

Metran-501-PKD-R Portable Pressure Calibrator



- **Pressure range**
0 -0.063...60 MPa
- **Measurement and generation limits of electrical signals:**
dc voltage 0-1.1 V;
direct current 0-22 mA
- **Pressure measurement accuracy**
 ± 0.04 , ± 0.05 , $\pm 0.1\%$ of URL
- **Supply of transmitters under test with voltage of 24 V from Metran-516 Power Supply**
- **Pressure measurement units:**
Pa, kPa, MPa, kgf/m², kgf/cm², mmHg, cmHg, mmH₂O, mbar, bar
- **Dust and water tightness per IP54**
- **RS232 Interface (optional)**
- **"RV Calibration" Software**
- **Power supply:**
 - built-in Ni-Cd battery;
 - Metran-516 Grid Power Supply

Metran-501-PKD-R portable pressure calibrator is designated for precise measurement and reproduction of gage pressure, vacuum, voltage and dc strength.

It is used as the standard for verification and calibration of pressure, differential pressure, vacuum and gage-vacuum transmitters, standard pressure gages, vacuum gages and other measuring instruments; as well as secondary indicating and recording instruments.

It provides calibration of a pressure instruments in operating conditions.

Main functional capabilities:

- measurement and reproduction of electrical signals;
- pressure relay testing;
- automatic calculation of measurement accuracy of the device under test;
- archiving of transmitter calibration results into non-volatile memory;
- entering of non-standard ranges;
- calibration data transfer into PC via RS232 interface.

DESIGN AND OPERATING PRINCIPLE

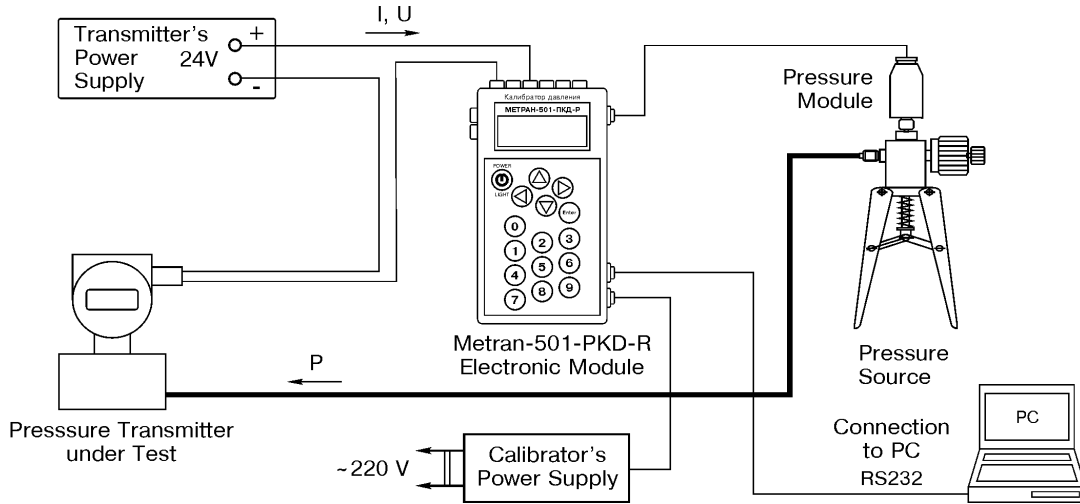


Fig. 1. Verification and Calibration of Pressure Transducers/Transmitters.

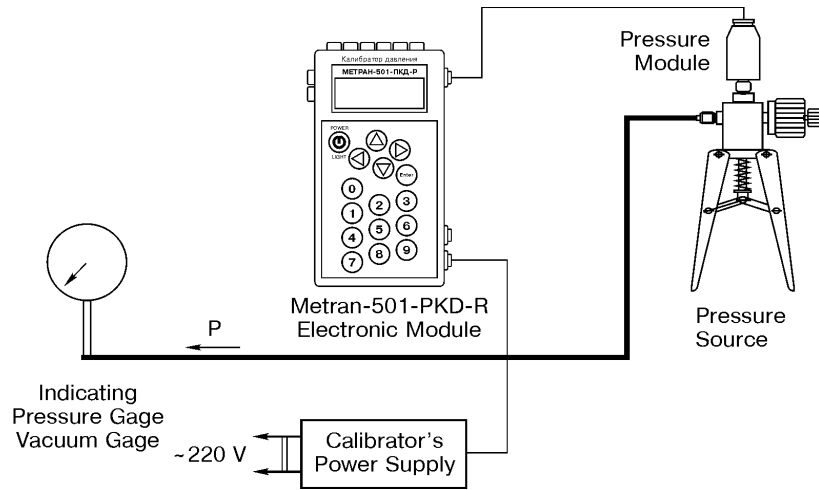


Fig. 2. Verification and Calibration of Indicating Pressure Gauges.

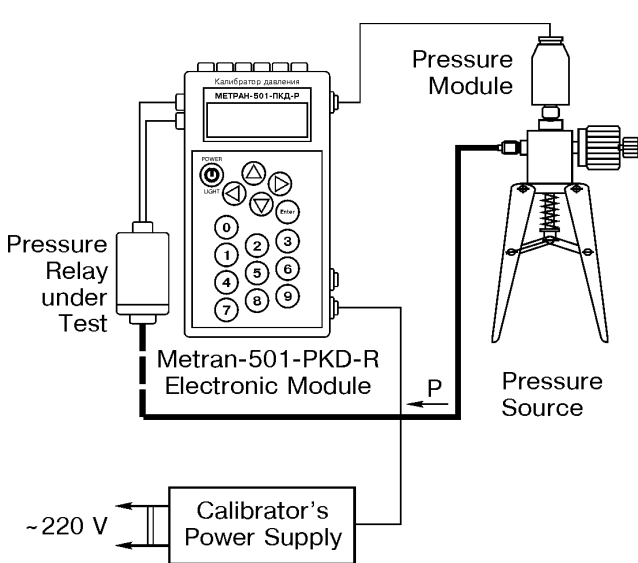


Fig. 3. Pressure Relays Verification.

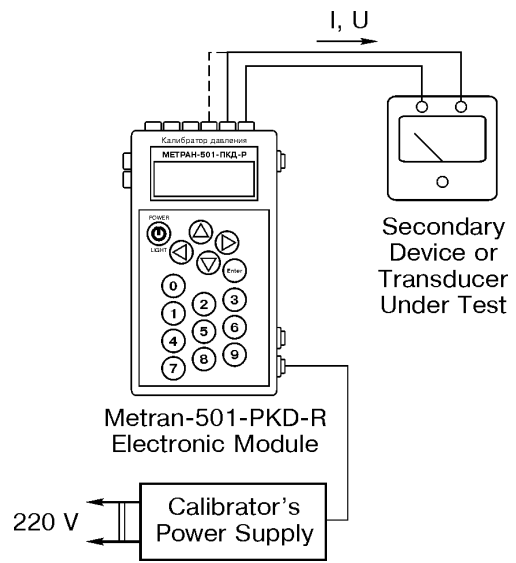


Fig. 4. Verification and Calibration of Recorders, etc.

DESIGN

The main components of the calibrator are:

- Electronic module;
- External reference pressure module;
- Pressure sources: a pneumatic hand pump, a hydraulic hand press, and a multifunctional hand pump (pneumohydraulic).

All calibrator's components are supplied in a compact, easy-to-handle carrying case.

The **electronic module** of calibrator is designed as a hand-held device in a plastic housing, with the keypad and liquid-crystal alphanumeric display (LCD) on the front panel, and with connectors for an external reference pressure module, an external power supply, a transmitter under test, a PC adapter connection, a pressure relay and measurement circuits and generation of electrical signals for devices under test on the top and side faces.

The **external reference pressure module** is a standard instrument for pressure and vacuum measurement.

Main components of the external reference pressure module are a precision pressure sensor, an analog-digital converter (ADC) and a non-volatile memory (EEPROM).

The non-volatile memory stores conversion characteristics of a precision pressure sensor, that are received at its calibration.

Modules K2.5; K6; K25; M0.16; M1; M25V; M63V; M100V are designed for use with clean filtered air only. If pressure cavities of transmitters under test are not purged correctly, residual corrosive measuring medium of transmitters can get into the pressure sensor and contaminate it or cause failure of operation. Operating practice shows false connection of pressure modules to water, oil, etc. Thus, to provide stable work of these modules it is necessary to use clean air only.

Modules K2.5D, K6D, K25D, M0.16D, M1D and M2.5 are designed with a protective diaphragm (membrane) of stainless steel 12X18H10T. These modules provide operation not only with air, but with liquid fluids: water, oil, technical liquids, which do not cause corrosion of protective diaphragm (membrane). **Modules M10, M25, M60** have the same protection.

OPERATING PRINCIPLE

Measuring pressure generated by the pressure source is directly applied to the reference pressure module and through a connecting hose to the pressure transmitter under test (if necessary, use reducing sleeves). An electrical signal of pressure module's precision sensor is converted into digital code with due account for sensor's characteristic conversion factors considering non-linearity and temperature effect. Module's output digital code that is proportional to the measuring pressure value is transmitted into a microprocessor unit through electronic module's input connector and after processing it is displayed on electronic module's LCD as the true pressure value produced by the pressure source in the working cavity of the pressure transmitter under test.

Through protection circuits preventing module's electronic circuit from overload, an electrical output signal of the transmitter under test is transmitted into multi-channel ADC input, which converts the value of measured electrical signal into a digital code processed by the microprocessor. The value of the electrical output signal from the transmitter under test is displayed on the calibrator's LCD.

When upper range limit of the reference module increases by 15%, the audible overload alarm actuates.

OPERATION MODES

The calibrator can operate in two display modes. The current value and measurement unit of pressure setting, range of transmitter output and current output value are displayed in Mode 1. In mode 2 the first line displays the same as in Mode 1, the second line indicates measurement error in % of URL.

Example:

| | | |
|--------|--------|-------|
| Mode 1 | kPa | 500 |
| | 0-5 mA | 2.508 |

| | | |
|--------|-------|-------|
| Mode 2 | kPa | 500 |
| | Error | 0.16% |

During verification (calibration) you may change the modes many times.

To provide verification or control of secondary devices operating with the pressure transmitter, the calibrator has a mode «Generation». In this mode, current or voltage values set with the help of the keypad are generated on a relevant output of the electronic module. The set value of electrical signals is displayed digitally on calibrator's LCD. If the pressure transmitter is connected in two-wire circuit, the power supply unit is switched off, as the calibrator is a source of current in the mode "Generation".

Programming of functional capabilities: setting of operation modes, selection of measurement ranges, data entry, etc. is performed with four basic keys of the electronic module. Menu "prompt messages" displayed on electronic module's LCD allows any user to master the calibrator operation without special training.

Use of RS232 interface with "RV Calibration" software enables transfer of calibration data directly from the calibrator into a PC for their further processing and automatic execution of transmitter verification report. The verification report includes general technical data (type, serial number, and verification interval), verification conditions, specifications (upper range limit, set measurement range, etc.), error curve and verification parameters.

The pressure module can operate with any electronic module of Metran-501-PKD-R Calibrator, as it contains the individual characteristic in its memory (EEPROM). It allows the customer to purchase the calibrator with a minimum quantity of modules initially, and then, as required, order additional modules and pressure sources without sending the electronic module to the manufacturer for calibration.

SPECIFICATIONS

PRESSURE RANGES

Table 1

| Pressure Module Code | Measurement Limits of Pressure Modules, MPa | Pressure Measurement Subranges, MPa | | | | Maximum Pressure, MPa |
|------------------------------|---|-------------------------------------|--------|----------|---------|-----------------------|
| Gage Pressure Modules | | | | | | |
| K2.5 | 0-0.0025 | 0-0.0016 | | 0-0.0025 | | 0.0035 |
| K2.5D | | | | | | 0.005 |
| K6 | 0-0.006 | 0-0.004 | | 0-0.006 | | 0.0085 |
| K6D | | | | | | 0.012 |
| K25 | 0-0.025 | 0-0.01 | | 0-0.016 | 0-0.025 | 0.035 |
| K25D | | | | | | 0.05 |
| M0.16 | 0-0.16 | 0-0.04 | 0-0.06 | 0-0.1 | 0-0.16 | 0.22 |
| M0.16D | | | | | | 0.32 |
| M1 | 0-1.0 | 0-0.25 | 0-0.4 | 0-0.6 | 0-1.0 | 1.4 |
| M1D | | | | | | 2 |
| M2.5 | 0-2.5 | 0-1.6 | | 0-2.5 | | 3.5 |
| M10 | 0-10 | 0-4.0 | | 0-6.0 | 0-10.0 | 14 |
| M25 | 0-25 | 0-16.0 | | 0-25.0 | | 35 |
| M60 | 0-60 | 0-40 | | 0-60 | | 70 |
| Gage-Vacuum Modules | | | | | | |
| V25 | -0.025...0 | - | | | | -0.035 |
| V63 | -0.063...0 | - | | | | -0.09 |
| V100 | -0.1...0 | - | | | | -0.1 |

Notes:

1. One electronic module can work with any quantity of pressure modules.
2. To provide minimum pressure transmitters verification/calibration error, measurement range of each plug-in reference module is divided into 2-4 subranges, and calibrator error is rated from upper range limit of a subdivision.
3. Letter "D" at the end of a code means a module with an isolating diaphragm.

**MEASUREMENT AND GENERATION RANGES
OF ELECTRICAL SIGNALS**

Table 2

| Parameter | Range |
|------------------------------|----------|
| In mode "Measurement" | |
| Direct current | 0-20 mA* |
| DC voltage | 0-1 V |
| In mode "Generation" | |
| Direct current | 0-20 mA |
| DC voltage | 0-1 V |

* Metran-501-PKD-R Calibrator enables measurement of pressure transmitter outputs 0-5, 5-0, 4-20, 20-4 mA.

Power supply of transmitters under test -

DC voltage 24 V. Maximum load current 50 mA.

Input resistance of electronic module:

- 10 MOhm min. - at voltage measurement
in the range of 0-1.0 V;
- 75 Ohm max.- at current measurement.

Power consumption of electronic module from grid power supply, maximum

0.4 W - in measurement mode;
0.6 W - in generation mode.

Weight of electronic module

0.45 kg max.

Average life time - 8 years minimum**Number of digits for parameters indication:**

5 decimal places - pressure/vacuum display;
6 decimal places - current/voltage display.

CALIBRATOR ACCURACY

Table 3

| Accuracy Code | Parameter | Range | Accuracy, minimum |
|---------------|-----------------------|------------------------|--------------------------------|
| 1 | In mode "Measurement" | | |
| | Gage Pressure | 0-0.16...0-60 MPa | ±0.04%URL |
| | | 0-25 kPa | ±0.05%URL |
| | | 0-2.5; 0-6 kPa | ±0.06%URL |
| | Vacuum | -25-0 kPa...-100-0 kPa | ±0.05%URL |
| | Current | 0-20 mA | ±(0.02% of reading +0.0005 mA) |
| | Voltage | 0-1 V | ±(0.02% of reading +0.0001 V) |
| | In mode "Generation" | | |
| | Current | 0-20 mA | ±(0.03% of reading +0.001 mA) |
| | Voltage | 0-1 V | ±(0.03% of reading +0.0002 V) |
| 2 | In mode "Measurement" | | |
| | Gage Pressure | 0-0.16...0-60 MPa | ±0.05%URL |
| | | 0-25 kPa | ±0.06%URL |
| | | 0-2.5; 0-6 kPa | ±0.1%URL |
| | Vacuum | -25-0 kPa...-100-0 kPa | ±0.06%URL |
| | Current | 0-20 mA | ±(0.02% of reading +0.001 mA) |
| | Voltage | 0-1 V | ±(0.02% of reading +0.0002 V) |
| | In mode "Generation" | | |
| | Current | 0-20 mA | ±(0.04% of reading +0.001 mA) |
| | Voltage | 0-1 V | ±(0.04% of reading +0.0002 V) |

URL - upper range limit of pressure module subrange;
Of reading - the current value of measured/generated (reproduced) quantity.

DELIVERY SET

| | |
|--|----------|
| The delivery set includes: | |
| - Electronic Module | 1 unit |
| - Pressure Module | by order |
| - Pressure Source | by order |
| - Battery | 1 unit |
| - Electrical Cable for connection of device under test | 1 unit |
| - Metran-516 Grid Power Supply | 1 unit* |
| - Carrying Case | 1 unit |
| - Data Sheet 1560.000PS | 1 copy |
| - Operation Manual 1560.000RE | 1 copy |
| - Verification Certificate | 1 copy |
| - Verification Procedure | 1 copy |
| - Options | by order |

* Metran-516 Power Supply provides voltage supply of 24 V for the calibrator and transmitters under test.

OPERATION CONDITIONS

Ambient temperature from 0 to 50°C.
Relative humidity from 30 to 80%.
Atmospheric pressure from 84 to 106.7 kPa.

OPTIONS

"RV Calibration" software includes CD with software and RS232 cable for PC connection.