

More Precision

wireSENSOR // Draw-wire displacement sensors



Low-cost draw-wire sensors

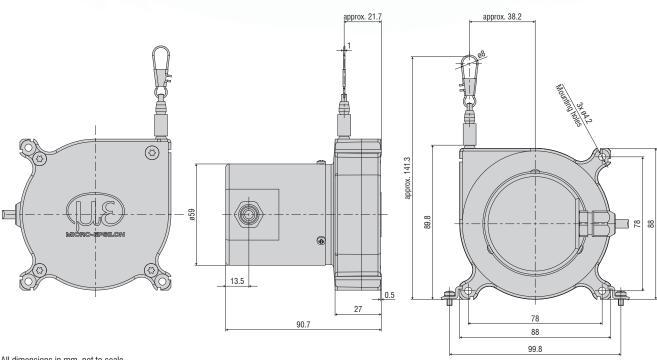
wire SENSOR MK88 analog

Robust plastic housing

Customer-specific designs

Potentiometer, current or voltage output

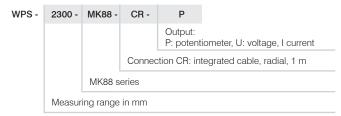




All dimensions in mm, not to scale

Model			WPS-2300-MK88	WPS-3500-MK88	WPS-5000-MK88	
Measuring range			2300 mm	3500 mm	5000 mm	
Analog outp	ut 1)			Potentiometer, current, voltage		
Resolution	Hybrid p	ootentiometer P10		towards infinity		
	Hybrid potentiometer P10	$\leq \pm 0.15\%$ FSO	≤ ±3.45 mm	-	-	
Linearity	Hybrid potentiometer P10	≤ ±0.3% FSO	-	≤ ±10.5 mm	-	
	Hybrid potentiometer P10	≤ ±0.4% FSO	-	-	≤ ±20 mm	
Sensor elem	nent			Hybrid potentiometer		
Wire extension	on force (max.)			approx. 9 N		
Wire retraction	on force (min.)		approx. 4 N			
Wire acceler	ration (max.)		approx. 7 g			
		Housing	Glass-fiber reinforced plastic (PA 6 GF30)			
Material		Protection cap	Glass-fiber reinforced plastic (PBT GF20)			
		Measuring wire	Polyamide-coated stainless steel (ø 0.45 mm)			
Wire mounting	ng		Wire clip			
Installation			Mounting holes or mounting grooves on the sensor housing			
Temperature	range	Storage	-20 +80 °C			
Temperature range Operation		-20 +80 °C (on request -40 +85 °C)				
Connection			integrated cable, radial, length 1 m			
Shock (DIN EN 60068-2-27)			50 g / 10 ms in 3 axes, 2 directions and 1000 shocks each			
Vibration (DI	N EN 60068-2-6)		20 g / 20 \dots 2000 Hz in 3 axes and 10 cycles each			
Protection cl	lass (DIN EN 60529)		IP65 (on request IP67)			
Weight			approx. 400 - 430 g (incl. cable)			

Article designation



FSO = Full Scale Output

1) Specifications for analog outputs from page 58 onwards.

Low-cost draw-wire sensors

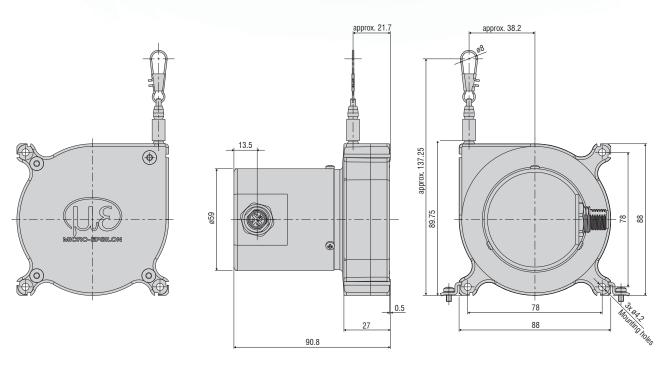
wire SENSOR MK88 digital

Robust plastic housing

Customer-specific designs

CANopen Interface

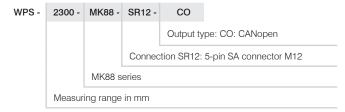




All dimensions in mm, not to scale

Model		WPS-3500-MK88	WPS-5000-MK88		
	2300 mm	3500 mm	5000 mm		
		CANopen			
	0.56 mm	0.85 mm	1.22 mm		
$0 \le \pm 0.15\% FSO$	≤ ±3.45 mm	-	-		
$0 \leq \pm 0.3\% \text{ FSO}$	-	≤ ±10.5 mm	-		
$0 \leq \pm 0.4\% \text{ FSO}$	-	-	≤ ±20 mm		
		Hybrid potentiometer			
		approx. 9 N			
	approx. 4 N				
Wire acceleration (max.)		approx. 7 g			
Housing	Glass-fiber reinforced plastic (PA 6 GF30)				
Protection cap	Glass-fiber reinforced plastic (PBT GF20)				
Measuring wire	Polyamide-coated stainless steel (ø 0.45 mm)				
	Wire clip				
	Mounting holes or mounting grooves on the sensor housing				
Storage	-20 +80 °C				
Operation	-20 +80 °C (on request -40 +85 °C)				
Connection		5-pole M12x1 connector, radial			
Shock (DIN EN 60068-2-27)		50 g / 10 ms in 3 axes, 2 directions and 1000 shocks each			
Vibration (DIN EN 60068-2-6)		20 g / 20 2000 Hz in 3 axes and 10 cycles each			
Protection class (DIN EN 60529)		IP65 (on request IP67) 2)			
	approx. 400 - 430 g (incl. cable)				
	0 ≤ ±0.3% FSO 0 ≤ ±0.4% FSO Housing Protection cap Measuring wire Storage	0.56 mm 0 ≤ ±0.15% FSO ≤ ±3.45 mm 0 ≤ ±0.3% FSO - 0 ≤ ±0.4% FSO - Housing Gi Protection cap Gi Measuring wire Poly Mounting h Storage Operation -20	2300 mm CANopen 0.56 mm 0.85 mm 0 ≤ ±0.15% FSO ≤ ±3.45 mm -		

Article designation



FSO = Full Scale Output

1) Specifications for digital outputs from page 59 onwards.

2) With plug version only when connected

Options

wireSENSOR

Customer-specific modifications for your series application

If the standard models do not meet certain specific requirements, draw-wire sensors from the standard range can be adapted accordingly by Micro-Epsilon. Cost-effective implementation can already be achieved with medium-sized quantities (depending on the type and number of changes).

- Inverted signal

Redundant signal outputsAlignment cable/connector outlet

Measuring wire

- Plastics
- Stainless steel (coated/uncoated)
- Different diameters
- Thicker wire for improved snap protection



Wire attachment

- Wire clip
- Eyelet
- Thread
- Wire extension



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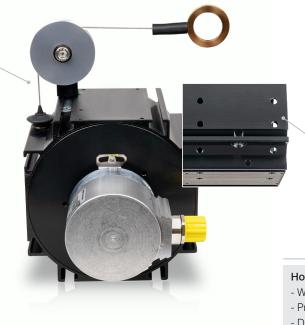


Sensor mounting

- Mounting bracket
- Mounting plate
- Magnetic holder

Wire guide

- Wire wiper
- Different designs of integrated deflection pulleys
- Wire outlet socket from ceramics for increased diagonal pull up to $15^{\circ}\,$



Housing and environment

- Wire outlet right (standard) / left
- Protection class up to IP69K
- Drainage holes
- Stainless steel spring
- Housing material
- Wire acceleration
- Snap protection

^{*} Some options cannot be combined with each other; availability of options on request

Accessories

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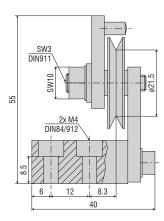
Wire deflection pulleys for external installation

TR1-WDS

Wire deflection pulley, adjustable, for sensors with a wire diameter ≤ 0.45 mm



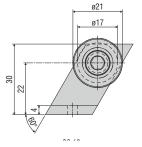
Set the distance so small that the wire cannot jump off!

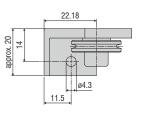


TR3-WDS

Wire deflection pulley, fixed, for sensors with a wire diameter $\leq 0.45 \ \text{mm}$



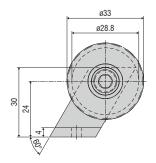


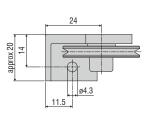


TR4-WD9

Wire deflection pulley, fixed, for sensors with a wire diameter of 0.8 mm to 1 mm





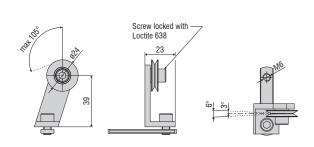


Wire deflection pulley for direct installation on the sensor housing

TR5-WDS

Integrated wire deflection pulley for P115 sensors with a wire diameter of 0.45 mm



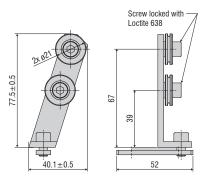


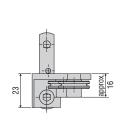
All dimensions in mm, not to scale

TR5-WDS(03)

Integrated double deflection pulley for P115 sensors with a wire diameter of 0.45 mm

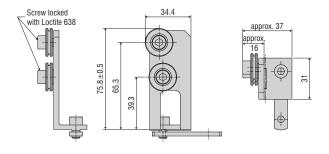






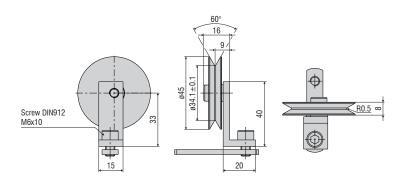
TR5-WDS(04)Integrated double deflection pulley, 90° angled, for P115 sensors with a wire diameter of 0.45 mm

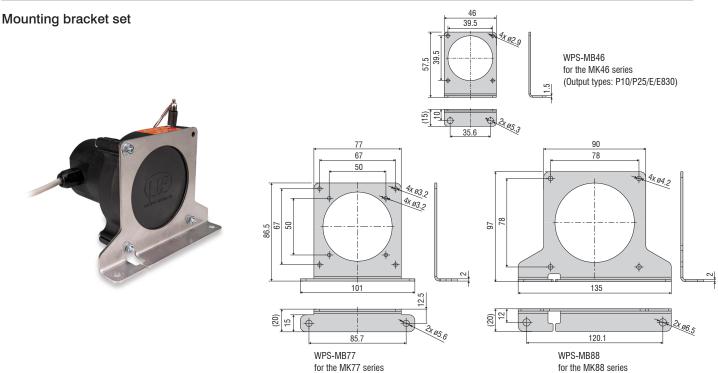




TR6-WDS(01)
Integrated wire deflection pulley for the P115 sensors with a wire diameter of 1 mm

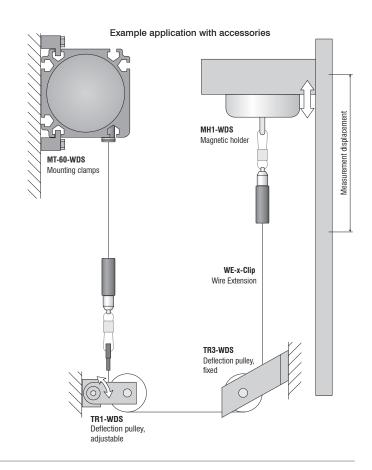






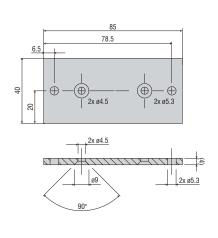
Accessories & Notes for installation wireSENSOR

Accessories	
WE-xxx-M4	Wire extension with M4 wire connection, x=wire length
WE-xxxx-Clip	Wire extension with eyelet, $x = wire length$
WE-xxx-Clip-WSS	Wire extension with clip and uncoated wire d=0.45 mm
WE-xxxx-Ring-PW	Wire extension with plastic ring and para-aramid wire, 1 mm
GK1-WDS	Fork head for M4
MH1-WDS	Magnetic holder for wire attachment
MH2-WDS	Magnetic holder for sensor mounting
MT-60-WDS	Mounting clamps for WDS-P60
FC8	Mating plug for WDS straight, 8-pin
FC8/90	Mating plug, 90° angled for WDS
PC3/8-WDS	Sensor cable, 3 m long, for WDS with 8-pin cable connector
WDS-MP60	Mounting plate for P60 models
WPS-MB46	Mounting bracket set for the MK46 series (output type: P10/P25/E/E830)
WPS-MB77	Mounting bracket set for the MK77 series
WPS-MB88	Mounting bracket set for the MK88 series
PC2/10-WDS-A	Cable for SSI encoder, 2 m long
PC10/10-WDS-A	Cable for SSI encoder, 10 m long
PC5/5-IWT	Sensor cable, 5 m long, M12x1 connector, 5-pin, A-coding



WDS-MP60 Mounting plate for P60 models



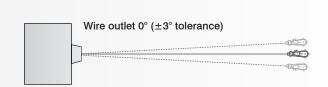


All dimensions in mm, not to scale

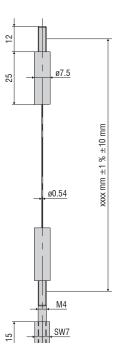
Installation instructions:

Wire attachment: during installation, do not allow at any time the measuring wire to freely return.

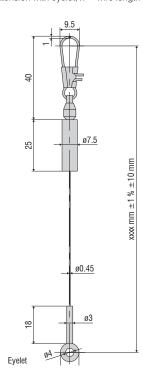
Angle of wire outlet: Make sure during installation that the wire outlet is straight (tolerance of $\pm 3^{\circ}$). Exceeding this tolerance leads to increased wear of the wire material and on the wire outlet.



WE-xxxx-M4Wire extension with M4 wire connection, x=wire length

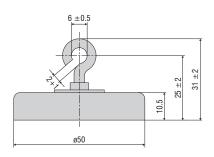


 $\label{eq:WE-xxxx-Clip} \mbox{Wire extension with eyelet, } \mbox{$x=$ wire length}$

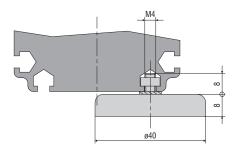


MH1-WDS

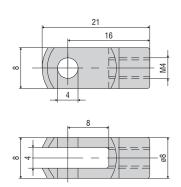
Magnetic holder for wire attachment



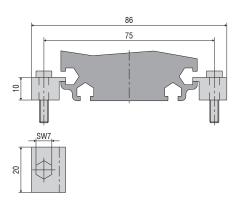
MH2-WDS Magnetic holder for sensor mounting



GK1-WDSFork head for M4



MT-60-WDS Mounting clamps for WDS-P60



Output specifications wireSENSOR

Analog

Output	Connector M16 -SA / -SR	Integrated cable -CA / -CR	Open contacts
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Potentiometer output (P)		12			
Input voltage Resistance Temperature coefficient	max. 32 VDC with 1 kOhm / max. 1 W 1 kOhm ±10 % (resistance divider) ±0.0025 % FSO/°C	5 4 3 8 1 7 6 Sensor side		2 - CW - 0	3881
		1 = Input + 2 = Ground 3 = Signal	White = Input + Brown = Ground Green = Signal	1 = Input + 2 = Signal 3 = Ground	② WIPER CCW ① — — — — 3 CW CLOCKWISE — —

Voltage output (U)	Voltage output (U)		
Supply voltage	14 27 VDC (non-stabilized)		
Current consumption	max. 30 mA	2	
Output voltage	0 10 VDC Option 0 5 / ±5 V	5 4	
Load resistance	>5 kOhm	7 6	
Output noise	0.5 mV _{eff}	Sensor side	
Temperature coefficient	±0.005 % FSO/°C		
Electromagnetic compatibility (EMC)	EN 61000-6-4 EN 61000-6-2		
Adjustment range (if supported by the model)		1 = Power supply	White = Supply
Zero	±20 % FSO	2 = Ground 3 = Signal	Brown = Ground Green = Signal
Sensitivity	±20 %	4 = Ground	Yellow = Ground

Current output (I)				
Supply voltage	14 27 VDC (non-stabilized)			
Current consumption	max. 35 mA			
Output current	4 20 mA	2		
Load	<600 Ohm	5 • 4		
Output noise	<1.6 μ A _{eff}	3		
Temperature coefficient	±0.01 % FSO/°C	7 6		
Electromagnetic compatibility (EMC)	EN 61000-6-4 EN 61000-6-2	Sensor side		
Adjustment range (if supported by the model)				
Zero	< ±18 % FSO	1 = Power supply	White = Supply	
Sensitivity	±15 %	2 = Ground	Brown = Ground	

CANopen

(for the MK88 and K100 series)

CANopen features		
Profiles	Communication profile CiA 301. Device profile CiA 406 (absolute linear encoder)	
SDO	1x SDO server	
PDO	2x TxPDO	
PDO modes	Event/time-triggered, synchronous (cyclic/acyclic)	
Preset value	The "Preset" parameter can be used to set the current measured value to any value. The difference from the original value is stored in the object.	
Direction	Via the operating parameter, the counting direction of the measured values can be reversed	
Diagnosis	Heartbeat, Emergency Message	
Default setting	AutoBaud(9), Node-ID 1	

Setting the baud rate		
Baud rate adjustable via LSS or object 0x3001		
0	1000 kBaud	
2	500 kBaud	
3	250 kBaud	
4	125 kBaud	
6	50 kBaud	
9	AutoBaud (default)	

Description of the connections		
Pin	Assignment	
1	n. c.	
2	V+ (732VDC)	
3	GND	
4	CAN-High	
5	CAN-Low	



Setting the subscriber address (node ID)

Address adjustable via LSS or object 0x3000 (1....127, 1=default)

Output specifications

wireSENSOR

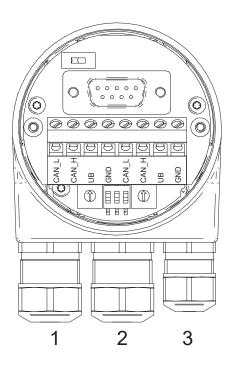
CANopen

(for P60, P96, P115 and P200 series)



Setting the CANopen baud rate					
Baud rate	DIP switch setting				
Daud Tale	1	2	3		
10 kBit/s	OFF	OFF	OFF		
20 kBit/s	OFF	OFF	ON		
50 kBit/s	OFF	ON	OFF		
125 kBit/s	OFF	ON	ON		
250 kBit/s	ON	OFF	OFF (factory settings)		
500 kBit/s	ON	OFF	ON		
800 kBit/s	ON	ON	OFF		
1 MBit/s	ON	ON	ON		

If Node-ID 00 is set, the baud rate can be programmed via the CAN bus.



Description of the CANopen connections		
GND	Ground connection for UB	
UB	Operating voltage	
CAN_H	CAN bus signal (dominant High)	
CAN_L	CAN bus signal (dominant Low)	

Max. core cross-section	
Single-wire (rigid)	1.5 mm 2
Fine-wired (flexible)	1.0 mm2
Fine-wired (flexible)	With ferrule 0.75 mm2
Fine-wired (flexible)	With ferrule 0.75 mm2
Cable diameter	

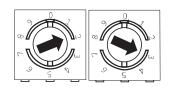
Cable diameter	
Cable gland 1,2	ø810 mm (-40+85 °C) ø59 mm (-25+85 °C)
Cable gland 3	Ø4.56 mm (-40+85 °C) Ø36 mm (-25+85 °C)

Tightening torque

Terminal block/screw terminal max. 0.4 Nm (recommended tightening torque 0.3 Nm)

Settings of the CANopen participant address

Address can be set with rotary switch. Example: Participant address 23



SSI (Gray Code)

Pin assignment Flange socket M23, 12-pin, pin contacts, CW (assignment according to option 3252)

PIN	Assignment
1	+Vs
2	0 V
3	Clock+
4	Data+
5	SET
6	Data-
7	Clock-
8	-
9	DIR
10	-
11	-
12	-

Connections	
SET	Zero setting input For setting a zero point at any point. The zeroing process is triggered by a High pulse and must take place after the rotating direction selection (DIR). Pulse duration > 100 ms. For maximum interference immunity, connect to 0 V after zeroing.
DIR	Counting direction input When not connected, this input is on High. DIR High means increasing output data with a clockwise rotating shaft when looking at the flange. DIR Low means increasing values with a counterclockwise rotating shaft when looking at the flange. For maximum interference immunity, connect to +Vs or 0 V depending on the direction of rotation.



Switching level		
SSI switch		
SSI clock	RS422 with terminating resistance 120 Ω	
SSI data	RS422	
Control inputs of input circuit		
Input level High	>0.7 UB	
Input level Low	<0.3 UB	

Output specifications

wireSENSOR

PROFIBUS

Profibus DP features	
Bus protocol	Profibus-DPV0
Device profile	Device class 1 and 2
Cyclical data exchange	Communication in accordance with DPV0
Input data	Position value Additional configurable speed signal
Output data	Preset value
Preset value	This parameter can be used to set the rotary encoder to a desired position value that corresponds to a defined axis position of the system. The storage is non-volatile.
Rotary direction	This parameter can be used to parameterize the direction of rotation in which the position value should rise or fall.
Scaling	Parameterization of the steps per rotation and the total resolution.
Gear factor	Adjustable via counter / denominator
Diagnosis	Position and parameter errors Monitoring multi-turn scanning Readable hour meter

	Terminal	
Termination resistor		Participant address
1	2	3
	Cable gland	

Cable: 1, 2 = \emptyset 8 - 10 mm (-40 - 85 °C) / \emptyset 5 - 9 mm (-25 - 85 °C) Cable: 3 = \emptyset 4.5 - 6 mm (-40 - 85 °C) / \emptyset 3 - 6 mm (-25 - 85 °C)

Pin assignment		
+Vs	Operating voltage 830 VDC	
0 V	Ground connection related to +Vs	
А	Negative data line	
В	Positive data line	

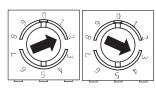
Terminals with the same designation are internally connected and functionally identical These internal terminal connections Vs-Vs / 0V-0V may be loaded with max. 1 A each

Terminator



Both ON = last participant Both OFF = participant X Default setting OFF

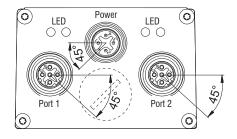
Participant address



Adjustable via rotary switch Example: Participant address 23 Default setting. 00

PROFINET

PROFINET features		
Bus protocol	PROFINET IO	
Device profile	Encoder Profile PNO 3.162 V4.1 and V3.1 PROFIdrive Profil PNO 3.172 V4.1	
Real-time classes	Realtime (RT) Class 1, IRT Class 3	
Transmission frequency	RT: 1 ms, 2 ms, 4 ms IRT: 250 \(\mu \text{s}, 500 \(\mu \text{s}, 1 \text{ ms}, 2 \text{ ms}, 4 \text{ ms} \)	
Update time	Min. 500 µs	
Product features	- 100 MBaud Fast Ethernet - Device replacement without removable media - Media redundancy protocol MRP - Gear factor / round axis	
Process data	 Position value 32-Bit input data with/without rotational speed 16 or 32 Bit Telegram 81-83 of the PROFIdrive profile 	
LED status display	Link/Activity, Status, Error	



Pin Assignment		
Operating voltage		
Pin	Connection	Description
1	UB	Operating voltage
2	n.c.	Do not connect
3	GND	Ground connection
4	n.c.	Do not connect



1x flange connector M12 (pin), A-coded

PROFINET (data line)		
Pin	Connection	Description
1	TxD+	Transmitted data+
2	RxD+	Received data+
3	TxD-	Transmitted data-
4	RxD-	Received data-

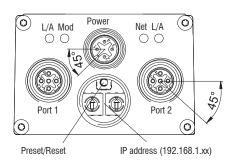


2x flange connector M12 (socket), D-coded

Output specifications wireSENSOR

EtherNet/IP

EtherNet/IP characteristics		
Bus protocol	EtherNet/IP	
Device profile	CIP Nov 2016, 22 _{hex} Encoder	
Cycle time	1 ms	
Product features	- Gear factor (round axis) and continuous operation - Plausibility test of adjustable parameters - Comprehensive diagnosis function - Adress Conflict Detection - Device Level Ring - Several simultaneous IO connections	
LED status display	2x Link/Activity, module status, network status	



Pin Assignment		
Operating voltage		
Pin	Connection	Description
1	UB	Operating voltage
2	d.c.	Do not connect
3	GND	Ground connection
4	d.c.	Do not connect



1x flange connector M12 (pin), A-coded

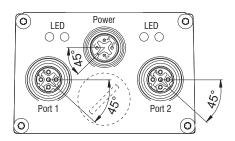
EtherNet/IP (data line)		
Pin	Connection	Description
1	TxD+	Transmitted data+
2	RxD+	Received data+
3	TxD-	Transmitted data-
4	RxD-	Received data-



2x flange connector M12 (socket), D-coded

EtherCAT

EtherCAT characteristics		
Bus protocol	EtherCAT	
Device profile	Encoder profile CANopen® CiA 406 Vers. 4.0.2 dated August 18, 2016	
Operating modes	Free Run, synchronous with SM3 Event, DC Mode (Distributed Clocks)	
Cycle time	Min. 62.5 μs	
Product features	- Gear factor (round axis) and continuous operation - Time stamp (time of position data acquisition) - Plausibility check of adjustable parameters - Comprehensive diagnosis function - Preset gauge for position - File Access over EtherCAT (FoE)	
Process data	 Position value 32-Bit input data with/without rotational speed 32 Bit Comprehensive process data mapping 	
LED status display	2x Link/Activity, RUN, ERR	



Pin Assignment		
Operating voltage		
Pin	Connection	Description
1	UB	Operating voltage
2	n.c.	Do not connect
3	GND	Ground connection
4	n.c.	Do not connect



1x flange connector M12 (pin), A-coded

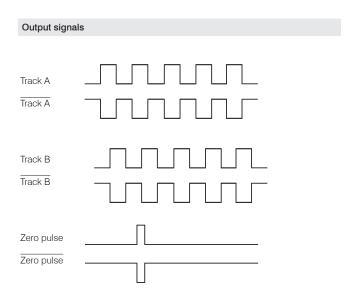
EtherCAT (data line)		
Pin	Connection	Description
1	TxD+	Transmitted data+
2	RxD+	Received data+
3	TxD-	Transmitted data-
4	RxD-	Received data-



2x flange connector M12 (socket), D-coded

Output specifications wireSENSOR

Incremental encoder



TTL Output	Line driver (5 VDC)
High level	≥ 2.5 V
Low level	≤ 0.5 V
High load	≤ 20 mA
Tracks	$A, \overline{A}, B, \overline{B}, 0$

Output TTL01/ TTL02	NPN (5 VDC ±5 %)
High level	> 4.5 V
Low level	< 1.0 V
High load	≤ 3 mA
Tracks (TTL01)	A, B, 0
Tracks (TTL02)	A, \overline{A} , B, \overline{B} , 0

Output HTL	Push-pull (10 30 VDC)
High level	≥ V+ -3 V
Low level	≤ 1.5 V
High load	≤ 40 mA
Tracks	A, \overline{A} , B, \overline{B} , O

Output E	Push-pull (5 VDC)
High level	≥ V+ -2.5 V
Low level	≤ 0.5 V
High load	≤ 50 mA
Tracks	A, B, 0

Output E830	Push-pull (8 30 VDC)
High level	≥ V+ -3 V
Low level	≤ 2.5 V
High load	≤ 50 mA
Tracks	A, B, 0

Pin assignment TTL, HTL		
Connector	Cable color	Assignment
Pin 1	pink	B-
Pin 2	-	-
Pin 3	blue	R+
Pin 4	red	R-
Pin 5	green	A+
Pin 6	yellow	A-
Pin 7	-	-
Pin 8	gray	B+
Pin 9	-	-
Pin 10	white	GND
Pin 11	-	-
Pin 12	brown	UB

Pin assignment E, E830		
Cable color	Assignment	
white	0 V	
brown	V+	
green	A	
-	Ā	
yellow	В	
-	B	
gray	0	

Pin assignment TTL01	
Cable color	Assignment
brown	0 V
gray	V+
white	Α
green	В
yellow	0

Pin assignment TTL02	
Cable color	Assignment
red	V+
black	0 V
brown	A
black	Ā
orange	В
black	B
yellow	0
black	n. c.

Sensors and Systems from Micro-Epsilon



Sensors and systems for displacement, distance and position



Sensors and measurement devices for non-contact temperature measurement



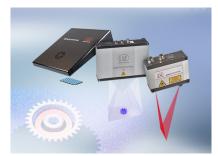
Measuring and inspection systems for metal strips, plastics and rubber



Optical micrometers and fiber optics, measuring and test amplifiers



Color recognition sensors, LED analyzers and inline color spectrometers



3D measurement technology for dimensional testing and surface inspection