

Preparing Authority: Vincent Pugh	<div> </div> <p style="text-align: center;">G128 - Guidance for DC/AC Power Scope Presentation</p>	Publication Date: 05/16/23
---	--	--

Review of several Scopes of Accreditation with AC and DC Power Generate functions listed using the Fluke 5500/5520 as a standard revealed several concerns about the presentation of these parameters on the scope of accreditation.

1. The ranges are not listed in the correct unit of measure for Power which is the watt.
2. It appears that, in most cases, the ranges are taken directly from the Fluke 5500/5520 manual listed in sections for DC Power and AC Power which list absolute uncertainties in tables listing voltage vs. current.
3. The footnotes for these sections refer the user to a section titled Calculation of Power Uncertainty and it appears that a number of CAB's are ignoring that footnote. The referenced section clearly refers to the use of watt and var as the units of measure.
4. Additionally, some of the scopes reviewed do not state the PF (power factor) that the AC Power CMC is derived at. The 5500/5520 has a significant accuracy limitation at power factors less than 1. Therefore, the power factor (PF) must be stated on the Scope of Accreditation.
5. Scope reviews also found that it is not clear what value the CMC relates to. Is it a % of voltage or amperes or some other unit not listed? This could be a violation of [ILAC P14](#) Sections 4.2 and 4.3.

Recommendations:

A2LA Calibration assessors who review Scopes of Accreditation similar to the one in this example should ensure that the CAB has calculated their CMC in accordance with the instructions contained in the relevant Fluke manual. They should also ensure that the units stated for the ranges and CMC reflect Watts, Vars or Volt Amperes as appropriate and do not violate the [ILAC P14](#) requirements sections 4.2 and 4.3 as enumerated in [A2LA R205 - Specific Requirements - Calibration Laboratory Accreditation Program](#).

In addition, the assessor should ensure that the CAB is applying the proper corrections for power factor (as enumerated in the Fluke manual) when calculating measurement uncertainty for the calibration of customers instruments.

CABs should review and correct their CMC calculations and Scopes of Accreditation to comply with the instructions contained in the relevant Fluke manual. They should also ensure that the units stated on the Scopes of Accreditation reflect Watts, Vars or Volt Amperes as appropriate.

Author Acknowledgement:

A2LA wishes to acknowledge and thank author Jack Ferris - A2LA Lead Assessor, Metrologist

INCORRECT PRESENTATION

Parameter/Equipment	Range	CMC ² (±)	Comments
DC Power ³ – 33 mV to 1020 V	330 µA to 330 mA > 330 mA to 3 A > 3 A to 20 A	0.018 % 0.041 % 0.078 %	Fluke 5520A

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Power ³ – PF = 1 33mV to 1020 V (3 to 9) mA (> 9 to 33) mA (> 33 to 90) mA (> 90 to 330) mA > 330 mA to 0.9 A (> 0.9 to 2.2) A (> 2.2 to 4.5) A (> 4.5 to 20.5) A (3 to 9) mA (> 9 to 33) mA (> 33 to 90) mA (> 90 to 330) mA > 330 mA to 0.9 A (> 0.9 to 2.2) A (> 2.2 to 4.5) A (> 4.5 to 20.5) A	(10 to 65) Hz (65 to 500) Hz	0.062 % 0.041 % 0.063 % 0.042 % 0.047 % 0.066 % 0.11 % 0.10 % 0.049 % 0.046 % 0.049 % 0.074 % 0.055 % 0.069 % 0.11 % 0.12 %	Fluke 5520A

Parameter/Range	Frequency	CMC ^{2, 4} (±)	Comments
AC Power ³ – (cont)			
(> 3 to 9) mA	500 Hz to 1 kHz	0.045 %	Fluke 5520A
(> 9 to 33) mA		0.041 %	
(> 33 to 90) mA		0.045 %	
(> 90 to 330) mA		0.041 %	
> 330 mA to 0.9 A		0.047 %	
(> 0.9 to 2.2) A		0.065 %	
(> 2.2 to 4.5) A		0.11 %	
(> 4.5 to 20.5) A		0.12 %	
(> 3 to 9) mA	(1 to 5) kHz	0.10 %	
(> 9 to 33) mA		0.068 %	
(> 33 to 90) mA		0.10 %	
(> 90 to 330) mA		0.084 %	
> 330 mA to 0.9 A		0.47 %	
(> 0.9 to 2.2) A	(5 to 10) kHz	0.47 %	
(> 3 to 9) mA		0.18 %	
(> 9 to 33) mA		0.16 %	
(> 33 to 90) mA		0.18 %	
(> 90 to 330) mA		0.16 %	
> 330 mA to 0.9 A		2.0 %	
(> 0.9 to 2.2) A		2.2 %	

CORRECT PRESENTATION

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
DC Power – Generate			
33 mV to 1020 V	109 µW to 1 mW	0.03 %	Fluke 5500A
	(1 to 11) mW	0.03 %	
	(11 to 108) mW	0.06 %	
	108 mW to 11 W	0.03 %	
	11 W to 5 kW	0.09 %	
	(5 to 12) kW	0.07 %	

Parameter/Equipment	Range	CMC ^{2, 4, 7} (±)	Comments
AC Power – Generate	(45 to 65) Hz PF=1		Fluke 5500A
33 mV to 1020 V	109 µW to 1 mW (1 to 4) mW (4 to 11) mW (11 to 40) mW (40 to 396) mW 396 mW to 11 W (11 to 264) W 264 W to 3 kW (3 to 11) kW	0.03 % 0.19 % 0.19 % + 0.06 nW 0.12 % + 0.06 nW 0.12 % + 0.58 nW 0.19 % + 5.76 nW 0.12 % 0.16 % 0.12 %	

DOCUMENT REVISION HISTORY

Date	Description
02/09/2105/16 /23	<ul style="list-style-type: none">➤ Updated ILAC P14 references➤ Corrected symbols
05/16/23	<ul style="list-style-type: none">➤ Corrected range in example calibration scope on page 4