The Task
In many different industrial applications, strain gauges are used to continuously measure mechanical quantities such as force/weight or deflection/torsion. In many cases, they are used as a reference input for monitoring systems, safety shutdown systems, or for similar critical tasks. As a rule, high demands are placed on accuracy, flexibility, and functional safety as well as electrical safety.

Strain gauges are highly sensitive resistors which react to mechanical stress with a slight change in resistance. These changes can be detected by a bridge circuit. The most common circuit design is the full bridge. In force transducers and load cells, the strain gauges are already mechanically applied in full bridge circuits. These sensors provide a raw signal which is prepared and standardized for further processing using a strain gauge transmitter.

The Problem
Customary strain gauge sensors have individual characteristics, which requires tedious and time-consuming adjustment of the respective strain gauge transmitter using potentiometers. Furthermore, strain gauge transmitters up to now had a very wide modular housing and therefore occupied a large amount of space in the enclosure. For worldwide applications, several versions with different supply voltages were often used.

The Solution
The universal SensoTrans DMS P 32200 strain gauge transmitters provide connection possibilities for all standard strain gauge force transducers and strain gauge load cells in full bridge configuration. They can be flexibly adapted to the respective measuring task using DIP and rotary encoder switches or via an IrDA interface.

3-port isolation with protective separation up to 300 V AC/DC according to EN 61140 ensures optimum protection of personnel and equipment as well as unaltered transmission of measuring signals. The SensoTrans DMS P 32200 offer maximum performance in the smallest of spaces. Adjusting the zero point and sensitivity to the individual strain gauge sensor is particularly convenient via the infrared port, for example using a PDA. Sensors with known characteristics can be very easily calibrated using four rotary encoder switches and eight DIP switches.

Special measuring tasks can be solved with SensoTrans devices which Knick configures according to individual specifications. Fixed-range devices without switch are used, for example, when manipulations or mix-ups must be precluded.

Knick offers the SensoTrans DMS P 32200 transmitter with SIL approval for applications with high demands on functional safety. The requirements of EN 61508 were implemented through specially developed hardware and software. The implemented fail-safe concept makes use of structural measures at the device level (redundancy of system components) and diagnostic methods for selective fault detection. The product is SIL 2 approved (EN 61508) by an authorized body (TÜV Rheinland).
Operating Software
The user-friendly, menu-guided Paraly SW 111 communication software runs on standard and pocket PCs and opens a number of further options such as input of customer-specific linearization curves, readout of the connection configuration, as well as the use of extensive diagnostic functions. Configuration, documentation and, if necessary, maintenance of entire plant components can be accomplished by “infrared remote control”. Moreover, the output current or voltage can be specified independently of the input value using the simulation function – a useful feature for plant commissioning or revision.

The Housing
The modular housing – 6 mm slim – is stingy with enclosure space and allows for high component densities. DIN rail bus connectors inserted in the mounting rail facilitate the power supply connection if necessary.

IrDA is a registered trademark of the Infrared Data Association.

Facts and Features

- Universal usability for strain gauges, pressure and load cells, and other resistive measuring bridges
- Convenient parameter setting via IrDA port – uncomplicated, menu-guided adjustment also “on site” including archiving of configuration data
- Intuitive configuration of basic parameters – easy, without tools, using 4 rotary and 8 DIP switches
- Calibrated range selection without complicated trimming
- Easy adjustment zero point and sensitivity adjustable via IrDA port
- Simulation of any desired output values for correct installation/commissioning
- Protective separation according to EN 61140 – protection of the maintenance staff and downstream devices against excessively high voltages up to 300 V AC/DC
- Functional safety up to SIL 2 (up to SIL 3 in the case of redundant configuration) with TÜV certificate – systematically developed according to EN 61508
- High accuracy with innovative switching concept
- Minimum space requirement in the enclosure – only 6 mm wide modular housing – more transmitters per meter of mounting rail
- Low-cost assembly quick mounting, convenient, connection of power supply via DIN rail bus connectors
- 5-year warranty

5 Year Warranty!
### Product Line

#### SensoTrans DMS P 32200, adjustable

<table>
<thead>
<tr>
<th>Order no.</th>
<th>P 32200 P0 /</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional safety (EN 61508)</td>
<td>Without 0 / SIL 2 (up to SIL 3 in the case of redundant configuration) 1</td>
</tr>
<tr>
<td>Power supply</td>
<td>24 V DC via screw terminals or DIN rail bus connector 0</td>
</tr>
</tbody>
</table>

#### SensoTrans DMS P 32200, fixed setting

<table>
<thead>
<tr>
<th>Order no.</th>
<th>P 32200 P0 /</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional safety (EN 61508)</td>
<td>Without 0 / SIL 2 (up to SIL 3 in the case of redundant configuration) 1</td>
</tr>
<tr>
<td>Power supply</td>
<td>24 V DC via screw terminals or DIN rail bus connector 0</td>
</tr>
</tbody>
</table>

**Customer-specific settings**
(e.g., cutoff frequency, zero point/sensitivity)

**As specified**

#### Accessories

- **Paraly SW 111**
- **ZU 0628** DIN rail bus connector
- **IsoPower A 20900**
- **ZU 0678** DIN rail bus connector
- **ZU 0677 power terminal block**

- **Communication software**
  Order no. SW 111
- **Power supply bridging for two isolators, A 20XXX P0 or P 32XXX P0**
  Order no. ZU 0628
- **Power supply unit 24 V DC, 1 A**
  Order no. A 20900 H4
- **Tapping of supply voltage (A 20900), routing to ZU 0628 DIN rail bus connector**
  Order no. ZU 0678
- **For connecting the 24 V DC supply voltage to the ZU 0628 DIN rail bus connector**
  Order no. ZU 0677
### Specifications

#### Strain gauge input data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td>±7.5 mV/V</td>
</tr>
<tr>
<td>Bridge resistance</td>
<td>200 ohms ... 10 kohms</td>
</tr>
<tr>
<td>Zero adjustment</td>
<td>Within the input range</td>
</tr>
<tr>
<td>Supply current (int. supply)</td>
<td>0 ... 5 mA</td>
</tr>
<tr>
<td>Supply voltage (ext. supply)</td>
<td>1 ... 2.8 V</td>
</tr>
<tr>
<td>Input error limits</td>
<td>± (2 µV/V + 0.1 % meas. val.) for spans ≥ 0.5 mV/V</td>
</tr>
<tr>
<td>Line monitoring</td>
<td>Short circuit or open circuit</td>
</tr>
<tr>
<td>Temperature coefficient at the input</td>
<td>&lt; 50 ppm/K of adjusted sensitivity</td>
</tr>
<tr>
<td>Overload capacity</td>
<td>5 V across all inputs</td>
</tr>
</tbody>
</table>

#### Output data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outputs</td>
<td>0 ... 20 mA, calibrated switching</td>
</tr>
<tr>
<td></td>
<td>4 ... 20 mA, (default setting 4 ... 20 mA)</td>
</tr>
<tr>
<td></td>
<td>0 ... 5 V</td>
</tr>
<tr>
<td></td>
<td>0 ... 10 V</td>
</tr>
<tr>
<td>Control range</td>
<td>0 ... approx. 102.5 % of span at 0 ... 20 mA, 0 ... 10 V or 0 ... 5 V output</td>
</tr>
<tr>
<td></td>
<td>−1.25 ... approx. 102.5 % of span at 4 ... 20 mA output</td>
</tr>
<tr>
<td>Resolution</td>
<td>16 bit</td>
</tr>
<tr>
<td>Simulation mode adjustable via IrDA</td>
<td>0 ... 20 mA current output: 0 ... 21 mA</td>
</tr>
<tr>
<td></td>
<td>4 ... 20 mA current output: 3 ... 21 mA</td>
</tr>
<tr>
<td></td>
<td>0 ... 5 V voltage output: 0 ... 5.25 V</td>
</tr>
<tr>
<td></td>
<td>0 ... 10 V voltage output: 0 ... 10.5 V</td>
</tr>
<tr>
<td>Load</td>
<td>Current output: ≤ 10 V (≤ 500 ohms at 20 mA)</td>
</tr>
<tr>
<td></td>
<td>Voltage output: ≤ 1 mA (≥ 10 kohms at 10 V)</td>
</tr>
<tr>
<td>Output error limits</td>
<td>Current output: ± (10 µA + 0.05 % meas. val.)</td>
</tr>
<tr>
<td></td>
<td>Voltage output: ± (5 mV + 0.05 % meas. val.)</td>
</tr>
<tr>
<td>Residual ripple</td>
<td>&lt;10 mVrms</td>
</tr>
<tr>
<td>Temperature coefficient at the output</td>
<td>&lt; 50 ppm/K full scale</td>
</tr>
<tr>
<td></td>
<td>(average TC in allowable operating temperature range, reference temperature 23 °C)</td>
</tr>
<tr>
<td>Error signaling</td>
<td>0 ... 20 mA output: I = 0 mA or ≥ 21 mA</td>
</tr>
<tr>
<td></td>
<td>4 ... 20 mA output: I ≤ 3.6 mA or ≥ 21 mA</td>
</tr>
<tr>
<td></td>
<td>0 ... 5 V or 0 ... 10 V output: V = 0 V or V ≥ 5.25 V or V ≥ 10.5 V</td>
</tr>
<tr>
<td></td>
<td>via output signal, red LED and IrDA for out-of-range conditions, incorrect parameter setting, sensor short circuit and line break, output load error, accidental changing of the switch settings during operation (only for SIL devices), other device errors. See also “Error Signaling” table.</td>
</tr>
</tbody>
</table>

#### Response

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic</td>
<td>Rising / falling linearly; configurable characteristic curves using interpolation points (via IrDA port)</td>
</tr>
<tr>
<td>Measuring rate</td>
<td>Approx. 3/s</td>
</tr>
</tbody>
</table>
## Specifications (continued)

### Display

- **Green LED**: Power supply
- **Yellow LED**: Signaling the connection type
- **IrDA communication**: IrDA communication
- **Red LED**: Maintenance request/device failure

### Power supply

- **Power supply**: 24 V DC (–20 %, +25 %), approx. 1.2 W
  The power supply can be routed from one device to another via DIN rail bus connectors.

### Isolation

- **Galvanic isolation**: 3-port isolation between input, output, and power supply
- **Test voltage**: 2.5 kV AC, 50 Hz: power supply against input against output
- **Working voltage (basic insulation)**: Up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2 according to EN 61010-1.
  For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent devices.

### Protection against electric shock

- **Protective separation** to EN 61140 by reinforced insulation according to EN 61010-1.
  Working voltage up to 300 V AC/DC across all circuits with overvoltage category II and pollution degree 2.
  For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent devices.

### Standards and approvals

- **Functional safety**: SIL 2 according to IEC 61508, SIL 3 with redundant configuration
- **EMC**
  - Product family standard: EN 61326
  - Emitted interference: Class B
  - Immunity to interference: Industrial environment
  - EMC requirements for devices with safety related functions
  - IEC 61326-3: Draft
- **cURus**: File no. 220033
  Standards: UL 508 and CAN/CSA 22.2 No. 14-95
- **RoHS conformity**: According to directive 2011/65/EU

### Interfaces

- **IrDA**: Specification 1.1, slave device for bidirectional communication
- **Paraly SW 111 communication software**: Paraly SW 111 communication software
- **Free download at www.knick.de**
### Further data

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ambient temperature</strong></td>
<td>- Operation: 0 … +55 °C mounted without gaps&lt;br&gt;0 … +65 °C with gaps ≥ 6 mm&lt;br&gt;Storage: −25 … +85 °C</td>
</tr>
<tr>
<td><strong>Ambient conditions</strong></td>
<td>Stationary, weather-protected operation&lt;br&gt;Relative humidity: 5 … 95 %, no condensation&lt;br&gt;Barometric pressure: 70 … 106 kPa&lt;br&gt;Water or wind-driven precipitation (rain, snow, hail, etc.) excluded</td>
</tr>
<tr>
<td><strong>Design</strong></td>
<td>Modular housing with screw terminals, 6.2 mm wide&lt;br&gt;See dimension drawings for further measurements</td>
</tr>
<tr>
<td><strong>Tightening torque</strong></td>
<td>0.6 Nm</td>
</tr>
<tr>
<td><strong>Ingress protection</strong></td>
<td>Terminals IP 20, housing IP 40</td>
</tr>
<tr>
<td><strong>Mounting</strong></td>
<td>For 35 mm DIN rail acc. to EN 60715</td>
</tr>
<tr>
<td><strong>Connection</strong></td>
<td>Conductor cross sections&lt;br&gt;Single wire: 0.2 … 2.5 mm²&lt;br&gt;Stranded wire: 0.2 … 2.5 mm²&lt;br&gt;24-14 AWG</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>Approx. 60 g</td>
</tr>
</tbody>
</table>

1) Slight deviations are possible while there is interference
**ProLine Interface Technology**

**Strain Gauge Transmitters**

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**Block Diagram**

- **Input**: Strain gauge
- **Power supply**: 24 V DC
- **μP**: 
- **Output**: 0(4) … 20 mA, 0 … (5)10 V

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Typical Applications

![Diagram of typical applications](image)

Sensor Trans DMS P 32200

PDA  PC

IrDA

Connection of Strain Gauges

4-wire connection

6-wire connection
(with external supply 1 … 3 V)
Dimension Drawing and Terminal Assignments

Terminal assignments

1  Input  +
2  Input  +
3  Input  –
4  Input  –
5  Output  +
6  Output  –
7  Power supply AC/DC
8  Power supply AC/DC

Conductor cross-section:
- single wire  0.2 … 2.5 mm²
- stranded wire  0.2 … 2.5 mm²
- 24-14 AWG

All dimensions in mm
## Error Signaling

<table>
<thead>
<tr>
<th>No.</th>
<th>Error</th>
<th>Signal configuration</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>With SIL function</td>
<td>Without SIL function</td>
</tr>
<tr>
<td>0</td>
<td>None</td>
<td>Not self-locking</td>
<td>Not self-locking</td>
</tr>
<tr>
<td>1</td>
<td>Underrange</td>
<td>Not self-locking</td>
<td>Not self-locking</td>
</tr>
<tr>
<td>2</td>
<td>Overrange</td>
<td>Not self-locking</td>
<td>Not self-locking</td>
</tr>
<tr>
<td>3</td>
<td>Sensor short circuit</td>
<td>Self-locking</td>
<td>Not self-locking</td>
</tr>
<tr>
<td>4</td>
<td>Sensor open</td>
<td>Self-locking</td>
<td>Not self-locking</td>
</tr>
<tr>
<td>5</td>
<td>Resistance error</td>
<td>Self-locking</td>
<td>Not self-locking</td>
</tr>
<tr>
<td>6</td>
<td>Output load error2)</td>
<td>Not self-locking</td>
<td>Not self-locking</td>
</tr>
<tr>
<td>7</td>
<td>Identification of connection</td>
<td>Self-locking</td>
<td>Not self-locking</td>
</tr>
<tr>
<td>8</td>
<td>Switch misadjusted</td>
<td>Self-locking</td>
<td>Not self-locking</td>
</tr>
<tr>
<td>9</td>
<td>Adjustment error</td>
<td>Self-locking</td>
<td>Not self-locking</td>
</tr>
<tr>
<td>10</td>
<td>Device error (subordinated error number differentiated via IrDA port)</td>
<td>Self-locking</td>
<td>Self-locking</td>
</tr>
</tbody>
</table>

1) With the "self-locking" configuration, the error signal is maintained after termination of the error cause. The error message can be reset through a restart (power supply on/off or via IrDA port).

2) With SIL models P 32200 P0/1x only

### Response of the Output Current (4 ... 20 mA) to Out-of-Range Conditions

- **Input**
  - 3.6
  - 3.8
  - 20.5
  - 21.0

- **Output / mA**
  - 0
  - 0.6
  - 3.6
  - 4.2
  - 4.8
  - 5.4
  - 6.0
  - 6.6
  - 7.2
  - 7.8
  - 8.4
  - 9.0
  - 9.6
  - 10.2
  - 10.8
  - 11.4
  - 12.0
  - 12.6
  - 13.2
  - 13.8
  - 14.4
  - 15.0
  - 15.6
  - 16.2
  - 16.8
  - 17.4
  - 18.0
  - 18.6
  - 19.2
  - 19.8
  - 20.4
  - 21.0

- **Output / mA**
  - 4 ... 20 mA
  - 0 ... 20 mA
  - 0 ... 5 V
  - 0 ... 10 V