fSENS Force Measurement

‑ Reliable  ‍‑ Accurate  ‍‑ Safe
Strong and Accurate

fSENS. Force Sensors from Hirschmann MCS

Benefits of the fSENS Series:
- Reliable and exact measurement results
- Standardized and customized
- Superior linearity and accuracy (≤ ±1 %)
- Technical expertise and close consultation with customers enable customized solutions
- Nominal forces ranging from single digits to thousands of kN
- Temperature compensation
- Sensors with E-modulus compensation also available
- IP66/67 protection class
- Use under extreme environmental conditions

Certifications:
- Wide operating temperature range (-40°C to +80°C)
- Diverse range of sensor interfaces (passive, current loop, voltage, digital buses, etc.)
- All sensor bodies 100% tested and CE-compliant
- Integrated safety
- Made in Germany

* Support on demand
Integrated Safety

All products meet the high safety standards of Hirschmann MCS.

Mechanical safety

- Shock and vibration resistance acc. to IEC 60721-3-5 class 5 M3
- IP66/67 protection rating
- Steel material: 100 % tested acc. to EN 10204 inspection certificate 3.1
- Double or triple mechanical safety margins for sensor bodies
  - Yielding and breaking points as required
  - Wide range of nominal loads

  → Double safety:
  Protecting the fSENS Force Sensor against yielding at forces of up to 2 times rated force and breakage up to 3.5 times.

  → Triple safety:
  For heavy duty applications; protecting the fSENS Force Sensor against yielding at forces of up to 3 times rated force and breakage up to 5 times.

Functional safety

- PL b/c implementation
  - Standard electronic components without conventional performance rating

- PL d (EN13849) / SIL2 (ISO61508) implementation
  Application safety solution
  - 2-channel solution with standard implementation and redundant interface
  - Dual current loop interface
  - Combined with a flow-operated PL d control unit (e.g., iSCALE Control System)

Electrical safety

- EMC approved acc. to IEC 61326-3-1 Crit. A

The TÜV certification includes the standard models of the redundant load pin fSENS MA, the compression load cell fSENS DKA and the fSENS RDKA.

Hirschmann MCS – tested quality:
- Electronics of the sensors
- Construction
- Bonding

Certified:
- Development
- Calculation and production process
- Material
- Redundancy
- Mechanical system and construction
- Quality management
- Service
Winning Accuracy

The fSENS Series from Hirschmann MCS features outstanding accuracy by overcoming:
- Non-linearity
- Hysteresis caused by used materials
- Zero-point deviation and time drift
- Temperature drift of components
- Influence of installation conditions
- Random, systematic, and stochastic errors
- Test equipment limitations

Drawing on extensive experience, Hirschmann MCS recommends the sensor that best meets individual requirements.

Hirschmann MCS makes every effort to produce and supply sensors that deliver consistently repeatable and reproducible results. Particular attention is given to their measurement instruments, testing methods, specifications, and staff training. Before delivery, every sensor of the fSENS Series receives a calibration sheet and a final inspection document showing that it complies with current design and product regulations.

All force sensors are calibrated specifically to corresponding applications. The accuracy of these sensors is assessed in accordance with the EN 612982 and VDI/VDE 2637/2638 standards.

fSENS and iSCALE Control System: Controlled Force

Benefits of using products of the fSENS Series in combination with the iSCALE Control System:
- Overload protection can be achieved
- Easy to control via cSCALE Controllers, vSCALE Consoles, xSENS Sensors, and the qSCALE SLI Software
- Modularity and scalability from one source, optimally geared to the required system’s design, choice of components, wiring, final acceptance testing, and startup
- Wide controller performance range
- Integrated diagnostic capabilities (for overload currents, short circuits, etc.)
- Tailored software solutions for different application types
- Flexibility in meeting the needs of both OEMs and end users

Load Pin with calibration supports

fSENS MA gSENS WGX iSENS RDCA

CANopen

Ethernet

vSCALE D3

GSM WLAN

Camera

cSCALE C6

Wireless

iSENS WGC iFLEX TRS

fSENS KMD iSENS HES

iSENS WSS
Overview of the fSENS Series

**fSENS KMD Load Cells**
- Measures static or dynamic tensile and compressive forces
- Range from single digits to thousands of kN
- Standardized solutions
- Customized solutions

**fSENS ZKA Tensile Load Cells**
- Measures static or dynamic tensile and compressive forces
- Range from single digits to thousands of kN
- Customized solutions
- Specifications identical to those of KMD load cells

**fSENS MA Load Pins**
- Measures static or dynamic shear forces
- Nominal loads from single digits to thousands of kN
- Customized solutions

**fSENS DKA/RDKA Compression Load Cells**
- Measures static or dynamic compressive forces
- Nominal loads from single digits to thousands of kN
- Standardized solutions
- Customized solutions
fSENS KMD – Load Cells
fSENS ZKA – Tensile Load Cells
Standardized KMD Load Cells

The extremely robust fSENS KMD force transducers are available in standard versions for a variety of load ranges and safety requirements.

- Compact and robust design
- Adaptable to any application
- Modular structure: steel bushing, ball bearings of different diameters
- Interfaces: 4...20 mA or CANopen
  - 2,5 to 7,5 V DC
  - 1 to 5 V DC

Technical Specifications

<table>
<thead>
<tr>
<th>Description</th>
<th>fSENS KMD / ZKA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature range</td>
<td>-40°C to +80°C***</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP66/67 (IEC60529)</td>
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<tr>
<td>Operating voltage</td>
<td>10 to 30 V</td>
</tr>
<tr>
<td>Current consumption</td>
<td>&lt; 50 mA (incl. amplifier)</td>
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<tr>
<td>Output signal</td>
<td>4...20 mA, CANopen, 2.5 to 7.5 V DC</td>
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<td></td>
<td>1 to 5 V DC</td>
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<tr>
<td>Temperature drift</td>
<td>0.1 %/10°K</td>
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<td>Linearity* (typical)</td>
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<td>Connector*</td>
<td>M12 or CANNON</td>
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<tr>
<td>Sensor material</td>
<td>Stainless steel (chromium ratio &gt; 12 %)</td>
</tr>
<tr>
<td>Preload*</td>
<td>150 % of nominal load</td>
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<tr>
<td>Safety margin against yielding*</td>
<td>&gt; 200 % (300 %) of nominal load</td>
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<td>Safety margin against breakage**</td>
<td>&gt; 350 % (500 %) of nominal load</td>
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<tr>
<td>Support apertures</td>
<td>Bearings and bushings</td>
</tr>
</tbody>
</table>

* Other values and types are available on request
** Depending on material
*** Surface temperature

Customized KMD Load Cells and ZKA Tensile Load Cells

Hirschmann MCS develops and supplies KMD load cells in various designs and customer-specific versions.

- For measurement ranges < 7 t and > 240 t
- Individual mounting requirements
- Individually adapted for any installation situation
- Alternative materials for higher corrosion resistance
- They can be equipped with:
  - different interfaces
  - optional mechanical design (forks, bushings, or bearings)
fSENS MA – Load Pins
Flexible & Configurable Load Pins

Hirschmann MCS develops, produces, and supplies load pins for any range of force:

- Range of interfaces
- Produced to customer-specific geometries and dimensions
- Optional details such as grease holes with grease fittings and DIN 15058-compliant axle holders
- Shear forces sensed by a Wheatstone bridge system of strain gauges
- Can be installed in place of normal shafts such as axles of sheaves, shackles, etc.
- Output signal proportional to the load

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fSENS DKA/RDKA – Compression Load Cells
There are several different options for compression load cells. According to the assembly requirements, nearly any geometrical circumstance can be considered and an optimal solution can be achieved.

Customized Compression Load Cells

Hirschmann MCS offers four standard Compression Load Cells of the enclosed fSENS DKA version

- Compact and robust design
- Corrosion-resistant: made of stainless steel with a chromium ratio > 15 %
- Self-adjusting in response to angle of force (up to 3°)
- Mounting plate and force path disconnected
- Simple assembly

Measurements ranges:

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<th>Dimensions (Ø x H)</th>
<th>Double Safety</th>
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<tr>
<td>1</td>
<td>Ø 55 x 47 [mm]</td>
<td>10-30 kN (1 to 3t)</td>
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<tr>
<td>2</td>
<td>Ø 55 x 47 [mm]</td>
<td>40-100 kN (4 to 10t)</td>
</tr>
<tr>
<td>3</td>
<td>Ø 55 x 47 [mm]</td>
<td>110-180 kN (11 to 18t)</td>
</tr>
<tr>
<td>4</td>
<td>Ø 85 x 59 [mm]</td>
<td>250-700 kN (25 to 70t)</td>
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An innovative solution for advanced requirements

Compression force transducers of the fSENS RDKA series are an ideal choice when design constraints rule out bolt replacements or “dead-end” installations.

- Usable when replacing plungers or installation at the “dead-end” is impossible.
- External or integrated amplifier
- Customer-specified solutions

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Hirschmann MCS is the world market leader in safe load indication for telescopic and lattice boom cranes and a specialist in robust controllers and sensors for mobile machines.

As one of the leading system suppliers, the company sets standards in innovative automation platforms for mobile applications in harsh environments. Drawing on expertise and experience gained during more than 40 years, the team of Hirschmann MCS enables communication between people and machines. The product and system solutions include software and hardware for sensors, controllers, and consoles for mobile machines and applications.

As a reliable, innovative, and flexible provider of leading-edge technology, high-quality products, and first-rate services, Hirschmann MCS is committed to ensuring that today’s components and solutions already comply with tomorrow’s specific safety requirements and generally valid standards.

Hirschmann Automation and Control GmbH
Hertzstr. 32-34
76275 Ettlingen
Germany
Phone: +49 (0)7243 709-0
hirschmann.mcs-sales@belden.com
www.hirschmann-mcs.com

China
Hirschmann Electronics Co., Ltd.
Phone: +86 (0) 516 8788 5799
infoecs@hirschmann-js.com

USA
Hirschmann Automation and Control Inc.
Phone: +1 717 263 7655
hirschmann.mcs@belden.com

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Member of:
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