INSTRUCTION MANUAL

LE 210 SERIES
LOAD MEASURING PINS

P/N 632.006 E

(MALE210/E)

REVISION RECORD SHEET

Issue	Date	Written by / Modified by	PM No.	Description	Signature (Product Manager)
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TABLE OF CONTENTS

PREFACE

Purpose and Scope of This Manual

This manual provides reference information for the LE 210 load measuring pins. It offers information concerning the installation, connection and use of these pins.

Who Should Use This Manual ?

This manual is written for users who wish to mount the LE 210 load measuring pins on hoisting, weighing or other installations, to connect them to electronic processing units and to use them with the aim to perform measurements.

The operator is assumed to have the necessary technical training in mechanical engineering and electronics to enable him to install of 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 chapters of this manual are presented in a logical order. You should read those that are most relevant to you and then keep the manual at hand for future reference.

The structure of the manual is as follows :

Chapter 1 : **Safety** - Contains important information for your personal safety and the correct use of the load measuring pins.

THIS CHAPTER SHOULD BE READ BEFORE ATTEMPTING TO INSTALL OR USE THE LOAD MEASURING PINS.

Chapter 2 : **Introduction** - Definition of the types of load measuring pins and their application.

Chapter 3 : **Measurement principle** - Explanation of the measurement principle of the load measuring pins.

Chapter 4 : **Mounting and connection** - Instructions concerning the mounting and cabling of the load measuring pins.

Chapter 5 : **Influence factors** - Explanation concerning the influence of the mounting position of the load measuring pins on the measured signals.

Chapter 6 : **Maintenance** - Instructions concerning the maintenance of the load measuring pins and a flow chart allowing detection of possible faults.

Chapter 7 : **Specifications** - Data sheets presenting the principal technical characteristics of the load measuring pins.

Appendix A : **Mechanical drawings** - Mechanical design drawings of the load measuring pins mentioned in this instruction manual.

Product Defect Report - Allows the user to indicate problems observed on a module/system, thus enabling our After-Sales Service department to repair the unit as quickly as possible.

Documentation Evaluation Form - Allows the user to provide us with valuable feedback on our documentation.

Related Publications

For additional information relating to the load measuring pins the reader is referred to the following documents :

- SDC 107 Data Sheet (Vibro-Meter P/N 124-001)
- PMU 271 Data Sheet (Vibro-Meter P/N 218-004)
- SDC 107 Instruction Manual (Vibro-Meter P/N 633.006)

1 SAFETY

1.1 Symbols Used in This Manual

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

*The **NOTE** symbol.* ☞

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 functioning of the product to be obtained.

The CAUTION safety symbol. ⚠

This is used to draw the operator's attention to information, directives, procedures, etc. which, if ignored, may result in damage being caused to the material being used.
The associated text describes the necessary precautions to take and the consequences that may arise if the precautions are ignored.

THE WARNING SAFETY SYMBOL. STOP

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

1.2 Important Remarks on Safety

CAUTION

Ths instruction manual should be read carefully and the safety instructions observed before installing, calibration or using the material described herein.

1.2.1 Location of Safety Symbols in This Manual

The operator should also take note of the safety-related information found elsewhere in this manual :

This symbol is found on the following pages :
1-2 ; 4-4; 4-6

This symbol does not appear in the manual

1.3 Additional Remarks on Safety

For the correct and safe use of this instrument, it is essential that both operating and servicing personnel follow generally accepted safety procedures in addition to safety precautions specified in this manual. Specific warning and caution statements, where they apply, will be found throughout the manual. These are highlighted by the corresponding warning and caution symbols (described above).

The safety procedures should be communicated to all personnel who are liable to operate the equipment described in this manual.

No modifications, transformations or repairs should be made to the equipment without having first obtained the written permission of Vibro-Meter. Failure to observe this will invalidate the warranty.

2 INTRODUCTION

When forces applied to mechanical structures have to be measured, often expensive modifications have to be effected on the structures. 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, Vibro-Meter propose the LE 210 and LE 221 load measuring pin series with an integrated electronic conditioning unit (see figure 2-1) for measurement and overload protection.

These pins are full bridge strain gauge force transducers available in 10 standard types for the measurement of forces from 2.5 to 1250 kN. They are suitable, for example, for :

- load measurement and overload protection on cranes, hoists, fork lift trucks and winches.
- acquisition of the traction force in the cable of skilifts, cableways and chairlifts.
- force measurement for regulation processes in industrial installations
- static weighing on platforms, containers, silos.

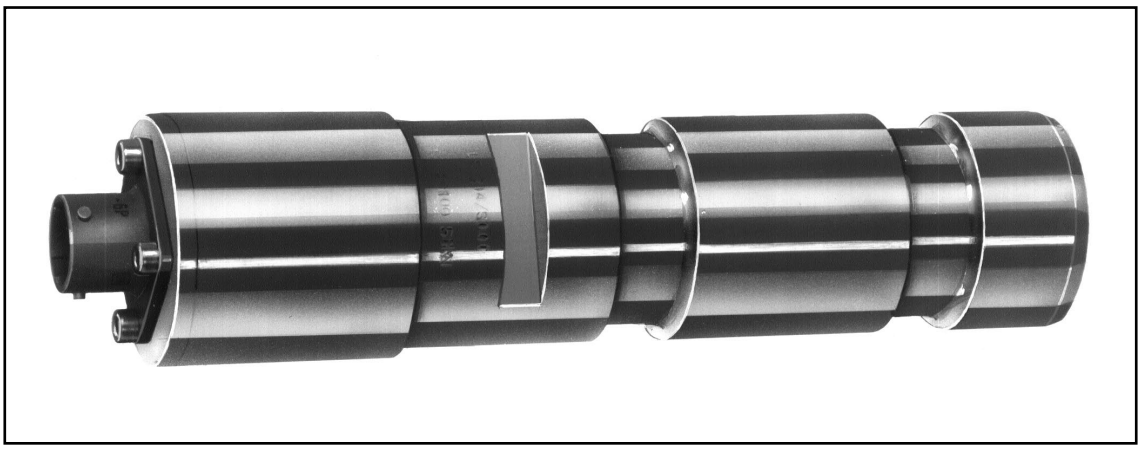

Fig. 2-1 : LE 210 series load measuring pin.

The LE 210 series comprises the following types :

Type	Rated load [kN]
LE 210	2.5
LE 211	5
LE 212	10
LE 213	20
LE 214	50

Type	Rated load [kN]
LE 216	100
LE 217	200
LE 218	500
LE 220	1000
LE 221	1250

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3 MEASUREMENT PRINCIPLE

A pin of the LE 210 or LE 230 series has the shape of a hollow cylinder. The outside diameter A features two circular grooves with a reduced diameter X (see figure 3-1). When a force F is applied to the central portion of the pin, deformations occur within the pin's body. These concentrate to the portions where the diameter is reduced, i.e. the two grooves.

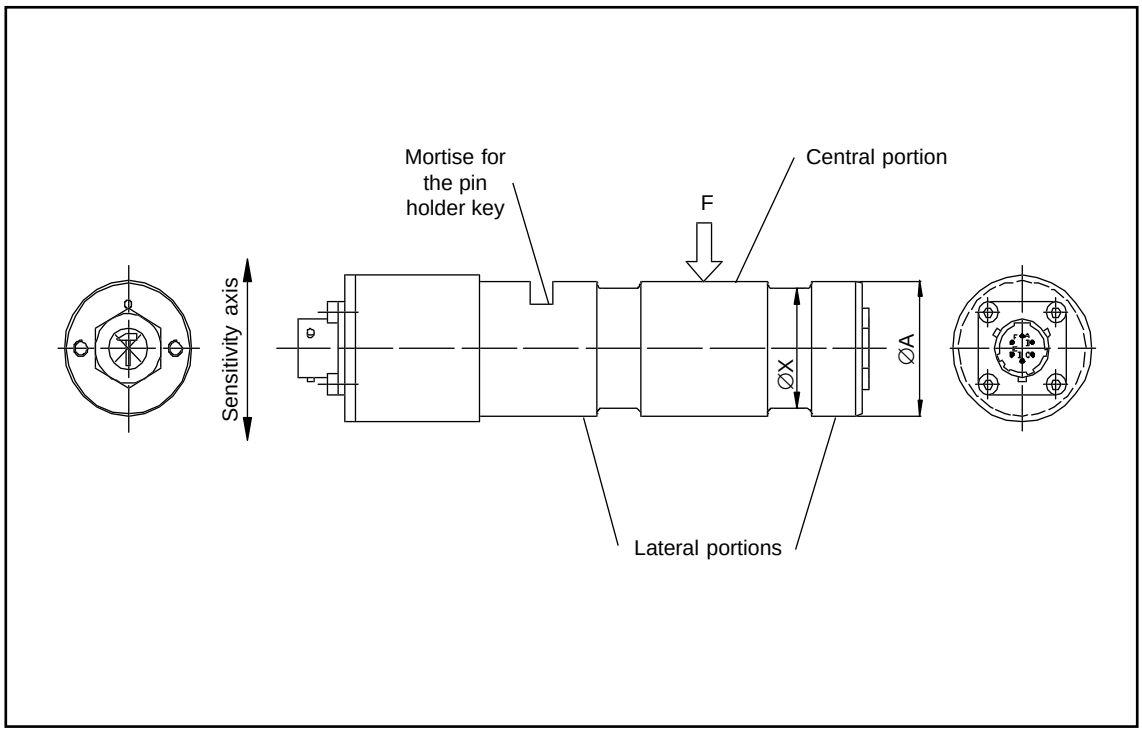

Fig. 3-1 : Body of the load measuring pin.

☞ *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.*

☞ *A measurement with a load measuring pin mounted upside down (mortise for the pin holder key) facing the opposite side to the applied force) does not work. The measurement signal corresponding to 4 to 20 mA can in no case be negative.*

The strain gauges are placed in the inside of the load measuring pin (see figure 3-2), together with several printed circuits supporting elements for the electrical trimming. The strain gauges are situated symmetrically in the bore, their situation coinciding with that of the grooves visible outside.

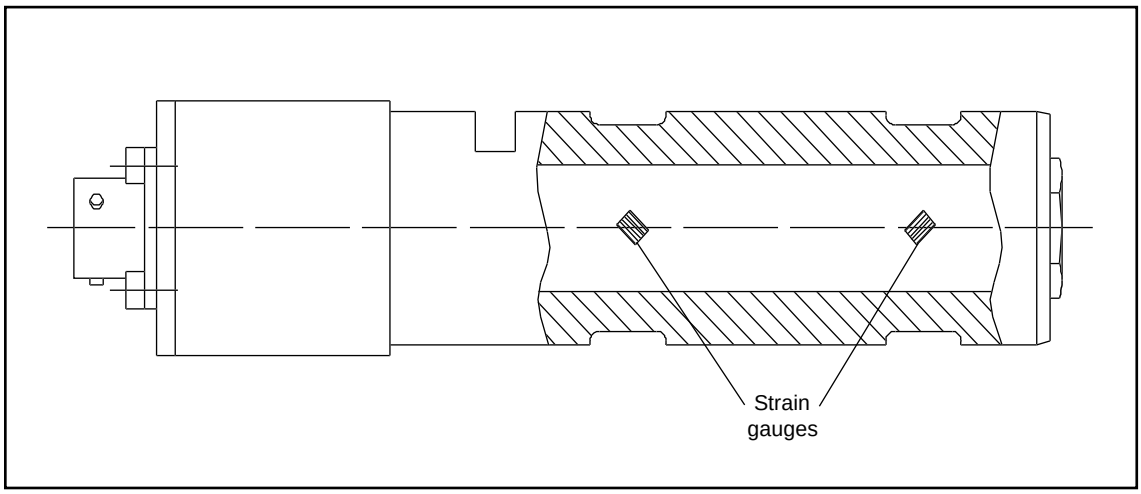

Fig. 3-2 : LE 210 series load measuring pin; unloaded.

When a load is applied to the load measuring pin in the direction of its sensitivity axis (see figure 3-3), the strain gauge full bridge produces a signal which is proportional to the load applied. The electronic conditioning unit integrated to the load measuring pin converts this voltage-based signal to a standard current-based signal of 4 to 20 mA

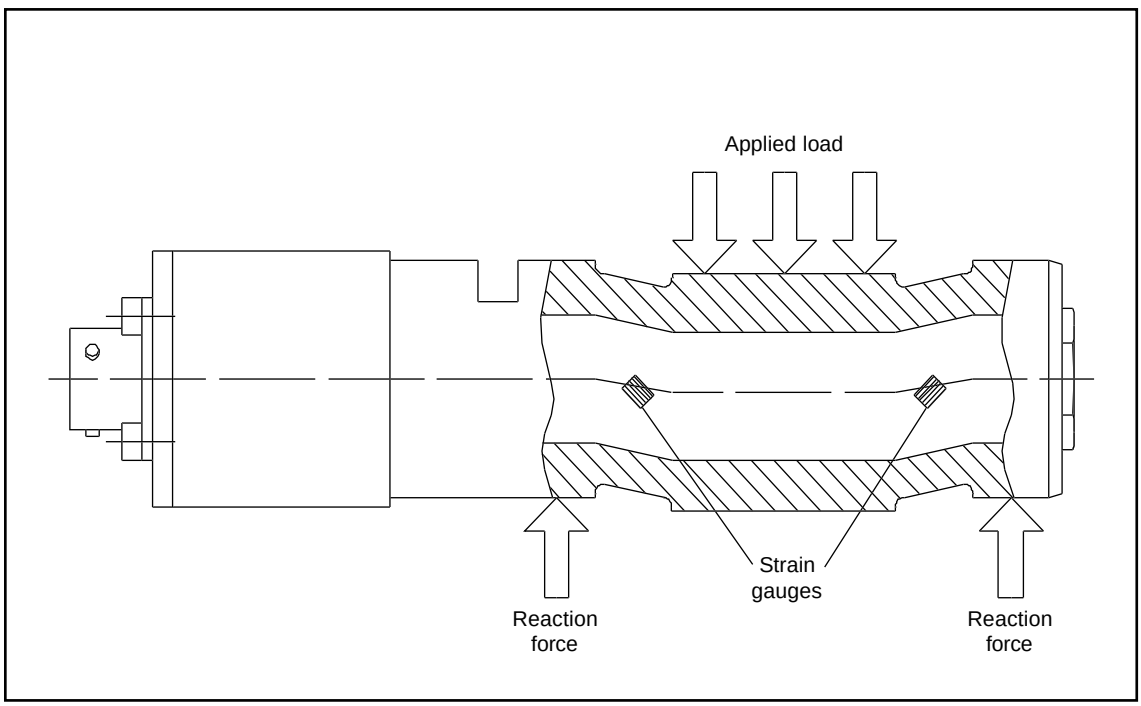

Fig. 3-3 : LE 210 series load measuring pin; loaded.

Checking of the applied load

The signal output by the LE 210 load measuring pin has a range of 16 mA; from 4 mA (corresponding to no load) to 20 mA (corresponding to rated load). In order to determine or to check the load applied to the load measuring pin, proceed as follows :

- Calculate the signal corresponding to the applied load by means of the rule of three :

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

- By means of a digital milliammeter measure the signal corresponding to the load applied.

- Compare the values of the calculated and measured signals. The difference should not exceed 1 %.

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

Checking example :

Type of load measuring pin : _____

Serial number : _____

Calculated signal :

$$\frac{\text{RATED SIGNAL (20 mA - 4 mA)} \times \text{APPLIED LOAD}}{\text{RATED LOAD}} + 4\ \text{mA} =$$

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

Measured signal : $\square\square.\square\square$ mA

☞ *This photocopiable sheet ougth to simplify the checking of the load measuring system. In the case of measurement problems it can alsobe sent in to the After-sales department of Vibro-Meter.*

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4 MOUNTING AND CONNECTION

In order to correctly proceed with the mounting and connecting of the load measuring pins and thus to avoid the measurement signals being perturbed, it is indispensable to follow the procedures described in the following sections.

☞ *The procedures contained in this instruction manual do not cover all the existing mounting and connection possibilities. Rather, the instruction manual provides the user with illustrated examples, intended to help in finding the appropriate solution for his specific application.*
Furthermore, the general manufacturer's instructions as well as security standards and recommendations should be respected by the user for special constructions.

4.1 Mounting of the load measuring pins with integrated electronic unit

1) 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 4-1 below.

Type of load measuring pin	P/N	Rated load [kN]	Rated diameter [mm]	Load measuring pin tolerances h6 [um]	Bore tolerances G7 [um]
LE 210	422-210-000-011	2.5	25	0 / -13	+28 /+7
LE 211	422-211-000-011	5	25	0 / -13	+28 /+7
LE 212	422-212-000-011	10	25	0 / -13	+28 /+7
LE 213	422-213-000-011	20	25	0 / -13	+28 /+7
LE 214	422-214-000-011	50	35	0 / -16	+34 / +9
LE 216	422-216-000-011 422-216-000-031	100	50	0 / -16	+34 / +9
LE 217	422-217-000-011 422-217-000-031	200	65	0 / -19	+40 / +10
LE 218	422-218-000-011 422-218-000-031	500	85	0 / -22	+47 /+12
LE 220	422-220-000-011 422-220-000-031	1000	100	0 / -22	+47 /+12
LE 221	422-221-000-011 422-221-000-031	1250	120	0 / -22	+47 /+12

Fig. 4-1 : Machining dimensions and tolerances according to DIN 7161.

☞ *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 be displaced with respect to each other, when load is applied (see figure 4-2). Elastic mounting, entailing parasite forces on the load measuring pin, should be avoided by all means.

The play between the lateral supports and the linking element (see figure 4-2) 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 friction on the gliding surface, thus impeding optimal force transmission to the load measuring pin.

Use slide (see figure 4-2) 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 figure 4-1 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.

2) Machine the pin holder key to the dimensions given in figure 4-3.
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.

3) Prepare 2 screws and 2 single-coil spring-lock washers for the fixing of the pin holder key following the information in figure 4-3.

4) Clean the load measuring pin as well as the bores in which it will be placed to ensure clean contact surfaces.

5) Grease the load measuring pin as well as the bores in which it will be placed by means of grease or oil.

☞ *When mounting roller bearings heat them to about 80°C to slide them more easily on the load measuring pin.*
Ensure that this operation does not generate a too great prestress on the load measuring pin when the bearing is in position and cooled down.

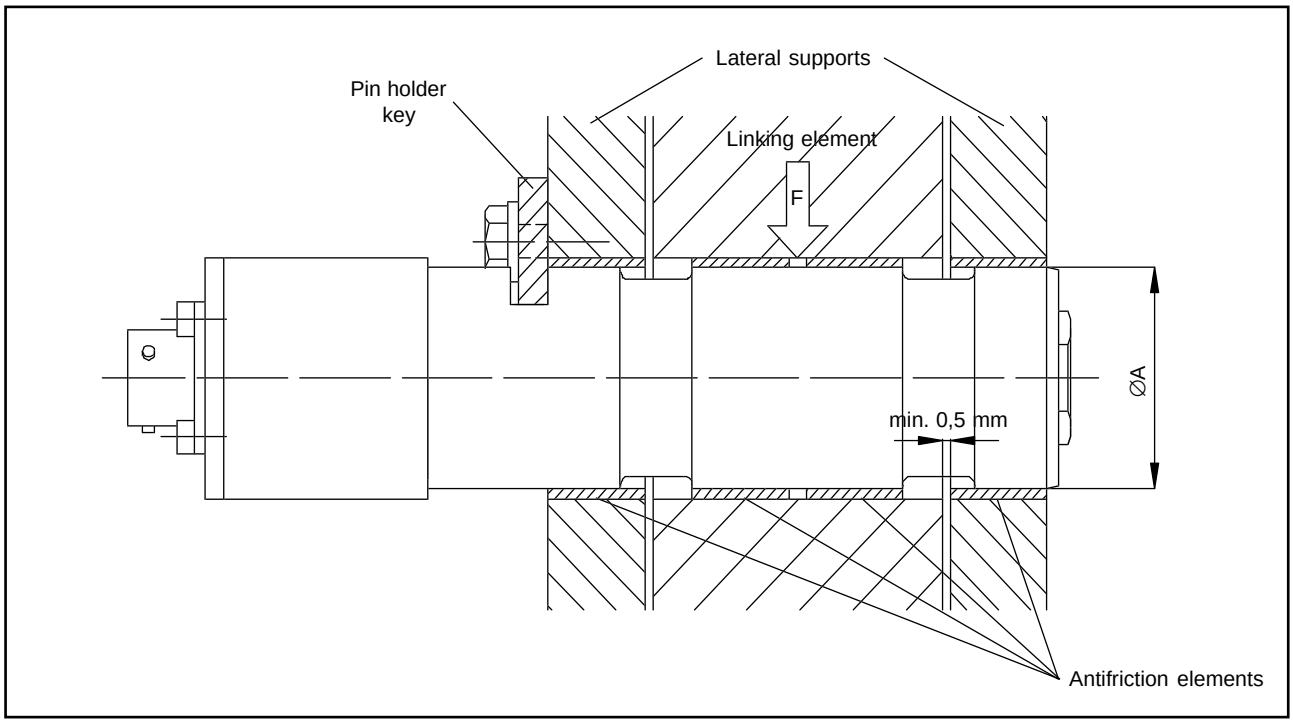
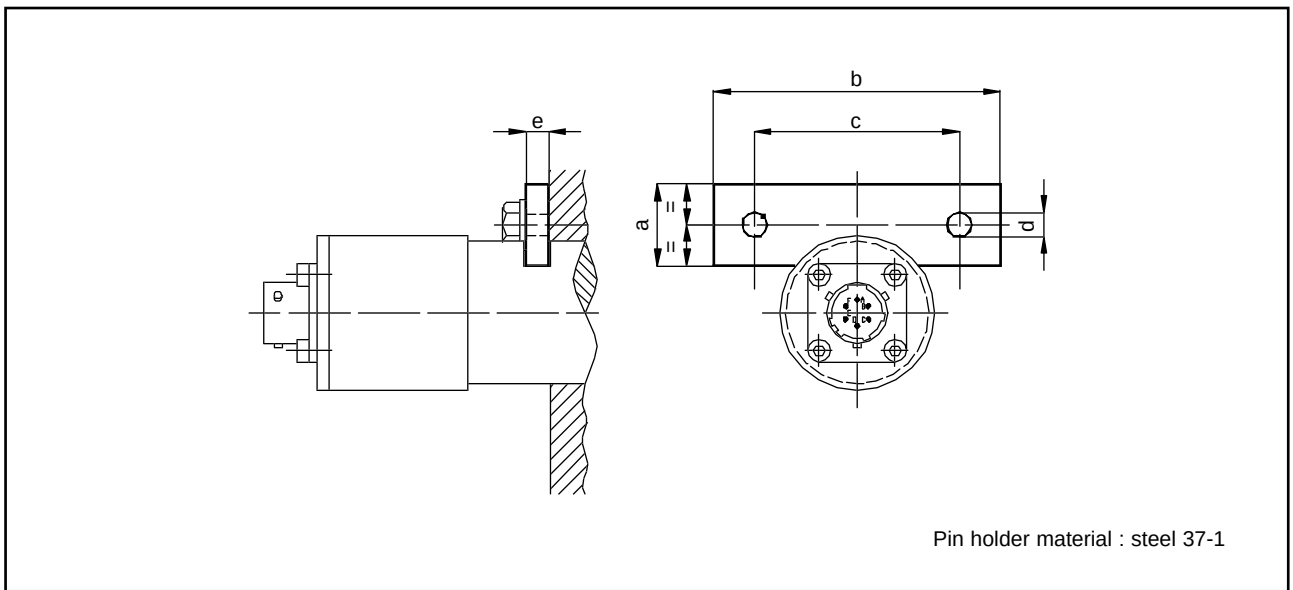


Fig. 4-2 : Load measuring pin mounted in its seat.



Load measuring pin	a [mm]	b [mm]	c [mm]	d [mm]	e [mm]	Fastening screw	Screwing torque [Nm]	Spring-lock washer
LE 210	20	60	36	9	5	M8	24	M8
LE 211	20	60	36	9	5	M8	24	M8
LE 212	20	60	36	9	5	M8	24	M8
LE 213	20	60	36	9	5	M8	24	M8
LE 214	25	80	50	11	6	M10	48	M10
LE 216	30	100	70	13	8	M12	83	M12
LE 217	40	140	100	17	10	M16	200	M16
LE 218	40	140	100	17	1	M16	200	M16
LE 220	40	140	100	17	10	M16	200	M16
LE 221	50	190	140	21	12	M20	390	M20

Fig. 4-3 : Dimensioning of the pin holder key.

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

☞ *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 always facing the force applied to the central portion.*

7) Slide manually the load measuring pin into its seat (see figure 4-5), until the mortise for receiving the pin holder key reaches the lateral support. This inserting of the load measuring pin should be done without the use of any tool. If it is impossible to slide the pin in, check the alignment (concentricity and axiality) of the elements and machine again, if necessary.
Insert the pin holder key into the mortise and align the key to coincide with the threaded holes for the fastening screws.

⚠ **Never hit the load measuring pin with a hammer or any other tool to insert it in its seat.**
Mechanical damage entailing measurement errors may occur if this prescription is not respected.
The violation of this prescription will cancel the guarantee.

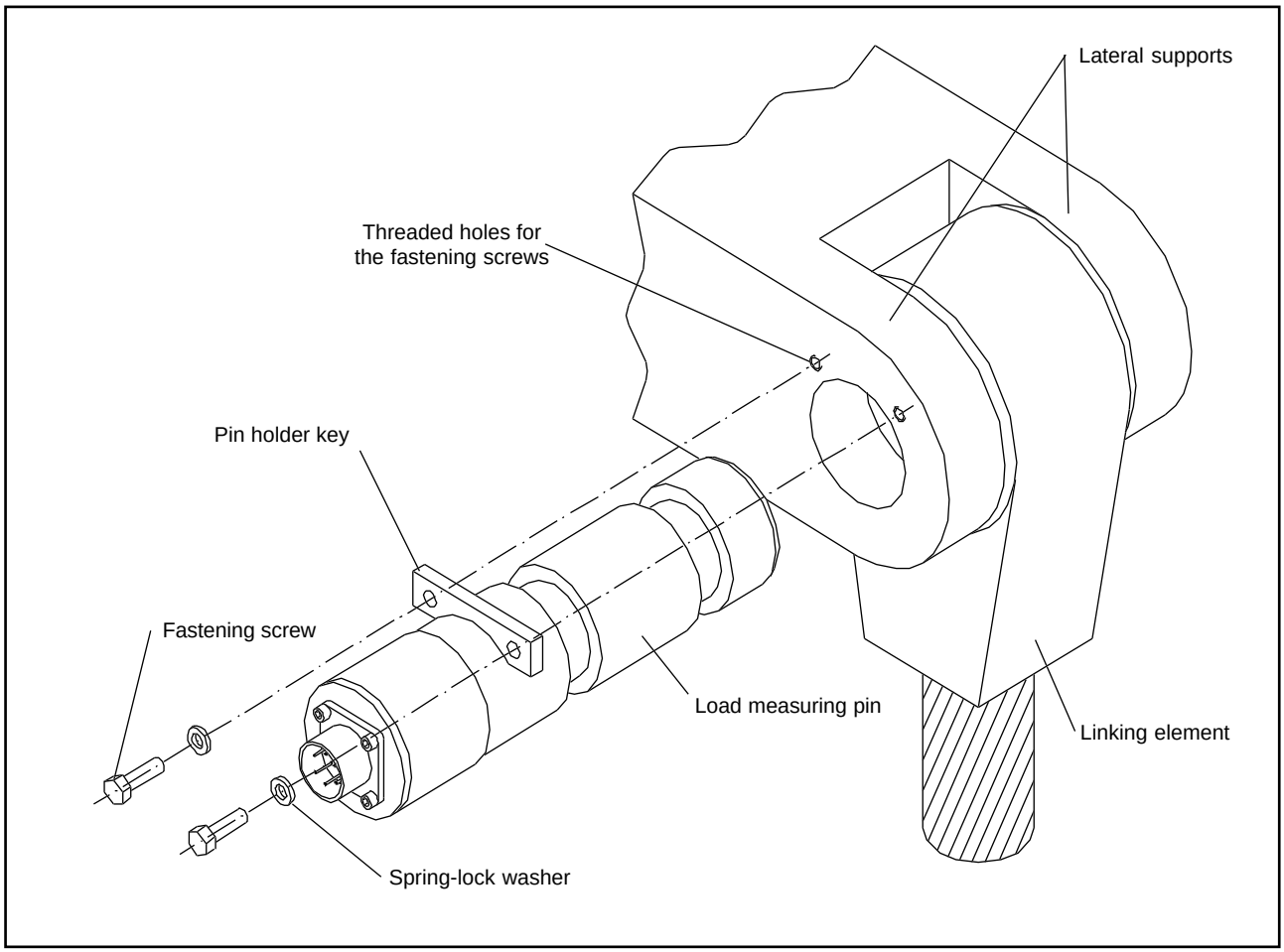


Fig. 4-4 : Positioning of the load measuring pin.

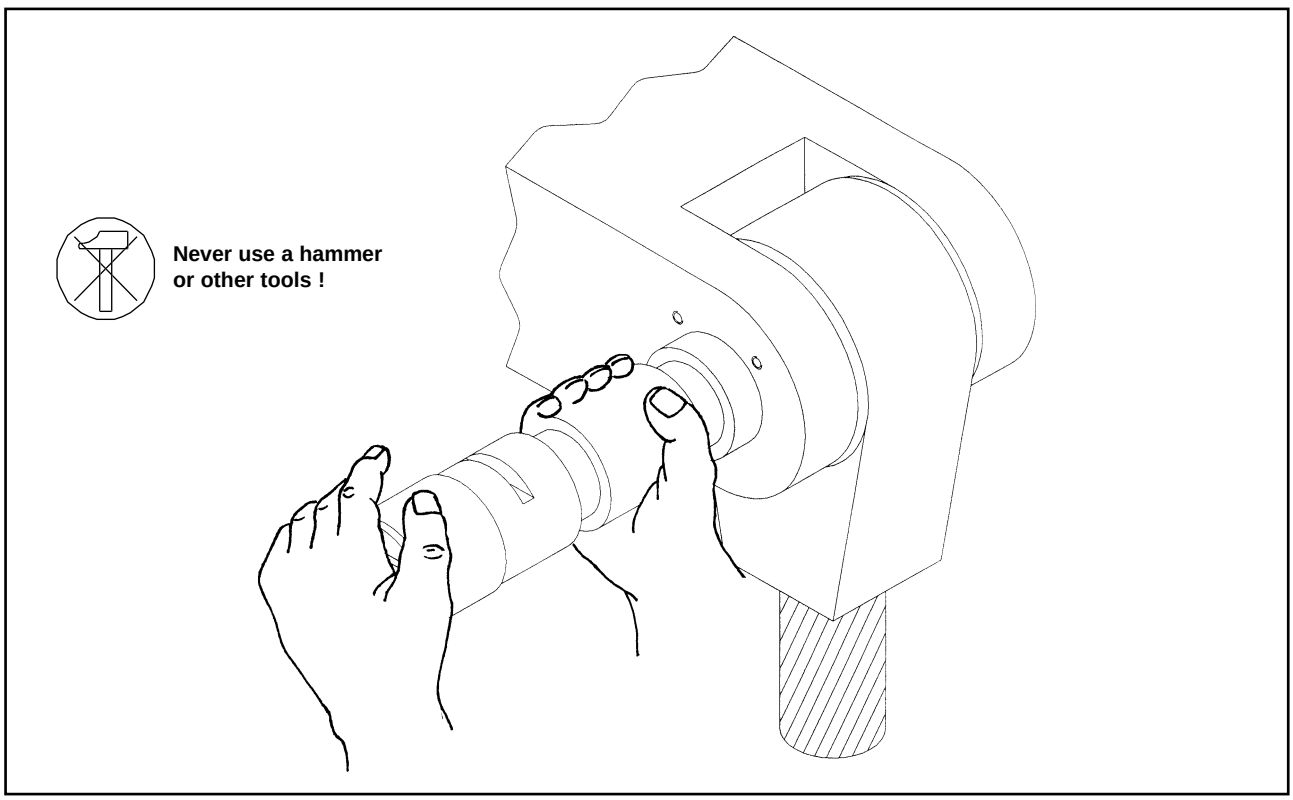


Fig. 4-5 : Inserting the load measuring pin.

8) Place the two fastening screws, fitted with their washers, into the holes of the pin holder key (see figure 4-6), and screw them into the previously threaded holes, applying the screwing torque specified in figure 4-3.

9) For pins equipped with lubricators (optional for LE 216 to LE 221) inject lubricant (grease or oil) by means of a grease gun or oil pump.

4.2 Extraction of the load measuring pins

- Before any attempt to extract, unload the load measuring pin (remove tare). This should allow its easy extraction.

- Load measuring pins LE 218 to LE 221 are fitted with two extraction screw threads at each end (see figure 4-6). These ought to be used to fix the extraction device (not provided by Vibro-Meter). We recommend fixing it on the same side as the electrical connector to avoid any damage when pulled out on the opposite end (see figure 4-7).
  Disconnect the cable in order to facilitate the extraction.

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 prescription is not respected.

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

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.

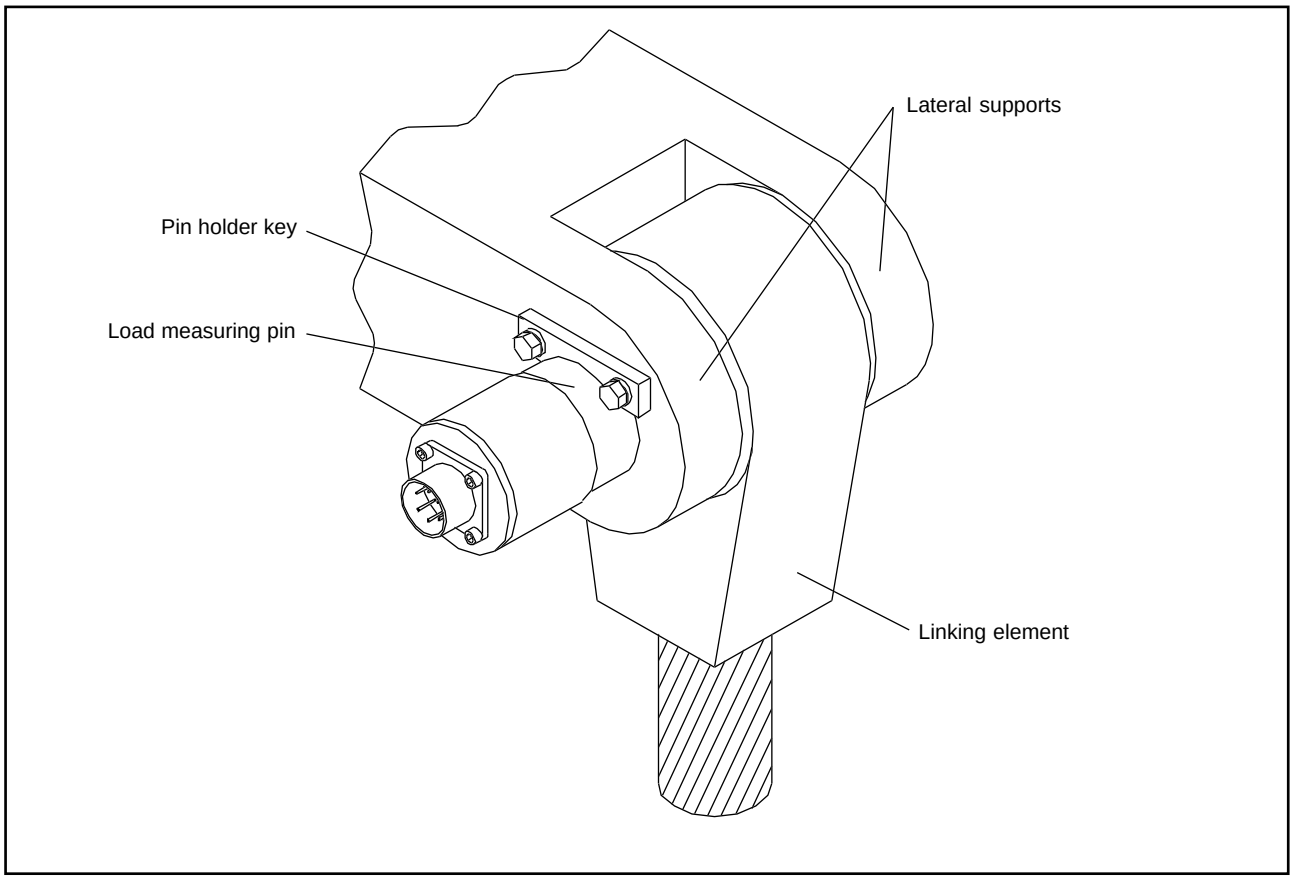


Fig. 4-6 : Mounted load measuring pin; LE 210 to LE 217.

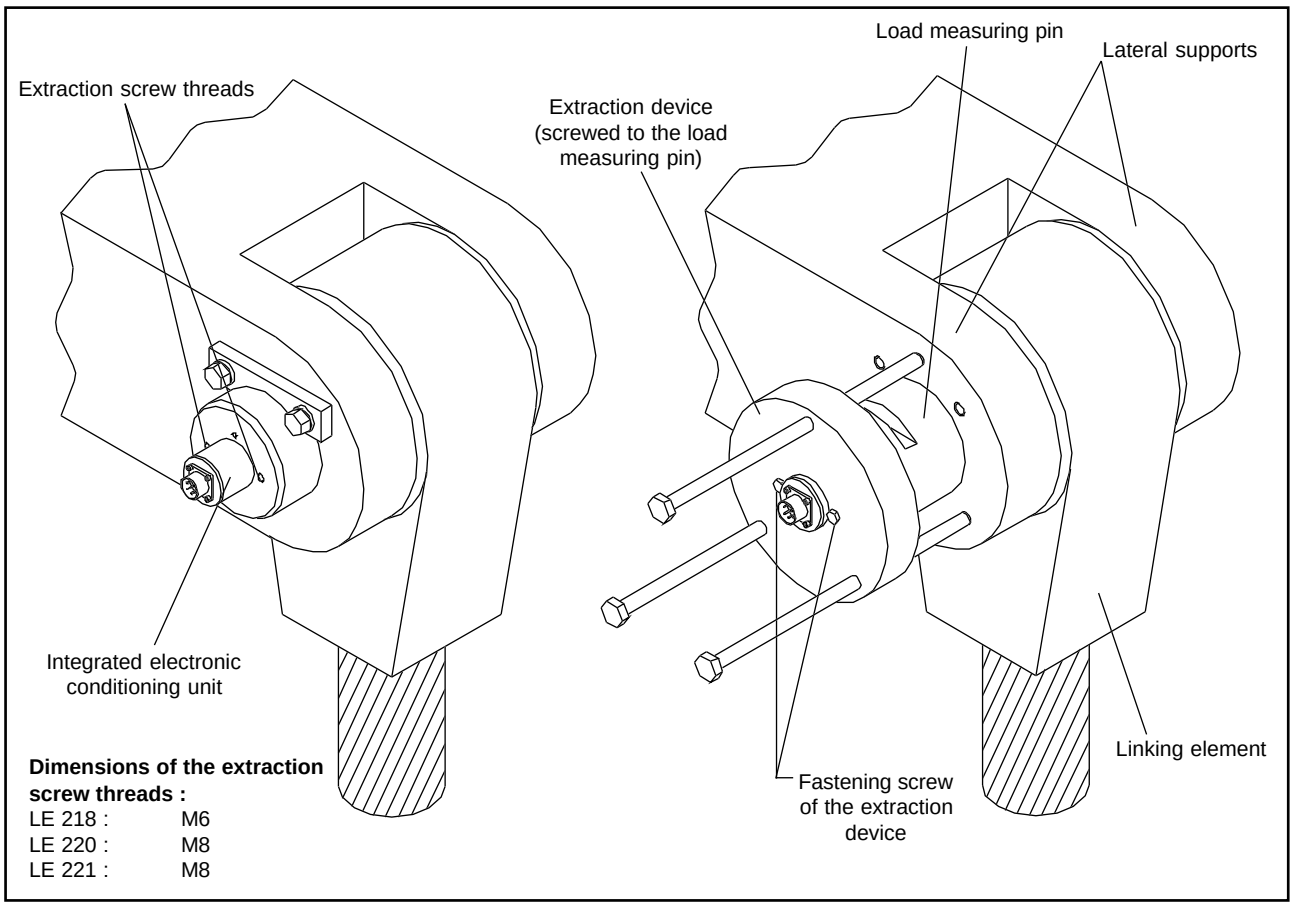
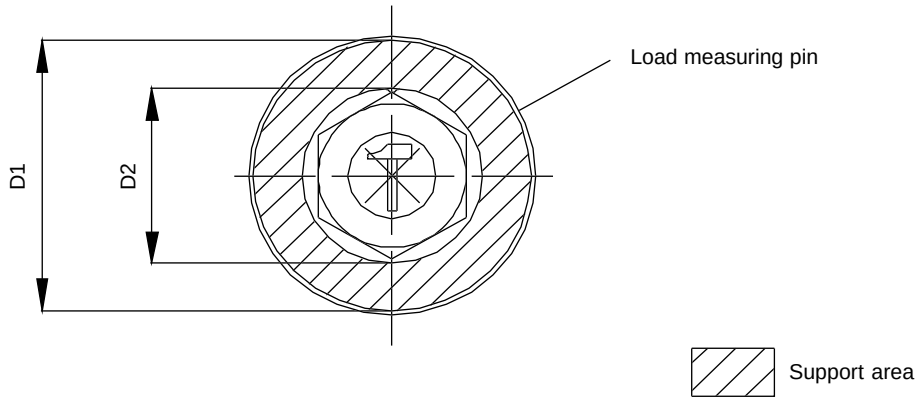


Fig. 4-7 : Pulling out the load measuring pin by means of an extraction device (principle); LE 218 to LE 221.

- For small size load measuring pins without extraction screw threads use a sleeve tube or a muff made in a metal of lesser stiffness than that of the pin (e.g. bronze, brass). Place the tube against the pin end opposite the electrical connector, taking care not to touch the hexagonal cover (see figure 4-8). Now hit the tube with a plastified hammer (shock absorption) to push the load measuring pin out of its seat. It is also possible to use for this operation a wooden cylinder.

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



Load measuring pin	D1 [mm]	D2 [mm]
LB 214 / LB 234	30	26
LB 235	40	35
LB 216 / LB 236	46	40
LB 217 / LB 237	60	40
LB 218 / LB 238	80	40
LB 220 / LB 240	90	40
LB 221 / LB 241	110	40

Fig. 4-8 : Support area on the end of the load measuring pin for a sleeve tube or a muff.

☞ *On the load measuring pins LE 210 to LE 213 the area of support is not sufficient. Use a wooden cylinder for the extraction of the load measuring pin.*

4.3 Connection of the load measuring pins

Methods of connecting load measuring pins to integrated electronic conditioning instruments proposed by Vibro-Meter 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 with an integrated electronic conditioning unit and of a separate processing unit. For the processing of the measurement signals provided by the load measuring pins Vibro-Meter proposes the use of SDC 107 measurement amplifiers shown in figure 4-9.

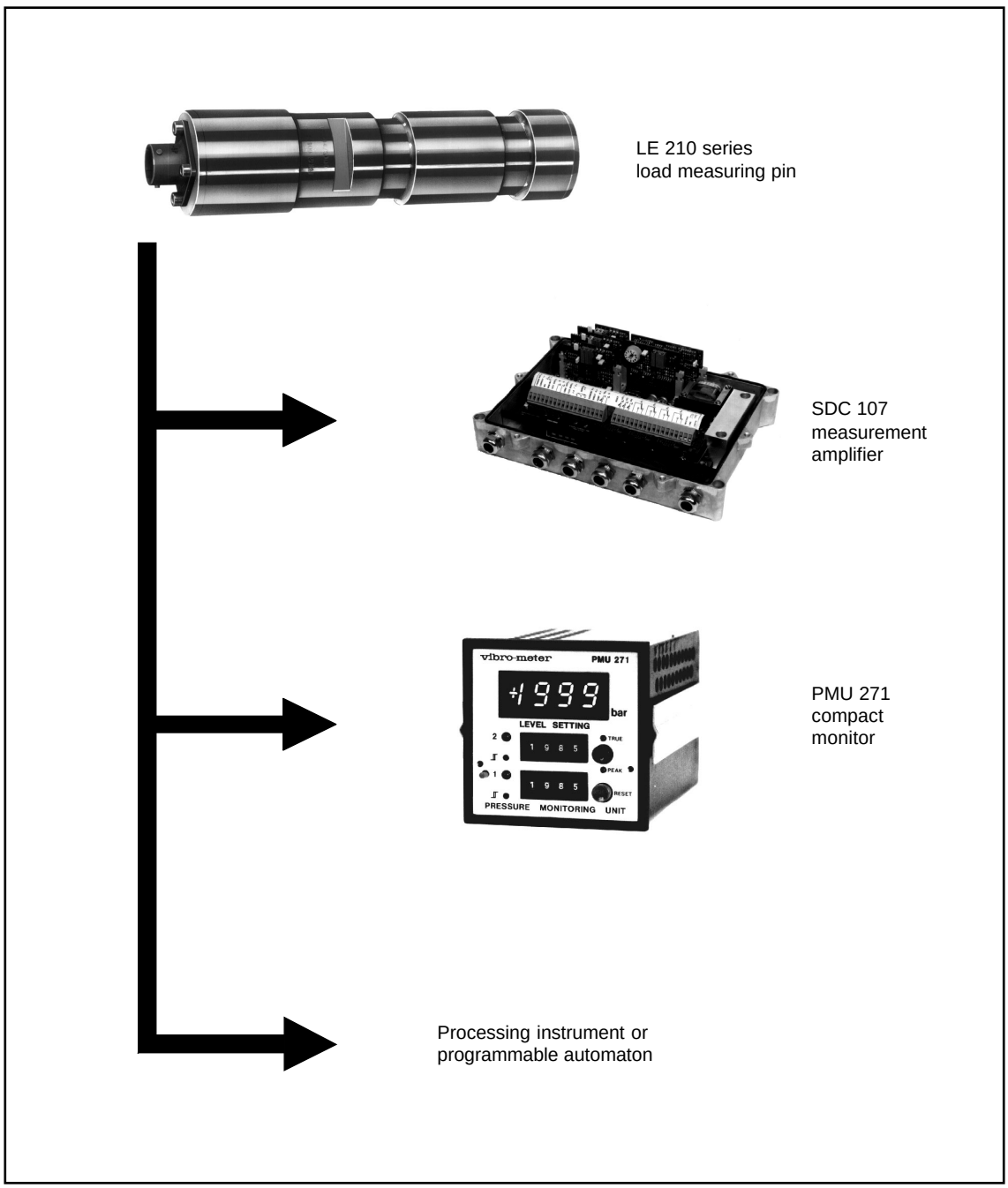


Fig. 4-9 : Electronic conditioning modules for connection to load measuring pins.

1) Connection of a load measuring pin with integrated electronic conditioning unit to any instrument

Connect the load measuring pin connection cable lead (see figure 4-10) to the input terminal of the instrument according to the instructions given in its instruction manual.

☞ *The load applied to a load measuring pin can not be inverted because the measuring system is unable to perform measurement below 3.5 mA (measurement range : 4 to 20 mA).*

Numeric example :

How to determine the load resistance R_L as a function of the supply voltage $U_{power\ supply}$ (see figure 4-11) ?

- The user wants to connect to a load measuring pin a device providing a supply voltage of 24 VDC ± 10 %.
- 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.
- The intersection of this line (21.6 VDC) with the 20 mA line determines the maximum value of the load resistance R_L (read the Y-axis value). In the given example, the maximum value of the load resistance corresponds to approximately 490 Ω.

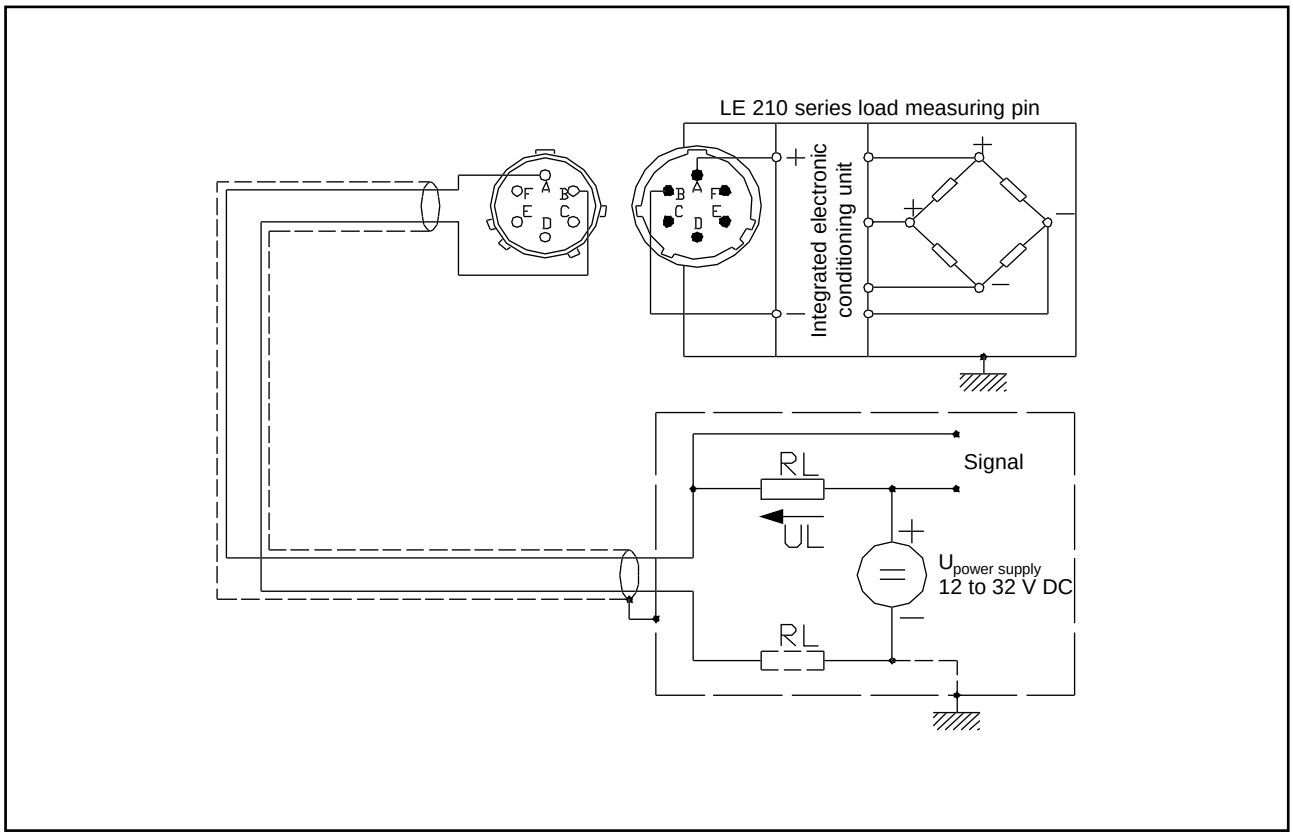


Fig. 4-10 : Connection of the load measuring pin to any instrument.

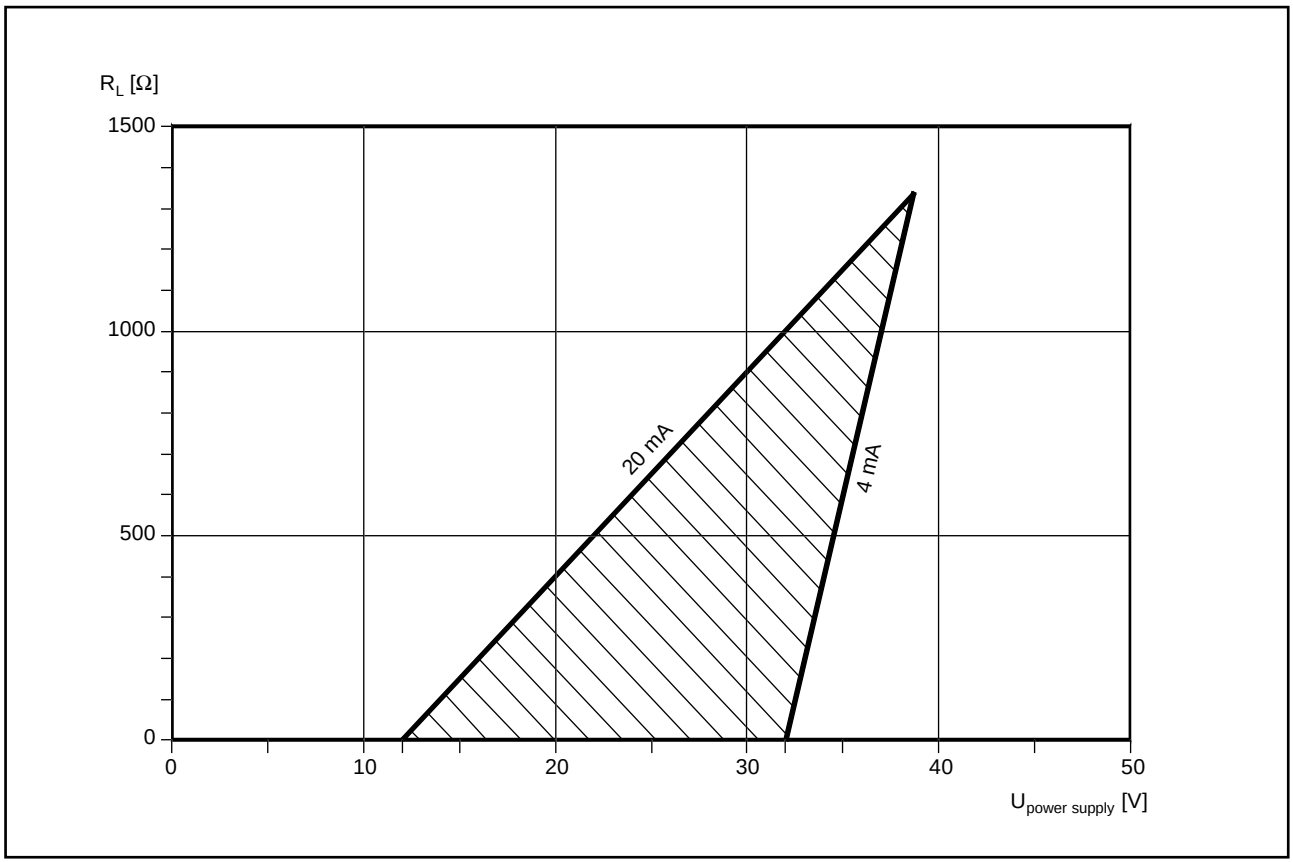


Fig. 4-11 : Diagram $R_L = f(U_{power\ supply})$ of the operating range of a load measuring pin.

2) Connection of a load measuring pin to an SDC 107 measurement amplifier

Connect the load measuring pin connection cable lead to the input terminal of the SDC 107 according to the indications given in figure 4-12.

☞ *For more information concerning the cabling of SDC 107, refer to its instruction manual.*

3) Connection of a load measuring pin to a PMU 271 compat monitor

Connect the load measuring pin connection cable lead to the input terminal of the PMU 271 according ot the indications given in figure 4-13.

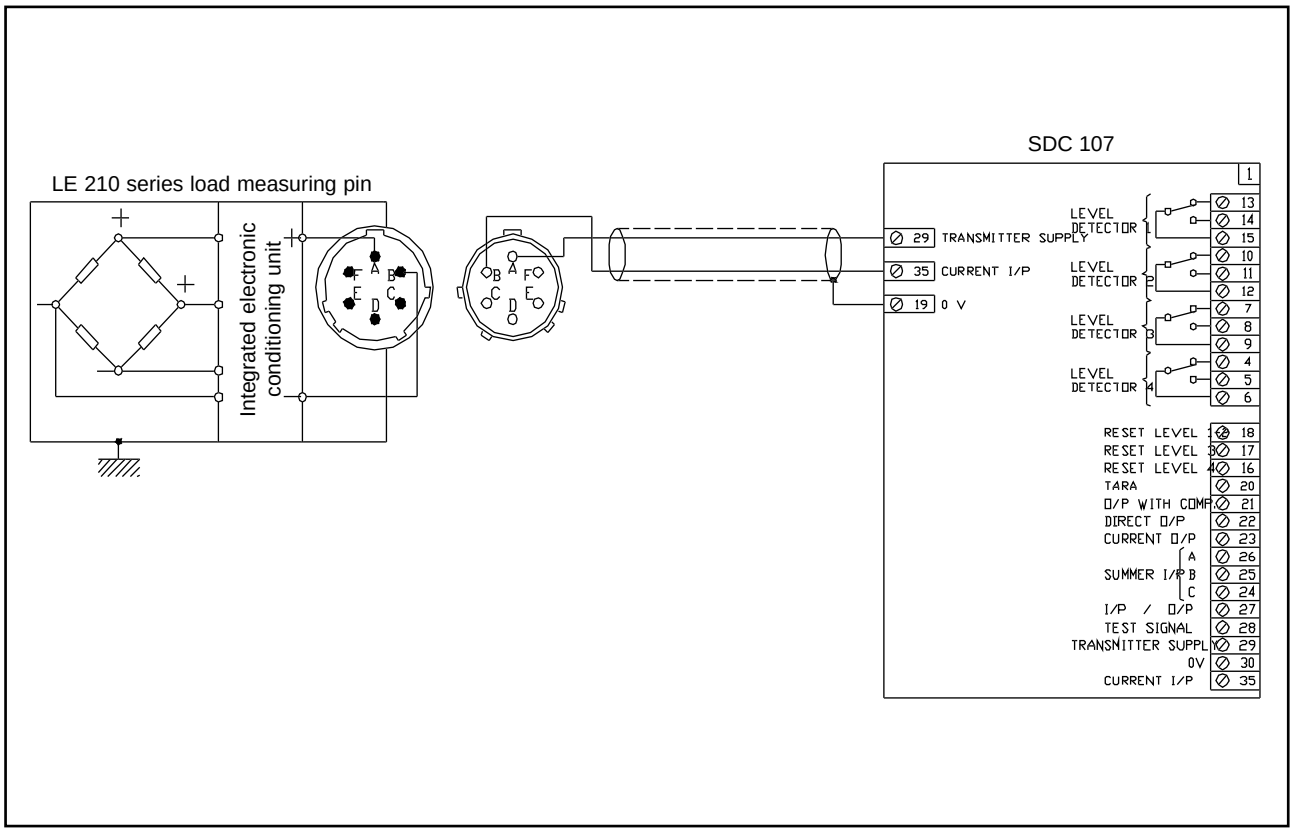


Fig. 4-12 : Connection of the load measuring pin to an SDC 107 measurement amplifier.

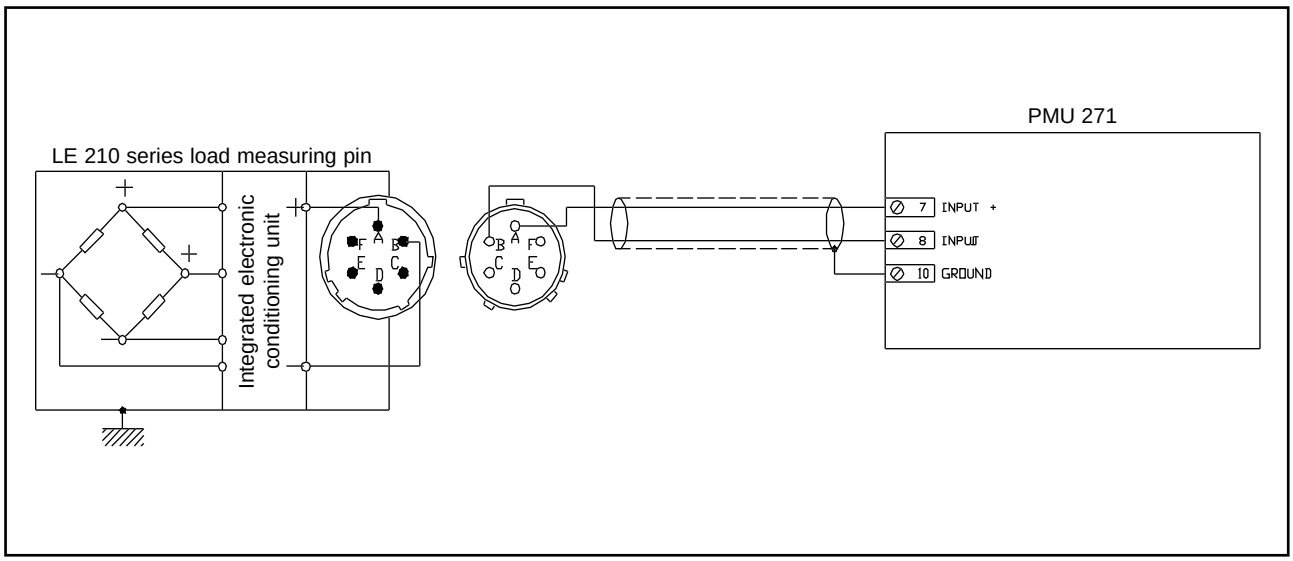


Fig. 4-13 : Connection of the load measuring pin to a PMU 271 compact monitor.

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5 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.

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

It will be also shown in this chapter that a badly effected mounting can rapidly impair the measurement accuracy of a load measuring pin and consequently diminish the security of the whole installation.

☞ *Owing to an EMC execution (electro-magnetic compatibility) the LE 210 series load measuring pins with integrated electronic conditioning unit conform with the EN 50082-2 European standard (1991).*

5.1 Influence of the pin's orientation

For the LB 210 and LB 230 series load measuring pins the identification of the sensitivity axis is performed by means of the pin holder key mortise. This being per 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 and facing this force.

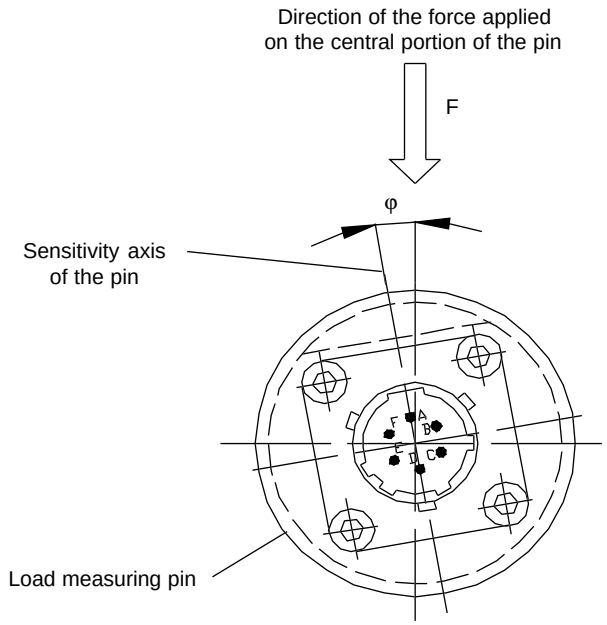
When the pin is not oriented optimally (see figure 5-1), the measurement signal is altered according to the following relation :

$$I_{eff} = I_{nom} \cdot \cos \varphi \; (I_{nom} = I_{measured} - 4 \text{ mA})$$

where : I_{eff} represents the actuel value of the signal
I_{nom} represents the rated value of the 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 = actual value (I_{eff}) ie 100 % of the full-scale value.

for $\varphi = 0^o$	$\cos \varphi = 1$	$I_{eff} = I_{nom}$
for $\varphi = 10^o$	$\cos \varphi = 0.985$	$I_{eff} = 98.5$ % of I_{nom}



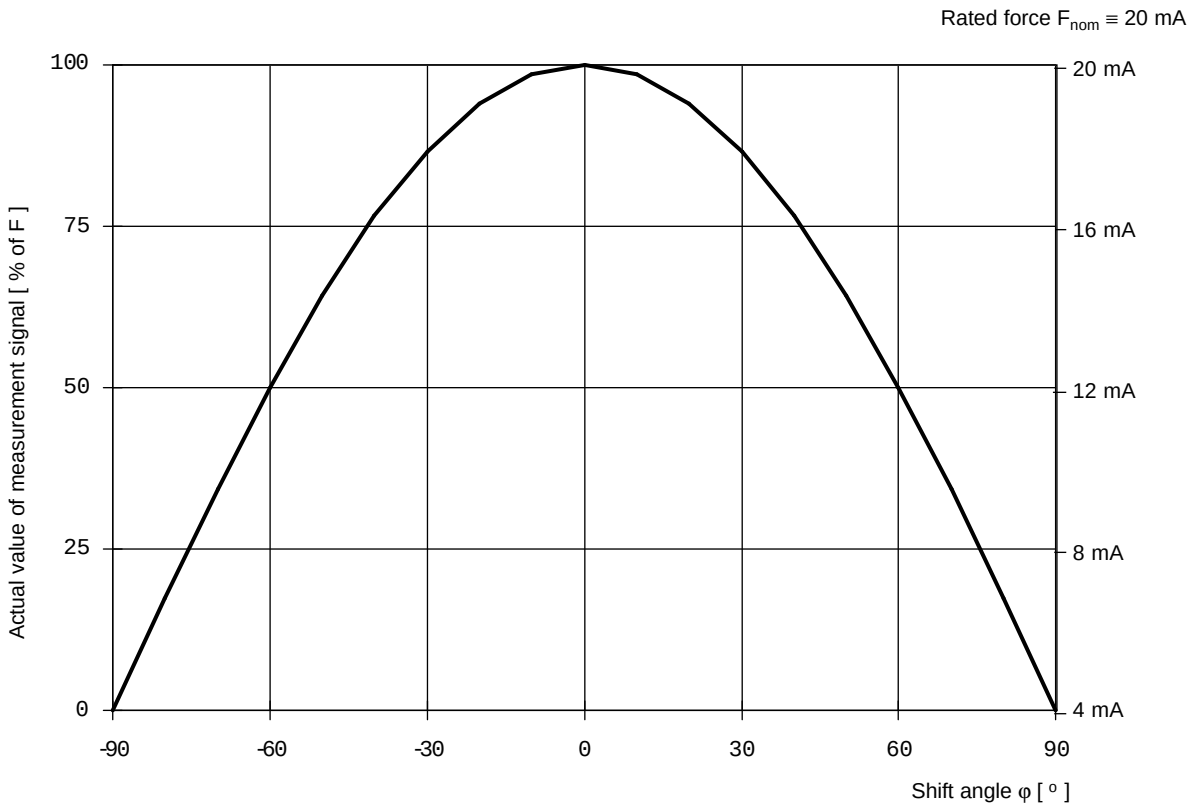


Fig. 5-1 : Influence of the pin's orientation.

5.2 Influence of the applied force

A load measuring pin is capable of measuring not only loads within the rated load range but loads up to 150 % of the rated load (see figure 5-2).

However, the applying of loads exceeding these limits can incur a permanent (plastic) deformation of the load measuring pin, or even its destruction. 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 are no longer guaranteed.

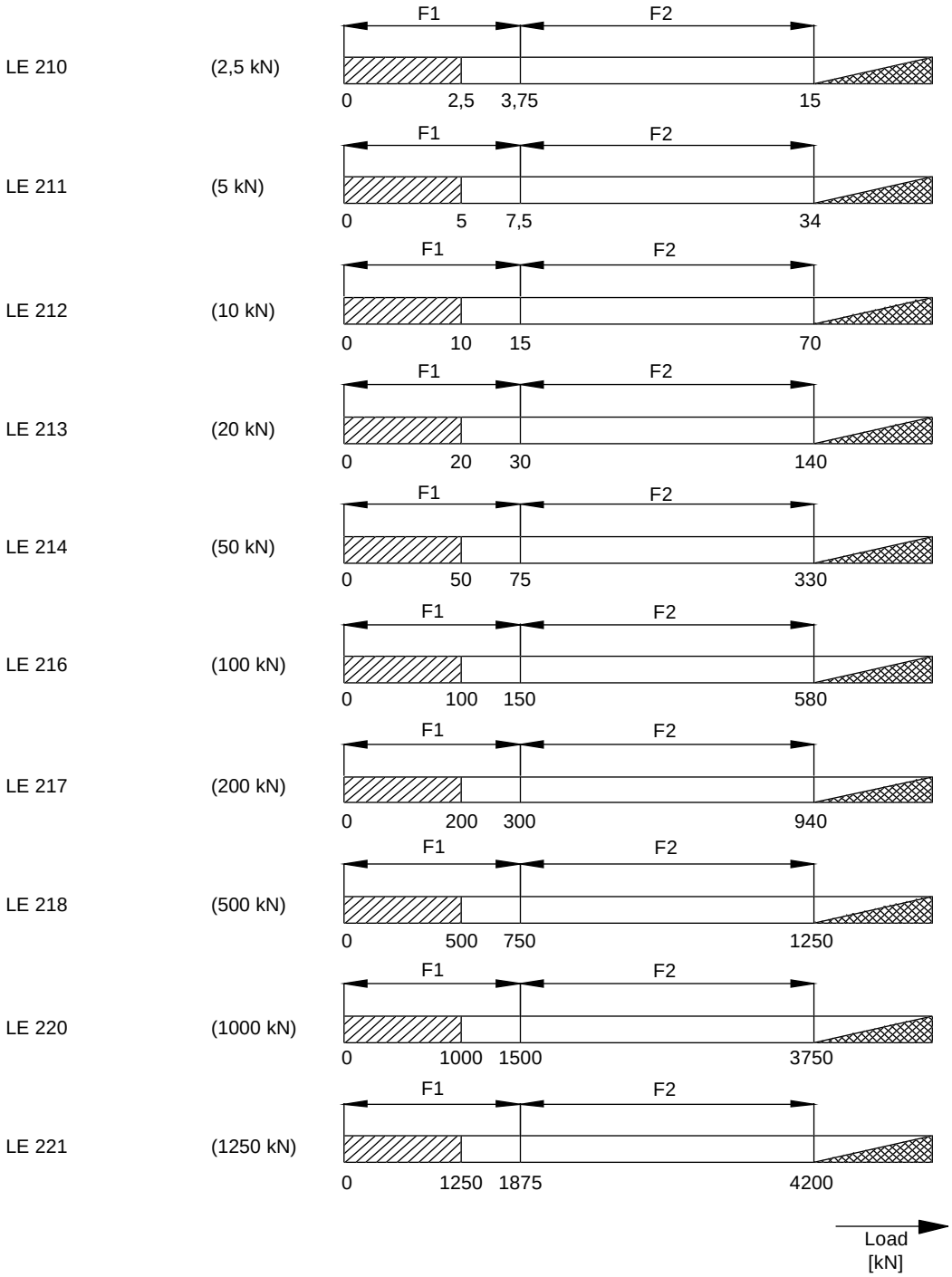


Fig. 5-2 : Application range of the load measuring pins.

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6 MAINTENANCE

6.1 Maintenance

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 indispensable. On request Vibro-Meter supplies load measuring pins with an incorporated device for the greasing of gliding surfaces (lubricator on option on load measuring pins LE 216 and LE 221).

Recommendations for the checking of the measurement current

The checking intervals will depend on the kind of application and on the long-term stability of the LE load measuring pin with integrated electronic conditioning unit.

6.2 Fault finding

The below table provides a procedure allowing easy checking of a load measuring pin's operation, on condition that the installation is fully cabled.

PROBLEM	POSSIBLE CAUSE	RECOMMENDATION
I < 4 mA	Calibration error	Send back the pin for calibration
	Inversion of applied load	Check and correct the direction of the applied load (see figure 3-3)
I = 0 mA	Broken transmission line	Check the line and the connections
	Defective integrated electronic conditioning unit or strain gauge full bridge	Send back the pin for repair
I > 20 mA	Calibration error	Send back the pin for calibration
	Overload	Check and reduce the applied load
I >> 20 mA (I > 25 mA)	Calibration error	Send back the pin for calibration
	Overload	Check and reduce the applied load
	Short-circuited transmission line	Check the line and the connections
	Defective integrated electronic conditioning unit	Send back the pin for repair

☞ *I corresponds to the measured current.*

☞ *The operating range of the integrated electronic conditioning unit is 3.5 mA to 25 mA.*

7 SPECIFICATIONS

The specifications of the load measuring pins described in this instruction manual are contained in the following data sheet :

Data sheet designation	**P/N**
- Load measuring pins LE 210	234-006

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DATA SHEET

Load
Force
Weight
234-006

LE 210 Series

vibro-meter
certified by
ISO 9001

Load Measuring Pins 2-Wire; 4 to 20 mA

FEATURES

- **Temperature-compensated transducers with strain gauges in full-bridge configuration**
- **Available in 10 standard ranges from 2.5 to 1250 kN**
- **Integrated 2-wire signal amplifier for transmission over great distances**
- **EMC execution for reliable trouble-free operation**
- **Rugged design corresponding to the quality characteristics of the LB 210 series**
- **Simple installation for cost-savin solutions to construction problems**

TYPICAL APPLICATIONS

When forces acting on mechanical constructions are measured, the additional equipment required can often be costly and difficult to install. The load measuring pin offers an excellent solution since it acts as a direct element in the assembly, replacing a non-instrumented pin or shaft.
The LE is a result of continual development of the well established LB series. The integral signal amplifier makes it ideal for applications in which separate signal conditioning is difficult to install and where the monitoring electronics are positioned at extended distances.

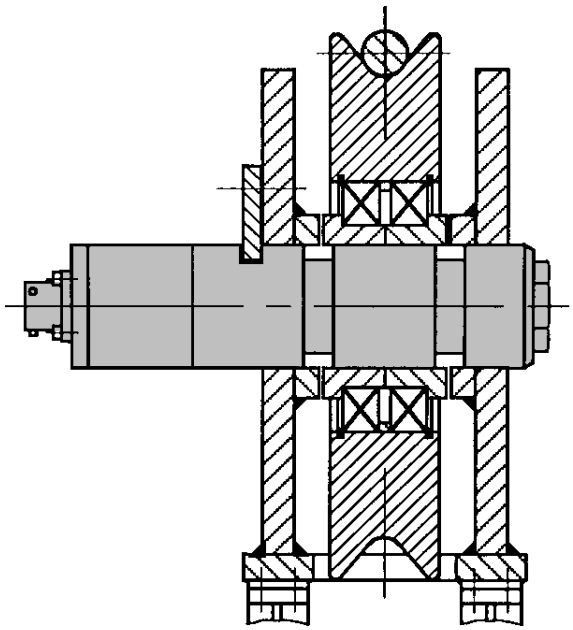
APPLICATION FIELDS

Load measuring devices and overload protecting instruments on :

- cranes, hoisting gear, elevators and winches

Owing to the EMC execution of the LE load measuring pins their operation remains trouble-free and reliable even in electromagnetically difficult environmental conditions.

MOUNTING EXAMPLE



SPECIFICATIONS (Standard Version)* LE 210 Series

DESIGN

The load measuring pin has 2 circular grooves and an axial bore. Inside the central bore, adjacent to the external grooves, the 4 strain gauges are mounted in a full-bridge configuration. The positioning and orientation of the strain gauges has been optimized by means of the finite element method (FEM).

OPERATING PRINCIPLE

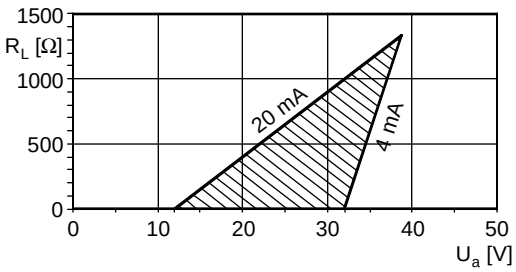
When a force is applied to the load measuring pin along its sensitive axis, the effect on the strain gauge bridge results in an output signal proportional to the applied force and which is converted by the integrated electronics to a standard 4 to 20 mA output. The line amplifier, realized in SMD (surface mounted device) technique, is protected by an appropriate circuitry against environmental radiation.

ELECTRICAL CHARACTERISTICS

Function principle	:	Full-bridge strain gauge
Strain gauge bridge impedance	:	5000 Ω
Output signal	:	Rated 4 to 20 mA; maximal 3.5 to 25 mA
Power supply	:	12 to 32 V DC with protected polarity reversal
Non-linearity error	:	< 0.25 % of fsd (LE 220 & LE 221 : 0.5 %)
Non-linearity + hysteresis error	:	< 0.5 % of fsd (LE 220 & LE 221 : 0.8 %)
Repeatability	:	± 0.1 % of fsd
Operating temperature	:	-25°C to +80°C
Storage temperature	:	-55°C to +125°C
Temperature influence		
- on zero	:	± 0.02 % of fsd / K
- on amplification/gain	:	± 0.02 % / K
Long terme stability		
- of zero	:	< 1 % of fsd / year no-cumulative
- of sensitivity	:	< 0.5 % of fsd / year no-cumulative
Influence on measurement signal		
- shift of force angle with respect to measurement axis	:	According to the cosine function

ELECTRICAL CONNECTION

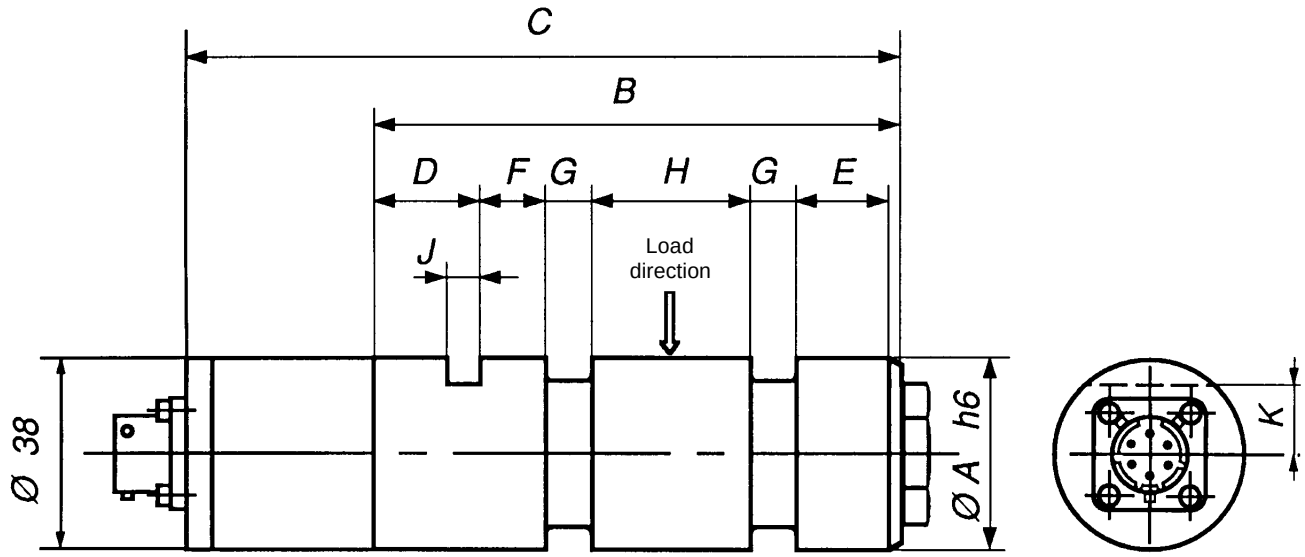
Output connector	:	Axial, type MS 3112 E 10-6P
Configuration	:	2-wires
Connection cable assembly	:	Options 3, 6 ,12, 20 m with : • straight connector MS 11S 3116 J10 6S • connector 90°, Souriau 851 08 EC 10 6S50
Load resistance	:	Admissible resistance of the 2-wire circuit at the connection of the LE 210
- Hatched operating domain	:	$\equiv \frac{\text{load resistance } R_L}{\text{supply voltage } U_a}$

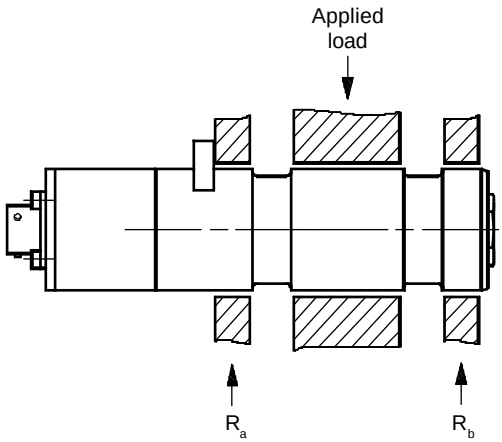


MECHANICAL CHARACTERISTICS

Material	:	LB load measuring pin : stainless steel 1.4057 LE transmitter housing : stainless steel 1.4305
Nominal load (fsd)	:	Refer to table on page 3
Overload admissible	:	150 % of rated load without influence on the measurement
Overload at rupture	:	≥ 500 % of rated load according to the type
Standard calibration	:	0 kN ≡ 4 mA ±0.25 mA fsd in kN ≡ 16 mA ±3 %
EMC	:	According to EN 50082-2 (1991)
Protection class	:	IP 66 according to DIN 40050
Fit	:	G7 / h6
Lubrification	:	Oiler ø4 DIN 3405 D or M10 DIN 3405 A according to the LE type
Weight	:	Refer to table on page 3

* For the special load measuring pins, some characteristics are not always valid.





Type	kN	øAh6 [mm]	B [mm]	C [mm]	D [mm]	E [mm]	F [mm]	G [mm]	H [mm]	J [mm]	K [mm]	Weight [kg]
LE 210	2.5	25	84	116	18	16	10	7	24	5.2	9	0.6
LE 211	5	25	84	116	18	16	10	7	24	5.2	9	0.6
LE 212	10	25	84	116	18	16	10	7	24	5.2	9	0.6
LE 213	20	25	84	116	18	16	10	7	24	5.2	9	0.6
LE 214	50	35	112	144	25	14	12	12	35	6.3	11.5	1.05
LE 216	100	50	161	193	32	24	18	18	48	10.5	20	2.4
LE 217	200	65	196	228	32	26	20	25	65	10.5	22.5	4.8
LE 218	500	85	258	290	34	39	35	28	89	10.5	28	11
LE 220	1000	100	347	379	36	61	55	35	120	10.5	36	19.6
LE 221	1250	120	347	379	36	61	55	35	120	12.5	40	28.8

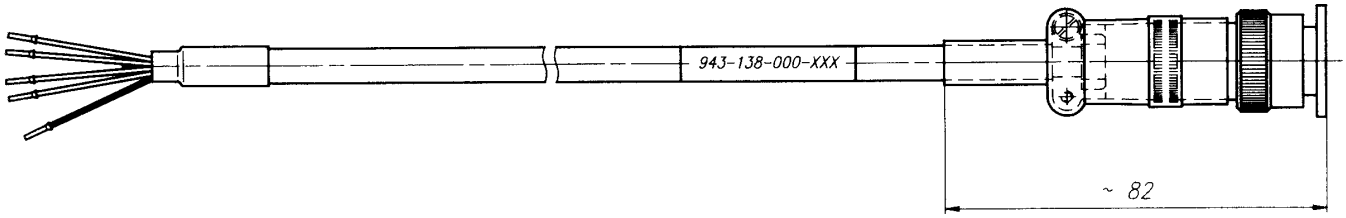
Ordering information :

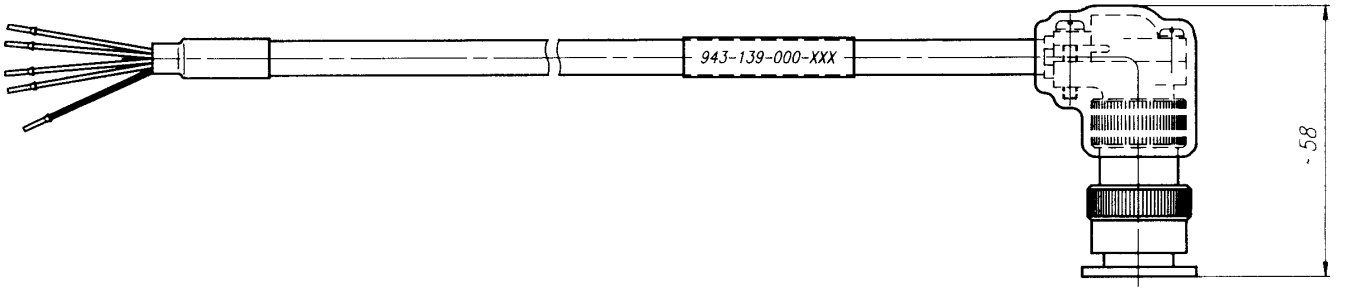
LOAD MEASURING PINS : P/N 422-2□□-000-0□1

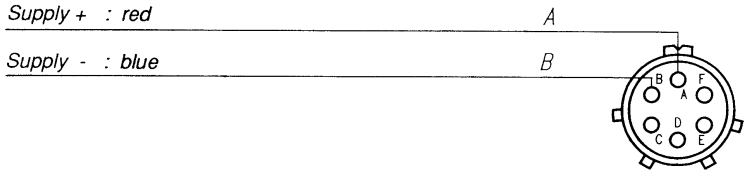
Type LE 2□0 - 2□1

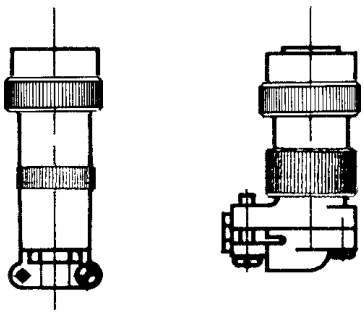
Lubrification : without LE 210 - 221 — 1

with LE 216 to LB 221 — 3









Ordering information :

COUNTER-CONNECTOR

- straight connector : P/N 957.11.08.0030
- 90° connector : P/N 957.11.08.0029

CONNECTION CABLE ASSEMBLY : P/N 943-13□-000-0□1

Straight connector 8
90° connector 9

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 the specifications without forewarning.

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A MECHANICAL DRAWING

Refer to the drawing in the data sheet in chapter 7.

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PRODUCT DEFECT REPORT

Please cut out or copy and send to Vibro-Meter Sales agent

If you should observe any problems with this Vibro-Meter product would you please contact your **Vibro-Meter agent**.
Please fill in this form (in English), giving as much specific information as possible on the problems observed. This will enable us to decide the quickest way to solve the problem.
NB : If more than one unit is defective, photocopy this sheet and fill in one copy for each unit.

☞ **THIS REPORT OR A COPY OF IT SHOULD ACCOMPANY THE DEFECTIVE UNIT AT ALL TIMES !**

NB : For plug-in modules this information can usually be found on the label stuck on its side.

Module type : _____

Part number (P/N) : _____

Serial number (S/N) : _____

Vibro-Meter order no. : _____

Date of purchase : _____

Site where used : _____

Problems observed : _____

_____

_____

_____

_____

_____

_____

(Please continue on back of sheet if necessary)

Is the problem :

☐ Always evident ?

☐ Temperature dependent ?

☐ Intermittent ?

(☒ Mark as appropriate)

In case we need any further information, please provide us with the name of an employee with whom we can make contact :

Name : _____

Department : _____

Company : _____

Address : _____

_____

_____

Country : _____ **Postal code :** _____

Tel. : _____ **Telex :** _____

Fax : _____

Signature : _____ **Date :** _____

PRODUCT DEFECT REPORT
(cont.)

Please use this space for any additional information :

DOCUMENTATION EVALUATION FORM

Instruction Manual : LE 210 SERIES
LOAD MEASURING PINS

P/N : 632.006 E

Vibro-Meter welcomes your evaluation of this intruction manual. Your comments and suggestions will help us to improve our documentation.

Please circle the following Yes or No :

• Is the document well organized ?	Yes	No
• Is the information technically accurate ?	Yes	No
• Would you like more technical detail ?	Yes	No
• Are the instructions clear and complete ?	Yes	No
• Are the descriptions easy to understand ?	Yes	No
• Are the examples and diagrams/photos helpful ?	Yes	No
• Are there enough examples and diagrams/photos ?	Yes	No
• Is the style/wording easy to read ?	Yes	No
• Are there any omissions ? (If so, please list below)	Yes	No

Comments : _____

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Country : _____ **Postal code :** _____

Signature : _____ **Date :** _____

Please cut out and mail to Vibro-Meter Thank you for your cooperation

Tape here

Please do not staple

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stamp
here

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CH-1701 Fribourg
Switzerland

Attn : Technical Documentation Dept. (I / M)