AMKASYN
Servo inverter KE/KE and KU
Option card EtherCAT (SoE)
KW-EC1 / KU-EC1

Version: 2008/16
Part-No.: 202080

Notes on this document

Name: PDK_202080_KUKW_Option_ EC1_en

Purpose: Option card handling

What has changed:

Version	Change	Topic	Initials
2006/15	First release		Les
2008/16	Entire document	Expansion KU-EC1	Les
2008/39	supplement	Requirement/software	Bls

Further documentation: -

Target group: Users and customers

Display conventions: -

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

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

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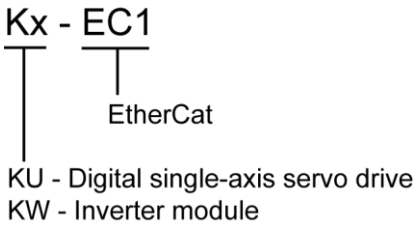
Content

1 Product description

1.1 Product name



Picture name: ZCH_KUKW-EC1_Produktbezeichnung.png

1.2 Ordering data

Product name	Ordering data	Use
KW-EC1	O804	New applications together with an AMK EtherCAT Master (e.g., AS PL15) or external controller
KU-EC1	O796	
KW-EC1	O753	Replacement card for existing applications with EtherCAT as master external controller

1.3 Requirement

Device	Hardware	Software
KU	Controller card KU-R03 with version ≥ 2.03	AER3_312_0620_201300
KW	Controller card KW-R03 with version ≥ 2.03	AER3_512_0620_201330

1.4 Product overview

The EtherCAT option card allows for communication between an EtherCAT master and slave (KW module or KU unit). These units use "Servo Drive Profile over EtherCAT (SoE)" (IEC 61491) as the communication protocol.

AMK conforms to the following compatibility classes:

- Class B position control, speed control and torque control
- Class C
- Communication cycle time min. 0.5 ms, range 2 (in steps of 0.5 ms)

Additional functions:

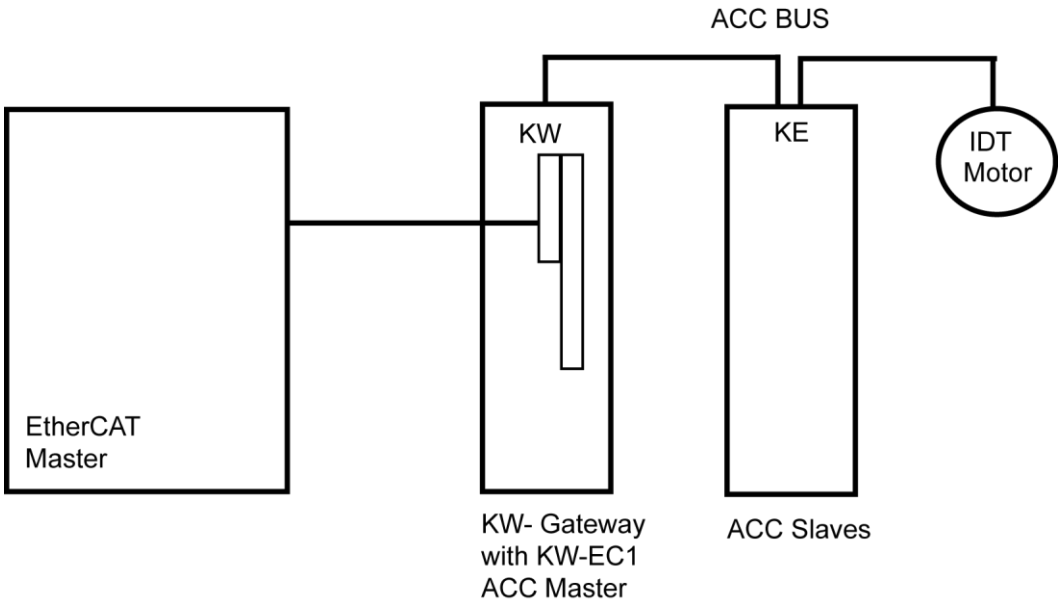
- Actual position value for slave
- Parameter set switching
- Calliper cycle level 1 (one calliper)
- Torque threshold Mdx
- Spindle positioning (only absolute positioning ID153)
- External encoder

Note:	The EtherCAT Master in use must support "Distributed Clock" functionality and the "Servo Drive Profile over EtherCAT (SoE)" protocol

Function gateway

For AMK modules not directly accessed via EtherCAT (e.g., KE, IDT ...), you can use the LKU-/ KW-EC1 option card as the gateway. To do this, a KW or KU unit with KU-/ KW-EC1 is used as the gateway device. The gateway device establishes a direct data connection between the EtherCAT and ACC BUS using the "routing" mechanism.

Principal device configuration:



Picture name: ZCH_Routing_Ablauf

The EtherCAT master writes the address of the ACC BUS device to be accessed into the "ID32944 SYADR" gateway parameter. All subsequent parameter accesses are forwarded to the corresponding slave (routing).

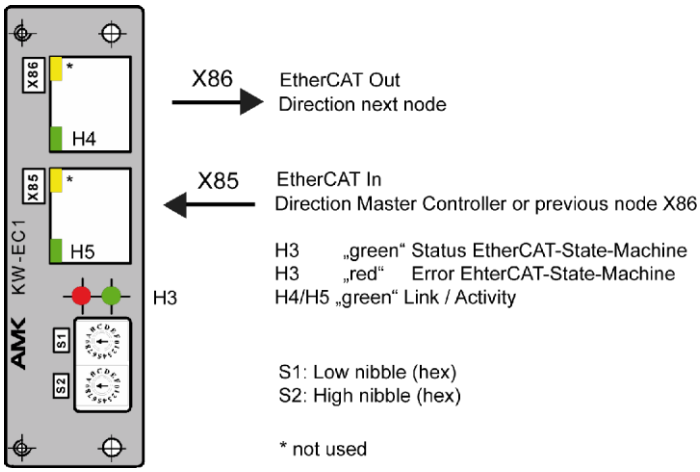
When a patch cable is plugged in, the green LED next to the RJ45 connectors remain lit to indicate that a patch cable has been plugged in. While data is being transferred, the LED begins to flash.
The LEDs above the rotary code switch flash in different sequences to indicate the status of the manual addressing or the type of error on the EtherCAT state machine.
Process data is mapped the same way as in the SERCOS interface using ID numbers ID15, ID16 und ID24.

1.5 Intended Use

The KU-EC1 and KW-EC1 option cards are designed for inverter modules KU or KW and provide them with an EtherCAT slave interface.
The KW-EC1 can be installed in slot 1 or 2 in the compact inverter.
The KU-EC1 is only conceived for use in slot 2 of the compact inverter KU.

2 Connector technology

2.1 Front panel of device



Picture name: ZCH_KEKW_KW-EC1_Frontblatte

2.2 Interfaces

2.2.1 Light-emitting diodes

The option card contains 6 LEDs, 4 of which are active and indicate the status of the network, master and slave.

H3 green LED indicator for status of EtherCAT State Machine (ESM)

Colour	Status	Explanation
Off	Init	The EtherCAT bus is initialised as soon as power is supplied to the electronics of the device.
Flashing f=2.5Hz; Ton=Toff 200ms	Preoperational	It is possible to configure the IDs using the demand data transfer feature.
Cyclical flashing Ton= 200 ms Toff= 1000 ms	Safe Operational	Data transferred from the slave is processed further and data transferred from the master is ignored. The drive can now synchronise.
On	Operational	Fault-free operation Data can be exchanged.

H3 red LED indicator for error status in EtherCAT State Machine (ESM)

Colour	Status	Definition	Example
Off	No Error	The EtherCAT communication status is indicated when LED H3 is green	-
Cyclical flashing Ton= 200 ms Toff= 200 ms	Invalid Configuration	General configuration fault	It is not permitted to command the status change from the master due to the registry and object settings.
Cyclical flashing Ton= 200 ms Toff= 1000 ms	Unsolicited State Change	State change has not been requested The slave unit has changed its own EtherCAT status. Parameter change in AL (application layer), status registry is set to 0x01: change/error.	Synchronisation fault, unit switches automatically to safe operating mode

H4/ H5 LED indicator for physical link (Link) / data transfer (Activity)

The greed LED on the RJ-45 connector indicates that the physical address exists or that data is being transferred.

The following condition of the LED indicates the respective status.

Colour	Status	Explanation
Green	Link	Connection established, no data transfer
Flickering at f=10Hz Ton=Toff = 50ms	Link and Activity	Connection established, data transfer underway
Off	Off	No connection, no data transfer

2.3 Cable properties

Terminal	X85
Designation	EtherCAT input (connection to EtherCAT master or previous node X86
Cable type	Patch cable in category CAT5e with RJ45 category
Note	Maximum line length of EtherCAT network is 100m

Terminal	X86
Designation	EtherCAT output (connection to next node X85
Cable type	Patch cable in category CAT5e with RJ45 category
Note	Maximum line length of EtherCAT network is 100m

3 Assembly

3.1 Specific safety instructions for personal protection

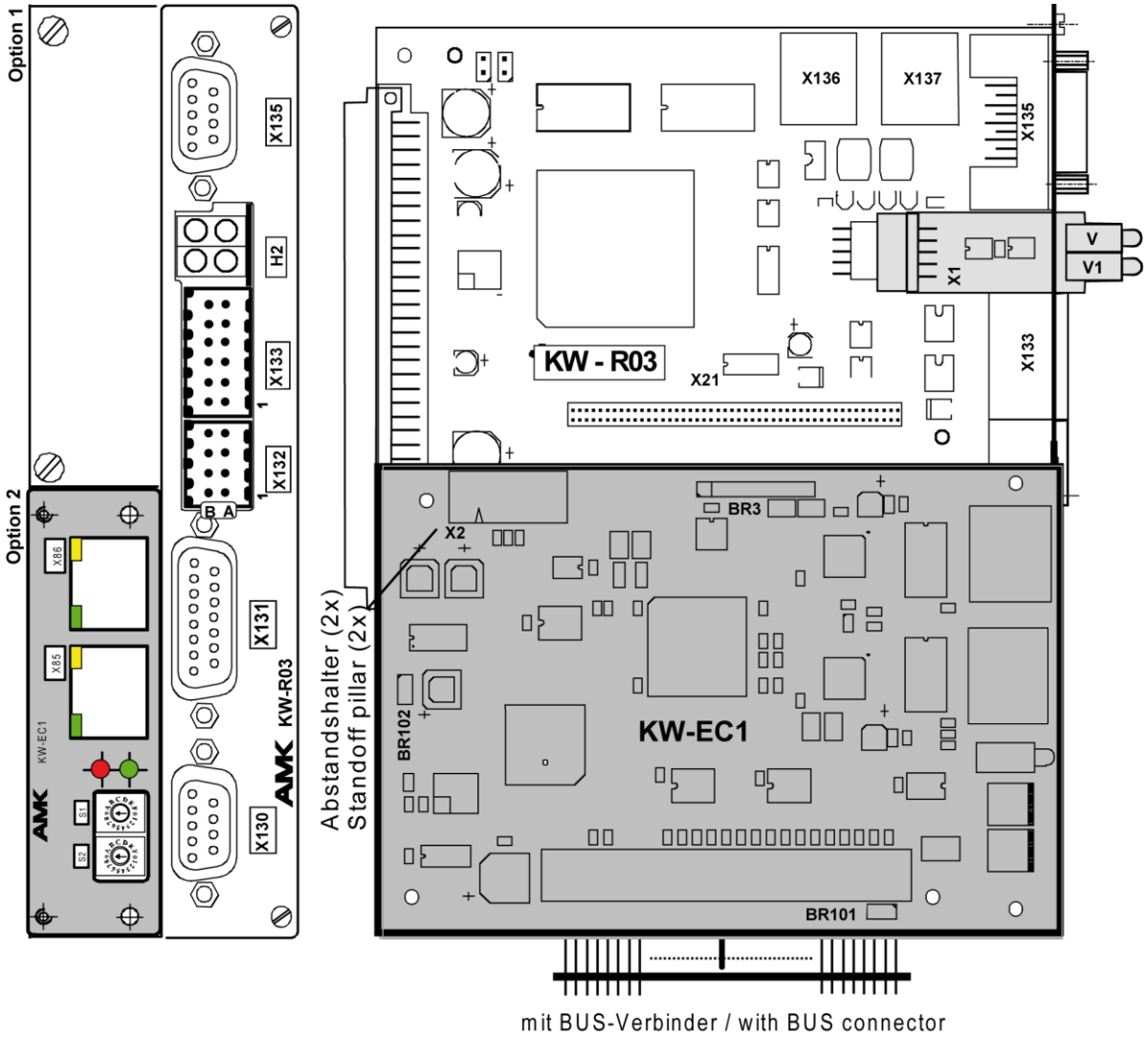
Electrical hazard 	The electrical terminals and connectors are electrically live and can be lethal when contacted. **Hazard prevention measures:** Before working on the device, be sure to open all power feeds using the main switch and secure them against being switched on again. Before beginning work on the modules, allow them to discharge for at least 3 minutes! Measure the terminal voltages to determine whether the terminal is de-energised or not. For instance, you can measure the voltage of the intermediate circuit between the UZP and UZN terminals.

3.2 Notes on how to prevent material damage:

Caution	**Static discharge can destroy components!** Avoid touching the electrical connections and contacts on the soldering and component side of the electronic modules (e.g., option cards, controller cards), because static discharge can destroy the components. **Hazard prevention measures:** Before handling the electronic component, you need to cause a static discharge by touching the PE.

3.3 Installation location and position

KU: The KU-EC1 may only be installed in slot 2 (bottom) of the KU controller card.
KW: The KW-EC1 can be installed in slot 1 or 2 of the KW controller card.



Picture name: KW-EC1_R03_Frontblende

3.4 Installation and Tools

1. Make sure that the drive system is disconnected from the grid and de-energised. (wait for discharge time of at least 3 minutes)
2. Disconnect the blind panel at the chosen slot by removing the two collar screws using a slotted head (Phillips) screwdriver.
3. If available, remove the collar screws from the left side of the option card in the other slot.
4. Remove the two collar screws from the right side of the front panel of the controller card and carefully remove the card. Place the controller card on a non-conducting, cushioned surface. Otherwise, static discharge may damage the electrical components.
5. Press the two lockable plastic standoff pillars into the corresponding holes on the controller card (assigned to slop 1 or 2).
6. Plug in the BUS connector until the side containing the longer pins is deep inside the slotted plugs of the option card and the BUS connector pins are flush with the socket plugs on the top.

7. Take the BUS connector on the option card with the short pins and press it into the corresponding socket connector on the controller card. At the same time, press the standoff pillar into the holes of the option card until they snap into place.

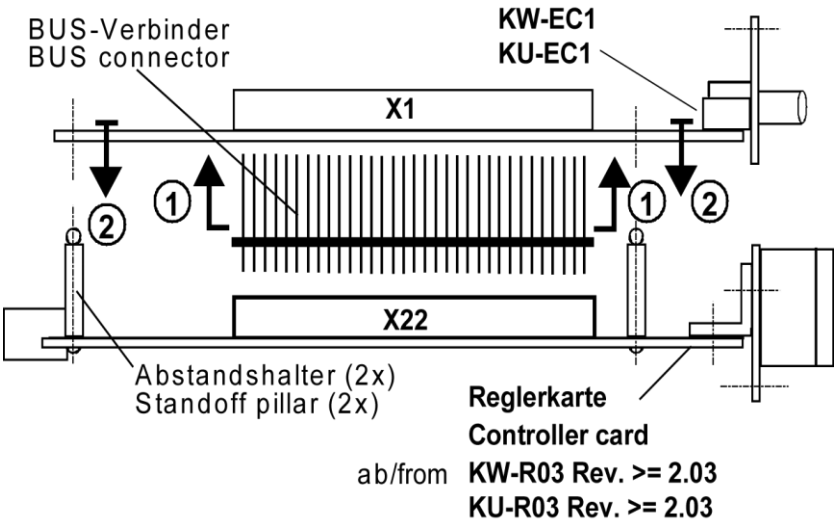


Figure name: KEKW_AE-EC1

8. Carefully slide the controller card together with the option card into the card slot until the controller card is firmly positioned in the mating connector.
9. Tighten the collar screws of the controller card and the option card(s).

4 Startup

4.1 Configuration file (XML Device Description File)

The EtherCAT master configures the EtherCAT slaves. To do this, you must make an "EtherCAT XML Device Description File“ available for each slave in the AMK master and this has to be stored in the master software.

The device description file also contains the distributed clock (DC) settings. The settings for the distributed clock are used to synchronise the EtherCAT slaves.

4.2 Configuration

No special parameters are required to operate the option card. All settings are made internally using the automatic card detection.

The communication parameters can be configured by the master during startup.

During this procedure, the following parameters are written by the master:

ID1	NC cycle time	Task configuration master
ID2	SERCOS cycle time	Task configuration master
ID15	Telegram type	Process data configuration master
ID16	List AT	Process data configuration master
ID24	List MDT	Process data configuration master

Note: The EtherCAT Master cycle time must be identical to the SERCOS cycle time ID2 and the NC cycle time ID1. If this is not the case, the times are automatically overwritten by the EtherCAT master. (Reboot necessary for AMK system / error message 2576 info 27 is issued.)

Note: If you are using an additional ACC bus master, do not select the hardware synchronization cycle (ID34026 bit3).

4.3 Bus device address

4.3.1 Set node addresses using rotary code switches S1 and S2

If the device addresses are to be set using rotary code switches S1 and S2, this hast to be activated in the configuration program of the EtherCAT master controller.

S1: Low Nipple (hex)

S2: High Nibble (hex)

If rotary code switch is deactivated (Deactivation performed in master) if addresses are distributed from EtherCAT master.

4.3.2 Set node address using parameter to ID34023

To use the node address in parameter ID34023, 00hex must be entered using the rotary code switch. (must be activated in EtherCAT master)

Note: If the address has been activated using the master, the rotary code switches and any settings in the ID34023 will be ignored.

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