Miniature Ring Load Cell
Model 8438

Application
The miniature ring load cells of the 8438 series have been specially designed to showcase with small external dimensions. These sensors can be used for a wide range of industrial and laboratory applications due to their small size. The small diameter and height make this miniature ring load cell perfect for installation in structures, in which the measured force is guided directly through the sensor after disconnection. Examples of this are force measurements on:

- Bolts
- Screws
- Plate and cover fasteners
- Bearing contact forces
- Spot welding machines
- Cutting tools

Description
The measured tension and compression force must be introduced axially and perpendicularly to the entire surface of the inner and outer bands of the sensor in the opposite direction. Conversion of the acting force into an electrical output signal is performed by strain gauges connected together in a full bridge circuit. To achieve optimal accuracy, the base of the sensor should rest on a smooth level surface, hardened to at least 63 HRC with sufficient dimensions. The base cover welded to the surface has a stabilizing effect on the sensor element. Lateral forces should be avoided anyway as they distort the measured results. During installation or operation, ensure that the cable outlet and the sensor cable are not subject to excessively high tensile or bending forces. Strain and bend relief may be necessary for the sensor cable on the machine side.

- Measuring ranges from 0 ... 5 N to 0 ... 200 kN
- Centric throughout hole
- Flat disc design
- Made of stainless steel
- Completely welded sensor body
- Nominal characteristic value standardization possible
### Technical Data

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Measuring Range</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>D5</th>
<th>A</th>
<th>H</th>
<th>C</th>
<th>L</th>
<th>K</th>
<th>M</th>
<th>B</th>
<th>ø T</th>
<th>Thread</th>
<th>Resonance Frequency [kHz]</th>
</tr>
</thead>
<tbody>
<tr>
<td>8438-5005</td>
<td>0 ... 5 N</td>
<td>12.7</td>
<td>11.4</td>
<td>10.2</td>
<td>5.1</td>
<td>2.5</td>
<td>3.0</td>
<td>3.8</td>
<td>-</td>
<td>-</td>
<td>1.2</td>
<td>1.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.4</td>
</tr>
<tr>
<td>8438-5010</td>
<td>0 ... 10 N</td>
<td>12.7</td>
<td>11.4</td>
<td>10.2</td>
<td>5.1</td>
<td>2.5</td>
<td>3.0</td>
<td>3.8</td>
<td>-</td>
<td>-</td>
<td>1.2</td>
<td>1.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.7</td>
</tr>
<tr>
<td>8438-5020</td>
<td>0 ... 20 N</td>
<td>25.4</td>
<td>21.6</td>
<td>20.6</td>
<td>6.6</td>
<td>5.1</td>
<td>6.4</td>
<td>7.1</td>
<td>4.8</td>
<td>8.0</td>
<td>1.4</td>
<td>3.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
</tr>
<tr>
<td>8438-5050</td>
<td>0 ... 50 N</td>
<td>25.4</td>
<td>21.6</td>
<td>20.6</td>
<td>6.6</td>
<td>5.1</td>
<td>6.4</td>
<td>7.1</td>
<td>4.8</td>
<td>8.0</td>
<td>1.4</td>
<td>3.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.1</td>
</tr>
<tr>
<td>8438-5100</td>
<td>0 ... 100 N</td>
<td>28.0</td>
<td>25.0</td>
<td>22.0</td>
<td>9.0</td>
<td>5.5</td>
<td>7.0</td>
<td>8.0</td>
<td>2.2</td>
<td>8.0</td>
<td>1.9</td>
<td>2.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1.2</td>
</tr>
<tr>
<td>8438-5200</td>
<td>0 ... 200 N</td>
<td>28.0</td>
<td>25.0</td>
<td>22.0</td>
<td>9.0</td>
<td>5.5</td>
<td>7.0</td>
<td>8.0</td>
<td>2.2</td>
<td>8.0</td>
<td>1.9</td>
<td>2.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.0</td>
</tr>
<tr>
<td>8438-5500</td>
<td>0 ... 500 N</td>
<td>28.0</td>
<td>25.0</td>
<td>22.0</td>
<td>9.0</td>
<td>5.5</td>
<td>7.0</td>
<td>8.0</td>
<td>2.2</td>
<td>8.0</td>
<td>1.9</td>
<td>2.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3.7</td>
</tr>
</tbody>
</table>

#### Electrical values
- Bridge resistance (full bridge): measuring range $\leq 10$ N semiconductor strain gauge 500 Ω, nominal
- measuring range $\geq 20$ N foil strain gauge 350 Ω, nominal

#### Excitation:
- measuring range $\leq 10$ N max. 5 V DC
- measuring range $\geq 20$ N max. 10 V DC

#### Nominal sensitivity:
- measuring range $\leq 10$ N 20 mV/V, nominal
- measuring range $0 ... 50 N$ 2 mV/V, nominal
- measuring range $0 ... 100 N$ 1 mV/V, nominal
- measuring range $0 ... 200 N$ 1.5 mV/V, nominal

* Deviations from the stated value are possible.

#### Environment conditions
- Range of operating temperature: $0 °C ... + 85 °C$
- Nominal temperature range: $+15 °C ... + 70 °C$
- Influence of temperature on zero: $\leq 0.03 %$ F.S./K
- Influence of temperature on sensitivity: $\leq 0.03 %$ Rdg./K

#### Mechanical values
- Non-linearity: $\leq 1.0 %$ F.S.
- Relative hysteresis: $\leq 0.75 %$ F.S.
- Non-repeatability with unchanged assembly position: $\leq 0.25 %$ F.S.
- Kind of measurement: tensile and compressive forces calibration in compressive direction (preferential measuring direction)
- Upon operation against the preferential measuring direction a changed characteristic value is possible.
- Deflection full scale: approx. 60 μm
- Mounting: measuring range $\geq 1000 N$ there are three mounting holes on the lower side of the sensor, equally spaced on T diameter with division 120°, one hole is located directly across the cable exit. This kind of mounting is allowed for compression load only.
- Operating force max: 150 % of capacity
- Dynamic load capacity: recommended 50 % of capacity max. 70 % of capacity
- Material: stainless steel 1.4542

#### Electrical connection:
- measuring range $\leq 10$ N cable length approx. 1.5 m
- measuring range $\geq 100 N$ suitable for drag chains cable length approx. 1.7 m
- all cables for measuring range $\geq 100 N$ are suitable for drag chains cable length approx. 2.0 m
- measuring range $\leq 10$ N shielded, TPE insulated cable with open ends for soldering, bending radius $\geq 20$ mm
- measuring ranges $0 ... 500 N$ additionally equipped with anti-kink protection bending radius $\geq 30$ mm
- measuring range $0 ... 1000 N$ additionally equipped with anti-kink protection and adapter for cable holder, bending radius $\geq 30$ mm

#### Protection class:
- acc. to EN 60529:
  - range $\leq 50 N$ IP54
  - range $\geq 100 N$ IP65

#### Dimensions:
- refer to table and dimensional drawing

#### General tolerances of dimensions:
- acc. to ISO 2768-f
- Weight: depending on the measuring range, from 5 g up to 900 g

#### Wiring code:
- measuring range $\leq 50 N$ $\geq 100 N$
- red / with excitation voltage positive
- black / brown excitation voltage negative
- green / green signal output negative
- white / yellow signal output positive