

Deutsche Akkreditierungsstelle GmbH

Annex to the Accreditation Certificate D-K-15192-01-00 according to DIN EN ISO/IEC 17025:2005

Period of validity: 2017-06-02 to 2022-06-01

Date of issue: 2017-06-02

Holder of certificate:

Häfner Gewichte GmbH
Lindenstraße 24, 74420 Oberrot, Germany

With the calibration laboratory:

MASSCAL - Kalibrierlaboratorium
Rottalstraße 95, 74420 Oberrot, Germany

Head: Dipl.-Ing.(FH) Martin Häfner
Deputies: Dipl.-Biol. Ulrich Rost
Gabriele Widmer

Accredited since: 2000-01-31

Calibration in the fields:

Mechanical quantities
- **Mass (mass standards) *)**
- **Volume of solids**
- **Density of solids**

*) also on-site calibration

Abbreviations used: see last page

Annex to the accreditation certificate D-K-15192-01-00

Permanent Laboratory

| Mesured quantity / Calibration item | Range | Measurement conditions / procedure | Best measurement capability ¹⁾ | Remarks |
|---------------------------------------------------|---------------------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mass Conventional mass / Mass standards | 1 mg, 2 mg, 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg | OIML R 111-1: 2004 | 0,60 µg 0,80 µg 1,0 µg 1,2 µg 1,5 µg 2,0 µg 2,5 µg | for fixed nominal values with weights OIML R 111-1:2004 according to the class E ₁ |
| | 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g | | 3,0 µg 4,0 µg 5,0 µg 6,0 µg 8,0 µg 10 µg 15 µg 30 µg 75 µg | with weights OIML R 111-1:2004 according to the class E ₁ Determination of volume by an accredited laboratory is required. Without determination of volume the measurement uncertainty increases adequate to an assumed volume uncertainty. |
| | 1 kg 2 kg 5 kg 10 kg 20 kg 50 kg | | 0,15 mg 0,30 mg 0,75 mg 1,5 mg 3,0 mg 8,0 mg | |
| | 100 kg 200 kg 500 kg 1000 kg | | 0,5 g 1,0 g 2,5 g 5,0 g | with weights OIML R 111-1:2004 according to the class F ₂ |
| | 2000 kg | | 30 g | with weights OIML R 111-1:2004 according to the class M ₁ |
| | 25 kg 40 kg 60 kg 250 kg | | 0,12 g 0,20 g 0,30 g 1,2 g | for free nominal values with weights OIML R 111-1:2004 according to the class F ₂ |
| | 2500 kg | | 38 g | for free nominal values with weights OIML R 111-1:2004 according to the class M ₁ |

¹⁾ The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Annex to the accreditation certificate D-K-15192-01-00

| Mesured quantity / Calibration item | Range | Measurement conditions / procedure | Best measurement capability ¹⁾ | Remarks |
|-------------------------------------|---------------------|------------------------------------|-------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mass | > 1 mg to 5 mg | | 1,8 µg | for free nominal values |
| Conventional mass / Mass standards | > 5 mg to 10 mg | | 2,3 µg | |
| | > 10 mg to 20 mg | | 2,8 µg | |
| | > 20 mg to 50 mg | | 3,0 µg | |
| | > 50 mg to 100 mg | | 3,2 µg | |
| | > 100 mg to 200 mg | | 3,5 µg | |
| | > 200 mg to 500 mg | | 3,8 µg | |
| | > 500 mg to 1 g | | 7,5 µg | |
| | > 1 g to 2 g | | 12 µg | for free nominal values Determination of volume by an accredited laboratory is required. Without determination of volume the measurement uncertainty increases adequate to an assumed volume uncertainty. |
| | > 2 g to 5 g | | 15 µg | |
| | > 5 g to 10 g | | 18 µg | |
| | > 10 g to 20 g | | 24 µg | |
| | > 20 g to 50 g | | 30 µg | |
| | > 50 g to 100 g | | 45 µg | |
| | > 100 g to 200 g | | 60 µg | |
| | > 200 g to 500 g | | 90 µg | |
| | > 500 g to 750 g | | 0,20 mg | |
| | > 750 g to bis 1 kg | | 0,45 mg | |
| | > 1 kg to 2 kg | | 0,90 mg | |
| | > 2 kg to 5 kg | | 2,2 mg | |
| | > 5 kg to 10 kg | | 4,5 mg | |
| | > 10 kg to 20 kg | | 9,0 mg | |
| | > 20 kg to 50 kg | | 20 mg | |
| | > 50 kg to 60 kg | | 30 mg | |
| | > 60 kg to 600 kg | | $5,0 \cdot 10^{-6} \cdot m_N$ | m_N Nominal value of the weight |
| | > 600 kg to 2500 kg | | $1,5 \cdot 10^{-5} \cdot m_N$ | |

¹⁾ The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Annex to the accreditation certificate D-K-15192-01-00

| Mesured quantity / Calibration item | Range | Measurement conditions / procedure | Best measurement capability ¹⁾ | Remarks |
|-------------------------------------|------------------|------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Volume | 1 g | Hydrostatic method | 0,60 mm ³ | Volume determination of mass standards with weights OIML R 111-1:2004 and of weights with free nominal values |
| | > 1 g to 2 g | | 0,80 mm ³ | |
| | > 2 g to 5 g | OIML R 111-1: 2004 | 0,90 mm ³ | |
| | > 5 g to 10 g | | 1,2 mm ³ | |
| | > 10 g to 20 g | | 1,5 mm ³ | |
| | > 20 g to 50 g | | 2,0 mm ³ | |
| | > 50 g to 100 g | | 2,8 mm ³ | |
| | > 100 g to 200 g | | 6,0 mm ³ | |
| | > 200 g to 500 g | | 14 mm ³ | |
| | > 500 g to 1 kg | | 28 mm ³ | |
| | > 1 kg to 2 kg | | 60 mm ³ | |
| | > 2 kg to 5 kg | | 0,14 cm ³ | |
| | > 5 kg to 10 kg | | 0,28 cm ³ | |
| | > 10 kg to 20 kg | | 0,80 cm ³ | |
| | > 20 kg to 50 kg | | 2,0 cm ³ | |
| Density | 1 g | Hydrostatic method | 33 kg/m ³ | Density determination of mass standards with weights OIML R 111-1:2004 and of weights with free nominal values |
| | > 1 g to 2 g | | 20 kg/m ³ | |
| | > 2 g to 5 g | OIML R 111-1: 2004 | 11 kg/m ³ | |
| | > 5 g to 10 g | | 7,0 kg/m ³ | |
| | > 10 g to 20 g | | 4,0 kg/m ³ | |
| | > 20 g to 50 g | | 2,0 kg/m ³ | |
| | > 50 g to 100 g | | 1,8 kg/m ³ | |
| | > 100 g to 200 g | | 1,8 kg/m ³ | |
| | > 200 g to 500 g | | 1,8 kg/m ³ | |
| | > 500 g to 1 kg | | 1,8 kg/m ³ | |
| | > 1 kg to 2 kg | | 1,8 kg/m ³ | |
| | > 2 kg to 5 kg | | 1,8 kg/m ³ | |
| | > 5 kg to 10 kg | | 1,8 kg/m ³ | |
| | > 10 kg to 20 kg | | 2,5 kg/m ³ | |
| | > 20 kg to 50 kg | | 2,5 kg/m ³ | |

¹⁾ The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

On-site calibration

| Mesured quantity / Calibration item | Range | Measurement conditions / procedure | Best measurement capability ¹⁾ | Remarks |
|-------------------------------------|------------------|------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| Mass Conventional mass | 1 mg, 2 mg, 5 mg | OIML R 111-1: 2004 | 0,060 mg | for fixed nominal values with weights OIML R 111-1:2004 according to the class M ₁ |
| | 10 mg | | 0,080 mg | |
| | 20 mg | | 0,10 mg | |
| | 50 mg | | 0,12 mg | |
| | 100 mg | | 0,16 mg | |
| | 200 mg | | 0,20 mg | |
| | 500 mg | | 0,25 mg | |
| | 1 g | | 0,30 mg | |
| | 2 g | | 0,40 mg | |
| | 5 g | | 0,50 mg | |
| 10 g | 0,60 mg | | | |
| 20 g | 0,80 mg | | | |
| 50 g | 1,0 mg | | | |
| 100 g | 1,6 mg | | | |
| 200 g | 3,0 mg | | | |
| 500 g | 8,0 mg | | | |
| 1 kg | 16 mg | | | |
| 2 kg | 30 mg | | | |
| 5 kg | 80 mg | | | |
| 10 kg | 0,16 g | | | |
| 20 kg | 0,30 g | | | |
| 50 kg | 0,80 g | | | |
| 100 kg | 1,6 g | | | |
| 200 kg | 3,0 g | | | |
| 500 kg | 8,0 g | | | |
| 1000 kg | 16 g | | | |
| 2000 kg | 30 g | | | |
| 25 kg | 0,4 g | | 0,4 g | for free nominal values with weights OIML R 111-1:2004 according to the class M ₁ |
| 40 kg | 0,6 g | | | |
| 60 kg | 0,9 g | | | |
| 250 kg | 4,0 g | | | |
| 2500 kg | 38 g | | | |
| 100 g bis 2500 kg | | $1,6 \cdot 10^{-5} \cdot m_N$ | | for free nominal values with weights OIML R 111-1:2004 mN Nominal value of the weight |

Abbreviations used:

OIML International Organization of Legal Metrology

¹⁾ The best measurement capabilities are stated according to EA-4/02. These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.