Calibration of high-quality reference standards

short processing times

Testo Industrial Services – More assurance, better service.

www.testotis.com
Your partner for calibration of reference standards

Testo Industrial Services is one of the leading manufacturer independent providers of calibration services in Europe. With more than 190 accredited calibration procedures, we cover nearly all requirements within the sectors of electrical-, mechanical-, dimensional-, thermodynamical- and flow calibration. Quality, reliability and low measurement uncertainties are characteristics for our service portfolio. Our services comprise from calibration to complete test equipment management solutions. Our primary laboratory works on the highest level of measurement technology. Furthermore, a specially developed logistics- and handling process completes our services.

Our advantages at a glance:

✔ Accredited for more than 190 calibration procedures
✔ Manufacturer independent calibration laboratory
✔ Lowest measurement uncertainties within Germany for the parameters temperature and humidity
✔ Lowest measurement uncertainties within the electrical low-frequency measurement technology
✔ Short processing times due to date arrangements

„For more than 16 years, I am responsible for the accredited laboratories at Testo Industrial Services. My focus is on the expansion of our calibration range at the highest level. Especially the low measurement uncertainties of our electrical- and thermodynamic measurement technologies are making me very proud.“

Eugen Sander, Head of DAkkS-laboratories
Customised logistics concept for a safe transport

As an accredited laboratory, we know that your reference standards are very valuable. Handing them over to an external transport service provider for shipment is nearly unimaginable. In order to make this step easier for you, we have optimized our company owned pick-up and delivery-service to meet the requirements of this special transport service. The specially manufactured transport boxes are adapted to the common references and are equipped with shock-, tilt- and temperature indicators. These boxes guarantee a safe hold during the transport. Our trained and experienced drivers deliver your reference standards safely to their destination.

Services of Testo industrial services GmbH

- Own pick-up and delivery service within selected regions in Europe
- Special transport boxes, equipped with shock-, tilt- and temperature indicators
- Experienced and trained drivers
- Individual journeys for your reference standards
- Insured transport

Own transportation

If you wish to send your references yourself, we welcome you to visit our calibration lab on site.

Please make an appointment via +49 766190901-8000.
Primary laboratory for electrical measurands

We calibrate your high-quality standards of the electrical LF measurement technology in our electrical primary laboratory. Our references are connected directly to the state institutions (PTB, METAS) and are used for the traceability of your reference standards.

The measurement uncertainties of our accredited calibration procedures are amongst the lowest of all DAkkS-laboratories. For example resistance standards can be calibrated with a measurement uncertainty starting at $55 \times 10^{-9}$. This is unique all over Europe!

The following reference standards are used for the electrical primary laboratory:

- DC standard Fluke 732A (with a history of 17 years) for DC voltage
- Extremely stable standard resistors (with a history of up to 24 years) in an oil bath Fluke 7015 for DC voltage and resistance
- AC/DC transfer standard Fluke 792A for alternating voltage
- AC Current Shunts Fluke A40B for alternating current
- Extremely stable reference-capacities and inductances for the measurement parameters capacity and inductivity

Extract of our scope of services:

- Voltage measurement standards, e.g. Fluke 732A
- Standard resistances from 100 $\mu\Omega$ to 100 T$\Omega$
- AC/DC-transfer with Fluke 792A, 5790A
- Calibrators, for example Fluke 5720A, 5700A, 5520A, 5820A …
- High-resolution multimeters, for example Fluke 8508A, Agilent/HP 3458A…
- Voltage ratio
- Phase angle
- Resistance ratio (AC/DC)
# Scope of services

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<th>Measuring range DAkkS</th>
<th>Measurement condition</th>
<th>Measurement uncertainty</th>
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<td>DC voltage</td>
<td>0 V to 1000 V</td>
<td></td>
<td>from 0,25 \cdot 10^{-6}</td>
</tr>
<tr>
<td>DC current</td>
<td>1 pA to 100 A</td>
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<td>DC resistance</td>
<td>100 µΩ to 100 TΩ</td>
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<td>from 55 \cdot 10^{-6}</td>
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<td>DC voltage power</td>
<td>10 mW to 100 kW</td>
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<td>from 10 \cdot 10^{-6}</td>
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<td>AC voltage</td>
<td>1 mV to 1000 V</td>
<td>10 Hz to 1 MHz</td>
<td>from 2 \cdot 10^{-6}</td>
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<tr>
<td>AC/DC voltage-transfer</td>
<td>1 mV to 1000 V</td>
<td>10 Hz to 1 MHz</td>
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<tr>
<td>AC power</td>
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<tr>
<td>AC/DC transfer</td>
<td>100 µA to 20 A</td>
<td>10 Hz to 10 kHz</td>
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<tr>
<td>AC active power</td>
<td>100 µW to 20 kW</td>
<td>10 Hz to 10 kHz</td>
<td>from 0,1 \cdot 10^{-3}</td>
</tr>
<tr>
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<td>1 pF to 1 µF</td>
<td>50 Hz to 1 MHz</td>
<td>from 10 \cdot 10^{-6}</td>
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<tr>
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<td>1 kHz</td>
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<td>2 mV/V to 5 mV/V</td>
<td>222 Hz to 4,8 kHz</td>
<td>from 0,04 µV/V</td>
</tr>
<tr>
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<td>0° to 360°</td>
<td></td>
<td>from 0,013°</td>
</tr>
<tr>
<td>Resistance ratio (AC/DC-measuring bridges)</td>
<td>AC/DC-power up to 400 Hz</td>
<td>0,16 to 6,3</td>
<td>from 2 \cdot 10^{-6}</td>
</tr>
</tbody>
</table>

Reference standards for alternating current power
Calibration of a Fluke 5790A
Resistances and shunts
Primary laboratory for thermodynamic measurands

At our thermodynamic primary laboratory, we are calibrating your temperature fixed-point cells, SPRT-resistance thermometers and dew point meter. The metrological connection will be realized with PTB standards. Our minimal measurement uncertainties are the result of:

- Our long-term experience in temperature- and humidity measurement technology.
- The unique combination and interdependence of our accredited measured value, pressure, temperature and electric.
At the 2-pressure/2-temperature humidity generator, the air humidity status will be determined by two temperatures and two pressures. From these values, the various humidity parameters will be calculated, according to the mathematical model „Sonntag and Greensplan“.

The measurement uncertainty of the calculated humidity is therefore directly dependent on the measurement uncertainty of pressure- and temperature calibration in which Testo achieves the smallest measurement uncertainty in all over Germany.

### Scope of performance

<table>
<thead>
<tr>
<th>DAkkS-Measuring Range/Measurement point</th>
<th>Description</th>
<th>Measurement uncertainty</th>
</tr>
</thead>
<tbody>
<tr>
<td>-189,3442 °C</td>
<td>Triple point of argon</td>
<td>4,0 mK</td>
</tr>
<tr>
<td>-38,8344 °C</td>
<td>Triple point of quicksilver</td>
<td>1,5 mK</td>
</tr>
<tr>
<td>0,010 °C</td>
<td>Triple point of water</td>
<td>0,8 mK</td>
</tr>
<tr>
<td>29,7666 °C</td>
<td>Melting point of gallium</td>
<td>1,0 mK</td>
</tr>
<tr>
<td>156,5985 °C</td>
<td>Solidification point of indium</td>
<td>2,5 mK</td>
</tr>
<tr>
<td>231,928 °C</td>
<td>Solidification point of tin</td>
<td>2,5 mK</td>
</tr>
<tr>
<td>419,527 °C</td>
<td>Solidification of zinc</td>
<td>2,5 mK</td>
</tr>
<tr>
<td>660,323 °C</td>
<td>Solidification of aluminum</td>
<td>7,0 mK</td>
</tr>
</tbody>
</table>

-196 ... -189 °C

-189 ... 0 °C

-40 ... +30 °C

0 ... +156 °C

0 ... 232 °C

>232 ... 420 °C

>232 ... 660 °C

-32 ... +85 °C

2-pressure/2-temperature-humidity-generator | 0,05 K |

Calibration resistance thermometer

Temperature fix point cells

Documentation on the humidity generator