

## Deutsche Akkreditierungsstelle GmbH

**Entrusted according to Section 8 subsection 1 AkkStelleG in connection with Section 1 subsection 1 AkkStelleGBV**

Signatory to the Multilateral Agreements of EA, ILAC and IAF for Mutual Recognition

# Accreditation



The Deutsche Akkreditierungsstelle GmbH attests that the calibration laboratory

### Rohde & Schwarz Meßgerätebau GmbH

with its calibration laboratories

**Rohde-und-Schwarz-Straße 1, 87700 Memmingen**  
**Graf Zeppelin-Straße 18, 51147 Köln**  
**Spidrova 49, 38501 Vimperk, Tschechien**

is competent under the terms of DIN EN ISO/IEC 17025:2018 to carry out calibrations in the following fields:

#### Electrical quantities

##### DC and low frequency quantities

- DC voltage<sup>a)</sup>
- AC voltage<sup>a)</sup>
- DC current<sup>a)</sup>
- AC current<sup>a)</sup>
- DC resistance<sup>a)</sup>
- AC/DC Transfer
- Capacitance<sup>a)</sup>

##### Time and frequency

- Time interval<sup>a)</sup>
- Frequency<sup>a)</sup>

##### High frequency quantities

- HF voltage<sup>a)</sup>
- HF power<sup>a)</sup>
- HF attenuation<sup>a)</sup>
- HF impedance<sup>a)</sup>
- HF noise
- Waveform quantities<sup>a)</sup>
- Modulation quantities<sup>a)</sup>
- Antenna quantities
- Rise Time<sup>a)</sup>
- Modulation quantities<sup>a)</sup>

a) also mobile facilities at location Köln

The accreditation certificate shall only apply in connection with the notice of accreditation of 16.06.2022 with the accreditation number D-K-15195-01. It comprises the cover sheet, the reverse side of the cover sheet and the following annex with a total of 29 pages.

Registration number of the certificate: **D-K-15195-01-00**

Berlin,  
16.06.2022

Dr. Florian Witt  
Head of Technical Unit

Translation issued:  
16.06.2022

  
Head of Technical Unit

*The certificate together with the annex reflects the status as indicated by the date of issue.*

*The current status of any given scope of accreditation can be found in the directory of accredited bodies maintained by Deutsche Akkreditierungsstelle GmbH at <https://www.dakks.de/en/accredited-bodies-search.html>.*

This document is a translation. The definitive version is the original German accreditation certificate.

See notes overleaf.

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The publication of extracts of the accreditation certificate is subject to the prior written approval by Deutsche Akkreditierungsstelle GmbH (DAkKS). Exempted is the unchanged form of separate disseminations of the cover sheet by the conformity assessment body mentioned overleaf.

No impression shall be made that the accreditation also extends to fields beyond the scope of accreditation attested by DAkKS.

The accreditation was granted pursuant to the Act on the Accreditation Body (AkkStelleG) of 31 July 2009 (Federal Law Gazette I p. 2625) and the Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products (Official Journal of the European Union L 218 of 9 July 2008, p. 30). DAkKS is a signatory to the Multilateral Agreements for Mutual Recognition of the European co-operation for Accreditation (EA), International Accreditation Forum (IAF) and International Laboratory Accreditation Cooperation (ILAC). The signatories to these agreements recognise each other's accreditations.

The up-to-date state of membership can be retrieved from the following websites:

EA: [www.european-accreditation.org](http://www.european-accreditation.org)

ILAC: [www.ilac.org](http://www.ilac.org)

IAF: [www.iaf.nu](http://www.iaf.nu)

# Deutsche Akkreditierungsstelle GmbH

## Annex to the Accreditation Certificate D-K-15195-01-00 according to DIN EN ISO/IEC 17025:2018

**Valid from:** 16.06.2022

Date of issue 16.06.2022

Holder of certificate:

**Rohde & Schwarz Meßgerätebau GmbH**

with its calibration laboratories

**Rohde-und-Schwarz-Straße 1, 87700 Memmingen**

**Graf Zeppelin-Straße 18, 51147 Köln**

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Calibration in the fields:

### Electrical quantities

#### DC and low frequency quantities

- DC voltage<sup>a)</sup>
- AC voltage<sup>a)</sup>
- DC current<sup>a)</sup>
- AC current<sup>a)</sup>
- DC resistance<sup>a)</sup>
- AC/DC Transfer
- Capacitance<sup>a)</sup>

#### Time and frequency

- Time interval<sup>a)</sup>
- Frequency<sup>a)</sup>

#### High frequency quantities

- HF voltage<sup>a)</sup>
- HF power<sup>a)</sup>
- HF attenuation<sup>a)</sup>
- HF impedance<sup>a)</sup>
- HF noise
- Waveform quantities<sup>a)</sup>
- Modulation quantities<sup>a)</sup>
- Antenna quantities
- Rise Time<sup>a)</sup>
- Modulation quantities<sup>a)</sup>

a) also mobile facilities at location Köln

*The management system requirements of DIN EN ISO/IEC 17025 are written in the language relevant to the operations of calibration laboratories. Laboratories that conform to the requirements of this standard, operate generally in accordance with the principles of DIN EN ISO 9001.*

*The certificate together with the annex reflects the status as indicated by the date of issue.*

*The current status of any given scope of accreditation can be found in the directory of accredited bodies maintained by Deutsche Akkreditierungsstelle GmbH at <https://www.dakks.de/en/content/accredited-bodies-dakks>.*

Abbreviations used: see last page

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**This document is a translation. The definitive version is the original German annex to the accreditation certificate.**

**Annex to the accreditation certificate D-K-15195-01-00**

**Location Memmingen, Permanent Laboratory**

**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks	
DC voltage Sources, Measuring instruments	1.018 V 10 V		$2 \cdot 10^{-6} \cdot U$ $1 \cdot 10^{-6} \cdot U$	U: Measured value	
	0 V to 500 V > 500 V to 1 kV		$10 \cdot 10^{-6} \cdot U + 1 \mu V$ $10 \cdot 10^{-6} \cdot U$		
DC current Measuring instruments  Sources	0 $\mu A$ to 10 $\mu A$ > 10 $\mu A$ to 220 mA > 220 mA to 2.2 A		1 nA $0.1 \cdot 10^{-3} \cdot I$ $0.14 \cdot 10^{-3} \cdot I$	I: Measured value	
	0 $\mu A$ to 10 $\mu A$ > 10 $\mu A$ to 100 mA > 100 mA to 60 A		1 nA $0.1 \cdot 10^{-3} \cdot I$ $0.2 \cdot 10^{-3} \cdot I$		
DC resistance Resistance, measuring instruments	0 $\Omega$ to 100 k $\Omega$ > 100 k $\Omega$ to 1 M $\Omega$ > 1 M $\Omega$ to 10 M $\Omega$ > 10 M $\Omega$ to 100 M $\Omega$ > 100 M $\Omega$ to 1 G $\Omega$		$15 \cdot 10^{-6} \cdot R + 60 \mu \Omega$ $20 \cdot 10^{-6} \cdot R + 2 \Omega$ $60 \cdot 10^{-6} \cdot R + 0.1 k\Omega$ $0.6 \cdot 10^{-3} \cdot R$ $5.1 \cdot 10^{-3} \cdot R$	R: Measured value	
AC voltage Measuring instruments	1 mV to 220 V	10 Hz to < 20 Hz 20 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	$0.40 \cdot 10^{-3} \cdot U + 8 \mu V$ $0.21 \cdot 10^{-3} \cdot U + 2 \mu V$ $0.20 \cdot 10^{-3} \cdot U + 2 \mu V$ $0.50 \cdot 10^{-3} \cdot U + 2 \mu V$	U: Measured value	
	1 mV to 22 V	> 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$1.0 \cdot 10^{-3} \cdot U + 18 \mu V$ $1.8 \cdot 10^{-3} \cdot U + 20 \mu V$ $4.0 \cdot 10^{-3} \cdot U + 20 \mu V$		
	> 22 V to U <sub>max</sub>	> 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$1.0 \cdot 10^{-3} \cdot U + 16 mV$ $5.0 \cdot 10^{-3} \cdot U + 30 mV$ $8.0 \cdot 10^{-3} \cdot U + 80 mV$		U <sub>max</sub> = 22 10 <sup>6</sup> · V Hz/ f[Hz]
	> 220 V to 1 kV	15 Hz to 50 Hz > 50 Hz to 1 kHz	$0.40 \cdot 10^{-3} \cdot U + 2.5 mV$ $0.11 \cdot 10^{-3} \cdot U + 2.5 mV$		
		1 mV to 3.5 V	10 Hz to 30 Hz > 30 Hz to 120 Hz > 120 Hz to 120 kHz > 120 kHz to 2 MHz > 2 MHz to 10 MHz > 10 MHz to 20 MHz > 20 MHz to 30 MHz > 30 MHz to 50 MHz	$3.3 \cdot 10^{-3} \cdot U + 3 \mu V$ $1.6 \cdot 10^{-3} \cdot U + 3 \mu V$ $1.3 \cdot 10^{-3} \cdot U + 3 \mu V$ $1.5 \cdot 10^{-3} \cdot U + 3 \mu V$ $3.5 \cdot 10^{-3} \cdot U + 3 \mu V$ $11.0 \cdot 10^{-3} \cdot U + 3 \mu V$ $25.0 \cdot 10^{-3} \cdot U + 15 \mu V$ $40.0 \cdot 10^{-3} \cdot U + 15 \mu V$	Voltage at 50 $\Omega$
Sources	1 mV to 10 mV	10 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 1 MHz	$0.5 \cdot 10^{-3} \cdot U + 4 \mu V$ $0.8 \cdot 10^{-3} \cdot U + 4 \mu V$ $5.0 \cdot 10^{-3} \cdot U + 4 \mu V$ $12.0 \cdot 10^{-3} \cdot U + 10 \mu V$		

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC voltage Sources	> 10 mV to 100 V	10 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 300 kHz > 300 kHz to 1 MHz	$0.5 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$ $0.5 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$ $1.4 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$ $4.0 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$ $11.0 \cdot 10^{-3} \cdot U + 10 \mu\text{V}$	U: Measured value
	> 100 V to 700 V	10 Hz to 20 Hz > 20 Hz to 50 kHz > 50 kHz to 100 kHz	$0.8 \cdot 10^{-3} \cdot U + 2 \text{ mV}$ $1.4 \cdot 10^{-3} \cdot U + 2 \text{ mV}$ $3.2 \cdot 10^{-3} \cdot U + 2 \text{ mV}$	
AC current Measuring instruments	100 $\mu\text{A}$ to 220 $\mu\text{A}$	10 Hz to 20 Hz > 20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$0.3 \cdot 10^{-3} \cdot I + 16 \text{ nA}$ $0.2 \cdot 10^{-3} \cdot I + 10 \text{ nA}$ $0.3 \cdot 10^{-3} \cdot I + 12 \text{ nA}$ $1.1 \cdot 10^{-3} \cdot I + 0.1 \mu\text{A}$	I: Measured value
	> 220 $\mu\text{A}$ to 2.2 mA	10 Hz to 20 Hz > 20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$0.3 \cdot 10^{-3} \cdot I + 40 \text{ nA}$ $0.2 \cdot 10^{-3} \cdot I + 35 \text{ nA}$ $0.22 \cdot 10^{-3} \cdot I + 110 \text{ nA}$ $1.2 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$	
	> 2.2 mA to 22 mA	10 Hz to 20 Hz > 20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$0.3 \cdot 10^{-3} \cdot I + 400 \text{ nA}$ $0.2 \cdot 10^{-3} \cdot I + 350 \text{ nA}$ $0.22 \cdot 10^{-3} \cdot I + 550 \text{ nA}$ $1.2 \cdot 10^{-3} \cdot I + 5 \mu\text{A}$	
	> 22 mA to 220 mA	10 Hz to 20 Hz > 20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$0.3 \cdot 10^{-3} \cdot I + 4 \mu\text{A}$ $0.2 \cdot 10^{-3} \cdot I + 3.5 \mu\text{A}$ $0.22 \cdot 10^{-3} \cdot I + 3.5 \mu\text{A}$ $1.2 \cdot 10^{-3} \cdot I + 10 \mu\text{A}$	
	> 220 mA to 2.2 A	20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$0.2 \cdot 10^{-3} \cdot I + 35 \mu\text{A}$ $0.47 \cdot 10^{-3} \cdot I + 80 \mu\text{A}$ $7.1 \cdot 10^{-3} \cdot I + 160 \mu\text{A}$	
	> 2.2 A to < 3 A	10 Hz to 45 Hz > 45 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$2 \cdot 10^{-3} \cdot I + 100 \mu\text{A}$ $0.7 \cdot 10^{-3} \cdot I + 100 \mu\text{A}$ $6.6 \cdot 10^{-3} \cdot I + 1 \text{ mA}$ $28 \cdot 10^{-3} \cdot I + 5 \text{ mA}$	
	3 A to < 11 A	45 Hz to 100 Hz > 100 Hz to 1 kHz > 1 kHz to 5 kHz	$0.7 \cdot 10^{-3} \cdot I + 2 \text{ mA}$ $1.1 \cdot 10^{-3} \cdot I + 2 \text{ mA}$ $0.3 \cdot 10^{-3} \cdot I + 16 \text{ nA}$	
	Sources	100 $\mu\text{A}$ to 1.2 mA	10 Hz to 20 Hz > 20 Hz to 45 Hz > 45 Hz to 10 kHz	

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AC current Sources	> 1.2 mA to 120 mA	> 10 Hz to 20 Hz > 20 Hz to 45 Hz > 45 Hz to 10 kHz	$6.0 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$ $3.2 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$ $2.3 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$	f: Measured value
	> 120 mA to 1 A	10 Hz to 20 Hz > 20 Hz to 45 Hz > 45 Hz to 5 kHz > 5 kHz to 10 kHz	$6.0 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$ $3.3 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$ $2.7 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$ $4.7 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$	
Frequency Oscillators Measuring instruments	0.1 MHz		$5 \cdot 10^{-12} \cdot f$	f: Measured value $U_{\text{TRIG}}$ : Trigger-uncertainty
	1 MHz			
	5 MHz			
	10 MHz			
	0.1 MHz to 110 GHz		$\sqrt{(1 \cdot 10^{-10} \cdot f)^2 + U_{\text{TRIG}}^2}$	
Time interval	1 ns to 100 s		$\sqrt{(1 \text{ ns})^2 + (1 \cdot 10^{-10} \cdot t)^2 + U_{\text{TRIG}}^2}$	t: Measured value
HF-Power Sources with mismatch correction	100 $\mu\text{W}$ to 10 mW	> DC to 1 MHz	$1.8 \cdot 10^{-3} \cdot P$	P: Measured value PC Type-N <sup>2)</sup> to 18 GHz  WG R220 <sup>2)</sup> WG R320 <sup>2)</sup> WG R400 <sup>2)</sup> WG R620 <sup>2)</sup> WG R620 <sup>2)</sup> WG: R900 <sup>2)</sup> WG: R900 <sup>2)</sup>
		> 1 MHz to 50 MHz	$2.3 \cdot 10^{-3} \cdot P$	
		> 50 MHz to 100 MHz	$2.5 \cdot 10^{-3} \cdot P$	
		> 100 MHz to 2.5 GHz	$4.0 \cdot 10^{-3} \cdot P$	
		2.5 GHz to 8 GHz	$6.0 \cdot 10^{-3} \cdot P$	
		> 8 GHz to 12.4 GHz	$7.7 \cdot 10^{-3} \cdot P$	
		> 12.4 GHz to 18 GHz	$10 \cdot 10^{-3} \cdot P$	
		18 GHz to 26.5 GHz	$5.3 \cdot 10^{-3} \cdot P$	
		26.5 GHz to 40 GHz	$5.6 \cdot 10^{-3} \cdot P$	
		40 GHz to 50 GHz	$15 \cdot 10^{-3} \cdot P$	
		50 GHz to 67 GHz	$29 \cdot 10^{-3} \cdot P$	
		> 67 GHz to 75 GHz	$32 \cdot 10^{-3} \cdot P$	
		75 GHz to 95 GHz	$32 \cdot 10^{-3} \cdot P$	
> 95 GHz to 110 GHz	$33 \cdot 10^{-3} \cdot P$			
HF-Power Sensors with mismatch correction	100 nW to 10 $\mu\text{W}$	> DC to 100 MHz	$5.8 \cdot 10^{-3} \cdot P$	P: Measured value PC Type-N <sup>2)</sup> to 18 GHz PC-3.5 <sup>2)</sup> to 33 GHz PC-2.92 <sup>2)</sup> to 40 GHz PC-2.4 <sup>2)</sup> to 50 GHz PC-1.85 <sup>2)</sup> to 67 GHz PC-1.00 <sup>2)</sup> to 110 GHz
		> 100 MHz to 2.5 GHz	$7.0 \cdot 10^{-3} \cdot P$	
		> 2.5 GHz to 4 GHz	$8.0 \cdot 10^{-3} \cdot P$	
		> 4 GHz to 8 GHz	$10 \cdot 10^{-3} \cdot P$	
		> 8 GHz to 12.4 GHz	$13 \cdot 10^{-3} \cdot P$	
		> 12.4 GHz to 18 GHz	$15 \cdot 10^{-3} \cdot P$	
		> 18 GHz to 26.5 GHz	$15 \cdot 10^{-3} \cdot P$	
		> 26.5 GHz to 40 GHz	$19 \cdot 10^{-3} \cdot P$	

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**Location Memmingen, Permanent Laboratory**

**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
HF-Power Sensors with mismatch correction	10 $\mu$ W to 200 mW	> DC to 1 MHz > 1 MHz to 100 MHz > 100 MHz to 2.5 GHz 2.5 GHz to 8 GHz > 8 GHz to 12.4 GHz > 12.4 GHz to 18 GHz > 18 GHz to 26.5 GHz > 26.5 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz	$3.0 \cdot 10^{-3} \cdot P$ $3.4 \cdot 10^{-3} \cdot P$ $5.1 \cdot 10^{-3} \cdot P$ $6.8 \cdot 10^{-3} \cdot P$ $8.4 \cdot 10^{-3} \cdot P$ $11 \cdot 10^{-3} \cdot P$ $14 \cdot 10^{-3} \cdot P$ $17 \cdot 10^{-3} \cdot P$ $21 \cdot 10^{-3} \cdot P$ $33 \cdot 10^{-3} \cdot P$	P: Measured value
	10 $\mu$ W to 125 mW	> 67 GHz to 75 GHz > 75 GHz to 95 GHz > 95 GHz to 110 GHz	$37 \cdot 10^{-3} \cdot P$ $41 \cdot 10^{-3} \cdot P$ $43 \cdot 10^{-3} \cdot P$	
HF-Power Sources. Measuring instruments with mismatch correction	0.2 fW to < 10 pW	> DC to 8 GHz > 8 GHz to 20 GHz	$21 \cdot 10^{-3} \cdot P$ $24 \cdot 10^{-3} \cdot P$	
	1 fW to < 10 pW	> 20 GHz to 40 GHz	$29 \cdot 10^{-3} \cdot P$	
	10 fW to < 10 pW	> 40 GHz to 50 GHz > 50 GHz to 67 GHz	$43 \cdot 10^{-3} \cdot P$ $49 \cdot 10^{-3} \cdot P$	
	10 pW to < 100 nW	> DC to 100 MHz > 100 MHz to 8 GHz > 8 GHz to 20 GHz > 20 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz	$15 \cdot 10^{-3} \cdot P$ $17 \cdot 10^{-3} \cdot P$ $20 \cdot 10^{-3} \cdot P$ $26 \cdot 10^{-3} \cdot P$ $34 \cdot 10^{-3} \cdot P$ $43 \cdot 10^{-3} \cdot P$	
	100 pW to < 100 uW	> 67 GHz to 75 GHz > 75 GHz to 95 GHz > 95 GHz to 110 GHz	$45 \cdot 10^{-3} \cdot P$ $47 \cdot 10^{-3} \cdot P$ $49 \cdot 10^{-3} \cdot P$	
	100 nW to 200 mW	> DC to 100 MHz > 100 MHz to 8 GHz > 8 GHz to 18 GHz > 18 GHz to 26.5 GHz > 26.5 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz	$10 \cdot 10^{-3} \cdot P$ $13 \cdot 10^{-3} \cdot P$ $16 \cdot 10^{-3} \cdot P$ $23 \cdot 10^{-3} \cdot P$ $23 \cdot 10^{-3} \cdot P$ $30 \cdot 10^{-3} \cdot P$ $35 \cdot 10^{-3} \cdot P$	
	100 $\mu$ W to 125 mW	> 67 GHz to 75 GHz > 75 GHz to 95 GHz > 95 GHz to 110 GHz	$40 \cdot 10^{-3} \cdot P$ $42 \cdot 10^{-3} \cdot P$ $44 \cdot 10^{-3} \cdot P$	
without mismatch correction	> 200 mW to 20 W	> DC to 100 MHz > 100 MHz to 4 GHz	$11 \cdot 10^{-3} \cdot P$ $14 \cdot 10^{-3} \cdot P$	
	> 200 mW to 4 W	> 4 GHz to 8 GHz > 8 GHz to 12.5 GHz > 12.5 GHz to 18 GHz	$15 \cdot 10^{-3} \cdot P$ $19 \cdot 10^{-3} \cdot P$ $23 \cdot 10^{-3} \cdot P$	

Annex to the accreditation certificate D-K-15195-01-00

Location Memmingen, Permanent Laboratory

Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
HF-Power Sources, Measuring instruments	> 200 mW to 2 W	> 18 GHz to 26.5 GHz	$25 \cdot 10^{-3} \cdot P$	
	> 200 mW to 1 W	> 26.5 GHz to 40 GHz	$31 \cdot 10^{-3} \cdot P$	
	> 20 W to 2 kW	> DC to 1 GHz	$24 \cdot 10^{-3} \cdot P$	
Display Linearity, Tuned HF Power, Attenuation	0 dB to 21 dB	> DC to 40 GHz	0.003 dB	A: Measured value
	> 21 dB to 111 dB	> DC to 40 GHz	$0.003 \text{ dB} + 0.0002 \cdot A$	
	> 111 dB to 121 dB	> DC to 40 GHz	0.03 dB	
	0 dB to 11 dB	> 40 GHz to 67 GHz	0.005 dB	
	> 11 dB to 111 dB	> 40 GHz to 67 GHz	$0.005 \text{ dB} + 0.0004 \cdot A$	
	0 dB to 21 dB	75 GHz	0.005 dB	
	0 dB to 60 dB	> 67 GHz to 110 GHz	$0.03 \text{ dB} + 0.001 \cdot A$	
	> 60 dB to 80 dB	> 67 GHz to 110 GHz	0.6 dB	
	> 80 dB to 90 dB	> 67 GHz to 110 GHz	1.8 dB	
		0 dB to 10 dB	65 GHz to < 70 GHz	0.11 dB
	0 dB to 10 dB	70 GHz to 85 GHz	0.10 dB	
HF-Transmission Phase angle $\varphi$	- 180 ° to 180 °	> DC to 100 MHz	0.5 °	Depending on attenuation value
		> 100 MHz to 10 GHz	0.7 °	
		> 10 GHz to 20 GHz	1.0 °	
		> 20 GHz to 40 GHz	1.8 °	
		> 40 GHz to 67 GHz	2.0 °	
		> 67 GHz to 110 GHz	3.0 °	
HF-Impedance Reflection factor	0.0 to 0.4	> DC to 10 GHz	0.0034	PC Type-N <sup>2)</sup>
	> 0.4 to 1.0	> DC to 10 GHz	$0.0015 + 0.005 \cdot  \Gamma $	
	0.0 to 0.4	> 10 GHz to 18 GHz	0.0034	$\Gamma$  : Magnitude of complex reflection Factor
	> 0.4 to 1.0	> 10 GHz to 18 GHz	$0.01 \cdot  \Gamma $	
	0.0 to 0.4	> 18 GHz to 33 GHz	0.0065	PC-3.5 <sup>2)</sup>
	> 0.4 to 1.0	> 18 GHz to 33 GHz	$0.001 + 0.013 \cdot  \Gamma $	
	0.0 to 0.4	> 33 GHz to 40 GHz	0.011	PC-2.92 <sup>2)</sup>
	> 0.4 to 1.0	> 33 GHz to 40 GHz	$0.005 + 0.016 \cdot  \Gamma $	
	0.0 to 1.0	> DC to 2 GHz	$0.0035 + 0.0042 \cdot  \Gamma ^2$	PC-2.4 <sup>2)</sup> . PC-1.85 <sup>2)</sup>
		> 2 GHz to 10 GHz	$0.0037 + 0.0050 \cdot  \Gamma ^2$	
		> 10 GHz to 20 GHz	$0.0042 + 0.0069 \cdot  \Gamma ^2$	
		> 20 GHz to 30 GHz	$0.0055 + 0.0101 \cdot  \Gamma ^2$	
		> 30 GHz to 40 GHz	$0.0067 + 0.0120 \cdot  \Gamma ^2$	
		> 40 GHz to 50 GHz	$0.0085 + 0.0151 \cdot  \Gamma ^2$	
	> 50 GHz to 67 GHz	$0.0113 + 0.0183 \cdot  \Gamma ^2$		
0.0 to 1.0	> DC to 2 GHz	$0.0036 + 0.0049 \cdot  \Gamma ^2$	PC-1.00 <sup>2)</sup>	
	> 2 GHz to 10 GHz	$0.0036 + 0.0052 \cdot  \Gamma ^2$		
	> 10 GHz to 20 GHz	$0.0041 + 0.0068 \cdot  \Gamma ^2$		
	> 20 GHz to 30 GHz	$0.0049 + 0.0095 \cdot  \Gamma ^2$		
	> 30 GHz to 40 GHz	$0.0056 + 0.0117 \cdot  \Gamma ^2$		
	> 40 GHz to 50 GHz	$0.0063 + 0.0131 \cdot  \Gamma ^2$		
	> 50 GHz to 67 GHz	$0.0074 + 0.0173 \cdot  \Gamma ^2$		
	> 67 GHz to 90 GHz	$0.0093 + 0.0213 \cdot  \Gamma ^2$		
	> 90 GHz to 110 GHz	$0.0122 + 0.0280 \cdot  \Gamma ^2$		
	> 110 GHz bis 114 GHz	$0.0142 + 0.0331 \cdot  \Gamma ^2$		



**Annex to the accreditation certificate D-K-15195-01-00**

**Location Memmingen, Permanent Laboratory**

**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
HF-Impedance Reflection factor	0.0 to 1.0	50 GHz to 75 GHz 60 GHz to 90 GHz 75 GHz to 110 GHz	$0.01 + 0.008 \cdot  \Gamma $ $0.01 + 0.008 \cdot  \Gamma $ $0.01 + 0.008 \cdot  \Gamma $	Connector: R620 Connector: R740 Connector: R900
	0.0 to 0.6	65 GHz to < 70 GHz	0.027	Free space impedance
	> 0.6 to 1.0	65 GHz to < 70 GHz	0.032	
	0.0 to 0.6	70 GHz to 85 GHz	0.026	
	> 0.6 to 1.0	70 GHz to 85 GHz	0.029	
HF-Impedance Phase angle	- 180 ° to 180 °	> DC to 110 GHz	$U_s \cdot 180^\circ / \pi$	$U_s = \arcsin(U/ \Gamma )$ U: Uncertainty of reflection factor
Modulation quantities	0.0 to 1.0	> DC $f_m \leq 100$ kHz	$0.001 \cdot m + K$	$m$ : Measurement value $f_{HF}$ = Carrier frequency $f_m$ = modulation freq. $f_{HF} > 5 \cdot f_m^{(3)}$
Amplitude modulation		100 kHz < $f_m \leq 1$ MHz	$0.002 \cdot m + K$	
Modulation degree $m$		1 MHz < $f_m \leq 10$ MHz	$0.007 \cdot m + K$	
Frequency modulation	10 Hz to 16 MHz	10 Hz < $f_m \leq 100$ kHz	$1 \cdot 10^{-3} \cdot \Delta f + K$	$\Delta f$ : Measurement value $f_{HF} > 5 \cdot (f_m + \Delta f)^{(3)}$
Frequency deviation $\Delta f$		100 kHz < $f_m \leq 200$ kHz	$2 \cdot 10^{-3} \cdot \Delta f + K$	
		200 kHz < $f_m \leq 10$ MHz	$5 \cdot 10^{-3} \cdot \Delta f + K$	
Phase modulation	(10 Hz/ $f_m$ ) to (16 MHz/ $f_m$ ) rad	10 Hz < $f_m \leq 100$ kHz	$1 \cdot 10^{-3} \cdot \Delta \phi + K$	$\Delta \phi$ : Measurement value $f_{HF} > 5 \cdot f_m^{(3)}$
Phase deviation $\Delta \phi$		100 kHz < $f_m \leq 200$ kHz	$2 \cdot 10^{-3} \cdot \Delta \phi + K$	
		200 kHz < $f_m \leq 10$ MHz	$5 \cdot 10^{-3} \cdot \Delta \phi + K$	
Waveform quantities	7 ps to 15 ps	Voltage range dependent on rise-time	4 ps	t: Measurement value
Rise time	> 15 ps to 25 ps		3 ps	
Pulse spectrum	> 25 ps to 100 ns 0.1 $\mu$ Vs to 50 $\mu$ Vs		9 kHz to 150 kHz	$40 \cdot 10^{-3} \cdot t + 2$ ps $25 \cdot 10^{-3} \cdot IS$
Cispr 16-1-1:2019	3 nVs to 1 $\mu$ Vs	150 kHz to 30 MHz	$25 \cdot 10^{-3} \cdot IS$	
	0.4 nVs to 200 nVs	30 MHz to 1 GHz	$27 \cdot 10^{-3} \cdot IS$	
Antenna factor	Depending on Antenna	20 MHz to 1 GHz	0.45 dB	with ground reflection
3-Antenna method Free-field		20 MHz to < 10 GHz	0.35 dB	without ground reflection
		10 GHz to 18 GHz	0.40 dB	
		20 MHz to < 2 GHz	0.40 dB	SAE ARP958:1999
Full absorber facility			2 GHz to 18 GHz	0.55 dB
		20 MHz to 18 GHz	0.60 dB	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Phase noise Oscillators Measuring instruments	> -77 dBc/Hz <sup>a)</sup>	1 Hz <sup>b)</sup>	1.5 dB	Carrier frequency: 100 MHz to 500 MHz
	-85 dBc/Hz to -77dBc/Hz	1 Hz	2.5 dB	
	> -92 dBc/Hz	3 Hz to 10 Hz	1.5 dB	
	-100 dBc/Hz to -92 dBc/Hz	3 Hz to 10 Hz	2.5 dB	<sup>a)</sup> Phase noise to
	> -106 dBc/Hz	10 Hz to 100 Hz	1.5 dB	Carrier level in dBc/Hz
	-114 dBc/Hz to -106 dBc/Hz	10 Hz to 100 Hz	2.5 dB	
	> -136 dBc/Hz	100 Hz to 1 kHz	1.5 dB	<sup>b)</sup> Offset frequency to carrier frequency
	-146 dBc/Hz to -136 dBc/Hz	100 Hz to 1 kHz	2.5 dB	
	> -160 dBc/Hz	1 kHz to 10 kHz	1.5 dB	
	-168 dBc/Hz to -160 dBc/Hz	1 kHz to 10 kHz	2.5 dB	
	> -167 dBc/Hz	10 kHz to 100 kHz	1.5 dB	
	-175 dBc/Hz to -167 dBc/Hz	10 kHz to 100 kHz	2.5 dB	
	> -174 dBc/Hz	100 kHz to 1 MHz	1.5 dB	
	-182 dBc/Hz to -174 dBc/Hz	100 kHz to 1 MHz	2.5 dB	
	> -186 dBc/Hz	1 MHz to 10 MHz	1.5 dB	
	-192 dBc/Hz to -186 dBc/Hz	1 MHz to 10 MHz	2.5 dB	
	> -64 dBc/Hz	1 Hz	1.5 dB	Carrier frequency 500 MHz to 1 GHz
	-73 dBc/Hz to -64 dBc/Hz	1 Hz	2.5 dB	
	> -82 dBc/Hz	3 Hz to 10 Hz	1.5 dB	
	-90 dBc/Hz to -82 dBc/Hz	3 Hz to 10 Hz	2.5 dB	
	> -95 dBc/Hz	10 Hz to 100 Hz	1.5 dB	
	-103 dBc/Hz to -95 dBc/Hz	10 Hz to 100 Hz	2.5 dB	
	> -123 dBc/Hz	100 Hz to 1 kHz	1.5 dB	
	-131 dBc/Hz to -123 dBc/Hz	100 Hz to 1 kHz	2.5 dB	
	> -153 dBc/Hz	1 kHz to 10 kHz	1.5 dB	
	-161 dBc/Hz to -153 dBc/Hz	1 kHz to 10 kHz	2.5 dB	
	> -170 dBc/Hz	10 kHz to 100 kHz	1.5 dB	
	-178 dBc/Hz to -170 dBc/Hz	10 kHz to 100 kHz	2.5 dB	
	> -172 dBc/Hz	100 kHz to 1 MHz	1.5 dB	
	-180 dBc/Hz to -172 dBc/Hz	100 kHz to 1 MHz	2.5 dB	
	> -172 dBc/Hz	1 MHz to 10 MHz	1.5 dB	
	-180 dBc/Hz to -172 dBc/Hz	1 MHz to 10 MHz	2.5 dB	
	> -55 dBc/Hz	1 Hz	1.5 dB	Carrier frequency: 1 GHz to 3 GHz
	-67 dBc/Hz to -55 dBc/Hz	1 Hz	2.5 dB	
	> -67 dBc/Hz	3 Hz to 10 Hz	1.5 dB	
	-93 dBc/Hz to -85 dBc/Hz	10 Hz to 100 Hz	2.5 dB	
	> -114 dBc/Hz	100 Hz to 1 kHz	1.5 dB	

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**Location Memmingen, Permanent Laboratory**

**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
	-122 to -114 dBc/Hz to dBc/Hz	100 Hz to 1 kHz	2.5 dB	
	> -146 dBc/Hz	1 kHz to 10 kHz	1.5 dB	
	-155 to -146 dBc/Hz to dBc/Hz	1 kHz to 10 kHz	2.5 dB	
	> -166 dBc/Hz	10 kHz to 100 kHz	1.5 dB	
	-174 to -166 dBc/Hz to dBc/Hz	10 kHz to 100 kHz	2.5 dB	
	> -168 dBc/Hz	100 kHz to 1 MHz	1.5 dB	
	-176 to -168 dBc/Hz to dBc/Hz	100 kHz to 1 MHz	2.5 dB	
	> -168 dBc/Hz	1 MHz to 10MHz	1.5 dB	
	-76 to -168 dBc/Hz to dBc/Hz	1 MHz to 10 MHz	2.5 dB	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks	
Phase noise	> -49 dBc/Hz	1 Hz	1.5 dB	Carrier frequency: 3 GHz to 6 GHz	
Oscillators	-57 to -49 dBc/Hz	1 Hz	2.5 dB		
Measuring instruments	> -62 dBc/Hz	3 Hz to 10 Hz	1.5 dB		
	-70 to -62 dBc/Hz	3 Hz to 10 Hz	2.5 dB		
	> -76 dBc/Hz	10 Hz to 100 Hz	1.5 dB		
	-84 to -76 dBc/Hz	10 Hz to 100 Hz	2.5 dB		
	> -105 dBc/Hz	100 Hz to 1 kHz	1.5 dB		
	-113 to -105 dBc/Hz	100 Hz to 1 kHz	2.5 dB		
	> -138 dBc/Hz	1 kHz to 10 kHz	1.5 dB		
	-146 to -138 dBc/Hz	1 kHz to 10 kHz	2.5 dB		
	> -156 dBc/Hz	10 kHz to 100 kHz	1.5 dB		
	-164 to -156 dBc/Hz	10 kHz to 100 kHz	2.5 dB		
	> -158 dBc/Hz	100 kHz to 1 MHz	1.5 dB		
	-166 to -158 dBc/Hz	100 kHz to 1 MHz	2.5 dB		
	> -158 dBc/Hz	1 MHz to 10 MHz	1.5 dB		
	-166 to -158 dBc/Hz	1 MHz to 10 MHz	2.5 dB		
	> -54 dBc/Hz	1 Hz	1.5 dB		Carrier frequency: 6 GHz to 8 GHz
	-62 to -54 dBc/Hz	1 Hz	2.5 dB		
	> -68 dBc/Hz	3 Hz to 10 Hz	1.5 dB		
	-76 to -68 dBc/Hz	3 Hz to 10 Hz	2.5 dB		
> -95 dBc/Hz	10 Hz to 100 Hz	1.5 dB			
-103 to -95 dBc/Hz	10 Hz to 100 Hz	2.5 dB			
> -122 dBc/Hz	100 Hz to 1 kHz	1.5 dB			
-130 to -122 dBc/Hz	100 Hz to 1 kHz	2.5 dB			
> -138 dBc/Hz	1 kHz to 10 kHz	1.5 dB			
-146 to -138 dBc/Hz	1 kHz to 10 kHz	2.5 dB			
> -142 dBc/Hz	10 kHz to 100 kHz	1.5 dB			
-146 to -142 dBc/Hz	10 kHz to 100 kHz	2.5 dB			
> -142 dBc/Hz	100 kHz to 1 MHz	1.5 dB			
-150 to -142 dBc/Hz	100 kHz to 1 MHz	2.5 dB			
> -142 dBc/Hz	1 MHz to 10 MHz	1.5 dB			
-150 to -142 dBc/Hz	1 MHz to 10 MHz	2.5 dB			

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
DC voltage Sources. Measuring instruments	0 V to 220mV > 220mV to 1 kV		$10 \cdot 10^{-6} \cdot U + 1 \mu\text{V}$ $16 \cdot 10^{-6} \cdot U$	U: Measured value
DC current Measuring instruments	0 $\mu\text{A}$ to 10 $\mu\text{A}$ > 10 $\mu\text{A}$ to 220 mA > 220 mA to 2.2 A 2.2 A to 3 A > 3 A to 11 A		1 nA $0.1 \cdot 10^{-3} \cdot I$ $0.14 \cdot 10^{-3} \cdot I$ $0.41 \cdot 10^{-3} \cdot I$ $0.55 \cdot 10^{-3} \cdot I + 500\mu\text{A}$	I: Measured value
Sources	0 $\mu\text{A}$ to 10 $\mu\text{A}$ > 10 $\mu\text{A}$ to 100 mA > 100 mA to 60 A		1 nA $0.1 \cdot 10^{-3} \cdot I$ $0.2 \cdot 10^{-3} \cdot I$	
DC resistance Resistance, measuring instruments	0 $\Omega$ to 100 k $\Omega$ > 100 k $\Omega$ to 1 M $\Omega$ > 1 M $\Omega$ to 10 M $\Omega$ > 10 M $\Omega$ to 100 M $\Omega$ > 100 M $\Omega$ to 1 G $\Omega$		$15 \cdot 10^{-6} \cdot R + 60 \mu\Omega$ $15 \cdot 10^{-6} \cdot R + 2 \Omega$ $50 \cdot 10^{-6} \cdot R + 100 \text{ k}\Omega$ $0.6 \cdot 10^{-3} \cdot R$ $5.1 \cdot 10^{-3} \cdot R$	R: Measured value
AC voltage Measuring instruments	1 mV to 220 V	10 Hz to < 20 Hz 20 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	$0.40 \cdot 10^{-3} \cdot U + 8 \mu\text{V}$ $0.21 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$ $0.20 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$ $0.50 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$	U: Measured value
	1 mV to 22 V	> 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$1.0 \cdot 10^{-3} \cdot U + 18 \mu\text{V}$ $1.8 \cdot 10^{-3} \cdot U + 20 \mu\text{V}$ $4.0 \cdot 10^{-3} \cdot U + 20 \mu\text{V}$	
	> 22 V to U <sub>max</sub>	> 100 kHz to 300 kHz > 300 kHz to 500 kHz > 500 kHz to 1 MHz	$1.0 \cdot 10^{-3} \cdot U + 16 \text{ mV}$ $5.0 \cdot 10^{-3} \cdot U + 30 \text{ mV}$ $8.0 \cdot 10^{-3} \cdot U + 80 \text{ mV}$	U <sub>max</sub> = 22·10 <sup>6</sup> V Hz/ f[Hz]
	> 220 V to 1 kV	15 Hz to 50 Hz > 50 Hz to 1 kHz	$0.40 \cdot 10^{-3} \cdot U + 2.5 \text{ mV}$ $0.11 \cdot 10^{-3} \cdot U + 2.5 \text{ mV}$	
	1 mV to 3.5 V	10 Hz to 30 Hz > 30 Hz to 120 Hz > 120 Hz to 120 kHz > 120 kHz to 2 MHz > 2 MHz to 10 MHz > 10 MHz to 20 MHz > 20 MHz to 30 MHz > 30 MHz to 50 MHz	$3.3 \cdot 10^{-3} \cdot U + 3 \mu\text{V}$ $1.6 \cdot 10^{-3} \cdot U + 3 \mu\text{V}$ $1.3 \cdot 10^{-3} \cdot U + 3 \mu\text{V}$ $1.5 \cdot 10^{-3} \cdot U + 3 \mu\text{V}$ $3.5 \cdot 10^{-3} \cdot U + 3 \mu\text{V}$ $11.0 \cdot 10^{-3} \cdot U + 3 \mu\text{V}$ $25.0 \cdot 10^{-3} \cdot U + 15 \mu\text{V}$ $40.0 \cdot 10^{-3} \cdot U + 15 \mu\text{V}$	Voltage at 50 $\Omega$
Sources	1 mV to 10 mV	10 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz > 100 kHz to 1 MHz	$0.5 \cdot 10^{-3} \cdot U + 4 \mu\text{V}$ $0.8 \cdot 10^{-3} \cdot U + 4 \mu\text{V}$ $5.0 \cdot 10^{-3} \cdot U + 4 \mu\text{V}$ $12.0 \cdot 10^{-3} \cdot U + 10 \mu\text{V}$	
	> 10 mV to 100 V	10 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz 100 kHz to 300 kHz > 300 kHz to 1 MHz	$0.5 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$ $0.5 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$ $1.4 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$ $0.4 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$ $11 \cdot 10^{-3} \cdot U + 10 \mu\text{V}$	U: Measured value Voltage at 50 $\Omega$

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC voltage Sources	> 100 V to 700 V	10 Hz to 20 Hz > 20 Hz to 50 kHz > 50 kHz to 100 kHz	$0.8 \cdot 10^{-3} \cdot U + 2 \text{ mV}$ $1.4 \cdot 10^{-3} \cdot U + 2 \text{ mV}$ $3.2 \cdot 10^{-3} \cdot U + 2 \text{ mV}$	U: Measured value
AC current Measuring instruments	100 $\mu$ A to 220 $\mu$ A	10 Hz to 20 Hz > 20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$0.3 \cdot 10^{-3} \cdot I + 16 \text{ nA}$ $0.2 \cdot 10^{-3} \cdot I + 10 \text{ nA}$ $0.3 \cdot 10^{-3} \cdot I + 12 \text{ nA}$ $1.1 \cdot 10^{-3} \cdot I + 0.1 \mu\text{A}$	I: Measured value
	> 220 $\mu$ A to 2.2 mA	10 Hz to 20 Hz > 20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$0.3 \cdot 10^{-3} \cdot I + 40 \text{ nA}$ $0.2 \cdot 10^{-3} \cdot I + 35 \text{ nA}$ $0.22 \cdot 10^{-3} \cdot I + 110 \text{ nA}$ $1.2 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$	
	> 2.2 mA to 22 mA	10 Hz to 20 Hz > 20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$0.3 \cdot 10^{-3} \cdot I + 400 \text{ nA}$ $0.2 \cdot 10^{-3} \cdot I + 350 \text{ nA}$ $0.22 \cdot 10^{-3} \cdot I + 550 \text{ nA}$ $1.2 \cdot 10^{-3} \cdot I + 5 \mu\text{A}$	
	> 22 mA to 220 mA	10 Hz to 20 Hz > 20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$0.3 \cdot 10^{-3} \cdot I + 4 \mu\text{A}$ $0.2 \cdot 10^{-3} \cdot I + 3.5 \mu\text{A}$ $0.22 \cdot 10^{-3} \cdot I + 3.5 \mu\text{A}$ $0.47 \cdot 10^{-3} \cdot I + 10 \mu\text{A}$	
	> 220 mA to 2.2 A	20 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$0.2 \cdot 10^{-3} \cdot I + 35 \mu\text{A}$ $0.47 \cdot 10^{-3} \cdot I + 80 \mu\text{A}$ $7.1 \cdot 10^{-3} \cdot I + 160 \mu\text{A}$	
	> 2.2 A to < 3 A	10 Hz to 45 Hz > 45 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$2 \cdot 10^{-3} \cdot I + 100 \mu\text{A}$ $0.7 \cdot 10^{-3} \cdot I + 100 \mu\text{A}$ $6.6 \cdot 10^{-3} \cdot I + 1 \text{ mA}$ $28 \cdot 10^{-3} \cdot I + 5 \text{ mA}$	
	3 A to < 11 A	45 Hz to 100 Hz > 100 Hz to 1 kHz > 1 kHz to 5 kHz	$0.7 \cdot 10^{-3} \cdot I + 2 \text{ mA}$ $1.1 \cdot 10^{-3} \cdot I + 2 \text{ mA}$ $33 \cdot 10^{-3} \cdot I + 2 \text{ mA}$	
Sources	100 $\mu$ A to 1.2 mA	10 Hz to 20 Hz > 20 Hz to 45 Hz > 45 Hz to 10 kHz	$6.0 \cdot 10^{-3} \cdot I + 0.1 \mu\text{A}$ $3.5 \cdot 10^{-3} \cdot I + 0.1 \mu\text{A}$ $2.6 \cdot 10^{-3} \cdot I + 0.1 \mu\text{A}$	
	> 1.2 mA to 120 mA	> 10 Hz to 20 Hz > 20 Hz to 45 Hz > 45 Hz to 10 kHz	$6.0 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$ $3.2 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$ $2.3 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$	
	> 120 mA to 1 A	10 Hz to 20 Hz > 20 Hz to 45 Hz > 45 Hz to 5 kHz > 5 kHz to 10 kHz	$6.0 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$ $3.3 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$ $2.7 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$ $4.7 \cdot 10^{-3} \cdot I + 1 \mu\text{A}$	

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Capacitance	1.1 nF to < 3.3 nF	10 Hz to 3 kHz	$6 \cdot 10^{-3} \cdot C + 0.01 \text{ nF}$	C: Measured value
	3.3 nF to < 11 nF	10 Hz to 1 kHz	$2.8 \cdot 10^{-3} \cdot C + 0.01 \text{ nF}$	
	11 nF to < 33 nF	10 Hz to 1 kHz	$2.8 \cdot 10^{-3} \cdot C + 0.1 \text{ nF}$	
	33 nF to < 110 nF	10 Hz to 1 kHz	$2.8 \cdot 10^{-3} \cdot C + 0.1 \text{ nF}$	
	110 nF to < 330 nF	10 Hz to 1 kHz	$2.8 \cdot 10^{-3} \cdot C + 0.3 \text{ nF}$	
	0.33 μF to < 1.10 μF	10 Hz to 600 Hz	$2.8 \cdot 10^{-3} \cdot C + 1 \text{ nF}$	
	1.1 μF to < 11 μF	10 Hz to 300 Hz	$2.8 \cdot 10^{-3} \cdot C + 3 \text{ nF}$	
	11 μF to < 33 μF	10 Hz to 120 Hz	$4.5 \cdot 10^{-3} \cdot C + 30 \text{ nF}$	
	33 μF to < 110 μF	DC to 80 Hz	$5 \cdot 10^{-3} \cdot C + 100 \text{ nF}$	
	110 μF to < 330 μF	DC to 80 Hz	$5 \cdot 10^{-3} \cdot C + 300 \text{ nF}$	
0.33 mF to < 1.1 mF	DC to 50 Hz	$5 \cdot 10^{-3} \cdot C + 1 \text{ μF}$		
Frequency Oscillators Measuring instruments	0.1 MHz		$5 \cdot 10^{-12} \cdot f$	f: Measured value $U_{\text{TRIG}}$ : Trigger-uncertainty
	1 MHz			
	5 MHz			
	10 MHz			
	0.1 mHz to 110 GHz		$\sqrt{(1 \cdot 10^{-10} \cdot f)^2 + U_{\text{TRIG}}^2}$	
Time period	1 ns to 100 s		$\sqrt{(1 \text{ ns})^2 + (1 \cdot 10^{-10} \cdot t)^2 + U_{\text{TRIG}}^2}$	t: Measured value
HF-Power HF-Power Sensors  with mismatch correction	100 nW to 10 μW	> DC to 100 MHz	$5.8 \cdot 10^{-3} \cdot P$	P: Measured value PC Type-N <sup>2)</sup> to 18 GHz PC-3.5 <sup>2)</sup> to 33 GHz PC-2.92 <sup>2)</sup> to 40 GHz PC-2.4 <sup>2)</sup> to 50 GHz PC-1.85 <sup>2)</sup> to 67 GHz PC-1.00 <sup>2)</sup> to 110 GHz
		> 100 MHz to 2.4 GHz	$7.0 \cdot 10^{-3} \cdot P$	
		> 2.4 GHz to 4 GHz	$8.0 \cdot 10^{-3} \cdot P$	
		> 4 GHz to 8 GHz	$10 \cdot 10^{-3} \cdot P$	
		> 8 GHz to 12.4 GHz	$13 \cdot 10^{-3} \cdot P$	
	> 12.4 GHz to 18 GHz	$15 \cdot 10^{-3} \cdot P$		
	> 18 GHz to 26.5 GHz	$15 \cdot 10^{-3} \cdot P$		
	> 26.5 GHz to 40 GHz	$19 \cdot 10^{-3} \cdot P$		
	10 μW to 200 mW	> DC to 1 MHz	$3.0 \cdot 10^{-3} \cdot P$	
		> 1 MHz to 100 MHz	$3.4 \cdot 10^{-3} \cdot P$	
> 100 MHz to 2.4 GHz		$5.1 \cdot 10^{-3} \cdot P$		
2.4 GHz to 8 GHz		$6.8 \cdot 10^{-3} \cdot P$		
> 8 GHz to 12.4 GHz		$8.4 \cdot 10^{-3} \cdot P$		
> 12.4 GHz to 18 GHz	$11 \cdot 10^{-3} \cdot P$			
> 18 GHz to 26.5 GHz	$14 \cdot 10^{-3} \cdot P$			
> 26.5 GHz to 40 GHz	$17 \cdot 10^{-3} \cdot P$			
> 40 GHz to 50 GHz	$21 \cdot 10^{-3} \cdot P$			
> 50 GHz to 67 GHz	$33 \cdot 10^{-3} \cdot P$			
HF-Power Sources	1 mW	50 MHz	$4.0 \cdot 10^{-3} \cdot P$	
	10 μW to 200 mW	> DC to 100 MHz > 100 MHz to 1 GHz	$5.0 \cdot 10^{-3} \cdot P$ $6.0 \cdot 10^{-3} \cdot P$	

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
HF-Power Sources. Measuring instruments with mismatch correction	0.2 fW to < 10 pW	> DC to 8 GHz > 8 GHz to 20 GHz	$21 \cdot 10^{-3} \cdot P$ $24 \cdot 10^{-3} \cdot P$	P: Measured value
	1 fW to < 10 pW	> 20 GHz to 40 GHz	$29 \cdot 10^{-3} \cdot P$	
	10 fW to < 10 pW	> 40 GHz to 50 GHz > 50 GHz to 67 GHz	$43 \cdot 10^{-3} \cdot P$ $49 \cdot 10^{-3} \cdot P$	
	10 pW to < 100 nW	> DC to 100 MHz > 100 MHz to 8 GHz > 8 GHz to 20 GHz > 20 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz	$15 \cdot 10^{-3} \cdot P$ $17 \cdot 10^{-3} \cdot P$ $20 \cdot 10^{-3} \cdot P$ $26 \cdot 10^{-3} \cdot P$ $34 \cdot 10^{-3} \cdot P$ $43 \cdot 10^{-3} \cdot P$	
	100 pW to < 100 uW	> 67 GHz to 75 GHz > 75 GHz to 95 GHz > 95 GHz to 110 GHz	$45 \cdot 10^{-3} \cdot P$ $47 \cdot 10^{-3} \cdot P$ $49 \cdot 10^{-3} \cdot P$	
	100 nW to 200 mW  10 µW to 125 mW	> DC to 100 MHz > 100 MHz to 8 GHz > 8 GHz to 18 GHz > 18 GHz to 26.5 GHz > 26.5 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz > 67 GHz to 75 GHz > 75 GHz to 95 GHz > 95 GHz to 110 GHz	$10 \cdot 10^{-3} \cdot P$ $13 \cdot 10^{-3} \cdot P$ $16 \cdot 10^{-3} \cdot P$ $23 \cdot 10^{-3} \cdot P$ $23 \cdot 10^{-3} \cdot P$ $30 \cdot 10^{-3} \cdot P$ $35 \cdot 10^{-3} \cdot P$ $40 \cdot 10^{-3} \cdot P$ $42 \cdot 10^{-3} \cdot P$ $44 \cdot 10^{-3} \cdot P$	
		> 200 mW to 20 W	> DC to 100 MHz > 100 MHz to 4 GHz	
> 200 mW to 4 W		> 4 GHz to 8 GHz > 8 GHz to 12.5 GHz > 12.5 GHz to 18 GHz	$15 \cdot 10^{-3} \cdot P$ $19 \cdot 10^{-3} \cdot P$ $23 \cdot 10^{-3} \cdot P$	
> 200 mW to 2 W		> 18 GHz to 26.5 GHz	$25 \cdot 10^{-3} \cdot P$	
> 200 mW to 1 W		> 26.5 GHz to 40 GHz	$31 \cdot 10^{-3} \cdot P$	
without mismatch correction				
Display Linearity. Level distance, Attenuation	0 dB to 21 dB	> DC to 40 GHz	0.003 dB	A: Measured value
	> 21 dB to 111 dB	> DC to 40 GHz	$0.003 \text{ dB} + 0.0002 \cdot A$	
	> 111 dB to 121 dB	> DC to 40 GHz	0.03 dB	
	0 dB to 11 dB	> 40 GHz to 67 GHz	0.005 dB	
	> 11 dB to 111 dB	> 40 GHz to 67 GHz	$0.005 \text{ dB} + 0.0004 \cdot A$	
	0 dB to 60 dB	> 67 GHz to 110 GHz	$0.03 \text{ dB} + 0.001 \cdot A$	
	> 60 dB to 80 dB	> 67 GHz to 110 GHz	0.6 dB	
	> 80 dB to 90 dB	> 67 GHz to 110 GHz	1.8 dB	



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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
HF-Transmission Phase angle $\varphi$	- 180 ° to 180 °	> DC to 100 MHz > 100 MHz to 10 GHz > 10 GHz to 20 GHz > 20 GHz to 40 GHz > 40 GHz to 67 GHz > 67 GHz to 110 GHz	0.5 ° 0.7 ° 1.0 ° 1.8 ° 2.0 ° 3.0 °	Dependent on Attenuation value
HF-Impedance Reflection factor	0.0 to 0.4	> DC to 10 GHz	0.0034	PC Type-N <sup>2)</sup>   $\Gamma$   : Magnitude of complex reflection factor PC-3.5 <sup>2)</sup>
	> 0.4 to 1.0	> DC to 10 GHz	0.0015 + 0.005 ·   $\Gamma$	
	0.0 to 0.4	> 10 GHz to 18 GHz	0.0034	PC-2.92 <sup>2)</sup>
	> 0.4 to 1.0	> 10 GHz to 18 GHz	0.01 ·   $\Gamma$	
	0.0 to 0.4	> 18 GHz to 33 GHz	0.0065	PC-2.4 <sup>2)</sup> . PC-1.85 <sup>2)</sup>
	> 0.4 to 1.0	> 18 GHz to 33 GHz	0.001 + 0.013 ·   $\Gamma$	
	0.0 to 0.4	> 33 GHz to 40 GHz	0.011	
	> 0.4 to 1.0	> 33 GHz to 40 GHz	0.005 + 0.016 ·   $\Gamma$	
	0.0 to 1.0	> DC to 2 GHz > 2 GHz to 10 GHz > 10 GHz to 20 GHz > 20 GHz to 30 GHz > 30 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz	0.0035 + 0.0042 ·   $\Gamma$   <sup>2</sup> 0.0037 + 0.0050 ·   $\Gamma$   <sup>2</sup> 0.0042 + 0.0069 ·   $\Gamma$   <sup>2</sup> 0.0055 + 0.0101 ·   $\Gamma$   <sup>2</sup> 0.0067 + 0.0120 ·   $\Gamma$   <sup>2</sup> 0.0085 + 0.0151 ·   $\Gamma$   <sup>2</sup> 0.0113 + 0.0183 ·   $\Gamma$   <sup>2</sup>	
	0.0 to 1.0	> DC to 2 GHz > 2 GHz to 10 GHz > 10 GHz to 20 GHz > 20 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz > 67 GHz to 90 GHz > 90 GHz to 110 GHz > 110 GHz to 114 GHz	0.0036 + 0.0049 ·   $\Gamma$   <sup>2</sup> 0.0036 + 0.0052 ·   $\Gamma$   <sup>2</sup> 0.0041 + 0.0068 ·   $\Gamma$   <sup>2</sup> 0.0049 + 0.0095 ·   $\Gamma$   <sup>2</sup> 0.0056 + 0.0117 ·   $\Gamma$   <sup>2</sup> 0.0063 + 0.0131 ·   $\Gamma$   <sup>2</sup> 0.0074 + 0.0173 ·   $\Gamma$   <sup>2</sup> 0.0093 + 0.0213 ·   $\Gamma$   <sup>2</sup> 0.0122 + 0.0280 ·   $\Gamma$   <sup>2</sup>	PC-1.00 <sup>2)</sup>
	0.0 to 1.0	50 GHz to 75 GHz 60 GHz to 90 GHz 90 GHz to 110 GHz	0.01 + 0.008 ·   $\Gamma$   0.01 + 0.008 ·   $\Gamma$   0.01 + 0.008 ·   $\Gamma$	Connector: R620 Connector: R740 Connector: R900
HF-Impedance Phase angle	- 180 ° to 180 °	> DC to 110 GHz	$U_s \cdot 180^\circ / \pi$	$U_s = \arcsin(U/ \Gamma )$ $U$ : Uncertainty of reflection factor
Modulation quantities Amplitude modulation Modulation degree $m$	0.0 to 1.0	> DC $f_m \leq 100$ kHz 100 kHz < $f_m \leq 1$ MHz 1 MHz < $f_m \leq 10$ MHz	0.001 · $m$ + $K$ 0.002 · $m$ + $K$ 0.007 · $m$ + $K$	$m$ : measured value $f_{HF}$ = Carrier frequency $f_m$ = Modulation freq. $f_{HF} > 5 \cdot f_m$ <sup>3)</sup>
Frequency modulation Frequency deviation $\Delta f$	10 Hz to 16 MHz	10 Hz < $f_m \leq 100$ kHz 100 kHz < $f_m \leq 200$ kHz 200 kHz < $f_m \leq 10$ MHz	$1 \cdot 10^{-3} \cdot \Delta f$ $2 \cdot 10^{-3} \cdot \Delta f$ $5 \cdot 10^{-3} \cdot \Delta f$	$\Delta f$ : measured value $f_{HF} > 5 \cdot f_m$ <sup>3)</sup>

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Phase modulation	(10 Hz/ to (16 MHz/	10 Hz < $f_m$ ≤ 100 kHz	$1 \cdot 10^{-3} \cdot \Delta\phi$	$\Delta\phi$ : measured value $f_{HF} > 5 \cdot f_m^{(3)}$
Phase deviation $\Delta\phi$	$f_m$ ) rad $f_m$ ) rad	100 kHz < $f_m$ ≤ 200 kHz 200 kHz < $f_m$ ≤ 10 MHz	$2 \cdot 10^{-3} \cdot \Delta\phi$ $5 \cdot 10^{-3} \cdot \Delta\phi$	
Waveform quantities	7 ps to 15 ps	Voltage range dependent on rise-time	4 ps	t: measured value
Rise time	>15 ps to 25 ps		3 ps	
	>25 ps to 100 ns		$40 \cdot 10^{-3} \cdot t + 2$ ps	
Pulse spectrum	0.1 $\mu$ Vs to 50 $\mu$ Vs	9 kHz to 150 kHz	$25 \cdot 10^{-3} \cdot /S$	/S: measured value
Cispr 16-1-1:2019	3 nVs to 1 $\mu$ Vs	150 kHz to 30 MHz	$25 \cdot 10^{-3} \cdot /S$	
	0.4 nVs to 200 nVs	30 MHz to 1 GHz	$27 \cdot 10^{-3} \cdot /S$	
Phase noise	> -77 dBc/Hz <sup>a)</sup>	1 Hz <sup>b)</sup>	1.5 dB	Carrier frequency: 100 MHz to 500 MHz
Oscillators,	-85 dBc/Hz to -77 dBc/Hz	1 Hz	2.5 dB	
Measuring instruments	> -92 dBc/Hz	3 Hz to 10 Hz	1.5 dB	a) Phase noise with regard to Carrier level in dBc/Hz
	-100 dBc/Hz to -92 dBc/Hz	3 Hz to 10 Hz	2.5 dB	
	> -106 dBc/Hz	10 Hz to 100 Hz	1.5 dB	
	-114 dBc/Hz to -106 dBc/Hz	10 Hz to 100 Hz	2.5 dB	
	> -136 dBc/Hz	100 Hz to 1 kHz	1.5 dB	
	-146 dBc/Hz to -136 dBc/Hz	100 Hz to 1 kHz	2.5 dB	
	> -160 dBc/Hz	1 kHz to 10 kHz	1.5 dB	
	-168 dBc/Hz to -160 dBc/Hz	1 kHz to 10 kHz	2.5 dB	
	> -167 dBc/Hz	10 kHz to 100 kHz	1.5 dB	
	-175 dBc/Hz to -167 dBc/Hz	10 kHz to 100 kHz	2.5 dB	
	> -174 dBc/Hz	100 kHz to 1 MHz	1.5 dB	b) Offset frequency to carrier frequency
	-182 dBc/Hz to -174 dBc/Hz	100 kHz to 1 MHz	2.5 dB	
	> -186 dBc/Hz	1 MHz to 10 MHz	1.5 dB	
	-192 dBc/Hz to -186 dBc/Hz	1 MHz to 10 MHz	2.5 dB	
	-64 dBc/Hz	1 Hz <sup>b)</sup>	1.5 dB	
	-73 dBc/Hz to -64 dBc/Hz	1 Hz	2.5 dB	
	> -82 dBc/Hz	3 Hz to 10 Hz	1.5 dB	
	-90 dBc/Hz to -82 dBc/Hz	3 Hz to 10 Hz	2.5 dB	
	> -95 dBc/Hz	10 Hz to 100 Hz	1.5 dB	
	-103 dBc/Hz to -95 dBc/Hz	10 Hz to 100 Hz	2.5 dB	
	> -123 dBc/Hz	100 Hz to 1 kHz	1.5 dB	
	-131 dBc/Hz to -123 dBc/Hz	100 Hz to 1 kHz	2.5 dB	
	> -153 dBc/Hz	1 kHz to 10 kHz	1.5 dB	
	-161 dBc/Hz to -153 dBc/Hz	1 kHz to 10 kHz	2.5 dB	
	> -170 dBc/Hz	10 kHz to 100 kHz	1.5 dB	
	-178 dBc/Hz to -170 dBc/Hz	10 kHz to 100 kHz	2.5 dB	
	> -172 dBc/Hz	100 kHz to 1 MHz	1.5 dB	Carrier frequency: 500 MHz to 1 GHz

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Phase noise Oscillators, Measuring instruments	-180 dBc/Hz to -172 dBc/Hz	100 kHz to 1 MHz	2.5 dB	Carrier frequency: 500 MHz to 1 GHz
	> -172 dBc/Hz	1 MHz to 10 MHz	1.5 dB	
	-180 dBc/Hz to -172 dBc/Hz	1 MHz to 10 MHz	2.5 dB	
	-55 dBc/Hz	1 Hz	1.5 dB	Carrier frequency: 1 GHz to 3 GHz
	-67 dBc/Hz to -55 dBc/Hz	1 Hz	2.5 dB	
	> -67 dBc/Hz	3 Hz to 10 Hz	1.5 dB	
	-79 dBc/Hz to -67 dBc/Hz	3 Hz to 10 Hz	2.5 dB	
	> -85 dBc/Hz	10 Hz to 100 Hz	1.5 dB	
	-93 dBc/Hz to -85 dBc/Hz	10 Hz to 100 Hz	2.5 dB	
	> -114 dBc/Hz	100 Hz to 1 kHz	1.5 dB	
	-122 dBc/Hz to -114 dBc/Hz	100 Hz to 1 kHz	2.5 dB	
	> -146 dBc/Hz	1 kHz to 10 kHz	1.5 dB	
	-155 dBc/Hz to -146 dBc/Hz	1 kHz to 10 kHz	2.5 dB	
	> -166 dBc/Hz	10 kHz to 100 kHz	1.5 dB	
	-174 dBc/Hz to -166 dBc/Hz	10 kHz to 100 kHz	2.5 dB	
	> -168 dBc/Hz	100 kHz to 1 MHz	1.5 dB	
	-176 dBc/Hz to -168 dBc/Hz	100 kHz to 1 MHz	2.5 dB	
	> -168 dBc/Hz	1 MHz to 10 MHz	1.5 dB	
	-76 dBc/Hz to -168 dBc/Hz	1 MHz to 10 MHz	2.5 dB	Carrier frequency: 3 GHz to 6 GHz
	> -49 dBc/Hz	1 Hz	1.5 dB	
-57 dBc/Hz to -49 dBc/Hz	1 Hz	2.5 dB		
> -62 dBc/Hz	3 Hz to 10 Hz	1.5 dB		
-70 dBc/Hz to -62 dBc/Hz	3 Hz to 10 Hz	2.5 dB		
> -76 dBc/Hz	10 Hz to 100 Hz	1.5 dB		
-84 dBc/Hz to -76 dBc/Hz	10 Hz to 100 Hz	2.5 dB		
> -105 dBc/Hz	100 Hz to 1 kHz	1.5 dB		
-113 dBc/Hz to -105 dBc/Hz	100 Hz to 1 kHz	2.5 dB		
> -138 dBc/Hz	1 kHz to 10 kHz	1.5 dB		
-146 dBc/Hz to -138 dBc/Hz	1 kHz to 10 kHz	2.5 dB		
> -156 dBc/Hz	10 kHz to 100 kHz	1.5 dB		
-164 dBc/Hz to -156 dBc/Hz	10 kHz to 100 kHz	2.5 dB		
> -158 dBc/Hz	100 kHz to 1 MHz	1.5 dB		
-166 dBc/Hz to -158 dBc/Hz	100 kHz to 1 MHz	2.5 dB		
> -158 dBc/Hz	1 MHz to 10 MHz	1.5 dB		
-166 dBc/Hz to -158 dBc/Hz	1 MHz to 10 MHz	2.5 dB		

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
	> -54 dBc/Hz	1 Hz	1.5 dB	Carrier frequency: 6 GHz to 8 GHz
	-62 dBc/Hz to -54 dBc/Hz	1 Hz	2.5 dB	
	> -68 dBc/Hz	3 Hz to 10 Hz	1.5 dB	
	-76 dBc/Hz to -68 dBc/Hz	3 Hz to 10 Hz	2.5 dB	
	> -95 dBc/Hz	10 Hz to 100 Hz	1.5 dB	
	-103 dBc/Hz to -95 dBc/Hz	10 Hz to 100 Hz	2.5 dB	
	> -122 dBc/Hz	100 Hz to 1 kHz	1.5 dB	
	-130 dBc/Hz to -122 dBc/Hz	100 Hz to 1 kHz	2.5 dB	
	> -138 dBc/Hz	1 kHz to 10 kHz	1.5 dB	
	-146 dBc/Hz to -138 dBc/Hz	1 kHz to 10 kHz	2.5 dB	
	> -142 dBc/Hz	10 kHz to 100 kHz	1.5 dB	
	-146 dBc/Hz to -142 dBc/Hz	10 kHz to 100 kHz	2.5 dB	
	> -142 dBc/Hz	100 kHz to 1 MHz	1.5 dB	
	-150 dBc/Hz to -142 dBc/Hz	100 kHz to 1 MHz	2.5 dB	
	> -142 dBc/Hz	1 MHz to 10 MHz	1.5 dB	
	-150 dBc/Hz to -142 dBc/Hz	1 MHz to 10 MHz	2.5 dB	

<sup>2)</sup> By the use of different connection systems the measurement uncertainty increases.

<sup>3)</sup> K: Uncertainty includes typical disturbances on carrier frequencies up to 3GHz. On carrier frequencies above 3GHz, disturbances, e.g. spurious deviation, has to be determined and considered in dependence of the measurement object.

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
DC voltage Sources, Measuring instruments	1 V; 1.018 V 10 V		$2 \cdot 10^{-6} \cdot U$ $1 \cdot 10^{-6} \cdot U$	U: Measured value
	0 V to 1 kV > 1 kV to 10 kV > 10 kV to 20 kV > 20 kV to 30 kV		$3 \cdot 10^{-6} \cdot U + 0.2 \mu\text{V}$ $0.1 \cdot 10^{-3} \cdot U$ $6 \cdot 10^{-3} \cdot U$ $22 \cdot 10^{-3} \cdot U$	
DC current Measuring instruments	1 $\mu\text{A}$ to 10 A > 10 A to 200 A		$10 \cdot 10^{-6} \cdot I$ $0.2 \cdot 10^{-3} \cdot I$	I: Measured value
Direct resistance Resistance, measuring instruments	1 $\Omega$ 10 k $\Omega$ 0.1 m $\Omega$ to < 1 m $\Omega$ 1 m $\Omega$ to < 1 $\Omega$ 1 $\Omega$ to 100 k $\Omega$ > 100 k $\Omega$ to 1 M $\Omega$ > 1 M $\Omega$ to 10 M $\Omega$ > 10 M $\Omega$ to 100 M $\Omega$ > 100 M $\Omega$ to 1 G $\Omega$ > 1 G $\Omega$ to 10 G $\Omega$		$2 \cdot 10^{-6} \cdot R$ $2 \cdot 10^{-6} \cdot R$ $50 \cdot 10^{-6} \cdot R$ $10 \cdot 10^{-6} \cdot R$ $3 \cdot 10^{-6} \cdot R$ $5 \cdot 10^{-6} \cdot R$ $30 \cdot 10^{-6} \cdot R$ $0.1 \cdot 10^{-3} \cdot R$ $0.2 \cdot 10^{-3} \cdot R$ $2 \cdot 10^{-3} \cdot R$	R: Measured value
Measuring instruments	0 $\Omega$ to 20 $\Omega$ > 20 $\Omega$ to 100 k $\Omega$ > 100 k $\Omega$ to 1 M $\Omega$ > 1 M $\Omega$ to 10 M $\Omega$ > 10 M $\Omega$ to 100 M $\Omega$ > 100 M $\Omega$ to 1 G $\Omega$ > 1 G $\Omega$ to 10 G $\Omega$		$3 \cdot 10^{-6} \cdot R + 20 \mu\Omega$ $3 \cdot 10^{-6} \cdot R$ $5 \cdot 10^{-6} \cdot R$ $30 \cdot 10^{-6} \cdot R$ $0.1 \cdot 10^{-3} \cdot R$ $0.5 \cdot 10^{-3} \cdot R$ $5 \cdot 10^{-3} \cdot R$	
AC voltage and AC/DC Transfer Sources, Measuring instruments	1 mV to < 220 V	10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	$0.2 \cdot 10^{-6} \cdot U + 0.5 \mu\text{V}$ $75 \cdot 10^{-6} \cdot U + 0.5 \mu\text{V}$ $35 \cdot 10^{-6} \cdot U + 0.5 \mu\text{V}$ $70 \cdot 10^{-6} \cdot U + 0.5 \mu\text{V}$ $0.1 \cdot 10^{-3} \cdot U + 1 \mu\text{V}$	U: Measured value
	1 mV to 70 V 1 mV to 22 V	> 100 kHz to 300 kHz > 300 kHz to 1 MHz	$0.2 \cdot 10^{-3} \cdot U + 1.5 \mu\text{V}$ $1.1 \cdot 10^{-3} \cdot U + 4 \mu\text{V}$	
	220 V to 1000 V	10 Hz to < 20 Hz 20 Hz to < 40 Hz 40 Hz to 20 kHz > 20 kHz to 50 kHz > 50 kHz to 100 kHz	$0.2 \cdot 10^{-3} \cdot U$ $0.1 \cdot 10^{-3} \cdot U$ $41 \cdot 10^{-6} \cdot U$ $0.14 \cdot 10^{-3} \cdot U$ $0.5 \cdot 10^{-3} \cdot U$	
	> 1 kV to 7 kV	45 Hz to 60 Hz	$2 \cdot 10^{-3} \cdot U$	
	1 mV to 7 V	1 MHz to 2 MHz > 2 MHz to 10 MHz > 10 MHz to 20 MHz > 20 MHz to 30 MHz	$0.6 \cdot 10^{-3} \cdot U + 2 \mu\text{V}$ $1.0 \cdot 10^{-3} \cdot U + 2.5 \mu\text{V}$ $1.5 \cdot 10^{-3} \cdot U + 4 \mu\text{V}$ $3.5 \cdot 10^{-3} \cdot U + 8 \mu\text{V}$	Voltage at 50 $\Omega$
	0.1 V to 2 V	> 50 MHz to 100 MHz > 100 MHz to 200 MHz > 200 MHz to 300 MHz > 300 MHz to 500 MHz > 500 MHz to 1 GHz	$4 \cdot 10^{-3} \cdot U$ $5 \cdot 10^{-3} \cdot U$ $7 \cdot 10^{-3} \cdot U$ $10 \cdot 10^{-3} \cdot U$ $15 \cdot 10^{-3} \cdot U$	

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
AC current and AC/DC-Transfer	1 mA to 10 A	10 Hz to < 10 kHz	$0.1 \cdot 10^{-3} \cdot I$	<i>I</i> : Measured value
AC current Sources Measuring instruments	> 10 A to 200 A	20 Hz to 45 Hz > 45 Hz to 5 kHz > 5 kHz to 20 kHz	$3 \cdot 10^{-3} \cdot I$ $2 \cdot 10^{-3} \cdot I$ $5 \cdot 10^{-3} \cdot I$	
Capacitance	1 nF	1 kHz	$30 \cdot 10^{-6} \cdot C$	C: Measured value substitution method direct measurement with brige
	0.1 pF to < 1 pF	50 Hz to < 100 Hz 100 Hz to < 200 Hz 200 Hz to < 1 kHz 1 kHz to 10 kHz	$0.1 \cdot C$ $10 \cdot 10^{-3} \cdot C$ $1 \cdot 10^{-3} \cdot C$ $0.4 \cdot 10^{-3} \cdot C$	
	1 pF to < 10 pF	50 Hz to < 100 Hz 100 Hz to < 1 kHz 1 kHz to 10 kHz	$10 \cdot 10^{-3} \cdot C$ $1 \cdot 10^{-3} \cdot C$ $0.15 \cdot 10^{-3} \cdot C$	
	10 pF to 100 pF	50 Hz to < 1 kHz 1 kHz to 10 kHz	$0.5 \cdot 10^{-3} \cdot C$ $0.1 \cdot 10^{-3} \cdot C$	
	100 pF to < 50 nF	50 Hz to 10 kHz	$0.1 \cdot 10^{-3} \cdot C$	
	50 nF to 200 nF	50 Hz to < 1 kHz 1 kHz to 10 kHz	$0.1 \cdot 10^{-3} \cdot C$ $0.4 \cdot 10^{-3} \cdot C$	
	200 nF to < 1 µF	50 Hz to 1 kHz > 1 kHz to 5 kHz > 5 kHz to 10 kHz	$0.1 \cdot 10^{-3} \cdot C$ $0.5 \cdot 10^{-3} \cdot C$ $2 \cdot 10^{-3} \cdot C$	
	1 µF to 5 µF	50 Hz to 1 kHz > 1 kHz to 2 kHz > 2 kHz to 5 kHz > 5 kHz to 10 kHz	$0.1 \cdot 10^{-3} \cdot C$ $0.4 \cdot 10^{-3} \cdot C$ $3 \cdot 10^{-3} \cdot C$ $10 \cdot 10^{-3} \cdot C$	
	5 µF to 10 µF	50 Hz to 1 kHz > 1 kHz to 2 kHz > 2 kHz to 5 kHz > 5 kHz to 10 kHz	$0.2 \cdot 10^{-3} \cdot C$ $0.8 \cdot 10^{-3} \cdot C$ $5 \cdot 10^{-3} \cdot C$ $20 \cdot 10^{-3} \cdot C$	
	10 µF to 100 µF	50 Hz to 1 kHz	$3 \cdot 10^{-3} \cdot C$	
Frequency Oscillators Measuring instruments	0.1 MHz 1 MHz 5 MHz 10 MHz		$5 \cdot 10^{-12} \cdot f$	<i>f</i> : Measured value <i>U</i> <sub>TRIG</sub> : Trigger- uncertainty
	0.1 mHz to 110 GHz		$\sqrt{(1 \cdot 10^{-10} \cdot f)^2 + U_{TRIG}^2}$	
Time interval	1 ns to 10 000 s		$\sqrt{(1 \text{ ns})^2 + (1 \cdot 10^{-10} \cdot t)^2 + U_{TRIG}^2}$	<i>t</i> : Measured value

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Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
HF-Power HF-Power Sensors with mismatch correction	100 nW to 10 µW	> DC to 100 MHz > 100 MHz to 2.4 GHz > 2.4 GHz to 4 GHz > 4 GHz to 8 GHz > 8 GHz to 12.4 GHz > 12.4 GHz to 18 GHz > 18 GHz to 26.5 GHz > 26.5 GHz to 40 GHz	$5.8 \cdot 10^{-3} \cdot P$ $7.0 \cdot 10^{-3} \cdot P$ $8.0 \cdot 10^{-3} \cdot P$ $10 \cdot 10^{-3} \cdot P$ $13 \cdot 10^{-3} \cdot P$ $15 \cdot 10^{-3} \cdot P$ $15 \cdot 10^{-3} \cdot P$ $19 \cdot 10^{-3} \cdot P$	P: Measured value PC Type-N <sup>2)</sup> to 18 GHz PC-3.5 <sup>2)</sup> to 33 GHz PC-2.92 <sup>2)</sup> to 40 GHz PC-2.4 <sup>2)</sup> to 50 GHz PC-1.85 <sup>2)</sup> to 67 GHz PC-1.00 <sup>2)</sup> to 110 GHz
	10 µW to 200 mW	> DC to 1 MHz > 1 MHz to 100 MHz > 100 MHz to 2.4 GHz > 2.4 GHz to 8 GHz > 8 GHz to 12.4 GHz > 12.4 GHz to 18 GHz > 18 GHz to 26.5 GHz > 26.5 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz	$3.0 \cdot 10^{-3} \cdot P$ $3.4 \cdot 10^{-3} \cdot P$ $5.1 \cdot 10^{-3} \cdot P$ $6.8 \cdot 10^{-3} \cdot P$ $8.4 \cdot 10^{-3} \cdot P$ $11 \cdot 10^{-3} \cdot P$ $14 \cdot 10^{-3} \cdot P$ $17 \cdot 10^{-3} \cdot P$ $21 \cdot 10^{-3} \cdot P$ $33 \cdot 10^{-3} \cdot P$	
Sources	1 mW	50 MHz	$4.0 \cdot 10^{-3} \cdot P$	
	10 µW to 200 mW	> DC to 100 MHz > 100 MHz to 1 GHz	$5.0 \cdot 10^{-3} \cdot P$ $6.0 \cdot 10^{-3} \cdot P$	
Sources. Measuring instruments with mismatch correction	0.2 fW to < 10 pW	> DC to 8 GHz > 8 GHz to 20 GHz	$21 \cdot 10^{-3} \cdot P$ $24 \cdot 10^{-3} \cdot P$	
	1 fW to < 10 pW	> 20 GHz to 40 GHz	$29 \cdot 10^{-3} \cdot P$	
	10 fW to < 10 pW	> 40 GHz to 50 GHz > 50 GHz to 67 GHz	$43 \cdot 10^{-3} \cdot P$ $49 \cdot 10^{-3} \cdot P$	
	10 pW to < 100 nW	> DC to 100 MHz > 100 MHz to 8 GHz > 8 GHz to 20 GHz > 20 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz	$15 \cdot 10^{-3} \cdot P$ $17 \cdot 10^{-3} \cdot P$ $20 \cdot 10^{-3} \cdot P$ $26 \cdot 10^{-3} \cdot P$ $34 \cdot 10^{-3} \cdot P$ $43 \cdot 10^{-3} \cdot P$	
	100 pW to < 100 uW	> 67 GHz to 75 GHz > 75 GHz to 95 GHz > 95 GHz to 110 GHz	$45 \cdot 10^{-3} \cdot P$ $47 \cdot 10^{-3} \cdot P$ $49 \cdot 10^{-3} \cdot P$	

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HF-Power Sources. Measuring instruments with mismatch correction	100 nW to 200 mW	> DC to 100 MHz > 100 MHz to 8 GHz > 8 GHz to 18 GHz > 18 GHz to 26.5 GHz > 26.5 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz	$10 \cdot 10^{-3} \cdot P$ $13 \cdot 10^{-3} \cdot P$ $16 \cdot 10^{-3} \cdot P$ $23 \cdot 10^{-3} \cdot P$ $23 \cdot 10^{-3} \cdot P$ $30 \cdot 10^{-3} \cdot P$ $35 \cdot 10^{-3} \cdot P$	P: Measured value
	10 µW to 125 mW	> 67 GHz to 75 GHz > 75 GHz to 95 GHz > 95 GHz to 110 GHz	$40 \cdot 10^{-3} \cdot P$ $42 \cdot 10^{-3} \cdot P$ $44 \cdot 10^{-3} \cdot P$	
	> 200 mW to 20 W	> DC to 100 MHz > 100 MHz to 4 GHz	$11 \cdot 10^{-3} \cdot P$ $14 \cdot 10^{-3} \cdot P$	
	> 200 mW to 4 W	> 4 GHz to 8 GHz > 8 GHz to 12.5 GHz > 12.5 GHz to 18 GHz	$15 \cdot 10^{-3} \cdot P$ $19 \cdot 10^{-3} \cdot P$ $23 \cdot 10^{-3} \cdot P$	
	> 200 mW to 2 W	> 20 GHz to 26.5 GHz	$25 \cdot 10^{-3} \cdot P$	
	> 200 mW to 1 W	> 26.5 GHz to 40 GHz	$31 \cdot 10^{-3} \cdot P$	
	without mismatch correction	> 20 W to 2 kW	> DC to 1 GHz	
> 20 W to 500 W		> 1 GHz to 4 GHz	$30 \cdot 10^{-3} \cdot P$	
> 4 W to 500 W		> 4 GHz to 10 GHz	$30 \cdot 10^{-3} \cdot P$	
> 4 W to 100 W		> 10 GHz to 18 GHz	$40 \cdot 10^{-3} \cdot P$	
> 2 kW to 10 kW		> DC to 1 GHz	$41 \cdot 10^{-3} \cdot P$	
Display Linearity Level distance, Attenuation	0 dB to 21 dB	> DC to 40 GHz	0.003 dB	A: Measured value
	> 21 dB to 111 dB	> DC to 40 GHz	$0.003 \text{ dB} + 0.0002 \cdot A$	
	> 111 dB to 121 dB	> DC to 40 GHz	0.03 dB	
	0 dB to 11 dB	> 40 GHz to 67 GHz	0.005 dB	
	> 11 dB to 111 dB	> 40 GHz to 67 GHz	$0.005 \text{ dB} + 0.0004 \cdot A$	
	0 dB to 60 dB	> 67 GHz to 110 GHz	$0.03 \text{ dB} + 0.001 \cdot A$	
	> 60 dB to 80 dB	> 67 GHz to 110 GHz	0.6 dB	
HF-Transmission Phase angle $\varphi$	- 180° to 180°	> DC to 100 MHz	0.5°	Dependent on Attenuation value
		> 100 MHz to 10 GHz	0.7°	
		> 10 GHz to 20 GHz	1.0°	
		> 20 GHz to 40 GHz	1.8°	
		> 40 GHz to 67 GHz	2.0°	
		> 67 GHz to 110 GHz	3.0°	



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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
HF-Impedance Reflection factor	0.0 to 0.4	> DC to 10 GHz	0.0034	PC Type-N <sup>2)</sup>  Γ : Magnitude of complex reflection factor
	> 0.4 to 1.0	> DC to 10 GHz	0.0015 + 0.005 ·  Γ	
	0.0 to 0.4	> 10 GHz to 18 GHz	0.0034	PC-3.5 <sup>2)</sup>
	> 0.4 to 1.0	> 10 GHz to 18 GHz	0.01 ·  Γ	
	0.0 to 0.4	> 18 GHz to 33 GHz	0.0065	PC-2.92 <sup>3)</sup>
	> 0.4 to 1.0	> 18 GHz to 33 GHz	0.001 + 0.013 ·  Γ	
	0.0 to 0.4	> 33 GHz to 40 GHz	0.011	PC-2.4 <sup>2)</sup> , PC-1.85 <sup>2)</sup>
> 0.4 to 1.0	> 33 GHz to 40 GHz	0.005 + 0.016 ·  Γ  <sup>2</sup>		
0.0 to 1.0	> DC to 2 GHz	0.0035 + 0.0042 ·  Γ  <sup>2</sup>		
	> 2 GHz to 10 GHz	0.0037 + 0.0050 ·  Γ  <sup>2</sup>		
	> 10 GHz to 20 GHz	0.0042 + 0.0069 ·  Γ  <sup>2</sup>		
	> 20 GHz to 30 GHz	0.0055 + 0.0101 ·  Γ  <sup>2</sup>		
	> 30 GHz to 40 GHz	0.0067 + 0.0120 ·  Γ  <sup>2</sup>		
	> 40 GHz to 50 GHz	0.0085 + 0.0151 ·  Γ  <sup>2</sup>		
0.0 to 1.0	> 50 GHz to 67 GHz	0.0113 + 0.0183 ·  Γ  <sup>2</sup>		
0.0 to 1.0	> DC to 2 GHz	0.0036 + 0.0049 ·  Γ  <sup>2</sup>	PC-1.00 <sup>2)</sup>	
	> 2 GHz to 10 GHz	0.0036 + 0.0052 ·  Γ  <sup>2</sup>		
	> 10 GHz to 20 GHz	0.0041 + 0.0068 ·  Γ  <sup>2</sup>		
	> 20 GHz to 30 GHz	0.0049 + 0.0095 ·  Γ  <sup>2</sup>		
	> 30 GHz to 40 GHz	0.0056 + 0.0117 ·  Γ  <sup>2</sup>		
	> 40 GHz to 50 GHz	0.0063 + 0.0131 ·  Γ  <sup>2</sup>		
	> 50 GHz to 67 GHz	0.0074 + 0.0173 ·  Γ  <sup>2</sup>		
	> 67 GHz to 90 GHz	0.0093 + 0.0213 ·  Γ  <sup>2</sup>		
	> 90 GHz to 110 GHz	0.0122 + 0.0280 ·  Γ  <sup>2</sup>		
	> 110 GHz to 114 GHz	0.0142 + 0.0331 ·  Γ  <sup>2</sup>		
0.0 to 1.0	50 GHz to 75 GHz	0.01 + 0.008 ·  Γ	Connector: R620 Connector: R740 Connector: R900	
	60 GHz to 90 GHz	0.01 + 0.008 ·  Γ		
	75 GHz to 110 GHz	0.01 + 0.008 ·  Γ		
HF-Impedance Phase angle φ	- 180 ° to 180 °	> DC to 110 GHz	$U_s \cdot 180^\circ / \pi$	$U_s = \arcsin(U/ \Gamma )$ U: Uncertainty of reflection factor
Modulation quantities Amplitude modulation Modulation degree m	0.01 to 1.0	> DC $f_m \leq 100$ kHz 100 kHz < $f_m \leq 1$ MHz 1 MHz < $f_m \leq 10$ MHz	0.001 · m + K 0.002 · m + K 0.007 · m + K	m: Measured value $f_{HF}$ = Carrier frequency $f_m$ = Modulation freq. $f_{HF} > 5 \cdot f_m^{(3)}$
Frequency modulation Frequency deviation Δf	10 Hz to 16 MHz	10 Hz < $f_m \leq 100$ kHz 100 kHz < $f_m \leq 200$ kHz 200 kHz < $f_m \leq 10$ MHz	$1 \cdot 10^{-3} \cdot \Delta f + K$ $2 \cdot 10^{-3} \cdot \Delta f + K$ $5 \cdot 10^{-3} \cdot \Delta f + K$	Δf: Measured value $f_{HF} > 5 \cdot (f_m + \Delta f)^{(3)}$
Phase modulation Phase deviation Δφ	(10 Hz/ $f_m$ ) rad to (16 MHz/ $f_m$ ) rad	10 Hz < $f_m \leq 100$ kHz 100 kHz < $f_m \leq 200$ kHz 200 kHz < $f_m \leq 10$ MHz	$1 \cdot 10^{-3} \cdot \Delta \phi + K$ $2 \cdot 10^{-3} \cdot \Delta \phi + K$ $5 \cdot 10^{-3} \cdot \Delta \phi + K$	Δφ: Measured value $f_{HF} > 5 \cdot (f_m + \Delta \phi)^{(3)}$

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Rise time	200 ps to 1 s	1 mV to 100 V in 50 Ω	$20 \cdot 10^{-3} \cdot t + (50 \text{ ps})^2/t$	<i>t</i> : Measured value
	2 ns to 1 s	100 V to 5 kV in 50 Ω	$20 \cdot 10^{-3} \cdot t + (0.3 \text{ ns})^2/t$	e.g. Burst according to EN 61000-4-4 :2013
	3 ns to 1 s	100 V to 8 kV in 1 kΩ	$20 \cdot 10^{-3} \cdot t + (0.5 \text{ ns})^2/t$	e.g. Surge according to EN 61000-4-5:2019
	10 ns to 1 s	100 V to 15 kV with HV-Probe	$20 \cdot 10^{-3} \cdot t + (2.2 \text{ ns})^2/t$	
	20 ns to 10 μs	1 mA to 5 kA with current transformer	$20 \cdot 10^{-3} \cdot t + (5 \text{ ns})^2/t$	
	0.7 ns to 500 ns	1 A to 150 A with ESD-Target	$30 \cdot 10^{-3} \cdot t$	ESD according to EN 61000-4-2:2009
Pulse duration	0.5 ns to 10 s		$2 \cdot 10^{-3} \cdot t + 10 \text{ ps} + \delta t_{\text{TRIG}}$	$\delta t_{\text{TRIG}}$ : Triggeruncertainty
Repetition time	1 ns to 10 s			
Burst duration	5 ns to 10 s			
Burst period	5 ns to 10 s			
Pulse voltage	10 mV to 500 V	200 ps ≤ Δ <i>t</i> ≤ 1 s at 50 Ω	$20 \cdot 10^{-3} \cdot U, \Delta t \geq 20 \text{ ns}$	<i>U</i> : Measured value Δ <i>t</i> : Pulse duration
	10 V to 5 kV 10 V to 8 kV	2,5 ns ≤ Δ <i>t</i> ≤ 1 s at 50 Ω 2,5 ns ≤ Δ <i>t</i> ≤ 1 s at 1 kΩ	$30 \cdot 10^{-3} \cdot U, \Delta t < 20 \text{ ns}$	e.g. Burst according to EN 61000-4-4:2013
	10 V to 15 kV	10 ns ≤ Δ <i>t</i> ≤ 1 s, high resistance		e.g. Surge according to EN 61000-4-5:2019
Pulse current	1 A to 5 kA	20 ns ≤ Δ <i>t</i> ≤ 10 ms	$20 \cdot 10^{-3} \cdot I$	<i>I</i> : Measured value
ESD-current pulse	1 A to 150 A	Current peak	$40 \cdot 10^{-3} \cdot I$	<i>I</i> : Measured value
	0.2 A to 150 A	Current grid values after 30 ns and 60 ns	$25 \cdot 10^{-3} \cdot I$	Calibration with Target according to EN 61000-4-2:2009
Pulse spectrum	0.1 μVs to 50 μVs	9 kHz to 150 kHz	$25 \cdot 10^{-3} \cdot IS$	<i>IS</i> : Measured value CISPR 16-1-1:2019
	3 nVs to 1 μVs	150 kHz to 30 MHz	$25 \cdot 10^{-3} \cdot IS$	
	0.4 nVs to 200 nVs	30 MHz to 1 GHz	$27 \cdot 10^{-3} \cdot IS$	

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Direct voltage Sources, Measuring instruments	0 V to 500 V		$10 \cdot 10^{-6} \cdot U + 1 \mu\text{V}$	U: Measured value
	500 V to 1000 V		$16 \cdot 10^{-6} \cdot U$	
	> 1 kV to 10 kV		$2 \cdot 10^{-3} \cdot U$	
	> 10 kV to 20 kV		$6 \cdot 10^{-3} \cdot U$	
	> 20 kV to 30 kV		$22 \cdot 10^{-3} \cdot U$	
Direct current, sources Measuring instruments	1 $\mu\text{A}$ to 1 A		$0.1 \cdot 10^{-3} \cdot I + 1 \text{ nA}$	I: Measured value
	> 1 A to 200 A		$0.2 \cdot 10^{-3} \cdot I$	
Direct resistance Resistance, measuring instruments	0 $\Omega$ to 100 k $\Omega$		$15 \cdot 10^{-6} \cdot R + 60 \mu\Omega$	R: Measured value
	> 100 k $\Omega$ to 1 M $\Omega$		$20 \cdot 10^{-6} \cdot R + 2 \Omega$	
	> 1 M $\Omega$ to 10 M $\Omega$		$60 \cdot 10^{-6} \cdot R + 0.1 \text{ k}\Omega$	
	> 10 M $\Omega$ to 100 M $\Omega$		$0.6 \cdot 10^{-3} \cdot R$	
	> 100 M $\Omega$ to 1 G $\Omega$		$5.1 \cdot 10^{-3} \cdot R$	
AC voltage Measuring instruments	1 mV to 220 V	10 Hz to < 20 Hz	$0.4 \cdot 10^{-3} \cdot U + 4 \mu\text{V}$	U: Measured value
		20 Hz to 20 kHz	$0.2 \cdot 10^{-3} \cdot U + 4 \mu\text{V}$	
		> 20 kHz to 100 kHz	$0.5 \cdot 10^{-3} \cdot U + 10 \mu\text{V}$	
	> 200 to 1000 V	50 Hz to 1 kHz	$0.2 \cdot 10^{-3} \cdot U$	Voltage at 50 $\Omega$
	1 mV to 10 V	100 kHz to 1 MHz	$2 \cdot 10^{-3} \cdot U + 5 \mu\text{V}$	
		> 1 MHz to 10 MHz	$2.5 \cdot 10^{-3} \cdot U + 6 \mu\text{V}$	
Voltage sources	1 mV to 100 V	10 Hz to 20 kHz	$0.5 \cdot 10^{-3} \cdot U + 3 \mu\text{V}$	U: Measured value
		> 20 kHz to 50 kHz	$0.7 \cdot 10^{-3} \cdot U + 3 \mu\text{V}$	
		> 50 kHz to 100 kHz	$1.5 \cdot 10^{-3} \cdot U + 5 \mu\text{V}$	
	> 100 V to 1000 V	100 kHz to 1 MHz	$11 \cdot 10^{-3} \cdot U + 10 \mu\text{V}$	
		10 Hz to 20 kHz	$0.8 \cdot 10^{-3} \cdot U$	
		> 20 kHz to 50 kHz	$1.5 \cdot 10^{-3} \cdot U$	
HF-Voltage	0.5 V to 3 V	> 50 kHz to 100 kHz	$3.2 \cdot 10^{-3} \cdot U$	U: Measured value
		45 Hz to 60 Hz	$2 \cdot 10^{-3} \cdot U$	
	0.5 V to 2 V	100 kHz to 30 MHz	$10 \cdot 10^{-3} \cdot U$	
		30 MHz to 100 MHz	$10 \cdot 10^{-3} \cdot U$	
AC current Measuring instruments	1 mA to 1 A	> 100 MHz to 500 MHz	$20 \cdot 10^{-3} \cdot U$	I: Measured value
		> 500 MHz to 1 GHz	$30 \cdot 10^{-3} \cdot U$	
		10 Hz to 20 Hz	$2 \cdot 10^{-3} \cdot I$	
		20 Hz to 1 kHz	$0.5 \cdot 10^{-3} \cdot I$	
	> 1 kHz to 5 kHz	$1 \cdot 10^{-3} \cdot I$		
	> 5 kHz to 10 kHz	$2 \cdot 10^{-3} \cdot I$		
Current sources	1 mA to 120 mA	10 Hz to 20 Hz	$3 \cdot 10^{-3} \cdot I$	
		> 20 Hz to 5 kHz	$2 \cdot 10^{-3} \cdot I$	
	> 5 kHz to 10 kHz	$5 \cdot 10^{-3} \cdot I$		
Capacitance	> 120 mA to 200 A	20 Hz to 45 Hz	$3.0 \cdot 10^{-3} \cdot I$	
		45 Hz to 20 kHz	$2.0 \cdot 10^{-3} \cdot I$	
	> 45 Hz to 5 kHz	$2 \cdot 10^{-3} \cdot I$		
AC current Measuring instruments	100 pF to <1 nF	1 kHz to 10 kHz	$1.5 \cdot 10^{-3} \cdot C$	C: Measured value
	1 nF to 1 $\mu\text{F}$	50 Hz to 10 kHz	$1.0 \cdot 10^{-3} \cdot C$	
	> 1 $\mu\text{F}$ to 10 $\mu\text{F}$	50 Hz to 1 kHz	$1.0 \cdot 10^{-3} \cdot C$	
	> 1 $\mu\text{F}$ to 10 $\mu\text{F}$	> 1 kHz to 10 kHz	$3 \cdot 10^{-3} \cdot C$	
	> 10 $\mu\text{F}$ to 100 $\mu\text{F}$	50 Hz to 1 kHz	$3 \cdot 10^{-3} \cdot C$	
HF-Power	100 nW to 10 $\mu\text{W}$	> DC to 100 MHz	$5.8 \cdot 10^{-3} \cdot P$	P: Measured value

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
HF-Power Sensors with mismatch correction		> 100 MHz to 2.4 GHz > 2.4 GHz to 4 GHz > 4 GHz to 8 GHz > 8 GHz to 12.4 GHz > 12.4 GHz to 18 GHz > 18 GHz to 26.5 GHz > 26.5 GHz to 40 GHz	$7.0 \cdot 10^{-3} \cdot P$ $8.0 \cdot 10^{-3} \cdot P$ $10 \cdot 10^{-3} \cdot P$ $13 \cdot 10^{-3} \cdot P$ $15 \cdot 10^{-3} \cdot P$ $15 \cdot 10^{-3} \cdot P$ $19 \cdot 10^{-3} \cdot P$	PC Type-N <sup>2)</sup> to 18 GHz PC-3.5 <sup>2)</sup> to 33 GHz PC-2.92 <sup>2)</sup> to 40 GHz PC-2.4 <sup>2)</sup> to 50 GHz PC-1.85 <sup>2)</sup> to 67 GHz PC-1.00 <sup>2)</sup> to 110 GHz
	10 µW to 200 mW	> DC to 1 MHz > 1 MHz to 100 MHz > 100 MHz to 2.4 GHz 2.4 GHz to 8 GHz > 8 GHz to 12.4 GHz > 12.4 GHz to 18 GHz > 18 GHz to 26.5 GHz > 26.5 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz	$3.0 \cdot 10^{-3} \cdot P$ $3.4 \cdot 10^{-3} \cdot P$ $5.1 \cdot 10^{-3} \cdot P$ $6.8 \cdot 10^{-3} \cdot P$ $8.4 \cdot 10^{-3} \cdot P$ $11 \cdot 10^{-3} \cdot P$ $14 \cdot 10^{-3} \cdot P$ $17 \cdot 10^{-3} \cdot P$ $21 \cdot 10^{-3} \cdot P$ $33 \cdot 10^{-3} \cdot P$	
HF-Power Sources. Measuring instruments with mismatch correction	10 µW to 200 mW	> DC to 100 MHz > 100 MHz to 1 GHz	$5.0 \cdot 10^{-3} \cdot P$ $6.0 \cdot 10^{-3} \cdot P$	
	0.2 fW to < 10 pW	> DC to 8 GHz > 8 GHz to 20 GHz	$21 \cdot 10^{-3} \cdot P$ $24 \cdot 10^{-3} \cdot P$	
	1 fW to < 10 pW	> 20 GHz to 40 GHz	$29 \cdot 10^{-3} \cdot P$	
	10 fW to < 10 pW	> 40 GHz to 50 GHz > 50 GHz to 67 GHz	$43 \cdot 10^{-3} \cdot P$ $49 \cdot 10^{-3} \cdot P$	
	10 pW to < 100 nW	> DC to 100 MHz > 100 MHz to 8 GHz > 8 GHz to 20 GHz > 20 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz	$15 \cdot 10^{-3} \cdot P$ $17 \cdot 10^{-3} \cdot P$ $20 \cdot 10^{-3} \cdot P$ $26 \cdot 10^{-3} \cdot P$ $34 \cdot 10^{-3} \cdot P$ $43 \cdot 10^{-3} \cdot P$	
	100 pW to < 100 µW	> 67 GHz to 75 GHz > 75 GHz to 90 GHz > 90 GHz to 110 GHz	$45 \cdot 10^{-3} \cdot P$ $47 \cdot 10^{-3} \cdot P$ $49 \cdot 10^{-3} \cdot P$	
	100 pW to 200 mW	> DC to 100 MHz > 100 MHz to 8 GHz > 8 GHz to 18 GHz > 18 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz	$10 \cdot 10^{-3} \cdot P$ $13 \cdot 10^{-3} \cdot P$ $16 \cdot 10^{-3} \cdot P$ $23 \cdot 10^{-3} \cdot P$ $21 \cdot 10^{-3} \cdot P$ $33 \cdot 10^{-3} \cdot P$	
	100 µW to 125 mW	> 67 GHz to 75 GHz > 75 GHz to 90 GHz > 90 GHz to 110 GHz	$40 \cdot 10^{-3} \cdot P$ $42 \cdot 10^{-3} \cdot P$ $44 \cdot 10^{-3} \cdot P$	
	> 200 mW to 20 W	> DC to 100 MHz > 100 MHz to 4 GHz	$11 \cdot 10^{-3} \cdot P$ $14 \cdot 10^{-3} \cdot P$	

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
HF-Power Sources. Measuring instruments with mismatch correction	> 200 mW to 4 W	> 4 GHz to 8 GHz > 8 GHz to 12.5 GHz > 12.5 GHz to 18 GHz	$15 \cdot 10^{-3} \cdot P$ $19 \cdot 10^{-3} \cdot P$ $23 \cdot 10^{-3} \cdot P$	P: Measured value
	> 200 mW to 2 W	> 18 GHz to 26.5 GHz	$25 \cdot 10^{-3} \cdot P$	
	> 200 mW to 1 W	> 26.5 GHz to 40 GHz	$31 \cdot 10^{-3} \cdot P$	
without mismatch correction	> 20 W to 2 kW	> DC to 1 GHz	$24 \cdot 10^{-3} \cdot P$	
	> 20 W to 500 W	> 1 GHz to 4 GHz	$30 \cdot 10^{-3} \cdot P$	
	> 4 W to 500 W	> 4 GHz to 10 GHz	$30 \cdot 10^{-3} \cdot P$	
	> 4 W to 100 W	> 10 GHz to 18 GHz	$40 \cdot 10^{-3} \cdot P$	
	> 2 kW to 10 kW	> DC to 250 MHz	$41 \cdot 10^{-3} \cdot P$	
Display Linearity Level distance, Attenuation	0 dB to 21 dB	> DC to 40 GHz	0.003 dB	A: Measured value
	> 21 dB to 111 dB	> DC to 40 GHz	$0.003 \text{ dB} + 0.0002 \cdot A$	
	> 111 dB to 121 dB	> DC to 40 GHz	0.03 dB	
	0 dB to 11 dB	> 40 GHz to 67 GHz	0.005 dB	
	> 11 dB to 111 dB	> 40 GHz to 67 GHz	$0.005 \text{ dB} + 0.0004 \cdot A$	
	0 dB to 60 dB	> 67 GHz to 110 GHz	$0.03 \text{ dB} + 0.001 \cdot A$	
	> 60 dB to 80 dB	> 67 GHz to 110 GHz	0.6 dB	
	> 80 dB to 90 dB	> 67 GHz to 110 GHz	1.8 dB	
HF-Transmission Phase angle $\varphi$	- 180 ° to 180 °	> DC to 100 MHz	0.5 °	Dependent on Attenuation value
		> 100 MHz to 10 GHz	0.7 °	
		> 10 GHz to 20 GHz	1.0 °	
		> 20 GHz to 40 GHz	1.8 °	
		> 40 GHz to 67 GHz	2.0 °	
		> 67 GHz to 110 GHz	3.0 °	
HF-Impedance Reflection factor	0.0 to 0.4	> DC to 10 GHz	0.0034	PC Type-N <sup>2)</sup>   $\Gamma$  : Magnitude of complex reflection factor
	> 0.4 to 1.0	> DC to 10 GHz	$0.0015 + 0.005 \cdot  \Gamma $	
	0.0 to 0.4	> 10 GHz to 18 GHz	0.0034	PC-3.5 <sup>2)</sup>
	> 0.4 to 1.0	> 10 GHz to 18 GHz	$0.01 \cdot  \Gamma $	
	0.0 to 0.4	> 18 GHz to 26.5 GHz	0.0065	PC-2.92 <sup>2)</sup>
	> 0.4 to 1.0	> 18 GHz to 26.5 GHz	$0.001 + 0.013 \cdot  \Gamma $	
	0.0 to 0.4	> 26.5 GHz to 40 GHz	0.011	PC-2.4 <sup>2)</sup> , PC-1.85 <sup>2)</sup>
	> 0.4 to 1.0	> 26.5 GHz to 40 GHz	$0.005 + 0.016 \cdot  \Gamma $	
	0.0 to 1.0	> DC to 2 GHz	$0.0035 + 0.0042 \cdot  \Gamma ^2$	
		> 2 GHz to 10 GHz	$0.0037 + 0.0050 \cdot  \Gamma ^2$	
	> 10 GHz to 20 GHz	$0.0042 + 0.0069 \cdot  \Gamma ^2$		
	> 20 GHz to 30 GHz	$0.0055 + 0.0101 \cdot  \Gamma ^2$		
	> 30 GHz to 40 GHz	$0.0067 + 0.0120 \cdot  \Gamma ^2$		
	> 40 GHz to 50 GHz	$0.0085 + 0.0151 \cdot  \Gamma ^2$		
	> 50 GHz to 67 GHz	$0.0113 + 0.0183 \cdot  \Gamma ^2$		

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**Calibration and Measurement Capabilities (CMC)**

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
HF-Impedance Reflection factor	0.0 to 1.0	> DC to 2 GHz > 2 GHz to 10 GHz > 10 GHz to 20 GHz > 20 GHz to 30 GHz > 30 GHz to 40 GHz > 40 GHz to 50 GHz > 50 GHz to 67 GHz > 67 GHz to 90 GHz > 90 GHz to 110 GHz > 110 GHz to 114 GHz	0.0036 + 0.0049 ·  Γ  <sup>2</sup> 0.0036 + 0.0052 ·  Γ  <sup>2</sup> 0.0041 + 0.0068 ·  Γ  <sup>2</sup> 0.0049 + 0.0095 ·  Γ  <sup>2</sup> 0.0056 + 0.0117 ·  Γ  <sup>2</sup> 0.0063 + 0.0131 ·  Γ  <sup>2</sup> 0.0074 + 0.0173 ·  Γ  <sup>2</sup> 0.0093 + 0.0213 ·  Γ  <sup>2</sup> 0.0122 + 0.0280 ·  Γ  <sup>2</sup> 0.0142 + 0.0331 ·  Γ  <sup>2</sup>	Connector <sup>2)</sup> : PC-1.00
	0.0 to 1.0	50 GHz to 75 GHz 60 GHz to 90 GHz 90 GHz to 110 GHz	0.01 + 0.008 ·  Γ  0.01 + 0.008 ·  Γ  0.01 + 0.008 ·  Γ	Connector: R620 Connector: R740 Connector: R900
HF-Impedance Phase angle φ	- 180 ° to 180 °	> DC to 110 GHz	$U_s \cdot 180^\circ / \pi$	$U_s = \arcsin(U/ \Gamma )$ U: Uncertainty of reflection factor
Frequency	0.1 MHz 1 MHz 5 MHz 10 MHz	Messzeit > 120 min	$1 \cdot 10^{-11} \cdot f$	f: Measured value U <sub>TRIG</sub> : Trigger-uncertainty
	0.1 mHz to 110 GHz	Messzeit > 5 min	$\sqrt{(1 \cdot 10^{-10} \cdot f)^2 + U_{TRIG}^2}$	
Time interval	1 ns to 10 000 s		$\sqrt{(1 \text{ ns})^2 + (1 \cdot 10^{-10} \cdot t)^2 + U_{TRIG}^2}$	
Modulation quantities Amplitude modulation Modulation degree m	0.01 to 1.0	> DC $f_m \leq 100 \text{ kHz}$ 100 kHz < $f_m \leq 1 \text{ MHz}$ 1 MHz < $f_m \leq 10 \text{ MHz}$	0.002 · m + K 0.005 · m + K 0.02 · m + K	m: Measured value $f_{HF}$ = Carrier frequency $f_m$ = Modulation freq. $f_{HF} > 5 \cdot f_m^{(3)}$
Frequency modulation Frequency deviation Δf	10 Hz to 16 MHz	10 Hz < $f_m \leq 100 \text{ kHz}$ 100 kHz < $f_m \leq 200 \text{ kHz}$ 200 kHz < $f_m \leq 10 \text{ MHz}$	$1 \cdot 10^{-3} \cdot \Delta f + K$ $2 \cdot 10^{-3} \cdot \Delta f + K$ $5 \cdot 10^{-3} \cdot \Delta f + K$	Δf: Measured value $f_{HF} > 5 \cdot (f_m + \Delta f)^{(3)}$
Phase modulation Phase deviation Δφ	(10 Hz/ $f_m$ ) rad to (16 MHz/ $f_m$ ) rad	10 Hz < $f_m \leq 100 \text{ kHz}$ 100 kHz < $f_m \leq 200 \text{ kHz}$ 200 kHz < $f_m \leq 10 \text{ MHz}$	$1 \cdot 10^{-3} \cdot \Delta \phi + K$ $2 \cdot 10^{-3} \cdot \Delta \phi + K$ $5 \cdot 10^{-3} \cdot \Delta \phi + K$	Δφ: Measured value $f_{HF} > 5 \cdot (f_m + \Delta \phi)^{(3)}$

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Calibration and Measurement Capabilities (CMC)

Measurement quantity / Calibration item	Range	Measurement conditions / procedure	Expanded uncertainty of measurement	Remarks
Waveform quantities	200 ps to 1 s	1 mV to 100 V in 50 Ω	$20 \cdot 10^{-3} \cdot t + (50 \text{ ps})^2/t$	t: Measured value
Rise time	2 ns to 1 s	100 V to 5 kV in 50 Ω	$20 \cdot 10^{-3} \cdot t + (0.3 \text{ ns})^2/t$	e.g. Burst according to EN 61000-4-4:2013
	3 ns to 1 s	100 V to 8 kV in 1 kΩ	$20 \cdot 10^{-3} \cdot t + (0.5 \text{ ns})^2/t$	e.g. Surge according to EN 61000-4-5:2019
	10 ns to 1 s	100 V to 15 kV. with HV-Probe	$20 \cdot 10^{-3} \cdot t + (2.2 \text{ ns})^2/t$	
	20 ns to 10 μs	1 mA to 5 kA with current transformer	$20 \cdot 10^{-3} \cdot t + (5 \text{ ns})^2/t$	
	0.7 ns to 500 ns	1 A to 150 A with ESD-Target	$30 \cdot 10^{-3} \cdot t$	ESD according to EN 61000-4-2:2009
Pulse duration	0.5 ns to 10 s		$2 \cdot 10^{-3} \cdot t + 10 \text{ ps} + \delta t_{\text{TRIG}}$	$\delta t_{\text{TRIG}}$ : Trigger uncertainty
Repetition time	1 ns to 10 s			
Burst duration	5 ns to 10 s			
Burst period	5 ns to 10 s			
Pulse voltage	10 mV to 500 V	$200 \text{ ps} \leq \Delta t \leq 1 \text{ s}$ at 50 Ω	$20 \cdot 10^{-3} \cdot U \cdot \Delta t \geq 20 \text{ ns}$	U: Measured value Δt: Pulse duration
	10 V to 5 kV	$2.5 \text{ ns} \leq \Delta t \leq 1 \text{ s}$ at 50 Ω	$30 \cdot 10^{-3} \cdot U \cdot \Delta t < 20 \text{ ns}$	e.g. Burst according to EN 61000-4-4:2013
	10 V to 8 kV	$2.5 \text{ ns} \leq \Delta t \leq 1 \text{ s}$ at 1 kΩ		e.g. Surge according to EN 61000-4-5:2019
	10 V to 15 kV	$10 \text{ ns} \leq \Delta t \leq 1 \text{ s}$ , high resistance		
Pulse current	1 A to 5 kA	$20 \text{ ns} \leq \Delta t \leq 10 \text{ ms}$	$20 \cdot 10^{-3} \cdot I$	I: Measured value
ESD-current pulse	1 A to 150 A	Current peak	$40 \cdot 10^{-3} \cdot I$	I: Measured value
	1 A to 150 A	Current grid values after 30 ns und 60 ns	$25 \cdot 10^{-3} \cdot I$	Calibration with Target according to EN 61000-4-2:2009
Pulse spectrum	0.1 μVs to 50 μVs	9 kHz to 150 kHz	$25 \cdot 10^{-3} \cdot IS$	IS: Measured value
	3 nVs to 1 μVs	150 kHz to 30 MHz	$25 \cdot 10^{-3} \cdot IS$	CISPR 16-1-1:2019
	0.4 nVs to 200 nVs	30 MHz to 1 GHz	$27 \cdot 10^{-3} \cdot IS$	

Abbreviations used:

CISPR Comité international spécial des perturbations radioélectriques  
 CMC Calibration and measurement capabilities