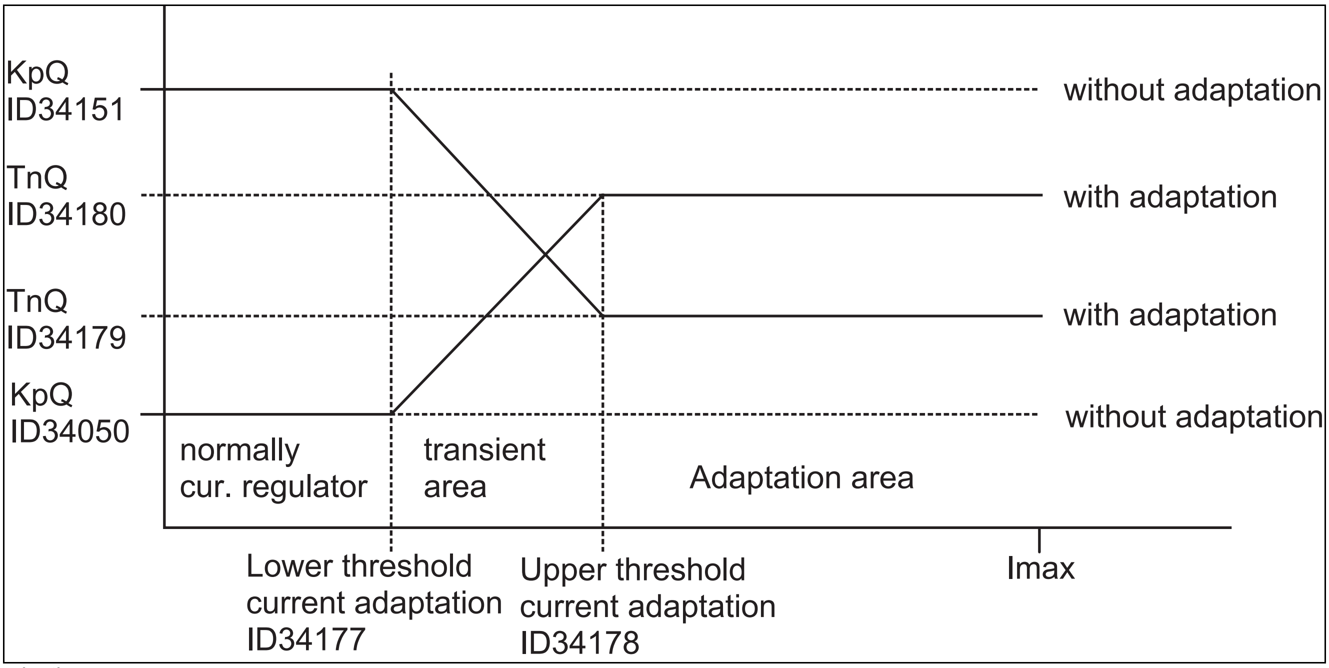
ID34178 Upper threshold current adaptation

ID34179 Gradient KpQ

ID34180 Gradient TnQ

Only synchronous motors

This parameters are used to adjust the current regulator and depends on the monitor in use. The values are indicated in the motor's data sheet and should be entered at start-up.

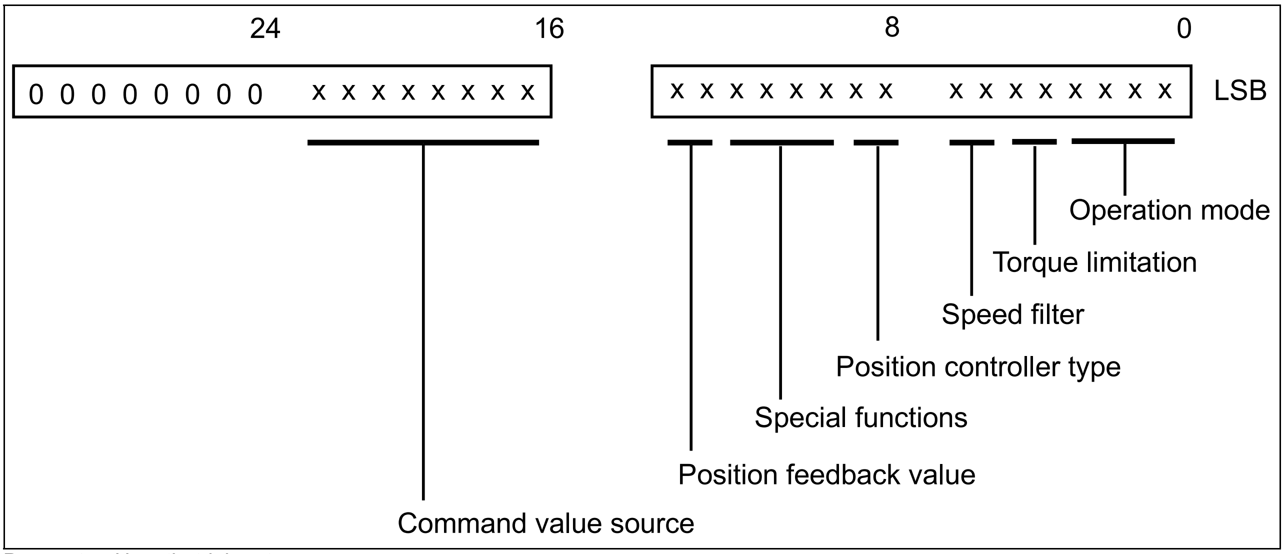

KpQ
ID34151
TnQ
ID34180
TnQ
ID34179
KpQ
ID34050
without adaptation
with adaptation
with adaptation
without adaptation
normally
cur. regulator
transient
area
Adaptation area
Lower threshold
current adaptation
ID34177
Upper threshold
current adaptation
ID34178
Imax

adaption

9 Operation Modes and command value sources

ID32800 AMK main operation mode

Determining the operation mode, the command value source and showing or hiding further options.



Parameter_Hauptbetriebsart

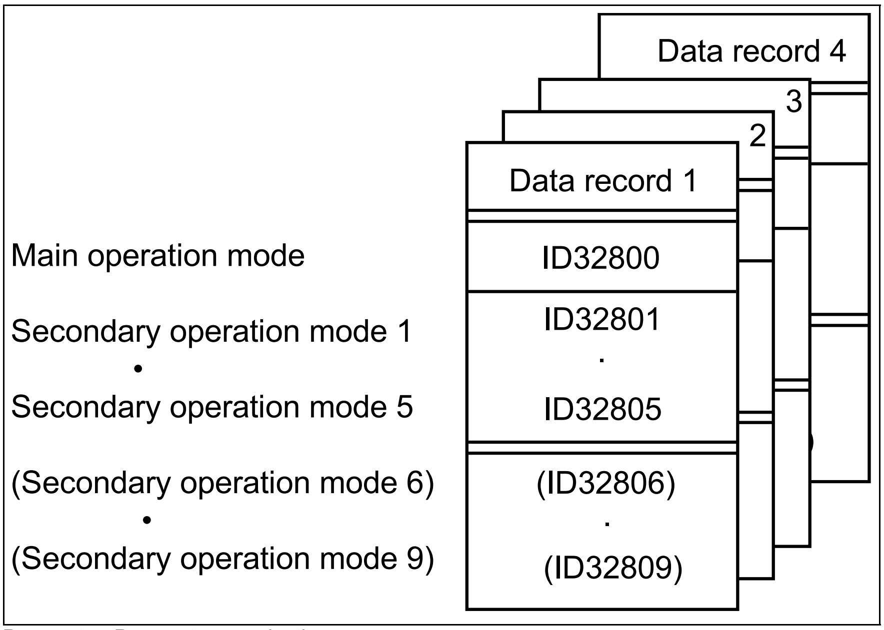
Example:	ID32800 = 0001 0043h	Speed control with active command value ramps, analogue command value setting at the analogue input A1
	ID32800 = 0041 0043h	Speed control with active command value ramps, numerical command value setting through the commanding interface

- **4 data sets** can be used for configuration.
  Data set "0" is used as main parameter set, data set 1 … 3 are assigned to the 1st to 3rd alternative parameter sets.
- The **main operation mode** ID32800 **must be defined by the user** (see ID32813) in the main parameter set. It is **activated automatically** after every system run-up (after "power on" or "error reset" or "changes database" and following "RF change").
- Up to **5 secondary operation modes ID32801 … ID32805** can be defined as required in each data set.
- The secondary operation modes ID32806 … ID32809 are not available for the user and serve for internal processes. E.g. homing, positioning relative and absolute, digital speed control, digital torque control…

  Note: During commanding of movement functions through binary inputs the drive switches from the current operating mode to an AMK secondary operating mode. After the function has been carried out the drive remains in the AMK secondary operating mode and can be switched back to the original operating mode by the operating mode change function.

  See chapter binary inputs, Querverweis Tabelle1 and the documentation AMK field bus protocol AFP T.-Nr. 27872.
- The "Voltage / frequency control" operation mode is set through the encoder type (ID32953 = 20h: encoder-less system).

Figure 7: Parameter organization in data blocks



Parameter_Parameterorganisation

Operating mode parameter ID32800… structure

High word		Low word	
Bit 31			Bit 0
0 0 0 0 0 0 0 0	**X X X X X X X X**	X X X X X X X X	X X X X X X X X
reserviert	**Command value source**	**Operation mode**, extensions, options	

Structure of the operation mode parameter

Bit-No.	Value	Meaning according to ID32800 (low word)
0 - 3	0 dec	**Operation mode** No operation mode defined
	1 dec	Reserved
	2 dec	Torque control
	3 dec	Speed control
	4 dec	Position control
	5 dec	Parallel slave
4 - 5	0	**Torque limitation** Positive and negative (ID82, ID83)
	1	Analogue input A2 (ID82, ID83)
6	0	**Speed filter (command value ramp)** Effect only in speed control operation mode Speed ramp inactive
	1	Speed ramp active (ID32780, ID32781)
7	0	**Speed fine interpolator FIPO (not with analogue command value setting)** Speed control without FIPO
	1	Speed control with FIPO (n setpoint/250 µs)
8	0	**Position controller type** P-position controller

Bit-No.	Value	Meaning according to ID32800 (low word)
9	0	**Following error compensation (SAK) acts at the command value sources diMainSetpoint and IPO** Position control without SAK
	1	Position control with SAK
10	0	**Fine interpolator (FIPO)** **acts only in the 32-bit position command value range (diMainSetpoint and IPO)** Position control without FIPO
	1	Position control with FIPO (setpoint/500µs), position setpoints must be synchronized with the inverter setpoints (s. ID2)
11	0	**Following error compensation (SAK) acts at the command value sources Square wave input, iAddSetpoint16 und diAddSetpoint32** Position control without SAK
	1	Position control with SAK
12	0	Standard functionality
	1	Extended functions (see special application chapter)
13	0	**2 π generation (see description of modulo value ID103)** Modulo value of the active position feedback source (ID116, ID117) (see Bit 14/15
	1	Modulo value according to ID103
14-15	0	**Position feedback value source** Motor encoder, internal encoder (ID116)
	1	External encoder (ID117, ID115), gear ratio ID121 / ID122 is taken into account
16 - 23	01_{hex}	**(T,Sp)** Analogue input A1
	03_{hex}	**(P,Sy)** Square wave input, diMainSetpoint
	14_{hex}	**(T,Sp,P,Sy)** Sollwert von erweiterter Funktion
	40_{hex}	**(L,Sy)** iAddSetpoint16
	41_{hex}, $3C_{hex}$	**(T,Sp,P,Sy)** iAddSetpoint16, diMainSetpoint, IPO
	42_{hex}	**(P,Sy)** iAddSetpoint16, iAddSetpoint32
	43_{hex}	**(P,Sy)** iAddSetpoint16, iAddSetpoint32, diMainSetpoint
	44_{hex}	**(P,Sy)** IPO (interner Interpolator)
	45_{hex}	**(P,Sy)** diMainSetpoint
	46_{hex}	**(P,Sy)** iAddSetpoint32 (Synchronous control with angle alignment)
	47_{hex}	**(P,Sy)** iAddSetpoint32, diMainSetpoint
24-31		Reserved

Attention: The external position feedback value source must only be defined in the main operation mode and is valid for all operation modes.

(T) Torque control, **(Sp)** Speed control, **(P)** Position control, **(Sy)** Synchronous control, **(IPO)** Internal interpolator

In Figure 10, Figure 9 and Figure 8 the command value sources are described for operating modes torque control, speed control and closed loop position control.
Explanatory notes to mode of functioning and application of the setpoint sources:

iAddSetpoint16 and Square wave input: (Incremental 16bit position setpoint source)
For setpoints via iAddSetpoint16 and Square wave input must be set ID2 = ID32958.
The position setpoint results to the incremental difference between two sampling instants (sampling time according to ID32958 16bit cycle time). The incremental difference may not exceed the value "2^{16}". The setpoint values e.g. can originate from the square wave input, from the AMK-PLC, via field buses, …

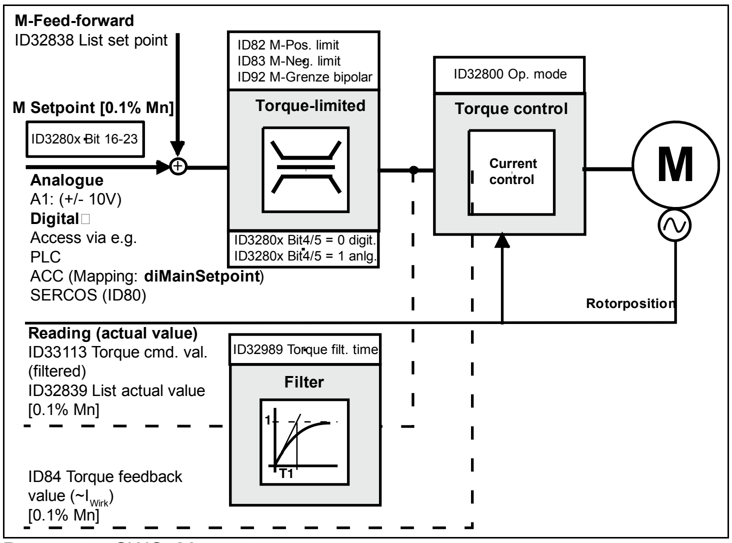
iAddSetpoint32: (Incremental 32bit position setpoint source)
For setpoints via iAddSetpoint32 must be set ID2 = ID32958.
The position setpoint results to the incremental difference between two sampling instants (sampling time according to ID32958 16bit cycle time). The incremental difference may not exceed the value "2^{32}". iAddSetpoint32 is used for function "synchronous control with angle alignment" (alignment controlled by the internal interpolator IPO). The synchronous setpoint is an incremental 32bit value from the AMK-PLC or is input via field buses.

diMainSetpoint: (Incremental 32bit setpoint source for position, speed and torque setpoints)
For setpoints via diMainSetpoint must be set ID2 = ID1.
In closed loop position control the position setpoint results to the incremental difference between two sampling instants (sampling time according to ID2 SERCOS cycle time). The incremental difference may not exceed the value "2^{32}".
In operating mode speed / torque control the speed / torque setpoints are fed into the appropriate controller as values according to the selected scaling (refer to chapter "scaling"). The setpoints can originate from the AMK-PLC, via field buses, the analog input A1… .

Setpoint transfer to an axis without PLC via ACC Bus / CAN Bus:
The setpoint sources iAddSetpoint16, iAddSetpoint32 and diMainSetpoint can be addressed from the AMK application interface (API). Setpoints via field buses (e.g. ACC, CAN) are written by means of a description file into the API variable of the related setpoint source.
Depending on the activated operating mode the incoming setpoint value is interpreted as position, speed or torque setpoint.
No PLC is required to process the incoming data via API.
The following correlation is valid:

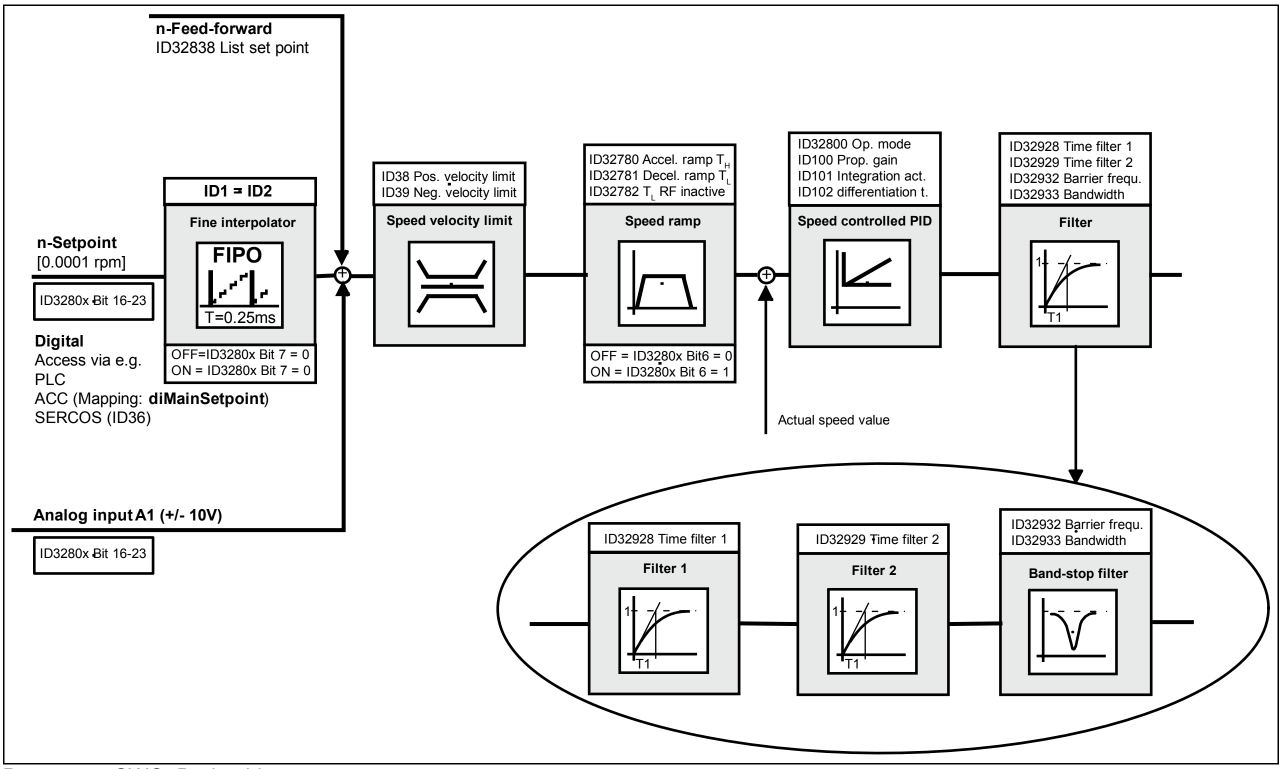
The AMK documentation "API" provides further explanations of the application interface.

Figure 8: Setpoint source and operating modes (Torque control)



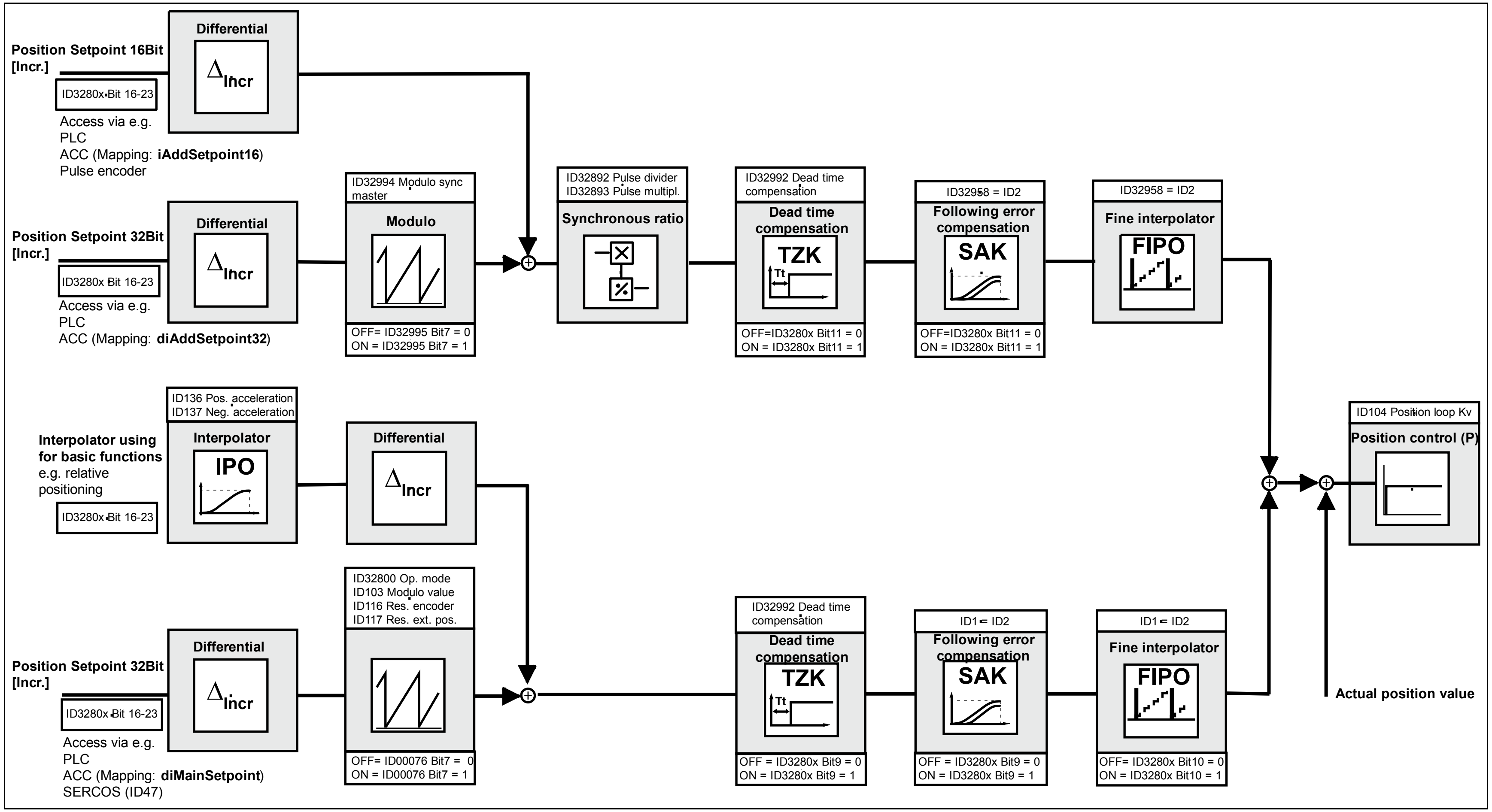
Parameter_SWQ_Moment

Figure 9: Setpoint sources and operating modes (speed control)



Parameter_SWQ_Drehzahl

Figure 10: Setpoint sources and operating modes (Closed loop position controller)



Parameter_SWQ_Lage

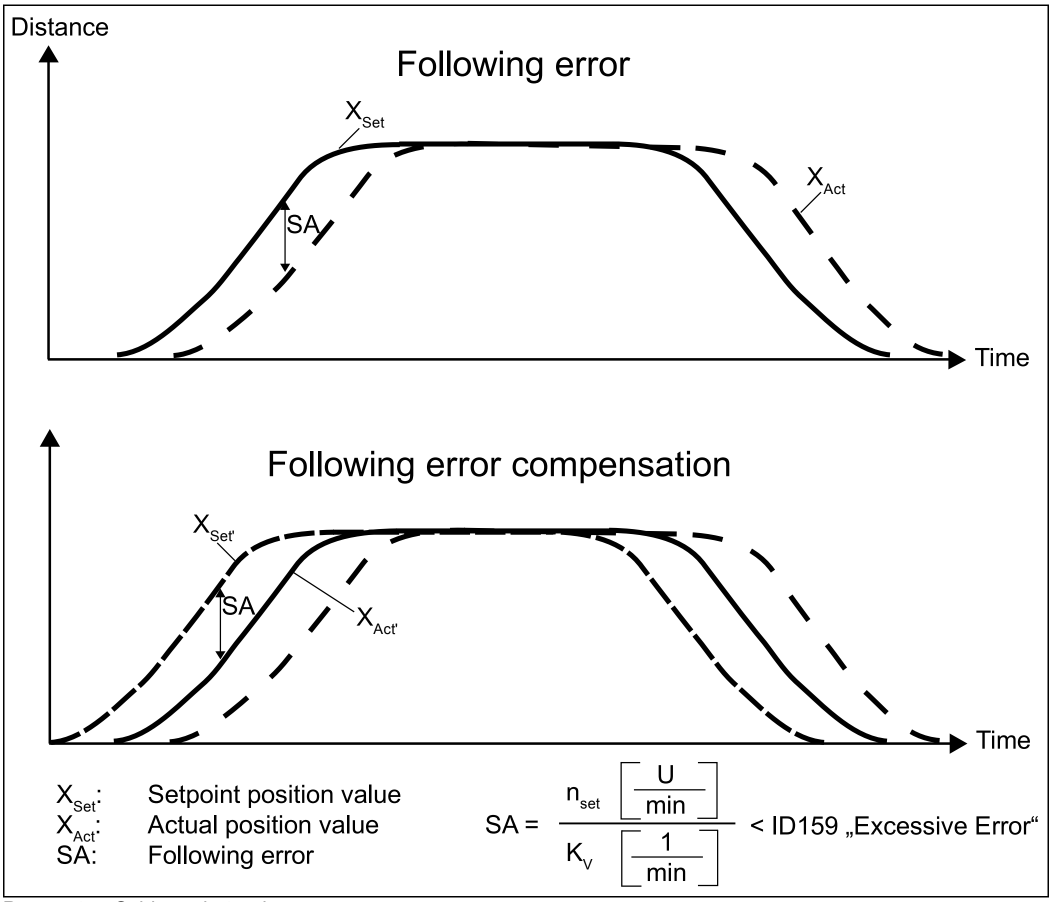
Difference formation (Δ incr.): The setpoint change between two continuous sampling times results in the position setpoint.

Modulo value formation: Setpoint differences are summed up to a certain value (modulo value), a saw tooth curve results.

SVH: The **synchronous ratio** results from the setpoint multiplier and the setpoint divider with which the position increments via the 16 bit channel are scaled.

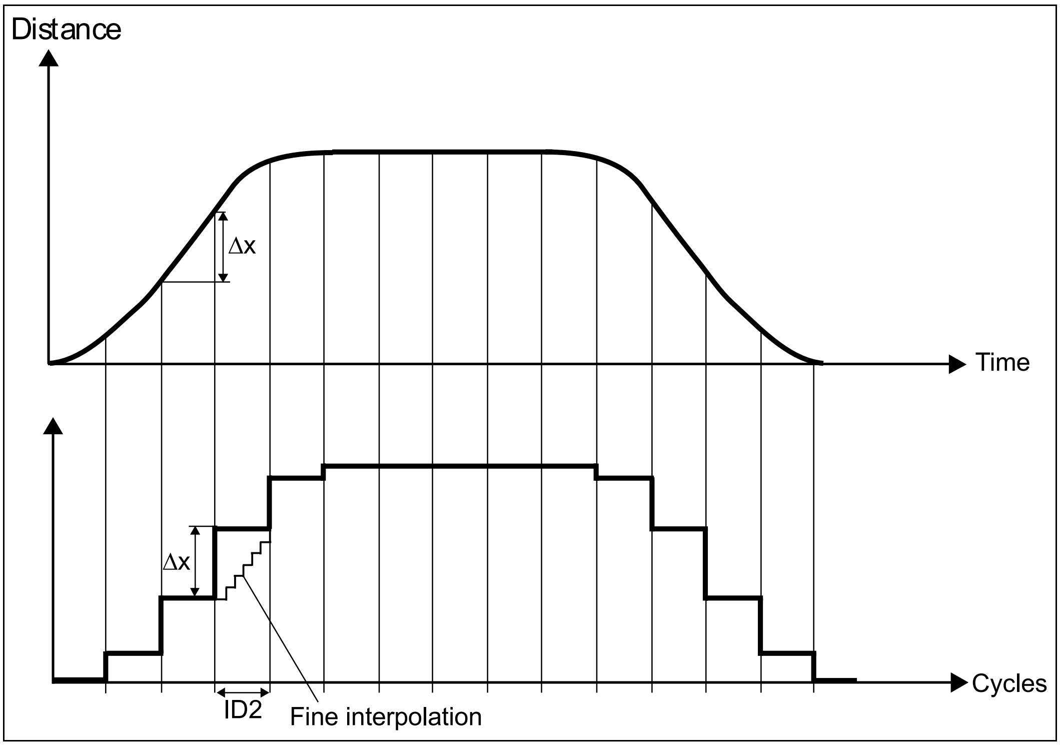
TZK: The dead time compensation acts as a precontrol time for position setpoints via the 16 bit (ID32992)/ 32 bit (ID32993) setpoint source.

SAK: **Following error compensation**, to compensate the following error in operating mode synchronous control.



Parameter_Schleppabstand

FIPO: **Fine interpolator** for linear interpolation between two setpoints output in the selected sampling time.
Theoretical position profile (first picture)
Cyclical set point (second picture)



Cycle time fine interpolation **16Bit** setpoints = $\frac{ID32958}{0{,}5ms}$

Cycle time fine interpolation **32 Bit** setpoints = $\frac{ID1}{0{,}5ms}$

The fine interpolation 32 Bit (FIPO) can be activated with parameter ID32800

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 mode 1 … 5 are structured like the AMK main operating mode. Switching over between the described operation mode is possible during operation. When switching over the operation mode, **the current position feedback value source cannot** be changed.
Secondary operation mode 6 … 9 are used AMK internally. The cannot be changed by the user.

10 Torque Parameters

ID00080 Torque command value [% M_N] (can be changed online)

Fixed torque command value, selection through binary input after function code assignment.

ID00082 Positive torque limit [% M_N] (can be changed online)

ID00083 Negative torque limit [% M_N] (can be changed online)

determining the positive / negative limitation of the torque command values. The entry is made in % related to the nominal torque of the motor, which is derived system-internally from the nominal current of the motor (ID111).
If torque command values exceed the limits, the message bit $M_d \geq M_{dLimit}$ (code 334) is set in addition. It must be possible to realize the entered value by the drive.

The following applies for calculating the maximum possible torque limit:

Formula 10: Calculating the torque limits

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

IDxx = ID82 or |ID83|
ID110 = Inverter peak current
ID111 = Motor nominal current
ID32769 = Motor magnetizing current

Note:	If "torque limitation through analogue input A2" is defined in the operation mode parameter, the larger absolute value of ID82 or ID83 limits the maximum torque if 10V are present at the analogue input A2. The analogue input voltage at A2 is processed by the system according to absolute value.

Example: ID82 = 100%
ID83 = -120%
10 V at A2 corresponds to 120% torque limit.

ID00084 Torque feedback value

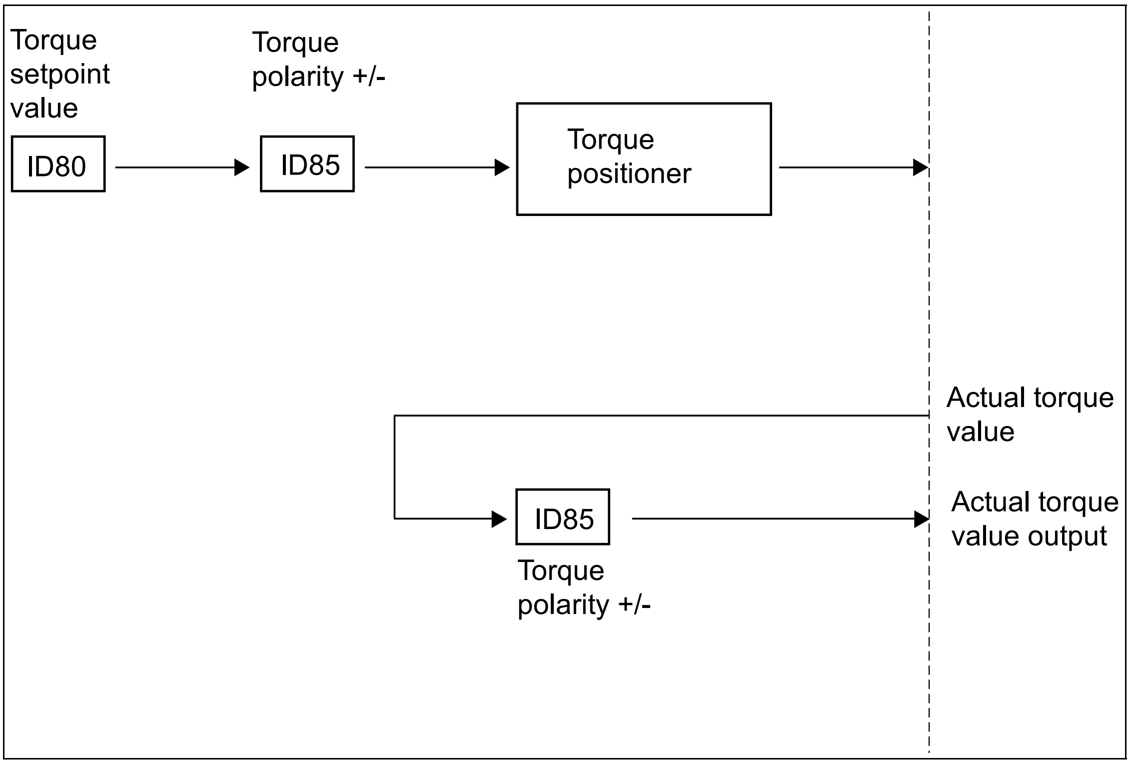
The torque feedback value can be evaluated by reading this Ident number. The display can be influenced by the torque scaling (see torque scaling parameter ID86).

ID00085 Torque polarity

Determining the polarity of torque data. **Clockwise** viewed onto the motor shaft (A bearing side) prevails with **positive torque command value** and **positive polarity**.

ID-No.	Value	Meaning according to ID85
0	0	Torque command value Polarity positive
	1	Polarity negative
1 - 15		Reserved

Figure 11: Effect of the torque polarity



Parameter_Drehmomentpolarität

Note: For general reversing of the motor rotation direction without intervention in control structures bit 16 in parameter ID32773 "service switch" can be used. With bit 16 = 1 the motor rotation direction is reserved.

ID00126 Torque limit Mdx [% MN] (can be changed online)

If the torque feedback value exceeds the **torque limit M_{dx}**, then the message bit $M_d \geq M_{dx}$ (code 333) is set.

ID32777 Torque at 10V at A1 [%MN]

Scaling the torque command values at the analogue input A1 of the inverter 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 range up to the nominal speed. Above the nominal speed, the real torque decreases inversely proportionally to the speed. The command value voltage ± 10 V is digitized with a resolution of 11 bits.

Formula 11: Torque with 10 V at analogue input A1

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

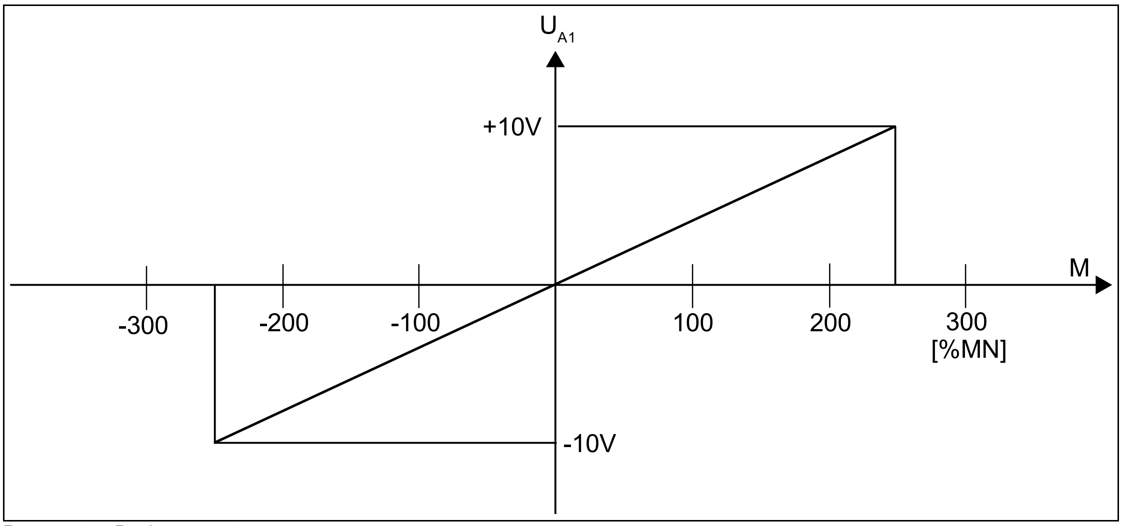
ID110 = Inverter peak current
ID32769 = Magnetizing current I_M
ID111 = Motor nominal current I_N

Example: ID32777 = 250% M_N, at 10 V input voltage at A1 (U_{A1})

Formula 12: Calculation example for torque determination

$$M_{\text{comd.}} = 250\%\, M_N \cdot \frac{U_{A1}}{10\text{ V}}$$

Figure 12: Torque depending upon the input voltage at A1



Parameter_Drehmoment

ID32989 Torque filter time T1 for command value display [ms]

A proportional element with 1st order delay (PT1 element) can be configured for a "quiet" display of the torque command value by entering a filter time.
The sampling time (Ta) for the torque command value displays is 1 ms.

11 Velocity Parameters

ID00036 Velocity command value [rpm] (can be changed online)

velocity command value. Activation through binary input after function code assignment.

ID00038 Positive velocity limit [rpm] (can be changed online)

ID00039 Negative velocity limit [rpm] (can be changed online)

Positive and negative limitation of the speed (velocity) command values. If velocity command values exceed the limits, the message bit $n_{command} > n_{limit}$ (code 335) is set. The accuracy is limited to |1 rpm|.

ID00040 Velocity feedback value

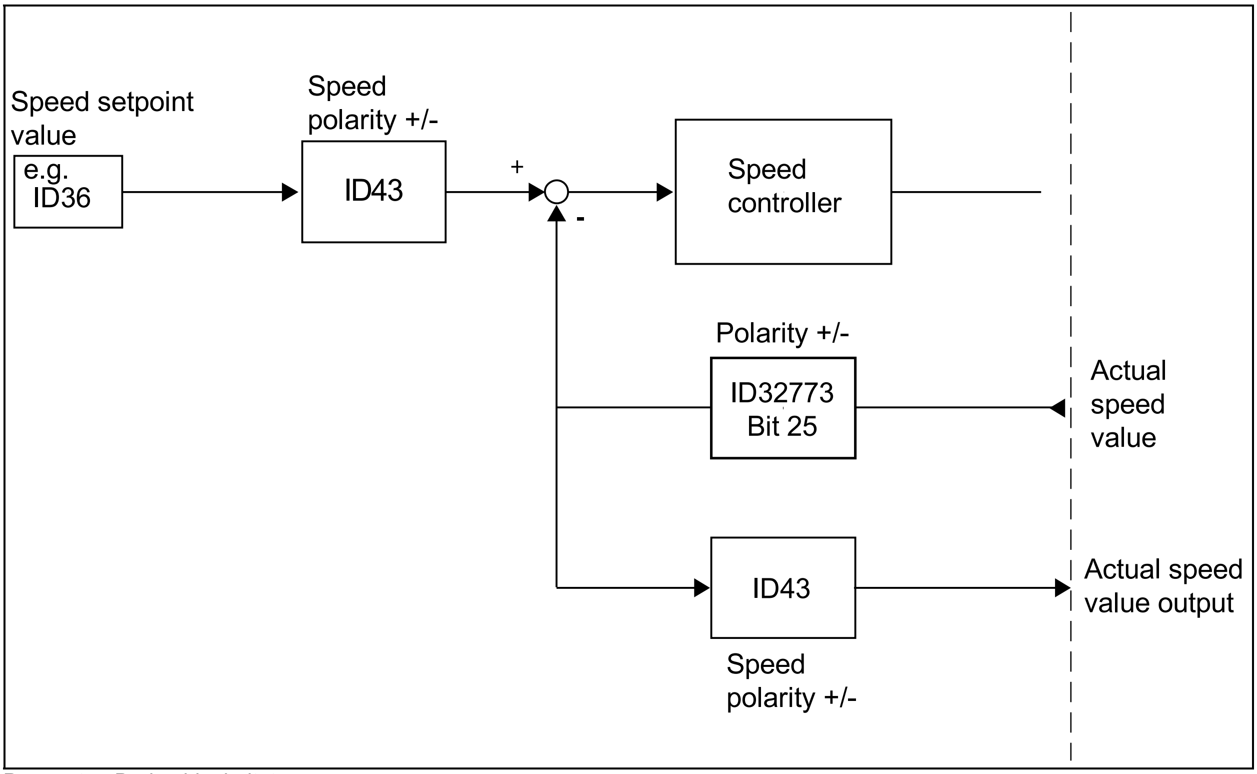
The velocity feedback value can be evaluated by reading this Ident number. The display is influenced by the velocity scaling (see velocity scaling parameter ID44).

ID00043 Velocity polarity

Determining the polarity of velocity data. Clockwise viewed onto the motor shaft (A bearing side) prevails for positive velocity command value and positive polarity.

<table>
<tr><th>Bit-No.</th><th>Value</th><th>Meaning according to ID43</th></tr>
<tr><td rowspan="2">0</td><td>0</td><td>Speed (velocity) command value
Polarity positive</td></tr>
<tr><td>1</td><td>Polarity negative</td></tr>
<tr><td>1</td><td></td><td>Reserved</td></tr>
<tr><td rowspan="2">2</td><td>0</td><td>Speed (velocity) feedback value (only for display)
Polarity positive</td></tr>
<tr><td>1</td><td>Polarity negative</td></tr>
<tr><td>3 - 15</td><td></td><td>Reserved</td></tr>
</table>

Figure 13: Effect of the velocity polarity



Parameter_Drehzahlpolarität

Note: For general reversing of the motor rotation direction without intervention in control structures bit 16 in parameter ID32773 can be used. With bit 16 = 1 the motor rotation direction is reversed.

Speed controller

ID00100
ID00101
ID00102

Example setting instructions for the PID speed controller

The PID speed controller is to be set and optimized depending on the application. The exact mathematical description of all variables of the control loop is in practice often extremely cumbersome and difficult. For this reason a simple procedure shall be described here with which the controller can be systematically adjusted. For this purpose a speed jump (without a ramp) is to be applied as a control variable to the input of the speed controller. The jump response (actual speed value) is to be used for evaluation of the controller setting. In the specification of the speed jump it must be ensured that the drive is operated below the torque limit.

Proceed as follows.

1. **Adjustment of the proportional amplification K_P (ID100)**
   Set I_d and T_N to 0; the controller then operates as a P-controller. By increasing the K_P value the controller shall be brought into overswing. The actual speed then runs similarly to the curve with the solid line in Figure 15.
   If the speed controller does not have a tendency to oscillate the actual torque value can be used to evaluate the control.

   The K_P value determined in this way is now halved and entered in ID100.

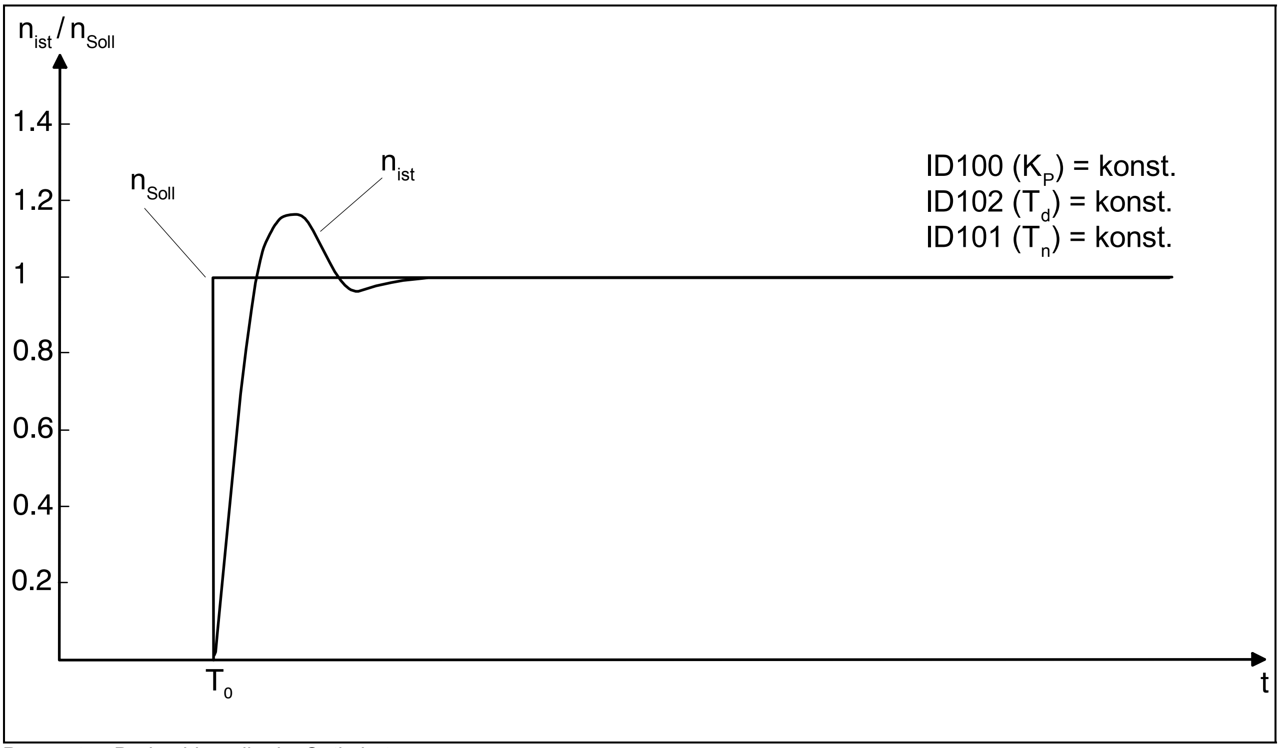
2. **Adjustment of the integral time T_N (ID101)**
   Now the integration time (starting from an initial value of e.g. 100 ms) is reduced until the die transient recovery time is minimal. With an optically set integral action time the actual speed value (jump response) more or less follows the solid line in Figure 16.

   With an optimally set PID controller the actual speed value as the response to a target value jump may overswing by a maximum of 20%.

3. **Adjustment of the differentiation time T_d (ID102)**
   The differentiation time T_d is increased until the desired damping of the jump response is achieved. The curve with the solid line in Figure 17 serves as the base for setting the PID controller.

   With an optimally set PID controller the actual speed value as the response to a target value jump may overswing by a maximum of 20%.

Figure 14: Transfer function of the speed control loop, effect of T_N

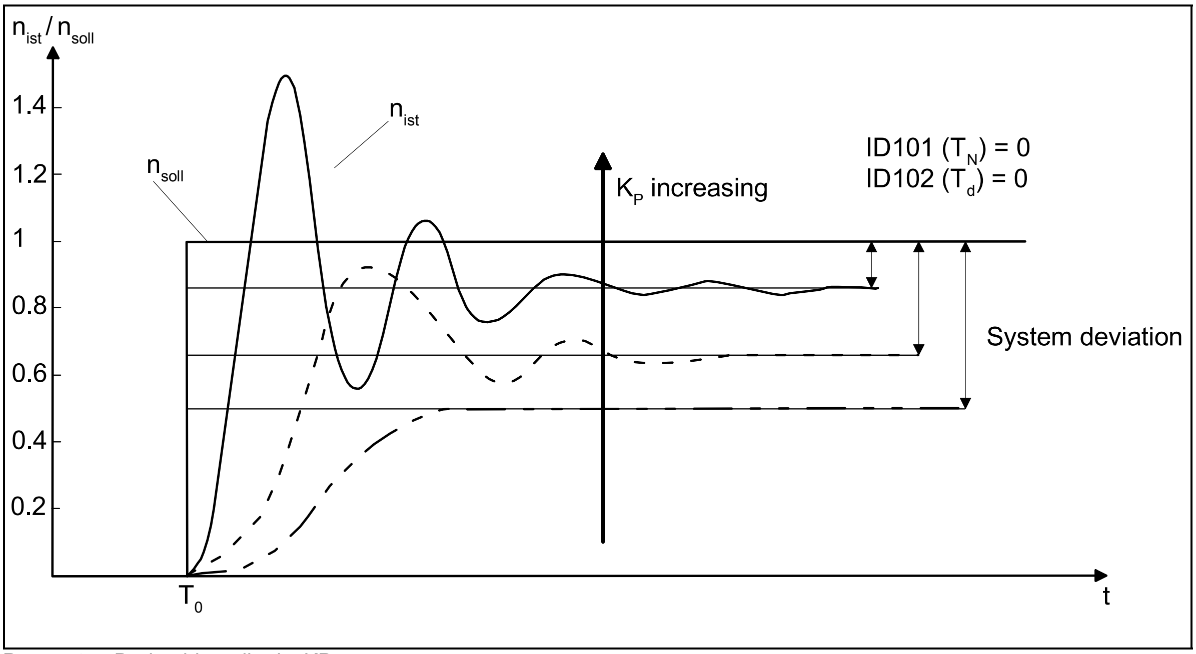


Parameter_Drehzahlregelkreis_Optimiert

ID00100 Velocity gain KP (can be changed online)

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

Figure 15: Transfer function of the speed control loop, effect of KP (ID100)



Parameter_Drehzahlregelkreis_KP

Graph of the feedback speed of the speed control loop with abrupt change of the velocity command value depending upon K_P (100).

Formula 13: Parameter dependencies ID100

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

Condition: $1 \leq \text{kpdzl} \leq 32767$

Formula 14: Torque dependence

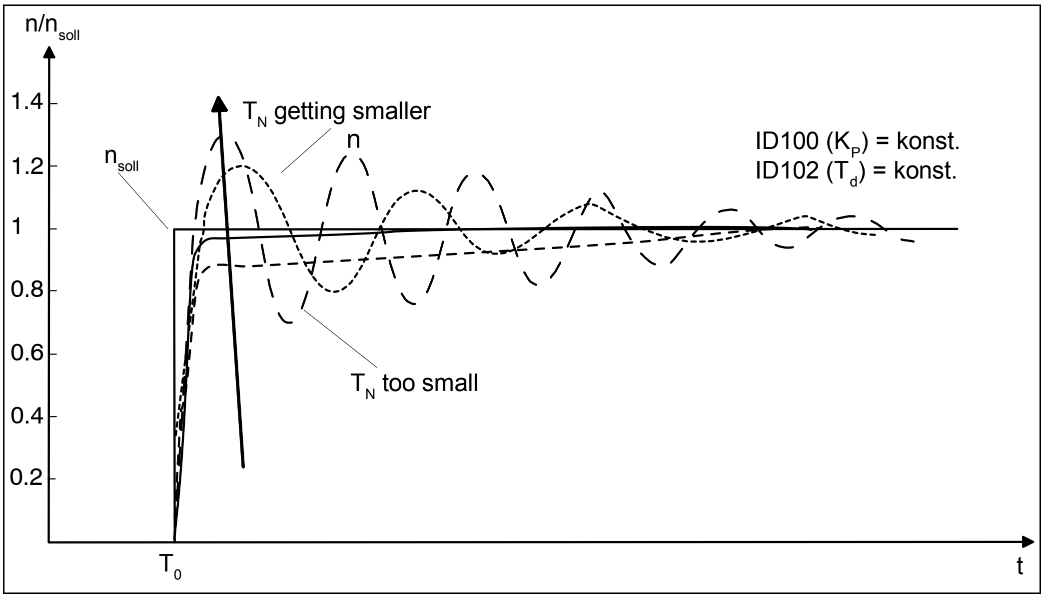
$$M[\text{Nm}] = \Delta n \left[0{,}0001 \cdot \text{min}^{-1}\right] \cdot \frac{\text{ID100} \cdot \text{ID32771}}{16384^2}$$

kpdzl	System-internal K_P factor
ID100	DZR gain K_P
ID110	Inverter peak current
ID111	Motor nominal current I_N
ID32769	Magnetizing current I_M
ID32771	Motor nominal torque
M [Nm]	Torque
Δn	Speed controller input variable $\Delta n = n_{command} - n_{feedback}$

ID00101 Velocity integral time T_N (can be changed online)

The integral time TN (integral component) of the PI speed controller must be optimized by the user.
The control deviation resulting from the P-controller is compensated by the integral component in the controller.
The integral time, i.e. the integral component of the PI speed controller is ineffective with T_N = 0 ms. The speed controller then works as pure P-controller.

Figure 16: Transfer function of the speed control loop, effect of T_N (ID101)



Parameter_Drehzahlregelkreis_TN

Graph of the feedback speed of the speed control loop with abrupt change of the velocity command value depending upon T_N (ID101).

Formula 15: Parameter dependencies ID101

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

Condition: $1 \leq \mathrm{kidzl} \leq 32767$

kidzl = System-internal factor
ID100 = DZR gain KP
ID101 = DZR integral time TN
ID110 = Inverter peak current
ID111 = Motor nominal current IN
ID32769 = Magnetizing current IM

Attention: The unit of Ident numbers is depending on the device
KU: ms/16
KW: ms

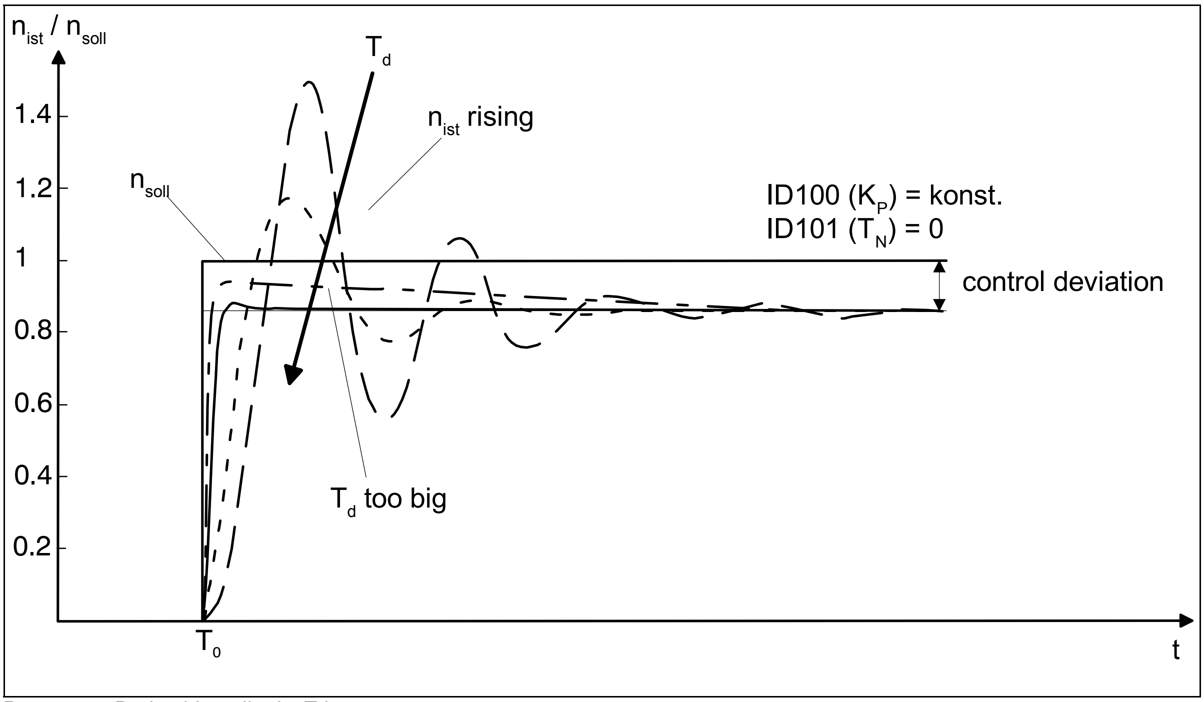
An example for systematic setting of the PID speed controller can be found in the explanations for ID100.

ID00102 Speed controller differentiation time T_d (rate time)

The differentiation time Td (differential component) of the PID speed controller must be optimized by the user. The D-component acts as a damping element in the PID controller.

With ID102 = 0 the differential component has no effect in the speed controller.

Figure 17: Response characteristic of the speed control loop, operation T_d (ID102)



Parameter_Drehzahlregelkreis_Td

Variation of the actual speed of the speed control loop when the speed setpoint in dependence to Td (ID102) is changed with a Step function.

Formula 16: Parameter dependence ID102

$$\mathrm{kddzl} = \mathrm{ID102} \cdot \mathrm{kpdzl}$$

Requirement: $1 \leq \mathrm{kddzl} \leq 32767$

kddzl system internal K_d-factor
kpdzl system internal K_P-factor

An example for systematical setting of the PID speed controller is in the explanations to ID100.

ID00124 Zero velocity window [rpm] (can be changed online)

If the velocity feedback value is within the zero velocity window ($|n_{feedback}| < \mathrm{ID124}$), then the message bit "$n_{feedback} < n_{min}$" (331) is set.

ID00125 Velocity limit nx [rpm] (can be changed online)

If the velocity feedback value is less than the velocity limit n_x ($|n_{feedback}| < ID125$), then the message bit "$n_{feedback} < n_x$" (332) is set.

ID00157 Velocity window [rpm] (can be changed online)

As long as the difference between velocity command value and velocity feedback value is less than the velocity window (ID157) ($|n_{command} - n_{feedback}| < ID157$), the message bit $n_{feedback} = n_{command}$ "Code 330" is set.

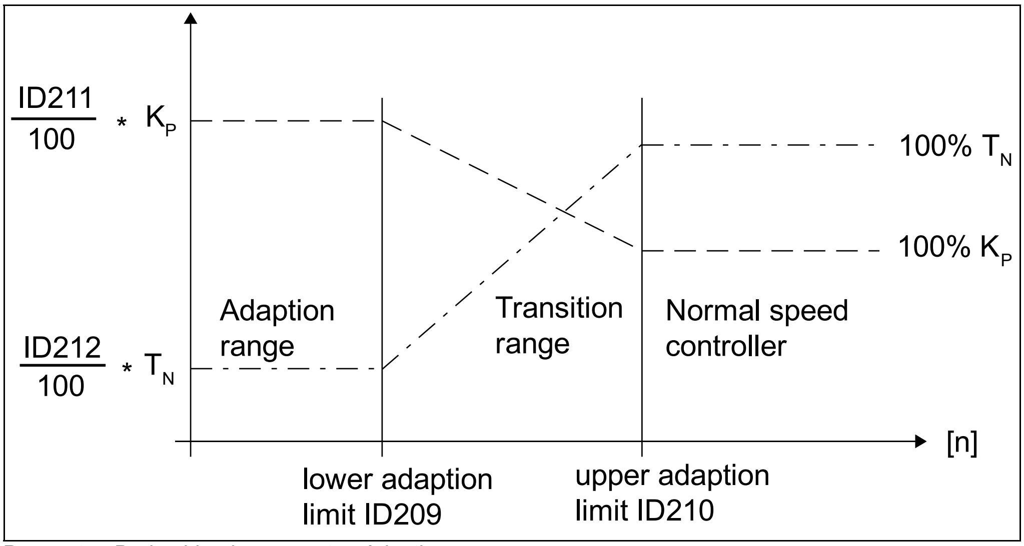
ID00209 DZR lower adaptation limit [rpm]

ID00210 DZR upper adaptation limit [rpm]

Velocity limit for the adaptation of K_P and T_N.
K_P and T_N change linearly in the range between the **lower and the upper adaptation limit**, i.e. the control response changes depending upon the velocity feedback value (See following illustrations).

Conditions: ID209 < ID210, Adaptation
ID209 = ID210, No adaptation

Figure 18: Adaptation of the speed controller parameters K_P and T_N



Parameter_Drehzahlreglerparameter_Adaption

Under the lower adaptation limit K_P and T_N act according to ID211 and ID212.
Above the upper adaptation limit K_P and T_N act unchanged according to ID100 and ID101, between linear adaptation.

ID00211 DZR gain adaptation [%]

The adaptive proportional gain states below the lower adaptation limit the percentage value related to the speed controller proportional gain K_P (ID100).

Formula 17: Adaptation of proportional gain

$$K_{P\,\text{Adaptation range}} = \text{ID100} \cdot \frac{\text{ID211}}{100\%}$$

ID00212 DZR integral time adaptation [%]

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

Formula 18: Adaptation of integral time

$$K_{P\,\text{Adaptation range}} = \text{ID100} \cdot \frac{\text{ID212}}{100\%}$$

The speed controller proportional gain and integral time change linearly in the range between the lower and the upper adaptation limit, i.e. the control response changes depending upon the velocity feedback value (see ID209, ID210).

ID32778 Velocity at 10V at A1 [rpm] (can be changed online)

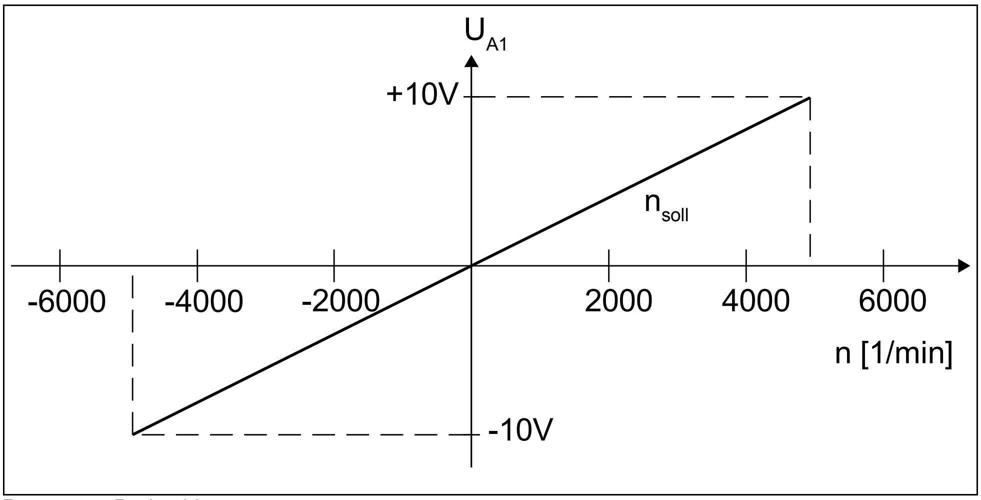
Absolute value of the velocity final value at 10V input voltage at the analogue input A1 of the inverter. The command value voltage $\pm$ 10V is processed with an internal resolution of $\pm$ 11 bits.

Example: At 10V command value the motor should rotate at 5000 rpm. ID32778 : 5000

Formula 19: Calculation example of the velocity at 10V at A1, ID32778

$$10\text{V} = 5000\text{ rpm} \rightarrow n_{\text{comd.}} = 5000\text{ rpm} \cdot \frac{U_{A1}}{10\text{V}}$$

Figure 19: Velocity depending upon the input voltage at A1



Parameter_Drehzahl

ID32779 Velocity offset at A1 [rpm] (can be changed online)

The parameter **"Velocity offset at A1"** offers in the operating mode "Analogue speed control" the possibility of adding a **constant velocity command value** to the relevant analogue command value (ID32778)

In the case of correction values of | ID32779 | 1 rpm, it should be observed 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}), no change of the slope of the straight line (see figure Velocity depending upon the input voltage at A1).

Note:	With ID34037/ID34038 "Offset analogue input 1/2" the offset of the inputs can be adjusted independent of the operating mode.

ID32780 Acceleration ramp T_H [ms] (can be changed online)

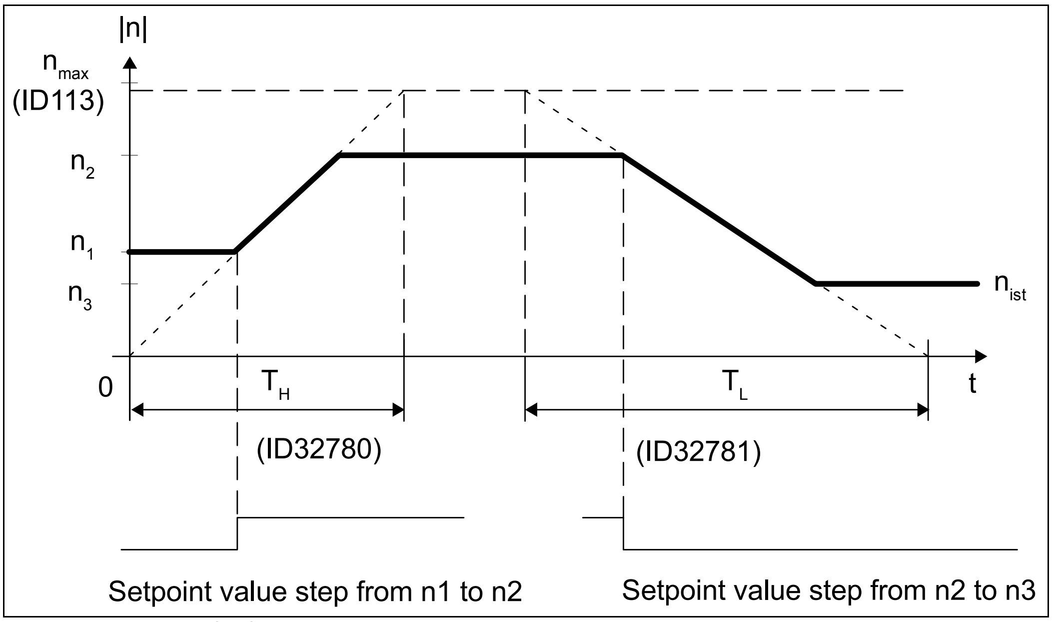
ID32781 Deceleration ramp T_L [ms] (can be changed online)

A ramp generator (ramp-up/ramp-down) becomes effective at the speed controller input by setting Bit6 = 1 in the operation mode parameter ID32800. The entered times apply for ramp-up and ramp-down between speed 0 rpm and maximum speed (ID113).

In the following illustration the effect of the acceleration and deceleration ramp parameter on setting velocity command value jumps is displayed.

$|n_2| < |n_1|$ → Acceleration ramp
$|n_3| > |n_2|$ → Deceleration ramp

Figure 20: Acceleration and deceleration ramp in relation to the maximum speed

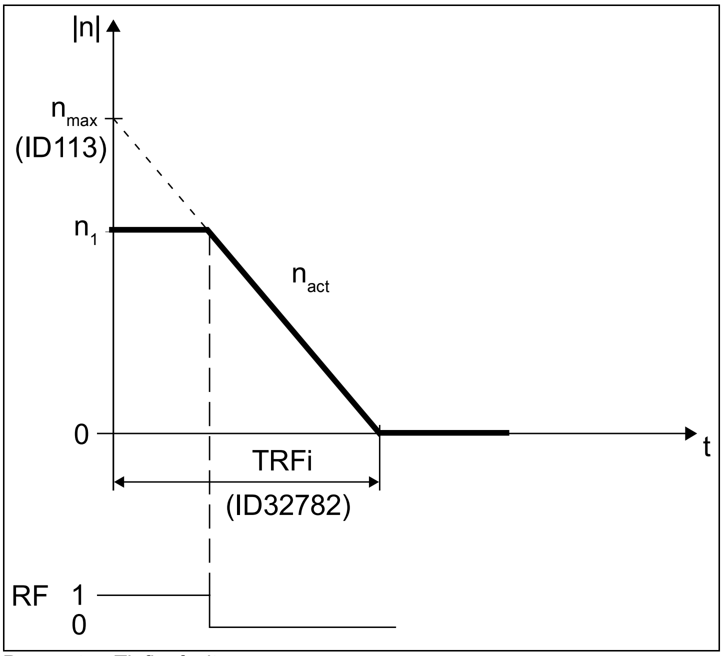


Parameter_Hoch-_Tieflaufzeit

ID32782 Deceleration ramp RF inactive [ms]

On removal of the controller enable, the motor is decelerated according to the "Ramp RF inactive" ramp ID32782. The entered time applies for the ramp-down from maximum speed (ID113) to speed 0.

Figure 21: Ramp-down time for RF inactive



Parameter_Tieflaufzeit

TRFi Ramp RF inactive (ID32782)

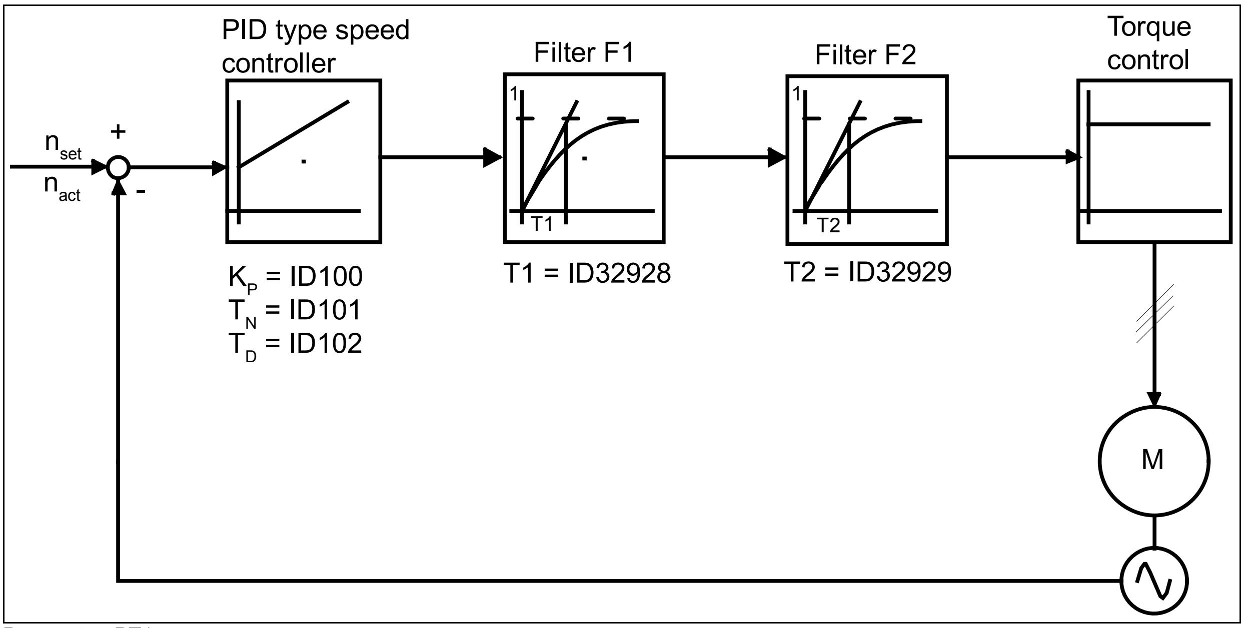
ID32928 Time filter 1 [ms]

ID32929 Time filter 2 [ms]

These parameters define the filter time constants for two freely programmable P-T1 torque filters F1 and F2. The filters are arranged after one another at the output of the speed controller. The use of the filter times matched to the system stabilizes the control loop and thus allows a higher loop gain by means of KP. The filters are used for example, for mastering inert masses. Expedient starting values for system optimization are for instance ID32928 = ID32929 = 2 ms. Values between 0.5 and 10 ms have proven themselves depending upon the application.

The time constants for filter F1 and F2 are entered in ID32928 and ID32929. The value "0" in ID32928 and ID32929 cancels the effect of the filters.

Figure 22: P-T1 Filter model



Parameter_PT1

The 3dB transition frequencies are:

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

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

ID32932 Barrier frequency [Hz]

As a result of the design the operation of machines can lead to resonance frequencies. To be able to filter out these frequencies, a configurable band filter is offered at the output of the speed controller (range 40Hz to 2 kHz).

If a value not equal to zero is written in ID32932, the filter is active and the entered value defines the barrier frequency of the band filter.

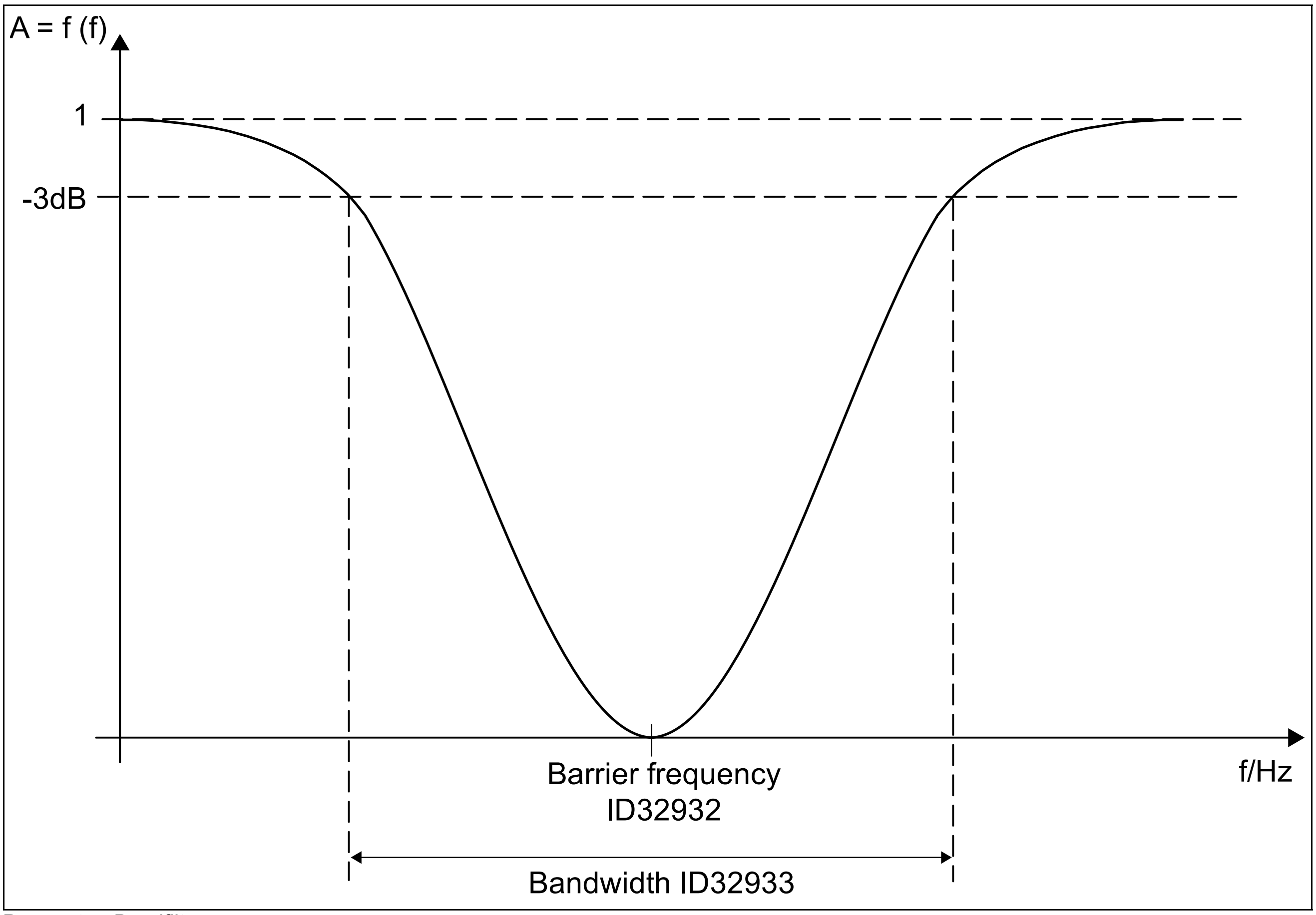
The bandwidth of the band filter is defined in ID32933.

ID32933 Bandwidth [Hz]

ID32933 identifies the 3dB bandwidth of the filter configured in ID32932.

For instance, if the resonance frequency of a machine is 800 Hz (ID32932 = 800 Hz) and the bandwidth is parameterized with 100 Hz (ID32933 = 100 Hz), then frequencies of 800 Hz ± 50 Hz are filtered out at the output of the speed controller.

Figure 23: Band filter pass characteristic



Parameter_Bandfilter

ID32991 U/f startup [%]

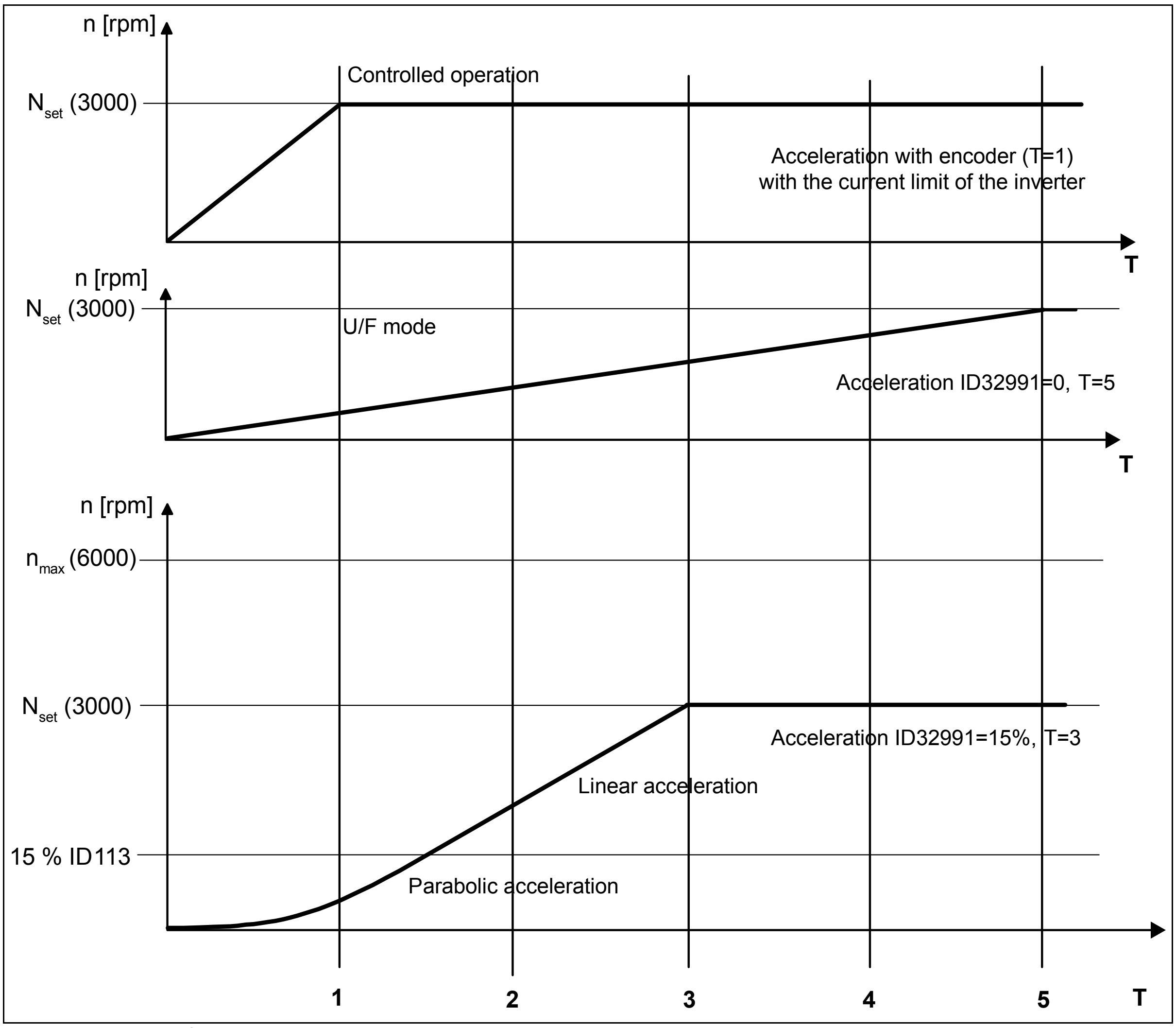
This parameter acts when operating a motor in voltage/frequency control (U/f mode). The U/f mode allows speed-controlled motor operation without encoder feedback. In U/f mode starting from standstill frequently represents a problem, since on the axis "breaking loose" a high current may flow and this can lead to overload of the control unit (short circuit shutdown).

This has the consequence that without soft start the speed ramp must be set flat on starting, but this leads to a non-dynamic response of the axis.

With ID32991, a voltage frequency control can be ramped up in parabola shape in the lower speed range (soft start). The motor accelerates to command speed linearly as from the speed determined in ID32991. The value to be entered in ID32991 is the relative speed related to the permissible maximum speed (ID113). The motor runs up according to a parabola until this speed is reached, then linearly with the ramp defined in ID32780.

If the drive is not at standstill, then it runs up with the linear ramp. The zero velocity window according to ID124 serves as decision criterion for the standstill.

Figure 24: Ramp-up behaviour in the U/f mode



Parameter_Hochlaufverhalten_UF

T = 1 is the time with which the motor used ramps up as quickly as possible in controlled operation. The converter runs at the current limit in this case. The minimum ramp-up time resulting from this is limited by the motor and the converter used.

In U/f mode with linear acceleration ramp, the ramp-up must be started with a factor of t = 5. A time of T = 3 is achieved by the parabola-shaped ramp-up.

The acceleration ramp in the U/f mode must be determined experimentally. Proceeding from long ramp-up times, the minimum acceleration ramp can be approximated step by step.

the effective acceleration ramp then results as follows:

$$Th_{eff} = ID32780 \cdot (1 + 0{,}01 \cdot ID32991)$$

The axis ramp-down is not influenced by ID32991, it corresponds to a t = 2 compared with that in the controlled drive.

Operation

The command frequency is set as in controlled operation by speed setting. The command value source is determined through the operation mode. The speed ramp according to ID32780, ID32781, ID32782 is effective if it is activated in the operation mode with bit 6. The ramp times may not be less than the physically achievable speed ramps of the system. Too steep ramps lead to message 2334 "Output terminal short circuit" or to the message 2321 "IGBT overcurrent". The command value is displayed after the ramp as velocity feedback value.

The following functions are not effective in the U/f mode:

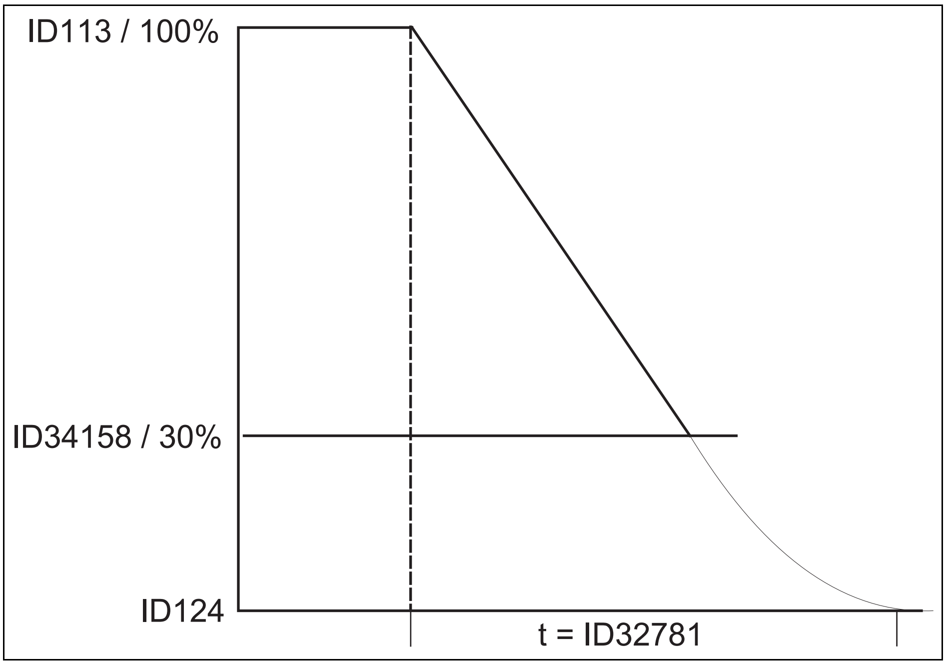
- I^2t converter monitoring
- Torque limitation e.g. according to ID82 / ID83
- Torque display
- Power display

The following parameters are decisive for the U/f operation mode:

Parameter	Designation	Description
ID32953	Encoder type	The motor model is selected with this parameter. 0020h must be entered for U/f mode.
ID32935	Standstill voltage	this parameter determines the voltage which is applied at standstill (frequency = 0). The voltage drop at the winding can thus be compensated
ID32768	Nominal motor voltage	this parameter determines the voltage which is applied at nominal speed
ID32772	Nominal speed	Up to this speed the voltage is increased to nominal voltage (ID32768). The voltage is kept constant at higher speeds
ID32775	Motor pole number	Pole number of the motor (name plate)
ID32780	Acceleration ramp	Time for ramping up from speed zero to maximum speed
ID32781	Deceleration ramp	Time for decelerating from maximum speed to standstill
ID32782	Deceleration ramp RF inactive	Deceleration ramp with controller enable removed (controlled ramp-down)
ID32991	U/f startup	Velocity limit for the transition from parabola-shaped starting into a linear ramp-up movement

ID34158 Soft breaking

The parameter ID34158 is used for soft breaking.
The value to enter is the relative speed in % of the maximum speed ID113.
If the motor reach this speed it will soft brake (parabolic deceleration) down to standstill (=ID124 zero velocity window).



12 Position Parameters

ID00049 Positive position limit [incr.] (can be changed online)

ID00050 Negative position limit [incr.] (can be changed online)

The position limits monitor the travel of the axis in positive and negative direction. Before evaluation of the message bit, a homing run must be performed.

In each case when the limit value is reached a reporting bit is set (33015 for $x_i \geq$ + Soft-End and 33013 for $x_i \leq$ - Soft-End) which can be assigned to a binary output. **The reporting bits do not generate an axis stop!** The evaluation of the binary outputs is performed by the higher-level controller.

If the axis is controlled through the 16-bit position command value channel, then an automatic axis stop (command value limitation in the 16-bit command value channel) on exceeding the limits can be parameterized through ID32773.

ID00055 Position polarity

The polarity of the position data is determined with this parameter, the direction of rotation of the axis changes with unchanged sign of the command value setting. Positive polarity = clockwise rotation viewed on the motor shaft.

Caution: With external position feedback value encoder the direction of rotation can be influenced in addition by ID115. The control direction of the position controller remains unchanged, the position command values and the position feedback value and the position feedback value display are switched corresponding to the illustration.

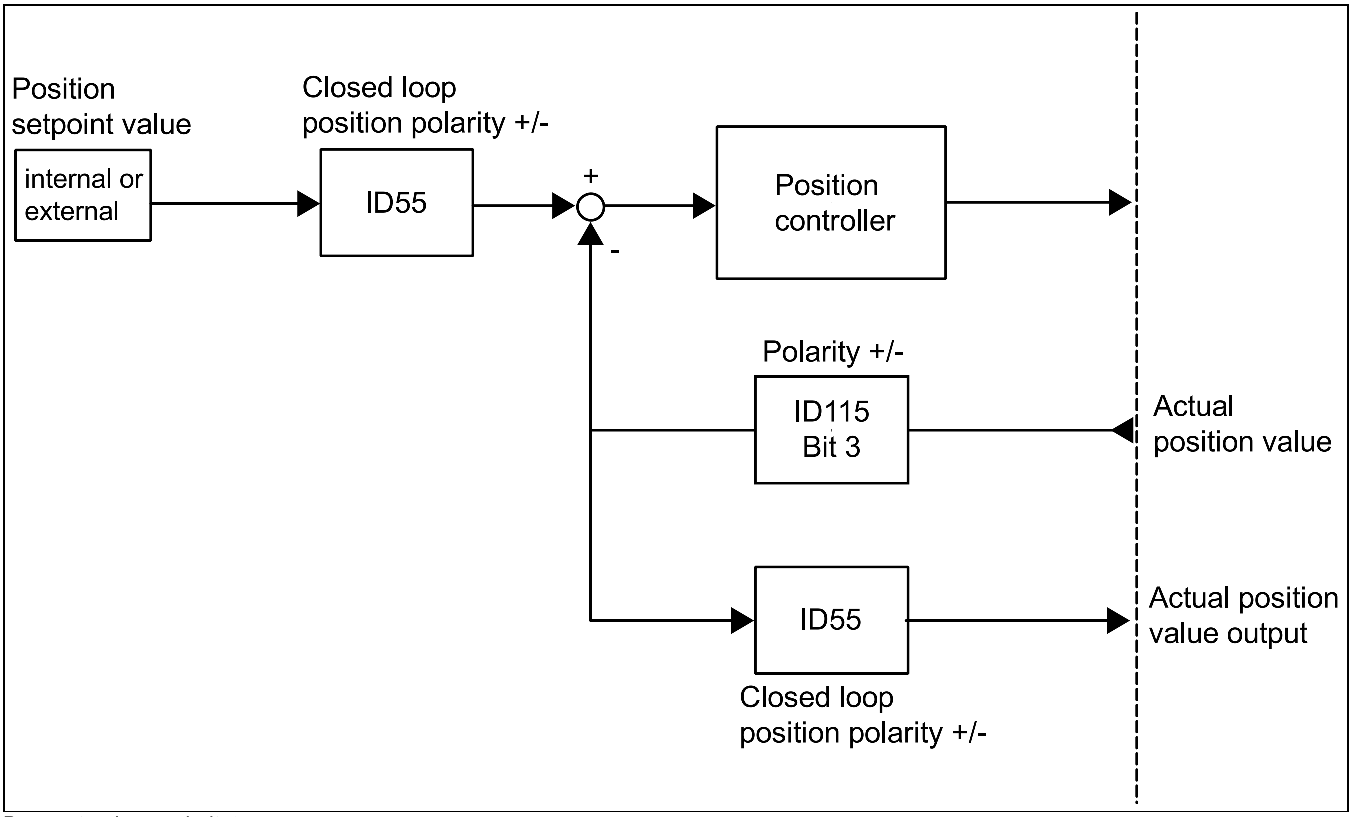
Bit-No.	Value	Meaning according to ID55
0	0	**Position command value** Polarity positive
	1	Polarity negative
1		Reserved
2	0	**Position feedback value motor encoder** Polarity positive
	1	Polarity negative
3	0	**Position feedback value ext. encoder** Polarity positive
	1	Polarity negative
4 - 15		Reserved

Command and feedback values must always be defined equally **in pairs**.

Only the following bit combinations are permitted:
0000h Polarity positive, independent of the position feedback value encoder
0005h Polarity negative, position feedback value encoder = motor encoder
0009h Polarity negative, position feedback value encoder = ext. encoder

Note: For general reversing of the motor rotation direction without intervention in control structures bit 16 in parameter ID32773 can be used. With bit 16 = 1 the motor rotation direction is reversed.

Figure 25: Effect of the position polarity



Parameter_Lagepolarität

ID00103 Modulo value [incr.]

The modulo value defines the final value of position data in the modulo format.
Values which are processed modulo count between zero and the modulo final value. The modulo values are displayed by the configurable 32-bit inverter message (code 32899 position feedback value modulo and code 32900 position command value modulo) see chapter Inverter Parameters. When there is a linear connection and output e.g. analogue voltage a saw tooth voltage is created.

The modulo value according to ID103 must be activated through the operation mode parameter of the current operation mode with bit 13 = 1.

This parameter acts among other things in positioning processes in connection with the drive function "Synchronous control …"

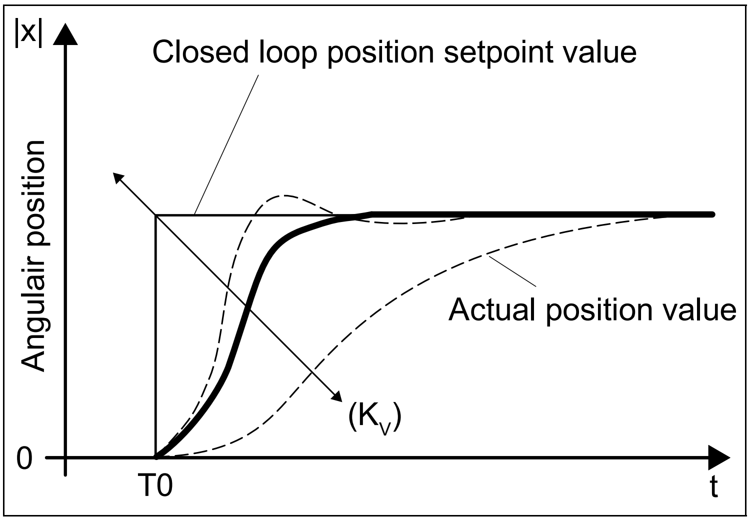
Apart from the modulo value according to ID103 the modulo value can also be processed according to ID116 / ID117 "External encoder resolution". For this purpose set "Motor encoder resolution" in the operation mode parameter bit 13 = 9.

It is described in the chapter Scaling Parameters how the processing format of ALL position data can be switched over from the absolute format (standard setting) into the modulo format.
(See ID76 position scaling parameter).

ID00104 Position loop K_V [rpm] (can be changed online)

Proportional gain K_V of the P-position controller

Figure 26: Transfer function of position control loop, effect of K_V (ID104)



Parameter_Lageregelkreis_KV

Graph of the position feedback value on step input of a position command value.

The following conditions must be completed with:

Formula 20: System-internal limitation of the velocity gain K_V

$$0.0555 \leq \frac{K_V}{0.0001 \cdot LA} \leq 32767$$

LA = Position resolution factor (encoder-dependent)

Motor encoder as position feedback value encoder:

LA = ID116 ID116 = motor encoder resolution

External rotational encoder:

Formula 21: Position resolution factor for external position feedback value encoder

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

ID117 = Resolution of external position feedback value encoder (line number per gear output revolution)
ID122 = Gear output revolutions
ID121 = Gear input revolutions

ID00115 Position feedback type

Properties of the external position feedback value encoder are defined in the position feedback type parameter. The parameter acts only for an active, external position feedback value encoder (see ID32800). The resolution of the position encoder defined here is determined in ID117 "External encoder resolution".

Bit-No.	Value	Meaning according to ID115
0	0	**Feedback value encoder type** Rotation encoder
	1	Linear encoder
1 – 2		Reserved
3	0	**Sense of movement** not inverted
	1	Inverted
4 - 15		Reserved

Caution: If the sense of movement of the external position feedback encoder is wrongly defined, then the position controller is switched over from "normal negative feedback" to "positive feedback" and the axis will accelerate to the defined velocity limit according to ID38, ID39. Furthermore, the selected position polarity according to ID55 must be observed.

ID00117 External encoder resolution [incr.]

The parameter acts only with external position feedback value encoder. refer to the datasheet of the external encoder for the pulse / line number. The parameter is used for calculating the K_V factor effective in the P position controller.
The use of an external actual position encoder must be specified in the main operating mode ID32800.

Note: If an external actual position encoder is defined then the actual position value is fundamentally evaluated by this encoder in all position-controlled operating modes.

The type of the external actual position encoder is to be defined in ID32953.

Formula 22: Determining the resolution for sine encoders

ID117 = 4 · ID32776 · PV
ID32776 – Sine encoder period
PV - Position refinement = (1 … 128, integer!)

Example: ID32776 = 50 (name plate), PV = 100 selected
ID117 = 20000 incr./motor revolution

Formula 23: Determining the resolution for resolvers

ID117 = 4 · 128 · PV
PV Position refinement = (1 … 128, integer!)

Formula 24: Determining the resolution for pulse encoders

(two square wave signals phase shifted by 90 degrees)

ID117 = 4 · ID32934 (Pulse encoder period)

Encoder resolution when using absolute value encoders (S- / T- and E- / F-type encoder)

ID117 = 4 · ID32776 · PV
PV - Position refinement = (1 … 128, integer!)
ID32776 - Sine encoder period

ID00121 Gear input revolutions [U]

ID00122 Gear output revolutions [U]

These parameters act in the AMK scaling base only for external position feedback value acquisition. There can be a change of the data reference in ID76 position scaling parameter. Refer to the name plate (or datasheet) of the gear for the parameter values. The gear ratio of the gear I is used among other things for calculating the KV factor effective in the P-position controller.

Formula 25: Gear ratio

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

The input and output revolutions must be entered as integers. The gear ratio is taken into account in addition in the area of speed adaptation in the "spindle positioning" and "synchronous control" drive functions for calculating command velocities, for instance.

Note:	With external actual position encoder and "Data reference on load", the transmission parameters have to be entered for the guide speed to be correctly calculated.

ID00123 Feed constant [mm/U]

The feed constant states which distance the slide moves for one revolution of the gear output.
When linear motors are used, the feed constant describes the length of a pole period of the linear motor.

In the scaling of data the relation between rotational movements and linear movements is defined through the feed constant.

ID00159 Excessive error [incr.]

If the difference between position command value and position feedback value (following error) is greater than the "excessive error", the controller enable is withdrawn from the drive and the axis coasts. At the same time the collective ready message is reset and a diagnosis message (No. 2318) is output.

Caution: The value in ID159 must be integer

OLD: It is internal multiplied with the factor 16384

NEW: From central processor KW-R02
There is no internal compensation. Setting the maximum permissible following error in [incr.]

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

$$\mathrm{SA}[\mathrm{mm}] = \frac{\text{Maximum feed velocity}[\mathrm{mm/min}]}{\text{ID104 Velocity gain } K_V\,[1/\mathrm{min}]}$$

The following error is converted from [mm] into [incr.] using the "Travel per motor revolution" and the "Encoder resolution" (ID116 and ID117):

$$\mathrm{SA}[\mathrm{incr.}] = \frac{\mathrm{SA}[\mathrm{mm}] \cdot \mathrm{ID116}[\mathrm{incr.}]}{\text{Travel / Motor revolution}[\mathrm{mm}]}$$

Formula 26: Calculation of ID159, excessive error

OLD: $$\mathrm{ID159} = \frac{\text{Max. permissible following error}[\mathrm{incr.}]}{16384}$$

NEW: ID159 = Max. permissible following error [incr.]

ID32811 Encoder type option

In this parameter the encoder type has to be entered ("A hex" for EnDat-encoder type E / F), if a 2nd sine / cosine encoder is connected to the KW system via the option card KW-EN1 (only EnDat-encoder type is supported). This encoder is used as external positioning encoder.

ID32824 Following distance

The following distance can be evaluated by reading this parameter. Only reading access to this parameter is possible.

ID32922 Residual distance window [incr.]

If an axis is moved with inactive controller enable, then this change of the position is registered as control difference dx. On activation of the controller enable, a decision is made (ID32922) whether dx is deleted or whether dx is allowed as compensation movement.

$\lvert dx \rvert \leq$ ID32922 –	Position control difference is compensated by return axis movement
$\lvert dx \rvert >$ ID32922 –	Position control difference is removed by residual distance deletion (without axis movement). A bit message (code 33048), which can be assigned to a binary output is generated internally simultaneously. In this way the higher level control system is signalled that a residual distance has been deleted.

Note: In drives which are driven in stepping motor mode, a homing run must absolutely be performed by the higher level control before the start of the automatic sequence is enabled. This can also become absolutely necessary in systems in synchronous operation depending upon the application.

ID32958 Cycle time 16 bit position setpoint value

The specified raster in which 16-bit position setpoint values (e.g. set pulses for synchronous running) are sampled; can be set a multiple of 0.5 ms.

Note: If 16-bit position setpoint values are specified (e.g. by AE-PLC) then depending on the application the same value must in certain circumstances be entered in ID32958 and in ID2 "Sercos cycle time".

13 Positioning Parameters

ID00041 Homing velocity [rpm] (can be changed online)

This parameter determines the velocity for the homing run. The minimum value achievable by the drive depends in addition upon the selected accelerations ID136 or ID137 and is proportional to these (interpolator-induced).

ID00051 Position feedback value

The position feedback value can be evaluated by reading this Ident number. The display can be influenced by the position scaling (see Position scaling parameter ID76).

ID00057 In position window [incr.]

If the difference between position command value and position feedback value is smaller in amount than the in position window $| X_{command} – X_{feedback} | < ID57$, the "in position" message bit (code 336) is set. The message bit is generated only in positioning processes (homing run, spindle positioning, point-to-point / angle control) and refers to the specified final position. It can be assigned to a binary output.

ID00136 Positive acceleration [U/s²] (can be changed online)

ID00137 Negative acceleration [U/s²] (can be changed online)

The parameters are input variables of the internal interpolator and define **the linear part** of the positive and negative acceleration during the positioning run. Both acceleration values must be pre assigned the same amount and may generally **NOT exceed** the maximum possible physical acceleration of the drive (current limitation in the inverter). The additional acceleration value according to ID32956 acts as further parameter on the acceleration.

ID32956 Additional acceleration value

The additional acceleration value describes the number of interpolator cycles up to reaching the nominal acceleration according to ID136 or ID137 defined by the user. The achieved interpolator cycle time (T_i) is 1 ms. Thus the following time (T1) until transition to nominal acceleration result:

Formula 27: Interpolator transient time to nominal acceleration

T1 = Ti · ID32956 = 5 ms · ID32956

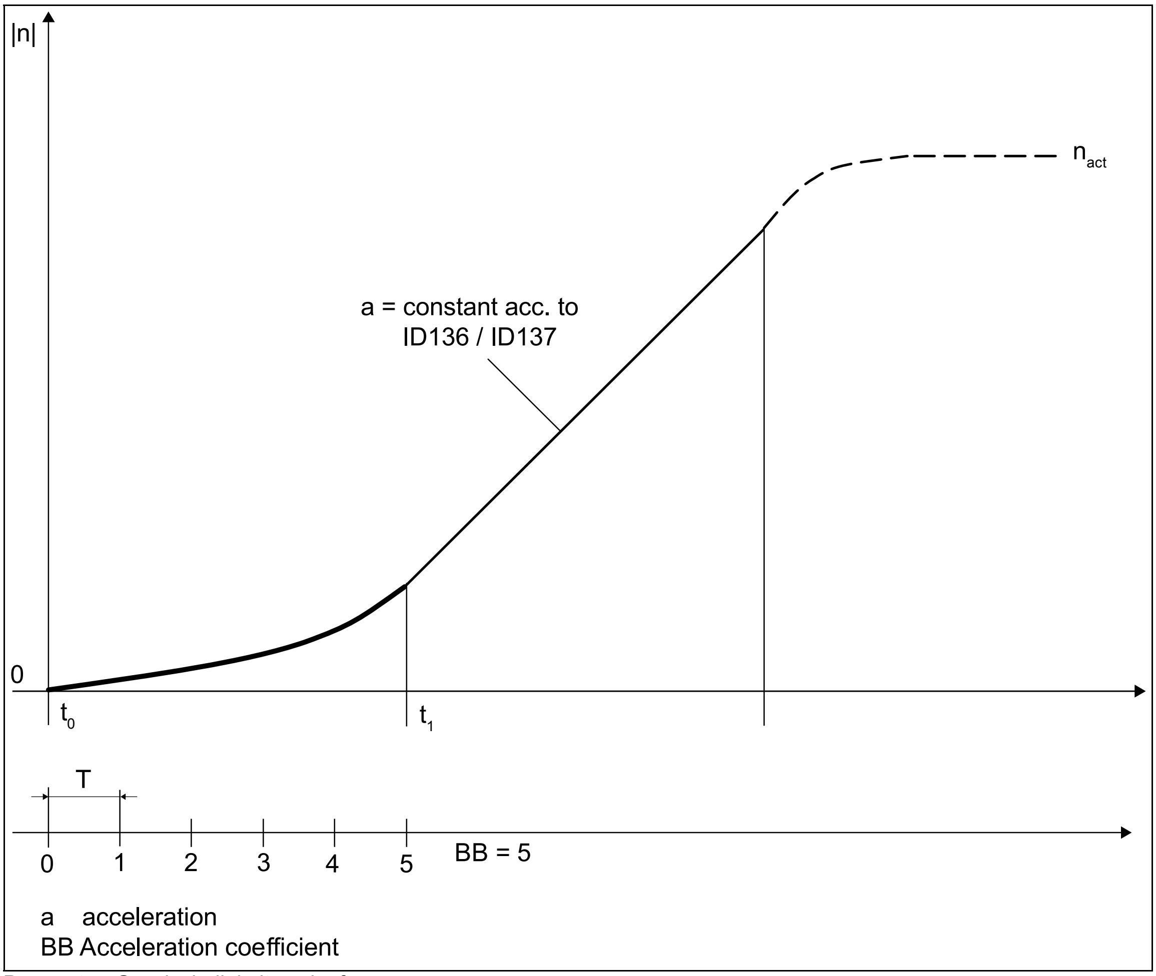
The following parameters influence the course of positioning by means of interpolator:

ID116	Motor encoder resolution
ID117	External motor encoder resolution
ID136 / ID137	Positive / negative acceleration
ID32956	Additional acceleration value
ID222	Spindle positioning speed
ID41	Homing velocity

The acceleration achievable by the interpolator according to ID136, ID137 depends directly upon the addition acceleration value (BB).

4/BB ≤ (ID136 / | ID137 |) ≤ BB/4

Figure 27: Velocity curve, additional acceleration value



Parameter_Geschwindigkeitsverlauf

T = 5 ms

Phase $t_1 - t_0$:	"Soft" transition to nominal acceleration. The time is determined by the additional acceleration value.
Phase $t_2 - t_1$:	Constant acceleration according to ID136 (or ID137 for deceleration)

ID00147 Homing parameter (can be changed online)

The homing parameter defines control instructions for the homing drive function (manufacturer-specific extension see ID32926)

Bit-No.	Value	Meaning according to ID147
0	0	**Homing direction** Positive = clockwise viewed onto the motor shaft
	1	Negative = counter clockwise viewed onto the motor shaft
1	0	**Active edge of the reference switch** Positive edge of the reference switch (cam)
	1	Negative edge of the reference switch (cam)
2 - 14		Reserved
15	0	**Manufacturer specific extension** Bit bar according to SERCOS Interface® definition
	1	AMK extensions effective according to ID32926

If reference is not made to ID32926, then active cam evaluation in combination with subsequent zero pulse evaluation (see ID32926) applies as standard setting.

ID32926 AMK homing parameter (can be changed online)

The AMK homing parameter defines manufacturer-specific control instructions for the homing run drive function (see also ID147).

Bit-No	Value	Meaning according to ID32926
0 - 7		Reserved
8	0	**Type of command value input for homing** Movement of the axis in the homing by means of internal interpolation
	1	* Movement of the axis in the homing run by means of external setpoint setting (e.g. by external interpolation or in the slave synchronous mode)
9	0	**Homing run onto fixed stop** Inactive
	1	Homing onto the 1st zero pulse after the direction reversal; triggering by a defined torque peak according to ID126 as reference signal
10	0	**Homing without change of the actual position value (step change)** Actual position is set to "0" in home position
	1	Actual position is NOT set to "0" in home position
11	0	**Cam evaluation active** Homing with cam evaluation
	1	Homing without cam evaluation (Homing onto the zero pulse of the current position feedback value encoder)
12	0	**Cam arrangement** Linear cam: For cam signal = 1 (axis is at cam) → cam free running in the opposite direction, reversing, travel to cam, referencing
	1	Rotation cam: For cam signal = 1 (axis stands on cam) the system rotates on and references in homing direction up to the next cam signal
13	0	**Zero pulse evaluation** Homing run with zero pulse evaluation after reaching the reference point switch (cam)
	1	Homing run without zero pulse evaluation. reference point switch (cam) delivers reference signal simultaneously
14	0	**Cam type** Pulse cam
	1	Range cam (see high homing velocity ID32940)
15		Reserved

* Bit8 = 1:
The function homing cycle (homing without cam evaluation, Bit11 = 1) takes over the absolute position value within one revolution (modulo-value) to the actual position value for resolver, S-type and E-type encoder (singleturn absolute encoder).
At the homing cycle with cam evaluation (Bit11 = 0) the modulo-absolute position will be taken over to the actual position value, if the edge of the cam switch is detected

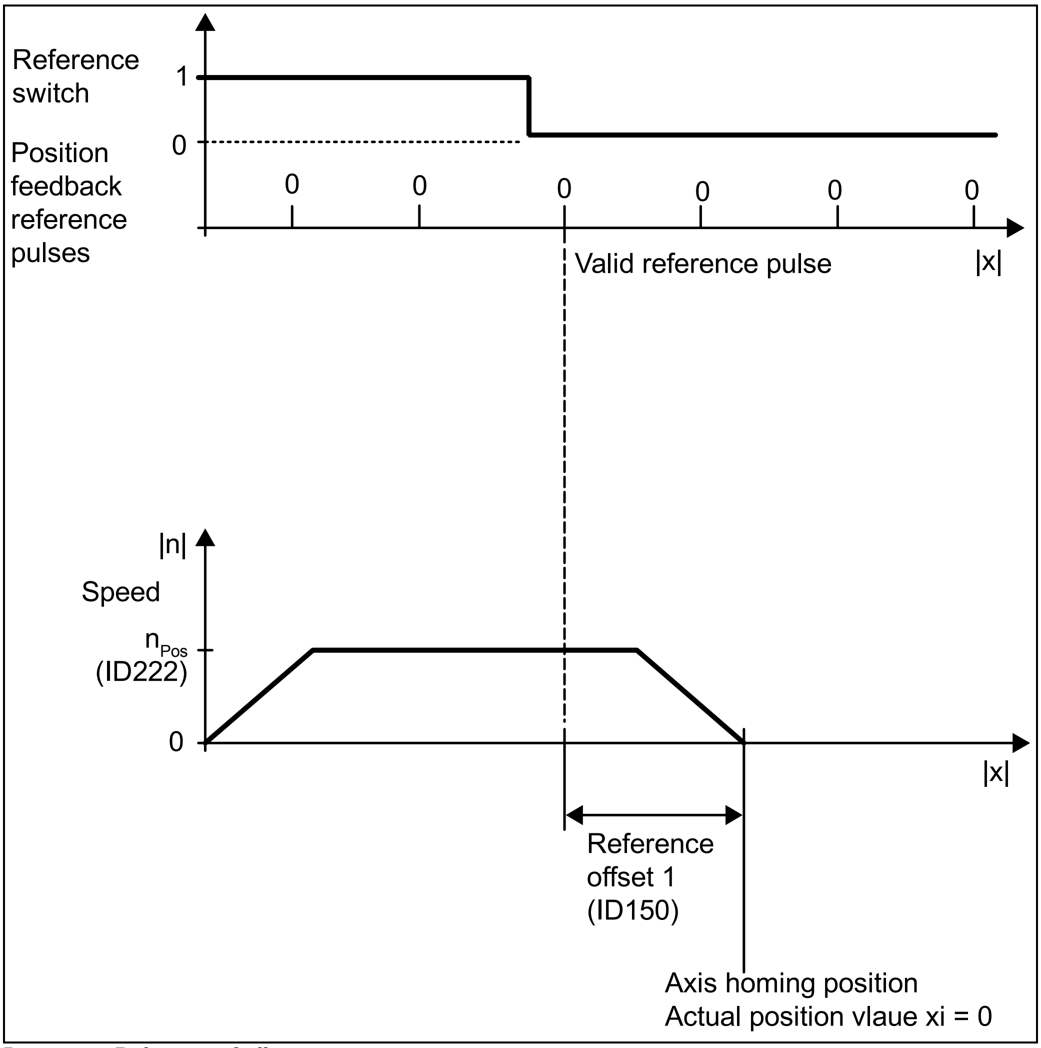
ID32936 Window

ID32936 "Window" is used with the mark positioning function to define the distance between two marks. The mark positioning is started cyclically via a binary input (assignment of function code 1031). Binary input BE4 must be used as the input for the mark signal for this function. For this purpose this input is assigned the code 401.

ID00150 Reference offset 1 (can be changed online)

Input of an offset between position encoder reference mark and zero position of the axis on homing. In this position the internal position counter is set to "0". This parameter is taken over during homing only in drive functions with homing (spindle positioning, homing run, synchronous control with angle alignment). In absolute value encoders the reference offset 1 is added with the correct sign to the read position feedback value.

Figure 28: Reference offset and angle position in homing



Parameter_Referenzmaßoffset

ID00153 absolute angle position [incr.] (can be changed online)

This parameter contains the absolute position setpoint for the "Absolute positioning" drive function. The absolute position, relative to the reference position, is determined taking into consideration the resolution of the current actual position encoder (ID116 for motor encoder resolution and ID117 for external actual position encoder resolution).

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

Formula 28: Calculation of the absolute angle position

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

By activating the position scaling the setpoint specification is also possible as a length or angle.

ID34070 Homing signal distance

The homing signal distance is the incremental distance between an external reference signal (NK) and the encoder zero pulse (NIP). The reference signal can be shifted virtual see ID32990.

After each successful homing run with NK and NIP, the value in ID34070 is updated. This also applies for drive functions in which the homing run is part (e.g. spindle positioning, synchronous control with angle compensation function).

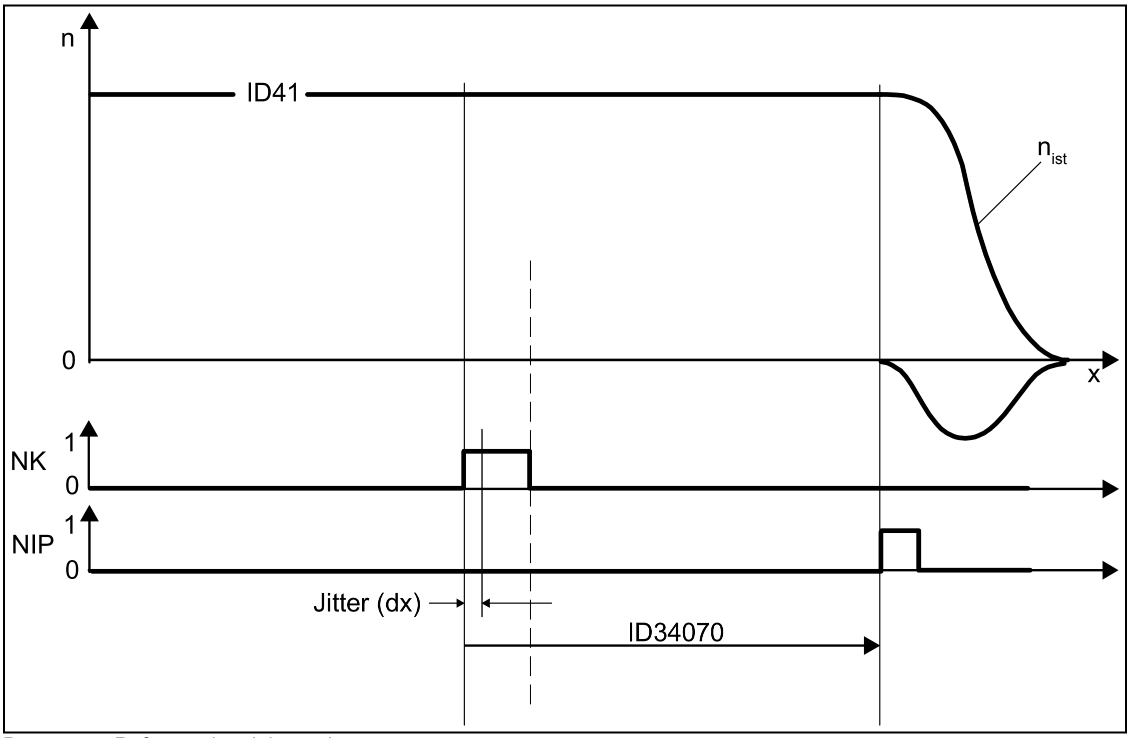
The value in ID34070 is present in the RAM memory as volatile system variable and is not filed permanently as database value.

The following events delete the value in ID34070:

- Homing run only to NIP or NK
- System booting
- "Reset reference point" command
- A type encoder basic adjustment
- Parameter set change
- Every homing concluded with error

Description: Exemplified by homing rung with NK and NIP without reference offset (ID150 = 0).

Figure 29: Homing signal distance



Parameter_Referenzsignalabstand

Because of the discrete sampling of the cam signal, there is an unsharpness (dx) the size of which depends upon the interpolator control speed and the sampling time (e.g. off, jitter).

The value range of ID34070 is 31 bits, whereby the value 0 displays an invalid value, therefore a not current homing signal distance.

ID32990 NK shift

The virtual cam shift acts only in conjunction with R type encoders (resolvers) and S type encoders (single-turn absolute value encoders) as position encoders (see ID32953).

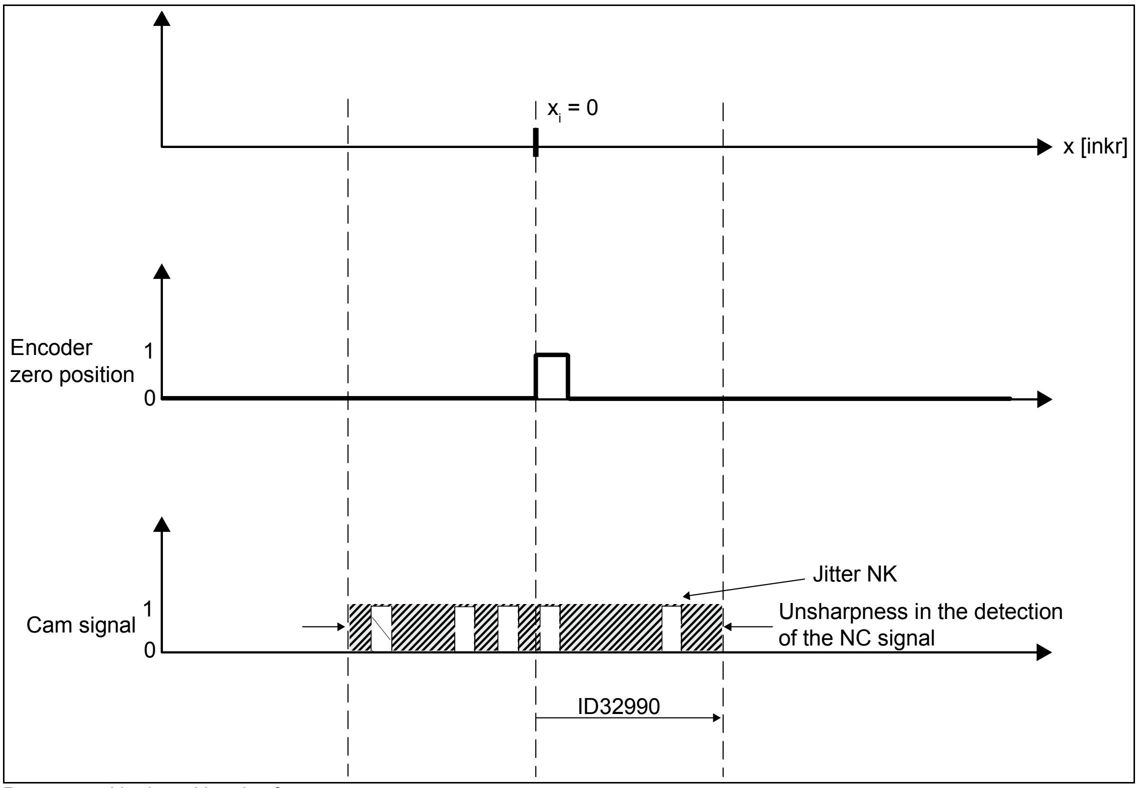
In the homing cycle with signal cams and encoder zero position ("index pulse") located closely together, it can happen that the signals are not acquired clearly by the system. The distance between the two signals can be read out from ID34070 after a homing cycle (see ID3470 homing signal distance). In various applications the cam signal and the zero position are determined by the design, so that the distance between the signals cannot be changed.

The homing cycle function expects firstly the cam signal and then the encoder index pulse. If both signals are too close together, it can happen that firstly the index pulse (zero position) and then the cam is detected. The consequence of this is that the motor homes one revolution offset to its zero position. Further error sources which are lead to a coordinate offset are, for instance, a toothed jumping over.

The parameter ID32990 defines a permissible capture range behind every zero position in which a cam signal is expected by the system and which is always assigned to the last encoder zero position. If the cam is detected in the capture range on homing, then homing is to the last zero position. This is done by a direction or rotation reversal of the motor shaft. The capture range does not act if ID32990 has the value zero.

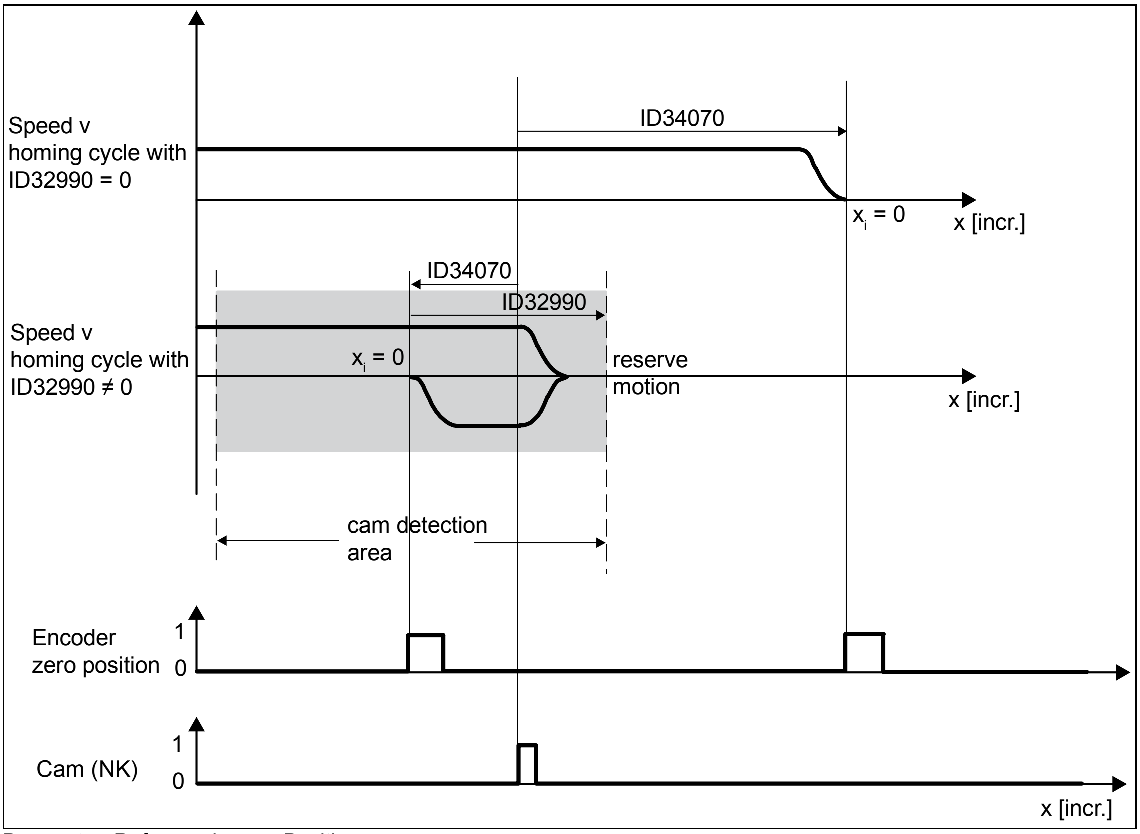
The following diagram illustrates the relationships.
The described behaviour corresponds to "normal" homing without capture range outside the capture range or with ID32990 = 0.

Figure 30: Unsharpness of the cam signal



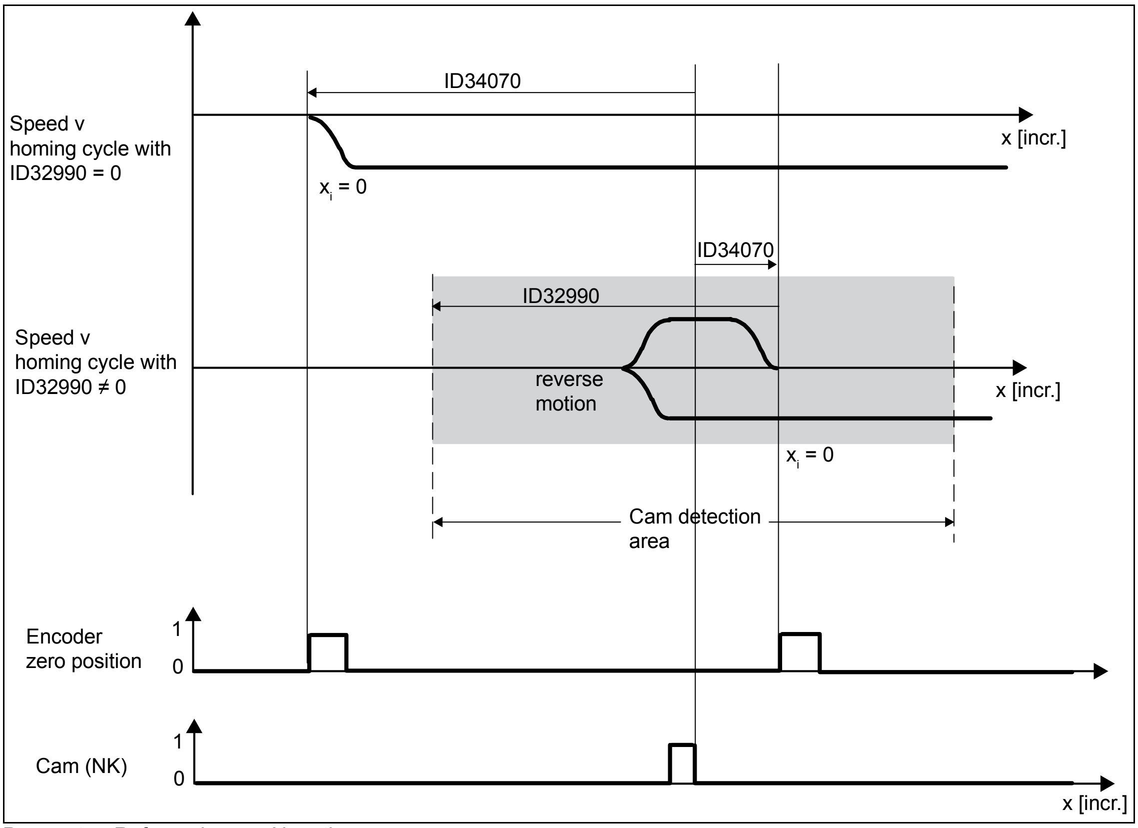
Parameter-Nocken_Unschärfe

Figure 31: Homing with ID32900 (positive starting direction, ID150 = 0)



Parameter_Referenzeierung_Positiv

Figure 32: Homing with ID32990 (negative starting direction, ID150 =0)



Parameter_Referenzierung_Negativ

The value for ID32990 must be determined according to the following formula.

The entry is in increments. The encoder resolution depends upon the set position encoder, internal motor encoder or external encoder (cf. position feedback value source ID32800 – ID32805). Either ID116 (motor encoder resolution) or ID117 (external position encoder resolution) must be entered in the following equations.

Due to the system, the following restriction applies for the value range:

$0 \leq \text{ID32990} < \text{encoder resolution}$ Value range for resolvers

$$\text{ID32990} = \frac{\text{Encoder resolution}}{2} + \text{ID34070} \quad \text{for } |\text{ID34070}| < (\text{encoder resolution} / 2)$$

$$\text{ID32990} = \frac{3 \cdot \text{Encoder resolution}}{2} - \text{ID34070} \quad \text{for } |\text{ID34070}| > (\text{encoder resolution} / 2)$$

If a negative value for ID32990 arises according to the above formulae, then the encoder resolution must be added to this value.

Process for determining ID32990 with unknown position of NK (cam) and zero position:

1. The real distance between cam and zero position resolver must be read from ID34070 after a homing cycle with ID32990 = 0.
2. Determine the range limit with the formulae.
3. The range limit is entered in ID32990.
4. The reference position (home position) can be shifted by the reference offset in ID150

Example:

1. Resolver is position encoder and motor encoder, Id116 = 65536
2. The real distance between cam and resolver zero position after a homing cycle with ID32990 = 0, result e.g. ID34070 = 50000
3. The required virtual cam shift is then calculated according to the following formula:
   $$\text{ID32990} = \frac{3 \cdot \text{encoder resolution}}{2} - \text{ID34070} \quad \text{for } |\text{ID34070}| > (\text{encoder resolution} / 2)$$
   ID32990 = 3 · 65536 /2 – 50000 = 48304
4. The reference position (home position) can be shifted by the reference offset in ID150

ID00173 Marker position A

This parameter acts in the homing drive function. The current position feedback value xi at which the reference mark is detected is filled in the marker position A. This position value is available for possible further processing through ID173. Depending upon the settings in the AMK homing parameter according to ID32926, the cam (NK) or the encoder zero pulse (NIP) is evaluated as reference mark.

When homing to cam signal (without encoder zero pulse evaluation), the position feedback value at which the cam signal is detected by the system is entered. On homing with cam and encoder zero pulse, the position feedback value at which the zero pulse is detected is stored.

ID00169 Probe control parameter (can be changed online)

This parameter acts in the probe function (e.g. in connection with SERCOS) interface).

It is determined by setting Bit0 **or** Bit1 to the value 1 whether the positive **or** negative edge of the probe function input should be evaluated. The positive **and** the negative edge may not be selected at the same time.

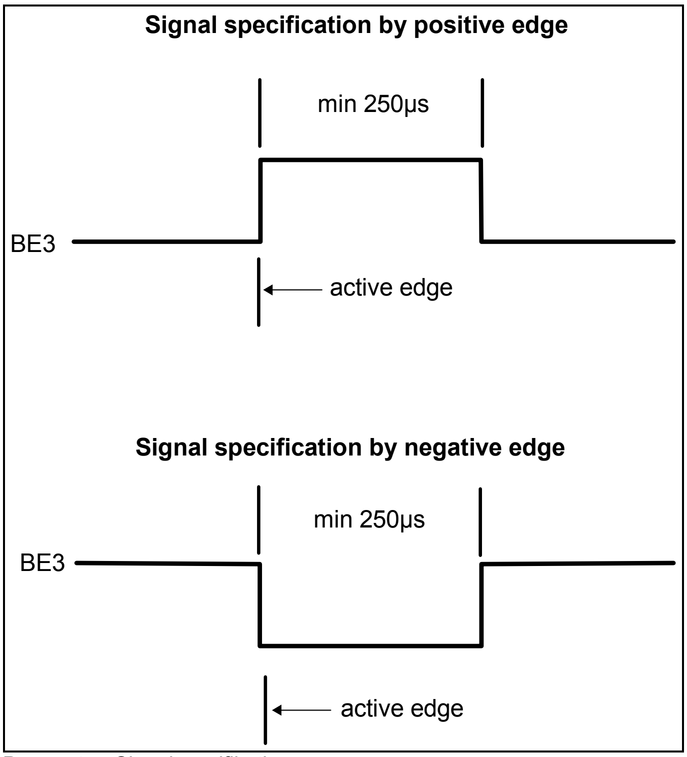
Structure of ID169 parameter

Bit-No.	Value	Meaning according to ID169
0	0	**Probe evaluation** No evaluation
	1	Positive edge is evaluated
1	0	**Probe evaluation** No evaluation
	1	Negative edge is evaluated
2 – 13		Reserved
14	0	**Pulse width measurement** Pulse sequence: positive then negative edge
	1	Pulse sequence: negative then positive edge
15		Reserved

The position feedback value at which the positive or negative edge was detected is stored in ID130 or ID131 respectively. Acknowledgement that the position feedback value has been stored is provided through the probe status ID179.

The probe function can be started through AFP or SERCOS. No homing is possible as from the start of the probe function. If a command containing a homing cycle occurs during a current measurement (spindle positioning or synchronous control with alignment). the active measuring cycle is aborted.

The binary input BE4 on KU / BE3 on KW must be used as the probe input. For this function code "0" must be assigned to the particular input.



Parameter_Signalspezifikation

ID00180 Relative spindle position (can be changed online) [incr.]

This parameter contains the relative (additive) position setpoint for the "Relative positioning" drive function.
The relative position setpoint is determined taking into consideration the resolution of the current actual position encoder (ID116 for motor encoder resolution and ID117 for external actual position encoder resolution). In relation to the current position the axis turns in a positive or negative direction, depending on the sign of the setpoint.

By activating the position scaling the setpoint specification is also possible as a length or angle.

ID00154 Spindle positioning parameter (can be changed online)

This parameter affects the spindle positioning drive function. Control commands are defined for the spindle positioning drive function. In normal operation the spindle positioning takes place in the currently active direction or rotation. In the case of the spindle positioning from a standstill, bit 0 in ID154 specifies the rotation direction for the positioning.
Speed sequences, type of cam and reference pulse evaluation etc. are defined in the manufacturer-specific extension in accordance with ID32925.

Bit-No.	Value	Meaning according to ID154
0	0	**Direction of rotation, if $n_{feedback}$ = 0** Clockwise
	1	Counterclockwise
1 - 14		Reserved
15	0	**Manufacturer-specific extensions** Bit bar according to SERCOS Interface ®
	1	AMK-specific extensions according to ID32925

ID32925 AMK spindle positioning parameter

The parameter acts in addition to ID154 "Spindle position type" in the spindle positioning drive function. The AMK spindle positioning parameter defines manufacturer-specific control.

Bit-No.	Value	Meaning according to ID32925
0 - 7		Reserved
8	0	**NIP evaluation** [1)] Without NIP evaluation (NK → x_i = 0)
	1	With NIP evaluation (NK → NIP → x_i = 0)
9	0	**NK edge active** [1)] Positive
	1	Negative
10	0	**Cam evaluation** Inactive (then always homing to NIP)
	1	Active
11	0	**Command velocity when homing from standstill ($n_{feedback}$ = 0)** n_{ipo} = ID222, if $\lvert n_{feedback}\rvert \leq 10\ min^{-1}$ (cannot be changed)
	1	n_{ipo} = ID32940, if $\lvert n_{feedback}\rvert \leq$ ID124 (caution: only expedient in interaction with bit 12 = 1, no override)
12	0	**Speed change in reference point search** in range $0 \leq \lvert n_{feedback}\rvert \leq n_{ipo}$ (Override) acceleration to maximum ID222
	1	No speed change
13	0	**Homing** If reference point not know
	1	Homing ALWAYS occurs (in each function call)
14	0	**Homing depending upon the prior history** If reference point not known
	1	Homing only if previously the spindle positioning or positioning drive function ran absolutely
15		Reserved

1)	Bits are effective only in connection with active cam evaluation (bit 10 = 1)
NIP	Zero pulse
NK	Cam signal (reference point switch)
n_{IPO}	Interpolator control speed
$n_{feedback}$	Feedback velocity of the axis on start of the spindle positioning drive function

Example:
The drive should be homed on each call of the spindle positioning function.
(Always homing on encoder zero pulse) e.g. ID32925 = 2000h

ID00222 Spindle positioning speed [rpm] (can be changed online)

The parameter acts in the spindle positioning drive function and in absolute/relative positioning. It describes the absolute amount of the control speed for the interpolator during the spindle positioning drive function. The minimum realizable value depends in addition on the selected acceleration see ID136, ID137 and is proportional to this (interpolator-included quantification).

ID32940 High homing velocity [rpm]

The parameter acts in the homing run drive function. This parameter determines the velocity for executing the homing run drive function with range cam. If the range cam is defined and if the homing run was started on this, then ID32940 is the effective guide speed for the interpolator up to leaving the cam. The homing run is executed outside the range cam with the homing velocity according to ID41 (parameterization see ID32926).

The spindle positioning drive function allows Bit 11 = 1 in ID32925 the use of this parameter as guide speed of the axis for the case that the axis stands still at the time of commanding the function (n = 0).

ID34074 Homing counter 1

ID34075 Actual counter 1

ID34076 Homing counter 2

ID34077 Actual counter 2

ID34078 Homing counter 3

ID34079 Actual counter 3

ID34080 Homing counter 4

ID34081 Actual counter 4

These parameters act in the case of a pulse encoder source connected to an inverter when they are configured via ID32948. The input pulses (2square pulses displaced by 90 degrees) are evaluated 4 times and are counted sequentially in the ID number "current counter". If a zero pulse is detected via the pulse encoder input the current counter level is transferred into the "reference counter" parameter and stored there until the value is once again overwritten by the next zero pulse.
The display for a counter pair (homing counter 1 ... 4 and actual counter 1 ... 4) must be activated through ID32948 message configuration. The code 03h must be written into the corresponding nibbles for this.

Example:
ID34074 homing counter 1 and ID34075 actual counter 1 are activated by nibble 0 in ID32948 being occupied with the code 03h.

14 Synchronous Running Parameters

ID00225 Synchronous parameter (can be changed online)

The parameter acts in the synchronous control drive function. The synchronous parameter differentiates the synchronous axis coupling with or without angle alignment of the SLAVE on the MASTER (manufacturer-specific extension see ID32927).

Bit-No.	Value (dec.)	Meaning according to ID225
0 - 1	0	**Synchronous control** Reserved
	1	Reserved
	2	Without angle alignment (position synchronous)
	3	With angle alignment (angle synchronous)
2 - 14		Reserved
15	0	**Manufacturer-specific extensions** Bit bar according to SERCOS Interface ® definition
	1	AMK-specific extension active according to ID32927

ID32927 AMK synchronous parameter (can be changed online)

Determines the response of the synchronous control drive function in addition to ID225 "Synchronous operating parameter". The evaluation of zero pulse and cam on homing the slave axis, as well as the driving characteristic in angle alignment can be varied. Condition for executing the angle alignment of the slave onto the master is the movement of the master and synchronization with homing.

Bit-No.	Value	Meaning according to ID32927
0 - 7		Reserved
8	0	**Zero pulse evaluation** 1) Without
	1	With
9	0	**Active edge of the cam signal** 1) Positive
	1	Negative
10	0	**Cam evaluation** Inactive (homing only on zero pulse)
	1	Active
11	0	**Direction reversal by angle alignment** 2) Permitted
	1	Not permitted
12	0	**Direction of rotation on alignment to MASTER** 2) Oversynchronous
	1	Undersynchronous

Bit-No.	Value	Meaning according to ID32927
13	0	**Type of angular displacement** Any rotation direction (for absolute angular displacement)
	1	Defined rotation direction (for relative angular displacement)
14	0	**Coordinates for angular displacement** Absolute related to reference point (ID268)
	1	Relative related to momentary angle position (ID278)
15	0	**Homing** If reference point is not known or if previously the function "synchronous control with angle alignment" was not active
	1	ALWAYS with each call for "synchronous control with angle alignment"

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

ID00228 Angle synchronous window [incr.] (can be changed online)

the parameter acts in the synchronous control drive function with angle alignment. If during the position synchronous operation in the course of the synchronous control drive function with angle alignment the difference between modulo position command value (X_{sm}) of the control spindle (MASTER) and the modulo position feedback value (X_{im}) of the synchronous spindle (SLAVE) in absolute terms is less than the angle synchronous window, the ANGLE SYNCHRONOUS message bit (code 308/33009) is set.

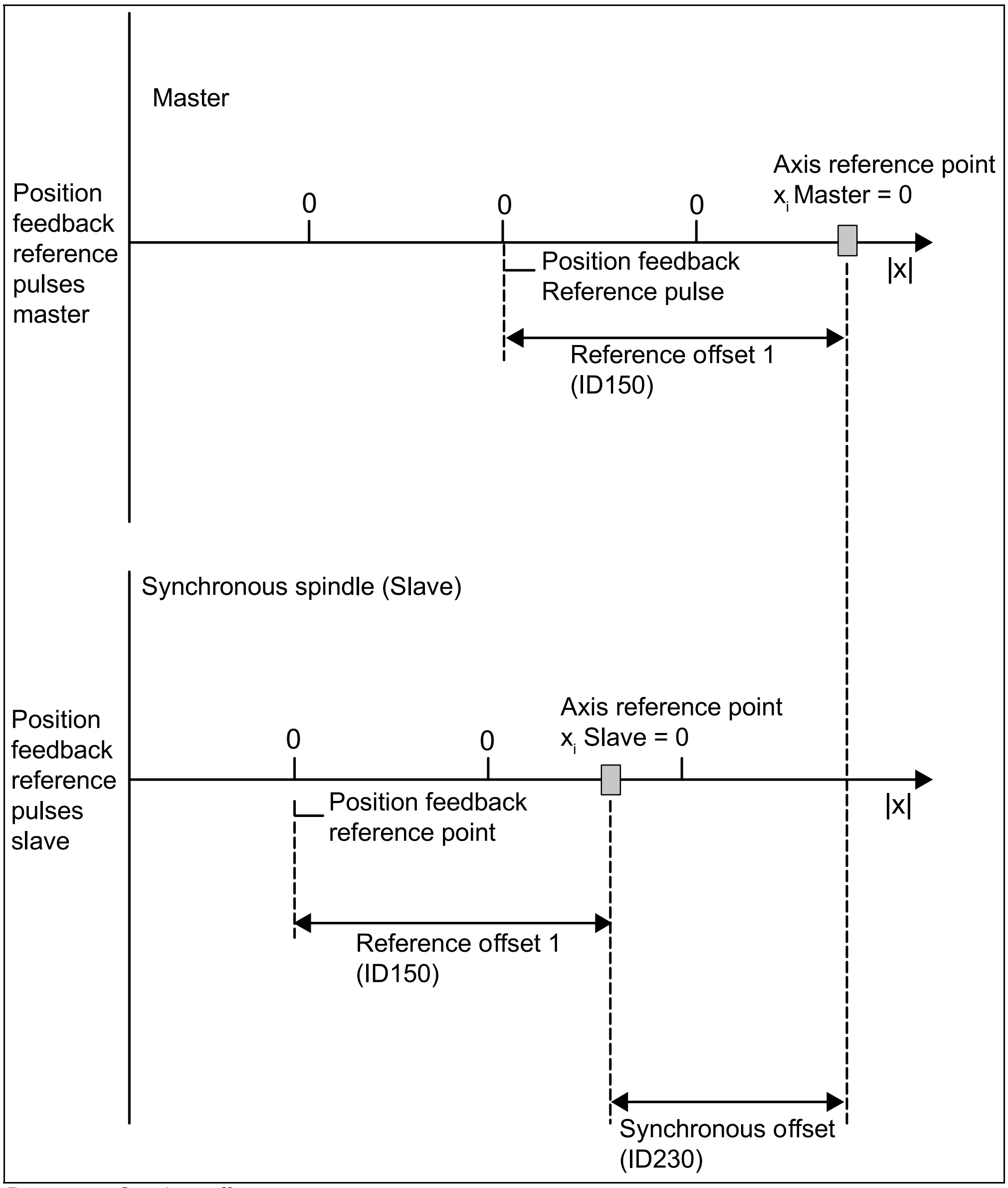
$$| X_{sm} – X_{im} | \leq \text{ID228} \rightarrow \text{ANGLE SYNCHRONOUS message}$$

The reporting bit is not set until the alignment of the SLAVE to the MASTER has been completed.
The current modulo value for the generation of the reporting bit is selected via the operating mode parameter (ID32800, …) as ID103, ID116 or ID117.

ID00230 Synchronous offset [incr.] (can be changed online)

Angle offset between the reference points of master and slave spindle. The parameter acts only in the synchronous control with angle alignment drive function while homing the slave on the motor.

Figure 33: Synchronous offset between master and slave



Parameter_Synchronoffset

ID00268 Synchronous angle position [incr.] (can be changed online)

The parameter acts in the "Synchronous control". It describes the absolute angle position between master and slave axis related to the synchronous offset ID230 in the "Synchronous control" drive function.

ID00278 Synchronous additive position [incr.] (can be changed online)

The parameter acts in the "Synchronous control" drive function. The parameter produces the additive angle shift between master and slave axis in the "Synchronous control" drive function.

ID32892 Pulse divider (can be changed online)

ID32893 Pulse multiplier (can be changed online)

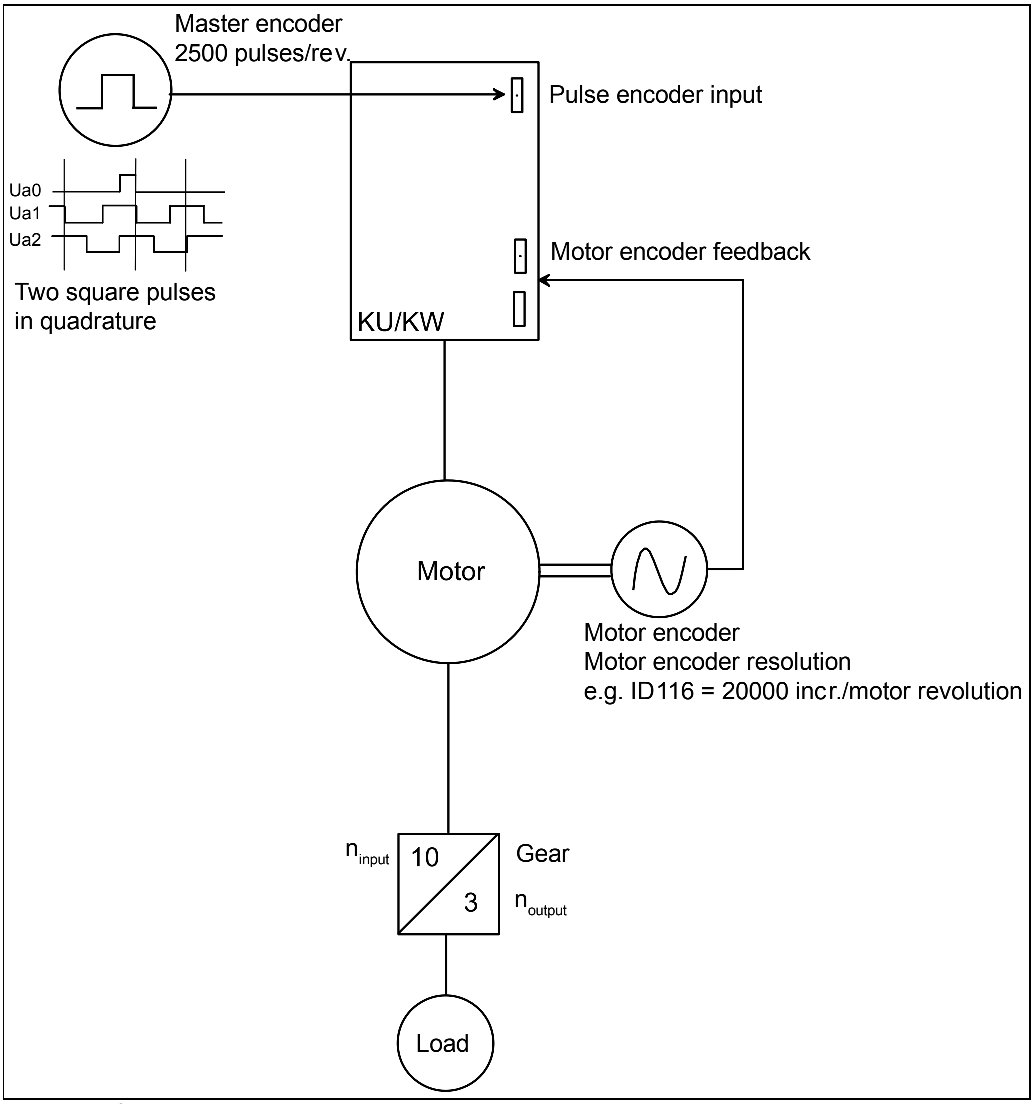
The synchronous ratio SVH between command value source (master) and synchronous drive (slave) is formed by the command value divider and command value multiplier parameters. The command value source is defined by the operation mode see ID32800 … . The command value divider ID32892 may be only an integer multiple of 65536 (2^{16}), if this condition is not complied with, a configuration error is displayed by the system.

Value ranges;

ID32892: 2^{16} (65536) … 2^{31} (2147483647), only integer multiplies of 2^{16} are permitted!

ID32893: $\pm 2^{31}$ (-2147483648 … + 2147483647). The direction of rotation in the SLAVE by a negative value in the pulse multiplier.

Figure 34: Example: Synchronous control with square wave encoder as master



Parameter_Synchronverhältnis

Requirement: on master revolution should produce one revolution at the load

Master encoder	The command value source (master) delivers 2500 pulses/revolution
Motor (slave)	The internal resolution of the position feedback source (here: motor encoder) amounts to 20000 increments / revolution. A gear step-down of i=10:3 acts between motor and load.

The input pulses of the encoder are evaluated 4 times in the slave. Thus [number of encoder pulses x 4] target increments act internally.

For the setpoint divider (ID32892) the following applies: It must be an integer multiple of 65536. The number 65536 must therefore always remain in the denominator of the relationship equation, while the numerator can be reduced by any values following extension with 65536.

Formula 29: Determining the values for pulse divider and pulse multiplier

$$\frac{ID32893}{ID32892} = \frac{\text{Motor encoder resolution (Slave)} \cdot 65536}{\text{Input pulses (Master) per revolution} \cdot 4 \cdot 65536} \cdot \frac{n_{input}}{n_{output}}$$

$$\frac{ID32893}{ID32892} = \frac{20000 \cdot 65536 \cdot 10}{2500 \cdot 4 \cdot 65536 \cdot 3} = \frac{2 \cdot 65536 \cdot 10}{65536 \cdot 3} = \frac{1310720}{196608}$$

The synchronous ratio must therefore be parameterized as follows:

Pulse multiplier (numerator): ID32893 = 1310720
Pulse divider (denominator): ID32892 = 196608

ID32952 Position synchronous window [incr.]

If the absolute amount of the position control difference (lrdiff) in the drive in the position control operation mode is smaller or equal to the window according to ID32952, then the POSITION SYNCHRONOUS message bit (code 33104 / 33010) is set by the drive, this can be output through a binary output.

| lrdiff | ≤ ID32952 → POSITION SYNCHRONOUS

Position control difference = position command value – position feedback value

ID32994 Modulo synchronous master

The modulo value defines the final value of position data in the modulo format. It is available for the command setpoint source iAddSetpoint32. The synchronous slave will be adjust with this parameter at the modulo system of the master.
The function must be activated with ID32995 “Operation mode SWQ1” with Bit 7 = 1.
The parameter has the same effect like the ID103 for the command setpoint source diMainSetpoint.

ID32995 Operation mode SWQ1

With the parameter ID32995 „Operation mode SWQ1“ can you choose the operation mode for the command setpoint source iAddSetpiont32.

Bit-Nr.	Value	Meaning according to ID32995
0 - 6		Reserve
7	0	Inactive
	1	Modulo value like ID 32994
8-15		Reserve

15 Binary Inputs

AMKASYN devices have binary inputs (BI) which are available as hardware in the basic unit. Additional binary inputs can be provided via the use of option cards. The number of the binary inputs on the basic unit and the option cards depends on the hardware used.

The AMKASYN operating software provides 3 binary input ports, each with 8 bits. Access to the input ports 1 and 2 is performed via option cards. Input port 3 is used for the binary inputs in the basic unit and is permanently assigned to these. The assignment of the input ports to the corresponding option card slot is performed using the following addressing parameters.

ID32873 Input port address 1

ID32968 Input port address 2

ID32977 Input port address 3: Fixed assignment "32"

By entering the address code into the parameter "Address input port 1 / 2", input ports 1 and 2 are assigned a slot and hence an I/O option card.

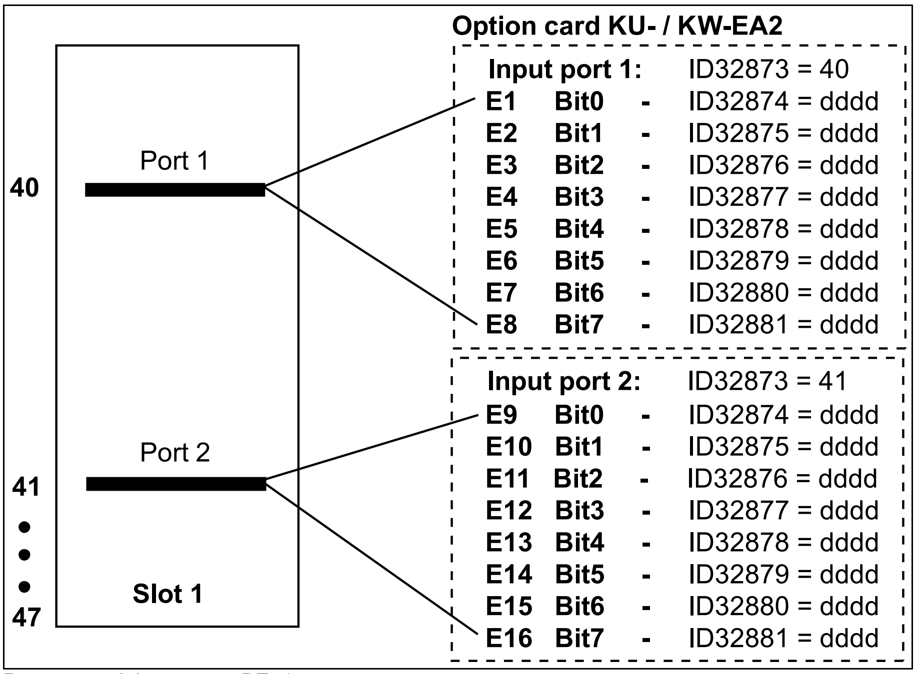
The entire binary address range can be used wherever an AMK PLC component is in use, irrespective of whether the hardware is present.

Address code	Explanation
40 **48**	Option card in slot **1**: E1 … E8 Option card in slot **2**: E1 … E8
41 **49**	Option card in slot **1**: E9 … E16 Option card in slot **2**: E9 … E16
Port 3: ID32977 = 32	Binary inputs – base device: BE1 … BE4

The following figure shows for slot 1 and 2 the reference between the port address and the input bits

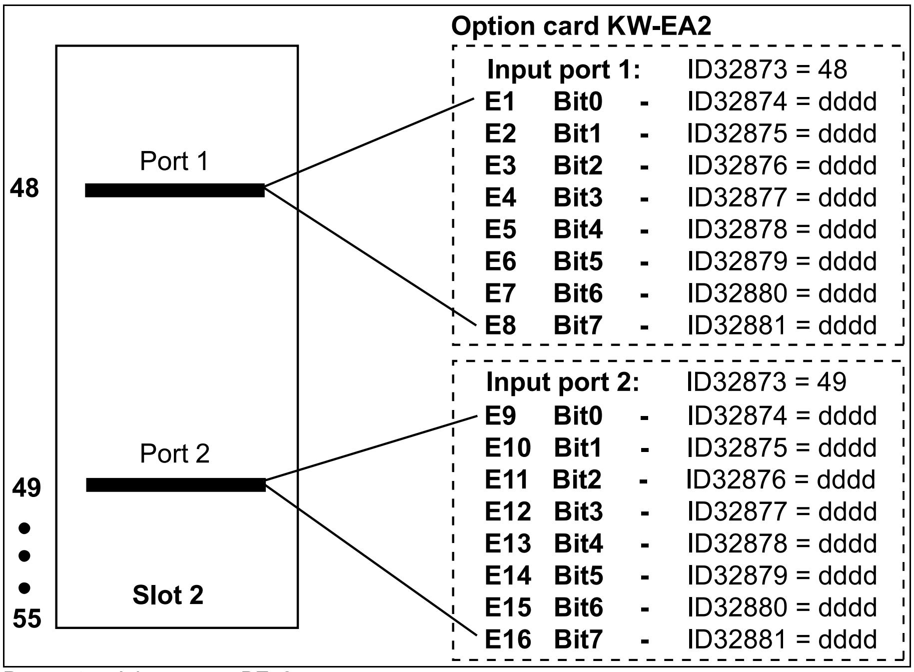
Figure 35: Assignment of binary input address space

Example: Slot 1
Input port 1: Byte address 40 (ID32873 = 40)
Input port 2: Byte address 41 (ID32968 = 41



Parameter_Adressraum_BE_1

Example: Slot 2
Input port 1: Byte address 48 (ID32873 = 48)
Input port 2: Byte address 49 (ID32968 = 49



Parameter_Adressraum_BE_2

The hardware availability of the binary inputs depends on the option card used.
dddd: Function code see Table 1

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 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 (BE1 … BE4)

ID32978 Port3 Bit0: Preassigned with "RF controller enable"

ID32979 Port3 Bit1: Preassigned with "FL delete error"

ID32980 Port3 Bit2: Preassigned with "UE inverter on"

ID32981 Port3 Bit3: Preassigned with "homing run"

Assignment of the binary inputs on the basic unit (input port 3):

	KU (BE-Code) controller card KU-R01	KW (BE-Code) Controller card KU-/KW-R02, KU-/KW-R03, KU-KW-R03P, KW-R04	KE (BE-Code)
BE1	RF (32904)	RF (32904)	FL (32913)
BE2	FL (32913)	FL (32913)	UE (32903)
BE3	UE (32903)	UE (32905)	
BE4	home position (33711) [1)]		

1) Default: going to home position with cam (NK) on encoder zero pulse

The input bits can be freely configured according to the following table (drive commanding, cam signal, …). For this purpose the corresponding code numbers are assigned to the input bits. Drive commanding, for instance, is then triggered internally by setting the binary input.

Example: The drive should be switched over between main operation mode and synchronous control.
Input E1 activates the main operation mode,
Input E2 switches over into synchronous control.

Input port1: ID32873 = 40
Port1 Bit0 (E1): ID32874 = 33700 (main operation mode)
Port1 Bit1 (E2): ID32875 = 33724 (for secondary operation mode 4)

With each positive edge at E1 / E2, the associated operation mode / function is activated in the drive

Table 1: Allocation of functions to binary inputs

Code	Function	Remarks
0 (0)		Function inactive
33130 -	Overvoltage protection and braking device in synchronous machines	**Use in synchronous motors in field-weakened operation and for braking in not filed-weakened synchronous motors** Automatic configuration to BE2 in connection with corresponding hardware See application note AP2002-38-1e
33700 (1000)	Operation mode change after main operation mode	Switching over according to ID32800
33701 (1001)	Operation mode change after secondary operation mode 1	Switching over according to ID32801
33702 (1002)	Operation mode change after secondary operation mode 2	Switching over according to ID32802
33703 (1003)	Operation mode change after secondary operation mode 3	Switching over according to ID32803
33704 (1004)	Operation mode change after secondary operation mode 4	Switching over according to ID32804
33705 (1005)	Operation mode change after secondary operation mode 5	Switching over according to ID32805
33706 (1006)	HOLD interpolator (IPO)	Interruption of a movement controlled by the IPO
33707 (1007)	FURTHER interpolator	Continuation of a movement controlled by the IPO **after HOLD**

Code	Function	Remarks
33708 (1008)	STOP drive, KMD abort function	Standstill (dig. DZR, n = 0) of the drive from every operation mode
33709 (1009)	Digital speed control	Velocity command value n = 0, ramp active
33710 (1010)	Digital speed control	Velocity command value n = ID36, ramp active
33711 (1011)	Homing run on reference point **x_i = 0**	Homing with / without cam evaluation according to ID147, ID32926, homing velocity = ID41
33712 (1012	spindle positioning to reference point **xi = 0**	**Speed resolving** homing with / without cam evaluation, driving characteristic according to ID154, ID32925, positioning speed = ID222
33713 (1013)	Absolute positioning	Position end value = ID153, control speed = ID222
33714 (1014)	Relative positioning	Relative spindle position = ID180, control speed = ID222
33716 (1016)	Current position feedback value is set to zero ($x_i = 0 \pm$ control deviation)	The current position feedback value x_i is shifted to x_i = 0 without axis movement, "homing performed" bit is deleted
33717 (1017)	Parameter set change after main parameter set (0)	Acts after RF change see ID32813
33718 (1018)	Parameter set change after 1. alternative parameter set (1)	Acts after RF change see ID32813
33719 (1019)	Parameter set change after 2. alternative parameter set (2)	Acts after RF change see ID32813
33720 (1020)	Parameter set change after 3. alternative parameter set (3)	Acts after RF change see ID32813
33721 (1021)	Dig. torque control	Torque command value M = 0
33722 (1022)	Dig. torque control	Torque command value M = ID80
33724 (1024)	Synchronous control NBA4	According to **ID32804**, ID225, ID32927
33725 (1025)	Synchronous control NBA5	According to **ID32805**, ID225, ID32927
33726 (1026)	(flying saw NBA5) **This function is no longer supported by the new KW / KU software**	According to **ID32805**, ID268, ID278
33727 (1027)	Special function	Customer-specific
33728 (1028)	STOP command value source 1 (SWQ1) Command value modulo reference ID103	Incoming master increments through the command value source 1 are no longer processed after the remaining travel in ID278 has been processed. Further processing of the master command value increments after a corresponding BAW or the next zero passage of the master modulo value. The master increments are processed modulo according to ID103
33729 (1029)	Reset master command value coordinates X34 (command value formation every 5 ms)	The command value reference modulo (ID103) at the pulse input X34 is zeroed. Position command value coordinate system x_s is zeroed and can thus be matched to the feedback value coordinate system x_i
33730 (1030)	System booting without RF	Complete parameter calculation with inactive controller enable. This takes place otherwise only at power on, delete error and RF activation after parameter changes
33732	System reset	Start-up the system, comparable if the 24 V power supply is switched OFF and ON
33733	Probe function start	Acc. to parameter ID130, ID131, ID169, ID34047, ID179

Code	Function	Remarks
33734	Probe function stop	Acc. to parameter ID130, ID131, ID169, ID34047, ID179
33780 (1080)	START PLC program	PLC PRG in user list 1 is started
33781 (1081)	STOP PLC program	PLC PRG is stopped
33782 (1082)	FURTHER AFP-PLC programs	Stopped PLC PRG is continued
33783 (1083)	SINGLE STEP AFP-PLC program	Single step performance of the PLC PRG
33790 (1090)	Strobe (strobe permissible only on Bit 4!, Bit0 … Bit4 are one group)	Bit0 to Bit3 are binary coded, with strobe L / H edge on Bit4, the command is performed according to Bit0 … Bit3
33791 (1091)	Absolute positioning (Bit0 … Bit3 = 33791, Bit4 = strobe)	No. 0 … 15 binary coded, x-command value according to ID34000 … ID34015 [incr.]
33792 (1092)	Relative positioning (Bit0 … Bit3 = 33792, Bit4 = strobe)	No. 0 … 15 binary coded, x-command value according to ID34000 … ID34015 [incr.]
33793 (1093)	Dig. speed control (Bit0 … Bit3 = 33793, Bit4 = strobe)	No. 0 … 15 binary coded, x-command value according to ID34000 … ID34015 [rpm]
33794 (1094)	Dig. torque control (Bit0 … Bit3 = 33794, Bit4 = strobe)	No. 0 … 15 binary coded, x-command value according to ID34000 … ID34015 [% M_N]
33800 (1100)	Absolute positioning	X-command value according to ID34000 [incr.]
33801 … (1101…)	… Control speed according to ID222	X-command value according to ID34001 [incr.] …
33819 (1119)	Absolute positioning	X-command value according to ID34019 [incr.]
33820 (1120)	Relative positioning	X-command value according to ID34000 [incr.]
33821 … (1121…)	… Control speed according to ID222	X-command value according to ID34001 [incr.] …
33839 (1139)	Relative positioning	X-command value according to ID34019 [incr.]
33840 (1140)	Dig. speed control	N-command value according to ID34000 [incr.]
33841 … (1141…)	Dig. speed control	N-command value according to ID34001 [rpm] …
33859 (1159)	Dig. speed control	N-command value according to ID34019 [rpm]
33860 (1160)	Dig. torque control	M-command value according to ID34000 [% M_N]
33861 … (1161…)	Dig. torque control	M-command value according to ID34001 [% M_N]
33879 (1179)	Dig. torque control	M-command value according to ID34019 [% M_N]
33880 … (1180…)	Absolute positioning	X-command value according to ID34000 [incr.] … N-command value according to ID34010 [rpm] …
33889 (1189)	Absolute positioning	X-command value according to ID34009 [incr.] N-command value according to ID34019 [rpm]
33890 … (1190…)	Relative positioning	X-command value according to ID34000 [incr.] … N-command value according to ID34010 [rpm] …
33899	Relative positioning	X-command value according to ID34009 [incr.] N-command value according to ID34019 [rpm]
33900 (1200)	Strobe_127 **Absolute positioning 127 positions [incr.]** according to ID32798 Control speed fixed ID222 Application: Bit0 … Bit6 = 32798 Bit7 = 1200	Bit0 to Bit5 are binary coded (position No. 0…26), strobe L / H edge on Bit7, the position is moved to No. 0 → Position 0 = ID32798.2 (low word) ID32798.3 (high word No. 1 → Position 1 = ID32798.4 (low word) ID32798.5 (high word) etc., ID32798.2 first useful date according to control panel display

Code	Function	Remarks
33901 (1201)	Strobe_63 **Absolute positioning** **63 positions [incr.]** **63 control speeds [rpm]** according to ID32798 Application: Bit0 … Bit5 = 32798 Bit6 = 1201	Bit0 to Bit6 are binary coded (position No. 0…62), strobe L / H edge on Bit6, the position is moved to No. 0 → Position 0 = ID32798.2 (low word) ID32798.3 (high word Velocity 0 = ID32798.128 No. 1 → Position 1 = ID32798.4 (low word) ID32798.5 (high word) Velocity 1 = ID32798.130 etc.
33902 (1202)	Dig. speed control	Decade switch
33903 (1203)	Dig. torque control	Decade switch
33904 (1204)	Absolute positioning	Decade switch
33905 (1205)	Relative positioning	Decade switch
33906 (1206)	Acknowledgement signal motor brake (QBR)	QBR = 1 brake closed QBR = 0 brake opened see ID206 / ID207
33909	Stop positive setpoint processing	If the configured binary input drops to zero volts (low active), then the setpoint is disabled in position or speed control within 2 ms. If the input is set, the setpoint is enabled within 2 ms
33910	Stop negative setpoint processing	The disable / enable for position or speed setpoints is within 2 ms
33912	Clear integral component of the speed controller	As long as this input is set the integral component of the speed controller is cleared
32902 (32902)	Reversing (T > = 10 ms)	+-$N_{command}$ = ID36, T = ID32955 = 1 s (time between changing the speed), ramp = ID32780 / ID32781
32903 (32903)	Inverter on	For units with main contactor
32904 (32904)	Controller enable	The signal RF can only be assigned to one input at the same time. After every change of RF the system must be switched OFF and ON again
32905 (32905)	Cam signal	Homing with cam
32907 (32907)	System input	Permanently preassigned internally by the system
32912 (32912)	Reset homing performed	Output bit "Reference point known" will be reset
32913 (32913)	Delete error	Signal FL is free to assign
33057 (33057)	Encoder basic adjustment	Drive must move

BAW Operation mode change
x_i 32-bit position feedback value
T_{abt} Sampling time of the binary inputs for drive commanding = 5 ms

(Cam signal evaluation in the time grid 2 ms)

For the inputs the low-high flank of an input signal at least "T_{abt}" in length is evaluated dynamically. The direct reaction of the drive takes place at the earliest after two sampling times T_{abt}.

All codes are processed in the T_{abt} cycle and can be acknowledged by configurable bit messages. The acknowledgement time is at least T_{abt} in legth.

Caution: A commanded parameter set change becomes effective only after the transition of the controller enable from OFF to ON.

ID34100 Binary input word

ID34101 Binary input word 1

ID34102 Binary input word 2

ID34103 Binary input word 3

ID34104 Binary input word 4

ID34105 Binary input word 5

ID34106 Binary input word 6

ID34107 Binary input word 7

ID34108 Binary input word 8

ID34109 Binary input word 9

ID34110 Binary input word 10

ID34111 Binary input word 11

ID34112 Binary input word 12

ID34113 Binary input word 13

ID34114 Binary input word 14

ID34115 Binary input word 15

ID34116 Binary input word 16

By means of ID34100 to ID34116 the input bits can be accessed reading and writing by data access online through arbitrary interfaces.

Address reference:
ID34100 indicates address space 32 (input port 3)
ID34101 indicates address space 40 (input port 1 and 2)
ID34102 indicates address space 42 etc.

If an I/O card is assigned to the address space addressed by means of ID34101 …, then the card access has priority over the ID access. The setting of the connected switches can be read in by the ID.

16 Binary Outputs

AMKASYN devices have binary outputs (BA) which are available as hardware in the basic unit. Additional binary outputs can be provided via the use of option cards. The number of binary outputs on the basic unit and the option card depends on the hardware used.

The AMKASYN operating software provides 3 binary output ports, each with 8 bits. Access to the output ports 1 and 2 is performed via option cards. Output port 3 is used for the binary outputs in the basic unit and is permanently assigned to these.
The assignment of the output ports to the corresponding option card slot is performed using the following addressing parameters:

ID32846 Output port address 1

ID32855 Output port address 2

ID32864 Output port address 3: Fixed assignment "544"

By entering the address code into the parameter "address output port 1/2", output ports 1 and 2 are assigned a slot and hence an EA option card.

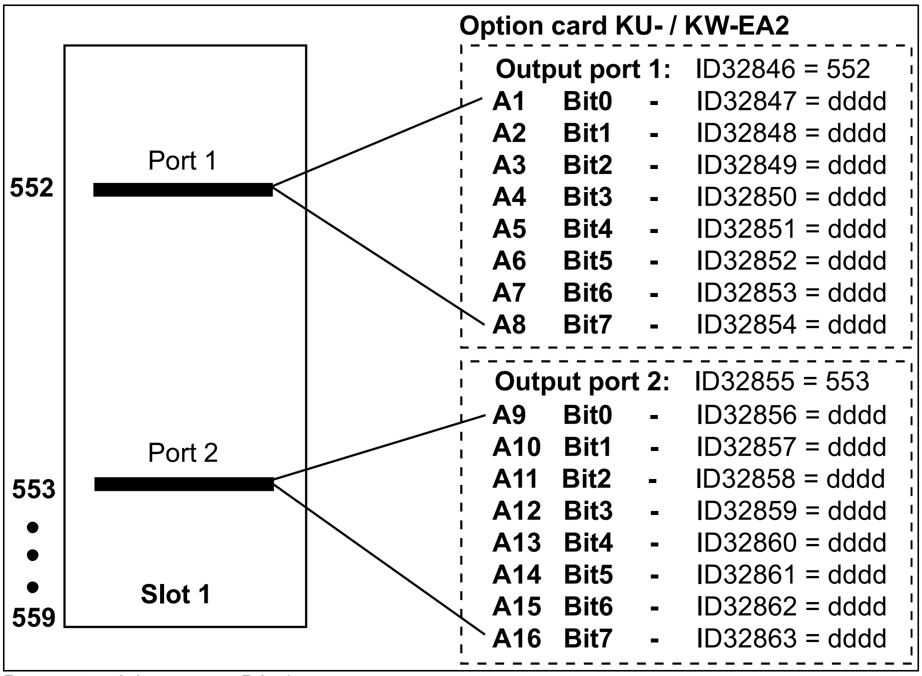
The entire binary address range can be used wherever an AMK PLC component is in use, irrespective of whether the hardware is available.

Address code	Explanation
552 560	Option card in slot 1: A1 … A8 Option card in slot 2: A1 … A8
553 561	Option card in slot 1: A9 … A16 Option card in slot 2: A9 … A16
Port 3: ID32864 = 544	Binary outputs – base device: BA1 … BA4

The following figure shows for slot 1 and 2 the reference between the port address and the output bits.

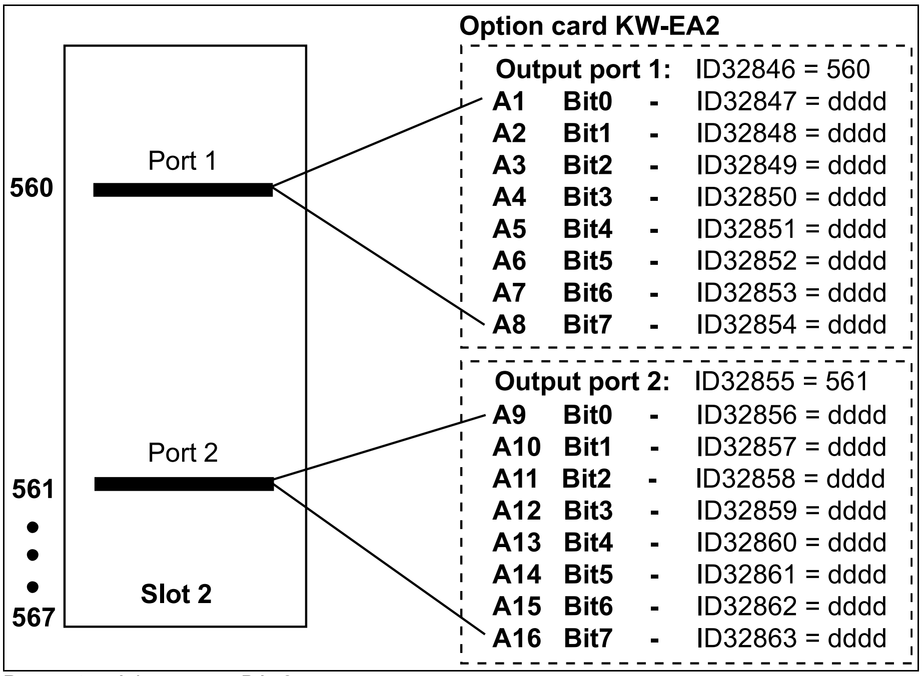
Figure 36: Assignment of address space binary outputs

Example: Slot 1
Output port 1: Byte address 552 (ID32873 = 552)
Output port 2: Byte address 553 (ID32968 = 553)



Parameter_Adressraum_BA_1

Example: Slot 2
Output port 1: Byte address 560 (ID32873 = 560)
Output port 2: Byte address 561 (ID32968 = 561)



Parameter_Adressraum_BA_2

The hardware availability of binary outputs depends upon the option card used.
dddd: Function code see Table 2

Binary outputs output port 1:

ID32847 Port1 Bit0

ID32848 Port1 Bit1

ID32849 Port1 Bit2

ID32850 Port1 Bit3

ID32851 Port1 Bit4

ID32852 Port1 Bit5

ID32853 Port1 Bit6

ID32854 Port1 Bit7

Binary outputs output port 2:

ID32856 Port2 Bit0

ID32857 Port2 Bit1

ID32858 Port2 Bit2

ID32859 Port2 Bit3

ID32860 Port2 Bit4

ID32861 Port2 Bit5

ID32862 Port2 Bit6

ID32863 Port2 Bit7

Binary outputs port 3 (BA1 … BA4)

ID32865 Port3 Bit0: Preassigned with "QRF"

ID32866 Port3 Bit1: Preassigned with "SBT"

ID32867 Port3 Bit2: Preassigned with "$n_{feedback} = n_{command}$"

ID32868 Port3 Bit3: Preasigned with "In position"

Assignment of binary outputs on the basic unit (output port 3):

	Controller card KU-R01	KE	Controller card KU-/KW-R02, KU-/KW-R03, KU-/KW-R03P, KW-R04
BA1	QRF (33031)	SBM (33029)	QRF (33031)
BA2	SBM (33029)	QUE (33030)	SBM (33029)
BA3	nist = nsoll (330)	Free (0)	BR (33052)
BA4	In Position	Free (0)	

By entering the associated code into the ID number of the output bit, internal bit messages from the drive can be assigned to the binary outputs (see the table below). The evaluation of this output information then takes place in the higher-level controller.

Table 2: Assignment of real time bit information to binary outputs

Code	Function	Remarks
0		Function inactive
308	Angle synchronous	ID228 angle synchronous window
310	Warning overload motor	Load integral limit I²t motor to ID114
330	$n_{feedback} = n_{command}$	ID157 velocity window
331	$n_{feedback} < n_{min}$	ID124 zero velocity window
332	$n_{feedback} < n_x$	ID125 velocity limit n_x
333	Md ≥ Mdx	ID126 torque limit M_{dx}
334	$M_{command} \geq M_{limit}$	ID82 / ID83 pos. / neg. torque limit
335	$N_{command} \geq N_{limit}$	ID38 / ID39 pos. / neg. velocity limit
336	"in position"	ID57 in position window
337	$P \geq P_x$	ID158 power limit P_x
409	Probe value positive edge stored (ID179 Bit0	(Acts in probe function) stored feedback position in ID130
410	Probe value negative edge stored (ID179 Bit1)	(Acts in probe function) stored feedback position in ID131
1202	Digital speed mode	Thumbwheel switch function
1203	Digital torque mode	Thumbwheel switch function
1204	Absolute positioning mode	Thumbwheel switch function
1205	Relative positioning mode	Thumbwheel switch function
33013	$x_i \leq$ -Soft end	ID50 neg. position limit
33014	Position synchronous	ID32952 position synchronous window
33015	xi ≥ +Soft end	ID49 pos. position limit
33016	Overcurrent warning inverter	Integral load limit I²t converter ID32999
33017	Overtemp. warning inverter	
33018	Motor overtemp. warning	External component, brake resistor
33021	Air overtemp. warning	Cooling air
33022	Ext. overtemp. warning	External component, brake resistor
33025	Mains overvoltage warning	Mains overvoltage (with signal filter 30s)
33026	Mains undervoltage warning	Mains undervoltage (with signal filter 30s)
33029	SBM	System ready message
33030	QUE	Acknowledgement inverter on
33031	QRF	Acknowledgement controller enable
33032	RF	Controller enable set
33034	KMD active	Drive function is active
33035	IPO active	Internal interpolator is active
33036	RFP known	Reference point is valid
33040	INPUT-BIT0 active	Acknowledgement E1 according to ID32874
33041	INPUT-BIT1 active	Acknowledgement E2 according to ID32875
33042	INPUT-BIT2 active	Acknowledgement E3 according to ID32876
33043	INPUT-BIT3 active	Acknowledgement E4 according to ID32877
33044	INPUT-BIT4 active	Acknowledgement E5 according to ID32878
33045	INPUT-BIT5 active	Acknowledgement E6 according to ID32879
33046	INPUT-BIT6 active	Acknowledgement E7 according to ID32880
33047	INPUT-BIT7 active	Acknowledgement E8 according to ID32881
33048	RESET residual distance	ID32922 residual distance window reset
33050	Rotation direction positive	Momentary motor direction

Code	Function	Remarks
33052	Motor brake control	ID32773 bit 13 = active BR = 0 brake closed BR = 1 brake opened, see ID206 / ID207 The monitoring of the acknowledgement bit must be activated by bit 13 of ID32773 for a brake with acknowledge signal. Code 33906 has to be assigned to the associated binary input (refer to Table 1 "Binary inputs")
33058	Parameter set 0 activated	Valid from message QRF
33059	Parameter set 1 activated	Valid from message QRF
33060	Parameter set 2 activated	Valid from message QRF
33061	Parameter set 3 activated	Valid from message QRF
33062	Main operation mode active	According to ID32800
33063	Secondary operation mode 1 active	According to ID32801
33064	Secondary operation mode 2 active	According to ID32802
33065	Secondary operation mode 3 active	According to ID32803
33066	Secondary operation mode 4 active	According to ID32804
33067	Secondary operation mode 5 active	According to ID32805
33068	Secondary operation mode 6 active	According to ID32806
33069	Secondary operation mode 7 active	According to ID32807
33070	Secondary operation mode 8 active	According to ID32808
33071	Secondary operation mode 9 active	According to ID32809
33072	Close motor contactor	Special lift function
33073	Close safety switch	Special lift function
33074	Warning active	Centralized warning (all warning messages linked with OR) KU: RF is not removed internally
33075	Fan control	Special lift function
33076	Second cycle output	System test
33077	Mains phase failure	Output of the bit message in 1ms
33078	Field bus QUIT_QCODE	HS = 1, order accepted and active
33120	Variable process state	SERCOS phase bit0
33121	Variable process state	SERCOS phase bit1
33122	Variable process state	SERCOS phase bit2
33123	VBNX	For UPS activation (extend mains failure display)
33130	**Overvoltage protection and braking device for synchronous machines**	**Application in synchronous motors in field-weakened operation and for braking in nor field-weakened synchronous motors** Automatic configuration on BA2 in connection with the corresponding hardware See AMK application note AP2002-38-1e
33131	Acknowledgement stop for positive setpoints	Positive setpoint settings in position or speed control are not executed
33132	Acknowledgement stop for negative setpoints	Negative setpoint settings in position or speed control are not executed
33133	Output stage enable (EF) signal	The input for the output stage enable signal is acknowledged as binary output and can be evaluated by PLC for example

Apart from the group ready message (code 33029) it is also possible to output a warning bit (code 33074). The warning bit is generated at each warning and remains active up to error deletion by the user. Warnings can be deleted at any time.

ID34120 Binary output word

ID34121 Binary output word 1

ID34122 Binary output word 2

ID34123 Binary output word 3

ID34124 Binary output word 4

ID34125 Binary output word 5

ID34126 Binary output word 6

ID34127 Binary output word 7

ID34128 Binary output word 8

ID34129 Binary output word 9

ID34130 Binary output word 10

ID34131 Binary output word 11

ID34132 Binary output word 12

ID34133 Binary output word 13

ID34134 Binary output word 14

ID34135 Binary output word 15

ID34136 Binary output word 16

The output bits can be assigned reading and writing by data access online through arbitrary interfaces by means of ID34120 to ID34136.

Address reference:
ID34120 Indicates address space 544, (output port 3)
ID34121 Indicates address space 552, (output port 1 and 2)
ID34122 Indicates address space 554 etc.

One observes that internal bits assigned through configuration data have priority over the ID access.

17 Analogue Outputs

ID32787 Source analogue channel 1

ID32789 Source analogue channel 2

ID32791 Source analogue channel 3

The analogue outputs serve for observing process variables. The output of the analogue messages is updated in a **1 ms cycle**.

The code of the signal source for assigning the analogue outputs are listed in Table 3 and Table 4. To assign an inverter message to an analogue output, the code must be written in the ident number "Source analogue channel x".

For source analogue channel 1 … 4

The scaling of the data always corresponds to the AMK scaling base. If no application-related scaling has been performed, then the default scaling applies:

- Position control [1 increment]
- Speed control [0.0001/min]
- Torque control [0.1 %Mn]

A further possibility is outputting the 16 and 32-bit Kx messages (ID32785, ID32786) on analogue outputs. This is the default configuration in the inverter. The code of the inverter messages can also be entered according to the table in the ident numbers of the Kx messages. This was necessary up to software level KU1.04/4299 in order to assign inverter messages to analogue output. This possibility continues to be available for compatibility reasons.

Preallocation of the analogue outputs

Changeable preallocation X32 (default values):

ID32787 = 32786	32-bit message from the drive, velocity feedback value [code 40]
ID32788 = 2000	00002000 min^{-1} → 10 V at AA1
ID32789 = 32785	16-bit message from the drive, torque feedback value [code 84]
ID32790 = 1000	100% MN → 10 V at AA2

Caution:
The KW basic unit has no analogue outputs. By using the optional service module KW-SM1, 3 analogue outputs can be used.

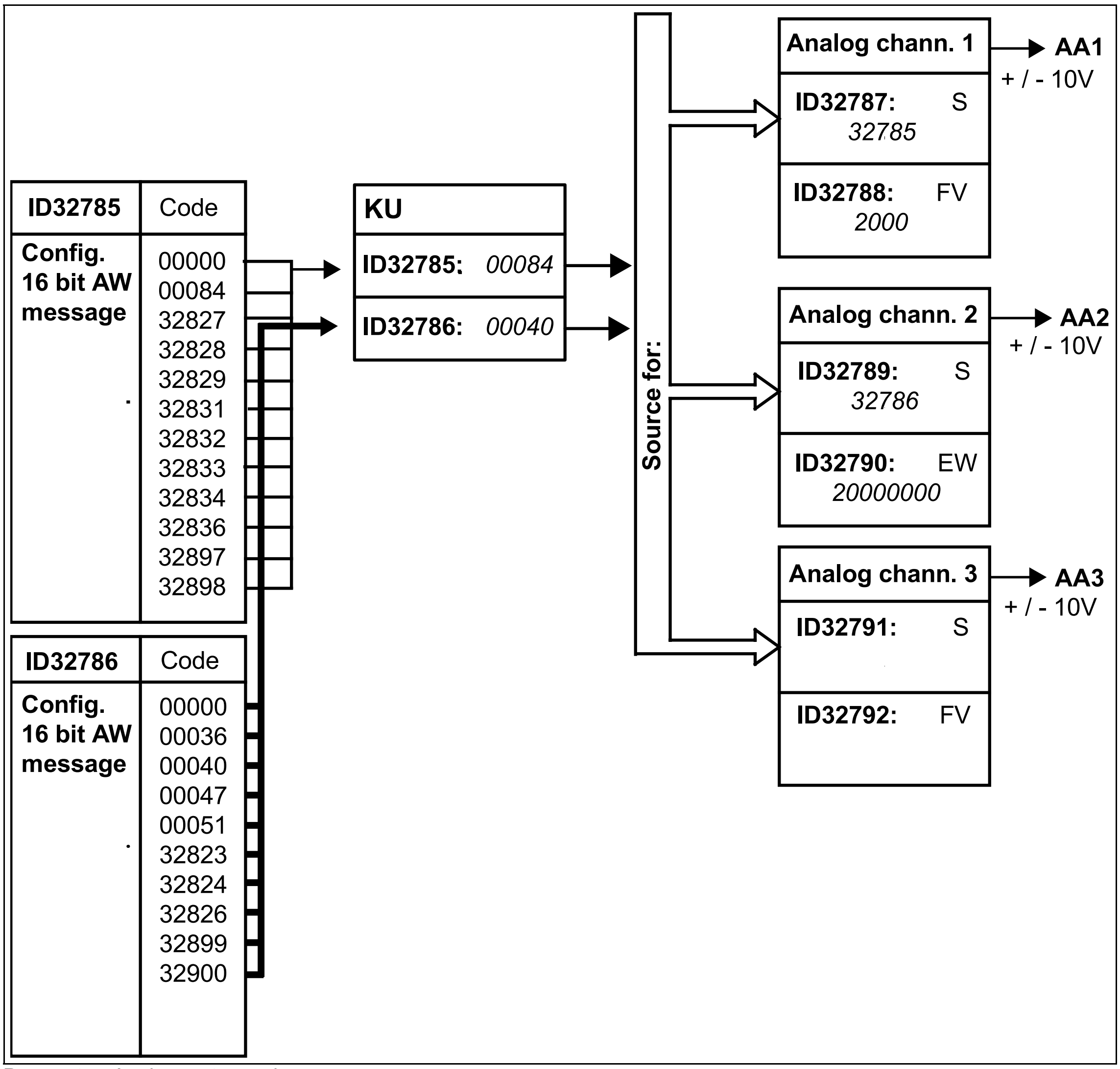
Resolution of the analogue outputs depending on the controller card:
KU-R01: 8 Bit for ± 10 V
from KU/KW-R02 (with KW-SM1): 12 Bit for ± 10 V

Table 3: Service codes for configuration "source analogue channel 1 ... 3"

Code	Function	Remarks
32906	Fixed value 8000h	Output of e.g. $\pm$ 10 V fixed ($\leq$ 30 mA)
32908	RAM analogue value 1	16Bit API-Variable iAnalogOut1
32909	RAM analogue value 2	16Bit API-Variable iAnalogOut2
32910	RAM analogue value 3	16Bit API-Variable iAnalogOut3
32911	RAM analogue value 4	16Bit API-Variable iAnalogOut4
33053	Position growth IPO	AZ-IPO output, 32bit
33054	Main absolute command value	32-bit command value in API (diMainSetpoint32)
33055	Accompanying absolute command value	16-bit accompanying command value in API (diAddSetpoint16)
33093	Analogue value output 1 only for service purposes	Output of 16-bit variables, address of the output value in ID32950
33094	Analogue value output 2 only for service purposes	Output of 16-bit variables, address of the output value in ID32951
33095	Analogue value output 3 only for service purposes	Output of 32-bit variables, address of the output value in ID32950
33096	Analogue value output 4 only for service purposes	Output of 32-bit variables, address of the output value in ID32951

Code 32908 … 32911 are for instance RAM data areas that can be written by S-Bus which can be output as analogue signal (D/A converted).

Figure 37: Signal and parameter assignment (over 16-/32 Bit message)



Parameter_Analogwertausgabe

ID32788 Final value analogue channel 1

ID32790 Final value analogue channel 2

ID32792 Final value analogue channel 3

Final value determination (EW) of the system variables to be output analogue. Related to the internal representation of the selected system variable, this numerical value corresponds to 10 V at the output of the analogue channel.

The input of a negative final value leads to forming the absolute mount of the analogue output. The final value to be determined is calculated as follows:

EW = ZW / SK + Data offset

EX – Analogue channel final value, e.g. value according to ID32788
ZW – Target value, e.g. feedback speed n = 2000 rpm
SK – Scaling factor according to Table 4

A possibly existing data offset must be taken from the tables, if no data offset is stated, then this must be occupied with 0.

Example 1:

It is required that the feedback speed of the drive is displayed at the analogue output AA3. Here 10 V output voltage should correspond to 3000 rpm.

Solution version 1: Direct assignment of the system variable to the analogue output

1. Determine source of the analogue output and assign it to an analogue output
   ID32791 = 40 (feedback speed)

2. Calculate final value

   Formula 30: Velocity feedback value, final value determination for analogue output

   $$\mathrm{ID32792} = \frac{\mathrm{ZW}}{\mathrm{SK}} = \frac{3000\ \mathrm{rpm}}{0.0001\ \mathrm{rpm}} = 30000000$$

   3000 rpm correspond to 10 V output voltage

Solution version 2: Configure analogue output with 16 and 32-bit Kx messages

1. Configure data to be output (Message 32)
   ID32786 = 40 (feedback speed)
   The module is caused to transmit the velocity feedback value cyclically every 0.5 ms.

2. Determine source of the analogue output
   ID32791 = 32786 (Source analogue output 3)
   The velocity feedback value is conducted by the drive to the analogue output AA3.

3. Calculate final value

   Formula 31: Velocity feedback value, final value determination for analogue output

   $$\mathrm{ID32792} = \frac{\mathrm{ZW}}{\mathrm{SK}} = \frac{3000\ \mathrm{rpm}}{0.0001\ \mathrm{rpm}} = 30000000$$

   3000 rpm correspond to 10V output voltage

Example 2:

The torque feedback value of the drive should be displayed at analogue output AA2. In this case 200% of the nominal torque should lead to 10 V output voltage

Solution version 1: Direct assignment of the system variable to the analogue

1. Determine source of the analogue and assign it to an analogue output
   ID32789 = 84 (torque feedback value)

2. Input final value

   Formula 32: Torque feedback value, final value determination analogue output

   $$\text{ID32790} = \frac{ZW}{SK} = \frac{200\% \cdot M_N}{0.1\% \cdot M_N} = 2000$$

   200% · MN correspond to 10 V output voltage

Solution version 2: Configure analogue output with 16 and 32-bit Kx messages

1. Configure data to be output
   ID32785 = 84 (Message 16)
   The module is caused to transmit the torque feedback value cyclically every 0.5 ms.

2. Determine the source of the analogue output
   ID32789 = 32785 (Source analogue output)
   The torque feedback value is conducted from the drive to the analogue output AA2.

3. Input final value

   Formula 33: Torque feedback value, final value determination analogue output

   $$\text{ID32790} = \frac{ZW}{SK} = \frac{200\% \cdot M_N}{0.1\% \cdot M_N} = 2000$$

   200% · MN correspond to 10 V output voltage

ID32897 Analogue Input A1

The analogue input voltage A1 evaluated by reading this parameter. Only reading access to this parameter is possible.

ID32898 Analogue Input A2

The analogue input voltage A2 evaluated by reading this parameter. Only reading access to this parameter is possible.

ID34037 Analogue input 1 offset

ID34038 Analogue input 2 offset

The parameter serves for compensating the offset error of the analogue input circuit. The effect is independent of the selected operating mode (speed control or torque control). The value entered in the parameter is added to the analogue input voltage 1 or 2.

18 Inverter Parameters

ID00110 Inverter peak current Kx [A]

The inverter peak current is determined in the factory and is processed at the first system booting. The value can be only read, any entry remains without effect. The parameter value is transferred from the unit-related fixed memory of the Kx converter into the ID110.

ID00112 Nominal current Kx [A]

The nominal current of the Kx converter is the permissible continuous current of the inverter, this is processed at the first system booting. The value can be read only, any entry remains without effect. The parameter value is transferred from the unit-related fixed memory of the Kx converter into the ID112.

ID00158 Power limit Px [VA] (can be changed online)

Monitoring ID: If the delivered power of the inverter exceeds the value stated in ID158, the message bit (code 337) is set.

ID00206 Drive on delay

ID00207 Drive off delay

Motor brakes have different reaction times under certain circumstances (pulling in or releasing). The control of the controller enable is regulated internally so that different reaction times are safely bridged over by means of ID206 (drive on delay) and ID207 (drive off delay).

A motor brake serves for fixing the motor shaft with energy-less drive (e.g. suspended axis application). The AMK drive is able to coordinate independently the activation and deactivation of the controller enable as well as actuation of the motor brake.

Sequence:

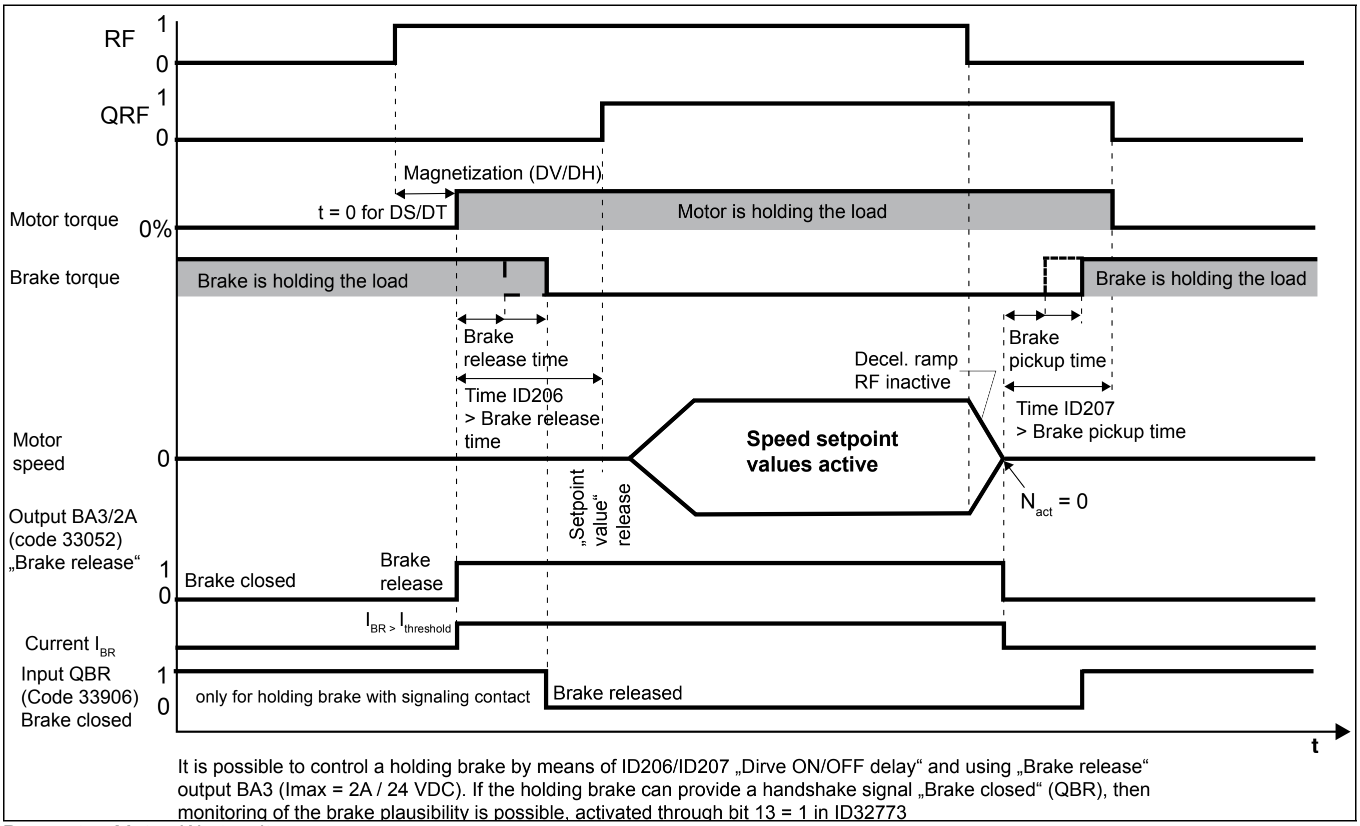
Control ON

- Brake active, motor free or energy
- RF on, motor energization
- Motor keeps position, brake is released
- After ID206 time is elapsed handshake QRF is set (QRF = 1)

Control OFF

- RF off, ramp down is activated
- $N_{feedback}$ = 0 (axis at standstill), activation of brake
- After ID207 time is elapsed, drive off (QRF = 0)
- Motor free of energy, brake keeps position

Figure 38: Drive On/Off delay



Parameter_Motor_Wartezeit

ID32785 Kx message 16 (can be changed online)

ID32786 Kx message 32 (can be changed online)

All codes shown in the Table 4 and Table 3 are able to assign to the Kx message

The required 16-bit or 32-bit system variable is transmitted cyclically every 500 µs by stating the code.

It is possible to transfer the low word of a 32-bit code in the 16-bit channel. It is also possible to transfer a 16-bit system variable in the low word of the 32-bit channel (in the high word there is no sign treatment).

The size of the message 32 (ID32786) can be output cyclically on the control panel by calling the menu item "actual value" (see "Cyclical display of system values").

Table 4: Codes for the inverter messages

16-bit system variables

Code	Function	Default scaling	Scaling
0	Function inactive	1	fixed
11	Status class 1	1	fixed
84	Actual torque value	0.1 % M_N 1)	Torque scaling
179	Measured value status (bit bar)	1	fixed
254	Number of active parameter set	1	fixed
390	Diagnostic number (error No.)	1	fixed
32827	Flux-generating current isd	ID110 / 16384	fixed
32828	Actual current value phase U	Unit-dependent 10)	fixed
32829	Actual current value phase V	Unit dependent 10)	fixed
32831	Resolver angle	incr.	fixed
32832	Encoder signal S2	2.5 V / 32768 10)	fixed
32833	Encoder signal S1	2.5 V / 32768 10)	fixed
32834	Torque-generating current (isq)	ID110 / 16384 3)	fixed
32836	DC bus voltage	752.5 V / 2048 5)	fixed
32897	Analogue input A1	10 V / 2048 5)	fixed
32898	Analogue input A2	10 V / 2048 5)	fixed
33090	Actual speed value (calculated)	rpm	fixed
33099	Increments per 0.5 ms through 16-bit setpoint source (diAddSetpoint16)	incr.	fixed
33100	Standardized actual power value	0.05 % PN 4)	fixed
33101	I²t formation inverter overcurrent	0.1 %	fixed
33102	I²t formation motor overcurrent	0.1 %	fixed
33103	Following error (16 bit)	incr.	fixed
33113	Setpoint torque value filtered according to ID32989	0.1 % MN	Torque scaling
33114	Process number (e.g. SERCOS phase)	1	fixed
34101… 34116	Binary input words (input port 0 and 1)	1	fixed
34121… 34136	Binary output words (output port 0 and 1)	1	fixed

32-bit system variables

Code	Function	Default scaling	Scaling
36	Velocity command value	0.0001 rpm	Velocity scaling
40	Actual speed value	0.0001 rpm	Velocity scaling
47	32-bit position command value (diMainSetpoint32, main command value)	incr.	Position scaling
51	Actual position value	incr.	Position scaling 9)
130	Touch probe value 1: Positive edge evaluation	incr.	Position scaling
131	Touch probe value 2: Negative edge evaluation	incr.	Position scaling
173	Marker (register) position A	incr.	Position scaling
189 or 33104	Following error compensation (SAK)	incr.	Position scaling
32823	Velocity command value after ramp	0.0001 rpm	Velocity scaling

Code	Function	Default scaling	Scaling
32824	Position deviation without following error compensation (SAK)	incr.	Position scaling
32899 or 33104	X_i_2π actual position value (modulo)	incr. 9)	Position scaling
32900	X_i_2π position setpoint value (modulo)	incr. 8) 9)	Position scaling
33098	Increments per NC cycle time through 32 bit	incr.	fixed

For more service codes see Table 3

1):
The actual torque value is a variable calculated in the inverter based on a motor model. The value is related to nominal torque (ID32771) of the motor and varies with the motor type and the motor temperature.

3):
The torque-generating current i_{sq} is proportional to the torque in the basic speed range (only up to nominal speed).

Formula 34: isqnom at nominal torque

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

ID110: Inverter peak current
ID111: Motor nominal current I_N
ID32769: Magnetizing current I_M

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

Formula 35: Nominal rating P_N of the motor

$$PN\,[W] = \frac{2\pi \cdot ID32771 \cdot ID32772}{60}$$

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

5):
Offset 2058, i.e. 2048 corresponds to 0V, 0 corresponds to –10 V and 4096 corresponds to +10 V. This offset must be taken into account in the analogue output.

7):
The position command value is composed additive within the converter additively of the 32-bit position command value 2 (e.g. interpolator) and the 16-bit position command value 1 (e.g. pulse input). The position command value 1 corresponds to the command value source in the operation mode parameters according to ID32800.

8) (only for AMK Service):
The range limits of the 2π formation vary with the position control difference, therefore the position command value 2π serves only for information. The position command value 2π is composed within the inverter additively of the 32-bit position command value 1 (e.g. interpolator) and the 16-bit position command value 2 (e.g. pulse input) and correlates with the position feedback value 2π.

9):
The display of the modulo position values (32-bit Kx message code 32899 and 32900) is always positive, without the direction of rotation information. In modulo processing (see ID76 position scaling parameter) the position feedback value is also displayed modulo.

ID32836 DC Bus voltage

The DC Bus voltage can be evaluated by reading this ident number. Only reading access to this parameter is possible.

ID32837 UZ (DC Bus voltage) monitoring

This parameter defines the lower threshold of the DC Bus voltage which is necessary in order to be able to switch in the controller enabling. With the KE/KW and KU systems this is a fixed value in accordance with the device class.
The monitoring of the DC Bus voltage is only performed during active controller enabling.

ID32837 = 0 default device specific value
ID32837 ≠ 0 variable threshold value in accordance with the parameter

ID32890 Pulse multiplier

This parameter will not be supported from Kx-R02 because no pulse transmission option cards are necessary. This parameter contains the factor with which the motor encoder signals (periods/revolution) are multiplied before they are then output as square wave signals through the pulse transmission option card. The following option cards are required depending upon the encoder type:

Encoder type	Pulse transmission card
I / T / S type encoder	Kx-IWI
A type encoder	KU-IWA
Resolver	KU-IWR

Caution:
ID32890 does not act in resolver applications. In the case of motors with resolvers, 1024 square pulses /revolution (2 tracks offset by 90°) are output permanently through the KU-IWR card. If the tracks are processed as quadrature signal, then the resolution of 4096 increments/revolution acts for following systems.

ID32964 Software pulse forwarding source

As from controller card KW-R02 the standard pulse input can also be used as pulse output for square wave pulses in quadrature. The pulses are output through connector X132 to the follower electronics (signal destination). There the square wave pulses are 4-fold evaluated as a standard.
ID32964 unequal "0" changes to output pulses (refer to table below).

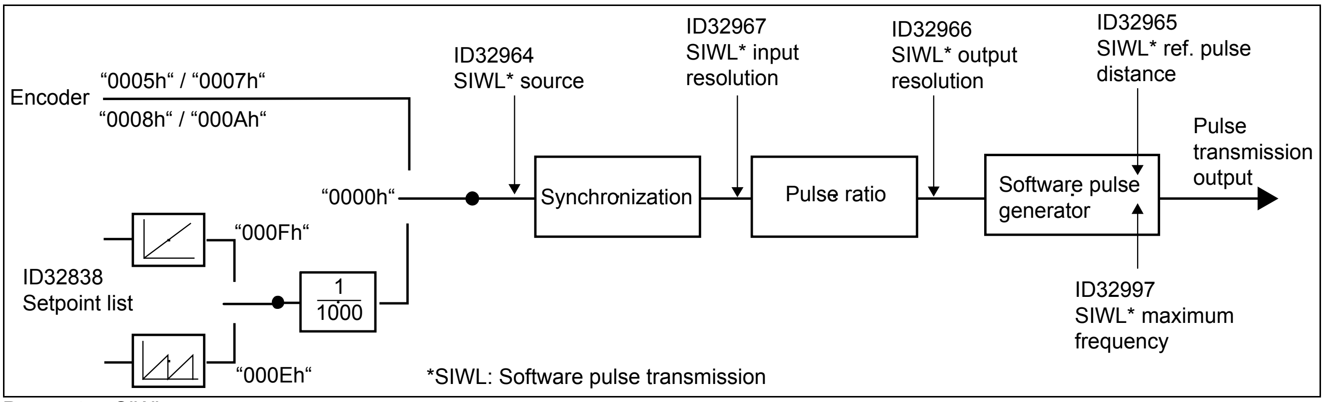
Note: Prior to the change from pulse input to pulse output it is essential that you check the connection wiring and ensure that the output signal is correctly wired to the input of the signal destination!

ID32964 = 0 Pulse input (default)
ID32964 ≠ **x** (≠0) Pulse output based on **signal source (code hex)**

Code hex	Signal source
0000	Software pulse forwarding switched off
0005	I (incremental encoder)
0007	S / T (absolute encoder, RS485)
0008	Revolver (R)
000A	E / F (absolute encoder, EnDat)
000E	Data from setpoint list ID32838 modulo e.g. AMK-PLC, Fieldbus
000F	Data from setpoint list ID32838 absolute e.g. AMK-PLC Fieldbus

The following figure shows an overview of the software pulse forwarding:

Figure 39: Software pulse transmission



Parameter_SIWL

The SIWL signal source is selected through the parameter ID32964. This can be encoder or setpoint list ID32838 from the AMK-PLC or field bus.

A synchronization module synchronizes an incoming zero pulse of the SIWL signal source with the SIWL output signals. The output zero pulse is based e.g. on an encoder reference pulse, the zero position of an absolute value encoder.
For SIWL source "F" (absolute) reference pulses are generated and output with a distance according to ID32965.
For SIWL source "E" (modulo) reference pulses are generated and output synchronized to the modulo value.

A pulse ratio between the SIWL source and the SIWL output can be set with parameters ID32967 "SIWL input resolution" and ID32966 "SIWL output resolution". With existing encoder reference pulse or zero position of the encoder, a reference pulse is output at the right time at the SIWL output.

Example 1:
The SIWL should generate 4000 pulses/revolution in operation with resolver.

ID32964 SIWL source	= 8 (resolver)
ID32966 SIWL output resolution	= 4000
ID32967 SIWL input resolution	= 128

ID32965 SIWL NIP distance does not act as SIWL source for encoder signals.

Example 2:
The SIWL should generate 1000 pulses/revolution in operation with I type encoder. The I type encoder has a resolution of 1024 pulses/revolution.

ID32964 SIWL source	= 5 (I type encoder)
ID32966 SIWL output resolution	= 1000
ID32967 SIWL input resolution	= 1024

ID32965 SIWL NIP distance does not act as SIWL source for encoder signals.

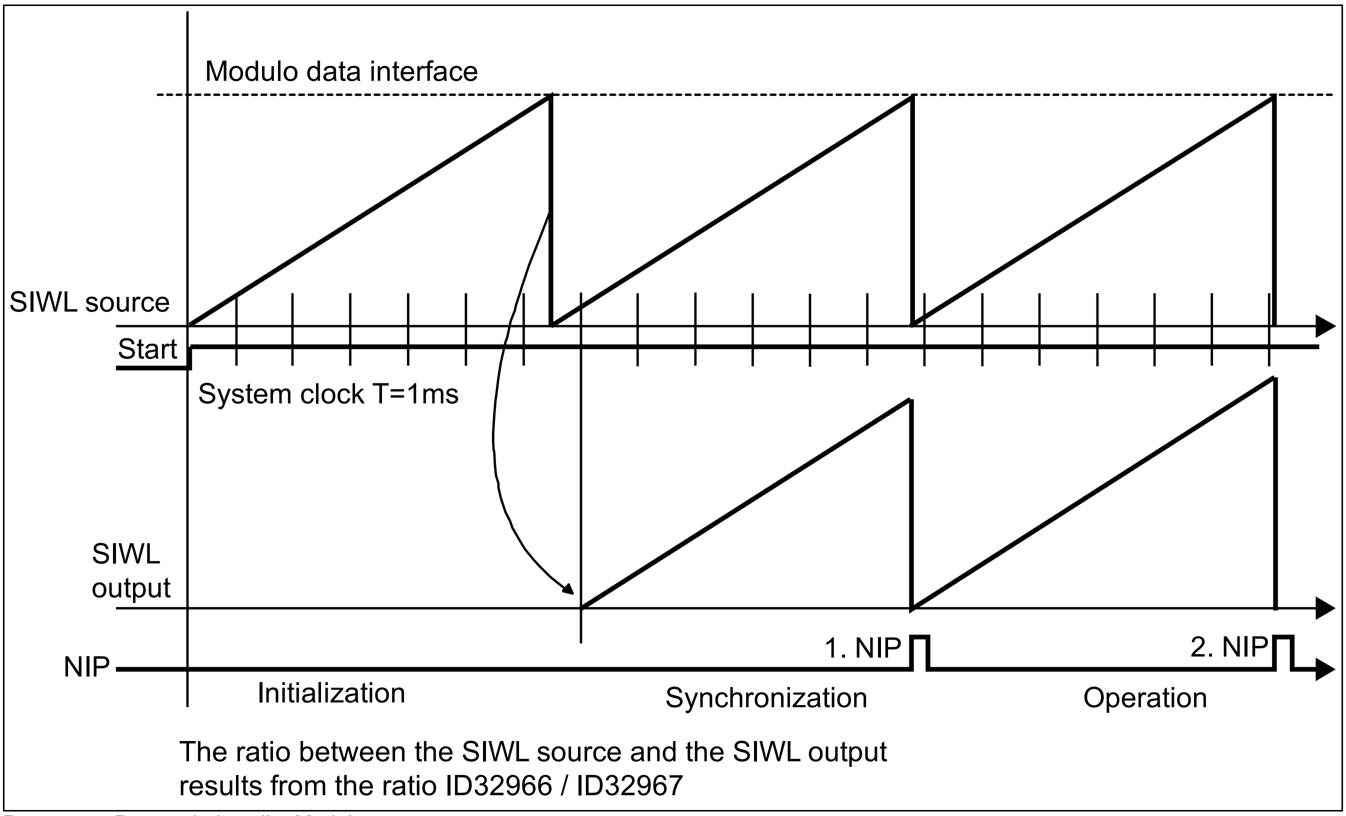
Example 3:
The setpoint list with a modulo value from the PLC or via field bus is source for SIWL.

ID32964 SIWL source	= E (Modulo value from ID32838 = 33911))
ID32966 SIWL output resolution	= 1000
ID32967 SIWL input resolution	= 20000

Reference pulses are output synchronized to the modulo value 1000. ID32965 SIWL NIP distance defines the modulo value of the setpoint source.
If setpoint list is selected as SIWL source, the data source in ID32838 setpoint list must be set to SIWL setpoint (Code 33911).

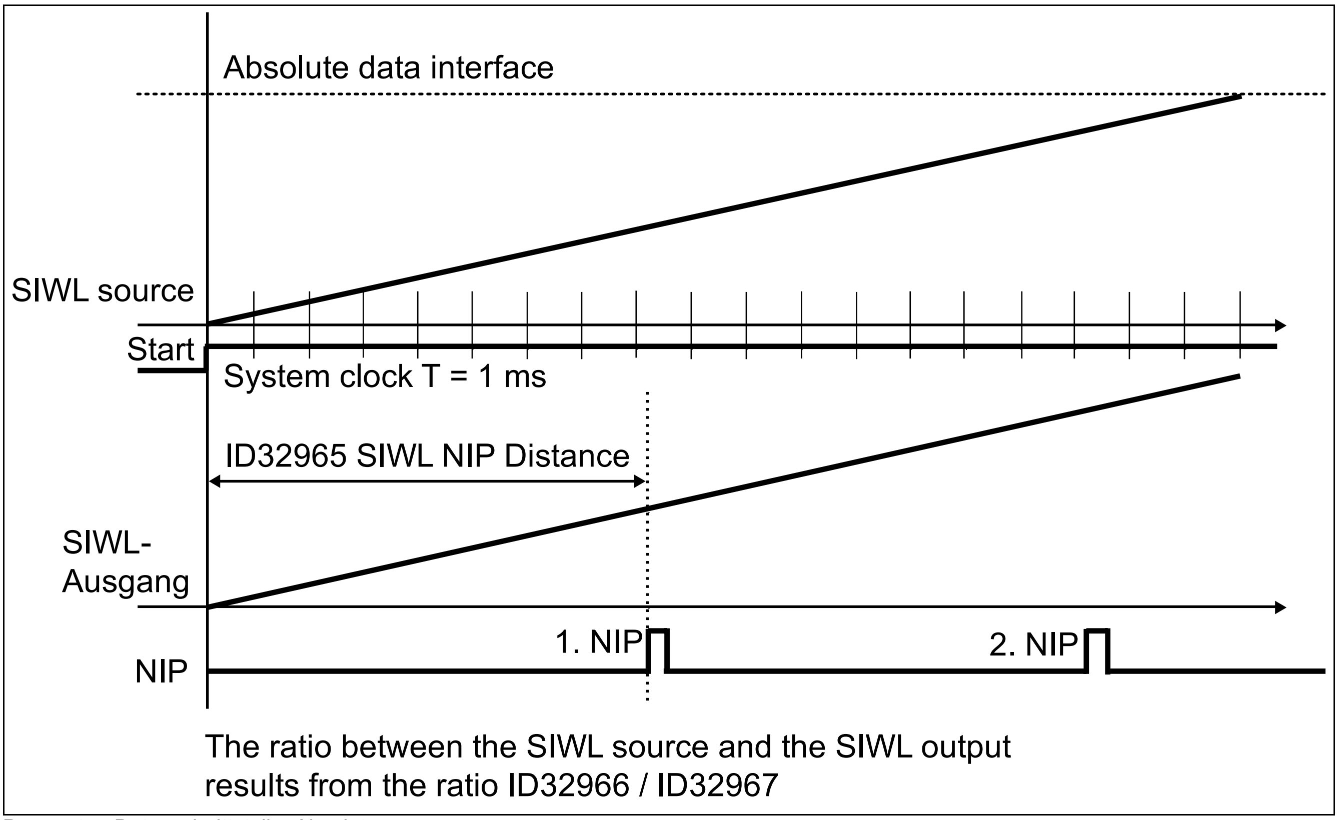
The following figures show the course for SIWL through data interface with modulo and absolute value input.

Figure 40: Modulo data interface



Parameter_Datenschnittstelle_Modulo

Figure 41: Absolute data interface



Parameter_Datenschnittstelle_Absolut

ID32965 SIWL NIP distance

If the data interface is selected as source in the software pulse forwarding SIWL ID32964, then a virtual zero pulse (NIP) is output in the grid of ID32965. If the SIWL source is a modulo value, then the NIP is output synchronized to the modulo value. With a continuous value (ID32964 = absolute data interface), then the NIP is output without synchronization in the grid of ID32965 SIWL NIP distance.

The distance between two pulses may not be less than 5 ms. This parameter is ineffective in the case of setpoint input through encoder.

ID32966 SIWL output resolution

The number of the SIWL output pulses at the pulse generator output is determined through this parameter. One zero pulse, which is synchronized in correct time to the zero pulse of the generator (pulse generator, sine generator), is output per output resolution.
In the case of absolute value encoders the zero position is determined and a reference to the output zero pulse is created.

In the synchronization to encoder zero pulse the first detected NIP is not output, since it is used for detection. In the case of sine generators with NIP, the NIP can be offset from the SIWL by ± 3 increments due to the principle.

ID32967 SIWL input resolution

The number of the SIWL input pulses from the SIWL source is defined through this parameter. This value corresponds to the encoder pitch or the modulo value for selected data interface in the parameter ID32964 SIWL source.

ID32997 SIWL maximum frequency

This parameter determines the maximum frequency of the SIWL. The lower the maximum frequency is selected, the finer are the frequency stages that can be output by the pulse generator. Small frequency stages result is smaller ripple of the SIWL output frequency. The SIWL maximum frequency must therefore be set only as large as necessary.

Example: The SIWL should output 1000 pulses/revolution. The maximum speed of the motor is 2000 rpm.

$$f_{SIWL,MaxFreq} = \frac{1000\ {}^{imp}/_{U} \cdot 2000\ {}^{U}/_{min}}{60} = 33.3\ \text{kHz}$$

ID32997 = 40 kHz is selected

ID32999 Converter overload threshold [0.1%]

This parameter determines when the warning 2357 "Device overload warning" is output. If the I^2t monitoring reaches an overload value of 100%, then the error message 2358 "Device overload error" is output and the drive coasts.

A bit message (code 33016) is generated at the same time as the warning. If the value is again less than the value in parameter ID32999, the warning bit is reset until the value is exceeded again.

The I^2t monitoring for the converter is always active.

ID33100 Actual power value

The power feedback value can be evaluated by reading this ident number. Only reading access to this parameter is possible. The display is permanently scaled: $P_{feedback}$ = 0.55 %P_N (motor name plate)

ID33101 Converter overload indication [0.1%]

This parameter indicates the current overload of the converter according to the I^2t monitoring. It can also be configured as 16-bit message.

ID33101 = 0	Nominal mode or below nominal mode
ID33101 > 0	Overload mode, shutdown at 100%, error message 2358

ID33116 Internal temperature

ID33117 External temperature

In the AMKASYN series the temperature of internal and external components (e.g. heat sink temperature or motor temperature) is measured by sensors. If critical temperatures are reached for the devices (e.g. as a result of overloading) a warning is generated and then an error message following expiry of a warning period in accordance with ID32943 (Service parameter). Continuous monitoring of the temperature values of the internal and external components is possible using ID33116 and ID33117.

ID33116 Internal temperature
In the KE/KW and RM device series ID33116 indicates the heat sink temperature.

ID33117 External temperature
In the KW device ID33117 indicates the motor temperature (in 0.1°C) and in the KE device the temperature of the brake resistor.

Note:	If implausible values are displayed the sensor and evaluation equipment does not correspond with the necessary hardware state.

KW-R02 as from PC board revision 1.06
KWs as from manufacturer date 02/24

ID34048 PWM-Frequency

This parameter can only be used if the hardware supports different PWM frequencies. Other devices generate a diagnostic message.

Allowed are the PWM frequency 4 kHz and 8 kHz, with 8 kHz as default setting. More output power will be available with 4 kHz

ID34055 EF Type

For safety reasons the content of ID34055 (EF type) must be read after replacement of drive components (KW module, controller card). If the replaced components meet all requirements for safety category 4 ID34055 contains value "4".
If one of the conditions is missing value "2" is indicated. the internal EF monitoring then is not possible, safety category 4 is not ensured!

ID34148 Voltage regulator proportional component K_P

ID34149 Voltage regulator integral action time T_N

If synchronous machines are used in the field weakening range the voltage regulator proportional component and integral component are to be optimized using ID34148 and ID34149.

19 General Parameters

ID00001 NC cycle time

The NC cycle time defines the time grid of the command value input. The command values can be made available for example by the following interfaces:

- SERCOS Interface®
- various field bus interfaces

This time base serves in the inverter additionally for quantification of the fine interpolator (see ID32800 …) of the input 32-bit position command value possible in the position control operation mode.

ID00002 SERCOS cycle

The SERCOS Interface® cycle time states the time intervals in which cyclical data are transferred (e.g. cyclical data in the SERCOS Interface® ring) and serves for clock synchronization between SERCOS Interface® master and the drive computer. Furthermore, the SERCOS Interface® cycle time determines the data updating rate of the message according to parameter ID32948.

ID00017 List of all operation data

List of ALL ID numbers defined in the system. All ID-related data access to the internal database are made on the basis of ID17. The list of all operation data cannot be changed by the user, it is read only.

In contrast to the listing of all parameters according to ID17 the parameters accessible to the customer are listed in the table of contents (at the beginning of this documentation). Parameters which are not listed are designated as system-internal and primarily serve the AMK service department and special application s (special descriptions, e.g. SERCOS description).

ID classes

GLOBAL
Parameters of this group act centrally and are filed once in the database. A parameter change causes after changing the controller enable a complete system initialization.

DRIVE_SPECIFIC
The parameter acts only in the corresponding parameter set. A parameter change causes after changing the controller enable a partial system initialization.

INSTANCE (I)
AMKASYN devices which provide the same type of optional slots allow, for example, parallel operation of several different field bus interfaces. In the case of field bus interfaces the communication parameters such as the baud rate are to be parameterized for each interface. Each option slot is referred to as an instance.

In the parameter menu of the control panel instanced parameters are identified with an "I" instead of a "P". The selection is performed using the "SHIFT P" key.

Instance	Addressed hardware
0	Basic unit ACC bus
1	Optional slot 1
2	Optional slot 2

ID00026 Configuration list status bits

ID26 allows an application specific arrange of 16 binary output messages in one status word ID144 (see chapter Binary outputs).
Parameter ID144 "status word" can be send e.g. via ACC bus networking to an AMK PLC option or to a higher ranking controller for evaluation.

This parameter is used if status bits must be arranged application specific and send to other nodes e.g. in an ACC bus network

Example: configuration ID26 (user data from list element 2)

Element	0	1	**2**	**3**	**4**	5	6	7	…	17
Content	36	36	**33029**	**330**	**336**	…				
Meaning	Length	Length	**SBM**	**$n_{act} = n_{set}$**	**in position**					
Status bit			**0**	**1**	**2**	3	4	5	…	15

Status bit	Binary output code *
0	33029, System ready
1	330, $n_{act} = n_{ist}$
2	336, in position

* see chapter binary outputs to find the full bit message list to configure to binary outputs.

ID00030 Software version

ID30 "Software version" is an ASCII list with 20 bytes of usable data. ID30 is used to uniquely identify all software.

Number [byte]	3	1	3	1	2	2	1	6	1
Content	**Device**	SP	**Version**	SP	**Year**	**Week**	SP	**Part number**	0

SP = space

Example: $$ID30 = \underbrace{\{24,24,}_{\text{Header}}\ \underbrace{\text{KW 200 0140 23988}\}}_{\text{Actual data}}$$

Note: ID30 is supported from the year 2002; older software versions of systems such as AZ/AW, KU either do not support this ID or only partially.

ID00096 Slave identifier SLKN

Determining the linkage of valid drive addresses in the SERCOS Interface® ring

HIGH BYTE: "own drive address"
LOW BYTE: "next drive address"

Refer to the SERCOS Interface® standard for further explanations.

ID00130 Probe value positive edge

This parameter acts in the probe drive function and pulse width measurement. If the positive edge occurs at the probe, the current position feedback value is stored in ID130. Storage of the position feedback value can be acknowledged through the code assignment (code 409) at a binary output (see Table 2).

ID00131 Probe value negative edge

This parameter acts in the probe drive function and pulse width measurement. If the negative edge occurs at the probe, the current position feedback value is stored in ID131. Storage of the position feedback value can be acknowledged through the code assignment (code 410) at a binary output (see Table 2).

ID00144 Status word

ID144 status word is displaying the actual state of maximum 16 real time bits. The content of the status word can be configured individually in ID26 configuration list status bits. All messages which are available to assign to binary outputs can be configured in ID26 (see chapter binary outputs).

The status word is part of the API (Application interface) with the API-variable name wStatusBitsId144. Access to the content is provided by reading the parameter ID144 or the CANopen index 0 x 204E or the API variable name. the content of the status word can be received by an AMK plc option or an external higher ranking controller.

This parameter will be used, if application specific status bits are required and e.g. the status bits will be send to other bus nodes via ACC bus.

ID00179 Probe status

This parameter acts as status message in the probe function. Depending upon the settings in ID169 probe control parameter, the probe status indicates whether the probe has been evaluated on the positive or negative edge.
The feedback position at which the positive or negative edge of the probe was detected can be read out from ID130 or ID131.

Note: Triggering the probe does not lead to the automatic standstill of the axis.

ID00182 Manufacturer status

ID82, manufacturer status class 3, abbreviated to "Manufacturer status" defines the significant status bits for KE/KW and copies of important control bits. This bit sequence can only be read.

LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SBM	**ERR**	**WRN**	**QUE**	**UE 1)**	**QRF**	**RF 1)**	res	res	res	res	res	res	res	res	res

1) The image of control signals is only for information and not for process control

ID00269 Memory mode

The memory mode defines the effect of parameter changing. Either temporary or resistant effect for parameter change can be selected. With this it is possible to control process parameters directly via field bus.

Parameter	Name	Value	Meaning
ID269	Memory mode	1	Parameter changes out of the list "temporary parameters ID270" effects directly the system without a new initialization of the drive system. The parameter change is valid until the next new initialization of the system.
ID269	Memory mode	0	Parameter changes take place after an new system initialization and are resident.

All parameters which can not be changed temporary are resident parameters independent of ID269. For compatibility to older software versions (only if SERCOS is used). ID32901 defines in bit8 the effect of parameter changes after power-ON (AMK Service: see ID32901 bit8).

ID00270 List of temporary parameters

Designates all online changeable parameters in the AMKASYN system. The online changeable parameters act immediately after commanding (t 5 ms) in the volatile working memory (RAM). by using the control panel, these parameters can also be transferred into the permanent database after enquiry and are thus not volatile.

Table 5: List of temporarily changeable parameters

Parameter	Designation	Internal representation	Scaling
ID36	Velocity command value	[0.0001 rpm]	Velocity scaling
ID38	Positive velocity limit	[0.0001 rpm]	Velocity scaling
ID39	Negative velocity limit	[0.0001 rpm]	Velocity scaling
ID41	Homing velocity	[0.0001 rpm]	Velocity scaling
ID49	Positive position limit	[1 incr.]	Position scaling
ID50	Negative position limit	[1 incr.]	Position scaling
ID80	Torque command value	[0.1 % M_N]	Torque scaling
ID82	Positive torque limit	[0.1 % M_N]	Torque scaling
ID83	Negative torque limit	[0.1 % M_N]	Torque scaling
ID100	Velocity loop gain K_P	[1]	fixed
ID101	Integral action time T_N	[0.1 ms]	fixed
ID104	Position loop K_V	[1/min]	fixed
ID124	Zero velocity window	[0.0001 rpm]	Velocity scaling
ID125	velocity limit n_x	[0.0001 rpm]	Velocity scaling
ID126	Torque limit M_{dx}	[0.1 % M_N]	Torque scaling
ID136	Positive acceleration interpolator	[0.001 U/s²] 1)	Acceleration scaling
ID137	Negative acceleration interpolator	[0.001 U/s²] 1)	Acceleration scaling
ID147	Homing parameter	[1]	fixed
ID150	Reference offset 1	[1 incr.] 2)	fixed
ID153	Absolute angle position	incr.	Position parameter
ID154	Spindle positioning parameter	[1]	fixed
ID157	Velocity window	[0.0001 rpm]	Velocity scaling
ID158	Power limit P_x	[1 VA]	fixed
ID169	Probe control parameter		fixed
ID180	Relative spindle position	incr.	Position scaling
ID222	Spindle positioning speed	[0.0001 rpm]	Velocity scaling
ID225	Synchronous parameter	[1]	fixed
ID228	Synchronous angle window	[incr.]	Position scaling
ID230	Synchronous offset	incr.	Position scaling
ID268	Synchronous angle position	incr.	Position scaling
ID278	Synchronous additive position	incr.	Position scaling
ID32778	Velocity at 10 V at A1	[0.0001 rpm]	fixed
ID32779	Velocity offset at A1	[0.0001 rpm]	fixed
ID32780	Acceleration ramp TH	[0.1 ms]	fixed
ID32781	Deceleration ramp TL	[0.1 ms]	fixed
ID32785	Kx message 16	[1]	fixed
ID32786	Kx message 32	[1]	fixed
ID32787	Source analogue 1	[1]	fixed
ID32788	Final value analogue 1	dep. on intern source	fixed
ID32789	Source analogue 2	[1]	fixed
ID32790	Final value analogue 2	dep. on intern source	fixed
ID32791	Source analogue 3	[1]	fixed
ID32792	Final value analogue 3	dep. on intern source	fixed

Parameter	Designation	Internal representation	Scaling
ID32892	Command value divider	[1] 3)	fixed
ID32893	Command value multiplier	[1] 3)	fixed
ID32926	AMK homing parameter	[1]	fixed
ID32927	AMK synchronous parameter	[1]	fixed
ID32935	Standstill voltage	[V]	fixed

All parameters which act on commands (…) must be changed temporarily before commanding. If parameters are changed during a command, then these become effective only at the following command. For example, when commanding speed control with ID36 as command value, the temporary velocity command value input in ID36 must be performed before commanding.

1) The acceleration changes must be completed before positioning. They act for every following positioning (not in position or velocity changes in current positioning).
2) The change of the reference offset must be completed before homing
3) The change of the synchronous ratio may be made with active controller enable only in small steps by means of command value multiplier, since the effect influences directly the command value channel and command value step changes occur.

Note: The effectiveness of temporary parameter changes after system initialization can be set in ID32901 (service parameter).

Standard setting ex works AMK:
All parameters are reinitialized from the database on system initialization, i.e. all temporary changes are lost.

ID00270 List of temporary parameters – service supplement

The following parameters are an excerpt from the list of temporarily changeable parameters. The parameters listed here can be changed temporarily by the AMK service, but are not available as ident number through the customer menu.

Parameter	Designation	Internal representation	Scaling
ID42	Homing acceleration (only for SERCOS interface)	[0.001 U/s²]	Acceleration scaling
ID52	Reference distance 1	[1 incr.]	Position scaling
ID91	Bipolar velocity limit	[0.0001 rpm]	Torque limit
ID92	Bipolar torque limit	[0.1 % M_{Nn}]	Torque limit
ID138	Bipolar acceleration limit	[0.000. U/s²]	Acceleration scaling
ID198	Initial coordinate value	[incr.]	Position scaling
ID217	Parameter set preselection	Parameter set number	fixed
ID275	Coordinate offset value	[incr.]	Position scaling
ID301	SERCOS allocation of real time control bit 1	Ident number	fixed
ID303	SERCOS allocation of real time control bit 2	Ident number	fixed
ID305	SERCOS allocation of real time status bit 1	Ident number	fixed
ID307	SERCOS allocation of real time status bit 2	Ident number	fixed

Parameters ID91, ID92, ID138 are bipolar parameters which are also present unipolar. For instance, ID138 corresponds to the unipolar parameters ID136 and ID137. The following applies:

- When writing a bipolar parameter, this is filed in both unipolar parameters.
- When reading the bipolar parameter, the value of the positive parameter is returned.

ID00390 Diagnosis number

If a warning of an error occurs in the drive, then the corresponding error code (see Diagnostic messages documentation) is written into this parameter. In the case of an error sequence, the first occurring error is always entered. When the "Delete Error" function is executed an existing entry in ID390 is deleted and the parameter value is set to zero. When field bus systems are used an extremely efficient error analysis is thus possible by reading ID390.
If different values are displayed with multiple, directly successive reading of ID390 then the device has an extended ID390 memory (e.g. KE device) which also displays subsequent events.

ID32773 Service switch

This parameter enables drive-specifically acting functionality to be switched on or off primarily by AMK service personnel (monitoring, special applications). The meaning of the individual bits is shown in the following table.

Example of representation with the following goal:

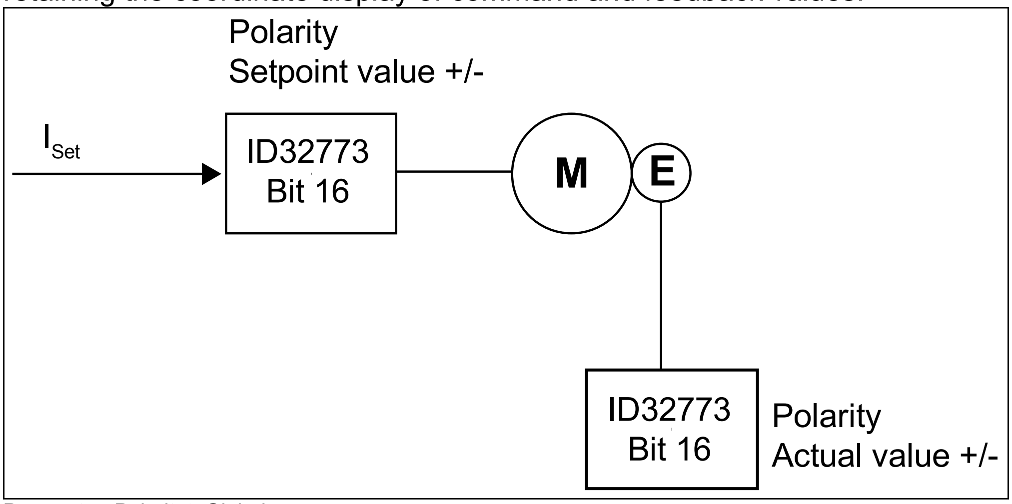
- Activating motor encoder signal monitoring
- Activating motor deceleration control for RF inactive
- Hardware current limiter
- Monitoring square wave inputs

Bit No.	28	24	20	16	12	8	4	0
binary	0 0 0 0	0 0 0 0	0 1 0 0	0 0 0 0	0 0 0 1	0 0 0 0	0 0 0 0	0 1 0 1
hex.	0	0	4	0	1	0	0	5

ID32773 = 401005h

Table 6: ID32773 Overview Service switch

Bit No.	Value	Meaning according to ID32773
0	0	**Sine encoder / resolver signal monitoring** inactive (see ID32953 motor, velocity, position encoder type)
	1	active: KU: Static monitoring of the sine / cosine tracks, an encoder line break is recognized (A / I / E / F / S type encoders and resolovers). In addition amplitude monitoring of the internally standardized signals takes place (exception: not with the A type encoder). KW: Monitoring of the sine and cosine tracks for violation of the minimum and maximum level. Exceeding the maximum level is tolerated once; if the level is exceeded twice in succession the diagnosis message 2311 "Motor encoder error" is output,. If the level falls below the minimum level the unit is immediately switched off with message 2311.
1	0	**AMK A type encoder tracking** inactive
	1	active AMK A type encoders are tracked online regarding their optimum working point
2	0	**Motor deceleration control on RF disable** inactive
	1	active When the axis is decelerated, no axis acceleration may be detected by the system, otherwise deceleration error message.
3	0	**Position limit monitoring according to ID49 / ID50 in the 16-bit position command value channel** inactive only monitoring (reporting) the position limits
	1	active Only for the 16-bit position setpoint channel: Monitoring of the position limit values in accordance with ID49 / ID50 at 500µs intervals (message) and setpoint limitation. The drive remains at a standstill on reaching the position limit value (ID49 / ID50) plus 1 increment.
4	0	Reserved
	1	Reserved
5	0	**Operation mode of the axis after RF disable** With renewed activation of RF, the axis remains in the current operation mode with the current command value channel (operation mode before RF disable, position reg, speed reg, torque control, …)
	1	With renewed activation of RF, the axis always remains in digital speed control with command value 0. (System-internal automatic operation mode change) These statements apply only for the case that no system initialization is initiated by the user in the meantime. Error deletion on missing SBT or parameter change in the database cause a system initialization and thus initiate the system generally in the main operation mode according to ID32800
6	0	**Encoder feedback zero pulse check** inactive
	1	active The zero pulse check effect at every homing run. If the zero pulse is missed or invalid, the diagnostic message 2335 is generated.

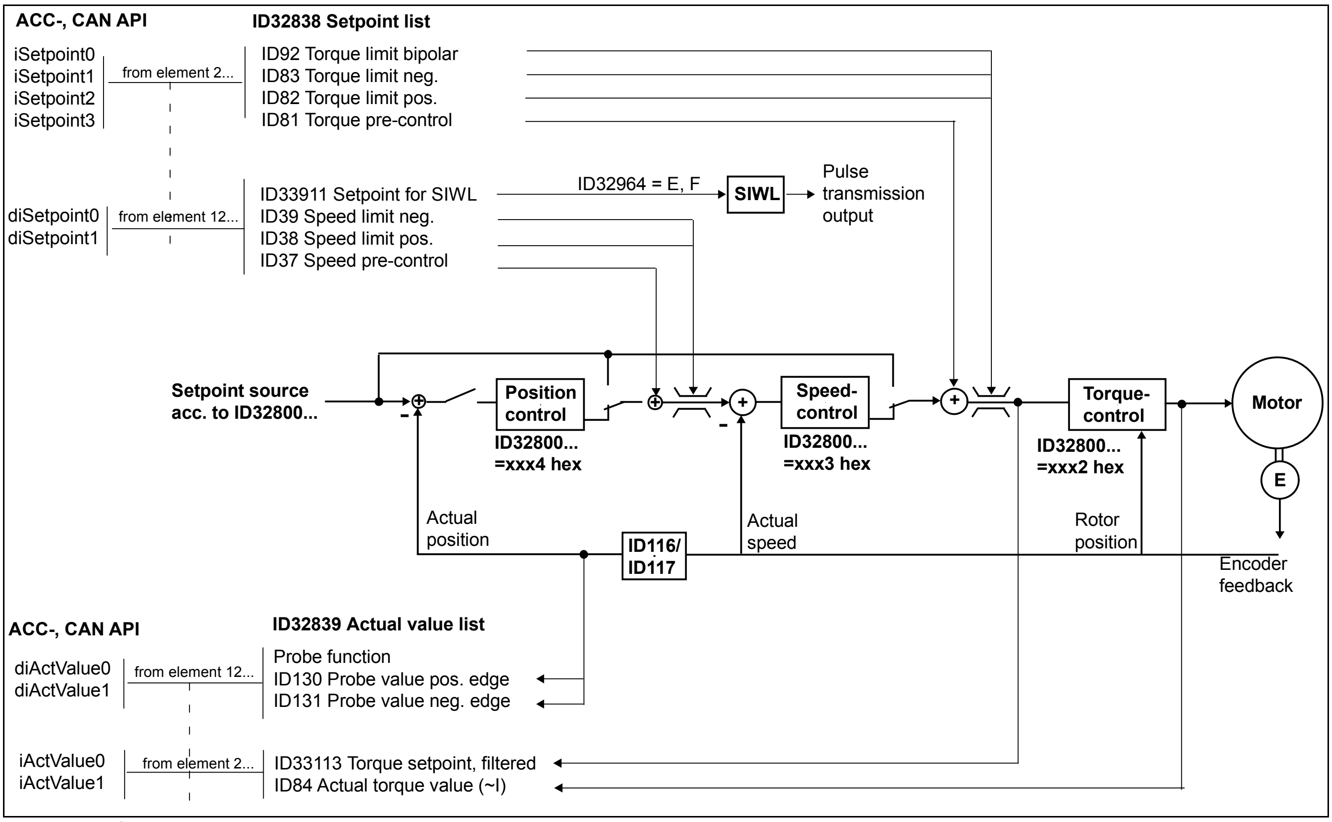
Bit No.	Value	Meaning according to ID32773
7	0	Reserved
	1	Reserved
8	0	Reserved
	1	Reserved
9	0	Reserved
	1	Reserved
10	0	Reserved
	1	Reserved
11	0	Reserved
	1	Reserved
12	0	**Monitoring pulse encoder input (X34)** inactive
	1	active All pulse encoder input signals are tested for phase opposition by means of comparator
13	0	**Monitoring brake acknowledgement** inactive
	1	active (see ID206 and ID207)
14	0	**I²t monitoring** inactive
	1	active Effective protection against overtemperature for motors with very small thermal time constant (e.g. linear motors). On exceeding the "Motor overload threshold" ID114 a warning message 2359 "Motor overload warning" is generated. On reaching 100% overload ID33102 "Motor overload indication" the error message 2360 "Motor overload error" is output and the drive will be ramped down according to ID32782 RF inactive and RF is switched off. The overload time of the motor can be adapted to the thermal time constant of the motor in ID32920.
15	0	**Encoder basic adjustment for A type encoders** with zero pulse evaluation
	1	without zero pulse evaluation
16	0	**Motor direction negated** inactive
	1	active Enables arbitrary installation position of the drive in relation to the mechanism while retaining the coordinate display of command and feedback values.  Parameter_Polarität_Global

Bit No.	Value	Meaning according to ID32773
17	0	**Regenerative braking** (effective only for KU25 and KU40) active only with "Controller enable handshake QRF
	1	**Regenerative braking** (effective only for KU25 and KU40) active as long as "DC Bus enable handshake QUE is set (QRF is not required)
18	0	**Reduced DC bus voltage rise** inactive
	1	active When decelerating the axis the torque is reduced so far that the cut-off threshold for overvoltage alarm 1059 is not reached
19	0	**Control direction monitoring switched off**
	1	**Control direction monitoring switched on** Monitoring takes place in the system initialization. Diagnostic message 2335 is displayed on incorrect control direction.
20	0	Reserved
	1	Reserved
21	0	Reserved
	1	Reserved
22	0	**Hardware current limitation** inactive
	1	active The hardware current limitation switches off the phase in which a current above a limit depending on the device is following. If the current drops below the threshold again, then the phase is switched back in.
23	0	**Reading the absolute position while initialization (only multiturn absolute encoder)** inactive
	1	active
24	0	**Monitoring of the actual position value (plausibility check) only for ENDAT encoder** inactive
	1	active The digital actual position setpoint of the ENDAT encoder will be compared with the system internal calculated position value. If a deviation is detected the diagnosis message 2344 monitor.act.pos is generated.

ID32838 Setpoint list

The AMK controller structure is influenced by entries in the setpoint list. In this way additive variables such as torque or speed pre-control values, limitations, setpoints for pulse forwarding (SIWL) etc. can be dynamically influenced and processed in addition to the setpoint value in the system frequency (ID2 SERCOS cycle time). Via an entry in the list the respective sinks are assigned to a variable in the application interface (API). An API variable is assigned permanently to each list element. The functionality can be used in applications with (AMK-PLC, SERCOS, ACC …).

Figure 42: Overview setpoint list, actual value list and pre-control



Parameter_Sollwertliste

List element	Content	Meaning	API variable
0	x	List header: Current list length (bytes)	
1	44	List header: Possible list length (bytes)	
2		Sink for 16-bit data	iSetpoint0
3			iSetpoint1
4			iSetpoint2
5			iSetpoint3
…11			reserved
12		Sink for 32-bit data	diSetpoint0
13			diSetpoint1
…21			reserved

The following entries in the setpoint list are supported:

ID	Sink	Standardization / Data format
0	Switched off	-
81	Torque pre-control	0.1 %MN, 16-bit
82	Torque limit positive	0.1 %MN, 16-bit
83	Torque limit negative	0.1 %MN, 16-bit
92	Torque limit bipolar	0.1 %MN, 16-bit
37	Speed pre-control	0.0001 1/min, 32-bit
38	Speed limit positive	0.0001 1/min, 32-bit
39	Speed limit negative	0.0001 1/min, 32-bit
100	Speed controller Prop. gain KP	16 bit
101	Speed controller integral action time TN	0.1 ms, 16-bit
102	Speed controller derivative action time TD	0.1 ms, 16-bit
33911	Setpoint for SIWL (pulse transmission)	Increments, 32-bit

Note: 16-bit data are to be entered in the elements 2 to 11; 32-bit data in 12 to 21

ID32839 Actual value list

16-bit and 32-bit system variables (e.g. actual torque value, …) can be output via entries in the actual value list. via the entry of a source in the actual value list the respective system parameter is assigned to a variable in the application interface (API). Can be used in application with (AMK-PLC, SERCOS, ACC…).

List element	Content	Meaning	API variable
0	x	List header: Current list length (bytes)	
1	44	List header: Possible list length (bytes)	
2		Source for 16-bit data	iActValue 0
3			iActValue 1
… 11			reserved
12		Source for 32-bit data	diActValue 0
13			diActValue 1
… 21			reserved

The following entries in the actual value list are supported:

ID	Source	Standardization / Data format
0	Switched off	-
84	Actual torque value	0.1 %Mn, 16-bit
130	Probe function, Probe value positive edge	Incr. 32Bit
131	Probe function, Probe value negative edge	Incr. 32Bit
33113	torque setpoint, filtered	0.1 %Mn, 16-bit

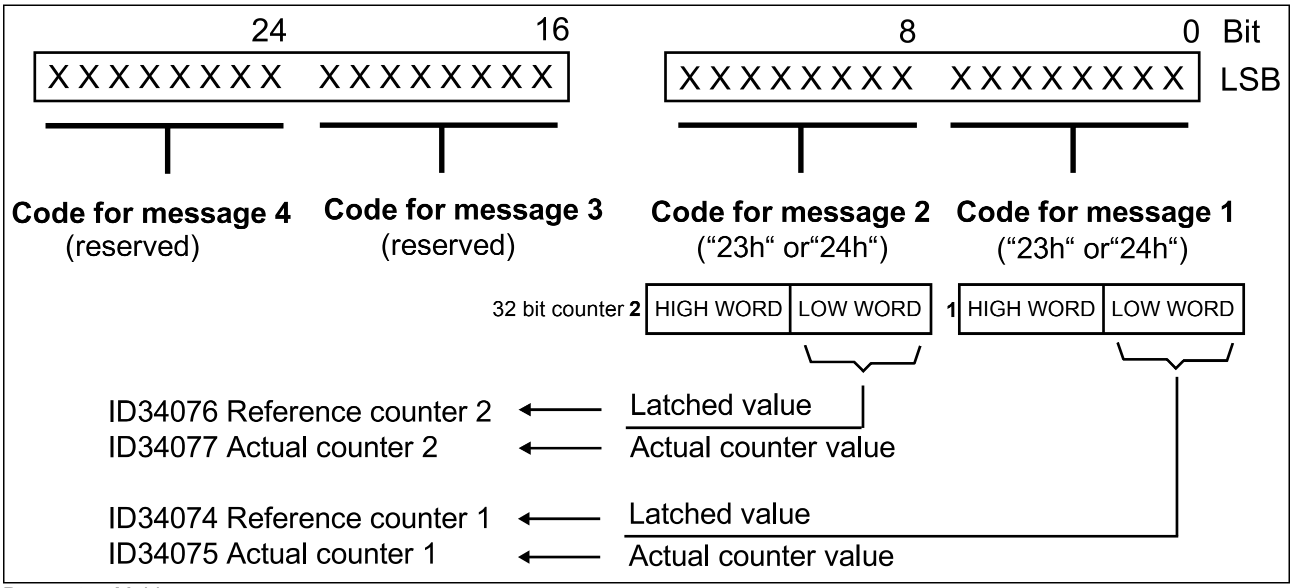
Note: 16-bit data are to be entered in the elements 2 to 11; 32-bit data in 12 to 21

ID32938 Customer variable 1

This variable is available to the customer as storage place. The contents of this parameter are not required by the AMKASYN system. Customer-specific own information per drive set can be filed in the system by the user in this 16-bit variable. this information can be read and processed further in the process required.

ID32948 Kx message (4 · 32 bits)

This parameter defines up to four 32-bit transfer values in the system-internal interface API. The parameter is expedient only in conjunction with option cards (SERCOS interface®, …). For instance, command values can be transferred from option cards into the interface, these are the processed by the system according to configuration. At present only message 1 and 2 are used.



Parameter_Meldung

The same command value source codes may not be used more than once.

Code [h]	Source
0	Source not defined
3	**Pulse encoder input** Division of the 16-bit pulse encoder information into the 32-bit message LOW WORD: Reference counter reading (actual position value will be latched every encoder zero pulse) HIGH WORD: Current counter reading (update of the actual position value after cycle time ID2)
23	**23 store pulse encoder (without zero pulse) value in case o a positive edge on BE2** With a rising edge on binary input BE2 the actual value on the square wave pulse input (pulse encoder without zero pulse) will be stored. The stored 32-bit information contains the following: LOW WORD: Reference counter reading (current counter will be latched every positive edge at BE2) HIGH WORD: current counter reading The binary input BE2 ID32979 "Port 3 Bit 1" must be assigned to code 0
24	**Actual position value of the encoder specified in ID32953 encoder type** The actual position value of the actual position encoder (acc. ID32953) will be stored if a signal edge acc. 169 on probe input BE3 at controller card Kx-R03(P) is recognized. Through this a exact relation is generated between the actual position value and an external mark sensor (e.g. print mark control. The time between two measurements must be at least 2 x ID2. Attention: By commanding a homing cycle the relation to the actual position value will be generated new. Division of the 16-bit pulse encoder information into the 32-bit message LOW WORD: Reference counter reading (actual position value will be latched every signal at BE3) HIGH WORD: Current counter reading (update of the actual position value after cycle time ID2) The binary input BE3 ID32980 "Port 3 Bit 2" must be assigned to code 0

ID32992 Dead time compensation 16-bit position setpoint value

ID32993 Dead time compensation 32-bit position setpoint value

With the time value in ID32992 and ID32993 a precontrol time for position setpoints via the 16 bit / 32 bit setpoint source can be set. The time value is scaled in [ms] and has a resolution of 1µs. The dead time compensation will only work, if the following error compensation (SAK) in ID32800 … is active.

ID32998 Setpoint switch

With the parameter 32998 “Setpoint switch” every setpoint channel at ID32838 “setpoint list” will be allocated to a bit. (cannel x = bit x)

For the Bits in ID32998 are significant:

Bit x: = 1 – setpoint channel x active
= 0 – setpoint channel x inactive

To activate (open) a setpoint switch e.g. channel 9 write 1 at the bit 9. To close the channel 9 write 0 on the bit 9.

Picture: Allocation of the bits of ID 32998 to the setpoint channels.

Bit 31		Bit 19	.....	Bit 10	Bit 9	……	Bit 0
		Kanal 19	……	Kanal 10	Kanal 9	……	Kanal 0

Commanding variables

ID34000 Variable 0

ID34001 Variable 1

ID34002 Variable 2

ID34003 Variable 3

ID34004 Variable 4

ID34005 Variable 5

ID34006 Variable 6

ID34007 Variable 7

ID34008 Variable 8

ID34009 Variable 9

ID34010 Variable 10

ID34011 Variable 11

ID34012 Variable 12

ID34013 Variable 13

ID34014 Variable 14

ID34015 Variable 15

ID34016 Variable 16

ID34017 Variable 17

ID34018 Variable 18

ID34019 Variable 19

The variables 0 … 19 are used in combination with drive commanding by binary inputs as command value storage for different command values such as torque command value, velocity command value or position command value (see "Assignment of binary inputs").

ID34047 Dead time measurement [0.001 ms]

Dead time with the probe function in fact of e.g. sensing device and input circuit can be compensated with this parameter. The probe value is compensated by the time value in this parameter.

ID34058 Active power network [W]

The network's active power is displayed by invoking this identification number. Positive values indicate the active power derived from the power network (motor operation). Negative values indicate the active power regeneratively fed back into the power network. Generator operation is only available on devices with regenerative feedback. The display is prescaled [P_{Active}] = [W].

ID34059 Time filter power network active power [ms]

To obtain a "steady" reading of the active power, the operator can configure a proportional element with a 1st order delay (PT1 element) by the entering a filter time. The scan period (Ta) for the torque setpoint display is 0.5 ms. A filter time of between 10 ms and 65 s is possible, depending on the application the value 0 is set internally at 10 ms.

ID34071 System name

An arbitrary name can be assigned to the drive with the "System designation" parameter. This may consist of a maximum of 16 ASCII characters, which are transferred for instance by means of field bus into the parameter. The assigned name can also be read out through the field bus. The system designation serves in networked systems for drive identification.

ID34072 Data record name

The ID34072 serves as data record name which may consist of a maximum of 16 ASCII characters. It is possible to write and read this parameter through field bus interfaces.

ID34144 Nominal voltage effective [V]

The actual value of the line current is displayed by invoking this identification number.

ID34145 Line current effective [A]

The actual value of the line current is displayed by invoking this identification number

ID34154 Start marker

The "start marker" parameter specifies the start position of the window in which a valid printing mark has to exist. This parameter has to be defined by a super ordinate control

ID34155 Marker window

The "mark window" parameter specifies the width of the window in which a valid printing mark has to exist. The sign of the value specifies the appropriate start-up or mark search direction. This parameter has to be defined by a superodinate control.

ID34157 Dead time compensation

Dead times through using the function pulse-width measuring can be compensated with this parameter. The measured value will be corrected with the configured value. Dead times can be caused trough sensors.

ID34171 Event filter

By configuring the parameters of ID34171 "Event filter", specific event classes can be filtered out.
Each class is represented by a bit in ID 34171 "Event filter". If the respective bit is set, events of the relevant class are not written to ID34088 "Event trace".
The following event classes are supported and can be filtered out:

Event class name	Bit in ID34171	Explanation
Error	0	Error messages of the system
Warning	1	Warning messages of the system
Option error	2	Error messages from interface cards such as ACC or SERCOS
Option warning	3	Warning messages from bus options
Delete error	4	Delete error
System	5	System messages such as Power On, Firmware Update...
External access	6	Access to the system parameters (AIPEX) or the file system (FTP)

ID34172 PLC Project info

In this project information the following entries are listed:

- Date
- Project name
- Title
- Version
- Author
- Comment

The entry of the project information is made in the programming software "CoDeSys" in the menu <Project> - <Project information>.

20 Scaling Parameters

The following parameters influence scaling (scaling or display resolution) of the operating parameters.
The scaling influences the 32-bit setpoint source diMainSetpoint32 and the interpolator.
The feedback value is always displayed scaled.

ID	Name	Remarks
76	**Scaling for position data**	
77	Scaling factor for translational position data	Is required only for parameter scaling of translational position data (ID76 Bit 3 = 1)
78	Scaling exponent for translational position data	Is required only for parameter scaling of translational position data (ID76 Bit 3 = 1)
79	Rotation resolution	Is required only for parameter scaling of translational position data (ID76 Bit 3 = 1)
44	**Scaling for speed / velocity data**	
45	Scaling factor for velocity data	Is required only for parameter scaling of velocity data (ID44 Bit 3 = 1)
46	Scaling exponent for velocity data	Is required only for parameter scaling of velocity data (ID44 Bit 3 = 1)
86	**Scaling for torque / force data**	
93	Scaling factor for torque / force data	Is required only for parameter scaling of torque / force data (ID86 Bit 3 = 1)
94	Scaling exponent for torque / force data	Is required only for parameter scaling of torque / force data (ID86 Bit 3 = 1)
160	Scaling for acceleration data	
161	Scaling factor for acceleration data	Is required only for parameter scaling acceleration data (ID160 Bit 3 = 1)
162	Scaling exponent for acceleration data	Is required only for parameter scaling of acceleration data (ID160 Bit 3 = 1)
121	Gear input revolutions	See ID76 data reference
122	Gear output revolutions	See ID76 data reference
123	Feed constant	The feed constant states the linear distance for none revolution of the drive. In linear motors it corresponds to the length of the pole period.
32771	Nominal motor torque	
116 117	Position encoder resolution	ID116 or ID117 is relevant depending upon the position feedback value set in ID32800
32800	Main operation mode	Only bit 14 is relevant for the selection of the position feedback value source.

A distinction must be made between 3 scaling types:

- AMK scaling base (default)
- Default scaling (fixed)
- Parameter scaling (user-specific)

AMK scaling base

The AMK scaling base is the scaling set ex works which corresponds to the previous standard

AMK scaling base (setting ex works):

Scaling for position data	**Internal resolution of the position encoder in [incr.]**
Scaling for speed data	10^{-4} rpm / 0.0001 rpm
Scaling for torque data	10^{-1} $\%M_N$ / 0.1 $\%M_N$
Scaling for acceleration data	10^{-3} r/s² / 0.001 U/s²

Preferred scaling

AMAKSYN works in preferred scaling with fixed values which can be taken from the following overview figures.

Position data (translational)	**Scaling factor**
Metric preferred scaling (meter)	$1 \cdot 10^{-7}$
Preferred scaling in inch (inch)	$1 \cdot 10^{-6}$
Position data (rotational)	$1 \cdot 10^{-4}$ angular degree
Velocity scaling (translational)	
Metric preferred scaling (meter/minute)	$1 \cdot 10^{-6}$ m/min^{-1}
Preferred scaling in inch (inch/minute)	$1 \cdot 10^{-5}$ in/min^{-1}
Velocity scaling (rotational)	$1 \cdot 10^{-4}$ min^{-1} $1 \cdot 10^{-6}$ s^{-1}
Force data (translational)	
Metric preferred scaling (Newton)	$1 \cdot 10^{-0}$ N
Preferred scaling in inch (pound-force)	$1 \cdot 10^{-1}$ lbf
Torque data (rotational)	
Metric preferred scaling (Newtonmeter)	$1 \cdot 10^{-0}$ Nm
Preferred scaling in inch (inch pound-force)	$1 \cdot 10^{-1}$ inlbf
Acceleration data (translational) Metric (meter / second²)	$1 \cdot 10^{-6}$ m/s²
Acceleration data (rotational)	$1 \cdot 10^{-3}$ U/s²

Parameter scaling

Parameter scaling allows free scaling of all data influenced by scaling, if the conditional for the scaling to be observed.
If parameter scaling is selected in the relevant scaling parameter, then scaling of the units via factors can be performed application-related. The factor must be entered in the corresponding indent numbers. The scaling of all data is defined with the aid of the 3 following formulae.

Velocity and acceleration data

Formula 36: Scaling of velocity and acceleration data

$$\text{Resolution} = \frac{\text{Dimension unit}}{\text{Time unit}} \cdot \text{scaling factor} \cdot 10^{\text{scaling exponent}}$$

Velocity and acceleration data are scaled through the scaling factor and the scaling exponent.

Scaling for	Scaling parameter	
	Scaling factor	Scaling exponent
Acceleration	ID161	ID162
Velocity	ID45	ID46

In the AMK scaling base, e.g. for speeds (in $1 \cdot 10^{-4}$ rpm) the scaling factor is ID45 = 1 and the scaling exponent ID46 = 4.

Torque and linear (translational) position data

Formula 37: Scaling of torque translational position data

$$\text{Resolution} = \text{Dimension unit} \cdot \text{Scaling factor} \cdot 10^{\text{Scaling exponent}}$$

Scaling for	Scaling parameter	
	Scaling factor	Scaling exponent
Torque	ID93	ID94
Translational position data	ID77	ID78

Rotational position data

Formula 38: Rotational scaling of position data

$$\text{Resolution} = \frac{360°}{\text{Rotation} - \text{position resolution (ID79)}}$$

Scaling for	Scaling parameter
	Rotation resolution
Rotational position data	ID79

For instance, if the rotation resolution is defined in ID79 as 3600, then a resolution of 10^{-1} angular degrees results.

Handling scaled parameters / AIPEX

During configuration of a parameter set, using the AMK software AIPEX, the scaling parameters must firstly be parameterized and initialized by system initialization. After restart, AIPEX must be logged in new or refresh with the F5 button.
The displayed values change e.g. from increments to millimetres if you are using position data translational. If you are using rotational scaling → angular degree.
After that all further parameters can be changed.

Examples:
Extension of the AIPEX parameter list. The displayed units change after refresh however the preset scaling.

		incremental scaling		linear scaling		rotational scaling	
47	Position cmd.val	0	Inkr.	0.000	mm	0.000	grad
48	Added cmd. val.	0	Inkr.	0.000	mm	0.000	grad
49	Pos.posit. limit	2147483647	Inkr.	214748.365	mm	214748.365	grad
50	Neg.posit. limit	-2147483648	Inkr.	-214748.365	mm	-214748.365	grad
51	Posit.feedb.val.	0	Inkr.	0.000	mm	0.000	grad
52	Home ref. posit.	0	Inkr.	0.000	mm	0.000	grad
53	Posit.feedb.val2	0	Inkr.	0.000	mm	0.000	grad
54	Reference dist.2	0	Inkr.	0.000	mm	0.000	grad

Scaling with scaling factor and scaling exponent

With a scaling factor of 1, scaling is changed by powers of 10 by changing the scaling exponent (…10^{-4}, 10^{-5}, 10^{-6}, …). If the scaling factor is larger than 1, then the scaling is changed in addition by this integral factor. A speed value then is displayed for instance in 1/50 rpm (0.02 rpm) if the scaling is defined as ID45 = 2 and the scaling exponent as ID46 = 2.

Example:
Linear scaling

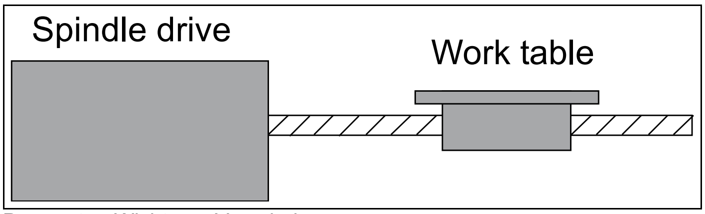
Scaling	ID77	ID78	Travel	Setpoint via PLC
1/1000 mm	1	-6	12,567 mm	12567
1/100 mm	1	-5	15,22 mm	1522
1/10 mm	1	-4	9,2 mm	92

Note: The boundary condition for the scaling factors must be observed. You can find calculation example in the following description.

Relationship between rotations and linear motions

In translational scaling, the relation to the linear motion is defined through the **feed constant ID123**. The feed constant states the linear distance per motor revolution. In linear motors ID123 corresponds to the length of the pole period of the motor.

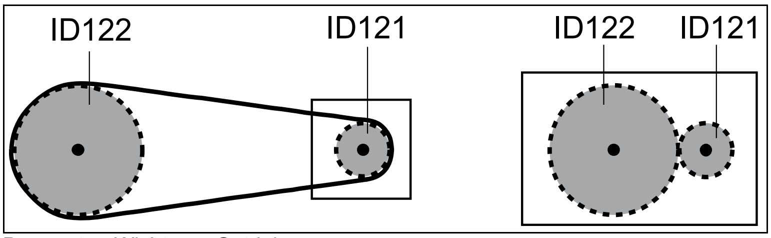
Example:
The input value at the ID123 "Feed constant" indicates which way the work table travels by one motor revolution.



Parameter_Wichtung_Vorschub

Gear between motor and load

When a gear is used between motor and load, the gear ratio ID121 / ID122.
In the default setting the gear ratio is not taken into account. To activate the gear ratio parameters the data reference must be changed to be load.
With the following parameters the data reference must be changed to take into account the gear ratio.
ID76 "position data scaling" and ID160 "acceleration scaling parameter" (Bit 6 = 1). The actual and the setpoint value related at the load. Data reference at the load means gear output.



Parameter_Wichtung_Getriebe

External distance measuring system at the load
An external distance measuring system must be defined in the operation mode parameter ID32800 and then applies for all further operation modes (ID32801 … ID32809).

The type of the external actual position encoder is to be defined in ID32953.

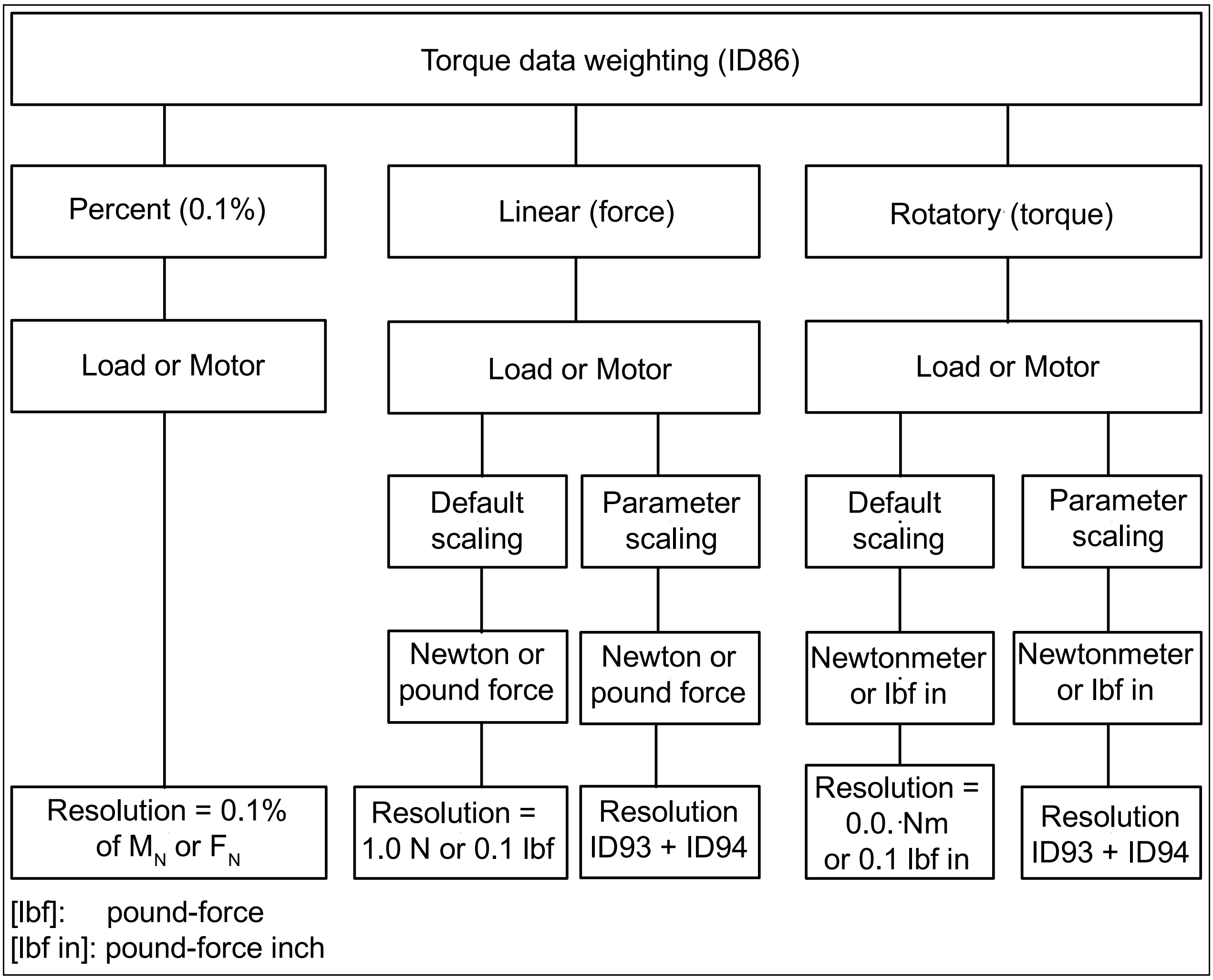
Note:	If an external actual position encoder is defined then the actual position value is fundamentally evaluated by this encoder in all position-controlled operating modes.

Feedback value encoder resolution

The resolution of the motor encoder (ID116) or of an external position encoder (ID117) must be defined for the required feedback value generation.

ID00086 Torque scaling parameter

Figure 43: Torque scaling parameter overview



Parameter_Wichtung_Drehmoment

The overview shows the resolution of the torque parameters depending upon the settings in ID86 torque scaling parameter.

In parameter scaling the resolution of torque data is determined by the scaling factor ID93 and the scaling exponent ID94.

The AMK scaling base for torque parameters is 0.1% MN.

The set scaling for torque data refers to the following parameters:
ID80, ID82, ID83, ID84, (Service ID92), ID126, ID32777, (Service ID33133)

* Parameters which are identified with "Service" are preset by AMK and not accessible through the customer menu

Parameter ID86 structure

Bit-No.	Value (dec.)	Meaning according to ID86
0 - 1	0	Scaling Percentage scaling
	1	Linear scaling (force)
	2	Rotational scaling (torque)
2		Reserved
3	0	Scaling type Default scaling
	1	Parameter scaling
4	0	Unit of measure for linear scaling (force) Newton [N]
	1	Pound-force [lbf]
	0	Unit of measure for rotational scaling (torque) Newtonmeter [Nm]
	1	Inch pound-force [inlbf]
5		Reserved
6	0	Data reference At the motor shaft
	1	Reserved
7 - 15		Reserved

Bit	Explanation
0 - 2	The scaling type distinguishes between force and torque. The percentage scaling refers to the nominal torque for rotation motors or to the nominal force for linear motors.
3	A distinction is made between default scaling with fixed resolution and parameter scaling with variable resolution. This is set with parameter ID93 scaling factor and ID94 scaling exponent.
4	The unit of measure is set by this bit depending upon the scaling
6	Only the motor data reference is allowed for torque/force data

Formula 39: Scaling of torque data in parameter scaling

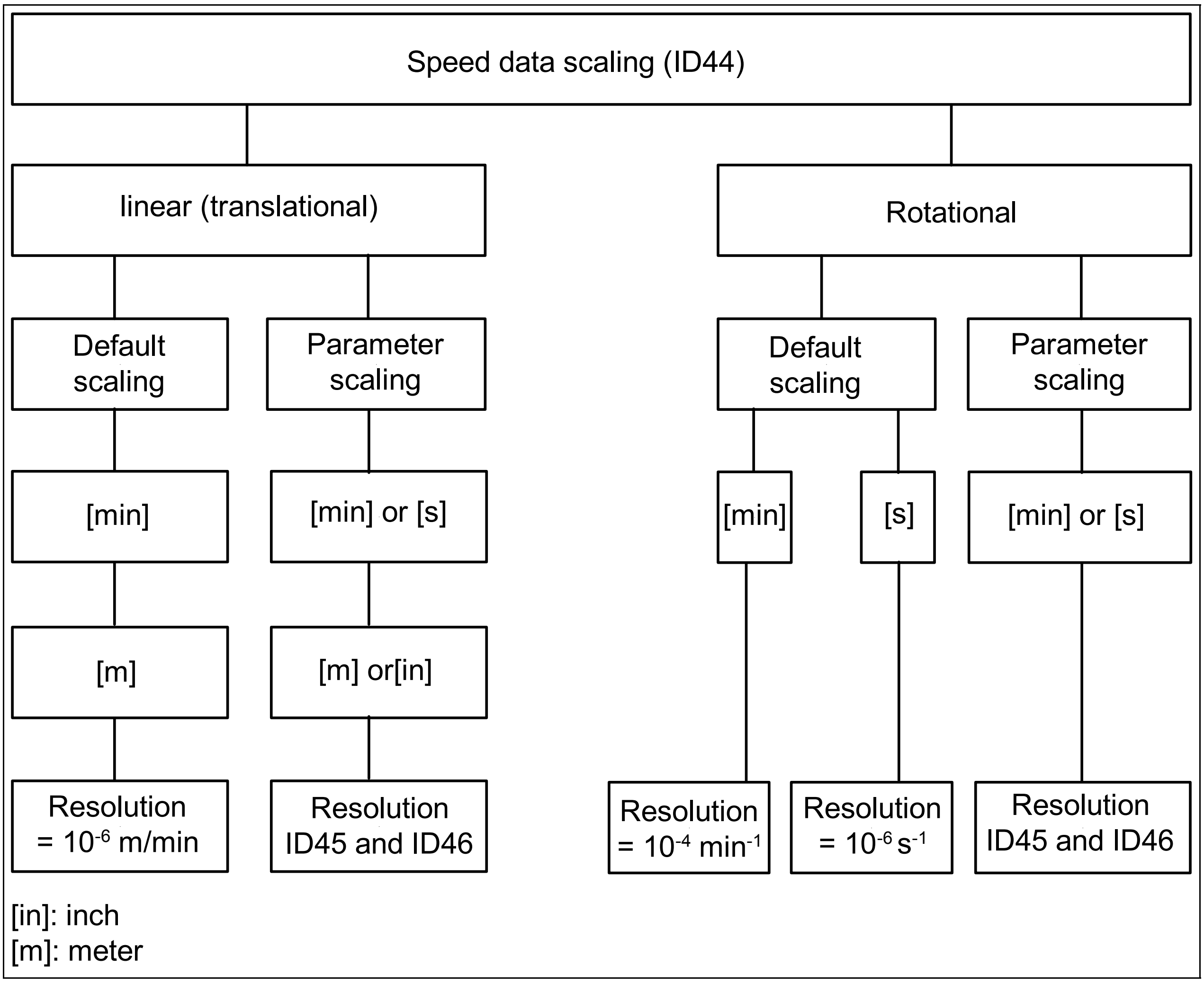
$$\text{Resolution} = \text{Dimension unit} \cdot \text{Scaling factor}\,(\text{ID93}) \cdot 10^{\text{Scaling exponent (ID94)}}$$

ID00093 Torque scaling factor

ID00094 Torque scaling exponent

The torque scaling factor and the scaling exponent are effective with parameter scaling selected and are included in the Formula 39.

ID00044 Velocity scaling parameter



Parameter_Wichtung_Drehzahl

The overview shows the resolution of the velocity data depending upon the settings in ID44 velocity scaling parameter.

In the case of parameter scaling, the resolution of velocity data is determined by the scaling factor ID45 and the scaling exponent ID46.

AMK scaling base for velocity parameters is 10^{-4} rpm.

Scaling of the velocity data acts on the following parameters:

ID36, ID38, ID39, ID40, ID41, (Service ID91), ID124, ID125, ID157, (Service ID183), (Service ID184), (Service ID213), (Service ID220), (Service ID221), ID222,(Service ID259), ID32778, ID32779, (Service ID32783), (Service ID32784), (Service ID32823), ID32940, (Service ID32947)

* Parameter which are identified with "Service" are preset by AMK and not accessible through the customer menu.

Parameter ID44 structure

Bit-No.	Value (dec.)	Meaning according to ID44
0 - 1	0	**Scaling type** Reserved
	1	Linear scaling
	2	Rotational scaling
2		Reserved
3	0	**Scaling type** Preferred scaling
	1	Parameter scaling
4	0	**Dimensional unit for linear scaling** Meter [m]
	1	Inch [in]
	0	**Dimensional unit for rotational scaling** Revolutions / (RAD*)
	1	Reserved
5	0	**Time unit** Minutes [min]
	1	Seconds [s]
6	0	**Data reference** At the motor shaft
	1	Reserved
7 - 15		Reserved

* In parameter scaling (rotational) the dimension unit is RAD instead of revolutions.

Bit	Explanation
0 - 2	Scaling of the units for rotational or linear motions can be performed
3	It is differentiated in default scaling with fixed resolution and parameter scaling with application-related resolution. This is set by the scaling factor and the scaling exponent
4	The dimensional unit is set depending upon the scaling type
5	The time unit can be chosen between minutes and seconds
6	Only the motor data reference is allowed for velocity data

In parameter scaling, the resolution of velocity parameters is determined by the scaling factor ID45 and the scaling exponent ID46:

Formula 40: Scaling velocity data in parameter scaling

$$\text{Resolution} = \frac{\text{Dimension unit}}{\text{Time unit}} \cdot \text{Scaling factor (ID45)} \cdot 10^{\text{Scaling exponent (ID46)}}$$

The formula applies both for linear and for rotational scaling. The relationship between the rotation motion and the linear motion results from the feed constant ID123.

Note: For the velocity parameters which refer to the AMKASYN Kx interpolator (IPO), the data reference is effective additionally from the position scaling parameter ID76. I.e. if the position encoder and the data reference of the position command value are unequal, the gear ratio (ID121 / ID122) is also calculated for the following parameters.

Velocity parameters for IPO

- Homing velocity ID41
- spindle positioning velocity ID222
- High homing velocity ID32940

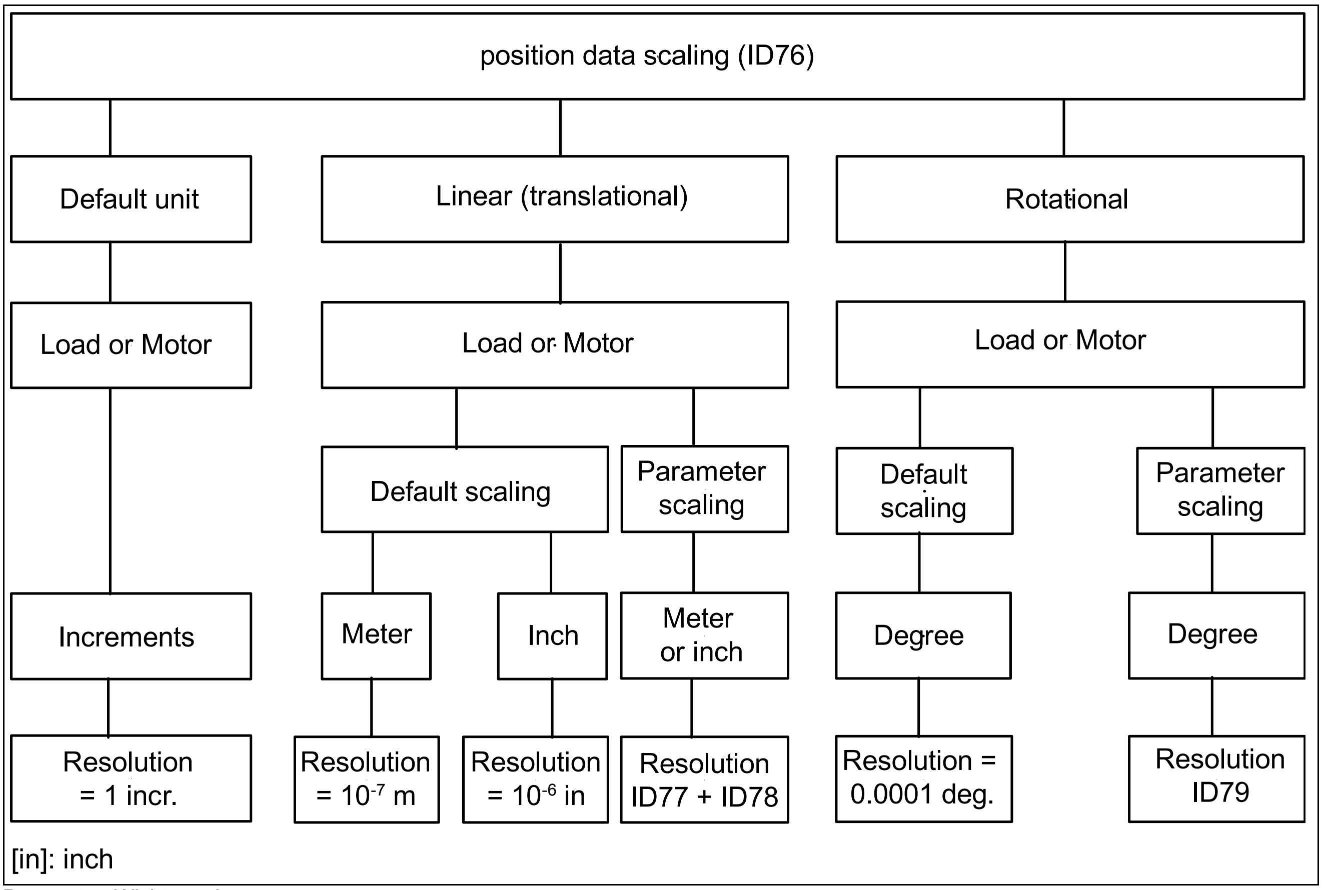
ID00045 Velocity scaling factor

ID00046 Velocity scaling exponent

The velocity scaling factor and the velocity scaling exponent are effective with parameter scaling selected and are included in the Formula 40.

ID00076 Position scaling parameter

Figure 44: Position scaling parameter overview



Parameter_Wichtung_Lage

The overview shows the resolution of the position data depending upon the settings in ID76 position scaling parameters.

In parameter scaling for linear motions, the resolution of the position data is determined by the scaling factor ID77 and the scaling exponent ID78.

In rotational parameter scaling the scaling factor ID79 rotation resolution must be determined.

Note:	The entered scaling factors will reduce to a 16-bit multiplicator and a 16-bit devisor by system internal. It must be possible to reduce the entered scaling factor into a 16-bit conversion size. If the system cannot reduce the scaling factor to a 16-bit value (max. 65535) the error message 1430 "position scaling" generates.

Boundary condition "linear scaling"

$$\frac{ID77 \cdot 10^{ID78} \cdot ID116 \cdot 10^{7} \cdot ID121}{ID123\,[mm] \cdot 10^{4} \cdot ID122} = \frac{Max\ 65.535 = FFFF_{hex}}{Max\ 65.535 = FFFF_{hex}}$$

Example:

$$\frac{1 \cdot 10^{-7} \cdot 65.536 \cdot 10^{7} \cdot 10}{5.\,[mm] \cdot 10^{4} \cdot 10} = \frac{655.360}{500.000} = \begin{pmatrix} \text{reduced} \\ \text{with } 160 \end{pmatrix} = \frac{4.096}{3.125}$$

Boundary condition "rotational scaling"

$$\text{Resolution} = \frac{ID116 \cdot ID121}{ID79 \cdot ID122} = \frac{Max.\ 65.535 = FFFF_{hex}}{Max.\ 65.535 = FFFF_{hex}}$$

Example:

$$\frac{20.000 \cdot 20.833}{360.000 \cdot 1.000} = \frac{416.660.000}{360.000.000} = \begin{pmatrix} \text{reduced} \\ \text{with } 20 \end{pmatrix} = \frac{20.833}{18.000}$$

The AMK scaling base for processing the position data in increments.

The set scaling of the position data refers to all following parameters:
(Service ID47), (Service ID48), ID49, ID50, ID51, (Service ID52), (Service ID53), (Service ID54), ID57, ID103, ID130, ID131, ID150, (Service ID151), ID153, ID173, (Service ID175), ID180, (Service ID189), (Service ID198), ID228, (Service ID229), ID230, (Service ID258), (Service ID261), ID268, (Service ID275), ID278, ID32824, (Service ID32826), ID32922, ID32952, (Service ID33098), (Service ID33104), ID34070

* Parameter which are identified with "Service" are preset by AMK and not accessible through the customer menu.

Parameter ID76 structure

Bit-No.	Value (dec.)	Meaning according to ID76
0 - 1	0	**Scaling type** Incremental scaling
	1	Linear scaling
	2	Rotational scaling
2		Reserved
3	0	**Scaling type** Preferred scaling
	1	Parameter scaling
4	0	**Unit of measure for linear scaling** Meter [m]
	1	Inch [in]
	0	**Unit of measure for rotational scaling** Angular degree
	1	Reserved
5		Reserved
6	0	**Data reference** At the motor shaft
	1	At the load
7	0	**Processing format** Absolute format (ID32800)
	1	Modulo format (according to ID103, ID32800)
8 - 15		Reserved

Bit	Explanation
0 - 2	It is possible to chose between different scaling types. In incremental scaling, position data are transferred in increments.
3	A distinction is made between default scaling with fixed resolution and parameter scaling with variable resolution. This is set with parameter ID77, ID78 and ID79.
4	The unit of measure can be set with this bit depending upon the scaling type.
6	It is determined with the aid of the data reference whether a gear must be taken into account. Since the position data in the Kx operating system always refer internally to the active position encoder (motor encoder or external position encoder), the following applies: • **(Bit 6 = 0):** If position encoder and data reference are the same, i.e. the position encoder is motor encoder and the data reference is at the motor shaft → no gear ratio is taken into account. • **(Bit 6 = 1):** If position encoder and data reference are not equal, i.e. the position encoder is motor encoder and the data reference is at the load → the gear ratio (ID121 / ID122) is taken into account (see figure in ID32953)
7	The processing format states whether the position data are processed as absolute position values or as modulo position values. The modulo position values move between 0 and the modulo end value 2π. In modulo format the difference between two consecutive command values may not be greater than one half of the modulo end value. Which value is evaluated as modulo end value depends upon the operation mode ID32800 bit 13. The modulo end value (ID103) must be convertible into increments without residue.

In parameter scaling the resolution of position parameters is determined by the scaling factor ID77 and the scaling exponent ID78 or by the rotation resolution ID79.

The relation between the rotation and the linear motion is produced with the feed constant ID123.

Formula 41: Linear scaling of position data in parameter scaling

$$\text{Resolution} = \text{Dimension unit} \cdot \text{scaling factor}\,(\text{ID77}) \cdot 10^{\text{scaling exponent}(\text{ID78})}$$

Formula 42: Rotational scaling of position data in parameter scaling

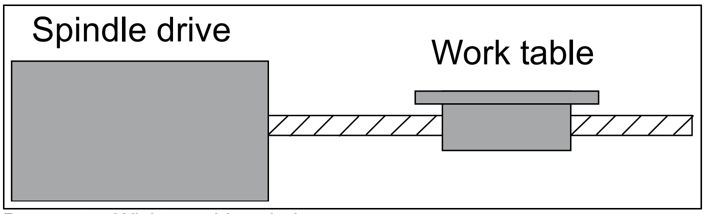
$$\text{Resolution} = \frac{360°}{\text{Rotation} - \text{position resolution}\,(\text{ID79})}$$

ID00077 Position scaling factor for linear motion

ID00078 Position scaling exponent for linear motion

The position scaling factor and the scaling exponent are effective with selected parameter scaling and are included in the Formula 41.

Example:
The example shows an absolute positioning with a preset value.
The positioning will be started with a plc or alternative via binary input.



Parameter_Wichtung_Vorschub

The spindle has got a lead of 5 mm/rev. (ID123 "feed constant")
Way to move 50,75 mm
Spindle position speed 300 rpm (ID222)
Resolution motor encoder 20480 increments (ID116)
No gear (ID121 / ID122)

the setpoint value must ensure for equivalent merit 1/100 mm.
1/100 mm = $1 \cdot 10^{-5}$
1 = ID77 "position scaling factor for linear motion" and –5 = ID78 "position scaling exponent for linear motion"

Boundary conditions controlling

The reduced numerator and denominator must be to a 16-bit value)

$$\frac{ID77 \cdot 10^{ID78} \cdot ID116 \cdot 10^{7} \cdot ID121}{ID123\,[mm] \cdot 10^{4} \cdot ID122} = \frac{1 \cdot 10^{-5} \cdot 20.480 \cdot 10^{7} \cdot 1}{5 \cdot 10^{4} \cdot 1} = \frac{1024}{25}$$

Parameterization
ID76 "position data scaling"

- Scaling type **linear**
- Scaling type **parameter scaling**
- Unit of measure **meter**
- Data reference **at the motor shaft**
- Processing format **absolute format (ID32800)**

Note:	After parameterize ID76 "position data scaling" the system must be restarted. After restart the parameters must upload from the system with AIPEX. Then the other parameters can be entered.

ID77	"position scaling factor for linear motion"	1
ID78	"position scaling exponent for linear motion"	-5
ID123	"Feed constant"	5.000 mm/U
ID222	"Spindle position speed"	300 rpm

Setpoint setting via plc controller
If you use a scaling 1/100 than you must preset for a movement of 50.75 mm a value of 5075

Setpoint setting via binary input
ID153 "spindle angle position" 50.00 mm

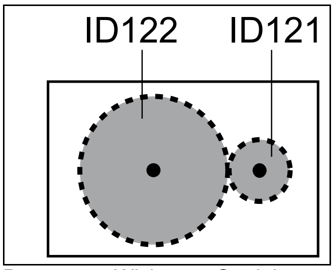
E.g. I/O option card 1 ID32874 "Port 1 Bit 0" Code 33713 "absolute positioning"
The actual value" can be read with the AIPEX monitor function. Indication after the scaling "millimetre"

ID00079 Rotation resolution

The scaling parameter for rotation position data results according to Formula 42.

Example:
ID79 = 360 → Scaling results as 1°
ID79 = 3600 → Scaling results as 0.1°

Example:
The example shows a position data rotational scaling with gear.
The setpoint setting should be in 1/100 degrees
Gear ratio (10/1) Input 10 U/rev. / Output 1 U/rev.
Motor with I type encoder (sinus encoder period 100 incr.)
Motor encoder resolution ID116 = 20000 incr.



Parameter_Wichtung_Getriebe

ID76 "Position data scaling"		ID160 "Acceleration scaling parameter"	
Scaling type:	rotational	**Scaling type:**	not relevant
Scaling type:	parameter scaling	**Scaling type:**	not relevant
Unit of measure:	angular degree	**Unit of measure:**	not relevant
Data reference	at the load	**Time unit:**	not relevant
Processing format:	absolute format	**Data reference:**	at the load

Note: after parameterize ID76 "Position data scaling" the system must be restarted. After restart the parameters must upload from the system with AIPEX. Then the other parameters can be entered.

ID121 Gear input revolutions = 10
ID122 Gear output revolutions = 1

Calculation resolution 1/100 degrees

$$\text{resolution} = \frac{360°}{\text{rotation pos. resolution (ID79)}}$$

$$\text{ID79} = \frac{360°}{\text{resolution}} = \frac{360°}{0.01} = 36.000$$

ID79 rotation pos. resolution = 36.000

Boundary conditions controlling

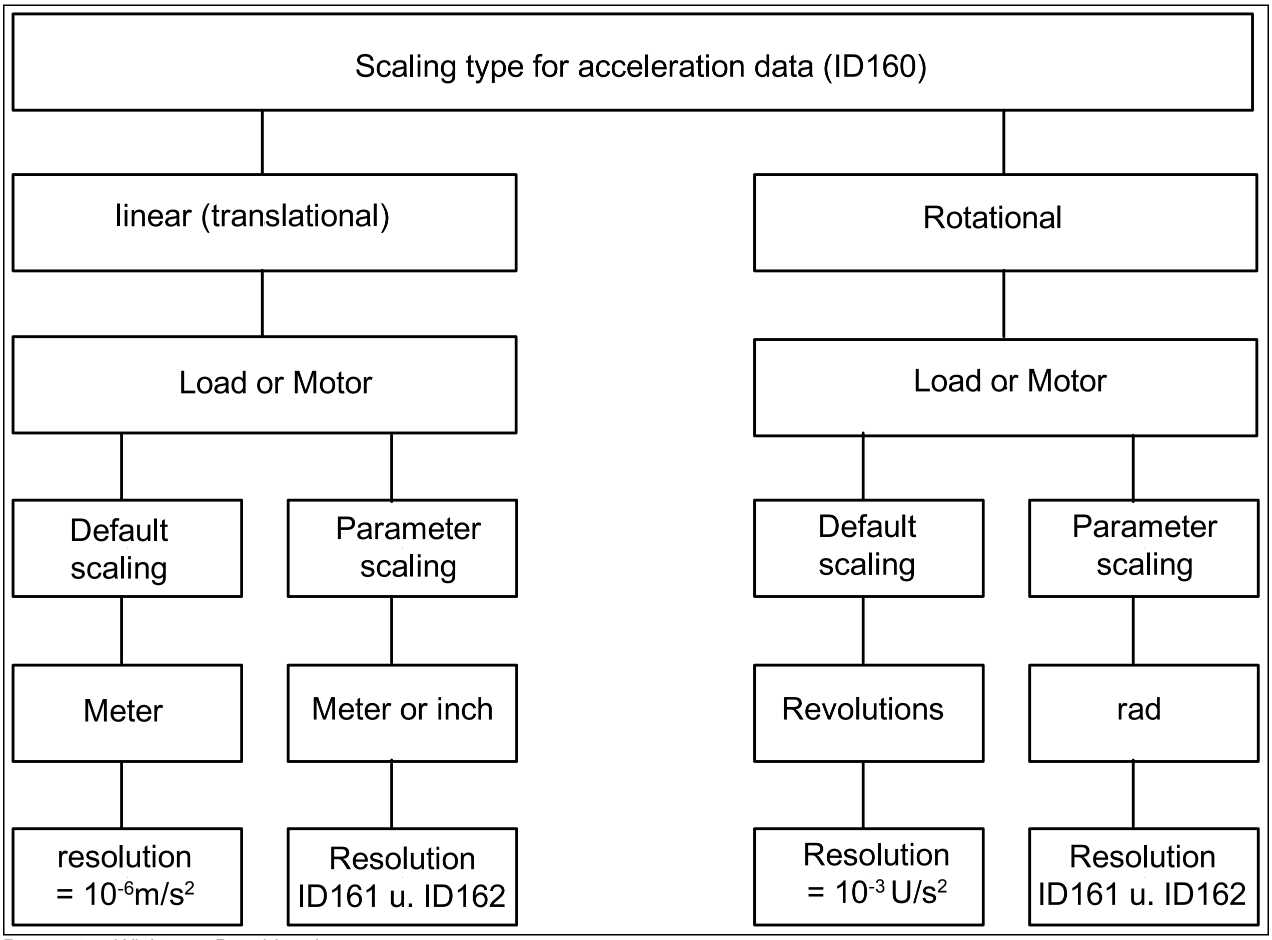
(The reduced numerator and denominator must be to a 16-bit value)

$$\frac{\text{ID116} \cdot \text{ID121}}{\text{ID79} \cdot \text{ID122}} = \frac{20.000 \cdot 10}{36.000 \cdot 1} = \frac{200.000 = 50_{hex}}{36.000 = 9_{hex}}$$

The "actual value" can read with the AIPEX monitor function. Indication after the scaling "degrees" (displayed value = gear output).

ID00160 Acceleration scaling parameter

Figure 45: Acceleration parameter overview



Parameter_Wichtung_Beschleunigung

The overview shows the resolution of the acceleration data depending upon the settings in ID160 acceleration scaling parameter.

In the scaling parameter for linear motions the resolution of the acceleration parameters is determined by the scaling factor ID161 and the scaling exponent ID162.

The AMK scaling base for acceleration data is in 10^{-3} U/s²

The set scaling for acceleration data acts on the following parameters:
(Service ID42), ID136, ID137, (Service ID138), (Service ID260)

* Parameters which are identified with "Service" are preset by AMK and not accessible through the customer menu.

Parameter ID160 structure

Bit-No.	Value (dec.)	Meaning according to ID160
0 - 1	0	**Scaling type** Reserved
	1	Linear scaling
	2	Rotational scaling
2		Reserved
3	0	**Scaling type** Preferred scaling
	1	Parameter scaling
4	0	**Unit of measure for linear scaling** Meter [m]
	1	Inch [in]
	0	**Unit of measure for rotational scaling** Revolutions [U] for preferred scaling Radians [RAD] for parameter scaling
	1	Reserved
5	0	**Time unit** Seconds [s²]
	1	Reserved
6	0	**Data reference** At the motor shaft
	1	At the load
7 - 15		Reserved

Bit	Explanations
0 - 2	The scaling type can be chosen between rotary and linear
3	A distinction is made between preferred scaling with fixed resolution and parameter scaling with variable resolution. Parameter scaling is set with parameter ID161 scaling factor and ID162 scaling exponent.
4	The unit of measure can be set by this bit independently of the scaling type.
5	The data reference cannot be set independently for the acceleration data. The data reference of position data and acceleration data **must** be set the same.

Formula 43: Resolution for linear and rotational scaling

$$\text{Resolution} = \frac{\text{Dimension unit}}{\text{Time unit}} \cdot \text{scaling factor}\,(\text{ID161}) \cdot 10^{\text{scaling exponent}\,(\text{ID162})}$$

ID00161 Acceleration scaling factor

ID00162 Acceleration scaling exponent

The acceleration scaling factor and acceleration scaling exponent are effective with parameter scaling selected and are included in Formula 43.

21 Communication Parameters

User specific parameters for operating different field bus systems (Profibus DP, CAN, ARCNET, SERCOS, LON,…) are defined in this parameter group. The parameters describe the field bus type and the supported scope of functions (protocol reference). The corresponding communication hardware (interface option) is detected automatically in system initialization.

Several field buses can be connected on one device. For each connected field bus the same parameter Ids are to be parameterized with different contents. The communication parameters are therefore **instance-related parameters**. The location of the interface is referred to as an instance.

Instance	Addressed hardware
0	Basic unit ACC-Bus
1	Optional slot 1
2	Optional slot 2

In the parameter menu of the control panel instanced parameters are identified by an "I" instead of a "P". The selection is made using the "SHIFT P" key.

Note: The CAN interface of the AE-PLC option card must be switched on via ID32799.

ID32949 SBUS participant address

Using the parameter ID32949, it is possible to switch the X135 connection on the controller card KU-/KW-R03 and KU-/KW-R03P between the Modbus (touch screen HMI) and the SBUS (KU-BF1) protocol.

ID32949 =00000000h → SBUS
=000000FFh → Modbus

KU-BF1 is supported regardless of the ID32949 settings. Even if ID32949 is set on the Modbus protocol, the KU-Bf1 can be inserted at any time and used as usual.

ID34023 BUS station address

Station address in the BUS system.

Profibus specific parameter assignment
CAN bus specific parameter assignment
Ethernet specific parameter assignment

ID34024 Bus transmission rate [kbit/s]

The parameter defines the transmission rate of the current field bus connection from the viewpoint of the drive (e.g. 19.20 [19.2 kbit/s], 2500.00 [2.5 Mbits/s] …).
For all nodes in the bus/network the transmission rate must be the same!

Profibus specific parameter assignment
CAN bus specific parameter assignment

ID34025 BUS mode

The different field bus systems allow differentiated transmission modes. The parameter defines the field bus functionality supported by the drive (see separate specifications of the interface modules, or option cards CAN, SERCOS, PROFIBUS, …)

Profibus specific parameter assignment
CAN bus specific parameter assignment

ID34026 BUS mode attribute

The parameter defines the differentiating features within a selected BUS mode according to ID34025 (see separate specifications of the interface modules, or option cards CAN, SERCOS, PROFIBUS, …)

Profibus specific parameter assignment
CAN bus specific parameter assignment

ID34027 BUS failure characteristic

The parameter describes the drive characteristic on BUS failure. The following drive reactions are supported depending upon the selected field bus system:

0 – no reaction
1 – Warning
2 – Error message (drive internal withdrawal of controller enable)

Profibus specific parameter assignment
CAN bus specific parameter assignment

ID34028 BUS output rate

Definition of the time interval of transmitting data (e.g. drive state, output data). The parameter is structured in low and high byte:

Low byte: Time base in ms [0…FFh]
High word: Mode according to following representation

0 Data output on request (max. in 5ms time grid)
1 Cyclically according to time in the low byte
2 Cyclically according to time in the low byte and data change of the state data of the drive
3 After executing an AFP job

ID34029 BUS status bit

8 freely configurable status bits (process acknowledgement bits or real time bits of the drive) can be assigned to the AFP status word by means of list ID34029 "Bus status bits". Thus it is possible to transmit current process information in the form of bits to the higher level control system. The contents of the elements of ID34029 correspond to the codes of the allocation of bit information to binary outputs (see ID32847 …). AFP status bit 0 corresponds to the first useful data entry in ID34029.

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

Element	0	1	**2**	**3**	**4**	5	6	7	8	9
Contents	20	20	**33029**	**330**	**336**	…				
Meaning	Length	Length	**SBM**	**Nfeed= Ncomd**	**In Posit.**	…				
AFP status bit			**0**	**1**	**2**	3	4	5	6	7

AFP status bit 0 Code 33029, group ready message
AFP status bit 1 Code 330, $N_{feedback} = N_{command}$
AFP status bit 2 Code 336, In Position

ID34142 Node list

The node list is generated in every network master while the system is booting (Network ON) (independent of the communication bus). The node list contains every accepted node in the network irrespective of the node's status.

The node list is updated online. Nodes that are no longer accepted are deleted from the list. Newly detected nodes are immediately entered into the list. The list is stored in The RAM memory, and is created during run time (no mapping in the permanent database).

Procedures, e.g. for the CAN network:

Network on:	Each participant sends a "Boot up" message at start-up, The master generates the node list based on the received "boot up" messages. "Node Guarding" monitors the presence of all participants contained in the node list.
Node guarding message:	If the master is unable to contact the node, it is removed from the list.
Boot up message:	Nodes are entered into the node list during run time

Header data --- Participant addresses --- Type of Participant

The type is calculated based on the current length of the header data. Addresses and types correspond to the slot code.

Type assignment

Each type establishes its type reference using the software version ID30. Since ID30 is itself a list, a shortened numerical type code in the node list is derived from ID30. The following categories of initialisation take place during boot up:

Device Type	Code	String recognition according to ID30
Undefined	0	
KE	1	KE
KW	2	KW, KWZ
SYMAC	3	AS
KU	4	KU
Kx-PLC1	5	PLC1, PLC2
KWF	6	KWF
IDT	7	IDT
Reserved	8	
Reserved	9	
Ext. WAGO E/A	10	
Ext. WAGO E/A (reserved)	11	

Example 1: with KW and KE modules

3 KW devices (address 1, 2 and 3) and one KE device (address 33) are attached to the ACC-Bus.
The following list is returned when reading out ID34142 instance 0.

Act. length	Max. length	Addresses				Types			
12	**132**	**1**	**2**	**3**	**33**	**2**	**2**	**2**	**1**
2 Byte	2 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte

Example 2: with active CAN-S Bus

One KW device (address 1) and one KE device (address 33) are attached at a CAN-S Bus at the option card KW-PLC1 with the address 2insert at slot 2
The following list is returned when reading out ID34142 instance 2.

Act. Length	Max. length	Addresses			Types		
10	**132**	**1**	**5**	**33**	**5**	**2**	**1**
2 Byte	2 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte	1 Byte

The user cannot modify this list (read only)

Note: If you read the Node list ID34142 with a SERCOS protocol or AIPEX, the header data will not be counted at the actual length.
Example 1: actual length = 8 Byte Example 2: actual length = 6 Byte

PROFIBUS-DP

Identnumber	Designation	Value	Meaning
ID34023	BUS participant address	e.g. 5h	e.g. 5h **1)**
ID34024	Bus transmission rate [kbit/s]	0h	drive adjusts itself automatically to the transmission rate of the master
ID34025	Bus mode		see bit rail **4)**
ID34026	Bus mode attribute	0h 1h	INTEL®-mode MOTOROLA®-mode **2)**
ID34027	Bus failure characteristic	0	drive reaction **3)**
ID34028	Bus output rate	0	not yet supported by PROFIBUS

1) The entered user address is only valid if the hexadecimal switches S1 and S2 on the option card have the value 13h (S2 = 1, S1 = 3). For all other settings the set number is the user number. Permitted user addresses are the values (00h to 7Fh) 0 … 126 (values > 126 result in the value 0).

2) On switching over between INTEL and MOTOROLA mode, the high word is exchanged with the low word of a double word. The high byte and the low byte are exchanged in turn in the high and low word. The changeover between INTEL and MOTOROLA mode is only available, if AFP-module is active (see ID34025).

3) 0: No reaction in case of Bus error
   1: alarm signal in case of Bus error
   2: error message in case of Bus error

4) Bus mode (Default value = 1: AFP selected, I/O module not selected)

Bit-No.	Value	Meaning
0	0	**SPS-AFP-address area** inactive
	1	AFP selected (only permissible if **no** active option card e.g. KW-PLC is plugged in)
1 - 3		Reserved
4	0	**SPS-SYNC module area** inactive
	1	SYNC-I/O0 module active (Byte 0 … 7)
5	0	**SPS-SYNC module area** inactive
	1	SYNC-I/O1 module active (Byte 8 … 15)
6	0	**SPS-SYNC module area** inactive
	1	SYNC-I/O2 module active (Byte 16 … 23)
7	0	**SPS-SYNC module area** inactive
	1	SYNC-I/O3 module active (Byte 24 … 31)
8	0	**SPS-I/O module area 2** inactive
	1	I/O4 module active (Byte 32 … 39)
9	0	**SPS-SYNC module area** inactive
	1	I/O5 module active (Byte 40 … 47)
10 - 11		Reserved
12	0	**SPS-I/O module area 1** inactive
	1	I/O0 module active (Byte 0 … 7) (reserved for IO option card [1)])
13	0	**SPS-I/O module area 1** inactive
	1	I/O1 module active (Byte 8 … 15)
14	0	**SPS-I/O module area 1** inactive
	1	I/O2 module active (Byte 16 … 23)
15	0	**SPS-I/O module area 1** inactive
	1	I/O3 module active (Byte 24 … 31)

[1)] The I/O module of I/O option cards in slot 1 or 2 is always copied to the PLC I/O address area (byte 0 … 7). If no PLC card is inserted but instead an I/O and a PROFBUS option card the I/O module can be addressed via PROFIBUS as an external I/O module, i.e. outputs can be written to and inputs read.

Module consistent data transmission of synchronous PLC variable in PROFIBUS DP

Data containers (named modules in the following), which are exchanged module-consistently between the AMK PLC and the PROFIBUS, can be selected through the parameter ID34025 Bus mode. The data are exchanged through the device-internal communication address area, which serves as data exchange between the PLC and the AMKASYN field bus interface (here PROFIBUS). The modules access synchronous and asynchronous areas in the communication address area. Synchronous modules are always updated to the ID2 SERCOS cycle time, asynchronous modules have no exact time at which they are updated. Synchronous modules must be used for transmitting cyclic data, e.g. actual values or setpoint values because of the equidistant sampling. Asynchronous modules are used to exchange time-uncritical and non-cyclic data. Both synchronous and asynchronous modules are transmitted module-consistently.

With every ID2 clock pulse up to 2 synchronous modules can be copied into and out of the communication address field. The copying process of 2 SYNC modules in each direction lasts 1 ms. After 2 synchronous modules have been transmitted, the remaining time up to the next ID2 clock pulse is used to transmit asynchronous modules. At a cycle time of e.g. ID2 = 2 ms, 2 synchronous and 2 asynchronous modules can be over accordingly in each direction.
The telegram is sent over the PROFIBUS only if all data of a PROFIBUS data telegram have been copied completely into the communication address area.

Note:
ID2 must not be set less than 1 ms!

Example 1:

A data telegram has a length of 48 bytes (0 6 modules). 4 of these modules should be configured for cyclic data and 2 for non-cyclic data. The 3 cycle modules are configured to the modules SYNC-I/O0, -I/O1, I/O2 and I/O3, the asynchronous modules to the address area I/O0 and I/O1. Accordingly the following assignment results for ID34025. The cycle time ID2 is selected at 1 ms.

ID34025 = 30F0 hex
ID2 = 1 ms

2 SYNC-I/O modules are copied in transmission and reception direction per ID2 cycle. A copying time of 2 x ID2 cycles corresponding to 2 ms results for 4 SYNC I/O modules. The 2 asynchronous modules are then copied, so that in total a processing time of 3 ms results for the entire data telegram.

<table>
<tr><th>Data telegram [bytes]</th><th>0 – 7</th><th>8 – 15</th><th>16 – 23</th><th>24 – 31</th><th>32 – 39</th><th>40 – 47</th></tr>
<tr><td>Module</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>Module type</td><td>SYNC-I/O0</td><td>SYNC-I/O1</td><td>SYNC-I/O2</td><td>SYNC-I/O3</td><td>I/O0</td><td>I/O1</td></tr>
<tr><td>Transmission in the ID2 = 1 ms selected</td><td colspan="2">1st ID2 cycle</td><td colspan="2">2nd ID2 cycle</td><td colspan="2">3rd ID2 cycle</td></tr>
<tr><td>Telegram cycle</td><td colspan="6">3 ms</td></tr>
</table>

Example 2:

The same data as in Example 1 should be transmitted, only now a cycle time ID2 of 2ms is selected

Data telegram [bytes]	0 – 7	8 – 15	32 – 39	40 – 47	32 – 39	40 – 47
Module	1	2	5	6	3	4
Module type	SYNC-I/O0	SYNC-I/O1	I/O0	I/O1	SYNC-I/O2	SYNC-I/O3
Transmission in the ID2 = 1 ms selected	1st ID2 cycle				2nd ID2 cycle	
Telegram cycle	3 ms					

CAN Bus

See also ID32799 configuration periphery for activate/deactivate field bus and/or programmable controller PS functionality.

ID-Number	Name	Value	Designation
ID34023	Bus participant address	e.g. 5h	e.g. 5h 1)
ID34024	Bus transmission rate [kbit/s]		range: 10kBaud – 1 Mbaud 3)
ID34025	Bus mode	0h 2h	Bit 1 = 0: CAN Slave Bit 1 = 1: CAN Master
ID34026	Bus mode attribute		4)
ID34027	Bus failure behaviour		see ID34027
ID34028	Bus output rate		not yet supported

1) The Bus participant address is valid, if the hexadecimal rotary coding switches S1 and S2 on the option card Kx-PSC/PLC are set to zero. Is the value unequal to zero the value of S1, S2 will be set to ID34023. The range of participant addresses is (01h to 7Fh) 1 … 127.

2) Entry of value 2h sets this axis as CAN BUS master

3) Permissible values:
   1000,00 1Mbaud;
   500,00 500kbaud;
   250,00 250kbaud;
   125,00 125kbaud;
   50,00 50kbaud;
   20,00 20kbaud;
   10,00 10kbaud;

If invalid value is entered the transmission rate will be set to the default value of 20 kbaud.

4) ID34026 "Bus mode attribute"

this parameter defines the differentiating features of the CAN Bus

Bit-No.	Value	Meaning
0		Reserved
1	0	**Hardware synchronisation cycle receiver** Inactive
	1	Active
2	0	**Receiver monitors hardware synchronisation cycle** Inactive
	1	If the synchronisation is lost, disrupted or cannot be accessed, the signal receiver generates an error message.
3	0	**Hardware synchronization cycle sender** Inactive
	1	Active (signal is sent)
4	0	**The master monitors the presence of slave nodes while rebooting CAN** All configured nodes must be present, else an error message is generated.
	1	Missing nodes are not initialised and no error message is generated.
5	0	**AMK Service: PGT in place of CANopen SYNC Message COB-ID80** Synchronous messages are sent upon receipt of the SYNC object COB-ID80
	1	Synchronous messages are sent as a result of the hardware synchronisation signal; no SYNC object COB-ID80 is required.
6	0	**Reinitialisation of CAN bus with "Delete error"** If errors occur that do not affect the CAN bus, it remains active despite these errors. No CAN bus initialisation after "Delete error"
	1	The CAN bus is automatically reinitialised with "Delete error"
7 - 8		Reserved
9	0	**Slaves are waiting for initialisation by the CAN master** Slave waits 60 seconds for initialisation by the NMT master. An error message is then generated
	1	Slave waits unlimited time for initialisation by the NMT master. (For use with masters with very long boot times).
10		Reserved
11	0	**CAN network with NMT master** Network consists of several slaves and one NMT master
	1	**CAN network without NMT master** Devices without bus master (NMT master) are activated in slave mode and the ACC bus is switched to "preoperational mode". This facilitates SDO transfer (For use in connecting PC software (e.g. AIPEX or CoDeSys to a KU/KW device via CANopen)).
12 - 15		**Bus master (NMT network management): startup delay** Queue time prior to initialisation of slaves in seconds (max. Fh = 15 s)

Example:

Master:

ID34026 = 3048h	- 3 sec. delay time for initialization - all configured nodes are checked of presence - new initialization of the bus after error reset - hardware synchronization ON

Slave:

ID34026 = 6h	- Hardware synchronization slave ON - Check synchronization slave ON

22 Special Applications

ID32798 User list 1

The user list 1 is a freely available data record for the user in the remanent memory area. For instance, in connection with functions at binary inputs (code 33900 and 33901) it is possible to file up to 127 absolute positions (see function overview: assignment to binary inputs). This facilitates simple process control controlled through binary inputs.

Total length: 512 bytes

Structure of the data record:

2 words header information
Current and maximum length of the list in bytes.

+xxx words useful data
Entry of useful data in the word format
in the range 0000h to FFFFh

Example:

Element	Value (hex)	Value (dec.)	Meaning
0 1	d0 200	208 512	actual list length maximum list length
2 3	EC78 FFFF	-5000	Useful data from element 2
4 5	4E20 0000	20000	Useful data from element 2
6 …			

ID34090 User list 2

ID34091 User list 3

User list 2 and 3 can be used in the same way as user list 1.

Total length: 768 bytes per user list

Structure of the data record:

2 words header information
Current and maximum length of the list in bytes.

+xxx words useful data
Entry of useful data in the word format
in the range 0000h to FFFFh

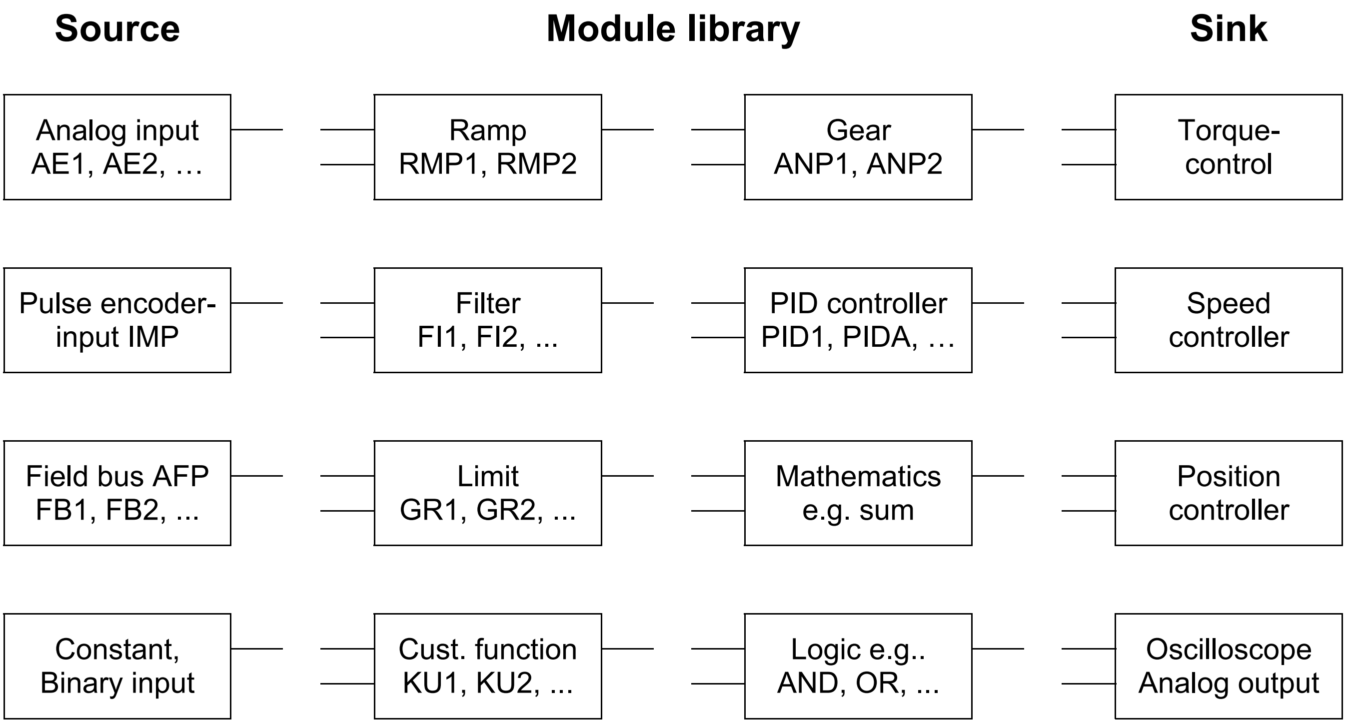
Extended functionality

Principle and activation

Signal paths and process sequences can be freely defined through parameters. For this purpose AMK provides the user a growing module library corresponding to the requirements. The module library consists of simple blocks which can be assembled to structures of arbitrary larger size corresponding to the requirements. The use of modules verified by AMK requires no programming knowledge or tools whatsoever and is summarized under the term "Extended functionality".

Extended functionality is parameterized through writable lists (as from ID34020, …). The model generation and linkage of individual modules such as PID controllers in association with lower level AMK standard speed controllers is supported by AMK application and service on the base of the available interfaces (currently control panel and AIPAR or APS). The structure of the software is designed that in the future every user can very simply handle the extended functionality by means of a graphical user interface (PC)!!!

Principle of extended functionality



The different components are linked corresponding to the required application by connection. The connecting lines identify a numerical connection or a binary connection.

The linkage list according to ID34020 arises as result. This is interpreted by the system at the run time and thus assures the required functionality. The data for certain modules can be changed at any time (also in operation of the modules).

The simplicity of model generation is described in detail below (see example "dancer controller (PIDA) with variable dancer command value") and is based on numerical connections between the individual components.

Numerical connection: Output data (16 or 32 bit) become input data of a following module

Binary connection: Output data binary output become input data (binary input) of a following module

The drive can be operated mixed with standard and extended functions. Extended functionality is selected by setting bit 12 = 1 in the low word of the operation mode parameter according to ID32800 …. If extended functionality is selected (e.g. PID1 controller), then set the command value source with code 14h ("extended controller") in the high word.

Example: Configuration according to ID32800:
Standard speed controller, digital command value standard ID32800 = 00 3C 00 43
Speed controller with **superimposed extended functionality** ID32800 = 00 **14** **1**0 43

Time characteristic

All extended functions run in the 10 ms time grid. Internal data references (processing width, scaling …) are aligned to this time grid. The internal switch-over between operation modes takes place within approx. 20 ms. The command values for the new operation mode must be input before or during the switch-over (depending upon the command). Corresponding acknowledgement bits identify the current status of the drive.

ID34020 List function

ID34020 is a linkage matrix and connects in a simple manner sources, function modules and sinks and thus facilities extended functionality for parameterizing.

With the "list function", special customer-specific functionality is assigned globally to the drive corresponding to the "sources and functions" table. Each function can be connected freely with other functions through max. 2 inputs and 1 output through a consecutively numbered data memory (buffer 1 … 15).

The sequence of the functions in the "list function" corresponds to the sequence of the system-internal processing. The data in Id34020 are structured in modules of 3 words each.

Structuring:

<table>
<tr><th colspan="2">Word0</th></tr>
<tr><td colspan="2">Function number according to "source and functions" table</td></tr>
<tr><th colspan="2">Word1</th></tr>
<tr><td>High byte</td><td>Low byte</td></tr>
<tr><td>Reserved</td><td>Output code</td></tr>
<tr><th colspan="2">Word2</th></tr>
<tr><td>High byte</td><td>Low byte</td></tr>
<tr><td>Input 2 code</td><td>Input 1 code</td></tr>
</table>

Changing list data

Using the AMK field bus "AFP" as well as the control panel, the data can be changed both online in the working memory and also permanently in the EEPROM stating the ID and the index in the corresponding list. The effectiveness of the data change in the drive must be transferred by the user by command. Thus is possible to activate the effect of individual parameters as well as parameter blocks at an arbitrary time in the running process.

Sources and functions

Sources and functions are described by codes. By entry of the codes in the "list function" these are interpreted by the system at the run time and the required functionality is executed in the 10 ms time grid. Mixed operation of standard and extended functionality is possible without difficulty by switching over operation modes.

Note: Functions without data record can be used and linked several times.

"Sources and functions" table

Code	Source / Function / Meaning	Data record
00h	No extended function active	
01h Filter	Command value analogue input of **AE1** [+10V → 7FFFh] T=0.25 ms over 4 values [-10V → 8000h]	None
02h Filter	Command value analogue input of **AE2** [+10V → 7FFFh] T=0.25 ms over 4 values [-10V → 8000h]	None
03h	Command value source fixed parameter according to ID34016 **SWQFIX16**	None
04h	Command value source fixed parameter according to ID34017 **SWQFIX17**	None
05h	Command value source fixed parameter according to ID34018 **SWQFIX18**	None
06h	Command value source fixed parameter according to ID34019 **SWQFIX19**	None
07h	Command value source field bus **SW16_1** [8000h … 7FFFh] **1)**	None
08h	Command value source field bus **SW16_2** [8000h … 7FFFh] **1)**	None
09h	Command value source field bus **SW16_3** [8000h … 7FFFh] **1)**	None
0ah	Command value source field bus **SW32** [80000000h … 7FFFFFFFh] **1)**	None
0bh	Command value source pulse input X34 **SWQIMP** (sampling time 10 ms, input pulses ≤ 32767 / 10 ms)	None
100h	**PID1** controller with variable limit, gain and feedback value filter (40 ms, 4 values) before PID summation point, see PID description	PID controller (ID34021)
101h	**RMP1**, 16 bit input/output, ramp up/ramp down time [0 ... 327670 ms in 10 ms steps, see description	Ramp1 (ID34022)
102h	**ADDMOM** addition of two 16-bit input variables [0.1% Mn] with interface to standard torque control	None
103h	**ADDDZR** addition of two 16-bit input variables [rpm] with interface to standard DZR [0.0001 rpm]	None
104h	**ADD16** addition of two 16-bit input variables (output 1:1, limited to 16 bits (±)) max. + 16 bits → 7FFFh, min: -16 bits → 8000h	None
105h	**ADD32** addition of two 32-bit input variables (output 1:1, limited to 32 bits (±)) max. + 32 bits → 7FFFFFFFh, min: -32 bits → 80000000h	None
106h	**NEG16** multiplication of a 16-bit input variable with factor -1	None

Code	Source / Function / Meaning	Data record
107h	**ANP1** transformation 1 of a 16-bit input variable by means of offset, factor and divisor, output limited to 16-bits () Command value standardizations, feedback value standardizations, … max: + 16 bits → 7FFFh, min: –16 bits → 8000h	ANP1 (ID34030)
108h	**ANP2** transformation 2, see ANP1	ANP2 (ID34031)
109h	**ANP3** transformation 3, see ANP1	ANP3 (ID34032)
10Ah	**ANP4** transformation 4, see ANP1	ANP4 (ID34033)
10Bh	**PIDA** adaptive PID controller with variable limit, gain and feedback value filter (40 ms, 4 values) before PID summation point, see PIDA description	PIDA controller (ID34034)
10Ch	**RMP2**, ramp, see RMP1	Ramp2 (ID34035)

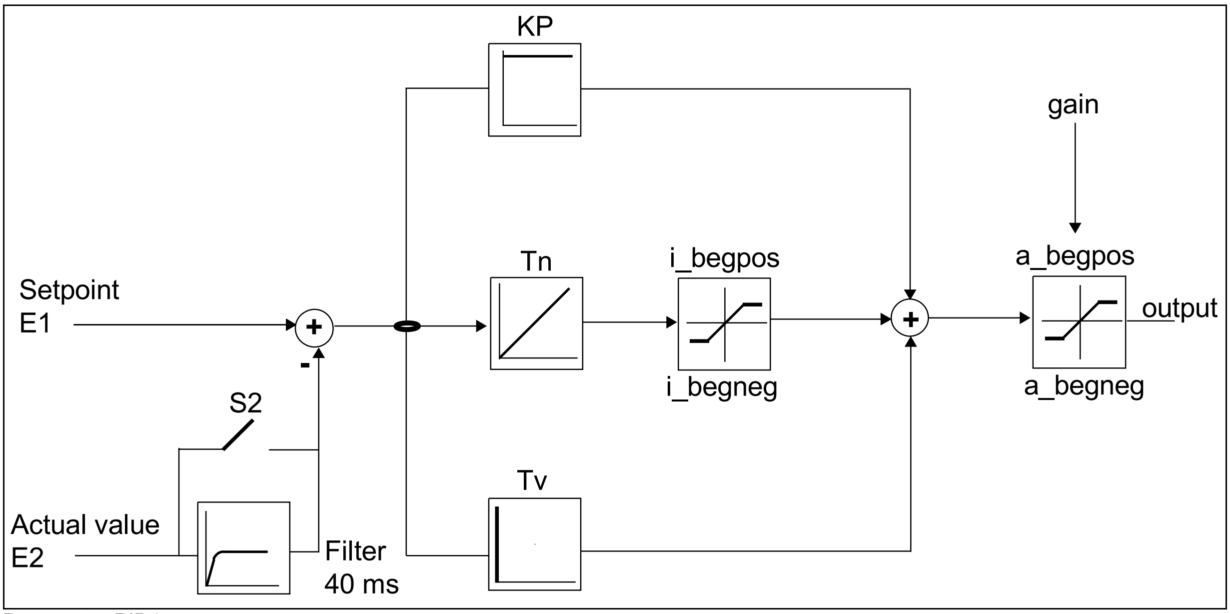
Note: Currently modules with numerical inputs and outputs are described exclusively.

1) The setpoint source field bus allows the issue of commands to the drive using the AFP protocol.

ID34021 PID1 controller

The PID1 controller data record describes the parameters of a freely parameterizable PID controller with integrated signal limiters. The effect of the individual variables can be taken from the model description. The parameters are set by reference to the known setting e.g. of a PI speed controller (firstly T_N=T_V =0 and optimized step change response through KP, then adapt T_n and T_V alternatingly to the requirements).

PID1 controller model description



Parameter_PID1

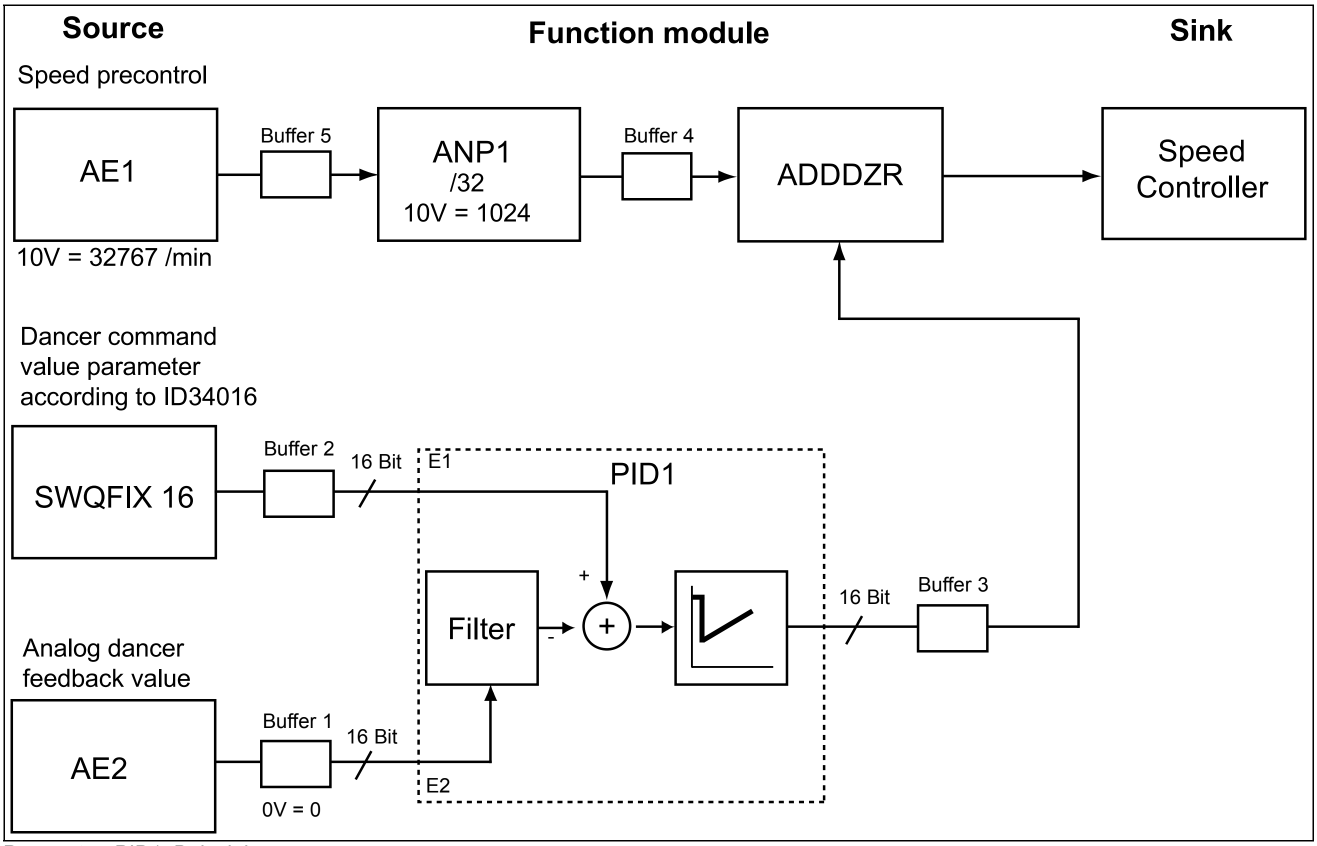
PID1 data assignment

PID1 data

Index	Type	Variable	Designation	Limits	Default
0	UNS16		Header info real length	18h	18h
1	UNS16		Header info max. length (bytes)	18h	18h
2	UNS16	w_bit block **1)**	Switch block S2 ... Bit0 reserved Bit1 = S2 = Filter off	0…FFFFh	0h
3	UNS16	uw_kp	P factor	0…7FFFh	200h
4	UNS16	uw_tn	Tn integral action time [ms]	0…7FFFh	1000h
5	UNS16	uw_tv	Tv derivative action time [ms]	0…7FFFh	1h
6	SGN16	sw_verst	Output gain	8000h…7FFFh	1h
7	SGN16	sw_i_begpos	Pos. I component limit	0…7FFFh	1F4h (500/min)
8	SGN16	sw_i_begneg	Neg. I component limit	8000…0	3E8h (1000/min)
9	SGN16	sw_a_begpos	Pos. output PID limit	0…7FFFh	FC18h (-1000/min)
10	SGN16	sw_a_begneg	Neg. output PID limit	8000h…0	
11	UNS16	uw_reserve	Reserve		

UNS16 16 bit without sign
SGN16 16 bit with sign

Example of dancer controller (PID1) with fixed dancer command value



Parameter_PID1_Beispiel

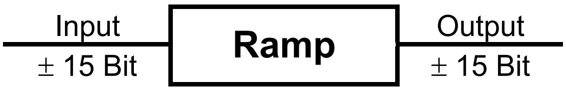
Linkage list according to ID34020 for above example

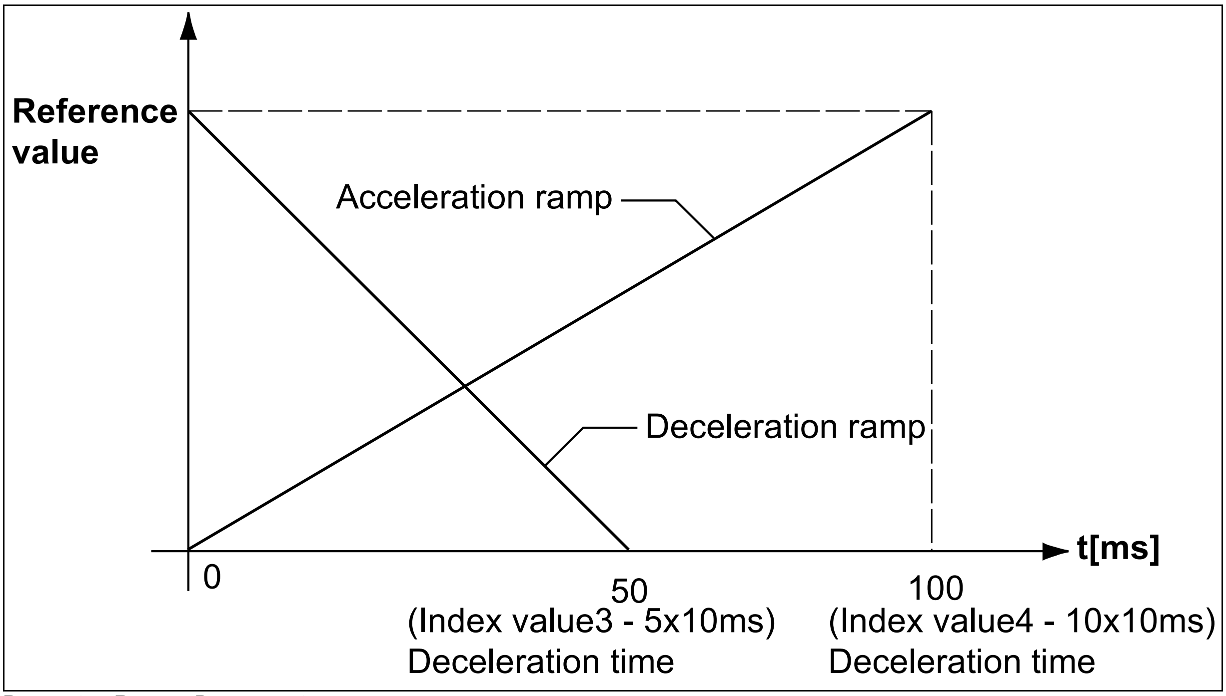
Index	Module	Meaning	Code[hex]	Explanation
00		Header information	0064	Real length
01		Header information	0064	Maximum length
02	**AE1**	Function No.	0001	Analog command value A1 speed, +10V → 7FFFh -10V → 8000h
03		Output	xx05	No. I/O buffer 5
04		Input2 / Input1	Xxxx	is not used
05	**AE2**	Function No.	0002	Analogue input A2, dancer feedback value +10V → 7FFFh -10V → 8000h
06		Output	xx01	No. I/O buffer 1
07		Input2 / Input1	Xxxx	is not used
08	**SWQ FIX16**	Function No.	0003	Dancer command value according to ID34016
09		Output	xx02	No. I/O buffer 2
10		Input2 / Input1	Xxxx	is not used
11	**PID1**	Function No.	0100	PID1 controller
12		Output	xx03	No. I/O buffer 3
13		Input2 / Input1	0102	Sources feedback value (E2) and command value (E1)
14	**ANP1**	Function No.	0107	Transformation for command value standardization
15		Output	xx04	No. I/O buffer 4
16		Input2 / Input1	xx05	No. I/O buffer 5
17	**ADD DZR**	Function No.	0103	Adder with output to the standard speed controller
18		Output	xxxx	is not used
19		Input2 / Input1	0304	Sources buffer 3 and 4

ID34022 Ramp1, RMP1

ID34035 Ramp2, RMP2

Incoming variables are output quantified at the output corresponding to the set slope. The ramp can be used as command or feedback value ramp. The slope of the ramp (ramp up / ramp down parameter) is defined by the reference value (32767) and the stated time [10 ms]. The reference value is free from a standardization or unit (torque, current, speed, …)





Parameter_Rampe_Bezugswert

Example: Use of the ramp as command value ramp for speeds [rpm]. Acceleration ramp = deceleration ramp = 1000 · 10 ms = 10 s. Thus a speed step change from 0 to 32768 rpm leads to a velocity command value ramp with duration of 10 s. A speed step change from 0 to 3276 rpm is consequently performed in 1 s.

Ramp data assignment ID34022 and ID34035

Index	Type	Variable	Designation	Limits
0h	UNS16		Header information real length	08h
1h	UNS16		Header information maximum length (bytes)	08h
2h	UNS16	uw_th	Acceleration ramp [10 ms]	0 … 7FFFh
3h	UNS16	uw_tt	Deceleration ramp [10 ms]	0 … 7FFFh

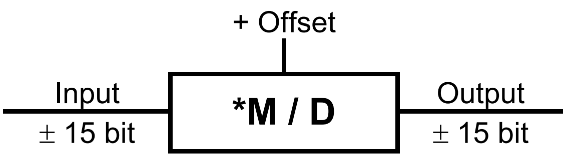
ID34030 Transformation, ANP1

ID34031 Transformation, ANP2

ID34032 Transformation, ANP3

ID34033 Transformation, ANP4

The transformation may be embedded in 16-bit signal branches. The input signal can be shifted statically before further processing by means of an offset addition. The transformation further permits signal conditioning by means ± 15-bit multiplier (M) and + 15-bit divisor (D). Division by 0 is intercepted. The output variable is limited to ± 15-bits. The transformation can be used for instance as electronic gear.



Transformation data assignment

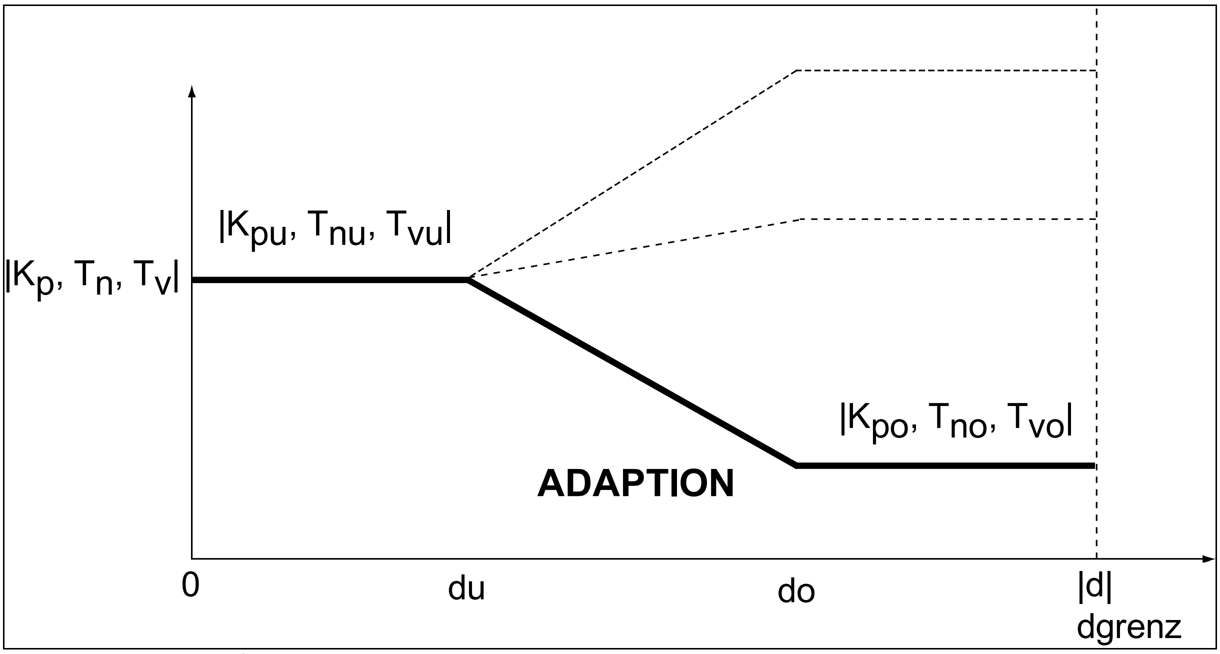
Index	Type	Variable	Designation	Limits
0h	UNS16		Header information real length	0Ah
1h	UNS16		Header information maximum length (bytes)	0Ah
2h	SGN16	sw_mult	Multiplier	8000h … 7FFFh
3h	UNS16	uw_div	Divisor	1 … 7FFFh
4h	SGN16	sw_offs	Offset (is added to input variable)	8000h … 7FFFh

ID34034 PIDA controller

The PIDA controller model allows a PID control loop to be built up with adaptation of the controller data K_P, T_n and T_v depending upon the input control difference with additional monitoring of a maximum input control difference.

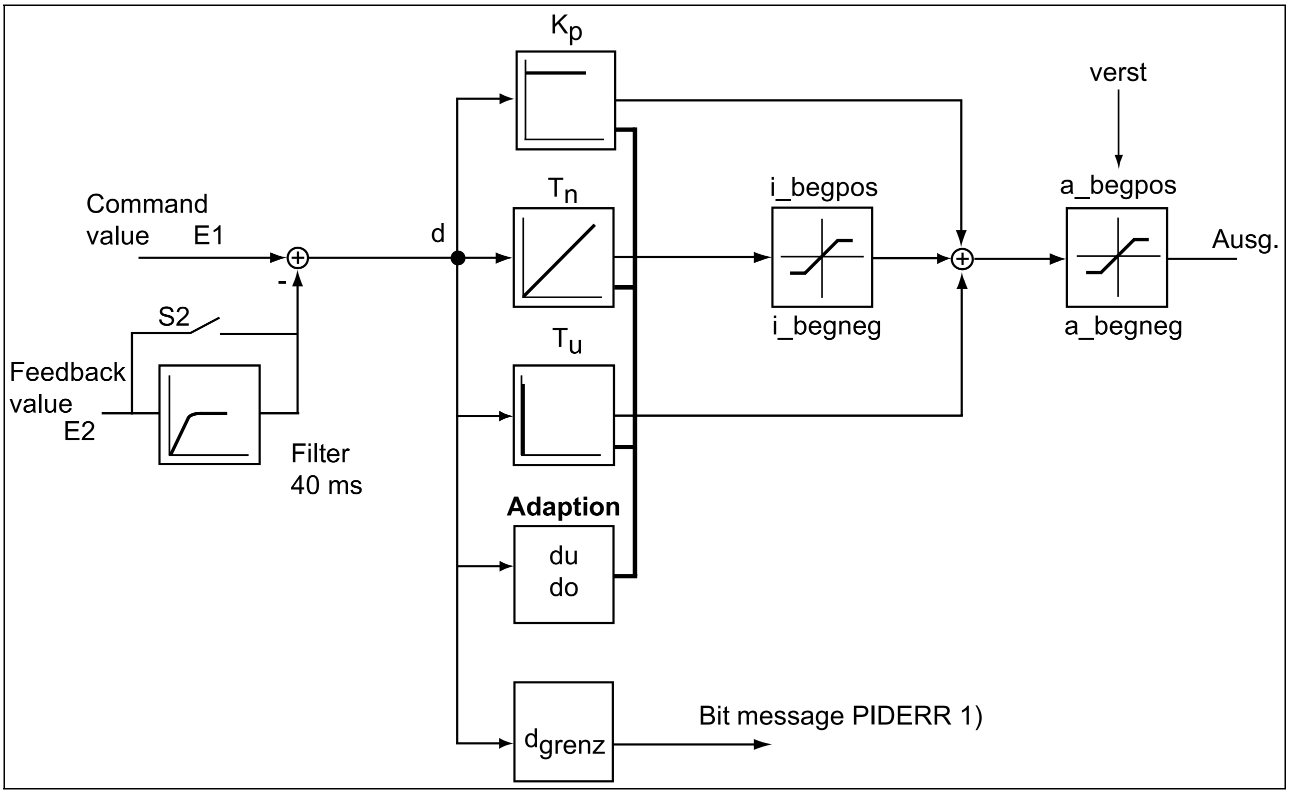
The PIDA controller data record describes the parameters of one of the freely parameterizable PID controllers with integrated signal limiters. The effect of the individual variables can be taken from the model description. The parameters are set by reference to the known setting e.g. of a PI speed controller (firstly T_n = T_v = 0 and optimized through KP step change response, then adapt T_n and T_v alternatingly to the requirements).

PIDA adaptation procedure



Parameter_Adaptionsverfahren

PIDA controller model description



Parameter_PIDA

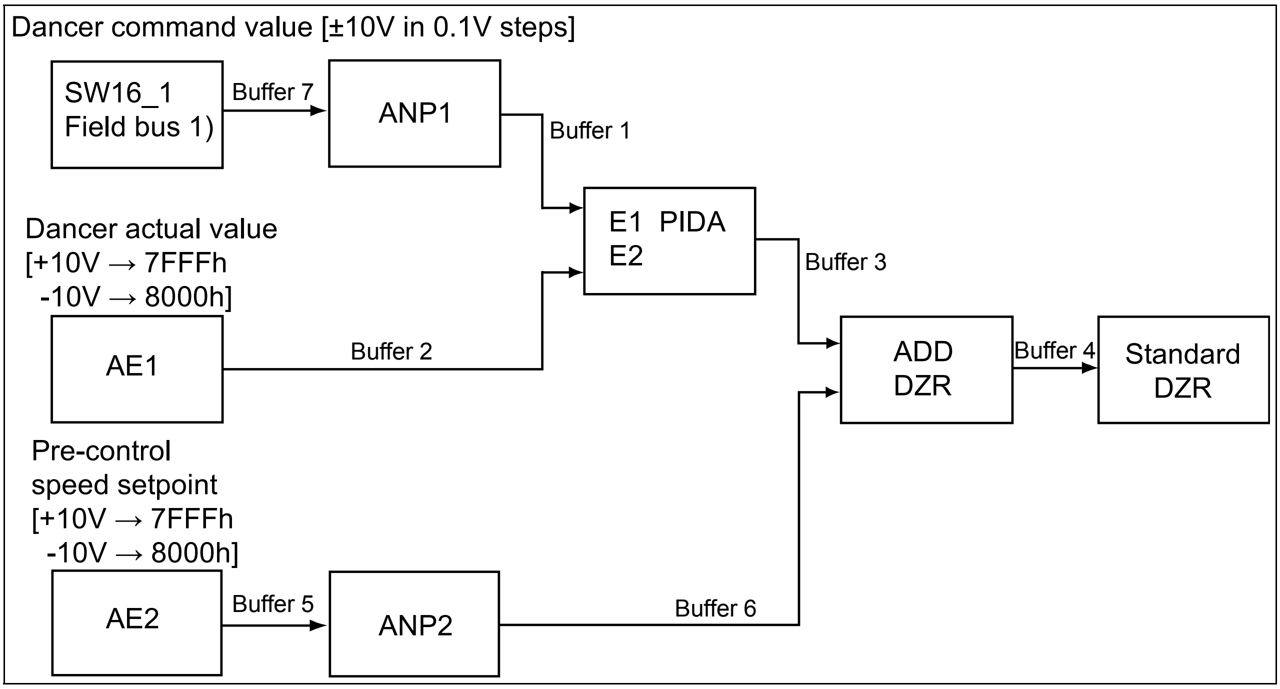
PIDA data assignment

Index	Type	Variable	Designation	Limits	Default
0	UNS16		Header info real length	24h	24h
1	UNS16		Header info max. length (bytes)	24h	24h
2	UNS16	uw_bit block **1)**	Switch block S2, ... Bit0 reserved Bit1 = S2 = 1 Filter off	0 ... FFFh	0h
3	UNS16	uw_dgrenz **1)**	Diff. limit monitoring binary output bit PIDERR = 1 |PIDcommand – PIDfeedback| ≥ |dlimit|	0 ... 7FFFh	3000h
4	UNS16	uw_du lower adaptation limit	Diff. below, the PID values Kpu, Tnu and Tvu apply |PIDcommand – PIDfeedback| ≤ |uw_du| **linear ADAPTATION KP, Tn, Tv between uw_du and uw_do**	0 … 7FFFh	1000h
5	UNS16	uw_do upper adaptation limit	Diff. above, the PID values Kpo, Tno and Tvo apply |PIDcommand – PIDfeedback| ≥ |uw_do| **linear ADAPTATION KP, Tn, Tv between uw_du and uw_do**	0 … 7FFFh	2000h
6	UNS16	Uw_kpu	P factor underneath range du	0 … 7FFFh	70h
7	UNS16	UW_tnu	Tnu integral action time [ms]	0 … 7FFFh	100h
8	UNS16	Uw_tvu	Tvu derivative action time [ms]	0 … 7FFFh	1h
9	UNS16	Uw_kpo	P factor above range do	0 … 7FFFh	400h
10	UNS16	Uw_tno	Tno integral action time [ms]	0 … 7FFFh	200h
11	UNS16	UW_tvo	Tvo derivative action time [ms]	0 … 7FFFh	1h
12	SGN16	Sw_verst	Output gain	[8000h ... 7FFFh]	1h
13	SGN16	sw_i_begpos	Pos. I component limit	0 … 7FFFh	1F4h (500/min)
14	SGN16	sw_i_begneg	Neg. I component limit	8000h … 0	FE0Ch (-500/min)
15	SGN16	sw_a_begpos	Pos. output PID limit	0 … 7FFFh	3E8h (1000/min)
16	SGN16	sw_a_begneg	Neg. output PID limit	8000h … 0	FC18h (-1000/min)
17	SGN16	uw_reserve	Reserve		

1) in preparation

UNS16 16 bits without sign
SGN16 16 bits with sign

Example of dancer controller (PIDA) with variable dancer command value



Parameter_PIDA_Beispiel

1) The issuing of commands via the field bus takes place using AFP (AMK field bus protocol)

Index	Module	Meaning	Code [hex]	Explanation
00		Header information	0064	Real length
01		Header information	0064	Maximum length
02	**SW16_1**	Function No.	0007	Field bus, dancer command value in 0.1V
03		Output	xx07	Output assignment
04		Input2 / Input1	Xxxx	Not used
05	**ANP1**	Function No.	0107	Transformation for command value standardization (conversion + 100 → 7FFFh, -100 → 8000h, data according to ID34030)
06		Output	xx01	Transfer to following module
07		Input2 / Input1	xx07	Input assignment
08	**AE1**	Function No.	0001	Dancer feedback value analogue input 1
09		Output	xx02	Transfer to following module
10		Input2 / Input1	Xxxx	Not used
11	**PIDA**	Function No.	010B	PIDA module data according to ID34034
12		Output	xx03	Transfer to following module
13		Input2 / Input1	0201	Dancer feedback value / command value
14	**AE2**	Function No.	0002	Precontrol velocity command value analogue input 2
15		Output	xx05	Tranfer to following module
16		Input2 / Input1	Xxxx	Not used

Index	Module	Meaning	Code [hex]	Explanation
17	**ANP2**	Function No.	0108	Transformation for command value standardization (data according to ID34031)
18		Output	xx06	Transfer to following module
19		Input2 / Input1	xx05	Input assignment
20	**ADDDZR**	Function No.	0103	Speed addition of the sources PIDA and ANP2 and output Ncommand to standard DZR
21		Output	xxxx	Transfer always to standard DZR [0.0001 rpm]
22		Input2 / Input1	0306	PIDA output [rpm] / ANP2 output [rpm]

xx Code must be initialized with 0

23 Imprint

Title **PDK_026249_Parameter_en**

Purpose **Description of the parameter for the AMK Drive systems KU and KE/KW**

Part number **26249**

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- The software version
- The device setup and the application
- The type of malfunction, suspected cause of the failure
- The diagnostic messages (error codes)

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