



## SCS Directory

Accreditation number: SCS 0058

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

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Initial accreditation: 06.12.1995  
Current accreditation: 14.03.2021 to 13.03.2026  
Scope of accreditation see: [www.sas.admin.ch](http://www.sas.admin.ch)  
(Accredited bodies)

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## Scope of accreditation as of 07.04.2021

### Calibration laboratory for electrical quantities, fiber optics, pressure, temperature, 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 220 mV ... < 2,2 V 2,2 V ... < 22 V 22 V ... < 220 V		7,2•10 <sup>-6</sup> + 0,6 $\mu$ V 3,5•10 <sup>-6</sup> + 1,6 $\mu$ V 2,6•10 <sup>-6</sup> + 7 $\mu$ V 3,5•10 <sup>-6</sup> + 120 $\mu$ V	Also possible in Fehraltorf and on site <sup>2)</sup>



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Calibration of voltage calibrators	220 V ... 1100 V		$4 \cdot 10^{-6} + 700 \mu\text{V}$	Also possible in Fehraltorf and on site <sup>2)</sup>	
	0 mV ... < 120 mV		$6.6 \cdot 10^{-6} + 0,1 \mu\text{V}$		
	120 mV ... < 1,2 V		$2 \cdot 10^{-6} + 0,2 \mu\text{V}$		
	1,2 V ... < 12 V		$2 \cdot 10^{-6} + 1 \mu\text{V}$		
	12 V ... < 120 V		$2 \cdot 10^{-6} + 14 \mu\text{V}$		
Fixed voltages	120 V ... 1050 V		$3 \cdot 10^{-6} + 200 \mu\text{V}$		
	100 mV		$6,5 \cdot 10^{-6}$		
Calibration of high voltage generators	1 V; 10 V; 100 V; 1000V		$2 \cdot 10^{-6}$	Also possible in Fehraltorf and on site <sup>3)</sup>	
	1 kV ... $\leq$ 10 kV	$R_L \geq 110 \text{ M}\Omega$	0,05 % + 0,11 V		
	> 10 kV ... 20 kV	$R_L \geq 200 \text{ M}\Omega$	0,06 % + 1,3 V		
	> 20 kV ... 35 kV	$R_L \geq 200 \text{ M}\Omega$	0,1 % + 3,0 V		
Calibration of voltage measurement instruments	> 35 kV ... 50 kV	$R_L \geq 760 \text{ M}\Omega$	1,2 % + 6,5 V	Also possible in Fehraltorf and on site <sup>4)</sup>	
	1 kV ... $\leq$ 10 kV		0,05 % + 0,11 V		
	> 10 kV ... 20 kV		0,05 % + 1,3 V		
<b>DC Current</b>	> 20 kV ... 35 kV		0,1 % + 3,1 V		
	> 35 kV ... 50 kV		1,2 % + 6,6 V		
	Calibration of ammeters				Also possible in Fehraltorf and on site <sup>2)</sup>
	0 $\mu\text{A}$ ... 12 $\mu\text{A}$		$16 \cdot 10^{-6} + 0,2 \text{ nA}$		
	> 12 $\mu\text{A}$ ... 120 $\mu\text{A}$		$16 \cdot 10^{-6} + 0,5 \text{ nA}$		
	> 120 $\mu\text{A}$ ... 1,2 mA		$16 \cdot 10^{-6} + 4,5 \text{ nA}$		
	> 1,2 mA ... 12 mA		$16 \cdot 10^{-6} + 41 \text{ nA}$		
	> 12 mA ... 120 mA		$16 \cdot 10^{-6} + 0,5 \mu\text{A}$		
> 120 mA ... 2 A		$17 \cdot 10^{-6} + 4,5 \mu\text{A}$			
> 2 A ... 20 A		$68 \cdot 10^{-6} + 43 \mu\text{A}$			
Calibration of current clamps	> 20 A ... 100 A		$73 \cdot 10^{-6} + 130 \mu\text{A}$		
	> 100 A ... 500 A	With current coil	$5,8 \cdot 10^{-3} + 26 \text{ mA}$		
Calibration of current calibrators	> 500 A ... 2500 A		$5,8 \cdot 10^{-3} + 160 \text{ mA}$	Also possible in Fehraltorf and on site <sup>2)</sup>	
	0 $\mu\text{A}$ ... 12 $\mu\text{A}$		$16 \cdot 10^{-6} + 0,11 \text{ nA}$		
	> 12 $\mu\text{A}$ ... 120 $\mu\text{A}$		$16 \cdot 10^{-6} + 0,4 \text{ nA}$		
	> 120 $\mu\text{A}$ ... 1,2 mA		$16 \cdot 10^{-6} + 3,6 \text{ nA}$		



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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>	> 1,2 mA ... 12 mA		$16 \cdot 10^{-6} + 35 \text{ nA}$	The measurement uncertainties indicated apply to decadic values  Also possible in Fehraltorf and on site <sup>2),5)</sup>	
	> 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 $\mu\Omega$		$70 \cdot 10^{-6}$		
	1 m $\Omega$		$45 \cdot 10^{-6}$		
	10 m $\Omega$ ; 100 m $\Omega$		$45 \cdot 10^{-6}$		
	With fixed resistors	1 $\Omega$ ; 10 $\Omega$			$10 \cdot 10^{-6}$
		100 $\Omega$ ; 1 k $\Omega$			$8 \cdot 10^{-6}$
		10 k $\Omega$			$5 \cdot 10^{-6}$
		19 k $\Omega$ ; 100 k $\Omega$			$8 \cdot 10^{-6}$
		1 M $\Omega$			$10 \cdot 10^{-6}$
		10 M $\Omega$			$12 \cdot 10^{-6}$
		100 M $\Omega$			$40 \cdot 10^{-6}$
1 G $\Omega$			$250 \cdot 10^{-6}$		
10 G $\Omega$			$520 \cdot 10^{-6}$		
100 G $\Omega$			$750 \cdot 10^{-6}$		
With precision resistance decades	1 T $\Omega$		$5 \cdot 10^{-3}$		
	10 T $\Omega$		$8 \cdot 10^{-3}$		
	100 T $\Omega$		$16 \cdot 10^{-3}$		
	10 m $\Omega$ ... 10 $\Omega$		$47 \cdot 10^{-6} + 0,82 \text{ m}\Omega$		
	> 10 $\Omega$ ... 1 k $\Omega$		$38 \cdot 10^{-6} + 1,3 \text{ m}\Omega$		
	> 1 k $\Omega$ ... 10 k $\Omega$		$29 \cdot 10^{-6} + 6 \text{ m}\Omega$		
	> 10 k $\Omega$ ... 100 k $\Omega$		$28 \cdot 10^{-6} + 58 \text{ m}\Omega$		
	> 100 k $\Omega$ ... 1 M $\Omega$		$33 \cdot 10^{-6} + 2,3 \text{ }\Omega$		
	> 1 M $\Omega$ ... 10 M $\Omega$		$150 \cdot 10^{-6} + 116 \text{ }\Omega$		
	> 10 M $\Omega$ ... 100 M $\Omega$		$600 \cdot 10^{-6} + 1,2 \text{ k}\Omega$		
> 100 M $\Omega$ ... 1 G $\Omega$		$0,14 \cdot 10^{-3}$			



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Calibration of resistances	> 1 G $\Omega$ ... 10 G $\Omega$		0,26•10 <sup>-3</sup>	Also possible in Fehraltorf and on site <sup>5)</sup>
	> 10 G $\Omega$ ... 100 G $\Omega$		0,6•10 <sup>-3</sup>	
	> 100 G $\Omega$ ... 1 T $\Omega$		0,9•10 <sup>-3</sup>	
	100 $\mu\Omega$ ... < 500 $\mu\Omega$		100•10 <sup>-6</sup>	
	500 $\mu\Omega$ ... < 5 m $\Omega$		75•10 <sup>-6</sup>	
	5 m $\Omega$ ... < 50 m $\Omega$		72•10 <sup>-6</sup>	
	50 m $\Omega$ ... < 500 m $\Omega$		44•10 <sup>-6</sup>	
	500 m $\Omega$ ... < 5 $\Omega$		10•10 <sup>-6</sup>	
	5 $\Omega$ ... < 50 $\Omega$		10•10 <sup>-6</sup>	
	50 $\Omega$ ... < 500 $\Omega$		10•10 <sup>-6</sup>	
	500 $\Omega$ ... < 5 k $\Omega$		10•10 <sup>-6</sup>	
	5 k $\Omega$ ... < 50 k $\Omega$		5,5•10 <sup>-6</sup>	
	50 k $\Omega$ ... < 500 k $\Omega$		7,5•10 <sup>-6</sup>	
	500 k $\Omega$ ... < 5 M $\Omega$		15•10 <sup>-6</sup>	
	5 M $\Omega$ ... < 50 M $\Omega$		60•10 <sup>-6</sup>	
	50 M $\Omega$ ... < 500 M $\Omega$		480•10 <sup>-6</sup>	
	500 M $\Omega$ ... < 5 G $\Omega$		600•10 <sup>-6</sup>	
5 G $\Omega$ ... < 50 G $\Omega$		850•10 <sup>-6</sup>		
50 G $\Omega$ ... < 500 G $\Omega$		1,65•10 <sup>-3</sup>		
500 G $\Omega$ ... < 5 T $\Omega$		6,8•10 <sup>-3</sup>		
5 T $\Omega$ ... < 50 T $\Omega$		9,2•10 <sup>-3</sup>		
50 T $\Omega$ ... 200 T $\Omega$		1,85•10 <sup>-2</sup>		
<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	0,11 %	
	> 80 W ... 7,68 kW	> 2 A ... 16 A	0,58 %	
		40 V ... 300 V		
	> 640 W ... 6 kW	> 16 A ... 20 A	0,58 %	
> 800 W ... 30 kW	20 A ... 100 A	0,11 %		



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Calibration of power analyzers	330 $\mu$ W ... 200 W	0,1 V ... 1000 V 3,3 mA ... 200 mA	0,58 %	Also possible in Fehraltorf 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	0,11 %	With current coil  Also possible in Fehraltorf and on site <sup>2)</sup>
	330 $\mu$ W ... <33 mW	0,1 V ... 1000 V 3,3 mA ... 1000 A	0,91 %	
	33 mW ... <110 mW		0,78 %	
	110 mW ... 100 kW		0,61 %	
> 100 kW ... 1 MW		0,83 %		
<b>AC Voltage</b> Calibration of voltage calibrators	10 mV ... < 22 mV	10 Hz	$954 \cdot 10^{-6} + 0,2 \mu$ V	Also possible in Fehraltorf and on site <sup>2)</sup>
		20 Hz; 40 Hz	$895 \cdot 10^{-6} + 0,1 \mu$ V	
		500 Hz; 1 kHz; 10 kHz;	$893 \cdot 10^{-6} + 0,1 \mu$ V	
		20 kHz; 50 kHz; 100 kHz	$470 \cdot 10^{-6} + 0,1 \mu$ V	
		200 kHz	$951 \cdot 10^{-6} + 0,1 \mu$ V	
		500 kHz	$1,3 \cdot 10^{-3} + 0,1 \mu$ V	
		700 kHz	$1,5 \cdot 10^{-3} + 0,2 \mu$ V	
		1 MHz	$1,5 \cdot 10^{-3} + 0,2 \mu$ V	
		22 mV ... < 70 mV	10 Hz	
	20 Hz		$696 \cdot 10^{-6} + 0,3 \mu$ V	
	40 Hz; 500 Hz; 1 kHz; 10 kHz		$680 \cdot 10^{-6} + 0,2 \mu$ V	
	20 kHz; 50 kHz		$702 \cdot 10^{-6} + 0,1 \mu$ V	
	100 kHz		$754 \cdot 10^{-6} + 0,1 \mu$ V	
	300 kHz		$812 \cdot 10^{-6} + 0,2 \mu$ V	
	500 kHz		$870 \cdot 10^{-6} + 0,1 \mu$ V	
	700 kHz		$1,2 \cdot 10^{-3} + 0,2 \mu$ V	
	1 MHz	$1,8 \cdot 10^{-3} + 0,2 \mu$ V		



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	70 mV ... < 220 mV	10 Hz	$150 \cdot 10^{-6} + 2 \mu\text{V}$	
		20 Hz	$150 \cdot 10^{-6} + 1 \mu\text{V}$	
		40 Hz	$100 \cdot 10^{-6} + 0,3 \mu\text{V}$	
		500 Hz; 1 kHz; 10 kHz; 20 kHz	$80 \cdot 10^{-6} + 0,3 \mu\text{V}$	
		50 kHz	$100 \cdot 10^{-6} + 0,2 \mu\text{V}$	
		100 kHz	$155 \cdot 10^{-6} + 0,2 \mu\text{V}$	
		200 kHz	$212 \cdot 10^{-6} + 0,1 \mu\text{V}$	
		500 kHz; 700 kHz	$295 \cdot 10^{-6} + 0,2 \mu\text{V}$	
		1 MHz	$443 \cdot 10^{-6} + 0,2 \mu\text{V}$	
	220 mV ... < 700 mV	10 Hz	$147 \cdot 10^{-6} + 8 \mu\text{V}$	
		20 Hz	$85 \cdot 10^{-6} + 3 \mu\text{V}$	
		40 Hz	$63 \cdot 10^{-6} + 2 \mu\text{V}$	
		500 Hz; 1 kHz; 10 kHz	$38 \cdot 10^{-6} + 2 \mu\text{V}$	
		20 kHz; 50 kHz; 100 kHz	$51 \cdot 10^{-6} + 1 \mu\text{V}$	
		200 kHz	$66 \cdot 10^{-6} + 1 \mu\text{V}$	
		500 kHz	$235 \cdot 10^{-6} + 1 \mu\text{V}$	
		700 kHz	$442 \cdot 10^{-6} + 1 \mu\text{V}$	
		1 MHz	$638 \cdot 10^{-6} + 1 \mu\text{V}$	
	700 mV ... < 2,2 V	10 Hz	$94 \cdot 10^{-6} + 25 \mu\text{V}$	
		20 Hz	$28 \cdot 10^{-6} + 10 \mu\text{V}$	
		40 Hz; 500 Hz; 1 kHz; 10 kHz; 20 kHz	$28 \cdot 10^{-6} + 3 \mu\text{V}$	
		50 kHz	$30 \cdot 10^{-6} + 1 \mu\text{V}$	
		100 kHz	$40 \cdot 10^{-6} + 2 \mu\text{V}$	
		200 kHz	$50 \cdot 10^{-6} + 2 \mu\text{V}$	
		500 kHz	$120 \cdot 10^{-6} + 1 \mu\text{V}$	
		700 kHz	$234 \cdot 10^{-6} + 2 \mu\text{V}$	
		1 MHz	$453 \cdot 10^{-6} + 2 \mu\text{V}$	



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	2,2 V ... < 7 V	10 Hz	$163 \cdot 10^{-6} + 42 \mu\text{V}$	
		20 Hz	$49 \cdot 10^{-6} + 28 \mu\text{V}$	
		40 Hz	$28 \cdot 10^{-6} + 13 \mu\text{V}$	
		500 Hz; 1 kHz; 10 kHz	$22 \cdot 10^{-6} + 14 \mu\text{V}$	
		20 kHz	$27 \cdot 10^{-6} + 10 \mu\text{V}$	
		50 kHz; 100 kHz	$33 \cdot 10^{-6} + 7 \mu\text{V}$	
		200 kHz	$51 \cdot 10^{-6} + 10 \mu\text{V}$	
		500 kHz	$348 \cdot 10^{-6} + 9 \mu\text{V}$	
		700 kHz	$407 \cdot 10^{-6} + 8 \mu\text{V}$	
		1 MHz	$424 \cdot 10^{-6} + 8 \mu\text{V}$	
	7 V ... < 22 V	10 Hz	$153 \cdot 10^{-6} + 291 \mu\text{V}$	
		20 Hz	$62 \cdot 10^{-6} + 73 \mu\text{V}$	
		40 Hz	$40 \cdot 10^{-6} + 21 \mu\text{V}$	
		500 Hz	$28 \cdot 10^{-6} + 29 \mu\text{V}$	
		1 kHz; 10 kHz; 20 kHz	$28 \cdot 10^{-6} + 15 \mu\text{V}$	
		50 kHz	$33 \cdot 10^{-6} + 17 \mu\text{V}$	
		100 kHz	$47 \cdot 10^{-6} + 12 \mu\text{V}$	
		200 kHz	$68 \cdot 10^{-6} + 10 \mu\text{V}$	
		500 kHz	$178 \cdot 10^{-6} + 12 \mu\text{V}$	
		700 kHz	$345 \cdot 10^{-6} + 41 \mu\text{V}$	
	1 MHz	$461 \cdot 10^{-6} + 41 \mu\text{V}$		
	22 V ... < 70 V	10 Hz	$112 \cdot 10^{-6} + 0,7 \text{ mV}$	
		20 Hz	$62 \cdot 10^{-6} + 257 \mu\text{V}$	
		40 Hz	$56 \cdot 10^{-6} + 181 \mu\text{V}$	
		500 Hz	$52 \cdot 10^{-6} + 111 \mu\text{V}$	
		1 kHz	$52 \cdot 10^{-6} + 138 \mu\text{V}$	
		10 kHz; 20 kHz	$52 \cdot 10^{-6} + 82 \mu\text{V}$	
		50 kHz	$52 \cdot 10^{-6} + 71 \mu\text{V}$	
		100 kHz	$66 \cdot 10^{-6} + 166 \mu\text{V}$	



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<b>AC Voltage</b>  Calibration of voltage measurement instruments	70 V ... < 220 V	10 Hz	$152 \cdot 10^{-6} + 2,1 \text{ mV}$	
		20 Hz	$68 \cdot 10^{-6} + 473 \text{ } \mu\text{V}$	
		40 Hz	$68 \cdot 10^{-6} + 195 \text{ } \mu\text{V}$	
		500 Hz; 1 kHz	$53 \cdot 10^{-6} + 222 \text{ } \mu\text{V}$	
		10 kHz; 20 kHz; 50 kHz	$53 \cdot 10^{-6} + 176 \text{ } \mu\text{V}$	
		100 kHz	$68 \cdot 10^{-6} + 601 \text{ } \mu\text{V}$	
	220 V ... < 700 V	10 Hz	$171 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
		20 Hz	$92 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
		40 Hz	$72 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
		500 Hz	$55 \cdot 10^{-6} + 860 \text{ } \mu\text{V}$	
		1 kHz	$55 \cdot 10^{-6} + 750 \text{ } \mu\text{V}$	
		10 kHz	$55 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
		20 kHz	$65 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
		50 kHz	$75 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
		100 kHz	$235 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
		700 V ... 1050 V	10 Hz	
	20 Hz		$93 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
	40 Hz		$72 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
	500 Hz; 1 kHz;		$56 \cdot 10^{-6} + 900 \text{ } \mu\text{V}$	
	10 kHz		$56 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
	20 kHz; 50 kHz		$76 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
	100 kHz		$235 \cdot 10^{-6} + 580 \text{ } \mu\text{V}$	
	10 mV ... < 22 mV		10 Hz; 20 Hz	
		40 Hz; 500 Hz; 1 kHz;	$840 \cdot 10^{-6} + 2,4 \text{ } \mu\text{V}$	
		10 kHz; 20 kHz;		
		50 kHz		
		100 kHz	$893 \cdot 10^{-6} + 3,5 \text{ } \mu\text{V}$	
		200 kHz	$895 \cdot 10^{-6} + 5,8 \text{ } \mu\text{V}$	
500 kHz		$895 \cdot 10^{-6} + 12 \text{ } \mu\text{V}$		
700 kHz		$900 \cdot 10^{-6} + 18 \text{ } \mu\text{V}$		





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	22 mV ... < 70 mV	1 MHz	$956 \cdot 10^{-6} + 18 \mu\text{V}$		
		10 Hz	$217 \cdot 10^{-6} + 24 \mu\text{V}$		
		20 Hz	$136 \cdot 10^{-6} + 18 \mu\text{V}$		
		40 Hz	$101 \cdot 10^{-6} + 2,4 \mu\text{V}$		
		500 Hz; 1 kHz; 10 kHz; 20 kHz	$93 \cdot 10^{-6} + 2,4 \mu\text{V}$		
		50 kHz; 100 kHz	$107 \cdot 10^{-6} + 2,4 \mu\text{V}$		
		200 kHz	$116 \cdot 10^{-6} + 4,7 \mu\text{V}$		
		500 kHz	$172 \cdot 10^{-6} + 12 \mu\text{V}$		
		700 kHz	$280 \cdot 10^{-6} + 24 \mu\text{V}$		
	70 mV ... < 220 mV	1 MHz	$290 \cdot 10^{-6} + 24 \mu\text{V}$		
		10 Hz	$183 \cdot 10^{-6} + 24 \mu\text{V}$		
		20 Hz	$110 \cdot 10^{-6} + 18 \mu\text{V}$		
		40 Hz; 500 Hz; 1 kHz; 10 kHz; 20 kHz; 50 kHz; 100 kHz	$60 \cdot 10^{-6} + 2,4 \mu\text{V}$		
		200 kHz	$63 \cdot 10^{-6} + 4,7 \mu\text{V}$		
		500 kHz	$136 \cdot 10^{-6} + 12 \mu\text{V}$		
		700 kHz; 1 MHz	$250 \cdot 10^{-6} + 25 \mu\text{V}$		
		220 mV ... < 700 mV	10 Hz	$178 \cdot 10^{-6} + 25 \mu\text{V}$	
			20 Hz	$100 \cdot 10^{-6} + 18 \mu\text{V}$	
	40 Hz		$41 \cdot 10^{-6} + 6 \mu\text{V}$		
	500 Hz; 1 kHz; 10 kHz		$27 \cdot 10^{-6} + 6 \mu\text{V}$		
	20 kHz; 50 kHz		$33 \cdot 10^{-6} + 6 \mu\text{V}$		
	100 kHz		$36 \cdot 10^{-6} + 6 \mu\text{V}$		
	200 kHz		$58 \cdot 10^{-6} + 12 \mu\text{V}$		
	500 kHz		$100 \cdot 10^{-6} + 24 \mu\text{V}$		
	700 kHz; 1 MHz		$192 \cdot 10^{-6} + 58 \mu\text{V}$		
	700 mV ... < 2,2 V	10 Hz	$175 \cdot 10^{-6} + 35 \mu\text{V}$		
		20 Hz	$96 \cdot 10^{-6} + 20 \mu\text{V}$		
40 Hz; 500 Hz; 1 kHz		$26 \cdot 10^{-6} + 6 \mu\text{V}$			



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	2,2 V ... < 7 V	50 kHz; 100 kHz	$33 \cdot 10^{-6} + 7 \mu\text{V}$	
		200 kHz	$45 \cdot 10^{-6} + 12 \mu\text{V}$	
		500 kHz	$90 \cdot 10^{-6} + 24 \mu\text{V}$	
		700 kHz; 1 MHz	$187 \cdot 10^{-6} + 58 \mu\text{V}$	
		10 Hz	$176 \cdot 10^{-6} + 48 \mu\text{V}$	
		20 Hz	$96 \cdot 10^{-6} + 33 \mu\text{V}$	
		40 Hz	$27 \cdot 10^{-6} + 16 \mu\text{V}$	
		500 Hz; 1 kHz; 10 kHz; 20 kHz	$23 \cdot 10^{-6} + 17 \mu\text{V}$	
		50 kHz	$26 \cdot 10^{-6} + 14 \mu\text{V}$	
		100 kHz	$29 \cdot 10^{-6} + 14 \mu\text{V}$	
		200 kHz	$47 \cdot 10^{-6} + 20 \mu\text{V}$	
		500 kHz	$93 \cdot 10^{-6} + 120 \mu\text{V}$	
	7 V ... < 22 V	700 kHz	$186 \cdot 10^{-6} + 120 \mu\text{V}$	
		1 MHz	$258 \cdot 10^{-6} + 120 \mu\text{V}$	
		10 Hz	$178 \cdot 10^{-6} + 300 \mu\text{V}$	
		20 Hz	$98 \cdot 10^{-6} + 76 \mu\text{V}$	
		40 Hz	$34 \cdot 10^{-6} + 23 \mu\text{V}$	
		500 Hz	$27 \cdot 10^{-6} + 31 \mu\text{V}$	
		1 kHz; 10 kHz; 20 kHz	$27 \cdot 10^{-6} + 20 \mu\text{V}$	
		50 kHz	$29 \cdot 10^{-6} + 21 \mu\text{V}$	
		100 kHz	$38 \cdot 10^{-6} + 17 \mu\text{V}$	
		200 kHz	$64 \cdot 10^{-6} + 20 \mu\text{V}$	
		500 kHz	$222 \cdot 10^{-6} + 120 \mu\text{V}$	
		22 V ... < 70 V	700 kHz; 1 MHz	
	10 Hz		$184 \cdot 10^{-6} + 740 \mu\text{V}$	
	20 Hz		$105 \cdot 10^{-6} + 310 \mu\text{V}$	
	40 Hz		$48 \cdot 10^{-6} + 204 \mu\text{V}$	
	500 Hz		$37 \cdot 10^{-6} + 145 \mu\text{V}$	
	1 kHz		$37 \cdot 10^{-6} + 167 \mu\text{V}$	



## SCS Directory

## Accreditation number: SCS 0058

Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
Calibration of high voltage sources	70 V ... < 220 V	10 kHz; 20 kHz	$37 \cdot 10^{-6} + 124 \mu\text{V}$	
		50 kHz	$38 \cdot 10^{-6} + 136 \mu\text{V}$	
		100 kHz	$49 \cdot 10^{-6} + 203 \mu\text{V}$	
		10 Hz	$187 \cdot 10^{-6} + 2,1 \text{ mV}$	
		20 Hz	$107 \cdot 10^{-6} + 504 \mu\text{V}$	
		40 Hz	$56 \cdot 10^{-6} + 216 \mu\text{V}$	
		500 Hz	$41 \cdot 10^{-6} + 241 \mu\text{V}$	
		1 kHz; 10 kHz; 20 kHz	$41 \cdot 10^{-6} + 220 \mu\text{V}$	
	220 V ... < 700 V	50 kHz	$42 \cdot 10^{-6} + 200 \mu\text{V}$	
		100 kHz	$57 \cdot 10^{-6} + 612 \mu\text{V}$	
		50 Hz	$70 \cdot 10^{-6} + 0,82 \text{ mV}$	
		500 Hz; 1 kHz	$50 \cdot 10^{-6} + 1,1 \text{ mV}$	
	700 V ... < 1050 V	50 Hz	$70 \cdot 10^{-6} + 0,82 \text{ mV}$	
		500 Hz; 1 kHz	$52 \cdot 10^{-6} + 1,1 \text{ mV}$	
Calibration of high voltage measurement instruments	1 kV ... 10 kV	$R_L \geq 110 \text{ M}\Omega$ ; 50 Hz	0,15 % + 0,2 V	RMS; $\hat{U}/\sqrt{2}$
	> 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	$R_L \geq 200 \text{ M}\Omega$	0,13 % + 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 ... $\leq$ 10 kV	50 Hz	0,15 % + 0,2 V	RMS; $\hat{U}/\sqrt{2}$
	> 10 kV ... 20 kV		0,13 % + 1,3 V	Also possible in Fehraltorf and on site <sup>7)</sup>
	> 20 kV ... 30 kV		0,13 % + 3,1 V	
	> 30 kV ... 50 kV		1,2 % + 22 V	
	> 50 kV ... 100 kV		1,2 % + 29 V	
Calibration of current calibrators	0,1 mA ... < 0,77 mA	40 Hz ... 1 kHz	$350 \cdot 10^{-6}$	Also possible in Fehraltorf and on site <sup>2)</sup>
		> 1 kHz ... 5 kHz	$450 \cdot 10^{-6}$	
	0,77 mA ... < 2 mA	40 Hz ... 1 kHz	$250 \cdot 10^{-6}$	
		> 1 kHz ... 5 kHz	$350 \cdot 10^{-6}$	



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
Calibration of ammeters	2 mA ... < 10 mA	20 Hz ... < 40 Hz	$135 \cdot 10^{-6} + 0,5 \mu\text{A}$	Also possible in Fehraltorf and on site <sup>2)</sup>
		40 Hz ... 10 kHz	$105 \cdot 10^{-6} + 0,5 \mu\text{A}$	
	10 mA ... < 30 mA	20 Hz ... < 40 Hz	$140 \cdot 10^{-6} + 4,2 \mu\text{A}$	
		40 Hz ... 10 kHz	$115 \cdot 10^{-6} + 4,2 \mu\text{A}$	
	30 mA ... < 100 mA	20 Hz ... < 40 Hz	$140 \cdot 10^{-6} + 4,2 \mu\text{A}$	
		40 Hz ... 10 kHz	$115 \cdot 10^{-6} + 4,2 \mu\text{A}$	
	100 mA ... < 300 mA	20 Hz ... < 40 Hz	$160 \cdot 10^{-6} + 35 \mu\text{A}$	
		40 Hz ... 10 kHz	$140 \cdot 10^{-6} + 35 \mu\text{A}$	
	300 mA ... < 2 A	20 Hz ... < 40 Hz	$165 \cdot 10^{-6} + 36 \mu\text{A}$	
		40 Hz ... < 5 kHz	$140 \cdot 10^{-6} + 36 \mu\text{A}$	
		5 kHz ... 10 kHz	$140 \cdot 10^{-6} + 36 \mu\text{A}$	
	2 A ... < 5 A	20 Hz ... < 40 Hz	$140 \cdot 10^{-6} + 155 \mu\text{A}$	
		40 Hz ... < 5 kHz	$115 \cdot 10^{-6} + 155 \mu\text{A}$	
		5 kHz ... 10 kHz	$115 \cdot 10^{-6} + 155 \mu\text{A}$	
	5 A ... < 10 A	20 Hz ... < 40 Hz	$140 \cdot 10^{-6} + 155 \mu\text{A}$	
		40 Hz ... < 5 kHz	$115 \cdot 10^{-6} + 160 \mu\text{A}$	
		5 kHz ... 10 kHz	$115 \cdot 10^{-6} + 155 \mu\text{A}$	
	10 A ... 20 A	20 Hz ... < 40 Hz	$145 \cdot 10^{-6} + 170 \mu\text{A}$	
		40 Hz ... 5 kHz	$115 \cdot 10^{-6} + 180 \mu\text{A}$	
	> 20 A ... 120 A	45 Hz ... 55 Hz	$210 \cdot 10^{-6}$	
	0,1 mA ... < 0,77 mA	40 Hz ... 1 kHz	$350 \cdot 10^{-6}$	
		> 1 kHz ... 5 kHz	$450 \cdot 10^{-6}$	
	0,77 mA ... < 2 mA	40 Hz ... 1 kHz	$250 \cdot 10^{-6}$	
		> 1 kHz ... 5 kHz	$350 \cdot 10^{-6}$	
2 mA ... < 10 mA	20 Hz ... < 40 Hz	$165 \cdot 10^{-6} + 0,5 \mu\text{A}$		
	40 Hz ... < 1 kHz	$110 \cdot 10^{-6} + 0,5 \mu\text{A}$		
	1 kHz ... < 5 kHz	$120 \cdot 10^{-6} + 0,8 \mu\text{A}$		
	5 kHz ... 10 kHz	$480 \cdot 10^{-6} + 1,3 \mu\text{A}$		
10 mA ... < 30 mA	20 Hz ... < 40 Hz	$170 \cdot 10^{-6} + 4,5 \mu\text{A}$		
	40 Hz ... < 1 kHz	$120 \cdot 10^{-6} + 4,5 \mu\text{A}$		



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
	30 mA ... < 100 mA	20 Hz ... < 40 Hz	$170 \cdot 10^{-6} + 4,5 \mu\text{A}$	
		40 Hz ... < 1 kHz	$120 \cdot 10^{-6} + 4,5 \mu\text{A}$	
		1 kHz ... < 5 kHz	$130 \cdot 10^{-6} + 5,5 \mu\text{A}$	
		5 kHz ... 10 kHz	$480 \cdot 10^{-6} + 7,5 \mu\text{A}$	
	100 mA ... < 300 mA	20 Hz ... < 40 Hz	$170 \cdot 10^{-6} + 40 \mu\text{A}$	
		40 Hz ... < 1 kHz	$150 \cdot 10^{-6} + 40 \mu\text{A}$	
		1 kHz ... < 5 kHz	$170 \cdot 10^{-6} + 45 \mu\text{A}$	
		5 kHz ... 10 kHz	$940 \cdot 10^{-6} + 70 \mu\text{A}$	
	300 mA ... < 2 A	20 Hz ... < 1 kHz	$175 \cdot 10^{-6} + 40 \mu\text{A}$	
		1 kHz ... < 5 kHz	$165 \cdot 10^{-6} + 45 \mu\text{A}$	
		5 kHz ... 10 kHz	$940 \cdot 10^{-6} + 70 \mu\text{A}$	
	2 A ... < 5 A	20 Hz ... < 40 Hz	$140 \cdot 10^{-6} + 160 \mu\text{A}$	
		40 Hz ... < 5 kHz	$115 \cdot 10^{-6} + 160 \mu\text{A}$	
		5 kHz ... 10 kHz	$115 \cdot 10^{-6} + 160 \mu\text{A}$	
	5 A ... < 10 A	20 Hz ... < 40 Hz	$140 \cdot 10^{-6} + 170 \mu\text{A}$	
		40 Hz ... < 5 kHz	$115 \cdot 10^{-6} + 180 \mu\text{A}$	
		5 kHz ... 10 kHz	$115 \cdot 10^{-6} + 170 \mu\text{A}$	
	10 A ... 20 A	20 Hz ... < 40 Hz	$145 \cdot 10^{-6} + 230 \mu\text{A}$	
40 Hz ... 5 kHz		$120 \cdot 10^{-6} + 180 \mu\text{A}$		
> 20 A ... 120 A	45 Hz ... 55 Hz	$210 \cdot 10^{-6}$		
Calibration of current clamps	50 A ... 500 A	45 Hz ... 55 Hz	0,58 % + 270 mA	With current coil
	>500 A ... 3000 A		0,58 %	
Calibration of Rogowski coils	50 A ... 1000 A	45 Hz ... 55 Hz	0,58 % + 540 mA	With current coil
	1000 A ... 6000 A		0,58 %	
<b>AC Power</b>		48,5 Hz ... 51,5 Hz		
Calibration of power sources (effective power)	2,4 W ... 30 kW	40 V ... 480 V		Measuring range referred to $\cos \varphi = 1$  Also possible in Fehraltorf and on site <sup>2)</sup>
		60 mA ... 100 A		
		$\cos \varphi = 1$	$160 \cdot 10^{-6}$	
		$\cos \varphi = 0,5 \dots < 1$ (c, i)	$295 \cdot 10^{-6}$	
		5 kHz ... 10 kHz	$180 \cdot 10^{-6} + 160 \mu\text{A}$	



## 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 power measurement instruments (effective power)	330 $\mu$ W ... < 2,4 W	48,5 Hz ... 51,5 Hz		Measuring range referred to $\cos \varphi = 1$  Also possible in Fehraltorf and on site <sup>2)</sup>  Voltages up to 1000 V with greater uncertainty possible	
		100 mV ... 40 V			
		3,3 mA ... 60 A			
	$\cos \varphi = 1$	0,13 %			
	$\cos \varphi = 0,5 \dots < 1$ (c, i)	0,37 %			
	2,4 W ... 30 kW	40 V ... 480 V			
60 mA ... 100 A					
$\cos \varphi = 1$		160•10 <sup>-6</sup>			
Calibration of power meter clamps (effective power)	330 $\mu$ W ... < 1 MW	48,5 Hz ... 51,5 Hz		Measuring range referred to $\cos \varphi = 1$  With current coil  Also possible in Fehraltorf and on site <sup>2)</sup>	
		100 mV ... 1000 V			
		3,3 mA ... 1000 A			
	$\cos \varphi = 1$	0,62 %			
	$\cos \varphi = 0,5 \dots < 1$ (c, i)	0,71 %			
	<b>Frequency</b>  Calibration of frequency counters		Measurement period:  $\geq 100$ s		
1 mHz ... < 1 Hz			2,0•10 <sup>-5</sup>		
1 Hz ... < 10 Hz			2,0•10 <sup>-7</sup>		
10 Hz ... < 100 Hz			2,0•10 <sup>-8</sup>		
100 Hz ... < 1 kHz			2,0•10 <sup>-9</sup>		
1 kHz ... < 10 kHz			2,0•10 <sup>-10</sup>		
10 kHz ... < 1 MHz			2,0•10 <sup>-11</sup>		
1 MHz ... < 3 GHz			$\geq 10$ s	1,0•10 <sup>-11</sup>	
3 GHz ... 50 GHz				1,0•10 <sup>-10</sup>	
Measurement period:  $\geq 100$ s					
Calibration of frequency generators		$\geq 100$ s		Also possible in Fehraltorf and on site <sup>2)</sup>	
		1 mHz ... < 1 Hz	2,0•10 <sup>-5</sup>		
		1 Hz ... < 10 Hz	2,0•10 <sup>-7</sup>		
		10 Hz ... < 100 Hz	2,0•10 <sup>-8</sup>		
		100 Hz ... < 1 kHz	2,0•10 <sup>-9</sup>		
1 kHz ... < 10 kHz	2,0•10 <sup>-10</sup>				



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks	
<b>Period</b>	10 kHz ... < 1 MHz		$2,0 \cdot 10^{-11}$	Phase comparison	
	1 MHz ... < 3 GHz	$\geq 10$ s	$1,0 \cdot 10^{-11}$		
	3 GHz ... 50 GHz	$\geq 10$ s	$1,0 \cdot 10^{-10}$		
	1 MHz; 5 MHz; 10 MHz	$\geq 1$ h	$1,0 \cdot 10^{-11}$		
	10 ns ... < 10 $\mu$ s	Measurement period: $\geq 10$ s	$2 \cdot 10^{-16}$		
	10 $\mu$ s ... < 100 $\mu$ s		$2 \cdot 10^{-15}$		
	100 $\mu$ s ... < 1 ms		$1 \cdot 10^{-15}$		
	1 ms ... < 10 ms		$2 \cdot 10^{-11}$		
	10 ms ... < 100 ms		$2 \cdot 10^{-9}$		
	100 ms ... < 1 s		$0,2 \cdot 10^{-6}$		
<b>Number of revolutions</b>	1 s ... 10 s	$\geq 100$ s	$20 \cdot 10^{-6}$	Optical	
	6 U/min ... < 30 U/min		$5,8 \cdot 10^{-4}$		
	30 U/min ... < 60 U/min		$1,2 \cdot 10^{-3}$		
	60 U/min ... < 1000 U/min		$6,7 \cdot 10^{-3}$		
<b>RF Power</b>	1000 U/min ... 100000 U/min		$5,6 \cdot 10^{-1}$	Analyzer:: VSWR $\leq 1,3$	
	Calibration of RF power meters	10 $\mu$ W ... 5 mW (-20 dBm ... + 7 dBm)	100 kHz ... 2,6 GHz		$2,9 \% + 0,84 \mu$ W
		0.001 pW ... 1 mW (-120 dBm ... 0 dBm)	2,5 MHz ... 1,3 GHz		3,8 %
		>1 $\mu$ W ... 2.5 mW (-30 dBm ... +4 dBm)	9 kHz ... < 2,4 GHz		$2,7 \% + 66$ nW
			2,4 GHz ... < 12,4 GHz		$3,4 \% + 66$ nW
			12,4 GHz ... 18 GHz		$4,7 \% + 66$ nW
		1 nW ... 1 $\mu$ W (-60 dBm ... -30 dBm)	10 MHz ... < 2,4 GHz		$3,8 \% + 0,16$ nW
			2,4 GHz ... <12,4 GHz		$4,8 \% + 0,16$ nW
			12,4 GHz ... 18 GHz		$6,6 \% + 0,16$ nW



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks	
Calibration of signal generators	10 $\mu$ W ... 100 mW (-20 dBm ... +20 dBm)	100 kHz ... 2,6 GHz	2,7 % + 0,84 $\mu$ W	Generator: VSWR $\leq$ 1,3	
	>0.1 pW ... 1 mW (-100 dBm ... 0 dBm)	2,5 MHz ... 1,3 GHz	3,2 %		
	0.001pW ... 0.1 pW (-120 dBm ... -100 dBm)	2,5 MHz ... 1,3 GHz	4,9 %		
	>1 $\mu$ W ... 100 mW (-30 dBm ... +20 dBm)	9 kHz ... < 2,4 GHz	2,9 % + 66 nW		
		2,4 GHz ... < 12,4 GHz	3,8 % + 66 nW		
		12,4 GHz ... 18 GHz	4,6 % + 66 nW		
	1 nW ... 1 $\mu$ W (-60 dBm ... -30 dBm)	10 MHz ... < 2,4 GHz	3,4 % + 0,16 nW		
		2,4 GHz ... < 12,4 GHz	4,5 % + 0,16 nW		
		12,4 GHz ... 18 GHz	5,7 % + 0,16 nW		
	<b>Reflexion</b>	0,01 ... < 0,1	9 kHz ... < 300 MHz		0,003 ... 0,004 16,6° ... 18.9°
300 MHz ... < 3 GHz			0,003 ... 0,004 16,7° ... 17.7°	3.5mm connector	
3 GHz ... 9 GHz			0,004 17,3° ... 19,1°	Also possible on site	
0,1 ... < 0,3			9 kHz ... < 300 MHz		0,003 ... 0,005 0,9° ... 2,4°
			300 MHz ... < 3 GHz		0,003 ... 0,004 0,9° ... 2,0°
			3 GHz ... 9 GHz	0,003 ... 0,004 1.0° ... 2.0°	
0,3 ... < 0,8		9 kHz ... < 300 MHz	0,003... 0,007 0,4° ... 0.9°		
		300 MHz ... < 3 GHz	0,003 ... 0,006 0,4° ... 0,7°		
		3 GHz ... 9 GHz	0,004 ... 0,006 0,4° ... 0,8°		





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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
	0,8 ... 1,0	9 kHz ... < 300 MHz	0,003 ... 0,009 0,2° ... 0,6°	Z = 50 $\Omega$  N connector  Also possible on site
		300 MHz ... < 3 GHz	0,003 ... 0,008 0,2° ... 0,5°	
		3 GHz ... 9 GHz	0,003 ... 0,008 0,3° ... 0,6°	
	0,01 ... < 0,1	9 kHz ... < 300 MHz	0,005 ... 0,006 28,5° ... 29,4°	
		300 MHz ... < 3 GHz	0,005 ... 0,009 28,5 ... 48,7°	
		3 GHz ... 9 GHz	0,009 48,6° ... 49,1°	
	0,1 ... < 0,3	9 kHz ... < 300 MHz	0,005 ... 0,007 1,5° ... 3,3°	
		300 MHz ... < 3 GHz	0,005 ... 0,009 1,5° ... 5,0°	
		3 GHz ... 9 GHz	0,009 2,5° ... 5,0°	
	0,3 ... < 0,8	9 kHz ... < 300 MHz	0,006 ... 0,009 0,6° ... 1,3°	
		300 MHz ... < 3 GHz	0,006 ... 0,010 0,7° ... 1,7°	
		3 GHz ... 9 GHz	0,009 ... 0,011 0,8° ... 1,7°	
0,8 ... 1,0	9 kHz ... < 300 MHz	0,009 ... 0,012 0,6° ... 0,8°		
	300 MHz ... < 3 GHz	0,009 ... 0,012 0,6° ... 0,8°		
	3 GHz ... 9 GHz	0,010 ... 0,015 0,7° ... 0,9°		



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
<b>Transmission</b>	0,01 ... < 0,1	9 kHz ... < 300 MHz	0,004 21,8° ... 22,9°	Z = 50 $\Omega$
		300 MHz ... < 3 GHz	0,004 ... 0,005 21,8° ... 22,4°	7mm connector
		3 GHz ... 9 GHz	0,004 ... 0,005 22,1° ... 23,2°	Also possible on site
	0,1 ... < 0,3	9 kHz ... < 300 MHz	0,004 ... 0,006 1,1° ... 2,7°	
		300 MHz ... < 3 GHz	0,004 1,1° ... 2,3°	
		3 GHz ... 9 GHz	0,004 ... 0,005 1,2° ... 2,4°	
	0,3 ... < 0,8	9 kHz ... < 300 MHz	0,004 ... 0,008 0,5° ... 1,1°	
		300 MHz ... < 3 GHz	0,004 ... 0,006 0,4° ... 0,9°	
		3 GHz ... 9 GHz	0,004 ... 0,007 0,5° ... 0,9°	
	0,8 ... 1,0	9 kHz ... < 300 MHz	0,004 ... 0,010 0,4° ... 0,7°	
		300 MHz ... < 3 GHz	0,004 ... 0,008 0,3° ... 0,5°	
		3 GHz ... 9 GHz	0,005 ... 0,009 0,3° ... 0,6°	
	0,030 ... < 0,200 0,200 ... < 0,300 0,300 ... < 0,400 0,400 ... < 0,500	10 MHz ... 18 GHz	0,020	N connector
			0,028	
			0,040	
			0,060	
	0 dB ... < 3 dB	9 kHz ... < 300 MHz	0,03 dB ... 0,04 dB 0,4° ... 0,5°	Z = 50 $\Omega$



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
		300 MHz ... < 3 GHz	0,04 dB ... 0,06 dB 0,5° ... 1,1°	3.5mm connector
	3 dB ... < 59 dB	3 GHz ... 9 GHz	0,06 dB ... 0,09 dB 1,1° ... 1,8°	Also possible on site
		9 kHz ... < 300 MHz	0,07 dB ... 0,09 dB 0,6° ... 0,7°	
		300 MHz ... < 3 GHz	0,07 dB ... 0,09 dB 0,6° ... 1,2°	
		3 GHz ... 9 GHz	0,09 dB ... 0,11 dB 1,2° ... 1,9°	
	60 dB ... < 80 dB	9 kHz ... < 300 MHz	0,11 dB ... 0,36 dB 0,8° ... 2,4°	
		300 MHz ... < 3 GHz	0,12 dB ... 0,22 dB 0,8° ... 1,8°	
		3 GHz ... 9 GHz	0,13 dB ... 0,23 dB 1,3° ... 2,3°	
	0 dB ... < 3 dB	9 kHz ... < 300 MHz	0,03 dB ... 0,04 dB 0,4° ... 0,5°	Z = 50 $\Omega$
		300 MHz ... < 3 GHz	0,04 dB ... 0,06 dB 0,5° ... 1,1°	N connector
		3 GHz ... 9 GHz	0,06 dB ... 0,09 dB 1,1° ... 1,8°	Also possible on site
	3 dB ... < 59 dB	9 kHz ... < 300 MHz	0,07 dB ... 0,10 dB 0,6° ... 0,7°	
		300 MHz ... < 3 GHz	0,07 dB ... 0,09 dB 0,6° ... 1,2°	
		3 GHz ... 9 GHz	0,08 dB ... 0,12 dB 1,2° ... 1,9°	
	60 dB ... < 80 dB	9 kHz ... < 300 MHz	0,11 dB ... 0,36 dB 0,8° ... 2,4°	
		300 MHz ... < 3 GHz	0,12 dB ... 0,22 dB 0,8° ... 1,8°	



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks	
	0 dB ... < 3 dB	3 GHz ... 9 GHz	0,13 dB ... 0,23 dB 1,3° ... 2,3°	Z = 50 $\Omega$	
		9 kHz ... < 300 MHz	0,03 dB ... 0,04 dB 0,4° ... 0,5°		
		300 MHz ... < 3 GHz	0,04 dB ... 0,06 dB 0,5° ... 1,1°		7mm connector
		3 GHz ... 9 GHz	0,06 dB ... 0,09 dB 1,1° ... 1,8°		Also possible on site
	3 dB ... < 59 dB	9 kHz ... < 300 MHz	0,07 dB ... 0,09 dB 0,6° ... 0,7°		
		300 MHz ... < 3 GHz	0,07 dB ... 0,09 dB 0,6° ... 1,2°		
		3 GHz ... 9 GHz	0,08 dB ... 0,11 dB 1,2° ... 1,9°		
		9 kHz ... < 300 MHz	0,11 dB ... 0,36 dB 0,8° ... 2,4°		
	60 dB ... < 80 dB	300 MHz ... < 3 GHz	0,12 dB ... 0,22 dB 0,8° ... 1,8°		
		3 GHz ... 9 GHz	0,13 dB ... 0,23 dB 1,3° ... 2,3°		
		1 kHz/1 M $\Omega$	1,3•10 <sup>-3</sup> + 16 $\mu$ V		Also possible on site <sup>2)</sup>
		> 120 mV ... 1,2 V	1 kHz/1 M $\Omega$		
> 1,2 V ... 12 V	1 kHz/1 M $\Omega$	1,2•10 <sup>-3</sup> + 698 $\mu$ V			
> 12 V ... 60 V	1 kHz/1 M $\Omega$	1,2•10 <sup>-3</sup> + 3,3 mV			
> 60 V ... 120 V	1 kHz/1 M $\Omega$	1,2•10 <sup>-3</sup> + 5,9 mV			
> 120 V ... 200 V	1 kHz/1 M $\Omega$	1,2•10 <sup>-3</sup> + 27 mV			
1 mV ... 120 mV	1 kHz/50 $\Omega$	1,3•10 <sup>-3</sup> + 16 $\mu$ V			
> 120 mV ... 1,2 mV	1 kHz/50 $\Omega$	1,3•10 <sup>-3</sup> + 62 $\mu$ V			
> 1,2 mV ... 3 V	1 kHz/50 $\Omega$	1,2•10 <sup>-3</sup> + 307 $\mu$ V			



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
DC voltage	> 3 V ... 5,5 V	1 kHz/50 $\Omega$	$1,2 \cdot 10^{-3} + 305 \mu\text{V}$	
	1 mV ... 300 mV	DC/1 M $\Omega$	$290 \cdot 10^{-6} + 32 \mu\text{V}$	
	> 300 mV ... 3 V	DC/1 M $\Omega$	$290 \cdot 10^{-6} + 122 \mu\text{V}$	
	> 3 V ... 15 V	DC/1 M $\Omega$	$290 \cdot 10^{-6} + 623 \mu\text{V}$	
	> 15 V ... 120 V	DC/1 M $\Omega$	$290 \cdot 10^{-6} + 801 \mu\text{V}$	
	> 120 V ... 200 V	DC/1 M $\Omega$	$290 \cdot 10^{-6} + 1,1 \text{ mV}$	
	1 mV ... 300 mV	DC/50 $\Omega$	$290 \cdot 10^{-6} + 32 \mu\text{V}$	
	> 300 mV ... 3 V	DC/50 $\Omega$	$290 \cdot 10^{-6} + 122 \mu\text{V}$	
> 3 V ... 5,5 V	DC/50 $\Omega$	$290 \cdot 10^{-6} + 100 \mu\text{V}$		
<b>Time base</b>				
Sampling rate	0,2 ms	99,5 MHz; 100,5 MHz 30 mVpp ... 1 Vpp 100 MS/s	$0,05 \cdot 10^{-6}$	
Time interval	1 ms	10 MHz / 1 Vpp	$0,4 \cdot 10^{-6}$	
Time marker	0,5 ns ... 20 s	100 mV ... 1 V	$1,2 \cdot 10^{-6} + 12 \text{ ps}$	
Risetime	$\geq 350 \text{ ps}$	4,4 mV ... 3,1 V	37 ps	
Flatness	5 mVpp ... 5 Vpp	$\leq 300 \text{ MHz}$	3,10 %	50 $\Omega$ , VSWR $\leq 1,6$ Calibrated to $U_{\text{inc}}$
		> 300 MHz ... 550 MHz	4,00 %	
	5 mVpp ... 3 Vpp	> 550 MHz ... 1,1 GHz	5,10 %	
	5 mVpp ... 5 Vpp	$\leq 10 \text{ MHz}$	3,10 %	1 M $\Omega$ , $C_{\text{in}} \leq 7 \text{ pF}$ Calibrated to $U_{\text{Load}}$
		> 10 MHz ... 100 MHz	5,90 %	
		> 100 MHz ... 150 MHz	10,40 %	
> 150 MHz ... 250 MHz	13,60 %			
Input resistance	50 $\Omega$		0,09 %	
	1 M $\Omega$		0,07 %	
<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	$\lambda = 1300 \text{ nm}$	1,8 %	
Absolute power	-5 dBm ... -30 dBm	$\lambda = 1310 \text{ nm}$	1,2 %	9 $\mu\text{m}$ Singlemode
	-5 dBm ... -30 dBm	$\lambda = 1550 \text{ nm}$	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
Linearity	-24 dBm ... -60 dBm	$\lambda = 850$ nm	1,5 %	50 $\mu$ m Multimode
	-22 dBm ... -60 dBm	$\lambda = 1300$ nm	1,5 %	
	-5 dBm ... -60 dBm	$\lambda = 1310$ nm	1,5 %	9 $\mu$ m Singlemode
	-5 dBm ... -60 dBm	$\lambda = 1550$ nm	1,6 %	
Calibration of fiber optic sources	0 dBm ... -60 dBm	$\lambda = 800 \dots 900$ nm	1,5 %	50 $\mu$ m Multimode
	-5 dBm ... -60 dBm	$\lambda = 1250 \dots 1350$ nm	1,2 %	
Absolute power	-5 dBm ... -60 dBm	$\lambda = 1200 \dots 1650$ nm	1,2 %	9 $\mu$ m Singlemode
	Attenuation range			
Calibration of fiber optic attenuators	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 ... < 1530 nm	P = +10 ... -60 dBm	0,35 nm	
	1530 nm ... 1570 nm		0,08 nm	
	> 1570 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	3,7•10 <sup>-5</sup> m/m	
Scale of attenuation			Position offset: 0,70 m	
Scale of attenuation	0 dB ... 30 dB	1310 nm	0,012 dB/dB	Deviation of the scale of attenuation:
		1550 nm	0,017 dB/dB	
		1625 nm	0,016 dB/dB	
		1650 nm	0,015 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 °C	
Thermometer with direct display and resistance thermometer	-90 °C ... 125 °C	Comparison with a standard platinum resistance thermometer in air in the bloc calibrator	0,026 °C	Also possible in Fehraltorf and on site <sup>2),8)</sup>
	> 125 °C ... 165 °C		0,09 °C	
	> 165 °C ... 300 °C		0,21 °C	



## SCS Directory

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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
Thermocouple elements	> 300 °C ... 450 °C	Comparison with a standard platinum resistance thermometer in liquid in the bath	0,24 °C	Also possible in Fehrltorf and on site <sup>2),8)</sup>
	> -30 °C ... 165 °C		0,11 °C	
	-35 °C ... <5 °C	Comparison with a standard platinum resistance thermometer in air in the climatic chamber	0,37 °C	
	5 °C ... 30 °C		0,25 °C	
	> 30 °C ... 45 °C		0,27 °C	
Type K; Type N	-90 °C ... 125 °C	Comparison with a standard platinum resistance thermometer in air in the bloc calibrator	0,28 °C + 0.001• t	Also possible in Fehrltorf and on site <sup>2),8)</sup>
Type J; Type T	> 125 °C ... 300 °C		0,26 °C + 0.0017• t	
	> 300 °C ... 450 °C		0,2 °C + 0.002• t	
Type R; Type S	-90 °C ... 125 °C	Comparison with a standard platinum resistance thermometer in liquid in the bath	0,25 °C + 0.004• t	Also possible in Fehrltorf and on site <sup>2),8)</sup>
	> 125 °C ... 300 °C		0,25 °C + 0.005• t	
	> 300 °C ... 450 °C		0,3 °C + 0.0053• t	
Type K; Type N	-30 °C ... 165 °C	Comparison with a standard platinum resistance thermometer in liquid in the bath	1,0 °C	Also possible in Fehrltorf and on site <sup>2),8)</sup>
Type J; Type T	-30 °C ... 165 °C		0,3 °C + 0.0012• t	
Type R; Type S	-30 °C ... 165 °C	Comparison with a standard platinum resistance thermometer in air in the climatic chamber	0,3 °C + 0.0042• t	Also possible in Fehrltorf and on site <sup>2),8)</sup>
Type K; Type N	-35 °C ... <5 °C		1,0 °C	
Type J; Type T	5 °C ... 30 °C		0,5 °C	
	> 30 °C ... 45 °C	0,4 °C		
	-35 °C ... <5 °C	0,4 °C		
Type R; Type S	5 °C ... 45 °C	Comparison with a standard platinum resistance thermometer in air in the climatic chamber	0,5 °C	Also possible in Fehrltorf and on site <sup>2),8)</sup>
	-35 °C ... < 5 °C		0,4 °C	
Thermal installations (Bloc calibrator, bath)	5 °C ... 45 °C	With Pt 100	1,1 °C	Also possible in Fehrltorf and on site <sup>2)</sup>
	-90 °C ... <-50 °C		0,065 °C	
	-50 °C ... 125 °C		0,055 °C	
	> 125 °C ... 300 °C		0,21 °C	
	> 300 °C ... 450 °C		0,24 °C	



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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
(Ovens, climate chambers) Anzeigeabweichung zum (Referenz-) Messort.	-90 °C ... -50 °C	With Pt 100	0,31 °C	Also possible on site
	> -50 °C ... 125 °C		0,30 °C	
	> 125 °C ... 250 °C		0,45 °C	
	> 250 °C ... 350 °C	With TC type J	1,22 °C + 0.003• t	
Electric calibration				
Measurement of RTD-temperature calibrator	-200 °C ... 300 °C	Pt 100	0,01 °C	Also possible in Fehraltorf and on site
	300 °C ... 800 °C		0,01 °C	
Simulations of RTD-temperature measuring instruments	-200 °C ... 0 °C	Pt 100	0,06 °C	
	>0 °C ... 100 °C		0,08 °C	
	>100 °C ... 630 °C		0,12 °C	
	>630 °C ... 800 °C		0,27 °C	
Measurement and simulations of thermocouple measuring instruments and -calibrators	600 °C ... 800 °C	type B	0,51 °C	
	>800 °C ... 1820 °C		0,39 °C	
	0 °C ... 1000 °C	type C	0,36 °C	
	>1000 °C ... 1800 °C		0,58 °C	
	>1800 °C ... 2316 °C		0,97 °C	
	-250 °C ... <-100 °C	type E	0,58 °C	
	-100 °C ... 650 °C		0,19 °C	
	>650 °C ... 2100 °C		0,24 °C	
	-210 °C ... <-100 °C	type J	0,31 °C	
	-100 °C ... <-30 °C		0,19 °C	
	-30 °C ... <150 °C		0,16 °C	
	150 °C ... 760 °C		0,20 °C	
	>760 °C ... 1200 °C		0,27 °C	
	-210 °C ... <-100 °C	type K	0,38 °C	
	-100 °C ... <-25 °C		0,21 °C	
	-25 °C ... 120 °C		0,19 °C	
>120 °C ... 1000 °C		0,30 °C		
>1000 °C ... 1372 °C		0,46 °C		
-210 °C ... <-100 °C	type L	0,43 °C		
-100 °C ... 800 °C		0,30 °C		
>800 ... 900 °C		0,20 °C		





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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
<b>Pressure</b>	-210 °C ... <-100 °C	type N	0,46 °C	
	-100 °C ... <-25 °C		0,25 °C	
	-25 °C ... 410 °C		0,22 °C	
	>410 °C ... 1300 °C		0,31 °C	
	0 °C ... <250 °C	type R	0,66 °C	
	250 °C ... 1000 °C		0,40 °C	
	>1000 °C ... 1767 °C		0,46 °C	
	0 °C ... <250 °C	type S	0,54 °C	
	250 °C ... 1400 °C		0,43 °C	
	>1400 °C ... 1767 °C		0,53 °C	
	-250 °C ... <-150 °C	type T	0,73 °C	
	-150 °C ... <0 °C		0,28 °C	
	0 °C ... 400 °C		0,19 °C	
	-200 °C ... <0 °C	type U	0,65 °C	
0 °C ... 600 °C	0,31 °C			
Absolute pressure in fluids	13,8 mbar ... 14 bar		0,0035 % + 0,004 mbar	Also other units possible: Pa; psi; mmHg; mmH2O
	> 14 bar ... 70 bar		0,005 %	
	> 70 bar ... 210 bar		0,005 %	
	> 210 bar ... 1000 bar		0,025 %	
Positive and negative gauge pressure in fluids	-900 mbar ... 14 bar		0,0035 %	Also onsite-calibration with higher measuring uncertainty possible
	> 14 bar ... 70 bar		0,005 %	
	> 70 bar ... 210 bar		0,005 %	
	> 210 bar ... 1000 bar		0,025 %	
Differential pressure in fluids	-160 mbar ... -10 mbar		0,008 % + 0,006 mbar	
	> -10 mbar ... < 10 mbar		0,01 % + 0,002 mbar	
	10 mbar ... 160 mbar		0,008 % + 0,006 mbar	



## SCS Directory

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Measured Quantity / Instrument or Gauge	Measurement Range	Measurement Conditions	Best Measurement Uncertainty $\pm$ <sup>1)</sup>	Remarks
Manometer of blood pressure monitor	0 ... 46,7 kPa 0 ... 350 mmHg	20 °C ... 25 °C	0,08 kPa 0,6 mmHg	According to Standards: SN EN 1060-1 SN EN 1060-2 SN EN 1060-3 EN ISO 81060-1 OMIL R16-1 OMIL R16-2
<b>Magnetic flux density</b>				
Calibration of magnetic field analyzers	0,1 $\mu$ T ... 200 $\mu$ T 0,1 $\mu$ T ... 25 $\mu$ T >200 $\mu$ T ... 250 $\mu$ T	10 Hz ... 1 kHz 1 kHz ... 2 kHz 10 Hz ... 1 kHz	1,80 % + 0,12 $\mu$ T 1,85 % + 0,12 $\mu$ T	Also other units possible: A/m; A/cm, Gauss
<b>Electric field strength</b>				
Calibration of electric field analyzers	0 V/m... 1330 V/m 0 V/m... 293 V/m 1,3 kV/m ... 20 kV/m	10 Hz ... 1 kHz 1 kHz ... 100 kHz 50 Hz	1,60 % + 0,12 V/m	

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

Notes and limitations:

- 2) 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 Fehraltorf 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 Fehraltorf 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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