**SCOPE 1 ЛК**

**Sofia, 31.10.2024**

UNISYST LTD

**CALIBRATION LABORATORY FOR MEASURING INSTRUMENTS**

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**Laboratory address:** 1582 Sofia, Druzhba-2, 144 Prof. Tsvetan Lazarov Blvd.

**To perform calibration of:**

| Type of scope: *fixed* | | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| **№** | **Measuring**  **instrument** | | **Measured quantity,**  **Measurement unit** | **Range of measurement** | **Measurement uncertainty** | **Calibration method** |
| 1 | 2 | | 3 | 4 | 5 | 6 |
| 1.\* | DC voltmeters | | Direct voltage,  DCU, V | from 0,0mV  to 200 mV | from 7,5.10-3 mV  to 2.10-2 mV | МК 7.02 01-01:2020 |
| from 0,2 V  to 200 V | from 2.10-2 mV  to 4,4.10-3 V |
| from 200 V  to 1 000 V | from 4,4.10-3 V  to 6.10-2 V |
| 2. | AC voltmeters  (45 Hz and  1 kHz) | | Alternating voltage,  ACU, V | from 10 mV  to 200 mV | from 3.10-2 mV  to 0,17 mV | МК 7.02 01-13:2020 |
| from 200 mV  to 200 V | from 0,17 mV  to 4.10-2 V |
| from 200 V  to 1000 V | from 4.10-2 V  to 0,35 V |
| 3.\* | DC voltage calibrators | | Direct voltage,  DCU, V | from 0,0 mV  to 100 mV | from 2,1.10-3 mV  to 5.10-3 mV | МК 7.02 01-01:2020 |
| from 0,1 V  to 10 V | from 5.10-6 V  to 2,4.10-4 V |
| from 10 V  to 1000 V | from 2,4.10-4 V  to 6.10-2 V |
| from 1000 V  to 20 000 V | from 1.101 V  to 2.102 V |
| 4.\* | AC voltage calibrators  (45 Hz and  1 kHz) | | Alternating voltage,  ACU, V | from 0,01 V  to 750 V | from 5.10-5 V  to 0,5 V | МК 7.02 01-13:2020 |
| AC voltage calibrators  (50 Hz) | | from 1000 V  to 20 000 V | from 2.101 V  to 4.102 V |
| 5.\* | DC ammeters | | Direct current,  DCI, A | from 0,0 mА  to 20 mА | from 1,8.10-4mА to 1,5.10-3 mА | МК 7.02 01-02:2018 |
| from 0,02 А  to 2 А | from  1,5.10-3 mА  to 2,4.10-4 А |
| from 2 A  to 20 А | from 2,4.10-4 A  to 6,7.10-3 А |
| 6. | AC ammeters  (45 Hz and  1 kHz) | | Alternating current,  ACI, A | from 0,1 mА  to 200 mА | from 3,8.10-3 mА  to 0,7 mА | МК 7.02 01-12:2018 |
| from 200 mA  to 20 А | from 0,7.10-3 А  to 6.10-3 A |
| 7.\* | AC current calibrators  (45 Hz and  1 kHz) | | Alternating current,  ACI, A | from 1 mА  to 100 mА | from 6.10-3 mА  to 9.10-2 mА | МК 7.02 01-12:2018 |
| from 100 mA  to 10 А | from 9.10-5 A  to 1,8.10-2 A |
| 8. | DCI/ACI  (45 Hz and  1 kHz)  clamp meter | | Direct and Alternating current,  DCI and ACI, A | from 0,01 A  to 1 000 А | from 5,8.10-3 А  to 0,2 A | МК 7.02 01-02:2018  МК 7.02 01-12:2018 |
| 9.\* | DC current calibrators | | Direct current,  DCI, A | from 0,0 mA  to 100 mA | from 4.10-4 mА  to 3,3.10-2 mА | МК 7.02 01-02:2018 |
| from 100 mA  to 10 А | from 3,3.10-2mА  to 9,4.10-3 A |
| 10.\* | DC ohmmeters | | Direct current resistance,  *R*, Ω | from 0,000 1 Ω  to 100 кΩ | from 3,2.10-8 Ω  to 2,4.10-3 kΩ | МК 7.02 01-04:2018 |
| from 1 кΩ  to 1 ТΩ | from 2,8.10-4 kΩ  to 7 GΩ |
| 11.\* | Electrical resistance measure | | Direct current resistance,  *R*, Ω | from 0,000 1 Ω  to 100 Ω | from 3.4.10-8 Ω  to 1,2.10-2 Ω | МК 7.02 01-03:2018 |
| from 100 Ω  to 100 МΩ | from 8,4.10-3 Ω  to 0,18 МΩ |
| 12. | Frequency meters | | Frequency,  *f*, Hz | from 1 Hz  to 20 МHz | oт 1,6.10-3 Hz  to 0,58kHz | МК 7.02 01-14:2018 |
| 13. | Frequency generators | | Frequency,  *f*, Hz | from 1 Hz  to 1 GHz | oт 5,8.10-6 Hz  to 8,2.10-7 GHz | МК 7.02 01-14:2018 |
| 14.\* | Inductance measuring instruments  (1 kHz) | | Inductance,  *L*, H | from 1 μН  to 50 mH | oт 3.10-4 mН  to 2.10-2 mН | МК 7.02 01-15:2018 |
| 15. | Capacitance measuring instruments (300 Hz and kHz) | | Capacity,  *С*, F | at frequency  300 Hz  from 1 nF to 50 μF | from 1 pF  to 2,9.10-2 nF | МК 7.02 01-15:2018 |
| at frequency  1000 Hz  from 1 nF  to 100 nF | from 1pF to 30 pF |
| 16. | Single-phase measuring instruments active power measurement (wattmeters) | | Power  P, W | AC power:  U= 230 V  f= 50 Hz  and  U= 115 V  f= 60 Hz  I: from 0,1 A  to 10 A  PF: from -1 to 1 | from 10 mW  to 0,50 W | МК 7.02 01-16:2018 |
| DC power:  U: from 1 V  to 240 V  I: from 0,01 A  to 10 A | from 7,9 µW  to 0,3 W |
| 17.\* | Measuring instruments for measurement and simulating absolute, atmospheric, positive and negative pressure | | Pressure,  *p*, bar | from  minus 2,5 mbar  to 2,5 mbar | 2,0.10-3 mbar | МК 7.02 01-11:2018 |
| from  minus 75 mbar  to 75 mbar | 2,5.10-3 mbar |
| from  minus 0,92 bar  to 70 bar | from 2,5.10-4 bar  to 6,5.10-3 bar |
| from 70 bar  to 700 bar | from 4,0.10-2 bar  to0,20bar |
| from 500 hPa  to 1 100 hPa | from 2,2.10-2 hPa  to 5,5.10-2 hPa |
| 18. | 18.1\* Thermometers (digital, analog and liquid) | | Temperature,  *t*, °С | from minus 40 °С  to 1 100 °С | from 0,06 °С  to 2,0 °С | МК 7.02 01-07:2018  МК 7.02 01-10:2018 |
| 18.2 Infrared thermometers | | from 150 °С  to 1 100 °С | from 1,1 °С  to 3,0 °С | МК 7.02 01-07:2018 |
| 19.\* | 19.1  Resistance thermometers | | Temperature,  *t*, °С  Resistance  R, Ω, | from minus 40 °С  to 600 °С | from 0,06 °С  to 0,2 °С | МК 7.02 01-08:2018 |
| from 1 Ω  to 10 000 Ω | from 7.10-3 Ω  to 0,12 Ω |
| 19.2 Thermocouples | | Temperature  t, °С  Thermoelectric voltage,  mV | from minus 40 °С  to 600 °С | from 0,30 °С  to 0,90 °С | МК 7.02 01-09:2018 |
| from 600 °С  to 1 100 °С | from 1,5 °С  to 2,5 °С |
| from minus 10 mV  to 200 mV | 2.10-3 mV |
| 20.\* | 20.1 Indicators with input: unified electrical signal | | Input:  Resistance,  *R*, Ω,  Direct current,  DCI, mA  Direct voltage,  DCU, mV (V) | from 0,001 Ω  to 10 кΩ | from 7.10-5 Ω  to 0,9 Ω | МК 7.02 01-06:2018 |
| from 0 mA  to 20 mA | from 0,6 10-4mA  to 6.10-4 mA |
| from minus 50 mV  to 150 mV  from 0 V  to 5 V | from 1.10-3 mV  to 2.10-3 mV |
| 20.2 Temperature indicators with input: DCU and R (simulation mode) | | Temperature,  t, °С | from minus 200 °С  to 1 600 °С | from 0,06 °С  to 5,0 °С | МК 7.02 01-05:2018 |
| 21. | Calipers  (depth gauge and height gauge) | | Length  *l*, mm | up to 200 mm | 18 μm | МК 7.02 01-17:2018 |
| 22. | Micrometers (micrometer depth gauge and height gauge) | | Length  *l*, mm | up to 200 mm | 5,8 μm | МК 7.02 01-18:2018 |
| 23. | Measure of length with scale marks | | Length  *l*, m | up to 2 m | 0,12 mm | МК 7.02 01-19:2018 |
| from 2 m  to 30 m | from 0,12 mm  to 0,6 mm |
| 24.\* | Stopwatches  and timers | Digital | Time interval, s | from 0 s  to 86400 s  (24 h) | 0,01 s/24 h | МК 7.02 01-20:2018 |
| Mechanical | Time interval, s | from 0 s  to 86400 s  (24 h) | 1,0 s/24 h |
| 25. | Installation testers | Trip time | Time,  ms | t: from 10 ms  to 2 000 ms | from 0,59 ms  to 0,90 ms | МК 7.02 01-21:2021 |
| Test current  (50 Hz) | Alternating current,  ACI, mА | Ia: from 10 mА  to 2 500 mА | from 0,09 mА  to 5,9 mА |
| Loop impedance | Impedance,  Ω | Z: from 0,098 Ω  to 1,8 kΩ | from 0,04 Ω  to 11 Ω |
| Contact voltage  (50 Hz) | Alternating voltage,  ACU, V | from 0,1 V  to 90 V | from 0,01 V  to 0,1 V |
| 26. | Hygrometers | | Relative humidity,  %rh | from 20 %rh  to 90 %rh | from 1,7 %rh  to 2,5 %rh | МК 7.02 01-22:2022 |

**Note:** Calibration of the measuring instruments specified in clauses whit (\*) is performed in the laboratory and on site, at the customer’s premises.

**References:**

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|  | МК 7.02 01-01/2020 | Method for calibration of voltmeters and calibrators for direct voltage. |
|  | МК 7.02 01-02/2018 | Method for calibration of ammeters and calibrators for direct current. |
|  | МК 7.02 01-03/2018 | Method for calibration of electrical resistance measure. |
|  | МК 7.02 01-04/2018 | Method for calibration of ohmmeters. |
|  | МК 7.02 01-05/2018 | Method for calibration of temperature indicators with input for thermocouples or resistance thermometers (ТС or RTD). |
|  | МК 7.02 01-06/2018 | Method for calibration of indicators on different quantities. |
|  | МК 7.02 01-07/2018 | Method for calibration of thermometers (digital, analog and infrared). |
|  | МК 7.02 01-08/2018 | Method for calibration of resistance thermometers. |
|  | МК 7.02 01-09/2018 | Method for calibration of thermocouples. |
|  | МК 7.02 01-10/2018 | Method for calibration of liquid thermometers. |
|  | МК 7.02 01-11/2018 | Method for calibration of measuring instruments for measuring and simulating of pressure. |
|  | МК 7.02 01-12/2018 | Method for calibration of ammeters and calibrators for alternating current. |
|  | МК 7.02 01-13/2020 | Method for calibration of voltmeters and calibrators for alternating voltage. |
|  | МК 7.02 01-14/2018 | Method for calibration of frequency meters and frequency generators |
|  | МК 7.02 01-15/2018 | Method for calibration of measuring instruments to measure R, L, C |
|  | МК 7.02 01-16/2018 | Method for calibration of measuring instruments to measure active power (wattmeters). |
|  | МК 7.02 01-17/2018 | Method for calibration of calipers (depth gauge and height gauge) |
|  | МК 7.02 01-18/2018 | Method for calibration of micrometers (micrometer depth gauge and height gauge). |
|  | МК 7.02 01-19/2018 | Method for calibration of measure of length with scale marks. |
|  | МК 7.02 01-20/2018 | Method for calibration of stopwatches and timers. |
|  | МК 7.02 01-21/2021 | Method for calibration of Installation testers. |
|  | МК 7.02 01-22/2021 | Method for calibration of hygrometers. |