Annex to declaration of accreditation (scope of accreditation)
Normative document: EN ISO/IEC 17025:2017
Registration number: **K 164**

of **Yokogawa Europe Solutions B.V.**
Yokogawa European Standards Laboratory

This annex is valid from: **03-02-2021** to **01-07-2023** Replaces annex dated: **17-06-2020**

Location(s) where activities are performed under accreditation

Head Office

Euroweg 2
3825 HD
Amersfoort
The Netherlands

Location	Abbreviation/ location code
Euroweg 2 3825 HD Amersfoort The Netherlands	AMF

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
LF	Electricity				
LF 0 0	DC/LF Quantities				AMF
LF 1 0	Direct Voltage				AMF
	1 V; 1.018 V		1.5 μV	Zener reference	
	10 V		15 μV		
	0.1 mV – 1 mV		$(1.2\cdot10^{-4} – 1.2\cdot10^{-3})\cdot U$	Generate	
	1 mV – 10 mV		$(1.8\cdot10^{-5} – 1.3\cdot10^{-4})\cdot U$		
	10 mV – 100 mV		$(2.1\cdot10^{-5} – 1.7\cdot10^{-4})\cdot U$		

[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
	100 mV – 200 mV		$(1.6\cdot10^{-5} – 2.4\cdot10^{-5})\cdot U$		
	200 mV – 2 V		$(6\cdot10^{-6} – 9\cdot10^{-6})\cdot U$		
	2 V – 10 V		$(5\cdot10^{-6} – 8\cdot10^{-6})\cdot U$		
	10 V – 20 V		$(5\cdot10^{-6} – 7\cdot10^{-6})\cdot U$		
	20 V – 200 V		$(5\cdot10^{-6} – 6\cdot10^{-6})\cdot U$		
	200 V – 1000 V		$(9\cdot10^{-6} – 1.1\cdot10^{-5})\cdot U$		
	1 V; 1.018 V		2.5 μV	Measure	
	10 V		25 μV		
	0.1 mV – 1 mV		$(1.2\cdot10^{-4} – 1.2\cdot10^{-3})\cdot U$	Measure	
	1 mV – 10 mV		$(3.2\cdot10^{-5} – 1.7\cdot10^{-4})\cdot U$		
	10 mV – 100 mV		$(1.6\cdot10^{-5} – 2.2\cdot10^{-4})\cdot U$		
	100 mV – 1 V		$(6\cdot10^{-6} – 6\cdot10^{-5})\cdot U$		
	1 V – 10 V		$(7\cdot10^{-6} – 1.1\cdot10^{-4})\cdot U$		
	10 V – 100 V		$(8\cdot10^{-6} – 7\cdot10^{-5})\cdot U$		
	100 V – 1100 V		$(2.4\cdot10^{-5} – 2.4\cdot10^{-4})\cdot U$		
LF 2 1	Direct Current				AMF
	100 μA – 200 μA		$(4\cdot10^{-5} – 5\cdot10^{-5})\cdot I$	Generating	
	0.2 mA – 2 mA		$(5\cdot10^{-5} – 2\cdot10^{-4})\cdot I$		
	2 mA – 20 mA		$(4\cdot10^{-5} – 2.8\cdot10^{-4})\cdot I$		
	20 mA – 200 mA		$(6\cdot10^{-5} – 2.8\cdot10^{-4})\cdot I$		
	0.2 A – 2 A		$(7\cdot10^{-5} – 4\cdot10^{-4})\cdot I$		
	2 A – 10 A		$(1.5\cdot10^{-5} – 4.3\cdot10^{-5})\cdot I$		
	10 A – 35 A		$(4\cdot10^{-4} – 5\cdot10^{-4})\cdot I$		
	10 μA – 100 μA		$(1.9\cdot10^{-5} – 4\cdot10^{-5})\cdot I$	Measure	

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HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
	100 μA – 1 mA		$(1.8\cdot10^{-5} – 1\cdot10^{-4})\cdot I$		
	1 mA – 10 mA		$(1.8\cdot10^{-5} – 1\cdot10^{-4})\cdot I$		
	10 mA – 30 mA		$(2.2\cdot10^{-5} – 5\cdot10^{-5})\cdot I$		
	30 mA – 100 mA		$(2.0\cdot10^{-5} – 4\cdot10^{-5})\cdot I$		
	100 mA – 300 mA		$(3\cdot10^{-5} – 4\cdot10^{-5})\cdot I$		
	300 mA – 1 A		$(6\cdot10^{-5} – 1.1\cdot10^{-4})\cdot I$		
	3 A – 10 A		$(1.3\cdot10^{-4} – 1.6\cdot10^{-4})\cdot I$		
	10 A – 30 A		$(4\cdot10^{-4} – 5\cdot10^{-4})\cdot I$		
LF 3 1	Alternating Voltage				AMF
	8 mV – 80 mV	53 Hz	$(3.0\cdot10^{-5} – 3.0\cdot10^{-4})\cdot U$	Generate / Measure	
	80 mV – 800 mV	53 Hz	$(3.0\cdot10^{-5} – 1.1\cdot10^{-4})\cdot U$		
	800 mV – 8 V	53 Hz	$(3.0\cdot10^{-5} – 1.3\cdot10^{-4})\cdot U$		
	8 V – 80 V	53 Hz	$(3.0\cdot10^{-5} – 1.5\cdot10^{-4})\cdot U$		
	80 V – 800 V	53 Hz	$(3.0\cdot10^{-5} – 1.5\cdot10^{-4})\cdot U$		
				Generate	
	10 mV – 100 mV	10 Hz – 40 Hz	$(1.2\cdot10^{-4} – 4\cdot10^{-3})\cdot U$	On impedance > 50MΩ	
		40 Hz – 20 kHz	$(7\cdot10^{-5} – 1.5\cdot10^{-3})\cdot U$	On impedance > 50MΩ	
		20 kHz – 100 kHz	$(7\cdot10^{-5} – 1.2\cdot10^{-3})\cdot U$	On impedance > 50MΩ	
		100 kHz – 500kHz	$(8\cdot10^{-5} – 7\cdot10^{-3})\cdot U$	On impedance > 50MΩ	
		500 kHz – 1 MHz	$(6\cdot10^{-4} – 1.5\cdot10^{-2})\cdot U$	On impedance > 50MΩ	
	100 mV – 1 V	10 Hz – 40 Hz	$(6\cdot10^{-5} – 9\cdot10^{-4})\cdot U$		
		40 Hz – 20 kHz	$(5\cdot10^{-5} – 8\cdot10^{-4})\cdot U$		
		20 kHz – 100 kHz	$(5\cdot10^{-5} – 5\cdot10^{-3})\cdot U$		
		100 kHz – 500 kHz	$(5\cdot10^{-4} – 6\cdot10^{-3})\cdot U$		
		500 kHz – 1 MHz	$(5\cdot10^{-4} – 1.3\cdot10^{-2})\cdot U$		
	1 V – 10 V	10 Hz – 40 Hz	$(5\cdot10^{-5} – 8\cdot10^{-4})\cdot U$		

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HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
		40 Hz – 20 kHz	$(5\cdot10^{-5} – 8\cdot10^{-4})\cdot U$		
		20 kHz – 100 kHz	$(5\cdot10^{-5} – 9\cdot10^{-4})\cdot U$		
		100 kHz – 500 kHz	$(9\cdot10^{-5} – 5\cdot10^{-3})\cdot U$		
		500 kHz – 1 MHz	$(5\cdot10^{-4} – 2.5\cdot10^{-2})\cdot U$		
	10 V – 100 V	10 Hz – 40 Hz	$(9\cdot10^{-5} – 1.0\cdot10^{-3})\cdot U$		
		40 Hz – 20 kHz	$(7\cdot10^{-5} – 1.0\cdot10^{-3})\cdot U$		
		20 kHz – 100 kHz	$(6\cdot10^{-5} – 2.5\cdot10^{-3})\cdot U$		
	100 V – 1100 V	60 Hz – 400 Hz	$(6\cdot10^{-5} – 1.5\cdot10^{-3})\cdot U$		
		400 Hz – 1 kHz	$(6\cdot10^{-5} – 1.0\cdot10^{-3})\cdot U$		
	60 mV <= 200 mV	10 Hz <= 40 Hz	$(5\cdot10^{-5} – 4\cdot10^{-4})\cdot U$	Measure	
		> 40 Hz <= 20 kHz	$(5\cdot10^{-5} – 2.0\cdot10^{-4})\cdot U$		
		> 20 kHz <= 1 MHz	$(1\cdot10^{-4} – 1.6\cdot10^{-3})\cdot U$		
	> 200 mV <= 600 mV	10 Hz <= 40 Hz	$(5\cdot10^{-5} – 6\cdot10^{-4})\cdot U$		
		> 40 Hz <= 20 kHz	$(4\cdot10^{-5} – 1.0\cdot10^{-4})\cdot U$		
		> 20 kHz <= 1 MHz	$(5\cdot10^{-5} – 1.3\cdot10^{-3})\cdot U$		
	> 600 mV <= 2 V	10 Hz <= 40 Hz	$(2.5\cdot10^{-5} – 6\cdot10^{-4})\cdot U$		
		> 40 Hz <= 20 kHz	$(2.5\cdot10^{-5} – 5\cdot10^{-5})\cdot U$		
		> 20 kHz <= 1 MHz	$(4\cdot10^{-5} – 9\cdot10^{-4})\cdot U$		
	> 2 V <= 6 V	10 Hz <= 40 Hz	$(2.5\cdot10^{-5} – 5\cdot10^{-4})\cdot U$		
		> 40 Hz <= 20 kHz	$(2.5\cdot10^{-5} – 5\cdot10^{-5})\cdot U$		
		> 20 kHz <= 1 MHz	$(4\cdot10^{-5} – 1.5\cdot10^{-3})\cdot U$		
	> 6 V <= 20 V	10 Hz <= 40 Hz	$(2.8\cdot10^{-5} – 6\cdot10^{-4})\cdot U$		
		> 40 Hz <= 20 kHz	$(2.5\cdot10^{-5} – 7\cdot10^{-5})\cdot U$		
		> 20 kHz <= 1 MHz	$(4\cdot10^{-5} – 1.5\cdot10^{-3})\cdot U$		
	> 20 V <= 60 V	10 Hz <= 40 Hz	$(3.0\cdot10^{-5} – 5\cdot10^{-4})\cdot U$		
		> 40 Hz <= 20 kHz	$(2.5\cdot10^{-5} – 7\cdot10^{-5})\cdot U$		
		> 20 kHz <= 100 kHz	$(5\cdot10^{-5} – 1.8\cdot10^{-4})\cdot U$		
	> 60 V <= 200 V	10 Hz <= 40 Hz	$(3.0\cdot10^{-5} – 5\cdot10^{-4})\cdot U$		
		> 40 Hz <= 20 kHz	$(2.9\cdot10^{-5} – 7\cdot10^{-5})\cdot U$		

HCS code	Measured quantity, Range	Frequency	CMC[1]	Remarks	Location
		> 20 kHz <= 100 kHz	$(5\cdot10^{-5} – 1.8\cdot10^{-4})\cdot U$		
	> 200 V <= 600 V	10 Hz <= 40 Hz	$(5\cdot10^{-5} – 7\cdot10^{-4})\cdot U$		
		> 40 Hz <= 20 kHz	$(3.0\cdot10^{-5} – 1.5\cdot10^{-4})\cdot U$		
		> 20 kHz <= 100 kHz	$(1.3\cdot10^{-4} – 4\cdot10^{-3})\cdot U$		
	> 600 V <= 1000 V	10 Hz <= 40 Hz	$(4\cdot10^{-5} – 5\cdot10^{-4})\cdot U$		
		> 40 Hz <= 20 kHz	$(4\cdot10^{-5} – 1.6\cdot10^{-4})\cdot U$		
		> 20 kHz <= 100 kHz	$(1.3\cdot10^{-4} – 4\cdot10^{-3})\cdot U$		
LF 4 1	Alternating Current				AMF
	10mA – 1 A	53 Hz	$(3\cdot10^{-5} – 2.4\cdot10^{-4})\cdot I$	Generate / Measure	
	1 A – 5 A	53 Hz	$(4\cdot10^{-5} – 6\cdot10^{-5})\cdot I$		
	5 A – 9 A	53 Hz	$4\cdot10^{-5}\cdot I$		
	9 A – 24 A	53 Hz	$5\cdot10^{-5}\cdot I$		
	24 A – 50 A	53 Hz	$(4\cdot10^{-5} – 5\cdot10^{-5})\cdot I$		
	50 A – 100 A	53 Hz	$5\cdot10^{-5}\cdot I$		
	100 A – 600 A	53 Hz	$(5\cdot10^{-5} – 8\cdot10^{-5})\cdot I$		
	600 A – 1200 A	53 Hz	$5\cdot10^{-5}\cdot I$		
	10 μA – 100 μA	10 Hz – 40 Hz	$(4\cdot10^{-4} – 4\cdot10^{-3})\cdot I$	Generate	
		40 Hz – 1 kHz	$(3\cdot10^{-4} – 4\cdot10^{-3})\cdot I$		
		1 kHz – 5 kHz	$(3\cdot10^{-4} – 3\cdot10^{-3})\cdot I$		
		5 kHz – 10 kHz	$(3\cdot10^{-4} – 7\cdot10^{-3})\cdot I$		
	0.1 mA – 1 mA	10 Hz – 40 Hz	$(2.6\cdot10^{-4} – 2.6\cdot10^{-3})\cdot I$		
		40 Hz – 1 kHz	$(2.2\cdot10^{-4} – 2.6\cdot10^{-3})\cdot I$		
		1 kHz – 5 kHz	$(2.2\cdot10^{-4} – 2.2\cdot10^{-3})\cdot I$		
		5 kHz – 10 kHz	$(2.2\cdot10^{-4} – 5\cdot10^{-3})\cdot I$		
	1 mA – 10 mA	10 Hz – 40 Hz	$(4\cdot10^{-4} – 4\cdot10^{-3})\cdot I$		
		40 Hz – 1 kHz	$(2.8\cdot10^{-4} – 4\cdot10^{-3})\cdot I$		
		1 kHz – 5 kHz	$(2.8\cdot10^{-4} – 3\cdot10^{-3})\cdot I$		

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		5 kHz – 10 kHz	$(3\cdot10^{-4} – 5\cdot10^{-3})\cdot I$		
	10 mA – 100 mA	10 Hz – 40 Hz	$(4\cdot10^{-4} – 4\cdot10^{-3})\cdot I$		
		40 Hz – 1 kHz	$(4\cdot10^{-4} – 4\cdot10^{-3})\cdot I$		
		1 kHz – 5 kHz	$(4\cdot10^{-4} – 3\cdot10^{-3})\cdot I$		
		5 kHz – 10 kHz	$(4\cdot10^{-4} – 6\cdot10^{-3})\cdot I$		
	0.1 A – 2 A	40 Hz – 1 kHz	$(4\cdot10^{-4} – 6\cdot10^{-3})\cdot I$		
		1 kHz – 5 kHz	$(6\cdot10^{-4} – 1.2\cdot10^{-2})\cdot I$		
		5 kHz – 10 kHz	$(1.4\cdot10^{-3} – 2.2\cdot10^{-2})\cdot I$		
	1 mA – 10 mA	10 Hz – 100 kHz	$(4\cdot10^{-5} – 4\cdot10^{-4})\cdot I$	Generate / Measure	
	10 mA – 100 mA	10 Hz – 100 kHz	$(4\cdot10^{-5} – 4\cdot10^{-4})\cdot I$		
	100 mA – 1 A	10 Hz – 100 kHz	$(4\cdot10^{-5} – 4\cdot10^{-4})\cdot I$		
	1 A – 5 A	10 Hz – 100 kHz	$(5\cdot10^{-5} – 3.0\cdot10^{-4})\cdot I$		
	5 A – 10 A	10 Hz – 100 kHz	$(7\cdot10^{-5} – 2.0\cdot10^{-4})\cdot I$		
	10 A – 20 A	10 Hz – 100 kHz	$(1.0\cdot10^{-4} – 3\cdot10^{-4})\cdot I$		
LF 4 2	AC Current Ratio				AMF
	Current transformer - ratio	53 Hz	$(3.7\cdot10^{-5} - 5\cdot10^{-5})\cdot I_{in}/I_{out}$	Measure Primary: 50 A to 1200 A Secondary:100 mA to 5 A	
	Current transformer - phase	53 Hz	6 mº		
LF 5 1	Power			Generate / Measure	AMF
	100 µW – 30 kW	DC	$(1.4\cdot10^{-5} – 4\cdot10^{-4})\cdot W$	100 mV – 1 kV 1 mA – 30 A	
	1 mW – 12 kW	53 Hz	$(4\cdot10^{-5} – 1.0\cdot10^{-3})\cdot W/VA$	0.1 –8 V, 10 mA – 1200 A $\cos(\varphi) = 1$	
	0.1 W – 240 kW	53 Hz	$(3\cdot10^{-5} – 1.0\cdot10^{-3})\cdot W/VA$	10–200 V, 10 mA – 1200 A $0 \leq \cos(\varphi) \leq 1$	

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	2 W – 960 kW	53 Hz	$(4 \cdot 10^{-5} – 1.4 \cdot 10^{-3}) \cdot$ W/VA	200–800 V, 10 mA – 1200 A, $\cos(\varphi) = 1$	
	0.1 mW – 100 mW	53 Hz	$(3 \cdot 10^{-5} – 4 \cdot 10^{-5}) \cdot$ W/VA	0.1 –8 V, 1 mA – 10mA $\cos(\varphi) = 1$	
	10 mW – 2 W	53 Hz	$(4 \cdot 10^{-5} – 1.8 \cdot 10^{-4}) \cdot$ W/VA	10–200 V, 1 mA – 10mA $0 \leq \cos(\varphi) \leq 1$	
	0.2 W – 8 W	53 Hz	$(4 \cdot 10^{-5} – 1.3 \cdot 10^{-4}) \cdot$ W/VA	200–800 V, 1 mA – 10mA $\cos(\varphi) = 1$	
	1 mW – 20 kW	10 Hz – 1 kHz	$(5 \cdot 10^{-5} – 4 \cdot 10^{-3})$ W/VA	(1.0 – 1000) V 1 mA – 20 A $0.940 \leq \cos(\varphi) \leq 1$	
	1 mW – 20 kW	10 Hz – 1 kHz	$(1.0 \cdot 10^{-4} – 6 \cdot 10^{-4})$ W/VA	(1.0 – 1000) V 1 mA – 20 A $0 \leq \cos(\varphi) \leq 0.940$	
	1 mW – 12 kW	>1 kHz – 10 kHz	$(5 \cdot 10^{-5} – 1.0 \cdot 10^{-3})$ W/VA	(1.0 – 600) V 1 mA – 20 A $0.940 \leq \cos(\varphi) \leq 1$	
	1 mW – 12 kW	>1 kHz– 10 kHz	$(6 \cdot 10^{-5} – 1.0 \cdot 10^{-3})$ W/VA	(1.0 – 600) V 1 mA – 20 A $0 \leq \cos(\varphi) \leq 0.940$	
	1 mW – 6 kW	>10 kHz – 100 kHz	$(6 \cdot 10^{-5} – 1.1 \cdot 10^{-2})$ W/VA	(1.0 – 300) V 1 mA – 20 A $0.940 \leq \cos(\varphi) \leq 1$	
	1 mW – 6 kW	>10 kHz– 100 kHz	$(3 \cdot 10^{-4} – 3 \cdot 10^{-2})$ W/VA	(1.0 – 300) V 1 mA – 20 A $0 \leq \cos(\varphi) \leq 0.940$	
LF 6 2	DC Resistance				AMF
	0.01 Ω		1.0 μΩ	Generate 4 wire	
	0.1 Ω		5 μΩ	Generate 4 wire	
	1 Ω		3 μΩ	Generate 4 wire	

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	1.9 Ω		0.08 mΩ	Generate 4 wire	
	10 Ω		0.80 mΩ	Generate 4 wire	
	19 Ω		0.3 mΩ	Generate 4 wire	
	100 Ω		1.0 mΩ	Generate 4 wire	
	190 Ω		1.9 mΩ	Generate 4 wire	
	1 kΩ		10 mΩ	Generate 4 wire	
	1.9 kΩ		19 mΩ	Generate 4 wire	
	10 kΩ		0.08 Ω	Generate 4 wire	
	19 kΩ		0.15 Ω	Generate 4 wire	
	100 kΩ		0.8 Ω	Generate 4 wire	
	190 kΩ		1.8 Ω	Generate 4 wire	
	1 MΩ		0.016 kΩ	Generate 4 wire	
	1.9 MΩ		0.05 kΩ	Generate 4 wire	
	10 MΩ		0.7 kΩ	Generate 4 wire	
	19 MΩ		1.3 kΩ	Generate 4 wire	
	100 MΩ		35 kΩ	Generate 2 wire	
	1 Ω – 100 MΩ		$(1.5\cdot10^{-4} – 5\cdot10^{-4})\cdot R$	Generate	
	1 mΩ – 10 mΩ		$(1.4\cdot10^{-4}\cdot R – 1.8\cdot10^{-4})\cdot R$	Measure	
	10 mΩ – 100 mΩ		$(5\cdot10^{-5}\cdot R – 6\cdot10^{-5})\cdot R$		
	100 mΩ – 1 Ω		$(1.7\cdot10^{-6}\cdot R – 3.0\cdot10^{-5})\cdot R$		
	1 Ω – 10 Ω		$(1.0\cdot10^{-5}\cdot R – 1.1\cdot10^{-5})\cdot R$		
	10 Ω – 100 Ω		$(1.0\cdot10^{-5}\cdot R – 1.2\cdot10^{-5})\cdot R$		
	100 Ω – 1 kΩ		$8\cdot10^{-6}\cdot R$		
	1 kΩ – 10 kΩ		$(6\cdot10^{-6}\cdot R – 1.7\cdot10^{-5})\cdot R$		
	10 kΩ – 100 kΩ		$(1.0\cdot10^{-5} – 7\cdot10^{-5})\cdot R$		
	100 kΩ – 1 MΩ		$(2.6\cdot10^{-5} – 2.3\cdot10^{-4})\cdot R$		

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	1 MΩ – 10 MΩ		$(6\cdot10^{-5} – 5\cdot10^{-4})\cdot R$		
	10 MΩ – 100 MΩ		$(4\cdot10^{-4} – 4\cdot10^{-3})\cdot R$		
	100 MΩ – 1 GΩ		$(2.9\cdot10^{-3} – 2.8\cdot10^{-2})\cdot R$		
TF	Time and Frequency				
TF 2 1	Frequency generation	10 MHz	$2.0\cdot10^{-12}\cdot f$	$\tau \geq 86.4$ ks	AMF
	Frequency measurement	0.1 Hz – 225 MHz	$2\cdot10^{-9}\cdot f$	$\tau = 1$ s	
			$2\cdot10^{-10}\cdot f$	$\tau = 10$ s	
			$4\cdot10^{-10}\cdot f$	$\tau = 100$ s	
			$2\cdot10^{-11}\cdot f$	$\tau = 1$ ks	
			$3\cdot10^{-12}\cdot f$	$\tau = 10$ ks	
			$2\cdot10^{-12}\cdot f$	$\tau = 100$ ks	

Remarks:

- The ambient temperature during calibration is nominally 23 °C.
- The measurements are carried out inside the permanent laboratory.