LE/LU Series
Load Measuring Pins

FEATURES

- Temperature-compensated transducers with strain gauges in full-bridge configuration.
- Available in 9 standard ranges from 5 kN to 1250 kN (0.56 tf to 140.5 tf).
- **Electronics for transmission over great distances:**
  - **2 wires (LE 210) 4-20 mA**
  - **3 wires (LE 310) 4-20 mA**
  - **4 wires (LU 210) 0-10 V.**
  - **5 wires (LE 510) available with dual channels 4-20 mA**
- Built-in test equipment (B.I.T.E.) included on LE 310 and LE 510 series.
- EMC execution for reliable trouble-free operation.
- Rugged design corresponding to the quality characteristics of LB 210 series.
- Insensitive to external mechanical and chemical effects.
- Ideal for use in hostile environments.
- Simple installation for cost-saving solutions to construction problems.
- Calibrated Output: 0–10 VDC (LU); 4–20 mA (LE)

Model LE 514 & LE 512
Load Measuring Pin

DESCRIPTION

Magtrol Load Measuring Pins are used to measure load and force and provide overload protection. The pins are mounted into machines in place of normal shafts and fitted with strain gauges, allowing them to produce a signal proportional to the measured load. Manufactured in Switzerland, Magtrol's LE/LU Series Load Measuring Pins are rugged with high resistance stainless steel and tight construction. Available in 9 standard ranges from 5 kN to 1250 kN, their operation remains trouble-free and reliable even in electromagnetically difficult environmental conditions.

Magtrol offers a wide range of Load-Force-Weight Transducers with optional integrated electronics or Load Monitoring Units (LMU) with B.I.T.E. functions creating an ideal measurement system which continuously checks for overloads and short circuits.

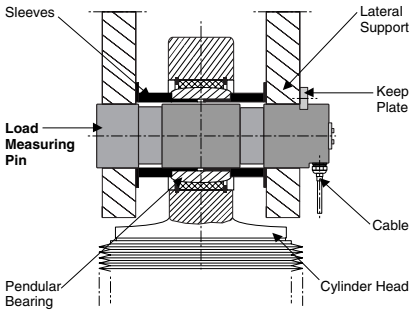
APPLICATIONS

When forces acting on mechanical constructions are measured, the additional equipment required can often be costly and difficult to install. Magtrol Load Measuring Pins offer an excellent solution since they act as a direct element in the assembly, replacing a non-instrumented pin or shaft. LE/LU Series Load Measuring Pins are used for load measuring devices and overload protection on cranes, hoisting gear, elevators and winches. The integrated electronics makes it ideal for applications in which separate signal conditioning is difficult to install and where the monitoring electronics are positioned at extended distances.

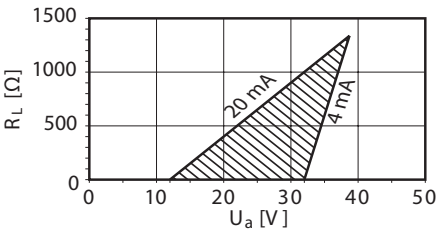
DESIGN

The Magtrol Load Measuring Pins has 2 circular grooves and an axial bore. Inside the central bore, adjacent to the external grooves, the strain gauges are mounted in a full-bridge configuration. The positioning and orientation of the strain gauges have been optimized by means of the finite element method (FEM).

MOUNTING EXAMPLE

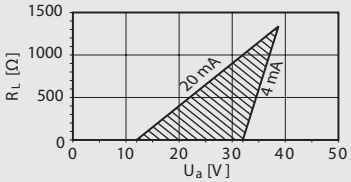


Specifications

Standard Version*	LE 211	LE 212	LE 213	LE 214	LE 216	LE 217	LE 218	LE 220	LE 221
MECHANICAL CHARACTERISTICS									
Nominal Load, fsd (Metric)	5 kN	10 kN	20 kN	50 kN	100 kN	200 kN	500 kN	1000 kN	1250 kN
Nominal Load, fsd (US)	0.56 tf	1.12 tf	2.25 tf	5.62 tf	11.24 tf	22.48 tf	56.20 tf	112.4 tf	140.5 tf
Overload Admissible	150% of rated load without influence on measurement								
Overload at Rupture (of rated load)	≥ 500%						400%	350%	
Material	Stainless steel 1.4057								
EMC	According to EN 61000-6-2 & EN 61326-1								
Protection Class	IP 66 according to DIN 40050								
Lubrication	Not available				Oiler ø4 DIN 3405 D or M10 DIN 3405 A according to the LE model (option)				
ELECTRICAL CHARACTERISTICS									
Operating Principle	Full-bridge strain gauge								
Strain Gauge Bridge Impedance:	5000 Ω								
Output Signal	Rated 4 to 20 mA; max. 3.5 to 25 mA								
Power Supply	12 to 32 VDC with protected polarity reversal < 35 mA								
Non-linearity Error	< 0.25% of fsd							< 0.5% of fsd	
Non-linearity + Hysteresis Error	< 0.5% of fsd							< 0.8% of fsd	
Repeatability	± 0.1% of fsd								
Operating Temperature	-25 °C to +80 °C								
Storage Temperature	-55 °C to +125 °C								
Temperature Influence: • On Zero • On Sensitivity	± 0.02% of fsd / K ± 0.02% / K								
Long Term Stability • Of Zero • Of Sensitivity	< 1% of fsd / year (not cumulative) < 0.5% / year (not cumulative)								
Influence on Measurement Signal (Shift of Force Angle with Respect to Measurement Axis)	According to the cosine function								
Standard Calibration	0 kN = 4 mA fsd in kN = 20 mA								
ELECTRICAL CONNECTION									
Output Connector	Axial, Souriau MS 3112 E 10-6P								
Configuration	2-wire								
Optional Connection Cable Assembly	3 m, 6 m, 12 m or 20 m Cable with: Straight Connector, Souriau MS 3116 J10 6S or 90° Connector, Souriau 851 08 EC 10 6S50								
Load Resistance	Admissible resistance of the 2-wire circuit at the connection of the LE 210 Hatched Operating Domain = Load Resistance R_L / Supply Voltage U_a 								

** Ratings apply to standard load pins only, special models are available by contacting Magtrol.*

Specifications

Standard Version 1 channel *	LE 311	LE 312	LE 313	LE 314	LE 316	LE 317	LE 318	LE 320	LE 321
MECHANICAL CHARACTERISTICS									
Nominal Load, fsd (Metric)	5 kN	10 kN	20 kN	50 kN	100 kN	200 kN	500 kN	1000 kN	1250 kN
Nominal Load, fsd (US)	0.56 tf	1.12 tf	2.25 tf	5.62 tf	11.24 tf	22.48 tf	56.20 tf	112.4 tf	140.5 tf
Overload Admissible	150% of rated load without influence on measurement								
Overload at Rupture (of rated load)	≥ 500%							400%	350%
Material	Stainless steel 1.4057								
EMC	According to EN 61326-1 & EN 61326-2-3								
Protection Class	IP 66 according to DIN 40050								
Lubrication	Not available				Oiler ø4 DIN 3405 D or M10 DIN 3405 A according to the LE model (variant)				
ELECTRICAL CHARACTERISTICS									
Operating Principle	Full-bridge strain gauge								
Strain Gauge Bridge Impedance:	350 Ω								
Output Signal	Rated 4 to 20 mA; max. 0.5 to 22 mA								
Power Supply	12 to 32 VDC with protected polarity reversal < 35 mA								
Non-linearity Error	< 0.5% of fsd								
Non-linearity + Hysteresis Error	< 0.8% of fsd								
Repeatability	± 0.1% of fsd								
Operating Temperature	-25 °C to +80 °C								
Storage Temperature	-30 °C to +90 °C								
Temperature Influence: • On Zero • On Sensitivity	± 0.02% of fsd / K ± 0.02% / K								
Long Term Stability • Of Zero • Of Sensitivity	< 1% of fsd / year (not cumulative) < 0.5% / year (not cumulative)								
Influence on Measurement Signal (Shift of Force Angle with Respect to Measurement Axis)	According to the cosine function								
Standard Calibration	0 kN = 4 mA fsd in kN = 20 mA								
B.I.T.E.									
Type of B.I.T.E. input	Logic signal, active-low, CMOS/TTL compatible, 1 B.I.T.E.								
Effect on the output	Addition of 70% ± 2% of the nominal load in standard (other % in option)								
ELECTRICAL CONNECTION									
Output	integrated 3 m, 6 m, 12 m or 20 m PVC Cable (Standard) or Axial Connector Souriau MS 3112 E10-6P (variant)								
Configuration	3-wire								
Wiring Colors	Supply + : Brown Common : Yellow Signal + : White B.I.T.E. : Green Case : Yellow/Black								
Optional Connection Cable Assembly	3 m, 6 m, 12 m or 20 m Cable with: Straight Connector, Souriau MS 3116 J10 6S or 90° Connector, Souriau 851 08 EC 10 6S50								
Load Resistance	Admissible resistance of the 3-wire circuit at the connection of the LE 310 series Hatched Operating Domain = Load Resistance R_L / Supply Voltage U_a 								

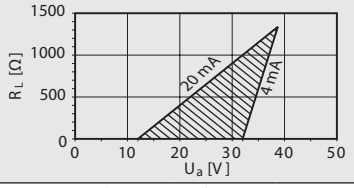
Specifications

LE 510

Standard Version 2 channel *	LE 511	LE 512	LE 513	LE 514	LE 516	LE 517	LE 518	LE 520	LE 521
MECHANICAL CHARACTERISTICS									
Nominal Load, fsd (Metric)	5 kN	10 kN	20 kN	50 kN	100 kN	200 kN	500 kN	1000 kN	1250 kN
Nominal Load, fsd (US)	0.56 tf	1.12 tf	2.25 tf	5.62 tf	11.24 tf	22.48 tf	56.20 tf	112.4 tf	140.5 tf
Overload Admissible	150% of rated load without influence on measurement								
Overload at Rupture (of rated load)	≥ 500%							400%	350%
Material	Stainless steel 1.4057								
EMC	According to EN 61326-1 & EN 61326-2-3								
Protection Class	IP 66 according to DIN 40050								
Lubrication	Not available				Oiler ø4 DIN 3405 D or M10 DIN 3405 A according to the LE model (variant)				
ELECTRICAL CHARACTERISTICS									
Operating Principle	2x Full-bridge strain gauge								
Strain Gauge Bridge Impedance:	2x 350 Ω								
Output Signal 2 channels	2x Rated 4 to 20 mA; max. 0.5 to 22 mA								
Power Supply	1 or 2x 12 to 32 VDC with protected polarity reversal < 35 mA / Common ground								
Non-linearity Error	< 0.5% of fsd								
Non-linearity + Hysteresis Error	< 0.8% of fsd								
Repeatability	± 0.1% of fsd								
Operating Temperature	-25 °C to +80 °C								
Storage Temperature	-30 °C to +90 °C								
Temperature Influence: • On Zero • On Sensitivity	± 0.02% of fsd / K ± 0.02% / K								
Long Term Stability • Of Zero • Of Sensitivity	< 1% of fsd / year (not cumulative) < 0.5% / year (not cumulative)								
Influence on Measurement Signal (Shift of Force Angle with Respect to Measurement Axis)	According to the cosine function								
Standard Calibration	0 kN = 4 mA fsd in kN = 20 mA								
Dual B.I.T.E.									
Type of B.I.T.E. input.	Logic signal, active-low, CMOS/TTL compatible, 1 B.I.T.E. input for each channel								
Effect on the output	Addition of 70% ± 2% of the nominal load in standard (other % in option)								
ELECTRICAL CONNECTION									
Output	Single integrated 3 m, 6 m, 12 m or 20 m PVC Cable (Standard) or Axial Connector Souriau MS 3112 E12-10P (variant)								
Configuration	5-wire								
Wiring Colors									
Optional Connection Cable Assembly	3 m, 6 m, 12 m or 20 m Cable with: Straight Connector, Souriau MS 3116 J12-10S or 90° Connector, Souriau 851 08 EC 12-10S50								
Load Resistance	Admissible resistance of the 5-wire circuit at the connection of the LE 510 series								

Supply + Ch1	Brown		Signal + Ch2	Yellow
Common	Black		B.I.T.E. Ch2	Grey
Signal + Ch1	White		Case	Yellow/Black
B.I.T.E. Ch1	Green			
Supply + Ch2	Red			
Common	Blue			

Hatched Operating Domain = Load Resistance R_L / Supply Voltage U_a



Specifications

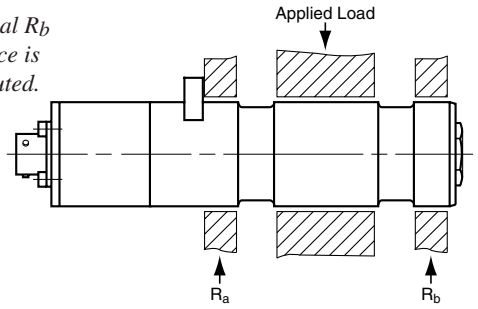
Standard Version*	LU 211	LU 212	LU 213	LU 214	LU 216	LU 217	LU 218	LU 220	LU 221
MECHANICAL CHARACTERISTICS									
Nominal Load, fsd (Metric)	5 kN	10 kN	20 kN	50 kN	100 kN	200 kN	500 kN	1000 kN	1250 kN
Nominal Load, fsd (US)	0.56 tf	1.12 tf	2.25 tf	5.62 tf	11.24 tf	22.48 tf	56.20 tf	112.4 tf	140.5 tf
Overload Admissible	150% of rated load without influence on measurement								
Overload at Rupture (of rated load)	≥ 500%						400%	350%	
Material	LU load measuring pin: Stainless steel 1.4057 LU transmitter housing: Stainless steel 1.4305								
EMC	According to EN 61000-6-2 & EN 61000-6-4 category B								
Protection Class	IP 66 according to DIN 40050								
Lubrication	Not available				Oiler ø4 DIN 3405 D or M10 DIN 3405 A according to the LU model (option)				
ELECTRICAL CHARACTERISTICS									
Operating Principle	Full-bridge strain gauge								
Strain Gauge Bridge Impedance	350 Ω								
Output Signal	0–10 VDC								
Power Supply	12 to 32 VDC with protected polarity reversal < 35 mA								
Non-linearity Error	< 0.25% of fsd							< 0.5% of fsd	
Non-linearity + Hysteresis Error	< 0.5% of fsd							< 0.8% of fsd	
Repeatability	± 0.1% of fsd								
Operating Temperature	-25°C to +80°C								
Storage Temperature	-55°C to +125°C								
Temperature Influence: • On Zero • On Sensitivity	± 0.02% of fsd / K ± 0.02% / K								
Long Term Stability • Of Zero • Of Sensitivity	< 1% of fsd / year (not cumulative) < 0.5% / year (not cumulative)								
Influence on Measurement Signal (Shift of Force Angle with Respect to Measurement Axis)	According to the cosine function								
Standard Calibration	0 kN = 0 V fsd in kN = 10 V								
ELECTRICAL CONNECTION									
Output Connector	Axial, Souriau MS 3112 E10-6P								
Configuration	4-wire								
Connection Cable Assembly	3 m, 6 m, 12 m or 20 m Cable with: Straight Connector, Souriau MS 3116 J10 6S or 90° Connector, Souriau 851 08 EC 10 6S50								

** Ratings apply to standard load pins only, special models are available by contacting Magtrol.*

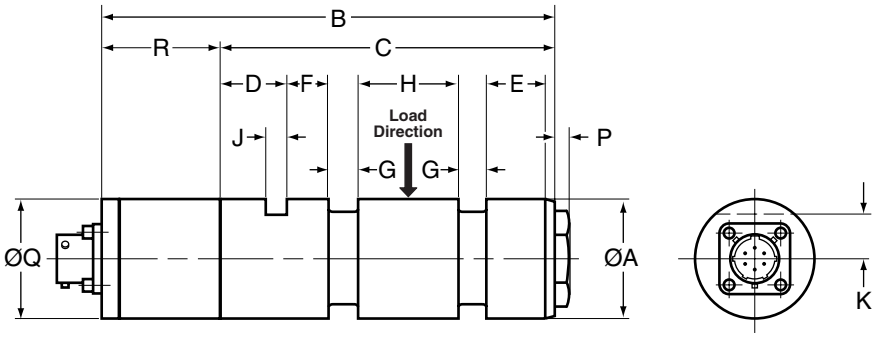
OPERATING PRINCIPLE

When force is applied to the Load Measuring Pin along its sensitive axis, the effect on the strain gauge bridge results in an output signal proportional to the applied force. The signal is then converted by the integrated electronics to a standard 4 to 20 mA (LE) or 0–10V (LU) output. Based on SMD (surface mounted device) technology, the electronics are well-protected against conducted and radiated electromagnetic fields.

R_a should equal R_b so that the force is evenly distributed.



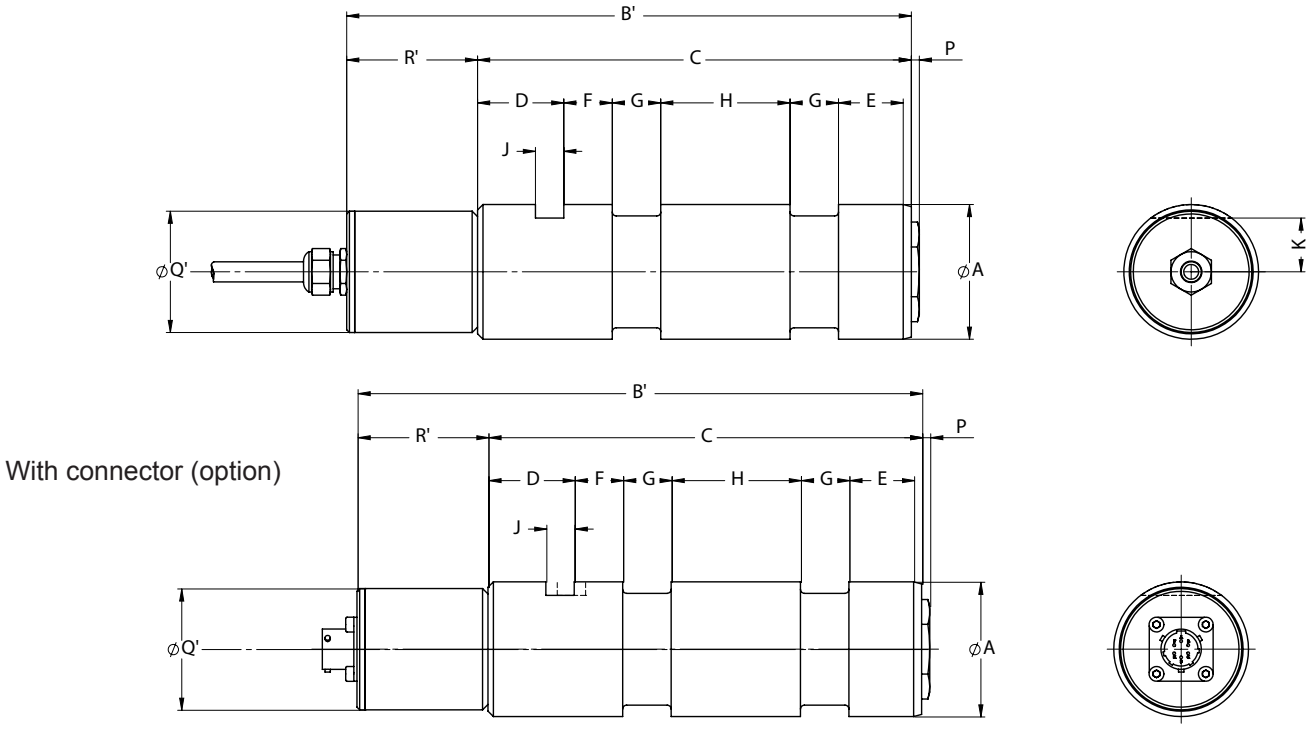
DIMENSIONS



NOTE:
Original dimensions are in Metric units. Dimensions converted to English units have been rounded up to 3 decimal places.

Model	units	Ø A	B	C	D	E	F	G	H	J	K	P	Ø Q	R	Weight
LE/LU 211	*mm*	25h6	136	84	18	16	10	7	24	5.2	9	3	38	52	0.6 kg
	in	0.984	5.354	3.307	0.709	0.63	0.394	0.276	0.945	0.205	0.354	0.118	1.496	2.047	1.323 lb
LE/LU 212	*mm*	25h6	136	84	18	16	10	7	24	5.2	9	3	38	52	0.6 kg
	in	0.984	5.354	3.307	0.709	0.63	0.394	0.276	0.945	0.205	0.354	0.118	1.496	2.047	1.323 lb
LE/LU 213	*mm*	25h6	136	84	18	16	10	7	24	5.2	9	3	38	52	0.6 kg
	in	0.984	5.354	3.307	0.709	0.63	0.394	0.276	0.945	0.205	0.354	0.118	1.496	2.047	1.323 lb
LE/LU 214	*mm*	35h6	149	112	25	14	12	12	35	6.3	11.5	3	38	37	1.05 kg
	in	1.378	5.866	4.409	0.984	0.551	0.472	0.472	1.378	0.248	0.453	0.118	1.496	1.457	2.315 lb
LE/LU 216	*mm*	50h6	198	161	32	24	18	18	48	10.5	20	3	38	37	2.4 kg
	in	1.969	7.795	6.339	1.26	0.945	0.709	0.709	1.89	0.413	0.787	0.118	1.496	1.457	5.291 lb
LE/LU 217	*mm*	65h6	233	196	32	26	20	25	65	10.5	22.5	3	38	37	4.8 kg
	in	2.559	9.173	7.717	1.26	1.024	0.787	0.984	2.559	0.413	0.886	0.118	1.496	1.457	10.582 lb
LE/LU 218	*mm*	85h6	295	258	34	39	35	28	89	10.5	28	3	38	37	11 kg
	in	3.347	11.614	10.158	1.339	1.535	1.378	1.102	3.504	0.413	1.102	0.118	1.496	1.457	24.251 lb
LE/LU 220	*mm*	100h6	384	347	36	61	55	35	120	10.5	36	3	38	37	19.6 kg
	in	3.937	15.118	13.661	1.417	2.402	2.165	1.378	4.724	0.413	1.417	0.118	1.496	1.457	43.211 lb
LE/LU 221	*mm*	120h6	384	347	36	61	55	35	120	12.5	40	3	38	37	28.8 kg
	in	4.724	15.118	13.661	1.417	2.402	2.165	1.378	4.724	0.492	1.575	0.118	1.496	1.457	63.493 lb

DIMENSIONS



NOTE:
Original dimensions are in Metric units. Dimensions converted to English units have been rounded up to 3 decimal places.

Model	units	Ø A	B'	C	D	E	F	G	H	J	K	P	Ø Q'	R'	Weight
LE 311/511	*mm*	25h6	147.6	84	18	16	10	7	24	5.2	9	3	45	63.6	0.6 kg
	in	0.984	5.811	3.307	0.709	0.63	0.394	0.276	0.945	0.205	0.354	0.118	1.771	2.504	1.323 lb
LE 312/512	*mm*	25h6	147.6	84	18	16	10	7	24	5.2	9	3	45	63.6	0.6 kg
	in	0.984	5.811	3.307	0.709	0.63	0.394	0.276	0.945	0.205	0.354	0.118	1.771	2.504	1.323 lb
LE 313/513	*mm*	25h6	147.6	84	18	16	10	7	24	5.2	9	3	45	63.6	0.6 kg
	in	0.984	5.811	3.307	0.709	0.63	0.394	0.276	0.945	0.205	0.354	0.118	1.771	2.504	1.323 lb
LE 314/514	*mm*	35h6	175.6	112	25	14	12	12	35	6.3	11.5	3	45	63.6	1.05 kg
	in	1.378	6.913	4.409	0.984	0.551	0.472	0.472	1.378	0.248	0.453	0.118	1.771	2.504	2.315 lb
LE 316/516	*mm*	50h6	209.6	161	32	24	18	18	48	10.5	20	3	45	48.6	2.4 kg
	in	1.969	8.252	6.339	1.26	0.945	0.709	0.709	1.89	0.413	0.787	0.118	1.771	1.913	5.291 lb
LE 317/517	*mm*	65h6	244.6	196	32	26	20	25	65	10.5	22.5	3	45	48.6	4.8 kg
	in	2.559	9.629	7.717	1.26	1.024	0.787	0.984	2.559	0.413	0.886	0.118	1.771	1.913	10.582 lb
LE 318/518	*mm*	85h6	306.6	258	34	39	35	28	89	10.5	28	3	45	48.6	11 kg
	in	3.347	11.614	10.158	1.339	1.535	1.378	1.102	3.504	0.413	1.102	0.118	1.771	1.913	24.251 lb
LE 320/520	*mm*	100h6	395.6	347	36	61	55	35	120	10.5	36	3	45	48.6	19.6 kg
	in	3.937	15.575	13.661	1.417	2.402	2.165	1.378	4.724	0.413	1.417	0.118	1.771	1.913	43.211 lb
LE 321/521	*mm*	120h6	395.6	347	36	61	55	35	120	12.5	40	3	45	48.6	28.8 kg
	in	4.724	15.575	13.661	1.417	2.402	2.165	1.378	4.724	0.492	1.575	0.118	1.771	1.913	63.493 lb

OPTIONS AND ORDERING INFORMATION

LE SERIES LOAD MEASURING PINS LE 2 □□/0 □3

- Model LE 2 1 1 – 2 2 1
- Lubrication (LE 211–221): Without — 1
  (LE 216–221): With — 3

Example

An LE 216 Load Measuring Pin with lubrication would be ordered as LE 216/033.

LU SERIES LOAD MEASURING PINS LU 2□□/1□1

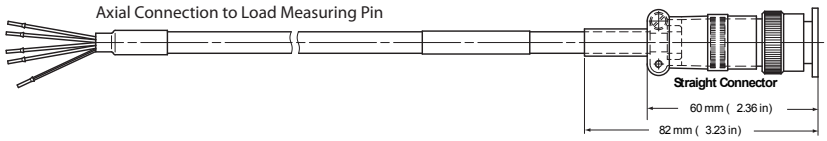
- Model LU 2 1 1 – 2 2 1
- Lubrication (LU 211–221): Without — 1
  (LU 216–221): With — 3

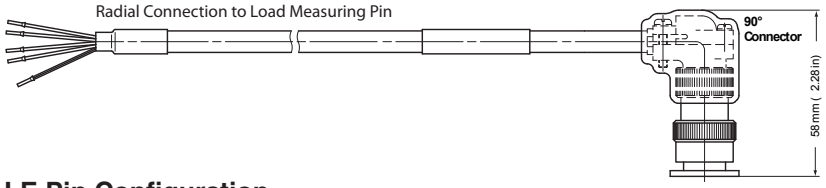
Example

An LU 216 Load Measuring Pin with lubrication would be ordered as LU 216/131.

ACCESSORIES

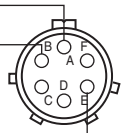
Cable Assemblies





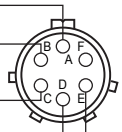
LE Pin Configuration

Supply +	red	A
Supply -	blue	B
Case	black	E



LU Pin Configuration

Supply +	red	A
Supply -	blue	B*
Signal +	white	C
Signal -	green	D*
Case	black	E



NOTE:
Pins B and D are connected together. This feature allows the user to cancel the voltage drop error due to the supply current on the cable (4-wire measurement).

Accessory Ordering Information

COUNTER-CONNECTOR

Straight Connector	P/N 957.11.08.0030
90° Connector	P/N 957.11.08.0029

CONNECTION CABLE ASSEMBLY

Part Number EH 13 □ / 0 □ 1

- Straight Connector — 8
- 90° Connector — 9

CONNECTION CABLE ASSEMBLY

Cable Length:
- 3 m — 1
- 6 m — 2
- 12 m — 3
- 20 m — 4

OPTIONS AND ORDERING INFORMATION

LE 310 SERIES LOAD MEASURING PINS LE 3□□/□□1

3-Wire LE (if the B.I.T.E. is used 1 extra wire has to be connected)

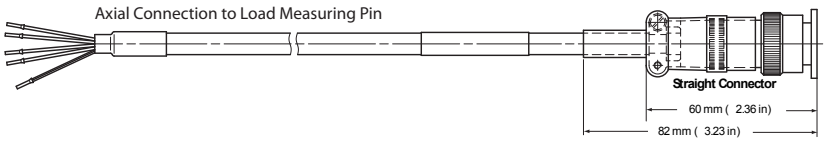
- Model LE 3[1][1]– 3[2][1]
- Lubrication NO (standard for any type from LE311 - 321): 0
  YES (available only on LE 316 - 321): 1
- Option: Axial connector: 0
  3 m length: 1
  6 m length: 2
  12 m length: 3
  20 m length: 4
- Minor revision number (compatibility is guaranteed)

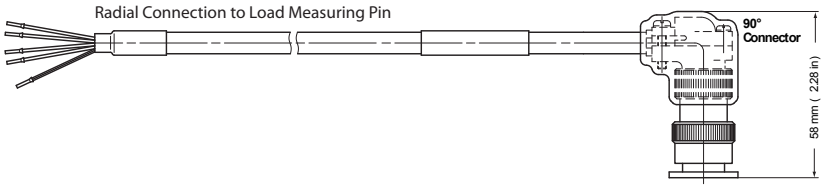
Example

An LE 316 Load Measuring Pin with lubrication and 6m cable would be ordered as LE 316/121.

ACCESSORIES

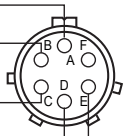
LE 310 Cable Assemblies





LE 310 Pin Configuration

Supply +	red	A
Common	blue	B
Signal +	white	C
B.I.T.E.	green	D
Case	black	E



Accessory Ordering Information

COUNTER-CONNECTOR

Straight Connector	P/N 957.11.08.0030
90° Connector	P/N 957.11.08.0029

CONNECTION CABLE ASSEMBLY

Part Number EH 13□/0□1

- Straight Connector — 8
- 90° Connector — 9

CONNECTION CABLE ASSEMBLY

Cable Length:
- 3 m — 1
- 6 m — 2
- 12 m — 3
- 20 m — 4

OPTIONS AND ORDERING INFORMATION

LE 510 SERIES LOAD MEASURING PINS LE 5□□/□□1

5-Wire X-X (redundant) LE with B.I.T.E. for each channel
(if the B.I.T.E. is used 2 extra wires have to be connected):

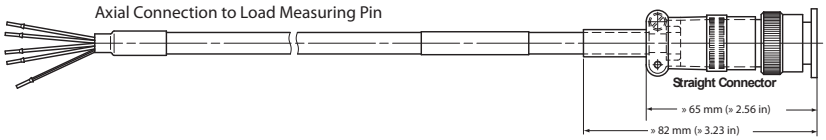
- Model LE 5 1 1 – 5 2 1
- Lubrication NO (standard for any type from LE511 - 521): 0
  YES (available only on LE 516 - 521): 1
- Option: Axial connector: 0
  3 m length: 1
  6 m length: 2
  12 m length: 3
  20 m length: 4
- Minor revision number (compatibility is guaranteed)

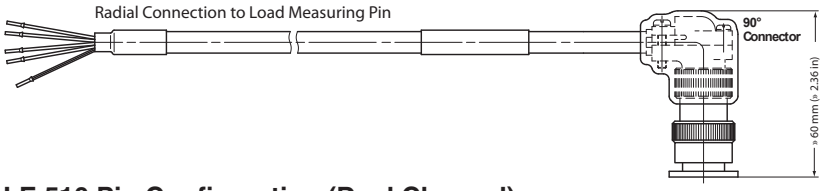
Example

An LE 516 Load Measuring Pin with lubrication and 6m cable would be ordered as LE 516/121.

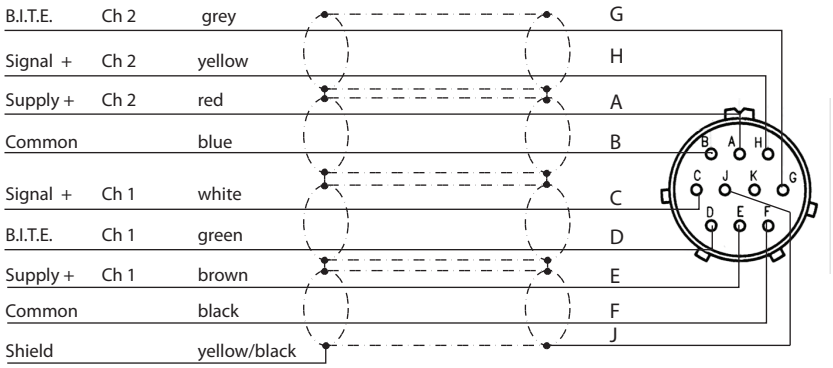
ACCESSORIES

LE 510 Cable Assemblies





LE 510 Pin Configuration (Dual Channel)



Accessory Ordering Information

COUNTER-CONNECTOR

Straight Connector	P/N 957.11.08.0103
90° Connector	P/N 957.11.08.0063

CONNECTION CABLE ASSEMBLY

Part Number ER 109 /□□1

- Straight Connector 3
- 90° Connector 1

CONNECTION CABLE ASSEMBLY

Cable Length:
3 m 1
6 m 2
12 m 3
20 m 4

Due to the continual development of our products, we reserve the right to modify specifications without forewarning.

www.magtrol.com

MAGTROL INC
70 Gardenville Parkway
Buffalo, New York 14224 USA
Phone: +1 716 668 5555
Fax: +1 716 668 8705
E-mail: magtrol@magtrol.com

MAGTROL SA
Route de Montena 77
1728 Rossens/Fribourg, Switzerland
Phone: +41 (0)26 407 3000
Fax: +41 (0)26 407 3001
E-mail: magtrol@magtrol.ch

Subsidiaries in:
Germany • France
China • India
Worldwide Network of Sales Agents

ISO 9001 BUREAU VERITAS Certification

LE/LU210-310-510-US 08/12