AMKASYN
Servo converter KWZ
Device description

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Imprint

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Version:

Version	Change	Letter symbol
2017/04	• Safety alert symbols changed to DIN EN ISO 7010	STL

Previous version: 2016/31

Product version:

Product AMK part no.	Firmware Version (AMK part no.)
KWZ	V1.06 2010/30 (part no. 203167)

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

Publisher: AMK Arnold Müller GmbH & Co. KG
Gaußstraße 37 - 39
D-73230 Kirchheim/Teck

Germany
Phone: +49 7021/50 05-0
Fax: +49 7021/50 05-176
E-mail: info@amk-group.com

Personally liable shareholder: AMK Verwaltungsgesellschaft mbH, Kirchheim/Teck
Registration court: Stuttgart HRB 231283; HRA 230681

Tax-Idnr.: DE 145912804

Service: Phone: +49 7021/50 05-190, Fax -193

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

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

E-mail: service@amk-antriebe.de

Internet address: www.amk-group.com

Content

1 Product presentation

1.1 Product name

AMKASYN Compact Two-Axes Inverter KWZ

KWZ	xx	-	x	y
|	|		|	|
|	|		|	Cooling
|	|		|	0: coldplate
|	|		|	F: integrated air cooling
|	|		Communication	
|	|		0: ACC bus	
|	|		EC: EtherCAT	
|	Nominal power / kW			
Device type				

KWZ: compact two-axes inverter

1.2 Order data

Device	Description	AMK Part-No.
KWZ 1	Output power 2 x 1 kVA (ACC-Bus Version)	E841
KWZ 2	Output power 2 x 2 kVA (ACC-Bus Version)	E842
KWZ 5	Output power 2 x 5 kVA (ACC-Bus Version)	E843
KWZ 1 - EC	Output power 2 x 1 kVA (EtherCAT Version)	E857
KWZ 2 - EC	Output power 2 x 2 kVA (EtherCAT Version)	E858
KWZ 5 - EC	Output power 2 x 5 kVA (EtherCAT Version)	E859
KWZ 1 - F	Output power 2 x 1 kVA (ACC-Bus Version)	E935
KWZ 2 - F	Output power 2 x 2 kVA (ACC-Bus Version)	E936
KWZ 4 - F	Output power 2 x 4 kVA (ACC-Bus Version)	E937
KWZ 1 - ECF	Output power 2 x 1 kVA (EtherCAT Version)	E938
KWZ 2 - ECF	Output power 2 x 2 kVA (EtherCAT Version)	E939
KWZ 4 - ECF	Output power 2 x 4 kVA (EtherCAT Version)	E940

1.3 Product overview

The KWZ is used as double-axis module with full servo capabilities in the drive system KE/KW.

Encoder systems of the type:

- Resolver

can be connected for operation with servo motors.

As alternative, the KWZ module can be used as “Sensorless Drive”. Sensorless Drive enables electronic open loop speed control of asynchronous and synchronous motors. The encoder system in the motor is not used for this.

A stiffness well above U/f operation is reached.

Two power output stages (axis A and axis B) and a two-axis control card are installed in a casing. Width (55 mm), height (330 mm) and depth (255 mm) of the casing correspond to the dimensions of the other KE/KW modules with less power.

The “Cold plate” technology for cooling (assembly of the KWZ module on a liquid-cooled back plate) enables compact dimensions and great performance with high reliability. As alternative, an air-cooling system is also available (derating factor for KWZ 5 has to be considered).

The KWZ is operated through the supply voltage 24 VDC and fed from the shared intermediate direct current link (KE module).

Safety category 4

Each KWZ module contains an output release with internal, error-proof monitoring through the control card.

The output release triggers a safe lock against a restart of the motor which corresponds to safety category 4 according to EN 954-1.

Safety function EF is carried out redundantly with two-channel hardware logic EF and two-channel software monitoring on the control card.

Communication and drive command

The KWZ can very simply be linked with all other AMKASYN drives and controls. Two interface versions are available:

With both versions the KWZ module offers a real-time data exchange to further drives and controllers. The ACC bus interface is compatible with the CANopen protocol (DS301 V4.01). Commands, start-up and diagnostics through CANopen are just as possible as the integration of decentralised E/A modules and other components compatible with CANopen.

The EtherCAT version enables the communication between a superordinate control (EtherCAT Master) and further AMK devices with EtherCAT interface. EtherCAT is operated with the profile “IEC 61491 Servo Drive Profile over EtherCAT” (SoE) and enables the diagnose, parameterisation and commanding with parameters.

Integrated movement functions

The two-axis module KWZ offers the same integrated movement functions as the AMKASYN servo drives KE/KW and KU.

- Momentum control with digital or analog setpoint
- Operation type analog speed control
- Digital speed and bearing control
- Absolute/relative positioning with adjustable ramps
- Reference point drive to machine zero point and/or reading absolute value
- Brake management
- Measuring button function (through BE3)
- Electronic drive of any type
- Synchronous run control between any number of axes

The integrated movement functions can be started through binary inputs or with an additional control component group through the ACC bus or EtherCAT.

Cyclic setpoint specification

In the ACC bus or EtherCAT network, the two-axis module can be supplied with cyclical setpoints by the ACC bus which are interpreted in dependence to the operating mode as torque, speed or position setpoints by the drive control. The setpoint is generated by the user program to the control or to another KW module.

EA interface

The EA interface offers inputs and outputs with maximum flexibility. The functionality of the binary inputs and outputs is configured through parameters.

1.4 Technical data

Device type	**KWZ 1** **KWZ 1-EC** **KWZ 1-F** **KWZ 1-ECF**	**KWZ 2** **KWZ 2-EC** **KWZ 2-F** **KWZ 2-ECF**	**KWZ 4-F** **KWZ 4-ECF**	**KWZ 5** **KWZ 5-EC**
Input voltage UZP, UZN (X05)	540 ...650 VDC			
Supply voltage	24 VDC ±15 %, corrugation max. 5%			
Input performance P (X08, X09)	24 W			
Degree of efficiency	approx 98%			
Cooling	KW x = External air or liquid cold plate KW x-F = Integrated air cooling			
Max. cold plate or ambient temperature	40 °C			
Control operation	PWM			
Switch frequency	8 kHz			
Input current[1) 4)] (X05)	3.8 A	7.6 A	15.2 A	19 A
	(KW A / KW B active)			
Output effective power [2) 4)](X04)	2x 1 kVA	2x 2 kVA	2x 4 kVA	2x 5 kVA

Device type	KWZ 1 KWZ 1-EC KWZ 1-F KWZ 1-ECF	KWZ 2 KWZ 2-EC KWZ 2-F KWZ 2-ECF	KWZ 4-F KWZ 4-ECF	KWZ 5 KWZ 5-EC
Output voltage (X04)	0 – 350 VAC (sine-shaped output current)			
Output frequency (X04) for PWM frequency 8 kHz:	0-800 Hz			
Control cycles momentum control	125 µs			
Control cycles speed control	125 µs			
Control cycles bearing control	1 ms			
Output effective current IN[2)4)] (X04)	2x 1.65 A	2x 3.3 A	2x 6.6 A	2x 8.25 A
Top output current Imax[3)] for max. 10 s	2x 3.3 A	2x 6.6 A	2x 13.2 A	2x 1.5 A
Max Dauer Imax at PWM 4 kHz fout > 0,2Hz fout ≤ 0,2Hz	 10 s 0.5 s	 10 s 0.5 s	 10 s 0.5 s	 10 s 0.5 s
Max Dauer Imax at PWM 8 kHz fout > 1 Hz fout ≤ 1 Hz	 10 s 0.5 s	 10 s 0.5 s	 10 s 0.5 s	 10 s 0.5 s
Derating factor Tsurroundings 30 °C[4)]	-	-	-	x 0.72
Derating factor Tsurroundings 40 °C[4)]	-	-	-	x 0.52
Protective/monitoring functions	Motor over-current/short-circuit/short-to-ground, Excess temperature KWZ-cooling element/motor, current overload after I²t			
Module width	55mm			
Weight	3 kg			

Legend KWZ

1) Values are valid for effective input voltage 400 V 50/60 Hz.

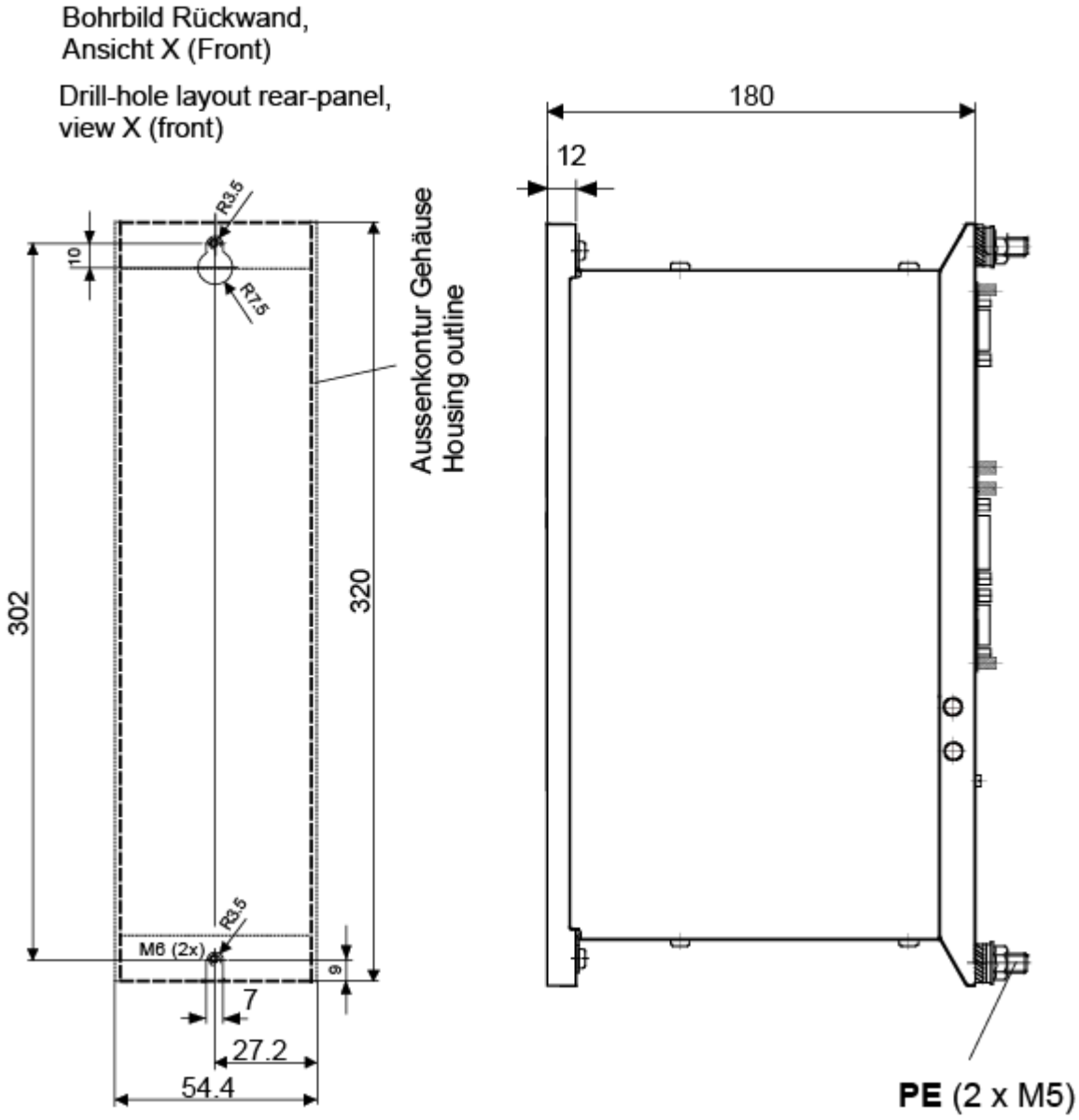
2) Values are valid for motor effective voltage 350 VAC.

3) The time for switch-on tx for an overcurrent Ix between IN and Imax is calculated according to the formula: tx = 30/((Ix/IN)2 - 1) result in (s). For output frequency < 0.2 Hz, the start-up time is internally reduced!

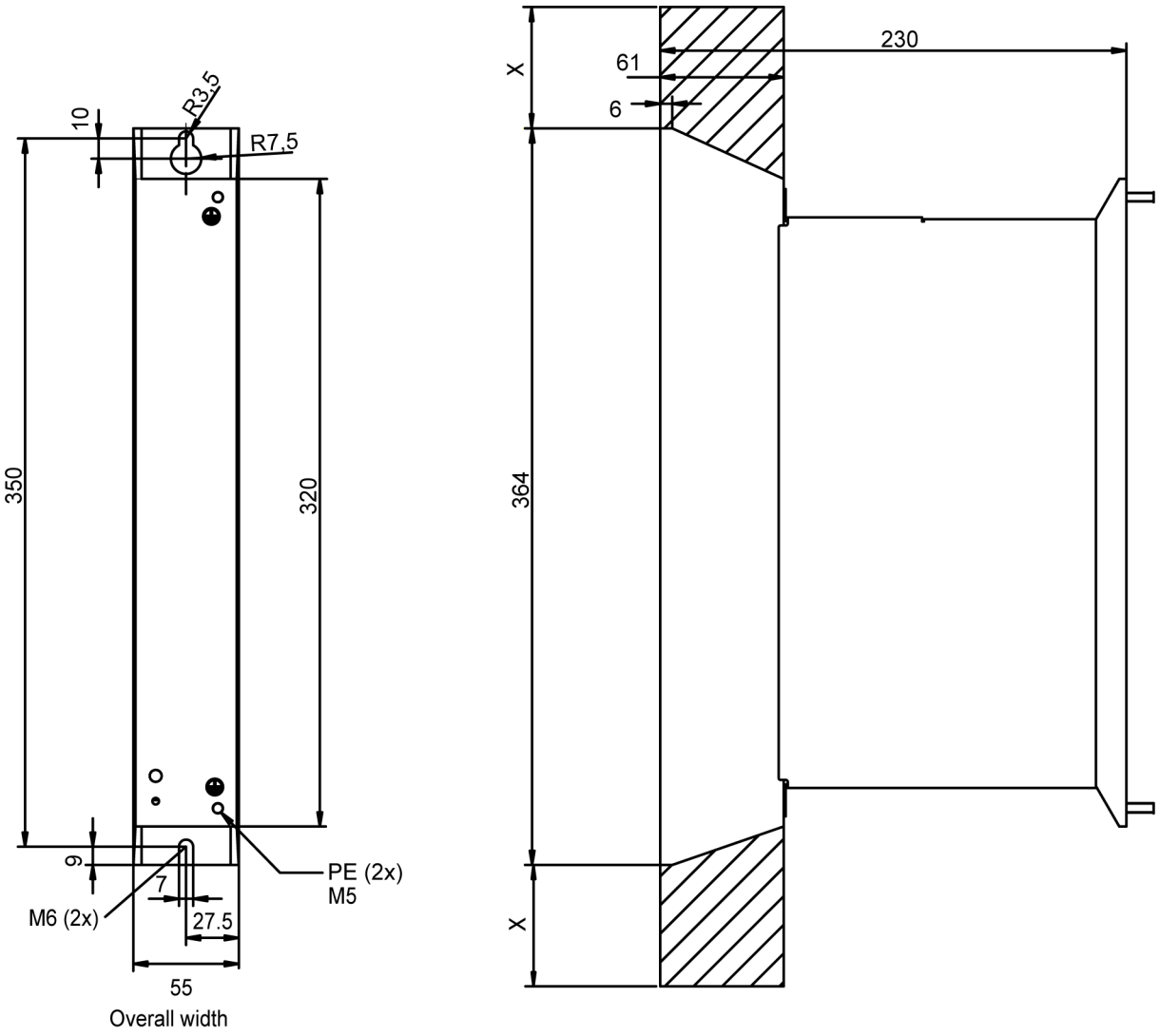
4) When mounting the coldplate module on an air-cooled cooling element KW-LK xx, please note the derating factors.

1.5 Dimensioned drawing

1.5.1 Coldplate modules:



1.5.2 Air-cooled modules



X free space for convection cooling
distance both sides min. 60

2 Safety instructions

KWZ modules are installation devices of safety class 1 (according to EN 50178) and have to be installed into a closed switch cabinet (IP 54) with a fixed connection. Please ensure that the switch cabinet protects against direct contact.

Please observe all applicable rules and regulations for the machine/system during installation. The machine/system has to correspond to the specifications of machine guideline 89/392/EEC, low voltage guideline 73/23/EEC and MV guideline 89/336/EEC within the European Community.

Danger

Any electrical equipment attached has to be designed to meet the electrical safety standards in accordance with EN 50178/EN 61800-2/EN 61800-3/EN 60204 when used as intended.

Only devices, electrical elements, or wiring may be connected to the signal interfaces that feature a “secure disconnection” of the connected circuits according to EN 50178.

Danger

Before working on the devices:

Disconnect power supply at the main switch.

There is a risk of death when working under voltage!

Attention: In the OFF status, LEDs do not display the zero-potential status of the device clamps!

Any plugs should only be plugged in or unplugged when the device is free of voltage. Never force plugs!

Only remove or attach cables to or from terminals when free of voltage.

Avoid touching the electrical connections; static discharge can destroy components.

Any work performed should be carried out only by trained and authorized technicians.

These are persons that have been well trained on the product and that are familiar with the transport, assembly, installation, control, and operation. They also have the appropriate qualifications of their vocation.

The technicians need to know and apply the valid regulations and standards for the electrical system/machine and safety. (EU: low voltage machine guideline, EN 60204, EN 292, EN 50178, national: accident prevention regulations VDE 0100, VBG 4, international IEC 60364, HD 384, IEC 60664)

Repair and work on devices that require them being opened may be carried out only by AMK Service and authorised personnel. Unauthorised opening of the devices means the loss of the warranty.

All documentation on the applied elements and the AMK safety regulations must be observed.

Generally, electrical drives carry the danger of non-intended use, uncontrolled movements due to defective components, software errors, operation errors, faults in the installation and/or components, environmental influences and of touching live parts.

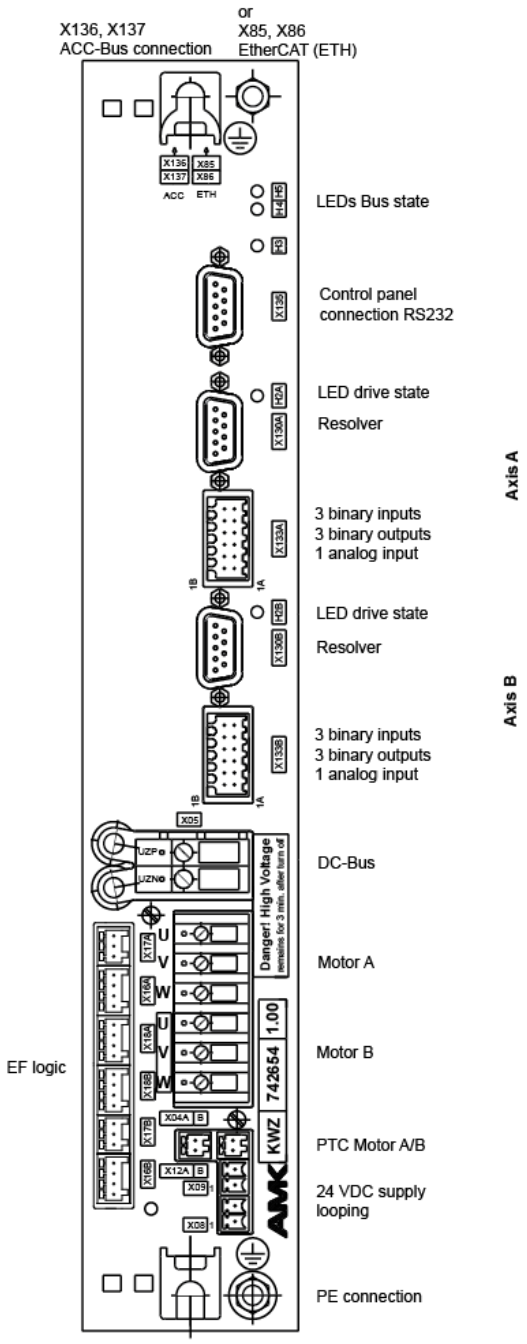
Improper handling of the devices and non-adherence to the warning notices may lead to damages and/or injury.

Warning

The system parameters may only be specified or modified by the machine's manufacturer. The value in the parameter for limit speed has to be adapted to the process and may not exceed the maximum permitted speed of the motor. The values for torque limits, start-up and run-down time have to be adjusted to the machine/mechanics. Entering false parameters influences the drive system and creates an increased risk of accident and damages!

3 Electrical connections

3.1 Interface description KWZ



3.1.1 X04 A/B Motor connection

PIN	Signification
U	Motor phase U
V	Motor phase V
W	Motor phase W

A false phase order during motor connection will lead to uncontrolled revolutions of the motor shaft!

3.1.2 X05 DC bus voltage

PIN	Signification
UZP	DC bus voltage (+)
UZN	DC bus voltage (-)

3.1.3 X08, X09 Supply voltage 24 VDC

PIN	Signification
1	0V (The 0 V potential of the power pack should be grounded at the central PE)
2	+ 24V

24 VDC external supply (power pack with potential separation according to VDE 0160) for the internal switch power pack and the ventilator in the KWx module. (Voltage looping over X08 or X09 for max. 4 additional KWx modules permitted). Failure of the 24 V supply > 10 ms creates an error message: Internally, the message “SBM” is reset and the motor runs down.

3.1.4 X12A/B Motor PTC resistor

Axis A: Encoding PIN 2
Axis B: Encoding PIN 1

PIN	Signification	Initial
1	Connection 2 for the motor PTC resistor	RT1
2	Connection 1 for the motor PTC resistor	RT2

Connection through a shielded cable, shield attached to one side of the KW casing.

Information for power output enable EF / EF2

Trigger signals for the control of power levels in the inverter (also in the double inverter KWZ) are released or locked for two channels through control inputs EF / EF2. With inputs EF / EF2 open, the motor is without current and safely secured against unintended start-up. EF and EF2 both have to be set before the controller enable RF is switched on. Removal of the output enable during operation creates an error and the motor will run down (see also section KWZ power output enable EF, EF2).

3.1.5 X16A/B Acknowledgement of power output enable

Axis A: Encoding PIN 4
Axis B: Encoding PIN 1

PIN	Signification	Initial	Comment
1	Feed +24 Vext. for relay contact QESA	WQSA	
1	Feed +24 Vext. for relay contact QESB	WQSB	
2	“Acknowledgement power output stage locked”	QESA	Relay contact opener (24 VDC, max. 200 mA). Only for EF = 0 and EF2 = 0 do the acknowledgement signals QES = 1 and QEF = 0 report that the enable relay has been removed and that the tact impulses are safely secured. The motor is not under current. .
2	“Acknowledgement power output stage locked”	QESB	
3	Feed + 24V ext.	WQF	Feed of the relay contact QEF (QEFA/B) (+24 Vext.), (in KWZ internally shared for A and B).

PIN	Signification	Initial	Comment
4	“Acknowledgement of power output stage enable”	QEFA	Relay contact closer (24 VDC, max. 200 mA). For EF = 1 und EF2 = 1, the status signals QEF = 1 und QES = 0, that the “Power output enable” has been set and the tact impulses for the power transistors are enabled. RF = 1 sets the motor under current.
4	“Acknowledgement of power output stage enable”	QEFB	

3.1.6 X17 A/B Power output enable EF / EF2 inverter A/B

Axis A: Encoding PIN 3
Axis B: Encoding PIN 2 2

PIN	Signification	Initial	Comment
1	Output stage enable EF2	EF2A	
1	Output stage enable EF2	EF2A	
2	0V ext.	WEF	Reference potential 0 Vext. for input voltage to EF (internally shared by A and B).
3	Output stage enable EF	EFA	
3	Output stage enable EF	EFB	

3.1.7 X18 A/B Relay power output enable A/B

Axis A: Encoding PIN 3
Axis B: Encoding PIN 2

PIN	Signification	Initial	Comment
1	“Acknowledgement output stage locked”	QESA	Relay contact opener (24 VDC, max. 200 mA
1	Feed +24 Vext.	WQSB	
2	“Acknowledgement output stage enable”	QEFA	Relay contact closer (24 VDC, max. 200 mA
2	“Acknowledgement output stage enable”	QEFB	Relay contact closer (24 VDC, max. 200 mA)
3	Output stage release signal EF2A	EF2A	
3	Output stage release signal EF2A	EF2B	
4	Looping signal EFA	EFA	
4	Looping signal EFB	EFB	

If the power output enable is only carried by one channel, Pin 3 (EFX_x) and Pin 4 (EF_x) have to be bridged with individual safeties of the drives in plugs 18A and 18B. For group safeties, Pin 1 … 4 in plugs 18A and 18B have to bridged parallel. In the last KWZ module of the group, Pin 1 and Pin 3 in plug 17B have to be bridged.

3.1.8 X85/X86 EtherCAT RJ45 connection (instead of ACC-BUS)

PIN	Signification	X85 EtherCAT IN	X86 EtherCAT OUT	Direction
1	Transmission Data +	TX+	TX+	Out
2	Transmission Data -	TX-	TX-	Out
3	Receive Data +	RX+	RX+	In
4	n.c.			
5	n.c.			
6	Receive Data -	RX-	RX-	In
7	n.c.			
8	n.c.			

Physical link

Terminal X85: EtherCAT Input (link to the EtherCAT Master or previous node X86)
Terminal X86: EtherCAT output (link to the next EtherCAT node)

Note: The communication in the EtherCAT network is done by patch cables of the CAT5e category (max. 100 m) with RJ45 connectors.

3.1.9 X130 A/B Encoder connection for Resolver

PIN	Resolver	Direction
1	n.c.	In
2	n.c.	In
3	+ SIN	In/Out
4	- SIN	In/Out
5	+ COS	In/Out
6	- COS	In/Out
7	+ UREF	Out
8	- UREF	Out
9	n.c.	Out
10	PE	

Connection through a shielded cable (parallel stranded). The cable shield has to be stranded on both sides.

Note: The encoder cables can be ordered with the following parts number from AMK.

For Resolver:

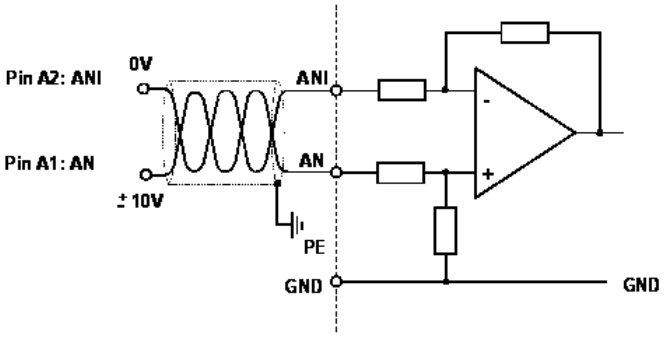
Encoder cable GD9 Resolver - KW/KU: T-Nr.: 101761
Encoder cable WD9 Resolver - KW/KU: T-Nr.: 101761

3.1.10 X133 A/B Analog input, binary inputs and outputs

Signification	Direction	Signal	PIN B	PIN A	Signal	Direction	Signification
Binary ground	In	BGND	1	1	AN	In	Analog channel not inverted
Binary ground	In	BGND	2	2	ANI	In	Analog channel inverted
Binary supply +24 V =	In	BVCC	3	3	BGND	In	Binary ground
Binary output 1 100 mA (QRF)	Out	BA1	4	4	BE1	In	Binary input 1 (RF)
Binary output 2 100 mA (SBM)	Out	BA2	5	5	BE2	In	Binary input 2 (FL)
Binary output 3 2 A (brake)	Out	BA3	6	6	BE3	In	Binary input 3 (NK), measuring input/timer

The E/A assignments can be configured with IDs. Refer to the table for the standard assignments.

Pin A4/B4, A5/B5, A6/B6: Binary inputs/outputs
Potentially separated by optocoupler
Nominal voltage inputs: +24 V
Nominal voltage outputs: +24 V
Nominal current inputs: 8 mA
Nominal current outputs BA1, BA2: 100 mA, permanently short-circuit safe
Nominal current output BA3: 2 A, permanently short-circuit safet
Cycle time for binary I/O: 1 ms
Connection through a shielded cable. The cable shield has to be placed onto the KWZ casing.

PIN	Signification	Initial	Comment
A1,A2	Analog inputs	AN, ANI	Input voltage: Nominal 0 … ±10 V Input current: Max. 10 mA The differential analog inputs permit a maximum input voltage of ±12 V! The resolution is 12 Bit for ±10 V. The request through the micro computer is carried out cyclically every 125 µs. Use the analog input to assign a torque or speed setpoint, depending on the selected operating mode. Connection through a shielded cable (parallel stranded). The cable shield has to be placed onto the KWZ casing. The BGND potential of the setpoint source may deviate a max. of ±10 V from the PE. 
A3, B1, B2	0V ext	BGND	Reference potential 0 Vext. of the external control voltage +24 Vext. for the supply of binary inputs and outputs.
A4	Binary input BE1 (default: RF “controller enable”)	BE1	Flank controlled (BE1 can be freely configured). Input voltage of +24 Vext. to RF releases the tact impulses in the inverter. The motor is under current, control is active. . **Prerequisite:** Successful system start-up after Power ON, acknowledged with SBM = 1. DC link voltage available, output stage release EF is set. If one of these prerequisites is not fulfilled, the system will signal an error. The message “System ready SBM” is reset and an error message is created. Removal of the controller enable (RF = 0) during operation will trigger braking of the revolving motor after a brake ramp which is preset through ID 32782. During stand-still, the tact impulses for the output stages are locked, the motor is without momentum (QRF = 0). . In case of an Emergency Off, the control RF has to be interrupted in its hardware through a contact with the Emergency Off circuit.
A5	Binary input BE2 (default: FL “Clear errors”)	BE2	Flank controlled (BE2 can be freely configured). **Prerequisite:** Prerequisite: RF Control enable inactive. In case of an error, the inverter module has to be re-initialised after the error has been removed through “Clear errors”. After start-up, the output SBM is set. “Clear errors” is set through an impulse (≥100 ms) at input “FL” or error deletion is carried out through the KW control panel (option) or the connected field bus system.
A6	Binary input BE3 (default: NK “Cams”)	BE3	Flank-controlled measuring input (BE3 can be configured freely). The measuring input is executed as measuring timer.
B3	+24V ext	BVCC	Shared feed of the external supply voltage +24 Vext. for the binary outputs.

PIN	Signification	Initial	Comment
B4	Binary output BA1 (default: QRF “Acknowledgement controller enable”)	BA1	Flank-controlled (BA1 can be freely configured). The output QRF is set if the drive is in control after RF = 1. The drive system is now ready to process setpoints. After removing RF (RF = 0), the drive is slowed down with the “run-down time for RF inactive” (ID 32782). Once a speed of “0” is reached, the QRF is reset and the motor is without torque.
B5	Binary output BA2 (default: SBM “System ready”)	BA2	Flank-controlled (BA2 can be freely configured). Output SBM is set as long as no error is recognized in the inverter module. SBM is reset in case of an error and reacts depending on the type of error (see “AMKASYN diagnostic messages”): The motor is slowed down after ramp ID 32782 or runs down. Errors in the voltage supply, in the computer or in the motor generator lead directly to a removal of the internal controller release as well as to a lock of the control impulses in the power part. The motor runs down. Thermal errors generate warnings, a warning bit is set internally which can be assigned to a binary output. After 4s, the warning is always transferred to the error status (SBM is reset) and the stop process is initiated (braking after ID 32782). Within the warning time, the superordinate control has the option to initiate the desired measures through the setpoint.
B6	Binary output BA3 (default BR output brake control)	BA3	Flank-controlled (BA3 can be freely configured). For direct control of a stop brake (+24 V, max. 2 A), Open emitter output with potential separation. Supply +24 Vext. through Pin B3/X133 (BVCC). If the output current exceeds 50 mA, it will be recognized as proper current for the brake and signalled to the system. For brake current larger than 2 A, error message “1100” is generated. The cable (shielded) for the stop brake has to be carried separately, place shield on both sides of the PE.

Note: The clamp KWZ - X133 is not compatible with the controller card clamps X133 onto the controller cards KU/KW-R03, KU/KW-R03P and KU/KW-R04.

3.1.11 X135 Control panel KU-BF1 and PC (D-SUB 9-pin, socket)

This interface is for parameter setting and diagnostics of the drive with the control panel KU-BF1 or an external PC.

AMK parameter software AIPEX has to be installed in order to communicate with the PC. The selection of the drive is carried out with the key combination Shift A for axis A and Shift B for axis B.

The power pack in the PC has to be capable of “safe electronic separation” according to EN 50178.

PIN	Signification	Initial	Comment
1	+ 12 V	12 P	+12 V supply, max. 100 mA secured through reset safety (PTC)
2	Receive Data	PC_RxD	
3	Transmit Data	PC_TxD	
4	n.c.		
5	Signal-Ground	GND	
6	n.c.		
7	n.c.		
8	Hardware recognition bit 0 = Control panel nc = SBUS/not connect	SBF	
9	n.c.		
10	PE	PE	Shield covering plug casing
11	PE	PE	Shield covering plug casing

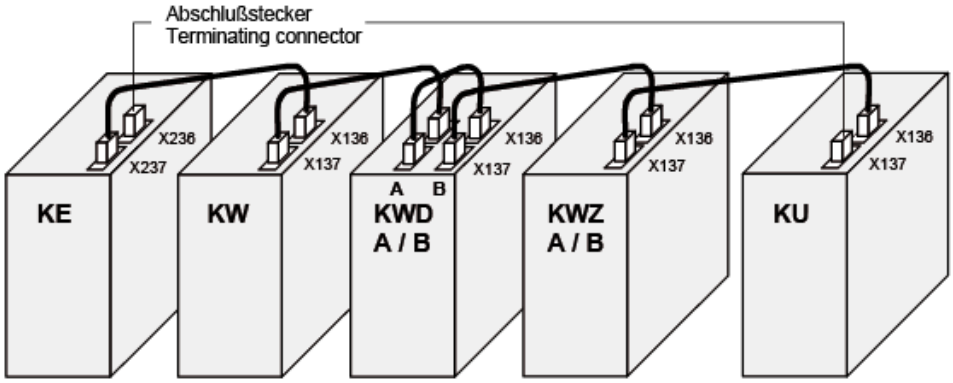
Note:	The connection cable to the PC may only contain the lines RXD, TXD and GND! A standard zero modem link cable may not be used. When using such a cable, defects at the PC input may occur!

3.1.12 X136/137 ACC Bus fire wire connection (instead of EtherCAT)

The system linkage is carried out through plug connectors X136 and X137 (KW) and through X236 and X237 (KE).

The standard fire wire cables according to IEEE 1394 which are used here, are cross-switched. Plug connectors X136 to X137 are also internally crossed. Wiring should be carried out as follows:

Further information can be found in the Chapter Networking through CANopen and ACC Bus



Note:	Set a Bus terminating plug (120 Ohm) at the end and beginning of each line.

ACC-Bus assignment X137/X237			ACC-Bus assignment X136/X236		
PIN	**X137**	**Signification**	**PIN**	**X136**	**Signification**
1	n.c.	AMK internal	1	n.c.	AMK internal
2	GND	Ground	2	GND	Ground
3	CAN_H	CAN High	3	SYNC_H	SYNC High
4	CAN_L	CAN Low	4	SYNC_L	SYNC Low
5	SYNC_H	SYNC High	5	CAN_H	CAN High
6	SYNC_L	SYNC Low	6	CAN_L	CAN Low
casing	PE	shield	casing	PE	shield

3.1.13 H2A/H2B Status LED

H2A Status LED axis A
H2B Status LED axis B
The LED on the front plate of the KWZ shows the following status:

Colour	Status	Comment
Green	System ready SBM	SBM shows the flawless status of the system after the KWZ module is supplied with 24 V electronic voltage.
Green (blinking)	Control active, QRF	The acknowledge inverter on (QRF = “Quittierung Reglerfreigabe” “Acknowledgement controller enable”) signals that the drive is under voltage and is under control. Prerequisite for setting controller release is a flawless system status (SBM set).
Red	Error	The error status removes the controller enable from the drive and resets the system ready message. Depending on the cause of the error the drive is braked automatically to zero speed or it runs down.
Orange	Warning without QRF	The drive can still be operated in control despite the warning. Reading the diagnosis number, e.g. with AIPEX or Read error with the SPS, is necessary for a reaction to the warning.
Orange	Programming mode	AMK service: In the programming mode, you can, for example, load new firmware.
Orange (blinking)	Warning with QRF	The drive can still be operated in control despite the warning. Reading the diagnosis number, e.g. with AIPEX or Read error with the SPS, is necessary for a reaction to the warning.

Blinking means: The indicator shall turn on and off iso-phase with a frequency of 2,5 Hz: on for 200 ms followed by off for 200 ms.

3.1.14 H3 LED Fieldbus state

The LED H3 shows the status of the existing fieldbus (ACC-Bus or EtherCAT).
For devices with ACC-Bus interface the LED display H3 has the following meaning:

Colour	Status	Signification for ACC-Bus
Off	Init	The ACC-Bus will be initializing after the KWZ module is supplied with 24 V electronic voltage.
Green (blinking)	Pre-Operational	System free of error. No transmit of process data’s (PDOs) .
Green	Operational	System free of error. Transmit of process data’s (PDOs) is possible.
Red (blinking)	Error	Configuration error. E.g. wrong transmission baud.

For devices with EtherCAT interface the LED display H3 has the following meaning:

Colour	Status	Signification for EtherCAT
Off	Init	The EtherCAT-Bus will be initializing after the KWZ module is supplied with 24 V electronic voltage.
Green (blinking)	Pre-Operational	Pre-Operational allows access to the IEC 61491 Ids via the “service channel” (EtherCAT mailbox.)
Green (single flash)	Safe-Operational	Cyclic data is transmitted and the drive has time synchronization.

Colour	Status	Signification for EtherCAT
Green	Operational	All inputs and outputs are valid
Red (blinking))	Error	Configuration error
Red (single flash)	Fallback	EtherCAT allows a fallback from “Operational” to Safe-Operational (e.g. in case of invalid inputs)

Blinking means: The indicator shall turn on and off iso-phase with a frequency of 2,5 Hz: on for 200 ms followed by off for 200 ms.
Single flash means: The indicator shall show one short flash (200 ms) followed by a long off phase (1000 ms).

3.1.15 H4/H5LED-display for EtherCAT

H4 status LED Physical link – data exchange with X86
H5 status LED Physical link – data exchange with X85
The green LED H4/H5 signals that the physical address exists or that a data transfer is taking place. The following condition of the LED indicates the respective status.

Colour	Status	Comment
Green	Link	Link available, no activity
Green (blinking)	Link / Activity	Link available, Activity available
Off	-	No link ,no activity

Blinking means: The indicator shall turn on and off iso-phase with a frequency of 2,5 Hz: on for 200 ms followed by off for 200 ms.

3.2 Power output enable EF, EF2

The “Power output enable EF, EF2” can be used against re-start in the two-axis inverter KWZ. This function is separately available for each drive. The control and acknowledgement signals are distinguished through supplement A or B.

The KWZ modules contains an power output enable with internal, error-proof monitoring through the control card. The external evaluation of the signals QEF/QES in an error-free control is therefore not necessary.

The output stage enable triggers a secure lock against motor start-up in the drive which corresponds to safety category 4 according to EN 954-1. The safety function EF is redundantly executed with two-channel hardware logic EF and two-channel software monitoring on the control card.

Interrupting the control inputs EF/EF2 will cause the trigger signals for control of the power output stages to be safely locked in two channels. The motor is in a secure state without having the drive system completely separated from power.

The output stage enable EF/EF2 may only be removed with the controller enable RF switched off and the motor in stand-still. Shut-down of EF/EF2 during the run will create an error message in the drive and the motor coast.

A mechanical brake has to also be used for a drive with hanging load.

When carrying out maintenance work, the system has to be shut down (main switch OFF)!

In case of an error in the EF monitoring logic (error code 2361), the drive can no longer be switched on, the motor is in a secure state.

The KWZ module has to be exchanged for error removal.

The safety devices “Power output enable” in inverters A and B are internally switched as follows:

The 0 V connection WEF of the four EF signals EF_A, EF2A, EF_B u. EF2B exists only once (shared for EF in both inverters A and B).

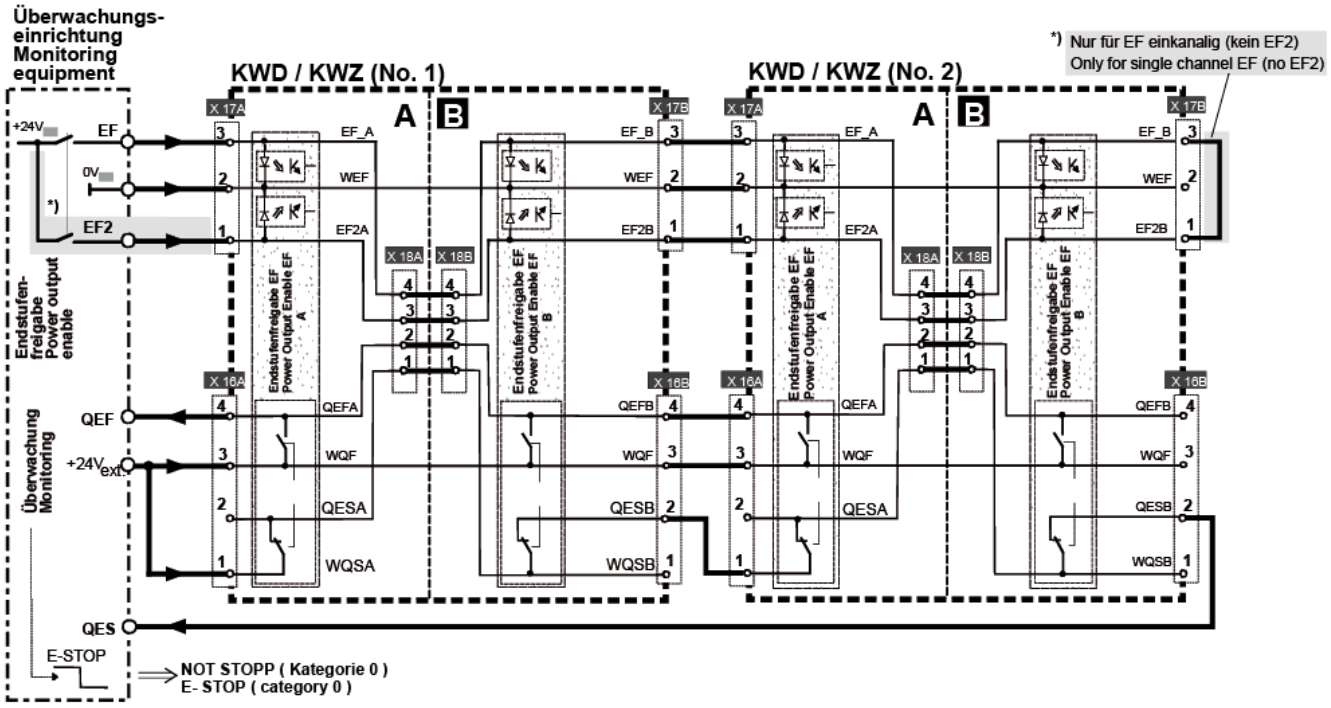
The +24 V connection WQF exists only once (shared for QEFA and QEFB in both inverters A and B).

The proper wiring of plugs X16A/B, X17A/B, X18A/B enables the output stage enables as follows:

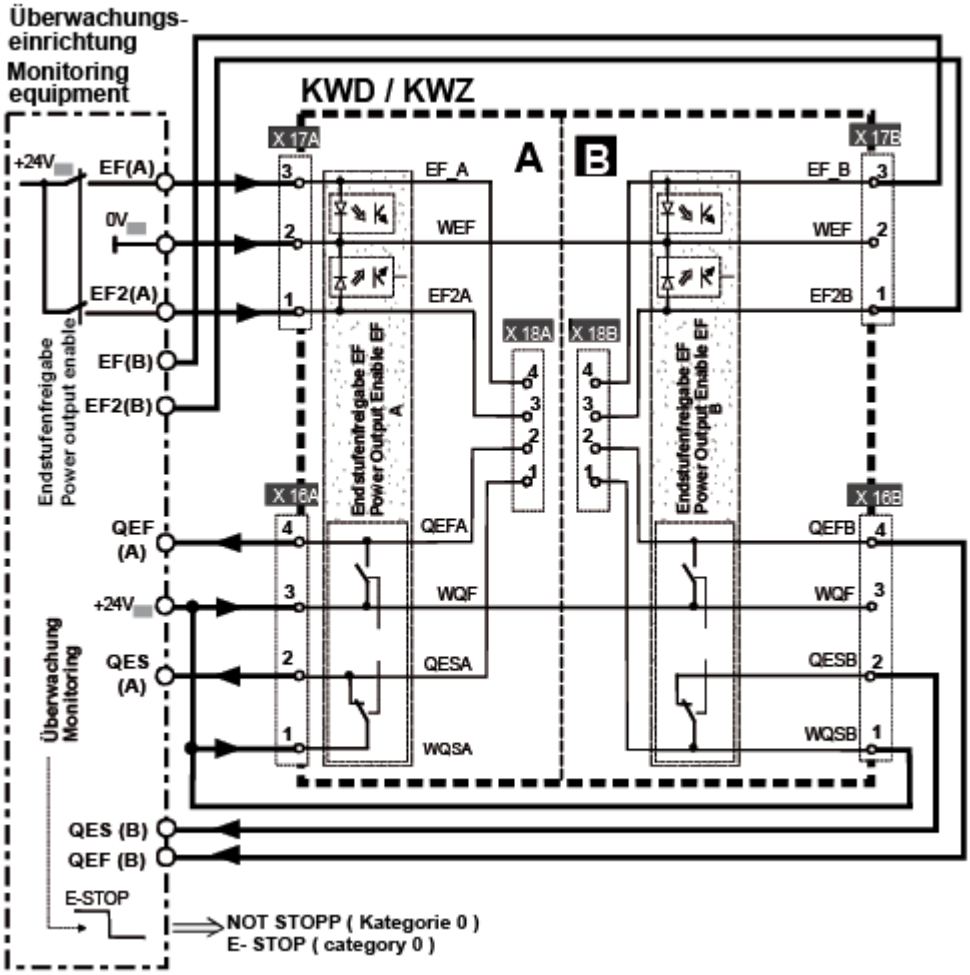
- Power output enables single safety (A/B), one-channel (only EF)
- Power output enables single safety (A/B), two-channel (EF and EF2)
- Power output enables group safety (A and B), one-channel (only EF)
- Power output enablese group safety (A and B), two-channel (EF and EF2)

The power output enable EF (according to safety category 4) does not require an external error-free monitoring of the EF acknowledgement signals QES/QEF.

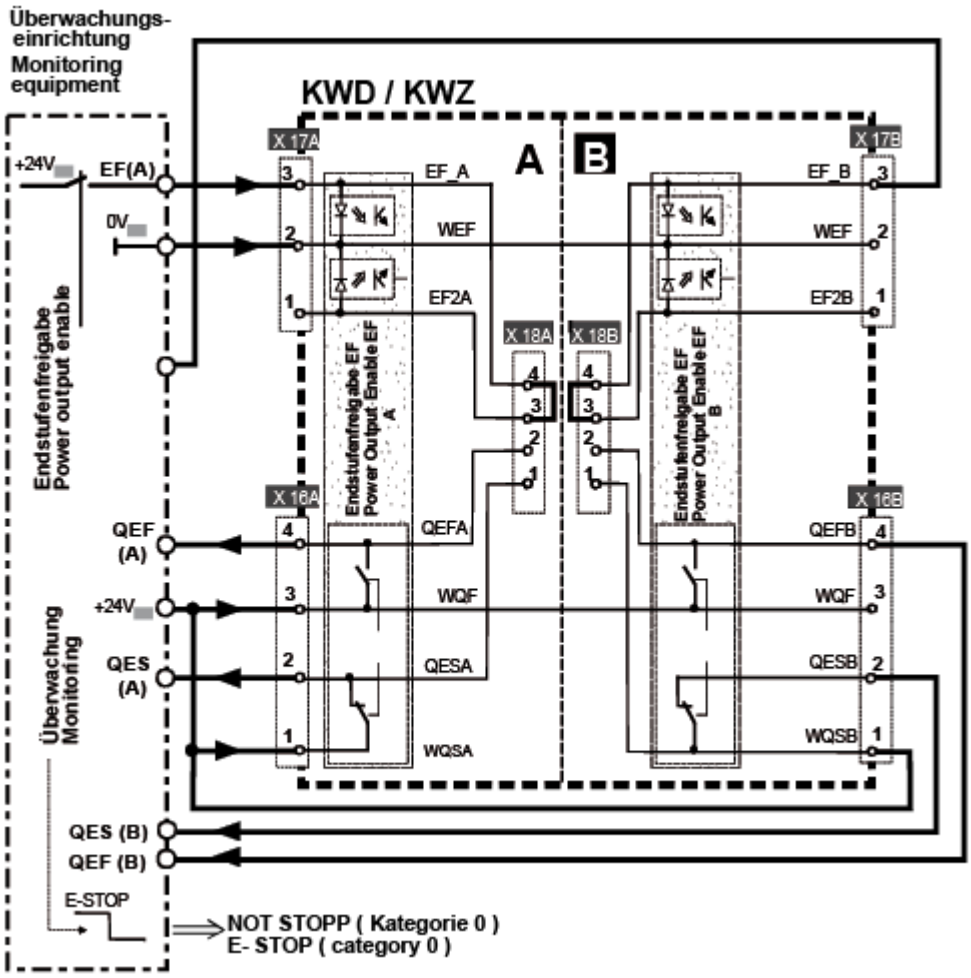
Power output enable group safety (A and B), two-channel (EF and EF2) (with additional information for EF one-channel):



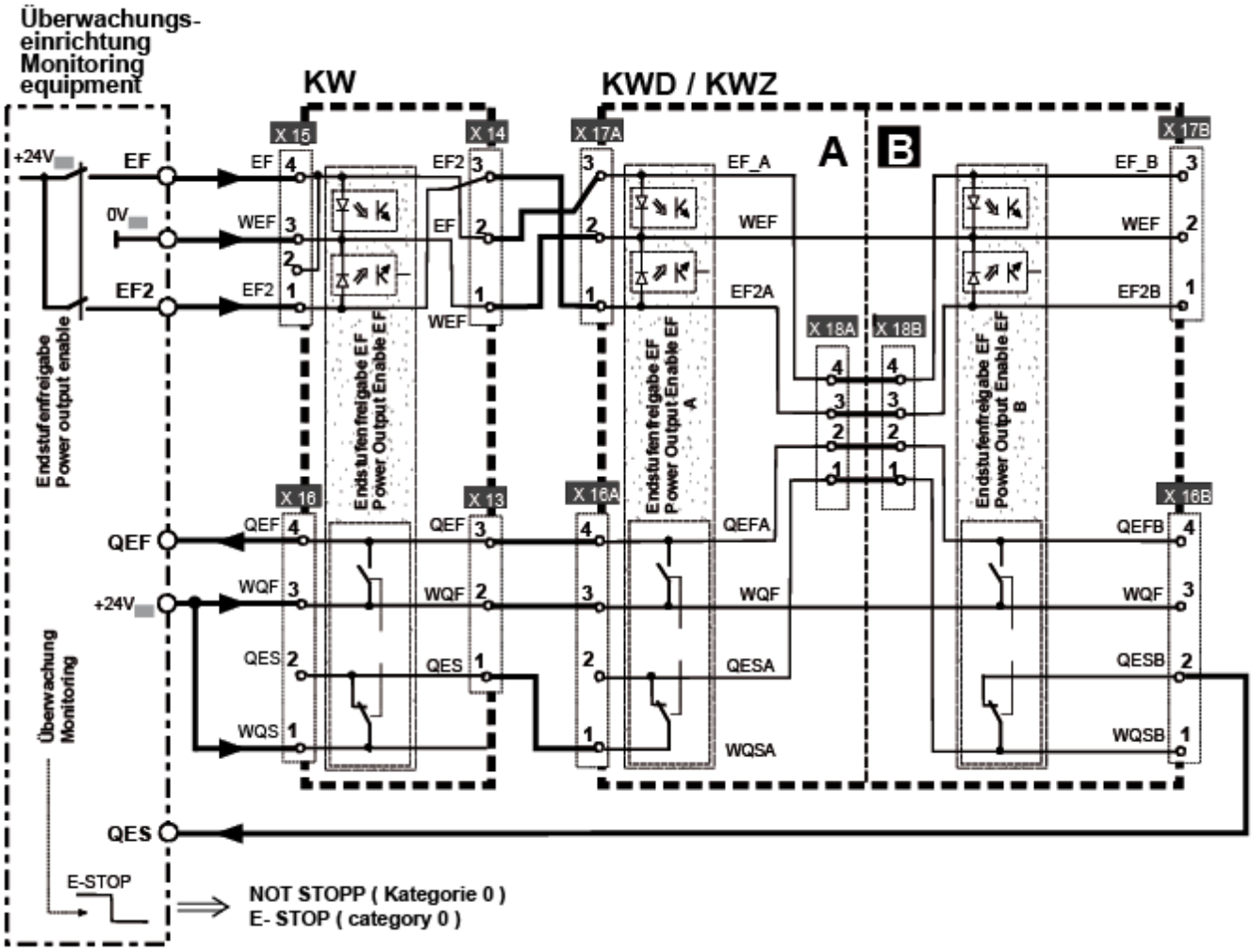
Power output enable single safety (A/B), two-channel (EF and EF2):



Power output enable single safety (A/B), one-channel (only EF):



Power output enable EF in combination KW/KWZ/KWD:



3.3 Cable making

AMK suggest following connection cables

Terminal	X04 A/B
Signification	Motor connection
Type	4-wires, shielded
Cross-section	1mm² / AWG16
Shield connection	Place the the cable shield on both sides onto the casing (PE).
Fabrication at the module	Pin-end connector (U,V,W), cable sleeve (PE)
Comment	The complete cables can be ordered from the AMK sales department.

Terminal	X05
Signification	DC-Bus (UZP, UZN)
Type	2-wires, non-shielded
Cross-section	4mm² / AWG10
Shield connection	
Fabrication at the module	Pin-end connector
Comment	A max. length of 1 m is permitted for the cable to connect the intermediate circuit voltage when assembling the device with a distance between the modules. A 2-wire shielded cable might have to be used in order to limit interference radiation. The shield has to be grounded over the casing on both sides. (Use of longer cables only after consulting with AMK).

Terminal	X08, X09
Signification	Power supply 24VDC, 0V
Type	2-wires, non-shielded
Cross-section	0,75mm² / AWG18
Shield connection	
Fabrication at the module	Terminal X08 bzw. Terminal X09
Comment	A max. of 5 modules may be connected through plug connectors X08 and X09.

Terminal	X12 A/B
Signification	Temperature sensor motor PTC resistor
Type	2-wires, shielded
Cross-section	0,5mm² / AWG20
Shield connection	Shield connection at the module, one side
Fabrication at the module	Terminal X12A bzw. Terminal X12B
Comment	

Terminal	X16 A/B, X17 A/B, X18 A/B
Signification	EF Logik
Type	4-wires, non-shielded
Cross-section	0,5mm² / AWG20
Shield connection	
Fabrication at the module	Terminal X16 A/B, Terminal X17A/B bzw. Terminal X18 A/B
Comment	

Terminal	X85 / X86
Signification	EtherCAT cable
Type	Patch- cable category CAT5e, shielded
Cross-section	0,34mm² / AWG22
Shield connection	Shield connection both sides
Fabrication at the module	RJ45-connector
Comment	Suggestion from AMK: Industrial Ethernet Standard cable Cat 5 Plus * 22AWG (shielded) Maximum length 100m

Terminal	X130
Signification	Encoder interface
Type	4 x 2 x 0,25 pair-stranded + 4 x 0,5 shielded
Cross-section	0,25mm² / 0,5mm²
Shield connection	Shield connection both sidest
Fabrication at the module	D-SUB plug with a metallic casing
Comment	The shield of the cable has to be grounded through the screw connection in the plug casing on the motor side. The shield mesh is pulled over the clamp insert. After screwing together, the shield is placed over the contact spring and the plug casing on the mass. The generator plug set, consisting of a round plug and 12 contact sockets can be obtained from AMK: Straight plug AMK parts no.: 49163 Angled plug AMK parts no.: 49362 Complete encoder cable: For Resolver: Encoder cable GD9 Resolver - KWZ: AMK part nr101761 Encoder cable WD9 Resolver - KWZ: AMK part nr101762

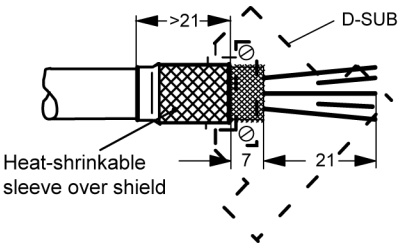
Terminal	X133 A/B
Signification	Binary In-/Outputs, Analog inputs
Type	6-wires, shielded
Cross-section	1mm² / AWG18
Shield connection	Shield connection at the module, one side
Fabrication at the module	Terminal X133 A, Terminal X133 B
Comment	A shielded cable has to be used for binary inputs and outputs. The shield of the cable has to be placed on one side of the KW casing. If a single shielded cable cannot be used for the entire length, a shielded cable with a length of approx. 1 m has to be laid to a transfer element. After that, individual cables without shield can be used.

Terminal	X135
Signification	Serial AIPEX-cable
Type	3-wires, shielded
Cross-section	1mm² / AWG18
Shield connection	Shield connection at the module, one side
Fabrication at the module	D-SUB plug with a metallic casing
Comment	AMK part nr. O576

Terminal	X136 / X137
Signification	ACC-Bus cable
Type	Pair-stranded, shielded
Cross-section	1mm² / AWG18
Shield connection	Shield connection both sides
Fabrication at the module	Firewire connector
Comment	ACC-Bus cable IEEE 1394 complete with plug 140 mm cable length, complete length 240 mm - AMK part nr. 29237 210 mm cable length, complete length 310 mm - AMK part nr. 29231 300 mm cable length, complete length 400 mm - AMK part nr. 200053 1m cable length, complete length 1,01 m - AMK part nr. 29523 1,8 m cable length, complete length 1,81 m - AMK part nr. 29543 4 m cable length, complete length 4,01 m - AMK part nr. 29544 5 m cable length, complete length 5,01m - AMK part nr. 200507 10 m cable length, complete length 10,01m - AMK part nr. 29545

Cable with D-Sub plug

1. Metallic D-SUB casings with a side cable output have to be used. The cable shield is grounded through the D-SUB casing on the KE/KW module.
2. Remove outer cable insulation (to approx. 21 mm for 9-pin D-SUB plug).
3. Evert cable shield over the outer insulation sleeve.
4. Fix and insulate the shield with heat-shrinkable sleeve so that a blank shielding edge of approx. 7 mm width remains.
5. Connect plug.
6. Relieve the cable with strain relief clamp and securely connect the everted blank shield edge with the metallic plug casing.
7. After plugging the corresponding plug pedestal into the KE/KW casing, the D-SUB plug has to be screwed onto the pedestal.
8. If shielded cables have to be interrupted by a plug connector, a continuing shield connection has to be ensured by placing the shield onto the plug casing. The shield may not lead over plug contacts.
9. Cables leading into the casing have to be secure with grounding cable screw connections with which the cable shield is directly attached to the PG casing.



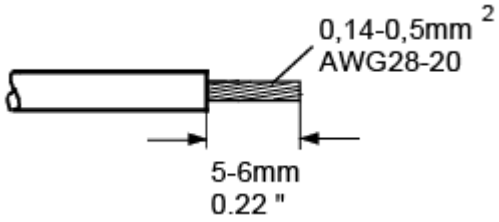
Cable for signal plug connector

For plug connectors X08, X09, X12 A/B, X16 A/B, X17 A/B, X18 A/B the conductor connection is realised through tension. For inserting and removing the conductor, the loosening switch on the clamp front has to be loosened with a screw driver. For service purposes, a control tap with a check plug D = 1.2 (1) mm is possible with these clamps.

For clamps X133 A/B, the tension spring has to be triggered with a screw driver (width 2 mm) by plugging it into the rectangular grooves in the centre of the clamp (place cable into round openings).

Please note:

The plug connectors are partially encoded. Do not push in with force. Never pull on cable but on the plug casing.



3.4 Tightening torques [Nm] for terminals

Terminal / fastening	for housing width 55mm
X05	2
X04	1
PE connection	4
Pressure bolts	-
Rear panel M6 mounting	8
D-SUB housing	0.8
Shield clamps	
SK 8	0.6
SK 14... 20	0.8
SK 35	1.8

4 Start up

4.1 Control panel KU-BF1

The control panel KU-BF1 (AMK Part-Nr. E628) is connected to interface X135. Axis A is addressed through "Shift" A, Axis B through "Shift" B.

4.2 Addressing KWZ

The participant address for the ACC-Bus has to be entered for each KWZ module separately through the serial interface RS232 (X135) with the control panel KU-BF1 (AMK parts no. E628) or with a PC with the AMK parameter software AIPEX (AMK parts no. 46600). It is internally listed in ID 34023 “Bus participant address”.

Default addressing KWZ

Axis A = 2
Axis B = 3
KWZ ACC-Bus addresses between 2 and 32 are permitted. Participant address “1” is always assigned to the MASTER.

4.3 Networking through CANopen and ACC-Bus

The drive system requires a Master and one-time Bus participant addresses for all devices in the network for ACC-Bus communication. The Bus transfer rate and the Bus cycle time has to be the same for all modules. A communication between all participants can only take place through the ACC-Bus once these conditions have been fulfilled.

Note:	A KWZ module cannot be declared as ACC-Bus Master.

The two-axis modules are integrated into the AMKASYN ACC-Bus network as slave participants. ACC-Bus Master can be a servo controller (e.g. KW or KU) or a superordinate control (e.g. compact control or AS-PLx). The ACC-Bus corresponds to the CAN Bus Standard 2.0B with CANopen protocol DS301 V4.01 extended by a hardware synchronisation signal.

Hardware synchronisation synchronises all drives and processes with a jitter smaller than 1µs and enables data exchange in ACC-Bus in real time. 2 synchronous messages (PDOs) can be sent and received per KWZ per 1 ms cycle time (see parameter ID 2). In total, a max. of 4 send and receive messages can be configured per axis per KWZ.

The message configuration is carried out in the AMK PC software AIPEX if an AMK control component group is ACC-Bus Master (CANopen Master).

In order to link several drives through the ACC-Bus, the communication parameters and cycle time have to be set for each participant.

ID	Description	Default value
ID00002	SERCOS Cycle-time = ID00001=ID32958	-
ID34023	Bus station address	A = 2, B = 3
ID34024	Bus transfer rate	1000 KBit/s
ID34025	Bus mode	Slave
ID34026	Bus mode attribute (hardware synchronisation)	Inactive
ID34027	Bus failure characteristic	2

The parameters can be set by creating a direct connection between PC and KWZ through the ACC-Bus interface. After the communication parameters have been set correctly in all participants, the drives can be linked through ACC-Bus. After another system start-up, the participant set as ACC-Bus master recognizes the connected slaves and initialises the bus connection. Use the AMK PC program AIPEX to access all participants with the PC through the ACC-Bus interface.

Standard CANopen devices such as CAN EA component groups or remote controls can be also connected to the ACC-Bus.

The ACC-Bus has to be connected to the first and last participant with the AMK bus limit resistance.

4.4 Networking with EtherCAT

No special parameterisation is necessary for operating the KWZ x -EC.

The parameterisation of the communication is done by the EtherCAT Master during the start up. The following IDNs are written during this process:

ID	Beschreibung	Quelle
ID00001	NC-cycle time	from task configuration

ID	Beschreibung	Quelle
ID00002	SERCOS-Zykluszeit	from task configuration
ID00015	Telegram-type	from process data configuration
ID00016	List AT	from process data configuration
ID00024	List MDT	from process data configuration

Note:	The EtherCAT Master cycle time needs to be identical to the SERCOS cycle time ID2 and the NC cycle time ID1. If that is not the case, then the times are overwritten by the EtherCAT Master. (Reboot of the AMK system necessary/Error message 2572 info 27 is generated.)

Configuration UE (DC Bus Enable) on KE

The KWZ-EC is a EtherCAT slave without ACC Bus. For the activation of UE (DC Bus Enable) the following options are available:

DC Bus Enable with the binary input on the KE. (X22 Pin2 / ID32795 = 0)
DC Bus Enable is automatically set with SBM (System Ready). (ID32795 = 8)
DC Bus Enable is set with the ACC Bus of a KW device (ID32795 = 9)

Configuration RF Inverter ON on the KWZ

ID32796 =

0 source RF = binary input on basic device X133 Pin A4

5 source RF = EtherCAT Master
25 source RF = EtherCAT Master & links binary input on basic device X133 Pin A4

4.4.1 Servo profile specific parameters

Following parameters are supported by AMK.

The configuration of data transferred between master and slave with the configuration lists ID16 and ID24 is included in this.

Additional parameters affect the setting of the executed operation modes and the configuration of real-time controller and status bits in the cyclically transferred control and status words.

Diagnostics are also displayed in specific IDs (e.g. ID403 status APV).

ID	Bezeichnung
11	Status class 1-errors
12	Status class 2-warnings
13	Status class 3-messages
15	Telegr. type par.
16	Config. list DT
18	Op.datalist com.ph.2
19	Op.datalist com.ph.3
20	Op.datalist com.ph.4
21	Inval.datalist com.ph.2
22	Inval.datalist com.ph.3
23	Inval.datalist com.ph.4
24	Config. list MDT
28	MST Error Counter
32	Primary operat. mode
33	Second. operat. mode1
34	Second. operat. Mode2
35	Second. operat. Mode3
95	Diagnosis [ASCII]
97	Maske Status class 2
98	Maske Status class 3
99	Reset Status class 1
129	Manufact.status class 1

ID	Bezeichnung
134	Master ctrl.word
135	Drive stat. word
143	SERCOS Version
148	Drive hom.cycle commd.
181	Diag. manufact. class 2
182	Diag. manufact. Status
185	Max. Länge im AT
186	Max. Länge im MDT
187	List of data AT
188	List of data MDT
284	Second. operat. Mode 4
285	Second. operat. Mode 5
286	Second. operat. Mode 6
287	Second. operat. Mode 7
301	Set Control bit1
303	Set Status bit1
305	Set Controlbit2
307	Set Status bit2
330	Nist = Nsoll
331	Nist < Nmin
332	Nist < Nx
333	Md >= Mdx
334	Md >= Mdgrenz
335	Nsoll > Ngrenz
336	In position
337	P >= Px
400	Referenz switch
403	Status LIW
404	Status actual position

4.5 Automatic current regulator adjustment

An automatic current regulator adjustment is carried out if one of the IDs equals 0.

ID34050 TN current Q

ID34052 TN current D

ID34151 Kp current Q

ID34152 Kp current D

or after modifying the motor parameters.

4.6 Further documentation

Detailed documentation for electrical start-up can be found in the servo inverter KE/KW and KWD AMK parts number 28932 documentation under chapter 12 “Start-up”.

In the following, all KWZ-specific parameters, binary inputs and output codes, API variables and AFP commands are listed.

4.7 Parameter overview

ID-No.	Designation	K	Default	Unit	Parameter	Temp. change
1	NC cycle time	3	1000	ms	GLOB	
2	SERCOS cycle	3	100	ms	GLOB	
17	List all op. data	0	0	-	GLOB	

ID-No.	Designation	K	Default	Unit	Parameter	Temp. change
26	Status word	0	0	-	GLOB	
30	Softwareversion	0	0	-	INST	
36	Veloc. cmd. value	1	1000.0	1/min	ANTR	yes
38	Pos. veloc limit	0	5000	1/min	ANTR	yes
39	Neg. veloc. limit	0	-5000	1/min	ANTR	yes
40	Veloc. feedb. val.	1	0.0	1/min	ANTR	
41	Homing velocity	0	100	1/min	ANTR	yes
43	Veloc. polarity	0	0	-	ANTR	
49	Pos. posit. limit	0	2147483647	Incr	ANTR	yes
50	Neg.posit. limit	0	2147483648	Incr	ANTR	yes
51	Posit.feedb.val	0	0	Incr.	ANTR	
55	Posit. polarity	0	0	-	ANTR	
57	In posit. window	0	1000	Incr.	ANTR	
76	Posit. scaling	0	0	-	ANTR	
80	Torque cmd. vlaue	1	10	% MN	ANTR	yes
82	Pos. torque limit	0	120	% MN	ANTR	yes
83	Neg. torque limit	0	-120	% MN	ANTR	yes
84	Torque feedb.val.	1	0	% MN	ANTR	
85	Torque polarity	0	0	-	ANTR	
100	Veloc. gain KP	0	200	-	ANTR	yes
101	Init.time veloc.	1	50.0	ms/x	ANTR	yes
102	Diff.time veloc.	0	0	ms	ANTR	yes
103	Modulo value	0	20000	Incr.	ANTR	
104	Posiiton loop KV	0	100	1/min	ANTR	yes
109	Motor peak curr.	2	5.00	A	ANTR	
110	Invert.peak.curr.	2	20.00	A	ANTR	
111	Mot. nom. curr.	2	2.50	A	ANTR	
112	Invert.nom.curr.	2	2.50	A	ANTR	
113	Maximum speed	0	6000	1/min	ANTR	
114	Overl.limit.mot.	1	500	%	ANTR	
115	Posit.feedb.type	0	0	-	ANTR	
116	Resol.mot.encod.	0	20000	Incr.	ANTR	
117	Resol.ext.encod	0	100	Incr.	ANTR	
121	Gear input rev.	0	10	rev.	ANTR	
122	Gear output rev.	0	10	rev.	ANTR	
123	Feed constant	4	10.0000	mm/rev	ANTR	
124	Zero veloc.wind.	0	50	1/min	ANTR	yes
125	Veloc.Thresh. nx	0	1000	1/min	ANTR	yes
126	Torq.thresh. Mdx	0	100	% MN	ANTR	yes
130	Probe val.p.edge	0	0	Incr.	ANTR	
131	Probe val.n.edge	0	0	Incr.	ANTR	
136	Positive accel.	0	100	U/ss	ANTR	yes
137	negative accel.	0	-100	U/ss	ANTR	yes
141	Motor type	0	0	-	ANTR	
144	Conf.sstatus bits	0	0	-	ANTR	yes
147	Homing par.	0	800h	-	ANTR	yes
150	Reference offs. 1	0	0	Incr.	ANTR	yes
153	Angle position	0	0	Incr.	ANTR	yes
154	Spindle pos.par.	0	800h	-	ANTR	yes

ID-No.	Designation	K	Default	Unit	Parameter	Temp. change
157	Velocity window	0	100	1/min	ANTR	yes
158	Power thresh. Px	0	100	WATT	ANTR	yes
159	Excess Error	0	10000	Incr.	ANTR	yes
169	Probe ctrl. par.	0	0	-	ANTR	yes
179	Probe status	0	0	-	ANTR	
180	Spindle pos.rel.	0	10000	Incr.	ANTR	yes
182	Manufact.status	0	0	-	GLOB	
206	Drive on delay	1	0.0	ms	ANTR	
207	Drive off delay	1	0.0	ms	ANTR	
209	Low adapt.limit	0	0	1/min	ANTR	
210	Upp. adapt.limit	0	0	1/min	ANTR	
211	Gain adaption	0	100	%	ANTR	
212	Integr. adaption	0	100	%	ANTR	
222	Spindl.pos.speed	0	300	1/min	ANTR	
225	Synchron par.	0	8003h	-	ANTR	yes
228	Angle syn.window	0	1000	Incr.	ANTR	yes
265	Language	0	0	-	GLOB	yes
269	ID memory mode	0	0	-	GLOB	yes
270	List temp. par	0	0	-	GLOB	
390	Diag. number	0	0	-	GLOB	
409	Measuring value, positive saved	0	0	0	ANTR	
410	Measuring value, negative saved	0	0	0	ANTR	
32768	Nom.motor volt.	1	350.0	V	ANTR	
32769	Magnet curr. IM	1	1.500	A	ANTR	
32770	Magnet.curr. IM1	1	1.000	A	ANTR	
32771	Nom. torque	1	2.0	MN	ANTR	
32772	Nom. velocity	0	3000	1/min	ANTR	
32773	Service switch	0	1005h	-	ANTR	
32774	Rotor const. TR	3	0.360	s	ANTR	
32775	Pole number mot.	0	4	-	ANTR	
32776	Sinus enc.period	0	1000	-	ANTR	
32777	Torque 10V [Va]	0	10	% MN	ANTR	
32778	Speed 10V [Va]	0	3000	1/min	ANTR	yes
32779	Speed offs. [Va]	4	0.0000	1/min	ANTR	yes
32780	Accel. ramp	0	100	ms	ANTR	yes
32781	Decel. ramp	0	100	ms	ANTR	yes
32782	RAMP RF inactive	0	100	ms	ANTR	
32785	Message 16	0	84	-	ANTR	yes
32786	Message 32	0	40	-	ANTR	yes
32795	Source UE	0	0	-	GLOB	
32796	Source RF	0	0	-	GLOB	
32798	User list 1	0	0	-	GLOB	yes
32800	AMK main op.mode	0	03c0043h	-	ANTR	
32801	AMK op. mode 1	0	0010043h	-	ANTR	
32802	AMK op. mode 2	0	0010043h	-	ANTR	
32803	AMK op. mode 3	0	0010043h	-	ANTR	
32804	AMK op. mode 4	0	0010043h	-	ANTR	

ID-No.	Designation	K	Default	Unit	Parameter	Temp. change
32805	AMK op. mode 5	0	0010043h	-	ANTR	
32821	Password	0	0	-	GLOB	
32824	Follow.distance	0	0	Incr.	ANTR	
32827	Magn.curr.feedb.	1	0.0	A	ANTR	
32834	Torq. curr.feedb.	1	0.0	A	ANTR	
32836	DC-bus voltage	0	0	V	GLOB	
32837	DC-bus monitor	1	0.0	V	GLOB	
32838	List setpoint	0	0	-	GLOB	
32839	List act. value	0	0	-	GLOB	
32841	Motor encoder list	0	-	-	GLOB	
32842	User encoder list	0	-	-	GLOB	
32843	Service command	0	0	-	GLOB	
32846	Output port 1	0	0	-	GLOB	
32847	Port 1 bit 0	0	0	-	GLOB	
32848	Port 1 bit 1	0	0	-	GLOB	
32849	Port 1 bit 2	0	0	-	GLOB	
32850	Port 1 bit 3	0	0	-	GLOB	
32851	Port 1 bit 4	0	0	-	GLOB	
32852	Port 1 bit 5	0	0	-	GLOB	
32853	Port 1 bit 6	0	0	-	GLOB	
32854	Port 1 bit 7	0	0	-	GLOB	
32855	Output port 2	0	0	-	GLOB	
32856	Port 2 bit 0	0	0	-	GLOB	
32857	Port 2 bit 1	0	0	-	GLOB	
32858	Port 2 bit 2	0	0	-	GLOB	
32859	Port 2 bit 3	0	0	-	GLOB	
32860	Port 2 bit 4	0	0	-	GLOB	
32861	Port 2 bit 5	0	0	-	GLOB	
32862	Port 2 bit 6	0	0	-	GLOB	
32863	Port 2 bit 7	0	0	-	GLOB	
32864	Output port 3	0	544	-	GLOB	
32865	Port 3 bit 0	0	33031	-	GLOB	
32866	Port 3 bit 1	0	33029	-	GLOB	
32867	Port 3 bit 2	0	0	-	GLOB	
32868	Port 3 bit 3	0	0	-	GLOB	
32873	Input port 1	0	0	-	GLOB	
32874	Port 1 bit 0	0	0	-	GLOB	
32875	Port 1 bit 1	0	0	-	GLOB	
32876	Port 1 bit 2	0	0	-	GLOB	
32877	Port 1 bit 3	0	0	-	GLOB	
32878	Port 1 bit 4	0	0	-	GLOB	
32879	Port 1 bit 5	0	0	-	GLOB	
32880	Port 1 bit 6	0	0	-	GLOB	
32881	Port 1 bit 7	0	0	-	GLOB	
32892	Pulse divider	0	655360	-	ANTR	yes
32893	Pulse multipl	0	655360	-	ANTR	yes
32897	Analog input A1	2	0.00	V	GLOB	
32904	Inverter on	0	0	-	GLOB	
32913	Clear error	0	0	-	GLOB	

ID-No.	Designation	K	Default	Unit	Parameter	Temp. change
32920	o.load time mot.	1	2	s	ANTR	
32922	Resid.dist.wind.	0	20000	incr.	ANTR	
32925	AMK posit. par.	0	0	-	ANTR	
32926	AMK homing par.	0	0800h	-	ANTR	yes
32927	AMK syn. par.	0	0	-	ANTR	yes
32928	Time filter 1	1	0.0	ms	ANTR	yes
32929	Time filter 2	1	0.0	ms	ANTR	yes
32932	Barrier frequ.	0	0	Hz	ANTR	
32933	Band width	0	0	Hz	ANTR	
32934	Pulse enc. period	1	1000	-	ANTR	yes
32935	Volt. standstill	0	0.0	V	ANTR	
32936	Window	0	1000	incr.	ANTR	
32940	High hom. veloc.	0	1000	1/min	ANTR	
32942	Service control	0	0	-	ANTR	
32948	Message 4x32	0	0	-	GLOB	
32949	Sbus user addr.	0	0	-	GLOB	
32952	Posit.syn.window	0	1000	incr.	ANTR	
32953	Encoder type	0	0000h	-	ANTR	
32956	Add. accel.value	3	10	-	ANTR	
32958	cmd. val 1 cycle	0	0.500	ms	ANTR	
32959	Offset resolver	0	0	-	ANTR	
32960	Input M.enc.gear	0	1	rpm.	ANTR	
32961	Outp. M.enc.gear	0	1	rpm.	ANTR	
32968	Input port 2	0	0	-	GLOB	
32969	Port 2 bit 0	0	0	-	GLOB	
32970	Port 2 bit 1	0	0	-	GLOB	
32971	Port 2 bit 2	0	0	-	GLOB	
32972	Port 2 bit 3	0	0	-	GLOB	
32973	Port 2 bit 4	0	0	-	GLOB	
32974	Port 2 bit 5	0	0	-	GLOB	
32975	Port 2 bit 6	0	0	-	GLOB	
32976	Port 2 bit 7	0	0	-	GLOB	
32977	Input port 3	0	32	-	GLOB	
32978	Port 3 bit 0	0	32904	-	GLOB	
32979	Port 3 bit 1	0	32913		GLOB	
32980	Port 3 bit 2	0	0	-	GLOB	
32981	Port 3 bit 3	0	0	-	GLOB	
32989	Torque filt.time	0	0	ms	GLOB	
32990	NK-shift	0	0	incr.	ANTR	
32991	U/f start up	0	0	%	ANTR	
32992	Dead time comp. 1	3	0.000	ms	ANTR	
32993	Dead time comp. 2	3	0.0000	ms	ANTR	
32999	overl.limit inv	1	500	0.1%	ANTR	
33101	Diso.overl.inv	1	500	0.1%	ANTR	
33116	Temp. internal	1	0.0	GRAD_C	GLOB	
33730	System booting	1	0	-	GLOB	
33732	System reset	0	0	-	GLOB	
34000	Variable 0	0	0	-	ANTR	
34001	Variable 1	0	0	-	ANTR	

ID-No.	Designation	K	Default	Unit	Parameter	Temp. change
34002	Variable 2	0	0	-	ANTR	
34003	Variable 3	0	0	-	ANTR	
34004	Variable 4	0	0	-	ANTR	
34005	Variable 5	0	0	-	ANTR	
34006	Variable 6	0	0	-	ANTR	
34007	Variable 7	0	0	-	ANTR	
34008	Variable 8	0	0	-	ANTR	
34009	Variable 9	0	0	-	ANTR	
34010	Variable 10	0	0	-	ANTR	
34011	Variable 11	0	0	-	ANTR	
34012	Variable 12	0	0	-	ANTR	
34013	Variable 13	0	0	-	ANTR	
34014	Variable 14	0	0	-	ANTR	
34015	Variable 15	0	0	-	ANTR	
34016	Variable 16	0	0	-	ANTR	
34017	Variable 17	0	0	-	ANTR	
34018	Variable 18	0	0	-	ANTR	
34019	Variable 19	0	0	-	ANTR	
34023	BUS. part.	0	1	-	INST	
34024	BUS transm. rate	0	0.00		INST	
34025	BUS mode	2	0001h	-	INST	
34026	BUS mode attrib	0	0	-	INST	
34027	BUS fail.charac	0	2	-	INST	
34029	AFP status bits	0	0	-	GLOB	
34037	Offs.analoginp. 1	0	0	0.01V	GLOB	
34045	Inductance LQ	2	0	-	ANTR	yes
34046	Inductance LD	0	0	-	ANTR	
34047	Dead time meas.	0	0	0.001 ms	ANTR	
34048	PWM frequency	3	8	kHz	GLOB	
34050	TN current Q	0	0	0.1ms	ANTR	
34051	KP current D	1	0	0.1 V/A	ANTR	yes
34052	TN current D	1	0	0.1 ms	ANTR	yes
34070	Hom.sign.dist.	0	0	incr.	ANTR	
34094	Rise time SWC	3	0.000	A/s	ANTR	
34095	Final value SWC	1	0.0	A	ANTR	
34096	Standstill current	2	0.00	A	ANTR	
34100	Bin. Inp. Word	0	0	-	GLOB	
34101	Bin. Inp. Word 1	0	0	-	GLOB	
34105	Bin. Inp. Word 5	0	0	-	GLOB	
34120	Bin. Out. Word	0	0	-	GLOB	
34121	Bin. Out Word 1	0	0	-	GLOB	
34125	Bin. Out Word 5	0	0	-	GLOB	
34148	V contr. Gain	0	500	-	ANTR	yes
34149	V contr.int.time	1	5.0	ms	ANTR	yes
34151	Kp current Q	2	0.00	V/A	ANTR	yes
34152	Kp current D	2	0.00	V/A	ANTR	yes
34153	Maximum speed motor	0	100000	rpm.	ANTR	
34154	Start marker	0	0	incr.	ANTR	yes
34155	Marker window	0	0	incr.	ANTR	yes

ID-No.	Designation	K	Default	Unit	Parameter	Temp. change
34160	Part number motor	0	0	-	ANTR	
34161	Prod. date motor	0	0	-	ANTR	
34162	Serial num. motor	0	0	-	ANTR	
34164	Resistance Rtt	2	0.00	Ω	ANTR	
34165	Hold. torque brake	1	0.0	Nm	ANTR	
34166	Temperature sensor mot	0	0	-	ANTR	
34167	Inductance Ktt	1	0.0	mH	ANTR	
34168	Time Imax motor	1	0.0	sec.	ANTR	
34177	Low. thresh. cur. adapt.	0	0	%	ANTR	yes
34178	Upper thresh. cur. adapt	0	0	%	ANTR	yes
34179	Gradient KpQ	0	0	%	ANTR	yes
34180	Gradient TnQ	0	0	%	ANTR	yes
34183	Velocity Threshold SL	0	0	0.0001/min	ANTR	
34184	Starting current SL	3	0	0.001A	ANTR	
34185	Resistance rotor	2	0	0.01Ohm	ANTR	
34186	Inductance stator	1	0	0.1mH	ANTR	
34187	Inductance rotor	1	0	0.1mH	ANTR	
34188	Main inductance	1	0	0.1mH	ANTR	

The KWZ parameters are described in the parameter description AMK parts number 26249 in great detail.

4.7.1 Functions of Binary Inputs

Binary inputs can be assigned the following functions (e.g. drive commands, control signals …).

The inputs are assigned as follows as default:

Input	Parameter	Default
BE1	ID 32978	Control release RF (Code 32904)
BE2	ID 32979	Clear errors FL (Code 32913)
BE3	ID 32980	-

Allocation of functions to binary inputs

Code	Function	Remarks
0		Function inactive
32904	RF (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. (see ID32796 source RF)
32905	NK (Cam signal)	Homing with cam
32913	Delete error	Signal FL is free to assign
33700	Operation mode change after main operation mode	Switching over according to ID32800
33701	Operation mode change after secondary operation mode 1	Switching over according to ID32801
33702	Operation mode change after secondary operation mode 2	Switching over according to ID32802
33703	Operation mode change after secondary operation mode 3	Switching over according to ID32803
33704	Operation mode change after secondary operation mode 4	Switching over according to ID32804
33705	Operation mode change after secondary operation mode 5	Switching over according to ID32805
33708	STOP drive, KMD abort function	Standstill (dig. DZR, n = 0) of the drive from every operation mode

Code	Function	Remarks
33709	Digital speed control	Velocity command value N-command = 0, ramp active
33710	Digital speed control	Velocity command value N-command = ID36, ramp active
33711	Homing run on reference point $x_i = 0$	Homing with / without cam evaluation according to ID147, ID32926, homing velocity = ID41
33713	Absolute positioning	Position end value X-command = ID153, control speed N-command = ID222
33714	Relative positioning	Relative spindle position X-command = ID180, control speed N-command = ID222
33721	Digital torque control = 0	Torque command value M-command = 0
33722	Digital torque control = ID80	Torque command value M-command = ID80
33730	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
33733	Probe function start	Acc. to parameter ID130, ID131, ID169, ID34047, ID179
33734	Probe function stop	Acc. to parameter ID130, ID131, ID169, ID34047, ID179
33790	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 … Bi
33791	Absolute positioning (Bit0 … Bit3 = 33791, Bit4 = strobe)	No. 0 … 15 binary coded, x-command value according to ID34000 … ID34015 [incr.]
33792	Relative positioning (Bit0 … Bit3 = 33792, Bit4 = strobe)	No. 0 … 15 binary coded, x-command value according to ID34000 … ID34015 [incr.]
33793	Digital speed control (Bit0 … Bit3 = 33793, Bit4 = strobe)	No. 0 … 15 binary coded, x-command value according to ID34000 … ID34015 [rpm]
33794	Digital torque control (Bit0 … Bit3 = 33794, Bit4 = strobe)	No. 0 … 15 binary coded, x-command value according to ID34000 … ID34015 [% MN]
33800	Absolute positioning	X-command according to ID34000 [Inkr] N-command according to ID222 [min^{-1}]
33801	Absolute positioning	X-command according to ID34001 [Inkr] N-command according to ID222 [min^{-1}]
33802	Absolute positioning	X-command according to ID34002 [Inkr] N-command according to ID222 [min^{-1}]
33803	Absolute positioning	X-command according to ID340023 [Inkr] N-command according to ID222 [min^{-1}]
33804	Absolute positioning	X-command according to ID34004 [Inkr] N-command according to ID222 [min^{-1}]
33805	Absolute positioning	X-command according to ID34005 [Inkr] N-command according to ID222 [min^{-1}]
33806	Absolute positioning	X-command according to ID34006 [Inkr] N-command according to ID222 [min^{-1}]
33807	Absolute positioning	X-command according to ID34007 [Inkr] N-command according to ID222 [min^{-1}]
33808	Absolute positioning	X-command according to ID34008 [Inkr] N-command according to ID222 [min^{-1}]
33809	Absolute positioning	X-command according to ID34009 [Inkr] N-command according to ID222 [min^{-1}]
33810	Absolute positioning	X-command according to ID34010 [Inkr] N-command according to ID222 [min^{-1}]
33811	Absolute positioning	X-command according to ID34011 [Inkr] N-command according to ID222 [min^{-1}]
33812	Absolute positioning	X-command according to ID34012 [Inkr] N-command according to ID222 [min^{-1}]

Code	Function	Remarks
33813	Absolute positioning	X-command according to ID34013 [lnkr] N-command according to ID222 [min^{-1}]
33814	Absolute positioning	X-command according to ID34014 [lnkr] N-command according to ID222 [min^{-1}]
33815	Absolute positioning	X-command according to ID34015 [lnkr] N-command according to ID222 [min^{-1}]
33816	Absolute positioning	X-command according to ID34016 [lnkr] N-command according to ID222 [min^{-1}]
33817	Absolute positioning	X-command according to ID34017 [lnkr] N-command according to ID222 [min^{-1}]
33818	Absolute positioning	X-command according to ID34018 [lnkr] N-command according to ID222 [min^{-1}]
33819	Absolute positioning	X-command according to ID34019 [lnkr] N-command according to ID222 [min^{-1}]
33820	Relative positioning	X-command according to ID34000 [lnkr] N-command according to ID222 [min-1]
33821	Relative positioning	X-command according to ID34001 [lnkr] N-command according to ID222 [min-1]
33822	Relative positioning	X-command according to ID34002 [lnkr] N-command according to ID222 [min-1]
33823	Relative positioning	X-command according to ID34003 [lnkr] N-command according to ID222 [min-1]
33824	Relative positioning	X-command according to ID34004 [lnkr] N-command according to ID222 [min-1]
33825	Relative positioning	X-command according to ID34005 [lnkr] N-command according to ID222 [min-1]
33826	Relative positioning	X-command according to ID34006 [lnkr] N-command according to ID222 [min-1]
33827	Relative positioning	X-command according to ID34007 [lnkr] N-command according to ID222 [min-1]
33828	Relative positioning	X-command according to ID34008 [lnkr] N-command according to ID222 [min-1]
33829	Relative positioning	X-command according to ID34009 [lnkr] N-command according to ID222 [min-1]
33830	Relative positioning	X-command according to ID34010 [lnkr] N-command according to ID222 [min-1]
33831	Relative positioning	X-command according to ID34011 [lnkr] N-command according to ID222 [min-1]
33832	Relative positioning	X-command according to ID34012 [lnkr] N-command according to ID222 [min-1]
33833	Relative positioning	X-command according to ID34013 [lnkr] N-command according to ID222 [min-1]
33834	Relative positioning	X-command according to ID34014 [lnkr] N-command according to ID222 [min-1]
33835	Relative positioning	X-command according to ID34015 [lnkr] N-command according to ID222 [min-1]
33836	Relative positioning	X-command according to ID34016 [lnkr] N-command according to ID222 [min-1]
33837	Relative positioning	X-command according to ID34017 [lnkr] N-command according to ID222 [min-1]
33838	Relative positioning	X-command according to ID34018 [lnkr] N-command according to ID222 [min-1]
33839	Relative positioning	X-command according to ID34019 [lnkr] N-command according to ID222 [min-1]
33840	Digital speed control	N-command according to ID34000 [lnkr]

Code	Function	Remarks
33841	Digital speed control	N-command according to ID34001 [Inkr]
33842	Digital speed control	N-command according to ID34002 [Inkr]
33843	Digital speed control	N-command according to ID34003 [Inkr
33844	Digital speed control	N-command according to ID34004 [Inkr
33845	Digital speed control	N-command according to ID34005 [Inkr
33846	Digital speed control	N-command according to ID34006 [Inkr
33847	Digital speed control	N-command according to ID34007 [Inkr
33848	Digital speed control	N-command according to ID34008 [Inkr
33849	Digital speed control	N-command according to ID34009 [Inkr
33850	Digital speed control	N-command according to ID34010 [Inkr
33851	Digital speed control	N-command according to ID34011 [Inkr]
33852	Digital speed control	N-command according to ID34012 [Inkr]
33853	Digital speed control	N-command according to ID34013 [Inkr]
33854	Digital speed control	N-command according to ID34014 [Inkr]
33855	Digital speed control	N-command according to ID34015 [Inkr]
33856	Digital speed control	N-command according to ID34016 [Inkr]
33857	Digital speed control	N-command according to ID34017 [Inkr]
33858	Digital speed control	N-command according to ID34018 [Inkr]
33589	Digital speed control	N-command according to ID34019 [Inkr]
33860	Digital torque control	M-command according to ID34000 [% M_N]
33861	Digital torque control	M-command according to ID34001 [% M_N]
33862	Digital torque control	M-command according to ID34002 % M_N]
33863	Digital torque control	M-command according to ID34003 [% M_N]
33864	Digital torque control	M-command according to ID34004 [% M_N]
33865	Digital torque control	M-command according to ID34005 [% M_N]
33866	Digital torque control	M-command according to ID34006 [% M_N]
33867	Digital torque control	M-command according to ID34007 % M_N]
33868	Digital torque control	M-command according to ID34008 [% M_N]
33869	Digital torque control	M-command according to ID34009 [% M_N]
33870	Digital torque control	M-command according to ID34010 [% M_N]
33871	Digital torque control	M-command according to ID34011 [% M_N]
33872	Digital torque control	M-command according to ID34012 [% M_N]
33873	Digital torque control	M-command according to ID34013 [% M_N]
33874	Digital torque control	M-command according to ID34014 [% M_N]
33875	Digital torque control	M-command according to ID34015 [% M_N]
33876	Digital torque control	M-command according to ID34016 [% M_N]
33877	Digital torque control	M-command according to ID34017 [% M_N]
33878	Digital torque control	M-command according to ID34018 [% M_N]
33879	Digital torque control	M-command according to ID34019 [% M_N]
33880	Absolute positioning	X-command value according to ID34000 [incr.] N-command value according to ID3401 [rpm]
33881	Absolute positioning	X-command value according to ID34001 [incr.] N-command value according to ID34011 [rpm]
33882	Absolute positioning	X-command value according to ID34002 [incr.] N-command value according to ID34012 [rpm]
33883	Absolute positioning	X-command value according to ID34003 [incr.] N-command value according to ID34013 [rpm]
33884	Absolute positioning	X-command value according to ID34004 [incr.] N-command value according to ID34014 [rpm]

Code	Function	Remarks
33885	Absolute positioning	X-command value according to ID34005 [incr.] N-command value according to ID34015 [rpm]
33886	Absolute positioning	X-command value according to ID34006 [incr.] N-command value according to ID34016 [rpm]
33887	Absolute positioning	X-command value according to ID34007 [incr.] N-command value according to ID34017 [rpm]
33888	Absolute positioning	X-command value according to ID34008 [incr.] N-command value according to ID34018 [rpm]
33889	Absolute positioning	X-command value according to ID34009 [incr.] N-command value according to ID34019 [rpm]
33890	Relative positioning	X-command value according to ID34000 [incr.] N-command value according to ID34010 [rpm
33891	Relative positioning	X-command value according to ID34001 [incr.] N-command value according to ID34011 [rpm]
33892	Relative positioning	X-command value according to ID34002 [incr.] N-command value according to ID34012 [rpm]
33893	Relative positioning	X-command value according to ID34003 [incr.] N-command value according to ID34013 [rpm]
33894	Relative positioning	X-command value according to ID34004 [incr.] N-command value according to ID34014 [rpm]
33895	Relative positioning	X-command value according to ID34005 [incr.] N-command value according to ID34015 [rpm]
33896	Relative positioning	X-command value according to ID34006 [incr.] N-command value according to ID34016 [rpm]
33897	Relative positioning	X-command value according to ID34007 [incr.] N-command value according to ID34017 [rpm]
33898	Relative positioning	X-command value according to ID34008 [incr.] N-command value according to ID34018 [rpm]
33899	Relative positioning	X-command value according to ID34009 [incr.] N-command value according to ID34019 [rpm]
33900	Strobe_127 Absolute positioning 127 positions [incr.] according to ID32798 Control speed fixed ID222 Application: Bit0 … Bit6 = 32798 Bit7 = 33900	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
33901	Strobe_63 Absolute positioning 63 positions [incr.] 63 control speeds [rpm] according to ID32798 Application: Bit0 … Bit5 = 32798 Bit6 = 33901	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.

4.7.2 Status bits at binary outputs

Binary outputs can be assigned internal bit information from the system (e.g. Nactual = Nsetpoint, in position, …).
The outputs are assigned as follows as default:

Input	Parameter	Default
BA1	ID 32865	Acknowledgement controller release QRF
BA2	ID 32866	System ready message SBM
BA3	ID 32867	-

Assignment of real time bit information to binary outputs

Code	Function	Remarks
0		Function inactive
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	Mcommand ³ M_{limit}	ID82 / ID83 pos. / neg. torque limit
335	Ncommand ³ 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
405	Measuring start signal	
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
33013	$x_i \leq$ Soft end	ID50 neg. position limit
33014	Position synchronous	ID32952 position synchronous window
33015	$x_i \geq$ Soft end	ID49 pos. position limit
33016	Overcurrent warning inverter	Integral load limit I²t converter ID32999
33017	Overtemp. warning inverter	
33029	SBM	System ready message
33030	QUE	DC-Bus charged
33031	QRF	Acknowledgement controller enable
33032	RF	Controller enable set
33034	KMD active	Drive function is active
33036	RFP known	Reference point is valid
33048	Remaining course deleted	ID32922 residual distance window reset
33052	Motor brake control	BR = 0 brake closed BR = 1 brake opened X133 A/B PIN 6 (BA 2 A direct control) ID32867 Port3 Bit2 (see ID206/ID207, ID32773 Bit13)
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

Code	Function	Remarks
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
33076	Second tact “Axis alive”	System test
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.
33135	EF2 Output stage enable signal	Image of the input bit EF/EF2 can be evaluated e.g. by a plc.
33136	EF Output stage enable signal	Image of the input bit EF/EF2 can be evaluated e.g. by a plc.
33131	Acknowledgement stop positive setpoint processing	Positive setpoint processing stopped
33132	Acknowledgement stop negative setpoint processing	Negative setpoint processing stopped

4.8 Data exchange

4.8.1 List of the API variables

The applicationinterface API is a user interface which enables simple access to the AMK drive functions. The API is a variable field of AMK firmware and enable control and analysis of the drive. It is divided into send variables (e.g. actual value, status variable, configurable cyclical display values, variables for evaluation of binary inputs …) and receiving variables (e.g. 16/32 bit setpoints, control variables, variable for the control of binary outputs …). Send and receive direction is defined from the drive.

AMK drives linked through a field bus (ACC-Bus) can exchange drive data using the API variables. AMK-SPS controls (SPS option cards, control cards with integrated SPS; SYMAC) have reading and writing access to the API variables of the bus participants.

The following API variables are available:

Note:: The API variables are described in detail in the documentation Application interface API (parts number: 200335)

API variable name	CAN Index	CAN Subindex	Use
Setpoints	0x2030		
diMainSetpoint	0x2030	0x01	Main setpoint 32 bit
diReserve1	0x2030	0x02	
iAddSetpoint16	0x2030	0x03	16 bit added setpoint
iReserve2	0x2030	0x04	
diAddSetpoint32	0x2030	0x05	32 bit added setpoint t
iSetSpeed	0x2030	0x06	Speed setpoint 16 bit
Actual values			
iMessage16	0x2040	0x01	= ID32785
diMessage32	0x2040	0x02	= ID32786
diActPosition	0x2040	0x03	Actual position value
Conf. Setpoints			
diSetpointSrc1	0x2050	0x01	

API variable name	CAN Index	CAN Subindex	Use
Ext. Actual values			
iActValue0	0x2090	0x01	Configuration
iActValue1	0x2090	0x02	Actual values
diActValue0	0x2091	0x01	(Actual value list ID 32839)
diActValue1	0x2091	0x02	
Stati/Control			
wDeviceState	0x2048	0x00	Status bits
wDeviceControl	0x2049	0x00	Control bits
wRealTimeBits	0x204A	0x00	Real time bit messages
wStatusBitsId144	0x204E	0x00	Status word
byErrorSys	0x204C	0x01	Error/Warning messages
byAxisState	0x204D	0x00	Status bits
bySystemIn	0x2060	0x00	Sends process image “Binary inputs”
bySystemOut	0x2070	0x00	Receives process image “Binary outputs”
Bin. I/O	0x6000		
byInp1Byte0	0x6000	0x01	Process image “Binary inputs”
byInp1Byte1	0x6000	0x02	Process image “Binary inputs”
byOutp1Byte0	0x6200	0x01	Process image “Binary outputs”
byOutp1Byte1	0x6200	0x02	Process image “Binary outputs”
Commanding			
lwAfpWriteBlock	0x2021	0x1..0x8	8 Byte AFP status data from drive
lwAfpReadBlock	0x02020	0x1..0x8	8 Byte AFP control data to drive
Ext. Setpoints			
iSetpoint0	0x2080	0x01	Configuration
iSetpoint 1	0x2080	0x02	Setpoints
iSetpoint 2	0x2080	0x03	(Setpoint list ID 32838)
iSetpoint 3	0x2080	0x04	
diSetpoint0	0x2081	0x01	
diSetpoint1	0x2081	0x02	

4.8.2 List of AFP commands

The AFP interface guarantees a simple and standard access to the AMKASYN drive functions. Use the AFP interface for typical functions, such as:

- control of controller release
- diagnosis and error treatment
- observation of real-time bits for process control
- cyclical setpoint preset [t ≥ 5 ms],]
- cyclical actual values analysis [t ≥ 1 ms],
- reading and writing parameters
- temporary data change
- drive commands
    - change of operating mode
    - speed control
    - referencing
    - positioning

- synchronization of coupled axes
- value changes in process

AMK controls provide an extended function library for the execution of these functions.

The AFP interface can be used for a data structure adjusted to the length of a CAN news unit (PDO) of 8 bytes user data in send and receive direction.

Incoming AFP commands are recognized in the time frame n x 5 ms.

The FAP handshake mechanisms guarantee the data-consistent transfer in both directions.

The following AFP commands are available:

Note: The commands are described in detail in the documentation AMK field bus protocol AFP (parts number: 27872)

Befehl	Code	Bedeutung
B_NULL	0	Reset
B_BREAK	1	Cancellation
B_CLRERR	4	Clear errors
B_RDERR	5	Read error number
B_RDDATA	6	Read ID
B_WRDATA	7	Write ID
B_RDBLK	8	Read ID list
B_WRBLK	9	Write ID list
B_WRBLKT	10	Write ID list temporary
B_TMP	11	Write ID temporary
B_ANZ	12	Update display values
B_RDSINCOS	13	Read absolute position
B_SOLL16	15	Setpoint 16
B_SOLL32	16	Setpoint 32
B_RDSOFT	25	Read software version
B_RDIO	26	Read EA
B_WRIO	27	Write EA
B_RDTMP	28	Read ID temporary
B_SYSHL	198	System start-up
B_BAW0	200	Change of operating mode in HBA0
B_BAW1	201	Change of operating mode in NBA1
B_BAW2	202	Change of operating mode in NBA2
B_BAW3	203	Change of operating mode in NBA3
B_BAW4	204	Change of operating mode in NBA4
B_BAW5	205	Change of operating mode in NBA5
B_MOM	212	Momentum control
B_DZR	213	Speed control
B_REF	214	Reference drive
B_POSA	216	Absolute positioning
B_POSR	217	Relative positioning
B_STOP	220	Stop
B_MESS_START	225	Measuring button start
B_MESS_STOP	226	Measuring button stop

4.9 Oscilloscope function (AIPEX)

The oscilloscope function corresponds to that of the KW system in the configuration. All binary signals from the Chapters for “Binary inputs and outputs” can be configured for the recording. The following values can also be recorded:

16 bit messages:

ID/Code	Significance	Scaling
84	Momentum actual value	0.1 %

ID/Code	Significance	Scaling
144	Configurable status word	
179	Measuring value status	
32828	Actual current phase U	0.01 A
32829	Actual current phase V	0.01 A
32831	Resolver angle	Incr
32832	Generator signal S2	2.5 V / 32768
32833	Generator signal S1	2.5 V / 32768
32834	Momentum-building current isq	ID110/2048
32836	Intermediate circuit voltage Uzk	752,5/2048
32897	Analog input voltage	10V/2048
33090	Actual speed value applied	1/min.
33100	Actual performance value normed	0,1%MN
33101	I2t overload inverter	0,1%
33116	I2t overload motor	0,1%

32 bit messages:

ID/Code	Significance	Scaling
36	Speed setpoint	0.0001 /min
40	Actual speed	0.0001 /min
47	Position setpoint	Incr.
51	Actual position value	Incr.
130	Positive measuring value	Incr.
131	Negative measuring value	Incr.
189	Tow distamce	Incr.
32824	Position control difference without SAK	Incr.
32826	Compensated tow distance SAK	Incr.
34070	Reference signal distance	Incr.
34154	Mark	Incr.
34155	Mark window	Incr.

Note: Triggering external signals is not possible.

Info AMK Service: In addition to the KW oscilloscope, 2 channels with time bases 62.5 µs, 125 µs and 250 µs can be recorded. This should only be done for service purposes since the system's processing function is strained.

5 Certificates

The certificates are available through AMK sales or on the AMK website.

- CSA - Certificate of compliance
- Declaration of conformity
- TUEV

You can get it as follows:

- AMK homepage - service - download - registration - start online documentation - certificates
  (One-time manual activation by AMK sales department is necessary.
  The auto-registration via AMK homepage does not include access to the entire documentation.)
  www.amk-group.com/en/content/download_area

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AMK Arnold Müller GmbH & Co. KG
Phone : +49 7021/50 05-0, fax: +49 7021/50 05-199
E-Mail: info@amk-group.com
Homepage: www.amk-group.com