

IA 110

Calibrating a pressure sensor



Description

- test-pressure generated with dead-weight piston manometer
- electronic pressure sensor with ceramic measuring cell
- plotting a calibration curve
- compact experimental unit for group working or demonstration

The experimental unit IA 110 can be used to calibrate an electronic pressure sensor under practical conditions.

The test pressure is generated with a conventional piston manometer. The piston is loaded with weight rings and generates a defined test pressure $p = F_G / A_p$, where F_G is the force due to the weights and A_p is the cross-sectional area of the piston. A hand-operated spindle is used to relieve the pressure after measurement allowing the piston to return to a rest position. The influence of friction is minimised by rotating the piston during measurement. The test pressure generated in this way is applied to the diaphragm of a pressure sensor. The pressure-dependent electrical output signal is indicated on a digital display.

The pressure sensor used is a state-of-the-art ceramic measuring cell, in which strain-dependent piezo resistors are mounted on a ceramic diaphragm.

The resistors are configured to form a measuring bridge. An integrated amplifier circuit evaluates the pressure-dependent detuning of the measuring bridge and outputs a proportional voltage signal.

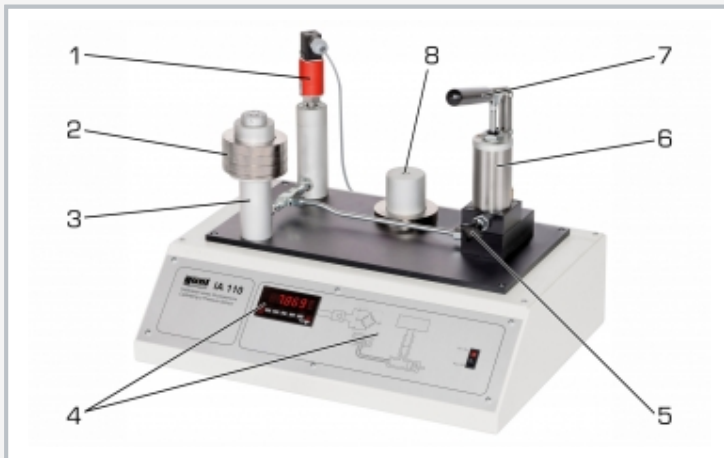
The kit also includes a second pressure sensor in the form of a cutaway model for enhanced clarity. The entire experimental unit is contained in a compact housing, and is easy to handle.

Learning objectives/experiments

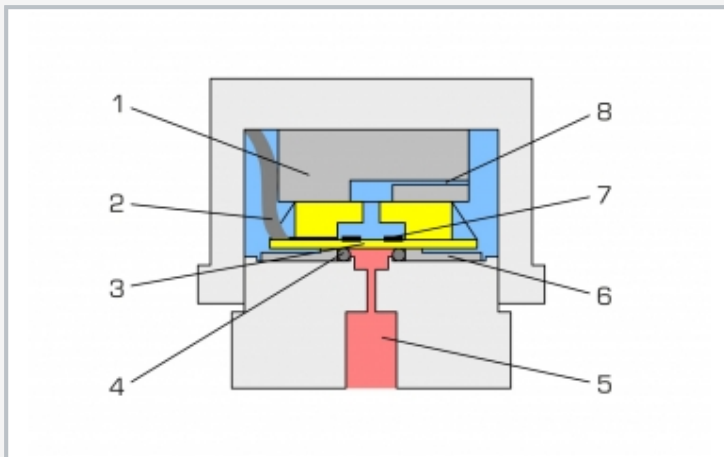
- familiarisation with, and carrying out of the calibration of an electronic pressure sensor
- plotting the sensor output signal dependent on the pressure applied
- familiarisation with the design and operation of a piezo-resistive electronic pressure sensor
- familiarisation with the installation and connection of the pressure sensor
- information on applications, measuring ranges and accuracies of typical electronic pressure sensors

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1 pressure sensor being calibrated, 2 loading device: weight carrier with piston and weights, 3 cylinder, 4 digital display for displaying the output signal and process schematic, 5 manual adjustment to relieve the pressure, 6 compensating cylinder, 7 pump lever for the compensation cylinder, 8 holder for weight carrier



1 brace, 2 connecting cable, 3 ceramic measuring cell with diaphragm, 4 sealing ring, 5 pressure connection, 6 pressure plate, 7 piezo resistors, 8 pressure equalisation bore for relative pressure measurement



Interior layout of an electronic pressure sensor

Specification

- [1] calibration unit with dead-weight piston manometer and hand-operated spindle
- [2] electronic pressure sensor with ceramic measuring cell, integrated amplifier and voltage output
- [3] digital display for output signal
- [4] additional pressure sensor as cutaway model
- [5] set of weights
- [6] transmission medium: hydraulic oil
- [7] process schematic on front panel

Technical data

Pressure sensor

- measuring range: 0...2,5bar
- supply: 24VDC
- output signal: 0...10VDC

Piston manometer with pressure piston

- diameter: 12mm
- number of weights: 5
- pressure graduations:
 - ▶ 0,5bar
 - ▶ 1,0bar
 - ▶ 1,5bar
 - ▶ 2,0bar
 - ▶ 2,5bar

Digital display: 4 1/2 digits

Hydraulic oil: HLP ISO 32

230V, 50Hz, 1 phase

230V, 60Hz, 1 phase

120V, 60Hz, 1 phase

UL/CSA optional

LxWxH: 600x450x450mm

Weight: approx. 20kg

Scope of delivery

- 1 experimental unit
- 1 set of weights
- 1 oil (1L)
- 1 cutaway model
- 1 set of instructional material

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Optional accessories

020.30009 WP 300.09 Laboratory trolley