MICRO-EPSILON

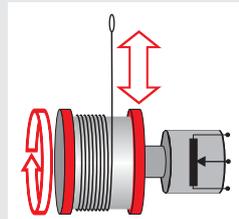# More Precision.

wireSENSOR
Draw wire sensors / CET / String pots

wireSENSOR
# Analog series P60 / P96

Best seller - most economic model
**Very robust sensor housing**
Easy and flexible mounting

Universal analog sensors for industrial applications

The analog series P60 and P96 are for general purpose use. Numerous options enable a suitable sensor to be selected for almost any application. Mounting grooves on four sides of the housing facilitate quick and flexible mounting. Various types of signal outputs and an optimized size make this series suitable for a wide range of applications, also in harsh environments.

The series has an attractive price/performance ratio based on state of the art technology.
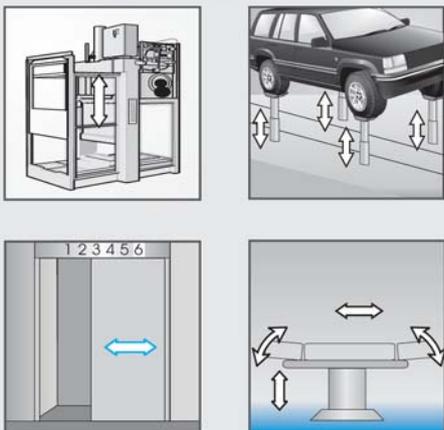
Model P60-P *(P60-U/I)*
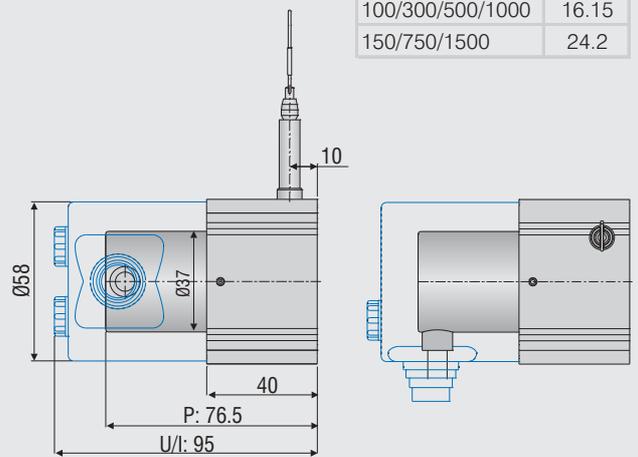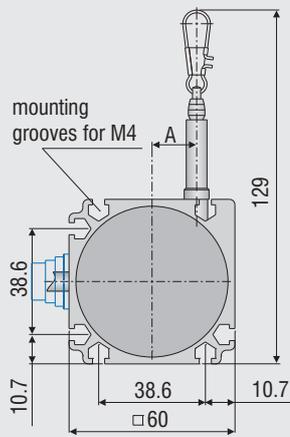
Measuring range	A
100/300/500/1000	16.15
150/750/1500	24.2

Model P96-P *(P96-U/I)*
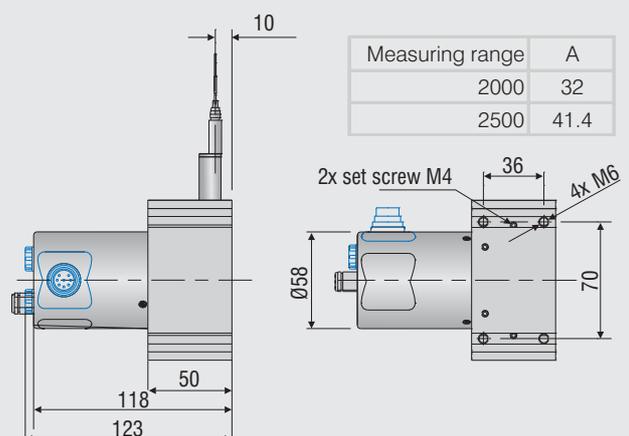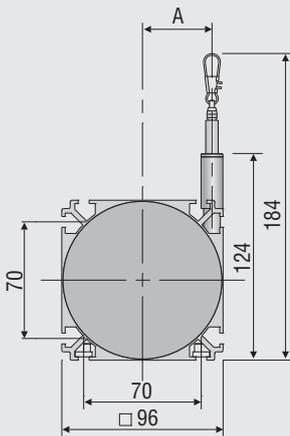
Measuring range	A
2000	32
2500	41.4

Dimensions in mm, not to scale. Please ask for detailed reference drawings.

		WDS-100-P60	WDS-150-P60	WDS-300-P60	WDS-500-P60	WDS-750-P60	WDS-1000-P60	WDS-1500-P60	WDS-2000-P96	WDS-2500-P96
Output						P/U/I				
Measuring range	mm	100	150	300	500	750	1000	1500	2000	2500
Linearity	±0.1 % FSO ±mm	-	-	-	0.5	0.75	1	1.5	2.0	2.5
	±0.25 % FSO ±mm	-	-	0.75	-	-	-	-	-	-
	±0.5 % FSO ±mm	0.5	0.75	-	-	-	-	-	-	-
Resolution	mm	0.1	0.15	0.2			quasi infinite			
Sensor element			wire-wound				hybrid-potentiometer			
Temperature range						-20 ... +80 °C				
Material	housing					aluminum				
	draw wire		coated polyamid stainless steel (ø 0.45 mm)							ø 0.8 mm	
Sensor mounting			mounting grooves in the housing							slot nuts	
Wire mounting						wire clip				
Wire acceleration			appr. 10 - 15 g (dependent upon measuring range)							8 g	
Wire retraction force (min)	N	6.5	4.5	6	6	4	5	3.5	7.5	5.5
Wire extension force (max)	N	7.5	5.5	7.5	7.5	5.5	7.5	5.5	11	9
Protection class	DIN EN 60529					IP 65 (only if connected)				
Vibration	IEC 68-2-6					20 g, 20 Hz - 2kHz				
Mechanical shock	IEC 68-2-27					50 g, 10 ms				
Electrical connection	output P		integral cable, radial, 1 m long							int. cable, axial, 1 m	
	output U/I					connector, radial, 8-pin, DIN45326				
Weight				appr. 370 g					appr. 1.1 kg		

FSO = Full Scale Output

Specifications for analog outputs on page 31.

Article description

WDS- *2500* - *P96* - *CA* - *P*

Output option
P: potentiometer (P60 only with connection CR)
P: potentiometer (P96 only with connection CA)
U: voltage (only with connection SR)
I: current (only with connection SR)

Connection SR: radial plug (incl. female connector)
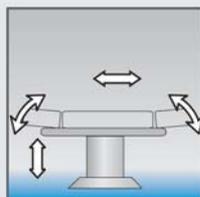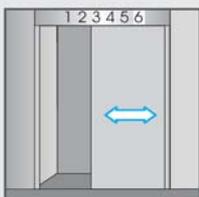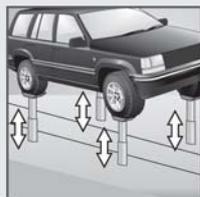CA: integral cable, axial, 1m
CR: integral cablel, radial, 1m

Model P60
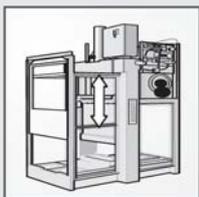P96

Measuring range in mm
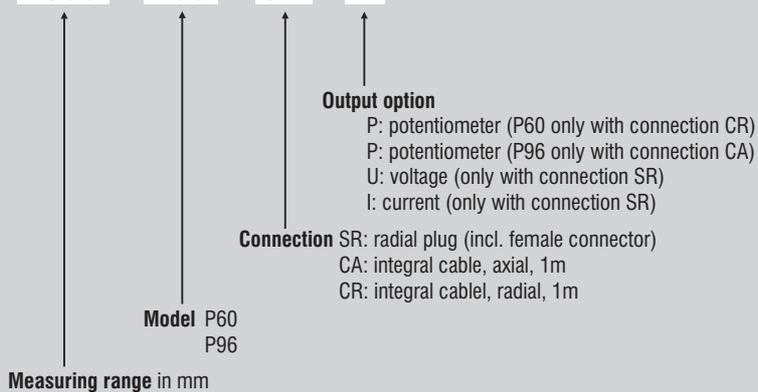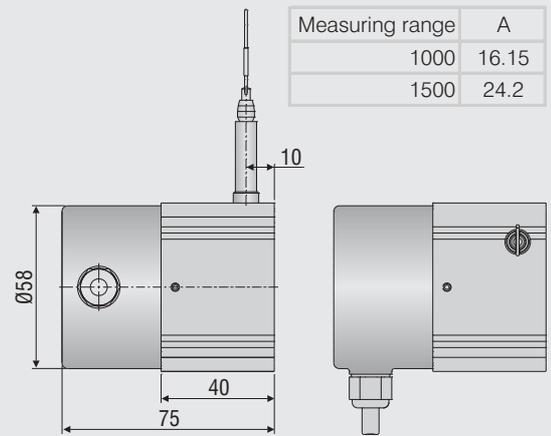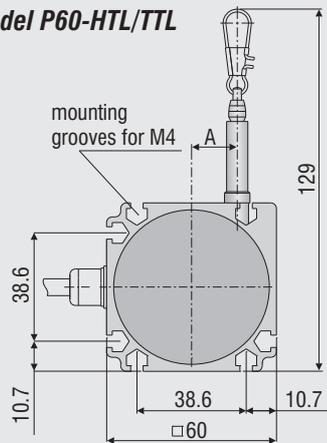
wireSENSOR
Digital series P60 / P96

Best seller - most economic model
Very robust sensor housing
Easy and flexible mounting

Universal digital sensors for industrial applications

The digital series P60 and P96 are for general purpose use. Numerous options enable a suitable sensor to be selected for almost any application. Mounting grooves on four sides of the housing facilitate quick and flexible mounting. The series has an attractive price/performance ratio based on state of the art technology. Various types of signal outputs and an optimized size make this series suitable for a wide range of applications, also in harsh environments.

Model P60-HTL/TTL

mounting grooves for M4

Measuring range	A
1000	16.15
1500	24.2

Model P96-HTL/TTL

Measuring range	A
2000	26
3000	41.4

2x slot nut
4x M6
2x set screw M4
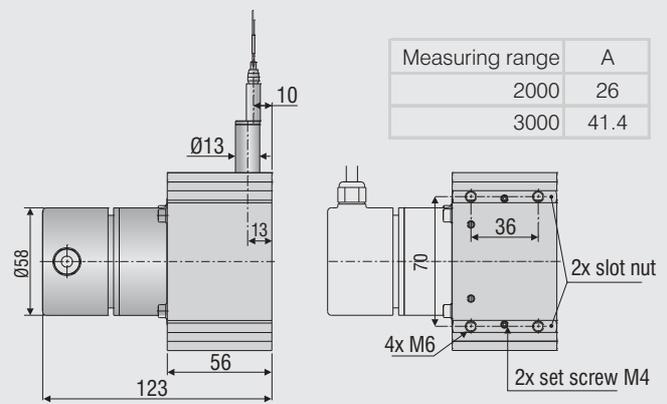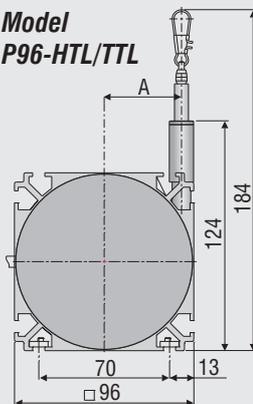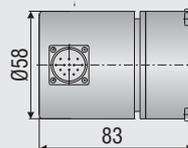
Model P96-SSI

Model P96-CO/PB

Dimensions in mm, not to scale. Please ask for detailed reference drawings.

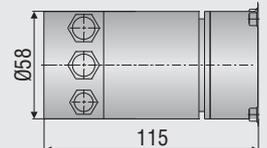|		WDS-1000-P60	WDS-1500-P60	WDS-3000-P96
Output		HTL, TTL		HTL, TTL, SSI, PB, CO
Measuring range		1000 mm	1500 mm	3000 mm
Linearity	±0.02 % FSO	±0.2 mm	±0.3 mm	±0.6 mm
Resolution	HTL, TTL	0.067 mm (15 pulses/mm)	0.1 mm (10 pulses/mm)	0.087 mm (11.53 pulses/mm)
Resolution	SSI, PB, CO	-	-	0.032 mm
Sensor element		incremental encoder		incremental-/absolute-encoder
Temperature range		-20 ... +80 °C		
Material	housing	aluminum		
	draw wire	coated polyamid stainless steel (ø 0.45 mm)		ø 0.8 mm
Sensormontage		mounting grooves in the housing		slot nuts
Wire mounting		wire clip		
Wire acceleration		10 g	15 g	7 g
Wire retraction force (min)		5 N	3.5 N	5.5 N
Wire extension force (max)		7.5 N	5.5 N	9 N
Protection class	DIN EN 60529	IP 65 (only if connected)		
Vibration	IEC 68-2-6	20 g, 20 Hz - 2 kHz		
Mechanical shock	IEC 68-2-27	50 g, 10 ms		
Electrical connection	output HTL, TTL	integral cable, radial, 1 m long		
	output SSI	connector, radial, 12-pin		
	output PB, CO	bus cover		
Weight		appr. 1 kg		appr. 1.7 kg

FSO = Full Scale Output

Article description

WDS- *3000* - *P96* - *CR* - *TTL*

Output option TTL
HTL
SSI (only P96)
CO: CANopen (only P96)
PB: Profibus DP (only P96)

Connection SR (only SSI): radial plug (incl. female connector)
CR (only HTL, TTL): integral cable, radial, 1m
BH (only CO, PB)

Model P60
P96

Measuring range in mm
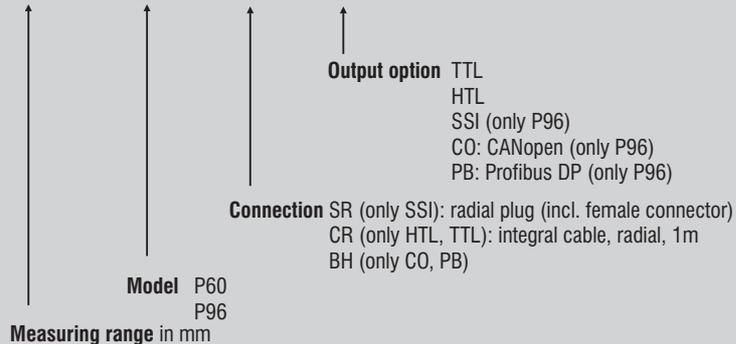
wireSENSOR
Accessories and mounting

WE-x-M4, WE-x-Clip Wire extension x=length

TR1-WDS Pulley wheel, adjustable

TR3-WDS Pulley wheel, fixed

GK1-WDS Attachment head for M4

MH1-WDS Magnetic holder for wire mounting

MH2-WDS Magnetic holder for sensor mounting
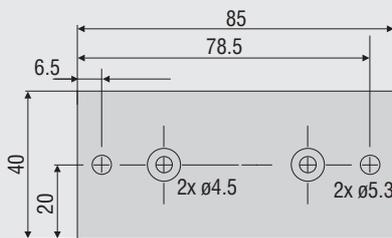
MT-60-WDS Mounting clamp for WDS-P60

FC8 Female connector for WDS, 8-pin

FC8/90 Female connector 90° for WDS, 8-pin

PC 3/8 Sensor cable, length 3 m

PS 2010 Power supply (chassis mounting 35 x 7.5 mm); input 120/230 VAC; output 24 VDC / 2.5 A; L/B/H 120 x 20 x 40 mm

WDS-MP60 Mounting plate for P60 sensors

Application example with accessories

MT-60-WDS
mounting clips

MH1-WDS
magnetic holder

measuring range

WE-x-Clip
wire extension

TR3-WDS
pulley wheel, fix

TR1-WDS
pulley wheel, adjustable

85
78.5
6.5
40
20
2x ø4.5
2x ø5.3

Mounting plate WDS-MP60
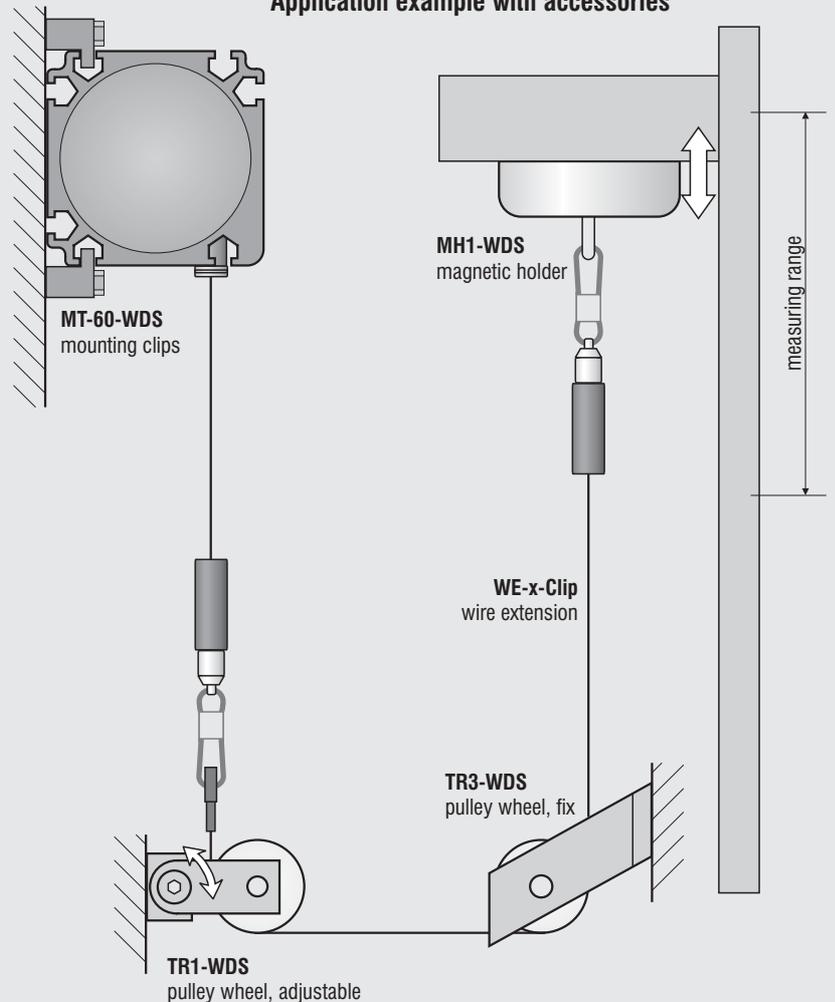
Installation information:

Wire attachment: The free return of the measurement wire is not permissible and it is essential that this is avoided during installation.

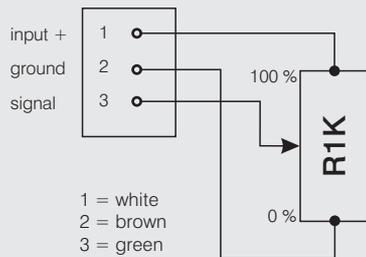### Wire exit angle:

When mounting a draw-wire displacement sensor, a straight wire exit (±3° tolerance) must be taken into account. If this tolerance is exceeded, increased material wear on the wire and at the wire aperture must be expected.

wire aperture 0° (±3° tolerance)
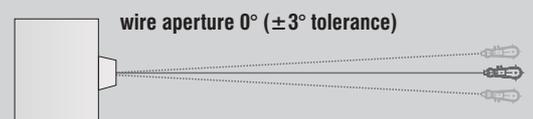
wireSENSOR
Electrical data analog

input + 1
ground   2   100 %
signal   3

1 = white
2 = brown   0 %
3 = green

R1K

Potentiometric output (P)	
Supply voltage	max. 32 VDC at 1 kOhm / 1 W max
Resistance	1 kOhm ±10 % (potentiometer)
Temperature coefficient	±0.0025 % FSO/°C
Sensitivity	depends on measuring range individually shown on test report

supply   1
ground   2   zero   gain
signal   3
ground   4
         5   U
         6
         7   0-10 Vdc
         8

Voltage output (U)	
Supply voltage	14 ... 27 VDC (non stabilized)
Current consumption	30 mA max
Output voltage	0 ... 10 VDC
	option 0 ... 5 / ±5 V
Load impendance	>5 kOhm
Signal noise	0.5 mV$_{eff}$
Temperature coefficient	±0.005 % FSO/°C
Electromagnetic compatibility (EMC)	EN 50081-2
	EN 50082-2
Adjustment ranges	
Zero	±20 % FSO
Sensitivity	±20 %

supply   1
ground   2   zero   gain
         3
         4   I
         5
         6
         7   4-20 mA
         8

Current Output (I)	
Supply voltage	14 ... 27 VDC (non stabilized)
Current consumption	35 mA max
Output current	4 ... 20 mA
Load	<600 Ohm
Signal noise	<1.6 μA_{eff}
Temperature coefficient	±0.01 % FSO/°C
Electromagnetic compatibility (EMC)	EN 50081-2
	EN 50082-2
Adjustment ranges	
Zero	±18 % FSO
Sensitivity	±15 %
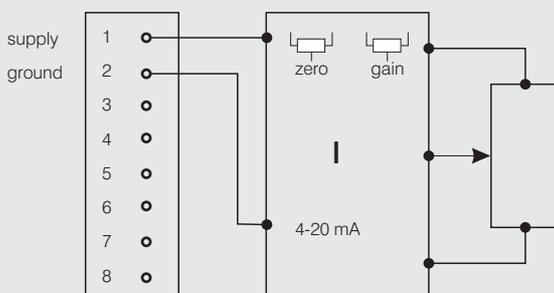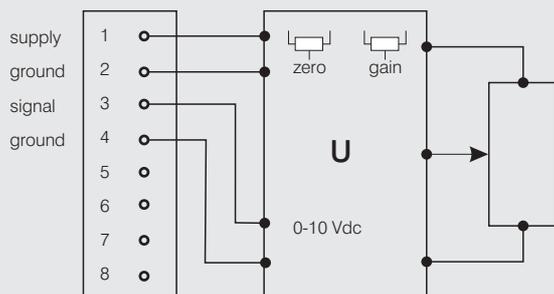
wireSENSOR
Absolute encoder output specifications: SSI

Contact description

1 UB	Encoder power supply connection.
2 GND	Encoder ground connection. The voltage drawn to GND is UB.
3 Pulse +	Positive SSI pulse input. Pulse + forms a current loop with pulse -. A current of approx. 7 mA in direction of Pulse + input generates a logical 1 in positive logic.
4 Data +	Positive, serial data output of the differential line driver. A High level at the output corresponds to logical 1 in positive logic.
5 ZERO	Zero setting input for setting a zero point at any desired point within the entire resolution. The zeroing process is triggered by a High pulse (pulse duration $\geq$100 ms) and must take place after the rotating direction selection (UP/DOWN). For maximum interference immunity, the input must be connected to GND after zeroing.
6 Data -	Negative, serial data output of the differential line driver. A High level at the output corresponds to logical 0 in positive logic.
7 Pulse -	Negative SSI pulse input. Pulse - forms a current loop with pulse +. A current of approx. 7 mA in direction of Pulse - input generates a logical 0 in positive logic.
8 / 10 $\overline{\text{DATAVALID}}$ $\overline{\text{DATAVALID}}$ $\overline{\text{MT}}$	Diagnosis outputs $\overline{\text{DV}}$ and $\overline{\text{DV}}$ $\overline{\text{MT}}$ Jumps in data word, e.g. due to defective LED or photoreceiver, are displayed via the $\overline{\text{DV}}$ output. In addition, the power supply of the multiturn sensor unit is monitored and the $\overline{\text{DV}}$ $\overline{\text{MT}}$ output is set when a specified voltage level is dropped below. Both outputs are Low-active, i.e. are switched through to GND in the case of an error.
UP/DOWN	UP/DOWN counting direction input. When not connected, this input is on High. UP/$\overline{\text{DOWN}}$-High means increasing output data with a clockwise shaft rotating direction when looking at the flange. UP/$\overline{\text{DOWN}}$-Low means increasing values with a counter-clockwise shaft rotating direction when looking at the flange.
11 / 12	Not in use

Pin assignment

Pin	Cable color	Assignment
1	brown	UB
2	black	GND
3	blue	Pulse +
4	beige	Data +
5	green	ZERO
6	yellow	Data -
7	violet	Pulse -
8	brown/yellow	$\overline{\text{DATAVALID}}$
9	pink	UP/DOWN
10	black/yellow	$\overline{\text{DATAVALID}}$ $\overline{\text{MT}}$
11	-	-
12	-	-
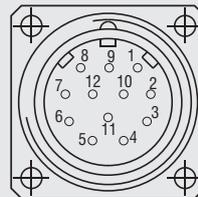
Please use leads twisted in pairs for extension cables.

Inputs

Control signals UP/DOWN and Zero

Level High	> 0.7 UB
Level Low	< 0.3 UB

Connection:	UP/DOWN input with 10 kohms to UB, zeroing input with 10 kohms to GND.

SSI pulse

Optocoupler inputs for electrical isolation

Outputs

SSI data	RS485 driver

Diagnostic outputs

Push-pull outputs are short-circuit-proof

Level High	> UB -3.5 V (with I = -20 mA)
Level Low	< 0.5 V (with I = 20 mA)

wireSENSOR
Absolute encoder output specifications: CANopen

CANopen features

Bus protocol	CANopen
Device profile	CANopen - CiA DSP 406, V 3.0
CANopen Features	Device Class 2, CAN 2.0B
Operating modes	Polling Mode (asynch, via SDO)
(with SDO progr.)	Cyclic Mode (asynch-cyclic) The encoder cyclically sends the current process actual value without a request by a master. The cycle time can be parameterized for values between 1 and 65535 ms. Synch Mode (synch-cyclic) The encoder sends the current actual process value after receiving a synch telegram sent by a master. The synch counter in the encoder can be parameterized so that the position value is not sent until after a defined number of synch telegrams.
	Acyclic Mode (synch-acyclic)
Preset value	With the "Preset" parameter the encoder can be set to a desired actual process value that corresponds to the defined axis position of the system. The offset value between the encoder zero point and the mechanical zero point of the system is saved in the encoder.
Rotating direction	With the operating parameter the rotating direction in which the output code is to increase or decrease can be parameterized. Scaling The steps per revolution and the total revolution can be parameterized.
Diagnosis	The encoder supports the following error messages:
	- Position and parameter error
	- Lithium cell voltage at lower limit (Multiturn)
Default setting	50 kbit/s, node number 0
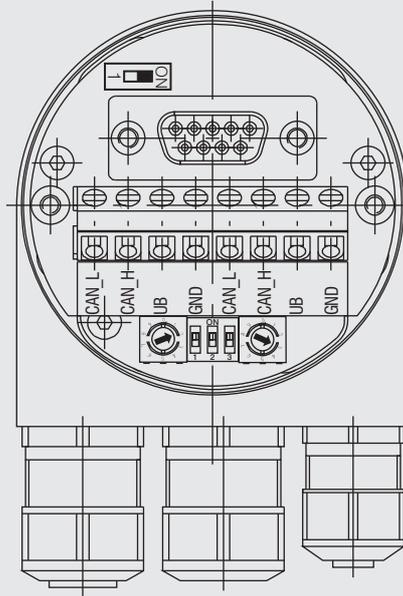
Setting of terminating Resistor for CANopen

ON = Last user
OFF = User X

Setting CANopen baud rate

Baud rate	Setting Dip Switch		
	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
500 kBit/s	ON	OFF	ON
800 kBit/s	ON	ON	OFF
1 MBit/s	ON	ON	ON

Contact description CANopen

CAN_L	CAN Bus Signal (dominant Low)
CAN_H	CAN Bus Signal (dominant High)
UB	Supply voltage 10...30 VDC
GND	Ground contact for UB
	(Terminals with the same designation are internally interconnected)

Settings of user address for CANopen

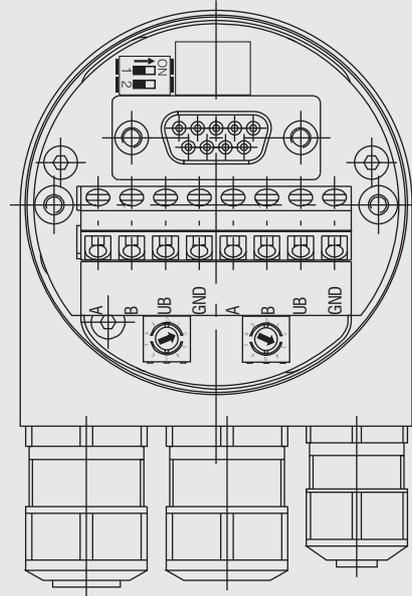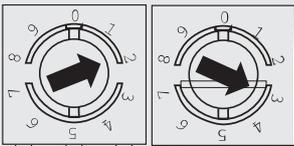Address can be set with rotary switch. Example: User address 23
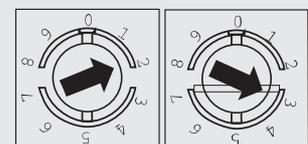
wireSENSOR
Absolute encoder output specifications: Profibus

Profibus-DP features

Bus protocol	Profibus-DP
Profibus features	Device Class 1 and 2
Data exch. functions	Input: Position value
	Additional parameterized speed signal (readout of the current rotary speed)
	Output: Preset value
Preset value	With the "Preset" parameter the encoder can be set to a desired actual value that corresponds to the defined axis position of the system.
Parameter functions	Rotating direction: With the operating parameter the rotating direction for which the output code is to increase or decrease can be parameterized.
Scaling:	The steps per revolution and the total revolution can be parameterized.
Diagnosis	The encoder supports the following error messages:
	- Position error
	- Lithium cell voltage at lower limit (Multiturn)
Default setting	User address 00

Settings of terminating resistors for Profibus-DP

ON = last user
OFF = user X

Settings of user address for Profibus-DP

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

Contact description Profibus-DP

A	A negative serial data line
B	Positive serial data line
UB	Supply voltage 10...30 VDC
GND	Ground contact for UB

(Terminals with the same designation are internally interconnected)

wireSENSOR
Output specifications Incremental-encoder

Signal output

A

$\overline{A}$

B

$\overline{B}$

O

$\overline{O}$

Pin assignment TTL, HTL

Pin	Cable color	Assignment
1	pink	B inv.
2	blue	UB Sense
3	red	N (reference pulse)
4	black	N inv. (reference pulse inv.)
5	brown	A
6	green	A inv.
7	-	-
8	grey	B
9	-	-
10	white/green	GND
11	white	GND Sense
12	brown/green	UB
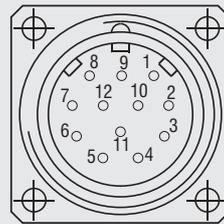
Pin 2 and Pin 12 are internally connected as well as Pin 11 and 10.

For cable length >10 m twisted pair wires are required.

Output TTL — Linedriver (5 VDC)

Level High	$\geq$ 2.5 V	(with I = -20 mA)
Level Low	$\leq$ 0.5 V	(with I = 20 mA)
Load High	$\leq$ 20 mA	
Output	A, $\overline{A}$, B, $\overline{B}$, O	

Output HTL — Push-pull (10 ... 30 VDC)

Level High	$\geq$ UB -3 V	(with I = -20 mA)
Level Low	$\leq$ 1.5 V	(with I = 20 mA)
Load	$\leq$ 40 mA	
Output	A, $\overline{A}$, B, $\overline{B}$, O	

Output E — Push-pull (5 VDC)

Level High	UB -2.5 V
Level Low	$\leq$ 0.5 V
Load	$\leq$ 50 mA
Output	A, B, O

Output E830 — Push-pull (8 ... 30 VDC)

Level High	UB -3 V
Level Low	$\leq$ 2.5 V
Load	$\leq$ 50 mA
Output	A, B, O

Connection assignment E, E830

Pin	Cable color	Assignment
-	white	0V
-	brown	+UB
-	green	A
-	-	$\overline{A}$
-	yellow	B
-	-	$\overline{B}$
-	grey	0

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for displacement, position and dimension

Sensors and measurement devices
for non-contact temperature measurement

Measurement systems
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