

## Series PD-33X

Piezoresistive differential pressure transmitters with 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
- Line pressure up to 600 bar
- Excellent long-term stability



### Technology

- Insulated and encapsulated piezoresistive pressure sensor (classic "wet-wet")
- High-quality differential pressure transducers and tried-and-tested mathematical compensation

### Typical applications

- Filter monitoring
- Flow rate measurement
- Leakage measurement
- Laboratory use
- Industrial applications

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#### Accuracy

± 0,05 %FS

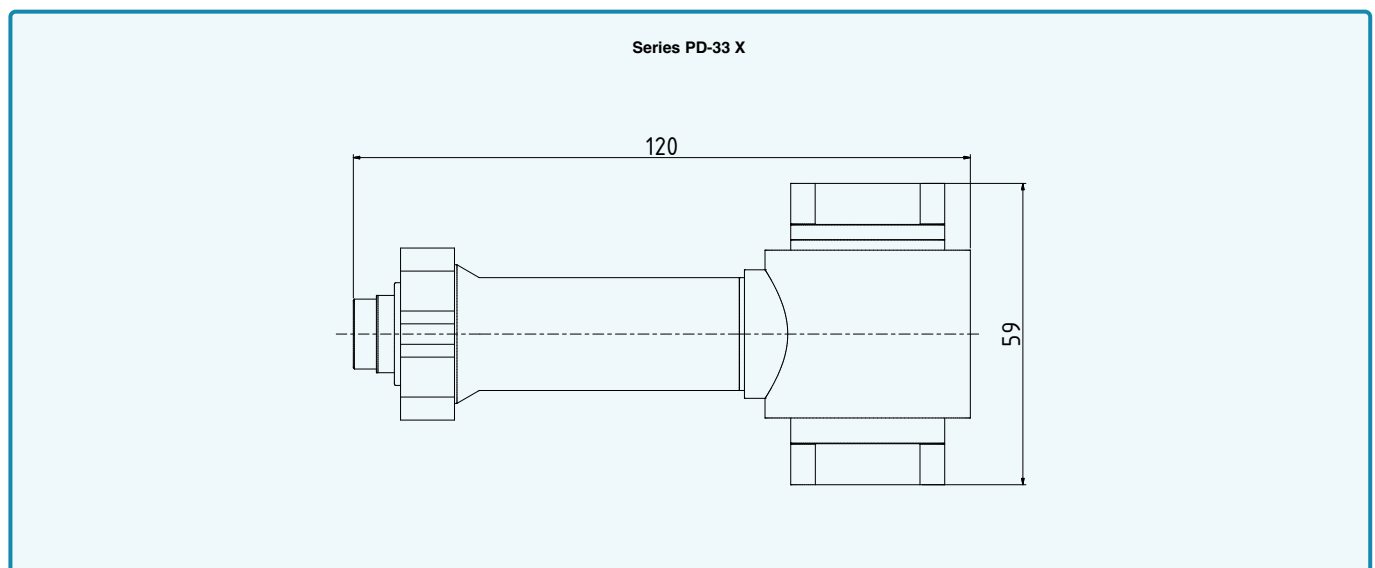
#### Total error band

± 0,1 %FS @ -10...80 °C

#### Pressure ranges

0...0,3 to 0...30 bar

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## Series PD-33X – specifications

### Standard pressure ranges

Differential pressure PD		Positive proof pressure	Negative proof pressure
0...0,3	-0,3...0,3	5	2,5
0...1	-1...0	15	7,5
	-1...-1		
0...3		50	25
0...6			
0...10			
0...16		120	60
0...30			
bar diff.		bar	
Reference pressure at 0 bar differential pressure		Based on reference pressure	

#### Note:

all intermediate ranges for the analog interface possible from the standard ranges by scaling (turn-down) at no extra charge. Smallest range: 0,1 bar  
Also negative and further +/- ranges possible. Optional: adjustment directly at intermediate ranges

### 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...40 °C)	$\leq \pm 0,05$ %FS	Max. deviation within the compensated pressure and temperature range.
Total Error Band (-10...80 °C)	$\leq \pm 0,1$ %FS	Max. deviation within the compensated pressure and temperature range. 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 range	10...40 °C	Extended temperature range RT.
	-10...80 °C	Other optional temperature ranges within -40...125 °C 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.
Line pressure	$\leq 200$ bar	Either, see Dimensions & options
	$\leq 600$ bar	
Line pressure dependency	$< 0,005$ %FS/bar	For pressure ranges $\geq 3$ bar
	$< 0,15$ mbar/bar	For pressure ranges $< 3$ bar
Position dependency	$\leq \pm 3$ mbar	Calibrated with horizontal positioning of the pressure connections.
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 If there is an error in the device, NaN is displayed.
Note	For pressure ranges $< 1$ bar, all data apply with reference to a full-range signal (FS) of 1 bar.	

#### Temperature

Accuracy	$\leq \pm 2$ °C	The temperature is measured on the pressure sensor (silicon chip) that sits behind the metallic separating diaphragm. The data apply within the compensated temperature range.
Resolution	$\leq 0,01$ °C	
Internal measurement rate	$> 10$ Hz	

## Series PD-33X – specifications

### 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 mA	3,5...22,5 mA	< 8 mA	< 8 mA	< 8 mA
RS485 voltage insulation	± 32 VDC	± 18 VDC	± 32 VDC	± 32 VDC	± 32 VDC
Note	Disturbance of the 4...20 mA signal occurs during communication through the digital interface. 3-wire types are suitable for simultaneous operation of the analog and digital interface.				

Start-up time (power supply ON)	< 250 ms
Overvoltage protection and reverse polarity	± 32 VDC
GND case insulation	> 10 MΩ @ 300 VDC

#### Analog interface

Load resistance	< $(U - 8 \text{ V}) / 25 \text{ mA}$	2-wire
	> 5 kΩ	3-wire
Limiting frequency	≥ 300 Hz	2-wire
		3-wire (0,1...2,5 V)
	≥ 1000 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	Standard settings: bus address 1, baud rate 9600 bit/s  Other default settings available on request. Can be reconfigured via software by the customer later.
Unit of pressure	bar	
Unit of temperature	°C	
Data type	Float32 and Int32	
Baud rates	9600 and 115'200 bit/s	
Lines	up to 1,2 km	

#### Electrical connection

Plug	Round plug 423 - 723 - 425	M16 x 0,75	DIN EN 61076-2-106, 5-pole
	Round plug	M12 x 1	DIN EN 61076-2-101, A-coded, 5-pole
	Bayonet connector	Souriau Serie 8525	MIL-STD-1669, 5-pole
	Valve connector (without RS485)	Form A (18 mm)	DIN EN 175301-803-A (DIN 43650)
Cable	∅ 5,8 mm, PE sheath	5-wire, cable gland	

#### Electromagnetic compatibility

CE conformity as per 2014/30/EU (EMC)	EN IEC 61326-1 / EN IEC 61326-2-3 / EN IEC 61000-6-1 / EN IEC 61000-6-2 / EN IEC 61000-6-3 / EN IEC 61000-6-4
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## Series PD-33X – specifications

### Mechanical data

#### Wetted parts

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

#### Other materials

Pressure transducer oil filling	Silicone oil	others on request
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#### Further details

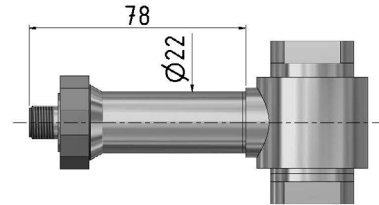
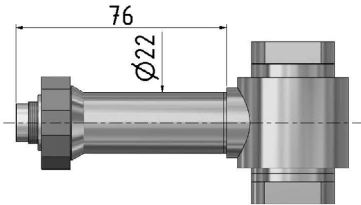
Pressure connection	G1/4 female	See Dimensions and options
	1/4-18NPT female	
Width x height	59 mm x approx. 120 mm	
Weight	approx. 500 g	Line pressure 200 bar
	approx. 650 g	Line pressure 600 bar

### Ambient conditions

Media temperature range	-20...125 °C	Optional -40...125 °C	Icing not permitted
Ambient temperature range	-20...85 °C	Optional -40...85 °C	
Storage temperature range	-20...85 °C		
Protection	IP67	Round plug 423 - 723 - 425, M16 x 0.75	
	IP65	Valve plug, form A, DIN EN175301-803-A (formerly DIN 43650)	
	IP65	Bayonet connector, Souriau series 8525	
	IP67	Round plug, M12 x 1	
	IP68	Cable gland	
Notes	Degrees of protection are valid with the corresponding mating plug in mated condition.		
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	

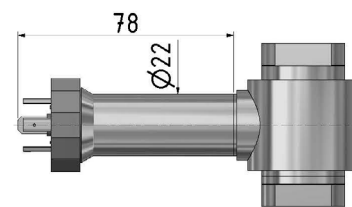
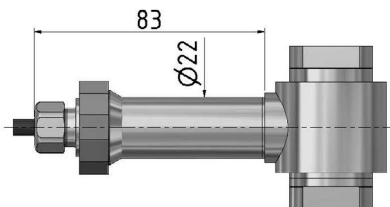
## Series PD-33X – Dimensions and options

### Electrical connections



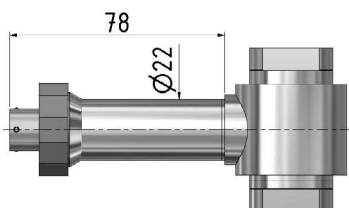
Round plug 423 - 723 - 425	2-wire	3-wire
M16 x 0,75	4...20 mA	0...max. 10 V
	1 OUT/GND	1 GND
	2 n.c.	2 +OUT
	3 +Vs	3 +Vs
	4 RS485A	4 RS485A
	5 RS485B	5 RS485B

Round plug	2-wire	3-wire
M12 x 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

Valve plug	2-wire	3-wire
Form A	4...20 mA	0...max. 10 V
	1 OUT/GND	1 GND
	2 n.c.	2 +OUT
	3 +Vs	3 +Vs
	↓ CASE	↓ CASE

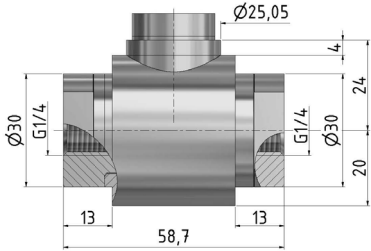
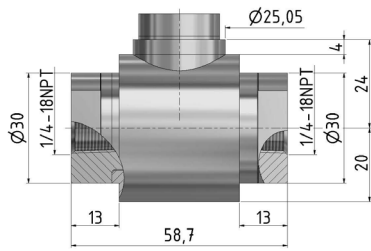


Bayonet connector	2-wire	3-wire
Souriau Serie 8525	4...20 mA	0...max. 10 V
	C OUT/GND	C GND
	B n.c.	B +OUT
	A +Vs	A +Vs
	D RS485A	D RS485A
	F RS485B	F RS485B
	Shield on CASE	Shield on CASE

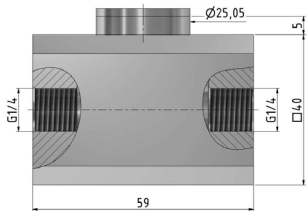
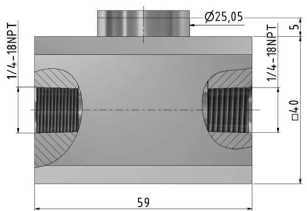
## Series PD-33X – Dimensions and options

### Available pressure connections

For line pressure  $\leq 200$  bar

G1/4 female	1/4-18NPT female
	
ISO 228-1	ISO 228-1

For line pressure  $\leq 600$  bar

G1/4 female	1/4-18NPT female
	
ISO 228-1	ISO 228-1

### Other customer-specific options

- Other compensated pressure ranges
- Other compensated temperature ranges within  $-40 \dots 125$  °C are possible
- Other electrical connections
- O-Ring made of other materials
- Version without internal seals
- Other oil filling types for pressure transducers
- Integration of application-specific calculations
- Modifications to customer-specific options

### Examples of related products

- Series PD-33Xc: Differential pressure transmitters with highest accuracy and CANopen interface
- Series 33X: Pressure transmitters with excellent accuracy 0,01 %FS
- Series 35X: Pressure transmitters with front-flush metal diaphragm and highest accuracy
- Series PD-23X: Differential pressure transmitters with high accuracy
- OEM series: Pressure transducers with electronics (e.g. series PD-10LX) for integration in one's own systems

## Series PD-33X – 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

Calibration protocol	Mating connector to round plug 423 - 723 - 425 IP40	Mating connector to valve connector, form A, DIN EN 175301-803-A
		

### Accessories

Interface converter	Mating connector for round connector, M12 x 1	
		
<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>