**SCOPE 1 ЛК**

**Sofia, 31.10.2024**

UNISYST LTD

**CALIBRATION LABORATORY FOR MEASURING INSTRUMENTS**

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**To perform calibration of:**

| Type of scope: *fixed* |
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| **№** | **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 mVto 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 Vto 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 Vto 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 01-02:2018МК 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 3,3.10-2mАto 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 Hzfrom 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 Vf= 50 HzandU= 115 Vf= 60 HzI: from 0,1 A to 10 A PF: from -1 to 1 | from 10 mWto 0,50 W | МК 7.02 01-16:2018 |
| DC power:U: from 1 V to 240 VI: from 0,01 A to 10 A  | from 7,9 µWto 0,3 W |
| 17.\* | Measuring instruments for measurement and simulating absolute, atmospheric, positive and negative pressure | Pressure,*p*, bar | from minus 2,5 mbarto 2,5 mbar | 2,0.10-3 mbar | МК 7.02 01-11:2018 |
| from minus 75 mbarto 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 °Сto 1 100 °С | from 0,06 °С to 2,0 °С | МК 7.02 01-07:2018МК 7.02 01-10:2018 |
| 18.2 Infrared thermometers | from 150 °Сto 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 °Сto 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, °СThermoelectric voltage, mV | from minus 40 °Сto 600 °С | from 0,30 °С to 0,90 °С | МК 7.02 01-09:2018 |
| from 600 °Сto 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, mADirect 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 mVfrom 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 °Сto 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 msto 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 mАto 2 500 mА | from 0,09 mА to 5,9 mА |
| Loop impedance | Impedance,Ω | Z: from 0,098 Ωto 1,8 kΩ | from 0,04 Ωto 11 Ω |
| Contact voltage(50 Hz) | Alternating voltage, ACU, V | from 0,1 Vto 90 V | from 0,01 Vto 0,1 V |
| 26. | Hygrometers | Relative humidity, %rh | from 20 %rhto 90 %rh | from 1,7 %rhto 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. |