



The Dutch Accreditation Council RvA, by law appointed as
the national accreditation body for The Netherlands,
hereby declares that accreditation has been granted to:

TRESCAL Zoetermeer B.V. Technical Operations Zoetermeer

The organisation has demonstrated to be able to generate technical valid results in a
competent way and work according to a management system.

This accreditation is based on an assessment against the requirements
as laid down in EN ISO/IEC 17025:2017.

The accreditation covers the activities as specified in the authorized
annex bearing the registration number.

The accreditation is valid provided that the organisation
continues to meet the requirements.

The accreditation with registration number:

K 052

is granted on 12 September 1989

This declaration is valid until

1 March 2026

The board of the Dutch Accreditation Council,
on its behalf,


mr. J.A.W.M. de Haas

Annex to declaration of accreditation (scope of accreditation)
Normative document: EN ISO/IEC 17025:2017
Registration number: **K 052**

of **TRESCAL Zoetermeer B.V.**
Technical Operations

This annex is valid from: **24-04-2025 to 01-12-2028**

Replaces annex dated: **12-06-2024**

Location(s) where activities are performed under accreditation

Head Office

Storkstraat 2 - 4
2722 NN
Zoetermeer
Nederland

Location	Abbreviation/ location code
Storkstraat 2 – 4 2722 NN Zoetermeer The Netherlands	ZTM
On Site	OS

HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
LF 0 0	DC/LF Electricity				
LF 1 0	Direct Voltage				ZTM
	0 µV – 10 µV		$3 \cdot 10^{-6} \cdot U + 0.1 \mu V$	Measurement	
	10 µV – 100 µV		$5 \cdot 10^{-3} \cdot U$		
	100 µV – 1 mV		$5 \cdot 10^{-4} \cdot U$		
	1 mV – 10 mV		$1 \cdot 10^{-4} \cdot U$		
	10 mV – 100 mV		$3 \cdot 10^{-5} \cdot U$		
	100 mV – 2 V		$7 \cdot 10^{-6} \cdot U$		

¹ Calibration and Measurement Capability (CMC): Demonstrated measurement uncertainty, with coverage probability of 95%, in a given measurement point or measurement range. Measurement uncertainty, U , is calculated according to EA-4/02 "Evaluation of the Uncertainty of Measurement in Calibration".

This annex has been approved by the Board of the
Dutch Accreditation Council, on its behalf,

J.A.W.M. de Haas

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
	2 V – 20 V		$3 \cdot 10^{-6} \cdot U$		
	20 V – 1 kV		$6 \cdot 10^{-6} \cdot U$		
	0 mV – 10 mV		$5.5 \cdot 10^{-5} \cdot U + 0.5 \mu\text{V}$	Measurement	OS
	10 mV – 100 mV		$4 \cdot 10^{-5} \cdot U$		
	100 mV – 1 kV		$1 \cdot 10^{-5} \cdot U$		
	0.1 V		$1 \cdot 10^{-6} \cdot U$	Measurement and generation	
	1 V		$9 \cdot 10^{-7} \cdot U$		
	1.018 V		$9 \cdot 10^{-7} \cdot U$		
	10 V		$7 \cdot 10^{-7} \cdot U$		
	100 V		$7 \cdot 10^{-7} \cdot U$		
	1000 V		$1.2 \cdot 10^{-6} \cdot U$		
	0 mV – 10 mV		$4 \cdot 10^{-6} \cdot U + 0.5 \mu\text{V}$	Generation	
	10 mV – 100 mV		$6 \cdot 10^{-5} \cdot U$		
	100 mV – 2.2 V		$1.5 \cdot 10^{-5} \cdot U$		
	2.2 V – 22 V		$7 \cdot 10^{-6} \cdot U$		
	22 V – 1 kV		$1 \cdot 10^{-5} \cdot U$		
	0 mV – 10 mV		$2 \cdot 10^{-5} \cdot U + 1 \mu\text{V}$	Generation	OS
	10 mV – 330 mV		$3 \cdot 10^{-5} \cdot U$		
	330 mV - 1 kV		$2 \cdot 10^{-5} \cdot U$		
	Conversion factor (0.001 – 1) V/V		$1 \cdot 10^{-3} \cdot U/U$	also on site	
LF 1 2	Direct Voltage ratio			Measurement	ZTM
	(0.001 – 1) V/V		$1 \cdot 10^{-3} \cdot U/U$	primary voltage 100 mV to 1000 V, secondary voltage 0.1 mV to 1000 V	ZTM, OS

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
LF 1 3	Direct High Voltage				ZTM
	1 kV – 30 kV		$8 \cdot 10^{-4} \cdot U$	Measurement	ZTM, OS
	1 kV – 30 kV		$1 \cdot 10^{-3} \cdot U$	Generation	ZTM, OS
LF 1 4	Pulse Amplitude				ZTM
	2mV	10 Hz	$1 \cdot 10^{-3} \cdot U$	Generation in 1MOhm	
	2mV	100Hz/1kHz	$5 \cdot 10^{-4} \cdot U$	Generation in 1MOhm	
	5mV – 100V	10Hz/100Hz/1kHz	$5 \cdot 10^{-4} \cdot U$	Generation in 1MOhm	
	2mV – 100V	10 Hz – 1 kHz	$5 \cdot 10^{-4} \cdot U$	Measurement	
LF 2 0	Direct Current			Measurement and generation	ZTM
	0 A – 10 μ A		$2 \cdot 10^{-5} \cdot I + 0.4 \text{ nA}$		
	10 μ A – 1 mA		$1 \cdot 10^{-5} \cdot I$		
	1 mA – 150 mA		$2.5 \cdot 10^{-5} \cdot I$		
	0.15 A – 15 A		$2 \cdot 10^{-5} \cdot I$		
	15 A – 20 A		$5 \cdot 10^{-5} \cdot I$		
	20 A – 100 A		$1.2 \cdot 10^{-4} \cdot I - 4 \cdot 10^{-5} \cdot I$		
	10 μ A – 100 μ A		$4 \cdot 10^{-4} \cdot I$	Generation	OS
	100 μ A – 10 mA		$2 \cdot 10^{-4} \cdot I$		
	10 mA – 100 mA		$2 \cdot 10^{-4} \cdot I$		
	0.1 A – 1 A		$3 \cdot 10^{-4} \cdot I$		
	1 A – 10 A		$5 \cdot 10^{-4} \cdot I$		
	10 A – 20 A		$1 \cdot 10^{-3} \cdot I$		
	10 μ A – 100 μ A		$4 \cdot 10^{-5} \cdot I$	Measurement	OS
	100 μ A – 10 mA		$4 \cdot 10^{-5} \cdot I$		
	10 mA – 100 mA		$5 \cdot 10^{-5} \cdot I$		
	0.1 A – 1 A		$1 \cdot 10^{-4} \cdot I$		
	1 A – 20 A		$1.3 \cdot 10^{-4} \cdot I$		

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
	100 mA – 20 A		$3.5 \cdot 10^{-3} \cdot I$	Generation, only for current clamps / probes	ZTM, OS
	20 A – 1000 A		$8 \cdot 10^{-3} \cdot I$		
	Conversion factor (0.001 – 1) V/A		$3.5 \cdot 10^{-3} \cdot U/U$		ZTM, OS
LF 2 2	Direct Current Ratio				ZTM
	(0.001 – 1) V/A		$3.5 \cdot 10^{-3} \cdot U/I$	primary current 100 mA to 1000 A, secondary voltage 0.1 mV to 1000 V	ZTM, OS
LF 3 0	Alternating Voltage			Measurement and generation	ZTM
	0.7 mV – 2 mV	10 Hz – 20 Hz	$1.4 \cdot 10^{-3} \cdot U + 1 \mu V$	Generation > 200V at 50 Hz – 1 kHz	
		20 Hz – 40 Hz	$5.8 \cdot 10^{-4} \cdot U + 1 \mu V$		
		40 Hz – 20 kHz	$3.3 \cdot 10^{-4} \cdot U + 1 \mu V$		
		20 kHz – 50 kHz	$6.3 \cdot 10^{-4} \cdot U + 1.6 \mu V$		
		50 kHz – 100 kHz	$9.4 \cdot 10^{-4} \cdot U + 3.1 \mu V$		
		100 kHz – 500 kHz	$1.9 \cdot 10^{-3} \cdot U + 6.2 \mu V$		
		500 kHz – 1 MHz	$2.8 \cdot 10^{-3} \cdot U + 6.2 \mu V$		
	2 mV – 7 mV	10 Hz – 20 Hz	$6.7 \cdot 10^{-4} \cdot U + 1 \mu V$		
		20 Hz – 40 Hz	$2.9 \cdot 10^{-4} \cdot U + 1 \mu V$		
		40 Hz – 20 kHz	$1.7 \cdot 10^{-4} \cdot U + 1 \mu V$		
		20 kHz – 50 kHz	$3.2 \cdot 10^{-4} \cdot U + 1.6 \mu V$		
		50 kHz – 100 kHz	$4.7 \cdot 10^{-4} \cdot U + 3.1 \mu V$		
		100 kHz – 500 kHz	$1.1 \cdot 10^{-3} \cdot U + 6.2 \mu V$		
		500 kHz – 1 MHz	$2.0 \cdot 10^{-3} \cdot U + 6.2 \mu V$		

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	7 mV – 20 mV	10 Hz – 20 Hz	$2.0 \cdot 10^{-4} \cdot U + 1 \mu V$		
		20 Hz – 40 Hz	$1.0 \cdot 10^{-4} \cdot U + 1 \mu V$		
		40 Hz – 20 kHz	$6 \cdot 10^{-5} \cdot U + 1 \mu V$		
		20 kHz – 50 kHz	$1.1 \cdot 10^{-4} \cdot U + 1.6 \mu V$		
		50 kHz – 100 kHz	$2.1 \cdot 10^{-4} \cdot U + 3.1 \mu V$		
		100 kHz – 500 kHz	$6 \cdot 10^{-4} \cdot U + 6.2 \mu V$		
		500 kHz – 1 MHz	$1.1 \cdot 10^{-3} \cdot U + 6.2 \mu V$		
	20 mV – 70 mV	10 Hz – 20 Hz	$2.0 \cdot 10^{-4} \cdot U + 1.2 \mu V$		
		20 Hz – 40 Hz	$1.0 \cdot 10^{-4} \cdot U + 1.2 \mu V$		
		40 Hz – 20 kHz	$6.0 \cdot 10^{-5} \cdot U + 1.2 \mu V$		
		20 kHz – 50 kHz	$1.1 \cdot 10^{-4} \cdot U + 1.6 \mu V$		
		50 kHz – 100 kHz	$2.1 \cdot 10^{-4} \cdot U + 2.4 \mu V$		
		100 kHz – 500 kHz	$4.0 \cdot 10^{-4} \cdot U + 6.2 \mu V$		
		500 kHz – 1 MHz	$1.5 \cdot 10^{-3} \cdot U + 6.2 \mu V$		
	70 mV – 200 mV	10 Hz – 20 Hz	$1.7 \cdot 10^{-4} \cdot U + 1.2 \mu V$		
		20 Hz – 40 Hz	$7 \cdot 10^{-5} \cdot U + 1.2 \mu V$		
		40 Hz – 20 kHz	$4.0 \cdot 10^{-5} \cdot U + 1.2 \mu V$		
		20 kHz – 50 kHz	$6 \cdot 10^{-5} \cdot U + 1.6 \mu V$		
		50 kHz – 100 kHz	$1.3 \cdot 10^{-4} \cdot U + 2.4 \mu V$		
		100 kHz – 500 kHz	$3.0 \cdot 10^{-4} \cdot U + 6.2 \mu V$		
		500 kHz – 1 MHz	$1.1 \cdot 10^{-3} \cdot U + 6.2 \mu V$		
	200 mV – 700 mV	10 Hz – 20 Hz	$1.7 \cdot 10^{-4} \cdot U + 1.2 \mu V$		
		20 Hz – 40 Hz	$6 \cdot 10^{-5} \cdot U + 1.2 \mu V$		
		40 Hz – 20 kHz	$4.0 \cdot 10^{-5} \cdot U + 1.2 \mu V$		
		20 kHz – 50 kHz	$5 \cdot 10^{-5} \cdot U + 1.6 \mu V$		
		50 kHz – 100 kHz	$7 \cdot 10^{-5} \cdot U + 2.4 \mu V$		
		100 kHz – 500 kHz	$3.0 \cdot 10^{-4} \cdot U + 6.2 \mu V$		
		500 kHz – 1 MHz	$1.1 \cdot 10^{-3} \cdot U + 6.2 \mu V$		

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	700 mV – 2 V	10 Hz – 20 Hz	$1.6 \cdot 10^{-4} \cdot U$		
		20 Hz – 40 Hz	$6 \cdot 10^{-5} \cdot U$		
		40 Hz – 20 kHz	$3 \cdot 10^{-5} \cdot U$		
		20 kHz – 50 kHz	$5 \cdot 10^{-5} \cdot U$		
	700 mV – 2 V	50 kHz – 100 kHz	$7 \cdot 10^{-5} \cdot U$		
		100 kHz – 500 kHz	$3 \cdot 10^{-4} \cdot U$		
		500 kHz – 1 MHz	$1.0 \cdot 10^{-3} \cdot U$		
	2 V – 20 V	10 Hz – 20 Hz	$1.6 \cdot 10^{-4} \cdot U$		
		20 Hz – 40 Hz	$6 \cdot 10^{-5} \cdot U$		
		40 Hz – 20 kHz	$3 \cdot 10^{-5} \cdot U$		
		20 kHz – 50 kHz	$5 \cdot 10^{-5} \cdot U$		
		50 kHz – 100 kHz	$7 \cdot 10^{-5} \cdot U$		
		100 kHz – 500 kHz	$4 \cdot 10^{-4} \cdot U$		
		500 kHz – 1 MHz	$1.2 \cdot 10^{-3} \cdot U$		
	20 V – 200 V	10 Hz – 20 Hz	$1.6 \cdot 10^{-4} \cdot U$		
		20 Hz – 40 Hz	$8 \cdot 10^{-5} \cdot U$		
		40 Hz – 20 kHz	$5 \cdot 10^{-5} \cdot U$		
		20 kHz – 50 kHz	$6 \cdot 10^{-5} \cdot U$		
		50 kHz – 100 kHz	$8 \cdot 10^{-5} \cdot U$		
	200 V – 1000 V	10 Hz – 20 Hz	$1.6 \cdot 10^{-4} \cdot U$	Generation > 200V at 50 Hz – 1 kHz	
		20 Hz – 40 Hz	$8 \cdot 10^{-5} \cdot U$		
		40 Hz – 20 kHz	$5 \cdot 10^{-5} \cdot U$		
		20 kHz – 50 kHz	$1.1 \cdot 10^{-4} \cdot U$		
		50 kHz – 100 kHz	$4 \cdot 10^{-4} \cdot U$		

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
	1 mV – 10 mV	1 Hz – 40 Hz	$2 \cdot 10^{-3} \cdot U$	Measurement	OS
		40 Hz – 1 kHz	$2 \cdot 10^{-3} \cdot U$		
		1 kHz – 20 kHz	$2 \cdot 10^{-3} \cdot U$		
		20 kHz – 50 kHz	$3 \cdot 10^{-3} \cdot U$		
		50 kHz – 100 kHz	$6 \cdot 10^{-3} \cdot U$		
		100 kHz – 300 kHz	$4 \cdot 10^{-2} \cdot U$		
	10 mV – 10 V	1 Hz – 20 kHz	$3 \cdot 10^{-4} \cdot U$	Measurement	OS
		20 kHz – 50 kHz	$5 \cdot 10^{-4} \cdot U$		
		50 kHz – 100 kHz	$9 \cdot 10^{-4} \cdot U$		
		100 kHz – 300 kHz	$3 \cdot 10^{-3} \cdot U$		
		300 kHz – 1 MHz	$9 \cdot 10^{-2} \cdot U$		
		1 MHz – 2 MHz	$1.3 \cdot 10^{-2} \cdot U$		
	10 V – 100 V	1 Hz – 20 kHz	$4 \cdot 10^{-4} \cdot U$	Measurement	OS
		20 kHz – 50 kHz	$5 \cdot 10^{-4} \cdot U$		
		50 kHz – 100 kHz	$1.3 \cdot 10^{-3} \cdot U$		
		100 kHz – 300 kHz	$4 \cdot 10^{-3} \cdot U$		
		300 kHz – 1 MHz	$1.3 \cdot 10^{-2} \cdot U$		
	100 V – 1000 V	1 Hz – 1 kHz	$5.5 \cdot 10^{-4} \cdot U$	Measurement	OS
		1 kHz – 20 kHz	$7 \cdot 10^{-4} \cdot U$		
		20 kHz – 50 kHz	$1.3 \cdot 10^{-3} \cdot U$		
		50 kHz – 100 kHz	$2.6 \cdot 10^{-2} \cdot U$		
	1 mV – 33 mV	10 Hz – 45 Hz	$1 \cdot 10^{-3} \cdot U$	Generation	OS
		45 Hz – 20 kHz	$5 \cdot 10^{-4} \cdot U$		
		20 kHz – 50 kHz	$1 \cdot 10^{-3} \cdot U$		
		50 kHz – 100 kHz	$4 \cdot 10^{-3} \cdot U$		
		100 kHz – 500 kHz	$8 \cdot 10^{-3} \cdot U$		

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
	33 mV – 330 mV	10 Hz – 45 Hz	$5 \cdot 10^{-4} \cdot U$	Generation	OS
		45 Hz – 20 kHz	$3 \cdot 10^{-4} \cdot U$		
		20 kHz – 50 kHz	$5 \cdot 10^{-4} \cdot U$		
		50 kHz – 100 kHz	$1 \cdot 10^{-3} \cdot U$		
		100 kHz – 500 kHz	$2 \cdot 10^{-3} \cdot U$		
	330 mV – 3.3 V	10 Hz – 45 Hz	$5 \cdot 10^{-4} \cdot U$	Generation	OS
		45 Hz – 20 kHz	$3 \cdot 10^{-4} \cdot U$		
		20 kHz – 50 kHz	$5 \cdot 10^{-4} \cdot U$		
		50 kHz – 100 kHz	$1 \cdot 10^{-3} \cdot U$		
		100 kHz – 500 kHz	$3 \cdot 10^{-3} \cdot U$		
	3.3 V – 33 V	10 Hz – 45 Hz	$5 \cdot 10^{-4} \cdot U$	Generation	OS
		45 Hz – 20 kHz	$3 \cdot 10^{-4} \cdot U$		
		20 kHz – 50 kHz	$5 \cdot 10^{-4} \cdot U$		
		50 kHz – 100 kHz	$1 \cdot 10^{-3} \cdot U$		
	33 V – 330 V	45 Hz – 20 kHz	$3 \cdot 10^{-4} \cdot U$	Generation	OS
		20 kHz – 50 kHz	$5 \cdot 10^{-4} \cdot U$		
		50 kHz – 100 kHz	$2 \cdot 10^{-3} \cdot U$		
	330 V – 1,000 V	45 Hz – 10 kHz	$3 \cdot 10^{-4} \cdot U$	Generation	OS
	Conversion factor (0.001 – 1) V/V	10 Hz – 100 kHz	$(1 \cdot 10^{-3} - 2 \cdot 10^{-3}) \cdot U/U$		ZTM, OS
LF 3 2	Alternating Voltage Ratio				ZTM
	(0.001 – 1) V/V	10 Hz – 100 kHz	$(1 \cdot 10^{-3} - 2 \cdot 10^{-3}) \cdot U/U$	primary voltage 100 mV to 1000 V, secondary voltage 0.1 mV to 1000 V	ZTM, OS
LF 3 3	Alternating High voltage			Measurement and generation	ZTM
	1 – 30 kV	50 Hz	$4.5 \cdot 10^{-3} \cdot U$		ZTM, OS

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
LF 4 0	Alternating current				ZTM
	10 µA – 100 µA	10 Hz – 40 Hz	$3 \cdot 10^{-4} /$	Measurement	
		40 Hz – 1 kHz	$1.5 \cdot 10^{-3} /$		
		1 kHz – 10 kHz	$4 \cdot 10^{-3} /$		
		10 kHz – 30 kHz	$1.5 \cdot 10^{-2} /$		
	100 µA – 1 mA	10 Hz – 1 kHz	$2 \cdot 10^{-4} /$		
		1 kHz – 10 kHz	$4 \cdot 10^{-4} /$		
		10 kHz – 30 kHz	$7 \cdot 10^{-4} /$		
	1 mA – 20 A	20 Hz – 10 kHz	$2 \cdot 10^{-4} /$		
		10 kHz – 30 kHz	$2.5 \cdot 10^{-4} /$		
	20 A – 100 A	20 Hz – 30 kHz	$7 \cdot 10^{-4} /$	Measurement	
	10 µA – 100 µA	10 Hz – 40 Hz	$3 \cdot 10^{-4} /$	Generation	
		40 Hz – 1 kHz	$1.5 \cdot 10^{-3} /$		
		1 kHz – 10 kHz	$4 \cdot 10^{-3} /$		
		10 kHz – 30 kHz	$1.5 \cdot 10^{-2} /$		
	100 µA – 1 mA	10 Hz – 1 kHz	$2.5 \cdot 10^{-4} /$	Generation	
		1 kHz – 10 kHz	$4 \cdot 10^{-4} /$		
		10 kHz – 30 kHz	$7 \cdot 10^{-4} /$		
	1 mA – 100 mA	20 Hz – 30 kHz	$2.5 \cdot 10^{-4} /$		
	100 mA – 11 A	20 Hz – 10 kHz	$2.5 \cdot 10^{-4} /$		
	11 A – 20 A	20 Hz – 5 kHz	$2.5 \cdot 10^{-4} /$		
	20 A – 100 A	20 Hz – 30 kHz	$7 \cdot 10^{-4} /$		
	6 µA – 120 µA	10 – 20 Hz	$5 \cdot 10^{-3} /$	Measurement	OS
		20 – 45 Hz	$3 \cdot 10^{-3} /$		
		45 – 5 kHz	$2 \cdot 10^{-3} /$		

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	0.12 mA – 120 mA	10 – 20 Hz	$5 \cdot 10^{-3}/$	Measurement	OS
		20 – 45 Hz	$3 \cdot 10^{-3}/$		
		45 – 100 Hz	$2 \cdot 10^{-3}/$		
		100 Hz – 5 kHz	$1 \cdot 10^{-3}/$		
		5 kHz – 20 kHz	$2 \cdot 10^{-3}/$		
		20 kHz – 50 kHz	$5 \cdot 10^{-3}/$		
		50 kHz – 100 kHz	$8 \cdot 10^{-3}/$		
	0.12 A – 1.2 A	10 – 20 Hz	$5 \cdot 10^{-3}/$	Measurement	OS
		20 – 45 Hz	$3 \cdot 10^{-3}/$		
		45 Hz – 5 kHz	$2 \cdot 10^{-3}/$		
		5 kHz – 20 kHz	$4 \cdot 10^{-3}/$		
		20 kHz – 50 kHz	$1.5 \cdot 10^{-2}/$		
	29 μ A – 330 μ A	10 Hz – 1 kHz	$2 \cdot 10^{-3}/$	Generation	OS
		1 kHz – 5 kHz	$3 \cdot 10^{-3}/$		
		5 kHz – 10 kHz	$8 \cdot 10^{-4}/$		
		10 kHz – 30 kHz	$1.5 \cdot 10^{-2}/$		
	0.33 mA – 3.3 mA	10 Hz – 45 Hz	$2 \cdot 10^{-3}/$	Generation	OS
		45 Hz – 1 kHz	$1 \cdot 10^{-3}/$		
		1 – 5 kHz	$2 \cdot 10^{-3}/$		
		5 – 10 kHz	$5 \cdot 10^{-3}/$		
		10 – 30 kHz	$9 \cdot 10^{-3}/$		
	3.3 mA – 33 mA	10 – 20 Hz	$2 \cdot 10^{-3}/$	Generation	OS
		20 – 45 Hz	$1 \cdot 10^{-3}/$		
		45 Hz – 1 kHz	$5 \cdot 10^{-4}/$		
		1 kHz – 5 kHz	$8 \cdot 10^{-4}/$		
		5 kHz – 10 kHz	$2 \cdot 10^{-3}/$		
		10 kHz – 30 kHz	$4 \cdot 10^{-3}/$		

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	33 mA – 330 mA	10 – 20 Hz	$2 \cdot 10^{-3} /$	Generation	OS
		20 – 45 Hz	$1 \cdot 10^{-3} /$		
		45 Hz – 1 kHz	$5 \cdot 10^{-4} /$		
		1 – 5 kHz	$1 \cdot 10^{-3} /$		
		5 – 10 kHz	$2 \cdot 10^{-3} /$		
		10 – 30 kHz	$4 \cdot 10^{-3} /$		
	0.33 A – 1.1 A	10 – 45 Hz	$2 \cdot 10^{-3} /$	Generation	OS
		45 Hz – 1 kHz	$6 \cdot 10^{-4} /$		
		1 – 5 kHz	$6 \cdot 10^{-3} /$		
		5 – 10 kHz	$2.5 \cdot 10^{-2} /$		
	1.1 A – 3 A	40 – 45 Hz	$2 \cdot 10^{-3} /$	Generation	OS
		45 Hz – 1 kHz	$6 \cdot 10^{-4} /$		
		1 kHz – 5 kHz	$6 \cdot 10^{-3} /$		
		5 kHz – 10 kHz	$2.2 \cdot 10^{-2} /$		
	3 A – 11 A	45 Hz – 5 kHz	$1 \cdot 10^{-3} /$	Generation	OS
		5 kHz – 10 kHz	$2.5 \cdot 10^{-2} /$		
	11 A – 20.5 A	45 Hz – 5 kHz	$2 \cdot 10^{-3} /$	Generation	OS
		5 kHz – 10 kHz	$2.5 \cdot 10^{-2} /$		
	100 mA – 20 A	20 Hz – 1000 Hz	$4 \cdot 10^{-3} /$	Generation, only for current clamps / probes	ZTM, OS
	20 A – 1000 A	30 Hz – 60 Hz	$8 \cdot 10^{-3} /$		
	Conversion factor (0.001 – 1) V/A	20 Hz – 1000 Hz	$4 \cdot 10^{-3} \cdot U/I$		ZTM, OS
LF 4 2	Alternating Current Ratio				ZTM, OS
	(0.001 – 1) V/A	20 Hz – 1000 Hz,	$4 \cdot 10^{-3} \cdot U/I$	primary current 100 mA to 1000 A, secondary voltage 0.1 mV to 1000 V, >20 A 30 – 60 Hz	

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
LF 6 1	Resistance				ZTM
	0.08 mΩ		$1.5 \cdot 10^{-4} \cdot R$	Generation	
	0.2 mΩ; 0.4 mΩ; 0.8 mΩ		$1 \cdot 10^{-4} \cdot R$		
	1 mΩ		$3.5 \cdot 10^{-5} \cdot R$		
	10 mΩ		$1.5 \cdot 10^{-5} \cdot R$		
	100 mΩ		$5 \cdot 10^{-6} \cdot R$		
	1 Ω; 10 Ω; 100 Ω; 1000 Ω		$3 \cdot 10^{-6} \cdot R$		
	10 kΩ		$1 \cdot 10^{-6} \cdot R$		
	100 kΩ		$4 \cdot 10^{-6} \cdot R$		
	1 MΩ		$6 \cdot 10^{-6} \cdot R$		
	10 MΩ		$8 \cdot 10^{-6} \cdot R$		
	100 MΩ		$5.5 \cdot 10^{-5} \cdot R$		
	0 Ω		$1 \cdot 10^{-3} \Omega$	Generation	ZTM, OS
	0.1 mΩ – 11 Ω		$3.2 \cdot 10^{-5} \cdot R + 1 \cdot 10^{-3} \Omega$		
	11 Ω – 33 Ω		$6 \cdot 10^{-5} \cdot R$		
	33 Ω – 110 Ω		$3.3 \cdot 10^{-5} \cdot R$		
	110 Ω – 110 kΩ		$2.8 \cdot 10^{-5} \cdot R$		
	0.1 MΩ – 1.1 MΩ		$3 \cdot 10^{-5} \cdot R$		
	1.1 MΩ – 3.3 MΩ		$6 \cdot 10^{-5} \cdot R$		
	3.3 MΩ – 11 MΩ		$1.2 \cdot 10^{-4} \cdot R$		
	11 MΩ – 33 MΩ		$3 \cdot 10^{-4} \cdot R$		
	33 MΩ – 110 MΩ		$5 \cdot 10^{-4} \cdot R$		
	110 MΩ – 330 MΩ		$3 \cdot 10^{-3} \cdot R$		
	0.33 GΩ – 1.1 GΩ		$1.2 \cdot 10^{-2} \cdot R$		
	0.08 mΩ		$1.5 \cdot 10^{-4} \cdot R$	Measurement	
	1 mΩ		$6 \cdot 10^{-5} \cdot R$		
	10 mΩ		$5 \cdot 10^{-5} \cdot R$		

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
	100 mΩ		$3 \cdot 10^{-5} \cdot R$		
	1 Ω		$6 \cdot 10^{-6} \cdot R$		
	10 Ω; 100 Ω; 1 kΩ		$3 \cdot 10^{-6} \cdot R$		
	10 kΩ		$1 \cdot 10^{-6} \cdot R$		
	100 kΩ		$4 \cdot 10^{-6} \cdot R$		
	1 MΩ		$6 \cdot 10^{-6} \cdot R$		
	10 MΩ		$1 \cdot 10^{-5} \cdot R$		
	100 MΩ		$6 \cdot 10^{-5} \cdot R$		
	0.08 mΩ – 1 mΩ		$1.5 \cdot 10^{-4} \cdot R$		
	1 mΩ – 1 Ω		$3.5 \cdot 10^{-5} \cdot R$		
	1 Ω – 2 Ω		$3 \cdot 10^{-5} \cdot R$		
	2 Ω – 20 Ω		$2 \cdot 10^{-5} \cdot R$		
	20 Ω – 200 kΩ		$5 \cdot 10^{-6} \cdot R$		
	200 kΩ – 2 MΩ		$1 \cdot 10^{-5} \cdot R$		
	2 MΩ – 20 MΩ		$5 \cdot 10^{-5} \cdot R$		
	20 MΩ – 200 MΩ		$5 \cdot 10^{-4} \cdot R$		
	0.1 Ω – 10 Ω		$2 \cdot 10^{-5} \cdot R$	Measurement	OS
	10 Ω – 100 Ω		$1.5 \cdot 10^{-5} \cdot R$		
	0.1 kΩ – 1 kΩ		$1 \cdot 10^{-5} \cdot R$		
	1 kΩ – 10 kΩ		$1 \cdot 10^{-5} \cdot R$		
	10 kΩ – 100 kΩ		$1 \cdot 10^{-5} \cdot R$		
	0.1 MΩ – 1 MΩ		$1.5 \cdot 10^{-5} \cdot R$		
	1 MΩ – 10 MΩ		$5 \cdot 10^{-5} \cdot R$		
	10 MΩ – 100 MΩ		$4 \cdot 10^{-4} \cdot R$		
	100 MΩ – 200 MΩ		$4 \cdot 10^{-3} \cdot R$		

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
LF 6 4	Capacitance				ZTM
	1 pF	1 kHz	$1.5 \cdot 10^{-4} \cdot C$	Generation	
	10 pF	1 kHz	$4 \cdot 10^{-5} \cdot C$		
	100 pF; 1 nF	1 kHz	$1.5 \cdot 10^{-5} \cdot C$		
	10 nF	1 kHz	$1 \cdot 10^{-4} \cdot C$		
	100 nF	1 kHz	$1 \cdot 10^{-4} \cdot C$		
	1 μ F	1 kHz	$2.5 \cdot 10^{-4} \cdot C$		
	1 pF – 10 pF	1 kHz	$1.2 \cdot 10^{-5} \cdot C$	Measurement, $D < 0.01$	
	10 pF – 1 nF	1 kHz	$4 \cdot 10^{-5} \cdot C$		
	1 nF – 10 nF	1 kHz	$7 \cdot 10^{-5} \cdot C$		
	10 nF – 100 nF	1 kHz	$1.5 \cdot 10^{-4} \cdot C$		
	100 nF – 1 μ F	1 kHz	$3.3 \cdot 10^{-4} \cdot C$		
LF 6 7	Inductance			Measurement and generation	ZTM
	100 μ H	1 kHz	$2 \cdot 10^{-3} \cdot L$		
	1 mH	1 kHz	$5 \cdot 10^{-4} \cdot L$		
	10 mH	1 kHz	$5 \cdot 10^{-4} \cdot L$		
	100 mH	1 kHz	$5 \cdot 10^{-4} \cdot L$		
	1 H	1 kHz	$5 \cdot 10^{-4} \cdot L$		
	1 H	400 Hz	$5 \cdot 10^{-4} \cdot L$		

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
RF 0 0	High Frequency electricity				
RF 2 1	Reflection coefficient				ZTM, OS
	linear magnitude $ \Gamma $	0.05 GHz – 2 GHz	$0.005 + 0.004 \cdot \Gamma $	Measurement N connector. Best accuracy for a test object VSWR of maximum 1.04	
		>2 GHz – 18 GHz	$0.012 + 0.020 \cdot \Gamma $		
		0.05 GHz – 2 GHz	$0.006 + 0.007 \cdot \Gamma $	Measurement PC 3.5 connector. Best accuracy for a test object VSWR of maximum 1.06	
		>2 GHz – 18 GHz	$0.017 + 0.022 \cdot \Gamma $		
		>18 GHz – 26.5 GHz	$0.029 + 0.021 \cdot \Gamma $		
	VSWR				
		0.05 GHz – 2 GHz	0.011	Measurement N connector. Best accuracy for a test object VSWR of maximum 1.04	
		>2 GHz – 18 GHz	0.024		
		0.05 GHz – 2 GHz	0.011	Measurement PC 3.5 connector. Best accuracy for a test object VSWR of maximum 1.06	
		>2 GHz – 18 GHz	0.034		
		>18 GHz – 26.5 GHz	0.06		
RF 2 2	Attenuation				ZTM, OS
	10 dB – 30 dB	0.05 GHz – <1 GHz	0.05 dB	3) Measurement with measuring receiver, N or PC 7 connector	
		1 GHz – 14GHz	0.10 dB		
		>14 GHz – 18 GHz	0.15 dB		

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
	> 30 dB – 60 dB	0.05 GHz – <1 GHz	0.07 dB		
		1 GHz – 16 GHz	0.10 dB		
		>16 GHz – 18 GHz	0.15 dB		
	3 dB – 10 dB	0.05 GHz – <1 GHz	0.07dB	4) Measurement with VNA, N connector	
		1 GHz – 18 GHz	0.14 dB		
	>10 dB – 20 dB	0.05 GHz – <1 GHz	0.09 dB		
		1 GHz – 18 GHz	0.15 dB		
	>20 dB – 40 dB	0.05 GHz – <1 GHz	0.12 dB		
		1 GHz – 18 GHz	0.17 dB		
	>40 dB – 50 dB	(0.05 – 18) GHz	0.22 dB		
	>50 dB – 60 dB	0.05 GHz	0.32 dB		
		>0.05 GHz – 18 GHz	0.26 dB		
	3 dB – 20 dB	0.05 GHz – <1 GHz	0.08 dB	4) Measurement with VNA, PC 3.5 connector	
		1 GHz – 20 GHz	0.15 dB		
		>20 GHz – 26.5 GHz	0.17 dB		
	>20 dB – 40 dB	0.05 GHz – 20 GHz	0.17 dB		
		>20 GHz – 26.5 GHz	0.19 dB		
	>40 dB – 50 dB	0.05 GHz – 20 GHz	0.19 dB		
		>20 GHz – 26.5 GHz	0.21 dB		
	>50 dB– 60 dB	0.05 GHz	0.32 dB		
		>0.05 GHz – 0.5 GHz	0.24 dB		
		>0.5 GHz – 20 GHz	0.22 dB		
		>20 GHz – 26.5 GHz	0.24 dB		

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
	10 dB – 50 dB	0.05 GHz – 1 GHz	0.04 dB	Generation with a step attenuator, relative to 0 dB (e.g. network analyzer)	
	>50 dB – 60 dB	0.05 GHz – 1 GHz	0.05 dB		
	>60 dB – 70 dB	0.05 GHz – 1 GHz	0.10 dB		
	>70 dB – 80 dB	0.05 GHz – 1 GHz	0.20 dB		
RF 3 0	High frequency Power				ZTM, OS
	Calibration factor	100 kHz – 500 kHz	1.3 % – 1.0 %	1), 2), N connector. Nominal 1 mW, Calibration of a power sensor	
		500 kHz – 18 GHz	1.0 % – 2.0 %		
		10 MHz – 50 MHz	2.7 % – 2.1 %	1), 2), N connector. Nominal 1 µW, Calibration of a power sensor	
		50 MHz – 18 GHz	2.1 % – 3.6 %		
		10 MHz – 33 GHz	1.5 % – 3.0 %	1), 2). PC 3.5 connector. Nominal 1 mW, Calibration of a power sensor	
		10 MHz – 40 GHz	1.6 % – 5.0 %	1), 2). PC 2.92 connector. Nominal 1 mW, Calibration of a power sensor	
	Absolute power 1 mW	50 MHz	0.004 mW	N connector, measurement and generation	
	Absolute power 0 dBm	50 MHz	0.018 dB		
	Absolute power 0 to -10 dBm	100 kHz – 1 GHz	0.10 dB	4) BNC connector. Measurement with power sensor (e.g. generator)	
		100 kHz – 8 GHz	0.07 dB	4) N female or PC 7 connector. Measurement with power sensor (e.g. generator)	
		>8 GHz – 18 GHz	0.10 dB		
		10 MHz – 8 GHz	0.08 dB	4) PC 3.5 male or female connector. Measurement	
		>8 GHz – 18 GHz	0.12 dB		

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HCS code	Measured quantity, Range	Frequency	CMC ¹	Remarks	Location
		>18 GHz – 26.5 GHz	0.15 dB	with power sensor (e.g. generator)	
		> 26.5 GHz – 33 GHz	0.22 dB		
	Absolute power -10 to -90 dBm	2.5 MHz – 1000 MHz	0.20 dB	4) BNC connector. Measurement with measuring receiver (e.g. generator)	
	Absolute power -90 to -110 dBm	2.5 MHz – 1000 MHz	0.20 dB		
	Absolute power -10 to -90 dBm	2.5 MHz – 1300 MHz	0.20 dB	4) N female or PC 7 connector. Measurement with measuring receiver (e.g. generator)	
		>1.3 GHz – 2.6 GHz	0.25 dB		
	Absolute power -90 to -110 dBm	2.5 MHz – 1300 MHz	0.20 dB		
		>1.3 GHz – 2.6 GHz	0.25 dB		
	Absolute power -10 to -90 dBm	10 MHz – 1300 MHz	0.20 dB	4) PC 3.5 male or female connector. Measurement with measuring receiver (e.g. generator)	
		>1.3 GHz – 10 GHz	0.25 dB		
		>10 GHz – 21 GHz	0.35 dB		
		>21 GHz – 24 GHz	0.40 dB		
		>24 GHz – 26 GHz	0.60 dB		
	Absolute power -90 to -110 dBm	10 MHz – 1300 MHz	0.25 dB		
		>1.3 GHz – 10 GHz	0.30 dB		
		>10 GHz – 21 GHz	0.35 dB		
		>21 GHz – 24 GHz	0.40 dB		
		>24 GHz – 26 GHz	0.60 dB		
	Absolute power 0 to -10 dBm	100 kHz – 1 GHz	0.10 dB	4) BNC connector. Generation with splitter and power sensor (e.g. spectrum analyser)	
		100 kHz – 8 GHz	0.08 dB	4) N male or female or PC 7 connector. Generation with splitter and power sensor (e.g. spectrum analyser)	
		>8 GHz – 18 GHz	0.12 dB		

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		10 MHz – 8 GHz	0.10 dB	4) PC 3.5 male connector. Generation with splitter and power sensor (e.g. spectrum analyser)	
		>8 GHz – 18 GHz	0.16 dB		
		>18 GHz – 26.5 GHz	0.20 dB		
		>26.5 GHz – 30 GHz	0.24 dB		
		>30 GHz – 33 GHz	0.30 dB		
	Absolute power -10 to -90 dBm	50 MHz	0.25 dB	4) BNC connector. Generation with splitter and measuring receiver (e.g. spectrum analyser)	
	Absolute power -90 to -100 dBm	50 MHz	0.30 dB		
	Absolute power -10 to -90 dBm	50 MHz	0.25 dB	4) N male or female or PC 7 connector. Generation with splitter and measuring receiver (e.g. spectrum analyser)	
	Absolute power -90 to -100 dBm	50 MHz	0.30 dB		
	Absolute power -10 to -90 dBm	50 MHz	0.25 dB	4) PC 3.5 male connector. Generation with splitter and measuring receiver (e.g. spectrum analyser)	
	Absolute power -90 to -100 dBm	50 MHz	0.30 dB		
TF 0 0	Time and Frequency				
TF 2 1	Frequency				ZTM
	100 kHz		$1 \cdot 10^{-11} \cdot f$	Measurement measuring time $\tau \geq 1000$ s	
	1 MHz		$1 \cdot 10^{-11} \cdot f$		
	5 MHz		$1 \cdot 10^{-11} \cdot f$		
	10 MHz		$1 \cdot 10^{-11} \cdot f$		
	0.1 Hz – 1 Hz		12 μ Hz	Measurement. Generation measuring time $\tau \geq 20$ s	
	1 Hz – 10 Hz		12 μ Hz		
	10 Hz – 100 Hz		12 μ Hz – 1.2 μ Hz		
	100 Hz – 1 kHz		1.2 μ Hz		