

## Series 35X

Piezoresistive pressure transmitters with front-flush metal diaphragm and excellent accuracy

### Features

- RS485 interface can be combined with analog interface
- Analog interface rangeable by RS485 interface (turn-down)
- Modbus RTU protocol for process values and configuration
- Excellent long-term stability



### Technology

- Insulated and encapsulated piezoresistive pressure sensor
- Front-flush, seamless design with no internal seals
- High-quality pressure transducers and tried-and-tested mathematical compensation

### Typical applications

- Food industry
- Biotechnology
- Pharmaceutical industry
- Chemical industry
- Industrial applications

#### Accuracy

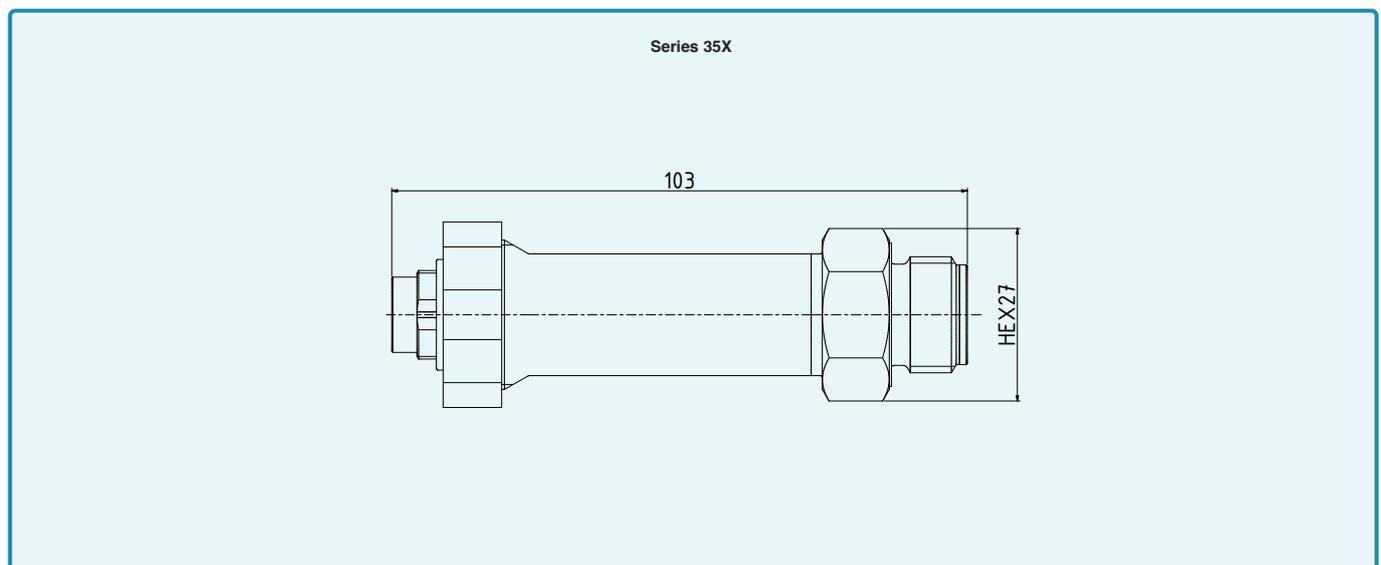
± 0,05 %FS

#### Total Error Band

± 0,1 %FS @ -10...80 °C

#### Pressure ranges

0...0,3 to 0...1000 bar



## Series 35X – Specifications

### Standard pressure ranges

| Relative pressure<br>PR                |            | Proof pressure              |
|--|------------|-----------------------------|
| 0...0,3                                | -0,3...0,3 | 3                           |
| 0...1                                  | -1...1     |                             |
| 0...3                                  | -1...3     | 9                           |
| 0...6                                  | -1...6     | 18                          |
| 0...10                                 | -1...10    | 30                          |
| 0...16                                 | -1...16    | 48                          |
| 0...30                                 | -1...30    | 90                          |
| bar rel.                               |            | bar                         |
| Reference pressure at ambient pressure |            | based on reference pressure |

| Absolute pressure<br>PAA                  | Absolute pressure<br>PA          | Proof pressure              |
|---|----------------------------------|-----------------------------|
| 0,8...1,2                                 |                                  | 3                           |
| 0...1                                     | 0...1                            |                             |
| 0...3                                     | 0...3                            | 9                           |
| 0...6                                     | 0...6                            | 18                          |
| 0...10                                    | 0...10                           | 30                          |
| 0...16                                    | 0...16                           | 48                          |
| 0...30                                    | 0...30                           | 90                          |
| 0...60                                    | 0...60                           | 180                         |
| 0...100                                   | 0...100                          | 300                         |
| 0...300                                   | 0...300                          | 600                         |
| 0...700                                   | 0...700                          | 1100                        |
| 0...1000                                  | 0...1000                         | 1100                        |
| bar abs.                                  | bar                              | bar                         |
| Reference pressure at 0 bar abs. (vacuum) | Reference pressure at 1 bar abs. | based on reference pressure |

### Performance

#### Pressure

|                                       |   |  |
|---------------------------------------|---|--|
| Digital nonlinearity                  | $\leq \pm 0,02$ %FS   | Best fitted straight line (BFSL)   |
| Accuracy @ RT (20...25 °C)            | $\leq \pm 0,05$ %FS   | Nonlinearity (best fitted straight line BFSL), pressure hysteresis, non-repeatability, zero point deviation and amplification deviation  |
| Total Error Band (-10...80 °C)        | $\leq \pm 0,1$ %FS  | Max. deviation within the compensated pressure and temperature range<br>Experience shows that, outside the compensated temperature range, the total error band in the ambient temperature range is expanded by 0,1 %FS |
| Compensated temperature ranges        | -10...80 °C   | Optional other compensated temperature ranges within -40...125 °C are possible   |
| Analog interface additional deviation | $\leq \pm 0,05$ %FS   | With reference to accuracy @ RT and the total error band   |
| Long-term stability                   | $\leq \pm 0,1$ %FS  | Per year under reference conditions, yearly recalibration recommended  |
| Position dependency                   | $\leq \pm 2$ mbar   | Calibrated in vertical installation position with pressure connection facing downwards   |
| Resolution                            | 0,0005 %FS  | Digital  |
| Signal stability                      | 0,0025 %FS  | Digital noise-free   |
| Internal measurement rate             | $\geq 1800$ Hz  | For version «3-wire + digital (0...10 V. 0...5 V)» > 6000 Hz   |
| Pressure range reserve                | $\pm 10$ %  | Outside the pressure range reserve, +Inf / -Inf is displayed<br>If there is an error in the device, NaN is displayed   |
| Vacuum resistance                     | For operating pressures $\leq 0,1$ bar abs., a vacuum-optimised version is recommended          |  |
| Note                                  | For pressure ranges < 1 bar, all data apply with reference to a full-range signal (FS) of 1 bar |  |

## Series 35X – Specifications

### Temperature

|                           |                                     |   |
|---------------------------|-------------------------------------|---|
| Accuracy                  | $\leq \pm 2 \text{ }^\circ\text{C}$ | The temperature is measured on the pressure sensor (silicon chip) that sits behind the metallic separating diaphragm<br>The data applies within the compensated temperature range |
| Resolution                | $\leq 0,01 \text{ }^\circ\text{C}$  |   |
| Internal measurement rate | $> 10 \text{ Hz}$                   |   |

### Electrical data

| Connectivity                              | digital   | 2-wire + digital     | 3-wire + digital     |                      |                      |
|---|---|----------------------|----------------------|----------------------|----------------------|
| Analog interface                          |   | 4...20 mA            | 0...10 V             | 0...5 V              | 0,1...2,5 V          |
| Digital interface                         | RS485   | RS485                | RS485                | RS485                | RS485                |
| Power supply                              | 3,2...32 VDC  | 8...32 VDC           | 13...32 VDC          | 8...32 VDC           | 3,2...32 VDC         |
| Power consumption (without communication) | $< 8 \text{ mA}$  | 3,5...22,5 mA        | $< 8 \text{ mA}$     | $< 8 \text{ mA}$     | $< 8 \text{ mA}$     |
| RS485 voltage insulation                  | $\pm 32 \text{ VDC}$  | $\pm 18 \text{ VDC}$ | $\pm 32 \text{ VDC}$ | $\pm 32 \text{ VDC}$ | $\pm 32 \text{ VDC}$ |
| Note                                      | Disturbance of the 4...20 mA signal occurs during communication via the digital interface<br>3-wire types are suitable for simultaneous operation of the analog and digital interface |                      |                      |                      |                      |

|   |  |
|---|--|
| Start-up time (power supply ON)             | $< 250 \text{ ms}$                       |
| Overvoltage protection and reverse polarity | $\pm 32 \text{ VDC}$                     |
| GND case insulation                         | $> 10 \text{ M}\Omega @ 300 \text{ VDC}$ |

### Analog interface

|                    |   |                            |
|--------------------|---|----------------------------|
| Load resistance    | $< (U - 8 \text{ V}) / 25 \text{ mA}$             | 2-wire                     |
|                    | $> 5 \text{ k}\Omega$                             | 3-wire                     |
| Limiting frequency | $\geq 300 \text{ Hz}$                             | 2-wire                     |
|                    | $\geq 1000 \text{ Hz}$                            | 3-wire (0,1...2,5 V)       |
|                    | $\geq 1000 \text{ Hz}$                            | 3-wire (0...10 V, 0...5 V) |
| Note               | Filter properties can be adjusted by the customer |                            |

### Digital interface

|                         |                        |  |
|-------------------------|------------------------|--|
| Type                    | RS485                  | Half-duplex  |
| Communication protocols | Modbus RTU             |  |
|                         | KELLER bus protocol    | Proprietary  |
| Identification          | Class.Group: 5.24      |  |
| Unit of pressure        | bar                    | Standard settings:<br>bus address 1,<br>baud rate 9600 bit/s   |
| Unit of temperature     | $^\circ\text{C}$       |  |
| Data type               | Float32 and Int32      | Other default settings available on request.<br>Can be reconfigured via software by the customer later |
| Baud rates              | 9600 and 115'200 bit/s |  |
| Lines                   | Up to 1,2 km           |  |

### Electrical connection

|           |  |                                    |
|-----------|--|------------------------------------|
| Plug type | Binder series 723                        | DIN EN 61076-2-106, 5-pin          |
|           | M12                                      | DIN EN 61076-2-101, A-coded, 5-pin |
|           | Souriau series 8525                      | MIL-STD-1669                       |
|           | GSP (without RS485)                      | EN 175301-803-A (DIN 43650)        |
| Cable     | $\varnothing 5,8 \text{ mm}$ , PE sheath | 5-wire, cable gland                |

### Electromagnetic compatibility

|                                       |   |
|---------------------------------------|---|
| CE conformity as per 2014/30/EU (EMC) | EN 61326-1/EN 61326-2-3/EN 61000-6-1/EN 61000-6-2/EN 61000-6-3/EN 61000-6-4 |
|---------------------------------------|---|

## Series 35X – Specifications

### Mechanical data

Materials in contact with media

|  |                           |                   |
|--|---------------------------|-------------------|
| Pressure connection                      | Stainless steel AISI 316L | others on request |
| Pressure transducer separating diaphragm | Stainless steel AISI 316L |                   |
| Pressure transducer seal (internal)      | none                      |                   |
| Pressure connection seal (external)      | Copper                    | others on request |

Other materials

|                                 |              |                   |
|---------------------------------|--------------|-------------------|
| Pressure transducer oil filling | Silicone oil | others on request |
|---------------------------------|--------------|-------------------|

Further details

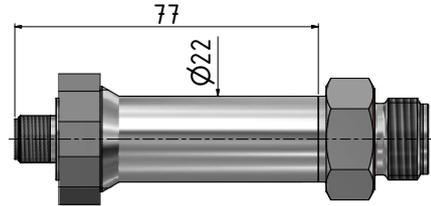
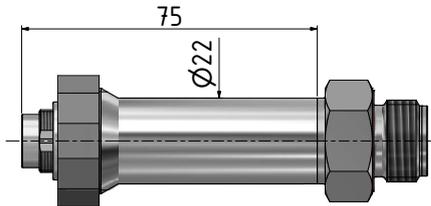
|                     |                  |   |
|---------------------|------------------|---|
| Pressure connection | G1/2 front-flush | For additional pressure connections, see Dimensions and options |
| Weight              | approx. 180 g    |   |

### Ambient conditions

|                                      |  |                     |  |
|--------------------------------------|--|---------------------|--|
| Media temperature range              | -40...125 °C   |                     | Icing not permitted  |
| Ambient temperature range            | -30...85 °C  |                     |  |
| Storage temperature range            | -20...85 °C  |                     |  |
| Protection                           | IP67   | Binder series 723   | For relative pressure, use a cable with integrated capillary |
|                                      | IP65   | GSP EN175301-803-A  |  |
|                                      | IP65   | Souriau series 8525 | For relative pressure IP54                                   |
|                                      | IP67   | M12                 |  |
|                                      | IP68   | Cable gland         |  |
| Notes                                | <ul style="list-style-type: none"> <li>Degrees of protection are valid with the corresponding mating plug</li> <li>The design implementation of the ventilation for relative pressure versions can be found in the respective technical drawing</li> </ul> |                     |  |
| Vibration resistance                 | 10 g, 10...2000 Hz, ± 10 mm  | IEC 60068-2-6       |  |
| Shock resistance                     | 50 g, 11 ms  | IEC 60068-2-27      |  |
| Pressure endurance @ RT (20...25 °C) | > 10 million pressure cycles   | 0...100 %FS         |  |

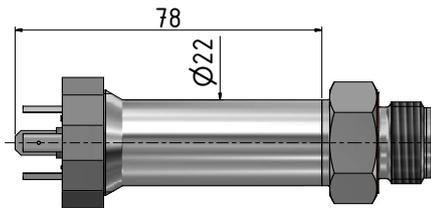
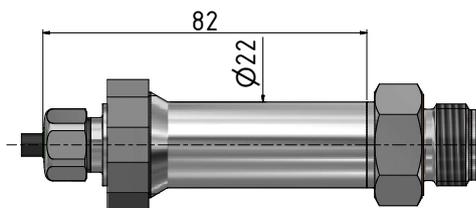
## Series 35X – Dimensions and options

### Electrical connections



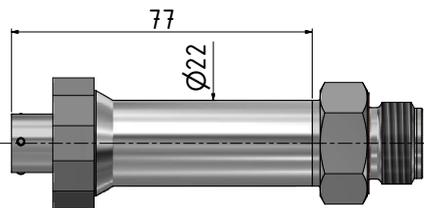
| Binder series 723 | 2-wire    | 3-wire        |
|-------------------|-----------|---------------|
| M16 × 0,75        | 4...20 mA | 0...max. 10 V |
|                   | 1 OUT/GND | 1 GND         |
|                   | 2 n.c.    | 2 +OUT        |
|                   | 3 +Vs     | 3 +Vs         |
|                   | 4 RS485A  | 4 RS485A      |
|                   | 5 RS485B  | 5 RS485B      |

| M12     | 2-wire    | 3-wire        |
|---------|-----------|---------------|
| M12 × 1 | 4...20 mA | 0...max. 10 V |
|         | 1 OUT/GND | 1 GND         |
|         | 2 n.c.    | 2 +OUT        |
|         | 3 +Vs     | 3 +Vs         |
|         | 4 RS485A  | 4 RS485A      |
|         | 5 RS485B  | 5 RS485B      |



| Cable gland | 2-wire         | 3-wire         |
|-------------|----------------|----------------|
| Cable ø 5,8 | 4...20 mA      | 0...max. 10 V  |
|             | WH OUT/GND     | WH GND         |
|             | RD n.c.        | RD +OUT        |
|             | BK +Vs         | BK +Vs         |
|             | BU RS485A      | BU RS485A      |
|             | YE RS485B      | YE RS485B      |
|             | Shield on CASE | Shield on CASE |

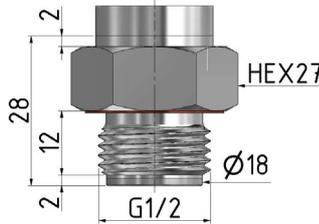
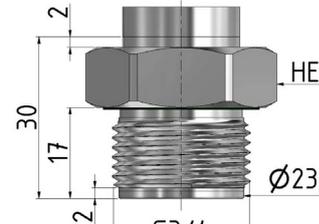
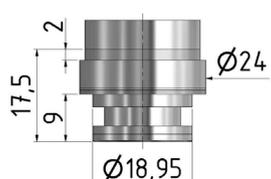
| GSP EN 175301-803-A | 2-wire    | 3-wire        |
|---------------------|-----------|---------------|
| □ 18                | 4...20 mA | 0...max. 10 V |
|                     | 1 OUT/GND | 1 GND         |
|                     | 2 n.c.    | 2 +OUT        |
|                     | 3 +Vs     | 3 +Vs         |
|                     | ↓ CASE    | ↓ CASE        |

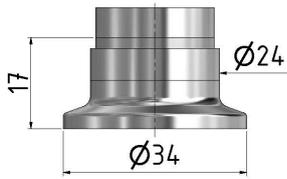
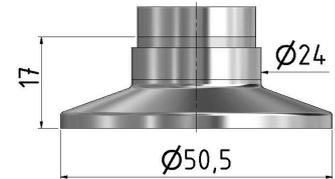
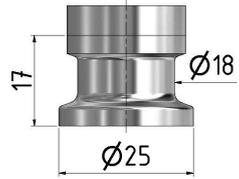


| Souriau series 8525 | 2-wire         | 3-wire         |
|---------------------|----------------|----------------|
|                     | 4...20 mA      | 0...max. 10 V  |
|                     | C OUT/GND      | C GND          |
|                     | B n.c.         | B +OUT         |
|                     | A +Vs          | A +Vs          |
|                     | D RS485A       | D RS485A       |
|                     | F RS485B       | F RS485B       |
|                     | Shield on CASE | Shield on CASE |

## Series 35X – Dimensions and options

### Available pressure connections

| G1/2 front-flush  | G3/4 front-flush  | Ingold fitting  |
|---|---|---|
|  |  |  |
| ISO 228-1   | ISO 228-1   | Pressure ranges limited   |

| Tri-Clamp DN20  | Tri-Clamp DN25-40/1"-1,5"  | Tri-Clamp 3/4"  |
|---|--|---|
|  |  |  |
| similar to DIN 32676, pressure ranges limited                                       | similar to DIN 32676, pressure ranges limited  | similar to DIN 32676, pressure ranges limited   |

### Other customer-specific options

- Other compensated pressure ranges
- Other compensated temperature ranges within -40...125 °C are possible
- Other electrical connections
- Parts that come into contact with media made from Hastelloy C-276
- O-rings made of other materials
- Other oil filling types for pressure transducers: e.g. special oils for oxygen applications
- Integration of application-specific calculations
- Modifications to customer-specific options

### Examples of related products

- Series 35XHT: Pressure transmitters with front-flush metal diaphragm for use in high temperatures
- Series 35Xc: Pressure transmitters with front-flush metal diaphragm and CANopen interface
- Series 33X: Pressure transmitters with excellent accuracy 0,01 %FS
- Series PD-33X: Differential pressure transmitters with a very high level of accuracy
- OEM series: Pressure transducers with electronics (e.g. series 10LX or 15SX with thread) for integration in one's own systems

## Series 35X – Software, scope of delivery and accessories

### Modbus interface

The X-line products have a digital interface (RS485 half-duplex), which supports the MODBUS RTU and KELLER bus protocols. Details of the communication protocols can be found at [www.keller-druck.com](http://www.keller-druck.com). Documentation, a Dynamic Link Library (DLL) and various programming examples are available for integrating the communication protocol into your own software.

### Interface converters

The connection to a computer is established via an RS485-USB interface converter. To ensure smooth operation, we recommend the K-114 with the corresponding mating plug, robust driver module, fast RX/TX switching and connectable bias and terminating resistors.

### "CCS30" software

The licence-free CCS30 software is used to carry out configurations and record measured values.

#### Measurement collection

- Live visualisation
- Adjustable measuring and storage interval
- Export function
- Parallel recording in bus operation
- Up to 100 measured values per second

#### Configuration

- Call up of information (pressure and temperature range, software version, serial number etc.)
- Readjustment of zero point and amplification
- Rescaling of analog output (unit, pressure range)
- Adjustment of low-pass filter
- Selection of instrument address and baud rate

### Scope of delivery

| KELLER test report  | Mating plug to Binder 723   | Female connector to DIN43650  |
|---|---|---|
|  |  |  |

### Accessories

| Interface converter  | Mating plug to M12   |  |
|--|--|--|
|   |   |   |
| <b>K-114</b> <ul style="list-style-type: none"> <li>• Analog measurement 0...10 V and 4...20 mA</li> <li>• 12 V measuring device supply via USB</li> <li>• USB interface electrically isolated</li> <li>• Bias and terminating resistors can be activated</li> </ul> | <b>Connection options</b> <ul style="list-style-type: none"> <li>• E.g. K-114-B with cable outlet instead of screw-type terminals for Binder series 723 (5-pin)</li> <li>• Various adapter cables available</li> </ul> | <ul style="list-style-type: none"> <li>• Angled socket, cable 5 m <i>PN 602515.0093</i></li> <li>• Angled socket, cable 2 m <i>PN 602515.0094</i></li> <li>• Female connector, cable 5 m <i>PN 602515.0095</i></li> <li>• Female connector, cable 2 m <i>PN 602515.0096</i></li> </ul> |