

Electrical – DC/Low Frequency



Parameter/Equipment	Range ⁴	CMC ^{2, 6} (±)	Comments
DC Voltage ³ – Generate	(0 to 220) mV	7 $\mu\text{V}/\text{V}$ + 0.5 μV	Fluke 5720A
	(0.22 to 2.2) V	4 $\mu\text{V}/\text{V}$ + 0.8 μV	
	(2.2 to 11) V	3 $\mu\text{V}/\text{V}$ + 5 μV	
	(11 to 22) V	3 $\mu\text{V}/\text{V}$ + 5 μV	
	(22 to 220) V	4 $\mu\text{V}/\text{V}$ + 50 μV	
	(220 to 1100) V	6 $\mu\text{V}/\text{V}$ + 0.5 mV	Fluke 732A array Fluke 732A, 752A
	10.00 V	0.5 $\mu\text{V}/\text{V}$	
	100.0 mV	0.9 $\mu\text{V}/\text{V}$	
	1.0 V	0.8 $\mu\text{V}/\text{V}$	
	10.0 V	0.75 $\mu\text{V}/\text{V}$	
100.0 V	0.8 $\mu\text{V}/\text{V}$		
1000.0 V	0.9 $\mu\text{V}/\text{V}$		
DC Voltage ³ – Measure	(0 to 120) mV	5 $\mu\text{V}/\text{V}$ + 1 μV	Agilent 3458A
	(0.1 to 1.2) V	4 $\mu\text{V}/\text{V}$ + 1 μV	
	(1.0 to 12) V	4 $\mu\text{V}/\text{V}$ + 2 μV	
	(10 to 120) V	6 $\mu\text{V}/\text{V}$ + 30 μV	
	(100 to 1050) V	18 $\mu\text{V}/\text{V}$ + 100 μV	Vitretek 4670A w/ HVL-100
(0.5 to 10) kV	0.04 % IV + 0.03 V		
(10 to 100) kV	0.075 % IV + 0.3 V		
DC Current ³ – Measure	(2 to 20) A	0.01 % IV	Fluke Y5020, HP 3458A
	(10 to 100) A (30 to 300) A	0.05 % IV 0.1 % IV	
	(12 to 120) μA	20 $\mu\text{A}/\text{A}$ + 800 pA	Guildline 9211A, Agilent 3458A Agilent 3458A
	(0.12 to 1.2) mA	20 $\mu\text{A}/\text{A}$ + 5.0 nA	
	(1.2 to 12) mA	20 $\mu\text{A}/\text{A}$ + 50 nA	
	(12 to 120) mA	35 $\mu\text{A}/\text{A}$ + 500 nA	
	(0.12 to 1.2) A	0.011 % IV + 10 μA	

Parameter/Equipment	Range ⁴	CMC ^{2,6} (±)	Comments
DC Current ³ – Generate	(0 to 220) μ A (0.22 to 2.2) mA (2.2 to 22) mA (22 to 220) mA (0.22 to 2.2) A (2.0 to 11) A	42 μ A/A + 7 nA 35 μ A/A + 8 nA 35 μ A/A + 50 nA 45 μ A/A + 0.8 μ A 70 μ A/A + 15 μ A 0.034 % + 480 μ A	Fluke 5720A Fluke 5720A w/ Fluke 5725A
Resistance ³ – Measure	(0.0 to 12) Ω (10 to 120) Ω (0.10 to 1.2) k Ω (1.0 to 12) k Ω (10 to 120) k Ω (0.10 to 1.2) M Ω (1.0 to 12) M Ω (10 to 120) M Ω	15 $\mu\Omega/\Omega$ + 50 $\mu\Omega$ 12 $\mu\Omega/\Omega$ + 500 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 500 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 5 m Ω 10 $\mu\Omega/\Omega$ + 50 m Ω 15 $\mu\Omega/\Omega$ + 2 Ω 50 $\mu\Omega/\Omega$ + 100 Ω 0.05 % IV + 1000 Ω	Agilent 3458A
Resistance ³ – Generate	10 000.00 Ω 1.0 Ω 1.0 Ω (Nominal) 1.9 Ω 10.0 Ω 19.0 Ω 100.0 Ω 190.0 Ω 1.0 k Ω 1.9 k Ω 10.0 k Ω 19.0 k Ω 100.0 k Ω 190.0 k Ω 1.0 M Ω 1.9 M Ω 10.0 M Ω 19.0 M Ω 100.0 M Ω	0.5 $\mu\Omega/\Omega$ 0.5 $\mu\Omega/\Omega$ 95 $\mu\Omega/\Omega$ 95 $\mu\Omega/\Omega$ 25 $\mu\Omega/\Omega$ 25 $\mu\Omega/\Omega$ 11 $\mu\Omega/\Omega$ 11 $\mu\Omega/\Omega$ 9 $\mu\Omega/\Omega$ 9 $\mu\Omega/\Omega$ 9 $\mu\Omega/\Omega$ 9 $\mu\Omega/\Omega$ 11 $\mu\Omega/\Omega$ 11 $\mu\Omega/\Omega$ 18 $\mu\Omega/\Omega$ 19 $\mu\Omega/\Omega$ 37 $\mu\Omega/\Omega$ 47 $\mu\Omega/\Omega$ 0.011 % IV	ESI SR-104 Leeds & Northrup 4210 Fluke 5720A

Parameter/Equipment	Range ⁴	CMC ² (±)	Comments
Resistance – Ratio Measurement	1:1 0.1:1 to 10:1 > 10:1 to 100:1	1.0 parts in 10 ⁶ 1.4 parts in 10 ⁶ 2.0 parts in 10 ⁶	MI 6010, MI 6000

Parameter/Range ⁴	Frequency	CMC ^{2,6} (±)	Comments
AC Voltage ³ – Generate			
(0 to 2.2) mV	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.027 % IV + 5 μV 0.011 % IV + 5 μV 90 μV/V + 5 μV 0.023 % IV + 5 μV 0.054 % IV + 6 μV 0.12 % IV + 12 μV 0.15 % IV + 25 μV 0.31 % IV + 25 μV	Fluke 5720A
(2.0 to 22) mV	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.027 % IV + 5 μV 0.011 % IV + 5 μV 90 μV/V + 5 μV 0.023 % IV + 5 μV 0.054 % IV + 6 μV 0.12 % IV + 12 μV 0.15 % IV + 25 μV 0.31 % IV + 25 μV	
(20 to 220) mV	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.027 % IV + 50 μV 0.01 % IV + 20 μV 50 μV/V + 10 μV 90 μV/V + 12 μV 0.013 % IV + 40 μV 0.042 % IV + 100 μV 0.11 % IV + 250 μV 0.18 % IV + 400 μV	
(0.20 to 2.2) V	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.027 % IV + 500 μV 0.01 % IV + 200 μV 50 μV/V + 70 μV 90 μV/V + 120 μV 0.012 % IV + 250 μV 0.031 % IV + 800 μV 0.11 % IV + 2.5 mV 0.16 % IV + 4 mV	

Parameter/ Range ⁴	Frequency	CMC ^{2,6} (±)	Comments
AC Voltage ³ – Generate (cont)			
(2.0 to 22) V	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.027 % IV + 5 mV 0.01 % IV + 2 mV 60 μV/V + 7 mV 0.01 % IV + 1.2 mV 0.017 % IV + 3 mV 0.1 % IV + 20 mV 0.52 % IV + 50 mV 0.9 % IV + 100 mV	Fluke 5720A
(20 to 220) V	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.027 % IV + 5 mV 0.01 % IV + 2 mV 60 μV/V + 700 μV 0.01 % IV + 12 mV 0.017 % IV + 3 mV	
(200 to 1100) V	(0.05 to 1) kHz	80 μV/V + 4 mV	
(200 to 750) V	(30 to 50) kHz (50 to 100) kHz	0.036 % IV + 11 mV 0.13 % IV + 45 mV	Fluke 5720A w/ Fluke 5725A
(200 to 1100) V	(0.04 to 1) kHz (1 to 20) kHz (20 to 30) kHz	80 μV/V + 4 mV 0.013 % IV + 6 mV 0.036 % IV + 11 mV	
AC Voltage ^{3,5} – Measure			
(0 to 2.2) mV	(10 to 19.99) Hz (20 to 39.99) Hz (0.040 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.17 % IV + 1.3 μV 0.074 % IV + 1.3 μV 0.042 % IV + 1.3 μV 0.081 % IV + 2.0 μV 0.12 % IV + 2.5 μV 0.23 % IV + 4.0 μV 0.24 % IV + 8.0 μV 0.35 % IV + 8.0 μV	Fluke 5790A
(2.2 to 7.0) mV	(10 to 19.99) Hz (20 to 39.99) Hz (0.040 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.085 % IV + 1.3 μV 0.037 % IV + 1.3 μV 0.021 % IV + 1.3 μV 0.04 % IV + 2.0 μV 0.06 % IV + 2.5 μV 0.12 % IV + 4.0 μV 0.13 % IV + 8.0 μV 0.23 % IV + 8.0 μV	

Parameter/ Range ⁴	Frequency	CMC ^{2, 6} (±)	Comments
AC Voltage ^{3, 5} – Measure (cont)			Fluke 5790A
(7.0 to 22.0) mV	(10 to 19.99) Hz (20 to 39.99) Hz (0.040 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.029 % IV + 1.3 μV 0.019 % IV + 1.3 μV 0.011 % IV + 1.3 μV 0.021 % IV + 2.0 μV 0.031 % IV + 2.5 μV 0.081 % IV + 4.0 μV 0.089 % IV + 8.0 μV 0.17 % IV + 8.0 μV	
(22 to 70) mV	(10 to 19.99) Hz (20 to 39.99) Hz (0.040 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.024 % IV + 1.5 μV 0.012 % IV + 1.5 μV 65 μV/V + 1.5 μV 0.013 % IV + 2.0 μV 0.026 % IV + 2.5 μV 0.051 % IV + 4.0 μV 0.067 % IV + 8.0 μV 0.11 % IV + 8.0 μV	
(70 to 220) mV	(10 to 19.99) Hz (20 to 39.99) Hz (0.040 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.021 % IV + 1.5 μV 85 μV/V + 1.5 μV 38 μV/V + 1.5 μV 69 μV/V + 2.0 μV 0.016 % IV + 2.5 μV 0.025 % IV + 4.0 μV 0.038 % IV + 8.0 μV 0.1 % IV + 8.0 μV	
(220 to 700) mV	(10 to 19.99) Hz (20 to 39.99) Hz (0.040 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.021 % IV + 1.5 μV 76 μV/V + 1.5 μV 33 μV/V + 1.5 μV 51 μV/V + 2.0 μV 79 μV/V + 2.5 μV 0.018 % IV + 4.0 μV 0.03 % IV + 8.0 μV 0.096 % IV + 8.0 μV	
(0.7 to 2.2) V	(10 to 19.99) Hz (20 to 39.99) Hz (0.040 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.02 % IV 66 μV/V 24 μV/V 46 μV/V 71 μV/V 0.016 % IV 0.026 % IV 0.09 % IV	

Parameter/ Range ⁴	Frequency	CMC ^{2,6} (±)	Comments
AC Voltage ^{3,5} – Measure (cont)			
(2.2 to 7.0) V	(10 to 19.99) Hz (20 to 39.99) Hz (0.040 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz (0.5 to 1) MHz	0.02 % IV 67 μV/V 24 μV/V 48 μV/V 81 μV/V 0.019 % IV 0.04 % IV 0.12 % IV	Fluke 5790A
(70 to 220) V	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz (100 to 300) kHz (300 to 500) kHz	0.02 % IV 68 μV/V 31 μV/V 69 μV/V 98 μV/V 0.021 % IV 0.05 % IV	
(220 to 700) V	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.02 % IV 96 μV/V 39 μV/V 0.012 % IV 0.04 % IV	
(700 to 1000) V	(10 to 19.99) Hz (20 to 39.99) Hz (0.040 to 20) kHz (20 to 50) kHz (50 to 100) kHz	0.02 % IV 96 μV/V 37 μV/V 0.012 % IV 0.04 % IV	
(0 to 10) kV	60 Hz	0.15 % IV + 0.1 V	Vitretek 4700A w/ HVL-100
(10 to 75) kV	60 Hz	0.15 % IV + 0.6 V	

Parameter/Range	Frequency	CMC ^{2,6} (±)	Comments
AC Current ³ – Measure			
(0 to 120) µA	(10 to 19.99) Hz (20 to 44.99) Hz (45 to 100) Hz (0.1 to 1) kHz	0.4 % IV + 30 pA 0.15 % IV + 30 pA 0.06 % IV + 30 pA 0.06 % IV + 30 pA	Agilent 3458A
(0.12 to 1.2) mA	(10 to 19.99) Hz (20 to 44.99) Hz (45 to 100) Hz (0.1 to 5) kHz	0.4 % IV + 200 pA 0.15 % IV + 200 pA 0.06 % IV + 200 pA 0.03 % IV + 200 pA	
(1.2 to 12) mA	(10 to 19.99) Hz (20 to 44.99) Hz (45 to 100) Hz (0.1 to 5) kHz	0.4 % IV + 2 µA 0.15 % IV + 2 µA 0.06 % IV + 2 µA 0.03 % IV + 2 µA	
(12 to 120) mA	(10 to 19.99) Hz (20 to 44.99) Hz (45 to 100) Hz (0.1 to 5) kHz	0.15 % IV + 20 µA 0.06 % IV + 20 µA 0.03 % IV + 20 µA 0.06 % IV + 20 µA	
(0.12 to 2.2) A	(10 to 19.99) Hz (20 to 44.99) Hz (45 to 100) Hz (0.1 to 5) kHz	0.4 % IV + 200 µA 0.16 % IV + 200 µA 0.08 % IV + 200 µA 0.1 % IV + 200 µA	
(2 to 20) A	(50 to 100) Hz 300 Hz 1 kHz 3 kHz 4 kHz 5 kHz	0.016 % IV 0.019 % IV 0.027 % IV 0.051 % IV 0.063 % IV 0.075 % IV	Fluke Y5020, HP 3458A
(20 to 1200) A	60 Hz 400 Hz	0.05 % IV 0.09 % IV	Weston 327 current transformer, Fluke Y5020, HP 3458A

Parameter/ Range	Frequency	CMC ^{2,6} (±)	Comments
AC Current ³ – Generate			
(0 to 220) μA	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.036 % IV + 2.1 μA 0.023 % IV + 2.1 μA 0.017 % IV + 2.1 μA 0.042 % IV + 2.1 μA 0.15 % IV + 2.1 μA	Fluke 5720A
(0.2 to 2.2) mA	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.036 % IV + 2.1 μA 0.023 % IV + 2.1 μA 0.017 % IV + 2.1 μA 0.029 % IV + 2.2 μA 0.15 % IV + 3.1 μA	
(2.0 to 22) mA	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.028 % IV + 0.5 μA 0.018 % IV + 0.4 μA 0.013 % IV + 0.4 μA 0.022 % IV + 0.7 μA 0.11 % IV + 6 μA	
(20 to 220) mA	(10 to 19.99) Hz (20 to 39.99) Hz (0.04 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.028 % IV + 5 μA 0.018 % IV + 4 μA 0.013 % IV + 3 μA 0.022 % IV + 4 μA 0.11 % IV + 12 μA	
(0.20 to 2.2) A	(0.02 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.03 % IV + 40 μA 0.046 % IV + 100 μA 0.7 % IV + 200 μA	
(2.0 to 11) A	(0.04 to 1) kHz (1 to 5) kHz (5 to 10) kHz	0.04 % IV + 170 μA 0.085 % IV + 380 μA 0.33 % + 750 μA	Fluke 5720A w/ Fluke 5725A
(2 to 20) A	50 to 100 Hz 300 Hz 1 kHz 3 kHz 4 kHz 5 kHz	0.016 % IV 0.019 % IV 0.027 % IV 0.051 % IV 0.063 % IV 0.075 % IV	Fluke Y5020, HP 3458A, Fluke 5725A
(20 to 100) A	60 Hz	0.05 % IV	Fluke Y5020, HP 3458A, Weston 327 CT, Vahalla 2555A

Parameter/ Range ⁴	Frequency	CMC ^{2,6} (±)	Comments
Capacitance ³ – Generate 1000 pF (330 to 500) pF (0.5 to 1.1) nF (1.1 to 3.3) nF (3.3 to 11) nF (11 to 33) nF (33 to 110) nF (110 to 330) nF (0.330 to 1.10) μF (1.1 to 3.3) μF (3.3 to 11) μF (11 to 33) μF (33 to 110) μF (110 to 330) μF (0.330 to 1.1) mF	1000 Hz (50 to 1000) Hz (50 to 400) Hz (50 to 200) Hz (50 to 100) Hz	5.0 μF/F 0.5 % IV + 10 pF 0.5 % IV + 10 pF 0.5 % IV + 10 pF 0.5 % IV + 10 pF 0.25 % IV + 100 pF 0.25 % IV + 100 pF 0.25 % IV + 300 pF 0.25 % IV + 1 nF 0.35 % IV + 3 nF 0.35 % IV + 10 nF 0.4 % IV + 30 nF 0.5 % IV + 100 nF 0.7 % IV + 300 nF 1 % IV + 300 nF	GenRad 1404A Fluke 5500A
Capacitance ³ – Measure (0.1 to 1000) pF (0 to 1) nF (1 to 10) nF (10 to 100) nF (0.1 to 1) μF (1 to 10) μF (10 to 100) μF (0.1 to 1) mF (1 to 10) mF (10 to 100) mF (0.1 to 1) F (1 to 10) F (10 to 31.8) F	1 kHz (0.050 to 2) kHz	0.01 % IV + 30 fF 0.1 % IV + 10 fF 0.1 % IV + 100 fF 0.1 % IV + 1 pF 0.1 % IV + 10 pF 0.1 % IV + 100 pF 0.1 % IV + 1 nF 0.1 % IV + 10 nF 0.1 % IV + 100 nF 0.1 % IV + 1 μF 0.1 % IV + 10 μF 0.1 % IV + 100 μF 0.1 % IV + 1 mF	GenRad 1620A Fluke PM6304C

Parameter/ Range	Range	CMC ² (±)	Comments
Thermocouple Simulation – Generate and Measure			
Type E	(-250 to -100) °C (-100 to -25) °C (-25 to 350) °C (350 to 650) °C (650 to 1000) °C	0.5 °C 0.16 °C 0.14 °C 0.16 °C 0.21 °C	Fluke 5500A
Type J	(-210 to -100) °C (-100 to -30) °C (-30 to 150) °C (150 to 760) °C (760 to 1200) °C	0.27 °C 0.16 °C 0.14 °C 0.17 °C 0.23 °C	
Type K	(-200 to -100) °C (-100 to -25) °C (-25 to 120) °C (120 to 1000) °C (1000 to 1372) °C	0.33 °C 0.18 °C 0.16 °C 0.26 °C 0.4 °C	
Type R	(0 to 250) °C (250 to 400) °C (400 to 1000) °C (1000 to 1767) °C	0.57 °C 0.35 °C 0.33 °C 0.4 °C	
Type S	(0 to 250) °C (250 to 1000) °C (1000 to 1400) °C (1400 to 1767) °C	0.47 °C 0.36 °C 0.37 °C 0.46 °C	
Type T	(-250 to -150) °C (-150 to 0) °C (0 to 120) °C (120 to 400) °C	0.63 °C 0.24 °C 0.16 °C 0.14 °C	