



## Installation Instructions LMGZ-Series

Highly precise, stainless steel force measuring bearing

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Bitte kontaktieren Sie Ihre nächstgelegene FMS Vertretung.**

# 1 Table of contents

- 1 TABLE OF CONTENTS ..... 2**
- 2 SAFETY INSTRUCTIONS..... 3**
  - 2.1 Presentation of safety information ..... 3
    - 2.1.1 Danger that could result in minor or moderate injuries..... 3
    - 2.1.2 Note regarding proper function ..... 3
  - 2.2 General safety information ..... 3
- 3 PRODUCT INFORMATION..... 4**
  - 3.1 Product description ..... 4
  - 3.2 Functional description ..... 4
  - 3.3 Overview and designation..... 4
  - 3.4 Order code ..... 5
  - 3.5 Scope of delivery..... 5
- 4 INSTALLATION..... 7**
  - 4.1 Installation conditions ..... 7
  - 4.2 Bearings ..... 7
  - 4.3 Shaft ends ..... 8
  - 4.4 Machine frame ..... 9
  - 4.5 Installation inside the machine frame ..... 11
  - 4.6 Installation Outside the machine frame..... 13
  - 4.7 Mounting brackets ..... 13
  - 4.8 Electrical connections ..... 15
- 5 MAINTENANCE ..... 16**
- 6 TECHNICAL DATA ..... 17**
- 7 DIMENSIONS ..... 18**

## 2 Safety instructions

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to the equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Do not stress the equipment over the specification limits neither during assembly nor operation. To do so can be potentially harmful to persons or equipment in the event of a fault to the equipment.

### 2.1 Presentation of safety information

The following safety symbols appear in this manual.

#### 2.1.1 Danger that could result in minor or moderate injuries



Danger, warning, caution

Failure to follow wiring instructions in this manual may result in equipment damage or personal injury.

#### 2.1.2 Note regarding proper function



Note

Note regarding proper operation

Simplification of operation

Ensuring function

### 2.2 General safety information



The Force Measuring Rollers may not be stressed over the specification limits neither during assembly nor operation. The unit's overload protection value may not be exceeded.



The attachment points for the Force Measuring Rollers on the machine frame must be properly designed. The bearings need to be appropriately mounted.



For proper installation and operation, follow the electrical wiring diagram and instructions in this manual.

## 3 Product information

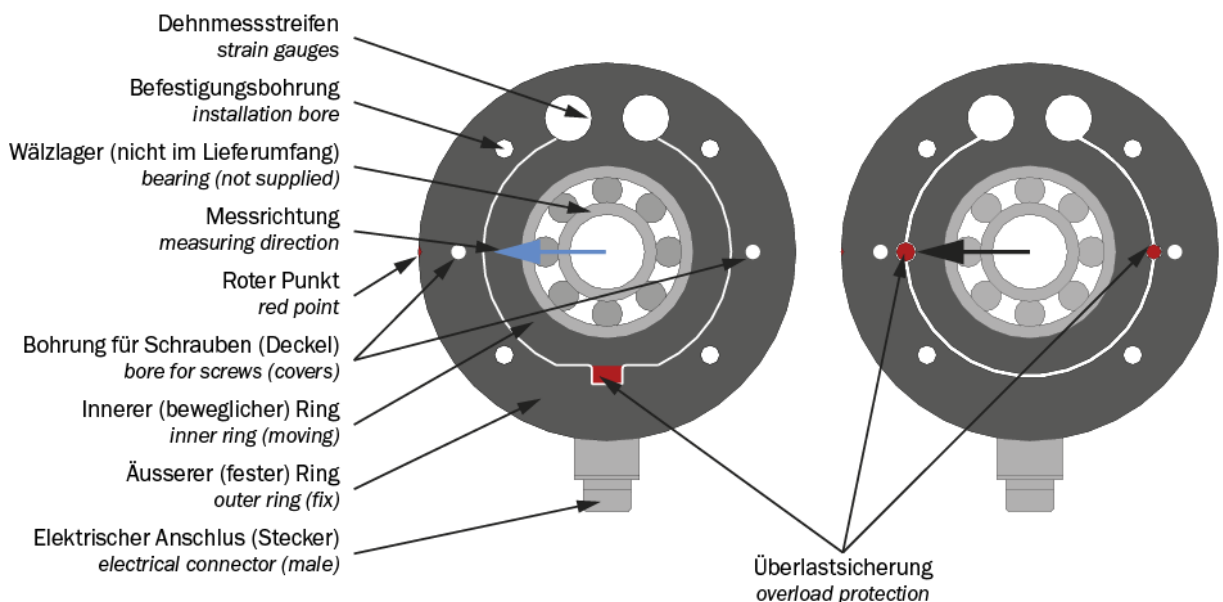
### 3.1 Product description

The force measuring bearings of the LMGZ-Series, designed for the measurement of tension on continuous material processing lines where live shaft idler rolls are utilized. The accuracy class of 0.3 % and the measuring range of 100:1 allows reproducible, highly precise measurements throughout the industry. The mechanical overload protection of up to 20-times the nominal force provides unsurpassed robustness. With the superior performance of the LMGZ-Series, accurate tension readings are obtained even with low web wrap angles and high roll weights. For installations where a Pillow Block mount is required the optional bracket can be utilized.

### 3.2 Functional description

The LMGZ-Series force measuring sensor combines the bearing seat and the force sensor within the same housing, thus minimizing the required installation space. The substantial overload protection translates to eliminated / minimized calibration issues due to machine upset conditions. The movement of the bending beam, which is proportional to the applied force, is detected by strain gauges arranged in a full bridge circuit and then converted into an electrical signal. This simple measurement principle delivers precise results even with low material tension and small web wrap angles. The Red Point, as located on the sensor body, should be aligned with the direction of the resultant force due to web tension.

### 3.3 Overview and designation



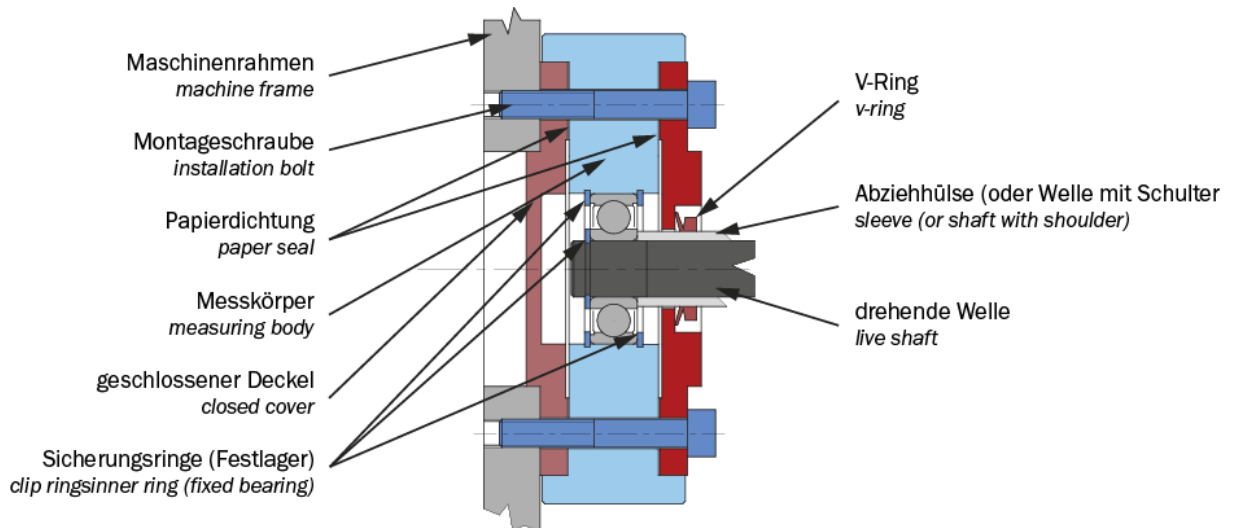


Figure 1: Overview and designation

### 3.4 Order code

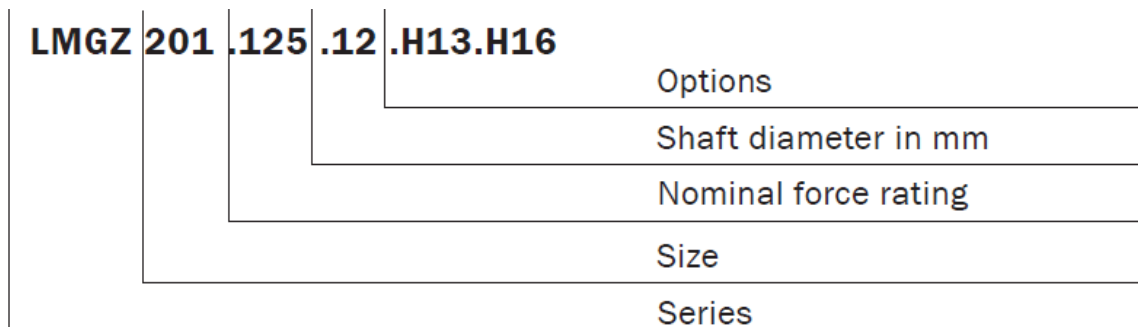


Figure 2: order code

### 3.5 Scope of delivery

#### Included in scope of delivery

force sensor, straight connector (female), open cover, closed cover, V-ring, clip ring, distance ring (for narrower bearing), thinner clip ring (for wider bearing)

#### Options

- H13** open covers for both sides, additional scope of supply 1 pcs. V-ring
- H14** right-angle connector in scope of supply, replaces straight connector
- H15** connector offset 90°, red point on connector side
- H16** temperature range up to 120°C (248°F)
- H18** with water tight, straight connector, replaces original connector
- H19** grease nipple
- H21** electrical connection with PG gland with 5 m (16 ft.) cable, replaces connector

**H29** increase chemical resistance against aggressive media, especially acids (please indicate chemical composition), temperature range up to 120 °C (248 °F)

**H30** increase chemical resistance against aggressive media, especially hydrocarbons and solvents (please indicate chemical composition), temperature range up to 120 °C (248 °F)

**H31** for vacuum applications to 10<sup>-7</sup> hPa , 10<sup>-5</sup> Torr, connector conditionally suitable for vacuum; temperature range up to 120 °C (248 °F)

**H32** for vacuum applications to 10<sup>-7</sup> hPa , 10<sup>-5</sup> Torr, temperature range up to 150 °C (302 °F), with pg-gland and 5 m (16 ft.) cable

**H33** temperature range up to 150 °C (302 °F), with pg-gland and 5 m (16 ft.) cable

#### **Accessories**

**Bearing, installation bracket, prefabricated cable (specify length) with connector (straight or right-angle)**

## 4 Installation

### 4.1 Installation conditions

The Force Measuring Roller are defined as “partly completed machinery” according to the Directives 2006/42/EC, article 2. In order to assure a proper functionality of the parts and assure the essential safety requirements of operators working with it, the following conditions for the assembly must be met:



The Force Measuring Rollers may not be stressed over the specification limits neither during assembly nor operation. The unit's overload protection value may not be exceeded.



The mounting points for the Force Measuring Rollers on the machine frame must be properly designed. The bearings need to be appropriately mounted.



For proper installation and operation, follow the electrical wiring diagram and instructions in this manual.

### 4.2 Bearings

We recommend the use of self-aligning ball bearings or spherical roller bearings.

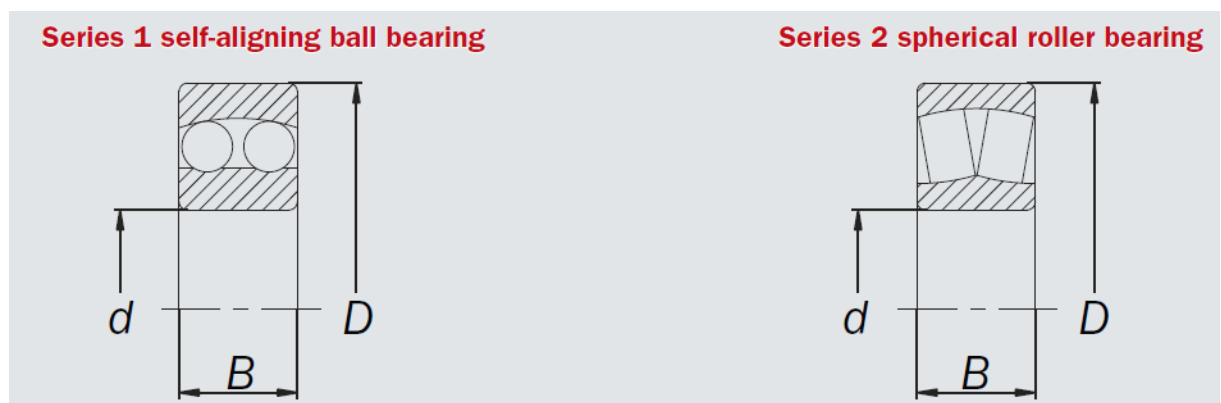


Figure 3: bearing types

LMGZ-Series : Bearings							
Force Sensor	Suitable bearing (bearings must be ordered separate)						
	Type	Series	Dimensions mm (in.)				
Type	Type		d	D	B		
LMGZ200	129	1	9 (0.3543)	26 (1.0236)	8 (0.3150)		
LMGZ201	1201	1	12 (0.4724)	32 (1.2598)	10 (0.3937)		
LMGZ203	1203	1	17 (0.6692)	40 (1.5748)	12 (0.4724)		
LMGZ204	1304	1	20 (0.7874)	52 (2.0472)	15 (0.5906)		
LMGZ205	1205	1	25 (0.9843)	52 (2.0472)	15 (0.5906)		
LMGZ307	1307	1	35 (1.3780)	80 (3.1496)	21 (0.8268)		
LMGZ308	1208	1	40 (1.5748)	80 (3.1496)	18 <sup>1)</sup> (0.7087)		
LMGZ310	1310	1	50 (1.9685)	110 (4.3307)	27 (1.0630)		
	21310	2	50 (1.9685)	110 (4.3307)	27 (1.0630)		
LMGZ312	2212	1	60 (2.3622)	110 (4.3307)	28 <sup>2)</sup> (1.1024)		
	22212	2	60 (2.3622)	110 (4.3307)	28 <sup>2)</sup> (1.1024)		
LMGZ313	1313	1	65 (2.5591)	140 (5.5118)	33 (1.2992)		
	21313	2	65 (2.5591)	140 (5.5118)	33 (1.2992)		
LMGZ316	2216	1	80 (3.1496)	140 (5.5118)	33 (1.2992)		
	22216	2	80 (3.1496)	140 (5.5118)	33 (1.2992)		

1) distance ring, in scope  
 2) thinner clip ring, in scope

Figure 4: Sizes and bearing dimensions

### 4.3 Shaft ends

The shaft ends which receive the inner rings of the rolling bearings must be manufactured as follows.

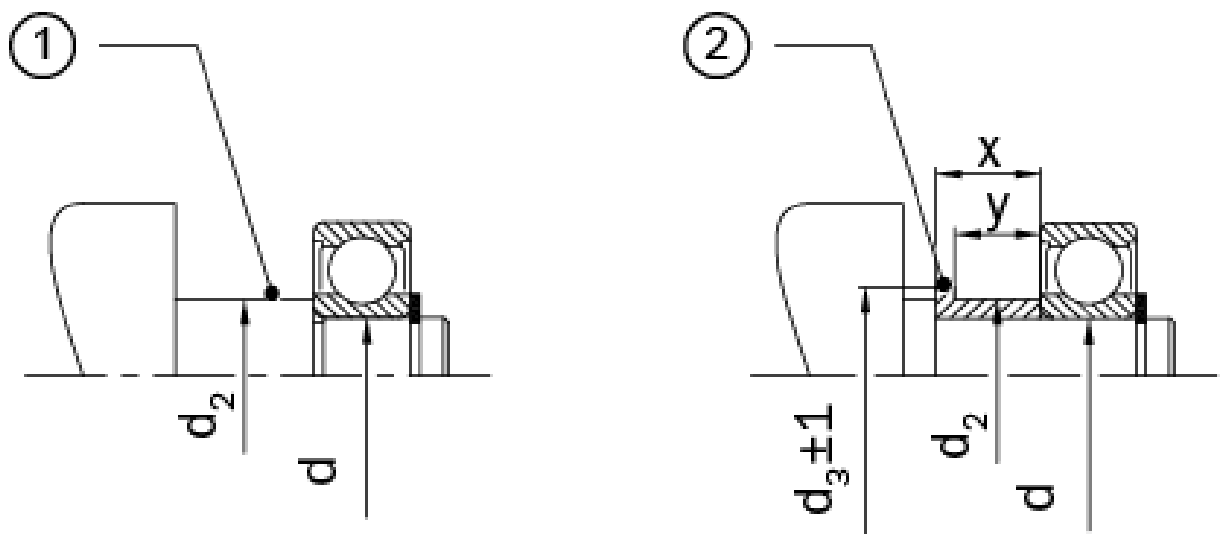


Figure 5: shaft end

- 1 shaft end with shoulder
- 2 Sleeve

#### Dimensions shaft ends (in mm)



<b>Size</b>	<b><math>d</math></b>	<b><math>d_2</math></b>	<b><math>d_3</math></b>
LMGZ200	9	14	24
LMGZ201	12	16	26
LMGZ203	17	22	32
LMGZ204	20	31	41
LMGZ205	25	31	41
LMGZ307	35	44	60
LMGZ308	40	48	60
LMGZ310	50	64	84
LMGZ312	60	70	84
LMGZ313	65	80	100
LMGZ316	80	90	100

The sleeve ensures that the occurring force during the removal of the bearing is only applied to the inner ring of the bearing. The sleeve is not included in the scope of delivery.

If a shaft with shoulder is used, the rolling bearing may be damaged while removing it from the shaft. In that case, a new rolling bearing must be used after each removal.

#### 4.4 Machine frame

The force sensors are centered with a pilot in the machine frame. 4 threaded bore are required for each force sensor.

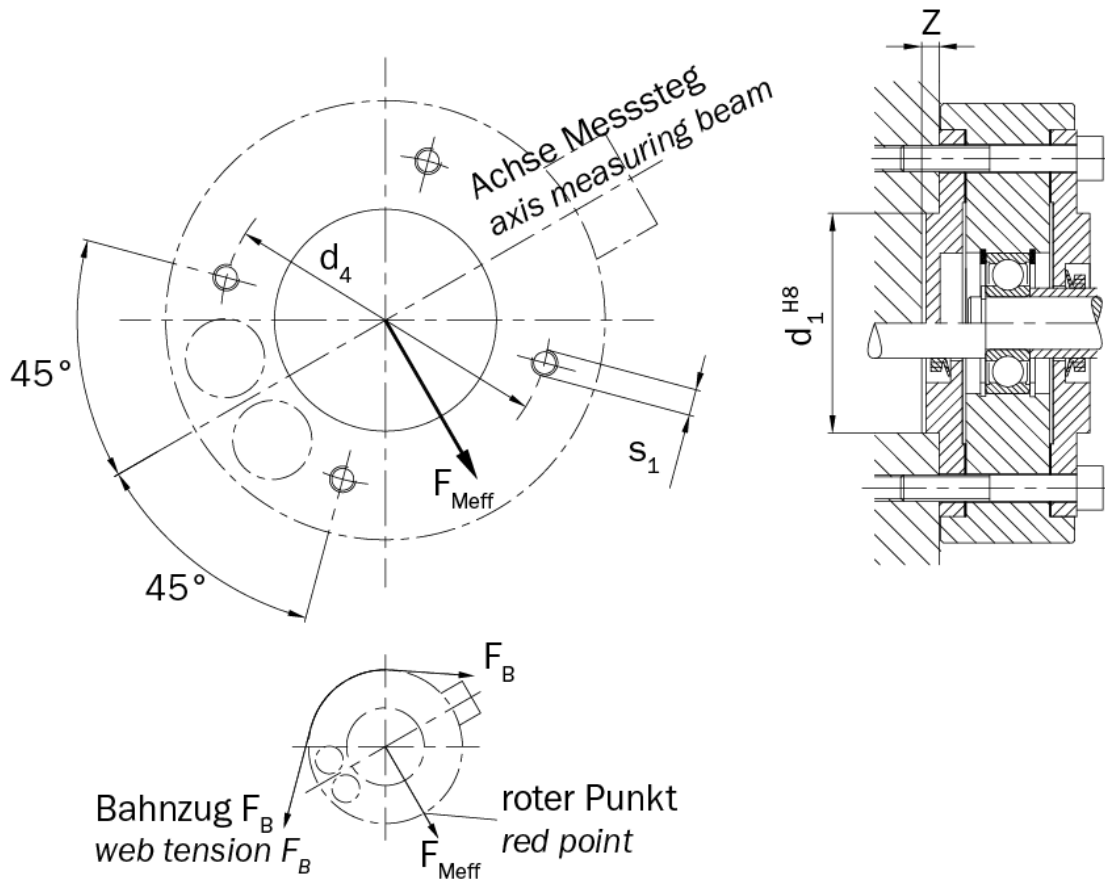
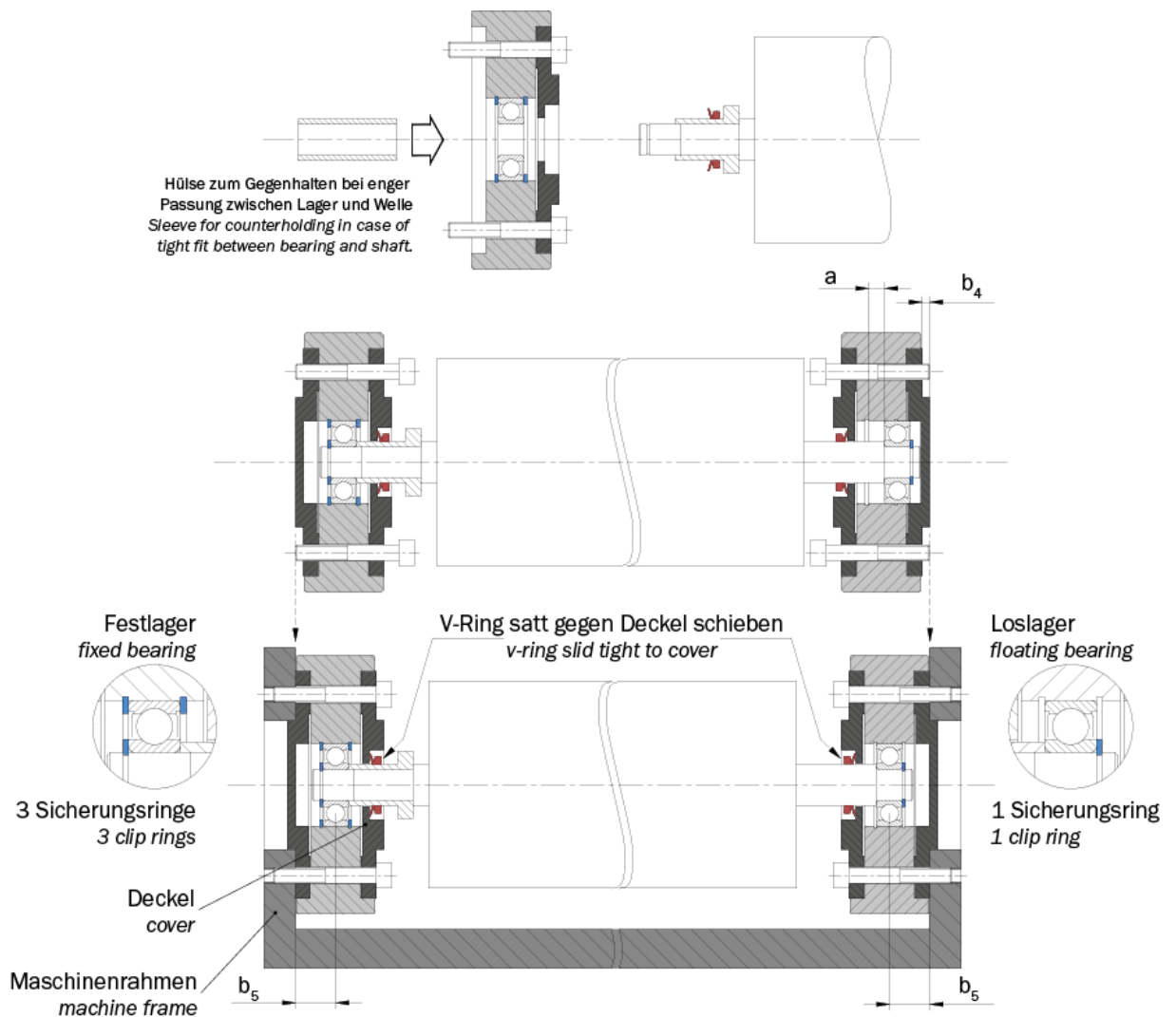


Figure 6: dimensions machine frame

Dimensions machine frame (in mm)					
Size	$d$	$d1$	$d4$	$s1$	$Z$ min.
LMGZ200	9	50	64	M5	4
LMGZ201	12	50	70	M6	4
LMGZ203	17	60	75	M6	4
LMGZ204	20	70	95	M6	5
LMGZ205	25	70	95	M6	5
LMGZ307	35	100	135	M8	5
LMGZ308	40	100	135	M8	5
LMGZ310	50	130	175	M10	5
LMGZ312	60	130	175	M10	5
LMGZ313	65	160	220	M10	5
LMGZ316	80	160	220	M10	5

Table 1: dimensions machine frame

### 4.5 Installation inside the machine frame



**Figure 7: Installation inside the machine frame**

**Dimension «a»**



In the optimum case, the dimension a should be = 0. At maximum the mass a can be

$$a_{Max} = (b_1 - b_2 - 2 * b_4)/2$$

See Dimensions table on page 18



**dimension «b<sub>5</sub>»**

$$b_5 = (b_1 - 2 * b_4)/2$$

See Dimensions table on page 18

### Fixed bearing

- Clean the shaft, check tolerance and cylindric shape of the bearing seat.
- Slide sleeve with v-ring onto to the shaft or slide v-ring onto the shaft end.
- Check for correct orientation of the sealing lip.
- Remove both covers from the force sensor. Types with overload protection with pins: Remove pins, mark them and store them safely.
- Insert bearing into the force sensor.
- Fixate bearing by installing 2 clip rings on each side of the bearing. The second clip ring can be taken from the force sensor of the floating bearing.
- Set open cover and paper seal into the correct side of the force sensor, so that the orientation of red point and connector correspond to the required installation position.
- Insert 4 screws into the force sensor.
- Press the bearing with force sensor onto the shaft. The force should only be applied to the inner ring of the bearing. Use a short length of mild steel tube as tool.
- Fixate the bearing to the shaft with a clip ring.
- Types with overload protection with pins: Insert 2 straight pins into force sensor.
- Mount closed cover and paper seal to the force sensor.
- Fasten the covers with the mounting screws.

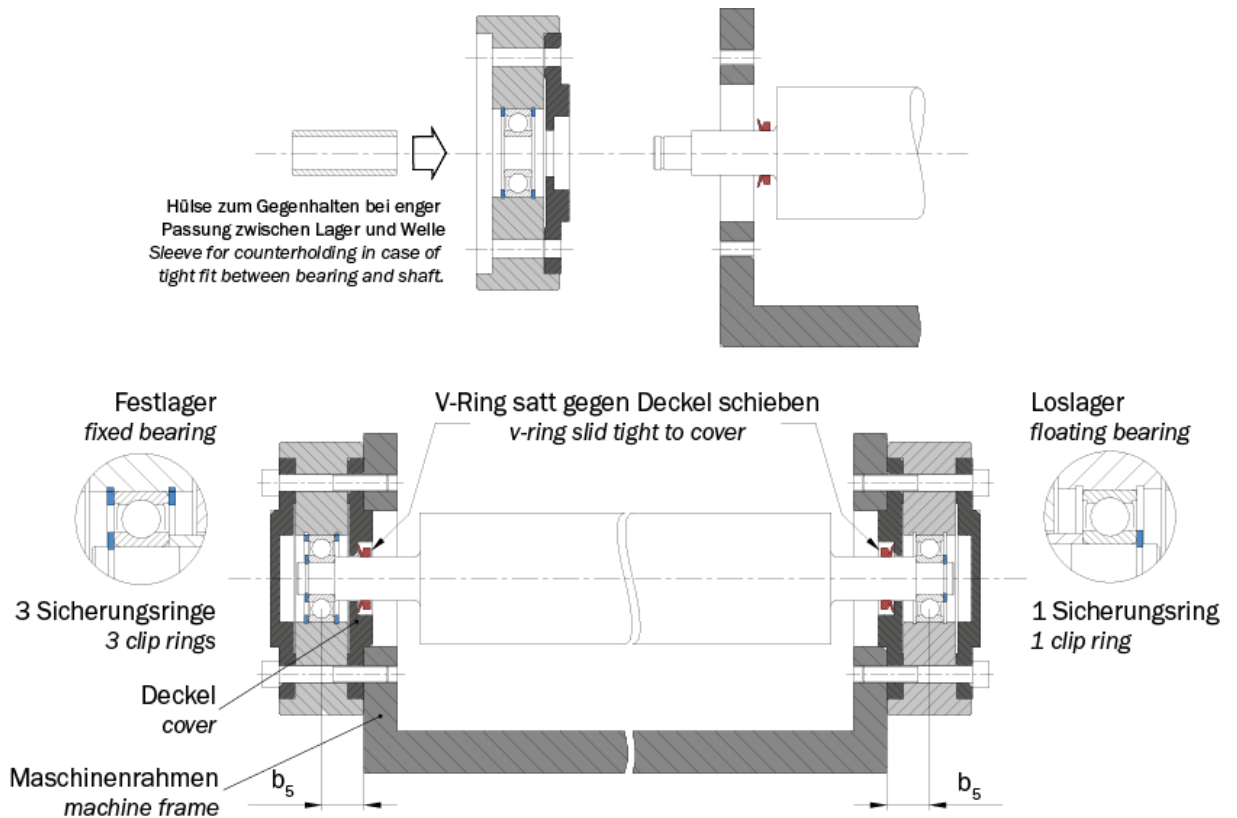
### Floating bearing

- Clean the shaft; check tolerance and cylindric shape of the bearing seat
- Slide sleeve with v-ring onto to the shaft or slide v-ring onto the shaft end.
- Check for correct orientation of the sealing lip.
- Remove both covers from the force sensor. Types with overload protection with pins: Remove pins, mark them and store them safely.
- Remove clip ring from the force sensor. Insert bearing loosely into force sensor.
- Set open cover and paper seal into the correct side of the force sensor, so that the orientation of red point and connector correspond to the required installation position.
- Insert 4 screws into the force sensor.
- Press the bearing with force sensor onto the shaft. The force should only be applied to the inner ring of the bearing. Use a short length of mild steel tube as tool.
- Fixate the bearing to the shaft with a clip ring.
- Types with overload protection with pins: Insert 2 straight pins into force sensor.
- Mount closed cover and paper seal to the force sensor.
- Fasten the covers with the mounting screws.

### Inserting the roll in the machine frame

- Slide floating force sensor towards the roll as far as possible
- Insert roll with force sensors into the machine frame.
- Align fixed bearing force sensor in regards of the orientation of the red point and place shoulder into the pilot.
- Tighten 4 screws.
- Align floating bearing force sensor in regards of the orientation of the red point and place shoulder into the pilot.
- Tighten 4 screws.
- Check for free spinning roll.
- Slide the two v-rings tight to the opened covers.

## 4.6 Installation Outside the machine frame



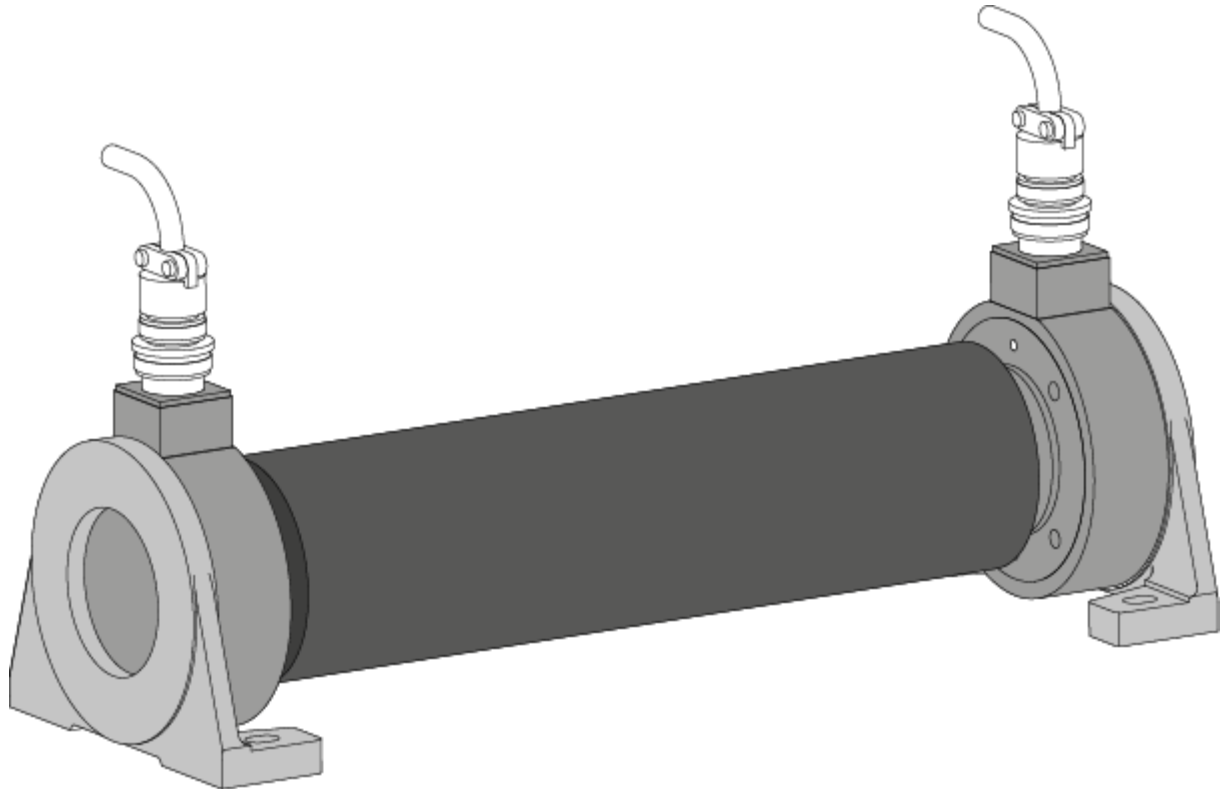
**Figure 8: Installation outside the machine frame**

First, place the roll in the machine frame and shift it at the appropriate position.

The other installation steps are similar to the installation inside.

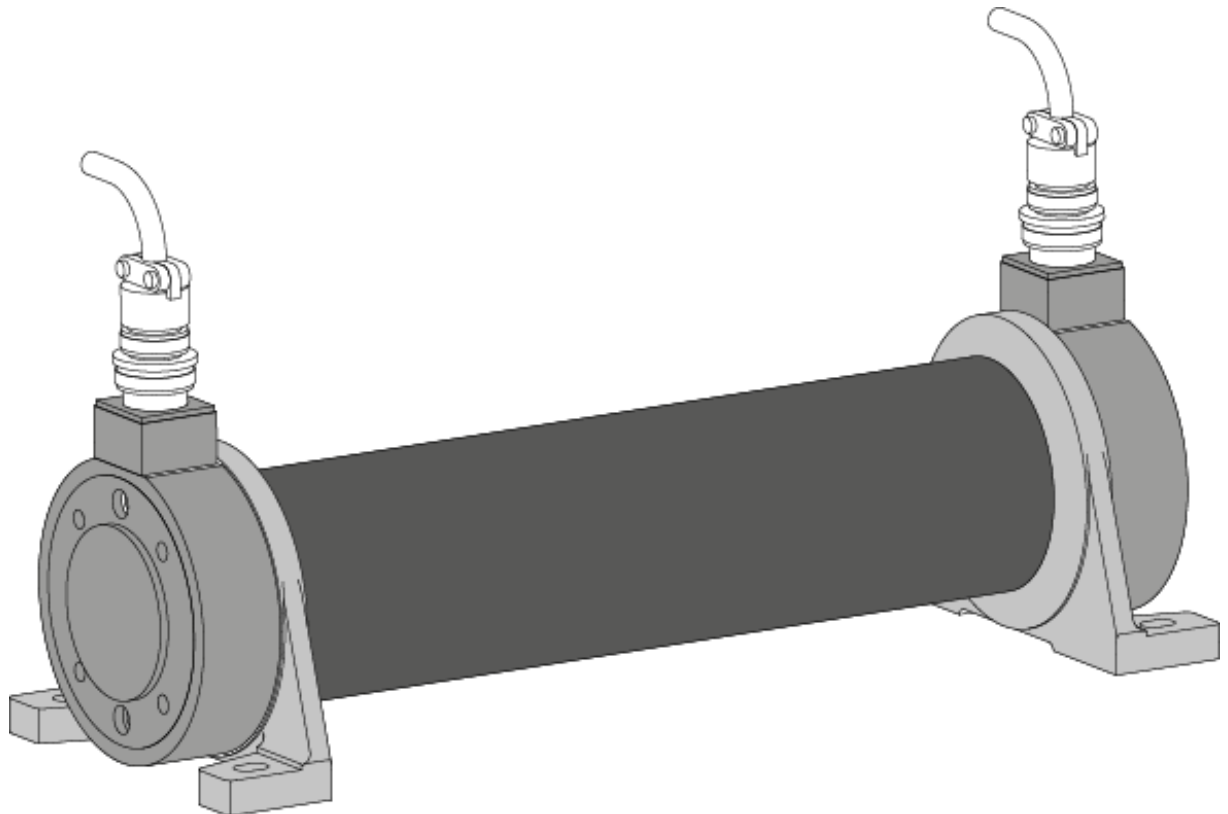
## 4.7 Mounting brackets

Mounting brackets GMGZ are available as accessories for the LMGZ-series.



**Figure 9: bracket installation inside**

- The force sensors are mounted to the roll as described earlier
- The brackets are mounted to the force sensors with 4 screws each
- The completely assembly is installed on the machine frame.



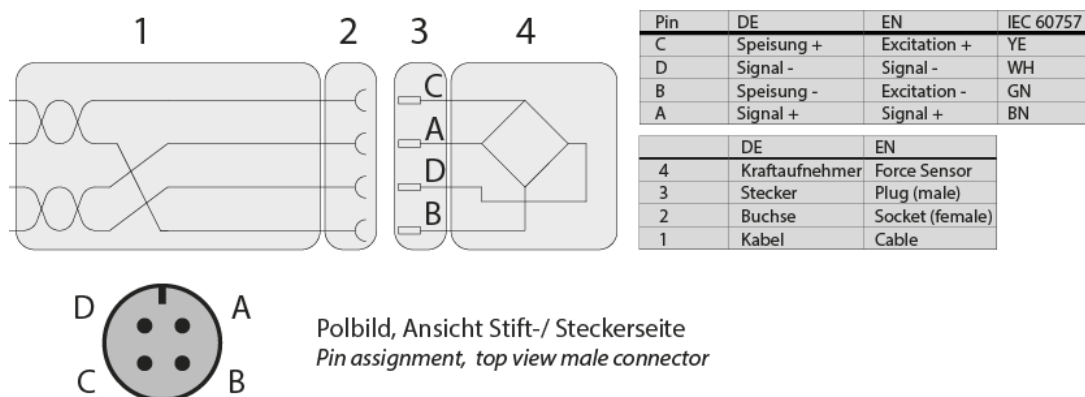
**Figure 10: bracket installation outside**

- Slide the brackets onto the roll
- The force sensors are mounted to the roll as described earlier
- The brackets are mounted to the force sensors with 4 screws each
- The completely assembly is installed on the machine frame.

## 4.8 Electrical connections

Connection between force sensor and measuring amplifier is realized by means of a 2 x 2 x 0.25mm<sup>2</sup> shielded, twisted-pair cable. The cable must be installed separate from power lines.

Connect the shielding only on the side of the measuring amplifier.



Farbangaben (IEC60757) und Codierung gelten nur für FMS Komponenten!  
 Color scheme (IEC60757) and pin codes are valid for FMS components, only!

**Figure 11: pin assignment Amphenol 4-pole**

## 5 Maintenance

FMS force sensors are maintenance free. Depending on the applied type of bearing, it may be necessary to re-lubricate them.

Therefore, the closed covers have to be removed.

If the force sensors are installed inside, the complete roll has to be removed from the machine to access the closed covers.



## 6 Technical data

Technical data	
Sensitivity	1.8 mV/ V
Tolerance of sensitivity	< $\pm 0.2$ %
Accuracy class	$\pm 0.3$ % ( $F_{Nom}$ )
Measuring range	100:1
Temperature coefficient	$\pm 0.1$ % / 10 K
Temperature range	-10 bis +60 °C
Protection class	IP42
Input resistance	350 $\Omega$
Power supply	1 bis 10 VDC
Overload protection	20-times nominal force
Max. axial load	20 % of nominal force
Material	Stainless steel
Electrical connection	Male flange connector Amphenol, 4-pole

Table 2: technical data

# 7 Dimensions

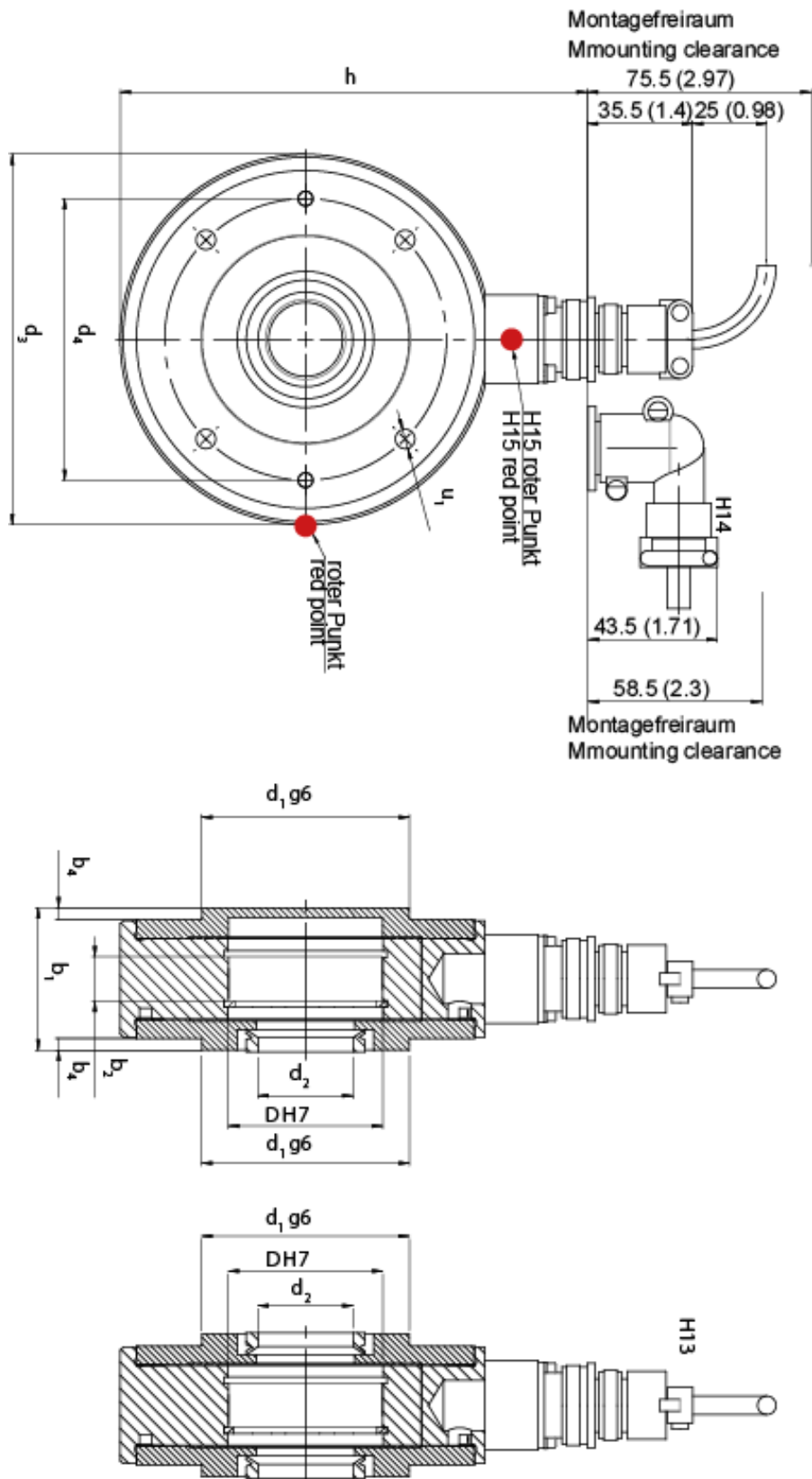


Figure 12: dimensions

<b>LMGZ-Series : Dimensions</b>										
<b>Size</b>	<b>D</b>	<b>d1</b>	<b>d2</b>	<b>d3</b>	<b>d4</b>	<b>b1</b>	<b>b2</b>	<b>b4</b>	<b>h</b>	<b>u</b>
Type	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)	mm (in.)
LMGZ 200	26 (1.02)	50 (1.97)	14 (0.55)	94 (3.70)	64 (2.52)	37 (1.46)	8 (0.31)	3 (0.12)	126 (4.96)	5.5 (0.22)
LMGZ 201	32 (1.26)	50 (1.97)	16 (0.63)	100 (3.94)	70 (2.76)	37 (1.46)	10 (0.39)	3 (0.12)	132 (5.20)	6.6 (0.26)
LMGZ 203	40 (1.57)	60 (2.36)	22 (0.87)	105 (4.13)	75 (2.95)	37 (1.46)	12 (0.47)	3 (0.12)	137 (5.39)	6.6 (0.26)
LMGZ 204	52 (2.05)	70 (2.76)	32 (1.26)	125 (4.92)	95 (3.74)	48 (1.89)	15 (0.59)	4 (0.16)	157.5 (6.20)	6.6 (0.26)
LMGZ 205	52 (2.05)	70 (2.76)	32 (1.26)	125 (4.92)	95 (3.74)	48 (1.89)	15 (0.59)	4 (0.16)	157.5 (6.20)	6.6 (0.26)
LMGZ 307	80 (3.15)	100 (3.94)	45 (1.77)	175 (6.89)	135 (5.31)	65.9 (2.59)	21 (0.83)	4 (0.16)	207.5 (8.17)	9 (0.35)
LMGZ 308	80 (3.15)	100 (3.94)	50 (1.97)	175 (6.89)	135 (5.31)	65.9 (2.59)	18 (0.71)	4 (0.16)	207.5 (8.17)	9 (0.35)
LMGZ 310	110 (4.33)	130 (5.12)	65 (2.56)	225 (8.86)	175 (6.89)	75.9 (2.99)	27 (1.06)	4 (0.16)	258 (10.16)	11 (0.43)
LMGZ 312	110 (4.33)	130 (5.12)	70 (2.76)	225 (8.86)	175 (6.89)	75.9 (2.99)	28 (1.10)	4 (0.16)	258 (10.16)	11 (0.43)
LMGZ 313	140 (5.51)	160 (6.30)	80 (3.15)	270 (10.63)	220 (8.66)	80.9 (3.19)	33 (1.30)	4 (0.16)	303.5 (11.95)	11 (0.43)
LMGZ 316	140 (5.51)	160 (6.30)	90 (3.54)	270 (10.63)	220 (8.66)	80.9 (3.19)	33 (1.30)	4 (0.16)	303.5 (11.95)	11 (0.43)

**Figure 13: dimensions**

*Datasheet\_LMGZ\_series.indd*



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