Beckhoff CANopen devices: now according to CANopen version 4

CANopen

New Features + *tips for integration in existing networks*

Since firmware release C1 the Beckhoff CANopen devices BK5120, BK5110 and LC5100 comply with the CANopen communication profile DS301 Version 4.01 and with the new CiA recommendation for the LED behaviour DRP303-3. The bus couplers have gained many new features. Furthermore, the performance of the firmware was significantly improved. The Beckhoff CANopen devices pass the new CANopen conformance test. Unfortunately the update implies to some minor functional changes, which generally do not lead to compatibility problems.

1. PDO Behaviour

1.1 Default Identifier für PDO3 + 4

New: The Rx- and Tx-PDOs 3+4 now have default identifiers. The same identifiers are used that so far have been assigned via object 0x5500. The Default mapping was not changed and the PDOs are only activated if the corresponding process data is present.

Advantage: Now up to 12 analogue input and output channels can be used without the need to activate the PDOs at boot-up via identifier distribution.

Effects when using new bus couplers in existing networks: none

1.2   Firmware performance improved

New: PDO handling is now significantly quicker (about factor 3-4).

Advantage: Shorter reaction times at input or output changes, higher sample rate.

Effects when using new bus couplers in existing networks: Possibly the bus load increases – especially when PDOs with analogue input data are communicated event driven (and "undamped"). Possible action:

1. Use the event timer (see below) to activate cyclic update of the PDOs with analogue input data (with disabled Global Interrupt Enable 0x6423!) or

2. send these PDOs synchronously (change transmission type from 255 or 254 e.g. to 1,2 or 5). Note: When using the Beckhoff CANopen PCI cards FC510x you can find the busload directly in a variable.

1.3   PDO event timer now supported

New: TxPDOs: Even if no event has occurred, event driven PDOs are sent once the event timer has expired. In case of an event the event timer is reset. Note: the event "change of analogue input" is switched on or off (default) via object 0x6423. RxPDOs: The event timer is used as watchdog to monitor the reception of event driven PDOs. In case no PDO has been received during the configured time span, the bus node enters the error state.

Advantage: The PDO transmission behaviour can now be adjusted even more individually. E.g. TxPDOs with analogue inputs can be sent with cycle times independent of the SYNC rate. The reception of event driven PDOs can be monitored.

Effects when using new bus couplers in existing networks: none

1.4   PDO fully synchronised with I/O-Update

New: If all PDOs are set to synchronous communication (transmission type 0...240) the I/O-Update is triggered by the reception of the SYNC telegram.

Advantage: Full synchronisation of the I/O behaviour (so far only the communication was synchronised).

Effects when using new bus couplers in existing networks: none

2.   LED Behaviour

2.1   LED behaviour now according to DRP303-3

New: The LED behaviour was adapted to the new CiA recommendation DRP303-3. Changes:

Device State	LED behaviour old	LED behaviour new
Device stopped	RUN LED off	RUN LED blinks once, then 1 s break
CAN warning limit exceeded	ERR LED blinks continuously	ERR LED blinks once, then 1 s break
Event Timer: RxPDO missing	-	ERR LED blinks 4 times, then 1 s break

Advantage: Uniform and manufacturer independent LED behaviour

Effects when using new bus couplers in existing networks: Optical diagnosis in error case has changed minimally. No change in normal operation.

3.   *Object Dictionary*

3.1   Identity Object now supported
New: The new CANopen Identity Object 0x1018 is now supported. It provides the following information about the device:
Sub index 1: Vendor ID. Beckhoff has the Vendor ID 2.

Sub index 2: Product Code. BK5120: 0x11400; BK5110: 0x113F6; LC5100: 0x113EC; IPwxyz-B510: 0x2wxyz; IL2301-B510: 0x2008FD.

Sub index 3: Revision Number

Sub index 4: Production date; Low Word, High Byte: Calendar week (dec), Low Byte: Calendar year

Advantage: Additional information about the device is provided manufacturer independently.

Effects when using new bus couplers in existing networks: none

3.2   0x100E: Guarding-Identifier now Read-Only
New: The default identifier for the Guarding and Heartbeat Protocol may not be changed any more.

Advantage: Clear assignment of the corresponding CAN Frames to the node addresses.

Effects when using new bus couplers in existing networks: Only, if Guarding identifier was changed.

3.3   Object 0x1004 removed
New: In CANopen Version 4.0 Object 0x1004 (Number of PDOs) is not supported any more, as it did not provide valuable information.

Advantage: reduced memory usage.

Effects when using new bus couplers in existing networks: Only, if number of PDOs was derived from object 0x1004.

3.4   Time-Out at SYNC monitoring extended
New: The watchdog for the SNYC monitoring is now set to the 1,5-fold of the value in Object 0x1006.

Advantage: Now the actually intended SYNC Interval can be written to Object 0x1006.

Effects when using new bus couplers in existing networks: none

4.   *Network Management*

4.1   Boot-Up message now uses guarding identifier
New: The boot-up message, that Beckhoff had introduced, in CANopen version 4 now has been defined manufacturer independently. Instead of an Emergency message without data now a Guarding telegram with one data byte (0) is sent.

Advantage: uniform definition, no change of the Data Length Code at run time any more.

Effects when using new bus couplers in existing networks: only, if boot-up message was analysed.

4.2   Heartbeat now supported

New: In addition to the node monitoring via Guarding protocol (cyclic scanning of node state via remote frame) now heartbeat is supported as well.

Advantage: Reduction of the bus load, individual monitoring cycle times configurable, no Remote frames required any more (are not fully supported by some CAN controller).

Effects when using new bus couplers in existing networks: none

5.   Miscellaneous:

5.1   Firmware-Update now via CANopen possible

New: Since Version C1 future Firmware updates can be performed via CANopen as well. This requires the Beckhoff CANopen card FC5101 or FC5102 (from Firmware 0.74) and TwinCAT. The download software can be found in the download section of the Beckhoff homepage or directly at

ftp.beckhoff.com/config/busterm/BK51x0/FC510xNodeUpdate.zip

Advantage: It is not necessary any more to perform a firmware update for each node individually via the serial interface. All Firmware update of one device type can be done at the same time.

Effects when using new bus couplers in existing networks: none

Note: Firmware update via CAN is only supported from Firmware Version C1 on, updates to C1 therefore have to be done via serial interface.

5.2   Firmware-Update via serial interface

For a firmware update via serial interface a KS-2000 interface cable and the update software is required (see Beckhoff homepage or directly at

ftp://ftp.beckhoff.com/config/busterm/FirmwareUpdate_v126.exe)

5.3   Downgrading to firmware version BA

In case you want to continue using BK5120 CANopen Bus Coupler with Firmware version BA (CANopen version 3), you can order these using product code BK5120-0010. Devices that already have firmware version C1 you can „downgrade" to BA as well. The firmware can be found at the Beckhoff homepage or directly at

 ftp.beckhoff.com/config/busterm/BK51x0/BK51x0BA.zip

If you have any further questions regarding the new firmware version please contact you local Beckhoff representative or the Beckhoff support hotline, phone +49 (0)5246 / 963-157. email: support@beckhoff.com