Installation Instructions

CA-Series

Compact force sensors with flexible installation options for use with dead shaft rolls

Document Version  2.00
Issue Date / Author  11/2019 / NS

Diese Bedienungsanleitung ist auch in Deutsch erhältlich. Bitte kontaktieren Sie Ihre nächstgelegene FMS Vertretung.

© by FMS Force Measuring Systems AG, CH-8154 Obergland – Alle Rechte vorbehalten.
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 Scope of delivery ................................................................................................................................ 4
   3.4 Order code ......................................................................................................................................... 5
4 INSTALLATION .......................................................................................................................................... 6
   4.1 Installation options ............................................................................................................................. 6
      4.1.1 PH Pilot mount ............................................................................................................................ 7
      4.1.2 FL Flat mount ................................................................................................................................ 7
      4.1.3 Installation bracket CA203.MB (accessory) ................................................................................ 8
   4.2 Bearings ............................................................................................................................................. 8
   4.3 Installation sequence .......................................................................................................................... 8
   4.4 Electrical connections ......................................................................................................................... 9
5 TECHNICAL DATA .................................................................................................................................. 10
   5.1 Dimensions ...................................................................................................................................... 11
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 regarding proper operation
Simplification of operation
Ensuring function

2.2 General safety information

The force sensors 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 sensor 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 CA-Series force measuring sensor offers compact dimensions and flexible installation options, and is designed for the measurement of tension on continuous material processing lines where dead shaft idler rolls are utilized. The product can be supplied with a Pilot or without a Pilot at the back of the unit. In addition, flexible mounting options include the ability to install the unit utilizing either four fasteners from the front or a single fastener from the rear. The included dowel pin can also be incorporated between force measuring bearing and the machine frame to ensure proper unit orientation. For installations where a Pillow Block mount is required the optional bracket can be utilized. Adapter diameters are available in various dimensions, in metric as well as in imperial sizes.

3.2 Functional description

The CA-Series force measuring sensor combines the bracket for the dead shaft idler roll 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 design includes dual bending beams, and this serves to eliminate the load specific influence of torque. The movement of the bending beams, 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 Scope of delivery

Included in scope of delivery
force sensor, straight connector (female), setting gauge, installation option PH: 4 pcs. DIN912 M6 x 40, installation option FL: dowel pin

Options
H14 right-angle connector in scope of supply, replaces straight connector
H16 temperature range up to 120 °C (248 °F)
H21 electrical connection with PG gland with 5 m (16 ft.) cable, replaces connector
H31 for vacuum applications to 1E-7 hPa , 1E-5 Torr, temperature range up to 120 °C (248 °F)
H32 vacuum to 1E-7 hPa , 1E-5 Torr, 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
PH Flange mount with 4 screws, pilot hole for centering
FL Flat face of force sensor, without shoulder, single screw mount, with dowel pin
3.4 Order code

*Figure 1: order code*  
*Datasheet_CA-Series.indd*
4 Installation

Force sensors 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 sensor 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 sensor 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.

4.1 Installation options

The force sensors of the C-series can be installed in two different ways.

Screw down on contact surface

⚠️ The force sensor should only be bolted down where it has contact to the machine frame.

PH - Flansch mit Zentrierschulter
PH - Flange with pilot hole for centering

FL - Flach mit Zentrierstift
FL - Flat with dowel pin

Figure 2: contact surface
4.1.1 PH Pilot mount

Figure 3: Pilot mount

Figure 4: dimension machine frame for PH mount

4.1.2 FL Flat mount

Figure 5: Flat mount
4.1.3 Installation bracket CA203.MB (accessory)

4.2 Bearings

Self-aligning bearings

The CA-Series is equipped with a self-aligning bearing that allows for compensation of angular misalignment (<2°) of the shaft.

4.3 Installation sequence

- Turn the adapter in a suitable position (preferable upwards) to facilitate the insertion of the measuring roller. The dead shaft adapter may be rotated so that its clamp is pointing upwards.
- This is done by loosening the M8 locking screw that connects the adapter to the sensor body, and rotate the adapter to the desired position.
- Four positions, 90 degrees apart, are provided.
- Insert position pin into its corresponding hole.
- Tighten the M8 bolt again.
- Remove the clamps (M6 bolts) and place both ends of the shaft in the adapters.
- The axial play between the sensor and the adapter in the fixed bearing side can be adjusted with the setting gauge.
- The play must be 2 mm ±1mm (0.039” – 0.079”). This will provide the required gap for movement due to thermal expansion and for the self-aligning capability of the unit to function properly.
- Slide the setting gage between adapter and sensor body.
- Tighten the clamp on the fixed bearing side.
- Tighten the set screw on the fixed bearing side.
- The axial play between the sensor and the adapter in the floating bearing side can also be adjusted with the setting gage.
- Slide the setting gage between adapter and sensor body.
- Tighten down the second clamp.
- On the floating bearing side, the set screw may not be tightened. We recommend to remove the set screw to avoid accidental tightening later on.
- Remove the setting gage.

**Figure 9: Fixed and floating bearing installation**

4.4 Electrical connections

Connection between the Force Measuring Rollers and machine controller is realized by means of a 5-pole cable with a cross-section of 0.25mm². The cable must be installed separate from power lines.

**Figure 10: pin assignment M12**
5 Technical data

<table>
<thead>
<tr>
<th>Technical data</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>1.8 mV/V</td>
</tr>
<tr>
<td>Tolerance of sensitivity</td>
<td>&lt;± 0.5 %</td>
</tr>
<tr>
<td>Accuracy class</td>
<td>±0.5% of nominal force rating</td>
</tr>
<tr>
<td>Temperature coefficient</td>
<td>±0.1%/10K</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-10 to +60°C</td>
</tr>
<tr>
<td>Input resistance</td>
<td>350Ω</td>
</tr>
<tr>
<td>Excitation voltage</td>
<td>1 to 12 VDC</td>
</tr>
<tr>
<td>Overload protection</td>
<td>10 times nominal force</td>
</tr>
<tr>
<td>Material</td>
<td>Stainless steel</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP42</td>
</tr>
<tr>
<td>Electrical connection</td>
<td>Male receptacle, flange mounting, M14×1, 5-pole</td>
</tr>
<tr>
<td>Measuring range</td>
<td>30:1</td>
</tr>
</tbody>
</table>

Table 1: technical data
5.1 Dimensions

Figure 11: Dimensions

C_BA_Manual.ai
### CA-Series: Diameter, Weight

<table>
<thead>
<tr>
<th>Sensors Type</th>
<th>D (mm in.)</th>
<th>Weight with adapter (kg lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA 203-100</td>
<td>25.4 (1.00)</td>
<td>1.96 (4.32)</td>
</tr>
<tr>
<td>CA 203-125</td>
<td>31.75 (1.25)</td>
<td>1.96 (4.32)</td>
</tr>
<tr>
<td>CA 203-150</td>
<td>38.1 (1.50)</td>
<td>1.96 (4.32)</td>
</tr>
<tr>
<td>CA 203-M25</td>
<td>25 (0.98)</td>
<td>1.96 (4.32)</td>
</tr>
<tr>
<td>CA 203-M30</td>
<td>30 (1.18)</td>
<td>1.96 (4.32)</td>
</tr>
<tr>
<td>CA 203-M40</td>
<td>40 (1.57)</td>
<td>1.96 (4.32)</td>
</tr>
</tbody>
</table>

### CA-Series: Nominal force, Total deflection

<table>
<thead>
<tr>
<th>Size Type</th>
<th>Nominal force (N lbf)</th>
<th>Total deflection (mm in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA 203</td>
<td>50 (11)</td>
<td>0.10 (0.0039)</td>
</tr>
<tr>
<td>CA 203</td>
<td>125 (27)</td>
<td>0.11 (0.0043)</td>
</tr>
<tr>
<td>CA 203</td>
<td>250 (55)</td>
<td>0.15 (0.0059)</td>
</tr>
<tr>
<td>CA 203</td>
<td>500 (110)</td>
<td>0.16 (0.0063)</td>
</tr>
<tr>
<td>CA 203</td>
<td>1000 (220)</td>
<td>0.17 (0.0067)</td>
</tr>
<tr>
<td>CA 203</td>
<td>1500 (337)</td>
<td>0.19 (0.0075)</td>
</tr>
</tbody>
</table>

*Figure 12: Dimensions*