

# Optoelectronic absolute encoder

## Models KBN 58-S and KBN 58-K

### SINGLE-TURN with CANopen interface



- Compact design for mechanical engineering and device technology
- According to CANopen Application Layer and Communication Profile, CiA Draft Standard 301, Version 4.1 and according to "Device Profile for Encoders CiA Draft Standard Proposal 406 Version 3.0"
- CANopen Layer Setting Services and Protocol (LSS), CiA DSP 305
- Resolution: 8192 steps/360° - 13-bit (Optional: up to 16-bit)
- Output code: Binary
- With speed signal
- Design form "S" with synchroniser flange (IP 64)  
Design form "K" with clamped flange (IP 66)

### Design

Aluminium flange and housing - stainless steel shaft - ball bearing with seal - code disk manufactured from glass or dimensionally stable plastic - GaAIAs diode - photo array with comparator and trigger circuit for long-term sensor system stabilisation - SMD technology.

The bit-parallel information on the rotational angle is processed in a  $\mu$ Controller with integrated CAN interface and made available via a CAN driver.

### Function

The CANopen application layer, the communication profile, CiA Draft Standard 301, version 4.1 and the CANopen interface specifications for encoders according to CiA DSP 406 version 3.0 are implemented in the absolute encoder. The requirements for a class 2 subscriber are met.

In addition to administrative and pre-defined messages according to CANopen (e.g.: synchronisation, NMT, LSS, ...), service data objects (SDOs) and process data objects (PDOs) are also supported. The latter are used for data exchange between the master and slave. During direct write and read access to individual object directory entries, the SDOs are exchanged between the master and slave. These SDOs are used mainly for device configuration (e.g. changing the transmission type of the Tx-PDO - object 1800H).

The node ID and baud rate (max. 1 Mbaud) are set via DIP switches in the connecting cap or via the LSS service. The object entries for the general features, PDO parameters, encoder parameters, diagnostic parameters and LMT/LSS are described in detail in the [KBN 11278](#) user manual.

## Model KBN

### Technical Data

#### CANopen features

■ NMT master:	No
■ NMT slave:	Yes
■ Maximum boot-up:	No
■ Minimum boot-up:	Yes
■ COB ID distribution:	Default, SDO
■ Node ID distribution:	Via DIP switches or LSS
■ No. of PDOs:	2 Tx
■ PDO modes:	Sync, async, cyclic, acyclic
■ Variable PDO mapping:	No
■ Emergency message:	Yes
■ Heartbeat:	Yes
■ No. of SDOs:	1 Rx / 1 Tx
■ Device profile:	CiA DSP 406 version 3.0

#### General parameters

■ Data rate:	
DIP switch:	20, 125, 500 kBaud, 1 MBaud
LSS:	20, 50, 125, 250, 500, 800 kBaud, 1 MBaud, default: 20 kBaud
■ Node address:	1-127 (can also be set via LSS), default: 1 and FFhex
■ Scaling function:	On/off and setting the preset value (see operating mode)
■ Cycle timer:	Cycle time (0 to 65,536 ms)
■ Alarms:	EEPROM error CRC error
■ Terminating resistor:	Engageable via DIP switches in the connecting cap

#### Operating modes (programmable with SDO)

##### Polling mode (asynchronous\*):

The encoder transmits the current actual position value, once the current position value has been queried via a "remote frame" message by the master.

##### Cyclic mode (asynchronous-cyclic\*):

The encoder transmits the current actual position value cyclically - without being requested by the master. The cycle time can be parameterised for values between 1 ms and 65,536 ms.

##### Sync mode (synchronous-cyclic\*):

After receiving a SYNC message transmitted by the master, the encoder transmits the current actual position value. The SYNC counter in the encoder can be parameterised so that the position value is only transmitted after a defined number of SYNC messages.

##### Acyclic mode (synchronous-acyclic\*):

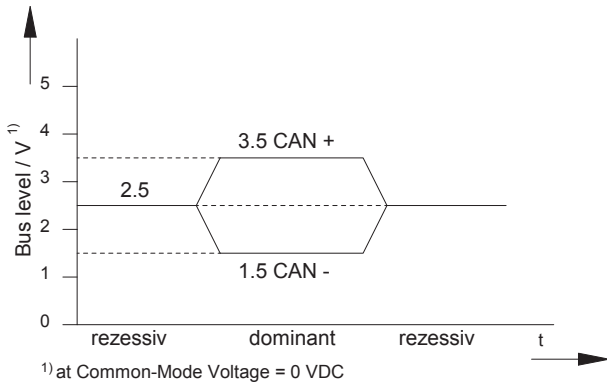
The encoder only transmits the current actual position value after receiving a SYNC message if the position value has changed since the last transmission.

\* PDO transmission type

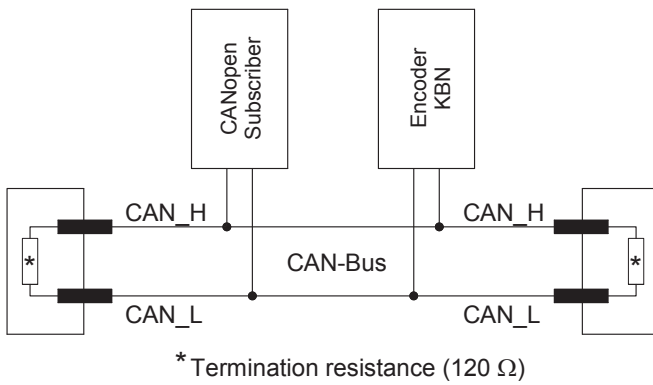
Model KBN

Technical Data

Output level according to ISO / DIS 11898



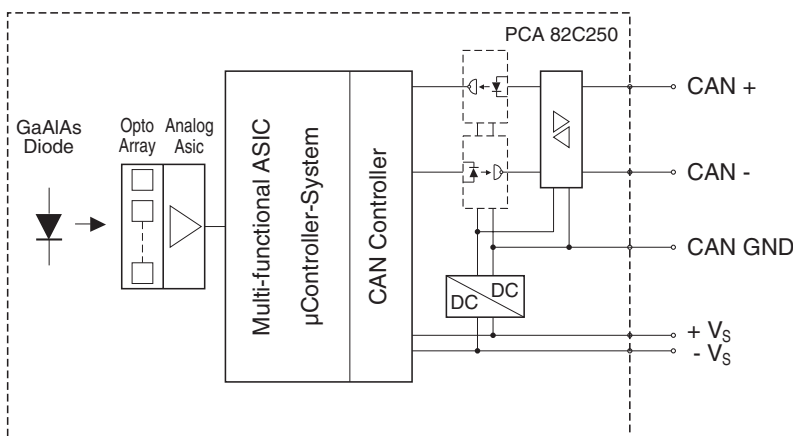
Bus activation according to ISO / DIS 11898



Speed signal

The speed signal is activated by bit 14 = 1 in object 6000hex. With 10 ms (=0) or with 100 ms (=1), bit 15 defines the gate time for recording the speed signal. To calculate the speed signal, the system works internally with the max. resolution of 16 bits (65,536 steps/revolution) and with the corresponding gate time. The measured speed value is entered in the objects 1A00 hex and 1A01 hex. The data format of the PDO position value (2 bytes) and speed signal (2 bytes) has a length of 4 bytes (see data format).

Principle circuit diagram

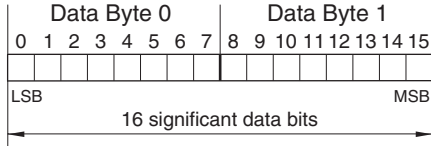


Model KBN

Technical Data

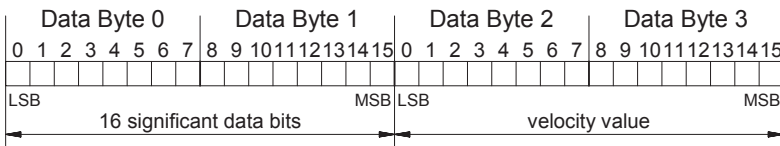
Data format (without speed signal)

PDO 1



Data format (with speed signal)

PDO 1 / PDO 2



Absolute encoder parameters

- Code sense\*: CW / CCW
- Resolution: 2 to 8192 steps / 360°  
Optional: 14-, 15-, 16-bit
- Reference value: 0 to total number of steps -1
- Serial number: Long integer value

\* Looking at the flange side

Electrical data

- Sensor system: GaAlAs diode - photo array
- Resolution (standard): 8192 steps / 360° - 13-bit  
Optional: 14-, 15-, 16-bit
- Division code: Grey
- Output code: Binary
- Measurement step dev.:  $\leq \pm 1' 59''$  with 13-bit ( $\pm 1$  digit)
- CAN interface: ISO / DIS 11898 (physical)
- Operating voltage: + 11 to + 30 VDC
- Operating current: 70 mA typ. / 90 mA max.
- EMC standards: EN 50081-2,  
EN 50082-2

## Model KBN

### Technical Data

#### Mechanical data

- Operating speed: 10,000 rpm max.
- Angular acceleration:  $10^5$  rad/s<sup>2</sup> max.
- Moment of inertia (rotor): 15 gcm<sup>2</sup>
- Operating torque:
  - ≤ 3 Ncm (KBN 58-S)
  - ≤ 8 Ncm (KBN 58-K)
- Starting torque:
  - ≤ 1 Ncm (KBN 58-S)
  - ≤ 4 Ncm (KBN 58-K)
- Perm. shaft load:
  - 100 N axial
  - 100 N radial
- Bearing service life: 10<sup>9</sup> revolutions
- Weight: Approx. 0.6 kg

#### Environmental data

- Operating temperature range:
  - 20 °C to + 60 °C
  - Optional: - 40 °C to + 85 °C
- Storage temperature range: - 20 °C to + 60 °C (due to packaging)
- Perm. relative humidity: 85 % without condensation
- Resistance:
  - To shock: 200 m/s<sup>2</sup>; 11 ms, DIN EN 60068-2-27
  - To vibration: 10 Hz ... 1000 Hz; 100 m/s<sup>2</sup>, DIN EN 60068-2-6
- Protection types (DIN EN 60529)
  - KBN 58-S: IP 64
  - KBN 58-K: IP 66 (Simmerring)

#### Connecting cap ZKC

T-coupler functionality with integrated addressing, planned for the following functions and connection cables:

- Node ID (1-6), baud rate (7-8) and bus terminating resistor (9-10) setting via DIP switches.
- Diagnostic LEDs
- 1 cable for the supply voltage (+ V<sub>s</sub> = 24 VDC, - V<sub>s</sub> = 0 VDC), cable gland PG 7
- 1 cable for bus in, cable gland PG 9
- 1 cable for bus out, cable gland PG 9

#### Documentation and supply sources

- Device Profile for Encoders, CiA Draft Standard 406, Version 3.0
- CANopen Application Layer and Communication Profile, CiA Draft Standard 301, Version 4.1
- CANopen Cabling and Connector Pin Assignment, CiA Draft Recommendation Proposal 303-1, Version 1.1.1
  
- CiA - CAN in Automation
  - Kontumazgarten 3
  - D-90429 Nürnberg
  - [www.can-cia.org](http://www.can-cia.org)
  
- TWK user manual [KBN 11278](#) and EDS file from [info@twk.de](mailto:info@twk.de)

**Model KBN**

Order number

**Absolute encoder**

<b>KBN 58</b>	<b>S</b>	<b>8192</b>	<b>R</b>	<b>C1</b>	<b>Z</b>	<b>01</b>
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Electrical and / or mechanical variants \*  
01 Standard

Electrical connection:  
Z Connecting cap

Profil:  
C1 C1-CANopen, DS 406 version 3.0

Output code:  
R Binary

Resolution:  
8192 Steps / 360°  
16,384 Steps / 360°  
32,768 Steps / 360°  
65,536 Steps / 360°

Design form  
S Synchroniser flange  
K Clamped flange

**KBN 58** Model series KBN 58

**Connecting cap ZKC**

<b>ZKC -</b>	<b>N</b>	<b>01</b>
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Electrical and / or mechanical variants \*  
01 Standard

N CANopen

ZKC Connecting cap for model series KBN

The cap is listed and supplied as a separate order item. It can be separated from the absolute encoder for setting purposes by releasing two screws.

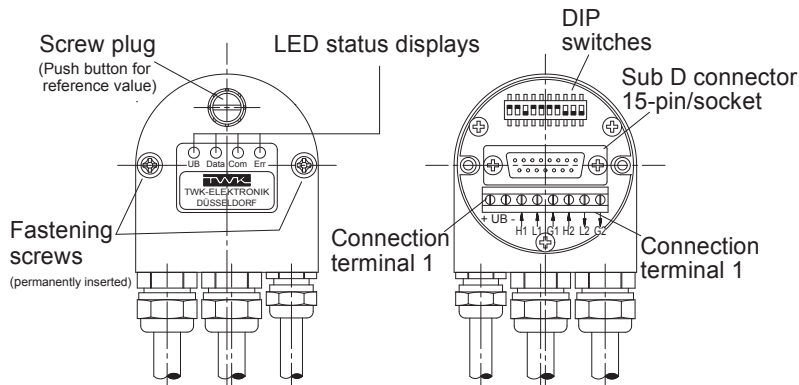
\* The basic versions according to the data sheet bear the number 01. Deviations are identified with a variant number and are documented in the factory.



Model KBN

Connecting cap

Connecting cap ZKC



Status LEDs	V <sub>S</sub>	DATA	COM	Err
Operating voltage	X			
Process data communication and communication OK	X	X	X	
Communication warning			Flash	
Bus off	X			
Error which triggers the emergency message or the SDO abort transfer protocol				X

DIP switch	1	2	3	4	5	6	7	8	9	10
ON = 1	LSB			MSB			Baud rate		Terminating resistor: on	
OFF = 0	Address 1 - 64 can be set (1: default address)								Terminating resistor: off	