



DLS SERIES

DRAW WIRE LINEAR SENSORS

Innovation In Motion

INNOVATION IN MOTION

The DLS series of draw-wire linear position sensors are a cost effective way to measure linear displacements up to 5000mm in the most demanding industrial environments. Using proven potentiometer and encoder technologies to provide analog or digital signals proportional to the displacement of a retractable steel wire, these sensors are ideally suited to a diverse range of applications where only minimal space is available. Applications include fork lifts, elevators, cranes, irrigation gates, automotive crash testing and airframe structural testing.

The operating principle

Draw-wire linear position sensors measure the linear movement of a component via a highly flexible steel wire which is wound onto a drum by a durable spring-driven motor. The winding drum is linked axially to a multi-turn potentiometer, incremental encoder or absolute encoder. A linear movement is transformed into a rotation by the draw-wire principle and converted into a proportional analog signal or to countable increments. Versions with integral electronics produce voltage and current signals at the output which are proportional to the displacement. Draw-wire sensors are simple in application and represent a very economical investment. There is a significant advantage in that, despite their compact installation size, the sensors can cover large measurement ranges.



Features

- 100 to 5000mm measuring range
- Rugged, compact design
 - Profiled enclosure
- Analogue and digital outputs
 - Protected to IP65
 - CE Approved

Benefits

- short to long range capability from a minimal sensor footprint
- Suitable for a wide range of industrial applications
- Easy and flexible installation
- Choice of interface signals
- Suited to hostile conditions
- Confidence in EMC performance



EMC Directive 2004/108/EC

The products detailed in this document have been tested to the requirements of EN 61326-1 and EN 61326-2-3



Quality Assurance

Penny + Giles are accredited to BS EN ISO9001:2000. Quality is at the heart of all our systems ensuring the reliability of our products from initial design to final despatch.

Certificate No. LRQ0924881

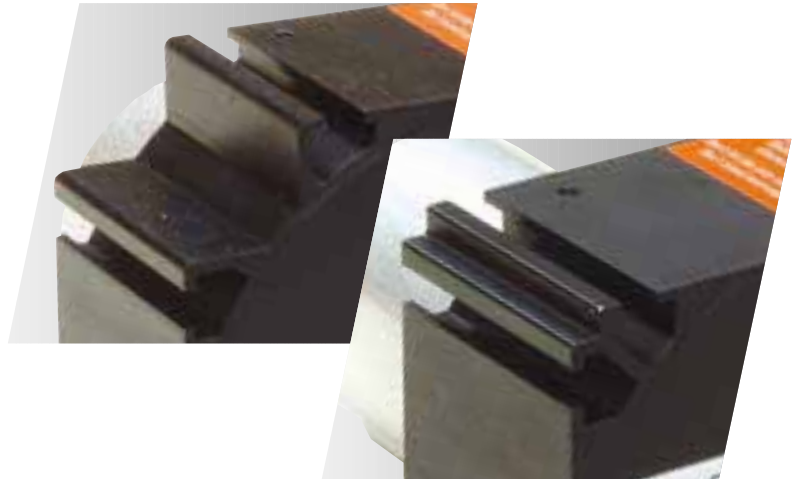
DLS DRAW-WIRE LINEAR SENSORS

Choice of models

The DLS linear sensors cover a measuring range from 100mm to 5000mm in three models. The P60 offers 100 to 1500mm range with a choice of three analogue and two digital output types. Models P96 and P115 cover five measuring ranges from 2000mm to 5000mm and offer three analogue and one digital output types.

Choice of mountings

The DLS linear sensors are housed in a high strength aluminium profile that has mounting grooves incorporated in four sides. These give the user a choice of using captive nuts with bolts to mount the sensor body, or to use optional mounting clamps from the range of accessories offered. The draw-wire can be attached to the moving component by a simple hook, or alternative magnetic holders, guide pulleys and wire extensions can be supplied to aid installation. The guide pulleys allow the draw-wire to be routed around obstacles in difficult installations.



Integrated signal conditioning

Users can save space, time and money by opting to use the versions that include integrated signal conditioning. The voltage (U) option allows the sensor to operate from 14 to 27Vdc supply and provides 0 to 10Vdc output. The current (I) option includes integrated electronics to provide a 2-wire 4 to 20mA output operating from a 14 to 27Vdc supply. Both voltage and current output options include user adjustable controls for zero and gain to aid installation and set-up.



DLS Series P60

Page 4

- Measuring range to 1500mm
- 60mm square housing
- Choice of potentiometer, voltage, current or encoder outputs
- Protected to IP65



DLS Series P96

Page 6

- Measuring range 2000 to 3000mm
- 96mm square housing
- Choice of potentiometer, voltage, current or encoder outputs
- Protected to IP65



DLS Series P115

Page 8

- Measuring range 3000 to 5000mm
- 115mm square housing
- Choice of potentiometer, voltage, current or encoder outputs
- Protected to IP65

DLS SERIES P60

Series P60 Draw Wire Linear Sensors are for general purpose use. Numerous options enable a suitable sensor to be selected for almost any application. There is a choice of seven measurement ranges with three analogue and two digital types of output signal. 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.

PERFORMANCE

Measuring range	mm	100	150	300	500	750	1000	1500
Output types (See data on page 10 for details)		P/U/I	P/U/I	P/U/I	P/U/I	P/U/I	P/U/I	P/U/I/E/A*
Independent linearity	P/U/I ±%	<0.5	<0.5	<0.25	<0.1	<0.1	<0.1	<0.1
	E ±%	-	-	-	-	-	-	<0.02
Resolution	P/U/I %	Virtually infinite						
	E mm	-	-	-	-	-	-	0.1
Sensor element								
Conductive plastic potentiometer		Y	Y					
Hybrid potentiometer				Y	Y	Y	Y	Y
Incremental encoder								Y
Absolute encoder*								Y

*specification for output A on request

Wire acceleration	g	10-15 (depends on measuring range)						
Wire extension force max.	N	7.5	5.5	7.5	7.5	5.5	7.5	5.5
Wire retraction force min.	N	6.5	4.5	6	6	4	5	3.5
Wire misalignment max.	°	3						

Operational temperature	°C	-20 to +80						
Protection class		IP65 (only if plug is connected to socket)						
Life (million cycles)	P/U/I	2	2	0.5	0.5	0.5	0.5	0.5
	E	-	-	-	-	-	-	10
Vibration IEC 68-2-6		20g, 20Hz - 2kHz						
Shock IEC 68-2-27		50g, 10ms						
Weight	g	370 (CR-P); 455 (SR-U/I)						

Materials

Housing	Aluminium, anodised
Measuring wire	Coated polyamid stainless steel (ø 0.45mm)
Sensor attachment	Mounting grooves in the housing
Wire attachment	Wire clip

AVAILABILITY

Options CR-P available from stock. Ask our sales office for details on other options

ORDERING CODES AND OPTIONS

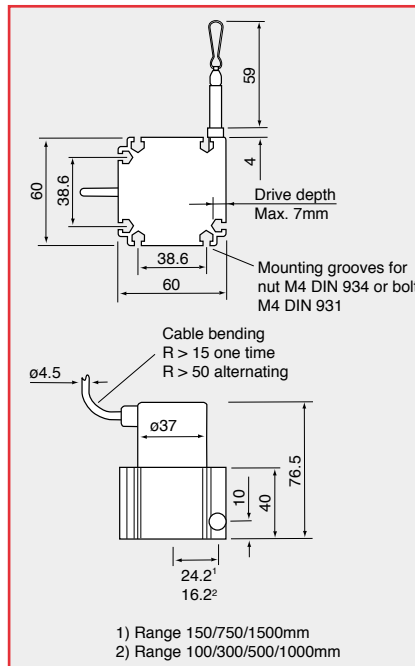
DLS - - P60 - -

Measuring range	Output
Connection	P = Potentiometer (all ranges)	
SR = Radial plug for outputs U and I		U = Voltage (all ranges)	
CR = Radial cable for outputs P and E		I = Current (all ranges)	
		E = Incremental Encoder (1500mm only)	
		A = Absolute Encoder (1500mm only)	

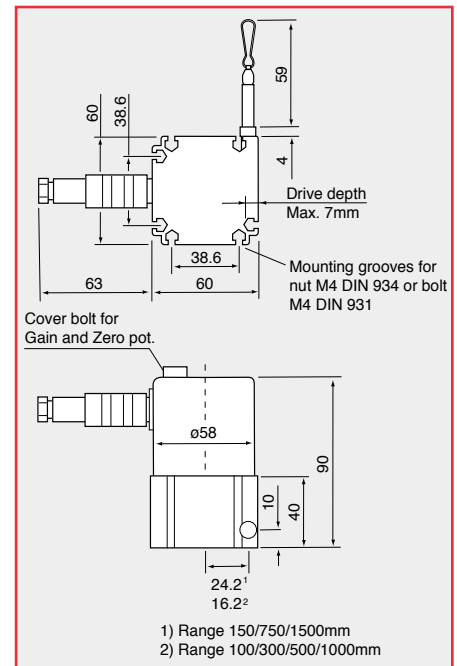
DLS SERIES P60 DIMENSIONS

Drawings not to scale

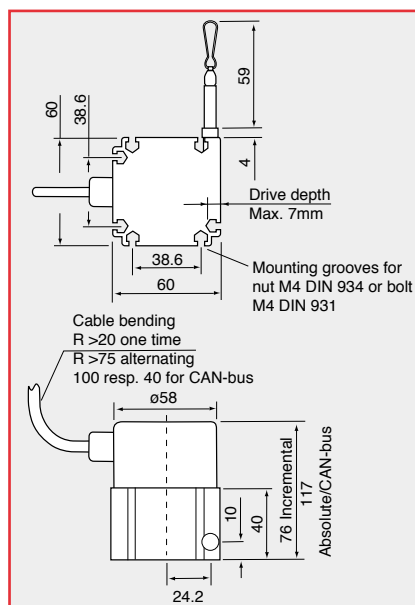
ANALOGUE OUTPUT DLS - - P60 - CR - P



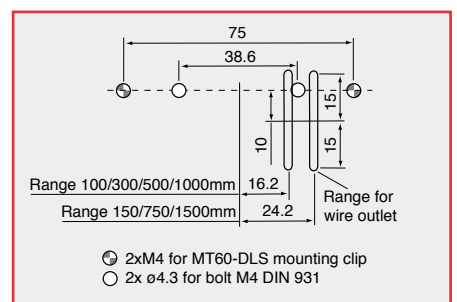
ANALOGUE OUTPUT DLS - - P60 - SR - U/I



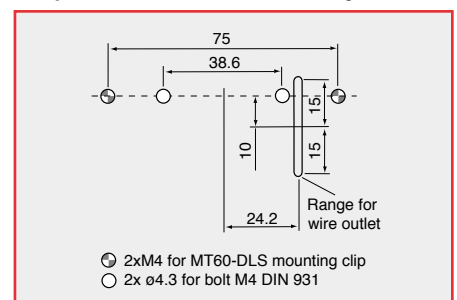
DIGITAL OUTPUT DLS - 1500 - P60 - CR - E



Dimensions for mounting analogue output version



Dimensions for mounting digital output version (1500mm only)



DLS SERIES P96

Series P96 Draw Wire Linear Sensors have a choice of three measurement ranges with three analogue and one digital output signal. 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, and is suitable for a range of industrial applications where large measurement ranges can be measured from a compact sensor footprint.

PERFORMANCE

Measuring range	mm		2000	2500	3000
Output types (See data on page 10 for details)			P/U/I	P/U/I	E
Independent linearity	P/U/I	±%	0.1	0.1	-
	E	±%	-	-	0.02
Resolution	P/U/I	%	Virtually infinite		
	E	mm	-	-	0.087
Sensor element					
Hybrid potentiometer			Y	Y	
Incremental encoder					Y
Wire acceleration	g		8		
Wire extension force max.	N		11	9	9
Wire retraction force min.	N		7.5	5.5	5.5
Wire misalignment max.	°		3		
Operational temperature	°C		-20 to +80		
Protection class			IP65 (only if plug is connected to socket)		
Life (million cycles)	P/U/I		0.5	0.5	-
	E		-	-	5
Vibration IEC 68-2-6			20g, 20Hz - 2kHz		
Shock IEC 68-2-27			50g, 5mS		
Weight	g		1100		
Materials					
Housing			Aluminium, anodised		
Measuring wire			Coated polyamid stainless steel (ø 0.45mm)		
Sensor attachment			Mounting grooves in the housing with slot nuts		
Wire attachment			Wire clip		

AVAILABILITY

Options CA-P available from stock. Ask our sales office for details on other options

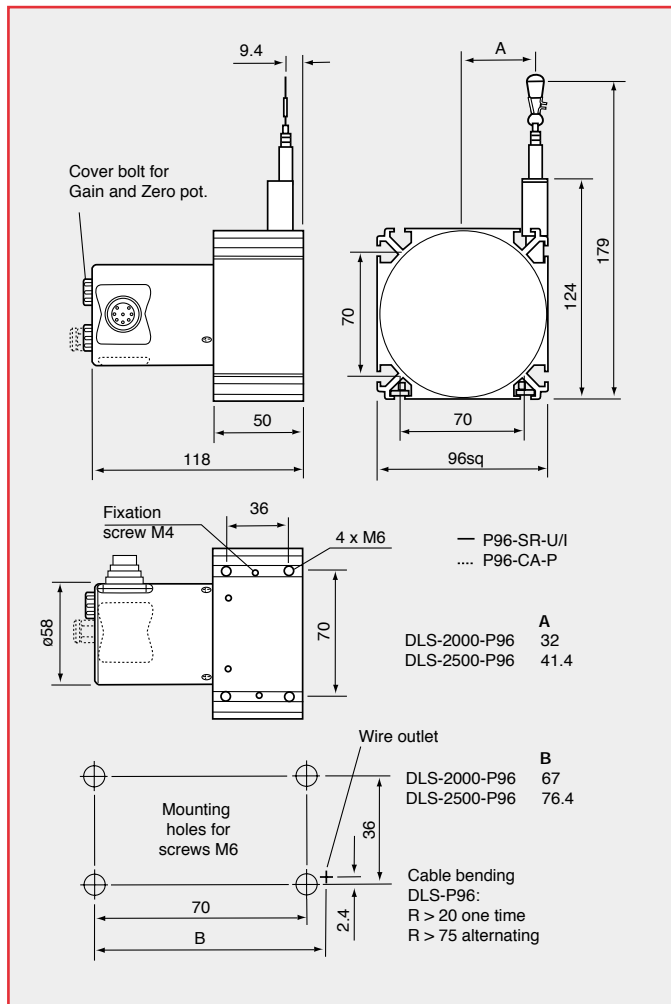
ORDERING CODES AND OPTIONS

DLS - - P96 - -	
Measuring range	Output
Connection	P = Potentiometer (2000/2500mm only)
	U = Voltage (2000/2500mm only)
	I = Current (2000/2500mm only)
	E = Incremental encoder (3000mm only)
SR = Radial plug for outputs U and I	
CA = Axial cable for output P	
CR = Radial cable for output E	

DLS SERIES P96 DIMENSIONS

Drawings not to scale

ANALOGUE OUTPUT DLS -- P96 - CA - P DLS -- P96 - SR - U/I



DLS SERIES P115

Series P115 Draw Wire Linear Sensors have a choice of three measurement ranges with three analogue and one digital output signal. 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, and is suitable for a range of industrial applications where large measurement ranges can be measured from a compact sensor footprint.

PERFORMANCE

Measuring range	mm		3000	4000	5000
Output types			P/U/I	P/U/I	P/U/I/E
<small>(See data on page 10 for details)</small>					
Independent linearity	P/U/I	±%	0.1	0.15	0.15
	E	±%	-	-	0.02
Resolution	P/U/I	%	Virtually infinite		
	E	mm	-	-	0.105
Sensor element					
Hybrid potentiometer			Y	Y	Y
Incremental encoder					Y
Wire acceleration	g		6		
Wire extension force max.	N		8	8.5	9
Wire retraction force min.	N		4.5	4	4
Wire misalignment max.	°		3		
Operational temperature	°C		-20 to +80		
Protection class			IP65 (only if plug is connected to socket)		
Life (million cycles)	P/U/I		0.5	0.5	0.5
	E		-	-	2
Vibration IEC 68-2-6			20g, 20Hz - 2kHz		
Shock IEC 68-2-27			50g, 5mS		
Weight	g		1100		
Materials					
Housing			Aluminium, anodised		
Measuring wire			Coated polyamid stainless steel (ø 0.45mm)		
Sensor attachment			Mounting grooves in the housing with slot nuts		
Wire attachment			Wire clip		

AVAILABILITY

Options CA-P available from stock. Ask our sales office for details on other options

ORDERING CODES AND OPTIONS

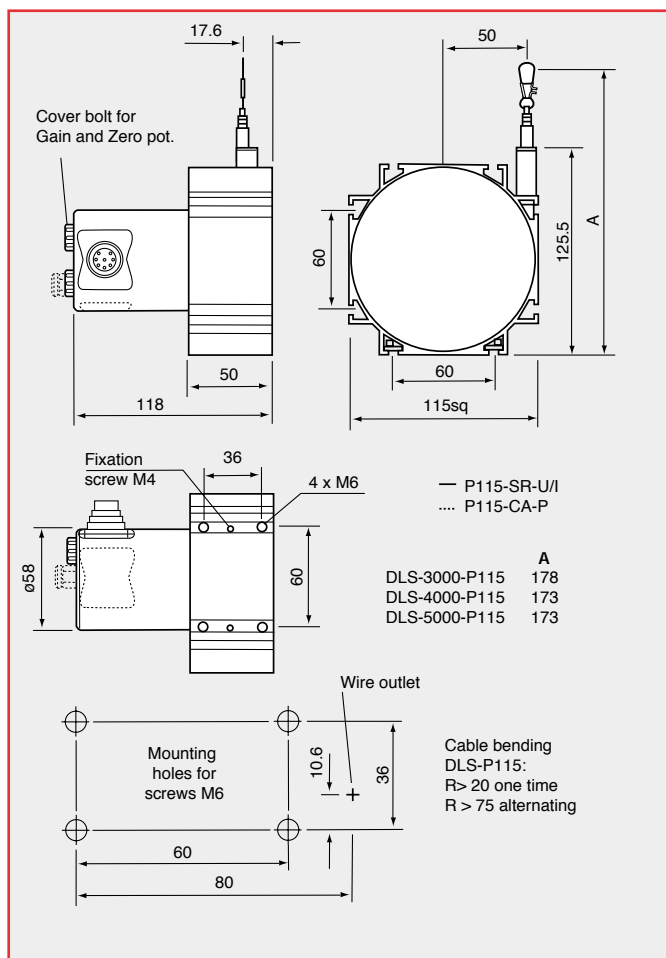
DLS - - P115 - -

Measuring range	Output
Connection	P = Potentiometer (all ranges)
SR = Radial plug for outputs U and I		U = Voltage (all ranges)
CA = Axial cable for output P		I = Current (all ranges)
CR = Radial cable for output E		E = Incremental encoder (5000mm only)

DLS SERIES P115 DIMENSIONS

Drawings not to scale

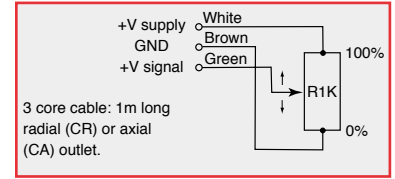
ANALOGUE OUTPUT DLS -- P115 - CA - P DLS -- P115 - SR - U/I



OUTPUT OPTIONS AND ELECTRICAL CONNECTIONS - ANALOGUE

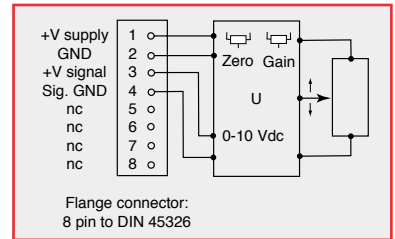
Potentiometric output (P)

Supply voltage (max.)	32Vdc
Resistance $\pm 10\%$	1k Ω
Recommended wiper current (max.)	3mA
Temperature coefficient	$\pm 0.0025\%$ FSO/ $^{\circ}\text{C}$
Sensitivity	Depends on measuring range (Specified on test report supplied)
Operating mode	The potentiometer must only be used as a voltage divider.
Wiper circuit impedance	Minimum of 0.5M Ω is recommended



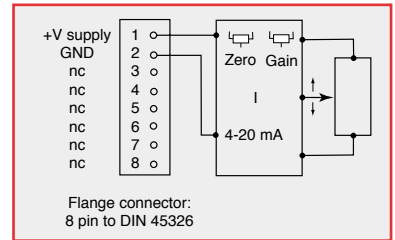
0 to 10Vdc Voltage output (U)

Supply voltage (max.)	14 to 27Vdc (unregulated)
Current consumption (max.)	30mA
Output voltage	0 to 10Vdc (Option: 0 to 5Vdc; ± 5 Vdc)
Output current (max.)	2mA
Load impedance	>5k Ω
Output noise	0.5mV _{eff}
Temperature coefficient	$\pm 0.005\%$ FSO/ $^{\circ}\text{C}$
EMC	EN61326-1; EN61526-2-3
Adjustment range	
	Zero $\pm 20\%$ FSO
	Gain $\pm 20\%$



4 to 20mA 2-wire Current output (I)

Supply voltage* (max.)	14 to 27Vdc (unregulated)
Current consumption (max.)	35mA
Output current range	4 to 20mA
Load	<600 Ω
Output noise	<1.6 μA_{eff}
Temperature coefficient	$\pm 0.01\%$ FSO/ $^{\circ}\text{C}$
EMC	EN61326-1; EN61526-2-3
Adjustment range	
	Zero $\pm 18\%$ FSO
	Gain $\pm 15\%$

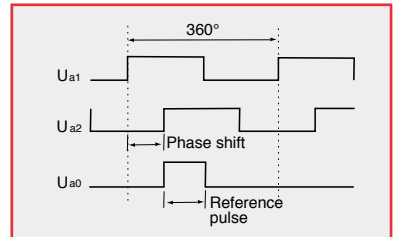


*measured at pins on sensor

OUTPUT OPTIONS AND ELECTRICAL CONNECTIONS - DIGITAL

Incremental Encoder output (E) -

Supply voltage	10 - 30Vdc
Current consumption (max.)	150mA
Output	HTL square wave
Resolution	
DLS-1500-P60-CR-E	10 pulses per mm, corresponds to 0.1mm
DLS-3000-P96-CR-E	11.53 pulses per mm, corresponds to 0.087mm
DLS-5000-P115-CR-E	9.52 pulses per mm, corresponds to 0.105mm
EMC	EN61326-1; EN61526-2-3



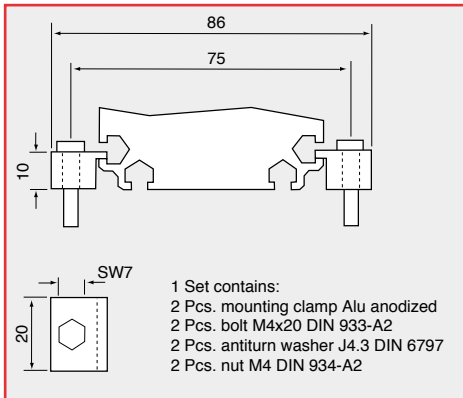
Absolute Encoder output (A) -

Please ask for more details on the absolute encoder outputs available, which include CAN bus, SSI and Profi bus.

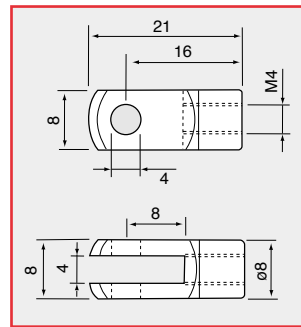
connection	output
brown	U _{a1}
green	$\overline{\text{U}}_{a1}$
grey	U _{a2}
pink	$\overline{\text{U}}_{a2}$
red	U _{a0}
black	$\overline{\text{U}}_{a0}$
blue	+10...30V sens
white	0V sens
brown/green	+10...30Vdc supply
white/green	0V supply
violet	U _{as}
screen	housing

ACCESSORIES

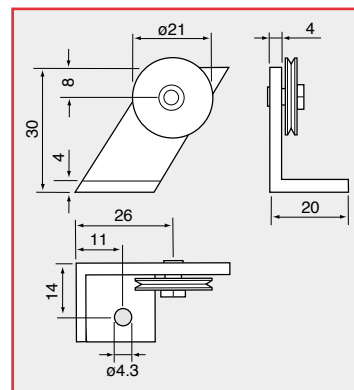
Mounting clamps for series P60 MT60-DLS



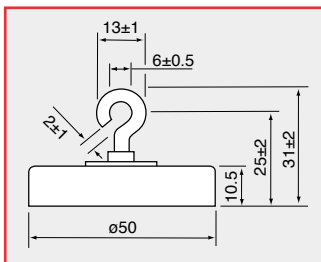
Attachment head with mounting thread M4 GK1-DLS



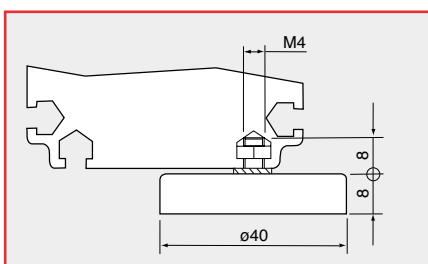
Guide pulley (fixed) with mounting socket TR3-DLS



Magnetic holder for wire clip MH1-DLS

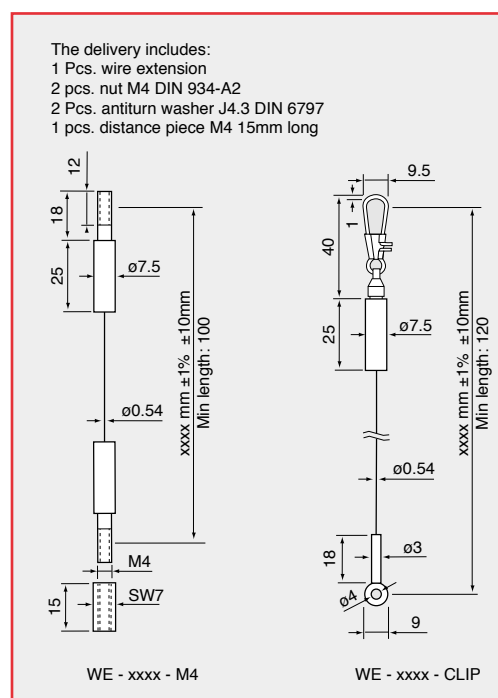


Magnetic holder for sensor body MH2-DLS

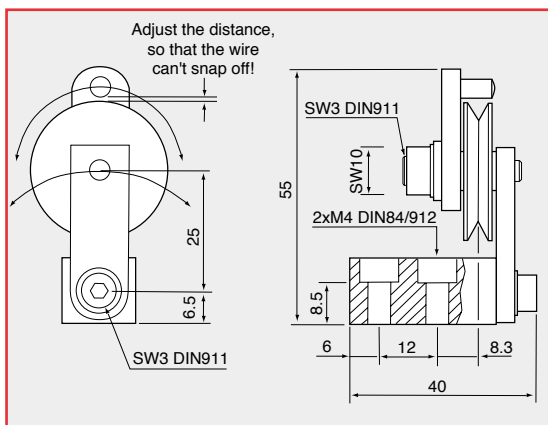


Wire extension with wire clip WE-xxxx-CLIP (max. 10m)

Wire extension with 2 x M4 thread WE-xxxx-M4 (max. 10m)



Guide pulley (adjustable) with mounting socket TR1-DLS



OTHER ACCESSORIES

- Sensor connecting cable, 3m long PC3/8
- Cable female plug (standard) FC8
- Cable female plug, 90° angled FC8/90