

Series 23SXc

High-precision piezoresistive pressure transmitters with CANopen®



Features

- CAN-Bus according to ISO 11898-2, device profile CiA 404 V1.2
- > 1,8 kHz sampling rate, all CiA transmission rates are supported
- Measured variables: Multiple pressure and temperature units available
- Excellent long-term stability

Technology

- Insulated and encapsulated piezoresistive pressure sensor
- Fully welded construction without internal seals
- High-quality pressure transducers and proven mathematical compensation
- Based on technology from the well-known 33X series with the highest level of accuracy

Typical applications

- Engine test benches
- Industrial applications
- Automation technology
- Mobile hydraulics

Accuracy

± 0,1 %FS

Total error band

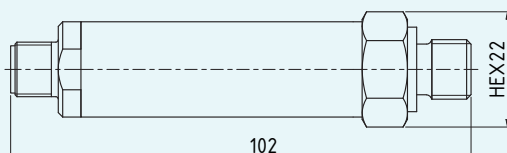
± 0,25 %FS @ -10...80 °C

Pressure ranges

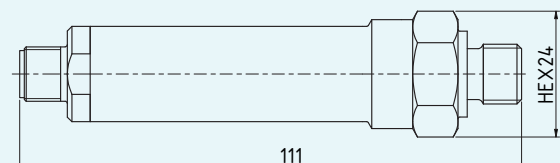
0...0,16 to 0...1000 bar



Series 23SXc: 0...0,16 to 0...160 bar



Series 23SXc: 0...250 to 0...1000 bar



Series 23SXc – Specifications

Standard pressure ranges

Relative pressure PR		Proof pressure
0...0,16	-0,16...0,16	3
0...0,25	-0,25...0,25	
0...0,4	-0,4...0,4	
0...0,6	-0,6...0,6	
0...1	-1...0	
0...1,6	-1...1,6	9
0...2,5	-1...2,5	12
0...4	-1...4	
0...6	-1...6	
0...10	-1...10	
0...16	-1...16	
0...25	-1...25	75
bar rel.		bar
Reference pressure at ambient pressure		Based on reference pressure

Absolute pressure PAA	Absolute pressure PA	Proof pressure
0,5...1,1		3
0...1		
0...1,6		9
0...2,5		12
0...4	0...4	
0...6	0...6	18
0...10	0...10	30
0...16	0...16	48
0...25	0...25	75
0...40	0...40	120
0...60	0...60	180
0...100	0...100	300
0...160	0...160	
0...250	0...250	500
0...400	0...400	800
0...600	0...600	1200
0...1000	0...1000	
bar abs.	bar	bar
Reference pressure at 0 bar abs. (vacuum)	Reference pressure at 1 bar abs.	Based on reference pressure

Performance

Pressure

Accuracy @ RT (20...25 °C)	$\leq \pm 0,1$ %FS	Non-linearity (best fitted straight line BFSL), pressure hysteresis, non-repeatability, zero point deviation and amplification deviation
Total error band (-10...80 °C)	$\leq \pm 0,25$ %FS	Max. deviation within the compensated pressure and temperature range. Experience shows that, outside the compensated temperature range, the total error band is expanded by 0,1 %FS within the ambient temperature range.
Compensated temperature range	-10...80 °C	Other temperature ranges within -40...125 °C possible as an option.
Long-term stability	$\leq \pm 0,15$ %FS	Per year under reference conditions, yearly recalibration recommended.
Position dependency	$\leq \pm 1,5$ mbar	Calibrated in vertical installation position with pressure connection facing downwards.
Resolution	0,002 %FS	
Signal stability	0,01 %FS	Noise-free
Internal measurement rate	> 1800 Hz	
Pressure range reserve	± 10 %	Outside the pressure range reserve, +Inf / -Inf is displayed. 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, accuracy, total error band and long-term stability for 1 bar full-scale (FS) range apply.	

Temperature

Accuracy (-10...80 °C)	$\leq \pm 2$ °C	The temperature is measured on the pressure sensor (silicon chip) that sits behind the metallic separating diaphragm. The specifications apply within the compensated temperature range.
Resolution	$\leq 0,01$ °C	
Internal measurement rate	> 10 Hz	

Serie 23SXc – Specifications

Electrical data

Connectivity	Digital
Digital interface	CANopen
Power supply	8...32 VDC
Power consumption (without communication)	< 200 mW
CANopen voltage insulation	± 32 VDC

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

Digital interface

Type	CAN-Bus	ISO 11898-2
Communication protocols	CANopen	CiA 301 V4.2
	Device profile	CiA 404 V1.2
Identification	Class.Group: 5.24	
Unit of pressure	bar, Pa, psi, mHg, mmH ₂ O, atm, at	Standard settings: Node ID 2, baud rate 500 kbit/s, pressure in bar, temperature in °C, PDO Float32. Other default settings available on request. Can be reconfigured via software by the customer later.
Unit of temperature	°C, °F, K	
Data type	Float32 or Int32 (selectable)	
Baud rates	10, 20, 50, 100, 125, 250, 500, 800, 1000 kbit/s and «auto baud rate»	
Lines	25 m @ 1 Mbit/s up to 5 km @ 10 kbit/s	

Electrical connection

Standard plug	M12	DIN EN 61076-2-101, A-coded, 5-pin
	Binder series 723	DIN EN 61076-2-106, 5-pin
Cable	ø 5,8 mm, PE sheath	5-pin, 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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Serie 23SXc – Specifications

Mechanical data

Materials in contact with media

Pressure connection	Stainless steel AISI 316L	≤ 400 bar	Others on request
	Stainless steel AISI 318LN, 1.4462	> 400 bar	
Pressure transducer separating diaphragm	Stainless steel AISI 316L		
Pressure transducer seal (internal)	None		
Pressure connection seal (external)	FKM (75 Shore) -20...200 °C	For media temperatures < -20 °C FVMQ (70 Shore, -60...175 °C) is used. Optional: EPDM (-40...150 °C)	

Other materials

Pressure transducer oil filling	Silicone oil	Others on request
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Further details

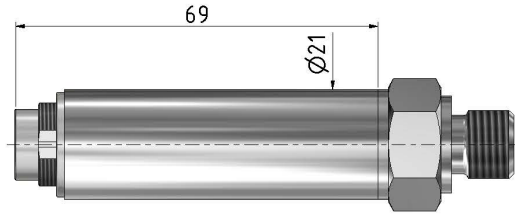
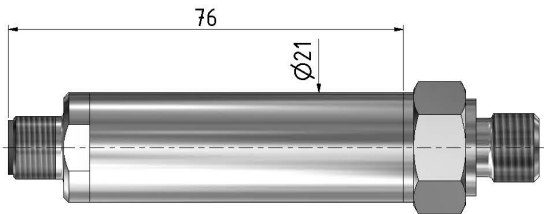
Pressure connection	G1/4 male	See Dimensions and options
	1/4-18NPT male	
Diameter × length	ø 21 mm × approx. 115 mm	
Weight (excluding cable)	approx. 130 g	Low pressure
	approx. 200 g	High pressure


Ambient conditions

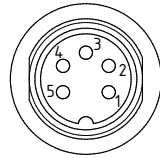
Media temperature range	-40...125 °C		Icing not permitted.
Ambient temperature range	-20...85 °C	Optional: -30...85 °C	
Storage temperature range	-20...85 °C		
Schutzart	IP67	M12	For relative pressure IP54.
	IP67	Binder series 723	For relative pressure, use a cable with integrated capillary.
	IP68	Cable gland	For relative pressure, cable with integrated capillary.
Notes	<ul style="list-style-type: none"> Protection ratings are valid with the corresponding mating plug. The design implementation of the ventilation for relative pressure versions can be found in the respective technical drawing. 		
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	

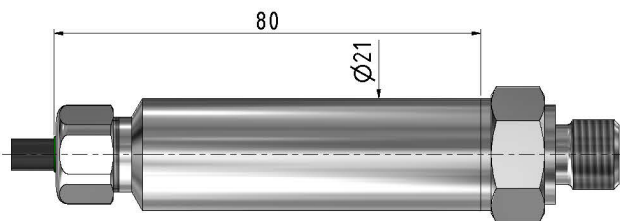
Serie 23SXc – Dimensions and options

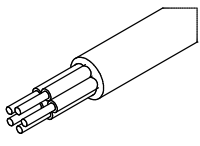
Electrical connections



M12	
M12 x 1	CANopen
	1 Shield
	2 +Vs
	3 GND
	4 CAN_H
	5 CAN_L

Binder series 723	
M16 x 0,75	CANopen
	1 GND
	2 n.c.
	3 +Vs
	4 CAN_H
	5 CAN_L

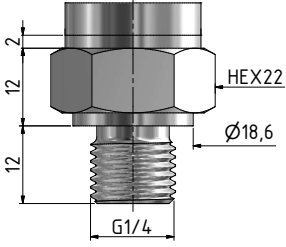
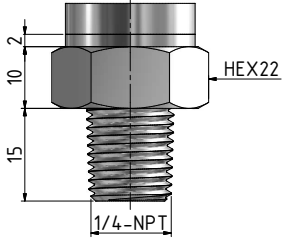


Cable gland	
Cable ø 5,8	CANopen
	WH GND
	RD n.c.
	BK +Vs
	BU CAN_H
	YE CAN_L
Shield on CASE	

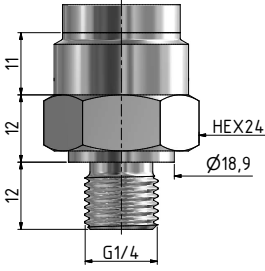
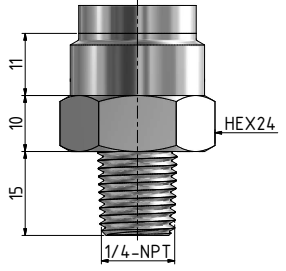
Serie 23SXc – Dimensions and options

Available pressure connections

For pressure range ≤ 160 bar

G1/4	1/4-18NPT
	
DIN EN ISO 1179-2	ASME/ANSI B 120.1

For pressure range > 160 bar

G1/4	1/4-18NPT
	
DIN EN ISO 1179-2	ASME/ANSI B 120.1

Other pressure connections available on request.

Other customer-specific options

- Other compensated pressure ranges
- Other compensated temperature ranges within $-40 \dots 125$ °C
- Other electrical connections
- Parts that come into contact with media made from Hastelloy C-276, Inconel 718 or titanium
- O-Rings made of other materials
- Other oil filling types for pressure transducers: e.g. special oils for oxygen applications
- Vacuum-optimised version for operating pressures $\leq 0,1$ bar abs.
- Integration of application-specific calculations
- Modifications to customer-specific applications

Examples of related products

- Series 23SX: Pressure transmitters with RS485 interface
- OEM series: Pressure transducer with electronics (e.g. series 9LXc or 20SXc with thread) for integration in one's own systems

Series 23SXc – Software, scope of delivery and accessories

Interface CANopen

The CAN bus is a bidirectional field bus that transmits the signals differentially and a-synchronously. The wiring effort is therefore low and the communication is very robust. The bit arbitration of CANopen enables not only pure master-slave queries (compare RS485 with ModBus), but also the event-triggered transmission of measurement data from a sensor to the controller.

CANopen features

- Supports all CiA 301 transmission rates:
10 kbit/s...1 Mbit/s and auto baud
- Supports 11/29 Bit identifiers according to CAN 2.0 A/B
- Internal sampling rate from > 1800 Hz, minimum PDO cycle time of 1 ms
- Digital filter: Moving and Repeating Average according to CiA 404
- Data types for process data: Float32 and Int32
- Selectable units:
 - Pressure: bar, Pa, psi, mHg, mmH2O, atm, at
 - Temperature: °C, °F, K
- Adjustable scaling factor and offset
- Object for recalibration date
- Auto-Zero function
- Auto start mode (NMT startup) e.g. for operation without master
- Pressure and temperature thresholds for range check freely selectable
- Free storage object for customer values

CANopen bus protocol

- Interface: CAN bus (ISO 11898-2)
- CANopen: CiA 301 V4.2
- Device profile: CiA 404 V1.2
- Node ID: Node assignment via LSS
- Error Control services: Heartbeat and Nodeguarding
- Process Data Objects (PDOs) for transmitting pressure, temperature values and statuses:
 - 3 PDOs for double pressure sensors
 - 2 PDOs for individual pressure sensors
- PDO transmission type: Time/SYNC triggered
- PDO mapping: Static
- Emergency news: Yes

The complete communication protocol and the EDS files are available on the KELLER website.

Interface converters



The connection to a computer is established via a PCAN-USB interface converter. The KELLER converter (K-510-M / B from PEAK) includes a 12 VDC power supply to operate a KELLER pressure transmitter without additional power supply.

Software CAN Calibration Tool




The License-free CAN Calibration Tool software can be used to configure and calibrate the pressure transmitter with CAN interface. Further informations are available in the manual on the KELLER website.

Series 23SXc – Software, scope of delivery and accessories

Scope of delivery

KELLER test report	Mating plug to Binder 723
	

Accessories

Calibration certificate	Interface converter	Mating plug to M12
		
<p>Issued by the external calibration laboratory of the German accreditation body DAkkS or the Swiss accreditation body SAS.</p>	<p>Adapter for USB connection High-Speed CAN connection transmission rates from 5 kbit/s up to 1 Mbit/s</p> <ul style="list-style-type: none"> • K-510-M for M12 PN 309010.0138 • K-510-B for Binder 723 PN 309010.0139 	<ul style="list-style-type: none"> • Angled socket, cable 5 m PN 602515.0093 • Angled socket, cable 2 m PN 602515.0094 • Female connector, cable 5 m PN 602515.0095 • Female connector, cable 2 m PN 602515.0096