Annex to ISO/IEC 17025 Accreditation
with number: **K 013**

of **Fluke Nederland B.V.**
Standaard Laboratorium
Eindhoven

Valid from: **08-07-2009** to **01-10-2011** Replaces annex dated: **27-06-2008**

HCS code	Measured quantity, Range	Frequency	Best measurement capabilities (k=2)	Remarks
LF 0 0	DC/LF Quantities			
LF 1 0	DC Voltage			measuring and generating
	10 V		$6 \cdot 10^{-7} \cdot U$	zenerreferences
	1 V and 1.018 V		$2.3 \cdot 10^{-6} \cdot U$	zenerreferences
	0 μV to 10 μV		0.3 μV	
	10 μV to 200 mV		$3 \cdot 10^{-6} \cdot U$ + 0.2 μV	
	200 mV to 1 V		$3 \cdot 10^{-6} \cdot U$	
	1 V to 2 V		$2 \cdot 10^{-6} \cdot U$	
	2 V to 10 V		$1 \cdot 10^{-6} \cdot U$	
	10 V to 1000 V		$2 \cdot 10^{-6} \cdot U$	
	1000 V to 1100 V		$4 \cdot 10^{-6} \cdot U$	
	9 V to 16 V		3.4 mV	6)
	295 V to 400 V		70 mV	6)
LF 2 0	DC Current			measuring and generating
	1 μA to 10 μA		$3 \cdot 10^{-5} \cdot I$	
	10 μA to 20 A		$2 \cdot 10^{-5} \cdot I$	
	0,5 A to 5 A		2.5 mA	6)
LF 3 0	AC Voltage			measuring and generating
	100 mV to 220 mV	10 Hz to 20 Hz	$3 \cdot 10^{-4} \cdot U$	

This annex has been approved by:

Ir. J.C. van der Poel
Chief Executive

HCS code	Measured quantity, Range	Frequency	Best measurement capabilities (k=2)	Remarks
		20 Hz to 40 Hz	$5 \cdot 10^{-5} \cdot U$	
		40 Hz to 20 kHz	$5 \cdot 10^{-5} \cdot U$	
		20 kHz to 50 kHz	$5 \cdot 10^{-5} \cdot U$	
		50 kHz to 100 kHz	$6 \cdot 10^{-5} \cdot U$	
		100 kHz to 200 kHz	$2 \cdot 10^{-4} \cdot U$	
		200 kHz to 500 kHz	$4 \cdot 10^{-4} \cdot U$	
		500 kHz to 1 MHz	$7 \cdot 10^{-4} \cdot U$	
	220 mV to 2.2 V	10 Hz to 20 Hz	$5 \cdot 10^{-5} \cdot U$	
		20 Hz to 40 Hz	$5 \cdot 10^{-5} \cdot U$	
		40 Hz to 20 kHz	$5 \cdot 10^{-5} \cdot U$	
		20 kHz to 50 kHz	$4 \cdot 10^{-5} \cdot U$	
		50 kHz to 100 kHz	$5 \cdot 10^{-5} \cdot U$	
		100 kHz to 200 kHz	$2 \cdot 10^{-4} \cdot U$	
		200 kHz to 500 kHz	$4 \cdot 10^{-4} \cdot U$	
		500 kHz to 1 MHz	$7 \cdot 10^{-4} \cdot U$	
	2.2 V to 22 V	10 Hz to 20 Hz	$5 \cdot 10^{-5} \cdot U$	
		20 Hz to 40 Hz	$4 \cdot 10^{-5} \cdot U$	
		40 Hz to 20 kHz	$4 \cdot 10^{-5} \cdot U$	
		20 kHz to 50 kHz	$4 \cdot 10^{-5} \cdot U$	
		50 kHz to 100 kHz	$5 \cdot 10^{-5} \cdot U$	
		100 kHz to 200 kHz	$2 \cdot 10^{-4} \cdot U$	
		200 kHz to 500 kHz	$4 \cdot 10^{-4} \cdot U$	
		500 kHz to 1 MHz	$8 \cdot 10^{-4} \cdot U$	
	22 V to 220 V	10 Hz to 20 Hz	$6 \cdot 10^{-5} \cdot U$	
		20 Hz to 40 Hz	$5 \cdot 10^{-5} \cdot U$	
		40 Hz to 20 kHz	$5 \cdot 10^{-5} \cdot U$	
		20 kHz to 50 kHz	$5 \cdot 10^{-5} \cdot U$	

HCS code	Measured quantity, Range	Frequency	Best measurement capabilities (k=2)	Remarks
		50 kHz to 100 kHz	$2 \cdot 10^{-4} \cdot U$	
	220 V to 1000 V	10 Hz to 20 Hz	$5 \cdot 10^{-5} \cdot U$	
		20 Hz to 40 Hz	$5 \cdot 10^{-5} \cdot U$	
		40 Hz to 20 kHz	$5 \cdot 10^{-5} \cdot U$	
		20 kHz to 50 kHz	$7 \cdot 10^{-5} \cdot U$	
		50 kHz to 100 kHz	$4 \cdot 10^{-4} \cdot U$	
LF 3 3	Pulse Amplitude			
	1 mV to 25 mV	10 Hz to 10 kHz	$2.6 \cdot 10^{-4} \cdot U$	measuring
	25 mV to 110 mV	10 Hz to 10 kHz	$2.6 \cdot 10^{-4} \cdot U$	
	110 mV to 2.2 V	10 Hz to 10 kHz	$2.6 \cdot 10^{-4} \cdot U$	
	2.2 V to 11 V	10 Hz to 10 kHz	$2.6 \cdot 10^{-4} \cdot U$	
	11 V to 130 V	10 Hz to 10 kHz	$2.6 \cdot 10^{-4} \cdot U$	
	6 mV to 25 mV	10 Hz to 10 kHz	$1 \cdot 10^{-2} \cdot U$	generating
	25 mV to 110 mV	10 Hz to 10 kHz	$5 \cdot 10^{-3} \cdot U$	
	110 mV to 2.2 V	10 Hz to 10 kHz	$5 \cdot 10^{-3} \cdot U$	
	2.2 V to 11 V	10 Hz to 10 kHz	$5 \cdot 10^{-3} \cdot U$	
	11 V to 130 V	10 Hz to 10 kHz	$5 \cdot 10^{-3} \cdot U$	
LF 3 4	AC/DC-Transfer			measuring and generating
	0.5 V to 50 V	40 Hz to 1 kHz	$5 \cdot 10^{-5} \cdot U$	
		1 kHz to 20 kHz	$5 \cdot 10^{-5} \cdot U$	
		20 kHz to 100 kHz	$6 \cdot 10^{-5} \cdot U$	
		100 kHz to 500 kHz	$2 \cdot 10^{-4} \cdot U$	
	0.5 V to 10 V	500 kHz to 1 MHz	$4 \cdot 10^{-4} \cdot U$	

HCS code	Measured quantity, Range	Frequency	Best measurement capabilities (k=2)	Remarks
	50 V to 100 V	40 Hz to 1 kHz	$4 \cdot 10^{-5} \cdot U$	
		1 kHz to 20 kHz	$4 \cdot 10^{-5} \cdot U$	
		20 kHz to 50 kHz	$5 \cdot 10^{-5} \cdot U$	
		50 kHz to 100 kHz	$5 \cdot 10^{-5} \cdot U$	
	100 V to 500 V	40 Hz to 1 kHz	$6 \cdot 10^{-5} \cdot U$	
		1 kHz to 20 kHz	$5 \cdot 10^{-5} \cdot U$	
		20 kHz to 50 kHz	$7 \cdot 10^{-5} \cdot U$	
		50 kHz to 100 kHz	$2 \cdot 10^{-4} \cdot U$	
	500 V to 1000 V	40 Hz to 20 kHz	$6 \cdot 10^{-5} \cdot U$	
		20 kHz to 50 kHz	$8 \cdot 10^{-5} \cdot U$	
		50 kHz to 100 kHz	$2 \cdot 10^{-4} \cdot U$	
LF 4 0	AC Current			measuring and generating
	100 µA to 1 mA	10 Hz to 1 kHz	$3.2 \cdot 10^{-4} \cdot I$	
		1 kHz to 5 kHz	$2.6 \cdot 10^{-4} \cdot I$	
		5 kHz to 10 kHz	$6.5 \cdot 10^{-4} \cdot I$	
		10 kHz to 20 kHz	$1.2 \cdot 10^{-3} \cdot I$	measuring only
	1 mA to 10 mA	10 Hz to 1 kHz	$2.3 \cdot 10^{-4} \cdot I$	
		1 kHz to 5 kHz	$1.7 \cdot 10^{-4} \cdot I$	
		5 kHz to 10 kHz	$4.3 \cdot 10^{-4} \cdot I$	
		10 kHz to 20 kHz	$6.7 \cdot 10^{-4} \cdot I$	measuring only
	10 mA to 1 A	10 Hz to 1 kHz	$2.4 \cdot 10^{-4} \cdot I$	
		1 kHz to 5 kHz	$2.1 \cdot 10^{-4} \cdot I$	
		5 kHz to 10 kHz	$4.9 \cdot 10^{-4} \cdot I$	
		10 kHz to 20 kHz	$8.2 \cdot 10^{-4} \cdot I$	measuring only
	1 A to 5 A	10 Hz to 1 kHz	$2.4 \cdot 10^{-4} \cdot I$	
		1 kHz to 5 kHz	$2.8 \cdot 10^{-4} \cdot I$	

HCS code	Measured quantity, Range	Frequency	Best measurement capabilities (k=2)	Remarks
		5 kHz to 10 kHz	$7.4 \cdot 10^{-4} \cdot I$	
		10 kHz to 20 kHz	$1.4 \cdot 10^{-3} \cdot I$	measuring only
	5 A to 20 A	10 Hz to 1 kHz	$3.3 \cdot 10^{-4} \cdot I$	
		1 kHz to 5 kHz	$3.8 \cdot 10^{-4} \cdot I$	
		5 kHz to 10 kHz	$7.8 \cdot 10^{-4} \cdot I$	
		10 kHz to 20 kHz	$1.4 \cdot 10^{-3} \cdot I$	measuring only
LF 6 2	DC Resistance			measuring and generating
	1 mΩ		$3 \cdot 10^{-5} \cdot R$	
	10 mΩ		$2 \cdot 10^{-5} \cdot R$	
	100 mΩ		$1 \cdot 10^{-5} \cdot R$	
	1 Ω		$3 \cdot 10^{-6} \cdot R$	
	10 Ω		$3 \cdot 10^{-6} \cdot R$	
	100 Ω		$3 \cdot 10^{-6} \cdot R$	
	1 kΩ		$3 \cdot 10^{-6} \cdot R$	
	10 kΩ		$2 \cdot 10^{-6} \cdot R$	
	100 kΩ		$3 \cdot 10^{-6} \cdot R$	
	1 MΩ		$3 \cdot 10^{-6} \cdot R$	
	10 MΩ		$5 \cdot 10^{-6} \cdot R$	
	100 MΩ		$2 \cdot 10^{-5} \cdot R$	
	1 GΩ		$6 \cdot 10^{-4} \cdot R$	
	1 mΩ to 10 mΩ		$9 \cdot 10^{-5} \cdot R$	
	10 mΩ to 100 mΩ		$3 \cdot 10^{-5} \cdot R$	
	100 mΩ to 1 Ω		$2 \cdot 10^{-5} \cdot R$	
	1 Ω to 10 MΩ		$5 \cdot 10^{-6} \cdot R$	
	10 MΩ to 100 MΩ		$2 \cdot 10^{-5} \cdot R$	
	100 MΩ to 1 GΩ		$6 \cdot 10^{-4} \cdot R$	

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HCS code	Measured quantity, Range	Frequency	Best measurement capabilities (k=2)	Remarks
LF 6 5	LF Capacitance			measuring and generating
	1 pF to 100 pF	1 kHz to 10 kHz	$3 \cdot 10^{-5} \cdot C$	
	100 pF to 1 nF	1 kHz to 5 kHz	$2 \cdot 10^{-5} \cdot C$	
	1 nF to 1 µF	1 kHz	$2 \cdot 10^{-4} \cdot C$	
	1 µF to 10 µF	100 Hz	$3 \cdot 10^{-4} \cdot C$	
	200 µF to 500 µF	DCV	$1.1 \cdot 10^{-3} \cdot C$	
	500 µF to 110 mF	DCV	$1 \cdot 10^{-3} \cdot C$	
RF 0 0	HIGH FREQUENCY QUANTITIES			
RF 1 0	CW Flatness			
	5 mVpp to 200 mVpp	50 kHz to 1100 MHz	$2.7 \cdot 10^{-2}$ related to 50 kHz/50 Ω	measuring
	200 mVpp to 6 Vpp	50 kHz to 1100 MHz	$2.5 \cdot 10^{-2}$ related to 50 kHz/50 Ω	measuring
	5 mVpp to 20 mVpp	50 kHz to 1100 MHz	$9 \cdot 10^{-2}$ related to 50 kHz/50 Ω	generating VSWR scope ≤ 1.3
	20 mVpp to 6 Vpp	50 kHz to 1100 MHz	$8 \cdot 10^{-2}$ related to 50 kHz/50 Ω	generating VSWR scope ≤ 1.3
TF 0 0	TIME & FREQUENCY			
TF 2 1	Frequency			measuring and generating
	10 MHz		$6 \cdot 10^{-11} \cdot f$	
	10 mHz to 1 MHz		$1 \cdot 10^{-10} \cdot f + T_e$	1)
	1 MHz to 300 MHz		$1 \cdot 10^{-10} \cdot f$	
	300 MHz to 1.5 GHz		$6 \cdot 10^{-9} \cdot f$	2)

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HCS code	Measured quantity, Range	Frequency	Best measurement capabilities (k=2)	Remarks
TF 2 2	Time Interval			
	1 µs to 10 s		$5 \cdot 10^{-10} \cdot t$	measuring only
	10 s to 10^5 s		$5 \cdot 10^{-10} \cdot t$ + 10 ns	measuring only
TF 2 3	Phase Angle			
	0 ° to 180 °	10 Hz to 50 Hz	0.05 °	at equal input voltages 100 mV < U_i < 300 V generate up to 120 V
		50 Hz to 1 kHz	0.08 °	
		1 kHz to 5 kHz	0.18 °	
		5 kHz to 10 kHz	0.35 °	
		10 kHz to 30 kHz	0.75 °	
	0 ° to 180 °	50 Hz	0.10 °	un equal input voltages 100 mV < U_i < 300 V ratio 1:100
		50 Hz to 1 kHz	0.25 °	
		1 kHz to 5 kHz	0.40 °	
		5 kHz to 10 kHz	1.0 °	
		10 kHz to 30 kHz	1.8 °	
TF 2 4	Rise time			
	275 ps to 20 µs	pulse repeat 1 MHz	50 ps	25 mV_{pp} through 1V_{pp} in 50 Ω measuring
TE 0 0	TEMPERATURE, HUMIDITY, THERMOPHYSICAL PROPERTIES			
TE 1 0	Resistance thermometers			also for indicators and recorder with resistance Thermometers
	5 °C to 15 °C		0.11 °C	measurements in climate chamber

HCS code	Measured quantity, Range	Frequency	Best measurement capabilities (*k*=2)	Remarks
	15 °C to 35 °C		0.075 °C	measurements in climate chamber
	35 °C to 65 °C		0.14 °C	measurements in climate chamber
	0.01 °C		0.0059 °C	triple point of water
	-80 °C to 125 °C		0.085 °C	5)
	-80 °C to 248 °C		0.014 °C	
	248 °C to 500 °C		0.021°C	
	500 °C to 660 °C		0.053°C	
	419.527 °C		0.015 °C	fixed point
TE 3 0	Thermocouples			also for indicators and recorders with thermocouples
	0 °C to 40 °C		0.039 °C	thermocouple Type-E
	-30 °C to 200 °C		0.16 °C	5)
	-80 °C to 248 °C		0.10 °C	
	248 °C to 420 °C		0.11 °C	
	420 °C to 660 °C		0.18 °C	
	660 °C to 700 °C		0.70 °C	
	700 °C to 1000 °C		0.88 °C	
TE 4 2	Liquid-in-Glass thermometer			
	-25 °C to 10 °C		0.038 °C	
	10 °C to 80 °C		0.026 °C	
	80 °C to 205 °C		0.039 °C	

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HCS code	Measured quantity, Range	Frequency	Best measurement capabilities (*k*=2)	Remarks
TE 6 2	Radiation (infrared)			pyrometers and black body sources
	-35 °C to 550 °C		0.20 °C to 0.55 °C	
	550 °C to 1000 °C		3.5 °C	
TE 9 0	Simulators/Display units			
	-200 °C to 850 °C		0.009 °C	3), 5) based on Pt100
	0 °C to 40 °C		0.050 °C	4) TC type E
	-250 °C to –200 °C		0.38 °C	4), 5)
	-200 °C to –100 °C		0.25 °C	4), 5)
	-100 °C to –25 °C		0.14 °C	4), 5)
	-25 °C to 120 °C		0.12 °C	4), 5)
	120 °C to 1000 °C		0.19 °C	4), 5)
	1000 °C to 1372 °C		0.30 °C	4), 5)
	1372 °C to 1767 °C		0.34 °C	4), 5)
TE 10 0	Calibration baths and furnaces			
	-80 °C to 300 °C		0.0003 °C	5) baths stability
	-80 °C to 140°C		0.033 °C	5)
	140 °C to 660 °C		0.053°C	5)
	660 °C to 1000 °C		0.70 °C	only for furnaces
	1000 °C to 1200 °C		2.2 °C	only for furnaces
RH 0 0	Relative Humidity			
	10 % rh to 70 % rh		0.37 % rh	15 °C to 50 °C
	70 % rh to 95 % rh		0.46 % rh	15 °C to 50 °C

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Remarks:

The calibrations in the electrical laboratory are carried out at an ambient temperature of nominal (23.0 ± 1.0) °C, with a relative humidity of nominal (45 ± 10) %.
The calibrations in the temperature and humidity laboratory are carried out at an ambient temperature of nominal (23 ± 3) °C, with a relative humidity of nominal (45 ± 20) %.
1) T_e = Trigger error for sine wave signals = $(4/f)\cdot 10^{-5}\cdot f$ (f = measured frequency).
2) Generate at T_a = (23 ± 3) °C.
3) Resistance Thermometers based on a Pt100. Others e.g. thermistors which actually measure resistance, see best measurement capabilities for electricity.
4) Thermocouple with internal reference junction compensation. Without, or with switched off reference junction compensation, which actually measures voltage, see best measurement capabilities for electricity.
5) Also on site; all other calibrations refers to calibrations carried out in a fixed laboratory.
Best measurement capability: the highest achievable accuracy for a given measuring point or measuring range, expressed as the total positive and negative measurement uncertainty.
6) Measuring on-site only

The measurement uncertainty is calculated according to EA-4/02 "Expression of the Uncertainty of Measurement in Calibration"