

Annex 03

of 2008-04-28 to the accreditation certificate of the calibration laboratory **DKD-K-23801**

Registration number:

Page 1 of 3

at
ZERA GmbH
Hauptstraße 392
53639 Königswinter
Germany
Phone: +49 2223 704-0
Fax: +49 2223 704-71
E-mail: zera@zera.de

Measured quantities:

DC voltage,
AC voltage,
AC current,
active power,
active energy,
reactive power,
reactive energy,
apparent power,
apparent energy

Head: Helmut Mauer
Deputy: Frank Quadflieg
Dipl.-Ing. (FH) Hubertus Hüttemann

Accredited since: 2000-01-27

Permanent Laboratory

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability ¹⁾	Remarks
DC voltage	1,018 V 10 V 2 V to 100 V 0,02 V to 0,1 V > 0,1 V to 1 V > 1 V to 10 V > 10V to 100 V > 100 V to 1000 V	Compared to 1,018 V respectively 10 V standard Comparison with 10 V standard with Kelvin Varley divider to HP 3458A	$3,2 \cdot 10^{-6}$ $3,3 \cdot 10^{-6}$ $3,7 \cdot 10^{-6}$ $7 \cdot 10^{-6} U + 11 \mu V$ $7 \cdot 10^{-6} U + 1 \mu V$ $7 \cdot 10^{-6}$ $11 \cdot 10^{-6}$ $16 \cdot 10^{-6}$	$U =$ measuring voltage
AC voltage	60 V; 120 V; 240 V; 480 V 30 V to 550 V	$40 \text{ Hz} \leq f \leq 60 \text{ Hz}$	$20 \cdot 10^{-6}$ $50 \cdot 10^{-6}$	with COM 303-3
AC current	5 mA to 20 mA > 0,02 A to 0,1 A > 0,1 A to 10 A > 10 A to 160 A	$40 \text{ Hz} \leq f \leq 60 \text{ Hz}$	$70 \cdot 10^{-6}$ $55 \cdot 10^{-6}$ $51 \cdot 10^{-6}$ $0,11 \cdot 10^{-3}$	
AC active power, single phase	37,5 mW to 11 W 0,15 W to 55 W 0,75 W to 5,5 kW 75 W to 88 kW	$40 \text{ Hz} \leq f \leq 60 \text{ Hz};$ $0,25 \leq \cos \varphi \leq 1$ $30 \text{ V} < U \leq 550 \text{ V}$ $5 \text{ mA} < I \leq 20 \text{ mA}$ $20 \text{ mA} < I \leq 100 \text{ mA}$ $0,1 \text{ A} < I \leq 10 \text{ A}$ $10 \text{ A} < I \leq 160 \text{ A}$	$94 \cdot 10^{-6}$ $68 \cdot 10^{-6}$ $61 \cdot 10^{-6}$ $0,12 \cdot 10^{-3}$	relative measurement uncertainty related to the apparent power with COM 303-3
AC active energy, single phase	3,75 Ws to 1,1 kWh 15 Ws to 1,53 Wh 75 Ws to 152,78 Wh 2,08 Wh to 2,44 kWh	$40 \text{ Hz} \leq f \leq 60 \text{ Hz};$ $0,25 \leq \cos \varphi \leq 1$ $30 \text{ V} < U \leq 550 \text{ V}$ $t = 100 \text{ s}$ $5 \text{ mA} < I \leq 20 \text{ mA}$ $20 \text{ mA} < I \leq 100 \text{ mA}$ $0,1 \text{ A} < I \leq 10 \text{ A}$ $10 \text{ A} < I \leq 160 \text{ A}$	$94 \cdot 10^{-6}$ $68 \cdot 10^{-6}$ $61 \cdot 10^{-6}$ $0,12 \cdot 10^{-3}$	relative measurement uncertainty related to the apparent energy with COM 303-3

¹⁾ The best measurement capabilities are stated according to DKD-3 (EA-4/02). These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability ¹⁾	Remarks
AC reactive power, single phase	37,5 mvar to 11 var 0,15 var to 55 var 0,75 var to 5,5 kvar	40 Hz ≤ f ≤ 60 Hz; 0,25 ≤ sin φ ≤ 1 30 V < U ≤ 550 V 5 mA < I ≤ 20 mA 20 mA < I ≤ 100 mA 0,1 A < I ≤ 10 A	98 · 10 ⁻⁶ 61 · 10 ⁻⁶ 54 · 10 ⁻⁶	relative measurement uncertainty related to the apparent power with COM 303-3
AC reactive energy, single phase	3,75 vars to 1,1 kvars 15 vars to 1,53 varh 75 vars to 152,78 varh	40 Hz ≤ f ≤ 60 Hz; 0,25 ≤ sin φ ≤ 1 30 V < U ≤ 550 V t = 100 s 5 mA < I ≤ 20 mA 20 mA < I ≤ 100 mA 0,1 A < I ≤ 10 A	98 · 10 ⁻⁶ 61 · 10 ⁻⁶ 54 · 10 ⁻⁶	relative measurement uncertainty related to the apparent energy with COM 303-3
AC apparent power, single phase	0,15 VA to 11 VA 0,6 VA to 55 VA 3 VA to 5,5 kVA 300 VA to 88 kVA	40 Hz ≤ f ≤ 60 Hz; 30 V < U ≤ 550 V 5 mA < I ≤ 20 mA 20 mA < I ≤ 100 mA 0,1 A < I ≤ 10 A 10 A < I ≤ 160 A	97 · 10 ⁻⁶ 58 · 10 ⁻⁶ 54 · 10 ⁻⁶ 0,11 · 10 ⁻³	relative measurement uncertainty related to the apparent power with COM 303-3
AC apparent energy, single phase	15 VAs to 1,1 kVAs 60 VAs to 5,5 kVAs 300 VAs to 152,78 VAh 8,33 VAh to 2,44 kVAh	40 Hz ≤ f ≤ 60 Hz; 30 V < U ≤ 550 V t = 100 s 5 mA < I ≤ 20 mA 20 mA < I ≤ 100 mA 0,1 A < I ≤ 10 A 10 A < I ≤ 160 A	97 · 10 ⁻⁶ 58 · 10 ⁻⁶ 54 · 10 ⁻⁶ 0,11 · 10 ⁻³	relative measurement uncertainty related to the apparent energy with COM 303-3
AC active power, three phase	112,5 mW to 165 W 2,25 W to 16,5 kW 225 W to 264 kW	40 Hz ≤ f ≤ 60 Hz; 0,25 ≤ cos φ ≤ 1 30 V < U ≤ 550 V 5 mA < I ≤ 100 mA 100 mA < I ≤ 10 A 10 A < I ≤ 160 A	98 · 10 ⁻⁶ 54 · 10 ⁻⁶ 0,12 · 10 ⁻³	relative measurement uncertainty related to the apparent power with COM 303-3
AC active energy, three phase	11,25 Ws to 4,58 Wh 225 Ws to 458,3 Wh 6,25 Wh to 7,33 kWh	40 Hz ≤ f ≤ 60 Hz; 0,25 ≤ cos φ ≤ 1 30 V < U ≤ 550 V t = 100 s 5 mA < I ≤ 100 mA 100 mA < I ≤ 10 A 10 A < I ≤ 160 A	98 · 10 ⁻⁶ 54 · 10 ⁻⁶ 0,12 · 10 ⁻³	relative measurement uncertainty related to the apparent energy with COM 303-3
AC reactive power, three phase	112,5 mvar to 16,5 kvar 225 var to 264 kvar	40 Hz ≤ f ≤ 60 Hz; 0,25 ≤ sin φ ≤ 1 30 V < U ≤ 550 V 5 mA < I ≤ 10 A 10 A < I ≤ 160 A	98 · 10 ⁻⁶ 0,13 · 10 ⁻³	relative measurement uncertainty related to the apparent energy with COM 303-3
AC reactive energy, three phase	11,25 vars to 458,3 varh 6,25 varh to 7,33 kvarh	40 Hz ≤ f ≤ 60 Hz; 0,25 ≤ sin φ ≤ 1 30 V < U ≤ 550 V t = 100 s 5 mA < I ≤ 10 A 10 A < I ≤ 160 A	98 · 10 ⁻⁶ 0,13 · 10 ⁻³	relative measurement uncertainty related to the apparent energy with COM 303-3

¹⁾ The best measurement capabilities are stated according to DKD-3 (EA-4/02). These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k=2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.

Measured quantity / Calibration item	Range	Measurement conditions / procedure	Best measurement capability ¹⁾	Remarks
AC apparent power, three phase	0,45 VA to 82,5 VA 4,5 VA to 16,5 kVA 0,9 kVA to 264 kVA	40 Hz $\leq f \leq$ 60 Hz; 30 V < U \leq 550 V 5 mA < I \leq 50 mA 50 mA < I \leq 10 A 10 A < I \leq 160 A	$98 \cdot 10^{-6}$ $54 \cdot 10^{-6}$ $0,11 \cdot 10^{-3}$	relative measurement uncertainty related to the apparent power with COM 303-3
AC apparent energy, three phase	45 VAs to 8,25 kVAs 450 VAs to 458,33 VAh 90 kVAs to 7,33 kVAh	40 Hz $\leq f \leq$ 60 Hz; 30 V < U \leq 550 V t = 100 s 5 mA < I \leq 50 mA 50 mA < I \leq 10 A 10 A < I \leq 160 A	$98 \cdot 10^{-6}$ $54 \cdot 10^{-6}$ $0,11 \cdot 10^{-3}$	relative measurement uncertainty related to the apparent energy with COM 303-3

¹⁾ The best measurement capabilities are stated according to DKD-3 (EA-4/02). These are expanded uncertainties of measurement with a coverage probability of 95% and have a coverage factor of $k = 2$ unless stated otherwise. Uncertainties without unit are relative uncertainties referring to the measurement value unless stated otherwise.