

# Physikalisch- Technische Bundesanstalt



**DKD**

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**Guideline  
DKD-R 9-3**


**Supplementary information  
regarding the calibration/  
verification of hardness testing  
machines**

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Edition 01/2023

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## Deutscher Kalibrierdienst (DKD) – German Calibration Service

Since its foundation in 1977, the German Calibration Service has brought together calibration laboratories of industrial enterprises, research institutes, technical authorities, inspection and testing institutes. On 3rd May 2011, the German Calibration Service was reestablished as a *technical body* of PTB and accredited laboratories.

This body is known as *Deutscher Kalibrierdienst* (DKD for short) and is under the direction of PTB. The guidelines and guides developed by DKD represent the state of the art in the respective areas of technical expertise and can be used by the *Deutsche Akkreditierungsstelle GmbH* (the German accreditation body – DAkkS) for the accreditation of calibration laboratories.

The accredited calibration laboratories are now accredited and supervised by DAkkS as legal successor to the DKD. They carry out calibrations of measuring instruments and measuring standards for the measurands and measuring ranges defined during accreditation. The calibration certificates issued by these laboratories prove the traceability to national standards as required by the family of standards DIN EN ISO 9000 and DIN EN ISO/IEC 17025.

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\* VMPA = Verband der Materialprüfungsanstalten e.V. (Association of Material Testing Institutes)

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## Foreword

DKD guidelines are application documents that meet the requirements of DIN EN ISO/IEC 17025. The guidelines contain a description of technical, process-related and organizational procedures used by accredited calibration laboratories as a model for defining internal processes and regulations. DKD guidelines may become an essential component of the quality management manuals of calibration laboratories. The implementation of the guidelines promotes equal treatment of the equipment to be calibrated in the various calibration laboratories and improves the continuity and verifiability of the work of the calibration laboratories. Moreover, the implementation of the guidelines helps to ensure that the state of the art in the respective field is taken into account in laboratory practice.

The DKD guidelines should not impede the further development of calibration procedures and processes. Deviations from guidelines as well as new procedures are permitted in agreement with the accreditation body if there are technical reasons to support this action.


Calibrations by accredited laboratories provide the user with the security of reliable measuring results, increase the confidence of customers, enhance competitiveness in the national and international markets, and serve as metrological basis for the monitoring of measuring and test equipment within the framework of quality assurance measures.

This guideline has been drawn up by the DKD Technical Committee *Materials Testing Machines* and the VMPA working group *Testing Machines and Equipment* and approved by the Board of the DKD.

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## 1 Scope of application

The specifications of this guideline aim to support the accredited calibration laboratories in applying the calibration standards DIN EN ISO 6506-2, 6507-2 and 6508-2 for the calibration and verification of hardness testing machines in a comparable and reliable manner.

The following sections directly address particularly important or unclearly defined points of the above-mentioned standards.

## 2 General specifications

The following formal requirements must be met by hardness testing machines to be calibrated:

- It must be possible to place/insert calibration equipment for the respective measurands to be calibrated into the testing machine.
- With Rockwell depth measuring devices, a continuous display of the measured values (in HR unit and/or length unit) must be possible. Furthermore, stepwise movement and measurement under preload are necessary.
- Access data must always be freely available to calibration laboratories, independent of the manufacturer, to ensure unrestricted operation at any time. This means it must be possible to freely calibrate and verify the machine. Obstructions/restrictions are not acceptable.

## 3 Specifications regarding DIN EN ISO 6506-2:2019-03 (Brinell)

### 3.1 Reference indentation

(cf. DIN EN ISO 6506-2, section 5.4.3)

Direct calibration of the measuring system according to section 5.4.1 of the standard is given a higher weighting than calibration according to section 5.4.3 of the standard. This becomes effective in case of contradictory statements of the two calibration criteria. Table 1 below illustrates how to solve the possible contradictions.

**Table 1:** Evaluation criteria


| 5.4.1 | 5.4.3 | Evaluation | Explanatory note                            |
|-------|-------|------------|---|
| NOK   | NOK   | NOK        | <b>Failed</b> according to both criteria    |
| NOK   | OK    | NOK        | <b>Failed</b> according to higher criterion |
| OK    | NOK   | OK         | <b>Passed</b> according to higher criterion |
| OK    | OK    | OK         | <b>Passed</b> according to both criteria    |

OK ... okay

NOK ... not okay

### 3.2 Indenters

The first use of the indenter ball in the hardness testing machine must be documented by the user in the calibration certificate of the indenter. The recommended replacement of the indenter every 2 years starts from the documented date of its first use.

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### 3.3 Intervals between verifications

(cf. DIN EN ISO 6506-2, section 7, and National Annex NA.3)

Based on the recommendation of the above-mentioned National Annex (NA.3), direct verification shall always be carried out together with the indirect verification when installing and modifying the testing machine, and at least at annual intervals.

## 4 Specifications regarding DIN EN ISO 6507-2:2018-07 (Vickers)

### 4.1 Indenters

The first use of an indenter in the hardness testing machine must be documented by the user in the calibration certificate of the indenter. The recommended recalibration interval of the indenter, which is 2 years, starts from the documented date of its first use.

### 4.2 Intervals between verifications

(cf. DIN EN ISO 6507-2, section 7, and National Annex NA.3)

Based on the recommendation of the above-mentioned National Annex (NA.3), direct verification shall always be carried out together with the indirect verification when installing and modifying the testing machine, and at least at annual intervals.

### 4.3 Length of indentation diagonals

When using light-microscopy measurement methods, the smallest permissible length of the indentation diagonal is limited to 20 µm. Smaller indentation diagonal lengths must be evaluated using measurement methods with higher resolution (for example, scanning electron microscopy).

## 5 Specifications regarding DIN EN ISO 6508-2:2015-06 (Rockwell)


### 5.1 Indenters

The first use of an indenter in the hardness testing machine must be documented by the user in the calibration certificate of the indenter. The recommended recalibration interval of the indenter, which is 2 years, starts from the documented date of its first use.

### 5.2 Indirect verification of the diamond indenter

(cf. DIN EN ISO 6508-2, section 6.2.3)

This section may be disregarded during verification of the testing machine.

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