

# Kalibrier-Zertifikat Calibration Certificate MUSTER

|  |                           |
|--|---------------------------|
| Gegenstand<br>Object   | Multimeter                |
| Hersteller<br>Manufacturer   | KEITHLEY Instruments GmbH |
| Typ<br>Type description  | 2001                      |
| Serien Nr.<br>Serial no.   | 12345                     |
| Inventar Nr.<br>Inventory no.  | ---                       |
| Prüfmittel Nr.<br>Test equipment no.   | ---                       |
| Equipment Nr.<br>Equipment no.   | 12345678                  |
| Standort<br>Location   | ---                       |
| Auftraggeber<br>Customer   | Mustermann GmbH           |
| Kunden Nr.<br>Customer ID no.  | DE-12345 Musterhausen     |
| Auftrags Nr.<br>Order no.  | 654321                    |
| Datum der Kalibrierung<br>Date of calibration                                  | 21.01.2019                |
| Datum der empfohlenen Rekalibrierung<br>Date of the recommended re-calibration | ---                       |

Hiermit bestätigen wir, dass das durchführende Kalibrierlabor ein Managementsystem nach ISO 9001:2008, sowie ISO/IEC 17025:2005 eingeführt hat. Die Urkunden finden Sie auf [www.testotis.de](http://www.testotis.de). Die für die Kalibrierung verwendeten Messeinrichtungen werden regelmäßig kalibriert und sind rückführbar auf die nationalen Normale der Physikalisch Technischen Bundesanstalt (PTB) Deutschlands oder auf andere nationale Normale. Wo keine nationalen Normale existieren, entspricht das Messverfahren den derzeit gültigen technischen Regeln und Normen. Die für diesen Vorgang angefertigte Dokumentation kann eingesehen werden. Alle erforderlichen Messdaten sind in diesem Kalibrier-Zertifikat aufgelistet.

Hereby we confirm that the performing calibration laboratory is working with a management system according to ISO 9001:2008 and ISO/IEC 17025:2005. Accreditation certificates can be found under [www.testotis.de](http://www.testotis.de). The measuring installations used for calibration are regularly calibrated and traceable to the national standards of the German Federal Physical Technical Institute (PTB) or other national standards. Should no national standards exist, the measuring procedure corresponds with the technical regulations and norms valid at the time of the measurement. The documents established for this procedure are available for viewing. All the necessary measured data can be found on the following page(s) of this calibration certificate.

## Konformitätsaussage Conformity

- Messwert(e) innerhalb der zulässigen Abweichung<sup>1)</sup>. Measured value(s) within the allowed deviation<sup>1)</sup>.
- Messwert(e) außerhalb der zulässigen Abweichung<sup>1)</sup>. Measured value(s) beyond the allowed deviation<sup>1)</sup>.

<sup>1)</sup> Die Messunsicherheit wurde nach GUM mit dem Erweiterungsfaktor k=2 berechnet und enthält die Unsicherheit des Verfahrens sowie die Unsicherheit des Prüflings. Die Konformitätsaussage erfolgte nach DIN EN ISO 14253-1 gemäß der Kalibrieranweisung QSA - TIS 7.5-02.

<sup>1)</sup> The measurement uncertainty was calculated according to the regulations of GUM with the coverage factor k=2 and contains the uncertainty of the measuring procedure and the uncertainty of the measuring system. The statement of conformity was made according to DIN EN ISO 14253-1 according to calibration instruction QSA - TIS 7.5-02.

Dieser Kalibrierschein darf nur vollständig weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine ohne Unterschrift und Stempel haben keine Gültigkeit.

This calibration certificate may not be reproduced other than in full except with permission of the issuing laboratory. Calibration certificates without signature and seal are not valid.

V 4.52 / DE

Stempel Seal



Fachverantwortlicher Supervisor

*Max Mustermann*

Max Mustermann

Bearbeiter Technician

*Martina Musterfrau*

Martina Musterfrau

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## Messeinrichtung Measuring equipment

| Referenz<br>Reference                      | Rückführung<br>Traceability | Rekal.<br>Next cal. | Zertifikat-Nr.<br>Certificate-no. | EQ-Nr.<br>EQ-no. |
|--|-----------------------------|---------------------|-----------------------------------|------------------|
| Calibrator FLUKE DEUTSCHLAND GmbH 5730A-05 | 15070-01-01 2019-01         | 2019-04             | E81186                            | 13267391         |

Referenzzertifikate sind auf [www.primasonline.com](http://www.primasonline.com) abrufbar Reference certificates are available at [www.primasonline.com](http://www.primasonline.com)

## Umgebungsbedingungen Ambient conditions

Temperatur Temperature (23 ± 1) °C  
Relative Luftfeuchte Relative Humidity (40 ± 20) %

## Messverfahren Measuring procedure

Die Kalibrierung erfolgt nach Kalibrieranweisung 4\_AA\_00190\_DE - in Abstimmung nach VDI/VDE/DGQ/DKD 2622  
The calibration is performed according to the 4\_AA\_00190\_DE procedure- in accordance with VDI/VDE/DGQ/DKD 2622

Prüfprozedur Procedure F:keithley:2001:5700A:IEEE / Rev.:6.1

## Messergebnisse Measuring results

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## Besondere Bemerkungen Special remarks

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| Bereich<br>Range                  | Referenzwert<br>(Normal)<br>Reference value | Messbedingung<br>Measuring<br>condition | Angezeigter Wert<br>UUT<br>Indicated value<br>UUT | zulässige<br>Abweichung<br>allowed deviation | Messunsicherheit<br>(k=2)<br>Measuring<br>uncertainty (k=2) | Ausnutzung der zul.<br>Abw. in %<br>Utilization of<br>allowed dev. in % | Diagramm<br>Diagram |
|-----------------------------------|---|---|---|--|---|---|---------------------|
|                                   | ◆   |   | ●   |  | H   | -1 -0,7 +0,7 +1   |                     |
| <b>Wechselspannung AC voltage</b> |   |   |   |  |   |   |                     |
| 200mV                             | 20.0000 mV                                  | 1kHz                                    | 20.007 mV   | ±0.04mV                                      | 472 · 10 <sup>-6</sup>                                      | pass 17%  |                     |
| 200mV                             | 200.0000 mV                                 | 50Hz                                    | 199.890 mV  | ±0.53mV                                      | 140 · 10 <sup>-6</sup>                                      | pass 21%  |                     |
| 200mV                             | 200.0000 mV                                 | 1kHz                                    | 200.061mV   | ±0.13mV                                      | 140 · 10 <sup>-6</sup>                                      | pass 47%  |                     |
| 200mV                             | 200.0000 mV                                 | 5kHz                                    | 200.069 mV  | ±0.13mV                                      | 141 · 10 <sup>-6</sup>                                      | pass 53%  |                     |
| 200mV                             | 200.0000 mV                                 | 10kHz                                   | 200.074 mV  | ±0.13mV                                      | 140 · 10 <sup>-6</sup>                                      | pass 57%  |                     |
| 200mV                             | 200.0000 mV                                 | 50kHz                                   | 200.046 mV  | ±0.15mV                                      | 240 · 10 <sup>-6</sup>                                      | pass 31%  |                     |
| 200mV                             | 200.0000 mV                                 | 100kHz                                  | 199.853 mV  | ±0.37mV                                      | 580 · 10 <sup>-6</sup>                                      | pass 40%  |                     |
| 2V                                | 2.000000 V                                  | 50Hz                                    | 1.99934 V   | ±0.0053V                                     | 80 · 10 <sup>-6</sup>                                       | pass 12%  |                     |
| 2V                                | 2.000000 V                                  | 1kHz                                    | 2.00081V  | ±0.0013V                                     | 80 · 10 <sup>-6</sup>                                       | pass 63%  |                     |
| 2V                                | 2.000000 V                                  | 5kHz                                    | 2.00088 V   | ±0.0013V                                     | 80 · 10 <sup>-6</sup>                                       | pass 68%  |                     |
| 2V                                | 2.000000 V                                  | 10kHz                                   | 2.00092 V   | ±0.0013V                                     | 80 · 10 <sup>-6</sup>                                       | pass 71%  |                     |
| 2V                                | 2.000000 V                                  | 50kHz                                   | 2.00051V  | ±0.0015V                                     | 120 · 10 <sup>-6</sup>                                      | pass 34%  |                     |
| 2V                                | 2.000000 V                                  | 100kHz                                  | 1.99861V  | ±0.0037V                                     | 250 · 10 <sup>-6</sup>                                      | pass 38%  |                     |
| 20V                               | 2.00000 V                                   | 50Hz                                    | 1.9992 V  | ±0.008V                                      | 88 · 10 <sup>-6</sup>                                       | pass 10%  |                     |
| 20V                               | 2.00000 V                                   | 1kHz                                    | 2.0008 V  | ±0.0042V                                     | 88 · 10 <sup>-6</sup>                                       | pass 19%  |                     |
| 20V                               | 2.00000 V                                   | 5kHz                                    | 2.0005 V  | ±0.0047V                                     | 85 · 10 <sup>-6</sup>                                       | pass 11%  |                     |
| 20V                               | 2.00000 V                                   | 10kHz                                   | 2.0005 V  | ±0.0047V                                     | 89 · 10 <sup>-6</sup>                                       | pass 10%  |                     |
| 20V                               | 2.00000 V                                   | 50kHz                                   | 2.0008 V  | ±0.0056V                                     | 124 · 10 <sup>-6</sup>                                      | pass 14%  |                     |
| 20V                               | 2.00000 V                                   | 100kHz                                  | 2.0005 V  | ±0.0064V                                     | 252 · 10 <sup>-6</sup>                                      | pass 8%   |                     |
| 20V                               | 10.00000 V                                  | 50Hz                                    | 9.9929 V  | ±0.028V                                      | 64 · 10 <sup>-6</sup>                                       | pass 25%  |                     |
| 20V                               | 10.00000 V                                  | 1kHz                                    | 10.0009 V   | ±0.009V                                      | 64 · 10 <sup>-6</sup>                                       | pass 10%  |                     |
| 20V                               | 10.00000 V                                  | 5kHz                                    | 9.9995 V  | ±0.0115V                                     | 64 · 10 <sup>-6</sup>                                       | pass 5%   |                     |
| 20V                               | 10.00000 V                                  | 10kHz                                   | 9.9993 V  | ±0.0115V                                     | 64 · 10 <sup>-6</sup>                                       | pass 6%   |                     |
| 20V                               | 10.00000 V                                  | 50kHz                                   | 10.0004 V   | ±0.016V                                      | 115 · 10 <sup>-6</sup>                                      | pass 2%   |                     |
| 20V                               | 10.00000 V                                  | 100kHz                                  | 9.9981V   | ±0.02V                                       | 180 · 10 <sup>-6</sup>                                      | pass 10%  |                     |
| 20V                               | 20.00000 V                                  | 50Hz                                    | 19.9896 V   | ±0.053V                                      | 64 · 10 <sup>-6</sup>                                       | pass 20%  |                     |
| 20V                               | 20.00000 V                                  | 1kHz                                    | 20.0056 V   | ±0.015V                                      | 64 · 10 <sup>-6</sup>                                       | pass 38%  |                     |
| 20V                               | 20.00000 V                                  | 5kHz                                    | 20.0016 V   | ±0.02V                                       | 64 · 10 <sup>-6</sup>                                       | pass 8%   |                     |
| 20V                               | 20.00000 V                                  | 10kHz                                   | 20.0000 V   | ±0.02V                                       | 64 · 10 <sup>-6</sup>                                       | pass 0%   |                     |
| 20V                               | 20.00000 V                                  | 50kHz                                   | 20.0016 V   | ±0.029V                                      | 115 · 10 <sup>-6</sup>                                      | pass 5%   |                     |
| 20V                               | 20.00000 V                                  | 100kHz                                  | 19.9952 V   | ±0.037V                                      | 180 · 10 <sup>-6</sup>                                      | pass 13%  |                     |
| 200V                              | 20.0000 V                                   | 1kHz                                    | 20.004 V  | ±0.042V                                      | 70 · 10 <sup>-6</sup>                                       | pass 10%  |                     |
| 200V                              | 200.0000 V                                  | 50Hz                                    | 199.931V  | ±0.534V                                      | 76 · 10 <sup>-6</sup>                                       | pass 13%  |                     |
| 200V                              | 200.0000 V                                  | 1kHz                                    | 200.063 V   | ±0.154V                                      | 77 · 10 <sup>-6</sup>                                       | pass 41%  |                     |
| 200V                              | 200.0000 V                                  | 5kHz                                    | 200.033 V   | ±0.2004V                                     | 76 · 10 <sup>-6</sup>                                       | pass 16%  |                     |
| 200V                              | 200.0000 V                                  | 10kHz                                   | 200.018 V   | ±0.2004V                                     | 75 · 10 <sup>-6</sup>                                       | pass 9%   |                     |
| 750V                              | 70.000 V                                    | 1kHz                                    | 70.04 V   | ±0.182V                                      | 112 · 10 <sup>-6</sup>                                      | pass 22%  |                     |
| 750V                              | 700.000 V                                   | 50Hz                                    | 699.76 V  | ±2.051V                                      | 77 · 10 <sup>-6</sup>                                       | pass 12%  |                     |
| 750V                              | 700.000 V                                   | 500Hz                                   | 700.29 V  | ±0.861V                                      | 75 · 10 <sup>-6</sup>                                       | pass 34%  |                     |
| 750V                              | 700.000 V                                   | 1kHz                                    | 700.30 V  | ±0.861V                                      | 76 · 10 <sup>-6</sup>                                       | pass 35%  |                     |

Frequenz Frequency

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| Bereich<br>Range   | Referenzwert<br>(Normal)<br>Reference value | Messbedingung<br>Measuring<br>condition | Angezeigter Wert<br>UUT<br>Indicated value<br>UUT | zulässige<br>Abweichung<br>allowed deviation | Messunsicherheit<br>(k=2)<br>Measuring<br>uncertainty (k=2) | Ausnutzung der zul.<br>Abw. in %<br>Utilization of<br>allowed dev. in % | Diagramm<br>Diagram |
|--|---|---|---|--|---|---|---------------------|
|  |   |   |   |  |   | -1 -0,7 +0,7 +1   |                     |
| 100Hz  | 50.0000 Hz                                  | 1V                                      | 50.000 Hz   | ±0.015Hz                                     | 79 · 10 <sup>-6</sup>                                       | pass 1%   |                     |
| 1000Hz   | 500.000 Hz                                  | 1V                                      | 500.01Hz  | ±0.15Hz                                      | 79 · 10 <sup>-6</sup>                                       | pass 4%   |                     |
| 10kHz  | 5.00000 kHz                                 | 1V                                      | 5.0000 kHz  | ±0.0015kHz                                   | 79 · 10 <sup>-6</sup>                                       | pass 3%   |                     |
| 100kHz   | 50.0000 kHz                                 | 1V                                      | 50.001kHz   | ±0.015kHz                                    | 78 · 10 <sup>-6</sup>                                       | pass 7%   |                     |
| 1000kHz  | 500.000 kHz                                 | 1V                                      | 500.01kHz   | ±0.15kHz                                     | 78 · 10 <sup>-6</sup>                                       | pass 7%   |                     |
| 10MHz  | 1.00000 MHz                                 | 1V                                      | 1.0000 MHz  | ±0.0003MHz                                   | 97 · 10 <sup>-6</sup>                                       | pass 0%   |                     |
| <b>Gleichstromstärke DC current</b>  |   |   |   |  |   |   |                     |
| 200 µA   | 0.00000 µA                                  |   | 0.0010 µA   | ±0.005 µA                                    | 517 pA  | pass 20%  |                     |
| 200 µA   | 200.00000 µA                                |   | 200.0243 µA                                       | ±0.105 µA                                    | 63 · 10 <sup>-6</sup>                                       | pass 23%  |                     |
| 200 µA   | -200.00000 µA                               |   | -200.0230 µA                                      | ±0.105 µA                                    | 63 · 10 <sup>-6</sup>                                       | pass 22%  |                     |
| 2 mA   | 2.0000000 mA                                |   | 2.000331 mA                                       | ±0.00084 mA                                  | 63 · 10 <sup>-6</sup>                                       | pass 39%  |                     |
| 2 mA   | -2.0000000 mA                               |   | -2.000312 mA                                      | ±0.00084 mA                                  | 63 · 10 <sup>-6</sup>                                       | pass 37%  |                     |
| 20 mA  | 20.0000000 mA                               |   | 20.00105 mA                                       | ±0.0084 mA                                   | 50 · 10 <sup>-6</sup>                                       | pass 13%  |                     |
| 20 mA  | -20.0000000 mA                              |   | -20.00081 mA                                      | ±0.0084 mA                                   | 50 · 10 <sup>-6</sup>                                       | pass 10%  |                     |
| 200 mA   | 200.00000 mA                                |   | 200.0145 mA                                       | ±0.104 mA                                    | 83 · 10 <sup>-6</sup>                                       | pass 14%  |                     |
| 200 mA   | -200.00000 mA                               |   | -200.0130 mA                                      | ±0.104 mA                                    | 83 · 10 <sup>-6</sup>                                       | pass 13%  |                     |
| 2 A  | 2.0000000 A                                 |   | 1.999912 A  | ±0.00194 A                                   | 160 · 10 <sup>-6</sup>                                      | pass 5%   |                     |
| 2 A  | -2.0000000 A                                |   | -1.999806 A                                       | ±0.00194 A                                   | 160 · 10 <sup>-6</sup>                                      | pass 10%  |                     |
| <b>Wechselstromstärke AC current</b>   |   |   |   |  |   |   |                     |
| 200 µA   | 200.0000 µA                                 | 50Hz                                    | 199.940 µA  | ±0.73 µA                                     | 191 · 10 <sup>-6</sup>                                      | pass 8%   |                     |
| 200 µA   | 200.0000 µA                                 | 500Hz                                   | 200.000 µA  | ±0.83 µA                                     | 190 · 10 <sup>-6</sup>                                      | pass 0%   |                     |
| 200 µA   | 200.0000 µA                                 | 1kHz                                    | 199.943 µA  | ±0.83 µA                                     | 190 · 10 <sup>-6</sup>                                      | pass 7%   |                     |
| 2 mA   | 2.0000000 mA                                | 50Hz                                    | 1.99943 mA  | ±0.0063 mA                                   | 281 · 10 <sup>-6</sup>                                      | pass 9%   |                     |
| 2 mA   | 2.0000000 mA                                | 500Hz                                   | 2.00092 mA  | ±0.0027 mA                                   | 280 · 10 <sup>-6</sup>                                      | pass 34%  |                     |
| 2 mA   | 2.0000000 mA                                | 1kHz                                    | 2.00090 mA  | ±0.0027 mA                                   | 280 · 10 <sup>-6</sup>                                      | pass 33%  |                     |
| 20 mA  | 20.0000000 mA                               | 50Hz                                    | 19.9915 mA  | ±0.063 mA                                    | 281 · 10 <sup>-6</sup>                                      | pass 14%  |                     |
| 20 mA  | 20.0000000 mA                               | 500Hz                                   | 20.0080 mA  | ±0.027 mA                                    | 280 · 10 <sup>-6</sup>                                      | pass 30%  |                     |
| 20 mA  | 20.0000000 mA                               | 1kHz                                    | 20.0083 mA  | ±0.027 mA                                    | 280 · 10 <sup>-6</sup>                                      | pass 31%  |                     |
| 200 mA   | 200.00000 mA                                | 50Hz                                    | 199.925 mA  | ±0.63 mA                                     | 241 · 10 <sup>-6</sup>                                      | pass 12%  |                     |
| 200 mA   | 200.00000 mA                                | 500Hz                                   | 200.090 mA  | ±0.27 mA                                     | 240 · 10 <sup>-6</sup>                                      | pass 33%  |                     |
| 200 mA   | 200.00000 mA                                | 1kHz                                    | 200.094 mA  | ±0.27 mA                                     | 240 · 10 <sup>-6</sup>                                      | pass 35%  |                     |
| 2 A  | 2.0000000 A                                 | 50Hz                                    | 1.99882 A   | ±0.0074 A                                    | 410 · 10 <sup>-6</sup>                                      | pass 16%  |                     |
| 2 A  | 2.0000000 A                                 | 500Hz                                   | 2.00042 A   | ±0.0064 A                                    | 410 · 10 <sup>-6</sup>                                      | pass 7%   |                     |
| 2 A  | 2.0000000 A                                 | 1kHz                                    | 2.00044 A   | ±0.0064 A                                    | 410 · 10 <sup>-6</sup>                                      | pass 7%   |                     |
| <b>Temperatursimulation gemäß DIN EN IEC 60584 für TE Typ K Temperature simulation according to DIN EN IEC 60584 for Type-K thermocouple</b> |   |   |   |  |   |   |                     |
| 1372 °C  | -100.00 °C                                  |   | 0.0 °C  | ±0.5 °C                                      | 115 mK  | fail >150%  |                     |
| 1372 °C  | -100.00 °C                                  |   | -100.0 °C   | ±0.5 °C                                      | 115 mK  | pass 0%   |                     |
| 1372 °C  | -50.00 °C                                   |   | -50.0 °C  | ±0.5 °C                                      | 115 mK  | pass 0%   |                     |
| 1372 °C  | 0.00 °C                                     |   | 0.0 °C  | ±0.5 °C                                      | 115 mK  | pass 0%   |                     |
| 1372 °C  | 20.00 °C                                    |   | 20.0 °C   | ±0.5 °C                                      | 115 mK  | pass 0%   |                     |

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|------------------|---|---|---|--|---|---|---------------------|
|                  | ◆   |   | ●   |  | ⊞   | -1 -0,7 +0,7 +1   |                     |
| 1372 °C          | 50.00 °C                                    |   | 50.0 °C   | ±0.5 °C                                      | 115 mK  | pass 0%   |                     |
| 1372 °C          | 100.00 °C                                   |   | 100.0 °C  | ±0.5 °C                                      | 115 mK  | pass 0%   |                     |
| 1372 °C          | 500.00 °C                                   |   | 500.1 °C  | ±0.5 °C                                      | 115 mK  | pass 20%  |                     |
| 1372 °C          | 1000.00 °C                                  |   | 1000.2 °C   | ±0.5 °C                                      | 115 mK  | pass 40%  |                     |

zulässige Abweichung gemäß Herstellerangabe  
allowed deviation in accordance with manufacturer

Die dimensionslosen Anteile der Messunsicherheit U sind als relative Messunsicherheiten e bezogen auf den Messwert zu verstehen (U = e \* MW).

The non-dimensional fractions of the measuring uncertainty U are relative values e in relation to the indicated value (U = e \* i.v.).