



# **Installation Manual**

## **AA203 special version 590522**

**Force Measuring Sensor for Tension Measurement with  
Adapter for Dead Shaft**

Version 0.0      11/2015 NS



**Diese Montageanleitung ist auch in Deutsch erhältlich.  
Bitte kontaktieren Sie Ihren nächstgelegenen FMS Vertreter.**

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# 1 Safety Instructions

All safety related regulations, local codes and instructions that appear in the manual or on the 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 specified limits neither during assembly nor operation.

## 1.1 Description Conditions

### a) Danger of health injury or loss of life



#### **Danger**

*This symbol refers to high risk for persons to get heavily injured or to loss of life. It has to be followed strictly.*

### b) Risk of damage to machines



#### **Caution**

*This symbol refers to information, that, if ignored, could cause heavy mechanical damage. This warning has to be followed absolutely.*

### c) Note for proper function



#### **Note**

*This symbol refers to an important information about proper use. If not followed, malfunction can be the result.*

## 1.2 List of Safety Instructions



*The force measuring sensor may not be stressed over the specified limits neither during assembly nor operation. The unit's overload protection value may not be exceeded.*



*The attachment points for the force measuring sensors on the machine frame must be properly designed. The surfaces must be strong and rigid. Bending and twisting of the material will cause false signals from the sensor or prevent it from returning to zero.*



*To avoid ground loops and hence electrical interferences, the cable shield needs only to be connected to the measuring amplifier. On the sensor side the shield must remain open.*

## 2 Product Information

This force measuring sensor is for use in dead shaft roller applications.  
The red point on the sensor body indicates the positive measuring direction.

### 2.1 Dimensions

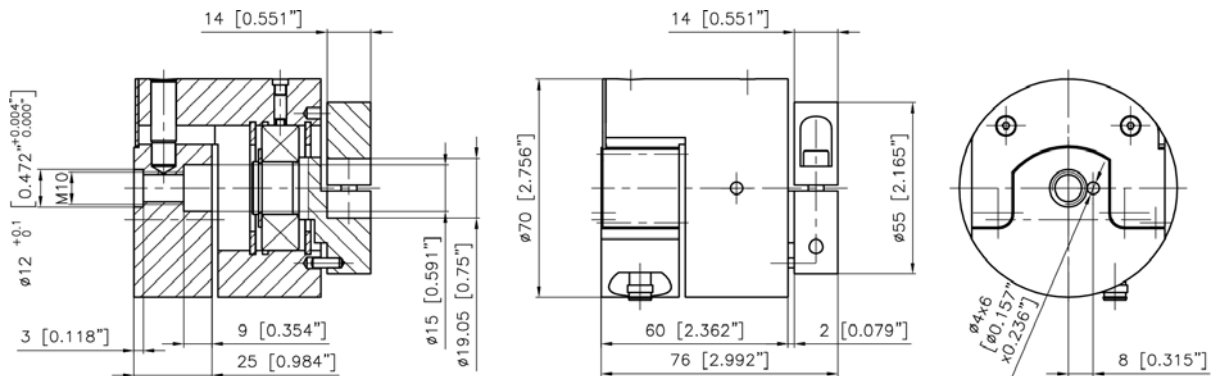


Figure 1: Dimensions

### 2.2 Product Range AA203-Series

Force Sensor Order Code	Nominal Force [N]	Nominal Force [lbf]
AA203.250DI075.590522	250	56.2

### 2.3 Scope of Supply

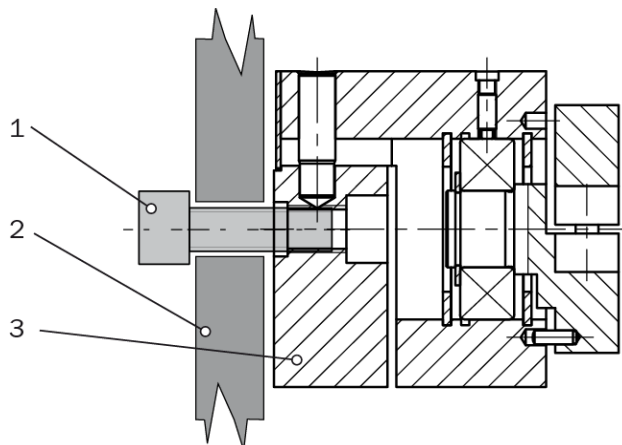
Force sensor including bearing and adapter, installation manual, 2 pcs. feeler gauges

**Not included:**

Mounting screw, sensor cable

## 3 Installation

### 3.1 Installation of the sensors to the machine frame



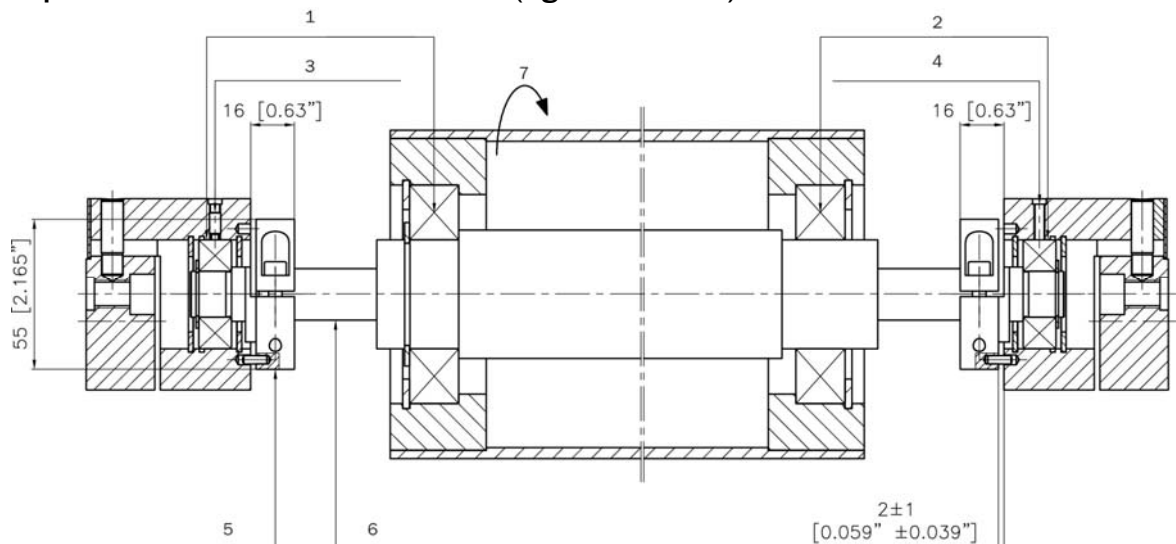
1 - M10 bolt; 2 - Machine frame; 3 - Sensor body

Figure 2: Installation with M10 bolt, length depends on machine frame dimension

1. Use an M10 bolt (not included, length depending on machine frame) to hold the sensor in place. Do not fully tighten the bolt at this moment.
2. Adjust angle and alignment of the red point as desired to the positive direction of the measuring force.
3. Fully tighten M10 bolt to secure position of the sensor.
4. As you have aligned the red point correctly, you might want to rotate the adapter for easier access to the shaft clamp. Please note that when properly installed, the web tension will force the roller shaft against the shaft coupling, not the clamp.
5. If you slightly tilt the adapter the indexing pin will be unlocked
6. There are 4 possible positions at a 90 deg. angle in which you can lock the adapter.

### 3.2 Installation of the roller / Bearing configuration

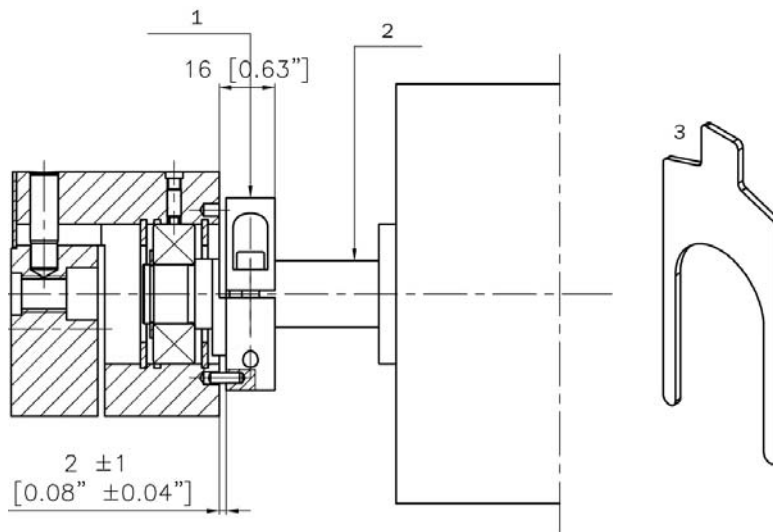
Assembly of the measuring roller with the force sensors is carried out as a fixed-floating-bearing arrangement. The shaft is locked axially in the fixed bearing. This is achieved by tightening a threaded pin as shown in below figure on the left hand side. The floating bearing compensates for possible length variations caused by thermal expansion or mechanical tolerances (right hand side).



- 1 - fixed bearing side; 2 - floating bearing side; 3 - threaded pin, fixed; 4 - without threaded pin; 5 - adapter with clamp shell on top; 6 - roller shaft fitting to adapter; 7 - rotating roller

**Figure 3: bearing configuration, roller assembly**

### 3.3 Alignment of the adapter



1 - adapter with shaft clamp; 2 - static roller shaft, clamped in adapter; 3 - feeler gauge

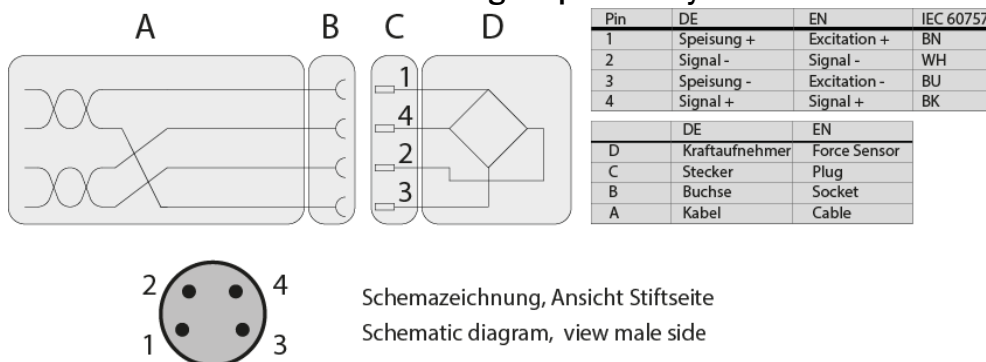
Figure 4: installing and adjusting the roller assembly

1. The axial play must be  $2\text{mm} \pm 1\text{mm}$  ( $0.08'' - 0.04''$ ). This will provide the needed gap for movement due to thermal expansion.
2. Use the enclosed feeler gauge to set the gap to the right dimension
3. Insert a feeler gauge on each sensor between the adapter and the sensor body.
4. Slightly press the adapter against the feeler gauge on the fixed bearing side.
5. Tighten the threaded pin and remove the feeler gauge on this side.
6. Disassemble the shaft clamps and insert the roller into the adapters.
7. If there is axial play between the roller and the adapters, centre the roller in the adapters.
8. Install the shaft clamp on the fixed bearing side and tighten it.
9. Slightly press the adapter on the floating bearing side against the feeler gauge.
10. Install the shaft clamp on this side and tighten the screws.
11. Make sure the roller is turning smoothly.

## 4 Electrical Connection

Use a  $4 \times 0.25\text{mm}^2$  [AWG 23] cable to connect the force measuring sensor with the amplifier. This cable must be installed away from power lines.

Connect the shield to the measuring amplifier only.



Farbangaben und Codierung gelten nur für FMS Komponenten!  
Colour scheme and pin codes are valid for FMS components, only!

Figure 5: Wiring

## 5 Maintenance / Disassembly

### 5.1 Maintenance

All FMS force measuring sensors are maintenance-free. Depending on the type of bearing used, it may be necessary to periodically lubricate the bearings.

### 5.2 Disassembly

The disassembly of the Force Measuring Sensors is done by reversing the order of the assembly procedure.



#### Note

*The self-aligning ball bearings can be pulled-off by using a bearing puller.*



#### Note

*Despite of all reasonable precautions the self-aligning ball bearings could be damaged when pulled-off from the shaft. FMS therefore recommends the replacement of bearings whenever they are removed.*

## 6 Design and Functionality

### 6.1 Functional Description

The force measuring sensors are based on a dual flexion beam design with mechanical hard-stop for high overload protection. Foil type strain gauges mounted in a full Wheatstone -bridge configuration in each sensor perform the actual tension measurement. The dual flexion beam design eliminates angular deflection and load dependent torque effects. It ensures tension measurement with the highest accuracy and reliability under the most stringent requirements. Even with low material wrap angles and high roller weights, tension will still be measured accurately.

The built in mechanical hard-stop provides high overload protection and ensures that frequent calibration is not required.

### 6.2 Technical Specification

<b>Sensitivity</b>	1.8mV/V $\pm$ 2%
<b>Accuracy class</b>	$\pm$ 0.5% (of $F_{nominal}$ )
<b>Force Measuring Range</b>	20 : 1
<b>Temperature coefficient</b>	$\pm$ 0.1% / 10K
<b>Temperature range</b>	-10...+60 °C [14...+140 °F]
<b>Input resistance</b>	350 $\Omega$
<b>Supply voltage</b>	1...12 VDC
<b>Protection Class</b>	IP 42
<b>Electrical Connector</b>	M8-connector
<b>Overload Protection</b>	10 times (of $F_{nominal}$ )
<b>Weight</b>	0.8 kg, [1.75 lbs]
<b>Sensor Material</b>	Special aluminum alloy



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