

# שרותי כיול - אורך

| Measurement Standards   | Reference Document                        | Best Measurement Capability       | Range         | Measured Quantity, Instrument |
|---|---|-----------------------------------|---------------|-------------------------------|
| Automatic Gauge Block Interferometer                                | Instruction Manual of TESA Interferometer | from 0.024 to 0.038 $\mu\text{m}$ | 0.5 – 100 mm  | Gauge Blocks                  |
| Standard Gauge Blocks; TESA UPC Comparator                          | Instruction Manual of TESA Comparator     | from 0.038 to 0.104 $\mu\text{m}$ | 0.5 – 100 mm  | Gauge Blocks                  |
| Standard Gauge Blocks and / or Length Bars; Federal Comparator      | Instruction Manual of Federal Comparator  | from 0.04 to 0.3 $\mu\text{m}$    | 25 - 600 mm   | Gauge Blocks and Length Bars  |
| Standard Gauge Blocks and / or Length Bars; Matrix Level Comparator | BCS<br>The Calibration of Length Bars     | from 0.6 to 1.2 $\mu\text{m}$     | 600 – 1200 mm | Gauge Blocks and Length Bars  |

# שרותי כיול - מסה

| <b>Measurement Standard</b>                   | <b>Reference Document</b> | <b>Best Measurement Capability</b>              | <b>Range</b>  | <b>Measured Quantity, Instrument</b> |
|---|---------------------------|---|---------------|--------------------------------------|
| Standard Weights;<br>Mass Comparator Balances | DIN-1305;<br>OIML R-111   | from 1 $\mu$ g for<br>1mg up to 5mg<br>for 20kg | 1mg -<br>20kg | Weights                              |

# שרותי כיול – תדר וזמן

| <b>Measurement Standard</b>                                  | <b>Reference Document</b> | <b>Best Measurement Capability</b> | <b>Range</b>   | <b>Measured Quantity, Instrument</b> |
|--|---------------------------|------------------------------------|----------------|--------------------------------------|
| UTC (INPL);<br>Cs Atomic clocks and<br>time interval counter | In-house<br>method        | $10^{-14}$                         | 1Hz -<br>20MHz | Oscillators<br>and Clocks            |

# שרותי כיול – מתח והתנגדות חשמליים

| Measurement Standard  | Reference Document                           | Best Measurement Capability  | Range  | Measured Quantity, Instrument  |
|---|--|--|--|--------------------------------|
| <b>Electric Potential</b>   |  |  |  |                                |
| Josephson System, DC reference voltage standards; Multimeter Datron 1281  | DFM procedure                                | 0.015-0.15 ppm   | 1V; 1.018V; 10V  | DC Voltage reference standards |
| <b>Electrical resistance</b>  |  |  |  |                                |
| Standard resistors. Guildline current comparator resistance bridge model 9975; Guideline transfer standard resistor model 9350 / 10ohms | Technical manual for model 9975<br>Guideline | 0.70 ppm<br>0.15 ppm<br>0.20 ppm<br>0.30 ppm<br>0.40 ppm<br>0.50 ppm<br>2.0 ppm<br>3.0 & 7.0 ppm | 0.1Ω<br>1Ω<br>10Ω<br>100Ω<br>1000Ω<br>10.000Ω<br>100.000Ω<br>1 & 10 MΩ | DC standard resistors          |

# שרותי כיול - טמפרטורה

| Measurement Standard                                       | Reference Document             | Best Measurement Capability  | Range  | Measured Quantity, Instrument           |
|--|--------------------------------|--|--|---|
| Triple point cells,<br>Tinsley Automatic AMBASSADOR bridge | NIST<br>Technical<br>Note 1265 | $1.1 \cdot 10^{-3} \text{ }^{\circ}\text{C}$   | $0.01^{\circ}\text{C}$   | Triple point of water                   |
| SPRTs with<br>Tinsley Automatic AMBASSADOR bridge          | NIST<br>Technical<br>Note 1265 | $1.8 \cdot 10^{-3} \text{ }^{\circ}\text{C}$<br>$1.6 \cdot 10^{-3} \text{ }^{\circ}\text{C}$<br>$1.6 \cdot 10^{-3} \text{ }^{\circ}\text{C}$<br>$1.8 \cdot 10^{-3} \text{ }^{\circ}\text{C}$<br>$2.0 \cdot 10^{-3} \text{ }^{\circ}\text{C}$ | $-30^{\circ}\text{C}$<br>$0^{\circ}\text{C}$<br>$50^{\circ}\text{C}$<br>$100^{\circ}\text{C}$<br>$150\text{-}250^{\circ}\text{C}$  | SPRT                                    |
| SPRTs with<br>Tinsley Automatic AMBASSADOR bridge          | NIST<br>Technical<br>Note 1265 | $3.0 \cdot 10^{-3} \text{ }^{\circ}\text{C}$<br><br>$11 \cdot 10^{-3} \text{ }^{\circ}\text{C}$<br><br>$21 \cdot 10^{-3} \text{ }^{\circ}\text{C}$<br><br>$51 \cdot 10^{-3} \text{ }^{\circ}\text{C}$  | $0\text{-}50^{\circ}\text{C}$<br>( $0.01^{\circ}\text{C}/\text{div}$ )<br>$-30\text{-}100^{\circ}\text{C}$<br>( $0.1^{\circ}\text{C}/\text{div}$ )<br>$100\text{-}200^{\circ}\text{C}$<br>( $0.2^{\circ}\text{C}/\text{div}$ )<br>$200\text{-}250^{\circ}\text{C}$<br>( $0.5^{\circ}\text{C}/\text{div}$ ) | Precision mercury-in-glass thermometers |

# שרותי כיול – טמפרטורה (המשך)

| Measurement Standard                                   | Reference Document  | Best Measurement Capability                  | Range                                    | Measured Quantity, Instrument                                |
|--|---|--|--|--|
| Reference thermocouples type S; Multimeter Datron 1281 | NIST Technical note 1265; NIST Monograph 175  | 0.30°C<br>0.40°C                             | 0-660.32°C<br>660.32 - 1064.18°C         | Type S and type R thermocouples                              |
| Standard mercury in glass thermometer                  | 1) OIML guide to practical temperature measurements<br>2) NPL Techniques of temperature measurement             | 0.01 - 0.1°C<br>0.02 - 0.1°C<br>0.04 - 0.1°C | -30-<br>+100°C<br>100-200°C<br>200-250°C | Thermometers   |
| Standard Ribbon-Filament Lamp                          | 1) OIML R-18; OIML guide to practical temperature measurements;<br>2) NPL Techniques of temperature measurement | 2.6 – 4.9 °C                                 | 800-<br>1600°C                           | Optical pyrometers (Visual disappearing filament pyrometers) |

# שרותי כיול - זווית

| Measurement Standard    | Reference Document   | Best Measurement Capability | Range      | Measured Quantity, Instrument |
|-------------------------|--|-----------------------------|------------|-------------------------------|
| Standard indexing table | NBSIR 80-1967  | 0.2"                        | up to 360° | Angle Gauges                  |
| Standard indexing table | "Precision polygons" HILGER & WATTS, BZ125                             | 0.5"                        | up to 360° | Precision polygons            |
| Standard indexing table | NBSIR 80-1967  | 0.1"                        | up to 360° | Indexing tables               |
| Standard indexing table | K.J. Hume "Metrology with autocollimators" HILGER & WATTS, London 1965 | 0.1"                        | up to 15'  | Autocollimators               |

# שרותי כיול – לחץ, וואקום

| <b>Measurement Standard</b>        | <b>Reference Document</b>               | <b>Best Measurement Capability</b> | <b>Range</b>           | <b>Measured Quantity, Instrument</b> |
|------------------------------------|---|------------------------------------|------------------------|--------------------------------------|
| Measurement by Dead Weight Testers | EAL Technical guide line;<br>OIML R-101 | 30ppm                              | up to 690kPa<br>(gas)  | Pressure gauges                      |
| Measurement by Dead Weight Testers | EAL Technical guide line;<br>OIML R-101 | 50ppm                              | up to 6900kPa<br>(gas) | Pressure gauges                      |
| Measurement by Dead Weight Testers | EAL Technical guide line;<br>OIML R-101 | 70ppm                              | 70-55200<br>kPa (oil)  | Pressure gauges                      |
| Measurement by Dead Weight Testers | EAL Technical guide line;<br>OIML R-101 | 80ppm                              | 55-121MPa<br>(oil)     | Pressure gauges                      |

# שרותי כיול – סטנדרטים לאומיים

## בפיתוח: תחומי פיסיקה

| Measurement Standard   | Reference Document   | Best Measurement Capability                        | Range   | Measured Quantity, Instrument                    |
|--|--|--|---|--|
| Standard capacitance measuring assembly  | R.D.T. Electronics Engineering instruction                       | 100 ppm  | $10^{-17} - 10^{-6}$ F  | Capacitors                                       |
| Fixed points:<br>a) triple point of mercury,<br>b) melting point of gallium,<br>c) freezing point of tin,<br>d) freezing point of zinc,<br>e) freezing point of aluminum | BIPM calibration certificates                                    | 1.1 mK<br>1.0 mK<br>1.1 mK<br>1.1 mK<br><br>4.1 mK | 234.3116 K<br>302.9146 K<br>505.078 K<br>692.677 K<br><br>933.473 K | Standard Platinum Resistance Thermometers (SPRT) |
| Standard luxmeter and standard lamps   | Calibration certificates for standard lamps;<br>LMI manual B 500 | 2%   | $10^{-3} - 5 \cdot 10^5$ lx   | Illuminance meters                               |

# שרותי כיול – סטנדרטים לאומיים בפיתוח: כמות החומר

| Measurement Standard  | Reference Document   | Best Measurement Capability                                    | Range   | Measured Quantity, Instrument                    |
|---|--|--|---|--|
| pH standard including Pt-Pt-hydrogen electrode                              | IUPAC recommendation – 2003; NIST special publication 260-53 | 0.006 pH   | 3.5 – 10.1 pH   | pH-meters, electrodes, solutions                 |
| Conductivity of solutions standard  | NIST special publication 260-142                             | 1%<br>0.1%   | $5 \cdot 10^{-4}$ - $5 \cdot 10^{-3}$ S/m<br>$5 \cdot 10^{-3}$ – 10 S/m | Conductometers and solutions                     |
| GC, GC-MS, HPLC, AAS with flow injection system, UV-Vis spectrophotom. etc. | Variety of specific documents                                | Specific for every analyte and sample matrix, for every method | 0.01 ppb – 100%   | Analytical instruments, substances and materials |