

# Calibration Certificate

Kalibrierschein

Certificate Number 24-0090-101871-01

Zertifikatsnummer

## Unit Data

Item  
Gegenstand  
**Harmonic Mixer, 60 GHz to 90 GHz**

Manufacturer  
Hersteller  
**ROHDE & SCHWARZ**

Type  
Typ  
**R&S® FS-Z90**

Material Number  
Materialnummer  
**1048.0371.02**

Serial Number  
Seriennummer  
**101871**

Asset Number  
Inventarnummer

This calibration certificate documents, that the named item is tested and measured against defined specifications. Measurement results are located usually in the corresponding interval with a probability of approx. 95% (coverage factor  $k = 2$ ). Calibration is performed with test equipment and standards directly or indirectly traceable by means of approved calibration techniques to the PTB/DKD or other national/international standards, which realize the physical units of measurement according to the International System of Units (SI). In all cases where no standards are available, measurements are referenced to standards of the R&S laboratories. Principles and methods of calibration correspond with EN ISO/IEC 17025. This calibration certificate may not be reproduced other than in full. Calibration certificates without signatures are not valid. The user is obliged to have the object recalibrated at appropriate intervals.

## Order Data

Customer  
Auftraggeber

Order Number  
Bestellnummer

Date of Receipt  
Eingangsdatum

## Performance

Place and Date of Calibration  
Ort und Datum der Kalibrierung

**Meckenheim, 2019-01-10**

Scope of Calibration  
Umfang der Kalibrierung

**Standard Calibration**

Statement of Compliance  
(Incoming)  
Konformitätsaussage  
(Anlieferung)

**New device**

Statement of Compliance  
(Outgoing)  
Konformitätsaussage  
(Auslieferung)

**All measured values are within the data sheet specifications.**

Extend of Calibration Documents  
Umfang des Kalibrierdokuments

**2 pages Calibration Certificate  
5 pages Outgoing Results**

Dieser Kalibrierschein dokumentiert, dass der genannte Gegenstand nach festgelegten Vorgaben geprüft und gemessen wurde. Die Messwerte lagen im Regelfall mit einer Wahrscheinlichkeit von annähernd 95% im zugeordneten Werteintervall (Erweiterte Messunsicherheit mit  $k = 2$ ). Die Kalibrierung erfolgte mit Messmitteln und Normalen, die direkt oder indirekt durch Ableitung mittels anerkannter Kalibriertechniken rückgeführt sind auf Normale der PTB/DKD oder anderer nationaler/internationaler Standards zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Wenn keine Normale existieren, erfolgt die Rückführung auf Bezugsnormale der R&S-Laboratorien. Grundsätze und Verfahren der Kalibrierung beziehen sich auf EN ISO/IEC 17025. Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Kalibrierscheine ohne Unterschriften sind ungültig. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

## Radiometer Physics GmbH; Meckenheim

Date of Issue  
Ausstellungsdatum

**2019-01-11**

Head of Laboratory  
Laborleitung

Schulze

Person Responsible  
Bearbeiter

*H. Heinze*

Heinze

Page (Seite) 1/2  
Vers2010-05-05/  
RPG2014-02-28

Calibration Method  
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %  
Relative LuftfeuchteAmbient Temperature  
Umgebungstemperatur(23 <sup>+7</sup><sub>-3</sub>) °CWorking standards used (having a significant effect on the accuracy)  
Verwendete Gebrauchsnormale (mit signifikantem Einfluss auf die Genauigkeit)

| Item<br>Gegenstand      | Type<br>Typ  | Serial Number<br>Seriennummer | Calibration Certificate Number<br>Kalibrierscheinnummer | Cal. Due<br>Kalibr. bis |
|-------------------------|--------------|-------------------------------|---------------------------------------------------------|-------------------------|
| Vector Network Analyzer | R&S® ZVA67   | 101097                        | 20-300432406                                            | 2020-07-21              |
| Powersensor             | R&S® NRP-Z55 | 140093                        | 20-300426316                                            | 2019-05-17              |
| Powersensor             | R&S® NRP-Z58 | 101063                        | 0001-300474490                                          | 2019-08-06              |
| Calibration kit         | WR12         | E10001                        | RPG-PAQA-TN-2014-005                                    | 2019-02-01              |

**UGB1** A compliance statement may be possible where a confidence level of less than 95 % is acceptable.  
Die Bestätigung der Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

**UGB2** A non-compliance statement may be possible where a confidence level of less than 95 % is acceptable.  
Die Bestätigung der Nicht-Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

Ref.: ILAC-G8:03/2009 'Guidelines on the Reporting of Compliance with Specification'.

**Notes**

## Anmerkungen

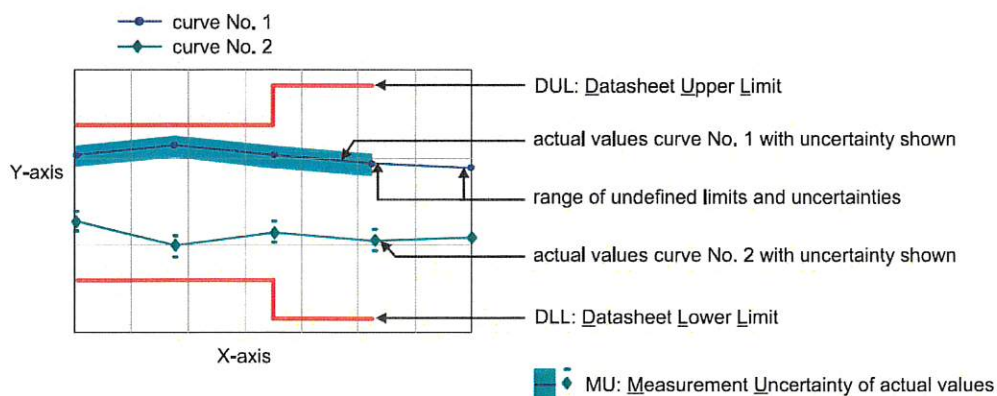
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is actually put into operation.

## Outgoing Results

The following abbreviations may be used in this document

|            |                                                                                                                                                                                                                                                                            |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| {a}        | No measurement uncertainty stated because the errors always add together.<br>So it is sure that a measurement result evaluated as "PASS" is pass.                                                                                                                          |
| {b}        | The measurement uncertainty depends on the measurement result. The stated measurement uncertainty is valid for the close area around the specification. Measurement results outside the close area have a higher measurement uncertainty but are within the specification. |
| {c}        | Functional test, therefore no measurement uncertainty is stated.                                                                                                                                                                                                           |
| {d}        | Typical value, refer to performance test.                                                                                                                                                                                                                                  |
| {e}        | The measurement uncertainty is taken into account when setting the measuring system.                                                                                                                                                                                       |
| DL or DT   | Data Limit for symmetrical tolerance limits                                                                                                                                                                                                                                |
| DLL        | Datasheet Lower Limit                                                                                                                                                                                                                                                      |
| DUL        | Datasheet Upper Limit                                                                                                                                                                                                                                                      |
| MU         | Measurement Uncertainty                                                                                                                                                                                                                                                    |
| MLL or MLV | Measurement Uncertainty Lower Value                                                                                                                                                                                                                                        |
| MUL or MUV | Measurement Uncertainty Upper Value                                                                                                                                                                                                                                        |
| Nom.       | Nominal Value                                                                                                                                                                                                                                                              |
| Dev.       | Deviation                                                                                                                                                                                                                                                                  |
| MErr.      | Measurement Error                                                                                                                                                                                                                                                          |
| Act.       | Actual Value                                                                                                                                                                                                                                                               |
| UGB        | Uncertainty Guard Band: Measuring uncertainty violates the data (spec.) limit.                                                                                                                                                                                             |
| UGB1       | Measurement results marked as UGB1 show conformity with a probability of >50 % and <95 %.                                                                                                                                                                                  |
| UGB2       | Measurement results marked as UGB2 show non-conformity with a probability of >50 % and <95 %.                                                                                                                                                                              |
| DU         | Datasheet Uncertainty                                                                                                                                                                                                                                                      |

### Explanation of charts

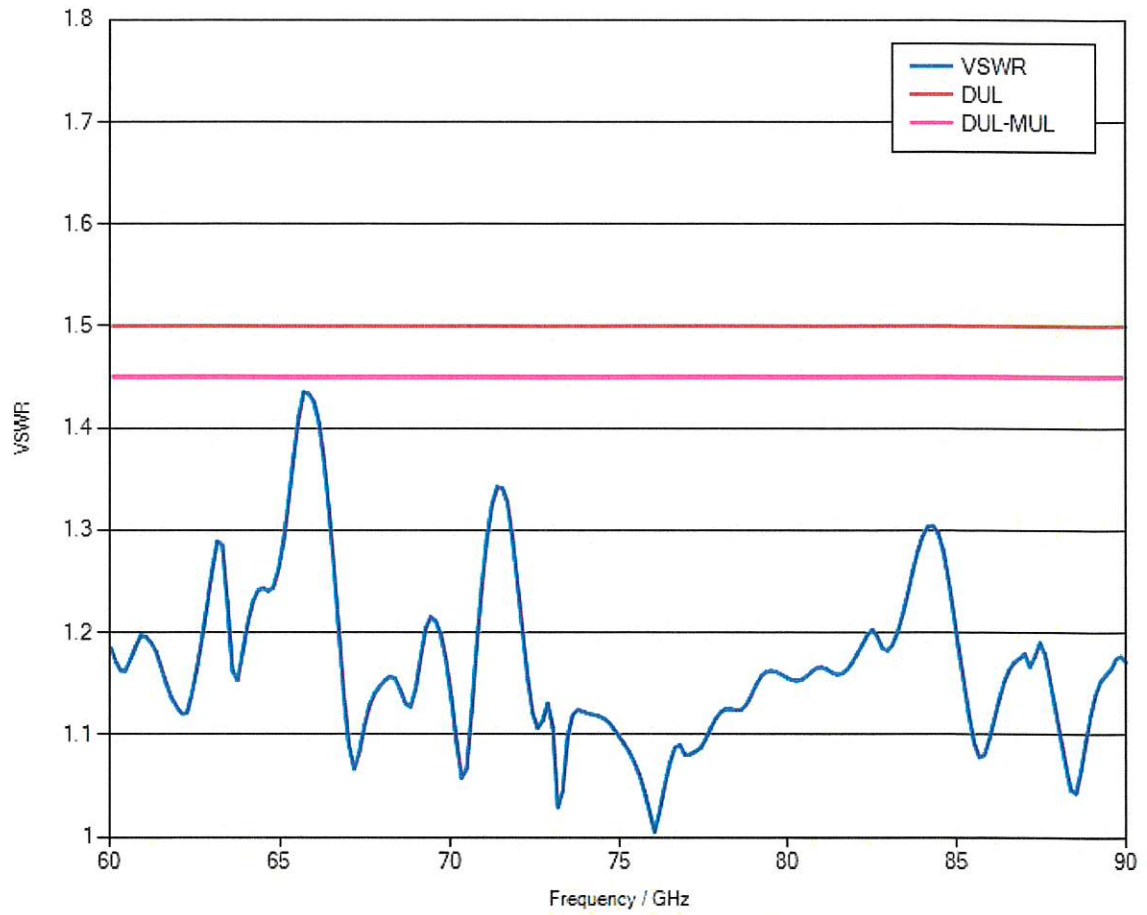


**Software used for measurement**

| Item Type                               | Version | Remark |
|-----------------------------------------|---------|--------|
| Measurement Studio Professional Edition | 2013    |        |
| MixerCertification                      | 7_09    |        |

## 1.1 RF Input – VSWR

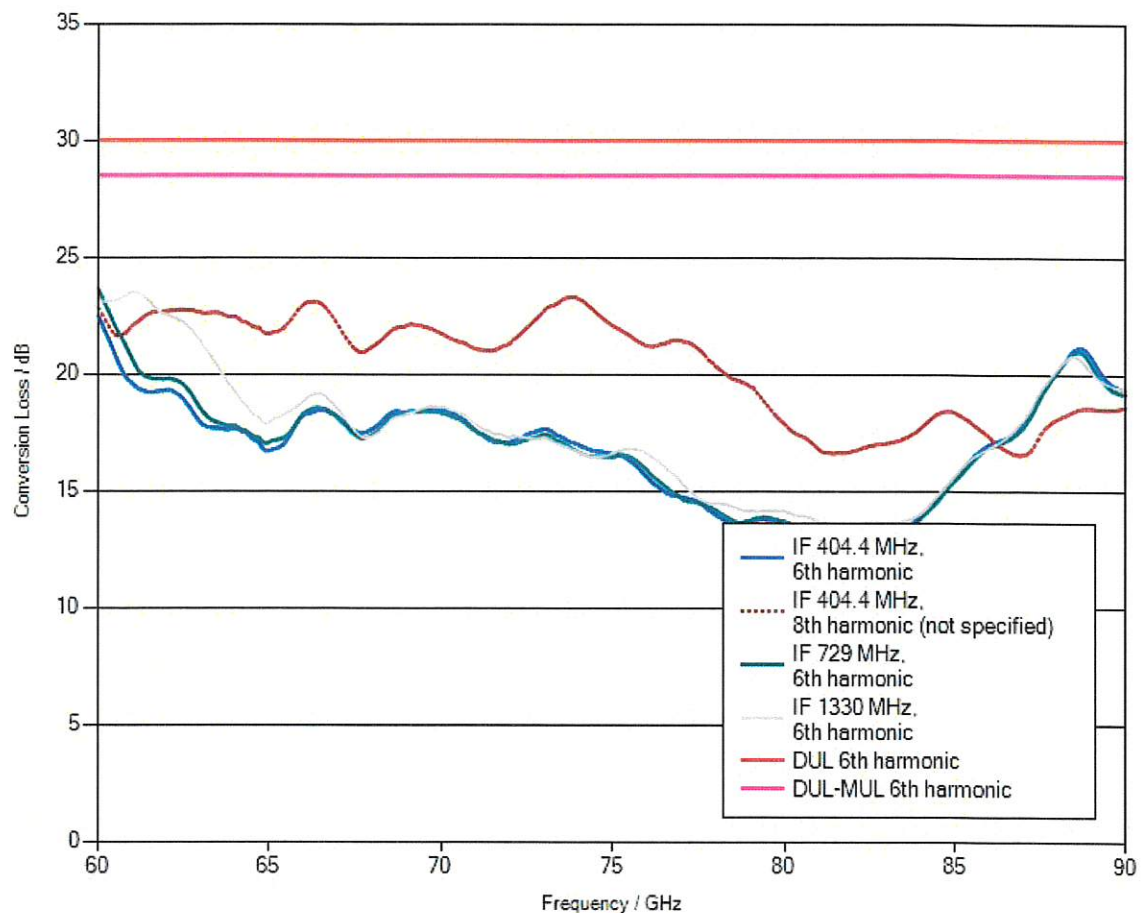
Measurement uncertainty: 0.05 (VSWR)



## 1.2 Conversion loss

LO level +14 dBm nominal  
Bias 0 A

Measurement uncertainty: 1.5 dB



**Note:** Numeric calibration data can be found attached to the PDF file of the calibration certificate. Click the “paper clip” symbol to display the file.

The file has been renamed for safety reasons.

When downloading the file onto your PC, please delete the “.file” extension and unzip the data.

### 1.3 Frequency response within 1 GHz

|                                 | DUL           | Actual<br>(worst case) | Evaluation    |
|---------------------------------|---------------|------------------------|---------------|
| IF = 404.4 MHz,<br>6th harmonic | 6 dB          | 2.76 dB                | PASS          |
| IF = 404.4 MHz,<br>8th harmonic | not specified | 1.83 dB                | not specified |
| IF = 729 MHz,<br>6th harmonic   | 6 dB          | 2.71 dB                | PASS          |
| IF = 1330 MHz,<br>6th harmonic  | 6 dB          | 2.02 dB                | PASS          |