



Transmitter P 31 Compact series

Two-wire transmitter with 4...20 mA output
Three-wire transmitter with 0...10 V output

Sensing element with thin-film poly-silicon strain gauge, thus:

- no moving mechanical parts
- excellent long-term stability
- high reproducibility

Pressure ranges graduated to DIN 16 128

Overload limit of 4x measuring span

Version with damping device

External smooth separating diaphragm

Diaphragm and process coupling of stainless steel

Stainless steel housing, protection mode IP65



PROFILE

The transmitter P31 converts the applied pressure spans of 0...1 bar to 0...400 bar into a pressure-proportional standard signal of 4...20 mA or 0...10 V.

DESCRIPTION

The pressure-sensitive element is a silicon substrate with a vacuum-deposited thin-film strain gauge bridge of poly-silicon. Because of its small dimensions, the sensor features good behaviour with pulsating pressure media and vibrations.

The elasticity of silicon ensures very good reproducibility and hysteresis as well as an overload limit of 4x span (max. 600 bar). Because of their high natural frequency, silicon sensors are also suitable for measuring fast pressure changes.

Transmitter P31 has a stainless steel process coupling with an external separating diaphragm. The silicon sensing element is mouted behind the diaphragm, and the space between is filled with silicone oil. The process coupling is threaded G 1/2 A or M20 x 1,5 for an elastomer FPM seal or metal seal to DIN 3852.

There are two versions of the coupling: with or without a built-in damping device. Damping is provided by a baffle installed in the content side. Versions ≥ 40 bar also have a protective plate in front of the separating diaphragm.

The damped version is recommended for applications involving incompressible media in which pressure peaks exceeding the maximum pressure range are likely. Such peaks can be caused for instance by pumps, fast shut-off valves, solenoid valves, hydraulic actuators, etc.

Transmitter P31 is designed for rough environments, and the very compact stainless steel housing has protection type IP65.

The electronics of the transmitter P31 work on the two-wire or three-wire principle, and form a single entity together with the pressure sensor. The specified measuring range (see ordering data) is factory-set for an output signal of 4...20 mA or 0...10 V.

A DC voltage supply is used for energization.

Electrical connections are made via an angled connector to DIN 43 650, type C, with a Pg7 cable entry and screw terminals.

PRINCIPLE OF OPERATION

The process pressure is applied to the sensor (1. Fig. 1), where it acts on a semi-conductor strain gauge bridge. The resistance change of the bridge results in a pressure-proportional output signal from the bridge. The bridge draws its power supply from a constant voltage source (2).

The output signal of the bridge is connected to the output terminals via the amplifier and the output stage (3). Two different electronic versions are available, namely two-wire 4...20 mA and three-wire 0...10 V. The output signals are factory-set with a tolerance for the initial value and end value (see technical data).

The diode (4) provides protection against reversed polarity of the supply, whereas diode (5) clips smaller voltage peaks.

An external 12...30 V DC supply at terminals 1 and 2 energizes the two-wire electronics of the transmitter; an external 15...30 V DC supply at terminals 3 and 2 energizes the three-wire electronics of the transmitter.

TECHNICAL DATA

INPUT

Spans

Gauge pressure

1 to 400 bar (see ordering data)

Span start: preset

Span end: preset

Overload limit

4 x span, max. pressure 600 bar (static overload)

Overload effect: < 0,1% of span

Process media: gases and liquids

Materials wetted by process

Stainless steel

Diaphragm: 1.4435 (X2 CrNiMo 1810)

Coupling: 1.4301 (X5 CrNi 189)

Filling medium: silicone oil

OUTPUT

Output signal

4...20 mA (two-wire)

0...10 V (three-wire) [0 V \pm 20 mV]

Characteristic: linear

Conformity

\leq 0,6% of span (terminal based)

Tolerance

Start/end value \leq 0,4% of span

Load

Two-wire 4...20 mA:

$$R_L = \frac{U_s - 12\text{ V}}{0,02\text{ A}} \quad U_s = \text{supply voltage}$$

Three-wire 0...10 V: > 5 k Ω

Settling time

approx. 2 ms without damping device

approx. 5 ms with damping device

\leq 25 bar

approx. 3 ms with damping device

\leq 40 bar

POWER SUPPLY

Transmitter supply

12...30 V DC (two-wire)

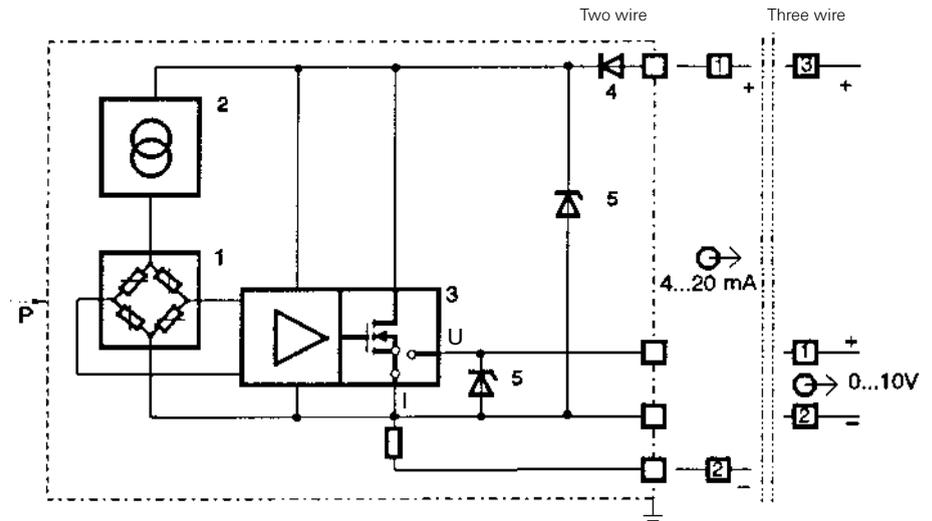
15...30 V DC (three-wire)

Effect of supply voltage

\leq 0,3% between 12 and 30 V DC (two-wire)

\leq 0,3% between 15 and 30 V DC (three-wire)

Fig. 1 Block diagram



- 1 Semi-conductor sensor
- 2 Constant voltage source
- 3 Output amplifier

- 4 Reversed polarity protection
- 5 Peak voltage clipper

Permissible ripple: $\leq 4V_{pp}$

Power consumption

$\leq 6\text{ mA}$ (three-wire)

ENVIRONMENTAL CONDITIONS

Ambient temperature limits

-25...+70 °C

Process temperature limits

-25...+70 °C

Temperature effect on span start

Typically 0,2%/10 K of span

max. 0,5%/10 K of span

With measuring ranges ≤ 6 bar, the values are 0,1%/10 K higher

Temperature effect on span

Typically 0,2%/10 K, max. 0,4%/10 K of span

Storage temperature: -40...+80 °C

Climatic category

Class 4 Z (with Z = 70 °C) to VDI/VDE

3540 (corresponds with HSC to

DIN 40 040)

Shock and vibration

Shock test Eb: to DIN IEC 68-2-29

Vibration test Fc: to DIN IEC 68-2-6

ELECTROMAGNETIC COMPATIBILITY

Complies with **EN 50081-1** and **EN 50082-2** for unrestricted use in industrial and residential areas.

GENERAL

Materials

Housing: stainless steel 1.4301

Connector: polyamide

Mode of protection

Housing: IP 65 to DIN 40 050

(IEC 529)

Process connection

G 1/2 A or M20 x 1,5

Sealing to DIN 3852

Either with the FPM (Viton) elastomer sealing ring supplied with the transmitter or

with metal sealing ring Form D, A 21 x 26 mm ϕ to DIN 7603 (not supplied)

Electrical connection

Connector, DIN 43 650, type C, Pg7, screw terminals for 1,5 mm²

Mounting position: Not critical

Mounting method

Threaded coupling G 1/2 A or M20 x 1,5

Mounting torque error: typical < 0,3%

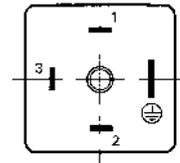
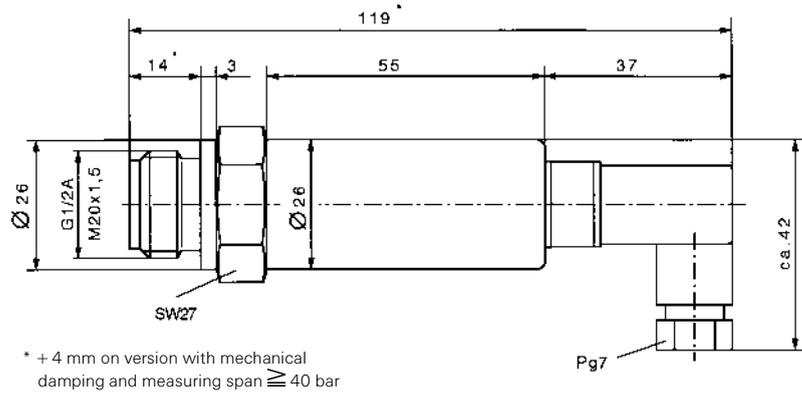
Weight: approx. 0,18 kg

Operating instructions

9499 040 41801

Accessories: 1 operating instruction

Fig. 2 Dimensions (mm) and electrical connections



Two wire:
 1 = output (+)
 2 = output (-)
 3 = N.C.

Three wire:
 1 = output (+)
 2 = output/supply (-)
 3 = supply (+)

(⊕) = measurement earth
 (⊖) = measurement earth

* + 4 mm on version with mechanical damping and measuring span \leq 40 bar

Gauge pressure	Measuring ranges	
	0... 1,0 bar	05
	0... 1,6 bar	06
	0... 2,5 bar	07
	0... 4 bar	08
	0... 6 bar	09
	0... 10 bar	10
Coupling without damping	0... 16 bar	11
	0... 25 bar	12
	0... 40 bar	13
	0... 60 bar	14
	0... 100 bar	15
	0... 160 bar	16
	0... 250 bar	17
	0... 320 bar	18
	0... 400 bar	19

Transmitter P 31

9 4 0 4 2 8 0 1

Process conn. G 1/2 A, metal seal	6
Process conn. M20 x 1,5, metal seal	7
Process conn. G 1/2 A, FPM seal	8
Process conn. M20 x 1,5, FPM seal	9
Two-wire version, output 4... 20 mA	0
Three-wire version, output 0... 10 V	3

Gauge pressure	Measuring ranges	
	0... 6 bar	59
	0... 10 bar	60
Coupling with damping device	0... 16 bar	61
	0... 25 bar	62
	0... 40 bar	63
	0... 60 bar	64
	0... 100 bar	65
	0... 160 bar	66
	0... 250 bar	67
	0... 320 bar	68
	0... 400 bar	69

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