



# **LB / LE / LU Series Load Measuring Pins**



**User's Manual**

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# Revisions To This Manual

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The contents of this manual are subject to change without prior notice. Should revisions be necessary, updates to all Magtrol User's Manuals can be found at Magtrol's web site at [www.magtrol.com/support/manuals.htm](http://www.magtrol.com/support/manuals.htm).

Please compare the date of this manual with the revision date on the web site, then refer to the manual's Table of Revisions for any changes/updates that have been made since this edition.

## REVISION DATE

First English Edition – rev. A– April 2012

Date	Edition	Change	Section(s)
24.04.12	1st Edition - rev. A	Dimension L for LB 218 is now 32 mm instead of 25 mm before Dimension L for LB 220 is now 35 mm instead of 25 mm before	1.2.1

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# Preface

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## PURPOSE OF THIS MANUAL

This manual contains all the information required for the setup, connection and general use of Magtrol's Load Measuring Pins. Please read this manual in its entirety before operating. Keep the manual in a safe place for quick reference whenever a question should arise.

## WHO SHOULD USE THIS MANUAL

This manual is intended for those who install load measuring pins for lifting or weighing installations and connect them to electronic signal processing systems to carry out measurements. The operator is assumed to have the necessary technical training in mechanical engineering and electronics to enable him to install these load measuring pins.

## MANUAL ORGANIZATION

This section gives an overview of the structure of the manual and the information contained within it. Some information has been deliberately repeated in different sections of the document to minimize cross-referencing and to facilitate understanding through reiteration.

The structure of the manual is as follows:

- Chapter 1: INTRODUCTION – Contains the technical data sheets for the load measuring pins, which describe the units and provide an overview of their possible applications.
- Chapter 2: INSTALLATION/CONFIGURATION – Provides the information needed for the setup and connection of the load measuring pins.
- Chapter 3: OPERATING PRINCIPLES – Describes the load measuring pins measuring principle.
- Chapter 4: INFLUENCE FACTORS – Contains explanations concerning the influence of the mounting position of the load measuring pins on the measured signals.
- Chapter 5: MAINTENANCE – Contains information on lubrication procedures and provides recommendations for the calibration and checking of the measuring current and voltage.
- Chapter 6: TROUBLESHOOTING – Provides solutions to common problems encountered during configuration and running of the load measuring pins.
- Appendix A: OIML CERTIFICATION – OIML Certificate (for certain LB 230 Series Load Measuring Pins).

## CONVENTIONS USED IN THIS MANUAL

The following symbols and type styles may be used in this manual to highlight certain parts of the text:



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**Note:** This is intended to draw the operator's attention to complementary information or advice relating to the subject being treated. It introduces information enabling the correct and optimal function of the product.

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**CAUTION:** THIS IS USED TO DRAW THE OPERATOR'S ATTENTION TO INFORMATION, DIRECTIVES, PROCEDURES, ETC. WHICH, IF IGNORED, MAY RESULT IN DAMAGE TO THE MATERIAL BEING USED. THE ASSOCIATED TEXT DESCRIBES THE NECESSARY PRECAUTIONS TO TAKE AND THE CONSEQUENCES THAT MAY ARISE IF THESE PRECAUTIONS ARE IGNORED.

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**WARNING!** THIS INTRODUCES DIRECTIVES, PROCEDURES, PRECAUTIONARY MEASURES, ETC. WHICH MUST BE EXECUTED OR FOLLOWED WITH THE UTMOST CARE AND ATTENTION, OTHERWISE THE PERSONAL SAFETY OF THE OPERATOR OR THIRD PARTY MAY BE AT RISK. THE READER MUST ABSOLUTELY TAKE NOTE OF THE ACCOMPANYING TEXT, AND ACT UPON IT , BEFORE PROCEEDING FURTHER.

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# 1. Introduction

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## 1.1 GENERAL DESCRIPTION

When the force applied to mechanical structures needs to be measured, expensive modifications to the structure are often necessary. Load measuring pins present considerable advantages, since they replace conventional force transducers and at the same time are easily integrated into a measurement system. They are used in replacement of non-instrumented load-carrying pins.

As a solution to load measuring problems Magtrol proposes a wide range of products dedicated to load measuring and overload protection:

- LB 210 - LB 221 : standard models with voltage output
- LB 231 - LB 241 : enhanced models for use in hostile environments
- LE 210 - LE 221 : models with calibrated current output.
- LU 210 - LU 221 : models with calibrated voltage output.

## 1.2 DATA SHEETS

### 1.2.1 LB 210 SERIES LOAD MEASURING PINS



LB 210  
Data Sheet

## LB 210 Series Load Measuring Pins

### FEATURES

- For overload detection and load measurement from 2.5 kN to 1250 kN (0.28 tf to 140.5 tf).
- Admissible Overload: 150% of the nominal load.
- Overload at Rupture: up to 500% of the nominal load.
- Insensitive to external mechanical and chemical effects.
- Ideal for use in hostile environments.
- Temperature-compensated transducers with strain gauges in full-bridge configuration.
- Simple installation for cost-saving solutions to measurement problems.
- High reliability for strict safety requirements.
- Many options may be added to the lower-cost standard load pin for greater flexibility.
- Can be designed with special dimensions for adaptation to various construction conditions.



### 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 LB 210 Series Load Pins are rugged with high resistance stainless steel and tight construction, designed specifically for use in harsh industrial environments. Available in 10 standard ranges from 2.5 kN to 1250 kN, these highly ergonomic pins can be used for either new or refitted installations and are adaptable to various conditions.

Magtrol Load Measuring Pins can be used alone or as part of a complete measurement system. Magtrol offers a wide range of Load-Force-Weight Transducers in various executions and accuracy classes and our Load Monitoring Units (LMUs) constitute an ideal safe measurement system which continuously checks for overloads and short circuits.

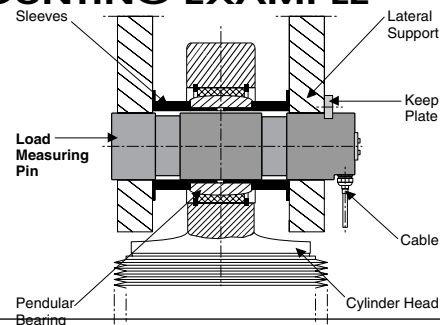
### APPLICATIONS

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. LB 210 Series Load Pins are used for load measuring devices and overload protection on cranes, hoisting gear, elevators and winches, and force measurement for regulation processes in industrial installations and machinery production.

### DESIGN

The Magtrol Load Pin 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

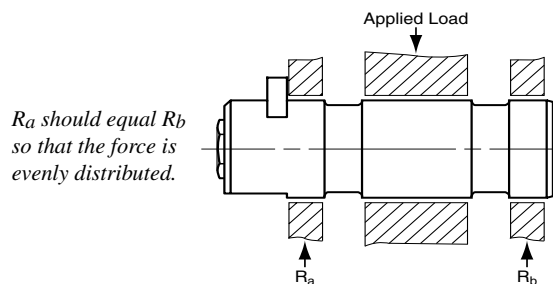
**LB 210**

Standard Version*	LB 210	LB 211	LB 212	LB 213	LB 214	LB 216	LB 217	LB 218	LB 220	LB 221	
<b>MECHANICAL CHARACTERISTICS</b>											
Nominal Load, fsd (Metric)	2.5 kN	5 kN	10 kN	20 kN	50 kN	100 kN	200 kN	500 kN	1000 kN	1250 kN	
Nominal Load, fsd (US)	0.28 tf	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 Limit	250% of rated load with new calibration										
Overload at Rupture (of rated load)	≥ 500%							400%	350%		
Material	Stainless steel 1.4057										
Protection Class	IP 66 according to DIN 40050										
Fit	G7 / h6										
Lubrication	not available					Oiler ø4 DIN 3405 D or M10 DIN 3405 A according to the LB model					
<b>ELECTRICAL CHARACTERISTICS</b>											
Operating Principle	Full-bridge strain gauge										
Bridge Impedance:											
• Input	400 Ω										
• Output	350 Ω										
Power Supply	5 to 12 V DC / AC										
Zero Adjustment	± 1% of fsd										
Transducer Sensitivities	0.5 mV/V ± 3%			1 mV/V ± 3%				1.8 mV/V ± 3%			
Non-linearity Error	< 0.25% of fsd			< 0.25% of fsd				< 0.5% of fsd			
Non-linearity + Hysteresis Error	< 0.5% of fsd			< 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	± 0.02% of fsd / K										
• On Sensitivity	± 0.02% / K										
Influence on Measurement Signal (Shift of Force Angle with Respect to Measurement Axis)	According to the cosine function										
<b>ELECTRICAL CONNECTION</b>											
Cable Type	K-414										
Cable Length	3 m (standard); 6 m, 12 m, 20 m (optional)										
PG Output	Axial, with heat-shrinkable sleeve					Radial, with heat-shrinkable sleeve (standard); Axial, with heat-shrinkable sleeve (optional)					
Optional Output Connector	not available					Radial, MS 3112 E 10-6P					
Optional Connection Cable Assembly	not available					3 m, 6 m, 12 m or 20 m Cable with: Straight Connector, 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

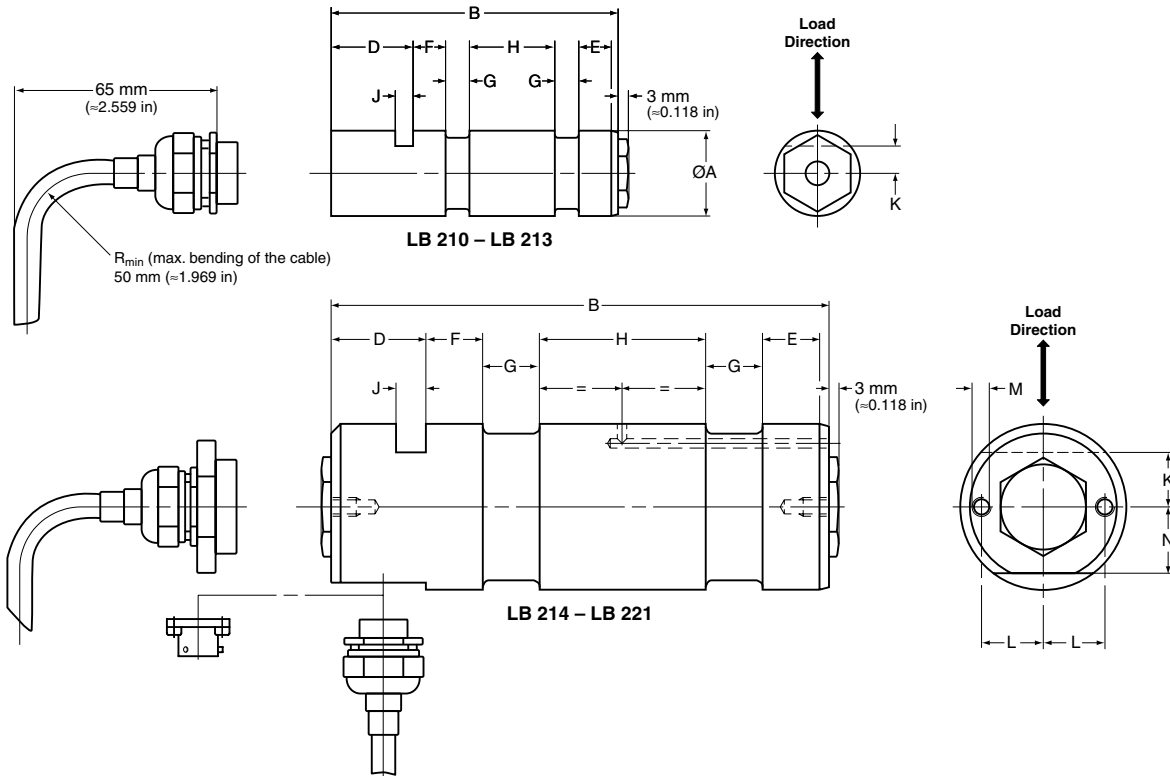
When force is applied to the Load Measuring Pin along its sensitive axis, the effect on the strain gauge bridge results in an output signal proportional to the applied force. The powering of the strain gauge bridge, as well as the amplification of its output signal voltage, is performed by an external amplifier. Depending on the execution, the latter allows the monitoring of several levels.



# Specifications

## LB 210

### DIMENSIONS



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

Model	units	$\varnothing A$	B	D	E	F	G	H	J	K	L	M	N	Weight
LB 210	mm	25h6	84	18	16	10	7	24	5.2	9	---	---	---	0.2 kg
	in	0.984	3.307	0.709	0.630	0.394	0.276	0.945	0.205	0.354	---	---	---	0.441 lb
LB 211	mm	25h6	84	18	16	10	7	24	5.2	9	---	---	---	0.2 kg
	in	0.984	3.307	0.709	0.630	0.394	0.276	0.945	0.205	0.354	---	---	---	0.441 lb
LB 212	mm	25h6	84	18	16	10	7	24	5.2	9	---	---	---	0.2 kg
	in	0.984	3.307	0.709	0.630	0.394	0.276	0.945	0.205	0.354	---	---	---	0.441 lb
LB 213	mm	25h6	84	18	16	10	7	24	5.2	9	---	---	---	0.2 kg
	in	0.984	3.307	0.709	0.630	0.394	0.276	0.945	0.205	0.354	---	---	---	0.441 lb
LB 214	mm	35h6	112	25	14	12	12	35	6.3	11.5	---	---	16	0.65 kg
	in	1.378	4.409	0.984	0.551	0.472	0.472	1.378	0.248	0.453	---	---	0.630	1.433 lb
LB 216	mm	50h6	161	32	24	18	18	48	10.5	20	---	---	21.5	2.0 kg
	in	1.967	6.339	1.260	0.945	0.709	0.709	1.890	0.413	0.787	---	---	0.847	4.409 lb
LB 217	mm	65h6	196	32	26	20	25	65	10.5	22.5	---	---	28.5	4.4 kg
	in	2.559	7.717	1.260	1.024	0.787	0.984	2.559	0.413	0.886	---	---	1.122	9.700 lb
LB 218	mm	85h6	258	34	39	35	28	89	10.5	28	32	M6	35	10.6 kg
	in	3.347	10.158	1.339	1.535	1.378	1.102	3.504	0.413	1.102	1.260	---	1.378	23.369 lb
LB 220	mm	100h6	347	36	61	55	35	120	10.5	36	35	M8	45	19.2 kg
	in	3.937	13.661	1.417	2.402	2.165	1.378	4.724	0.413	1.417	1.378	---	1.772	42.328 lb
LB 221	mm	120h6	347	36	61	55	35	120	12.5	40	35	M8	45	28.4 kg
	in	4.724	13.661	1.417	2.402	2.165	1.378	4.724	0.492	1.575	1.378	---	1.772	62.611 lb

# Ordering Information

**LB 210**

## OPTIONS AND ORDERING INFORMATION

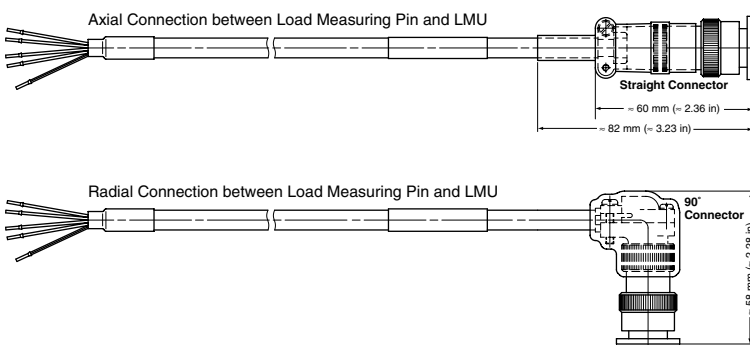
<b>STANDARD MODELS</b>		LB 2	□	□	-011/00	□
• Model LB 2	□	□	-2	□	□	
• Model LB 2	□	□	-2	□	□	
<b>OPTIONS FOR MODELS LB 214 – LB 221</b>		LB 2	□	□	-111/	□
• Model LB 2	□	□	-2	□	□	
• Lubrication (LB 214–221):	Without (standard)					0
	(LB 216–221): With					1
• Electrical Connection:	PG Radial (standard)					0
	PG Axial					1
	Radial Connector					2 0
<b>CONNECTION CABLE ASSEMBLY</b>						
• Cable Length:	3 m					1
	6 m					2
	12 m					3
	20 m					4

**Example**

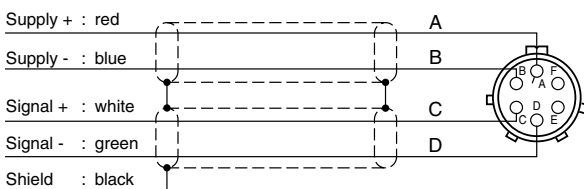
An LB 216 Load Measuring Pin with lubrication, PG axial electrical connection and 20 m cable would be ordered as LB 216-111/114.

## ACCESSORIES

### Cable Assemblies



### Pin Configuration



### 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

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

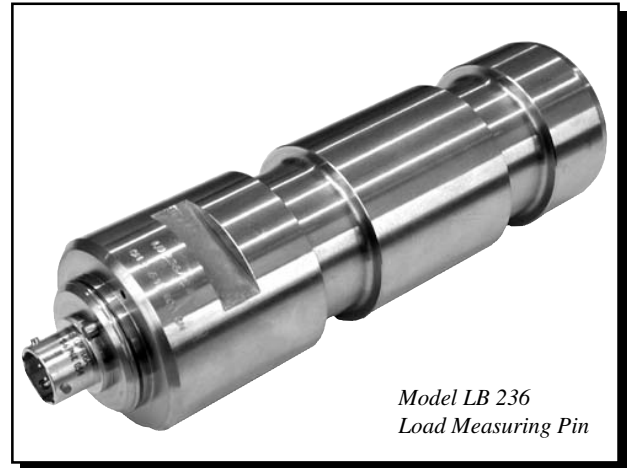
## 1.2.2 LB 230 SERIES LOAD MEASURING PINS

## LB 230 Series Load Measuring Pins

OIML Classified

### FEATURES

- Temperature-compensated transducers with strain gauges in full-bridge configuration.
- Available in 10 standard ranges from 5 kN to 1250 kN (0.56 tf to 140.5 tf).
- Classified according to OIML R60 D0.1 from 50 to 200 kN for scales in class III.
- Hermetically sealed execution for harsh environmental conditions (IP 67).
- Compensation for axial forces makes the load pin virtually insensitive to all lateral forces.
- Dimensions compatible with the standard LB 210 series.
- High reliability for strict safety requirements.
- Simple installation for cost-saving solutions to measurement problems.



### 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. Made in Switzerland, Magtrol's LB 230 Series Load Pins are rugged with high resistance stainless steel and tight construction, making for an essentially maintenance-free life. Available in 10 standard ranges from 5 kN to 1250 kN, these temperature compensated transducers come with strain gauges in full-bridge configuration. Because the strain gauges are inside a hermetically sealed pin, they are insensitive to external mechanical and chemical effects making them ideal for use in harsh environmental conditions.

Magtrol Load Measuring Pins can be used alone or as part of a complete measurement system. Magtrol offers a wide range of Load-Force-Weight Transducers in various executions and accuracy classes and our Load Monitoring Units (LMUs) constitute an ideal safe measurement system which continuously checks for overloads and short circuits.

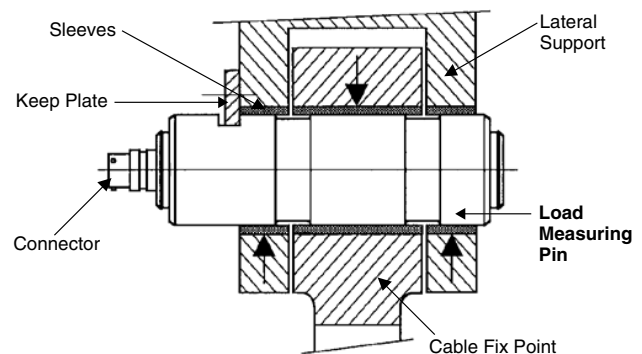
### APPLICATIONS

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. LB 230 Series Load Pins can be used in new or refitted installations for many applications including mobile or stationary weighing, load measuring on cranes, hoisting gear, elevators and floor conveyors and force detection in harsh tropical, offshore, marine and harbor environments.

### DESIGN

The load measuring pin has 2 circular grooves and an axial bore. Inside the central bore, adjacent to the external grooves, 8 strain gauges are mounted in a double full-bridge configuration. The positioning and orientation of the strain gauges has been optimized by means of the finite element method (FEM). Any transverse or axial forces, even when acting on any part of the pin, have practically no influence on the measurement signal.

### MOUNTING EXAMPLE



# Specifications

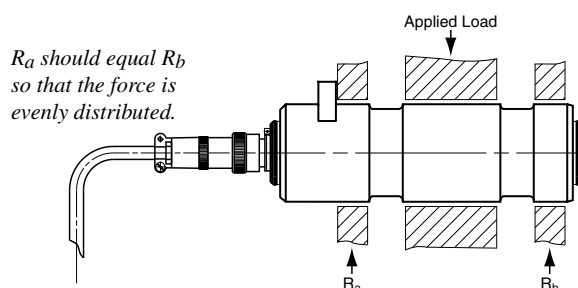
**LB 230**
**GENERAL  
INFORMATION**

Standard Version*	LB 231	LB 232	LB 233	LB 234	LB 235	LB 236	LB 237	LB 238	LB 240	LB 241	
<b>MECHANICAL CHARACTERISTICS</b>											
Nominal Load, fsd (Metric)	5 kN	10 kN	20 kN	50 kN	70 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	7.87 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 the measurement										
Overload Limit	250% of rated load with new calibration										
Overload at Rupture (of rated load)	≥ 500%							400%	350%		
Material	Stainless steel 1.4057										
Protection Class	IP 67 according to DIN 40050										
Fit	G7 / h6										
<b>ELECTRICAL CHARACTERISTICS</b>											
Operating Principle	Double full-bridge strain gauge										
Bridge Impedance:											
• Input	800 Ω										
• Output	700 Ω										
Power Supply	5 to 12 V DC / AC										
Zero Adjustment	± 1% of fsd										
Transducer Sensitivities	0.5 mV/V ± 3%			1 mV/V ± 3%				1 mV/V ± 3%			
Non-linearity Error	< 0.2% of fsd										
Non-linearity + Hysteresis Error	< 0.4% of fsd										
Repeatability	± 0.1% of fsd										
OIML Class	not available			R60 D0.1				not available			
Operating Temperature	-25 °C to +80 °C										
Storage Temperature	-55 °C to +125 °C										
Temperature Influence:											
• On Zero	± 0.02% of fsd / K										
• On Sensitivity	± 0.02% / K										
Influence on Measurement Signal (Shift of Force Angle with Respect to Measurement Axis)	According to the cosine function										
<b>ELECTRICAL CONNECTION</b>											
Output Connector	Axial, Souriau 8525 IH 10B 06 PNH										
Connection Cable Assembly	3 m, 6 m, 12 m or 20 m Cable with: Straight Connector, 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

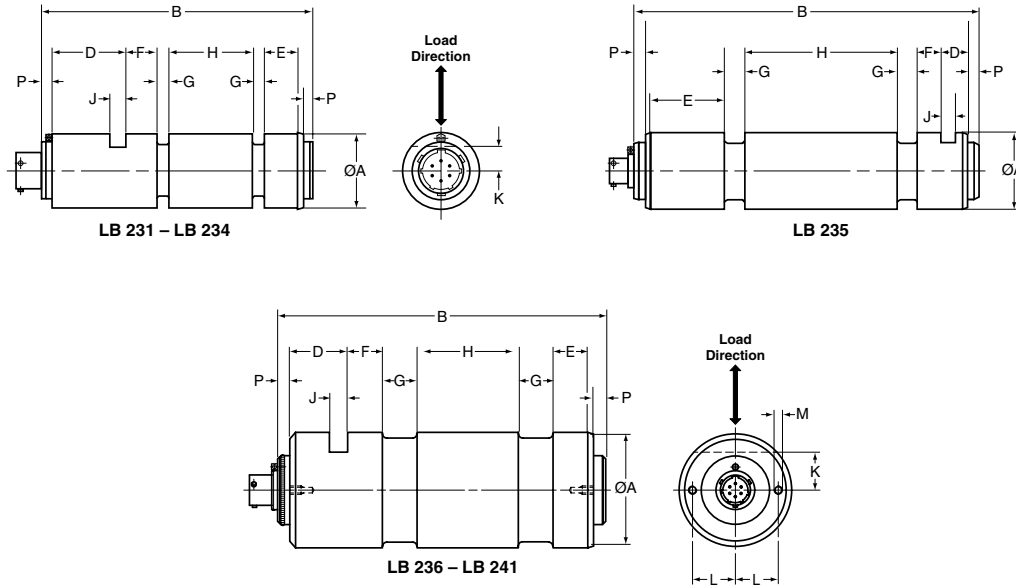
When force is applied to the Load Measuring Pin along its sensitive axis, the effect on the strain gauge bridge results in an output signal proportional to the applied force. The powering of the strain gauge bridge, as well as the amplification of its output signal voltage, is performed by an external amplifier. Depending on the execution, the latter allows the monitoring of several levels.



**Specifications**

**LB 230**

**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	D	E	F	G	H	J	K	L	M	P	Weight
LB 231	mm	25h6	86	16	14	10	7	24	5.2	9	---	---	3	0.2 kg
	in	0.984	3.386	0.630	0.551	0.394	0.276	0.945	0.205	0.354	---	---	0.118	0.441 lb
LB 232	mm	25h6	86	16	14	10	7	24	5.2	9	---	---	3	0.2 kg
	in	0.984	3.386	0.630	0.551	0.394	0.276	0.945	0.205	0.354	---	---	0.118	0.441 lb
LB 233	mm	25h6	86	16	14	10	7	24	5.2	9	---	---	3	0.2 kg
	in	0.984	3.386	0.630	0.551	0.394	0.276	0.945	0.205	0.354	---	---	0.118	0.441 lb
LB 234	mm	35h6	114	23	12	12	12	35	6.3	11.5	---	---	3	0.65 kg
	in	1.378	4.488	0.906	0.472	0.472	0.472	1.378	0.248	0.453	---	---	0.118	1.433 lb
LB 235	mm	45h6	196	15	41	14	12	88	8.5	16	---	---	6	1.8 kg
	in	1.772	7.717	0.591	1.614	0.551	0.472	3.465	0.335	0.630	---	---	0.236	3.968 lb
LB 236	mm	50h6	165	28	20	18	18	48	10.5	20	---	---	6	2 kg
	in	1.969	6.496	1.102	0.787	0.709	0.709	1.890	0.413	0.787	---	---	0.236	4.409 lb
LB 237	mm	65h6	200	28	22	20	25	65	10.5	22.5	---	---	6	4.4 kg
	in	2.559	7.874	1.102	0.866	0.787	0.984	2.559	0.413	0.886	---	---	0.236	9.700 lb
LB 238	mm	85h6	262	30	35	35	28	89	10.5	28	25	M6	6	10.6 kg
	in	3.346	10.315	1.181	1.378	1.378	1.102	3.504	0.413	1.102	0.984	---	0.236	23.369 lb
LB 240	mm	100h6	351	30	55	55	35	120	10.5	36	35	M8	8	19.2 kg
	in	3.937	13.819	1.181	2.165	2.165	1.378	4.724	0.413	1.417	1.378	---	0.315	42.329 lb
LB 241	mm	120h6	351	30	55	55	35	120	12.5	40	35	M8	8	28.4 kg
	in	4.724	13.819	1.181	2.165	2.165	1.378	4.724	0.492	1.575	1.378	---	0.315	62.611 lb

# Ordering Information

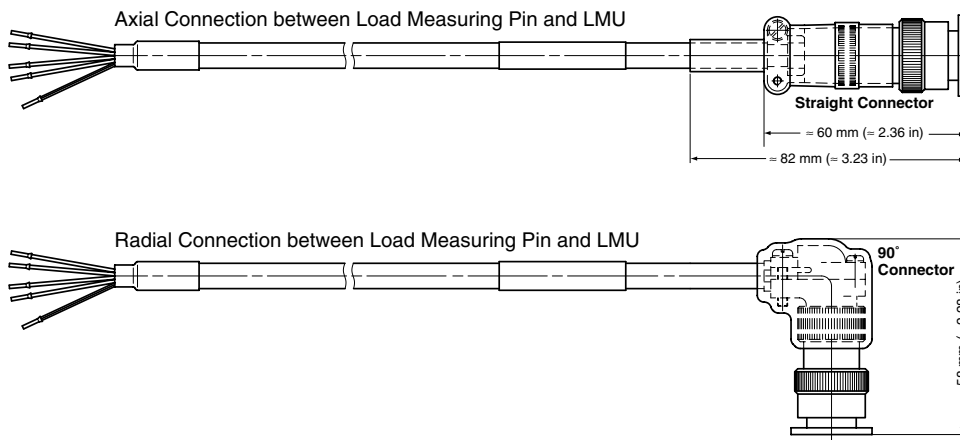
**LB 230**

## ORDERING INFORMATION

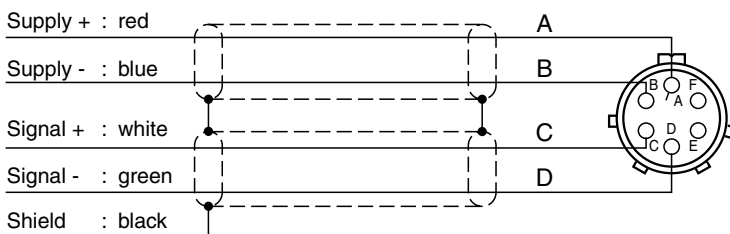
<b>LOAD MEASURING PINS</b>	LB 2□□/021
• Model LB 231 - 241	

## ACCESSORIES

### Cable Assemblies



### Pin Configuration



**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

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

### 1.2.3 LE 210 AND LU 210 LOAD MEASURING PINS

## LE 210 and LU 210 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).
- Integrated 2-wire (LE) or 4-wire (LU) electronics for transmission over great distances.
- 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)

### 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 210 Series Load Pins (the result of continual development of the well-established LB Series) 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 Load Measuring Pins can be used alone or as part of a complete measurement system. Magtrol offers a wide range of Load-Force-Weight Transducers in various executions and accuracy classes and our Load Monitoring Units (LMUs) constitute an ideal safe measurement system which continuously checks for overloads and short circuits.

### DESIGN

The load measuring pin has 2 circular grooves and an axial bore. The strain gauges are mounted in a full-bridge configuration, inside the central bore, adjacent to the external grooves. This ensures they are insensitive to external mechanical and chemical effects. The positioning and orientation of the strain gauges has been optimized by means of the finite element method (FEM).

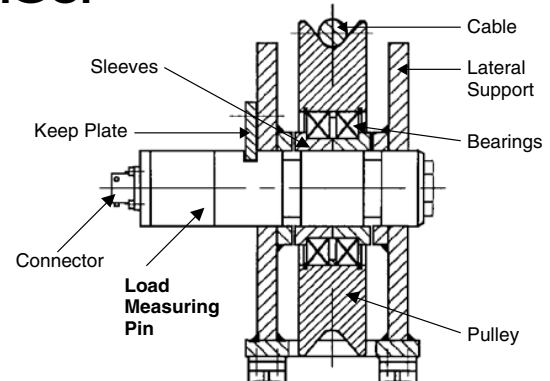


Model LE or LU 214  
Load Measuring Pin

### APPLICATIONS

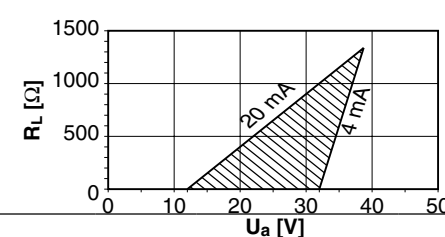
When forces acting on mechanical constructions are measured, the additional equipment required can often be costly and difficult to install. Magtrol Load Measuring Pins offer an excellent solution since they act as a direct element in the assembly, replacing a non-instrumented pin or shaft. LE/LU 210 Series Load 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.

### MOUNTING EXAMPLE



# Specifications

LE 210

Standard Version*	LE 211	LE 212	LE 213	LE 214	LE 216	LE 217	LE 218	LE 220	LE 221
<b>MECHANICAL CHARACTERISTICS</b>									
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	LE load measuring pin: Stainless steel 1.4057 LE transmitter housing: Stainless steel 1.4305								
EMC	According to EN 6100-6-2 & EN 6100-6-4 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 LE model (option)				
<b>ELECTRICAL CHARACTERISTICS</b>									
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								
<b>ELECTRICAL CONNECTION</b>									
Output Connector	Axial, MS 3112 E 10-6P								
Configuration	2-wire								
Connection Cable Assembly	3 m, 6 m, 12 m or 20 m Cable with: Straight Connector, 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  $\text{Hatched Operating Domain} = \frac{\text{Load Resistance } R_L}{\text{Supply Voltage } U_a}$ 								

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


**Specifications**
**LU 210**

<b>Standard Version*</b>	<b>LU 211</b>	<b>LU 212</b>	<b>LU 213</b>	<b>LU 214</b>	<b>LU 216</b>	<b>LU 217</b>	<b>LU 218</b>	<b>LU 220</b>	<b>LU 221</b>
<b>MECHANICAL CHARACTERISTICS</b>									
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 6100-6-2 & EN 6100-6-4 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)				
<b>ELECTRICAL CHARACTERISTICS</b>									
Operating Principle	Full-bridge strain gauge								
Strain Gauge Bridge Impedance	350 Ω								
Output Signal	0–10 V								
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								
<b>ELECTRICAL CONNECTION</b>									
Output Connector	Axial, MS 3112 E 10-6P								
Configuration	4-wire								
Connection Cable Assembly	3 m, 6 m, 12 m or 20 m Cable with: Straight Connector, MS 3116 J10 6S or 90° Connector, Souriau 851 08 EC 10 6S50								

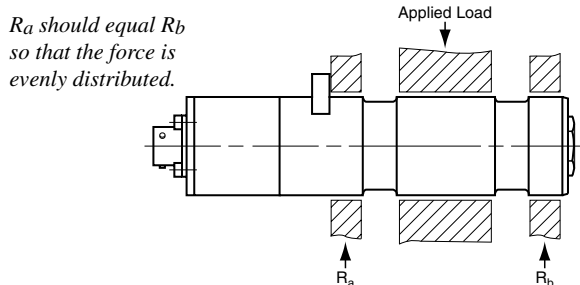
\* Ratings apply to standard load pins only, special models are available by contacting Magtrol.

# Specifications

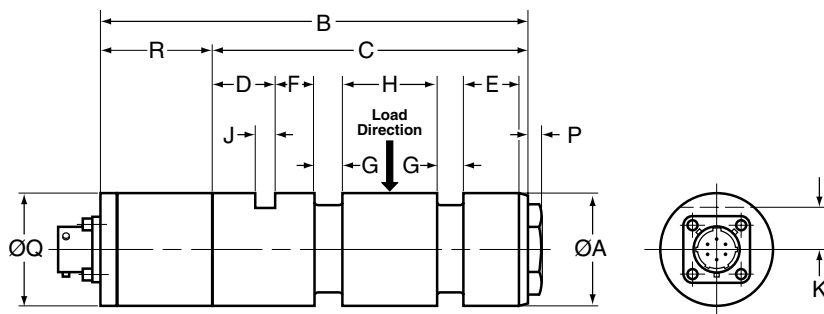
LE/LU 210

## 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.



## 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

# Ordering Information

LE/LU 210

## OPTIONS AND ORDERING INFORMATION

LE SERIES LOAD MEASURING PINS		LE 2 <input type="checkbox"/> <input type="checkbox"/> / 0 <input type="checkbox"/> 3
• Model LE 2 <input type="checkbox"/> <input type="checkbox"/> - 2 <input type="checkbox"/> <input type="checkbox"/>	_____	
• 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.

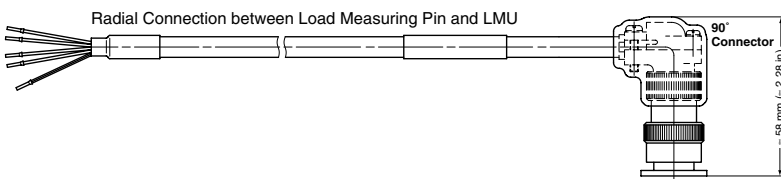
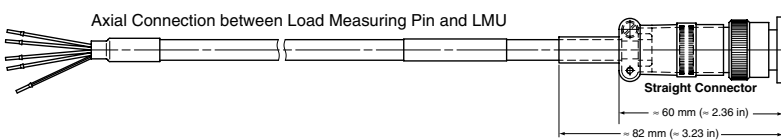
LU SERIES LOAD MEASURING PINS		LU 2 <input type="checkbox"/> <input type="checkbox"/> / 1 <input type="checkbox"/> 1
• Model LU 2 <input type="checkbox"/> <input type="checkbox"/> - 2 <input type="checkbox"/> <input type="checkbox"/>	_____	
• Lubrication (LU 211-221): Without	_____	1
(LU 216-221): With	_____	3

**Example**

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

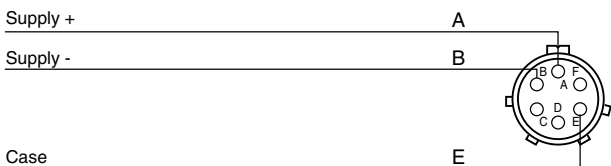
## ACCESSORIES

### Cable Assemblies

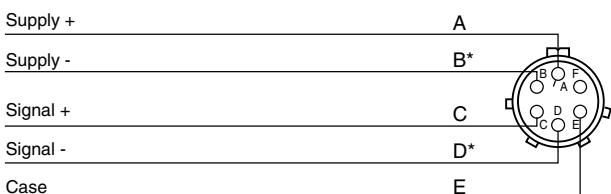


Accessory Ordering Information	
<b>COUNTER-CONNECTOR</b>	
Straight Connector	P/N 957.11.08.0030
90° Connector	P/N 957.11.08.0029
<b>CONNECTION CABLE ASSEMBLY</b>	
Part Number	EH 13 <input type="checkbox"/> / 0 <input type="checkbox"/> 1
• Straight Connector	_____ 8
• 90° Connector	_____ 9
<b>CONNECTION CABLE ASSEMBLY</b>	
Cable Length:	3 m _____ 1
	6 m _____ 2
	12 m _____ 3
	20 m _____ 4

### LE Pin Configuration



### LU Pin Configuration



**\*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).

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

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## 2. Installation / Configuration

---

In order to set up a functional system, it is important to follow the mechanical and electrical procedures described in the following sections. Proper installation is necessary to insure the measured signals will not be disrupted by incorrect mounting.



Note: The procedures contained in this instruction manual do not cover all the existing mounting and connection possibilities. However, they help the user find the appropriate solution for their specific application. Likewise, installation and connection of load pins specially designed for the specific requirements of the user should be carried out as described in this manual. Furthermore, the general manufacturer's instructions as well as security standards and recommendations should be respected by the user for special models.

---

### 2.1 MOUNTING THE LOAD MEASURING PINS

#### 2.1.1 GENERAL MOUNTING INSTRUCTIONS

Bore the lateral supports and linking element in which the load measuring pin will be placed according to the dimensions and tolerances given in the figure below.

Type of load measuring pin	Nominal load <i>kN</i>	Nominal diameter <i>mm</i>	Pin tolerance <i>h6 μm</i>	Bore tolerance <i>G7 μm</i>
<b>LB / LE / LU 210</b>	2.5	25	0 / -13	+28 / +7
<b>LB / LE / LU 211 &amp; LB 231</b>	5	25	0 / -13	+28 / +7
<b>LB / LE / LU 212 &amp; LB 232</b>	10	25	0 / -13	+28 / +7
<b>LB / LE / LU 213 &amp; LB 233</b>	20	25	0 / -13	+28 / +7
<b>LB / LE / LU 214 &amp; LB 234</b>	50	35	0 / -16	+34 / +9
<b>LB 235</b>	70	45	0 / -16	+34 / +9
<b>LB / LE / LU 216 &amp; LB 236</b>	100	50	0 / -16	+34 / +9
<b>LB / LE / LU 217 &amp; LB 237</b>	200	65	0 / -19	+40 / +10
<b>LB / LE / LU 218 &amp; LB 238</b>	500	85	0 / -22	+47 / +12
<b>LB / LE / LU 220 &amp; LB 240</b>	1000	100	0 / -22	+47 / +12
<b>LB / LE / LU 221 &amp; LB 241</b>	1250	120	0 / -22	+47 / +12

*Machining dimensions and tolerances according to DIN 7161*



Note: When bushings are used for adaptation to the load measuring pins, tolerances G7 - N7 (depending on the application type) should be applied.

---

- Ensure a rigid mounting. The lateral supports should not move with respect to each other when load is applied (see *figure 2–1*). Elastic mounting, entailing parasitic forces on the load measuring pin, should be avoided by all means.
- The play between the lateral supports and the linking element (see *figure 2–1*) should be limited to values between 0.5 mm and 1 mm. If these parts are pressed against each other, the induced strong lateral contact pressure produces too strong a friction on the gliding surface, thus impeding optimal force transmission to the load measuring pin.
- Use slide (see *figure 2–1*) or roller bearings.
- If the load measuring pin is subject to lateral forces, use thrust bearings and spacing or gliding washers between the lateral supports and the linking element to eliminate friction.
- To improve the linearity and hysteresis of the measurement, place anti-friction elements into the bores of the lateral supports and linking element.
- The bores in the lateral supports must be cylindrical and concentric to each other. The tolerances indicated in the above figure leave sufficient play for the load measuring pin to slide in place without effort (light-push fit).
- On welded constructions the bores of the lateral supports must be remachined after the welding.

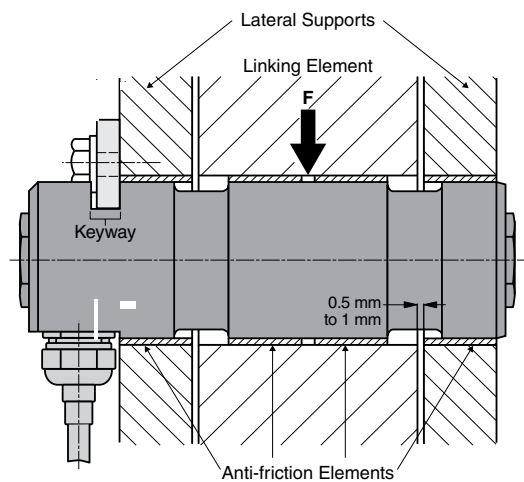
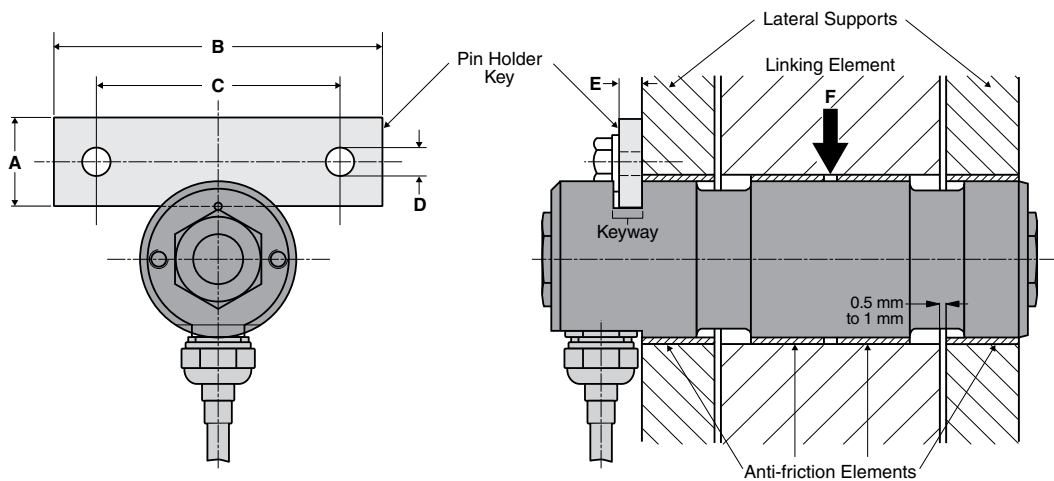


Figure 2–1 Load measuring pin mounted in its seat

**2.1.2****PIN HOLDER KEY**

1. Machine the pin holder key to the dimensions given in *figure 2–2*. Bore and thread the fastening screw holes according to the specified dimensions (respect both bore and thread depth). The mortise on the load measuring pin is by 0.5 mm wider than the pin holder key. Thus no strain can be transmitted through the key to the pin itself.
2. Prepare 2 screws and 2 single-coil spring-lock washers for the fixing of the pin holder key following the information in *figure 2–2*.



Load measuring pins	Dimensions mm					Fastening screw	Screwing torque Nm	Spring-lock washer
	A	B	C	D	E			
<b>LB / LE / LU 210</b>	20	60	36	9	5	M8	24	M8
<b>LB / LE / LU 211 &amp; LB 231</b>	20	60	36	9	5	M8	24	M8
<b>LB / LE / LU 212 &amp; LB 232</b>	20	60	36	9	5	M8	24	M8
<b>LB / LE / LU 213 &amp; LB 233</b>	20	60	36	9	5	M8	24	M8
<b>LB / LE / LU 214 &amp; LB 234</b>	25	80	50	11	6	M10	48	M10
<b>LB 235</b>	30	100	70	13	8	M12	83	M12
<b>LB / LE / LU 216 &amp; LB 236</b>	30	100	70	13	8	M12	83	M12
<b>LB / LE / LU 217 &amp; LB 237</b>	40	140	100	17	10	M16	200	M16
<b>LB / LE / LU 218 &amp; LB 238</b>	40	140	100	17	10	M16	200	M16
<b>LB / LE / LU 220 &amp; LB 240</b>	40	140	100	17	10	M16	200	M16
<b>LB / LE / LU 221 &amp; LB 241</b>	50	190	140	21	12	M20	390	M20

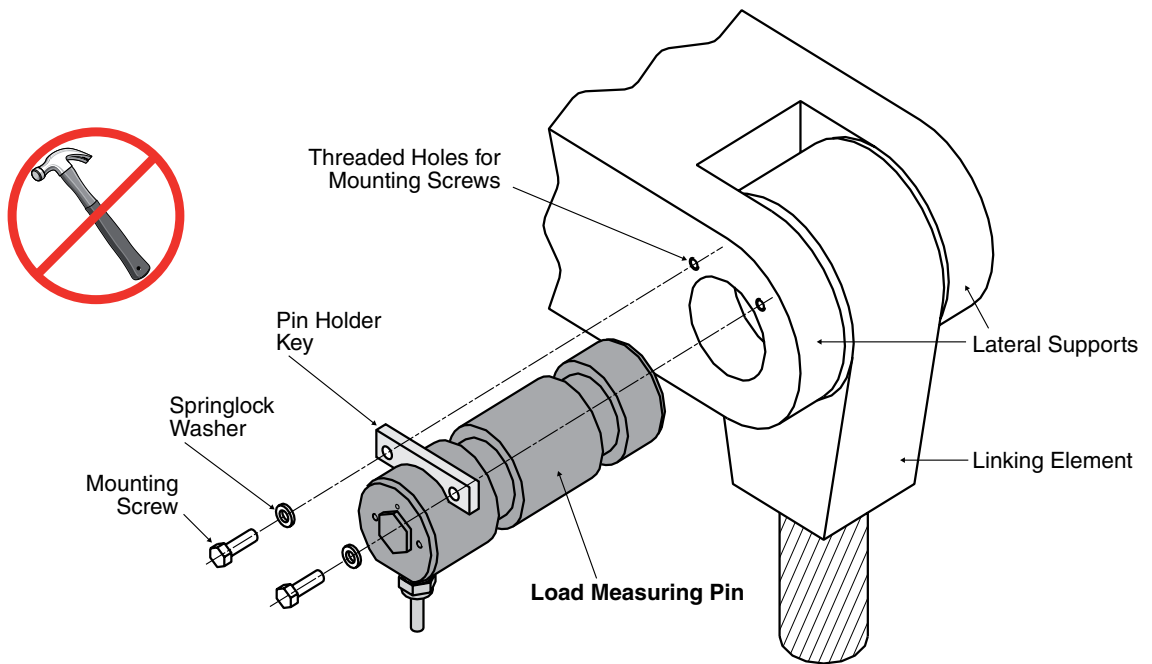
Figure 2–2 Dimensions of the pin holder key

**2.1.3 POSITIONING OF THE LOAD MEASURING PIN**

1. Clean the load measuring pin as well as the bores in which it will be placed to ensure clean contact surfaces.
2. Lubricate the load measuring pin as well as the bores in which it will be placed by means of grease or oil.



**Note:** When mounting roller bearings heat them to about 80 °C to slide them more easily on the load measuring pin.



*Figure 2–3 Positioning of the load measuring pin*



**CAUTION:** NEVER HIT THE LOAD MEASURING PIN WITH A HAMMER OR ANY OTHER TOOL TO INSERT IT IN ITS SEAT. MECHANICAL DAMAGE WHICH COULD RESULT IN MEASUREMENT ERRORS MAY OCCUR IF THIS WARNING IS NOT COMPLIED WITH. ANY BREACH OF THIS WARNING WILL INVALIDATE THE GUARANTEE.

**CONFIGURATION**

- Position the load measuring pin facing the bores in which it will be seated (see *figure 2–3*). Turn it so that the mortise for receiving the pin holder key is facing upward and perpendicular to the applied force.



**Note:** The direction of the sensitivity axis can be found by means of the mortise for the pin holder key. The latter is perpendicular to the sensitivity axis and is normally facing the force applied to the central portion.



**CAUTION:** THE TEST REPORT OF OUR STANDARD LOAD PINS WERE CREATED WITH THE PIN HOLDER KEY FACING UPWARDS. IF THE LOAD PIN IS INSTALLED WITH THE PIN HOLDER KEY FACING DOWNWARDS, A SLIGHT VARIATION IN THE SIGNAL WILL BE OBSERVED.

- Manually slide the load measuring pin into its seat (see *figure 2–3*), until the mortise for receiving the pin holder key reaches the lateral support. This inserting of the load measuring pin should be done without the use of any tool. If it is impossible to slide the pin in, check the alignment (concentricity and axiality) of the elements and machine again, if necessary.
- Insert the pin holder key into the mortise and align the key to coincide with the threaded holes for the fastening screws.
- Place the two fastening screws, fitted with their washers, into the holes of the pin holder key (see *figure 2–3*), and screw them into the previously threaded holes, applying the screwing torque specified in *figure 2.2*.
- For pins equipped with lubricators (optional for LB 216 - LB 221, LE 216 - LE 221 and LU 216 - LU 221) inject lubricant (grease or oil) by means of a grease gun or oil pump.

## 2.2 EXTRACTION OF THE LOAD MEASURING PINS

### 2.2.1 EXTRACTION OF PINS USING AN EXTRACTION DEVICE

- Before any attempt to extract, unload the load measuring pin (remove tare). This should allow its easy extraction.
- Load measuring pins LB 218 - LB 221, LE 218 - LE 221, LU 218 - LU 221 and LB 238 - LB 241 are fitted with two extraction screw threads at each end (see *figure 2–4* and *figure 2–6*) which should be used to fix the extraction device.

Use this thread to fix an extraction device (not provided by Magtrol, see *figure 2–5*). We recommend fixing it on the same side as the stuffing gland (LB 210 series pins) or the electric connector (LB 230, LE 210 and LU 210 series pins) to avoid their damage if the pin is pulled out on the opposite end (see *figure 2–4*).

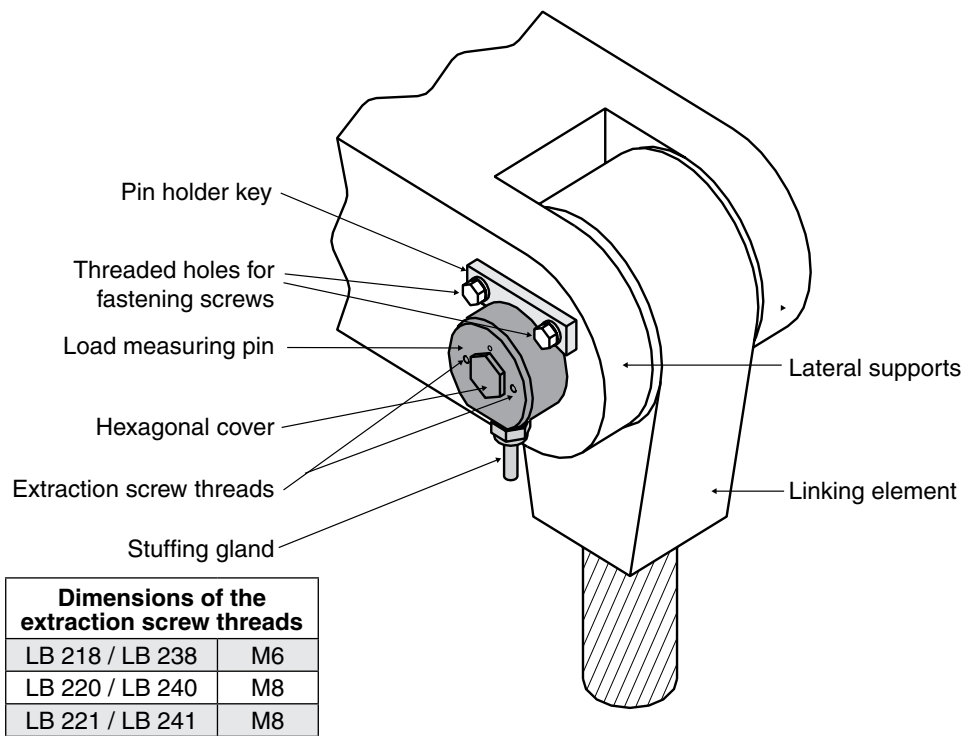


Figure 2-4 Mounted LB Series Load Measuring Pin

For load measuring pins with an electrical connector it is possible to disconnect the cable in order to facilitate the extraction.



**CAUTION:** NEVER UNSCREW THE STUFFING GLAND OF A LOAD MEASURING PIN. NEVER HIT THE STUFFING GLAND OR THE ELECTRICAL CONNECTOR WITH ANY TOOL. NEVER EXTRACT THE LOAD MEASURING PIN BY PULLING AT ITS CABLE, STUFFING GLAND OR ELECTRICAL CONNECTOR. THE WATERPROOFNESS OF THE LOAD MEASURING PIN IS NO LONGER GUARANTEED IF THIS WARNING IS NOT COMPLIED WITH.

If the load measuring pin is bonded in its seat, first rotate it around its axis by means of the screws screwed into the extraction screw threads. It is also possible to apply a derusting agent, which can prove effective in some cases.



**CAUTION:** NEVER USE THE HEXAGONAL COVERS AT THE ENDS OF THE LOAD MEASURING PINS TO ROTATE OR TO PULL THEM. THE COVERS MAY UNSCREW. IN THAT CASE THE WATERPROOFNESS OF THE LOAD MEASURING PIN IS NO LONGER GUARANTEED AND THE ELECTRONIC CIRCUITS WITHIN THE LOAD MEASURING PIN CAN BE DAMAGED.

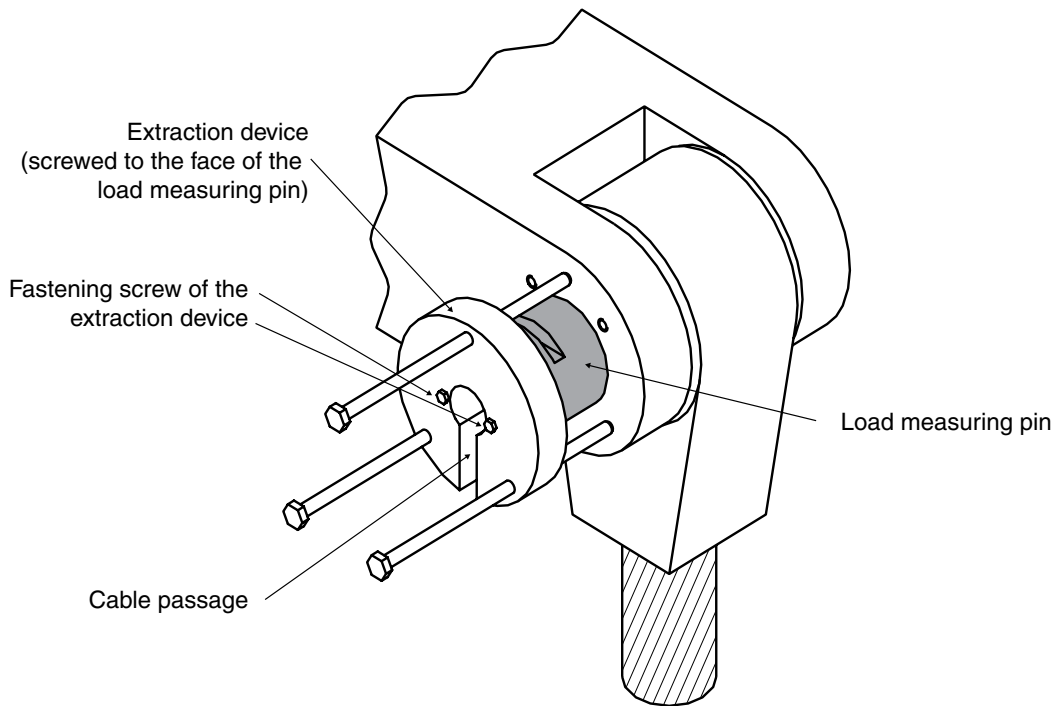
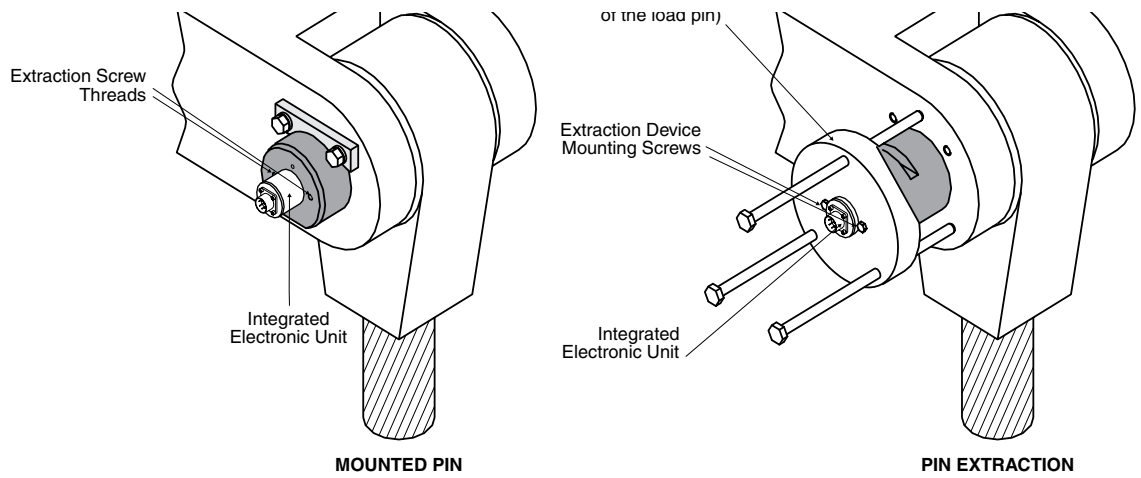


Figure 2-5 Pulling out a LB Series Load Measuring Pin by means of an extraction device



Dimensions of the extraction screw threads	
LE 218	M6
LE 220	M8
LE 221	M8

Figure 2-6 Pulling out a load measuring pin by means of an extraction device (principle used with LE/LU 218 - LE/LU 221 Series Load Pins)

**2.2.2 EXTRACTION OF SMALL SIZE LOAD MEASURING PINS**

1. For small size load measuring pins without extraction screw threads use a sleeve tube or a muff made of a metal of lesser stiffness than that of the pin (e.g. bronze, brass).
2. Place the tube against the pin end opposite the stuffing gland or electrical connector, taking care not to touch the hexagonal cover (see figure 2–8).

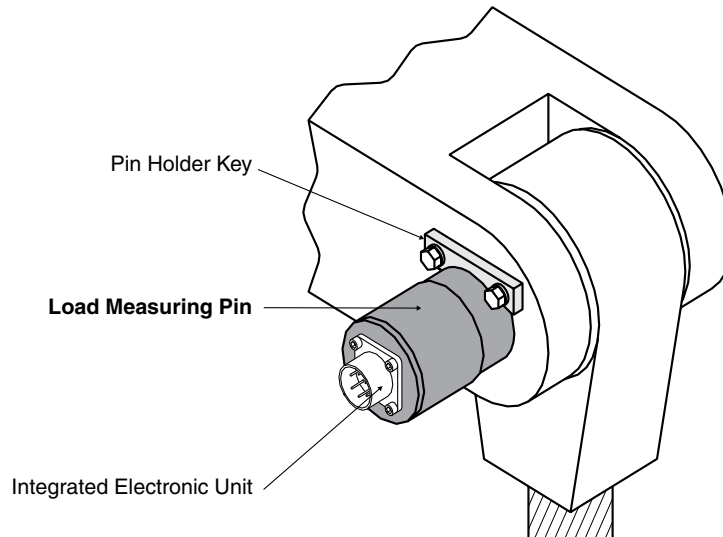
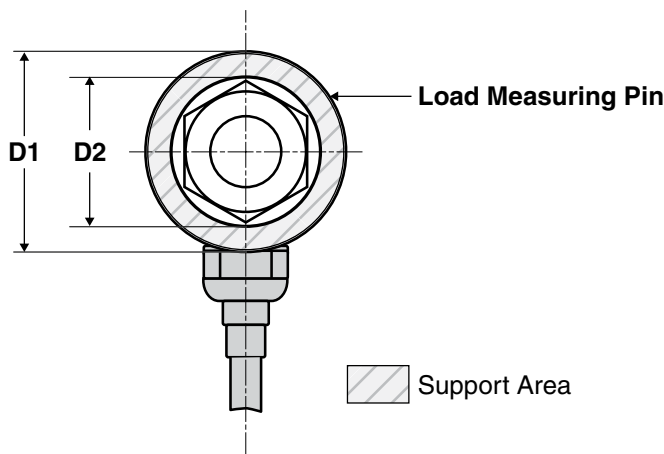


Figure 2–7 Mounted LE / LU Series Load Measuring Pin (LE/LU 210 - LE/LU 217)

3. Next, hit the tube with a plasticized hammer (shock absorption) to push the load measuring pin out of its seat. It is also possible to use a wooden cylinder for this operation.

For the extraction of roller bearings use an extracting device, taking care not to exert any pressure on the cover of the load measuring pin.



Load measuring pins	D1	D2
LB/LE/LU 214 & LB 234	30	26
LB 235	40	35
LB/LE/LU 216 & LB 236	46	40
LB/LE/LU 217 & LB 237	60	40
LB/LE/LU 218 & LB 238	80	40
LB/LE/LU 220 & LB 240	90	40
LB/LE/LU 221 & LB 241	110	40

Figure 2–8 Support area on the end of the load measuring pin for a sleeve tube or a muff.

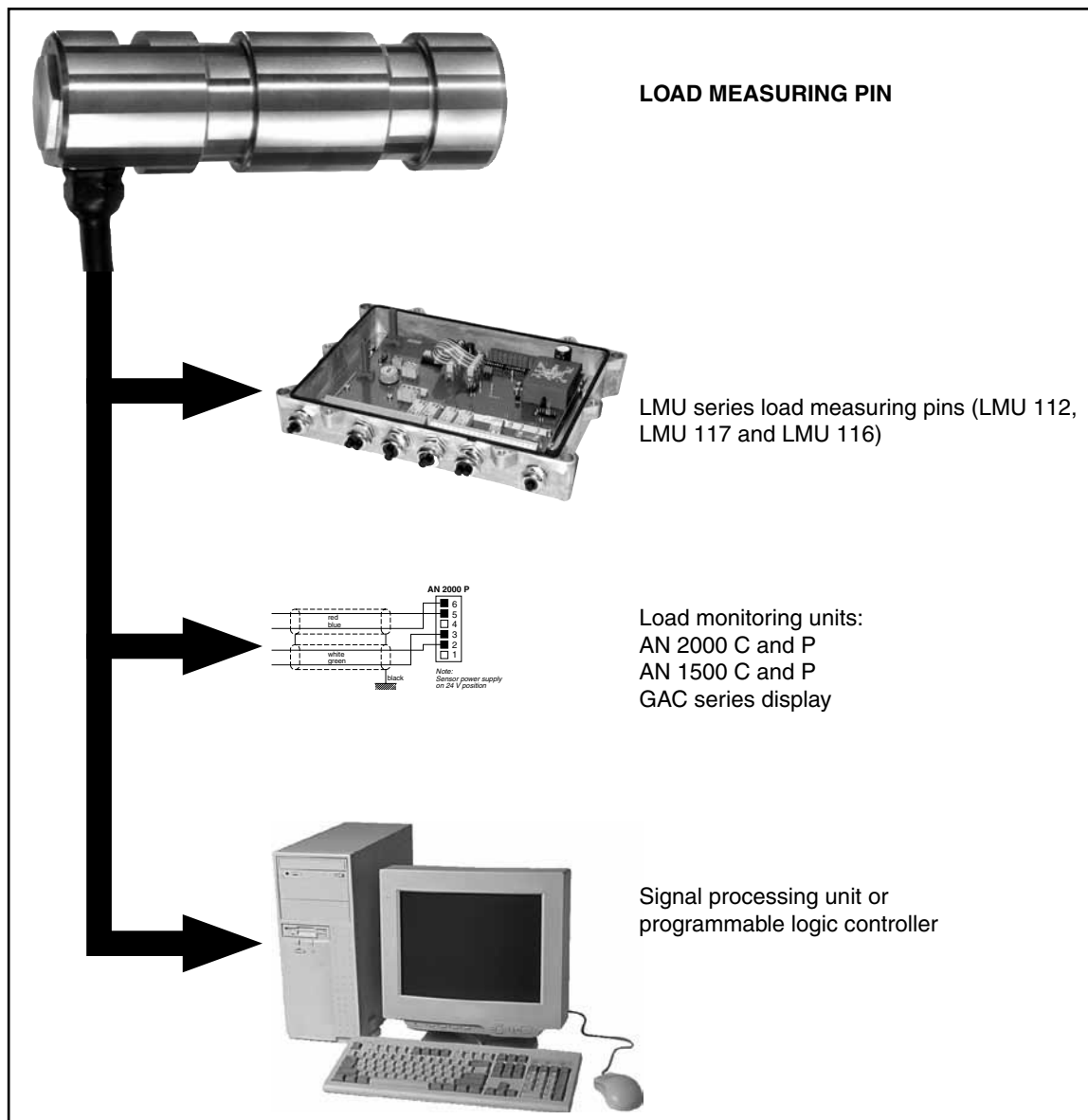


**Note:** On the load measuring pins LB / LE / LU 210 - LB / LE / LU 213 and LB 231 - LB 233 the area of support is not sufficient. Use a wooden cylinder for the extraction of the load measuring pin.

### 2.3 CONNECTION OF THE LOAD MEASURING PINS

Methods of connecting load measuring pins to electronic conditioning instruments supplied by Magtrol are described in this chapter. The load measuring pins can, however, also be connected to instruments from other suppliers.

A measuring and monitoring chain is composed of a transducer and an electronic signal conditioning module. For conditioning signals supplied by load measuring pins Magtrol offers a range of electronic units shown in *figure 2–9*.



CONFIGURATION

Figure 2–9 Electronic conditioning modules for connection to load measuring pins

### 2.3.1 CONNECTION OF A LOAD MEASURING PIN TO ANY INSTRUMENT

Connect the load measuring pin connection cable lead (see *section 2.3.1.2 Wiring*) to the input terminal of the instrument according to the instructions given in its instruction manual.

#### 2.3.1.1 Preventing measuring problems

Instructions for all connection types.



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CAUTION: DO NOT INSTALL A CABLE NEAR A HIGH-VOLTAGE LINE. DISRUPTION OF THE MEASUREMENT SIGNAL MAY OCCUR IF THIS WARNING IS NOT COMPLIED WITH.

---



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CAUTION: CONNECT THE CABLE SCREENING TO THE EARTH AT ONE END ONLY. DISRUPTION OF THE MEASUREMENT SIGNAL DUE TO EARTH LOOPS MAY OCCUR IF THIS WARNING IS NOT COMPLIED WITH.

---

If it is not possible to orient the LB 210 and LB 230 Series Load Measuring Pin according to the mounting instructions given in the preceding sections, it may be mounted upside down (the mortise of the pin holder key downward). In this case, however, the sign of the signal is inverted. So that the sign is positive, two wires of the cable have to be interchanged (either those of the power supply or those of the signal), when connecting the conditioning module. In the case of inverted force, the sensitivity may be slightly altered ( $\pm 1.5\%$ ).



---

Note: LE 210 and LU 210 Series Load Measuring Pins cannot be mounted upside down. An inverted force would generate a negative current in the current source contained in the load pin, which is in fact impossible.

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2.3.1.2 Cable Connection

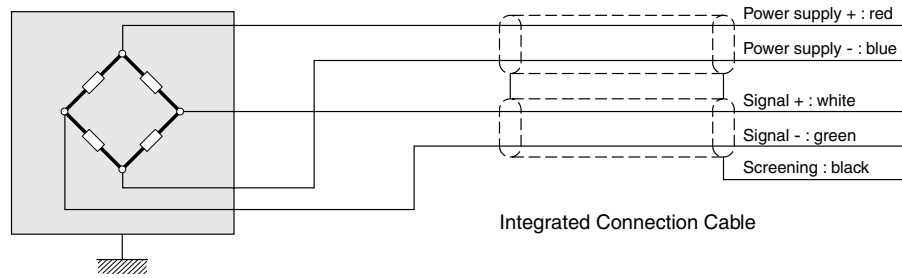


Figure 2-10 Connection of a LB 210 Series Load Measuring Pin (without connector)



Figure 2-11 Connection of a LB 210 Series Load Measuring Pin (with connector)

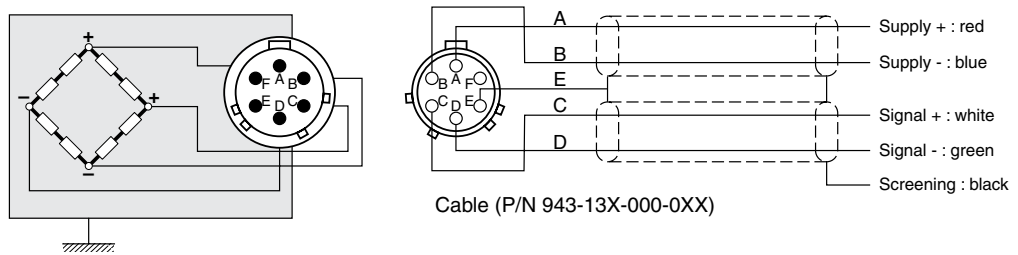


Figure 2-12 Connection of a LB 230 Series Load Measuring Pin

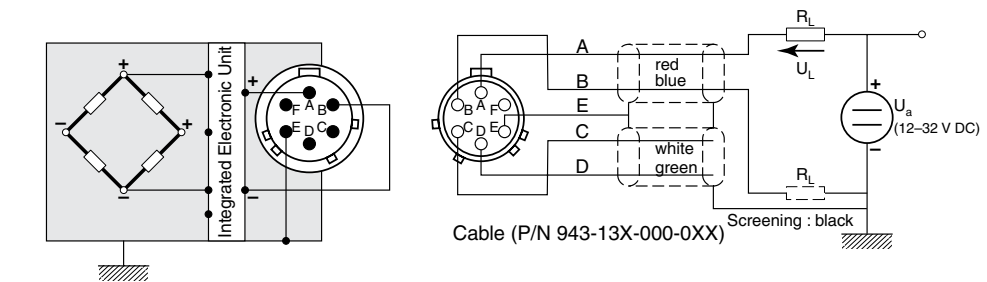


Figure 2-13 Connection of a LE 210 Series Load Measuring Pin

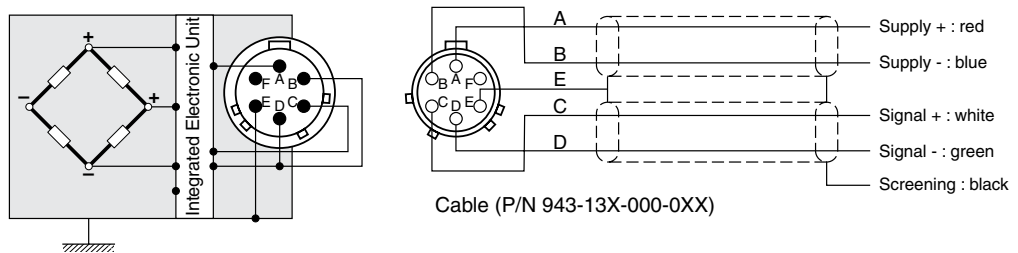


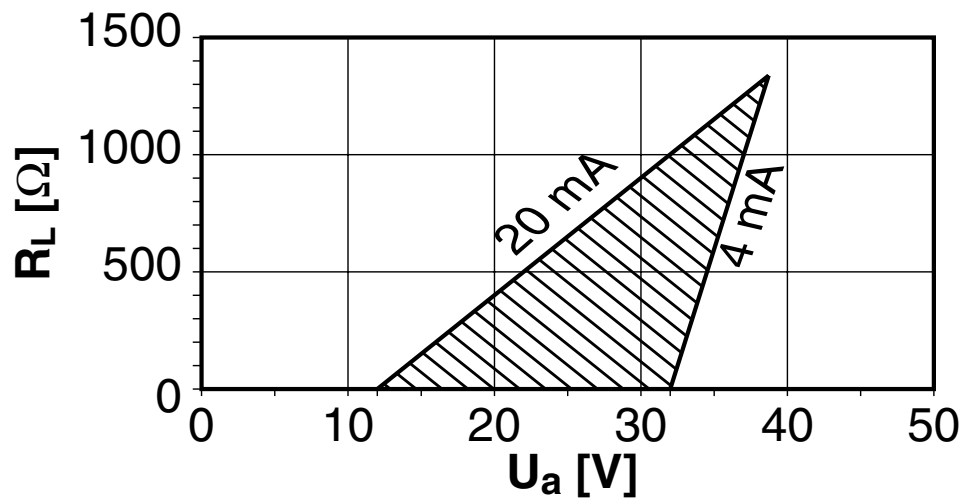
Figure 2-14 Connection of a LU 210 Series Load Measuring Pin

CONFIGURATION

### 2.3.1.3 Determining $R_L$ : numeric example for the LE 210 Series Load Measuring Pin

How to determine the load resistance  $R_L$  as a function of the supply voltage  $U_a$ ?

1. The user wants to connect the load measuring pin to a device providing a supply voltage of 24 VDC  $\pm 10\%$ .
2. Considering the defined tolerance, the supply voltage will range between 21.6 VDC and 26.4 VDC. Transfer the lowest value (21.6 VDC) on the X-axis of the diagram. Draw from this point a vertical line to the 20 mA line.
3. The intersection of this line (21,6 VDC) with the 20 mA determines the maximum value for the load resistance  $R_L$  (read the value on the y-coordinate). In the given example, the maximum value of the load resistance corresponds to approximately 490 W.



$$\text{Plage de travail (hachuré)} = \frac{\text{Résistance de charge } R_L}{\text{Tension d'alimentation } U_a}$$

Figure 2–15  $R_L = f(U_a)$  diagram of the LE 210 Series Load Measuring Pins operating range

**2.3.2 CONNECTION OF A LOAD MEASURING PIN TO AN LMU SERIES LOAD MONITORING UNIT**

Connect the load measuring pin connection cable lead to the input terminal of the load monitoring unit according to the indications in *figures 2–16 through figure 2–18*. All three units, LMU 212, LMU 217 and LMU 216, have the same terminals as the LMU 216 and LMU 217 are just extensions of the LMU 212 unit.



**Note:** For more information concerning the cabling of the LMU Series Load Monitoring Units, refer to their instruction manuals.

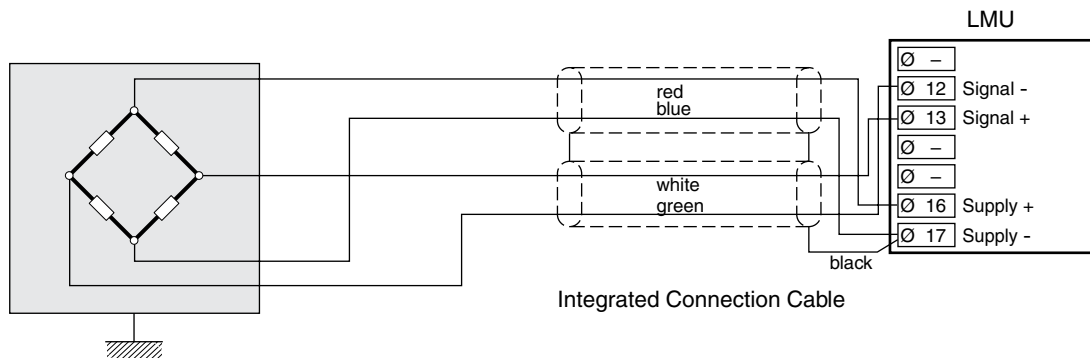


Figure 2–16 Connection of a LB 210 Series Load Pin (without connector) to a LMU Load Monitoring Unit

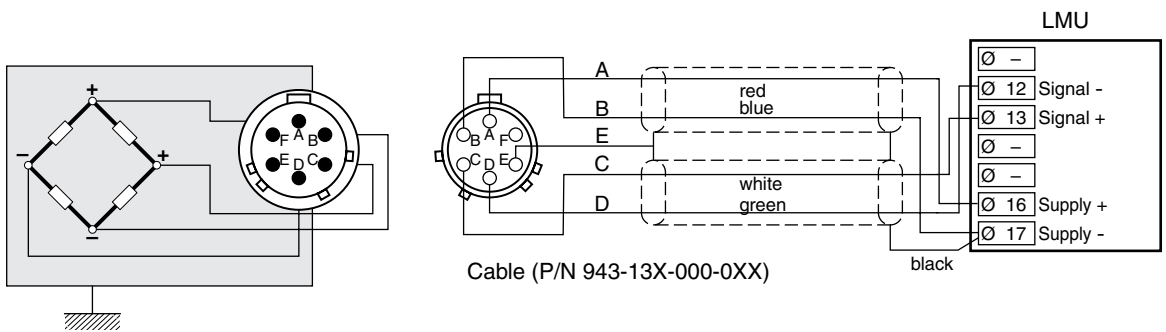


Figure 2–17 Connection of a LB 210 Series Load Pin (with connector) to a LMU Load Monitoring Unit

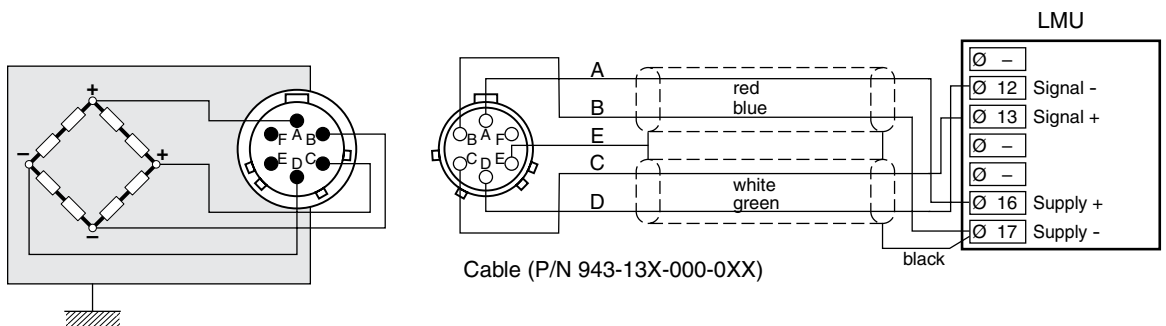


Figure 2–18 Connection of a LB 230 Series Load Pin to a LMU Load Monitoring Unit

CONFIGURATION

**2.3.3 CONNECTION OF A LOAD MEASURING PIN TO AN AN 1500 DIGITAL DISPLAY MONITOR**

For LB Series Load Pins, connect the load measuring pin cable to the AN 1500 C input terminals as indicated in *figure 2–19*.

For LB, LE and LU Series Load Pins, connect the load measuring pin cable to the AN 1500 P input terminals as indicated in *figures 2–20, 2–21 and 2–22*.



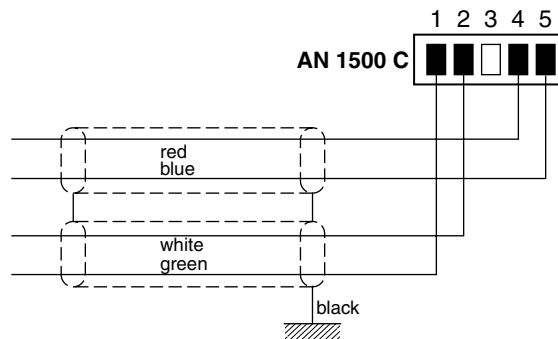
Note: For more information concerning the cable connections of the AN 1500 C and the AN P, refer to their instruction manual.



Note: The AN 1500 C has no current input. The LE 210 Series Load Measuring Pins cannot be directly connected to them.

**2.3.3.1 AN 1500 C Series Digital Signal Monitor**

CN2 TERMINAL	AN 1500 C
PIN 1	signal – [V]
PIN 2	signal + [0–30 mV]
PIN 3	signal + [0–300 mV]
PIN 4	power supply +
PIN 5	power supply –



*Figure 2–19 Connection of the LB 210 / LB 230 Series Load Measuring Pins to an AN 1500 C*

CONFIGURATION

2.3.3.2 AN 1500 P Series Digital Signal Monitor

CN2 TERMINAL	AN 1500 P
PIN 1	signal – [V ou mA]
PIN 2	signal + [V]
PIN 3	signal + [mA]
PIN 4	power supply +
PIN 5	power supply –

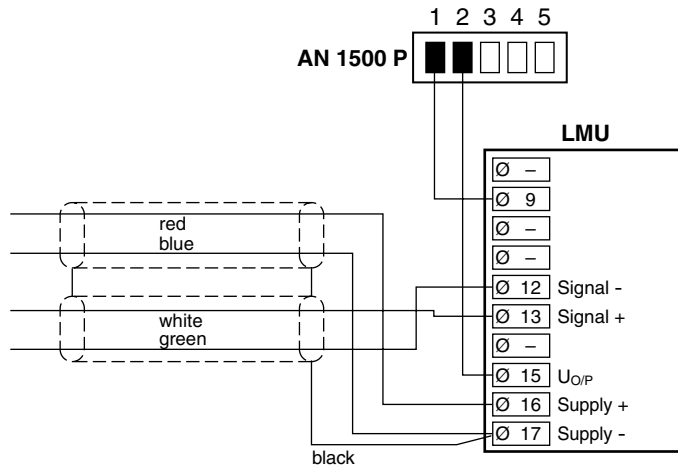
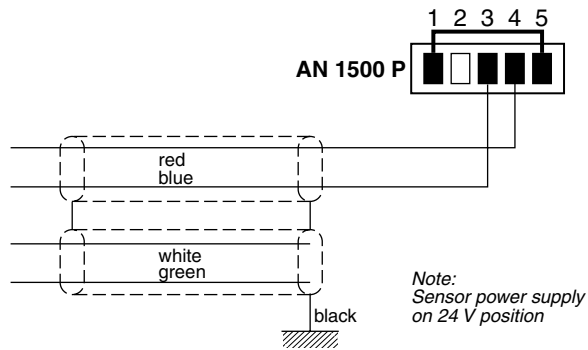
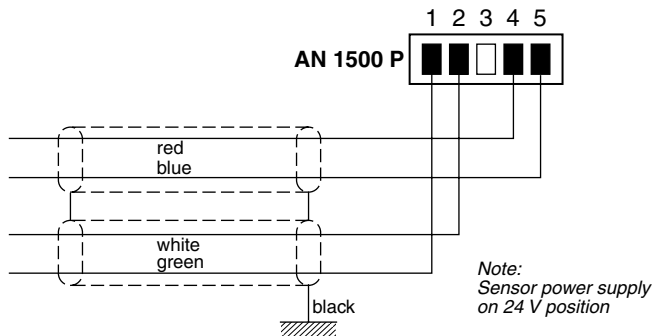


Figure 2–20 Connection of the LB 210 / LB 230 Series Load Measuring Pins to an AN 1500 P through an LMU Series Load Monitoring Unit



Note:  
Sensor power supply  
on 24 V position

Figure 2–21 Connection of the LE 210 Series Load Measuring Pins to an AN 1500 P



Note:  
Sensor power supply  
on 24 V position

Figure 2–22 Connection of the LU 210 Series Load Measuring Pins to an AN 1500 P

CONFIGURATION

**2.3.4 CONNECTION OF A LOAD MEASURING PIN TO AN AN 2000 DIGITAL SIGNAL CONDITIONER/MONITOR**

For LB Series Load Pins, connect the load measuring pin cable to the AN 2000 C input terminals as indicated in *figure 2–23*.

For LB, LE and LU Series Load Pins, connect the load measuring pin cable to the AN 2000 P input terminals as indicated in *figures 2–24, 2–25 and 2–26*.



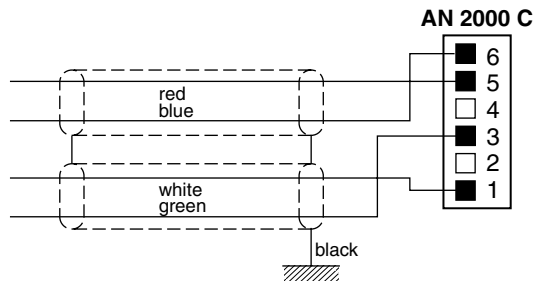
Note: For more information concerning the cable connections of the AN 2000 C, refer to the corresponding instruction manual.



Note: The AN 2000 C has no current input. The LE 210 Series Load Measuring Pins cannot be directly connected to them.

**2.3.4.1 AN 2000 C Series Digital Signal Conditioner/Monitor**

CN3 TERMINAL	AN 2000 C
PIN 6	power supply –
PIN 5	power supply +
PIN 4	N/C
PIN 3	signal – [V]
PIN 2	N/C
PIN 1	signal + [V]



*Figure 2–23 Connection of the LB 210 / LB 230 Series Load Measuring Pins to an AN 2000 C*

2.3.4.2 AN 2000 P Series Digital Signal Conditioner/Monitor

CN TERMINAL 3	AN 2000 P
PIN 6	power supply –
PIN 5	power supply +
PIN 4	signal + [mA]
PIN 3	signal – [V ou mA]
PIN 2	signal + [V]
PIN 1	N/C

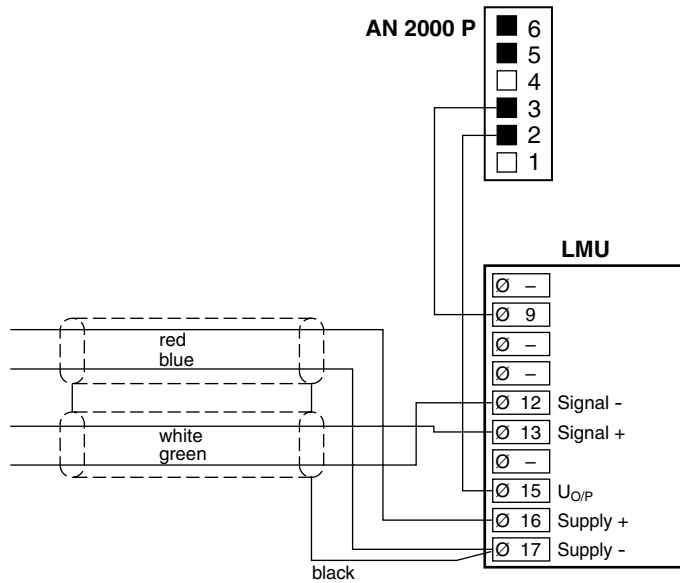


Figure 2–24 Connection of the LB 210 / LB 230 Series Load Measuring Pins to an AN 2000 P through an LMU Series Load Monitoring Unit

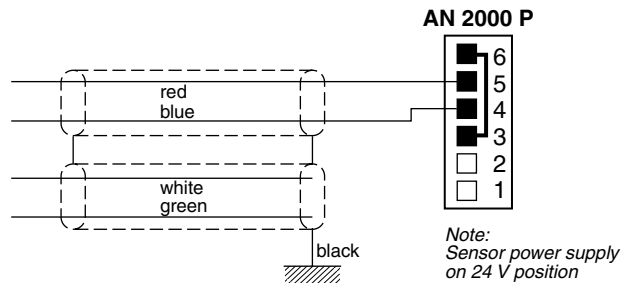


Figure 2–25 Connection of the LE 210 Series Load Measuring Pins to an AN 2000 P

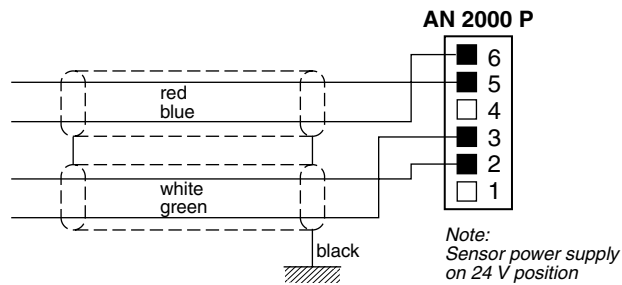


Figure 2–26 Connection of the LU 210 Series Load Measuring Pins to an AN 2000 P

CONFIGURATION

**2.3.5 CONNECTION OF A LOAD MEASURING PIN TO GAC SERIES LARGE DIGITAL DISPLAY**

For LB Series Load Pins, connect the load measuring pin cable to the GAC Series Large Digital Display input terminals as indicated in *figure 2–28*.

For LB, LE and LU Series Load Pins connect the load measuring pin cable to the GAC Series Large Digital Display input terminals as indicated in *figures 2–29 and 2–30*.



Note: For more information concerning the cabling of the GAC Series Large Digital Display, refer to the instruction manual.

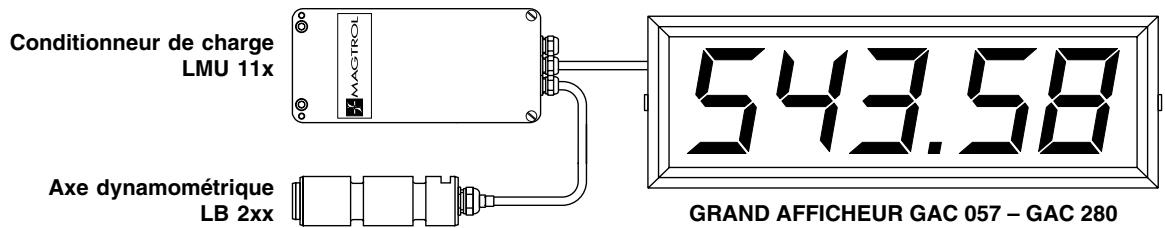


Figure 2–27 Connection of the LB 210 / LB 230 Series Load Measuring Pins to a GAC through an LMU Series Load Monitoring Unit

GAC 057 – GAC 280 : ANALOG INPUTS	
PIN 1	shield
PIN 2	common
PIN 3	signal [mA]
PIN 4	signal [V]
PIN 5	power supply

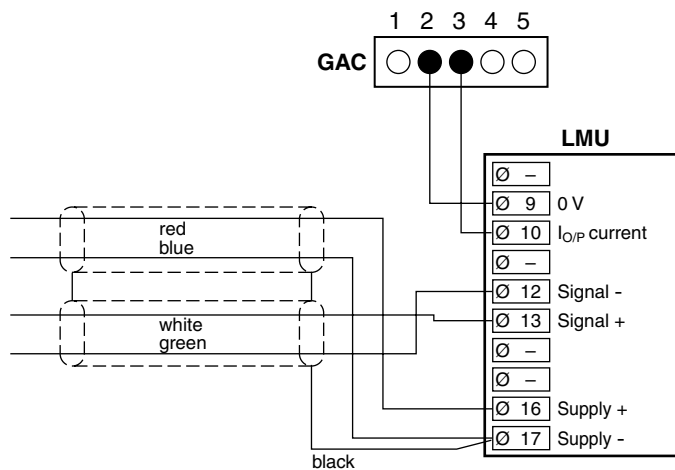


Figure 2–28 Connection of the LB 210 / LB 230 Series Load Measuring Pins to a GAC through an LMU Series Load Monitoring unit

CONFIGURATION

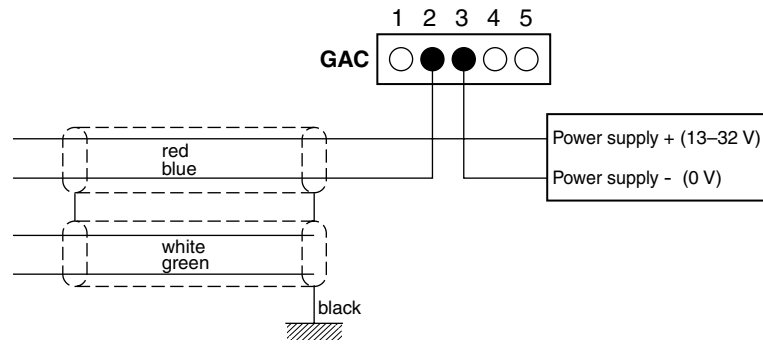


Figure 2-29 Connection of the LE 210 Series Load Measuring Pins



**CAUTION:** THE POWER SUPPLY VOLTAGE MUST BE AT LEAST 13 V, AND NOT ONLY 12 V AS THE GAC GENERATES A VOLTAGE DROP OF 1 V.

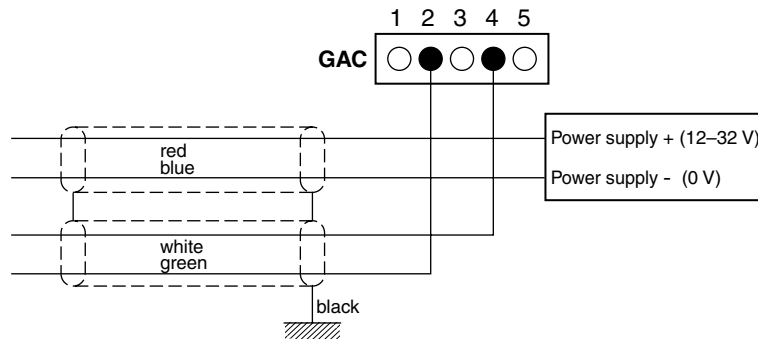


Figure 2-30 Connection of the LU 210 Series Load Measuring Pins

CONFIGURATION

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## 3. Operating Principle

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### 3.1 MEASUREMENT PRINCIPLE

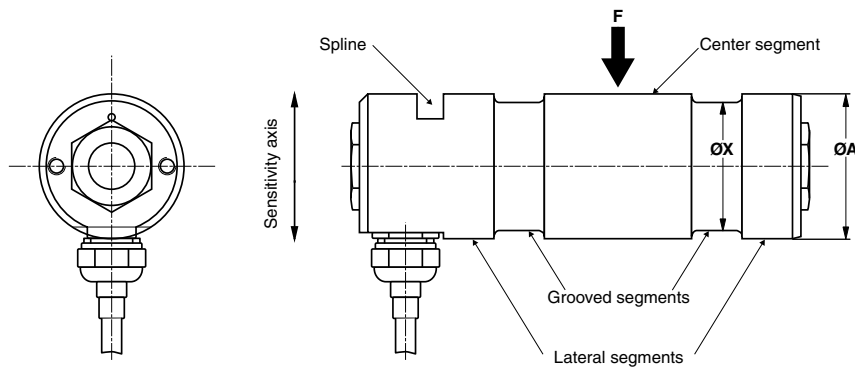
The LB 210, LB 230, LE 210 and LU 210 Series Measuring Pins have the shape of a hollow cylinder. The outside diameter "A" features two circular grooves with a reduced diameter "X" (see *figure 3-1*). Due to the reduced pin section, the deformations caused by the application of the force "F" on the central portion of the pin concentrate themselves on the area of both circular grooves.



---

Note: To avoid any unnecessary redundancy, the LB 210 Series Load Measuring Pins will, if not specially specified, be used to explain the operating principle of the pins manufactured by Magtrol.

---



*Figure 3-1 Body of the LB 210 Series Load Measuring Pin*



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Note: The direction of the sensitivity axis can be found by means of the mortise for the pin holder key. The latter is perpendicular to the sensitivity axis and should be facing the force applied to the central portion.

---



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Note: Measurements with an LE 210 and LU 210 Series Load Measuring Pin mounted upside down will not work. Both series have been designed to produce a positive current (LE) or voltage (LU) measurement signal.

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CAUTION: THE TEST REPORT OF OUR STANDARD LOAD PINS WERE CREATED WITH THE PIN HOLDER KEY FACING UPWARDS. IF THE LOAD PIN IS INSTALLED WITH THE PIN HOLDER KEY FACING DOWNWARDS, A SLIGHT VARIATION IN THE SIGNAL WILL BE OBSERVED.

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### 3.2 STRAIN GAUGES

Strain gauges are placed on the inside of the load measuring pin. The strain gauges are situated symmetrically in the bore, their situation coinciding with that of the grooves visible outside.

When a load is applied to the load measuring pin in the direction of its sensitivity axis, the strain gauge full bridge produces a signal which is proportional to the load applied. For all LB Series Load Measuring Pins an external power supply for the strain gauges is necessary. The output signal processing is carried out by an external amplifier. Magtrol also offers LE and LU Series Load Pins with an integrated strain gauge power supply and amplifier.

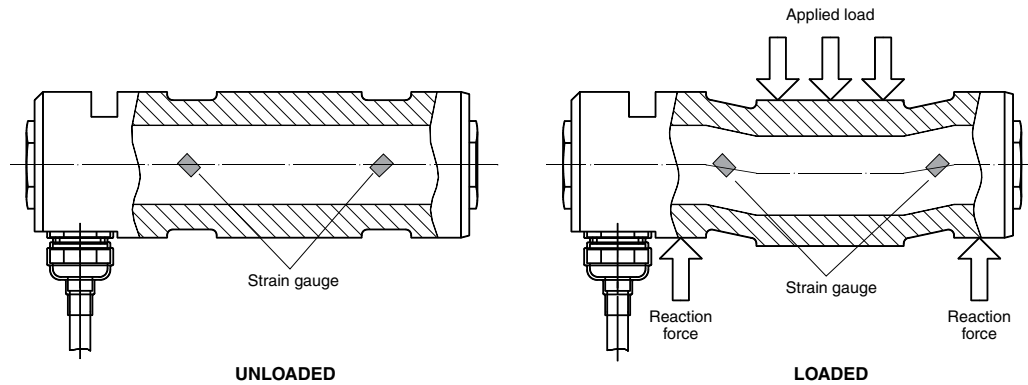


Figure 3-2 Unloaded and loaded LB 210 Series Load Measuring Pin

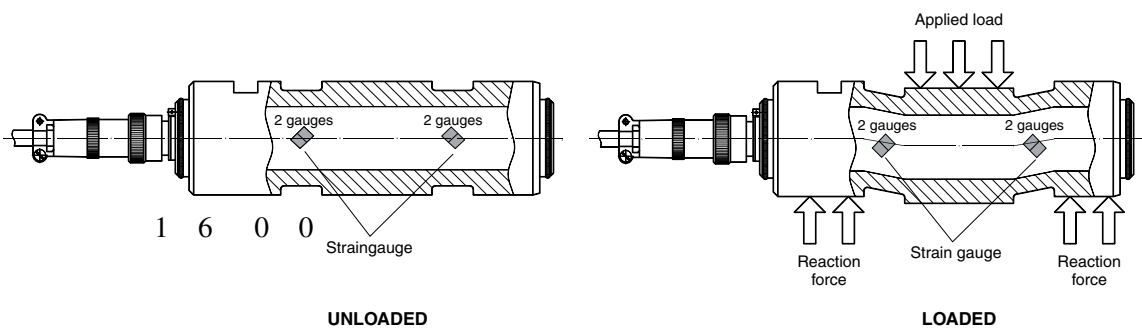


Figure 3-3 Unloaded and loaded LB 230 Series Load Measuring Pin



Note: With their double bridge strain gauges the LB 230 Series Load Measuring Pins are nearly insensitive to transversal or axial loads. This is equally true for excentered loads.

OPERATING PRINCIPLE

### 3.3 CHECKING OF THE APPLIED LOAD

#### 3.3.1 LB 210 AND LB 230 SERIES LOAD MEASURING PINS

In order to determine or to check the load applied to an LB 210 or LB 230 Load Measuring Pin, proceed as follows:

1. Determine the sensitivity of the load measuring pin by referring to measuring protocol delivered with the load pin under “Rated output” (for example 0,998 mV/V).
2. Measure the pin's power supply voltage generated by the signal conditioning electronic using a digital voltmeter (for example 10 VDC).
3. At rated load, the signal supplied by the load measuring pin corresponds to the sensitivity value multiplied by the supply voltage (for example 0,998 mV/V × 10 V = 9,98 mV).

For any measured signal the applied load can be easily calculated by means of the rule of three.

**Checking example**

Type of load measuring pin: \_\_\_\_\_

Serial number: \_\_\_\_\_

**Rated signal:**


SUPPLY VOLTAGE × SENSITIVITY

$\square\square \cdot \square\square \text{ V} \times \square\square \cdot \square\square\square \text{ mV/V} = \square\square \cdot \square\square\square \text{ mV}$

**Calculated signal:** 0 0

$$\frac{\text{RATED SIGNAL} \times \text{APPLIED LOAD}}{\text{RATED LOAD}} =$$

$$\frac{\square\square \cdot \square\square\square \text{ mV} \times \square\square \cdot \square\square \text{ kN}}{\square\square \cdot \square\square \text{ kN}} = \square\square \cdot \square\square\square \text{ mV}$$

**Measured signal:**   $\square\square \cdot \square\square\square \text{ mV}$

Note: This form, which can be copied, should simplify checking the load measuring system. In the case of measurement problems it can also be sent in to the After Sales Service Department at Magtrol

**3.3.2 LE 210 SERIES LOAD MEASURING PINS**

In order to determine or to check the load applied to an LE 210 Load Measuring Pin, proceed as follows:

1. The signal corresponding to the rated load is equal to 16 mA (20 mA–4 mA).
2. Calculate the signal corresponding to the applied load by means of the following formula:

$$\text{Calculated signal [mA]} = \left( \frac{\text{Rated signal [mA]} \times \text{Applied load [kN]}}{\text{Rated load [kN]}} \right) + 4\text{mA}$$

3. By means of a digital milliamperemeter measure the signal corresponding to the load applied.
4. Compare the values of the calculated and measured signals. The difference should not exceed 1 %.

For any measured signal the applied load can be easily calculated by means of the rule of three.

**Checking example**

Type of load measuring pin: \_\_\_\_\_

Serial number: \_\_\_\_\_

**Calculated signal:**

$$\frac{\text{RATED SIGNAL} \times \text{APPLIED LOAD}}{\text{RATED LOAD}} + 4 \text{ mA} =$$

$$\frac{\boxed{\phantom{00}} \cdot \boxed{\phantom{00}} \text{ mA} \times \boxed{\phantom{00}} \cdot \boxed{\phantom{00}} \text{ kN}}{\boxed{\phantom{00}} \cdot \boxed{\phantom{00}} \text{ kN}} + 4 \text{ mA} = \boxed{\phantom{00}} \cdot \boxed{\phantom{00}} \text{ mA}$$

**Measured signal:**     $\boxed{\phantom{00}} \cdot \boxed{\phantom{00}} \text{ mA}$

Note: This form, which can be copied, should simplify checking the load measuring system. In the case of measurement problems it can also be sent in to the After Sales Service Department at Magtrol.

OPERATING PRINCIPLE

**3.3.3 LU 210 SERIES LOAD MEASURING PIN**

In order to determine or to check the load applied to the LU 210 Load Measuring Pin, proceed as follows:

1. The signal corresponding to the rated load is equal to 10 V.
2. Calculate the signal corresponding to the applied load by means of the following formula:

$$\text{Calculated signal [V]} = \left( \frac{\text{Rated signal [V]} \times \text{Applied load [kN]}}{\text{Rated load [kN]}} \right)$$

3. By means of a digital voltmeter measure the signal corresponding to the load applied.
4. Compare the values of the calculated and measured signals. The difference should not exceed 1 %.

For any measured signal the applied load can be easily calculated by means of the rule of three.

**Checking example**

Type of load measuring pin: \_\_\_\_\_

Serial number: \_\_\_\_\_

**Calculated signal:**

$$\frac{\text{RATED SIGNAL} \times \text{APPLIED LOAD}}{\text{RATED LOAD}} =$$

$$\frac{\square\square \cdot \square\square \text{ V} \times \square\square \cdot \square\square \text{ kN}}{\square\square \cdot \square\square \text{ kN}} = \square\square \cdot \square\square \text{ V}$$

**Measured signal:**       $\square\square \cdot \square\square \text{ V}$

**OPERATING PRINCIPLE**

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Note:                      This form, which can be copied, should simplify checking the load measuring system. In the case of measurement problems it can also be sent in to the After Sales Service Department at Magtrol

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## 4. Influence Factors

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The measurement signal delivered by the load measuring pin can be influenced by the orientation of the pin in its seat and by possible overloads. Both topics are treated in this chapter.



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Note: The recommendations listed in this chapter should be followed exactly so that the load measuring pin characteristics are guaranteed. This chapter will also demonstrate how an incorrect mounting can impair the measurement accuracy of a load measuring pin and consequently diminish the security of the whole installation.

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Note: Having been designed according to the EMC (Electro Magnetic Compatibility) directives, the LE 210 and LU 210 Series Load Measuring Pins with integrated electronics complies with the EN 50082-2 (1991) standard.

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### 4.1 INFLUENCE OF THE PIN'S ORIENTATION

For the LB 210, LB 230, LE 210 and LU 210 Series Load Measuring Pins the identification of the sensitivity axis is performed by means of the pin holder key mortise. This being by definition perpendicular to the sensitivity axis, the pin should be mounted so that it is perpendicular to the force applied on the central portion of the pin.



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CAUTION: THE TEST REPORT OF OUR STANDARD LOAD PINS WERE CREATED WITH THE PIN HOLDER KEY FACING UPWARDS. IF THE LOAD PIN IS INSTALLED WITH THE PIN HOLDER KEY FACING DOWNWARDS, A SLIGHT VARIATION IN THE SIGNAL WILL BE OBSERVED.

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Note: A measurement with an LE 210 and LU 210 Series Load Measuring Pin mounted upside down will not work, both series have been designed to produce a positive current (LE) or voltage (LU) measurement signal.

---

When the pin is not optimally positioned (see *figures 4-1 and 4-2*), the measurement signal will be altered accordingly, as follows:

**4.1.1 LB 210 AND LB 230 LOAD MEASURING PINS**

$$U_{\text{eff}} = U_{\text{rated}} \cos \varphi$$

where:  $U_{\text{eff}}$  represents the effective value of the measured signal  
 $U_{\text{rated}}$  represents the rated value of the measured signal  
 $\varphi$  represents the angle between the sensitivity axis of the transducer and the direction of the force applied on the central portion of the pin.

Example : Output signal = effective value ( $U_{\text{eff}}$ ) i.e. 100 % of the full scale value.  
 for  $\varphi = 0^\circ$   $\cos \varphi = 1$   $U_{\text{eff}} = U_{\text{rated}}$   
 for  $\varphi = 10^\circ$   $\cos \varphi = 0,985$   $U_{\text{eff}} = 98,5 \% U_{\text{rated}}$

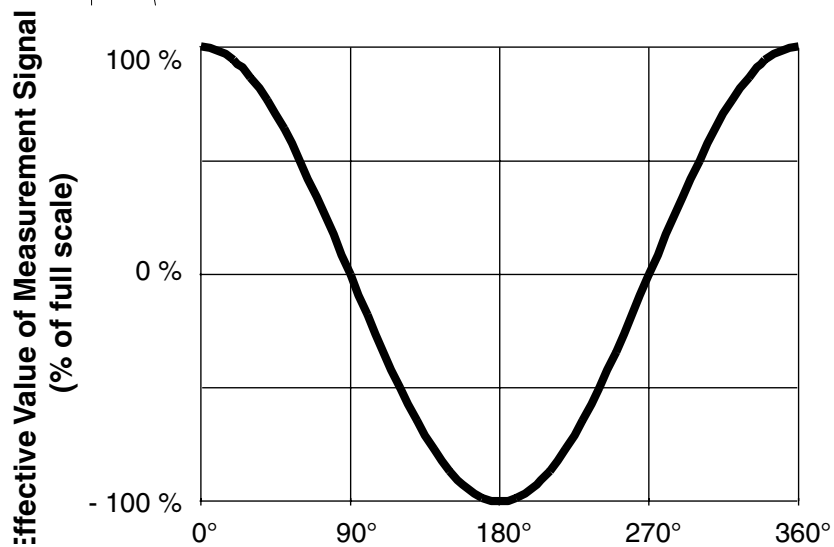
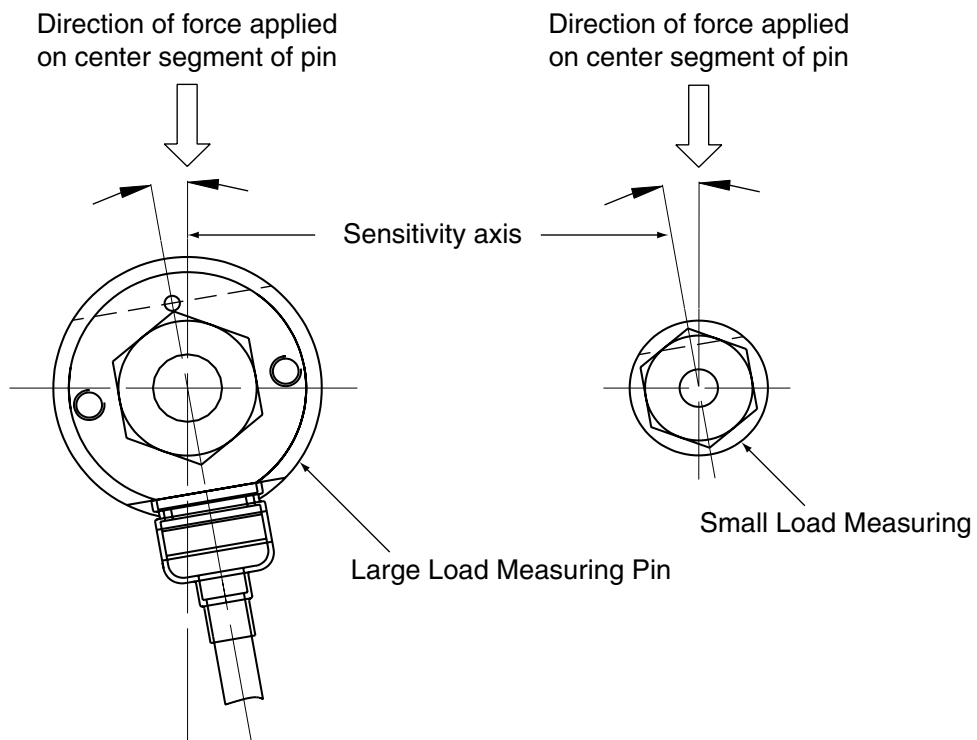


Figure 4-1 Influence of the LB 210 and LB 230 Series Load Measuring Pins' orientation

OPERATION

**4.1.2 LE 210 SERIES LOAD MEASURING PINS**

$$I_{\text{eff}} = I_{\text{rated}} \cos \varphi$$

where :  $I_{\text{eff}}$  represents the effective value of the measured signal  
 $I_{\text{rated}}$  represents the rated value of the measured signal ( $I_{\text{rated}} = I_{\text{measured}} - 4 \text{ mA}$ )  
 $\varphi$  represents the angle between the sensitivity axis of the transducer and the direction of the force applied on the central portion of the pin.

Example : Output signal = effective value ( $I_{\text{eff}}$ ) i.e. 100 % of the full scale value.  
 for  $\varphi = 0^\circ$   $\cos \varphi = 1$   $I_{\text{eff}} = I_{\text{rated}}$   
 for  $\varphi = 15^\circ$   $\cos \varphi = 0,966$   $I_{\text{eff}} = 96,6 \% I_{\text{rated}}$

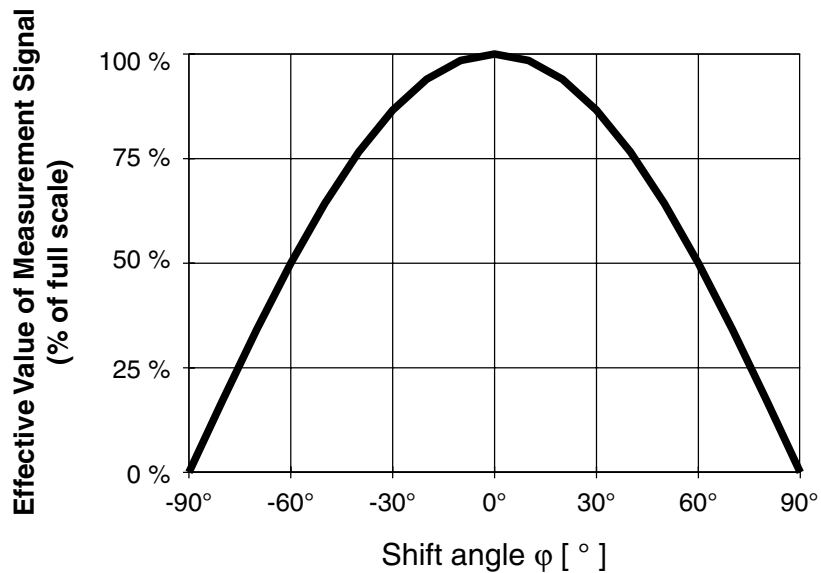
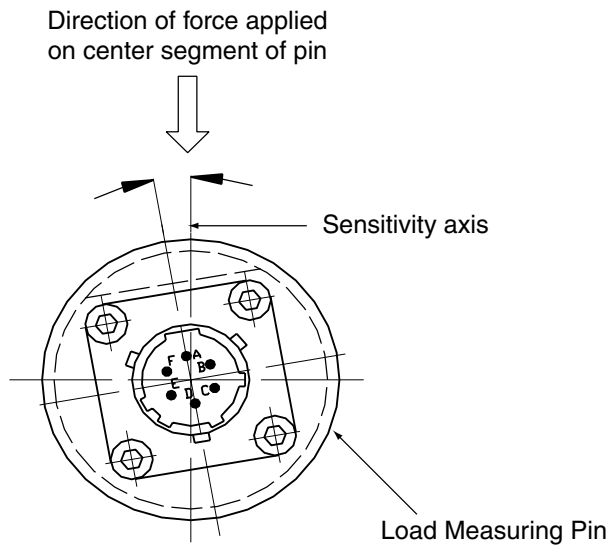


Figure 4–2 Influence of the LE 210 Series Load Measuring Pins' orientation

OPERATION

**4.1.3 LU 210 SERIES LOAD MEASURING PINS**

$$U_{\text{eff}} = U_{\text{rated}} \cos \varphi$$

where :  $U_{\text{eff}}$  represents the effective value of the measured signal  
 $U_{\text{rated}}$  represents the rated value of the measured signal  
 $\varphi$  represents the angle between the sensitivity axis of the transducer and the direction of the force applied on the central portion of the pin.

Example : Output signal = effective value ( $U_{\text{eff}}$ ) i.e. 100 % of the full scale value.  
 for  $\varphi = 0^\circ$   $\cos \varphi = 1$   $U_{\text{eff}} = U_{\text{rated}}$   
 for  $\varphi = 10^\circ$   $\cos \varphi = 0,985$   $U_{\text{eff}} = 98,5 \% U_{\text{rated}}$

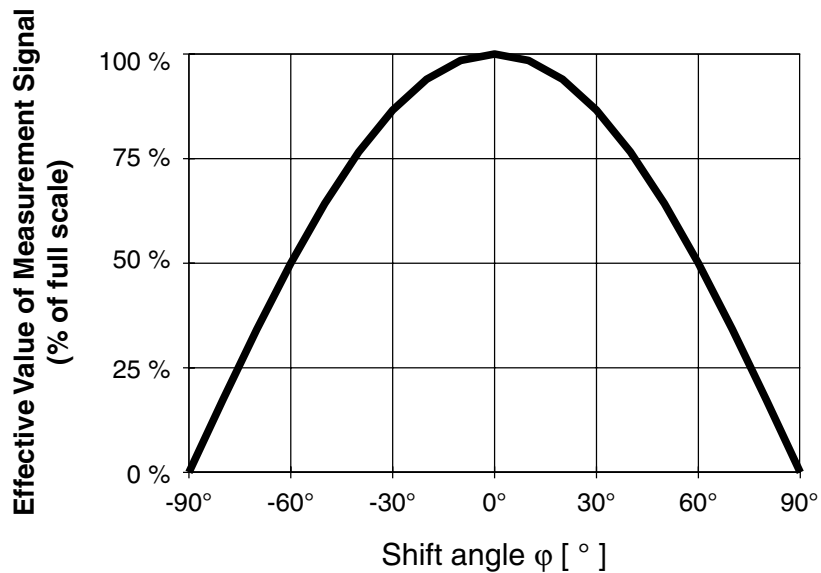
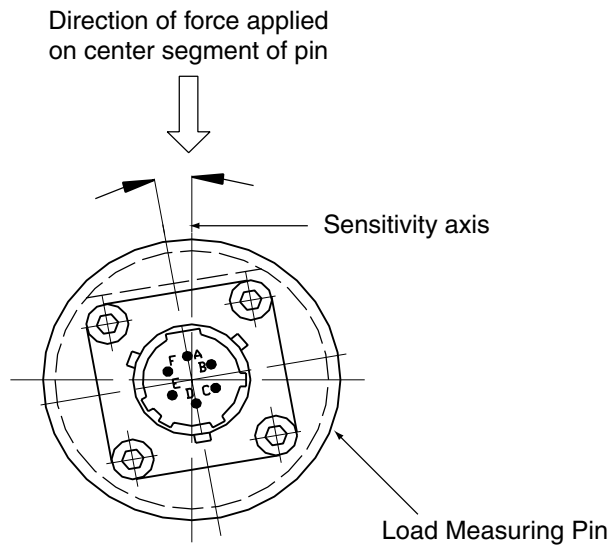


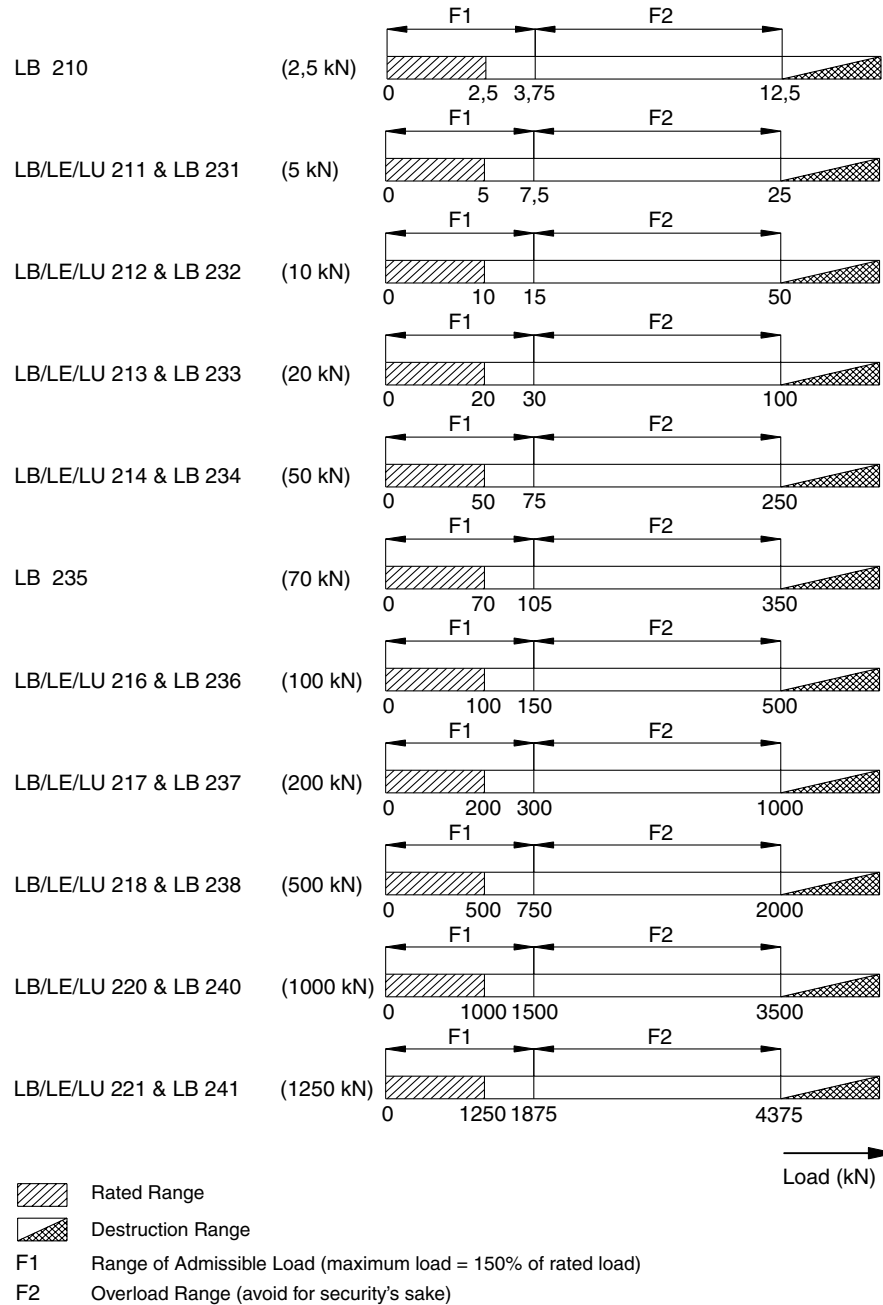
Figure 4–3 Influence of the LU 210 Series Load Measuring Pins' orientation

OPERATION

## 4.2 INFLUENCE OF THE APPLIED FORCE

A load measuring pin is capable of measuring not only loads within the rated load range but loads up to 150 % of the rated load (see *figure 4-4*).

However, applying loads in excess of these limits can result in permanent (plastic) deformation of the load measuring pin, or even cause it to be destroyed. In such a case, the measurement signals do not correspond to the load applied in reality. Consequently, the security of the installation and that of the user can no longer be guaranteed.



OPERATION

Figure 4-4 Application range of the load measuring pins.

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## 5. Maintenance

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### 5.1 LUBRICATION

All gliding surfaces of mechanical parts must be lubricated. In particular the load measuring pin must be greased before it is mounted. If the load measuring pin is used with compensation pulleys, a periodical greasing is sufficient.

When the operating conditions are particularly hostile (considerable humidity, high temperature, dust, etc), it is recommended to grease the bearings at short intervals.

For rotating pulleys mounted on gliding bearings lubrication is important. On request Magtrol supplies load measuring pins with an incorporated device for the greasing of gliding surfaces (lubricator is an option on LB 216 - LB 221, LE 216 - LE 221 and LU 216 - LU 221 Load Measuring Pins).

### 5.2 CALIBRATION

Recommendations for calibrating (LB 210 and LB 230 Load Measuring Pins) and the checking of measuring current and voltage (LE 210 and LU 210 load measuring pins)

The most frequently encountered problems when operating load measuring pins are the detachment of the strain gauges or the plastic deformation due to an overload, as well as a torn cable during an incorrect manipulation.

The checking frequency depends on the application or on the maintenance schedule planned for the installation.

## 6. Troubleshooting

Two different procedures are used for troubleshooting, depending on where the load measuring pin is fitted with an integrated electronics (LE 210 and LU 210 Series) or not (LB 210 and LB 230 Series). The following tables list a number of problems encountered with load pins and the measure to take as a remedy. It is assumed that the installation has been completed.



Note: If none of the following measures show any effect, please contact your Magtrol representative.

### 6.1 TROUBLESHOOTING ON LB 210 AND LB 230 SERIES LOAD PINS

Problem	Possible cause	Remedy
No supply voltage	Broken transmission line	Check the line and the connections.
Output voltage < 0.000 V	Inversion of the applied load	Check and correct the direction of the applied load.
	Crossing of the power supply or signal cables	Check and correct the cabling.
Output voltage = 0.000 V	Broken transmission line	Check the line and the connections.
	No load	Apply a load of 20% of the rated load.
Error between measured and calculated signal	Difference between the applied effective load and the load used for calculation	Recalculate taking a possible demultiplication (pulley, lever arm, etc.).

### 6.2 TROUBLESHOOTING ON LE 210 SERIES LOAD PINS

Problem	Possible cause	Remedy
Output current < 4 mA	Calibration error	Send back the pin for calibration.
	Inversion of applied load	Check and correct the direction of the applied load.
Output current = 0 mA	Broken transmission line	Check the line and the connections.
	Defect in the integrated electronics or weighing bridge	Send back the pin for checking and repair.
Output current > 20 mA	Calibration error	Send back the pin for calibration.
	Overload	Check and reduce the applied load.
Output current > 25 mA	Calibration error	Send back the pin for calibration.
	Overload	Check and reduce the applied load.
	Short-circuited transmission line	Check the line and the connections.
	Defect in the integrated electronics	Send back the pin for checking and repair.



Note: The operating range of the integrated electronics is between 3.5 mA and 25 mA for all LE 210 Series Load Measuring Pins.

### 6.3 TROUBLESHOOTING ON LU 210 SERIES LOAD PINS

Problem	Possible cause	Remedy
Output voltage < 0.000 V	Calibration error	Send back the pin for calibration.
	Broken transmission line	Check the line and the connections.
Output voltage = 0.000 V	Inversion of the applied load	Check and correct the direction of the applied load.
	Defect in the integrated electronics or weighing bridge	Send back the pin for checking and repair.
Output voltage > 10.000 V	Calibration error	Send back the pin for calibration.
	Overload	Check and reduce the applied load.
Output voltage > 10.2 V	Calibration error	Send back the pin for calibration.
	Short-circuited transmission line	Check the line and the connections.
	Defect in the integrated electronics	Send back the pin for checking and repair.



Note: The operating range of the integrated electronics is between 0 V and 10.2 V for all LU 210 Series Load Measuring Pins.

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# Appendix A : OIML Certification

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Certain LB 230 (LB 334, LB 235, LB 236 and LB 237) series load measuring pin have been certified by the OIML.



Eidgenössisches Amt für Messwesen  
Office fédéral de métrologie  
Ufficio federale di metrologia  
Swiss Federal Office of Metrology

Nr. 12.2-0311

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## Konformitätszertifikat

**Messmittel:** Lastmessbolzen  
Fabrikant: Vibro-Meter AG, Fribourg  
Typ: LB234, LB235, LB236, LB237  
OIML-Klassierung: D0.1  
Höchstlast: 5000 kg, 7000 kg, 10000 kg, 20000 kg  
Minimale Totlast: 0 kg  
Grenzlast: 1.5 Mal die Höchstlast  
Kleinstes Eichintervall:  $v_{\min} = \text{Lastbereich}/100$   
Konstruktion gemäss Zeichnung PZ 5876

**Antragsteller:** Vibro-Meter AG, Fribourg

Dieses Zertifikat bestätigt die Übereinstimmung der oben genannten Typenserie mit den Anforderungen der Empfehlung der Organisation Internationale de Métrologie Légale (OIML)

R60 "Metrological regulation for load cells" ed. 1991.

Die Konformität mit der R60 wurde aufgrund der Resultate der Prüfungen an dem mit den übrigen Typen baugleichen Typ LB235 festgestellt. Diese Resultate sind im zugehörigen Messbericht Nr. 12.2-0283 beschrieben.

Abteilung Mechanik, Strahlung  
und Thermometrie

Dr. Bruno Vaucher, Abteilungschef

Wabern, 12. März 1993  
Zg

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CH-3084 Wabern, Lindenweg 50  
Tel. +41 (0)31 963 31 11  
Fax +41 (0)31 963 32 10  
Telex 912 860 topo ch

7 92 6000 61021/3

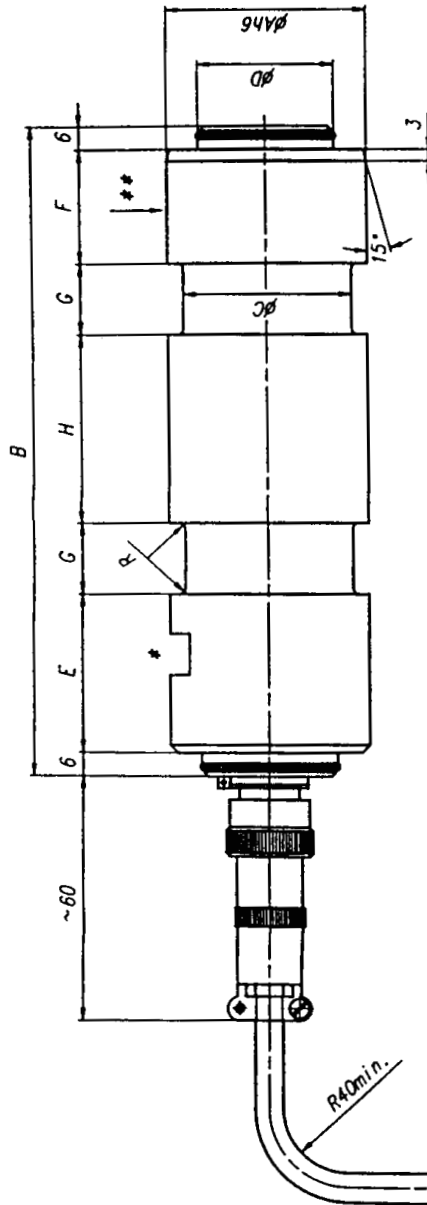
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Office fédéral de métrologie  
Ufficio federale di metrologia  
Swiss Federal Office of Metrology

Messbericht (Fortsetzung)

Nr. 12.2-0283



TYPE	kN	A	B	C	D	E	F	G	H	R
LB 234	50	35	113	31	30	24	18	12	35	1,5
LB 235	70	45	196	33	34	43	29	12	88	2
LB 236	100	50	165	42	34	40	29	18	48	1,5
LB 237	200	65	194	58	34	37	30	25	65	1,5

Rev.	Date	Drawn	Appr.	Repl. by:	Scale	Scale	Scale
1				mm to 60 mm: 3	mm over 60 mm	1:1	1:1
Tolerances: 3				Material: Anilin I. FBG Nr. 1.4057 780-930 N/mm <sup>2</sup>			
Finish: X-Y				DWG. N°			
P/N: 122-23X-000-021				TYPE: LB 234 + 237			
vibro-meter				SWITZERLAND			
FICM N°				8 3980			
Drawn				16.2.98			
Checked				17.6.98			
Appr.				17.6.98			

\*: Retainer key is on the other side \*\* for LB 235

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# Service Information

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## RETURNING MAGTROL EQUIPMENT FOR REPAIR AND/OR CALIBRATION

Before returning equipment to Magtrol for repair and/or calibration, please visit Magtrol's Web site at <http://www.magtrol.com/support/rma.htm> to begin the Return Material Authorization (RMA) process. Depending on where the equipment is located and which unit(s) will be returned, you will be directed to either ship your equipment back to Magtrol, Inc. in the United States or Magtrol SA in Switzerland.

### Returning Equipment to Magtrol, Inc. (United States)

When returning equipment to Magtrol, Inc.'s factory in the United States for repair and/or calibration, a completed Return Material Authorization (RMA) form is required.

1. Visit Magtrol's Web site at <http://www.magtrol.com/support/rma.htm> to begin the RMA process.
2. Complete the RMA form online and submit.
3. An RMA number will be issued to you via e-mail. Include this number on all return documentation.
4. Ship your equipment to:  
MAGTROL, INC.  
70 Gardenville Parkway  
Buffalo, NY 14224  
Attn: Repair Department
5. After Magtrol's Repair Department receives and analyzes your equipment, a quotation listing all the necessary parts and labor costs, if any, will be faxed or e-mailed to you.
6. After receiving your repair estimate, provide Magtrol with a P.O. number as soon as possible. A purchase order confirming the cost quoted is required before your equipment can be returned.

### Returning Equipment to Magtrol SA (Switzerland)

If you are directed to ship your equipment to Switzerland, no RMA form/number is required. Just send your equipment directly to Magtrol SA in Switzerland and follow these shipment instructions:

1. Ship your equipment to:  
MAGTROL SA  
After Sales Service  
Route de Montena 77  
1728 Rossens / Fribourg  
Switzerland  
VAT No: 485 572
2. Please use our forwarder : TNT • 1-800-558-5555 • Account No 154033  
Only ship ECONOMIC way (3 days max. within Europe)
3. Include the following documents with your equipment:
  - Delivery note with Magtrol SA's address (as listed above)
  - Three pro forma invoices with:
    - Your VAT number
    - Description of returned goods
    - Noticed failures
    - Value - for customs purposes only
    - Origin of the goods (in general, Switzerland)
4. A cost estimate for repair will be sent to you as soon as the goods have been analyzed. If the repair charges do not exceed 25% the price of a new unit, the repair or calibration will be completed without requiring prior customer authorization.



*Testing, Measurement and Control of Torque-Speed-Power • Load-Force-Weight • Tension • Displacement*

**[www.magtrol.com](http://www.magtrol.com)**

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