Annex to declaration of accreditation (scope of accreditation)
Normative document: EN ISO/IEC 17025:2017
Registration number: **K 063**

of **Kiwa Dare B.V.**

This annex is valid from: **06-11-2024** to **01-11-2025** Replaces annex dated: **04-09-2024**

Location(s) where activities are performed under accreditation

Head Office

Vijzelmolenlaan 7
3447 GX
Woerden
The Netherlands

Location	Abbreviation/ location code
Vijzelmolenlaan 7 3447 GX Woerden The Netherlands	WO
On-site	OS

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
LF 0 0	DC/LF ELECTRICITY				
LF 1 0	DIRECT VOLTAGE				WO
	0 mV – 2 mV		$6 \cdot 10^{-6} \cdot U$ + 1.1 μV	Generating	
	2 mV – 20 mV		$8 \cdot 10^{-6} \cdot U$ + 1.1 μV		
	20 mV – 200 mV		$1.0 \cdot 10^{-5} \cdot U$ + 1.0 μV		
	200 mV – 2 V		$1.1 \cdot 10^{-5} \cdot U$ + 1.0 μV		
	2 V – 20 V		$6 \cdot 10^{-6} \cdot U$ + 22 μV		
	20 V – 200 V		$8 \cdot 10^{-6} \cdot U$ + 0.2 mV		
	200 V – 1000 V		$9 \cdot 10^{-6} \cdot U$ + 2.7 mV		

[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
	0 mV – 200 mV		$3 \cdot 10^{-5} \cdot U$ + 0.8 μV	Measuring	
	200 mV – 2 V		$7 \cdot 10^{-6} \cdot U$ + 2.0 μV		
	2 V – 20 V		$7 \cdot 10^{-6} \cdot U$ + 20 μV		
	20 V – 200 V		$1.2 \cdot 10^{-5} \cdot U$ + 0.15 mV		
	200 V – 1000 V		$1.1 \cdot 10^{-5} \cdot U$ + 1.8 mV		
LF 2 0	DIRECT CURRENT				WO
	0 μA – 200 μA		$5 \cdot 10^{-3} \cdot I$ + 5 nA	Generating	
	200 μA – 2 mA		$5 \cdot 10^{-4} \cdot I$ + 12 nA		
	2 mA – 20 mA		$7 \cdot 10^{-5} \cdot I$ + 0.12 μA		
	20 mA – 200 mA		$5 \cdot 10^{-5} \cdot I$ + 1.8 μA		
	200 mA – 1 A		$1.2 \cdot 10^{-4} \cdot I$ + 30 μA		
	1 A – 2 A		$2.4 \cdot 10^{-4} \cdot I$ + 0.04 mA		
	0 μA – 200 μA		$5 \cdot 10^{-2} \cdot I$ + 5 nA	Measuring	
	200 μA – 2 mA		$5 \cdot 10^{-3} \cdot I$ + 0.05 μA		
	2 mA – 20 mA		$5 \cdot 10^{-4} \cdot I$ + 0.5 μA		
	20 mA – 200 mA		$1.3 \cdot 10^{-4} \cdot I$ + 5 μA		
	200 mA – 2 A		$2.4 \cdot 10^{-4} \cdot I$ + 0.05 mA		

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HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
LF 3 0	ALTERNATING VOLTAGE				WO
	1 mV – 2 mV	30 Hz – 3.3 kHz	$1.1 \cdot 10^{-3} \cdot U + 7\ \mu V$	Generating, 2-wire	
		3.3 kHz – 10 kHz	$1.8 \cdot 10^{-3} \cdot U + 7\ \mu V$		
		10 kHz – 33 kHz	$4 \cdot 10^{-3} \cdot U + 7\ \mu V$		
		33 kHz – 100 kHz	$1.0 \cdot 10^{-2} \cdot U + 7\ \mu V$		
	2 mV – 20 mV	30 Hz – 1 kHz	$3.2 \cdot 10^{-4} \cdot U + 7\ \mu V$		
		1 kHz – 3.3 kHz	$5 \cdot 10^{-4} \cdot U + 7\ \mu V$		
		3.3 kHz – 10 kHz	$1.3 \cdot 10^{-3} \cdot U + 6\ \mu V$		
		10 kHz – 33 kHz	$3.5 \cdot 10^{-3} \cdot U + 6\ \mu V$		
		33 kHz – 100 kHz	$1.2 \cdot 10^{-2} \cdot U + 6\ \mu V$		
	20 mV – 200 mV	30 Hz – 330 Hz	$2.3 \cdot 10^{-4} \cdot U + 12\ \mu V$		
		330 Hz – 1 kHz	$3.1 \cdot 10^{-4} \cdot U + 10\ \mu V$		
		1 kHz – 3.3 kHz	$6 \cdot 10^{-4} \cdot U + 6\ \mu V$		
		3.3 kHz – 10 kHz	$1.3 \cdot 10^{-3} \cdot U + 6\ \mu V$		
		10 kHz – 33 kHz	$3.6 \cdot 10^{-3} \cdot U + 6\ \mu V$		
		33 kHz – 100 kHz	$1.2 \cdot 10^{-2} \cdot U + 6\ \mu V$		
	90 mV – 2V	10 Hz – 32 Hz	$1.3 \cdot 10^{-4} \cdot U + 50\ \mu V$	Generating, 4-wire	
		32 Hz – 330 Hz	$9 \cdot 10^{-5} \cdot U + 50\ \mu V$		
		330 Hz – 3.3 kHz	$6 \cdot 10^{-5} \cdot U + 30\ \mu V$		
		3.3 kHz – 33 kHz	$9 \cdot 10^{-5} \cdot U + 25\ \mu V$		
		33 kHz – 100 kHz	$1.0 \cdot 10^{-4} \cdot U + 0.22\ mV$		
		100 kHz – 330 kHz	$1.6 \cdot 10^{-3} \cdot U + 0.8\ mV$		
		330 kHz – 1 MHz	$1.4 \cdot 10^{-2} \cdot U + 2.0\ mV$		
	2 V – 20 V	10 Hz – 32 Hz	$1.1 \cdot 10^{-4} \cdot U + 0.6\ mV$		
		32 Hz – 330 Hz	$7 \cdot 10^{-5} \cdot U + 0.5\ mV$		
		330 Hz – 33 kHz	$6 \cdot 10^{-5} \cdot U + 0.4\ mV$		
		33 kHz – 100 kHz	$2.2 \cdot 10^{-4} \cdot U + 2.0\ mV$		
	2 V – 20 V	100 kHz – 330 kHz	$1.6 \cdot 10^{-3} \cdot U + 7\ mV$		

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
		330 kHz – 1 MHz	$1.1 \cdot 10^{-2} \cdot U$ + 12 mV		
	20 V – 200 V	10 Hz – 32 Hz	$1.7 \cdot 10^{-4} \cdot U$ + 9 mV		
		32 Hz – 330 Hz	$1.2 \cdot 10^{-4} \cdot U$ + 6 mV		
		330 Hz – 10 kHz	$7 \cdot 10^{-5} \cdot U$ + 5 mV		
		10 kHz – 33 kHz	$8 \cdot 10^{-5} \cdot U$ + 6 mV		
		33 kHz – 100 kHz	$4 \cdot 10^{-4} \cdot U$ + 20 mV		
	200 V – 1000 V	50 Hz – 330 Hz	$9 \cdot 10^{-4} \cdot U$ + 50 mV		
		330 Hz – 10 kHz	$7 \cdot 10^{-4} \cdot U$ + 40 mV		
		10 kHz – 33 kHz	$9 \cdot 10^{-4} \cdot U$ + 50 mV		
	2 mV – 200 mV	20 Hz – 40 Hz	$3 \cdot 10^{-4} \cdot U$ + 15 µV	Measuring	
		40 Hz – 2 kHz	$2.8 \cdot 10^{-4} \cdot U$ + 15 µV		
		2 kHz – 10 kHz	$2.7 \cdot 10^{-4} \cdot U$ + 15 µV		
		10 kHz – 30 kHz	$5 \cdot 10^{-4} \cdot U$ + 20 µV		
		30 kHz – 100 kHz	$1.0 \cdot 10^{-3} \cdot U$ + 40 µV		
	200 mV – 2 V	20 Hz – 40 Hz	$2.1 \cdot 10^{-4} \cdot U$ + 55 µV		
		40 Hz – 100 Hz	$1.9 \cdot 10^{-4} \cdot U$ + 55 µV		
		100 Hz – 300 Hz	$1.7 \cdot 10^{-4} \cdot U$ + 55 µV		
		300 Hz – 1000 Hz	$1.6 \cdot 10^{-4} \cdot U$ + 40 µV		
		1 kHz – 3 kHz	$1.8 \cdot 10^{-4} \cdot U$ + 40 µV		
		3 kHz – 10 kHz	$3 \cdot 10^{-4} \cdot U$ + 0.05 mV		
		10 kHz – 60 kHz	$6 \cdot 10^{-4} \cdot U$ + 0.30 mV		
		60 kHz – 100 kHz	$6 \cdot 10^{-4} \cdot U$ + 0.30 mV		
		100 kHz – 300 kHz	$4.10^{-3} U$ + 2.5 mV		
		300 kHz – 1 MHz	$1.2 \cdot 10^{-2} \cdot U$ + 24 mV		
	2 V – 20 V	20 Hz – 40 Hz	$2.1 \cdot 10^{-4} \cdot U$ + 0.6 mV		
		40 Hz – 100 Hz	$1.9 \cdot 10^{-4} \cdot U$ + 0.6 mV		
		100 Hz – 3 kHz	$1.9 \cdot 10^{-4} \cdot U$ + 0.6 mV		
		3 kHz – 10 kHz	$3.0 \cdot 10^{-4} \cdot U$ + 0.5 mV		

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
		10 kHz – 60 kHz	$6 \cdot 10^{-4} \cdot U + 3.0$ mV		
		60 kHz – 300 kHz	$3.7 \cdot 10^{-3} \cdot U + 30$ mV		
		300 kHz – 1 MHz	$1.2 \cdot 10^{-2} \cdot U + 0.24$ V		
	20 V - 200 V	20 Hz – 40 Hz	$2.2 \cdot 10^{-4} \cdot U + 6$ mV		
		40 Hz – 100 Hz	$1.9 \cdot 10^{-4} \cdot U + 7$ mV		
		100 Hz – 300 Hz	$1.7 \cdot 10^{-4} \cdot U + 6$ mV		
		300 Hz – 10 kHz	$1.8 \cdot 10^{-4} \cdot U + 5$ mV		
		10 kHz – 30 kHz	$3.0 \cdot 10^{-4} \cdot U + 6$ mV		
		30 kHz – 100 kHz	$7 \cdot 10^{-4} \cdot U + 30$ mV		
	200 V - 1000 V	40 Hz – 3 kHz	$2.2 \cdot 10^{-4} \cdot U + 30$ mV		
		3 kHz – 10 kHz	$1.9 \cdot 10^{-4} \cdot U + 0{,}04$ V		
		10 kHz – 30 kHz	$4 \cdot 10^{-4} \cdot U + 0{,}08$ V		
LF 4 0	ALTERNATING CURRENT				WO
	100 µA – 200 µA	10 Hz – 32 Hz	$3.0 \cdot 10^{-4} \cdot I + 13$ nA	Generating	
		32 Hz – 330 Hz	$1.9 \cdot 10^{-3} \cdot I + 11$ nA		
		330 Hz – 1000 Hz	$6 \cdot 10^{-3} \cdot I + 5$ nA		
	200 µA – 2 mA	10 Hz – 32 Hz	$1.6 \cdot 10^{-4} \cdot I + 0.15$ µA		
		32 Hz – 330 Hz	$1.6 \cdot 10^{-4} \cdot I + 0.17$ µA		
		330 Hz – 1000 Hz	$1.5 \cdot 10^{-4} \cdot I + 0.17$ µA		
		1 kHz – 3.3 kHz	$2.0 \cdot 10^{-4} \cdot I + 0.20$ µA		
		3.3 kHz – 5 kHz	$2.8 \cdot 10^{-4} \cdot I + 0.17$ µA		
	2 mA – 20 mA	10 Hz – 32 Hz	$1.6 \cdot 10^{-4} \cdot I + 1.5$ µA		
		32 Hz – 330 Hz	$1.6 \cdot 10^{-4} \cdot I + 1.7$ µA		
		330 Hz – 1000 Hz	$1.4 \cdot 10^{-4} \cdot I + 1.7$ µA		
	2 mA – 20 mA	1 kHz – 3.3 kHz	$2.6 \cdot 10^{-4} \cdot I + 1.7$ µA		
		3.3 kHz – 5 kHz	$2.7 \cdot 10^{-4} \cdot I + 1.7$ µA		
	20 mA – 200 mA	10 Hz – 32 Hz	$1.6 \cdot 10^{-4} \cdot I + 15$ µA		

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
		32 Hz – 330 Hz	$1.6 \cdot 10^{-4} \cdot I$ + 16 µA		
		330 Hz – 1000 Hz	$1.4 \cdot 10^{-4} \cdot I$ + 17 µA		
		1 kHz – 3.3 kHz	$2.6 \cdot 10^{-4} \cdot I$ + 17 µA		
		3.3 kHz – 5 kHz	$2.6 \cdot 10^{-4} \cdot I$ + 17 µA		
	200 mA – 1 A	10 Hz – 32 Hz	$4 \cdot 10^{-4} \cdot I$ + 0.15 mA		
		32 Hz – 330 Hz	$6 \cdot 10^{-4} \cdot I$ + 0.15 mA		
		330 Hz – 1000 Hz	$1.5 \cdot 10^{-3} \cdot I$ + 0.10 mA		
		1 kHz – 3.3 kHz	$5 \cdot 10^{-3} \cdot I$ + 0.09 mA		
		3.3 kHz – 5 kHz	$8 \cdot 10^{-3} \cdot I$ + 33 µA		
	1 A - 2 A	10 Hz – 32 Hz	$8 \cdot 10^{-4} \cdot I$ + 0.20 mA		
		32 Hz – 330 Hz	$9 \cdot 10^{-4} \cdot I$ + 0.20 mA		
		330 Hz – 1000 Hz	$1.6 \cdot 10^{-3} \cdot I$ + 0.20 mA		
		1 kHz – 3.3 kHz	$5 \cdot 10^{-3} \cdot I$ + 0.09 mA		
		3.3 kHz – 5 kHz	$8 \cdot 10^{-3} \cdot I$ + 33 µA		
	100 µA – 200 µA	50 Hz – 1000 Hz	$4 \cdot 10^{-4} \cdot I$ + 25 nA	Measuring	
		1 kHz – 5 kHz	$6 \cdot 10^{-4} \cdot I$ + 0.05 µA		
	200 µA – 2 mA	50 Hz – 300 Hz	$4 \cdot 10^{-4} \cdot I$ + 0.25 µA		
		300 Hz – 1000 Hz	$4 \cdot 10^{-4} \cdot I$ + 0.25 µA		
		1 kHz – 5 kHz	$6 \cdot 10^{-4} \cdot I$ + 0.5 µA		
	2 mA – 20 mA	50 Hz – 300 Hz	$4 \cdot 10^{-4} \cdot I$ + 2.5 µA		
		300 Hz – 1000 Hz	$4 \cdot 10^{-4} \cdot I$ + 2.5 µA		
		1 kHz – 5 kHz	$6 \cdot 10^{-4} \cdot I$ + 5 µA		
	20 mA – 200 mA	50 Hz – 1000 Hz	$4 \cdot 10^{-4} \cdot I$ + 25 µA		
		1 kHz – 5 kHz	$6 \cdot 10^{-4} \cdot I$ + 0.05 mA		
	200 mA – 2 A	50 Hz – 1000 Hz	$1.2 \cdot 10^{-3} \cdot I$ + 0.5 mA		
		1 kHz – 5 kHz	$2.5 \cdot 10^{-3} \cdot I$ + 1.3 mA		
LF 6 0	IMPEDANCE (DC/LF)				

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HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
LF 6 2	DC resistance				WO
	1 Ω		0.2 mΩ	Generating, 4-wire	
	10 Ω		0.5 mΩ		
	100 Ω		1.9 mΩ		
	1 kΩ		21 mΩ		
	10 kΩ		0.2 Ω		
	100 kΩ		2.3 Ω		
	1 MΩ		33 Ω		
	10 MΩ		0.7 kΩ		
	100 MΩ		22 kΩ		
	10 Ω		0.24 Ω	Generating, 2-wire	
	100 Ω		0.24 Ω		
	1 kΩ		0.35 Ω		
	10 kΩ		0.5 Ω		
	100 kΩ		2.6 Ω		
	1 MΩ		33 Ω		
	10 MΩ		0.7 kΩ		
	100 MΩ		22 kΩ		
	0 Ω – 20 Ω		$2.0 \cdot 10^{-5} \cdot R$ + 0.12 mΩ	Measuring, 4-wire	
	20 Ω – 200 Ω		$1.5 \cdot 10^{-5} \cdot R$ + 0.5 mΩ		
	200 Ω – 2000 Ω		$1.2 \cdot 10^{-5} \cdot R$ + 2.5 mΩ		
	2 kΩ – 20 kΩ		$1.2 \cdot 10^{-5} \cdot R$ + 25 mΩ		
	20 kΩ – 200 kΩ		$2.1 \cdot 10^{-5} \cdot R$ + 0.4 Ω		
	200 kΩ – 2 MΩ		$3.1 \cdot 10^{-5} \cdot R$ + 10 Ω		
	2 MΩ – 20 MΩ		$4.0 \cdot 10^{-5} \cdot R$ + 0.25 kΩ	Measuring, 2-wire	
	20 MΩ – 200 MΩ		$3.5 \cdot 10^{-4} \cdot R$ + 15 kΩ		

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
	200 MΩ – 2 GΩ		$3.5 \cdot 10^{-3} \cdot R$ + 1.1 MΩ		
RF 0 0	HIGH FREQUENCY QUANTITIES				
RF 2 0	Impedance				WO
	LISN Impedance	9 kHz – 30 MHz	0.3 Ω - 1.1 Ω 1.2° – 8°	50 Ω // (50 µH + 5 Ω) and 50 Ω // 50 µH	
		100 kHz – 150 MHz	0.5 Ω - 0.9 Ω 3.3° – 8°	50 Ω // (5 µH + 1 Ω) and 50 Ω // 5 µH	
	CDN Impedance	150 kHz – 300 MHz	5 Ω – 6 Ω 2.4° – 3.9°	150 Ω, 0 ° nominal	
RF 2 1	Reflection coefficient (N-type)			3)	WO, OS
	Magnitude 0 – 1.0	9 kHz – 1 MHz	0.005 (0.013) + 0.007·ρ + 0.005·ρ²	Nominal impedance 50 Ω at nominal -10 dBm RF power	
		1 MHz – 2 GHz	0.005 (0.013) + 0.003·ρ + 0.005·ρ²		
		2 GHz – 8 GHz	0.02 (0.03) + 0.004·ρ + 0.02·ρ²		
		8 GHz – 18 GHz	0.03 (0.04) + 0.004·ρ + 0.05·ρ²		
	(2.92mm)	10 MHz - 2 GHz	0,008 + 0,010·ρ + 0.005·ρ²		
		2 GHz – 8 GHz	0,030 + 0,010·ρ + 0.005·ρ²		
		8 GHz – 18 GHz	0.05 + 0.010·ρ + 0.005·ρ²		
		18 GHz – 26.5 GHz	0.06 + 0.010·ρ + 0.005·ρ²		
		26.5 GHz – 40 GHz	0.08 + 0.010·ρ + 0.005·ρ²		
	Phase -180° – +180°	9 kHz – 1 GHz	$u(\theta) = arcsin\left(\frac{u(\lvert\rho\rvert)}{\lvert\rho\rvert}\right)$	If the magnitude is less than its uncertainty, the phase uncertainty is ± 180°	

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HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
RF 2 2	Transmission Coefficient			For coaxial 50 Ω devices 1, 3)	WO, OS
	Magnitude (0 – -30 dB) (N-type)	9 kHz – 100 kHz	0.04 dB (0.20 dB)	At nom. -10 dBm RF power	OS
		100 kHz – 10 MHz	0.04 dB (0.14 dB)		
		10 MHz – 1500 MHz	0.08 dB (0.14 dB)		
		1500 MHz – 8 GHz	0.12 dB (0.18 dB)		
		8 GHz – 18 GHz	0.12 dB (0.27 dB)		
	(2.92 mm)	10 MHz – 50 MHz	0.08 dB to 0.05 dB*	* linear with log(freq)	
		50 MHz – 1 GHz	0.05 dB		
		1 GHz – 40 GHz	0.05 dB to 0.18 dB*		
	Magnitude (-30 – -50 dB) (N-type)	9 kHz – 100 kHz	0.08 dB (0.14 dB)	At nom. 0 dBm RF power	
		100 kHz – 1500 MHz	0.08 dB (0.14 dB)		
		1500 MHz – 8 GHz	0.12 dB (0.18 dB)		
		8 GHz – 18 GHz	0.15 dB (0.30 dB)		
	(2.92 mm)	10 MHz – 50 MHz	0.5 dB to 0.15 dB*	* linear with log(freq)	
		50 MHz – 8 GHz	0.15 dB		
		8 GHz – 40 GHz	0.15 dB to 0.5 dB*		
	Magnitude (-50 – -70) dB (N-type)	9 kHz – 100 kHz	0.25 dB (0.37dB)	At nom. +10 dBm RF power (+5 dBm > 8 GHz)	
		100 kHz – 8 GHz	0.25 dB (0.31 dB)		
		8 GHz – 18 GHz	0.25 dB (0.4 dB)		
	(2.92mm)	10 MHz – 100 MHz	2.5 dB to 1.0 dB*	* linear with log(freq)	
		100 MHz – 8 GHz	1.0 dB		
		8 GHz – 40 GHz	1.0 dB to 2.5 dB*		
	Magnitude (-70 – -80) dB (N-type)	9 kHz – 100 kHz	0.7 dB (0.9 dB)	At nom. +10 dBm RF power (+5 dBm > 8 GHz)	
		100 kHz – 8 GHz	0.7 dB (0.8 dB)		

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
		8 GHz – 18 GHz	0.7 dB (0.9 dB)		
	(2.92mm)	10 MHz – 100 MHz	6 dB to 1.2 dB*	* linear with log(freq)	
		100 MHz – 8 GHz	1.2 dB		
		8 GHz – 40 GHz	1.2 dB to 6 dB*		
	Magnitude (-80 – -90) dB (N-type)	30 kHz – 8 GHz	2.0 dB (2.1 dB)	At nom. +10 dBm RF power (+5 dBm > 8 GHz)	OS
		8 GHz – 18 GHz	2.0 dB (2.2 dB)		
	(2.92mm)	100 MHz – 3 GHz	2.0 dB		
		3 GHz – 18 GHz	2.0 dB to 8 dB*	* linear with log(freq)	
	Magnitude (-90 – -100) dB (N-type)	30 kHz – 18 GHz	5 dB (6 dB)	At nom. +10 dBm RF power (+5 dBm > 8GHz)	
	(2.92mm)	100 MHz – 3 GHz	5 dB		
		3 GHz – 8 GHz	5 dB to 8 dB*	* linear with log(freq)	
	Antenna Reflection coefficient				
	Magnitude 0 – 1.0	30 MHz – 700 MHz	$0.06 + 0.020\cdot\rho + 0.008\cdot\rho^2$	Nominal impedance 50 Ω at nominal -10 dBm RF power	
		700 MHz – 1500 MHz	$0.07 + 0.020\cdot\rho + 0.013\cdot\rho^2$		
		1500 MHz – 3000 MHz	$0.08 + 0.020\cdot\rho + 0.013\cdot\rho^2$		
RF 3 0	HIGH FREQUENCY POWER			1, 3)	WO
	Calibration Factors of Power meters (N-type)	9 kHz – 10 MHz	0.05 dB	At nom. 0 dBm RF power	
		10 MHz – 3 GHz	0.06 dB		
		3 GHz – 6 GHz	0.07 dB		
		6 GHz – 10 GHz	0.07 – 0.09 dB		
		10 GHz – 18 GHz	0.09 dB		

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HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
		10 MHz – 2 GHz	0.06 dB	At nom. -30 dBm RF power	
		2 GHz – 6 GHz	0.07 dB		
		6 GHz – 10 GHz	(0.07 – 0.10) dB		
		10 GHz – 18 GHz	0.10 dB		
	(2.92mm)	10 MHz – 18 GHz	0.10 dB	2.92 mm At nom. 0 dBm RF power	
		18 GHz – 40 GHz	0.20 dB		
		10 MHz – 18 GHz	0.10 dB	At nom. -30 dBm RF power	
		18 GHz – 40 GHz	0.20 dB		
	Linearity of RF power				
	0 - +20 dBm	50 MHz – 500 MHz	0.05 dB		
	0 - +10 dBm	9 kHz – 10 MHz	0.13 dB		
		10 MHz – 3 GHz	0.05 dB		
		3 GHz – 6 GHz	0.08 dB		
	0 – -10 dBm	9 kHz – 10 MHz	0.13 dB		
		10 MHz – 3 GHz	0.05 dB		
		3 GHz – 6 GHz	0.05 dB		
	0 – -20 dBm	9 kHz – 10 MHz	0.26 dB		
		10 MHz – 3 GHz	0.05 dB		
		3 GHz – 6 GHz	0.08 dB		
	0 – -30 dBm	9 kHz – 10 MHz	0.26 dB		
		10 MHz- 3 GHz	0.07 dB		
		3 GHz – 6 GHz	0.08 dB		
	0 – -40 dBm	10 MHz – 6 GHz	0.09 dB		
	0 – -50 dBm	10 MHz – 6 GHz 50 MHz	0.18 dB 0.10 dB		
	0 – -60 dBm	10 MHz – 6 GHz 50 MHz	0.35 dB 0.20 dB		

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
	Absolute power -60 to +20 dBm (N-Type)				
		9 kHz – 10 MHz	0.06 dB	At nom. 0 dBm RF power	
		10 MHz – 6 GHz	0.07 dB		
		6 GHz – 10 GHz	0.10 dB		
		10 GHz – 18 GHz	0.12 dB		
		10 MHz – 6 GHz	0.07 dB	At norm. -30 dBm RF Power	
		6 GHz – 10 GHz	0.10 dB		
		10 GHz – 18 GHz	0.14 dB		
	(2.92 mm)	10 MHz – 30 MHz	0.35 dB	At nom. 0 dBm RF power	
		30 MHz – 18 GHz	0.15 dB		
		18 GHz – 40 GHz	0.25 dB		
		10 MHz – 30 MHz	0.35 dB	At norm. -30 dBm RF Power	
		30 MHz – 18 GHz	0.15 dB		
		18 GHz – 40 GHz	0.25 dB		
	Frequency response of power measuring devices (N-type)				
		9 kHz – 10 MHz	0.05 dB	At nom. 0 dBm RF power	
		10 MHz – 3 GHz	0.06 dB		
		3 GHz – 6 GHz	0.07 dB		
		6 GHz – 10 GHz	0.07 – 0.10 dB		
		10 GHz – 18 GHz	0.10 dB		
		10 MHz – 3 GHz	0.06 dB	At nom. -30 dBm RF power	

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
		3 GHz – 6 GHz	0.07 dB		
		6 GHz – 10 GHz	0.07 – 0.10 dB		
		10 GHz – 18 GHz	0.10 dB		
	(2.92 mm)	10 MHz – 1 GHz	0.10 dB	At nom. 0 dBm RF power	
		1 GHz – 6 GHz	0.15 dB		
		6 GHz – 40 GHz	0.15 dB – 0.6 dB		
		10 MHz – 1 GHz	0.10 dB	At nom. -30 dBm RF power	
		1 GHz – 6 GHz	0.15 dB		
		6 GHz – 40 GHz	0.15 dB – 0.6 dB		
	EMC detectors				
	Peak, Quasi Peak, Average, RMS Sine wave accuracy	9 kHz – 0.15 MHz 0.15 MHz – 30 MHz 30 MHz – 300 MHz 300 MHz-1000 MHz 1 GHz – 18 GHz	± 0.25 dB ± 0.25 dB ± 0.4 dB ± 0.4 dB ± 0.5 – 0.8 dB	Band A, Peak, QP, AVG, RMS Band B, Peak, QP, AVG, RMS Band C, Peak, QP, AVG, RMS Band D, Peak, QP, AVG, RMS Band E, Peak, AVG, RMS	
	Peak detector, Absolute accuracy	9 kHz – 0.15 MHz 0.15 MHz – 15 MHz 15 MHz – 30 MHz 30 MHz – 300 MHz 300 MHz ~~- 300 MHz~~ 300MHz – 1000 MHz	± 0.5 dB ± 0.5 dB ± 0.6 dB ± 0.6 dB ± 0.6 dB ± 0.9 dB	Band A Band B Band B Band C Band D Band D	
	Peak detector, absolute calibration	1 GHz – 18 GHz	± 0.25 dB	Band E	
	Peak detector, variation with frequency	9 kHz – 1000 MHz	± 0.25 dB	Band A, B, C, D	
	Peak detector, variation with frequency	1 GHz – 18 GHz	± 0.30 dB	Band E	

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
	Quasi Peak detector, Response to broadband signals Absolute Calibration	9 kHz – 0.15 MHz 0.15 MHz – 30 MHz 30 MHz – 300 MHz 300 MHz 301 MHz - 650 MHz 651 MHz - 1000 MHz	± 0.5 dB ± 0.5 dB ± 0.5 dB ± 0.5 dB ± 0.8 dB ± 0.9 dB	Band A Band B Band C Band D Band D Band D	
	Quasi Peak detector, variation to pulse freq	Single to 100 Hz Single to 1000 Hz Single – 1 Hz 2 Hz 10Hz – 1000 Hz Single – 1 Hz 2 Hz 10Hz – 1000 Hz	± 0.5 dB ± 0.5 dB ± (0.8 - 1.3) dB ± (0.6 - 1.0) dB ± (0.5 - 1.0) dB ± (1.3 - 1.8) dB ± (1.0 - 1.7) dB ± (0.5 - 0.9) dB	Band A Band B Band C Band C Band C Band D Band D Band D	
	AVG detector, Absolute accuracy	9 kHz – 0.15 MHz 0.15 MHz – 30 MHz 30 MHz – 300 MHz 300 MHz- 1000 MHz 1 GHz – 18 GHz	± 0.5 dB ± 0.5 dB ± 0.5 dB ± 0.5 dB ± (0.5 – 1.0) dB	Band A Band B Band C Band D Band E	
	AVG detector, variation with frequency	9 kHz – 0.15 MHz 0.15 MHz – 30 MHz 30 MHz – 300 MHz 300 MHz- 1000 MHz 1 GHz – 18 GHz	± 0.25 dB ± 0.25 dB ± 0.25 dB ± 0.25 dB ± (0,25 - 0,4) dB	Band A Band B Band C Band D Band E	
	AVG detector, Intermittent, unsteady, drifting narrow band	9 kHz – 18 GHz	± 0.25 dB	Band A, B, C, D, E	
	RMS detector, Absolute accuracy	9 kHz – 0.15 MHz 0.15 MHz – 30 MHz 30 MHz – 300 MHz 300 MHz- 1000 MHz 1 GHz – 18 GHz	± 0.5 dB ± 0.5 dB ± 0.5 dB ± 0.5 dB ± (0.6 – 1.2) dB	Band A Band B Band C Band D Band E	
	RMS detector, variation with frequency	9 kHz – 18 GHz	± 0.25 dB	Band A, B, C, D, E	
	RMS detector, Intermittent, unsteady, drifting narrow band	9 kHz – 18 GHz	± 0.25 dB	Band A, B, C, D, E	
	Bandwidth of RBW filters				
	1 Hz – 10 MHz	9 kHz – 2.4 GHz	0.8 + 0.02·*BW*		

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
	1 Hz – 10 MHz	10 MHz – 18 GHz	0.08 + 0.02·*BW*		
RF 5 0	ELECTRICAL / MAGNETIC FIELD QUANTITIES /EMC				WO
	Electrical Field Strength (1 – 200) V/m	9 kHz – 30 MHz	(0.5 – 0.6) dB	Temcell 4)	
		30 MHz – 75 MHz	(0.6 – 1.3) dB		
		75 MHz – 200 MHz	1.3 dB		
	Electrical Field Strength (1 – 100) V/m	200 MHz – 1 GHz	1.2 dB	Anechoic Chamber	
		1 GHz – 8 GHz	1.1 dB		
		8 GHz – 12 GHz	1.2 dB		
		12 GHz –15 GHz	(1.2 - 1.5) dB		
		15 GHz – 18 GHz	1.5 dB		
		18 GHz – 40 GHz	2.4 dB		
	Antenna factor				
	ANSI C63.5 CISPR 16-1-6	30 MHz – 5 GHz	0.8 dB	OATS, Standard Site method 5)	
	ANSI C63.5 CISPR 16-1-6	30 MHz – 1 GHz	0.8 dB	OATS, Reference antenna method 5)	
	Antenna symmetry - Dipole - Biconical - Hybrid	30 MHz – 1 GHz	0.25 dB	OATS ANSI C63.5 CISPR 16-1-4 5)	
	Quasi Free Space	20 MHz – 100 MHz	0.9 dB	Free Space Environment, Three Antenna Method 5)	
		100 MHz – 200 MHz	0.8 dB		
		200 MHz – 5 GHz	0.7 dB		

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HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
		1 GHz – 10 GHz	1.4 dB	Full Anechoic Room, Three Antenna Method 4)	
		10 GHz – 12 GHz	(1.4 – 2.1) dB		
		12 GHz – 18 GHz	2.1 dB		
	SAE ARP 958	20 MHz – 100 MHz	0.9 dB	For military or automotive use 5)	
		100 MHz – 200 MHz	0.8 dB		
		200 MHz – 5 GHz	0.7 dB		
	Shielding Effectiveness			According to EN50147 and Mil Std 285 5)	OS
	Magnetic Field 100 dB	10 kHz – 30 MHz	5 dB		
	Electric Field 120 – 150 dB	10 MHz – 300 MHz	5 dB		
	Plane wave 110 – 140 dB	30 MHz – 1 GHz	5 dB		
	Plane wave 110 – 140 dB	1 GHz – 18 GHz	6 dB		
	Normalized Site Attenuation			According to CISPR 16-1-4 using broadband antennae Horizontal and vertical polarization, distance between 3 m and 30 m 5)	OS
	NSA	30 MHz – 1000 MHz	1.6 dB		
	Site Voltage Standing Wave Ratio			According to CISPR 16-1-4 using reciprocal method 4)	OS
	S_{VSWR}	1 GHz – 18 GHz	2.0 dB		
	Field Uniformity			According to IEC 61000-4-3 4)	OS
	Forward Power	80 MHz – 18 GHz	1.3 dB		
	Field Uniformity	80 MHz – 18 GHz	1.7 dB		

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
	Surge generators and coupling/decoupling networks waveform surge voltage			According to EN 61000-4-5 1.2/50 µs pulse 10/700 µs pulse	WO, OS
	0 V – 550 V		6.7 V + 0.022·*U* 6.7 V + 0.025·*U*	Coupling/decoupling networks for AC/DC power supply circuits only in combination with appropriate surge generator	WO OS
	0 V – 1.1 kV		13.4 V + 0.022·*U* 13.4 V + 0.025·*U*		WO OS
	0 V – 2.8 kV		33.5 V + 0.022·*U* 33.5 V + 0.025·*U*		WO OS
	0 V – 5.5 kV		67 V + 0.022·*U* 67 V + 0.025·*U*		WO OS
	Waveform surge current				WO, OS
	Current amplitude			1.2/50 µs pulse 10/700 µs pulse	
	0 – 15 A		0.18 A + 0.022·*I* 0.18 A + 0.029·*I*	Measurements at coupling/decoupling network input, output; coupling modes line to neutral, line to earth and neutral to earth	WO OS
	0 – 30 A		0.36 A + 0.022·*I* 0.36 A + 0.029·*I*		WO OS
	0 – 60 A		0.72 A + 0.022·*I* 0.72 A + 0.029·*I*		WO OS
	0 – 150 A		1.8 A + 0.022·*I* 1.8 A + 0.029·*I*		WO OS
	0 – 300 A		3.6 A + 0.022·*I* 3.6 A + 0.029·*I*		WO OS
	0 – 600 A		7.2 A + 0.022·*I* 7.2 A + 0.029·*I*		WO OS
	0 – 1500 A		18 A + 0.022·*I* 18 A + 0.029·*I*		WO OS
	0 – 3000 A		36 A + 0.022·*I* 36 A + 0.029·*I*		WO OS

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
	Front time Voltage mode				WO, OS
	Pulse 1.2/50 µs	0.65 µs – 1.75 µs	0.08 µs	4)	
	Pulse 10/700 µs	5.5 µs – 15.5 µs	0.5 µs		
	Front time Current mode				WO, OS
	Pulse 1.2/50 µs	6.4 µs – 9.6 µs 1.4 µs – 3.6 µs	0.18 µs 0.07 µs	line – line line – PE	
	Pulse 10/700 µs	3.5 µs – 6.5 µs	0.27 µs		
	Duration Voltage Mode			4)	WO, OS
	Pulse 1.2/50 µs	35 µs – 65 µs	1.0 µs		
	Pulse 10/700 µs	490 µs – 910 µs	14 µs		
	Duration time Current Mode			4)	WO, OS
	Pulse 1.2/50 µs	11 µs – 21 µs	0.23 µs	Current, line to line	
		14 µs – 36 µs	0.23 µs	Current, line to earth	
	Pulse 10/700 µs	210 µs – 390 µs	6 µs		
	EFT/burst generators waveform (im)pulse. voltage into 50 Ω			According to EN 61000-4-4	WO, OS
	0 V – 150 V		2.0 V + 0.022·*U* 2.0 V + 0.025·*U*	4)	WO OS
	0 – 300 V		4.0 V + 0.022·*U* 4.0 V + 0.025·*U*	4)	WO OS
	0 – 600 V		8.0 V + 0.022·*U* 8.0 V + 0.025·*U*	4)	WO OS
	0 – 1.5 kV		20 V + 0.022·*U* 20 V + 0.025·*U*	4)	WO OS

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
	0 – 3 kV		37 V + 0.022·*U* 37 V + 0.025·*U*	4)	WO OS
	EFT/burst generators Waveform pulse voltage into 1 kΩ				WO, OS
	0 V – 500 V		6 V + 0.045·*U* 6 V + 0.048·*U*	4)	WO OS
	0 V – 1 kV		12 V + 0.045·*U* 12 V + 0.048·*U*	4)	WO OS
	0 V – 2 kV		24 V + 0.045·*U* 24 V + 0.048·*U*	4)	WO OS
	0 V – 5 kV		60 V + 0.045·*U* 60 V + 0.048·*U*	4)	WO OS
	Rise time (10 % – 90 %) 3 ns – 7 ns		0.3 ns	4)	WO, OS
	Pulse duration time (50 % – 50 %) 30 ns – 70 ns		2.0 ns	4)	WO, OS
	Repetition time			4)	
	5 µs – 15 µs		0.15 µs		
	150 µs – 600 µs		2.5 µs		
	Burst duration			4)	WO, OS
	10 ms – 20 ms		0.5 µs + 0.0005·*t*		
	Burst period			4)	WO, OS
	200 ms – 400 ms		500 µs		

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HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
	ESD Simulators Waveform discharge current				
	First peak current 3 – 10 A 6 – 20 A 15 – 50 A		 7 % 7 % 7 %	Standard and Networks: 150 pF / 330 Ω IEC 61000-4-2	
	Rise time 0.5 – 1.2 ns		 15 %		
	Current at t1 and t2 1 – 10 A 2 – 20 A 5 – 50 A		 7 % 7 % 7 %		
	ESD Simulators Waveform discharge current				
	First peak current 3 – 10 A 6 – 20 A 15 – 50 A		 0.08 + 0.032·*I* 0.16 + 0.032·*I* 0.4 + 0.032·*I*	Standard and networks: ISO 10605 All networks	
	Rise time 0.5 – 1.2 ns		0.08 ns		
	Current at t1 and t2 1 – 10 A 2 – 20 A 5 – 50 A		 0.08 + 0.032·*I* 0.16 + 0.032·*I* 0.4 + 0.032·*I*	Standard and networks: ISO 10605 150 pF / 330 Ω 330 pF / 330 Ω	
	Current at t1 and t2 0.1 – 1.0 A 0.2 – 2.0 A 0.5 – 5.0 A		 0.008 + 0.023·*I* 0.02 + 0.023·*I* 0.04 + 0.023·*I*	Standard and networks: ISO 10605 150 pF / 2000 Ω 330 pF / 2000 Ω	
TF 0 0	TIME AND FREQUENCY				
TF 2 1	Frequency				WO
	10 mHz – 2.7 GHz		$(8 \cdot 10^{-10}/\tau + 1.8 \cdot 10^{-10}) \cdot f$	Measuring, 10 ms ≤ τ ≤ 400 s	

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HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
	10 mHz – 10 Hz		$3 \cdot 10^{-5} \cdot f$	Generating	
	10 Hz – 100 kHz		$(1 \cdot 10^{-5}/\tau) \cdot f$	Generating, 10 ms ≤ τ ≤ 400 s	
	100 kHz – 2.16 GHz		$(1 \cdot 10^{-9}/\tau + 1.8 \cdot 10^{-10}) \cdot f$	Generating, 10 ms ≤ τ ≤ 400 s	
TF 2 2	Time interval				WO
	0.5 ns – 10 µs		$(1.5 \cdot 10^{-4}) \cdot t + 15$ ps	Generating	
	10 µs – 1000 s		$(3 \cdot 10^{-5}) \cdot t$		

The calibrations are carried out at an ambient temperature of (23 ± 2) °C and a relative humidity of (50 ± 10) %, with an exception for calibrations marked 4 or 5.

1. |ρ dut| < 0.02
2. | ρ dut|< 0.2
3. All calibrations are based on equipment using N-type connectors, unless otherwise noted.
4. The calibrations are carried out at ambient conditions within (23 ± 7) °C and (50 ± 20) %.
5. The calibrations are carried out at ambient conditions within (20 ± 15) °C and (50 ± 40) %.