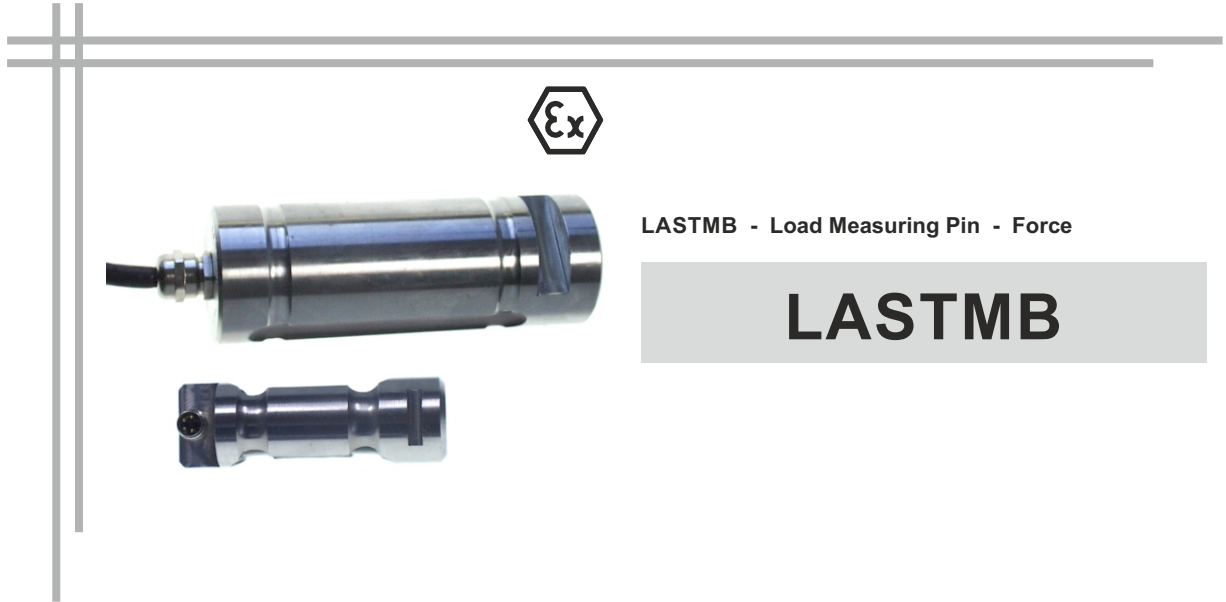


# Operating Manual



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**● Content**

1	General (Information, Signs and Abbreviations)	3
2	Transport, Packaging, Storage	3
3	Safety Instructions	4
4	Start-Up, Operation	6
4.1	Function	6
4.2	Before Mounting	6
4.3	Mounting	7
4.4	Electrical Start-Up	9
4.5	Supply Voltage	10
4.6	Electrical Connection	10
4.7	Function Test / Fault Detection	10
5	Fault Recovery	11
6	Maintenance, Dismounting, Return, Cleaning, Disposal	12
7	Technical Data	13
8	Dimensions	14

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## ● 1 General

### 1.1 Information

- This operating manual gives important handling instructions for the LASTMB load measuring pin. Compliance with all safety and handling instructions in this manual is a requirement for safe work.
- This operating manual must be read and understood by qualified personnel before mounting and start-up of the load measuring pin.
- This operating manual is part of the product. Please keep this manual at a place accessible for all users and on-site.
- Please comply with the local regulations and safety instructions for the field of application of the LASTMB. Please comply with the specifications on product label and test certificate.
- If the serial number on the product label becomes illegible (e. g. through mechanical damage), traceability can not be ensured.
- The load measuring pin LASTMB described in this manual is carefully designed and manufactured using state-of-the-art technology. Every component undergoes strict quality inspection in all stages of manufacture.
- The manufacturer's liability is void in the case of any damage caused by using the product contrary to its intended use, non-compliance with these operating instructions, unauthorised modifications to the LASTMB or assignment of insufficiently qualified skilled personnel.

### 1.2 Signs and Abbreviations



#### **Warning!**

Non-compliance can cause injuries to persons and/or the demolition of the device. There can be a danger to life.



#### **Attention!**

Non-compliance can cause faulty device operation or lead to property damage.



#### **Information!**

Non-compliance can influence device operation or cause unintentional reactions.

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## ● 2 Transport, Packaging, Storage

### 2.1 Transport

Check the device for any damage that may have been caused during transportation. Report obvious damage at once.

### 2.2 Packaging

Do not remove packaging until just before mounting. Keep the packaging, as it will provide optimum protection during transport (e.g. change in installation site, returns).

### 2.3 Storage

During long-term storage please avoid:

- Direct sunlight or close proximity to hot objects and surfaces
- Mechanical vibration, mechanical shock (e. g. by rough setup)
- Soot, steam, dust and corrosive gases

If possible, store the device in its original packaging or an equivalent one

### 3 Safety Instructions



Before mounting, start-up and operation please select the correct load measuring pin in terms of function and assembly.



You can find further important safety instructions in the individual chapters.

#### 3.1 Intended Use

The LASTMB is designed only for the intended use as described here and may only be used as intended.

The technical specifications as described in this operating manual are mandatory. Inappropriate handling or operating the device outside of its technical specifications makes an immediate shutdown and inspection by the manufacturer mandatory.

When the device is transported from a cold into a warm environment, condensation can cause a device malfunction. Wait for device temperature and room temperature to equalize before putting the device back into operation.

The manufacturer shall not be liable for claims of any kind based on operation contrary to the intended use.

#### 3.2 Personnel Qualification



##### Risk of injury if qualification is insufficient

Improper handling can lead to considerable property damage and injury.

- The required tasks as described in this operating manual should only be conducted by qualified personnel with qualifications as follows.
- Keep unqualified personnel away from hazardous areas.

For mounting and start-up of the LASTMB the personnel has to be familiar with the relevant regulations and directives of the country and must have the required qualification. They must have knowledge on measurement and control technology, have to be acquainted with electric circuits, have to be capable of carrying out the work described and have to be able to independently recognise potential hazards. Depending on the operational conditions they need to have the corresponding knowledge, e.g. of corrosive media.

#### 3.3 Special Hazards



Please comply with existing codes and regulations of your country (e. g. standards). Additionally for special applications, please comply with the applicable standards and directives.

**Non-compliance with appropriate regulations can cause heavy injuries and property damage!**



Electrostatic discharge (ESD) protection is required.

The proper use of grounded worktops and personal wristbands is required when working with open circuits (PCBs) to prevent damage to sensitive electronic components caused by electrostatic discharge.



Danger to life due to electric current. If live parts are touched, there is an immediate danger of death.

Installation and mounting of electrical equipment may only be carried out by qualified electricians.

Operation with a defective power supply unit (e. g. short-circuit from mains voltage to output voltage) can cause life-threatening voltages on the unit.



Do not use this device in safety or emergency stop installations. Improper use of the device may result in injury.

## ● 3 Safety Instructions (Continued)

### 3.4 Ex-Marking and Approval

Please make sure to read the operating manual before mounting and start-up of the LASTMB load measuring pin.



#### **Danger!**

#### **Danger to life caused by loss of explosion protection**

Non-compliance with these instructions and their contents can lead to loss of explosion protection.

- Observe the safety instructions and further explosion instructions in these operating instructions.
- Follow the requirements of the ATEX-directive.
- Observe the information given in the applicable type examination certificate and the relevant country-specific regulations for installation and use in hazardous areas (e.g. IEC 60079-14, NEC, CEC).

Check whether the classification is suitable for the application. Comply with the relevant national regulations.

#### **Type Overview of European Approvals**

Type	Ex-Marking	Ignition Protection Type
LASTMB LLXXX1XX0-00X	II 1G Ex ia IIC T6	Intrinsically safe equipment

For an explanation of the type code,  
see data sheet, section *Order Code*.

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## ● 4 Start-Up, Operation

### 4.1 Function

LASTMB load measuring pins include a strain gauge full bridge. The sensor signal from the application is changed by a connected measuring amplifier into a standardized signal. The transmitter applies a measuring current to the strain gauge bridge by means of its voltage supply. The output signal of the bridge changes in proportion to the force and can be further processed.

### 4.2 Before Mounting

- - Check if the load measuring pin was delivered in complete assembly.
  - - Inspect the LASTMB for possible damage during transportation. Should there be any obvious damage, inform the transport company and supplier immediately.
  - Keep the packaging, as it offers optimal protection during transportation.
  - Make sure to keep the mounting thread and the connection contacts from being damaged.
  - Check measurement range on application requirements before mounting.
  - Note serial number and installation site of the load measuring pin in your documentation.
  - Never raise or handle the load measuring pin at the cable. Don't overstretch the LASTMB cable!
- 
- - LASTMB load measuring pins are designed with a standard protection class of IP65 (higher classes available as option). Please do not use the load measuring pins in applications with higher protection class requirements.
  - When mounting the device inside a depression, please use protective equipment to prevent the load measuring pin from being soaked in water. (e.g. drain pipe, bilge pump)
  - Please ensure no substances capable of corroding or destroying the load measuring pin are close to the installation site.

## ● 4 Start-Up, Operation

### 4.3 Mounting

- - Check delivery on completeness and visible damage immediately after arrival.
- - If parts are missing or damage is detected, inform the transport company and supplier immediately.

#### 4.3.1 Check-Up of Load Measuring Pin at Installation Site

- - Check the load measuring pin before final mounting. Please take the valid values for a correctly operating LASTMB from the test certificate, the product label or this operating manual.
- Testing the load measuring pin is done as follows:  
(Specified values as given are valid for a LASTMB in standard version.)
  - a) Measure resistance between LASTM-bridge with disconnected amplifier.  
The resistance measured between supply wires has to be approx. 375 Ω.  
(Input resistance)
  - b) Check resistance between load measuring pin body and connection wires. The value, measured by multimeter, has to exceed 3000 MΩ.
  - c) Connect the load measuring pin to the amplifier and measure the voltage at the mV-output. If the pin is not loaded, the voltage at the mV-output has to be approx. 0 mV. If the measured value exceeds 10% of the output signal, the LASTMB needs replacement.
  - d) Repeat the measurement at the mV-output at different load levels, as per the test certificate.

Example:

Sensitivity of load measuring pin:	2 mV/V
Bridge supply of load measuring pin:	10 V
Measurement value of bridge output at zero load (0%):	approx. 0 mV
Measurement value of bridge output with load (100%):	approx. 20 mV
Measurement value of bridge output at 0,5 load (50%):	approx. 10 mV

(At other loads, recalculate values as needed.)

- - Note: Always give type and serial number of the defective load measuring pin when ordering a replacement.

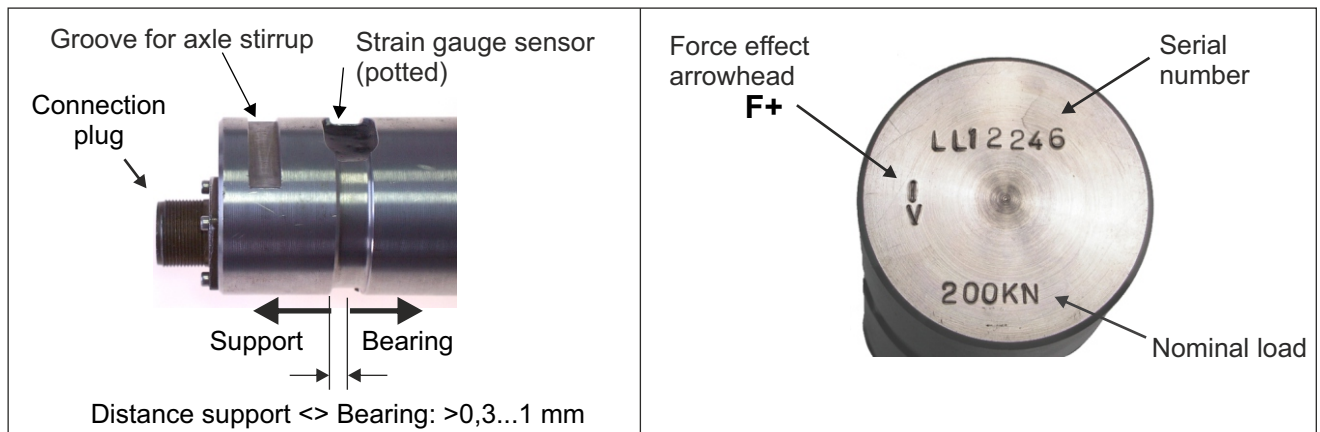
## 4 Start-Up, Operation

### 4.3 Mounting (Continued)

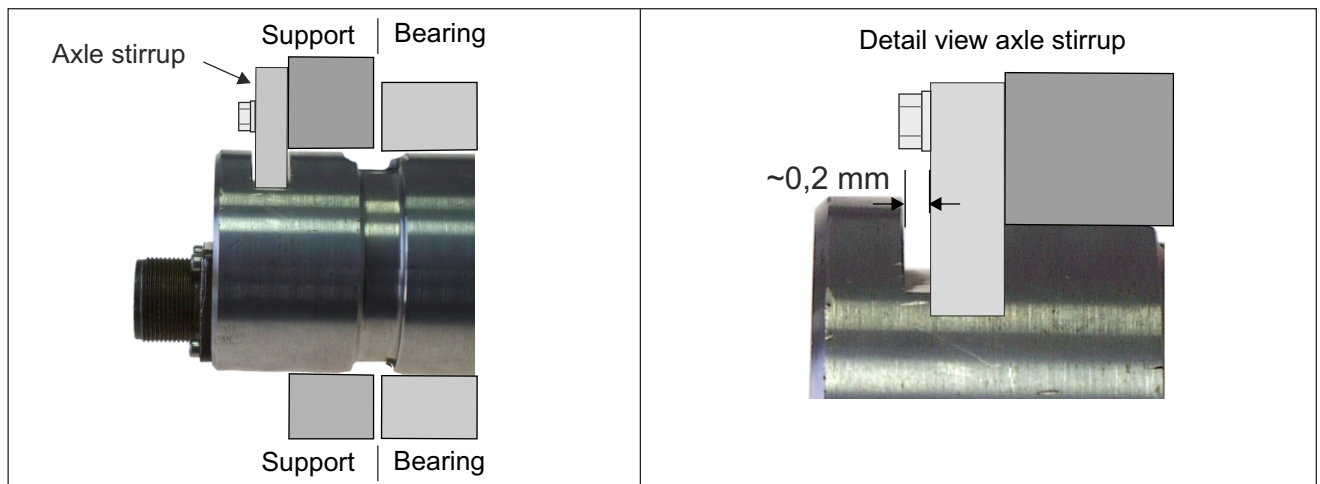
#### 4.3.2 Mechanical Mounting

- When mounting, always handle the load measuring pin with care!
- Do not use heavy tools, as for example, hammers. The LASTMB is a precision instrument.
- Accuracy will be distorted if other forces than the measurable weight forces affect the load measuring pin. **Environmental forces like vibrations, shock, wind forces and temperatures can distort the measurement result or even destroy the load measuring pin.** Please prevent all external influences.
- Only apply forces in effect direction. The effect direction is shown by an arrow on the load measuring pin. If no arrow is available, the effect direction lies vertical to the groove of the axle stirrup.  
**Note:** If you cannot determine effect direction correctly, please contact the supplier of your load measuring pin.

#### Mounting (Diagrams)



Note: For a measurement with highest possible accuracy, it is necessary to sufficiently lubricate all movable parts (e.g. fairleads, rope guides) inside the entire installation.



- The distance between support and bearing can avoid measurement distortions, e.g. distortions caused by friction.
- Avoid use of welding equipment after the LASTMB mounting. Current flow or inductance can destroy the load cell.
- **Note: Replace the load measuring pin during welding work in the closer area with a dummy-pin.** Alternatively, the connection of a flexible ground lead (copper, approx. 1 cm) between upper constructions and lower load cell support can lower the risk of load cell destruction.



## ● 4 Start-Up, Operation

### 4.3 Mounting (Continued)

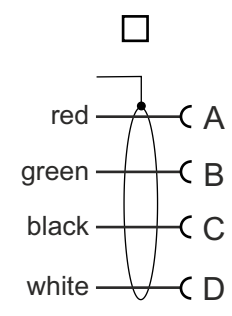
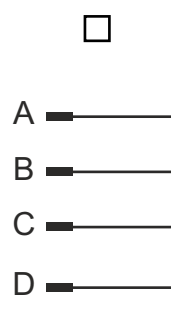
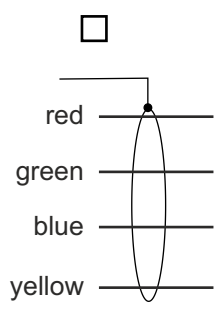
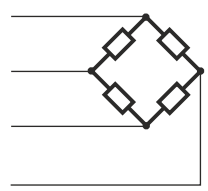
#### 4.3.3 Cable Laying

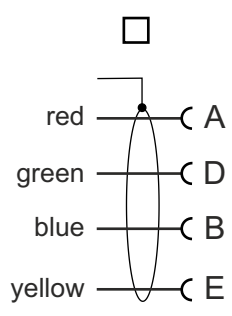
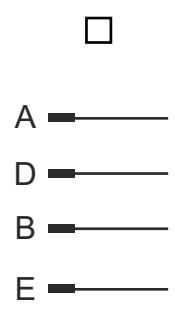

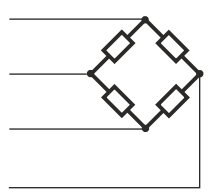
- - If necessary, protect the connection cables with protective piping.
- Lay the load measuring pin cables separately and in appropriate distance from high voltage and load cables.
- If the evaluation is more than 20 m away from the load cell, use a double-shielded extension cable with 4 x 1 mm<sup>2</sup> dimensions and a watertight connection socket.

### 4.4 Electrical Start-Up

- Please follow the connection diagrams below and the connection example on page 10. After connection and wiring, the device is ready for operation.
- ! Only operate the device when mounted. Comply with the temperature restrictions for before and during operation as specified for device operation.

#### Electrical Connection

<b>Shield</b> <b>+ Supply</b> <b>+ Output</b> <b>- Supply</b> <b>- Output</b>				
Connection	MIL-socket with cable (cable assembly)	MIL-plug	Cable	Strain gauge in load measuring pin

<b>Shield</b> <b>+ Supply</b> <b>+ Output</b> <b>- Supply</b> <b>- Output</b>				
Connection	MIL-socket with cable (cable assembly)	MIL-plug	Cable	Strain gauge in load measuring pin

## 4 Start-Up, Operation (Continued)

### 4.5 Supply Voltage



**Danger of electric shock!** Conduct electrical mounting only in dead voltage condition!



**Property damage by electrostatic discharge!**

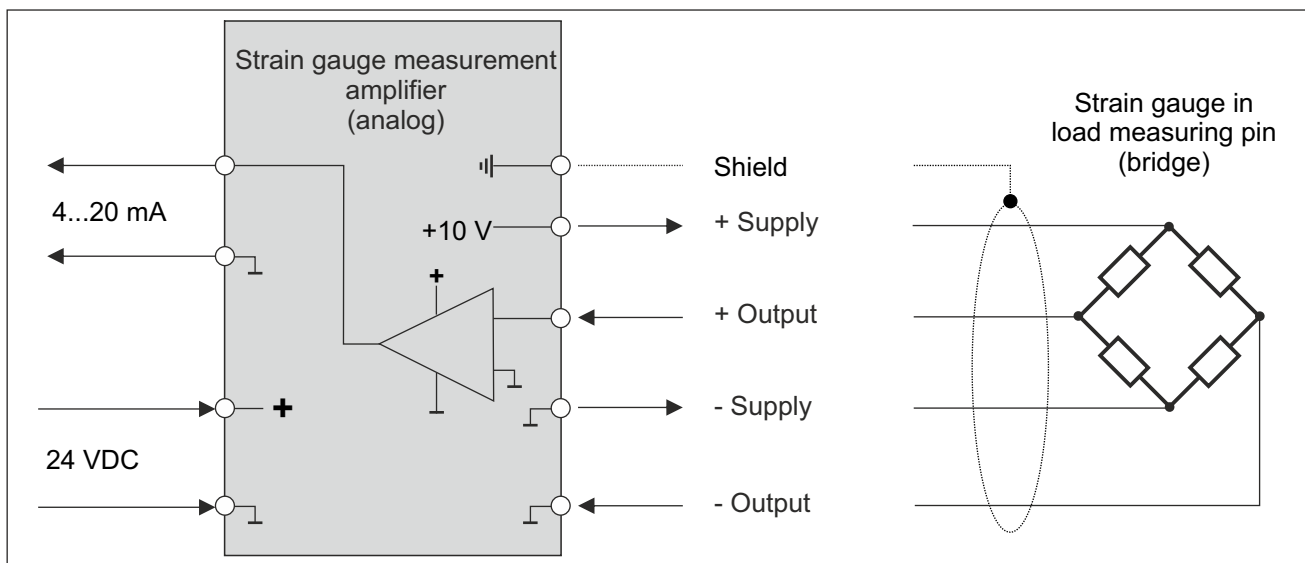
Comply with safety measures as per DIN EN 61340-5-1/-3, to prevent an electrostatic charge build-up!



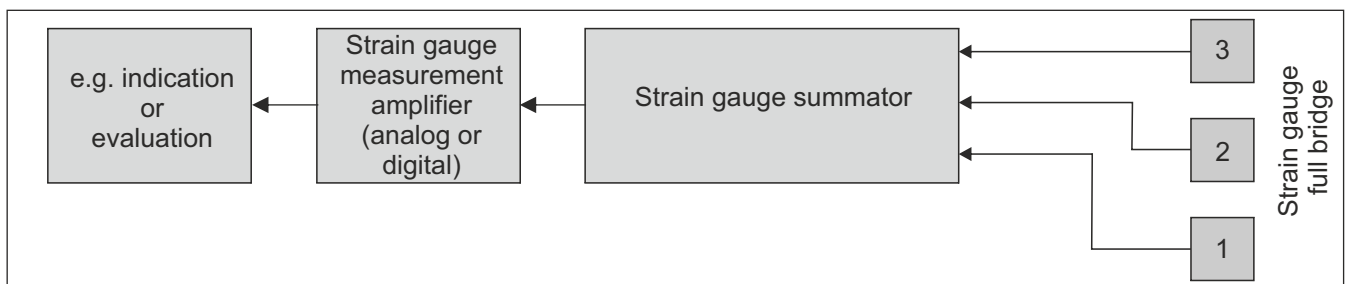
Only qualified personnel is allowed to work on the electronics.

### 4.6 Wiring and Connection Example

#### Connection Example



#### Wiring Example



One installation consists of 3 load measuring pins with one strain gauge full bridge each. The three strain gauge sensors are connected together into one summator. The sum signal will be transferred onto a strain gauge amplifier. The next device downstream will further process the output-signal of the amplifier.



**Notes for the electrical connection:**

The listed information can occasionally deviate from the actual device values. In this case, please comply with the product label! The product label always lists the current information for the specific device.

### 4.7 Function Test and Fault Detection



The output signal has to be proportional to the sensor signal. If not so, it can be a sign for a bad mounting position or a bad adjustment. In this case, please read under chapter 5 *Fault Recovery* (page 11) for further information.

## ● 5 Fault Recovery



Warning

- Only the manufacturer should conduct repairs.



- Do not use pointed, sharp or hard objects for cleaning. The electrical contacts can be damaged.
- Check in advance for the correct selection of voltage supply and wiring type.

Fault	Possible Cause	Measure
No output signal	Cable break No/wrong supply voltage	Check passage Adjust voltage supply as per operating manual
No/wrong output signal	Connection error	Observe pin assignment (see product label / operating manual)
Output signal doesn't change if load or force changes	Strain gauge transducer defect	Replace strain gauge transducer
Unexpected output signal	Device has wrong configuration	Adjust configuration
Unexpected output signal	Strain gauge transducer not suitable or defect	Select correct strain gauge transducer or replace defect device
Signal span erratic / not accurate	EMC interference sources in nearby area, e.g. frequency converter Operating temperatures too high/low, overheating	Shield sensor, shield cable, remove interference source Comply with specified temperatures as per operating manual



Other possible fault sources are:

- Exceeding the overload limit or other forms of mechanical load above the LASTMB-limits.
- Welding work close to the load measuring pin
- Wrong cleaning (see chapter 6.4) and moisture inside of the LASTMB because of sudden temperature changes
- Other chemical effects

Note: Unjustified reclamations can incur additional costs.

Check for correct operation after each system change. If the fault persists, send the load measuring pin in for repairs or replacement.

In case of service: Clean devices before returning. See also chapter 6 for further details.

## ● 6 Maintenance, Dismounting, Return, Cleaning, Disposal

### 6.1 Maintenance

- - The LASTMB load measuring pins are maintenance-free.
- Only the manufacturer is allowed to conduct repairs.

### 6.2 Dismounting

Achieve dead-voltage condition on device. Remove electrical connections. Use chapter 4.3 in reverse.

### 6.3 Return



Warning

Before returning a device, see chapter 6.4

To return a device, use original packaging or similar.

To protect against damage, use anti-static foil, insulating material or identification as sensitive measurement equipment.

### 6.4 Cleaning

Clean the device regularly to prevent increased dust formation on the device. Please keep the electrical contacts nice and clean!



#### **Damage to property!**

Abrasives or corrosive solvents can damage the contacts.

- Switch off and achieve complete dead-voltage condition on device before cleaning.
- Ensure no abrasives or corrosive solvents can touch the contacts.
- Use steam and hot liquids only at environmental temperatures above 0 °C!  
At temperatures below 0 °C, the application of steam and hot liquids causes condensation and can distort measurement results.

### 6.5 Disposal

- Dispose of device components and packaging materials in an environmentally safe manner in accordance with country-specific waste treatment and disposal regulations.
- Collect electrical and electronic parts separately. Separate metals and plastics. Dispose of printed circuit board assemblies professionally.

## ● 7 Technical Data

### Input

Measurement ranges: 0...100 kg up to 0...2000 t  
Input resistance: approx. 375  $\Omega$  (standard version)

### Output

Output signal: 2 mV/V (standard version)  
Output resistance: approx. 350  $\Omega$  (standard version)

### Accuracy

Gross error:  $\pm 0,1$  % of terminal value

### Supply

Supply voltage: max. 28 VDC  
Insulation resistance: > 3000 M $\Omega$  at 10 VDC

### Environmental Conditions

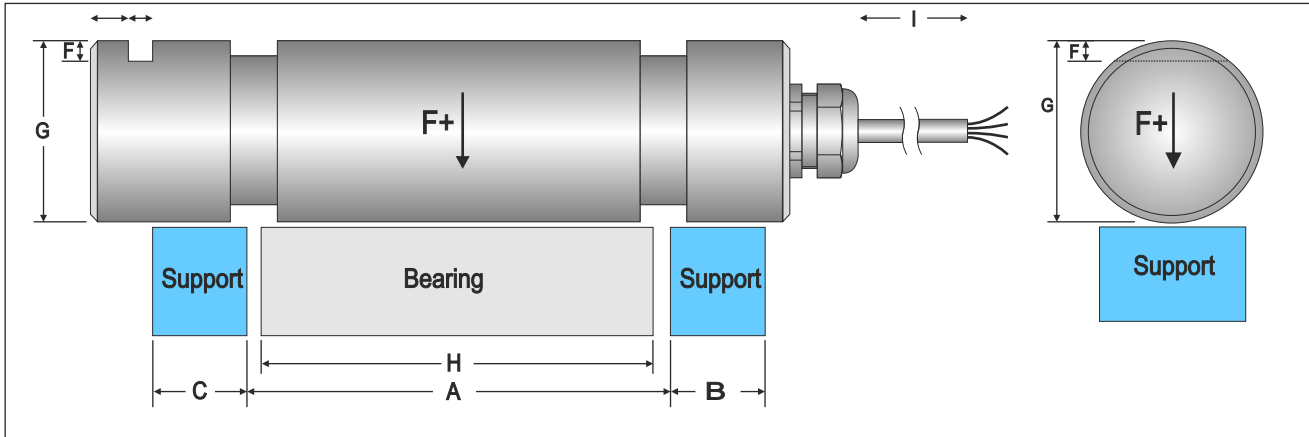
Working temperature: normal operation: -10...+40 °C  
maximal: -20...+70 °C

### Mechanics

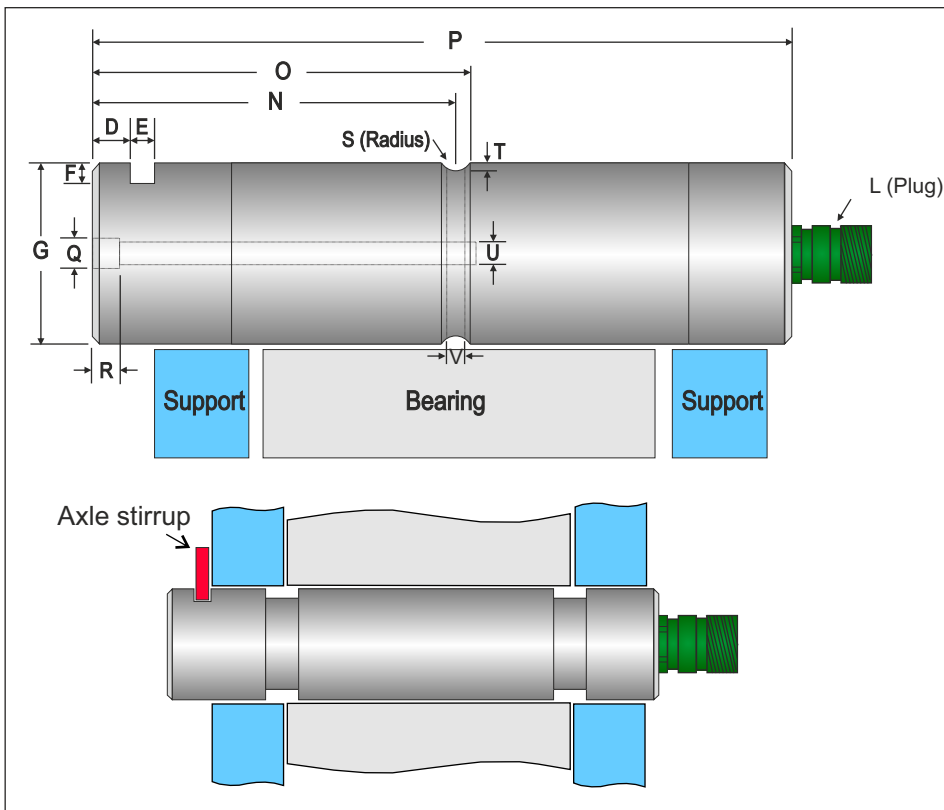
Dimensions: customized, see page 14  
Material: stainless steel Armco 17-4 PH  
Safe overload: 150% of nominal load  
Breaking load: 300% of nominal load  
Protection class: IP65 (standard version)  
IP66...IP68 (options)  
Cable outlet: Radial / Axial  
Electrical connection: cable, plugs (customized, see page 14)

## 8 Dimensions (in mm)

### 8.1 Load Measuring Pin without Lubrication Duct



### 8.2 Load Measuring Pin with Lubrication Duct

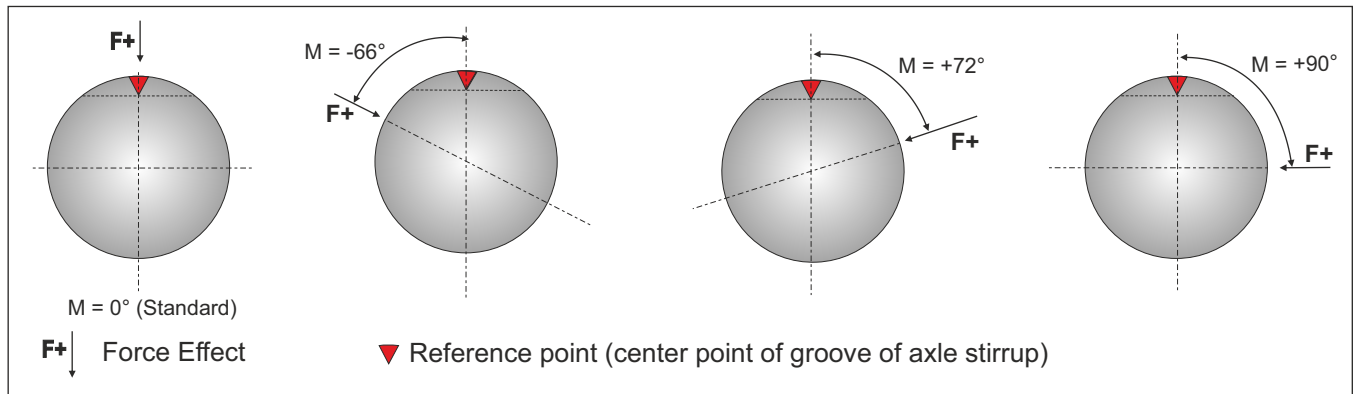


LASTMB load measuring pins are manufactured customizable, every dimension is possible. Electrical connection is realized either with a plug or with a cable connection.

## 8 Dimensions (Continued)

### 8.3 Force Effect

M = Angle of Force Effect (standard = 0°)



The standard version of the LASTMB load measuring pin assumes the force will be applied vertical to the reference point (center point of groove of axle stirrup). If local conditions make this impossible, please specify an angle of deviation.

