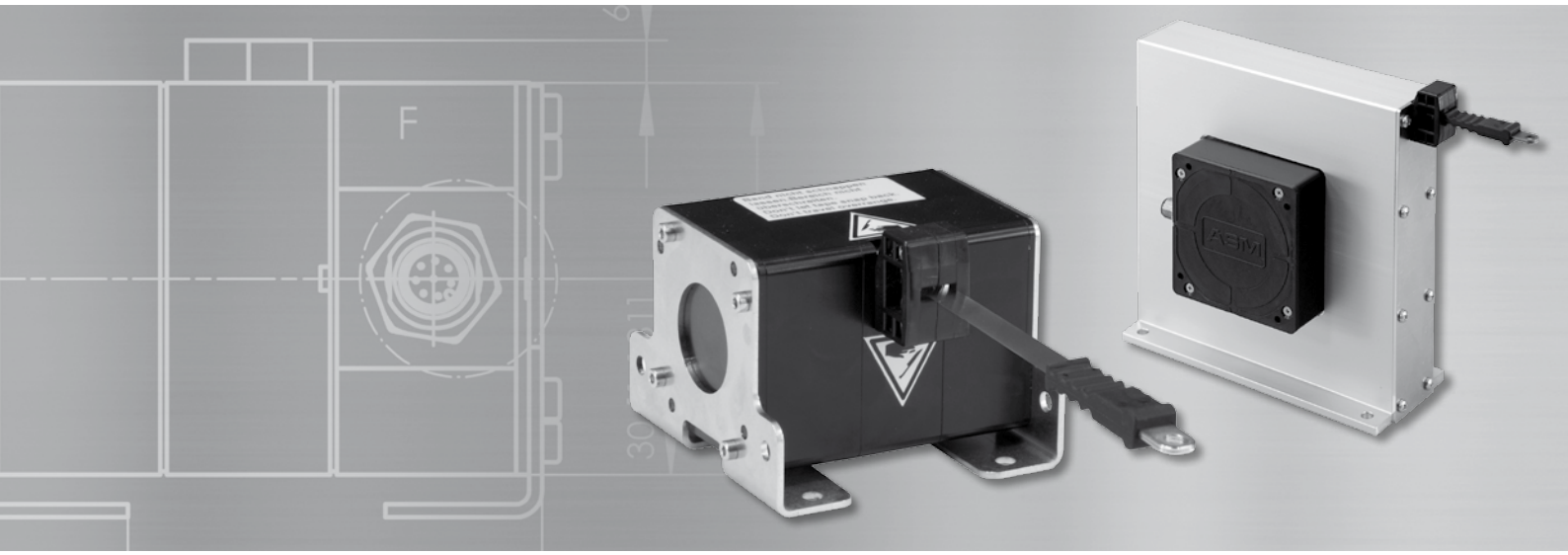
ASM®

perfect in sensors.

POSITAPE®

Tape Position Sensors

Installation and operation manual



Please read carefully before operation!

Contents

Safety instructions

If total failure or malfunction of the sensor can cause danger or injury to the operator or damage to the machinery or equipment it is recommended that additional safety measures should be incorporated into the system.

Any alteration, reconstruction or extension of the sensor is not allowed.

Sensor must be operated only within values specified in the datasheet.

Connection to power supply must be performed in accordance with safety instructions for electrical facilities and performed only by trained staff.

Do not connect / disconnect the sensor under tension.

Disregard of this advice can lead to malfunctions, damage to property or personal injury and releases the manufacturer from product liability.

Explanation of used safety signs and signal words

WARNING, Risk of Injury:
Indicates a potentially hazardous situation, which, if not avoided, could result in serious injury or property damage.

DANGER — **WARNING, Risk of Personal Injury or Death:**
Indicates a situation that can result in serious personal injury or death if not properly avoided.

WARNING — **WARNING, Risk of Personal Injury or Death:**
Indicates a situation that can result in moderate personal injury or death if not properly avoided.

CAUTION — **WARNING, Risk of Personal Injury:**
Indicates a situation that can result in minor personal injury if not properly avoided.

NOTICE — **WARNING, Risk of Property Damage:**
Indicates a situation that can result in minor to major property damage if not properly avoided.

Safety instructions

Do not open sensor
- Release of spring under tension can result in injury!

Do not snap tape
- Uncontrolled tape or metal tape retraction can break off tape fixing. Broken fixing and tape can result in injury. Also sensor will be damaged!

Do not travel over range
- Uncontrolled tape retraction can result in injury. Also sensor will be damaged!

Do not exceed maximum operating voltage listed in the catalog
- Risk of injury. Sensor will be damaged!

Avoid shocks to sensor case
- Sensor may be damaged!

Intended use

The tape position sensor is intended for distance measurement through the extraction of the measuring tape, when properly mounted and used in the properly rated ambient atmospheric and technical conditions for which the sensor is designated.

Unintended use

The unintended use is when the sensor is used outside its specified technical and ambient atmospheric conditions or when improperly mounted..

Description

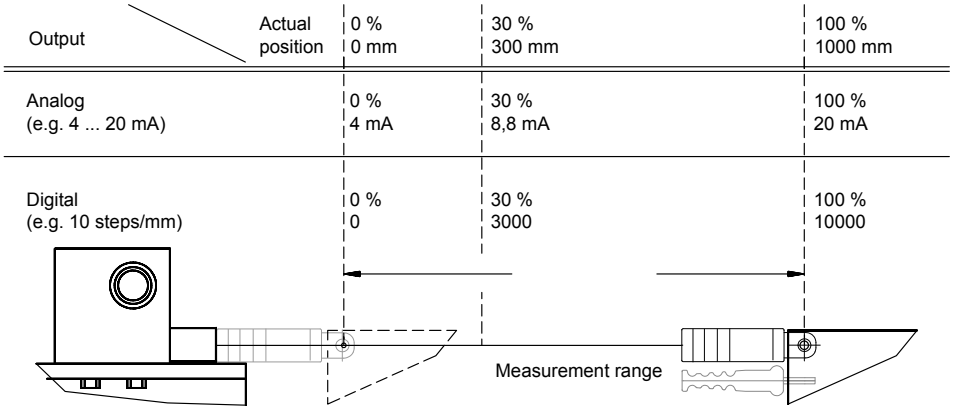
The purpose of position sensors is to transform position of a linear and guided movement into an electrical signal. Specifications of measuring range, environment, handling and connections as specified in the catalog, must be followed.
The catalog is part of this instruction manual. If the catalog is not available it may be requested by stating the respective model number.

The Operating Principle
Linear motion of the measuring tape is converted into rotation by means of a precision drum. A spring motor provides torque for the tape retraction.
Tape extraction or retraction is transformed into an electrical signal. Depending on application different sensing elements are used.
Optional: Subsequent signal conditioners convert the signal of the sensing element into voltage, current, or digital pulses suitable for standard interfaces.

Measurement Signal and Range

Measurement signal:

Analog	Measuring range corresponds to the electrical measuring range (e.g. 4...20 mA).
Digital	Inividual sensitivity is specified on label in steps per millimeter.



Delivery / shipment

Unpacking	Do not unpack sensor by pulling tape or tape clip.
Shipment damages	Check sensor immediately for shipping damage.

In case of any damage or equipment not operating appropriately, please contact supplier or ASM GmbH Moosinning. To avoid shipment damages, use original packing for further shipment. Avoid bending the tape arrester while packing the sensor.

Return consignment

Return consignment for calibration or repair: only with the RMA number (Return Material Authorization). Please contact ASM and request the RMA number:

ASM Automation Sensorik Messtechnik GmbH
Service&Repair

Am Bleichbach 18-24
D-85452 Moosinning

Tel. +49 8123 986-0
Fax +49 8123 986-500

service@asm-sensor.de
www.asm-sensor.com

Installation

Precautions

WARNING

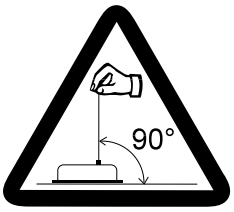
Do not damage tape!
Tape must not be oiled or lubricated!
Do not snap the tape!
Do not travel over range!
Do not crack the tape!
Tape travel should be axial to the tape outlet - no misalignment allowed!
Do not drag tape along objects!

Do not let snap the tape
Uncontrolled retraction of tape may damage sensor.
No warranty will be granted for snapped tapes.

Mounting
To ensure proper operation, install the sensor only as described in this manual.

Tape travel should only be axial to the tape outlet
- no misalignment is allowed.

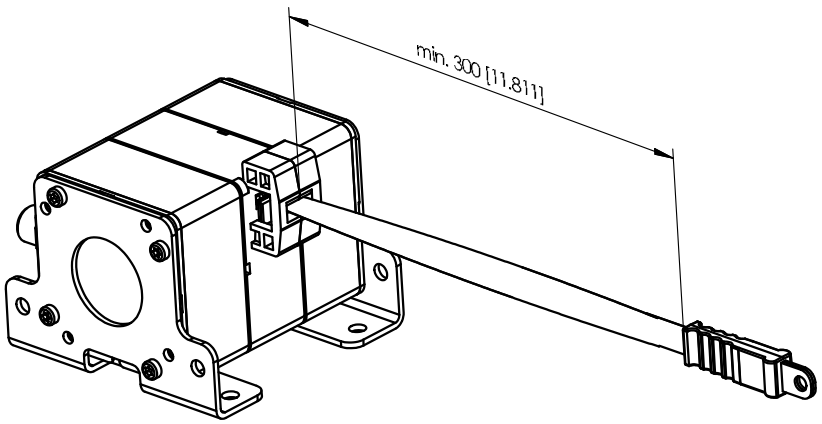
Tape misalignment shortens service life of sensor and causes error in measurement. Warranty will not be granted for damage caused by misalignment.



If tape travel axial to the tape outlet is not possible, the tape guide wheel WBR1 (accessories) must be used in order to turn the tape.
The deflection is possible only in one axe - on the plane side. Pulley wheels with the diameter of >15 mm are recommended (see accessories).

90° twist of the measurement tape

A singular tape twist of 90° is possible. Before turning the tape, a distance of at least 30 cm from the tape outlet must be kept in axial direction. While retracting the tape, it must be twisted back at the distance of at least 30 cm before the tape entirely enters the tape outlet.



Installation

Installation position

Covered or shielded travel of tape is preferred.	This prevents tape from damage, soiling and manipulation.
Tape outlet is preferred pointing downwards.	Soaking of liquids into the tape outlet is impossible, concentration of condensing water will be avoided.
Fit sensor on plain base or use three-point mounting on uneven surfaces.	This prevents sensor from bending and damage.

Fitting the sensor

Depending upon the sensor model, holes in the base plate or threads in the sensor housing enable attachment of the sensor. Dimensions required are listed in the catalog.

Tape attachment device

For fastening the tape clip the 5 mm dia. bore is provided.

Model	Sensor fastening	
	Holes in the base plate	Threads in the sensor housing
WB10ZG	-	X
WB12	-	X
WB21	X	-
WB61	X	-
WB85	X	-
WB100M	X	-

Torque

- The follwing torques / screws and screw materials are recommended.
- Use flat washers and/or screw protection if necessary.
- The user is responsible for the appropriate torque, since ASM does not know the operational conditions of the application.

Model	Screw	Screw material	Torque [Nm]
WB10xx	M5	A2	4,5
WB12xx	M5	A2	4,5

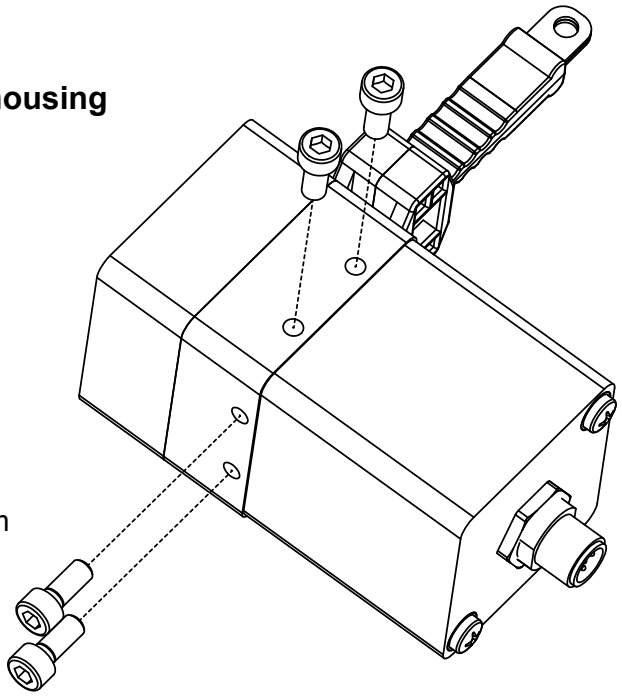
Mounting

Sensors with threads in the sensor housing

⚠ Mount the sensor on a flat surface.

Fixing is possible laterally or on the bottom side of the sensor.

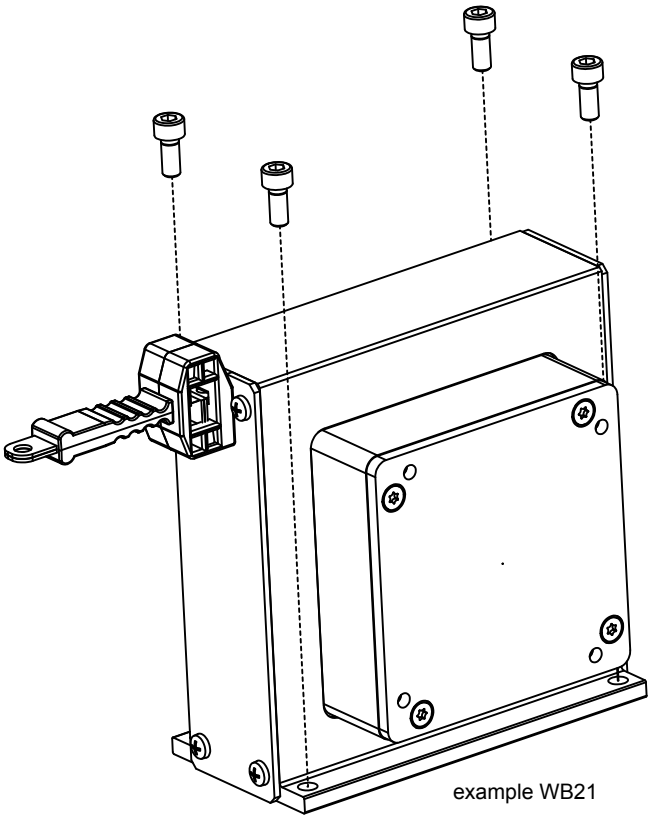
For the length of thread engagement see the outline drawing in the data sheet.



example WB10ZG

Sensors with holes in the base plate

⚠ Mount the sensor on a flat surface.



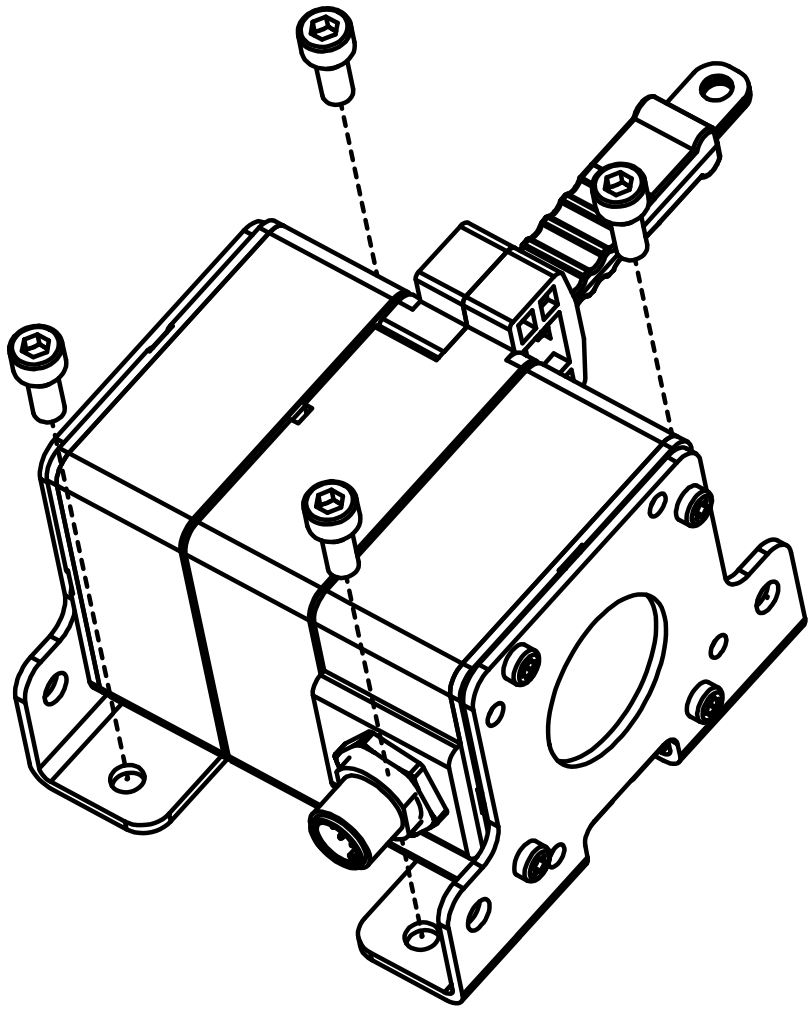
example WB21

Mounting

Sensors with mounting clamps

Mount the clamps on a flat surface.

The clamps are mounted ex-factory. Fixing is possible laterally or on the bottom side of the clamp.



example WB61

Calibration (ISO9001)

The recommended calibration interval is 1 year.

Test protocol and traceable calibration certificate (ISO9001) is available on request.

Electromagnetic Compatibility (EMC)

The electromagnetic compatibility depends on wiring practice. Recommended wiring:

- Use shielded twisted pair sensor tape.
- Ground shield single ended at switch cabinet. Connect shield directly before or at tape inlet of switch cabinet by low impedance ground tape bond. On delivery of preassembled sensor cables the shield is not connected to the sensor housing.
- Keep sensor signal well separated from power wiring e.g. AC wiring, motor or relay. Use separate conduit or ducts for each.

If application includes highly electromagnetic interference emitting equipment like switch converter drives additional measures are recommended:

- Use a twisted pair tape, shielded per pair and common.
- Use shielded conduits or ducts connected to ground potential.

Repair

WARNING

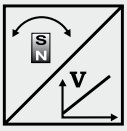
Sensors and accessories have to be repaired and adjusted at ASM in Moosinning.

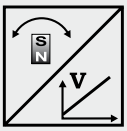
In order to avoid risk of injury and improper handling do not try to repair. No warranty or liability will be granted for opened sensors.

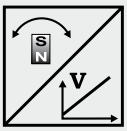
Remove the dirt from the dust wiper with subtle air blasts.

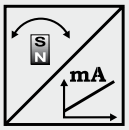
Disposal

Disposal according to applicable government regulations.

U2 Voltage output 0.5 ... 10 V 	Excitation voltage	8 ... 36 V DC
	Excitation current	typical 20 mA at 24 V DC typical 38 mA at 12 V DC max. 50 mA
	Output voltage	0,5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

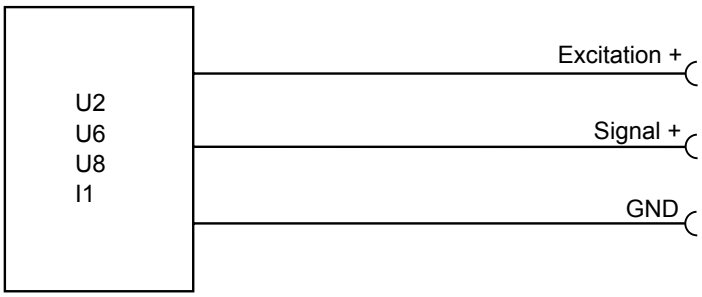
U6 Voltage output 0,5 ... 4,5 V 	Excitation voltage	5 V DC ± 5%
	Excitation current	typical 140 mA
	Output voltage	0,5 ... 4,5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

U8 Voltage output 0.5 ... 4,5 V 	Excitation voltage	8 ... 36 V DC
	Excitation current	typical 17 mA at 24 V DC typical 32 mA at 12 V DC max. 50 mA
	Output voltage	0,5 ... 4,5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

I1 Current output 4 ... 20 mA, 3 wire 	Excitation voltage	8 ... 36 V DC
	Excitation current	typical 36 mA at 24 V DC typical 70 mA at 12 V DC max. 120 mA
	Load R_L	500 Ω max.
	Output current	4 ... 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

*) WB10, WB100M: -20 ... +85 °C

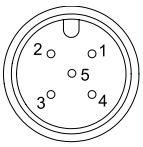
Output signals



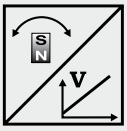
Signal Wiring	Signal	Plug connection	Cable connection
	Excitation +	1	brown
	Signal	2	white
	GND	3	blue
	Do not connect!	4	black
	Do not connect!	5	grey

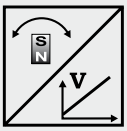
Connection

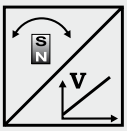
View to sensor connector

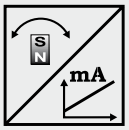


A-Coding

U2PMU, U2/PMZ Voltage output 0.5 ... 10 V 	Excitation voltage	8 ... 36 V DC
	Excitation current	typical 20 mA at 24 V DC typical 38 mA at 12 V DC max. 50 mA
	Output voltage	0,5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

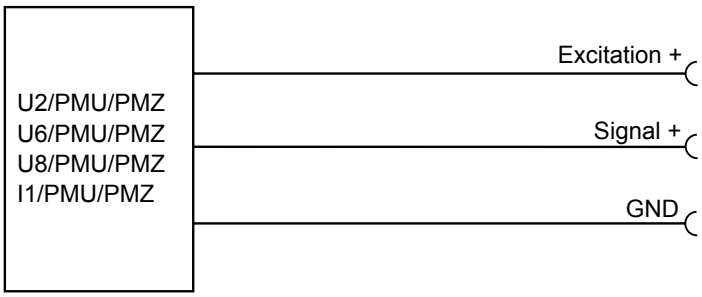
U6PMU, U6/PMZ Voltage output 0,5 ... 4,5 V 	Excitation voltage	5 V DC ± 5%
	Excitation current	typical 140 mA
	Output voltage	0,5 ... 4,5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

U8PMU, U8/PMZ Voltage output 0.5 ... 4,5 V 	Excitation voltage	8 ... 36 V DC
	Excitation current	typical 17 mA at 24 V DC typical 32 mA at 12 V DC max. 50 mA
	Output voltage	0,5 ... 4,5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

I1PMU, I1/PMZ Current output 4 ... 20 mA, 3 wire 	Excitation voltage	8 ... 36 V DC
	Excitation current	typical 36 mA at 24 V DC typical 70 mA at 12 V DC max. 120 mA
	Load R_L	500 Ω max.
	Output current	4 ... 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

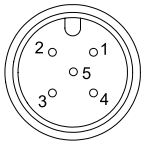
*) WB10, WB100M: -20 ... +85 °C

Output signals



Signal wiring	Signal	Plug connection	Cable connection
	Excitation +	1	brown
	Signal	2	white
	GND	3	blue
	Do not connect!	4	black
	SPAN/ZERO	5	grey

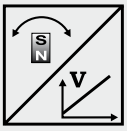
View to sensor connector

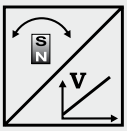


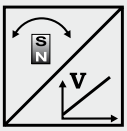
A-Coding

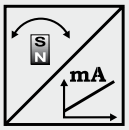
Option -PMU
Programming of the start and end value by the customer
Teach-In of start and end value for the options U2/PMU, I1/PMU, U8/PMU is provided by a binary signal SPAN/ZERO. At the start position connect signal SPAN/ZERO for a period of 2 … 3 seconds to GND via push button. At the end position connect signal SPAN/ZERO for a period of 5 … 6 seconds to GND via a push button. The teached positions will be stored non-volatile.
To reset the sensor to factory default signal ZERO/END must be connected to ground while powering up the sensor for 2 … 3 seconds.

Option -PMZ
Programming of the start value by the customer
Programming of the start value of the output range for the outputs U2/U8 and I1 is provided by a programming signal ZERO available at the connector. This Signal ZERO must be connected with GND via a push button, and then the position magnet of the sensor must be moved to the start resp. the end position. Pushing the button between 1 and 4 seconds sets the actual position as start position, pushing the button more than 5 seconds sets the actual position as end position. The values will be stored and are available after switching off the sensor.
To reset the sensor to the factory values the button must be pushed when the sensor is switched on.

U2R Voltage output 0.5 ... 10 V 	Excitation voltage	8 ... 36 V DC
	Excitation current	typical 20 mA at 24 V DC typical 38 mA at 12 V DC max. 50 mA per channel
	Output voltage	0,5 ... 10 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

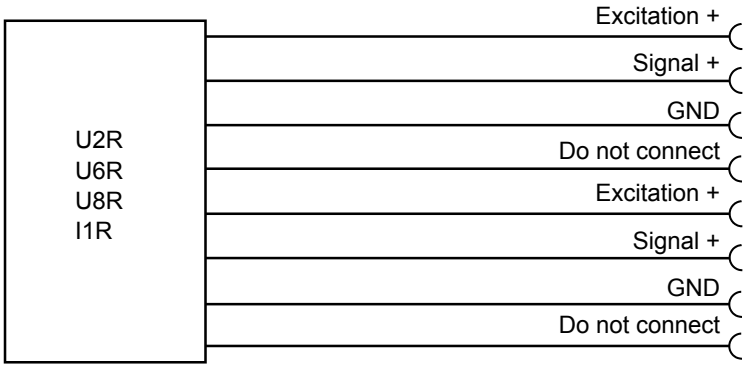
U6R Voltage output 0,5 ... 4,5 V 	Excitation voltage	5 V DC ± 5%
	Excitation current	typical 140 mA per channel
	Output voltage	0,5 ... 4,5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

U8R Voltage output 0.5 ... 4,5 V 	Excitation voltage	8 ... 36 V DC
	Excitation current	typical 17 mA at 24 V DC typical 32 mA at 12 V DC max. 50 mA per channel
	Output voltage	0,5 ... 4,5 V DC
	Output current	2 mA max.
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

I1R Current output 4 ... 20 mA, 3 wire 	Excitation voltage	8 ... 36 V DC
	Excitation current	typical 36 mA at 24 V DC typical 70 mA at 12 V DC max. 120 mA per channel
	Load R_L	500 Ω max.
	Output current	4 ... 20 mA
	Measuring rate	1 kHz standard
	Stability (temperature)	±50 x 10^{-6}/°C f.s. (typical)
	Protection	Reverse polarity, short circuit
	Operating temperature	-40 ... +85 °C
	EMC	DIN EN 61326-1:2013

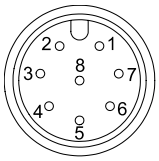
*) WB10, WB100M: -20 ... +85 °C

Output signals



	Channel	Signal	Connector M12, 8 pins	Cable connection
Signal wiring, redundant version with 2 channels and 1 connector	1	Excitation +	1	white
	1	Signal	2	brown
	1	GND	3	green
	1	Do not connect!	4	yellow
	2	Excitation +	5	grey
	2	Signal	6	pink
	2	GND	7	blue
	2	Do not connect!	8	red

View to sensor connector

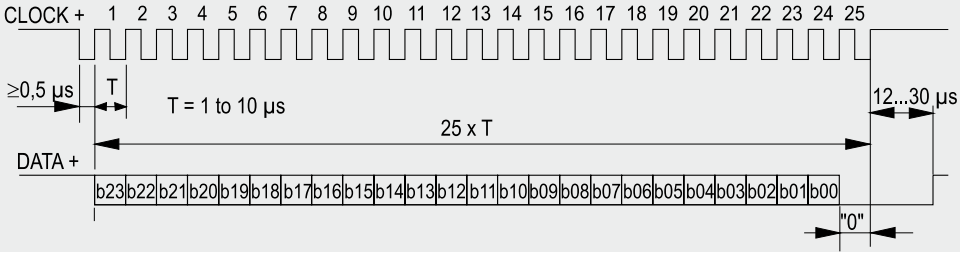


A-Coding

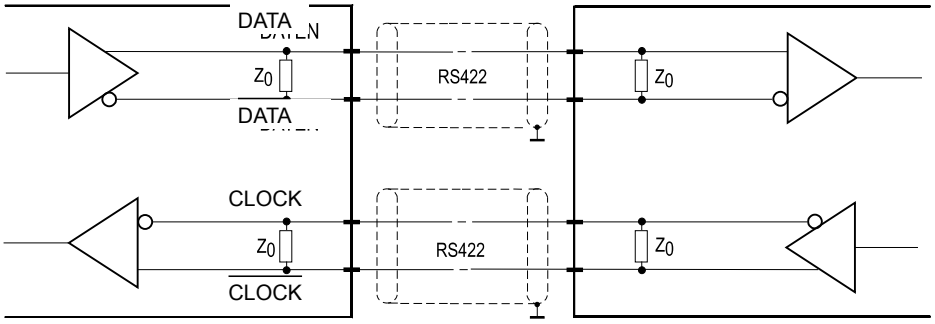
MSSI Synchronous serial SSI 	Interface	EIA RS-422
	Excitation voltage	8 ... 36 V DC
	Excitation current	typ. 19 mA at 24 V DC typ. 35 mA at 12 V DC max. 80 mA
	Clock frequency	100 kHz ... 500 kHz
	Code	Gray-Code, continuous progression
	Delay between pulse trains	20 µs min.
	Stability (temperature)	±50 x 10^{-6} / °C f.s. typical
	Operating temperature	-40 ... +85 °C
	Protection	Short circuit
	EMC	DIN EN 61326-1:2013

*) WB10, WB100M: -20 ... +85 °C

Data format
(train of 26 pulses)



Recommended processing circuit

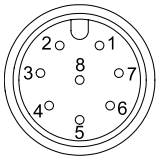


Transmission rate	**Cable length**	**Baud rate**
	50 m	100-400 kHz
	100 m	100-300 kHz

Note:
Extension of the cable length will reduce the maximum transmission rate.

Signal wiring/ Connection	**Signal**	**Connector Pin**	**Cable wire color**
	Excitation +	1	white
	Excitation GND	2	brown
	CLOCK	3	green
	$\overline{\text{CLOCK}}$	4	yellow
	DATA	5	grey
	$\overline{\text{DATA}}$	6	pink
	–	7	blu
	–	8	red

View to sensor connector



Apply the shield unilaterally! Avoid ground loops!

POSITAPE®
Output specification CANopen

Description

CANopen Interface according to CANopen-Standards CiA DS301 DS406, for WB Linear Position Sensors. Prozess data objects for Position und CAM switches. Programmable parameters include Preset, Offset, Resolution, CAM switches, Transmission mode.

MCANOP 	Communication profile	CANopen CiA 301 V 4.02, Slave
	Device profile	Encoder CiA 406 V 3.2
	Configuration services	Layer Setting Service (LSS), CiA Draft Standard 305 (transmission rate, node id)
	Error Control	Node Guarding, Heartbeat, Emergency Message
	Node ID	Default: 127; programmable via LSS or SDO
	PDO	3 TxPDO, 0 RxPDO, static mapping
	PDO Modes	Event-/Time triggered, Remote-request, Sync cyclic/acyclic
	SDO	1 server, 0 client
	CAM	8 cams
	Transmission rates	50 kBaud to 1 MBaud, default: 125 kBaud; programmable via LSS or SDO
	Bus connection	M12 connector, 5 pins
	Integrated terminating resistor	R_T = 120 Ω, user programmable
	Bus, galvanic isolated	No

Specifications	Excitation voltage	8 ... 36 V DC
	Excitation current	typ. 20 mA at 24 V DC typ. 40 mA at 12 V DC max. 80 mA
	Measuring rate	1 kHz (asynchronous)
	Stability (temperature)	±50 x 10^{-6} / °C f.s. typical
	Repeatability	1 LSB
	Operating temperature	-40 ... +85 °C
	Protection	Reverse polarity, short circuit
	Dielectric strength	1 kV (V AC, 50 Hz, 1 min.)
	EMC	DIN EN 61326-1:2013

Setup

WARNING

NOTICE

Warning notice

- Changing parameters may cause unexpected machine movement.
- Changing parameters may influence dependent parameters
- e.g. changing the resolution may have influence on position of CAM switches.
- Precautions have to be taken to avoid damage to human and machine parts!
- Change parameters only when machine is in a safe condition!

Before connecting the sensor to the CAN-Bus the devices have to be checked for correct bitrate and unique node-IDs. Both parameters are configurable by Layer-Setting-Service (LSS) or by Service Data Object (SDO). After power-on the sensor will enter pre-operational state and send a boot-up message being ready for configuration by Service Data Objects. Parameters configured by the user can be stored nonvolatile by SAVE command. On receiving „NMT-Node-Start“ the sensor transits to operational state and starts process data transmission. When „Auto-Start“ is configured the sensor will automatically transit to operational after boot-up without a need for the Node-Start message.

Node monitoring is supported by Node Guarding and Heartbeat protocol. Node Guarding implements cyclic querying of the node status by the NMT-Master within the guard time window. The Heartbeat protocol provides automatic transmission of the node status (heartbeat message) by the slave within producer heartbeat time window.

Following the CAN example protocols included in this manual the sensor may be used without CANopen master device.

Service Data Object (SDO) COB-Id

Service data objects (SDO) provide a peer to peer communication between master and slave. The communication object identifier (COB) of the SDO is defined by the Node-Id.

SDO	COB-Id	Default COB-Id
Master to Slave	600h + Node-Id	67Fh
Slave to Master	580h + Node-Id	5FFh

Process Data Object (TPDO)

Real time data transfer is provided by Process Data Objects (PDO). The PDO mapping is fixed. The PDO COB-Id is by default setting derived from the Node-Id (Predefined Connection Set) but may be changed to application specific values by object PDO COB-Id 1800..1803 Sub-Index-1. DLC defines the length of the data field.

COB-Id	DLC	Data Frame Byte0		Byte7
180h + Node-Id	length	Data Frame max 8 Byte		

Transmission behaviour of TPDO-1, -2, -4 is configurable by object PDO Communication Parameter 1800, 1801, 1803 sub-indices -1, -2, -3 and -5.

Transmission type example for TPDO-1	COB-Id 1800-1	Transmission Type 1800-2	Inhibit Time 1800-3	Event Timer [ms] 1800-5
Cyclic Asynchronous		FEh	1 .. 07FFFh	1 .. 07FFFh
Change of State		FEh	1 .. 07FFFh	0
Synchronous		N = 1 .. 240		-
Disable TPDO **Enable TPDO**	80 00 xx xx 00 00 xx xx	-		-

Transmission type «cyclic asynchronous» triggers TPDO-transmission periodically with a time period defined by the event timer.

Transmission type «change of state» will be enabled If the event timer is set to «0». This will trigger TPDO-transmission on change of the position value where «Inhibit time» defines a minimum time delay between consecutive TPDOs.

In «synch mode» a TPDO is transmitted on reception of a number of one or multiple SYNC commands.

Enable or disable a TPDO by setting Bit 31 of the COB-Id ‘0’ resp. ‘1’ (Default: «0» Enabled).

Object Dictionary Communication Profile CiA 301

Object	Index [hex]	Sub-index	Access	Type	Default	Value Range / Note
Device type	1000	0	ro	U32	80196h	encoder profile ‚406‘
Error register	1001	0	ro	U8	0	
COB-ID-Sync	1005	0	rw	U32	80	
Manufacturer device name	1008	0	ro	String	-	
Manufacturer hardware version	1009	0	ro	String	-	
Manufacturer software version	100A	0	ro	String	-	
Guard time	100C	0	rw	U16	0	0 .. 7FFFh
Life time factor	100D	0	rw	U8	0	0 .. FFh
Save Settings	1010	1	w	U32	-	„save“ (65766173h)
Load Manufacturer Settings	1011	1	w	U32	-	„load“ (64616F6Ch)*
COB-ID-EMCY	1014	0	ro	U32	FFh	NodeID+80h
Producer heartbeat time	1017	0	rw	U16	0	0 .. 7FFFh
Idendity Object VendorID	1018	1	ro	U32	252h	
Idendity Object Product Code		2	ro	U32	-	
Idendity Object Revision number		3	ro	U32	-	
Idendity Object Serial number		4	ro	U32	-	
COB-ID Server->Client	1200	1	ro	U32	67Fh	- SOD
COBID Client-> Sever	1200	2	ro	U32	5FFh	- SDO
PDO1 COB-ID	1800	1	rw	U32	1FFh	181h .. 1FFh
PDO1 Transmission-Type		2	rw	U8	FEh	0 .. FFh
PDO1 Inhibit time		3	rw	U16	0	0 .. 7FFFh
PDO1 Event timer		5	rw	U16	64h	0 .. 7FFFh
PDO2 COB-ID	1801	1	rw	U32	2FFh	281h .. 2FFh
PDO2 Transmission-Type		2	rw	U8	1	0 .. FFh
PDO2 Inhibit time		3	rw	U16	0	0 .. 7FFFh
PDO2 Event timer		5	rw	U16	0	0 .. 7FFFh
PDO4 COB-ID	1803	1	rw	U32	4FFh	381h .. 3FFh
PDO4 Transmission-Type		2	rw	U8	FEh	0 .. FFh
PDO4 Inhibit time		3	rw	U16	0	0 .. 7FFFh
PDO4 Event timer		5	rw	U16	0	0 .. 7FFFh
TPDO1-Mapped Object	1A00	1	ro	U32	60040020h	
TPDO2-Mapped Object	1A01	1	ro	U32	60040020h	
TPDO4-Mapped Object	1A03	1	ro	U32	63000108h	
NMT-Startup	1F80	0	rw	U32	0	0, 8

*) Reset to Manufacturer Default Setting, Bitrate und Node ID not affected

Device profile „Linear Encoder“ CiA 406
Single and dual redundant devices

Object	Index	Sub-Index	Access	Default	Value range / note
Manufacturer specific					
Node ID	2000	0	rw	127 *)	1...127
Bitrate	2010	0	rw	4 *)	0...4, 6
Hysteresis (change of state)	2040	0	rw	10	0 ... 1000
Termination resistor	2050	0	rw	0	0 (off) / 1 (on)
Filter	2102	0	r/w	1	1...255
Linear-Encoder CiA406					
Operating Parameters	6000	0	rw	0	Bit select
Total Measuring Range	6002	0	rw	-	Measuring range in 10 mm-Steps
Preset Value	6003	0	rw	0	
Position Value	6004	0	ro	-	
Measuring Step	6005	1	rw	10^3 nm	10^3 .. 10^6 nm
Cyclic Timer	6200	0	rw	100	10 ... 7FFFh
Profile SW Version	6507	0	ro		
Serial Number	650B	0	ro		
CAM CiA406					
Cam state register	6300	0	ro	0	
Cam enable register	6301	0	rw	0	
Cam polarity register	6302	0	rw	0	
Cam 1-8 low limit	6310.. 6317	1	rw	0	
Cam 1-8 high limit	6320.. 6327	1	rw	0	
Cam 1-8 hysteresis	6330.. 6337	1	rw	0	

*) For dual redundant devices: Always configure Baud-Rates to the same value and the Node-Ids to different values.

Operating Parameters (Object 6000)

15	..	..	..	4	3	2	1	0
-	-	-	-	-	md	sfc	-	-
msb								lsb

md = 0/1 Measuring direction in / out

sfc = 0/1 Scaling function disabled/enabled

Process Data Object (TPDO) Mapping

TPDO	COB-Id	DLC	Data Frame Byte0							Byte7
TPDO-01	180h +Node-Id	4	4 Byte Position Data							
			(LSB)	...	...	(MSB)				
TPDO-02	280h +Node-Id	4	4 Byte Position Data							
			(LSB)	...	...	(MSB)				
TPDO-04	480h +Node-Id	1	CAM State							

CAM State Data Format

8 Bit CAM State Register							
b7	b6	b5	b4	b3	b2	b1	b0
CAM 8	CAM 7	CAM 6	CAM 5	CAM 4	CAM 3	CAM 2	CAM 1

TPDO Default Settings

TPDO	Default COB-Id	Default Transmission Type
TPDO-01: Position Data, 4 Byte	1FFh	Event Timer 100ms (FE, T!=0)
TPDO-02: Position Data, 4 Byte	2FFh	Sync Mode
TPDO-04: CAM Status, 1 Byte	4FFh	Change of State Mode

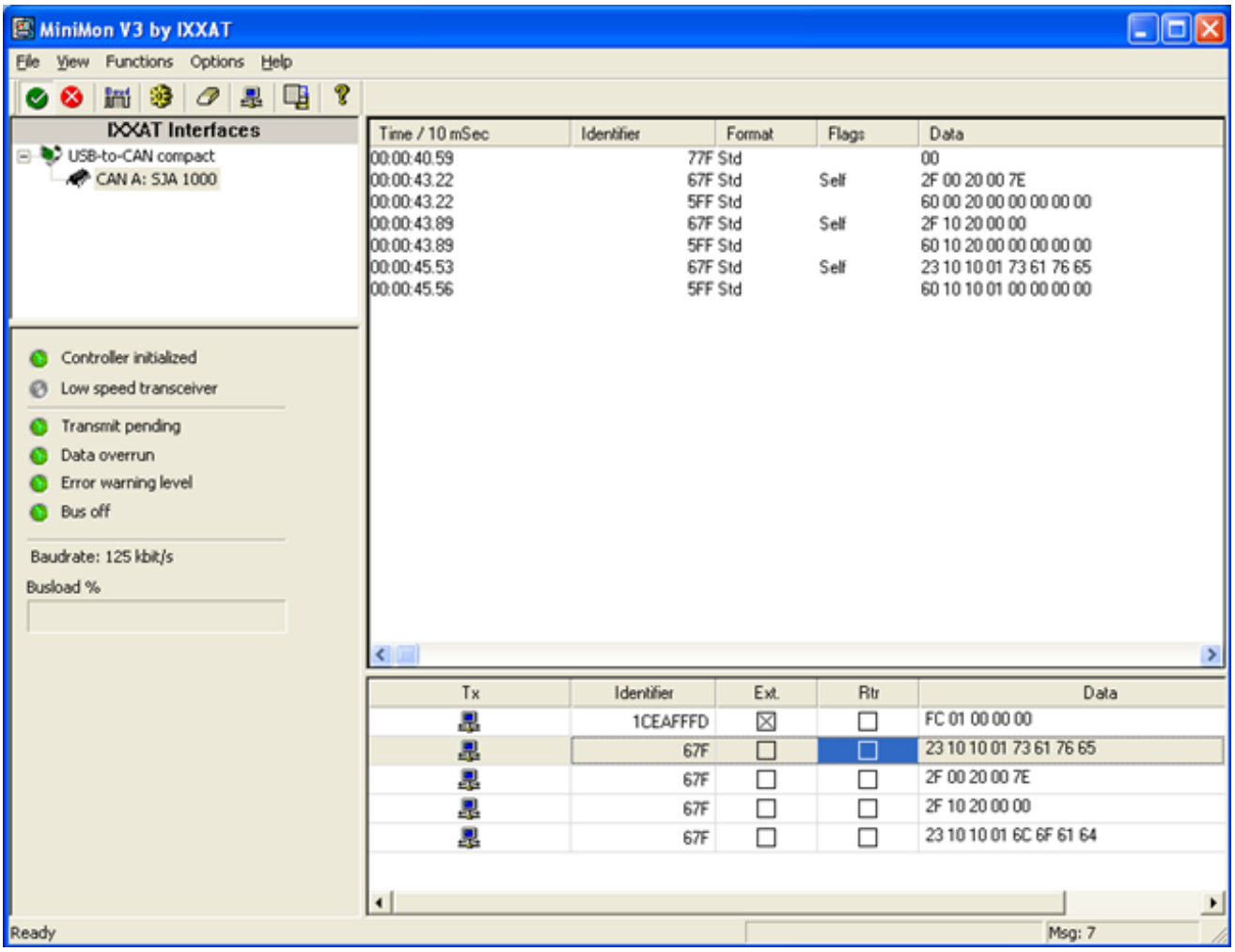
Baud Rate (Object 2010)

Baud Rate Index	Baud Rate [kbit/s]
0	1000
1	800
2	500
3	250
4	125
6	50

Examples

Example protocols are prepared using the IXXAT USB-to-CAN PC-Interface with CAN-Monitor „miniMon“ (IXXAT Automation GmbH, D-88250 Weingarten). These examples enable the user to configure and to run the CANopen slaves from a host PC without using a CANopen master ECU. The miniMon-screen has the configuration and status window at left side, a receive message window and a transmit message window below.

Configuration Example 1 - screenshot



Configuration Example 1 - detailed explanation

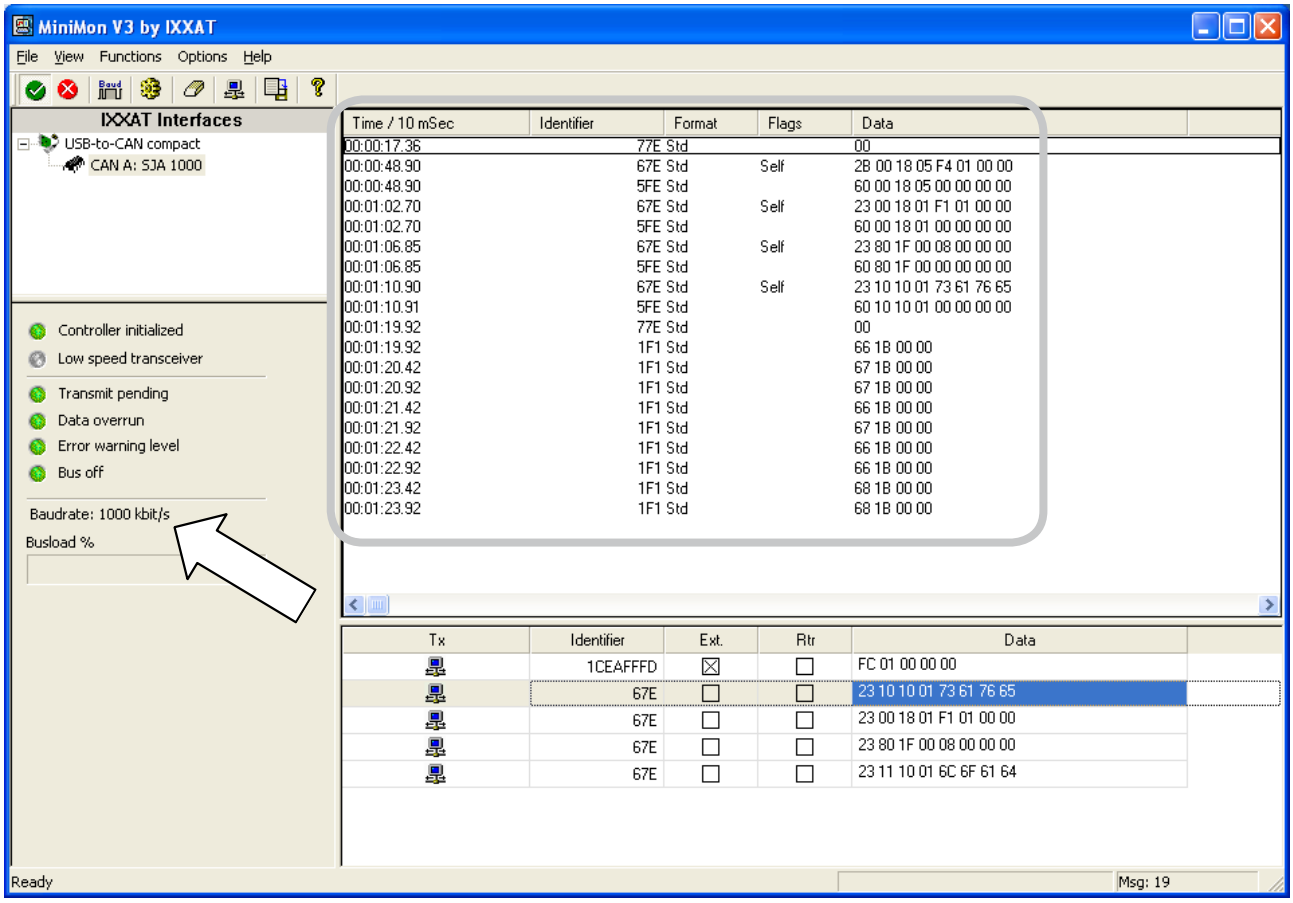
The example shows the Sensor responding on POWER ON with the Boot-Up message. By SDO message the node-Id and the baud rate will be changed to 7Eh and 1000kbit/s. Finally the host sends an SDO „SAVE“ to store the configuration nonvolatile.

Note: Changes of of node-Id and baud rate will become effective on next POWER ON sequence. So the SAVE command has to address the old SDO-COB-Id.

Screen Shot Explanation:

Time / 10 mSec	Identifier	Format	Flags	Data
00:00:40.59	*Boot-Up message*	77F Std		00
00:00:43.22	*Set node Id to 7E*	67F Std	Self	2F 00 20 00 7E
00:00:43.22	*Response*	5FF Std		60 00 20 00 00 00 00 00
00:00:43.89	*Set baud rate to 1000kbit/s*	67F Std	Self	2F 10 20 00 00
00:00:43.89	*Response*	5FF Std		60 10 20 00 00 00 00 00
00:00:45.53	*SAVE*	67F Std	Self	23 10 10 01 73 61 76 65
00:00:45.56	*Response*	5FF Std		60 10 10 01 00 00 00 00

Configuration Example 2 - screenshot



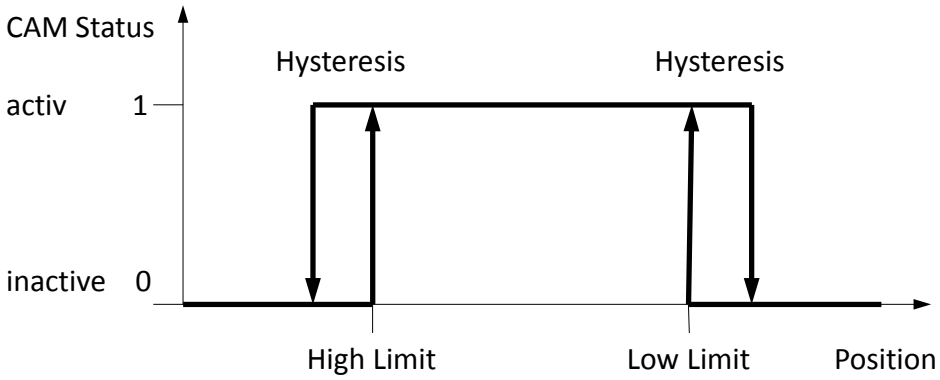
Configuration Example 2 - detailed explanation

The message window shows the slave responding on POWER ON with the Boot-Up message on new node-id 7Eh. Event timer of PDO1 is changed to 500ms and COB-Id of PDO1 is changed to 1F1h. Finally „Autostart“ is activated (automatic transition to operational) and the configuration stored nonvolatile with „SAVE“. On POWER OFF / POWER ON the slave starts sending PDOs asynchronously with the new COB-Id after the Boot-Up message.

Screenshot explanation:

Time / 10 mSec	Identifier	Format	Flags	Data
00:00:17.36	*Boot-Up Message*	77E Std		00
00:00:48.90	*Set PDO1 Event Timer 500*	67E Std	Self	2B 00 18 05 F4 01 00 00
00:00:48.90	*Response*	5FE Std		60 00 18 05 00 00 00 00
00:01:02.70	*Set PDO1 COB-Id to 1F1*	67E Std	Self	23 00 18 01 F1 01 00 00
00:01:02.70	*Response*	5FE Std		60 00 18 01 00 00 00 00
00:01:06.85	*Set Autostart*	67E Std	Self	23 80 1F 00 08 00 00 00
00:01:06.85	*Response*	5FE Std		60 80 1F 00 00 00 00 00
00:01:10.90	*SAVE*	67E Std	Self	23 10 10 01 73 61 76 65
00:01:10.91	*Response .. POWER OFF*	5FE Std		60 10 10 01 00 00 00 00
00:01:19.92	*Boot Up on POWER ON*	77E Std		00
00:01:19.92	*Cyclic PDO Transfer*	1F1 Std		66 1B 00 00
00:01:20.42	*on Power On*	1F1 Std		67 1B 00 00
00:01:20.92	*...*	1F1 Std		67 1B 00 00
00:01:21.42	*...*	1F1 Std		66 1B 00 00
00:01:21.92	*...*	1F1 Std		67 1B 00 00
00:01:22.42	*...*	1F1 Std		66 1B 00 00
00:01:22.92	*...*	1F1 Std		66 1B 00 00
00:01:23.42	*...*	1F1 Std		68 1B 00 00
00:01:23.92	*...*	1F1 Std		68 1B 00 00

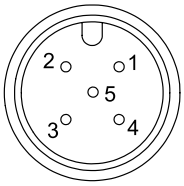
CAM function



Signal wiring / connection

Signal	Plug connection
Shield	1
Excitation +	2
GND	3
CAN-H	4
CAN-L	5

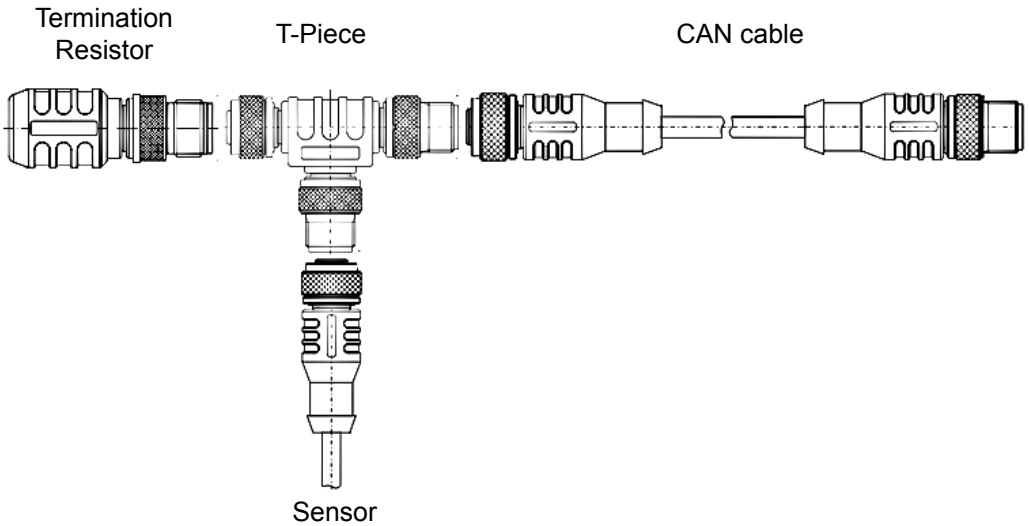
View to sensor connector



A-Coding

CAN bus wiring

Connect the device by a T-connector to the CAN trunk line. Total length of stubs should be minimized. Do not use single stub lines longer than 0.5 m. Connect terminating resistors 120 Ohm at both ends of the trunk line.



POSITAPE®
Output specification CAN SAE J1939

Description

Linear encoder according to standard SAE J1939. Customer configuration of operating parameters by Peer-to-Peer. Process data exchange by Broadcast message.

MCANJ1939 	CAN specification	ISO 11898, Basic and Full CAN 2.0 B
	Transceiver	24V-compliant, not isolated
	Communication profile	SAE J1939
	Baud rate	250 kBit/s
	Internal temination resistor	120 Ω user programmable
	Address	Default 247d, configurable

NAME Fields	Arbitrary address capable	1	Yes
	Industry group	0	Global
	Vehicle system	7Fh (127d)	Non specific
	Vehicle system instance	0	
	Function	FFh (255d)	Non specific
	Function instance	0	
	ECU instance	0	
	Manufacturer	145h (325d)	Manufacturer ID
	Identity number	0nnn	Serial number 21 bit

Parameter Group Numbers (PGN)	Configuration data	PGN EFddh	Proprietary-A (PDU1 peer-to-peer) dd Sensor Node ID
	Process data	PGN FFnnh	Proprietary-B (PDU2 broadcast); nn Group Extension (PS) configurable

Specifications	Excitation voltage	8 ... 36 V DC
	Excitation current	typ. 20 mA at 24 V DC typ. 40 mA at 12 V DC max. 80 mA
	Resolution	10 µm
	Measuring rate	1 kHz (asynchronous)
	Stability (temperature)	±50 x 10^{-6} / °C f.s.
	Repeatability	1 LSB
	Operating temperature	-40 ... +85 °C
	Protection	Reverse polarity, short circuit
	Dielectric strength	1 kV (V AC, 50 Hz, 1 min.)
	EMC Automation	EN 61326-1:2013

*) WB10, WB100M: -20 ... +85 °C

WARNING

Warning notice

- Changing the parameters can cause a sudden step of the instantaneous value and can result in unexpected machine (re)actions!
- Precautions to prevent danger for man or machine are necessary!
- Execute parametrizing at standstill of the machine only!

Setup

Node-ID
The default Node-ID the sensor will claim on power up is user or factory configurable. The user can configure by ”Commanded Address” service according to the J1939 standard or by Peer-to-Peer message as described below.

User configuration
User accessible parameters including node-id may be configured by peer-to-peer proprietary A message PGN 0EF00h. The parameters are accessed by byte-index and read/write operations coded in the data frame. The slave will return the data frame including the acknowledge code. Parameter values will be effective immediatly. On execution of ”Store Parameters” the configuration is saved nonvolatile.

Peer-to-peer message (PGN 0x00EF00), send/receive format

	PGN		8 Byte data frame							
	PGN_{HIGH}	PGN_{LOW} (Node-ID)	Index	Rd/Wr	0	Ack	4-Byte Data			
Request: Control Unit → Sensor										
→	0EFh	dd	i	0/1	0	0	LSB	..	..	MSB
Response: Control Unit ← Sensor										
←	0EFh	cc	i	0/1	0	a	LSB	..	..	MSB

a: Acknowledge codes:
0: Acknowledge, 81: Read only parameter, 82: Range overflow,
83: Range underflow, 84: Parameter does not exist
dd: Sensor Node-ID (Default 0F7h, 247d)
cc: Control-Unit Node-ID

Configuration examples

Example: Set Transmit Cycle to 10ms, Index 31, Node-ID 247d (F7h)

	PGN_{HIGH}	PGN_{LOW}	8 Byte data frame							
→	0EFh	F7h	1Fh	01h	00	00	0Ah	00	00	00
←	0EFh	cc	1Fh	01h	00	00	0Ah	00	00	00

Example: Read Transmit Cycle value, Index 31

→	0EFh	F7h	1Fh	00	00	00	00	00	00	00
←	0EFh	cc	1Fh	00	00	00	0Ah	00	00	00

Example: Store Parameters permanently, Index 28

→	0EFh	F7h	1Ch	01h	00	00	65h	76h	61h	73h
←	0EFh	cc	1Ch	01h	00	00	65h	76h	61h	73h

Reload factory defaults, Index 29

→	0EFh	F7h	1Dh	01h	00	00	64h	61h	6Fh	6Ch
←	0EFh	cc	1Dh	01h	00	00	64h	61h	6Fh	6Ch

Example: Broadcast (PGNLow = 0FFh - Reload factory defaults of all sensors, Index 29

→	0EFh	0FFh	1Dh	01h	00	00	64h	61h	6Fh	6Ch
←	0EFh	cc	1Dh	01h	00	00	64h	61h	6Fh	6Ch

Encoder - Parameters

Parameter	Index [dec]	Default	Range / Selection	Unit	Read / Write
Control					
Node ID	20	247	128 ... 247		rd/wr [1]
Baude rate	21	3 (250kB)	-		rd
Termination resistor	22	0	0/1 (off/on)		rd/wr [2]
Store parameters	28	-	”save” [3]		wr
Reload factory defaults	29	-	”load” [3]		wr [2]
Communication					
Transmit mode	30	0	0 timer 1 request 2 event		rd/wr
Transmit cycle	31	100	10 ... 65535	ms	rd/wr
PGN Group Extension	32	0	0 ... 255		rd/wr
Event mode hysteresis	38	0	0 ... 16383	steps	rd/wr
Process data byte order	39	0	0 little / 1 big endian		rd/wr
Measurement					
Code sequence	70	0	0 CW 1 CCW		rd/wr
Measuring step	73	100	10 ... 10000	µm	rd/wr
Preset	74	0	0 ... 2^{14} - 1	steps	rd/wr
Averaging filter	77	1	1 ... 255		rd/wr
Identification					
SW Version	198	-	4 bytes	number	rd
Serial number	199	-	4 bytes	number	rd
Identity number	200	-	21 bit	number	rd

[1] Write access to index 20 (change of node ID) is effective immediately and initiates address claiming
[2] Effective on next power-up
[3] „save“ MSB...LSB: 73h, 61h, 76h, 65h
„load“ MSB...LSB: 6Ch, 6Fh, 61h, 64h

Broadcast access by PGN_{Low} = 0FFh adresses the specified index of all sensors

Depending on configuration ordered default settings may be different, refer to ASM homepage.

Process data

Process data are transmitted by broadcast proprietary-B-Message PGN 0x00FFxx where the low byte is configurable.

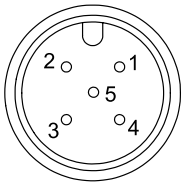
Data field of process data

B7	B6	B5	B4	B3	B2	B1	B0
Error				Position value			
Byte *)				MSB			LSB

*) Error codes: 0 = no error, 1 = error

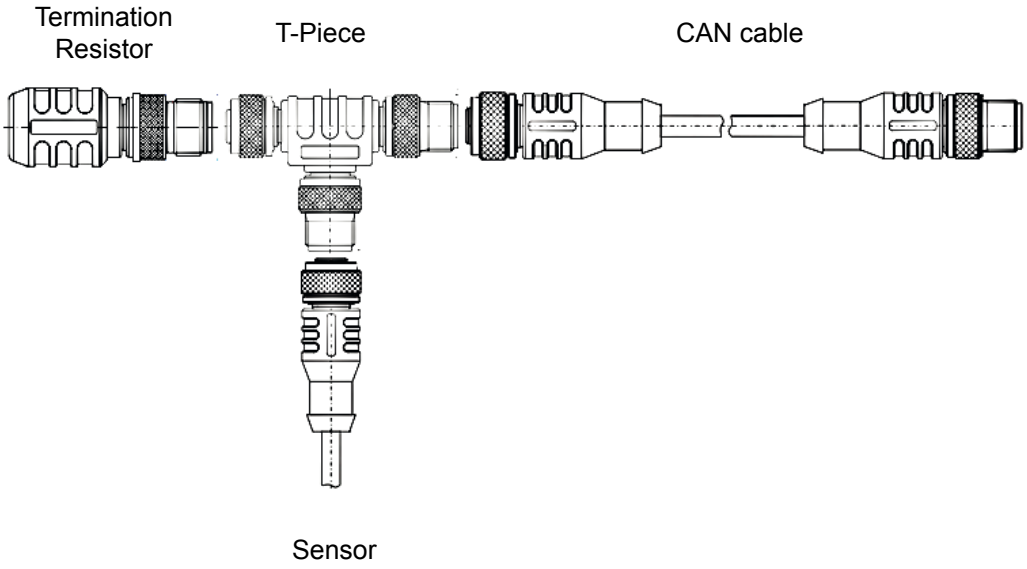
Signal wiring	Signal	Plug connection	Cable connection
	Shield	1	braid
	Excitation +	2	white
	GND	3	brown
	CAN-H	4	blue
	CAN-L	5	black

View to sensor connector



CAN Bus wiring

Connect the device by a T-connector to the CAN trunk line. Total length of stubs should be minimized. Do not use single stub lines longer than 0.5 m. Connect terminating resistors 120 Ohm at both ends of the trunk line.



Connector cable
M12, 4 pin

Suitable for 5-pin sensor connectors, shielded

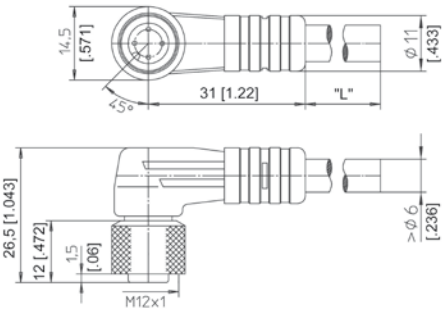
The 4-lead shielded cable is supplied with a mating 4-pin 90° M12 connector at one end and 4 wires at the other end. Available lengths are 2 m, 5 m and 10 m. Wire: cross sectional area 0.34 mm².

Order code:

KAB - XM - M12/4F/W - LITZE

IP69K: **KAB - XM - M12/4F/W/69K - LITZE**

Length in m



Connector cable
M12, 4 pin

Suitable for 5-pin sensor connectors, shielded

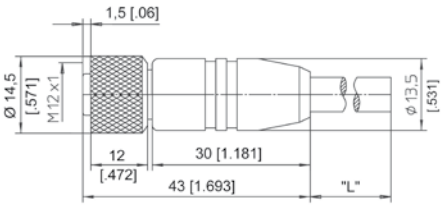
The 4-lead shielded cable is supplied with a mating 4-pin M12 connector at one end and 4 wires at the other end. Available lengths are 2 m, 5 m and 10 m. Wire: cross sectional area 0.34 mm².

Order code:

KAB - XM - M12/4F/G - LITZE

IP69K: **KAB - XM - M12/4F/G/69K - LITZE**

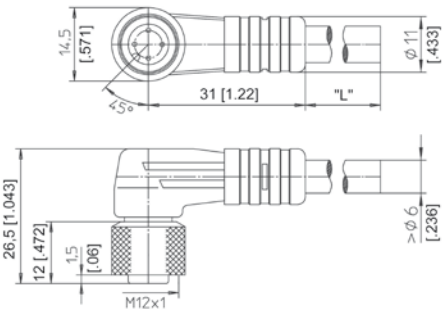
Length in m



Signal wiring M12, 4 pin	**Connector pin / cable color**			
	1	2	3	4
	brown	white	blue	black

Connector cable
M12, 5 pin,
shielded connector

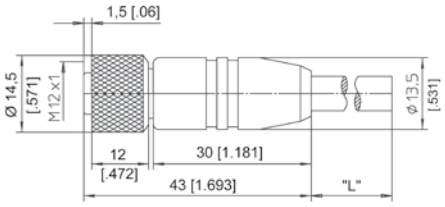
The 5-lead shielded cable is supplied with a mating 5-pin 90° M12 connector at one end and 5 wires at the other end. Available lengths are 2 m, 5 m and 10 m. Wire: cross sectional area 0.34 mm².
Order code:



KAB - XM - M12/5F/W - LITZE
IP69K: **KAB - XM - M12/5F/W/69K - LITZE**
Length in m

Connector cable
M12, 5 pin,
shielded connector

The 5-lead shielded cable is supplied with a mating 5-pin M12 connector at one end and 5 wires at the other end. Available lengths are 2 m, 5 m and 10 m. Wire: cross sectional area 0.34 mm².
Order code:



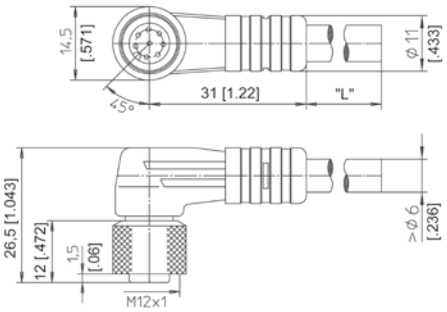
KAB - XM - M12/5F/G - LITZE
IP69K: **KAB - XM - M12/5F/G/69K - LITZE**
Length in m

Signal wiring M12, 5 pin	**Connector pin / cable color**				
	1	2	3	4	5
	brown	white	blue	black	grey

Connector cable
M12, 8 pin,
shielded connector

The 8-lead shielded cable is supplied with a mating 8-pin 90° M12 connector at one end and 8 wires at the other end. Available lengths are 2 m, 5 m and 10 m. Wire: cross sectional area 0.25 mm².
Order code:

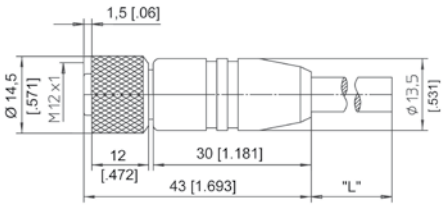
KAB - XM - M12/8F/W - LITZE
IP69: **KAB - XM - M12/8F/W/69K - LITZE**
Length in m



Connector cable
M12, 8 pin,
shielded connector

The 8-lead shielded cable is supplied with a mating 8-pin M12 connector at one end and 8 wires at the other end. Available lengths are 2 m, 5 m and 10 m. Wire: cross sectional area 0.25 mm².
Order code:

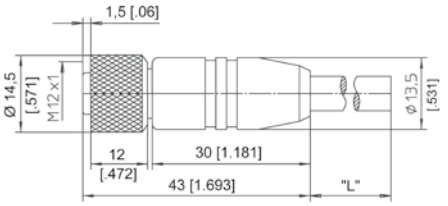
KAB - XM - M12/8F/G - LITZE
IP69: **KAB - XM - M12/8F/G/69K - LITZE**
Length in m



Signal wiring M12, 8 pin	**Connector pin / cable color**							
	1	2	3	4	5	6	7	8
	white	brown	green	yellow	grey	pink	blue	red

Connector/bus cable
M12, 5 pin
CAN bus,
shielded connector

The 5-lead shielded cable is supplied with a female 5-pin M12 connector at one end and a male 5-pin M12 connector at the other end. Available lengths are 0.3, 2, 5 and 10 m.



Order code:

KAB - XM - M12/5F/G - M12/5M/G - CAN

IP69: **KAB - XM - M12/5F/G/69K - M12/5M/G/69K - CAN**

Length in m

T-piece for bus cable
M12, 5 pin
CAN bus

Order code:

KAB - TCONN - M12/5M - 2M12/5F - CAN

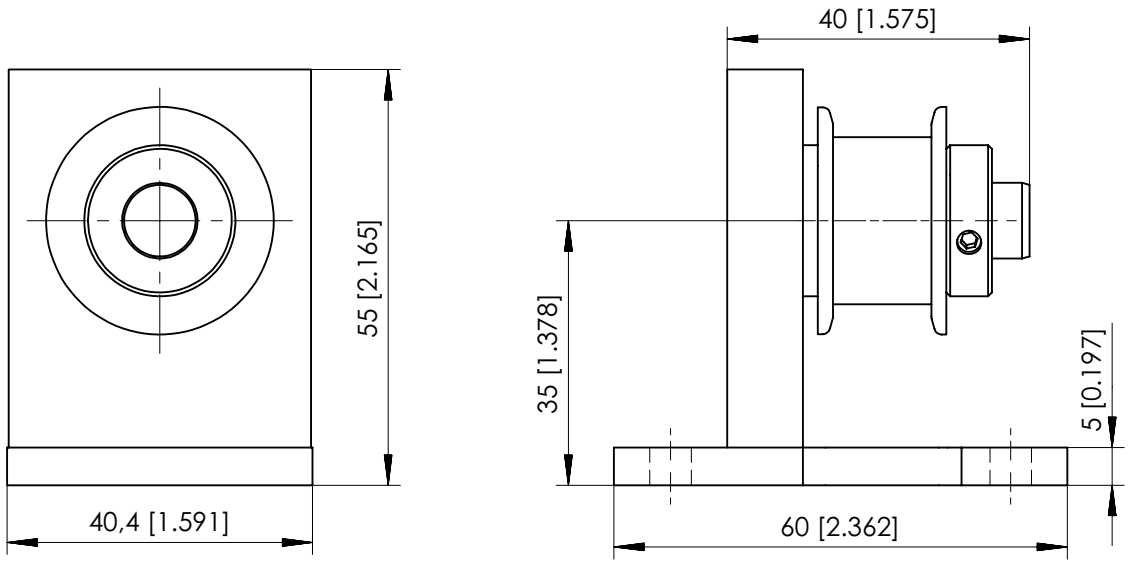
Terminating resistance
5 pin M12
CAN bus

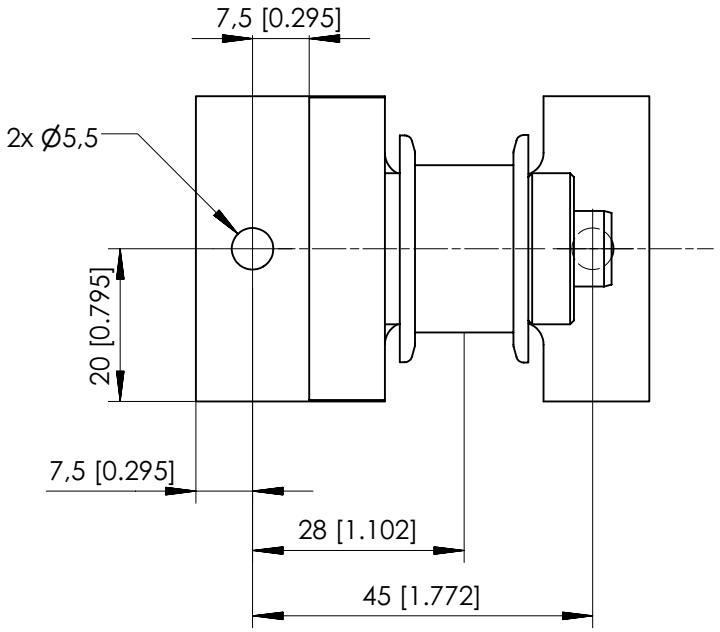
Order code:

KAB - RTERM - M12/5M/G - CAN

Tape pulley

Order code: **WBR1**





Dimensions in mm [inch].
Dimensions informative only.
For guaranteed dimensions consult factory.

POSITAPE®
Reliability Characteristics

Models	WB10, WB12, WB17KT, WB21, WB25KT, WB27KT, WB61, WB85, WB100M	
Outputs	**single-channel**	
	U2	Voltage output 0,5 ... 10 V
	U6, U8	Voltage output 0,5 ... 4,5 V
	I1	Current output 4 ... 20 mA
	MCANOP	CAN-BUS (CANopen)
	MCANJ1939	CAN-BUS (SAE J1939)
	MSSI	SSI output
	dual-channel	
	U2R	Voltage output 0,5 ... 10 V, redundant
	U6R, U8R	Voltage output 0,5 ... 4,5 V, redundant
	I1R	Current output 4 ... 20 mA, redundant
	MCANOPR	CAN-BUS, redundant (CANopen)
	MCANJ1939R	CAN-BUS, redundant (SAE J1939)

Characteristics	Device type	B
	Life period (electronics) $MTTF_d$	320 years / channel*)
	Probability of failure PFH (λ_{DU})	350 Fit / channel
	Life period (mechanics) B_{10}	$5*10^6$ cycles (draft)
	Probability of failure (mechanics) λ_{MECH}	$0,1 * C_h / B_{10}$ C_h = cycles per hour
	Working life	10 years
	Calibration intervall	annually
Operating conditions	Pull-out speed (max)	1 m/s
	Pull-in speed (max)	1 m/s
	Assembly	No deflection
Standards	Functional Safety	IEC 61508-1, -2, -6
	Safety of machinery	ISO 13849-1
	Failure rate of electronic components (Siemens)	SN 29500

*) = Reference Conditions: Reference Supply Voltage UB_{REF}= 24 V, Reference Temperature ϑ_{REF}= 60 °C

EU Declaration of Conformity

We: **ASM**
Automation Sensorik
Messtechnik GmbH
Am Bleichbach 18-24
85452 Moosinning / Germany

declare under our sole responsibility that the product

Model: **POSITAPE® Tape Position Sensor**

Type: **WB10, WB12, WB17KT, WB21, WB25KT, WB27KT, WB61, WB85**
WB100M

to which this declaration relates is in conformity with the following standards or other normative documents:

Directives: 2014/30/EU (EMC)

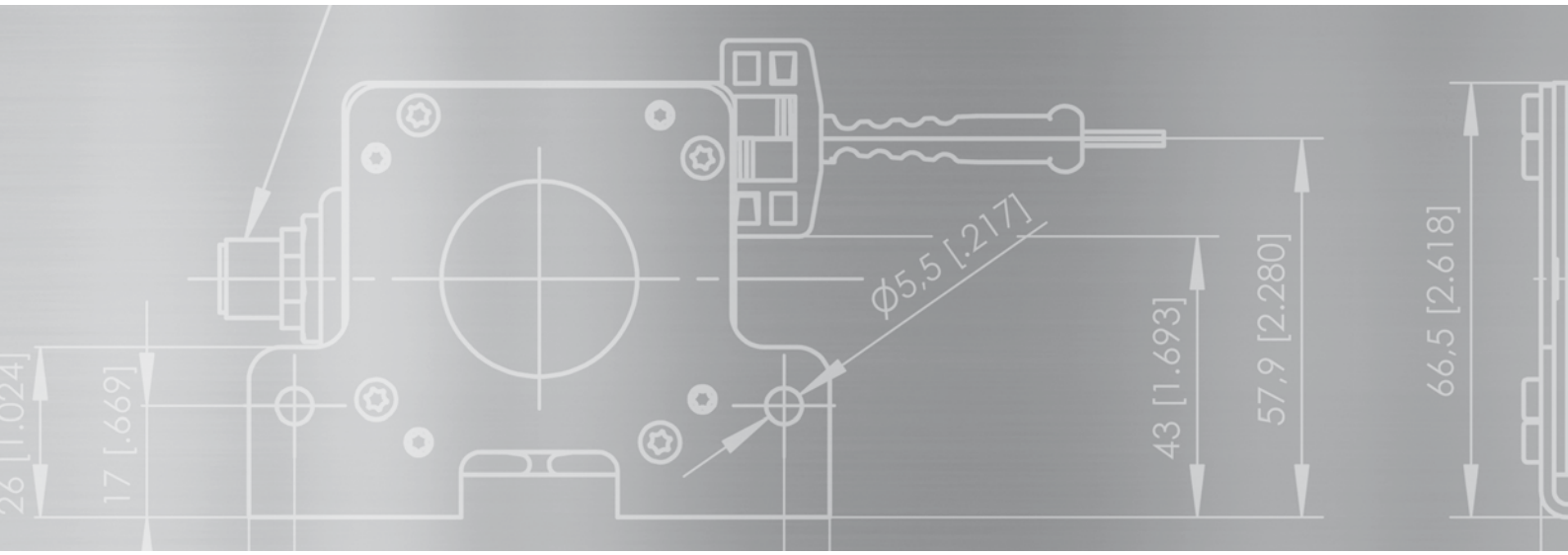
Standards: EN 61326-1:2013 (EMC)

Moosinning, 22nd February 2016

p.p. Peter Wirth
Head of Development

perfect in sensors.

www.asm-sensor.com
USA: www.asmsensors.com



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