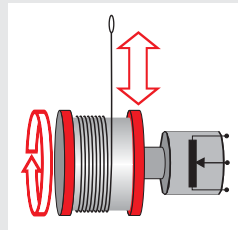**MICRO-EPSILON**

More Precision.

wireSENSOR
Draw wire sensors / CET / String pots

wireSENSOR
Draw-wire displacement and position sensors

Measuring ranges to 50,000mm
Resolution quasi infinite
Compact overall design
Easy mounting for any application
High reliability and long life cycle
Analog and digital outputs

Principle

Draw-wire displacement sensors measure linear movements using a highly flexible steel cable. The cable drum is attached to a sensor element which provides a proportional output signal. Measurements are performed with high accuracy and high dynamic response. The use of high quality components guarantees a long life cycle and high operational reliability.

MICRO-EPSILON offers a wide selection of draw-wire displacement sensors with numerous types of output signal. This means that each customer has the opportunity of selecting the best sensor for his application. Choose between analog and digital outputs to optimize your individual measurement task. OEM-solutions for customized integration possible.

wireSENSORs are application friendly due to the excellent measurement range to size ratio and the fact that they are easy to mount and use.

The rugged sensor construction ensures reliable operation even under difficult ambient conditions.

Sensor design WDS-P60

spring

sensor element

measuring wire and wire clip

wire drum

aluminum housing   ball bearing
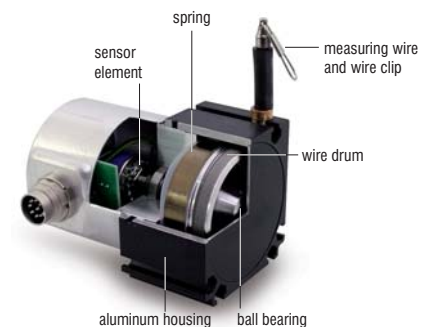
Typical applications

Miniature draw-wire sensors monitor the satellite release process from the Ariane booster rocket.
Picture: DaimlerChrysler Aerospace/Dornier GmbH

Customized string pots measure the lifting height on fork-lift trucks.
Picture: Still Wagner GmbH & Co. KG

Model	WPS-MK30 MK46	WPS-MK30 MK46	WPS-MK77	WPS-MK77	WPS-MK120	WDS-MPM	WDS-MP/MPW	WDS-P60/P96	WDS-P60/P96	WDS-P115	WDS-P115	WDS-P200	WDS-.....-M (mechanics)
Output	analog	digital	analog	digital	analog	analog	analog	analog	digital	analog	digital	digital	-
page	4-5	6-7	8-9	8-9	10-11	12-13	14-15	16-17	18-19	20-21	22-23	24-25	26-27
Measuring range													
50mm	•					•							
100mm							•	•					
150mm	•					•		•					
250mm	•					•							
300mm							•	•					
500mm	•	•					•	•					
750mm	•	•						•					
1000mm	•						•	•	•				
1250mm	•	•											
1500mm								•	•				•
2000mm			•	•				•					
2500mm								•					
3000mm					•				•	•			•
4000mm										•			
5000mm					•					•	•		•
7500mm					•					•			
10.000mm										•	•		•
15.000mm										•	•		•
30.000mm												•	•
40.000mm												•	•
50.000mm												•	•
Protection class	IP 20	IP 54	IP 20	IP 54	IP 65	IP 65	IP 65/67	IP 65	IP 65	IP 65	IP 65	IP 65	encoder specific
Analog output													
potentiometer (P)	•		•		•	•	•	•		•			
voltage (U)					•			•		•			
current (I)					•			•		•			
Digital output													
Incremental		•		•					•		•	•	
absolute									•		•	•	

Specifications for analog and digital outputs on page 31 continuing.

MK30 draw-wire displacement sensors measure the position of hospital beds.
Picture: Brumaba

P200 draw-wire displacement sensors determine the exact position of personnel elevators.
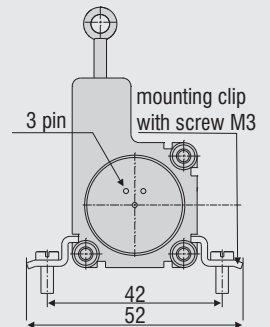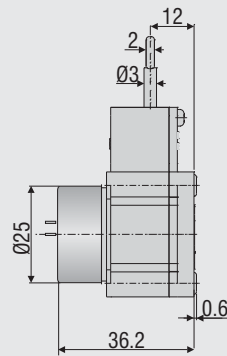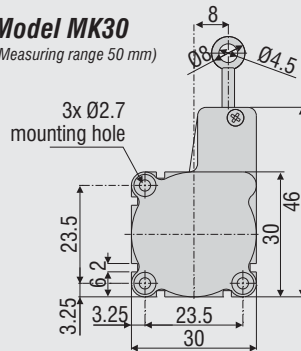Picture: Butz & Neumair Aufzugbau GmbH

04

wireSENSOR
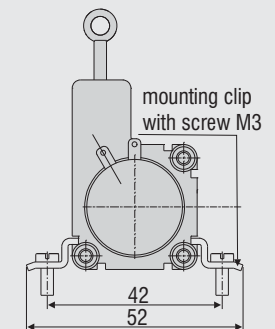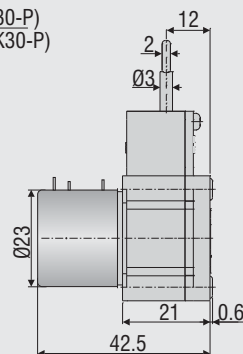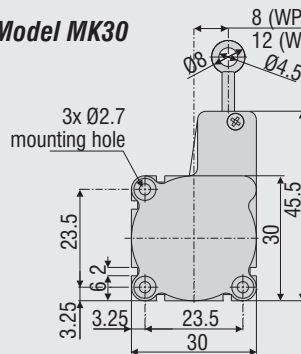## Analog series MK30 / MK46

Low cost high volume model
Customized versions
Smallest design in its class

Sensors of the WPS series are used in high volume applications. Due to the favorable price and the compact sensor size, new possibilities in machine design and cost optimization are available to the user. The wide range of models offers the best fit for individual and customized applications. Various measurement ranges, output interfaces and accuracy classes can be selected within this series.
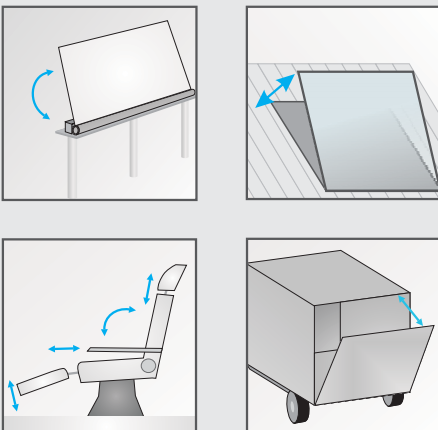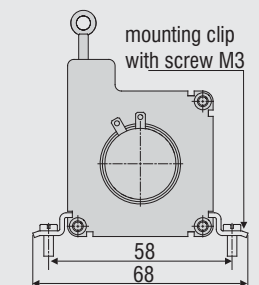
Model MK30
(Measuring range 50 mm)

3x Ø2.7 mounting hole

3 pin

mounting clip with screw M3

Model MK30

8 (WPS-500-MK30-P)
12 (WPS-750-MK30-P)

3x Ø2.7 mounting hole

mounting clip with screw M3

Model MK46

18 (WPS-1000-MK46-P)
20 (WPS-1250-MK46-P)

3x Ø2.7 mounting hole

mounting clip with screw M3
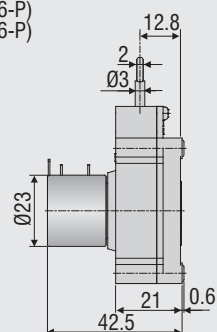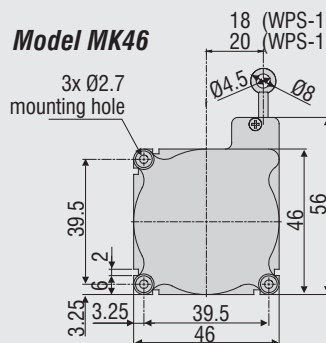
Model			WPS-50 MK30	WPS-150 MK30	WPS-250 MK30	WPS-500 MK30	WPS-750 MK30	WPS-1000 MK46	WPS-1250 MK46
Output						P			
Measuring range			50mm	150mm	250mm	500mm	750mm	1000mm	1250mm
Linearity	conductive plastic pot.	±0.5 % FSO	0.25mm	-	-	-	-	-	-
	wire pot.	±0.25 % FSO	-	-	0.625mm	1.25mm	1.87mm	2.5mm	3.12mm
	hybrid pot.	±0.25 % FSO	-	0.375mm	-	-	-	-	-
	hybrid pot.	±0.1 % FSO	-	-	0.25mm	0.5mm	0.75mm	1mm	1.2mm
Resolution	wire pot.		-	0.1mm	0.1mm	0.15mm	0.2mm	0.3mm	0.4mm
	conductive plastic pot./hybrid pot.		quasi infinite						
Sensor element			conductive plastic- / wire- / hybrid-potentiometer						
Temperature range			-20 ... +80 °C						
Material	housing		plastic						
	draw wire		coated polyamid stainless steel (ø 0.36mm)						
Wire mounting			eyelet						
Sensor mounting			mounting holes / mounting grooves						
Wire acceleration			appr. 5g						
Wire retraction force (min)			appr. 1 N						
Wire extension force (max)			appr. 2.5 N					1.6 N	1.5 N
Protection class DIN EN 60529	P		IP 20						
Electrical connection	P		soldering tag						
Weight	P		appr. 45g					appr. 80g	

FSO = Full Scale Output

Specifications for analog outputs on page 31.

Article description

WPS- 1000 - MK46 - CR - P25
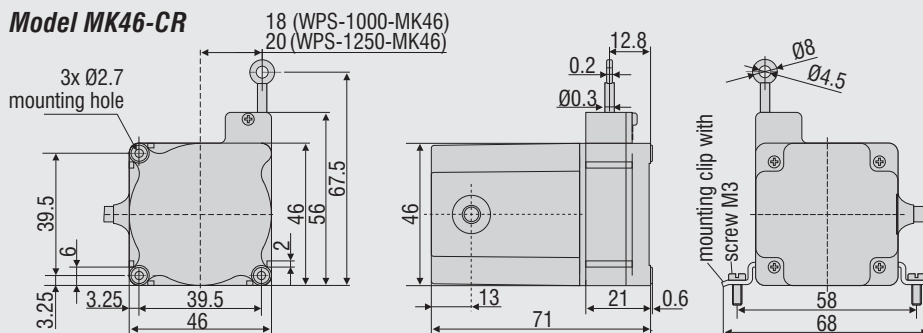
Output option potentiometer P50 (linearity ±0.5 % FSO)
potentiometer P25 (linearity ±0.25 % FSO)
potentiometer P10 (linearity ±0.1 % FSO)

Connection CR only possible for MK46 (optional):
integral cable, radial, 1m

Model MK30
MK46

Measuring range in mm

Model MK46-CR

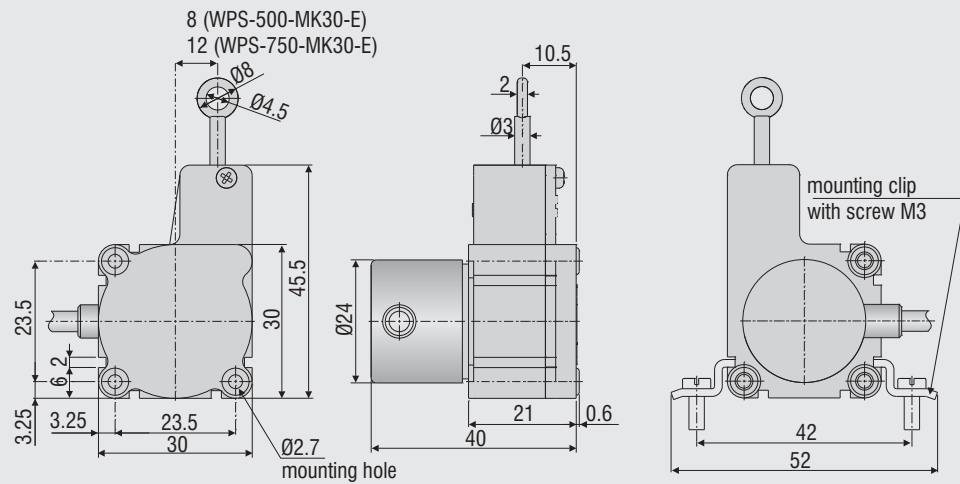Dimensions in mm, not to scale. Please ask for detailed reference drawings.
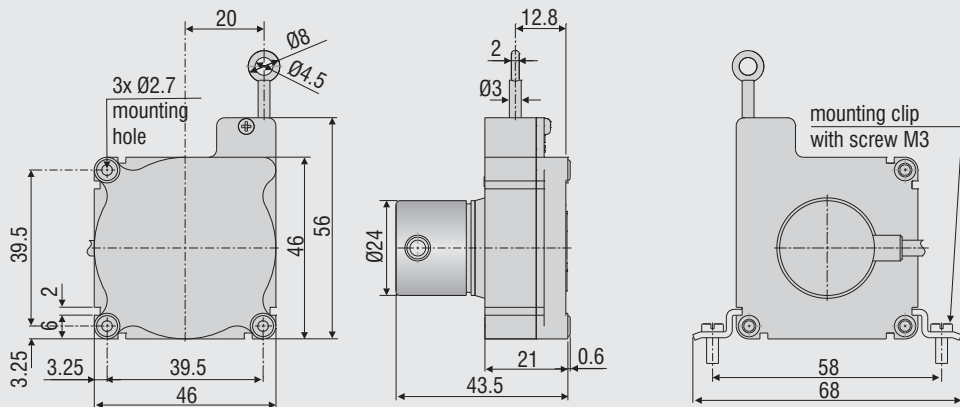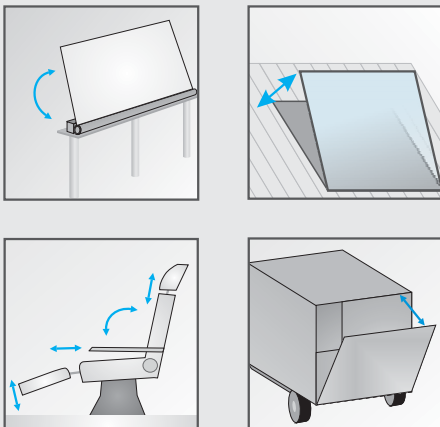
wireSENSOR
Digital series MK30 / MK46

Low cost high volume model
Customized versions
Smallest design in its class

Sensors of the WPS series are used in high volume applications. Due to the favorable price and the compact sensor size, new possibilities in machine design and cost optimization are available to the user. The wide range of models offers the best fit for individual and customized applications. Various measurement ranges, output interfaces and accuracy classes can be selected within this series.

Model MK30

8 (WPS-500-MK30-E)
12 (WPS-750-MK30-E)

Ø8
Ø4.5
10.5
2
Ø3
45.5
23.5
30
Ø24
6 2
3.25 3.25 23.5
30
21 0.6
40
Ø2.7
mounting hole

mounting clip
with screw M3
42
52

Model MK46

20
Ø8
Ø4.5
12.8
2
Ø3
3x Ø2.7
mounting
hole
39.5
46 56
Ø24
2
6
3.25 3.25 39.5
46
21 0.6
43.5

mounting clip
with screw M3
58
68

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

Model			WPS-500 MK30	WPS-750 MK30	WPS-1250 MK46
Output			E		
Measuring range			500mm	750mm	1250mm
Linearity	encoder	±0.05 % FSO	0.25mm	0.375mm	0.63mm
Resolution	encoder		10 pulses/mm	6.7 pulses/mm	4 pulses/mm
			0.1mm	0.15mm	0.25mm
Sensor element			incremental encoder		
Temperature range			-20 ... +80 °C		
Material	housing		plastic		
	draw wire		coated polyamid stainless steel (ø 0.36mm)		
Wire mounting			eyelet		
Sensor mounting			mounting holes / mounting grooves		
Wire acceleration			appr. 5 g		
Wire retraction force (min)			appr. 1 N		
Wire extension force (max)			appr. 2.5 N		1.5 N
Protection class DIN EN 60529	E		IP54		
Electrical connection	E		cable radial, 1m		
Weight	E		appr. 80g		appr. 120g

FSO = Full Scale Output

Specifications for digital outputs on page 35.

Article description

WPS- **750** - **MK30** - **E830**

Output option encoder E (5 ... 24 VDC)
encoder E830 (8 ... 30 VDC)

Model MK30
MK46
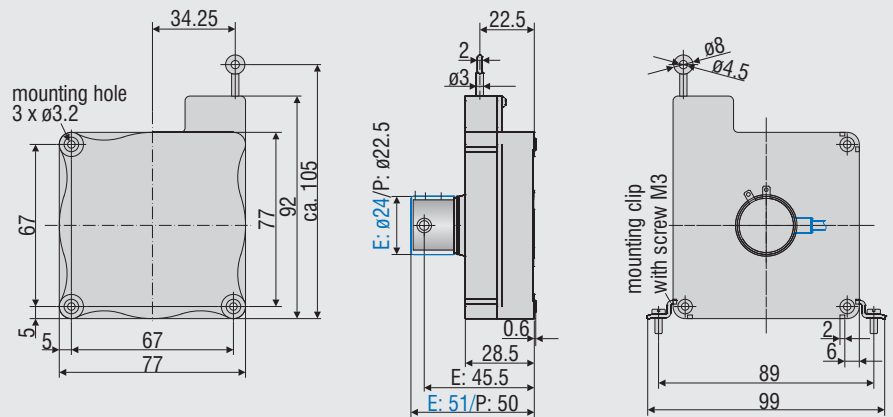
Measuring range in mm
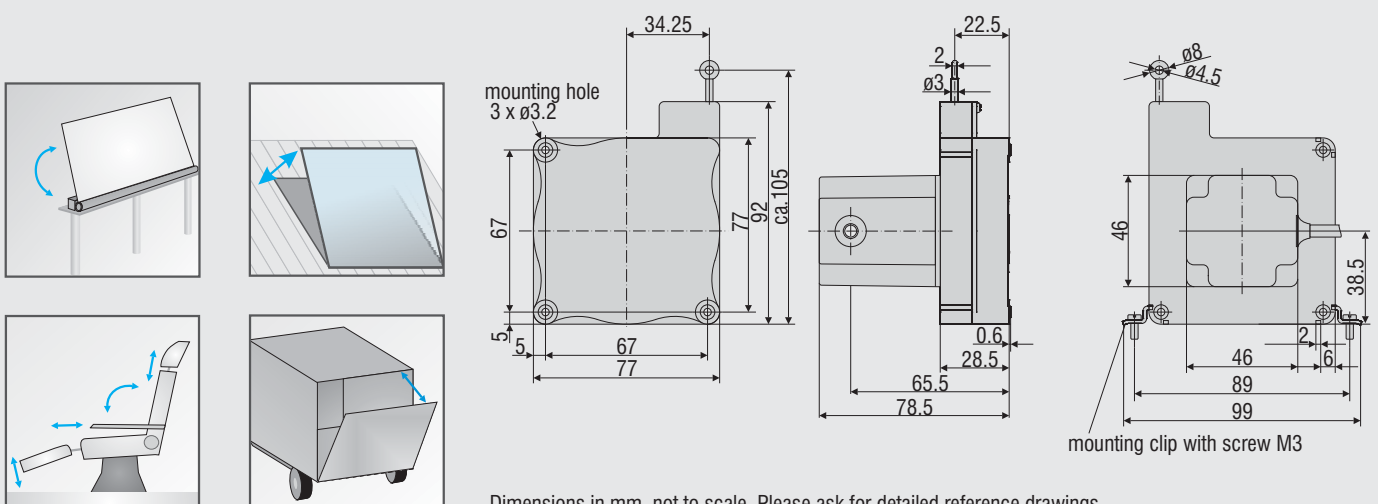
wireSENSOR
Series MK77

Low cost OEM sensors
Potentiometric or incremental output
Customized versions

Sensors of the WPS series are used in high volume applications. Due to the favorable price and the compact sensor size, new possibilities in machine design and cost optimization are available to the user.

Model MK77-P25 / E / E830), with potentiometer or encoder

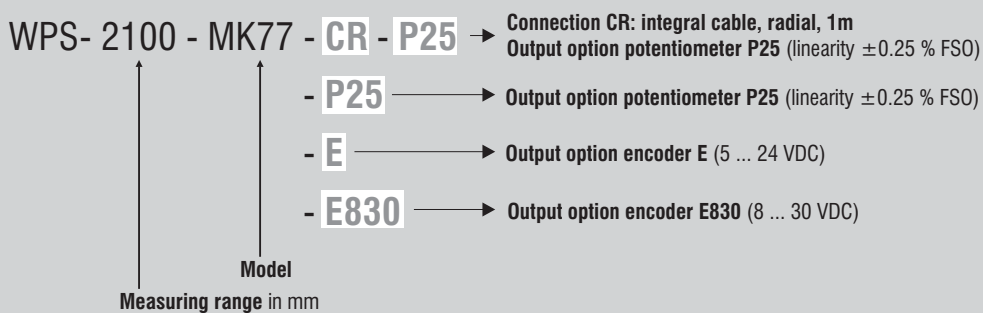*Model MK77-CR-P25, with potentiometer and integrated cable*

mounting clip with screw M3

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

Model			WPS-2100-MK77	WPS-2100-MK77
Output			P25	E/E830
Measuring range			2100mm	
Linearity	wire pot.	±0.25 % FSO	5.25mm	-
	encoder	±0.05 % FSO	-	1.05mm
Resolution	wire pot.		0.55mm	-
	encoder		-	0.43mm
Sensor element			wire potentiometer or incremental encoder	
Temperature range			-20 to 80 °C	
Material	housing		plastic	
	draw wire		coated polyamid stainless steel	
Wire mounting			eyelet	
Cable diameter			0.45mm	
Wire retraction force (min)			3.5 N	
Wire extension force (max)			5 N	
Wire acceleration (max)			5g	
Protection class			IP 20	IP 54
Electrical connection	P25		soldering tag	-
	CR-P25		cable radial, 1m	-
	E		-	cable radial, 2m
Weight	P25		appr. 0.2kg	-
	CR-P25		appr. 0.25kg	-
	E		-	appr. 0.27kg

FSO = Full Scale Output

Specifications for analog and digital outputs on page 31 and continuing.

Article description

WPS- 2100 - MK77 - **CR** - **P25** → **Connection CR: integral cable, radial, 1m**
Output option potentiometer P25 (linearity ±0.25 % FSO)

- **P25** ⟶ **Output option potentiometer P25** (linearity ±0.25 % FSO)

- **E** ⟶ **Output option encoder E** (5 ... 24 VDC)

- **E830** ⟶ **Output option encoder E830** (8 ... 30 VDC)

Model

Measuring range in mm

# wireSENSOR
Analog series MK120

Low cost high volume model

Very compact sensor

Fibre glass reinforced polyamide housing

Sensors of the WPS series are used in high volume applications. Due to the favorable price and the compact sensor size, new possibilities in machine design and cost optimization are available to the user.

Model WPS-3000/5000-MK120-CR-X
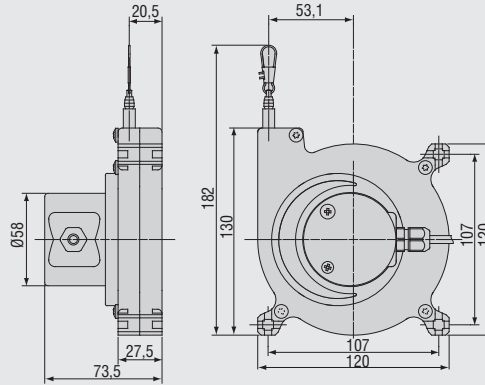
Model WPS-7500-MK120-CR-X
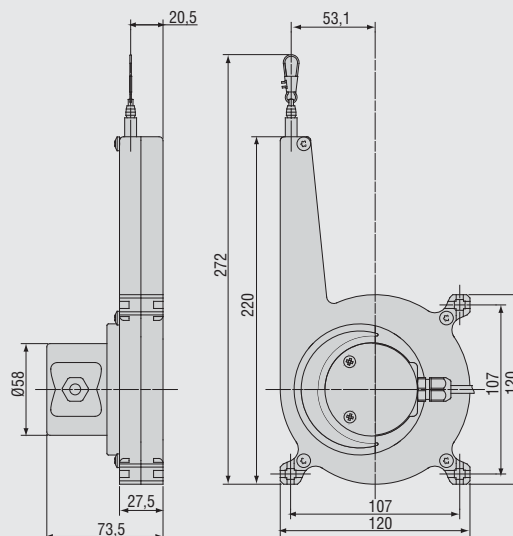
Dimensions in mm, not to scale. Please ask for detailed reference drawings.

Model	WPS-3000-MK120	WPS-5000-MK120	WPS-7500-MK120
Output	P, U, I		
Measuring range	3000mm	5000mm	7500mm
Linearity ±0.15% FSO	±4.5mm	±7.5mm	±11.25mm
Resolution	quasi infinite		
Temperature range	-20 to 80 °C		
Material housing	plastic PA6		
draw wire	0.45mm coated		
Wire mounting	wire clip		
Wire acceleration	2.5g		1.5g
Wire retraction force (min)	5.5 N	5 N	7 N
Wire retraction force (max)	8 N		13 N
Electrical connection	integrated cable, radial, 1m length		
Protection class	IP65		
Weight	0.75kg		0.9kg

FSO = Full Scale Output
Specifications for analog outputs on page 31.

Article description

WPS- *3000* - MK120 CR - P

Output P: potentiometer
U: voltage
I: current

Connection CR: integral cablel, radial, 1m
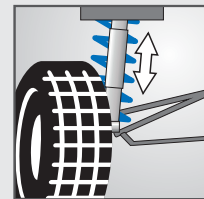
Model

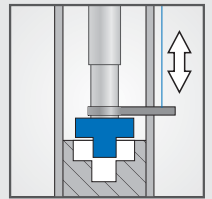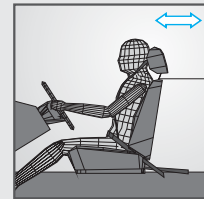**Measuring range** in mm

# wireSENSOR
Analog series MPM

Extreme compact sensor

Subminiature-design

Flexible mounting

High speed measurement, wire acceleration up to 100g

The MPM series are the preferred choice in applications which are characterized by fast movements, short displacements and limited space conditions. A double swivel mounting flange enables quick and easy sensor adjustment.

Miniaturized components, combined with high resolution hybrid potentiometers, ensure a high level of operational reliability and measurement accuracy even under difficult application conditions.

Model MPM
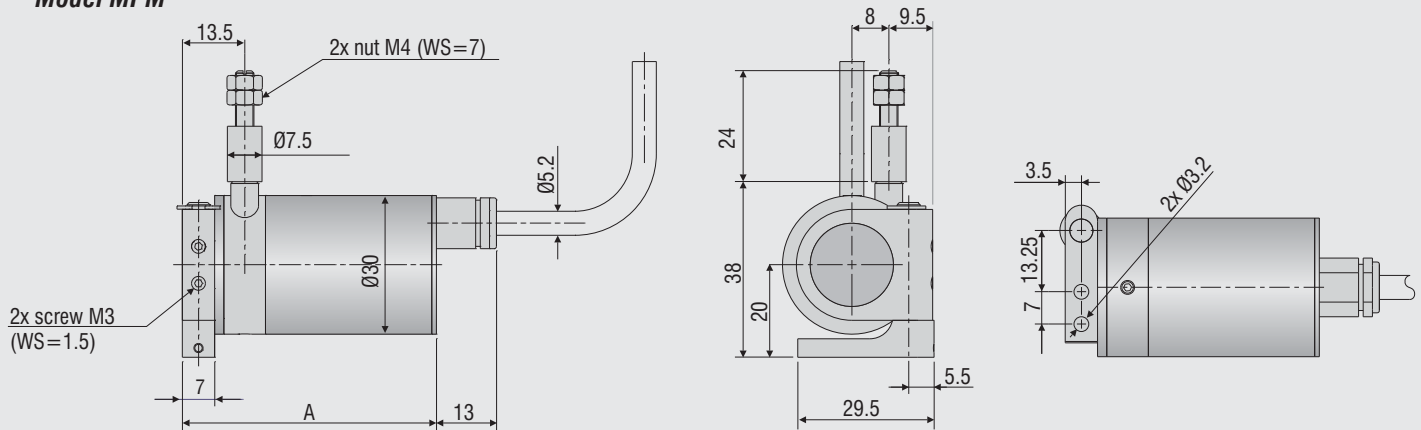
WDS-	50-MPM	150-MPM	250-MPM	50-HG	150-HG	250-HG
A	55	64	64	61	70	70

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

Model		WDS-50 MPM	WDS-150 MPM	WDS-250 MPM
Output		P	P	P
Measuring range		50mm	150mm	250mm
Linearity	±0.2 % FSO	-	±0.3mm	±0.5mm
	±0.25 % FSO	±0.125mm	-	-
Resolution		quasi infinite		
Sensor element		conductive plastic potentiometer	hybrid potentiometer	
Temperature range		-20 ... +80 °C		
Material	housing	aluminium		
	draw wire	stainless steel (ø 0.45 mm)		
Sensor mounting		swivel flange in two axes 180 ° / 360 °		
Wire mounting		thread M4		
Wire acceleration		appr. 25 g (option HG: 100 g)		
Wire retraction force (min)		1.5 N (option HG: 10 N)		
Wire extension force (max)		3.5 N (option HG: 17 N)		
Protection class	DIN EN 60529	IP 65		
Vibration	IEC 68-2-6	20g, 20Hz - 2kHz		
Mechanical shock	IEC 68-2-27	50g, 20ms		
Electrical connection		integral cable, axial, 3-leads, 1m long		
Weight		appr. 150g		

FSO = Full Scale Output

Article description

WDS- *250* - MPM - C - P- *HG*

Option HG wire acceleration up to 100 g

Output P: potentiometer

Connection C: integral cablel, 1m

Model

Measuring range in mm
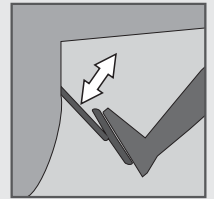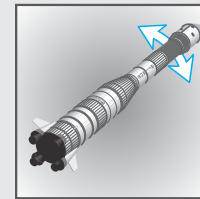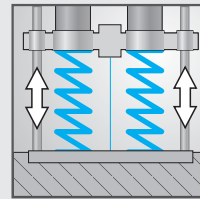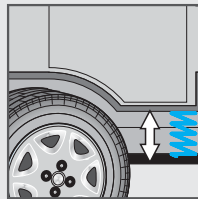
wireSENSOR
Analog series MP / MPW

Miniature design
MPW - waterproof option
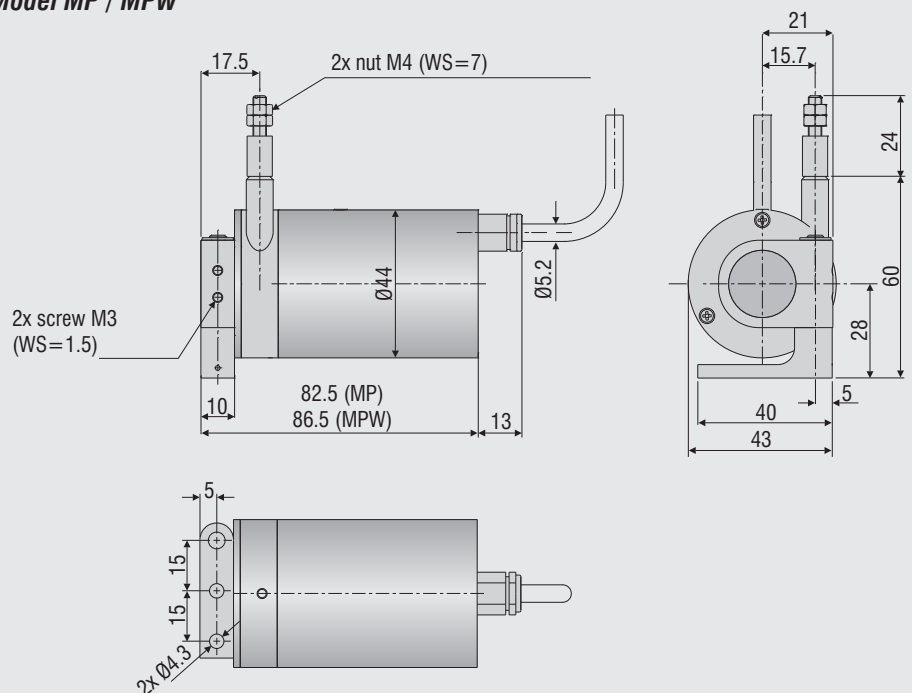**For fast measurement**

Sensors for stationary and mobile application

String pots of the series MP/MPW are designed both for industrial use and for mobile applications. This draw-wire position sensors are the preferred choice where displacements must be acquired under limited installation conditions. The double swivel flange enables quick and easy sensor adjustment.

The series MPW (waterproof) is particularly intended for applications in harsh ambient conditions.
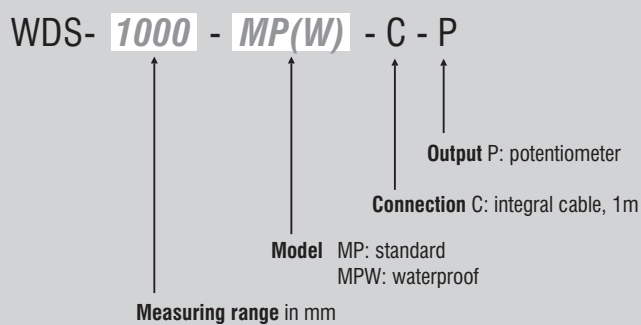

Model MP / MPW

2x nut M4 (WS=7)
17.5
2x screw M3 (WS=1.5)
Ø44
Ø5.2
82.5 (MP)
86.5 (MPW)
10
13
21
15.7
24
60
28
5
40
43
5
15
15
2x Ø4.3

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

Model		WDS-100 MP(W)	WDS-300 MP(W)	WDS-500 MP(W)	WDS-1000 MP(W)
Output		P	P	P	P
Measuring range		100mm	300mm	500mm	1000mm
Linearity	±0.1 % FSO	-	-	0.5mm	1mm
	±0.25 % FSO	-	0.75mm	-	-
	±0.5 % FSO	0.5mm	-	-	-
Resolution		0.15mm	0.2mm	quasi infinite	
Sensor element		wire-wound		hybrid-potentiometer	
Temperature range		-20 ... +80 ℃			
Material	housing	aluminum			
	draw wire	stainless steel (ø 0.45mm)			
Wire mounting		thread M4			
Sensor mounting		swivel flange in two axes 180 ° / 360 °			
Wire acceleration		appr. 30g			
Wire retraction force (min)		7 N	7 N	6.5 N	5 N
Wire extension force (max)		8.5 N	8.5 N	8.5 N	8 N
Protection class DIN EN 60529	series MP	IP 65			
	series MPW	IP 67			
Vibration	IEC 68-2-6	20g, 20Hz - 2kHz			
Mechanical shock	IEC 68-2-27	50g, 10ms			
Electrical connection		integral cable, axial, 3-leads, 1m long			
Weight		appr. 270g			

FSO = Full Scale Output

Article description

WDS- *1000* - *MP(W)* - C - P

Output P: potentiometer

Connection C: integral cable, 1m

Model MP: standard
MPW: waterproof

Measuring range in mm

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.
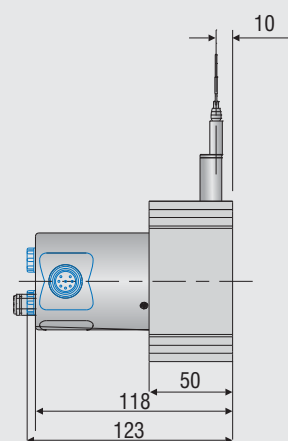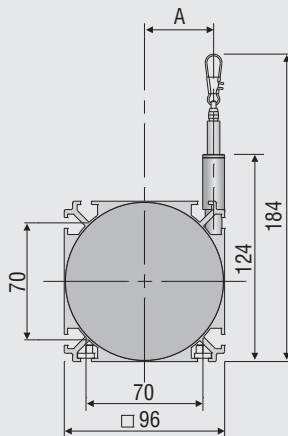
The series has an attractive price/performance ratio based on state of the art technology.

Model P60-P (P60-U/I)
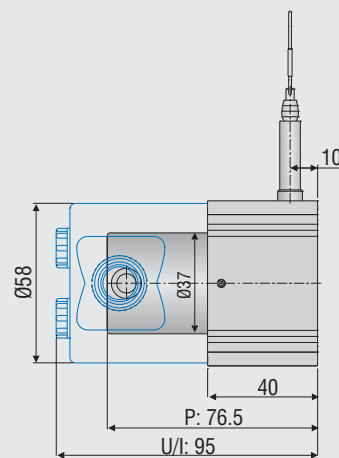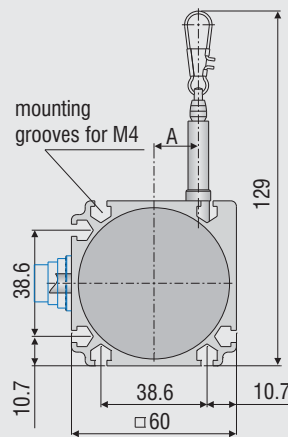
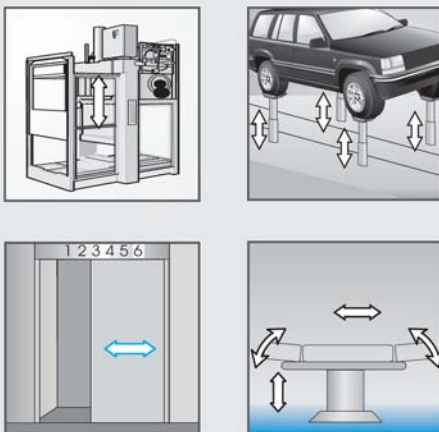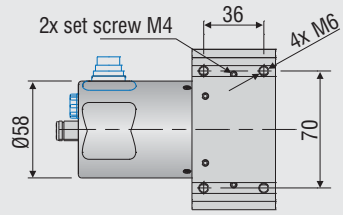| Measuring range	A
100/300/500/1000	16.15
150/750/1500	24.2

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.

Model		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
Linearity ±0.25 % FSO	±mm	-	-	0.75	-	-	-	-	-	-
Linearity ±0.5 % FSO	±mm	0.5	0.75	-	-	-	-	-	-	-
Resolution	mm	quasi infinite								
Sensor element		conductive plastic potentiometer		hybrid potentiometer						
Temperature range		-20 ... +80 °C								
Material housing		aluminum								
Material draw wire		coated polyamid stainless steel (ø 0.45 mm)							ø 0.8mm	
Sensor mounting		mounting grooves in the housing							slot nuts	
Wire mounting		wire clip								
Wire acceleration		appr. 10 - 15g (dependent upon measuring range)							8g	
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		20g, 20Hz - 2kHz								
Mechanical shock IEC 68-2-27		50g, 10ms								
Electrical connection output P		integral cable, radial, 1m long							int. cable, axial, 1m	
Electrical connection output U/I		connector, radial, 8-pin, DIN45326								
Weight		appr. 370g							appr. 1.1kg	

FSO = Full Scale Output

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
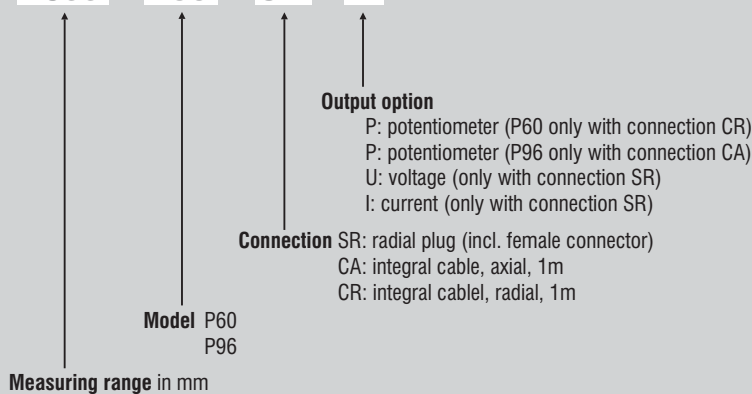
wireSENSOR
Digital series P60 / P96

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.
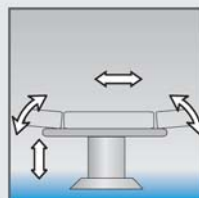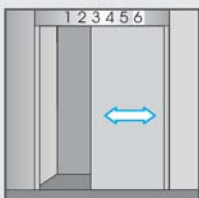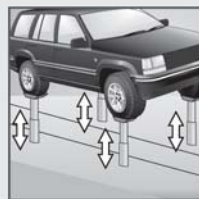
Model P60-HTL/TTL
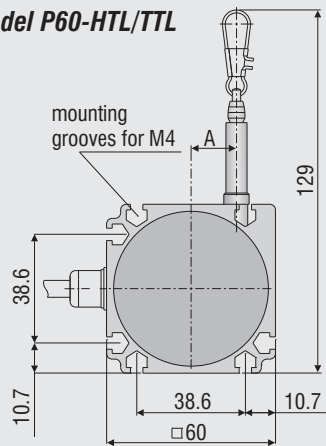
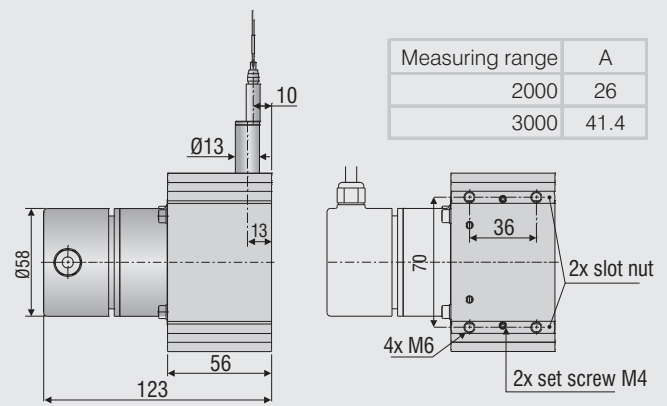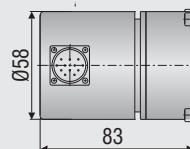| Measuring range	A
1000	16.15
1500	24.2
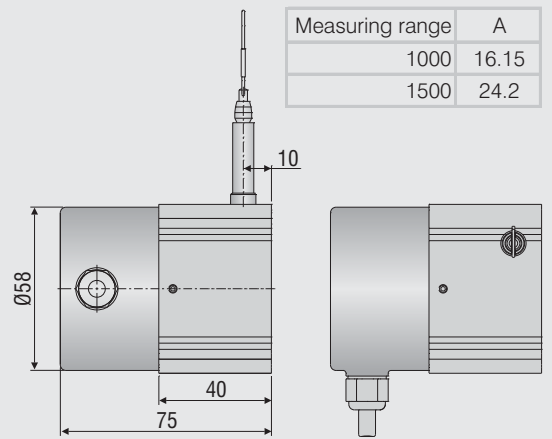
Model P96-HTL/TTL
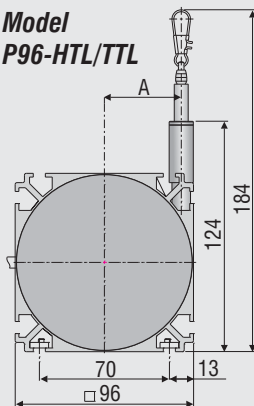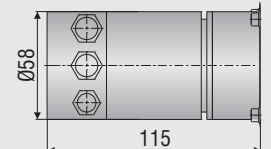

Measuring range	A
2000	26
3000	41.4

Model P96-SSI

Model P96-CO/PB

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

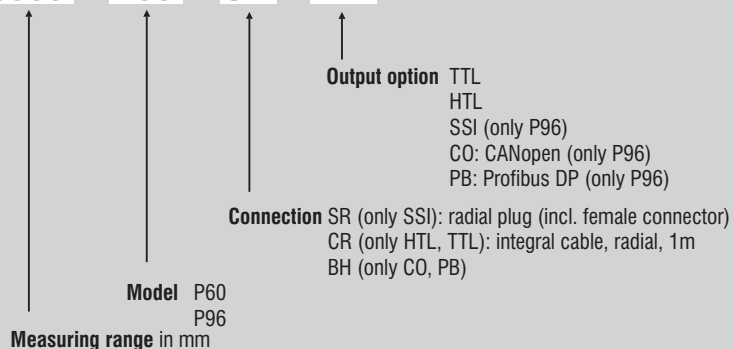| Model	WDS-1000-P60	WDS-1500-P60	WDS-3000-P96
Output	HTL, TTL		HTL, TTL, SSI, PB, CO
Measuring range	1000mm	1500mm	3000mm
Linearity ±0.02 % FSO	±0.2mm	±0.3mm	±0.6mm
Resolution HTL, TTL	0.067mm (15 pulses/mm)	0.1mm (10 pulses/mm)	0.087mm (11.53 pulses/mm)
Resolution SSI, PB, CO	-	-	0.032mm
Sensor element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

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
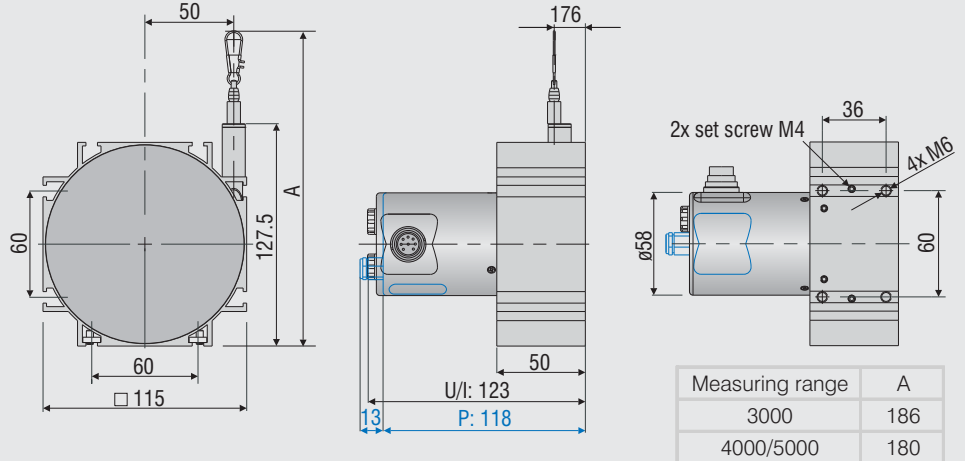
wireSENSOR
Analog series P115

Very robust sensor housing
Easy and flexible mounting
Compact design with long ranges

Analog string pots for applications with long measuring range

The P115 series offer measurement ranges from 3000 to 15000 mm. This string pots feature a rugged design and high measurement accuracy. Various types of signal outputs and an optimized size make this wire sensor series suitable for a wide range of applications, also in harsh industrial environments.

Model P115-U/I (P115-P) Measuring ranges 3000 - 5000 mm

2x set screw M4
4x M6

Measuring range	A
3000	186
4000/5000	180

U/I: 123
P: 118

Model P115-U/I/P Measuring ranges 7500 - 15000 mm

wire stripper
2x set screw M4
2x slot nuts

Measuring range	A	B
7500	37	153
10000	44.5	196
15000	60.5	228

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

Model	WDS-3000-P115	WDS-4000-P115	WDS-5000-P115	WDS-7500-P115	WDS-10000-P115	WDS-15000-P115
Measuring range	3000mm	4000mm	5000mm	7500mm	10000mm	15000mm
Output	P, U, I					
Linearity ±0.1 % FSO	±3mm	-	-	-	-	-
Linearity ±0.15 % FSO	-	±6mm	±7.5mm	±11.3mm	±15mm	±22.5mm
Resolution	quasi infinite					
Sensor element	hybrid-potentiometer					
Temperature range	-20 ... +80 °C					
Material housing	aluminum					
Material draw wire	coated polyamid stainless steel (ø 0.45mm)			coated polyamid stainless steel (ø 1.0mm)		
Sensor mounting	slot nuts					
Wire mounting	wire clip					
Wire acceleration	appr. 6g					
Wire retraction force (min)	4.5 N	4 N	4 N	8 N	8 N	8 N
Wire extension force (max)	8 N	8.5 N	9 N	24 N	21 N	25 N
Protection class DIN EN 60529	IP 65 (only if connected)					
Vibration IEC 68-2-6	20g, 20Hz - 2kHz					
Mechanical shock IEC 68-2-27	50g, 20ms					
Electrical connection output P	integral cable, axial, 1m long					
Electrical connection output U/I	connector, radial, 8-pin, DIN45326					
Weight	appr. 1.1kg			2.2kg	3.2kg	3.5kg

FSO = Full Scale Output

Specification for analog outputs on page 31.

Article description

WDS- *3000* - P115 - *SR* - *U*

Output P: potentiometer   connection CA: P115-3000/4000/5000
                                             connection SA: P115-7500/10000/15000
               U: voltage   connection SR: P115-3000/4000/5000
                                               connection SA: P115-7500/10000/15000
               I: current   connection SR: P115-3000/4000/5000
                                             connection SA: P115-7500/10000/15000

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

Model P115

Measuring range in mm

wireSENSOR
Digital series P115

Very robust sensor housing
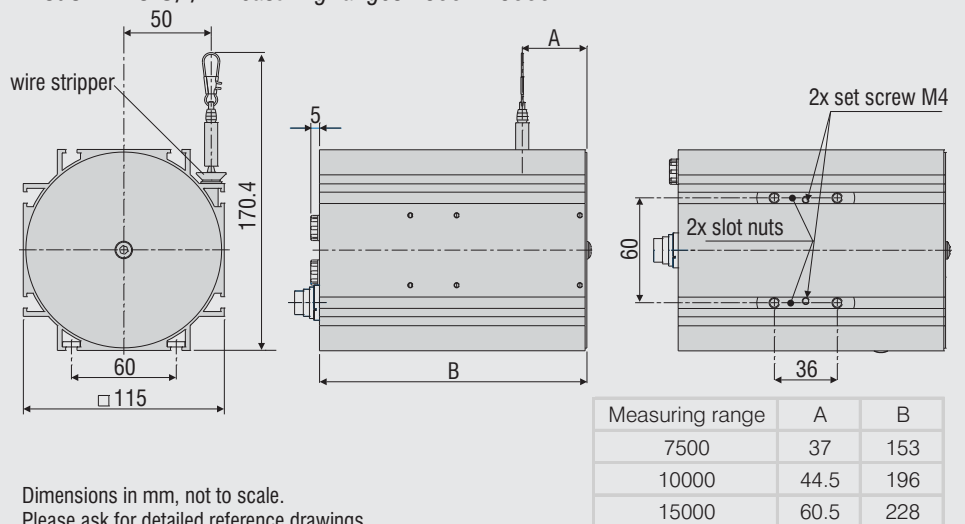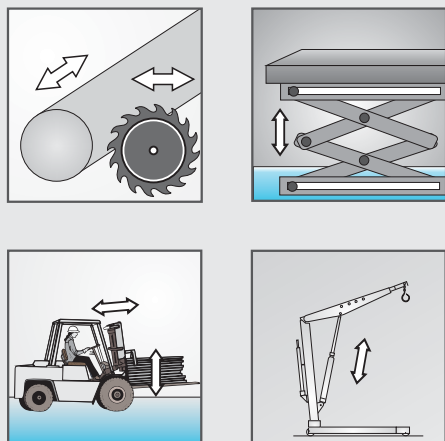**Easy and flexible mounting**
Compact design with long ranges

Digital string pots for applications with long measuring range
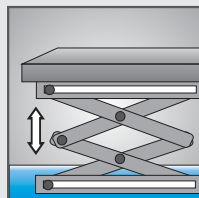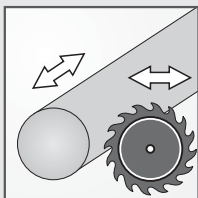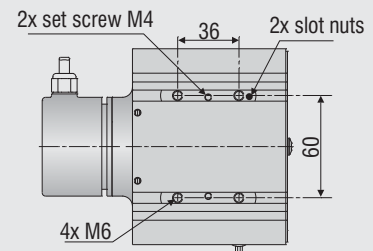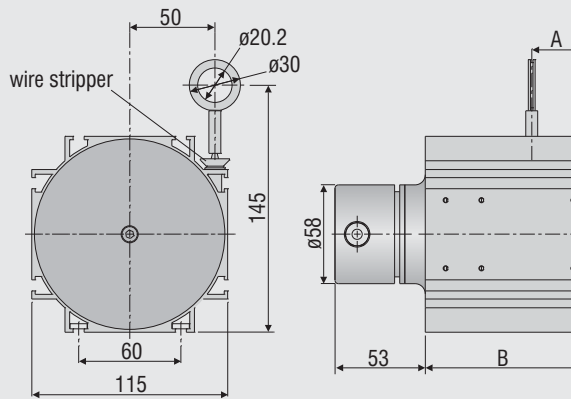
The P115 series offer measurement ranges from 5000 to 15000 mm. This string pots feature a rugged design and high measurement accuracy. Various types of signal outputs and an optimized size make this wire sensor series suitable for a wide range of applications, also in harsh industrial environments.

Model P115-HTL/TTL

50
ø20.2
ø30
wire stripper
145
ø58
A
2x set screw M4
36
2x slot nuts
60
4x M6
60
115
53
B

Model P115-SSI

ø58
69

Model P115-CO/PB

ø58
101
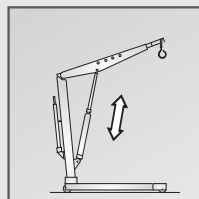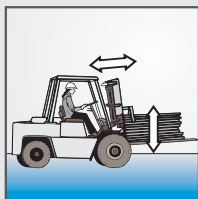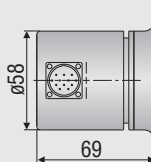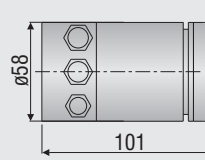
Measuring range	A	B
5000	28.5	91
7500	37	112
10000	44.5	155
15000	60.5	187

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

Model		WDS-5000-P115	WDS-7500-P115	WDS-10000-P115	WDS-15000-P115
Measuring range		5000mm	7500mm	10000mm	15000mm
Output		HTL, TTL, SSI, PB, CO			
Linearity	±0.01 % FSO	-	-	±1mm	±1.5mm
	±0.02 % FSO	±1mm	±1.5mm	-	-
Resolution	HTL, TTL	0.105mm (9.52 pulses/mm)			
	SSI, PB, CO	0.038mm			
Sensor element		incremental-/absolute-encoder			
Temperature range		-20 ... +80 °C			
Material	housing	aluminum			
	draw wire	coated polyamid stainless steel (ø 1.0mm)			
Sensor mounting		slot nuts			
Wire mounting		eyelet			
Wire acceleration		5g	6g	3g	3g
Wire retraction force (min)		4 N	8 N	8 N	8 N
Wire extension force (max)		16 N	24 N	21 N	25 N
Protection class		IP 65 (only if connected)			
Vibration	IEC 68-2-6	20g, 20Hz - 2kHz			
Mechanical shock	IEC 68-2-27	50g, 10ms			
Electrical connection	output HTL/TTL	integral cable, radial, 1m long			
	output SSI	connector, radial, 12-pin			
	output PB, CO	bus cover			
Weight		appr. 2kg	appr. 2.5kg	appr. 3.5kg	appr. 4.5kg

FSO = Full Scale Output

Specifications for digital outputs on page 32 and continuing.

Article description

WDS- *5000* - P115 - *SR* - *SSI*

Output option TTL
HTL
SSI
CO: CANopen
PB: Profibus DP

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

Model P115

Measuring range in mm
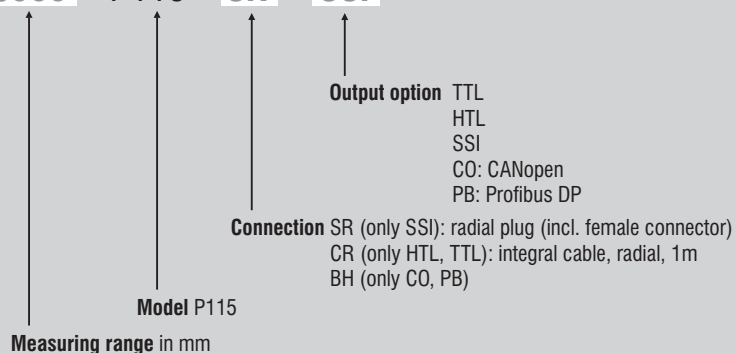
wireSENSOR
Series P200

Robust sensor design
Long range sensor - up to 50,000mm
Various digital interfaces

The P200 series are specially designed for industrial applications in elevator enginee-ring, crane systems and high bay ware-houses. The rugged housing and solid, high quality components guarantee high operational reliability and a long service life even in difficult industrial environments.

Model P200
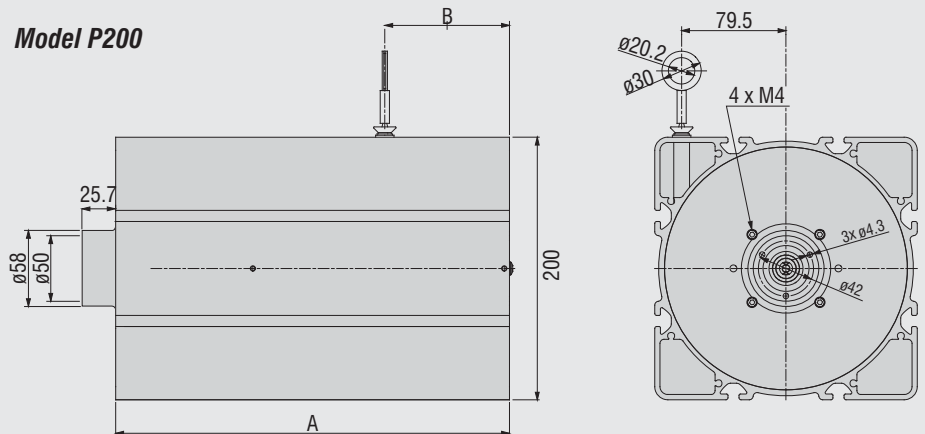
Model P200-HTL/TTL
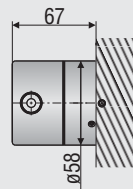
Model P200-SSI

Model P200-CO/PB

Measuring range	A	B
30000	268	75
40000	300	95
50000	333.5	95

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

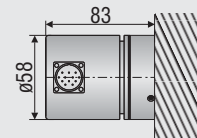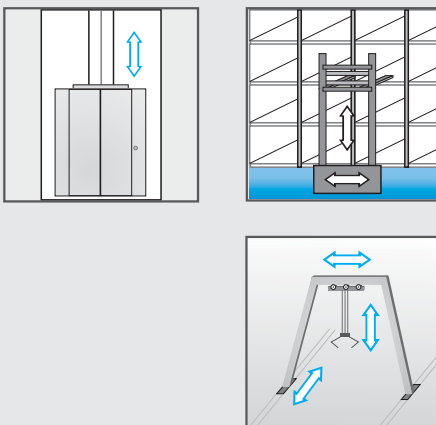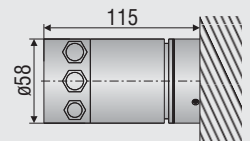| Model	WDS-30000-P200	WDS-40000-P200	WDS-50000-P200
Measuring range	30000mm	40000mm	50000mm
Output	HTL, TTL, SSI, PB, CO		
Travel per encoder revolution	500mm		
Linearity ± 0.01 % FSO	3mm	4mm	5mm
Resolution HTL, TTL	0.167mm (6 pulses/mm)		
Resolution SSI, PB, CO	0.061mm		
Temperature range	-20 ... +80 °C		
Sensor element	incremental-/absolute encoder		
Material	housing: aluminum		
	draw wire: coated polyamid stainless steel (ø 0.8mm)		
Wire mounting	eyelet		
Sensor mounting	slot nuts		
Wire acceleration	2g		
Wire retraction force (min)	12 N	11 N	11 N
Wire extension force (max)	22 N	22 N	24 N
Protection class	IP 65		
Electrical connection output HTL, TTL	integral cable, radial, 1m long		
Electrical connection output SSI	connector, radial, 12-pin		
Electrical connection output PB, CO	bus cover		
Weight	appr. 10kg	appr. 11kg	appr. 12kg

FSO = Full Scale Output

Article description

WDS- *30000* - P200 - *SR* - *SSI*

Output option TTL
HTL
SSI
CO: CANopen
PB: Profibus DP

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

Model P200

Measuring range in mm

wireSENSOR
Take up spool

Use almost any encoder
Robust sensor design
High quality sensor components

Rugged draw-wire mechanics for encoder mounting

The wireSENSOR mechanics of the Z60, P96, P115 and P200 series are designed for easy mounting of an incremental or absolute encoder. The selection of the interface, resolution and type of connection can therefore be individually configured.

Optimum matching to the signal conditioning system is ensured. High precision components and a rugged housing offer high operational reliability and a long life time even under harsh industrial conditions.

take up spool (mechanics)   **adapter**   **customer-specific encoder**
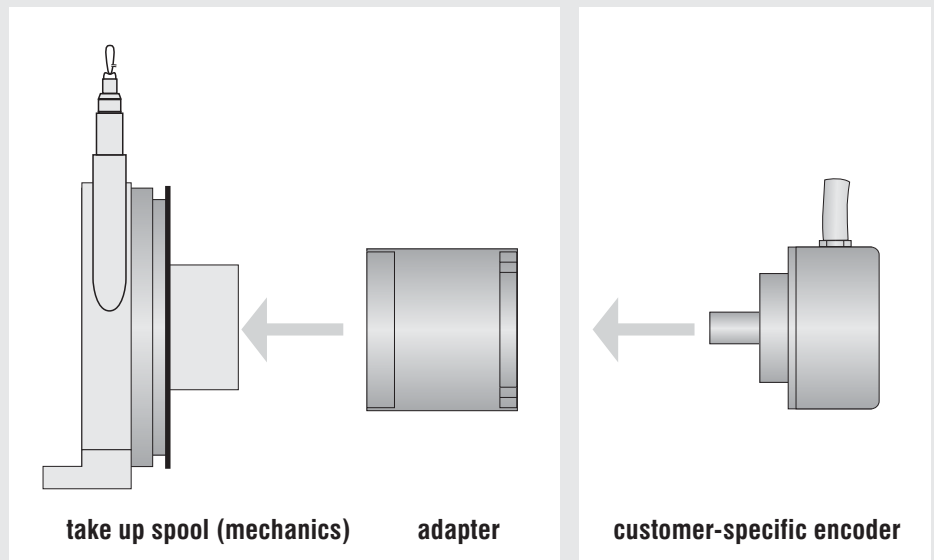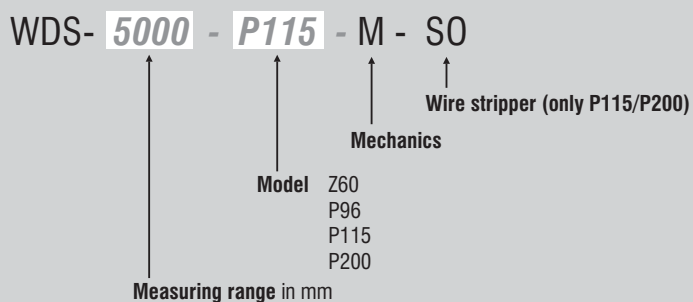
A complete measurement unit always consists of the basic draw-wire mechanism and the adapter for the customer-specific encoder.

The adapter contains all the necessary mounting accessories for fitting the encoder and is included in delivery of the P96, P115 and P200 series.

Model	WDS-1500 Z60-M	WDS-3000 P96-M	WDS-5000 P115-M	WDS-7500 P115-M	WDS-10000 P115-M	WDS-15000 P115-M	WDS-30000 P200-M	WDS-40000 P200-M	WDS-50000 P200-M
Measuring range	1500mm	3000mm	5000mm	7500mm	10000mm	15000mm	30000mm	40000mm	50000mm
Output	dependent upon encoder								
Linearity ±0.01% FSO	-	-	-	-	1mm	1.5mm	3mm	4mm	5mm
Linearity ±0.02% FSO	0.3mm	0.6mm	1mm	1.5mm	-	-	-	-	-
Resolution	dependent upon encoder								
Travel per encoder revolution	150mm	260.09mm	315.07mm				500mm		
Suitable encoder-adapter-flange — WDS-EAC 1	not available								
Suitable encoder-adapter-flange — for clamping flange									
Suitable encoder-adapter-flange — WDS-EAS 1	included in delivery								
Suitable encoder-adapter-flange — for synchro flange									
Temperature range operation	-20...+80°C								
Temperature range storage	-40...+80°C								
Material housing	aluminum								
Material wire	coated polyamid stainless steel								
Material wire	ø 0.45mm	ø 0.8mm	ø 1.0mm				0.8mm		
Wire mounting	wire clip	eyelet							
Sensor mounting	2 mounting holes	slot nuts							
Wire acceleration	10g	7g	5g	6g	3g	3g			
Wire retraction force (min)	3.5 N	5 N	4 N	8 N	8 N	8 N	12 N	11 N	11 N
Wire extension force (max)	5.5 N	10 N	16 N	24 N	21 N	25 N	22 N	22 N	24 N
Protection class	dependent upon encoder								
Vibration	20g, 20Hz...2kHz								
Mechanical shock	50g, 10ms								
Weight	0.3kg	1.1kg	1.4kg	1.9kg	2.8kg	3.2kg	9.5kg	10kg	11kg

FSO = Full Scale Output

Article description

WDS- *5000* - *P115* - M - SO

Wire stripper (only P115/P200)

Mechanics

Model   Z60
        P96
        P115
        P200

Measuring range in mm

wireSENSOR
Mechanics

Model Z60

7.5

ø 58

10

55.5 for encoder
with synchro flange

68.5 for encoder
with clamping flange

ø 10

52

76

5

25
35

23

2 x ø4.3

12.5

25   10.5

Model P96

M4
2x M4

28

96

70
96

ø10

ø13

ø13

ø58
ø50

4
56
81.7

36

set screw M4

4x M4x6

2x slot nuts
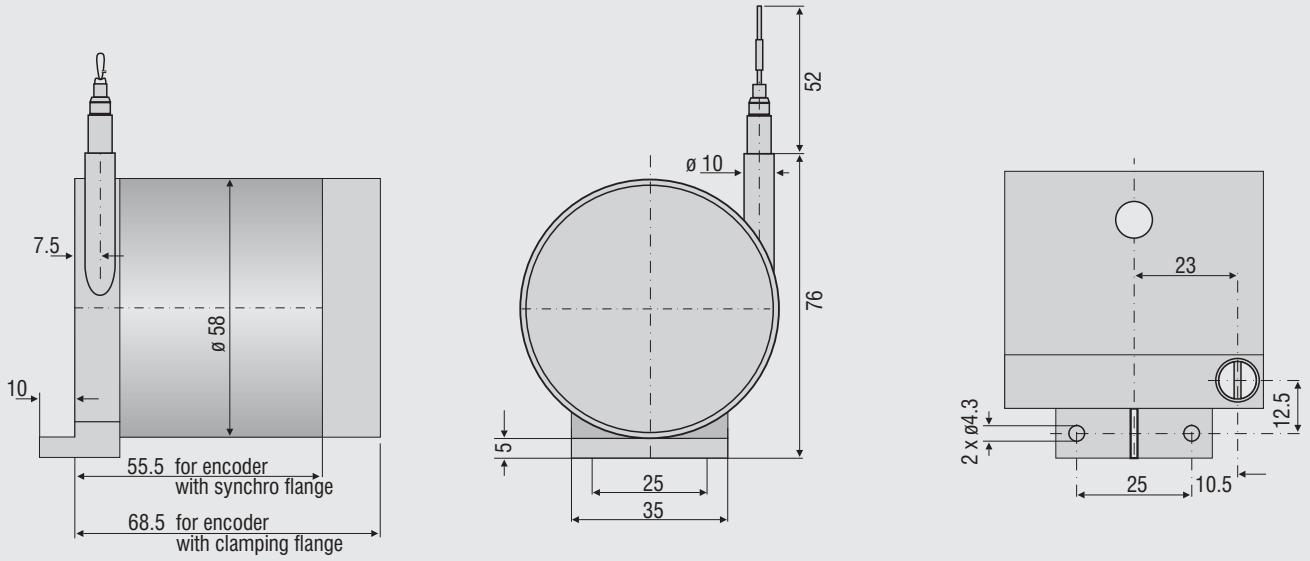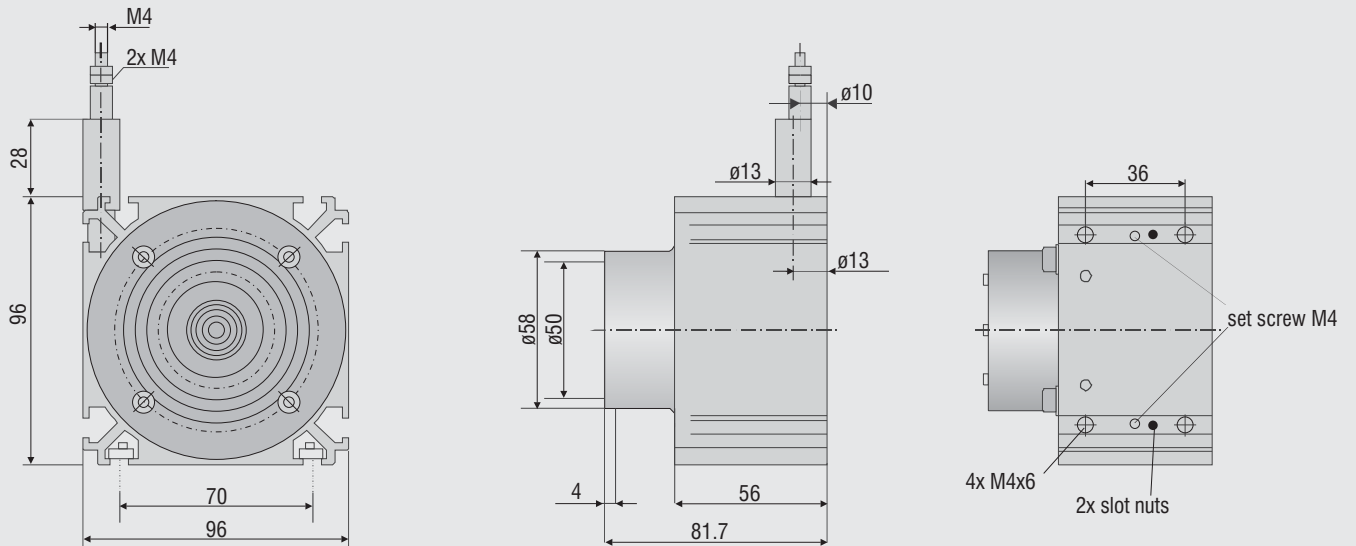
Dimensions in mm, not to scale. Please ask for detailed reference drawings.

Model P115

Measuring range	A	B
5000	28.5	91
7500	37	112
10000	4.5	155
15000	60.5	187

Model P200

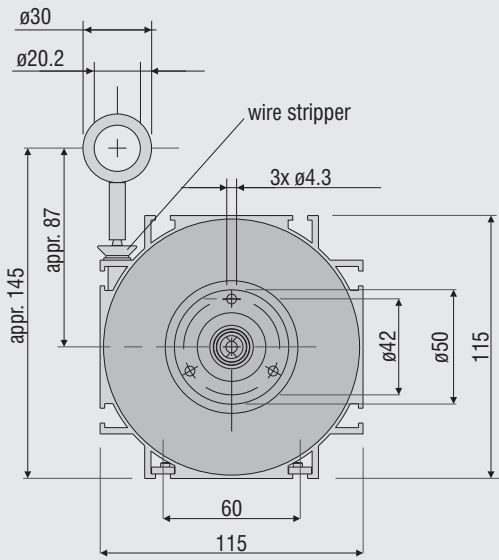| Measuring range	A	B
30000	268	75
40000	300	95
50000	333.5	95

Dimensions in mm, not to scale. Please ask for detailed reference drawings.
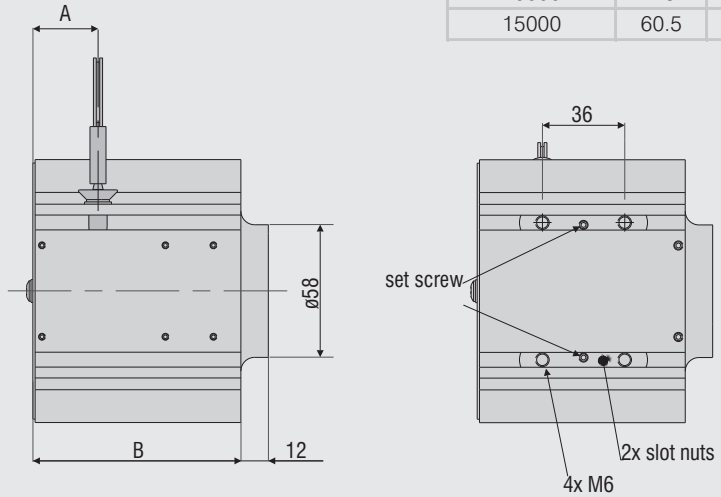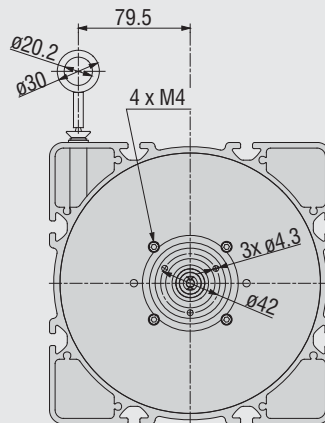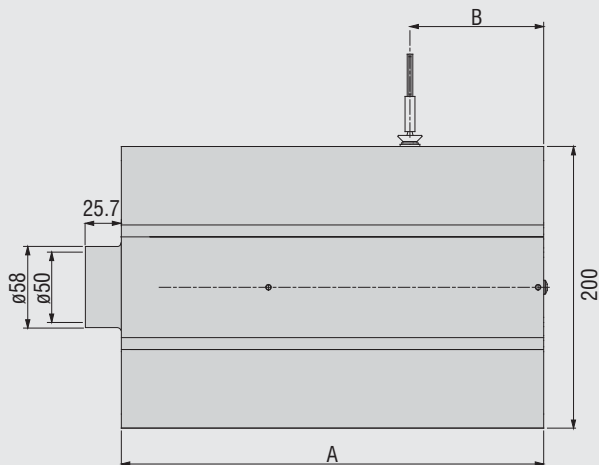
wireSENSOR
Accessories and mounting

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
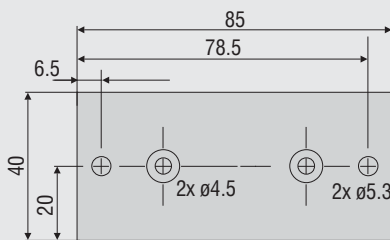
PC 3/8 Sensor cable, length 3 m

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

MH1-WDS
magnetic holder

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
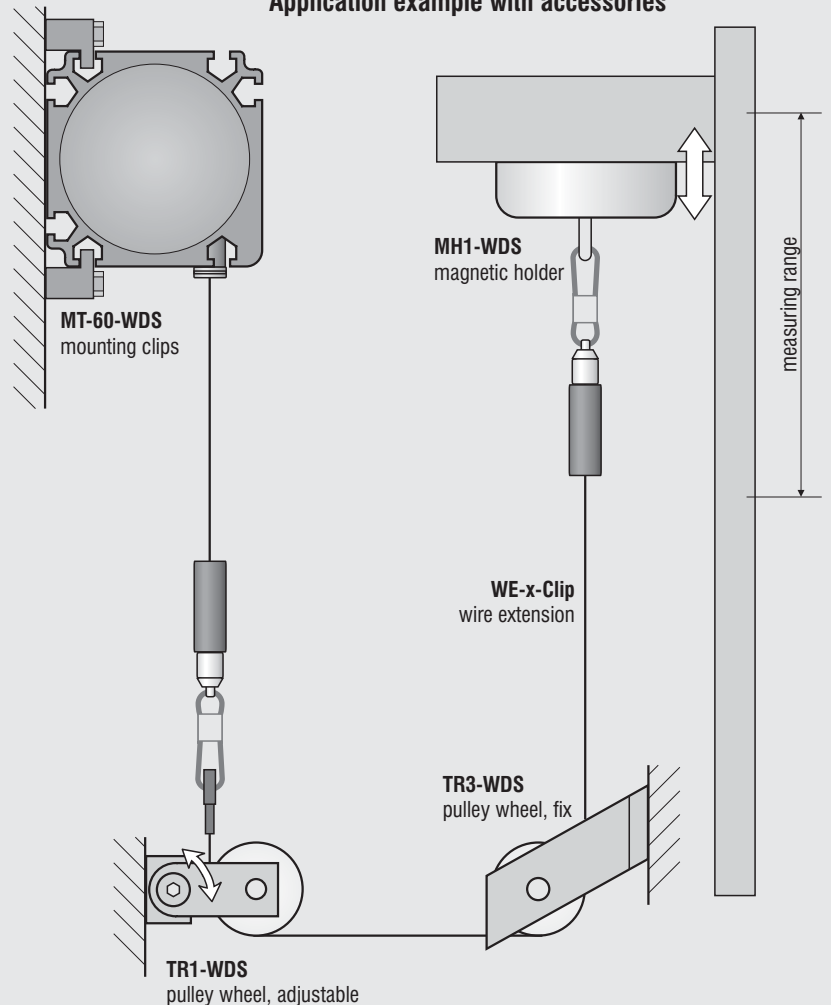
Installation information:

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

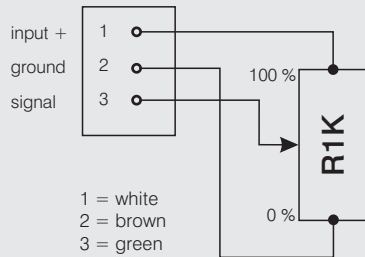### Wire exit angle:

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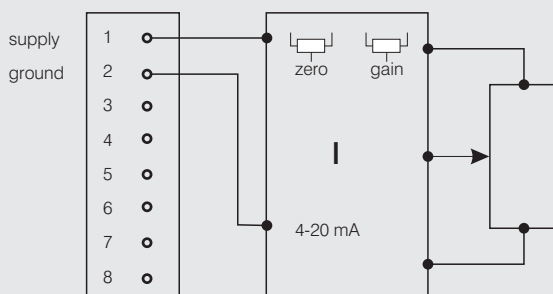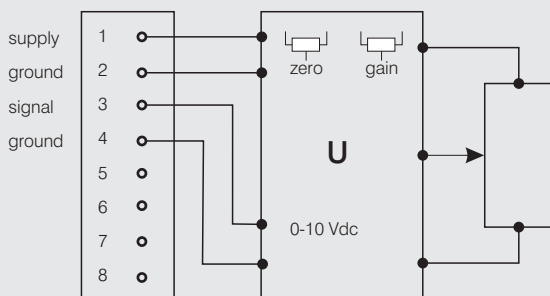
wire aperture 0° (±3° tolerance)
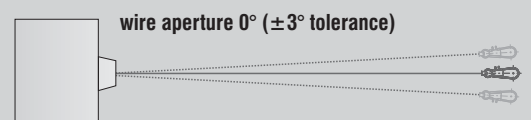
wireSENSOR
Electrical data analog

input + 1
ground   2   100 %
signal   3

R1K

1 = white
2 = brown
3 = green

0 %

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

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

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

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

Current Output (I)	
Supply voltage	14 ... 27 VDC (non stabilized)
Current consumption	35mA max
Output current	4 ... 20mA
Load	<600Ohm
Signal noise	$<1.6\,\mu A_{eff}$
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	-	-
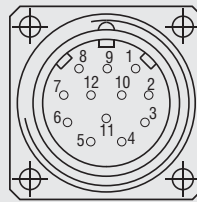
Please use leads twisted in pairs for extension cables.

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
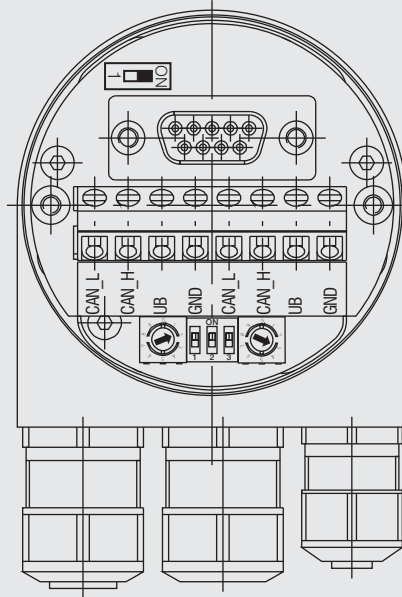
Outputs

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
10kBit/s	OFF	OFF	OFF
20kBit/s	OFF	OFF	ON
50kBit/s	OFF	ON	OFF
125kBit/s	OFF	ON	ON
250kBit/s	ON	OFF	OFF
500kBit/s	ON	OFF	ON
800kBit/s	ON	ON	OFF
1MBit/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

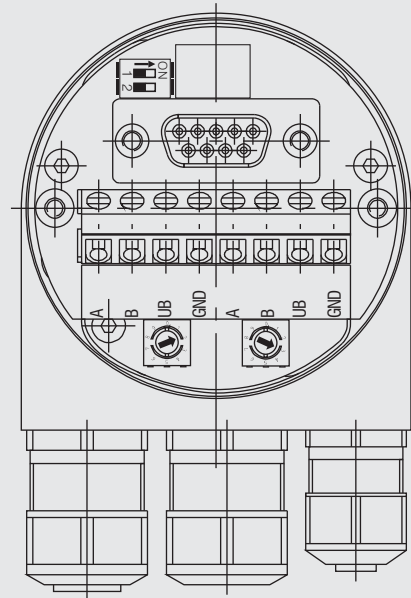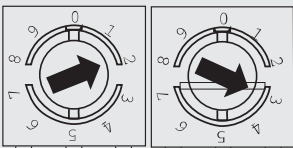Address can be set with rotary switch. Example: User address 23
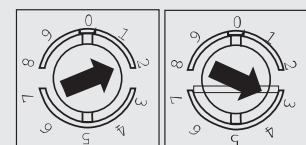
wireSENSOR
Absolute encoder output specifications: Profibus

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

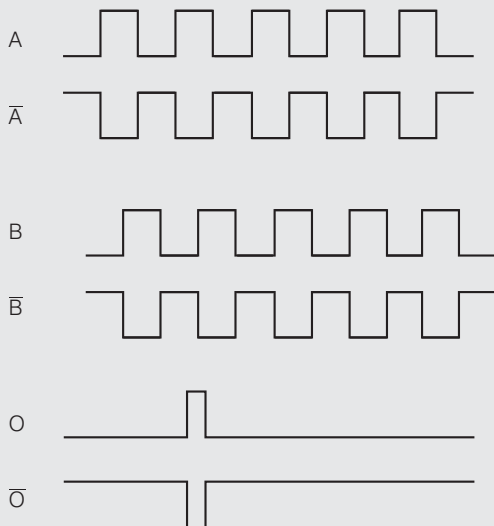## Contact description Profibus-DP

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
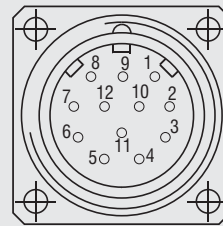
Pin 2 and Pin 12 are internally connected as well as Pin 11 and 10.

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

Output TTL	Linedriver (5 VDC)	
Level High	$\geq$ 2.5V	(with I = -20mA)
Level Low	$\leq$ 0.5V	(with I = 20mA)
Load High	$\leq$ 20mA	
Output	A, $\overline{A}$, B, $\overline{B}$, O	

Output HTL	Push-pull (10 ... 30 VDC)	
Level High	$\geq$ UB -3V	(with I = -20mA)
Level Low	$\leq$ 1.5V	(with I = 20mA)
Load	$\leq$ 40mA	
Output	A, $\overline{A}$, B, $\overline{B}$, O	

Output E	Push-pull (5 VDC)
Level High	UB -2.5V
Level Low	$\leq$ 0.5V
Load	$\leq$ 50mA
Output	A, B, O

Output E830	Push-pull (8 ... 30 VDC)
Level High	UB -3V
Level Low	$\leq$ 2.5V
Load	$\leq$ 50mA
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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