MAGTROL

LB-LE-LU SERIES
LOAD MEASURING PINS

USER GUIDE

www.magtrol.com

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PREFACE

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.

Chapter 7: SERVICES INFORMATION - Informations, contact and adresse relative for repair and/or calibration

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:

NOTICE

Indicates information considered important but not hazard related.

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.

CAUTION

INDICATES A HAZARDOUS SITUATION THAT, IF NOT AVOIDED, COULD RESULT IN MINOR OR MODERATE INJURY.

THIS IS ALSO 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.

WARNING

INDICATES A HAZARDOUS SITUATION THAT, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY.

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.

DANGER

INDICATES A HAZARDOUS SITUATION THAT, IF NOT AVOIDED, WILL RESULT IN DEATH OR SERIOUS INJURY. THE SIGNAL WORD "DANGER" IS TO BE LIMITED TO THE MOST EXTREME SITUATIONS.

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.

The safety symbol may subsequently vary depending on the source of the hazard. Here below are examples

Fig.A-1 Various safety pictograms according to ISO 7010

1. INTRODUCTION

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
- LB 231 - LB 241 : enhanced models for use in hostile environments
- LE 2XX Series: models with calibrated current output.
- LU 2XX Series: models with calibrated voltage output.
- LE 4XX Series : models with calibrated current output and B.I.T.E monitoring.
- LE 6XX Series : models with redundant calibrated current output and B.I.T.E monitoring.

1.2 SEMANTIC

In this manual, often different terminologies are used to speak about the "Load Measuring Pins". The primary purpose is to make this user manual useful and easily readable. Below are the different terminologies used: "Load Measuring Pin" and "Load Pin" are synonyms; "LX XXX Series" is an abreviation for "LX XXX Series Load Measuring Pins", etc. The term "Series" stand for all the products of the series (e.g. LE 4XX Series refers to LE 410 to LE 421).

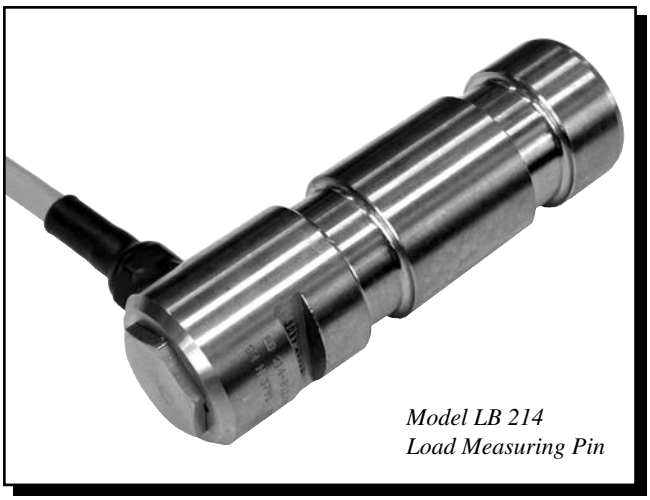
1.3 DATASHEETS

1.3.1 LB 210 SERIES - LOAD MEASURING PINS

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. On request, available with double bridge redundant.
- 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.



Model LB 214
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 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.

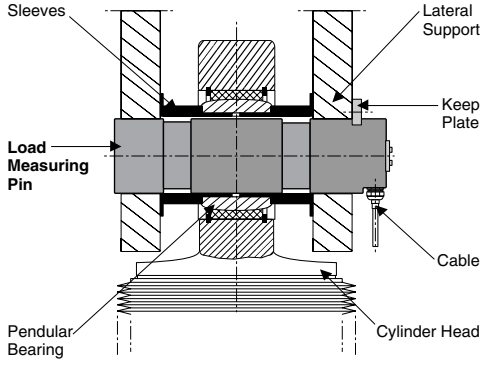
DESIGN

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).

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.

MOUNTING EXAMPLE



Specifications

LB 210

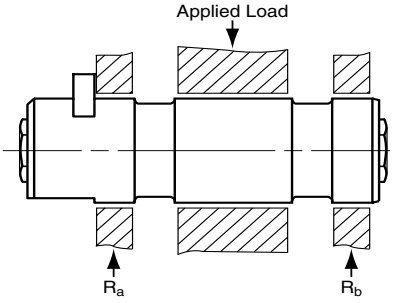
Standard Version*	LB 210	LB 211	LB 212	LB 213	LB 214	LB 216	LB 217	LB 218	LB 220	LB 221
MECHANICAL CHARACTERISTICS										
Nominal Load, fsd (Metric)	2.5 kN	5 kN	10 kN	20 kN	50 kN	100 kN	200 kN	500 kN	1000 kN	1250 kN
Nominal Load, fsd (US)	0.28 tf	0.56 tf	1.12 tf	2.25 tf	5.62 tf	11.24 tf	22.48 tf	56.20 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%	300%	
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				
ELECTRICAL CHARACTERISTICS										
Operating Principle	Full-bridge strain gauge									
Bridge Impedance: • Input • Output	400 Ω 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 • On Sensitivity	± 0.02% of fsd / K ± 0.02% / K									
Influence on Measurement Signal (Shift of Force Angle with Respect to Measurement Axis)	According to the cosine function									
ELECTRICAL CONNECTION										
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

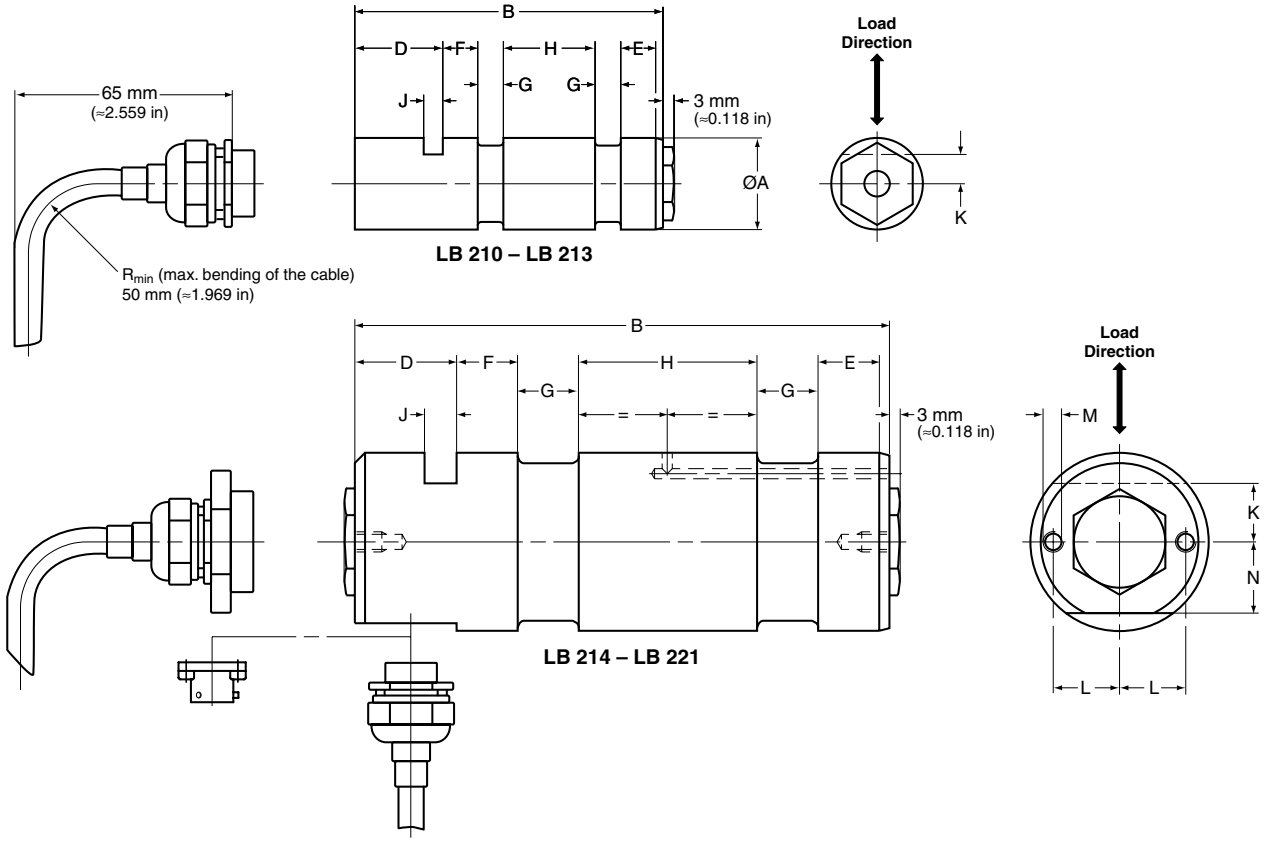
When force is applied to the Load Measuring Pin along its sensitive axis, the effect on the strain gauge bridge results in an output signal proportional to the applied force. The powering of the strain gauge bridge, as well as the amplification of its output signal voltage, is performed by an external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

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



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	Ø 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

STANDARD MODELS — LB 2□□-011/ 0 0□

- Model LB 2 1 0 – 2 1 3 — Electrical Connection: PG Axial
- Model LB 2 1 4 – 2 2 1 — Electrical Connection: PG Radial

OPTIONS FOR MODELS LB 214 – LB 221 — LB 2□□-111/ □□□

- Model LB 2 1 4 – 2 2 1
- 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

CONNECTION CABLE ASSEMBLY

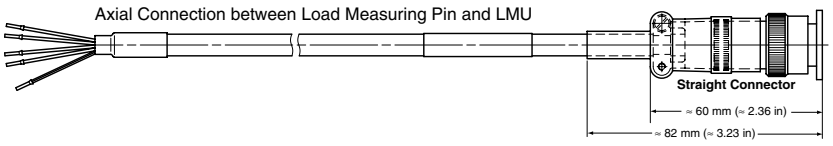
- Cable Length: 3 m — 1
  6 m — 2
  12 m — 3
  20 m — 4

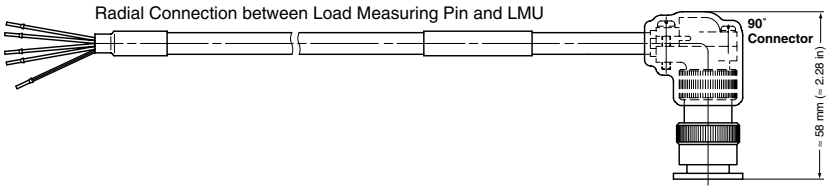
Example

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

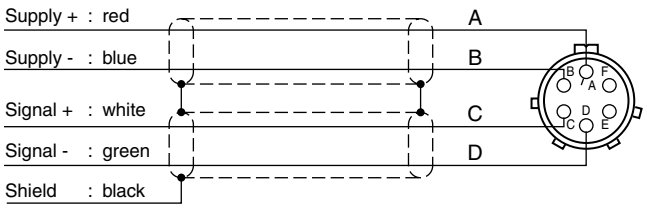
ACCESSORIES

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.

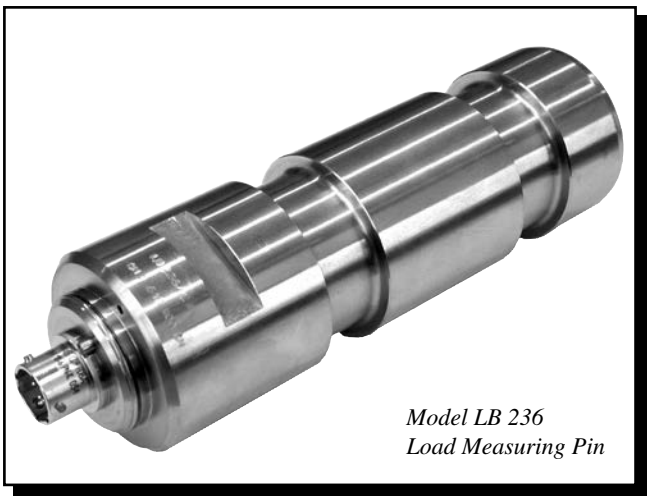
1.3.2 LB 230 SERIES - LOAD MEASURING PINS

LB 230 Series
Load Measuring Pins

OIML Classified

FEATURES

- Temperature-compensated transducers with strain gauges in full-bridge configuration. On request, available with double bridge redundant.
- 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 IIII.
- 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.



Model LB 236
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. 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.

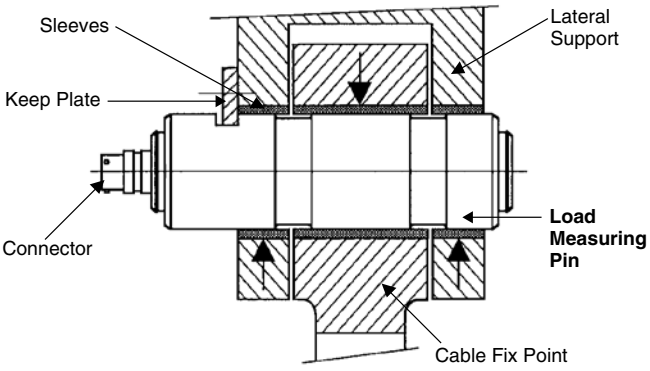
DESIGN

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.

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.

MOUNTING EXAMPLE



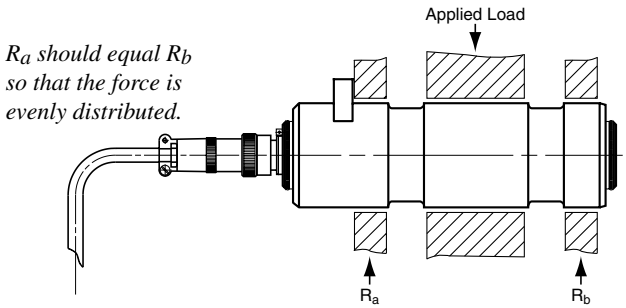
Specifications LB 230

Standard Version*	LB 231	LB 232	LB 233	LB 234	LB 235	LB 236	LB 237	LB 238	LB 240	LB 241
MECHANICAL CHARACTERISTICS										
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%	300%	
Material	Stainless steel 1.4057									
Protection Class	IP 67 according to DIN 40050									
Fit	G7 / h6									
ELECTRICAL CHARACTERISTICS										
Operating Principle	Double full-bridge strain gauge									
Bridge Impedance: • Input • Output	800 Ω 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 • On Sensitivity	± 0.02% of fsd / K ± 0.02% / K									
Influence on Measurement Signal (Shift of Force Angle with Respect to Measurement Axis)	According to the cosine function									
ELECTRICAL CONNECTION										
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.*

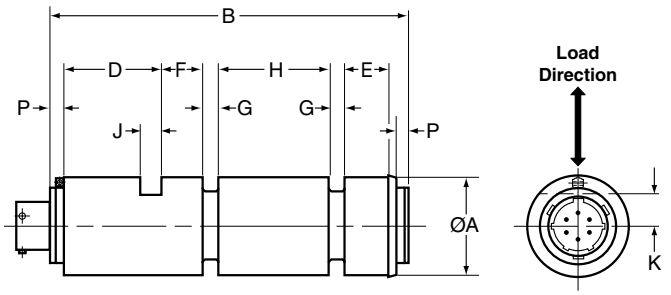
OPERATING PRINCIPLE

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.

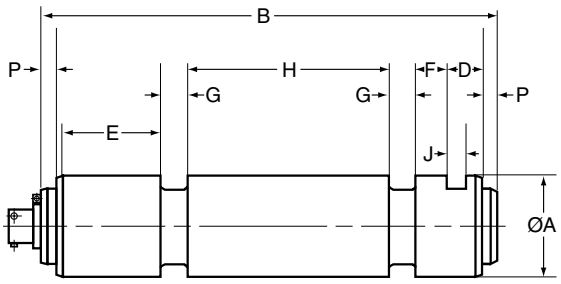


Specifications LB 230

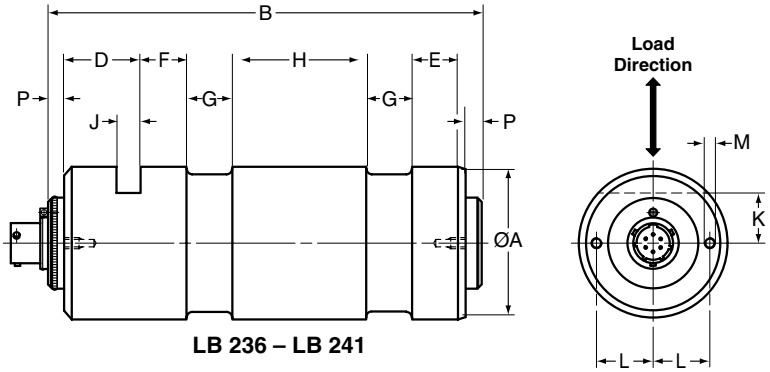
DIMENSIONS



LB 231 – LB 234



LB 235



LB 236 – LB 241

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

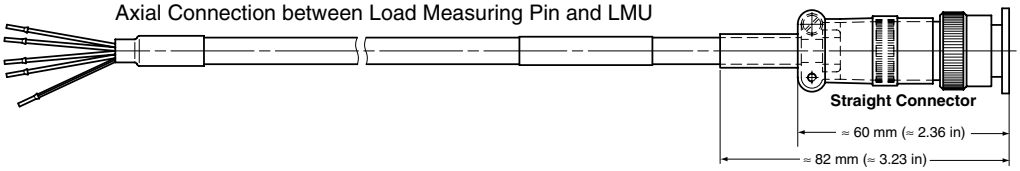
LOAD MEASURING PINS LB 2☐☐/021

- Model LB 2☐1 – 2☐1

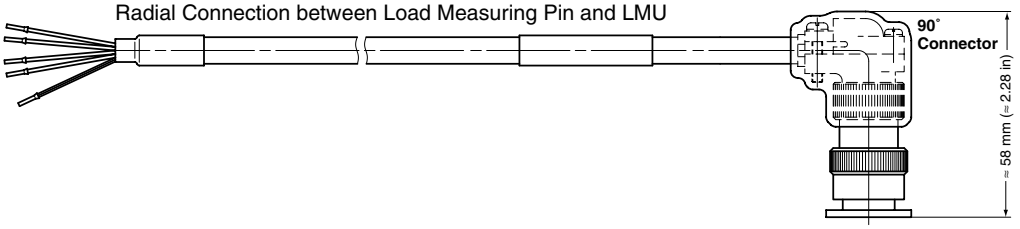
ACCESSORIES

Cable Assemblies

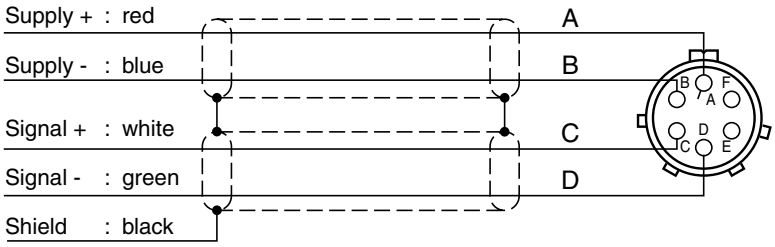
Axial Connection between Load Measuring Pin and LMU



Radial Connection between Load Measuring Pin and LMU



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.

1.3.3 LE-LU SERIES - LOAD MEASURING PINS

LE-LU SERIES
LOAD MEASURING PINS

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. Idealy for use on Safety Applications according to **ECE-R10, ISO 13849-1 : CAT4** & **PLe** and **IEC 62061 : SIL3** (LE 6XX SERIES); **ISO 13849-1 : CAT2** & **PLd** and **IEC 62061 : SIL2** (LE 4XX SERIES).

FEATURES

- Temperature-compensated transducers with strain gauges in full-bridge configuration. On request, available with double bridge redundant.
- Available in several standard ranges from 2.5 kN to 1250 kN (0.28 tf to 140.5 tf).
- Electronics for transmission over great distances:
  · 2 wires (LE 210) 4-20 mA
  · 3 wires (LE 410) 4-20 mA
  · 4 wires (LU 210) 0-10 V
  · 6 wires (LE 610) available with dual channels 4-20 mA
- Built-in test equipment (B.I.T.E.) included on LE 410 series & LE 610 series.
- Complies with Safety Standards ISO 13849-1 and IEC 62061.
- 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).

Fig.1 : Load Measuring Pin model LE 614 & LE 612

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 several standard ranges from 2.5 kN to 1250 kN, their operation remains trouble-free and reliable even in electromagnetically difficult environmental conditions.

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 measuring loads and overload protection on cranes, hoisting gear, elevators and winches. The integrated electronics makes them ideal for applications in which separate signal conditioning is difficult to install and where the monitoring electronics are positioned at extended distances.

MAGTROL

LE-LU SERIES

DESIGN

Magtrol Load Measuring Pins have two 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).

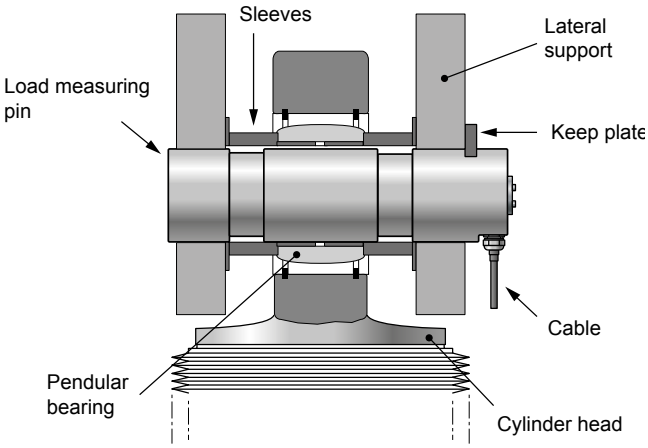


Fig.2 : Mounting example

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.

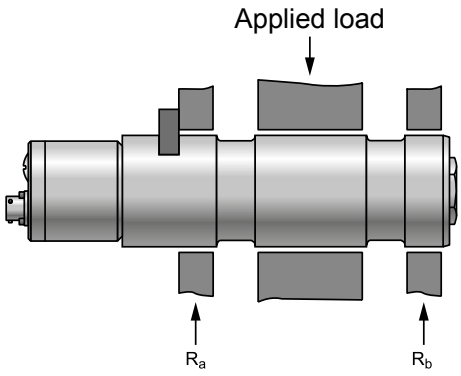
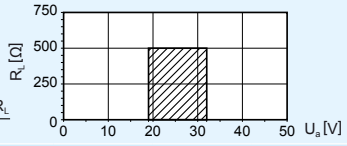
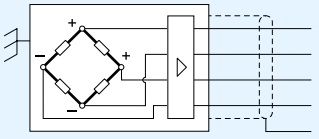


Fig.3 : Ra should equal Rb so that the force is evenly distributed

MAGTROL **LE-LU SERIES**

SPECIFICATIONS LE 4XX SERIES

STANDARD VERSION 1 CHANNEL [a]	LE 410	LE 411	LE 412	LE 413	LE 414	LE 416	LE 417	LE 418	LE 420	LE 421
LOAD MEASURING										
Nominal Load (Metric) [b]	2.5 kN	5 kN	10 kN	20 kN	50 kN	100 kN	200 kN	500 kN	1000 kN	1250 kN
Nominal Load (US) [b]	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 (% of NL)	150 % (of rated load without influence on measurement)									
Overload at Rupture (% of NL)	≥500 %								400 %	300 %
Non-linearity Error [b]	<0.5 %									
Non-linearity + Hysteresis Error [b]	<0.8 %									
Repeatability [b]	±0.1 %									
Standard Calibration	4 mA - 20 mA corresponds to 0 kN - Full Scale Defection in kN									
MECHANICAL CHARACTERISTICS & ENVIRONMENT										
Technology	Full-bridge strain gauge									
Material	Stainless steel 1.4057									
Lubrication	Not available					Oiler ø4 DIN 3405 D or M10 DIN 3405 A				
Operating Temperature	-25 °C to +80 °C									
Storage Temperature	-30 °C to +90 °C									
Temperature Influence on Zero [b]	±0.02 % / K									
Temperature Influence on Sensitivity	±0.02 % / K									
Long Term Stability of Zero [b]	<1 % / year (not cumulative)									
Long Term Stability of Sensitivity	<0.5 % / year (not cumulative)									
EMC | Vehicle approval Ⓔ	According to EN 61326-1, EN 61326-2-3 | ECE-R10									
Angle influence on signal output [c]	According to the cosine function									
Protection Class	IP66 (connected) according to EN 60529									
SAFETY STANDARDS & B.I.T.E.										
Safety Standards	ISO 13849-1 : CAT2 and PLd | IEC 62061 : SIL 2									
Type of B.I.T.E. input	Active low, compatible with switch, relay, open collector or open drain, 1 B.I.T.E									
Effect on the output	Addition of 70 % ±10 % of the nominal load in standard (other % in option)									
ELECTRICAL CHARACTERISTICS & CONNECTIONS										
Strain Gauge Bridge Impedance	350 Ω									
Power Supply	19 to 32 VDC (with protected polarity reversal)									
Output Signal	Rated 4 to 20 mA; max. 0.5 to 22 mA									
Load Resistance	Admissible resistance of 3-wire circuit at connection of LE 4XX series Hatched: Operating Domain = Load Resistance R_L / Supply Voltage U_a 									
Output	Integrated 3 m, 6 m, 12 m or 20 m, cable Radox K-414 (standard)or axial connector HUMMEL M16 [d]									
Configuration	3-wires									
Optional Connection Cable Assembly	3 m, 6 m, 12 m or 20 m cable with connector HUMMEL M16 female [d]									
Wiring Colors	 Power Supply + : red Ground (GND) - : blue Current Output + : white B.I.T.E : green Case / Shield : yellow / black									

a) Rating apply to standard load pins only, special models available on request.
b) Full scale.
c) Variation of the measuring signal due to the angle positioning.
d) Other longer cables lenghts avaible on request.

MAGTROL LE-LU SERIES

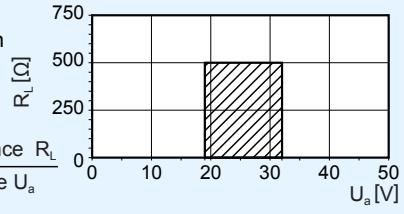
SPECIFICATIONS LE 6XX SERIES

STANDARD VERSION 2 CHANNELS [a]	LE 610	LE 611	LE 612	LE 613	LE 614	LE 616	LE 617	LE 618	LE 620	LE 621
LOAD MEASURING										
Nominal Load (NL) (Metric) [b]	2.5 kN	5 kN	10 kN	20 kN	50 kN	100 kN	200 kN	500 kN	1000 kN	1250 kN
Nominal Load (NL) (US) [b]	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 (% of NL	150 % (of rated load without influence on measurement)									
Overload at Rupture (% of NL))	≥ 500 %								400 %	300 %
Non-linearity Error [b]	< 0.5 %									
Non-linearity + Hysteresis Error [b]	< 0.8 %									
Repeatability [b]	± 0.1 %									
Standard Calibration	4 mA - 20 mA corresponds to 0 kN - Full Scale Defection in kN									
MECHANICAL CHARACTERISTICS & ENVIRONMENT										
Technology	2x Full-bridge strain gauge									
Material	Stainless steel 1.4057									
Lubrication	Not available					Oiler ø4 DIN 3405 D or M10 DIN 3405 A				
Operating Temperature	-25 °C to +80 °C									
Storage Temperature	-30 °C to +90 °C									
Temperature Influence on Zero [b]	± 0.02 % / K									
Temperature Influence on Sensitivity	± 0.02 % / K									
Long Term Stability of Zero [b]	< 1 % / year (not cumulative)									
Long Term Stability of Sensitivity	< 0.5 % / year (not cumulative)									
EMC | Vehicle approval Ⓔ	According to EN 61326-1, EN 61326-2-3 | ECE-R10									
Angle influence on signal output [c]	According to the cosine function									
Protection Class	IP 66 (connected) according to EN 60529									
SAFETY STANDARDS & DUAL B.I.T.E.										
Safety Standards	ISO 13849-1 : CAT4 and PLe | IEC 62061 : SIL 3									
Type of B.I.T.E. input.	Active low, compatible with switch, relay, open collector or open drain, 1 B.I.T.E. input for each channel									
Effect on the output	Addition of 70 % ± 10 % of the nominal load in standard (other % in option)									
ELECTRICAL CHARACTERISTICS & CONNECTIONS										
Strain Gauge Bridge Impedance	2 x 350 Ω									
Power Supply	19 to 32 VDC (with protected polarity reversal (1x or 2x))									
Output Signal 2 channels	Rated 4 to 20 mA; max. 0.5 to 22 mA (2x)									
Output	Integrated 3 m, 6 m, 12 m or 20 m cable Radox K-814 (standard) or axial connector HUMMEL M16 [d]									
Configuration	6-wire									
Optional Connection Cable Assembly	3 m, 6 m, 12 m or 20 m cable with connector HUMMEL M16 female [d]									

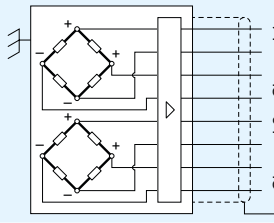
Load Resistance

Admissible resistance of 6-wire circuit at connection of LE 6XX series

Hatched: Operating Domain = Load Resistance R_L / Supply Voltage U_a



Wiring Colors

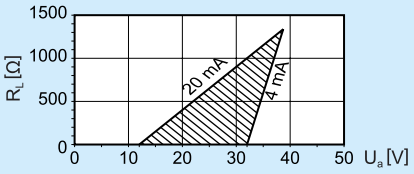


Power Supply +	: red
Ground (GND) -	: blue
Current Output +	: withe
B.I.T.E	: green
Power Supply +	: brown
Ground (GND) -	: black
Current Output +	: grey
B.I.T.E	: yellow
Case / Shield	: yellow / black

a) Rating apply to standard load pins only, special models available on request.
b) Full scale.
c) Variation of the measuring signal due to the angle positioning.
d) Other longer cables lenghts avaible on request.

MAGTROL LE-LU SERIES

SPECIFICATIONS LE 2XX SERIES

STANDARD VERSION [a]	LE 211	LE 212	LE 213	LE 214	LE 216	LE 217	LE 218	LE 220	LE 221
LOAD MEASURING									
Nominal Load (NL) (Metric) [b]	5 kN	10 kN	20 kN	50 kN	100 kN	200 kN	500 kN	1000 kN	1250 kN
Nominal Load (NL) (US) [b]	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 (% of NL)	150 % (without influence on measurement)								
Overload at Rupture (% of NL)	> 500 %						400 %	300 %	
Non-linearity Error [b]	< 0.25 %							< 0.5 %	
Non-linearity + Hysteresis Error [b]	< 0.5 %							< 0.8 %	
Repeatability [b]	± 0.1 %								
Standard Calibration	4 mA - 20 mA corresponds to 0 kN - Full Scale Defection in kN								
MECHANICAL CHARACTERISTICS									
Technology	Full-bridge strain gauge								
Material	Stainless steel 1.4057								
Lubrication	Not available				Oiler ø4 DIN 3405 D or M10 DIN 3405 A				
ENVIRONMENT									
Operating Temperature	-25 °C to +80 °C								
Storage Temperature	-30 °C to +90 °C								
Temperature Influence on Zero [b]	± 0.02 % / K								
Temperature Influence on Sensitivity	± 0.02 % / K								
Long Term Stability on Zero [b]	< 1 % / year (not cumulative)								
Long Term Stability on Sensitivity	< 0.5 % / year (not cumulative)								
EMC	According to EN 61000-6-2 & EN 61326-1								
Influence α on Measurement Signal [c]	According to the cosine function								
Protection Class	IP 66 according to DIN 40050								
ELECTRICAL CHARACTERISTICS & CONNECTIONS									
Strain Gauge Bridge Impedance:	5000 Ω								
Power Supply	12 to 32 VDC (with protected polarity reversal < 35 mA)								
Output Signal	Rated 4 to 20 mA; max. 3.5 to 25 mA								
Load Resistance	Admissible resistance of the 2-wire circuit at the connection of the LE 2XX Hatched: Operating Domain = Load Resistance R_L / Supply Voltage U_a 								
Output Connector	Axial connector, Souriau 851 02 E 10 6P50								
Configuration	2-wire								
Optional Connection Cable Assembly	3 m, 6 m, 12 m or 20 m cable with axial or 90° connector [d,e]								

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

b) Full scale.

c) Variation of the measuring signal due to the angle positioning.

d) Axial connector: Souriau 851 06 JC 10 6S50, 90° connector: Souriau 851 08 EC 10 6S50.

e) Other longer cables lenghts avaible on request.

MAGTROL LE-LU SERIES

SPECIFICATIONS LU 2XX SERIES

STANDARD VERSION [a]	LU 211	LU 212	LU 213	LU 214	LU 216	LU 217	LU 218	LU 220	LU 221
LOAD MEASURING									
Nominal Load (NL) (Metric) [b]	5 kN	10 kN	20 kN	50 kN	100 kN	200 kN	500 kN	1000 kN	1250 kN
Nominal Load (NL) (US) [b]	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 (% of NL)	150 % (of rated load without influence on measurement)								
Overload at Rupture (% of NL)	≥ 500 %						400 %	300 %	
Non-linearity Error [b]	< 0.25 %							< 0.5 %	
Non-linearity + Hysteresis Error [b]	< 0.5 %							< 0.8 %	
Repeatability [b]	± 0.1 %								
Standard Calibration	0 V - 10 V corresponds to 0 kN - Full Scale Defection in kN								
MECHANICAL CHARACTERISTICS									
Technology	Full-bridge strain gauge								
Material	Stainless steel 1.4057								
Lubrication	Not available				Oiler ø4 DIN 3405 D or M10 DIN 3405 A				
ENVIRONMENT									
Operating Temperature	-25 °C to +80 °C								
Storage Temperature	-30 °C to + 90 °C								
Temperature Influence on Zero [b]	± 0.02 % / K								
Temperature Influence on Sensitivity	± 0.02 % / K								
Long Term Stability of Zero [b]	< 1 % / year (not cumulative)								
Long Term Stability of Sensitivity	< 0.5 % / year (not cumulative)								
EMC	According to EN 61000-6-2 & EN 61000-6-4 category B								
Influence α on Measurement Signal [c]	According to the cosine function								
Protection Class	IP 66 according to DIN 40050								
ELECTRICAL CHARACTERISTICS & CONNECTIONS									
Strain Gauge Bridge Impedance	350 Ω								
Power Supply	12 to 32 VDC (with protected polarity reversal < 35 mA)								
Output Signal	0–10 VDC								
Output Connector	Axial connector, Souriau 851 02 E 10 6P50								
Configuration	4-wire								
Connection Cable Assembly	3 m, 6 m, 12 m or 20 m cable with axial or 90° connector [d,e]								

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

b) Full scale.

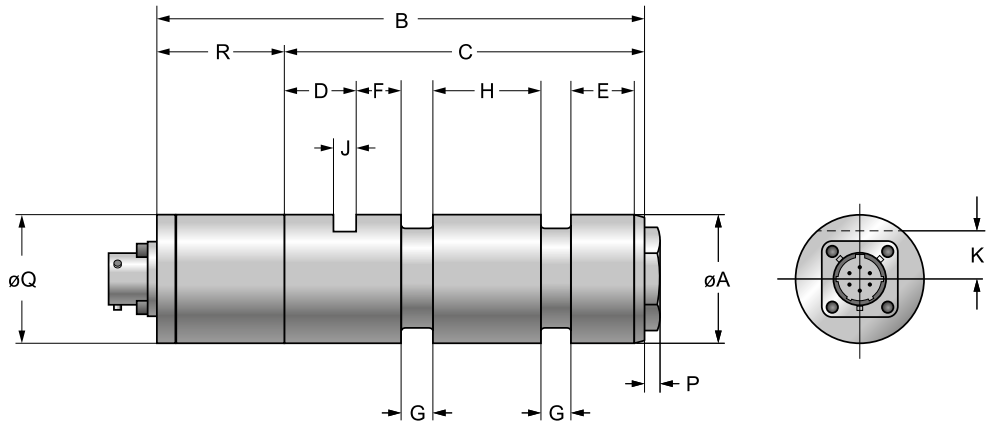
c) Variation of the measuring signal due to the angle positioning.

d) Axial connector: Souriau 851 06 JC 10 6S50, 90° connector: Souriau 851 08 EC 10 6S50.

e) Other longer cables lenghts avaible on request.

MAGTROL LE-LU SERIES

DIMENSIONS LE-LU 2XX SERIES



MODEL	units	øA	B	C	D	E	F	G	H	J	K	P	øQ	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

NOTES: Original dimensions are in Metric units. Dimensions converted to English units have been rounded up to 3 decimal places.
3D STEP files of most of our products are available on our website: www.magtrol.com ; other files are available on request.

MAGTROL

LE-LU SERIES

ORDERING INFORMATION LE 4XX SERIES

ORDERING NUMBER	LE 4	_ _	/	_	_	X

11, 12, ... 21 : Model LE

0 : Without Lubrication (standard)
1 : With Lubrication (available only on LE 416-421)

0 : Axial connector
1 : Cable length 3 m
2 : Cable length 6 m
3 : Cable length 12 m
4 : Cable length 20 m [a)]

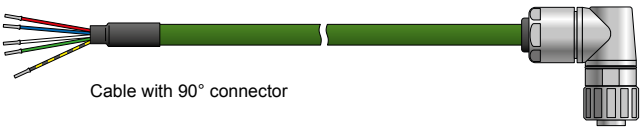
a) Other longer cables lenghts avaible on request.

Example: LE 416 Load Measuring Pin with lubrication and 6m cable would be ordered as follows: LE 416/12X.

ACCESSORIES LE 4XX SERIES

CABLE ASSEMBLIES

Cable with axial connector



Cable with 90° connector

CABLE ASSEMBLY ORDERING INFORMATION

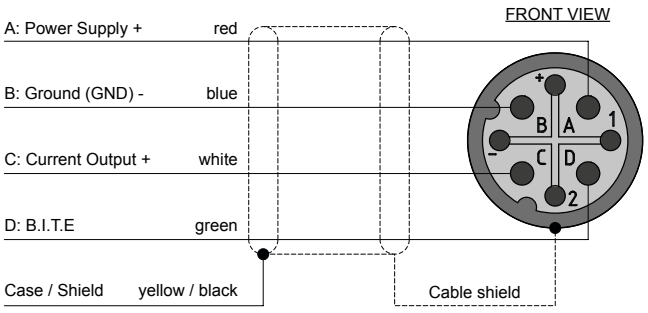
ORDERING NUMBER	EH 14	_	/ 0	_	X

8 : Axial connector
9 : 90° connector

1 : Cable length 3 m
2 : Cable length 6 m
3 : Cable length 12 m
4 : Cable length 20 m [a)]

a) Other longer cables lenghts avaible on request.

LE 4XX PIN CONFIGURATION



COUNTER CONNECTOR

Axial connector	PN 957-11-07-3101
90° connector	PN 957-11-07-3102

MAGTROL **LE-LU SERIES**

ORDERING INFORMATION LE 6XX SERIES

ORDERING NUMBER	LE 6	_ _	/	_	_	X

11, 12, ... 21 : Model LE

0 : Without Lubrication (standard)
1 : With Lubrication (available only on LE 616-621)

0 : Axial connector
1 : Cable length 3 m
2 : Cable length 6 m
3 : Cable length 12 m
4 : Cable length 20 m [a)]

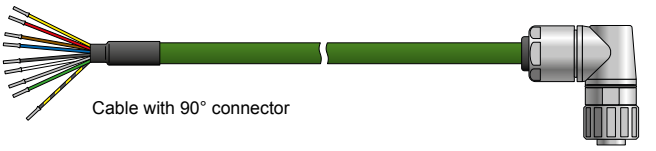
a) Other longer cables lenghts avaible on request.

Example: LE 616 Load Measuring Pin with lubrication and 6 m cable would be ordered as follows : LE 616/12X.

ACCESSORIES LE 6XX SERIES

CABLE ASSEMBLIES

Cable with axial connector



Cable with 90° connector

CABLE ASSEMBLY ORDERING INFORMATION

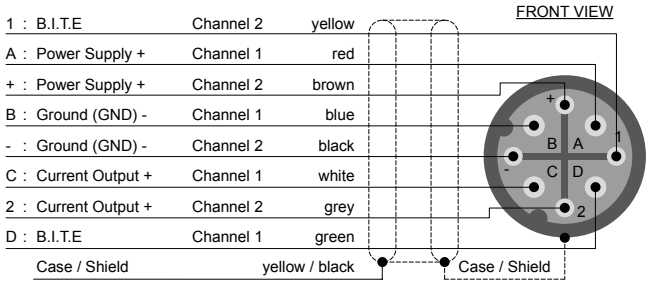
ORDERING NUMBER	ER 11	_	/ 0	_	X

8 : Axial connector
9 : 90° connector

1 : Cable length 3 m
2 : Cable length 6 m
3 : Cable length 12 m
4 : Cable length 20 m [a)]

a) Other longer cables lenghts avaible on request.

LE 6XX PIN CONFIGURATION (DUAL CHANNELS)



COUNTER CONNECTOR

Axial connector	PN 957-11-07-3111
90° connector	PN 957-11-07-3112

MAGTROL

LE-LU SERIES

ORDERING INFORMATION LE-LU 2XX SERIES

ORDERING NUMBER	LE 2	_ _	/ 0	_	X

11, 12, ... 21 : Model LE

1 : Without Lubrication (standard)
3 : With Lubrication (available only on LE 216-221)

Example: LE 216 Load Measuring Pin with lubrication would be ordered as follows: LE 216/03X.

ORDERING NUMBER	LU 2	_ _	/ 1	_	X

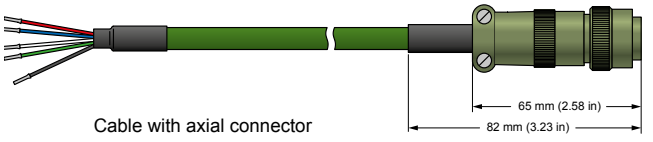
11, 12, ... 21 : Model LU

1 : Without Lubrication (standard)
3 : With Lubrication (available only LU 216-221)

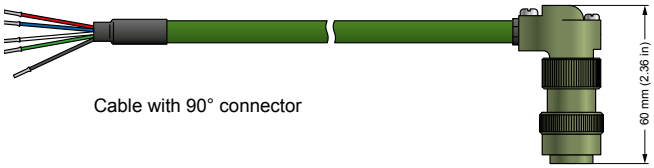
Example: LU 216 Load Measuring Pin with lubrication would be ordered as follows: LU 216/13X.

ACCESSORIES LE-LU 2XX SERIES

CABLE ASSEMBLIES



Cable with axial connector



Cable with 90° connector

CABLE ASSEMBLY ORDERING INFORMATION

ORDERING NUMBER	EH 13	_	/ 0	_	X

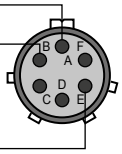
8 : Axial connector
9 : 90° connector

1 : Cable length 3 m
2 : Cable length 6 m
3 : Cable length 12 m
4 : Cable length 20 m [a)]

a) Other longer cables lenghts avaible on request.

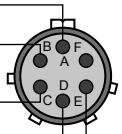
LE 2XX PIN CONFIGURATION

Power Supply +	red	A
Power Supply -	blue	B
Case	black	E



LU 2XX PIN CONFIGURATION

Power Supply +	red	A
Power Supply -	blue	B [a)]
Signal +	white	C
Signal -	green	D [a)]
Case	black	E



a) 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).

COUNTER CONNECTOR

Axial connector	PN 957-11-08-0030
90° connector	PN 957-11-08-0029

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Offices in: Germany
France - China - India
Worldwide Distribution Network

ISO 9001 BUREAU VERITAS Certification

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.

NOTICE

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 kN	Nominal diameter mm	Pin tolerance h6 µm	Bore tolerance G7 µm
LB 210, LE 410 & LE 610	2.5	25	0 / -13	+28 / +7
LB/LE/LU 211, LB 231, LE 411 & LE 611	5	25	0 / -13	+28 / +7
LB/LE/LU 212, LB 232, LE 412 & LE 612	10	25	0 / -13	+28 / +7
LB/LE/LU 213, LB 233, LE 413 & LE 613	20	25	0 / -13	+28 / +7
LB/LE/LU 214, LB 234, LE 414 & LE 614	50	35	0 / -16	+34 / +9
LB 235	70	45	0 / -16	+34 / +9
LB/LE/LU 216, LB 236, LE 416 & LE 616	100	50	0 / -16	+34 / +9
LB/LE/LU 217, LB 237, LE 417 & LE 617	200	65	0 / -19	+40 / +10
LB/LE/LU 218, LB 238, LE 418 & LE 618	500	85	0 / -22	+47 / +12
LB/LE/LU 220, LB 240, LE 420 & LE 620	1000	100	0 / -22	+47 / +12
LB/LE/LU 221, LB 241, LE 421 & LE 621	1250	120	0 / -22	+47 / +12

Machining dimensions and tolerances according to DIN 7161

NOTICE

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 Fig. 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 Fig. 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 Fig. 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 antifriction elements into the bores of the lateral supports and linking element.
- The bores in the lateral supports must be cylindrical and concentric to each another. 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.

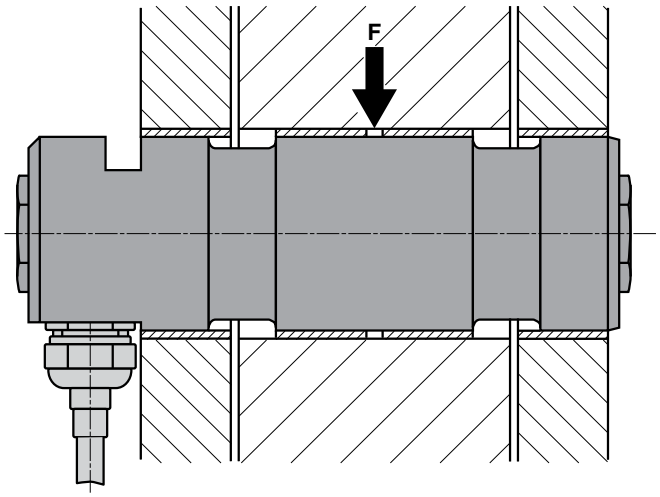


Fig. 2-1. Load measuring pin mounted in its seat

2.1.2 PIN HOLDER KEY

1. Machine the pin holder key to the dimensions given (*see Fig. 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 (*see Fig. 2-3*).

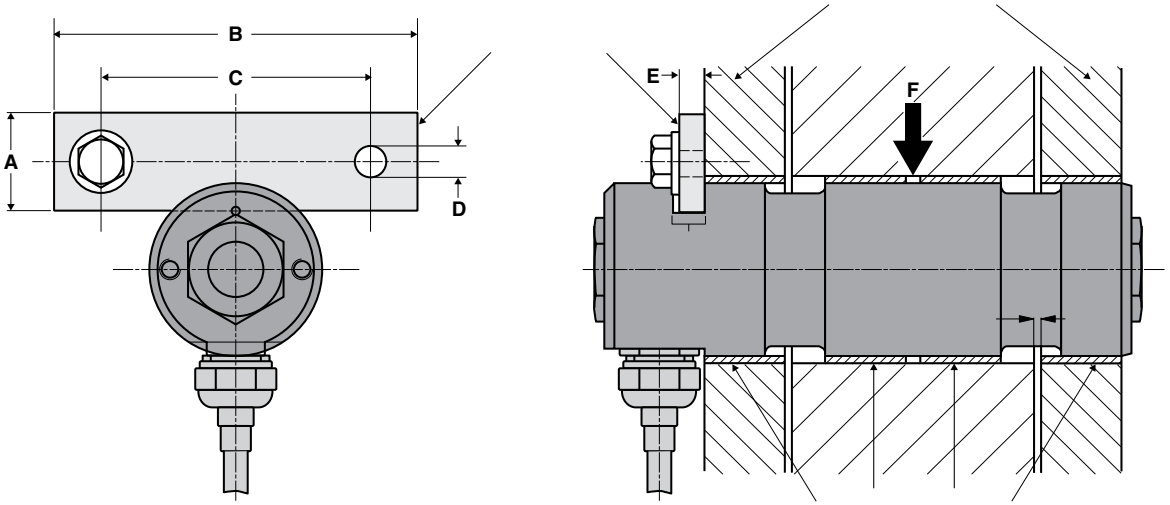


Fig. 2-2. Instalation of the pin holder key

Type of load measuring pin	Dimensions mm					Fastening screw	Screwing torque
	A	B	C	D	E		N·m
LB 210, LE 410 & LE610	20	60	36	9	5	M8	24
LB/LE/LU 211, LB 231, LE 411 & LE 611	20	60	36	9	5	M8	24
LB/LE/LU 212, LB 232, LE 412 & LE 612	20	60	36	9	5	M8	24
LB/LE/LU 213, LB 233, LE 413 & LE 613	20	60	36	9	5	M8	24
LB/LE/LU 214, LB 234, LE 414 & LE 614	25	80	50	11	6	M10	48
LB 235	30	100	70	13	8	M12	83
LB/LE/LU 216, LB 236, LE 416 & LE 616	30	100	70	13	8	M12	83
LB/LE/LU 217, LB 237, LE 417 & LE 617	40	140	100	17	10	M16	200
LB/LE/LU 218, LB 238, LE 418 & LE 618	40	140	100	17	10	M16	200
LB/LE/LU 220, LB 240, LE 420 & LE 620	40	140	100	17	10	M16	200
LB/LE/LU 221, LB 241, LE 421 & LE 621	50	190	140	21	12	M20	390

Fig. 2-3. Dimensions table for mounting with pin holder key

2.1.3 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.

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.

NOTICE

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

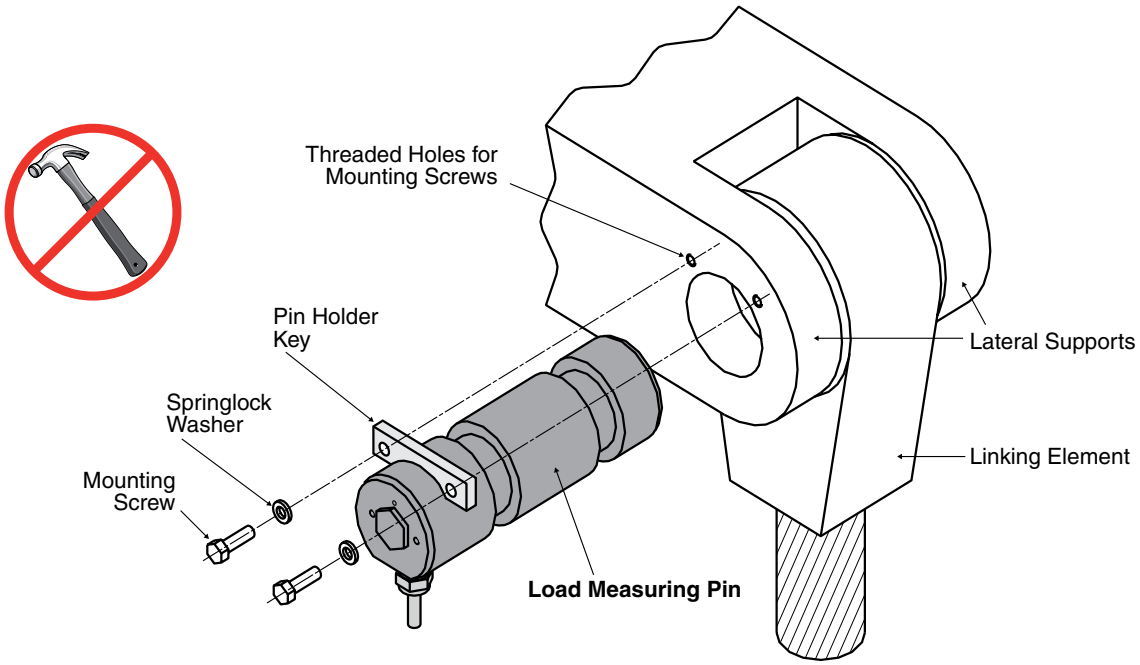


Fig. 2-4. Positioning of the load measuring pin

Position the load measuring pin facing the bores in which it will be seated (*see Fig. 2-4*). Turn it so that the mortise for receiving the pin holder key is facing upward and perpendicular to the applied force.

NOTICE

The direction of the sensitivity axis is defined by the position of holding key. This one is perpendicular to the sensitivity axis and is normally facing the force applied to the central portion (please refer to **section 4.1**).

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.

3. Manually slide the load measuring pin into its seat (*see Fig. 2-4*), 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.
4. Insert the pin holder key into the mortise and align the key to coincide with the threaded holes for the fastening screws.
5. Place the two fastening screws, fitted with their washers, into the holes of the pin holder key (*see Fig. 2-4*), and screw them into the previously threaded holes, applying the screwing torque specified in table (*see Fig. 2-3*).
6. For pins equipped with lubricators (optional for LB 216 - LB 221, LE 216 - LE 221 and LU 216 - LU 221, LE 416 - LE 421 and LE 616 - LE 621) inject lubricant (grease or oil) by means of a grease gun or oil pump.

2.2 EXTRACTION OF THE LOAD MEASURING PINS

NOTICE

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.

NOTICE

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.

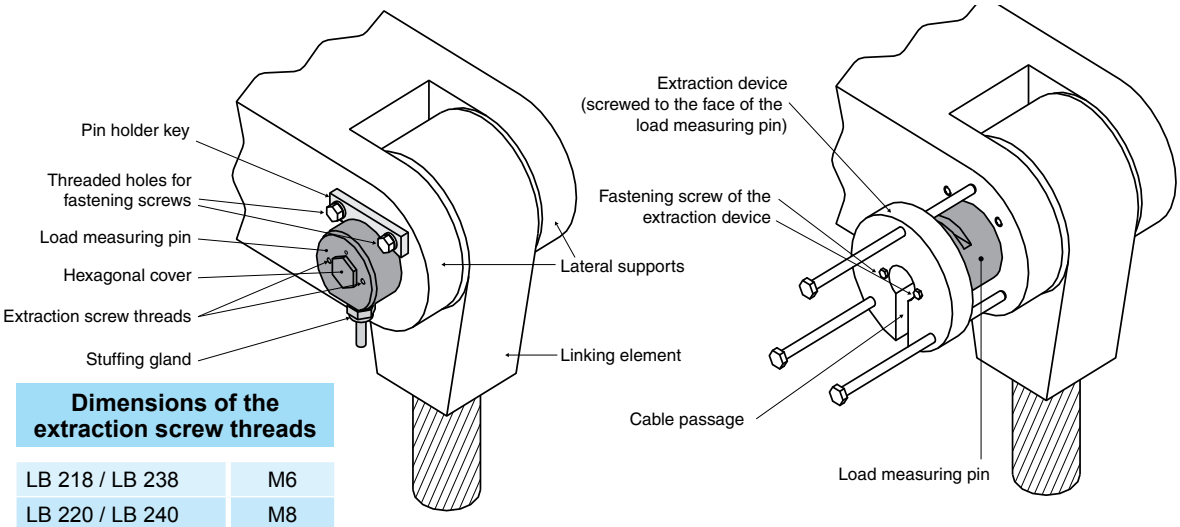
THE COVERS MAY UNSCREW. IN THAT CASE THE WATERPROOFNESS OF THE LOAD MEASURING PIN IS NO LONGER GUARANTEED AND THE ELECTRONIC CIRCUITS WITHIN THE LOAD MEASURING PIN CAN BE DAMAGED.

2.2.1 EXTRACTION OF LARGE SIZE LOAD PINS USING AN EXTRACTION DEVICE (LB/LE/LU 218 - 221, LB 238 - LB 241, LE 418 - LE 421 AND LE 618 - LE 621)

7. Before any attempt to extract, unload the load pin (remove tare). This should allow its easy extraction.
8. Load measuring pins LB/LE/LU 218 - 221, LB 238 - 241, LE 418 - 421 and LE 618 - 621 are fitted with two extraction screw threads at each end (*see Fig. 2-5 & Fig. 2-6*) which should be used to fix the extraction device.

   Use this thread to fix an extraction device (not provided by MAGTROL, *see Fig. 2-5*). We recommend fixing it on the same side as the stuffing gland (LB 210, LE 4XX and LE 6XX series load pins with integrated cable) or the electric connector (LB 230, LE/LU 2XX, LE 4XX and LE 6XX series load pin with connector) to avoid their damage if the pin is pulled out on the opposite end (*see Fig. 2-5*).

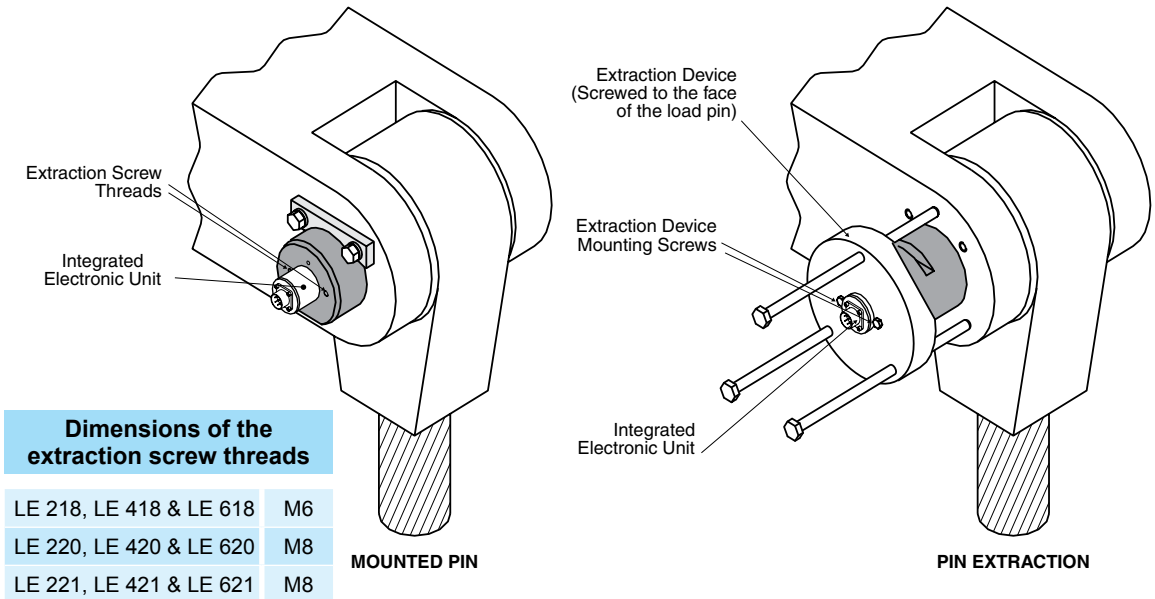
2.2.1.1 LB SERIES LOAD MEASURING PINS



Dimensions of the extraction screw threads	
LB 218 / LB 238	M6
LB 220 / LB 240	M8
LB 221 / LB 241	M8

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

2.2.1.2 LE/LU SERIES LOAD MEASURING PINS



Dimensions of the extraction screw threads	
LE 218, LE 418 & LE 618	M6
LE 220, LE 420 & LE 620	M8
LE 221, LE 421 & LE 621	M8

Fig. 2-6. Pulling out a load measuring pin by means of an extraction device (principle used with LE/LU 218, LE 418 and 618, LE/LU 221. LE 421 and 621 Series Load Pins)

2.2.2 EXTRACTION OF SMALL SIZE LOAD MEASURING PINS

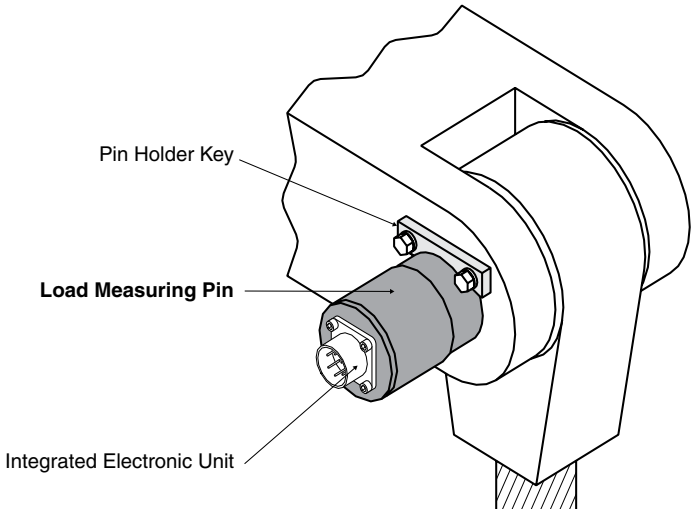
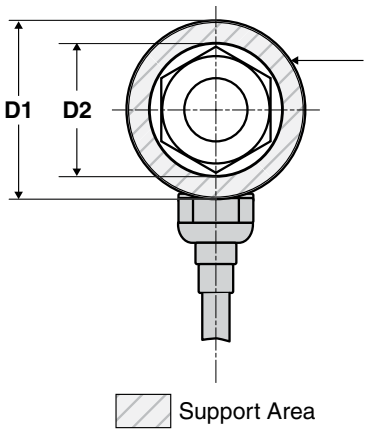


Fig. 2-7. Mounted LE / LU Series Load Pin (LE/LU 211, LE 411 and LE 611 to LE/LU 217 respectively . LE 417 and LE 617)

1. Before any attempt to extract, unload the load measuring pin (remove tare). This should allow its easy extraction.
2. 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).
3. Place the tube against the pin end opposite the stuffing gland or electrical connector, taking care not to touch the hexagonal cover (*see Fig. 2-8*).
4. 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.

2.2.3 EXTRACTION OF LOAD MEASURING PINS ON BEARINGS

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, LE 414 & LE 614	30	26
LB 235	40	35
LB/LE/LU 216, LB 236, LE 416 & LE 616	46	40
LB/LE/LU 217, LB 237, LE 417 & LE 617	60	40
LB/LE/LU 218, LB 238, LE 418 & LE 618	80	40
LB/LE/LU 220, LB 240, LE 420 & LE 620	90	40
LB/LE/LU 221, LB 241, LE 421 & LE 621	110	40

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

NOTICE On the load measuring pins LB/LE/LU 210 - 213, LB 231 - 233, LE 411 - 413 and LE 611 - 613 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 (*see Fig. 2-9*).

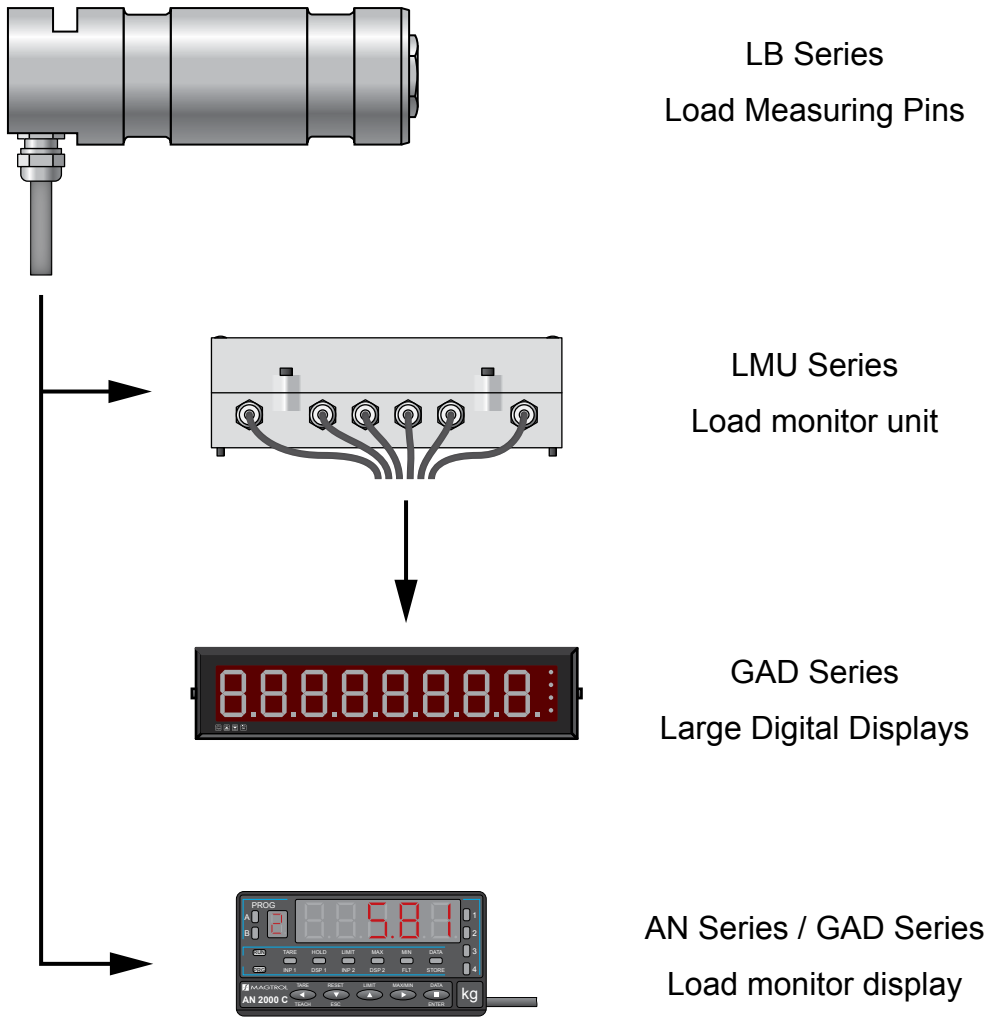


Fig. 2-9. Electronic conditioning modules for connection to load measuring pins

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**) 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.

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.

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.

CAUTION IF SEVERAL SYSTEMS HAVE BEEN PRECALIBRATED, ENSURE THAT EACH AXIS IS USED WITH THE CONDITIONING ELECTRONICS WITH WHICH IT HAS BEEN CALIBRATED (REFER TO MEASUREMENT PROTOCOLS AND SERIAL NUMBERS)

OTHERWISE MEASUREMENT ERRORS COULD BE GENERATED AND A RECALIBRATION WOULD THEN BECOME NECESSARY

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 (±1.5 %).

NOTICE LE/LU 2XX, LE 4XX and LE 6XX 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.

2.3.1.2 CABLE CONNECTION LB SERIES

CAUTION BEFORE CONNECTING A LOAD MEASURING PIN TO A SIGNAL PROCESSING UNIT, MAKE SURE THAT BOTH UNITS ARE NOT RECEIVING POWER. THE CONNECTION WILL ONLY TAKE PLACE WHEN ALL THE USUAL MEASURES TO AVOID AN ELECTRIC SHOCK, WERE TAKEN.

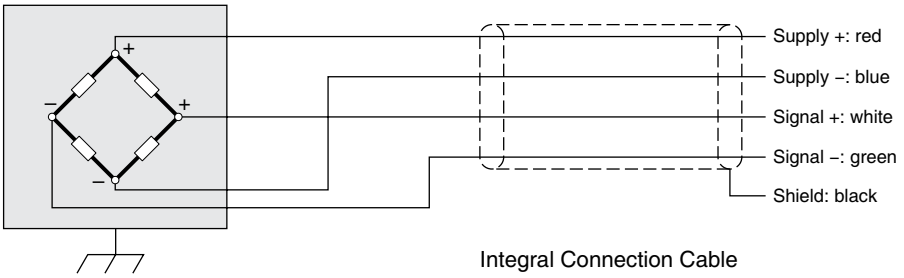


Fig. 2-10. Connection of a LB 210 Series Load Measuring Pin (without connector)

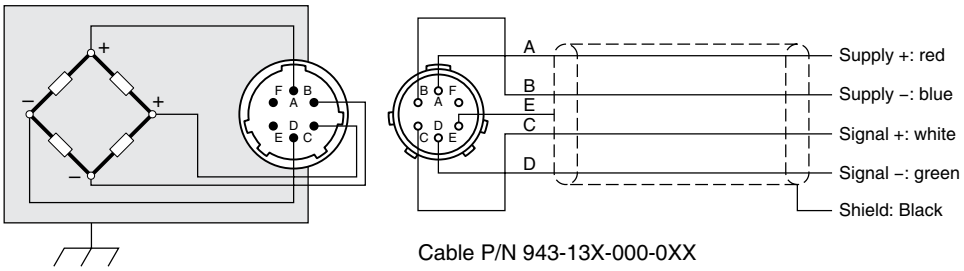


Fig. 2-11. Connection of a LB 210 Series Load Measuring Pin (with connector)

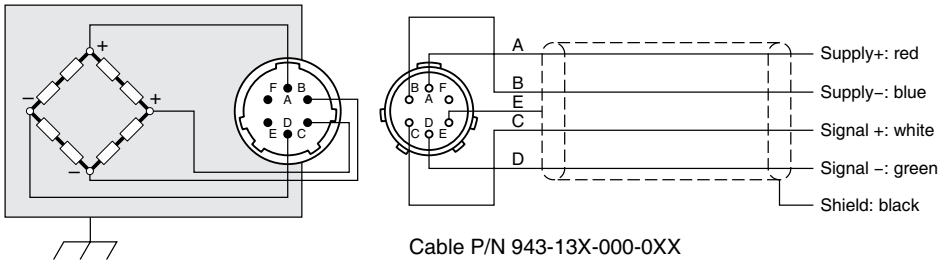


Fig. 2-12. Connection of a LB 230 Series Load Measuring Pin

2.3.1.3 CABLE CONNECTION LE 2XX SERIES

CAUTION

THE MAXIMUM CURRENT CONSUMPTION OF A LOAD MEASURING PIN OF THE LE 2XX SERIES IS 25 mA. TO PREVENT ALL RISKS IN CASE OF A SHORT-CIRCUIT, IT IS ADVISABLE TO INSTALL A FUSE OR A CIRCUIT BREAKER OF 0.1 A ON THE CURRENT OUTPUT OF THE SIGNAL CONDITIONING UNIT.

NOTICE

If a programmable logic controller with built-in current limitation is used, there is no need for installing an additional device.

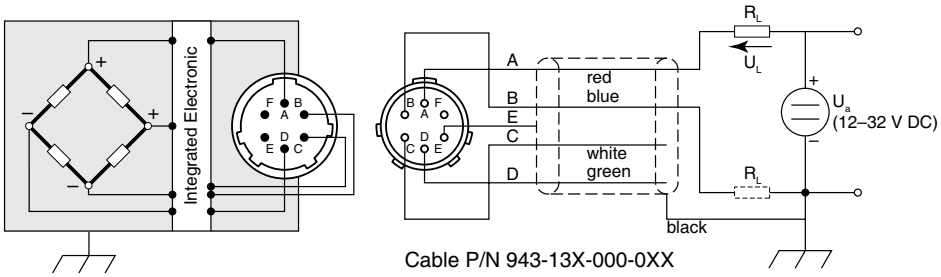


Fig. 2-13. Connection of a LE 2XX Series Load Measuring Pin

2.3.1.4 CABLE CONNECTION LU 2XX SERIES

CAUTION

THE MAXIMUM CURRENT CONSUMPTION OF A LOAD MEASURING PIN OF THE LU 2XX SERIES IS 35 mA. TO PREVENT ALL RISKS IN CASE OF A SHORT-CIRCUIT, IT IS ADVISABLE TO INSTALL A FUSE OR A CIRCUIT BREAKER OF 0.1 A ON THE CURRENT OUTPUT OF THE SIGNAL CONDITIONING UNIT.

NOTICE

If a programmable logic controller with built-in current limitation is used, there is no need for installing an additional device.

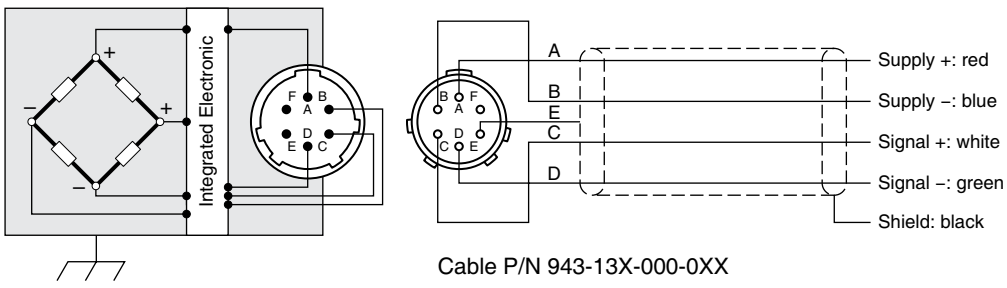


Fig. 2-14. Connection of a LU 2XX Series Load Measuring Pin

2.3.1.5 CABLE CONNECTION LE 4XX SERIES

CAUTION THE MAXIMUM CURRENT CONSUMPTION OF A LOAD MEASURING PIN OF THE LE 4XX SERIES IS 50 mA. TO PREVENT ALL RISKS IN CASE OF A SHORT-CIRCUIT, IT IS ADVISABLE TO INSTALL A FUSE OR A CIRCUIT BREAKER OF 0.1 A ON THE CURRENT OUTPUT OF THE SIGNAL CONDITIONING UNIT.

NOTICE If a programmable logic controller with built-in current limitation is used, there is no need for installing an additional device.

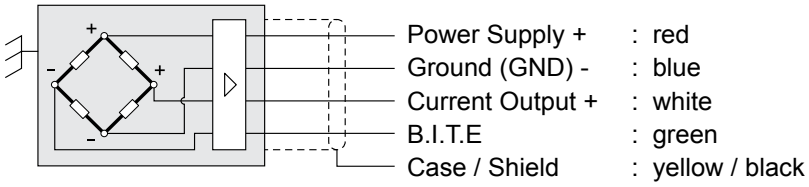


Fig. 2-15. Connection of a LE 4XX Series Load Measuring Pin

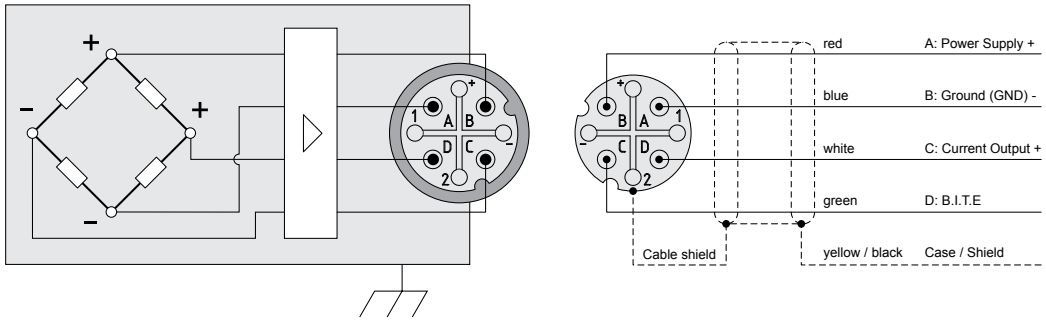


Fig. 2-16. Connection of a LE 4XX Series Load Measuring Pin

2.3.1.6 CABLE CONNECTION LE 6XX SERIES

CAUTION THE MAXIMUM CURRENT CONSUMPTION OF A LOAD MEASURING PIN OF THE LE 6XX SERIES IS 2 x 50 mA. TO PREVENT ALL RISKS IN CASE OF A SHORT-CIRCUIT, IT IS ADVISABLE TO INSTALL A FUSE OR A CIRCUIT BREAKER OF 2 x 0.1 A ON THE CURRENT OUTPUT OF THE SIGNAL CONDITIONING UNIT.

NOTICE If a programmable logic controller with built-in current limitation is used, there is no need for installing an additional device.

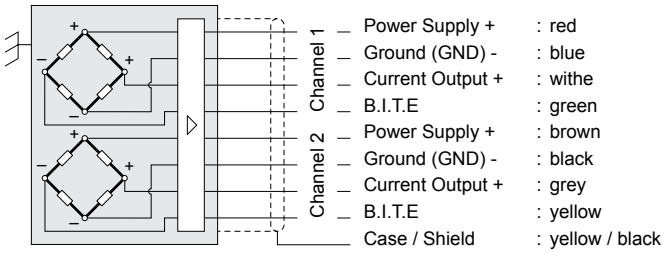


Fig. 2-17. Connection of a LE 6XX Series Load Measuring Pin

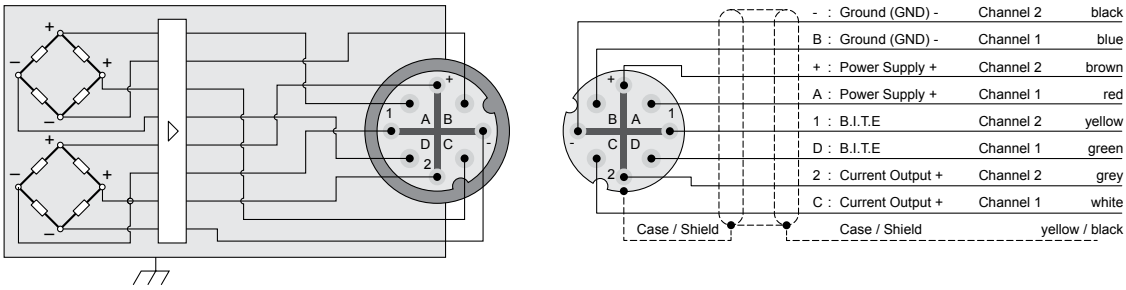


Fig. 2-18. Connection of a LE 6XX Series Load Measuring Pin

2.3.1.7 DETERMINING R_L : NUMERIC EXAMPLE FOR THE LE 2XX, LE 4XX AND LE 6XX SERIES

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 ± 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 Ω.

$$\text{Operating range (hatched)} = \frac{\text{Load Resistance } R_L}{\text{Power Supply } U_a}$$

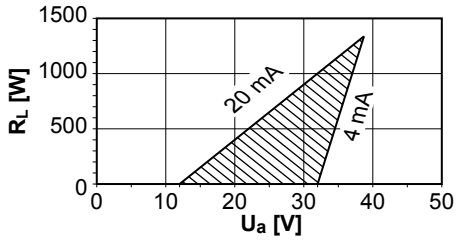


Fig. 2-19. $R_L = \int (U_a)$ diagram of the LE 2XX Series Load Measuring Pins operating range

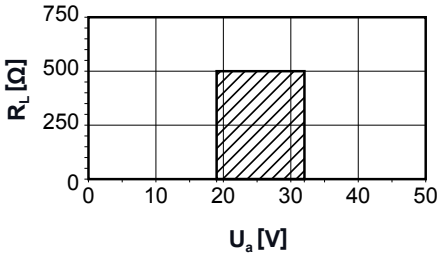


Fig. 2-20. $R_L = \int (U_a)$ diagram of the LE 4XX & LE 6XX Series Load Measuring Pins operating range

2.3.2 CONNECTION OF A LOAD MEASURING PIN LB SERIES TO 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 (*see Fig. 2-21 to Fig. 2-23*). All three units, LMU 212, LMU 216 and LMU 217, have the same terminals as the LMU 216 and LMU 217 are just extensions of the LMU 212 unit.

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

2.3.2.1 LB 210 SERIES & LMU LOAD MONITORING UNIT

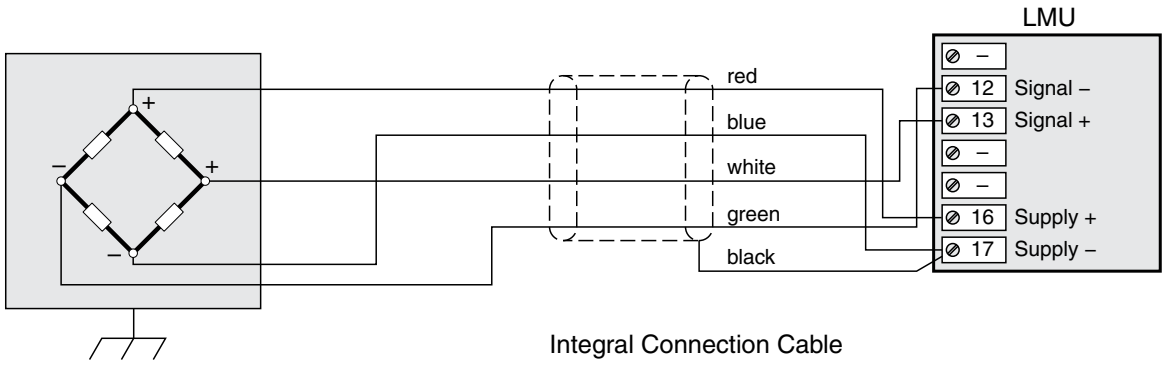


Fig. 2-21. Connection of a LB 210 Series Load Pin (without connector) to a LMU Load Monitoring Unit

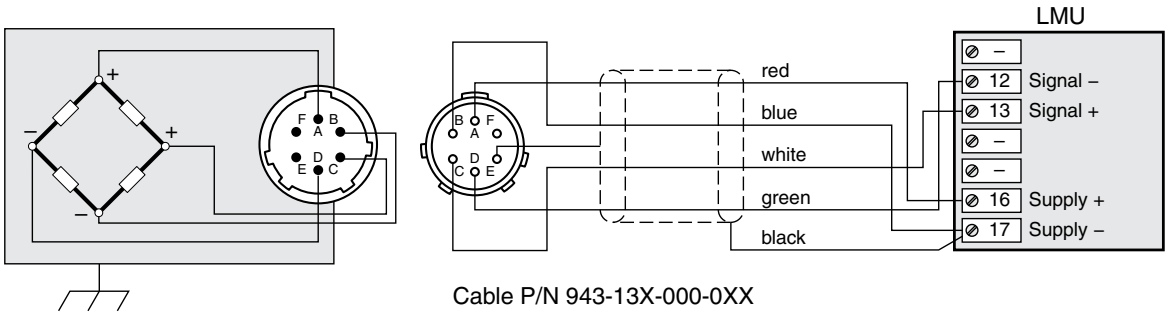


Fig. 2-22. Connection of a LB 210 Series Load Pin (with connector) to a LMU Load Monitoring Unit

2.3.2.2 LB 230 SERIES & LMU LOAD MONITORING UNIT

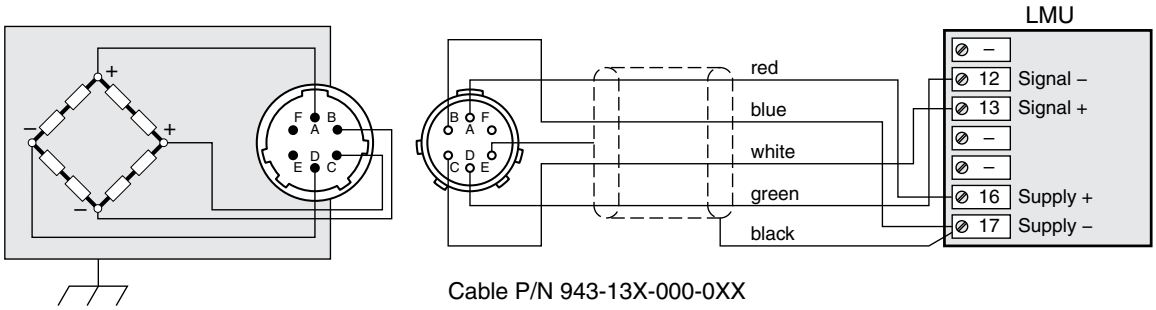


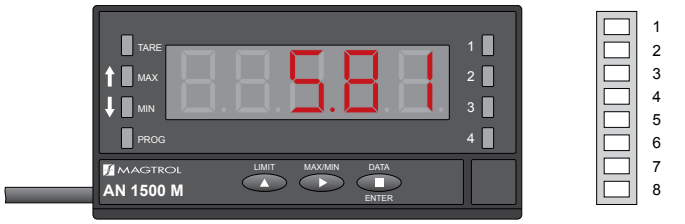
Fig. 2-23. Connection of a LB 230 Series Load Pin to a LMU Load Monitoring Unit

2.3.3 CONNECTION OF A LOAD MEASURING PIN TO AN 1500 M (DIGITAL DISPLAY MONITOR)

For LB Series Load Pins, connect the load measuring pin cable to the AN 1500 M input terminals as indicated (*see Fig. 2-25*).

For LB, LE and LU Series Load Pins, connect the load measuring pin cable to the AN 1500 M input terminals as indicated (*see Fig. 2-26 & Fig. 2-30*).

NOTICE For more information concerning the cable connections of the AN 1500 M, please refer to its user manual.



AN 1500 M - CN2 TERMINAL	
PIN 1	power supply –
PIN 2	power supply +[24 VDC]
PIN 3	power supply +[5 or 10 VDC]
PIN 4	not used
PIN 5	signal + [mA]
PIN 6	signal + [V]
PIN 7	not used
PIN 8	signal - [V or mA]

Fig. 2-24. AN 1500 M with his terminal block and table of connections

2.3.3.1 LB SERIES & AN 1500M SERIES DIGITAL SIGNAL CONDITIONER/MONITOR

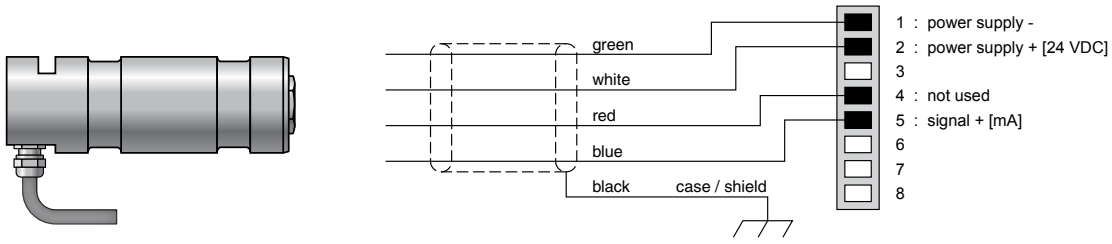


Fig. 2-25. Connection of the LB 210 / LB 230 Series Load Measuring Pins to an AN 1500 M

2.3.3.2 LE 2XX SERIES & AN 1500M SERIES DIGITAL SIGNAL DISPLAY MONITOR

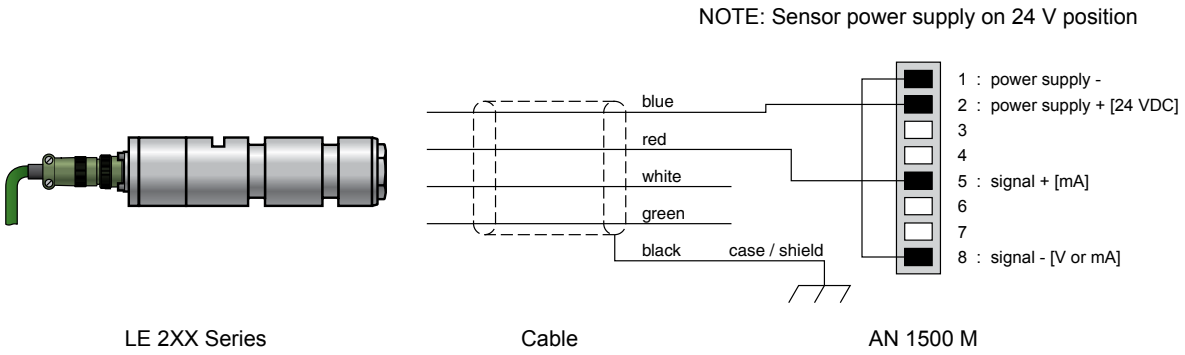


Fig. 2-26. Connection of the LE 210 Series Load Measuring Pins to an AN 1500 M

2.3.3.3 LU 2XX SERIES & AN 1500M SERIES DIGITAL SIGNAL DISPLAY MONITOR

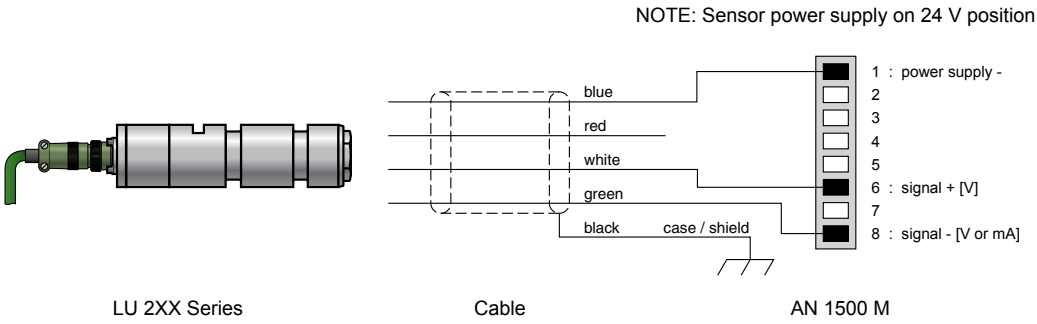


Fig. 2-27. Connection of the LU 210 Series Load Measuring Pins to an AN 1500 M

2.3.3.4 LE 4XX SERIES & AN 1500M SERIES DIGITAL SIGNAL DISPLAY MONITOR

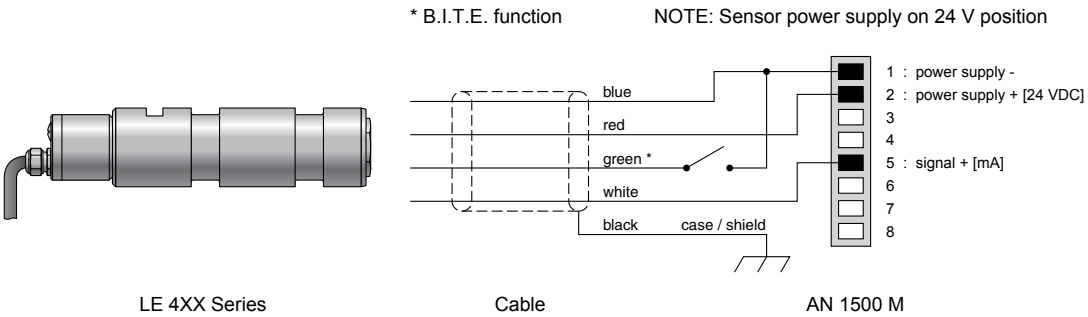


Fig. 2-28. Connection of the LE 4XX Series Load Measuring Pins to an AN 1500 M
** B.I.T.E function: please refer to* **chapter 3.4**

2.3.3.5 LE 6XX SERIES & AN 1500M SERIES DIGITAL SIGNAL DISPLAY MONITOR

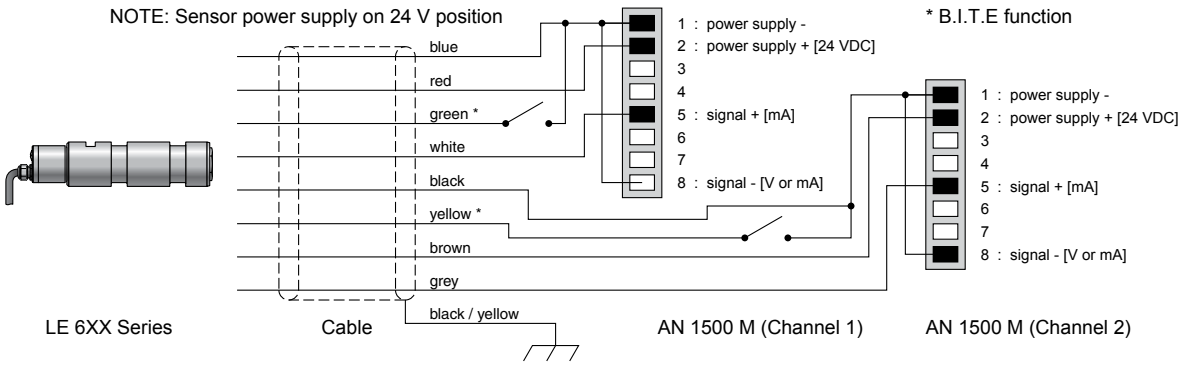


Fig. 2-29. Connection of the LE 6XX Series Load Measuring Pins to an AN 1500 M
** B.I.T.E function: please refer to* **chapter 3.4**

2.3.3.6 LB SERIES, LMU & AN 1500M SERIES DIGITAL SIGNAL DISPLAY MONITOR

In the following configuration the AN 1500 M Series is used only as display

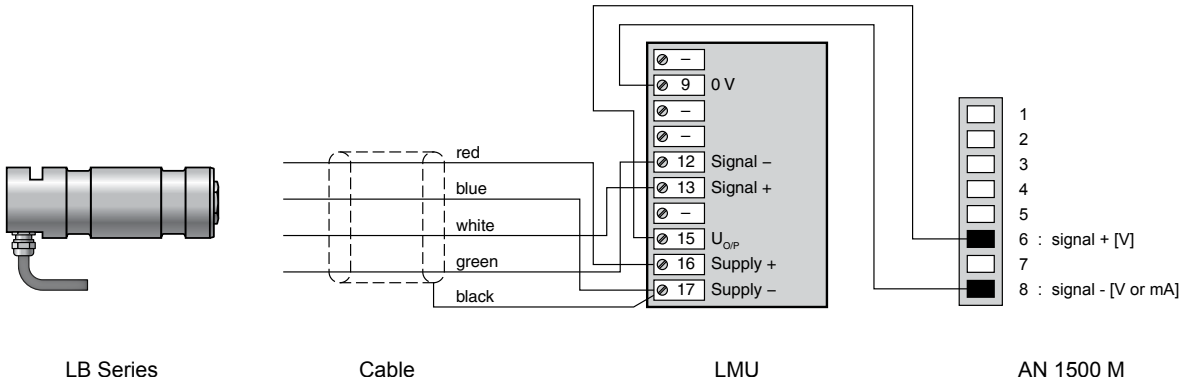


Fig. 2-30. Connection of the LB 210 / LB 230 Series Load Pins to an AN 1500 M through an LMU Series Load Monitoring Unit

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

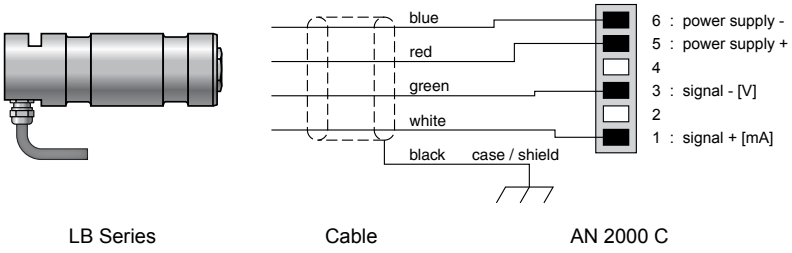
For LB Series Load Pins, connect the load measuring pin cable to the AN 2000 C input terminals as indicated (*see Fig. 2-31*).

For LB, LE and LU Series Load Pins, connect the load measuring pin cable to the AN 2000 P input terminals as indicated (*see Fig. 2-32 to Fig. 2-36*).

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

NOTICE The AN 2000 C has no current input. The LE 2XX, LE 4XX and LE 6XX Series Load Measuring Pins cannot be directly connected to them.

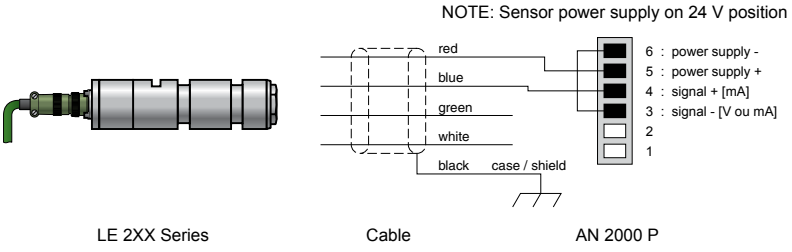
2.3.4.1 LB SERIES & AN 2000 C SERIES DIGITAL SIGNAL CONDITIONER/MONITOR



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

Fig. 2-31. Connection of the LB 210 / LB 230 Series Load Measuring Pins to an AN 2000 C

2.3.4.2 LE 2XX SERIES & AN 2000 P SERIES DIGITAL SIGNAL DISPLAY/MONITOR



AN 2000 P - CN3 TERMINAL	
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

Fig. 2-32. Connection of the LE 2XX Series Load Measuring Pins to an AN 2000 P

2.3.4.3 LU 2XX SERIES & AN 2000 P SERIES DIGITAL SIGNAL DISPLAY/MONITOR

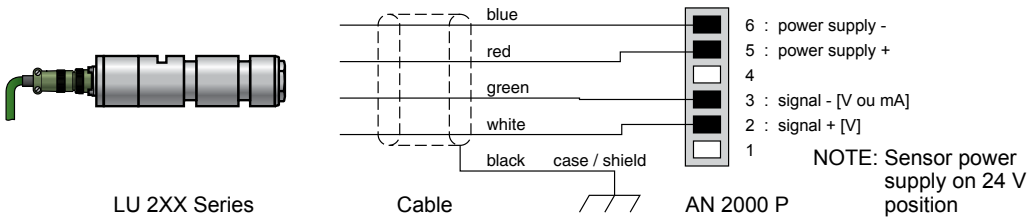


Fig. 2-33. Connection of the LU 2XX Series Load Measuring Pins to an AN 2000 P

2.3.4.4 LE 4XX SERIES & AN 2000 P SERIES DIGITAL SIGNAL DISPLAY/MONITOR

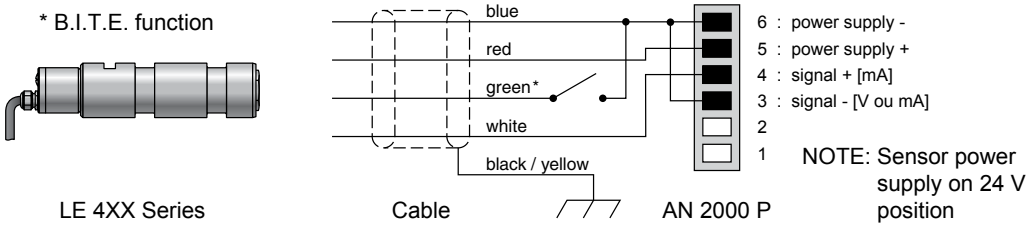


Fig. 2-34. Connection of the LE 4XX Series Load Measuring Pins to an AN 2000 P
** B.I.T.E function: please refer to* **chapter 3.4**

2.3.4.5 LE 6XX SERIES & AN 2000 P SERIES DIGITAL SIGNAL DISPLAY/MONITOR

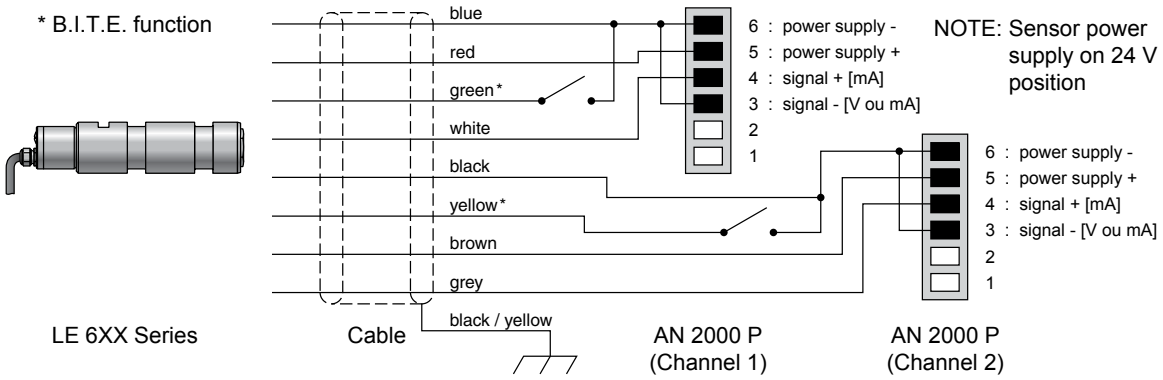


Fig. 2-35. Connection of the LE 6XX Series Load Measuring Pins to an AN 2000 P
** B.I.T.E function: please refer to* **chapter 3.4**

2.3.4.6 LB SERIES, LMU & AN 2000 P SERIES DIGITAL SIGNAL DISPLAY/MONITOR

In the following configuration the AN 2000 P Series is used only as display

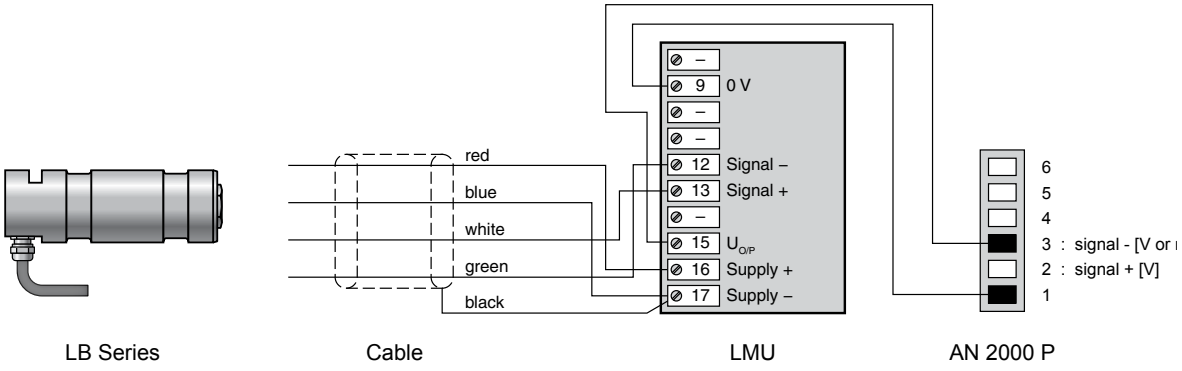


Fig. 2-36. Connection of the LB 210 / LB 230 Series Load Pins to an AN 2000 P through an LMU Series Load Monitoring Unit

2.3.5 CONNECTION OF A LOAD MEASURING PIN TO GAD SERIES (LARGE DIGITAL DISPLAY)

For LB Series Load Pins, connect the load measuring pin cable to the GAD Series Large Digital Display input terminals as indicated (*see Fig. 2-37*).

For LB, LE and LU Series Load Pins connect the load measuring pin cable to the GAD Series Large Digital Display input terminals as indicated (*see Fig. 2-38 to Fig. 2-42*).

NOTICE For more information concerning the cabling of the GAD Series Large Digital Display, refer to the instruction manual.

2.3.5.1 LB SERIES, LMU & GAD SERIES LARGE DIGITAL DISPLAY

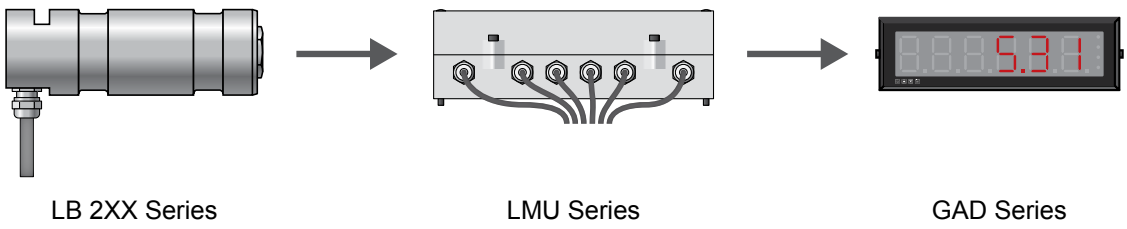


Fig. 2-37. Connection of the LB 210 / LB 230 Series Load Pins to a GAD through an LMU Series Load Monitoring Unit

GAD 057 - 280 : ANALOG INPUTS	
PIN 1	supply +
PIN 2	signal -
PIN 3	signal [mA]
PIN 4	signal [V]
PIN 5	NC
PIN 6	supply -

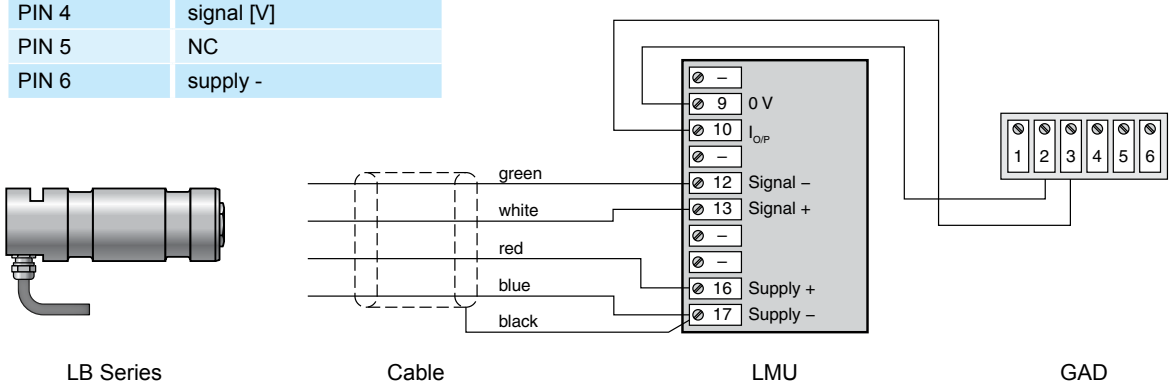


Fig. 2-38. Connection of the LB 210 / LB 230 Series Load Measuring Pins to a GAD through an LMU Series Load Monitoring unit

2.3.5.2 LE 2XX SERIES & GAD SERIES LARGE DIGITAL DISPLAY

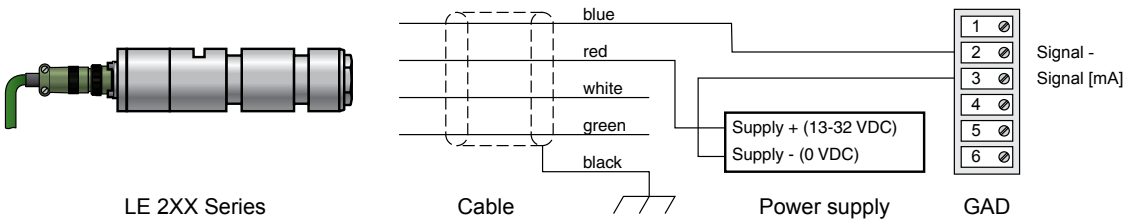


Fig. 2-39. Connection of the LE 2XX Series Load Measuring Pins

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

2.3.5.3 LU 2XX SERIES & GAD SERIES LARGE DIGITAL DISPLAY

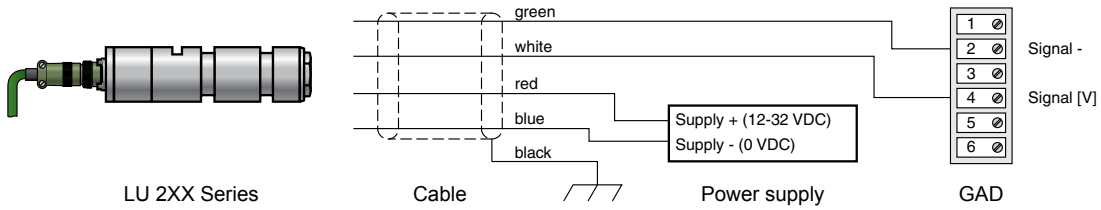


Fig. 2-40. Connection of the LU 2XX Series Load Measuring Pins

2.3.5.4 LE 4XX SERIES & GAD SERIES LARGE DIGITAL DISPLAY

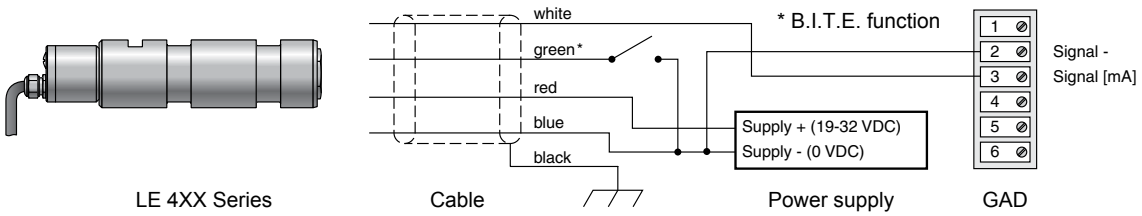


Fig. 2-41. Connection of the LE 4XX Series Load Measuring Pins
** B.I.T.E function: please refer to* **chapter 3.4**

2.3.5.5 LE 6XX SERIES & GAD SERIES LARGE DIGITAL DISPLAY

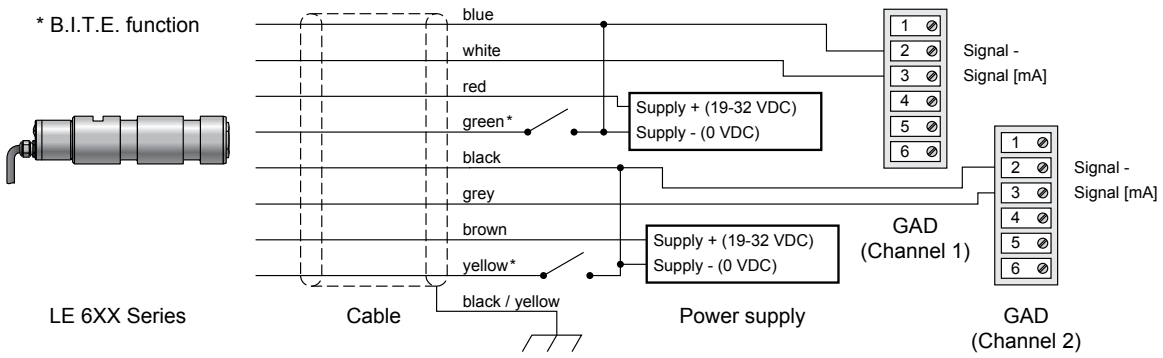


Fig. 2-42. Connection of the LE 6XX Series Load Measuring Pins
** B.I.T.E function: please refer to* **chapter 3.4**

3. OPERATING PRINCIPLE

3.1 MEASUREMENT PRINCIPLE

The LB 210, LB 230, LE 2XX and LU 2XX, LE 4XX and LE 6XX Series Load Measuring Pins have the shape of a hollow cylinder. The outside diameter "A" features two circular grooves with a reduced diameter "X" (*see Fig. 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.

NOTICE 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.

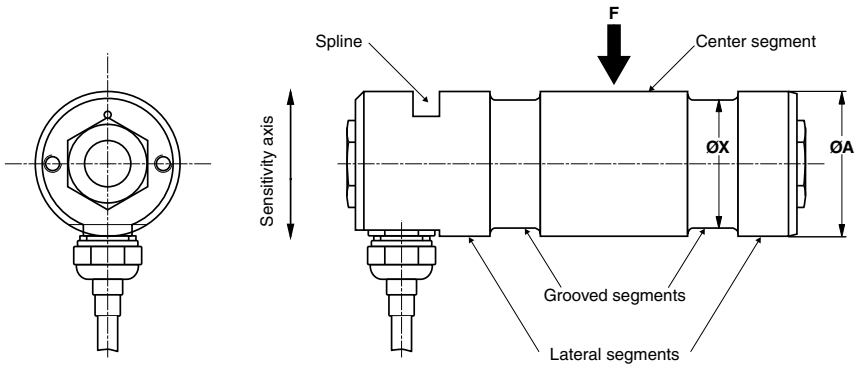


Fig. 3-1. Body of the LB 210 Series Load Measuring Pin

NOTICE 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.

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 NEGATIVE SIGNAL WILL BE OBSERVED.

NOTICE Measurements with an LE 2XX, LU 2XX, LE 4XX and LE 6XX 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.

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.

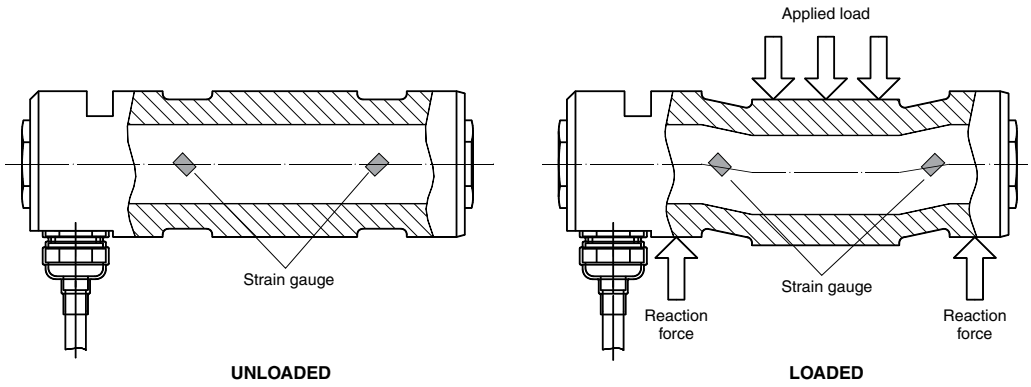


Fig. 3-2. Unloaded and loaded LB 210 Series Load Measuring Pin

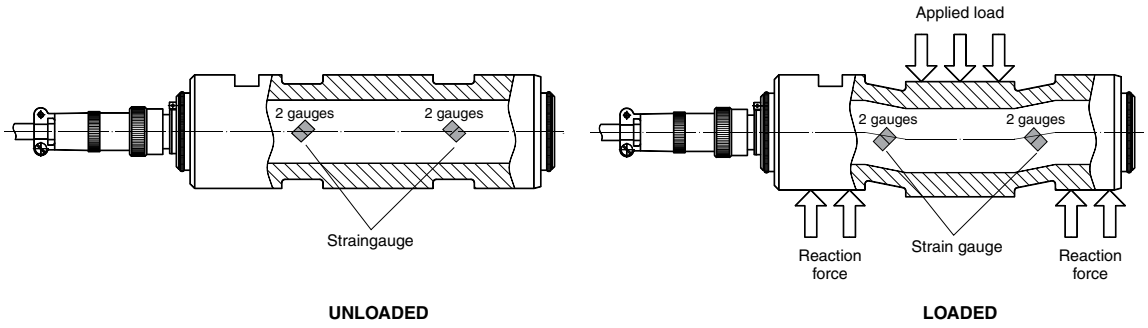


Fig. 3-3. Unloaded and loaded LB 230 Series Load Measuring Pin

NOTICE 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.

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

Model LB SERIES

Type of load measuring pin :

Serial number :

RATED SIGNAL

SUPPLY VOLTAGE × SENSITIVITY = RATED SIGNAL

. V × . mV/V = . mV

CALCULATED SIGNAL

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

$$\frac{\text{. mV} \times \text{. kN}}{\text{. kN}} = \text{. mV}$$

MEASURED SIGNAL . mV

NOTICE

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 2XX, LE 4XX AND LE 6XX SERIES LOAD MEASURING PINS

In order to determine or to check the load applied to an LE 2XX 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

Model LE SERIES

Type of load measuring pin :

Serial number :

CALCULATED SIGNAL

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

$$\frac{16.00\ \text{mA} \times \square\square.\square\square\ \text{kN}}{\square\square.\square\square\ \text{kN}} + 4\,\text{mA} = \square\square.\square\square\ \text{mA}$$

MEASURED SIGNAL $\square\square.\square\square\square$ mA

NOTICE 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.

3.3.3 LU 2XX SERIES LOAD MEASURING PINS

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

Model LU SERIES

Type of load measuring pin :

Serial number :

CALCULATED SIGNAL

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

$$\frac{10.00\ \text{V} \times \square\square.\square\square\ \text{kN}}{\square\square.\square\square\ \text{kN}} = \square\square.\square\square\ \text{V}$$

MEASURED SIGNAL $\square\square.\square\square\square$ V

NOTICE 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

3.4 B.I.T.E. TEST FUNCTION FOR LE 4XX & LE 6XX SERIES

The B.I.T.E. (Built In Test Function) of the LE 4XX and LE 6XX series makes it possible to test each channel separately by simulating a load of 70% of the nominal load. To enable the B.I.T.E. function, you must connect the B.I.T.E. input to the ground and the current output of the load pin will go up to 15.2 mA (= 4 mA + 70% x 16 mA). The test signal shall be used only when there is no load acting on the load pin to avoid the indication of an incorrect load signal. It is possible to command the test signal with a Programmable Logic Controller (use PLC relay, open collector or open-drain output) or a push-button. When the B.I.T.E. test function is not needed, you should either connect the B.I.T.E. connection to the + terminal of the power supply or not connect it at all (*see Fig. 3-4 & Fig. 3-5*).

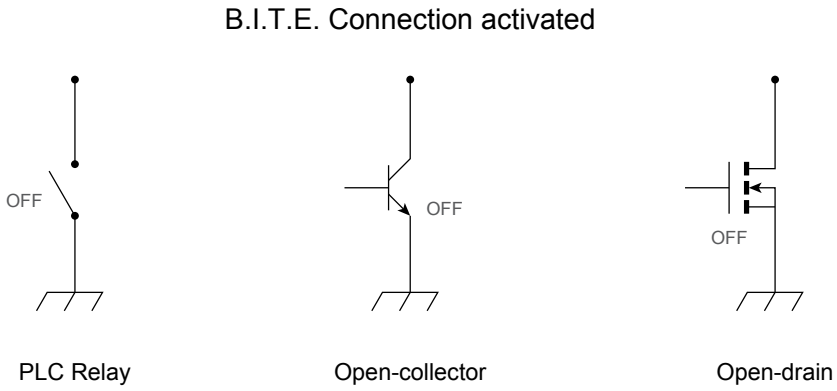


Fig. 3-4. Activation of the B.I.T.E. Test Function for the LE 4XX & LE 6XX Series

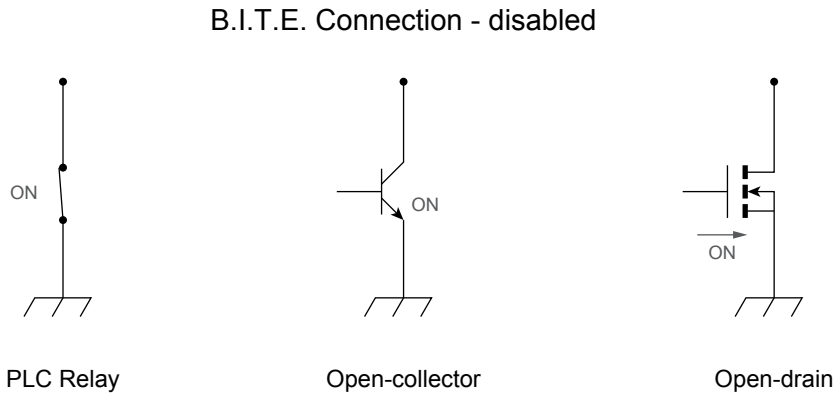


Fig. 3-5. Desactivation of the B.I.T.E. Test Function for the LE 4XX & LE 6XX Series

NOTICE Another property of the LE 4XX and LE6XX is monitoring the supply voltage permanently: if it drops below 16 V, the output current shut down to 0 mA.

4. INFLUENCE FACTORS

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.

NOTICE

The recommendations listed in this chapter should be followed exactly so that the load measuring pin characteristics are guaranteed.

This chapter will also demonstate how an incorrect mounting can impair the measurement accuracy of a load measuring pin and consequently diminish the security of the whole installation.

NOTICE

Having been designed according to the EMC (Electro Magnetic Compatibility) directives, the LE 2XX, LU 2XX, LE 4XX and LE 6XX Series Load Measuring Pins with integrated electronics complies with EN 61000-6-2, EN 61326-1 & EN 61326-2-3.

4.1 INFLUENCE OF THE LOAD PIN ORIENTATION

For the LB 210, LB 230, LE 2XX, LU 2XX, LE 4XX and LE 6XX 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.

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.

NOTICE

A measurement with an LE 2XX, LU 2XX, LE 4XX and LE 6XX 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 Fig. 4-1 & Fig. 4-2*), the measurement signal will be altered accordingly, as follows:

4.1.1 LB 210 AND LB 230 LOAD MEASURING PINS

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

Where : U_{eff} represents the effective value of the measured signal
U_{rated} represents the rated value of the measured signal
φ 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_{eff}) i.e. 100 % of the full scale value.
- for φ = 0° » cos φ = 1 » $U_{eff} = U_{rated}$
- for φ = 10° » cos φ = 0,985 » U_{eff} = 98,5 % U_{rated}

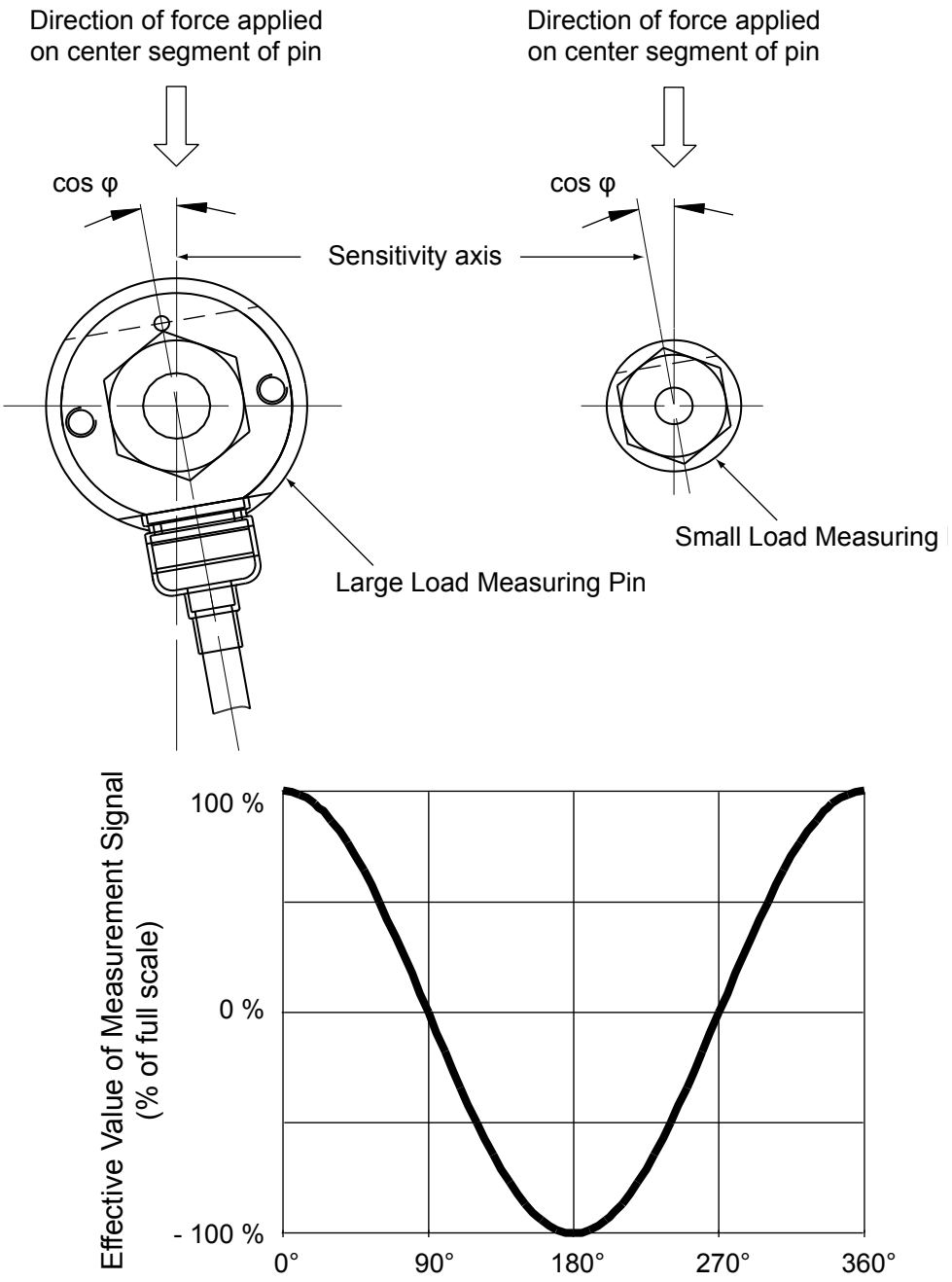


Fig. 4-1. Influence of the LB 210 and LB 230 Series Load Measuring Pins' orientation

4.1.2 LE 2XX, LE 4XX AND LE 6XX SERIES LOAD MEASURING PINS

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

Where : I_{eff} represents the effective value of the measured signal
I_{rated} represents the rated value of the measured signal ($I_{rated} = I_{measured} - 4\,mA$)
ϕ 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_{eff}) i.e. 100 % of the full scale value.
for $\varphi = 0°$ » $\cos \varphi = 1$ » $I_{eff} = I_{rated}$
for $\varphi = 15°$ » $\cos \varphi = 0{,}966$ » $I_{eff} = 96{,}6\ \%\ I_{rated}$

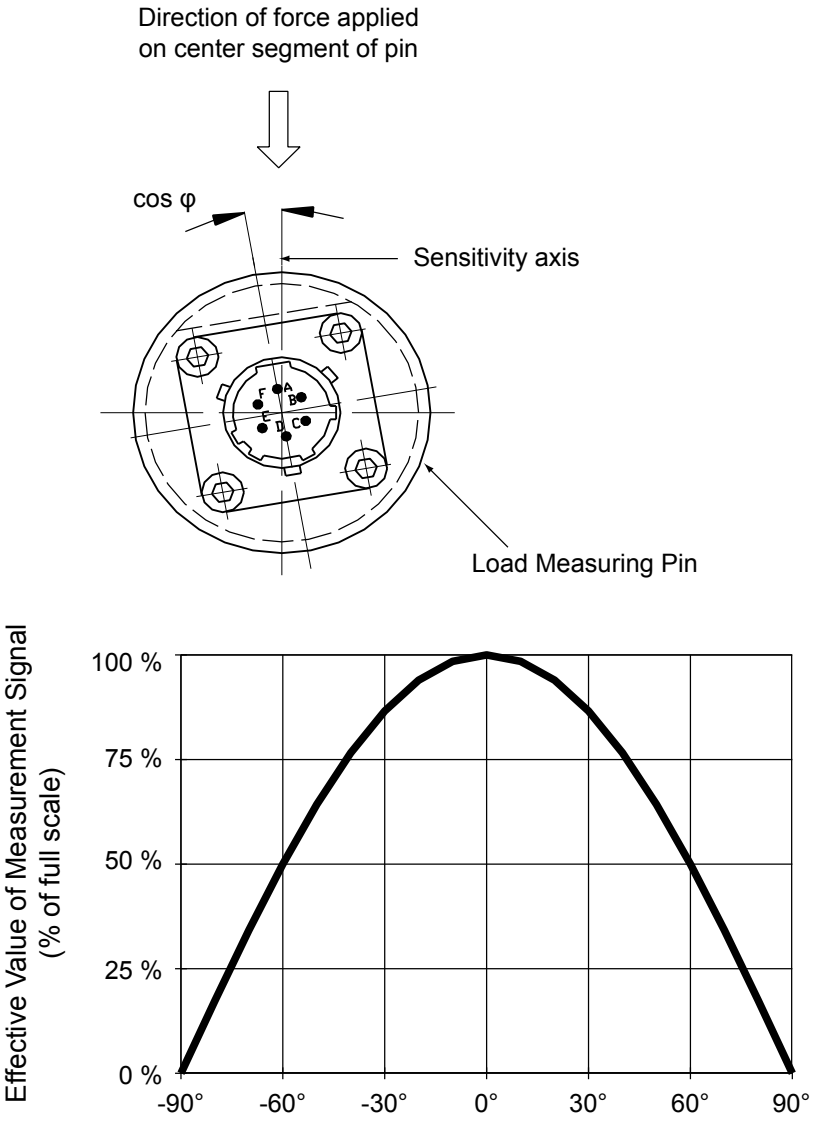


Fig. 4-2. Influence of the LE 2XX, LE 4XX and LE 6XX Series Load Measuring Pins' orientation

4.1.3 LU 2XX SERIES LOAD MEASURING PINS

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

Where : U_{eff} represents the effective value of the measured signal
U_{rated} represents the rated value of the measured signal
ϕ 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_{eff}) i.e. 100 % of the full scale value.
for φ = 0° » cos φ = 1 » $U_{eff} = U_{rated}$
for φ = 10° » cos φ = 0,985 » U_{eff} = 98,5 % U_{rated}

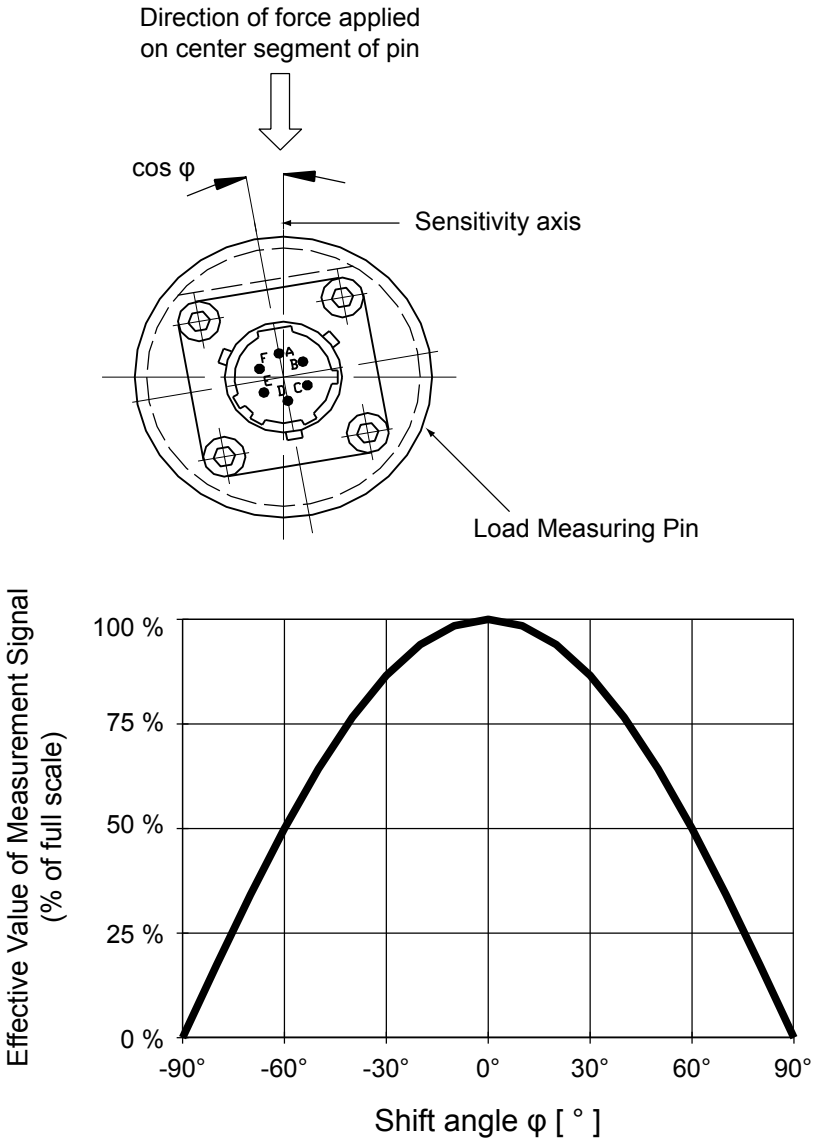


Fig. 4-3. Influence of the LU 2XX Series Load Measuring Pins' orientation

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 Fig. 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.

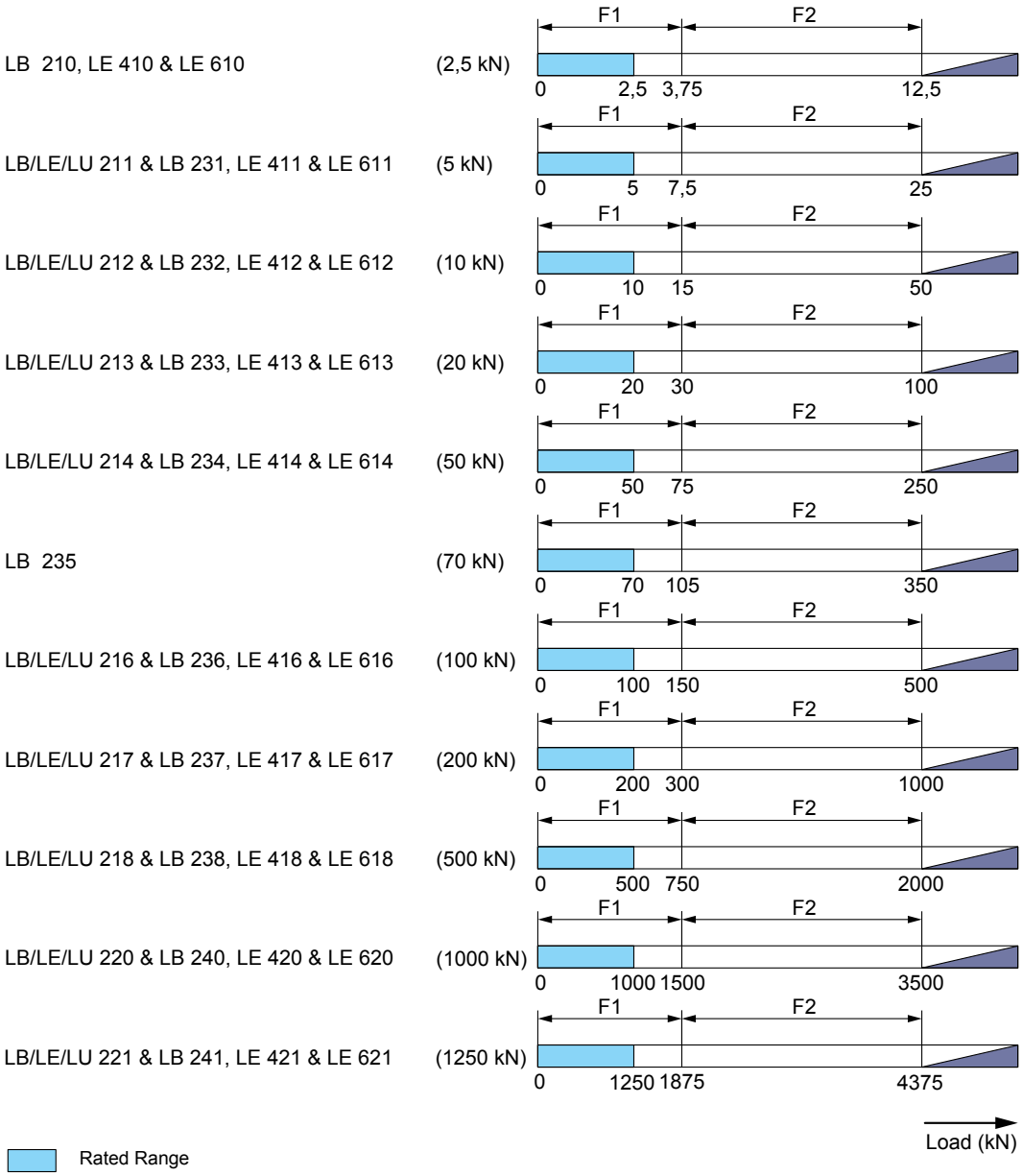


Fig. 4-4. Application range of the load measuring pins.

5. MAINTENANCE

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, LU 216 - LU 221, LE 416 - LE 421 and LE 616 - LE 621 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 2XX and LU 2XX Series load measuring pins) and measuring current for LE 2XX, LE 4XX and LE 6XX.

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 2XX, LE 4XX, LE 6XX and LU 2XX 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.

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

6.1 TROUBLESHOOTING ON LB 210 AND LB 230 SERIES

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 2XX SERIES

PROBLEM	POSSIBLE CAUSE	REMEDY
Output current < 4 mA	Calibration error	Send the pin back 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 the pin back for checking and repair.
Output current > 20 mA	Calibration error	Send the pin back for calibration.
	Overload	Check and reduce the applied load.
Output current > 25 mA	Calibration error	Send the pin back 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 the pin back for checking and repair.

NOTICE The operating range of the integrated electronics is between 3.5 mA and 25 mA for all LE 2XX Series Load Measuring Pins.

6.3 TROUBLESHOOTING ON LU 2XX SERIES

PROBLEM	POSSIBLE CAUSE	REMEDY
Output voltage < 0.000 V	Calibration error	Send the pin back 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 the pin back for checking and repair.
Output voltage > 10.000 V	Calibration error	Send the pin back for calibration.
	Overload	Check and reduce the applied load.
Output voltage > 10.2 V	Calibration error	Send the pin back for calibration.
	Short-circuited transmission line	Check the line and the connections.
	Defect in the integrated electronics	Send the pin back for checking and repair.

NOTICE The operating range of the integrated electronics is between 0 V and 10.2 V for all LU 2XX Series Load Measuring Pins.

6.4 TROUBLESHOOTING ON LE 4XX AND LE 6XX SERIES

PROBLEM	POSSIBLE CAUSE	REMEDY
Output current < 4 mA	Calibration error	Send the pin back for calibration
	Inversion of applied load	Check and correct the direction of the applied load.
Signal not expected > 4 mA	Calibration error	Send the pin back for calibration
	Unexpected load in the installation	Remove unwanted load or tare
Output current = 0 mA	Supply voltage below 18 VDC	Increase supply voltage > 19 to 32 VDC
	Broken or short-circuit transmission line	Check the line and the connections.
	Defect in the integrated electronics or weighing bridge	Send the pin back for check and repair.
B.I.T.E. enabled and output current > 15.2 mA ±2.4 mA	A small load is already applied on the sensor	Remove all current applied load or take it in account in your calculation.
Output current > 20 mA	Calibration error	Send the pin back for calibration
	Overload	Check and reduce the applied load.
	B.I.T.E. enabled and load applied	Check and reduce the applied load.
Output current > 25 mA	Calibration error	Send the pin back 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 the pin back for check and repair.
	B.I.T.E. enabled and large load applied	Remove load applied when using B.I.T.E.

NOTICE The operating range of the integrated electronics is between 0.5 mA and 22 mA for all load pins of the LE 4XX and LE 6XX Series.

7. SERVICES INFORMATION

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.

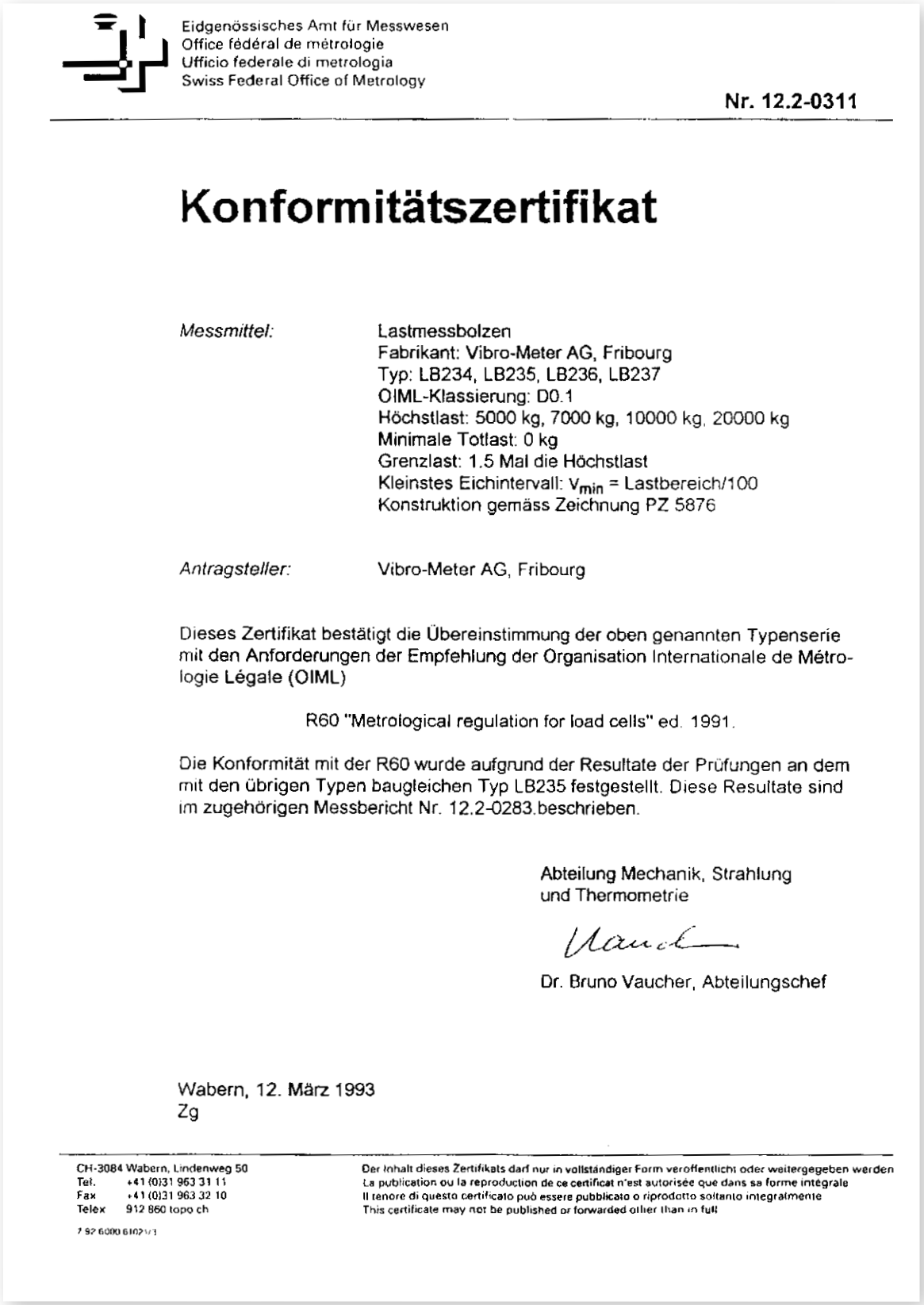
RETURNING EQUIPMENT TO MAGTROL SA (SWITZERLAND)

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: CHE-105.475.279
2. Please use our forwarder : TNT; 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)
   - Five (5) pro forma invoices with:
     - Your VAT number
     - Value - for customs purposes only
     - Description of returned goods
     - Origin of the goods (in general, Switzerland)
     - Noticed failures
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.

APPENDIX A : OIML CERTIFICATION

Some Load Measuring Pins from the Series LB 230 (LB 334, LB 235, LB 236 and LB 237) 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

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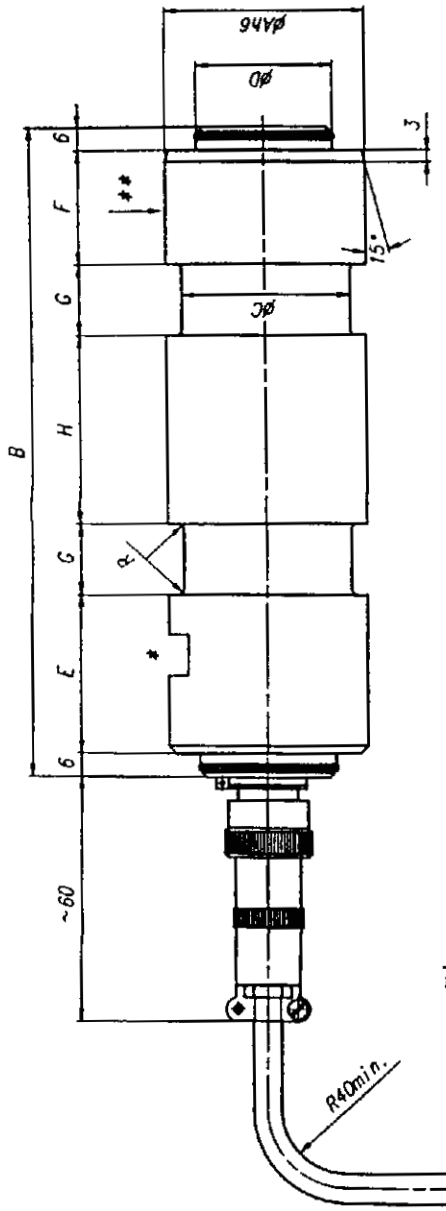
Eidgenössisches Amt für Messwesen
Office fédéral de métrologie
Ufficio federale di metrologia
Swiss Federal Office of Metrology

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

vibro-meter SWITZERLAND
FBCH N° 3 3980
Drawn 16.2.81
Checked 17.2.81
Appr. 18.2.81
Scale 1:1
DWG. N° PZ 5876
Rev. Date Drawn Appr. Regd. by: Regd. for:
Tolerances: ± mm to 50 mm: 2 mm over 50 mm
Material: Antiall KNB Nr. 1.4057 780-930 N/mm²
Finish: X-X
LOAD MEASURING PIN
P/N: 122-23X-000-021 TYPE: LB 234 ÷ 237

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

REVISIONS TO THIS MANUAL

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 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 DATES

DATE	EDITION	CHANGE	SECTION(S)
April 2012	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
July 2012	1st Edition - rev. B	Load measuring pin from LE 310 and LE 510 series added	1.1, 2.1.1, 2.1.2, 2.2.1, 2.2.2, 2.3.1.1, 2.3.1.3, 2.3.2, 2.3.3, 2.3.3.2, 2.3.4, 2.3.5, 3.1, 3.3.2, 4, 4.1, 4.1.2, 4.2, 5.1, 5.2, 6.4
Nov. 2014	1st Edition - rev. C	Update all data sheet	1.2.1, 1.2.2, 1.2.3
Aug. 2017	2nd Edition - rev. A	Updated all informations concerning the new LE-LU series; global update regarding the continuous updates. Global reorganization and new design for the manual	All

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Subsidiaries in

Germany, France
India & China
Worldwide Network
of Sales Agents

ISO 9001
BUREAU VERITAS
Certification

LB-LE-LU User Guide | v01 | 08 / 2017