

## SCS-Directory

**Accreditation number: SCS 0058**

International standard: ISO/IEC 17025:2017  
 Swiss standard: SN EN ISO/IEC 17025:2018

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 Current accreditation: 14.03.2026 to 13.03.2031  
 Scope of accreditation see: [www.sas.admin.ch](http://www.sas.admin.ch)  
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### Scope of accreditation as of 14.03.2026

**Calibration laboratory for electrical quantities, fiber optics, pressure, temperature, humidity, magnetic and electric fields**

Calibration and Measurement Capability (CMC)

Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
<b>DC Voltage</b>				
Calibration of voltage measurement instruments	0 mV ... < 220 mV		$7,2 \cdot 10^{-6} U + 0,6 \mu\text{V}$	Also possible in the branches and on site <sup>2)</sup> U = Measurement value
	220 mV ... < 2,2 V		$3,5 \cdot 10^{-6} U + 1,6 \mu\text{V}$	
	2,2 V ... < 22 V		$2,6 \cdot 10^{-6} U + 7 \mu\text{V}$	
	22 V ... < 220 V		$3,5 \cdot 10^{-6} U + 120 \mu\text{V}$	
	220 V ... 1100 V		$4 \cdot 10^{-6} U + 700 \mu\text{V}$	



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Calibration of voltage calibrators	0 mV ... < 120 mV		$6,6 \cdot 10^{-6} U + 0,1 \mu\text{V}$	Also possible in the branches and on site <sup>2)</sup>
	120 mV ... < 1,2 V		$2 \cdot 10^{-6} U + 0,2 \mu\text{V}$	
	1,2 V ... < 12 V		$2 \cdot 10^{-6} U + 1 \mu\text{V}$	
	12 V ... < 120 V		$2 \cdot 10^{-6} U + 14 \mu\text{V}$	
	120 V ... 1050 V		$3 \cdot 10^{-6} U + 200 \mu\text{V}$	
Fixed voltages	100 mV		$6,5 \cdot 10^{-6} U$	
	1 V; 10 V; 100 V; 1000V		$2 \cdot 10^{-6} U$	
<b>High voltage</b>				
Calibration of high voltage generators	1 kV ... 10 kV	$R_L \geq 110 \text{ M}\Omega$	0,05 % + 0,11 V	Procedure KA0022 Also possible in Fehraltdorf and on site <sup>3)</sup>
	> 10 kV ... 20 kV	$R_L \geq 200 \text{ M}\Omega$	0,06 % + 1,3 V	
	> 20 kV ... 35 kV	$R_L \geq 200 \text{ M}\Omega$	0,12 % + 3,0 V	
	> 35 kV ... 50 kV	$R_L \geq 760 \text{ M}\Omega$	1,2 % + 6,5 V	
Calibration of voltage measurement instruments	1 kV ... 10 kV		0,05 % + 0,13 V	Procedure KA0022 Also possible in Fehraltdorf and on site <sup>4)</sup>
	> 10 kV ... 20 kV		0,06 % + 1,4 V	
	> 20 kV ... 35 kV		0,12 % + 3,1 V	
	> 35 kV ... 50 kV		1,2 % + 6,6 V	
<b>DC Current</b>				
Calibration of ammeters	0 $\mu\text{A}$ ... 12 $\mu\text{A}$		$16 \cdot 10^{-6} I + 0,2 \text{ nA}$	Also possible in the branches and on site <sup>2)</sup>  I = Measurement value
	> 12 $\mu\text{A}$ ... 120 $\mu\text{A}$		$16 \cdot 10^{-6} I + 0,5 \text{ nA}$	
	> 120 $\mu\text{A}$ ... 1,2 mA		$16 \cdot 10^{-6} I + 4,5 \text{ nA}$	
	> 1,2 mA ... 12 mA		$16 \cdot 10^{-6} I + 41 \text{ nA}$	
	> 12 mA ... 120 mA		$16 \cdot 10^{-6} I + 0,5 \mu\text{A}$	
	> 120 mA ... 2 A		$17 \cdot 10^{-6} I + 4,5 \mu\text{A}$	
	> 2 A ... 20 A		$68 \cdot 10^{-6} I + 43 \mu\text{A}$	
	> 20 A ... 100 A		$73 \cdot 10^{-6} I + 130 \mu\text{A}$	
	Calibration of current clamps	> 100 A ... 500 A	With current coil	
> 500 A ... 2500 A			$5,8 \cdot 10^{-3} I + 160 \text{ mA}$	
Calibration of current calibrators	0 $\mu\text{A}$ ... 12 $\mu\text{A}$		$16 \cdot 10^{-6} I + 0,11 \text{ nA}$	Also possible in the branches and on site <sup>2)</sup>
	> 12 $\mu\text{A}$ ... 120 $\mu\text{A}$		$16 \cdot 10^{-6} I + 0,4 \text{ nA}$	
	> 120 $\mu\text{A}$ ... 1,2 mA		$16 \cdot 10^{-6} I + 3,6 \text{ nA}$	
	> 1,2 mA ... 12 mA		$16 \cdot 10^{-6} I + 35 \text{ nA}$	



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks			
<b>DC Resistance</b>	> 12 mA ... 120 mA		$16 \cdot 10^{-6} / + 350 \text{ nA}$				
	> 120 mA ... 2 A		$17 \cdot 10^{-6} / + 3,7 \text{ }\mu\text{A}$				
	> 2 A ... 20 A		$68 \cdot 10^{-6} / + 36 \text{ }\mu\text{A}$				
	> 20 A ... 100 A		$73 \cdot 10^{-6} / + 40 \text{ }\mu\text{A}$				
	Calibration of resistance measurement instruments	100 $\mu\Omega$		$70 \cdot 10^{-6} R$	The measurement uncertainties indicated apply to decadic values		
		1 m $\Omega$		$45 \cdot 10^{-6} R$			
		10 m $\Omega$ ; 100 m $\Omega$		$45 \cdot 10^{-6} R$			
		With fixed resistors	1 $\Omega$ ; 10 $\Omega$			$5 \cdot 10^{-6} R$	Also possible in the branches and on site <sup>2),5)</sup>
			100 $\Omega$ ; 1 k $\Omega$			$6 \cdot 10^{-6} R$	
			10 k $\Omega$			$5 \cdot 10^{-6} R$	
			19 k $\Omega$ ; 100 k $\Omega$			$6 \cdot 10^{-6} R$	
			1 M $\Omega$			$5 \cdot 10^{-6} R$	
			10 M $\Omega$			$10 \cdot 10^{-6} R$	
			100 M $\Omega$			$40 \cdot 10^{-6} R$	
			1 G $\Omega$			$250 \cdot 10^{-6} R$	
10 G $\Omega$			$520 \cdot 10^{-6} R$				
100 G $\Omega$			$750 \cdot 10^{-6} R$				
1 T $\Omega$			$5 \cdot 10^{-3} R$				
10 T $\Omega$			$8 \cdot 10^{-3} R$				
100 T $\Omega$			$16 \cdot 10^{-3} R$				
With precision resistance decades	10 m $\Omega$ ... 10 $\Omega$		$47 \cdot 10^{-6} R + 0,83 \text{ m}\Omega$	Also possible in the branches and on site <sup>2),5)</sup>			
	> 10 $\Omega$ ... 1 k $\Omega$		$38 \cdot 10^{-6} R + 1,3 \text{ m}\Omega$				
	> 1 k $\Omega$ ... 10 k $\Omega$		$29 \cdot 10^{-6} R + 6 \text{ m}\Omega$				
	> 10 k $\Omega$ ... 100 k $\Omega$		$28 \cdot 10^{-6} R + 58 \text{ m}\Omega$				
	> 100 k $\Omega$ ... 1 M $\Omega$		$33 \cdot 10^{-6} R + 2,4 \text{ }\mu\Omega$				
	> 1 M $\Omega$ ... 10 M $\Omega$		$150 \cdot 10^{-6} R + 120 \text{ }\mu\Omega$				
	> 10 M $\Omega$ ... 100 M $\Omega$		$600 \cdot 10^{-6} R + 1,2 \text{ k}\Omega$				
> 100 M $\Omega$ ... 1 G $\Omega$		$1,4 \cdot 10^{-3} R$					
	> 1 G $\Omega$ ... 10 G $\Omega$		$2,6 \cdot 10^{-3} R$				



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
Calibration of resistances	> 10 G $\Omega$ ... 100 G $\Omega$		6,1•10 <sup>-3</sup> R	Also possible in the branches and on site <sup>5)</sup>
	> 100 G $\Omega$ ... 1 T $\Omega$		9•10 <sup>-3</sup> R	
	100 $\mu\Omega$ ... < 500 $\mu\Omega$		100•10 <sup>-6</sup> R	
	500 $\mu\Omega$ ... < 5 m $\Omega$		75•10 <sup>-6</sup> R	
	5 m $\Omega$ ... < 50 m $\Omega$		72•10 <sup>-6</sup> R	
	50 m $\Omega$ ... < 500 m $\Omega$		44•10 <sup>-6</sup> R	
	500 m $\Omega$ ... < 5 $\Omega$		10•10 <sup>-6</sup> R	
	5 $\Omega$ ... < 50 $\Omega$		10•10 <sup>-6</sup> R	
	50 $\Omega$ ... < 500 $\Omega$		10•10 <sup>-6</sup> R	
	500 $\Omega$ ... < 5 k $\Omega$		10•10 <sup>-6</sup> R	
	5 k $\Omega$ ... < 50 k $\Omega$		5,5•10 <sup>-6</sup> R	
	50 k $\Omega$ ... < 500 k $\Omega$		7,5•10 <sup>-6</sup> R	
	500 k $\Omega$ ... < 5 M $\Omega$		15•10 <sup>-6</sup> R	
	5 M $\Omega$ ... < 50 M $\Omega$		60•10 <sup>-6</sup> R	
	50 M $\Omega$ ... < 500 M $\Omega$		480•10 <sup>-6</sup> R	
	500 M $\Omega$ ... < 5 G $\Omega$		600•10 <sup>-6</sup> R	
	5 G $\Omega$ ... < 50 G $\Omega$		850•10 <sup>-6</sup> R	
	50 G $\Omega$ ... < 500 G $\Omega$		1,7•10 <sup>-3</sup> R	
500 G $\Omega$ ... < 5 T $\Omega$		6,7•10 <sup>-3</sup> R		
5 T $\Omega$ ... < 50 T $\Omega$		9,1•10 <sup>-3</sup> R		
50 T $\Omega$ ... 200 T $\Omega$		19•10 <sup>-3</sup> R		
<b>DC Power</b>		40 V ... 480 V		
Calibration of power generators	2,4 W ... 96 W	60 mA ... < 200 mA	0,58 %	
	> 8 W ... 240 W	200 mA ... 500 mA	0,35 %	
	> 20 W ... 960 W	> 500 mA ... 2 A	0,12 %	
	> 80 W ... 7,68 kW	> 2 A ... 16 A	0,52 %	
		40 V ... 300 V		
	> 640 W ... 6 kW	> 16 A ... 20 A	0,58 %	
> 800 W ... 30 kW	20 A ... 100 A	0,14 %		



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks	
Calibration of power analyzers	330 $\mu$ W ... 200 W	0,1 V ... 1000 V 3,3 mA ... 200 mA	0,58 %	Also possible in the branches and on site <sup>2)</sup>	
	> 20 mW ... 500 W	> 200 mA ... 500 mA	0,35 %		
	> 50 mW ... 2 kW	> 500 mA ... 2 A	0,12 %		
	> 200 mW ... 20 kW	> 2 A ... 20 A	0,59 %		
Calibration of power meter clamps	> 800 W ... 30 kW	40 V ... 300 V > 20 A ... 100 A	0,14 %	With current coil  Also possible in the branches and on site <sup>2)</sup>	
	330 $\mu$ W ... < 33 mW	0,1 V ... 1000 V 3,3 mA ... 1000 A	0,84 %		
	33 mW ... < 110 mW		0,69 %		
	110 mW ... 100 kW		0,60 %		
> 100 kW ... 1 MW		0,84 %			
<b>AV Voltage</b>					
Calibration of voltage calibrators	10 mV ... < 22 mV	10 Hz	$1,1 \cdot 10^{-3} U + 0,3 \mu\text{V}$	Also possible in the branches and on site <sup>2)</sup>  U = Measurement value	
		20 Hz; 40 Hz; 500 Hz	$1,1 \cdot 10^{-3} U + 0,1 \mu\text{V}$		
		1 kHz; 10 kHz;	$1,2 \cdot 10^{-3} U + 0,1 \mu\text{V}$		
		20 kHz; 50 kHz; 100 kHz	$1,2 \cdot 10^{-3} U + 0,1 \mu\text{V}$		
		200 kHz; 500 kHz	$1,2 \cdot 10^{-3} U + 0,1 \mu\text{V}$		
		700 kHz; 1 MHz	$1,1 \cdot 10^{-3} U + 0,2 \mu\text{V}$		
		22 mV ... < 70 mV	10 Hz		$370 \cdot 10^{-6} U + 0,8 \mu\text{V}$
			20 Hz		$370 \cdot 10^{-6} U + 0,3 \mu\text{V}$
			40 Hz		$370 \cdot 10^{-6} U + 0,1 \mu\text{V}$
	500 Hz; 1 kHz		$360 \cdot 10^{-6} U + 0,2 \mu\text{V}$		
	10 kHz; 20 kHz; 50 kHz; 100 kHz		$360 \cdot 10^{-6} U + 0,1 \mu\text{V}$		
	200 kHz; 500 kHz		$370 \cdot 10^{-6} U + 0,2 \mu\text{V}$		
	70 mV ... < 220 mV	700 kHz	$380 \cdot 10^{-6} U + 0,2 \mu\text{V}$		
		1 MHz	$610 \cdot 10^{-6} U + 0,2 \mu\text{V}$		
		10 Hz	$53 \cdot 10^{-6} U + 2,1 \mu\text{V}$		
		20 Hz	$53 \cdot 10^{-6} U + 1,1 \mu\text{V}$		
			40 Hz; 500 Hz	$53 \cdot 10^{-6} U + 0,3 \mu\text{V}$	



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
	220 mV ... < 700 mV	1 kHz; 10 kHz; 20 kHz; 50 kHz; 100 kHz	$53 \cdot 10^{-6} U + 0,2 \mu\text{V}$	
		200 kHz; 500 kHz	$69 \cdot 10^{-6} U + 0,2 \mu\text{V}$	
		700 kHz	$84 \cdot 10^{-6} U + 0,2 \mu\text{V}$	
		1 MHz	$92 \cdot 10^{-6} U + 0,2 \mu\text{V}$	
		10 Hz	$58 \cdot 10^{-6} U + 9 \mu\text{V}$	
		20 Hz	$50 \cdot 10^{-6} U + 3 \mu\text{V}$	
		40 Hz	$47 \cdot 10^{-6} U + 2 \mu\text{V}$	
		500 Hz; 1 kHz; 10 kHz; 20 kHz; 50 kHz	$42 \cdot 10^{-6} U + 2 \mu\text{V}$	
		100 kHz	$47 \cdot 10^{-6} U + 1 \mu\text{V}$	
		200 kHz	$56 \cdot 10^{-6} U + 1 \mu\text{V}$	
	700 mV ... < 2,2 V	500 kHz	$76 \cdot 10^{-6} U + 1 \mu\text{V}$	
		700 kHz	$190 \cdot 10^{-6} U + 1 \mu\text{V}$	
		1 MHz	$120 \cdot 10^{-6} U + 1 \mu\text{V}$	
		10 Hz	$52 \cdot 10^{-6} U + 26 \mu\text{V}$	
		20 Hz	$42 \cdot 10^{-6} U + 11 \mu\text{V}$	
		40 Hz	$41 \cdot 10^{-6} U + 4 \mu\text{V}$	
		500 Hz; 1 kHz; 10 kHz; 20 kHz	$41 \cdot 10^{-6} U + 2 \mu\text{V}$	
		50 kHz; 100 kHz	$42 \cdot 10^{-6} U + 2 \mu\text{V}$	
		200 kHz	$53 \cdot 10^{-6} U + 2 \mu\text{V}$	
		500 kHz	$65 \cdot 10^{-6} U + 2 \mu\text{V}$	
	2,2 V ... < 7 V	700 kHz	$160 \cdot 10^{-6} U + 2 \mu\text{V}$	
		1 MHz	$100 \cdot 10^{-6} U + 2 \mu\text{V}$	
		10 Hz	$66 \cdot 10^{-6} U + 44 \mu\text{V}$	
		20 Hz	$40 \cdot 10^{-6} U + 30 \mu\text{V}$	
		40 Hz	$27 \cdot 10^{-6} U + 13 \mu\text{V}$	
		500 Hz	$24 \cdot 10^{-6} U + 15 \mu\text{V}$	
		1 kHz	$24 \cdot 10^{-6} U + 13 \mu\text{V}$	
		10 kHz	$24 \cdot 10^{-6} U + 8 \mu\text{V}$	
		20 kHz	$27 \cdot 10^{-6} U + 10 \mu\text{V}$	



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	7 V ... < 22 V	50 kHz	$27 \cdot 10^{-6} U + 7 \mu\text{V}$	
		100 kHz	$33 \cdot 10^{-6} U + 7 \mu\text{V}$	
		200 kHz	$42 \cdot 10^{-6} U + 10 \mu\text{V}$	
		500 kHz	$210 \cdot 10^{-6} U + 9 \mu\text{V}$	
		700 kHz	$310 \cdot 10^{-6} U + 9 \mu\text{V}$	
		1 MHz	$400 \cdot 10^{-6} U + 8 \mu\text{V}$	
		10 Hz	$76 \cdot 10^{-6} U + 310 \mu\text{V}$	
		20 Hz	$31 \cdot 10^{-6} U + 77 \mu\text{V}$	
		40 Hz	$27 \cdot 10^{-6} U + 21 \mu\text{V}$	
		500 Hz	$27 \cdot 10^{-6} U + 30 \mu\text{V}$	
		1 kHz	$27 \cdot 10^{-6} U + 16 \mu\text{V}$	
		10 kHz; 20 kHz	$27 \cdot 10^{-6} U + 9 \mu\text{V}$	
		50 kHz	$27 \cdot 10^{-6} U + 18 \mu\text{V}$	
		100 kHz	$27 \cdot 10^{-6} U + 13 \mu\text{V}$	
		200 kHz	$57 \cdot 10^{-6} U + 11 \mu\text{V}$	
		500 kHz	$180 \cdot 10^{-6} U + 13 \mu\text{V}$	
		700 kHz	$350 \cdot 10^{-6} U + 43 \mu\text{V}$	
		1 MHz	$470 \cdot 10^{-6} U + 43 \mu\text{V}$	
	22 V ... < 70 V	10 Hz	$42 \cdot 10^{-6} U + 740 \mu\text{V}$	
		20 Hz	$33 \cdot 10^{-6} U + 270 \mu\text{V}$	
		40 Hz	$33 \cdot 10^{-6} U + 190 \mu\text{V}$	
		500 Hz	$24 \cdot 10^{-6} U + 120 \mu\text{V}$	
		1 kHz	$24 \cdot 10^{-6} U + 150 \mu\text{V}$	
		10 kHz	$24 \cdot 10^{-6} U + 68 \mu\text{V}$	
		20 kHz	$24 \cdot 10^{-6} U + 85 \mu\text{V}$	
		50 kHz	$24 \cdot 10^{-6} U + 72 \mu\text{V}$	
		100 kHz	$33 \cdot 10^{-6} U + 180 \mu\text{V}$	
	70 V ... < 220 V	10 Hz	$52 \cdot 10^{-6} U + 2,2 \text{ mV}$	
		20 Hz	$42 \cdot 10^{-6} U + 500 \mu\text{V}$	
		40 Hz	$42 \cdot 10^{-6} U + 210 \mu\text{V}$	



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<b>AC Voltage</b>  Calibration of voltage measurement instruments	220 V ... < 700 V	500 Hz	$33 \cdot 10^{-6} U + 240 \mu\text{V}$		
		1 kHz	$33 \cdot 10^{-6} U + 210 \mu\text{V}$		
		10 kHz	$33 \cdot 10^{-6} U + 190 \mu\text{V}$		
		20 kHz	$33 \cdot 10^{-6} U + 120 \mu\text{V}$		
		50 kHz	$33 \cdot 10^{-6} U + 170 \mu\text{V}$		
		100 kHz	$42 \cdot 10^{-6} U + 640 \mu\text{V}$		
		10 Hz	$67 \cdot 10^{-6} U + 900 \mu\text{V}$		
		20 Hz	$53 \cdot 10^{-6} U + 900 \mu\text{V}$		
		40 Hz	$53 \cdot 10^{-6} U + 900 \mu\text{V}$		
		500 Hz	$33 \cdot 10^{-6} U + 890 \mu\text{V}$		
		1 kHz	$33 \cdot 10^{-6} U + 770 \mu\text{V}$		
		10 kHz	$33 \cdot 10^{-6} U + 800 \mu\text{V}$		
		20 kHz	$38 \cdot 10^{-6} U + 800 \mu\text{V}$		
		50 kHz	$46 \cdot 10^{-6} U + 800 \mu\text{V}$		
		100 kHz	$53 \cdot 10^{-6} U + 800 \mu\text{V}$		
	700 V ... 1050 V	10 Hz	$99 \cdot 10^{-6} U + 1 \text{ mV}$		
		20 Hz	$56 \cdot 10^{-6} U + 1 \text{ mV}$		
		40 Hz	$53 \cdot 10^{-6} U + 950 \mu\text{V}$		
		500 Hz	$33 \cdot 10^{-6} U + 910 \mu\text{V}$		
		1 kHz	$33 \cdot 10^{-6} U + 930 \mu\text{V}$		
		10 kHz	$33 \cdot 10^{-6} U + 950 \mu\text{V}$		
		20 kHz	$38 \cdot 10^{-6} U + 950 \mu\text{V}$		
		50 kHz	$46 \cdot 10^{-6} U + 950 \mu\text{V}$		
		100 kHz	$61 \cdot 10^{-6} U + 950 \mu\text{V}$		
		10 mV ... < 22 mV	10 Hz; 20 Hz		$1,1 \cdot 10^{-3} U + 5,8 \mu\text{V}$
			40 Hz; 500 Hz;		$1,1 \cdot 10^{-3} U + 2,4 \mu\text{V}$
			1 kHz; 10 kHz; 20 kHz; 50 kHz		$1,2 \cdot 10^{-3} U + 2,4 \mu\text{V}$
			100 kHz		$1,2 \cdot 10^{-3} U + 3,5 \mu\text{V}$
			200 kHz		$1,2 \cdot 10^{-3} U + 5,8 \mu\text{V}$



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	22 mV ... < 70 mV	500 kHz	$1,2 \cdot 10^{-3} U + 12 \mu\text{V}$		
		700 kHz; 1 MHz	$1,1 \cdot 10^{-3} U + 18 \mu\text{V}$		
		10 Hz	$410 \cdot 10^{-6} U + 24 \mu\text{V}$		
		20 Hz	$380 \cdot 10^{-6} U + 18 \mu\text{V}$		
		40 Hz	$370 \cdot 10^{-6} U + 2,4 \mu\text{V}$		
		500 Hz; 1 kHz; 10 kHz; 20 kHz; 50 kHz; 100 kHz	$360 \cdot 10^{-6} U + 2,4 \mu\text{V}$		
		200 kHz	$370 \cdot 10^{-6} U + 4,7 \mu\text{V}$		
		500 kHz	$390 \cdot 10^{-6} U + 12 \mu\text{V}$		
		700 kHz	$450 \cdot 10^{-6} U + 24 \mu\text{V}$		
		1 MHz	$700 \cdot 10^{-6} U + 24 \mu\text{V}$		
		70 mV ... < 220 mV	10 Hz	$190 \cdot 10^{-6} U + 24 \mu\text{V}$	
			20 Hz	$110 \cdot 10^{-6} U + 18 \mu\text{V}$	
	40 Hz		$60 \cdot 10^{-6} U + 2,4 \mu\text{V}$		
	500 Hz; 1 kHz; 10 kHz; 20 kHz		$55 \cdot 10^{-6} U + 2,4 \mu\text{V}$		
	50 kHz; 100 kHz		$60 \cdot 10^{-6} U + 2,4 \mu\text{V}$		
	200 kHz		$60 \cdot 10^{-6} U + 4,7 \mu\text{V}$		
	500 kHz		$140 \cdot 10^{-6} U + 12 \mu\text{V}$		
	700 kHz; 1 MHz		$250 \cdot 10^{-6} U + 24 \mu\text{V}$		
	220 mV ... < 700 mV		10 Hz	$190 \cdot 10^{-6} U + 25 \mu\text{V}$	
			20 Hz	$110 \cdot 10^{-6} U + 18 \mu\text{V}$	
			40 Hz	$49 \cdot 10^{-6} U + 5,1 \mu\text{V}$	
			500 Hz; 1 kHz; 10 kHz	$44 \cdot 10^{-6} U + 5,1 \mu\text{V}$	
		20 kHz	$49 \cdot 10^{-6} U + 4,8 \mu\text{V}$		
		50 kHz; 100 kHz	$50 \cdot 10^{-6} U + 5,9 \mu\text{V}$		
		200 kHz	$66 \cdot 10^{-6} U + 12 \mu\text{V}$		
		500 kHz	$120 \cdot 10^{-6} U + 24 \mu\text{V}$		
		700 kHz	$260 \cdot 10^{-6} U + 58 \mu\text{V}$		
	1 MHz	$210 \cdot 10^{-6} U + 58 \mu\text{V}$			



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	700 mV ... < 2,2 V	10 Hz	$190 \cdot 10^{-6} U + 35 \mu\text{V}$	
		20 Hz	$110 \cdot 10^{-6} U + 21 \mu\text{V}$	
		40 Hz	$43 \cdot 10^{-6} U + 6.2 \mu\text{V}$	
		500 Hz; 1 kHz; 10 kHz; 20 kHz	$43 \cdot 10^{-6} U + 5.1 \mu\text{V}$	
		50 kHz; 100 kHz	$46 \cdot 10^{-6} U + 6,2 \mu\text{V}$	
		200 kHz	$64 \cdot 10^{-6} U + 12 \mu\text{V}$	
		500 kHz	$110 \cdot 10^{-6} U + 24 \mu\text{V}$	
		700 kHz	$230 \cdot 10^{-6} U + 58 \mu\text{V}$	
		1 MHz	$200 \cdot 10^{-6} U + 58 \mu\text{V}$	
	2,2 V ... < 7 V	10 Hz	$190 \cdot 10^{-6} U + 50 \mu\text{V}$	
		20 Hz	$110 \cdot 10^{-6} U + 35 \mu\text{V}$	
		40 Hz	$30 \cdot 10^{-6} U + 16 \mu\text{V}$	
		500 Hz	$27 \cdot 10^{-6} U + 18 \mu\text{V}$	
		1 kHz	$27 \cdot 10^{-6} U + 16 \mu\text{V}$	
		10 kHz	$27 \cdot 10^{-6} U + 13 \mu\text{V}$	
		20 kHz	$30 \cdot 10^{-6} U + 14 \mu\text{V}$	
		50 kHz	$32 \cdot 10^{-6} U + 14 \mu\text{V}$	
		100 kHz	$36 \cdot 10^{-6} U + 14 \mu\text{V}$	
		200 kHz	$55 \cdot 10^{-6} U + 20 \mu\text{V}$	
		500 kHz	$220 \cdot 10^{-6} U + 120 \mu\text{V}$	
	700 kHz	$360 \cdot 10^{-6} U + 120 \mu\text{V}$		
	1 MHz	$440 \cdot 10^{-6} U + 120 \mu\text{V}$		
	7 V ... < 22 V	10 Hz	$190 \cdot 10^{-6} U + 310 \mu\text{V}$	
		20 Hz	$100 \cdot 10^{-6} U + 79 \mu\text{V}$	
		40 Hz	$30 \cdot 10^{-6} U + 23 \mu\text{V}$	
		500 Hz	$30 \cdot 10^{-6} U + 32 \mu\text{V}$	
		1 kHz	$30 \cdot 10^{-6} U + 19 \mu\text{V}$	
		10 kHz; 20 kHz	$30 \cdot 10^{-6} U + 13 \mu\text{V}$	
		50 kHz	$32 \cdot 10^{-6} U + 22 \mu\text{V}$	
		100 kHz	$32 \cdot 10^{-6} U + 18 \mu\text{V}$	



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks		
	22 V ... < 70 V	200 kHz	$67 \cdot 10^{-6} U + 21 \mu\text{V}$			
		500 kHz	$200 \cdot 10^{-6} U + 120 \mu\text{V}$			
		700 kHz	$390 \cdot 10^{-6} U + 130 \mu\text{V}$			
		1 MHz	$500 \cdot 10^{-6} U + 130 \mu\text{V}$			
		10 Hz	$180 \cdot 10^{-6} U + 780 \mu\text{V}$			
		20 Hz	$100 \cdot 10^{-6} U + 330 \mu\text{V}$			
		40 Hz	$36 \cdot 10^{-6} U + 220 \mu\text{V}$			
		500 Hz	$37 \cdot 10^{-6} U + 150 \mu\text{V}$			
		1 kHz	$27 \cdot 10^{-6} U + 180 \mu\text{V}$			
		10 kHz	$27 \cdot 10^{-6} U + 120 \mu\text{V}$			
		20 kHz	$27 \cdot 10^{-6} U + 130 \mu\text{V}$			
		50 kHz	$29 \cdot 10^{-6} U + 140 \mu\text{V}$			
		100 kHz	$37 \cdot 10^{-6} U + 210 \mu\text{V}$			
		70 V ... < 220 V	10 Hz		$190 \cdot 10^{-6} U + 2,3 \text{ mV}$	
	20 Hz		$110 \cdot 10^{-6} U + 530 \mu\text{V}$			
	40 Hz		$44 \cdot 10^{-6} U + 230 \mu\text{V}$			
	500 Hz		$36 \cdot 10^{-6} U + 260 \mu\text{V}$			
	1 kHz		$36 \cdot 10^{-6} U + 230 \mu\text{V}$			
	10 kHz		$36 \cdot 10^{-6} U + 210 \mu\text{V}$			
	20 kHz		$36 \cdot 10^{-6} U + 160 \mu\text{V}$			
	50 kHz		$37 \cdot 10^{-6} U + 210 \mu\text{V}$			
	100 kHz		$46 \cdot 10^{-6} U + 650 \mu\text{V}$			
	220 V ... < 700 V		50 Hz		$58 \cdot 10^{-6} U + 1,1 \text{ mV}$	
		500 Hz; 1 kHz	$40 \cdot 10^{-6} U + 1,1 \text{ mV}$			
		700 V ... < 1050 V	50 Hz		$58 \cdot 10^{-6} U + 1,2 \text{ mV}$	
	500 Hz; 1 kHz		$40 \cdot 10^{-6} U + 1,1 \text{ mV}$			
	<b>High voltage</b>		2 kV ... 20 kV		$R_L \geq 760 \text{ M}\Omega; 16,7 \text{ Hz}$	$1,2 \% + 6,6 \text{ V}$
		> 20 kV ... 30 kV			$1,2 \% + 22 \text{ V}$	
		1 kV ... 10 kV	$R_L \geq 110 \text{ M}\Omega; 50 \text{ Hz}$		$0,15 \% + 0,2 \text{ V}$	



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks	
Calibration of high voltage measurement instruments	> 10 kV ... 20 kV	$R_L \geq 200 \text{ M}\Omega$	0,13 % + 0,7 V	Also possible in Fehraltorf and on site <sup>6)</sup>	
	> 20 kV ... 30 kV	$R_L \geq 200 \text{ M}\Omega$	0,15 % + 3,0 V		
	> 30 kV ... 50 kV	$R_L \geq 760 \text{ M}\Omega$	1,2 % + 22 V		
	> 50 kV ... 100 kV	$R_L \geq 760 \text{ M}\Omega$	1,2 % + 29 V		
	AC Current	1 kV ... 10 kV	50 Hz	0,15 % + 0,3 V	Procedure KA0022 RMS; $\hat{U}/\sqrt{2}$
		> 10 kV ... 20 kV		0,13 % + 0,8 V	
		> 20 kV ... 30 kV		0,15 % + 3,1 V	
		> 30 kV ... 50 kV		1,2 % + 23 V	
Calibration of current calibrators	> 50 kV ... 100 kV		1,2 % + 30 V	Also possible in Fehraltorf and on site <sup>7)</sup>	
	0,1 mA ... < 0,22 mA	40 Hz ... 5 kHz	$1,2 \cdot 10^{-3} /$		
	0,22 mA ... < 0,77 mA	40 Hz ... 1 kHz	$400 \cdot 10^{-6} /$	$I =$ Measurement value	
		> 1 kHz ... 5 kHz	$470 \cdot 10^{-6} /$		
	0,77 mA ... < 2 mA	40 Hz ... 1 kHz	$180 \cdot 10^{-6} /$		
		> 1 kHz ... 5 kHz	$300 \cdot 10^{-6} /$		
	2 mA ... 10 mA	20 Hz ... < 40 Hz	$100 \cdot 10^{-6} / + 0,44 \mu\text{A}$		
		40 Hz ... 5 kHz	$120 \cdot 10^{-6} / + 0,44 \mu\text{A}$		
		> 5 kHz ... 10 kHz	$200 \cdot 10^{-6} / + 0,44 \mu\text{A}$		
	> 10 mA ... 30 mA	20 Hz ... < 40 Hz	$110 \cdot 10^{-6} / + 4,5 \mu\text{A}$		
		40 Hz ... 10 kHz	$120 \cdot 10^{-6} / + 4,5 \mu\text{A}$		
	> 30 mA ... 100 mA	20 Hz ... < 40 Hz	$120 \cdot 10^{-6} / + 4,5 \mu\text{A}$		
		40 Hz ... 10 kHz	$130 \cdot 10^{-6} / + 4,5 \mu\text{A}$		
	> 100 mA ... 300 mA	20 Hz ... < 40 Hz	$130 \cdot 10^{-6} / + 31 \mu\text{A}$		
		40 Hz ... 10 kHz	$140 \cdot 10^{-6} / + 31 \mu\text{A}$		
	> 300 mA ... 2 A	20 Hz ... < 40 Hz	$130 \cdot 10^{-6} / + 31 \mu\text{A}$		
40 Hz ... 5 kHz		$140 \cdot 10^{-6} / + 31 \mu\text{A}$			
> 5 kHz ... 10 kHz		$160 \cdot 10^{-6} / + 31 \mu\text{A}$			
> 2 A ... 5 A	20 Hz ... < 40 Hz	$120 \cdot 10^{-6} / + 38 \mu\text{A}$			
	40 Hz ... 10 kHz	$140 \cdot 10^{-6} / + 44 \mu\text{A}$			



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
Calibration of ammeters	> 5 A ... 10 A	20 Hz ... < 40 Hz	$120 \cdot 10^{-6} / + 47 \mu\text{A}$	Also possible in the branches and on site <sup>2)</sup>
		40 Hz ... 5 kHz	$150 \cdot 10^{-6} / + 57 \mu\text{A}$	
		> 5 kHz ... 10 kHz	$190 \cdot 10^{-6} / + 57 \mu\text{A}$	
	> 10 A ... 20 A	20 Hz ... < 40 Hz	$130 \cdot 10^{-6} / + 89 \mu\text{A}$	
		40 Hz ... 5 kHz	$290 \cdot 10^{-6} / + 120 \mu\text{A}$	
		> 5 kHz ... 10 kHz	$910 \cdot 10^{-6} / + 130 \mu\text{A}$	
	> 20 A ... 120 A	45 Hz ... 55 Hz	$200 \cdot 10^{-6} /$	
	0,1 mA ... < 0,22 mA	40 Hz ... 5 kHz	$1,2 \cdot 10^{-3} /$	
		0,22 mA ... < 0,77 mA	40 Hz ... 1 kHz	
		> 1 kHz ... 5 kHz	$480 \cdot 10^{-6} /$	
		0,77 mA ... < 2 mA	40 Hz ... 1 kHz	
		> 1 kHz ... 5 kHz	$310 \cdot 10^{-6} /$	
		2 mA ... 10 mA	20 Hz ... < 40 Hz	
	40 Hz ... 1 kHz		$130 \cdot 10^{-6} / + 0,46 \mu\text{A}$	
	> 1 kHz ... 5 kHz		$140 \cdot 10^{-6} / + 0,74 \mu\text{A}$	
	> 5 kHz ... 10 kHz		$510 \cdot 10^{-6} / + 1,3 \mu\text{A}$	
	> 10 mA ... 30 mA	20 Hz ... < 40 Hz	$150 \cdot 10^{-6} / + 4,6 \mu\text{A}$	
		40 Hz ... 1 kHz	$130 \cdot 10^{-6} / + 4,6 \mu\text{A}$	
		> 1 kHz ... 5 kHz	$140 \cdot 10^{-6} / + 5,7 \mu\text{A}$	
		> 5 kHz ... 10 kHz	$480 \cdot 10^{-6} / + 7,4 \mu\text{A}$	
	> 30 mA ... 100 mA	20 Hz ... < 40 Hz	$160 \cdot 10^{-6} / + 4,6 \mu\text{A}$	
		40 Hz ... 1 kHz	$140 \cdot 10^{-6} / + 4,6 \mu\text{A}$	
		> 1 kHz ... 5 kHz	$150 \cdot 10^{-6} / + 5,7 \mu\text{A}$	
		> 5 kHz ... 10 kHz	$480 \cdot 10^{-6} / + 7,4 \mu\text{A}$	
> 100 mA ... 300 mA	20 Hz ... 1 kHz	$160 \cdot 10^{-6} / + 32 \mu\text{A}$		
	> 1 kHz ... 5 kHz	$170 \cdot 10^{-6} / + 39 \mu\text{A}$		
	> 5 kHz ... 10 kHz	$940 \cdot 10^{-6} / + 66 \mu\text{A}$		
> 300 mA ... 2 A	20 Hz ... 1 kHz	$160 \cdot 10^{-6} / + 32 \mu\text{A}$		
	> 1 kHz ... 5 kHz	$170 \cdot 10^{-6} / + 40 \mu\text{A}$		
	> 5 kHz ... 10 kHz	$940 \cdot 10^{-6} / + 66 \mu\text{A}$		



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks		
Calibration of current clamps	> 2 A ... 5 A	20 Hz ... < 40 Hz	$120 \cdot 10^{-6} / + 50 \mu\text{A}$			
		40 Hz ... 10 kHz	$140 \cdot 10^{-6} / + 60 \mu\text{A}$			
	> 5 A ... 10 A	20 Hz ... < 40 Hz	$120 \cdot 10^{-6} / + 60 \mu\text{A}$			
		40 Hz ... 5 kHz	$150 \cdot 10^{-6} / + 80 \mu\text{A}$			
		> 5 kHz ... 10 kHz	$190 \cdot 10^{-6} / + 80 \mu\text{A}$			
	> 10 A ... 20 A	20 Hz ... < 40 Hz	$130 \cdot 10^{-6} / + 130 \mu\text{A}$			
		40 Hz ... 5 kHz	$290 \cdot 10^{-6} / + 170 \mu\text{A}$			
		> 5 kHz ... 10 kHz	$910 \cdot 10^{-6} / + 180 \mu\text{A}$			
	> 20 A ... 120 A	45 Hz ... 55 Hz	$200 \cdot 10^{-6} /$			
	Calibration of Rogowski coils	50 A ... 500 A	45 Hz ... 55 Hz		$5,8 \cdot 10^{-3} / + 280 \text{ mA}$	With current coil
		> 500 A ... 3000 A			$5,8 \cdot 10^{-3} /$	
	<b>Capacitance</b> Calibration of capacitance measuring devices	1 pF  10 pF 100 pF 1000 pF 10 nF  100 nF  1 $\mu\text{F}$	100 Hz; 1 kHz;		$360 \cdot 10^{-6} \text{ C}$	Decadic values only Also possible in the branches <sup>2)</sup>
10 kHz			$370 \cdot 10^{-6} \text{ C}$	C = Measurement value		
100 Hz; 1 kHz; 10 kHz			$360 \cdot 10^{-6} \text{ C}$			
100 Hz; 1 kHz; 10 kHz			$360 \cdot 10^{-6} \text{ C}$			
100 Hz; 1 kHz; 10 kHz			$360 \cdot 10^{-6} \text{ C}$			
100 Hz			$130 \cdot 10^{-6} \text{ C}$			
1 kHz			$96 \cdot 10^{-6} \text{ C}$			
100 Hz			$230 \cdot 10^{-6} \text{ C}$			
1 kHz			$110 \cdot 10^{-6} \text{ C}$			
100 Hz			$440 \cdot 10^{-6} \text{ C}$			
1 kHz			$130 \cdot 10^{-6} \text{ C}$			
<b>Inductance</b> Calibration of inductance meters			100 $\mu\text{H}$	100 Hz	$3,5 \cdot 10^{-3} \text{ L}$	Decadic values only Also possible in the branches <sup>2)</sup>
	1 kHz	$410 \cdot 10^{-6} \text{ L}$		L = Measurement value		



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks	
<b>AC Power</b>	1 mH	100 Hz	$440 \cdot 10^{-6} L$		
		1 kHz	$190 \cdot 10^{-6} L$		
	10 mH	100 Hz; 1 kHz	$140 \cdot 10^{-6} L$		
	100 mH	100 Hz; 1 kHz	$140 \cdot 10^{-6} L$		
	1 H	100 Hz; 1 kHz	$140 \cdot 10^{-6} L$		
	10 H	1 kHz	$190 \cdot 10^{-6} L$		
		48,5 Hz ... 51,5 Hz			
	2,4 W ... 30 kW	40 V ... 480 V			Measuring range referred to $\cos \varphi = 1$
	Calibration of power sources (effective power)		60 mA ... 100 A		
			$\cos \varphi = 1$	$160 \cdot 10^{-6} P$	Also possible in Fehrltorf and on site <sup>2)</sup>
Calibration of power measurement instruments (effective power)	330 $\mu$ W ... < 2,4 W	$\cos \varphi = 0,5 \dots < 1$ (c, i)	$295 \cdot 10^{-6} P$	P = Measurement value	
		48,5 Hz ... 51,5 Hz		Measuring range referred $\cos \varphi = 1$	
Calibration of power meter clamps (effective power)	2,4 W ... 30 kW	100 mV ... 40 V			
		3,3 mA ... 60 A			
		$\cos \varphi = 1$	0,13 %	Also possible in Fehrltorf and on site <sup>2)</sup>	
		$\cos \varphi = 0,5 \dots < 1$ (c, i)	0,37 %		
Calibration of power meter clamps (effective power)	330 $\mu$ W ... < 1 MW	40 V ... 480 V		Voltages up to 1000 V with greater uncertainty possible	
		60 mA ... 100 A			
		$\cos \varphi = 1$	$160 \cdot 10^{-6} P$		
		$\cos \varphi = 0,5 \dots < 1$ (c, i)	$295 \cdot 10^{-6} P$		
<b>Frequency</b>	330 $\mu$ W ... < 1 MW	48,5 Hz ... 51,5 Hz		Measuring range referred $\cos \varphi = 1$	
		100 mV ... 1000 V			
		3,3 mA ... 1000 A		With current coil	
		$\cos \varphi = 1$	0,62 %	Also possible in Fehrltorf and on site <sup>2)</sup>	
Calibration of frequency counters	1 mHz ... < 10 mHz	$\cos \varphi = 0,5 \dots < 1$ (c, i)	0,71 %		
		Measurement period:			
		$\geq 100$ s			
	1 mHz ... < 10 mHz		$2,0 \cdot 10^{-5} f$	Also possible in the branches and on site <sup>2)</sup>	
	10 mHz ... < 100 mHz		$8,9 \cdot 10^{-6} f$	f = Measurement value	
	100 mHz ... < 1 Hz		$1,9 \cdot 10^{-6} f$		



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks	
Calibration of frequency generators	1 Hz ... < 10 Hz		$2,0 \cdot 10^{-7} f$	Also possible in the branches and on site <sup>2)</sup>	
	10 Hz ... < 100 Hz		$2,0 \cdot 10^{-8} f$		
	100 Hz ... < 1 kHz		$1,2 \cdot 10^{-9} f$		
	1 kHz ... < 10 kHz		$1,1 \cdot 10^{-10} f$		
	10 kHz ... < 1 MHz		$1,6 \cdot 10^{-11} f$		
	1 MHz ... < 3 GHz	$\geq 10$ s	$9,7 \cdot 10^{-12} f$		
	3 GHz ... 50 GHz		$5,9 \cdot 10^{-11} f$		
	1 mHz ... < 10 mHz	$\geq 100$ s	$2,0 \cdot 10^{-5} f$		
	10 mHz ... < 100 mHz		$8,9 \cdot 10^{-6} f$		
	100 mHz ... < 1 Hz		$1,9 \cdot 10^{-6} f$		
Period	1 Hz ... < 10 Hz		$2,0 \cdot 10^{-7} f$	Phase comparison	
	10 Hz ... < 100 Hz		$2,0 \cdot 10^{-8} f$		
	100 Hz ... < 1 kHz		$1,2 \cdot 10^{-9} f$		
	1 kHz ... < 10 kHz		$1,1 \cdot 10^{-10} f$		
	10 kHz ... < 1 MHz		$1,6 \cdot 10^{-11} f$		
	1 MHz ... < 3 GHz	$\geq 10$ s	$9,7 \cdot 10^{-12} f$		
	3 GHz ... 50 GHz	$\geq 10$ s	$5,9 \cdot 10^{-11} f$		
	1 MHz; 5 MHz; 10 MHz	$\geq 1$ h	$9,6 \cdot 10^{-12} f$		
	10 ns ... < 10 $\mu$ s	$\geq 10$ s	$1,5 \cdot 10^{-16} t$		t = Measurement value
	10 $\mu$ s ... < 100 $\mu$ s		$1,7 \cdot 10^{-15} t$		
100 $\mu$ s ... < 1 ms		$1,1 \cdot 10^{-13} t$			
1 ms ... < 10 ms		$1,2 \cdot 10^{-11} t$			
	10 ms ... < 100 ms		$2 \cdot 10^{-9} t$		
	100 ms ... < 1 s		$2 \cdot 10^{-7} t$		
	1 s ... 10 s	$\geq 100$ s	$2 \cdot 10^{-5} t$		



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks	
<b>Number of revolutions</b>	6 U/min ... < 30 U/min		$5,9 \cdot 10^{-4} n$	Optical	
	30 U/min ... < 60 U/min		$7,6 \cdot 10^{-4} n$	n = Measurement value	
	60 U/min ... < 1000 U/min		$6,9 \cdot 10^{-3} n$		
	1000 U/min ... < 10000 U/min		$6,7 \cdot 10^{-2} n$		
	10000 U/min ... 100000 U/min		$5,8 \cdot 10^{-1} n$		
<b>RF- Power</b>					
Calibration of RF power meters	>10 $\mu$ W ... 10 mW (-20 dBm ... +10 dBm)	9 kHz ... <2,4 GHz	2,7 % + 73 nW	Analyzer: VSWR $\leq$ 1,3	
		2,4 GHz ... <12,4 GHz	3,2 % + 73 nW		
		12,4 GHz ... 18 GHz	3,9 % + 73 nW		
	>10 nW ... 10 $\mu$ W (-50 dBm ... -20 dBm)	10 MHz ... <2,4 GHz	5,7 % + 155 pW		
		2,4 GHz ... <8 GHz	6,9 % + 155 pW		
		8 GHz ... <18 GHz	11 % + 155 pW		
	100 $\mu$ W ... 10 mW (-10 dBm ... +10 dBm)	2,5 MHz ... 1,3 GHz	3,2 % + 0,51 $\mu$ W		
		>10 nW ... 100 $\mu$ W (-50 dBm ... -10 dBm)	2,5 MHz ... 1,3 GHz		3,9%
		>0,1 pW ... 10 nW (-100 dBm ... -50 dBm)	2,5 MHz ... 1,3 GHz		4,7%
		>0,001 pW ... 0,1 pW (-120 dBm ... -100 dBm)	2,5 MHz ... 1,3 GHz		5,7%
Calibration of signal generators	100 $\mu$ W ... 100 mW (-10 dBm ... +20 dBm)	2,5 MHz ... 1,3 GHz	2,7 % + 0,51 $\mu$ W	Generator: VSWR $\leq$ 1,3	
		>10 nW ... 100 $\mu$ W (-50 dBm ... -10 dBm)	2,5 MHz ... 1,3 GHz		3,5%
	>0,1 pW ... 10 nW (-100 dBm ... -50 dBm)	2,5 MHz ... 1,3 GHz	4,3%		
	>0,001 pW ... 0,1 pW (-120 dBm ... -100 dBm)	2,5 MHz ... 1,3 GHz	5,4%		
	>10 $\mu$ W ... 100 mW	9 kHz ... <2,4 GHz	2,2 % + 72 nW		



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
<b>Reflection factor</b>	(-20 dBm ... +20 dBm)	2,4 GHz ... <12,4 GHz	2,9 % + 72 nW	
		12,4 GHz ... 18 GHz	3,5 % + 72 nW	
	>10 nW ... 12,589 $\mu$ W	10 MHz ... <2.4 GHz	5,5 %+ 156 pW	
		2,4 GHz ... <12,4 GHz	6,7 % + 156 pW	
	(-50 dBm ... -19 dBm)	2,4 GHz ... <12,4 GHz	6,7 % + 156 pW	
		12,4 GHz ... 18 GHz	10,4 % + 156 pW	
One port (Value and phase)	0 ... 1	9 kHz ... 20 GHz	See matrix M.1 & M.2	Z = 50 $\Omega$
				3.5mm Connector
	0 ... 1	9 kHz ... 18 GHz	See matrix M.3 & M.4	Also possible on site
				Z = 50 $\Omega$
	0 ... 1	9 kHz ... 18 GHz	See matrix M.5 & M.6	N Connector
				Also possible on site
	0 ... 1	9 kHz ... 18 GHz	See matrix M.7 & M.8	Z = 50 $\Omega$
				7mm Connector
<b>Transmission factor</b>	0 dB ... 80 dB	9 kHz ... 20 GHz	See matrix M.9 & M.10	Z = 50 $\Omega$
				3.5mm Connector
	0 dB ... 80 dB	9 kHz ... 18 GHz	See matrix M.11 & M.12	Also possible on site
				Z = 50 $\Omega$
0 dB ... 80 dB	9 kHz ... 18 GHz	See matrix M.13 & M.14	N Connector	
			Also possible on site	
				Z = 50 $\Omega$
				7mm Connector
				Also possible on site



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
	0 dB ... 80 dB	9 kHz ... 3 GHz	See matrix M.15 & M.16	Z = 50 $\Omega$ BNC Connector Also possible on site

Matrix M.1: HF- Reflection factor, Value |G|; 3.5mm - Connector 50  $\Omega$

Value   $\Gamma$	9 kHz ... 300 MHz	300 MHz ... 3 GHz	3 GHz ... 9 GHz	9 GHz ... 20 GHz
0	0.004	0.003 to 0.004	0.004	0.004 to 0.005
0.1	0.005 to 0.003	0.003 to 0.004	0.003 to 0.004	0.004 to 0.005
0.2	0.005 to 0.003	0.003 to 0.004	0.004	0.004 to 0.005
0.3	0.005 to 0.003	0.003 to 0.004	0.004	0.004 to 0.005
0.4	0.004 to 0.006	0.004	0.004 to 0.005	0.004 to 0.005
0.5	0.004 to 0.006	0.004	0.004 to 0.005	0.004 to 0.005
0.6	0.004 to 0.006	0.005 to 0.004	0.004 to 0.006	0.006 to 0.004
0.7	0.005 to 0.007	0.006 to 0.005	0.005 to 0.006	0.006 to 0.004
0.8	0.006 to 0.008	0.006 to 0.005	0.005 to 0.007	0.007 to 0.005
0.9	0.006 to 0.009	0.007 to 0.004	0.005 to 0.008	0.007 to 0.005
1	0.003 to 0.008	0.008 to 0.003	0.007 to 0.004	0.004 to 0.007



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Matrix M.2: HF- Reflection factor, Phase angle  $\varphi$ ; 3.5mm - Connector 50  $\Omega$

Value $ \Gamma $	9 kHz ... 300 MHz	300 MHz ... 3 GHz	3 GHz ... 9 GHz	9 GHz ... 20 GHz
0	-	-	-	-
0.1	2.4 deg to 1.7 deg	1.7 deg to 1.9 deg	1.8 deg to 2.0 deg	2.3 deg to 2.8 deg
0.2	1.4 deg to 0.9 deg	0.9 deg to 1.0 deg	1.0 deg to 1.1 deg	1.2 deg to 1.5 deg
0.3	0.9 deg to 0.6 deg	0.6 deg to 0.7 deg	0.7 deg to 0.8 deg	0.9 deg to 1.2 deg
0.4	0.8 deg to 0.5 deg	0.6 deg to 0.5 deg	0.6 deg to 0.7 deg	0.7 deg to 1.0 deg
0.5	0.7 deg to 0.5 deg	0.5 deg	0.5 deg to 0.7 deg	0.6 deg to 0.9 deg
0.6	0.5 deg to 0.6 deg	0.5 deg to 0.4 deg	0.4 deg to 0.6 deg	0.6 deg to 0.8 deg
0.7	0.4 deg to 0.6 deg	0.5 deg to 0.4 deg	0.4 deg to 0.6 deg	0.6 deg to 0.8 deg
0.8	0.4 deg to 0.6 deg	0.5 deg to 0.4 deg	0.4 deg to 0.6 deg	0.5 deg to 0.7 deg
0.9	0.3 deg to 0.6 deg	0.5 deg to 0.3 deg	0.4 deg to 0.6 deg	0.4 deg to 0.7 deg
1	0.2 deg to 0.4 deg	0.5 deg to 0.2 deg	0.3 deg to 0.4 deg	0.4 deg to 0.7 deg

Matrix M.3: HF- Reflection factor, Value  $|G|$ ; N - Connector 50  $\Omega$

Value $ \Gamma $	9 kHz ... 300 MHz	300 MHz ... 3 GHz	3 GHz ... 9 GHz	9 GHz ... 18 GHz
0	0.004	0.004	0.005 to 0.004	0.005 to 0.006
0.1	0.005 to 0.004	0.004	0.005 to 0.004	0.005 to 0.006
0.2	0.005 to 0.004	0.004 to 0.005	0.005 to 0.004	0.005 to 0.007
0.3	0.005 to 0.004	0.004 to 0.005	0.004 to 0.005	0.005 to 0.007
0.4	0.006 to 0.004	0.004 to 0.005	0.004 to 0.005	0.005 to 0.007
0.5	0.006 to 0.004	0.004 to 0.005	0.004 to 0.006	0.005 to 0.006
0.6	0.005 to 0.006	0.005 to 0.006	0.005 to 0.006	0.005 to 0.006
0.7	0.005 to 0.007	0.005 to 0.006	0.005 to 0.007	0.005 to 0.007
0.8	0.006 to 0.008	0.006 to 0.007	0.005 to 0.007	0.007 to 0.005
0.9	0.009 to 0.005	0.004 to 0.008	0.004 to 0.008	0.008 to 0.005
1	0.003 to 0.007	0.003 to 0.009	0.008 to 0.004	0.004 to 0.009

Matrix M.4: HF- Reflection factor, Phase angle  $\varphi$ ; N - Connector 50  $\Omega$

Value $ \Gamma $	9 kHz ... 300 MHz	300 MHz ... 3 GHz	3 GHz ... 9 GHz	9 GHz ... 18 GHz
0	-	-	-	-
0.1	2.5 deg to 1.8 deg	1.9 deg to 2.3 deg	2.4 deg to 2.0 deg	2.5 deg to 3.1 deg
0.2	1.5 deg to 0.9 deg	1.0 deg to 1.2 deg	1.0 deg to 1.2 deg	1.3 deg to 2.0 deg
0.3	1.0 deg to 0.7 deg	0.7 deg to 0.8 deg	0.7 deg to 0.9 deg	0.9 deg to 1.3 deg
0.4	0.8 deg to 0.6 deg	0.6 deg to 0.7 deg	0.6 deg to 0.8 deg	0.7 deg to 1.0 deg
0.5	0.7 deg to 0.5 deg	0.5 deg to 0.6 deg	0.5 deg to 0.7 deg	0.6 deg to 0.8 deg
0.6	0.6 deg to 0.5 deg	0.5 deg	0.5 deg to 0.6 deg	0.5 deg to 0.7 deg
0.7	0.4 deg to 0.6 deg	0.4 deg to 0.5 deg	0.4 deg to 0.6 deg	0.5 deg to 0.7 deg
0.8	0.4 deg to 0.6 deg	0.4 deg to 0.5 deg	0.4 deg to 0.6 deg	0.5 deg to 0.6 deg
0.9	0.6 deg to 0.4 deg	0.3 deg to 0.5 deg	0.3 deg to 0.6 deg	0.4 deg to 0.6 deg
1	0.2 deg to 0.4 deg	0.2 deg to 0.5 deg	0.2 deg to 0.5 deg	0.3 deg to 0.6 deg



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Matrix M.5: HF- Reflection factor, Value  $|G|$ ; 7mm - Connector 50  $\Omega$

Value $ \Gamma $	9 kHz ... 300 MHz	300 MHz ... 3 GHz	3 GHz ... 9 GHz	9 GHz ... 18 GHz
0	0.004	0.004	0.004 to 0.005	0.005 to 0.007
0.1	0.005 to 0.004	0.004	0.004	0.005 to 0.006
0.2	0.006 to 0.004	0.004	0.004	0.005 to 0.006
0.3	0.006 to 0.004	0.004 to 0.005	0.004 to 0.005	0.005 to 0.007
0.4	0.004 to 0.006	0.005 to 0.004	0.004 to 0.005	0.005 to 0.007
0.5	0.005 to 0.007	0.005 to 0.004	0.005 to 0.006	0.005 to 0.008
0.6	0.005 to 0.007	0.006 to 0.005	0.005 to 0.006	0.006 to 0.009
0.7	0.005 to 0.008	0.006 to 0.005	0.005 to 0.007	0.006 to 0.010
0.8	0.006 to 0.009	0.007 to 0.005	0.006 to 0.008	0.007 to 0.010
0.9	0.007 to 0.010	0.008 to 0.005	0.006 to 0.009	0.008 to 0.013
1	0.004	0.004 to 0.005	0.005 to 0.007	0.006 to 0.009

Matrix M.6: HF- Reflection factor, Phase angle  $\varphi$ ; 7mm - Connector 50  $\Omega$

Value $ \Gamma $	9 kHz ... 300 MHz	300 MHz ... 3 GHz	3 GHz ... 9 GHz	9 GHz ... 18 GHz
0	-	-	-	-
0.1	2.8 deg to 2.2 deg	2.2 deg to 2.3 deg	2.3 deg to 2.2 deg	2.6 deg to 3.2 deg
0.2	1.6 deg to 1.1 deg	1.1 deg to 1.2 deg	1.2 deg	1.3 deg to 1.7 deg
0.3	1.1 deg to 0.8 deg	0.8 deg	0.8 deg to 0.9 deg	0.9 deg to 1.3 deg
0.4	0.9 deg to 0.6 deg	0.7 deg to 0.6 deg	0.6 deg to 0.8 deg	0.8 deg to 1.1 deg
0.5	0.7 deg to 0.5 deg	0.6 deg to 0.5 deg	0.5 deg to 0.7 deg	0.7 deg to 0.9 deg
0.6	0.5 deg to 0.7 deg	0.5 deg	0.5 deg to 0.6 deg	0.6 deg to 0.9 deg
0.7	0.5 deg to 0.7 deg	0.5 deg to 0.4 deg	0.5 deg to 0.6 deg	0.6 deg to 0.9 deg
0.8	0.4 deg to 0.7 deg	0.5 deg to 0.4 deg	0.5 deg to 0.6 deg	0.5 deg to 0.7 deg
0.9	0.4 deg to 0.7 deg	0.5 deg to 0.4 deg	0.4 deg to 0.6 deg	0.5 deg to 0.8 deg
1	0.4 deg to 0.3 deg	0.3 deg	0.3 deg to 0.4 deg	0.4 deg to 0.6 deg

Matrix M.7: HF- Reflection factor, Value  $|G|$ ; BNC - Connector 50  $\Omega$

Value $ \Gamma $	9 kHz ... 300 MHz	300 MHz ... 3 GHz
0	0.008	0.008 to 0.009
0.1	0.008	0.008 to 0.009
0.2	0.008 to 0.009	0.008 to 0.010
0.3	0.008 to 0.009	0.008 to 0.011
0.4	0.008 to 0.009	0.009 to 0.013
0.5	0.008 to 0.009	0.009 to 0.016
0.6	0.008 to 0.010	0.010 to 0.018
0.7	0.009 to 0.011	0.011 to 0.021
0.8	0.010 to 0.012	0.012 to 0.024
0.9	0.011 to 0.013	0.013 to 0.027
1	0.011 to 0.013	0.013 to 0.030



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Matrix M.8: HF- Reflection factor, Phase angle  $\varphi$ ; BNC - Connector 50  $\Omega$

Value $ \Gamma $	9 kHz ... 300 MHz	300 MHz ... 3 GHz
0	-	-
0.1	4.1 deg to 4.6 deg	4.6 deg to 5.2 deg
0.2	2.1 deg to 2.4 deg	2.4 deg to 3.3 deg
0.3	1.4 deg to 1.6 deg	1.6 deg to 2.8 deg
0.4	1.1 deg to 1.3 deg	1.3 deg to 2.6 deg
0.5	0.9 deg to 1.1 deg	1.1 deg to 2.5 deg
0.6	0.8 deg to 1.0 deg	1.0 deg to 2.4 deg
0.7	0.7 deg to 0.9 deg	0.9 deg to 2.4 deg
0.8	0.7 deg to 0.9 deg	0.9 deg to 2.4 deg
0.9	0.7 deg to 0.9 deg	0.9 deg to 2.4 deg
1	0.6 deg to 0.8 deg	0.8 deg to 2.4 deg

Matrix M.9: HF- Transmission factor; 3.5mm - Connector 50  $\Omega$

Attenuation absolute	9 kHz ... 300 MHz	300 MHz ... 3 GHz	3 GHz ... 9 GHz	9 GHz ... 20 GHz
0 dB	0.04 dB to 0.05 dB	0.05 dB to 0.09 dB	0.09 dB to 0.15 dB	0.15 dB
3 dB	0.08 dB to 0.09 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
6 dB	0.08 dB to 0.09 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
10 dB	0.09 dB to 0.08 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
20 dB	0.09 dB to 0.07 dB	0.07 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB to 0.15 dB
30 dB	0.09 dB to 0.07 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
40 dB	0.09 dB to 0.08 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
50 dB	0.10 dB to 0.08 dB	0.08 dB to 0.12 dB	0.12 dB to 0.17 dB	0.16 dB to 0.17 dB
60 dB	0.14 dB to 0.12 dB	0.12 dB to 0.15 dB	0.15 dB to 0.19 dB	0.19 dB to 0.20 dB
70 dB	0.20 dB to 0.16 dB	0.17 dB to 0.19 dB	0.19 dB to 0.23 dB	0.26 dB to 0.31 dB
80 dB	0.36 dB to 0.21 dB	0.21 dB to 0.24 dB	0.24 dB to 0.27 dB	0.50 dB to 0.71 dB

Matrix M.10: HF- Transmission factor, Phase angle  $\varphi$ ; 3.5mm - Connector 50  $\Omega$

Attenuation absolute	9 kHz to 300 MHz	300 MHz to 3 GHz	3 GHz to 9 GHz	9 GHz to 20 GHz
0 dB	0.4 deg	0.4 deg to 0.8 deg	0.8 deg to 1.3 deg	1.3 deg to 1.8 deg
3 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.3 deg	1.3 deg to 1.9 deg
6 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.3 deg	1.3 deg to 1.9 deg
10 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.3 deg	1.3 deg to 1.9 deg
20 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.3 deg to 1.9 deg
30 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.3 deg to 1.9 deg
40 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.3 deg to 1.9 deg
50 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.4 deg to 1.9 deg
60 dB	0.8 deg to 0.9 deg	0.8 deg to 1.1 deg	1.1 deg to 1.5 deg	1.5 deg to 2.1 deg
70 dB	1.4 deg to 1.1 deg	1.1 deg to 1.3 deg	1.3 deg to 1.7 deg	1.9 deg to 2.6 deg
80 dB	2.4 deg to 1.4 deg	1.5 deg to 1.6 deg	1.6 deg to 2.0 deg	3.4 deg to 4.9 deg

1) The given extended measurement uncertainty is the standard uncertainty of the measurement multiplied by an extension factor  $k = 2$ , witch corresponds to a confidence level of about 95% for a normal distribution.



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Matrix M.11: HF- Transmission factor  $r$ ; N - Connector 50  $\Omega$

Attenuation absolute	9 kHz to 300 MHz	300 MHz to 3 GHz	3 GHz to 9 GHz	9 GHz to 18 GHz
0 dB	0.04 dB to 0.05 dB	0.05 dB to 0.09 dB	0.09 dB to 0.15 dB	0.15 dB
3 dB	0.08 dB to 0.09 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
6 dB	0.08 dB to 0.09 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
10 dB	0.08 dB to 0.09 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
20 dB	0.09 dB to 0.07 dB	0.07 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB to 0.15 dB
30 dB	0.09 dB to 0.07 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
40 dB	0.09 dB to 0.08 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
50 dB	0.08 dB to 0.10 dB	0.08 dB to 0.12 dB	0.12 dB to 0.17 dB	0.16 dB to 0.17 dB
60 dB	0.14 dB to 0.12 dB	0.12 dB to 0.15 dB	0.15 dB to 0.19 dB	0.19 dB to 0.20 dB
70 dB	0.20 dB to 0.16 dB	0.17 dB to 0.19 dB	0.19 dB to 0.23 dB	0.26 dB to 0.31 dB
80 dB	0.36 dB to 0.21 dB	0.22 dB to 0.24 dB	0.24 dB to 0.27 dB	0.50 dB to 0.68 dB

Matrix M.12: HF- Transmission factor, Phase angle  $\varphi$ ; N - Connector 50  $\Omega$

Attenuation absolute	9 kHz to 300 MHz	300 MHz to 3 GHz	3 GHz to 9 GHz	9 GHz to 18 GHz
0 dB	0.4 deg	0.4 deg to 0.8 deg	0.8 deg to 1.3 deg	1.3 deg to 1.7 deg
3 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.3 deg	1.3 deg to 1.8 deg
6 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.3 deg	1.3 deg to 1.8 deg
10 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.3 deg	1.3 deg to 1.8 deg
20 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.3 deg to 1.8 deg
30 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.3 deg to 1.8 deg
40 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.3 deg to 1.8 deg
50 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.4 deg to 1.8 deg
60 dB	0.8 deg to 1.0 deg	0.8 deg to 1.1 deg	1.1 deg to 1.5 deg	1.5 deg to 2.0 deg
70 dB	1.4 deg to 1.1 deg	1.1 deg to 1.3 deg	1.3 deg to 1.7 deg	1.9 deg to 2.5 deg
80 dB	2.4 deg to 1.4 deg	1.5 deg to 1.6 deg	1.6 deg to 2.0 deg	3.5 deg to 4.8 deg

Matrix M.13: HF- Transmission factor; 7mm - Connector 50  $\Omega$

Attenuation absolute	9 kHz to 300 MHz	300 MHz to 3 GHz	3 GHz to 9 GHz	9 GHz to 18 GHz
0 dB	0.04 dB to 0.05 dB	0.05 dB to 0.09 dB	0.09 dB to 0.15 dB	0.15 dB
3 dB	0.08 dB to 0.09 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
6 dB	0.08 dB to 0.09 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
10 dB	0.08 dB to 0.09 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
20 dB	0.09 dB to 0.07 dB	0.07 dB to 0.11 dB	0.11 dB to 0.16 dB	0.15 dB to 0.16 dB
30 dB	0.09 dB to 0.07 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
40 dB	0.09 dB to 0.08 dB	0.08 dB to 0.11 dB	0.11 dB to 0.16 dB	0.16 dB
50 dB	0.08 dB to 0.10 dB	0.08 dB to 0.12 dB	0.12 dB to 0.17 dB	0.16 dB to 0.17 dB
60 dB	0.14 dB to 0.12 dB	0.12 dB to 0.15 dB	0.15 dB to 0.19 dB	0.19 dB to 0.21 dB
70 dB	0.20 dB to 0.16 dB	0.17 dB to 0.19 dB	0.19 dB to 0.23 dB	0.26 dB to 0.31 dB
80 dB	0.36 dB to 0.21 dB	0.22 dB to 0.24 dB	0.24 dB to 0.27 dB	0.51 dB to 0.70 dB

1) The given extended measurement uncertainty is the standard uncertainty of the measurement multiplied by an extension factor  $k = 2$ , witch corresponds to a confidence level of about 95% for a normal distribution.



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Matrix M.14: HF- Transmission factor, Phase angle  $\varphi$ ; 7mm - Connector 50  $\Omega$

Attenuation absolute	9 kHz to 300 MHz	300 MHz to 3 GHz	3 GHz to 9 GHz	9 GHz to 18 GHz
0 dB	0.4 deg	0.4 deg to 0.8 deg	0.8 deg to 1.3 deg	1.3 deg to 1.7 deg
3 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.3 deg	1.3 deg to 1.8 deg
6 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.3 deg	1.3 deg to 1.8 deg
10 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.3 deg	1.3 deg to 1.8 deg
20 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.3 deg to 1.8 deg
30 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.3 deg to 1.8 deg
40 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.3 deg to 1.8 deg
50 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg	0.9 deg to 1.4 deg	1.4 deg to 1.9 deg
60 dB	0.8 deg to 1.0 deg	0.8 deg to 1.1 deg	1.1 deg to 1.5 deg	1.5 deg to 2.0 deg
70 dB	1.4 deg to 1.1 deg	1.1 deg to 1.3 deg	1.3 deg to 1.7 deg	1.9 deg to 2.5 deg
80 dB	2.4 deg to 1.4 deg	1.5 deg to 1.6 deg	1.6 deg to 2.0 deg	3.5 deg to 4.9 deg

Matrix M.15: HF- Transmission factor; BNC - Connector 50  $\Omega$

Attenuation absolute	9 kHz to 300 MHz	300 MHz to 3 GHz
0 dB	0.04 dB to 0.05 dB	0.05 dB to 0.09 dB
3 dB	0.08 dB to 0.09 dB	0.08 dB to 0.11 dB
6 dB	0.10 dB to 0.08 dB	0.08 dB to 0.11 dB
10 dB	0.10 dB to 0.08 dB	0.08 dB to 0.11 dB
20 dB	0.10 dB to 0.07 dB	0.07 dB to 0.11 dB
30 dB	0.10 dB to 0.07 dB	0.08 dB to 0.11 dB
40 dB	0.10 dB to 0.08 dB	0.08 dB to 0.11 dB
50 dB	0.11 dB to 0.08 dB	0.08 dB to 0.12 dB
60 dB	0.15 dB to 0.12 dB	0.12 dB to 0.15 dB
70 dB	0.21 dB to 0.16 dB	0.17 dB to 0.19 dB
80 dB	0.37 dB to 0.21 dB	0.22 dB to 0.24 dB

Matrix M.16: HF- Transmission factor; Phase angle  $\varphi$ ; BNC - Connector 50  $\Omega$

Attenuation absolute	9 kHz to 300 MHz	300 MHz to 3 GHz
0 dB	0.4 deg	0.4 deg to 0.8 deg
3 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg
6 dB	0.6 deg to 0.7 deg	0.6 deg to 0.9 deg
10 dB	0.7 deg to 0.6 deg	0.6 deg to 0.9 deg
20 dB	0.8 deg to 0.6 deg	0.6 deg to 0.9 deg
30 dB	0.8 deg to 0.6 deg	0.6 deg to 0.9 deg
40 dB	0.8 deg to 0.6 deg	0.6 deg to 0.9 deg
50 dB	0.8 deg to 0.6 deg	0.6 deg to 0.9 deg
60 dB	1.0 deg to 0.8 deg	0.8 deg to 1.1 deg
70 dB	1.4 deg to 1.1 deg	1.1 deg to 1.3 deg
80 dB	2.5 deg to 1.4 deg	1.5 deg to 1.6 deg



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks	
<b>Calibration of Oscilloscopes</b>					
Rectangular voltage amplitude	1 mV ... 12 mV	1 kHz/1 M $\Omega$	$1,5 \cdot 10^{-3} U + 12 \mu\text{V}$	Also possible on site <sup>2)</sup>	
	> 12 mV ... 120 mV	1 kHz/1 M $\Omega$	$1,2 \cdot 10^{-3} U + 16 \mu\text{V}$		
	> 120 mV ... 600 mV	1 kHz/1 M $\Omega$	$1,2 \cdot 10^{-3} U + 39 \mu\text{V}$		
	> 600 mV ... 1,2 V	1 kHz/1 M $\Omega$	$1,2 \cdot 10^{-3} U + 62 \mu\text{V}$		
	> 1,2 V ... 5,5 V	1 kHz/1 M $\Omega$	$1,2 \cdot 10^{-3} U + 310 \mu\text{V}$		
	> 5,5 V ... 12 V	1 kHz/1 M $\Omega$	$1,2 \cdot 10^{-3} U + 700 \mu\text{V}$		
	> 12 V ... 30 V	1 kHz/1 M $\Omega$	$1,2 \cdot 10^{-3} U + 2,7 \text{ mV}$		
	> 30 V ... 60 V	1 kHz/1 M $\Omega$	$1,2 \cdot 10^{-3} U + 3,3 \text{ mV}$		
	> 60 V ... 120 V	1 kHz/1 M $\Omega$	$1,2 \cdot 10^{-3} U + 5,9 \text{ mV}$		
	> 120 V ... 200 V	1 kHz/1 M $\Omega$	$1,3 \cdot 10^{-3} U + 27 \text{ mV}$		
	DC voltage	1 mV ... 12 mV	1 kHz/50 $\Omega$		$1,5 \cdot 10^{-3} U + 12 \mu\text{V}$
		> 12 mV ... 120 mV	1 kHz/50 $\Omega$		$1,2 \cdot 10^{-3} U + 16 \mu\text{V}$
> 120 mV ... 600 mV		1 kHz/50 $\Omega$	$1,2 \cdot 10^{-3} U + 39 \mu\text{V}$		
> 600 mV ... 1,2 V		1 kHz/50 $\Omega$	$1,2 \cdot 10^{-3} U + 62 \mu\text{V}$		
> 1,2 V ... 5,5 V		1 kHz/50 $\Omega$	$1,2 \cdot 10^{-3} U + 310 \mu\text{V}$		
1 mV ... 300 mV		DC/1 M $\Omega$	$290 \cdot 10^{-6} U + 32 \mu\text{V}$		
> 300 mV ... 1,5 V		DC/1 M $\Omega$	$290 \cdot 10^{-6} U + 90 \mu\text{V}$		
> 1,5 V ... 3 V		DC/1 M $\Omega$	$290 \cdot 10^{-6} U + 130 \mu\text{V}$		
> 3 V ... 6 V		DC/1 M $\Omega$	$290 \cdot 10^{-6} U + 430 \mu\text{V}$		
> 6 V ... 15 V		DC/1 M $\Omega$	$290 \cdot 10^{-6} U + 630 \mu\text{V}$		
> 15 V ... 200 V		DC/1 M $\Omega$	$290 \cdot 10^{-6} U + 840 \mu\text{V}$		
		1 mV ... 300 mV	DC/50 $\Omega$	$290 \cdot 10^{-6} U + 32 \mu\text{V}$	
	> 300 mV ... 1.5 V	DC/50 $\Omega$	$290 \cdot 10^{-6} U + 90 \mu\text{V}$		
	> 1,5 V ... 3 V	DC/50 $\Omega$	$290 \cdot 10^{-6} U + 130 \mu\text{V}$		



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
<b>Time base</b>	> 3 V ... 5,5 V	DC/50 $\Omega$	$290 \cdot 10^{-6} U + 100 \mu V$	
Sampling rate	0,2 ms	99,5 MHz; 100,5 MHz 30 mVpp ... 1 Vpp 100 MS/s	$50 \cdot 10^{-9} t$	t = Measurement value
Time interval	1 ms	10 MHz / 1 Vpp	$290 \cdot 10^{-9} t$	
Time marker	0,5 ns ... 1 s	100 mV ... 1 V	$1,1 \cdot 10^{-6} t + 12 \text{ ps}$	
Risetime	$\geq 350 \text{ ps}$	4,5 mV ... 3,1 V	39 ps	
Flatness	5 mVpp ... 5 Vpp	$\leq 300 \text{ MHz}$	3,1 %	50 $\Omega$ , VSWR $\leq 1,6$
		> 300 MHz ... 550 MHz	4,1 %	Calibrated to $U_{inc}$
	5 mVpp ... 3 Vpp	> 550 MHz ... 1,1 GHz	5,1 %	
		> 1,1 GHz ... 3,2 GHz	6,2 %	
		$\leq 10 \text{ MHz}$	3,2 %	1 M $\Omega$ , $C_{in} \leq 7 \text{ pF}$
	5 mVpp ... 5 Vpp	> 10 MHz ... 100 MHz	5,9 %	Calibrated to $U_{Load}$
		> 100 MHz ... 150 MHz	11 %	
> 150 MHz ... 250 MHz		14 %		
Input resistance	50 $\Omega$		0,13 %	
	1 M $\Omega$		0,08 %	
<b>Optical power</b>				
Calibration of fiber optic power measurement instruments	-24 dBm ... -30 dBm	$\lambda = 850 \text{ nm}$	2,0 %	50 $\mu\text{m}$ Multimode
	-22 dBm ... -30 dBm	$\lambda = 1300 \text{ nm}$	2,0 %	
Absolute power	-5 dBm ... -30 dBm	$\lambda = 1310 \text{ nm}$	1,1 %	9 $\mu\text{m}$ Singlemode
	-5 dBm ... -30 dBm	$\lambda = 1550 \text{ nm}$	1,1 %	
Linearity	-24 dBm ... -60 dBm	$\lambda = 850 \text{ nm}$	1,6 %	50 $\mu\text{m}$ Multimode
	-22 dBm ... -60 dBm	$\lambda = 1300 \text{ nm}$	1,5 %	
	-5 dBm ... -60 dBm	$\lambda = 1310 \text{ nm}$	1,5 %	9 $\mu\text{m}$ Singlemode
	-5 dBm ... -60 dBm	$\lambda = 1550 \text{ nm}$	1,6 %	
Calibration of fiber optic sources	0 dBm ... -60 dBm	$\lambda = 800 \dots 900 \text{ nm}$	1,5 %	50 $\mu\text{m}$ Multimode
	-5 dBm ... -60 dBm	$\lambda = 1250 \dots 1350 \text{ nm}$	1,4 %	
Absolute power	-5 dBm ... -60 dBm	$\lambda = 1200 \dots 1600 \text{ nm}$	1,1 %	9 $\mu\text{m}$ Singlemode
	-5 dBm ... -60 dBm	$\lambda = 1600 \dots 1650 \text{ nm}$	1,2 %	



## SCS-Directory

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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
Calibration of fiber optic attenuators	Attenuation range			
	0 dB ... 40 dB	$\lambda = 850$ nm	1,6 %	50 $\mu$ m Multimode
	0 dB ... 40 dB	$\lambda = 1300$ nm	1,6 %	
Insertion loss	0 dB ... 60 dB	$\lambda = 1310$ nm	1,6 %	9 $\mu$ m Singlemode
	0 dB ... 60 dB	$\lambda = 1550$ nm	1,6 %	
<b>Wavelength of sources</b>	600 nm ... < 1520 nm	P = +10 ... -60 dBm	0,35 nm	
	1520 nm ... 1620 nm		0,07 nm	
	> 1620 nm ... 1750 nm		0,35 nm	
<b>Calibration of OTDR</b>	Distance:	$\lambda$ :	Deviation of the distance scale:	Also possible on site <sup>2)</sup>
SM-modules	0 km ... 100 km	1200 nm ... 1650 nm	3,8•10 <sup>-5</sup> m/m	
Scale of attenuation	0 dB ... 30 dB	1310 nm	0,013 dB/dB	
		1550 nm	0,022 dB/dB	
		1625 nm	0,026 dB/dB	
		1650 nm	0,023 dB/dB	
<b>Temperature</b>				
Thermal calibration				More units possible: °F; K
Fixed-point for ITS-90	0,01 °C	Triple point of water	0,015 K	
Thermometer with direct display and resistance thermometer	-90 °C ... 125 °C	Comparison with a standard platinum resistance thermometer in air in the bloc calibrator	0,035 K	Also possible in the branches and on site <sup>2), 8)</sup>
	> 125 °C ... 165 °C		0,084 K	
	> 165 °C ... 450 °C		0,16 K	
	> 450 °C ... 650 °C	0,21 K		
	> -30 °C ... 165 °C	Comparison with a standard platinum resistance thermometer in liquid in the bath	0,08 K	
	-50 °C ... < -40 °C	Comparison with a standard platinum resistance thermometer in air in the climatic chamber	1,22 K	
	-40 °C ... < -20 °C		0,37 K	
	-20 °C ... < -10 °C		0,26 K	
	-10 °C ... < 30 °C		0,25 K	



## SCS-Directory

## Accreditation number: SCS 0058

Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
Thermocouple elements	30 °C ... < 40 °C		0,28 K	
	40 °C ... < 60 °C		0,31 K	
	60 °C ... < 100 °C		1,3 K	
	100 °C ... < 120 °C		1,0 K	
	120 °C ... 150 °C		1,1 K	
Type K; Type N	-90 °C ... 125 °C	Comparison with a standard platinum resistance thermometer in air in the bloc calibrator	0,29 K + 0,002• t	Also possible in the branches and on site <sup>2), 8)</sup>
	> 125 °C ... 165 °C		0,30 K + 0,002• t	
	> 165 °C ... 450 °C		0,31 K + 0,002• t	
	> 450 °C ... 650 °C		0,34 K + 0,002• t	
Type J; Type T	-90 °C ... 125 °C		0,23 K + 0,005• t	
	> 125 °C ... 165 °C		0,23 K + 0,005• t	
	> 165 °C ... 450 °C		0,27 K + 0,005• t	
	> 450 °C ... 650 °C		0,30 K + 0,005• t	
Type R; Type S	0 °C ... 650 °C		1,0 K + 0,0004• t	
Type K; Type N	-30 °C ... 165 °C	Comparison with a standard platinum resistance thermometer in liquid in the bath	0,3 K + 0,002• t	Also possible in the branches and on site <sup>2), 8)</sup>
Type J; Type T	-30 °C ... 165 °C		0,32 K + 0,005• t	
Type R; Type S	-30 °C ... 165 °C		1,0 K + 0,0004• t	
Type K; Type N	-50 °C ... < -40 °C	Comparison with a standard platinum resistance thermometer in air in the climatic chamber	1,3 K	
	-40 °C ... < -20 °C		0,47 K	
	-20 °C ... < 40 °C		0,4 K	
	40 °C ... < 60 °C		0,42 K	
	60 °C ... 150 °C		1,31 K	
Type J; Type T	-50 °C ... < -40 °C		1,3 K	
	-40 °C ... < -20 °C		0,45 K	
	-20 °C ... < 30 °C		0,35 K	
	30 °C ... < 60 °C		0,41 K	
Type R; Type S	60 °C ... < 150 °C		1,32 K	
	-50 °C ... < -40 °C		1,6 K	
	-40 °C ... < 60 °C		1,1 K	
	60 °C ... 150 °C		1,7 K	



## SCS-Directory

## Accreditation number: SCS 0058

Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
Thermal installations				
Bloc calibrator with dry bloc insert	-90 °C ... < 125 °C	With PRT Pt 100	0,033 K	Also possible in the branches and on site <sup>2)</sup>
	125 °C ... 165 °C		0,083 K	
	> 165 °C ... 250 °C		0,1 K	
	> 250 °C ... 450 °C		0,16 K	
	> 450 °C ... 650 °C		0,21 K	
Bloc calibrator with micro bath insert	- 30 °C ... 165 °C		0,11 K	
(Ovens, climate chambers) Display deviation from the (reference-) measuring point	-90 °C ... -50 °C	With PRT Pt 100	0,2 K	Also possible on site <sup>2)</sup>
	> -50 °C ... 125 °C		0,2 K	
	> 125 °C ... 250 °C	With TC type J	0,21 K	
	> 250 °C ... 350 °C		1,1 K + 0.003• t	
measuring point in the thermal installations (Baths, Ovens, climate chambers)	-90 °C ... 150 °C	With PRT Pt 100	0,2 K	Also possible on site <sup>2)</sup>
	> 150 °C ... 350 °C	With TC Type J	1,0 K + 0.003• t	
<b>Relative humidity</b>	20 %rH ... < 45 %rH	Measuring point in climate chamber at 23 °C	1,43 %rH	
	45 %rH ... 80 %rH		1,5 %rH	
Electric calibration				
Measurement of RTD- temperature calibrator	-200 °C ... 300 °C	Pt 100 (Pt 385)	0,01 K	Also possible in the branches and on site <sup>2)</sup>
	> 300 °C ... 800 °C		0,02 K	
Simulations of RTD-temperature measuring instruments	-200 °C ... 0 °C	Pt 100 (Pt 385)	0,06 K	
	> 0 °C ... 100 °C		0,08 K	
	> 100 °C ... 630 °C		0,12 K	
	> 630 °C ... 800 °C	Pt 200 (Pt 385)	0,27 K	
	-200 °C ... 100 °C		0,05 K	
	> 100 °C ... 300 °C		0,06 K	
	> 300 °C ... 400 °C		0,14 K	
	> 400 °C ... 600 °C		0,16 K	
	> 600 °C ... 630 °C		0,19 K	
	-200 °C ... -80 °C	Pt 500 (Pt 385)	0,05 K	
	> -80 °C ... 100 °C		0,06 K	
	> 100 °C ... 260 °C		0,07 K	
	> 260 °C ... 400 °C		0,10 K	



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
Measurement and simulations of thermocouple measuring instruments and -calibrators	> 400 °C ... 600 °C	Pt 1000 (Pt 385)	0,11 K	Also possible in the branches and on site <sup>2)</sup>
	> 600 °C ... 630 °C		0,13 K	
	-200 °C ... 0 °C		0,04 K	
	> 0 °C ... 100 °C		0,05 K	
	> 100 °C ... 260 °C		0,06 K	
	> 260 °C ... 300 °C		0,07 K	
	> 300 °C ... 400 °C		0,08 K	
	> 400 °C ... 600 °C		0,09 K	
	> 600 °C ... 630 °C		0,27 K	
	600 °C ... 800 °C	Typ B	0,51 K	
	> 800 °C ... 1820 °C	Typ C	0,39 K	
	0 °C ... 1000 °C		0,36 K	
	> 1000 °C ... 1800 °C		0,58 K	
	> 1800 °C ... 2316 °C	Typ E	0,97 K	
	-250 °C ... < -100 °C		0,58 K	
	-100 °C ... 650 °C		0,19 K	
	> 650 °C ... 2100 °C		0,24 K	
	-210 °C ... < -100 °C		Typ J	
	-100 °C ... < -30 °C	0,19 K		
	-30 °C ... < 150 °C	0,16 K		
	150 °C ... 760 °C	Typ K	0,20 K	
	> 760 °C ... 1200 °C		0,27 K	
	-210 °C ... < -100 °C		0,38 K	
	-100 °C ... < -25 °C		0,21 K	
-25 °C ... 120 °C	0,19 K			
> 120 °C ... 1000 °C	0,30 K			
> 1000 °C ... 1372 °C	Typ L	0,46 K		
-210 °C ... < -100 °C		0,43 K		
-100 °C ... 800 °C		0,30 K		
> 800 ... 900 °C	Typ N	0,20 K		
-210 °C ... < -100 °C		0,46 K		
-100 °C ... < -25 °C		0,25 K		
-25 °C ... 410 °C		0,22 K		



## SCS-Directory

Accreditation number: SCS 0058

Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
<b>Pressure</b>	> 410 °C ... 1300 °C	Typ R	0,31 K	
	0 °C ... < 250 °C		0,66 K	
	250 °C ... 1000 °C		0,40 K	
	> 1000 °C ... 1767 °C		0,46 K	
	0 °C ... < 250 °C	Typ S	0,54 K	
	250 °C ... 1400 °C		0,43 K	
	> 1400 °C ... 1767 °C		0,53 K	
	-250 °C ... < -150 °C	Typ T	0,73 K	
	-150 °C ... < 0 °C		0,28 K	
	0 °C ... 400 °C	Typ U	0,19 K	
	-200 °C ... < 0 °C		0,65 K	
	0 °C ... 600 °C		0,31 K	
Absolute pressure in fluids	0.01 mbar ... 13,8 mbar		0,094 mbar	Also other units possible: Pa; psi; mmHg; mmH2O
	> 13,8 mbar ... 14 bar		$35 \cdot 10^{-6} p + 0,004$ mbar	
	> 14 bar ... 70 bar		$50 \cdot 10^{-6} p$	
	> 70 bar ... 210 bar		$50 \cdot 10^{-6} p$	
	> 210 bar ... 1000 bar		$250 \cdot 10^{-6} p$	
Positive and negative gauge pressure in fluids	-900 mbar ... 14 bar		$35 \cdot 10^{-6} p$	Also possible on site <sup>2)</sup>
	> 14 bar ... 70 bar		$50 \cdot 10^{-6} p$	
	> 70 bar ... 210 bar		$50 \cdot 10^{-6} p$	
	> 210 bar ... 1000 bar		$25 \cdot 10^{-6} p$	
Differential pressure in fluids	-160 mbar ... -77 mbar		0,015 mbar	
	> -77 mbar ... -10 mbar		$120 \cdot 10^{-6} p + 0,006$ mbar	
	> -10 mbar ... < 10 mbar		$100 \cdot 10^{-6} p + 0,006$ mbar	
	10 mbar ... < 77 mbar		$120 \cdot 10^{-6} p + 0,006$ mbar	
	77 mbar ... 160 mbar		0,015 mbar	
	0 ... 46,7 kPa		20 °C ... 25 °C	



## SCS-Directory

Accreditation number: SCS 0058

Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
Manometer of blood pressure monitor	0 ... 350 mmHg		0,6 mmHg	According to Standard: SN EN ISO 81060-1
<b>Magnetic flux density</b>				
Calibration of magnetic field analyzers	0,1 $\mu$ T ... 200 $\mu$ T	10 Hz ... 1 kHz	1,9 % + 0,12 $\mu$ T	Also other units possible: A/m; A/cm, Gauss
	0,1 $\mu$ T ... 25 $\mu$ T	> 1 kHz ... 2 kHz		
	> 200 $\mu$ T ... 250 $\mu$ T	10 Hz ... 1 kHz	1,9 % + 0,12 $\mu$ T	
<b>Electric field strength</b>				
Calibration of electric field analyzers	0 V/m ... 1330 V/m	10 Hz ... 1 kHz	1,6 % + 0,12 V/m	
	0 V/m ... 293 V/m	> 1 kHz ... 100 kHz		
	1,3 kV/m ... 20 kV/m	50 Hz		
<b>CDN</b>				
Impedance	0 $\Omega$ ... 250 $\Omega$	9 kHz ... 230 MHz	4,0 $\Omega$	According to SN EN 61000-4-6
Voltage Division Factor	0 dB ... 60 dB	9 kHz ... 230 MHz	0,4 dB	Also possible on site
<b>LISN</b>				
Impedance	0 $\Omega$ ... 250 $\Omega$	9 kHz ... 100 kHz	0,35 $\Omega$	According to CISPR 16-1-2
		>100 kHz ... 5 MHz	0,8 $\Omega$	Also possible on site
		>5 MHz ... 30 MHz	0,8 $\Omega$	
Phase	-180 ° ... 180 °	9 kHz ... 100 kHz	2,0 °	
		>100 kHz ... 5 MHz	1,0 °	
		>5 MHz ... 30 MHz	4,0 °	
Voltage Division Factor		9 kHz ... 30 MHz	0,4 dB	
Isolation	40 dB	9 kHz ... 20 MHz	1,2 dB	
		>20 MHz ... 30 MHz	2,8 dB	
	50 dB	9 kHz ... 20 MHz	2,4 dB	
		>20 MHz ... 30 MHz	2,8 dB	
	60 dB	25 kHz ... 20 MHz	2,2 dB	
		>20 MHz ... 30 MHz	2,8 dB	



## SCS-Directory

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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
<b>Surge</b>	70 dB	100 kHz ... 3 MHz	1,6 dB	According to SN EN 61000-4-5
		>3 MHz ... 30 MHz	3,6 dB	
Peak Voltage	0,4 kV ... 5 kV		5,3 %	Also possible on site
Peak Current	1 A ... 4 kA		7,1 %	
Rise Time Voltage	0,4 $\mu$ s ... 10 $\mu$ s		21 ns	
Rise Time Current	0,4 $\mu$ s ... 10 $\mu$ s		100 ns	
Pulse duration Voltage	10 $\mu$ s ... 100 $\mu$ s		800 ns	
Pulse duration Current	10 $\mu$ s ... 100 $\mu$ s		100 ns	
<b>Burst</b>				According to SN EN 61000-4-4
Peak Voltage	0,1 kV ... 4,2 kV		4,9 %	Also possible on site
Rise Time	2 ns ... 1 $\mu$ s		0,34 ns	
Pulse duration	5 ns ... 1 $\mu$ s		1,1 ns	
Burst duration	2 ms ... 20 ms	5 kHz Puls	2 ms	
	0,2 ... 20 ms	100 kHz Puls	0,2 ms	
Burst period	10 ms ... 500 ms		20 ms	
<b>NSA</b> Of semi-anechoic chambers				According to CISPR 16-1-4: 2020
<b>Site VSWR</b> Of semi-anechoic chambers	30 MHz ... < 59 MHz		3,3 dB	Only possible on site.
	59 MHz ... < 85 MHz		2,8 dB	
	85 MHz ... < 200 MHz		2,2 dB	
	200 MHz ... 1000 MHz		2,1 dB	
	1 GHz ... 6 GHz		1,2 dB	Only possible on site.
	> 6 GHz ... 12 GHz		1,5 dB	
	> 12 GHz ... 18 GHz		1,6 dB	



## SCS-Directory

Accreditation number: SCS 0058

Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
<b>Calibration of instrument transformers</b>				
Inductive voltage transformer	2 kV $\leq$ U <sub>p</sub> $\leq$ 60 kV  Usr: 100 V; 100/ $\sqrt{3}$ V 110 V; 110/ $\sqrt{3}$ V	50 Hz	0,018 % / 0,27 min	IEC 61869-1 IEC 61869-3 EN 61869-1 EN 61869-3
Inductive current transformer	5 A $\leq$ I <sub>p</sub> $\leq$ 2 kA > 2 kA $\leq$ I <sub>p</sub> $\leq$ 6 kA  Isr: 1 A; 5 A	50 Hz 50 Hz	0,023 % / 1,0 min 0,022 % / 1,4 min	IEC 61869-1 IEC 61869-3 EN 61869-1 EN 61869-3

The dimensionless parts of the measurement uncertainty are relative values, referred to the measured value.

### Notes and limitations:

- 2) Calibration on site with larger measurement uncertainties
- 3) in Gümligen up to 35 kV, in Fehraltorf and on site up to 50 kV
- 4) in Gümligen up to 12 kV, in Fehraltorf and on site up to 50 kV
- 5) in the branch and on site up to 5 T $\Omega$  possible
- 6) in Gümligen up to 30 kV, in Fehraltorf and on site up to 100 kV
- 7) in Gümligen up to 20 kV, in Fehraltorf and on site up to 100 kV (Generator should be available on site)
- 8) in the branch and on site: -30 °C ... 165 °C

In case of contradictions in the language versions of the directories, the German version shall apply.

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