cal equipment

Keithley 2001

Manufacturer	KEITHLEY INSTRUMENTS	Calibration date	July 16 2022
Model Number	Model 2001	Ambient Temperature	22.9 °C
Serial	0629860	Relative Humidity	41.0 %
ID Number	Mike	Pressure	1003.4 hPa
Notes	Test front V/R ports	Test type	Post-adjustment calibration

Reference standard	Mfg	Model	Options	Serial / Unc	CEID	Calibration date	Due date
MFC	Fluke	5720A	03/HLK	E2E6	XC01	07/08/2022	07/08/2023
Amplifier	Fluke	5725A		5930005	XA01	07/08/2022	07/08/2023
DMM	HP	3458A	001,X02	X	XD3	07/14/2022	10/14/2022
DC STD	xDevs.com	792X[2]	9.9999802 VDC	±1.0 ppm	XD01	Process calibration	Process calibration
STDR	ESI	SR104	10000.0013 KΩ	±0.20 ppm	XR04	02/22/2022	02/22/2024
STDR	Ohm Labs	109-AF	1.000037 GΩ	±9 ppm	TCMR	07/05/2022	07/05/2023
ARB	Keysight	33622A				Source only	Source only

MFC last calibrated	9.0 days ago	MFC since DCV ZERO	1.0 days ago
MFC since WBFLAT	554.0 days ago	MFC since WBGAIN	160.0 days ago
MFC Confidence level	**24h 95% REL**	MFC Calibrate date	2022-07-08 00:00:00
MFC Calibrate date Zero	2022-07-16 00:00:00	Calibrate date WB Flatness	2021-10-09 00:00:00
Calibrate date WB Gain	2022-02-07 00:00:00	CAL CONST 6.5V reference voltage	6.95747750309
CAL CONST 13V reference voltage	13.8553055727	CAL CONST 22V range positive zero	398.17849
CAL CONST 22V range negative zero	398.178	CAL CONST DAC Linearity	0.0
CAL CONST 10KOHM true output resistance	9999.8190781	CAL CONST 10KOHM standard resistance	9998.7587624
CAL CONST, Zero calibration temperature	22.0	CAL CONST, All calibration temp	22.0
Booster type	VB5725,IB5725	Current output posts	AUX

Calibrate date 5725A AMP	1988-10-01 00:00:00	Calibrated days ago	2015-12-06 00:00:00
CAL CONST, Amp ACAL temperature	23.0	CAL CONST, Amp CalCheck temperature	23.0

This note is test MFC dummy text block for further use. Calibrator was warmed up >365 days.

Meter Info	KEITHLEY INSTRUMENTS INC.,MODEL 2001,0629860,B10 /A02	Test date start	16 July 2022 22:16
Test specification interval	**24 hour DUT spec**	Line frequency	120V 60 Hz
Next calibration date	07/17/23	Last calibration date	07/17/22
DUT temperature to cal	0.4	Last calibration temperature	+23.7

Service information

Last calibration temperature
+23.7
All CAL values
9.996469E-01,-9.098341E-05,1.000397E+01,-1.040969E-04,9.999901E-01,5.647338E-07,1.000706E+01,1.306481E-04,9.999856E+01,4.963718E+02,9.634447E-03,1.166275E-02,5.070762E-03,1.064860E-02,1.3183,1.015000E+02,1.260000E+02,4.861828E-04,1.000606E+00,1.000502E+00,1.000387E+00,1.000233E+00,9.746004E-02,1.000368E+00,1.230000E+02,1.030000E+02,1.020000E+02,1.320000E+02,1.500000E+00,5.000000000000E+00,1.403151E+00,-3.614496E-06,1.753865E+00,-4.376322E-07,-7.015711E-01,1.154957E-05,1.753313E+00,-1.013529E-06,7.013700E-01,4.374085E-04,1.404282E+00,1.262449E-05,1.404231E+00,9.4078,1.402241E+00,9.394537E-06,1.389450E+00,9.308838E-06,1.407654E+00,9.430799E-06,1.499476E+00,-9.136107E-03,1.429759E+00,-9.169075E-04,1.787124E+00,-9.176850E-05,1.965785E+00,-9.622768E-06,2.480,-1.533008E-06,2.273019E+00,-6.584963E-07,2.499654E+00,-6.328570E-07,3.973067E+00,9.917540E-03,1.589328E+00,9.908705E-04,1.499476E+00,3.716220E-05,1.429759E+00,3.543438E-05,1.787124E+00,3.306,1.965785E+00,3.711534E-06,2.483856E+00,4.689688E-06,7.015906E-01,9.999983E-01,15693,8775,12251,29529,29529,29528,29529,1160,6458,9.357612E-03,9.813898E-04,9.813898E-04,8.921958E-05,7.06107.716017E-07,7.016430E-08,4.414386E-09,4.414386E-09
Reference
Direct MFC test, verification per-cal
DUT Condition
Test before calibration

Test procedure : $Id: k2001.py | Rev 2396 | 2022/07/14 23:28:32 tin_sl $

Source procedure : $Id: f5720b.py | Rev 2398 | 2022/07/15 20:35:54 tin_sl $

Main DC Voltage ranges performance test.
Checks zero offset and +/-FS calibration on all ranges
The following test for the offset voltage specification using MFC 0V source in 4-wire ext sense mode as reference.
DCV gain range points verify gain of the DC voltage function, using uncorrected 24-hour MFC output. DC voltage offset of DUT is nulled before FS tests.

Test Description	Expected Value	Measured Value	Measurement Uncertainty	Lower Limit	Upper Limit	Deviation	DUT Spec	Test Status
Short 0 mVDC	0.0000000E+00	**-0.31 µV**	0.50 µV	-1.700 µV	1.700 µV	N/A	1.20 µV	PASS
Short 0.0 VDC	0.0000000E+00	**-0.30 µV**	0.50 µV	-4.500 µV	4.500 µV	N/A	4.00 µV	PASS
Short 00.0 VDC	0.0000000E+00	**-4.00 µV**	0.50 µV	-80.500 µV	80.500 µV	N/A	80.00 µV	PASS
Short 000.0 VDC	0.0000000E+00	**50.00 µV**	0.50 µV	-600.500 µV	600.500 µV	N/A	0.60 mV	PASS
Short 0000.0 VDC	0.0000000E+00	**-100.00 µV**	0.50 µV	-6000.500 µV	6000.500 µV	N/A	6.00 mV	PASS
DCV Test	**0.1V-1000V**	**DUT**	**Source unc.**	**Low Limit**	**Hi limit**	**Measured**	**24h spec**	**Result**
0.2 VDC (0.20 Range)	0.2000000	**0.20000035**	7.27 ppm	0.19999535	0.20000465	1.758 ppm	16 ppm	PASS 7.56 %
-0.2 VDC (0.20 Range)	-0.2000000	**-0.19999952**	7.27 ppm	-0.20000465	-0.19999535	-2.417 ppm	16 ppm	PASS 10.39 %
0.1 VDC (2.00 Range)	0.1000000	**0.10000097**	7.27 ppm	0.099998373	0.10000163	9.667 ppm	9 ppm	PASS 59.41 %
1.0 VDC (2.00 Range)	1.0000000	**1.0000011**	3.86 ppm	0.99998714	1.0000129	1.050 ppm	9 ppm	PASS 8.16 %
2.0 VDC (2.00 Range)	2.0000000	**1.9999994**	3.86 ppm	1.9999743	2.0000257	-0.317 ppm	9 ppm	PASS 2.46 %
-0.1 VDC (2.00 Range)	-0.1000000	**-0.099999833**	7.27 ppm	-0.10000163	-0.099998373	-1.667 ppm	9 ppm	PASS 10.24 %
-1.0 VDC (2.00 Range)	-1.0000000	**-1.0000001**	3.86 ppm	-1.0000129	-0.99998714	0.100 ppm	9 ppm	PASS 0.78 %
-2.0 VDC (2.00 Range)	-2.0000000	**-1.9999999**	3.86 ppm	-2.0000257	-1.9999743	-0.067 ppm	9 ppm	PASS 0.52 %
1.0 VDC (20.00 Range)	1.0000000	**0.9999935**	3.86 ppm	0.99998514	1.0000149	-6.5 ppm	11 ppm	PASS 43.74 %
10.0 VDC (20.00 Range)	10.0000000	**9.999991**	2.77 ppm	9.9998623	10.000138	-0.9 ppm	11 ppm	PASS 6.54 %
20.0 VDC (20.00 Range)	20.0000000	**19.999984**	2.73 ppm	19.999725	20.000275	-0.792 ppm	11 ppm	PASS 5.77 %
-1.0 VDC (20.00 Range)	-1.0000000	**-1.0000093**	3.86 ppm	-1.0000149	-0.99998514	9.333 ppm	11 ppm	PASS 62.81 %
-10.0 VDC (20.00 Range)	-10.0000000	**-10.000005**	2.77 ppm	-10.000138	-9.9998623	0.5 ppm	11 ppm	PASS 3.63 %
-20.0 VDC (20.00 Range)	-20.0000000	**-19.999991**	2.73 ppm	-20.000275	-19.999725	-0.44 ppm	11 ppm	PASS 3.22 %
10 VDC (200.00 Range)	10.00000	**10.000058**	2.77 ppm	9.9998123	10.000188	5.833 ppm	16 ppm	PASS 31.08 %
100 VDC (200.00 Range)	100.00000	**100.001**	3.73 ppm	99.998027	100.00197	9.950 ppm	16 ppm	PASS 50.43 %
200 VDC (200.00 Range)	200.00000	**200.00208**	3.73 ppm	199.99605	200.00395	10.383 ppm	16 ppm	PASS 52.63 %
-10 VDC (200.00 Range)	-10.000000	**-10.000035**	2.77 ppm	-10.000188	-9.9998123	3.5 ppm	16 ppm	PASS 18.65 %
-100 VDC (200.00 Range)	-100.0000	**-100.00091**	3.73 ppm	-100.00197	-99.998027	9.117 ppm	16 ppm	PASS 46.21 %
-200 VDC (200.00 Range)	-200.0000	**-200.002**	3.73 ppm	-200.00395	-199.99605	10.000 ppm	16 ppm	PASS 50.68 %
100 VDC (1000.00 Range)	100.0000	**100.00087**	3.73 ppm	99.997327	100.00267	8.667 ppm	23 ppm	PASS 32.42 %
200 VDC (1000.00 Range)	200.0000	**200.0017**	3.73 ppm	199.99465	200.00535	8.5 ppm	23 ppm	PASS 31.80 %
1000 VDC (1000.00 Range)	1000.0000	**1000.0256**	5.45 ppm	999.96905	1000.0309	25.617 ppm	23 ppm	PASS 82.77 %
-100 VDC (1000.00 Range)	-100.0000	**-100.00105**	3.73 ppm	-100.00267	-99.997327	10.5 ppm	23 ppm	PASS 39.28 %
-200 VDC (1000.00 Range)	-200.000	**-200.00162**	3.73 ppm	-200.00535	-199.99465	8.083 ppm	23 ppm	PASS 30.24 %
-1000 VDC (1000.00 Range)	-1000.000	**-1000.0257**	5.45 ppm	-1000.0309	-999.96905	25.733 ppm	23 ppm	PASS 99.17 %

4W test procedure for all test points that verify Gain of the OHMF function. 4-wire kelvin connection is used between DMM and MFC. 1GΩ resistance range is tested using the external standard, as MFC unable to provide this range value.

OHM Test	1 Ohm to 1 GOhm	DUT	Source unc.	Low Limit	Hi limit	Measured	24h spec	Result
1 Ω	0.9997689	**0.99974954**	85.0 ppm	9.9964793E-01	9.9988987E-01	-19.366 ppm	36.0 ppm	PASS 16.00 %
1.9 Ω	1.8997939	**1.8997553**	85.0 ppm	1.8995640E+00	1.9000238E+00	-20.314 ppm	36.0 ppm	PASS 16.79 %
10 Ω	10.000591	**10.000306**	23.0 ppm	1.0000001E+01	1.0001181E+01	-28.491 ppm	36.0 ppm	PASS 48.29 %
19 Ω	19.000192	**18.999608**	23.0 ppm	1.8999071E+01	1.9001313E+01	-30.749 ppm	36.0 ppm	PASS 52.12 %
100 Ω	99.99593	**99.993707**	10.0 ppm	9.9991830E+01	1.0000003E+02	-22.234 ppm	31.0 ppm	PASS 54.23 %
190 Ω	189.99194	**189.98778**	10.0 ppm	1.8998415E+02	1.8999973E+02	-21.896 ppm	31.0 ppm	PASS 53.40 %
1.0 kΩ	1000.021	**1000.004**	8.0 ppm	9.9998700E+02	1.0000550E+03	-16.983 ppm	26.0 ppm	PASS 49.95 %
1.9 kΩ	1899.88	**1899.8415**	8.0 ppm	1.8998154E+03	1.8999446E+03	-20.273 ppm	26.0 ppm	PASS 59.63 %
10 kΩ	9999.8	**9999.7063**	8.0 ppm	9.9994900E+03	1.0000110E+04	-9.367 ppm	23.0 ppm	PASS 30.22 %
19 kΩ	18999.277	**18999.101**	9.0 ppm	1.8998669E+04	1.8999885E+04	-9.290 ppm	23.0 ppm	PASS 29.03 %
100 kΩ	99994.76	**99994.713**	9.0 ppm	9.9991410E+04	9.9998110E+04	-0.467 ppm	24.5 ppm	PASS 1.39 %
190 kΩ	189989.18	**189988.33**	9.0 ppm	1.8998282E+05	1.8999554E+05	-4.48 ppm	24.5 ppm	PASS 13.38 %
1.0 MΩ	999983.7	**999973.45**	16.0 ppm	9.9991320E+05	1.0000542E+06	-10.2 ppm	54.5 ppm	PASS 14.54 %
1.9 MΩ	1899982.1	**1899951.3**	17.0 ppm	1.8998463E+06	1.9001179E+06	-16.2 ppm	54.5 ppm	PASS 22.65 %
10 MΩ	9999118	**9998471.7**	33.0 ppm	9.9971432E+06	1.0001093E+07	-64.6 ppm	164.5 ppm	PASS 32.73 %
19 MΩ	18998781	**18996782**	43.0 ppm	1.8994839E+07	1.9002723E+07	-105 ppm	164.5 ppm	PASS 50.70 %
100 MΩ	100.00499 M	**99923255**	100.0 ppm	9.9684974E+07	1.0032501E+08	-817 ppm	3100 ppm	PASS 25.54 %
1 GΩ STD	1.000037 G	**0.99589133 G**	10.0 ppm	958104837.99	1036077362.01	-4162 ppm	9100 ppm	PASS 54.2 %

4W and 2W Zero test procedure for all test points that verify Zero offset of the OHMF function. 4-wire kelvin connection is used between DMM and MFC. 1GΩ resistance range is tested using the external standard, as MFC unable to provide this range value.

OHM ZERO 4W	DUT	Source unc.	Low Limit	Hi limit	Measured	24h spec	Result
20R Ω	**Range -0.0000012 Ω**	1.400e-04 Ω	-0.00014	0.00014	N/A	3.6000e-05 Ω	PASS
200R Ω	**Range -0.0000767 Ω**	1.400e-03 Ω	-0.0014	0.0014	N/A	2.3000e-05 Ω	PASS
2K Ω	**Range -0.0001500 Ω**	8.000e-03 Ω	-0.008	0.008	N/A	2.3000e-05 Ω	PASS
20K Ω	**Range -0.0015000 Ω**	8.000e-02 Ω	-0.08	0.08	N/A	2.3000e-05 Ω	PASS
200K Ω	**Range 0.0266667 Ω**	9.000e-01 Ω	-0.9	0.9	N/A	2.3000e-05 Ω	PASS
OHM ZERO 2W	**DUT**	**Source unc.**	**Low Limit**	**Hi limit**	**Measured**	**24h spec**	**Result**
200K Ω	**Range 0.2816667 Ω**	9.000e-01 Ω	-0.9	0.9	N/A	2.3000e-05 Ω	PASS
2M Ω	**Range 0.1923077 Ω**	9.000e+00 Ω	-9	9	N/A	2.3000e-05 Ω	PASS
20M Ω	**Range 3.5384615 Ω**	9.000e+01 Ω	-90	90	N/A	2.3000e-05 Ω	PASS
200M Ω	**Range 267.6923077 Ω**	2.000e+04 Ω	-20000.0	20000.0	N/A	2.3000e-05 Ω	PASS
1G Ω	**Range -46.1538462 Ω**	1.000e+05 Ω	-100000	100000	N/A	2.3000e-05 Ω	PASS

Procedure for all test points in the AC performance verification for ANAlog mode. AC-measurements does not suffer from TEMF offsets, test connection can be made using shielded leads terminated with dual banana plugs. MFC main AC output is used as reference source

ACV ANA Test	1V-10V	DUT	w/Guardband	Low Limit	Hi limit	Units	Measured	24h spec	Result
1.0 VAC @ 50.0 kHz	1.0	**0.9996238**	0.0129 %	0.99672091	1.00327909	VAC	-0.0376 %	0.3150 %	PASS 11.47 %
1.0 VAC @ 1.0 MHz	1.0	**0.9994153**	0.2500 %	0.989	1.011	VAC	-0.0585 %	0.8500 %	PASS 5.32 %
10 VAC @ 100 Hz	10	**9.995751**	73.18	9.9947682	10.0052318	VAC	-424.900 ppm	450.0 ppm	PASS 81.21 %
10 VAC @ 400 Hz	10	**9.997144**	73.18	9.9947682	10.0052318	VAC	-285.600 ppm	450.0 ppm	PASS 54.59 %
10 VAC @ 1.0 kHz	10	**9.997033**	73.18	9.9947682	10.0052318	VAC	-296.700 ppm	450.0 ppm	PASS 56.71 %
10 VAC @ 50.0 kHz	10	**10.000764**	0.0129 %	9.9672091	10.0327909	VAC	0.0076 %	0.3150 %	PASS 2.33 %
10 VAC @ 1.0 MHz	10	**10.12609**	0.3000 %	9.76	10.24	VAC	1.2609 %	2.1000 %	PASS 52.54 %

Procedure for all test points in the AC performance verification for SYNCronous mode. This is highest AC accuracy test. AC-measurements does not suffer from TEMF offsets, test connection can be made using shielded leads terminated with dual banana plugs. MFC main AC output is used as reference source

ACV SYNC Test	DUT	w/Guardband	Low Limit	Hi limit	Measured	24h spec	Result, % spec
0.02 V AC+DC @ 10 Hz	**0.020009**	0.0312 %	0.019907	0.020093	0.0450 %	0.4325 %	PASS 9.70 %
0.02 V AC+DC @ 20 Hz	**0.020009**	0.0312 %	0.019907	0.020093	0.0450 %	0.4325 %	PASS 9.70 %
0.02 V AC+DC @ 50 Hz	**0.02001**	0.0312 %	0.019907	0.020093	0.0500 %	0.4325 %	PASS 10.78 %
0.02 V AC+DC @ 60 Hz	**0.020012**	0.0312 %	0.019907	0.020093	0.0600 %	0.4325 %	PASS 12.94 %
0.02 V AC+DC @ 100 Hz	**0.020009**	0.0312 %	0.019907	0.020093	0.0450 %	0.4325 %	PASS 9.70 %
0.02 V AC+DC @ 1.0 kHz	**0.020003**	0.0312 %	0.019907	0.020093	0.0150 %	0.4325 %	PASS 3.23 %
0.02 V AC+DC @ 6.25 kHz	**0.020001**	0.0312 %	0.019907	0.020093	0.0050 %	0.4325 %	PASS 1.08 %
0.02 V AC+DC @ 10.0 kHz	**0.020003**	0.0312 %	0.019907	0.020093	0.0150 %	0.4325 %	PASS 3.23 %
0.02 V AC+DC @ 20.0 kHz	**0.020003**	0.0312 %	0.019907	0.020093	0.0150 %	0.4325 %	PASS 3.23 %
0.02 V AC+DC @ 50.0 kHz	**0.019988**	0.0447 %	0.019905	0.020095	-0.0600 %	0.4325 %	PASS 12.57 %
0.02 V AC+DC @ 100.0 kHz	**0.019973**	0.0773 %	0.019828	0.020172	-0.1350 %	0.7825 %	PASS 15.70 %
0.02 V AC+DC @ 200.0 kHz	**0.019916**	0.1500 %	0.019800	0.020200	-0.4200 %	0.8500 %	PASS 42.00 %
0.02 V AC+DC @ 300.0 kHz	**0.019884**	0.1500 %	0.019800	0.020200	-0.5800 %	0.8500 %	PASS 58.00 %
0.02 V AC+DC @ 500.0 kHz	**0.02014**	0.2500 %	0.019530	0.020470	0.7000 %	2.1000 %	PASS 29.79 %
0.02 V AC+DC @ 1.0 MHz	**0.020394**	0.4000 %	0.019500	0.020500	1.9700 %	2.1000 %	PASS 78.80 %
0.2 V AC+DC @ 10 Hz	**0.19999**	0.0121 %	0.199866	0.200134	-0.0050 %	0.0550 %	PASS 7.45 %
0.2 V AC+DC @ 20 Hz	**0.199996**	0.0121 %	0.199866	0.200134	-0.0020 %	0.0550 %	PASS 2.98 %
0.2 V AC+DC @ 50 Hz	**0.199996**	0.0121 %	0.199886	0.200114	-0.0020 %	0.0450 %	PASS 3.50 %
0.2 V AC+DC @ 60 Hz	**0.199994**	0.0121 %	0.199886	0.200114	-0.0030 %	0.0450 %	PASS 5.25 %
0.2 V AC+DC @ 100 Hz	**0.199993**	0.0121 %	0.199886	0.200114	-0.0035 %	0.0450 %	PASS 6.13 %
0.2 V AC+DC @ 1.0 kHz	**0.200002**	0.0121 %	0.199886	0.200114	0.0010 %	0.0450 %	PASS 1.75 %
0.2 V AC+DC @ 6.25 kHz	**0.200008**	0.0121 %	0.199886	0.200114	0.0040 %	0.0450 %	PASS 7.00 %
0.2 V AC+DC @ 10.0 kHz	**0.200009**	0.0121 %	0.199886	0.200114	0.0045 %	0.0450 %	PASS 7.88 %

0.2 V AC+DC @ 20.0 kHz	**0.20001**	0.0121 %	0.199886	0.200114	0.0050 %	0.0450 %	PASS 8.75 %
0.2 V AC+DC @ 50.0 kHz	**0.199964**	0.0256 %	0.199319	0.200681	-0.0180 %	0.3150 %	PASS 5.28 %
0.2 V AC+DC @ 100.0 kHz	**0.199736**	0.0591 %	0.198332	0.201668	-0.1320 %	0.7750 %	PASS 15.83 %
0.2 V AC+DC @ 200.0 kHz	**0.19907**	0.0964 %	0.198107	0.201893	-0.4650 %	0.8500 %	PASS 49.14 %
0.2 V AC+DC @ 300.0 kHz	**0.19849**	0.0964 %	0.198107	0.201893	-0.7550 %	0.8500 %	PASS 79.78 %
0.2 V AC+DC @ 500.0 kHz	**0.198363**	0.1500 %	0.198000	0.202000	-0.8185 %	0.8500 %	PASS 81.85 %
0.2 V AC+DC @ 1.0 MHz	**0.198519**	0.3000 %	0.197700	0.202300	-0.7405 %	0.8500 %	PASS 64.39 %
2.0 V AC+DC @ 10 Hz	**2.00022**	0.0050 %	1.998801	2.001199	0.0110 %	0.0550 %	PASS 18.35 %
2.0 V AC+DC @ 20 Hz	**2.00027**	0.0050 %	1.998801	2.001199	0.0135 %	0.0550 %	PASS 22.52 %
2.0 V AC+DC @ 50 Hz	**2.0003**	0.0050 %	1.999001	2.000999	0.0150 %	0.0450 %	PASS 30.03 %
2.0 V AC+DC @ 60 Hz	**2.0003**	0.0050 %	1.999001	2.000999	0.0150 %	0.0450 %	PASS 30.03 %
2.0 V AC+DC @ 100 Hz	**2.0003**	0.0050 %	1.999001	2.000999	0.0150 %	0.0450 %	PASS 30.03 %
2.0 V AC+DC @ 1.0 kHz	**2.00031**	0.0050 %	1.999001	2.000999	0.0155 %	0.0450 %	PASS 31.03 %
2.0 V AC+DC @ 6.25 kHz	**2.00036**	0.0050 %	1.998901	2.001099	0.0180 %	0.0500 %	PASS 32.75 %
2.0 V AC+DC @ 10.0 kHz	**2.00038**	0.0050 %	1.998901	2.001099	0.0190 %	0.0500 %	PASS 34.57 %
2.0 V AC+DC @ 20.0 kHz	**2.00035**	0.0050 %	1.998901	2.001099	0.0175 %	0.0500 %	PASS 31.84 %
2.0 V AC+DC @ 50.0 kHz	**1.99984**	0.0085 %	1.993529	2.006471	-0.0080 %	0.3150 %	PASS 2.47 %
2.0 V AC+DC @ 100.0 kHz	**1.99768**	0.0138 %	1.984224	2.015776	-0.1160 %	0.7750 %	PASS 14.71 %
2.0 V AC+DC @ 200.0 kHz	**1.99175**	0.0425 %	1.982149	2.017851	-0.4125 %	0.8500 %	PASS 46.22 %
2.0 V AC+DC @ 300.0 kHz	**1.98792**	0.0425 %	1.982149	2.017851	-0.6040 %	0.8500 %	PASS 67.67 %
2.0 V AC+DC @ 500.0 kHz	**1.98739**	0.1100 %	1.955800	2.044200	-0.6305 %	2.1000 %	PASS 28.53 %
2.0 V AC+DC @ 1.0 MHz	**1.99295**	0.1800 %	1.954400	2.045600	-0.3525 %	2.1000 %	PASS 15.46 %
20 V AC+DC @ 10 Hz	**20.0005**	0.0048 %	19.986036	20.013964	0.0025 %	0.0650 %	PASS 3.58 %
20 V AC+DC @ 20 Hz	**20.0008**	0.0048 %	19.986036	20.013964	0.0040 %	0.0650 %	PASS 5.73 %
20 V AC+DC @ 50 Hz	**20.0009**	0.0048 %	19.988036	20.011964	0.0045 %	0.0550 %	PASS 7.52 %
20 V AC+DC @ 60 Hz	**20.0009**	0.0048 %	19.988036	20.011964	0.0045 %	0.0550 %	PASS 7.52 %
20 V AC+DC @ 100 Hz	**20.0009**	0.0048 %	19.988036	20.011964	0.0045 %	0.0550 %	PASS 7.52 %
20 V AC+DC @ 1.0 kHz	**19.999**	0.0048 %	19.988036	20.011964	-0.0050 %	0.0550 %	PASS 8.36 %
20 V AC+DC @ 6.25 kHz	**19.9971**	0.0048 %	19.980036	20.019964	-0.0145 %	0.0950 %	PASS 14.53 %
20 V AC+DC @ 10.0 kHz	**19.9979**	0.0048 %	19.980036	20.019964	-0.0105 %	0.0950 %	PASS 10.52 %
20 V AC+DC @ 20.0 kHz	**20.0008**	0.0048 %	19.980036	20.019964	0.0040 %	0.0950 %	PASS 4.01 %
20 V AC+DC @ 50.0 kHz	**20.004**	0.0085 %	19.935291	20.064709	0.0200 %	0.3150 %	PASS 6.18 %
20 V AC+DC @ 100.0 kHz	**19.9974**	0.0121 %	19.932573	20.067427	-0.0130 %	0.3250 %	PASS 3.86 %
20 V AC+DC @ 200.0 kHz	**19.9741**	0.0336 %	19.803273	20.196727	-0.1295 %	0.9500 %	PASS 13.17 %
20 V AC+DC @ 300.0 kHz	**19.9749**	0.0336 %	19.803273	20.196727	-0.1255 %	0.9500 %	PASS 12.76 %
20 V AC+DC @ 500.0 kHz	**20.0065**	0.1100 %	19.138000	20.862000	0.0325 %	4.2000 %	PASS 0.75 %

20 V AC+DC @ 1.0 MHz	**20.1702**	0.1700 %	19.126000	20.874000	0.8510 %	4.2000 %	PASS 19.47 %
200.0 V AC+DC @ 100 Hz	**200.033**	0.0060 %	199.877964	200.122036	0.0165 %	0.0550 %	PASS 27.02 %
200.0 V AC+DC @ 1.0 kHz	**200.011**	0.0060 %	199.877964	200.122036	0.0055 %	0.0550 %	PASS 9.01 %
200.0 V AC+DC @ 6.25 kHz	**199.997**	0.0060 %	199.797964	200.202036	-0.0015 %	0.0950 %	PASS 1.48 %
200.0 V AC+DC @ 10.0 kHz	**200.009**	0.0060 %	199.797964	200.202036	0.0045 %	0.0950 %	PASS 4.45 %
200.0 V AC+DC @ 20.0 kHz	**200.033**	0.0060 %	199.797964	200.202036	0.0165 %	0.0950 %	PASS 16.33 %
700.0 V AC+DC @ 100 Hz	**699.8**	0.0074 %	699.283452	700.716548	-0.0286 %	0.0950 %	PASS 27.86 %
700.0 V AC+DC @ 1.0 kHz	**699.75**	0.0074 %	699.283452	700.716548	-0.0357 %	0.0950 %	PASS 34.83 %

Procedure for all test points that verify Gain of the DC current DCI function. Both +/-FS points are tested.
2-wire connection at LO and DCI is used between DMM and MFC.
DCI gain range points verify gain of the DC current function, using corrected 24-hour MFC output.

DCI Test	100nA-1A	DUT	Source unc.	Low Limit	Hi limit	Measured	24h spec	Result
Zero 00 µADC	0	**5.4E-10**						INFO
10 µADC	1E-05	**1.000044E-05**	71.82 ppm	9.998402E-06	1.00016E-05	44.000 ppm	88 ppm	PASS 27.53 %
20 µADC	2E-05	**2.000046E-05**	71.82 ppm	1.99968E-05	2.00032E-05	23.000 ppm	88 ppm	PASS 14.39 %
-10 µADC	-1E-05	**-9.99947E-06**	71.82 ppm	-1.00016E-05	-9.998402E-06	-53.000 ppm	88 ppm	PASS 33.16 %
20 µADC	-2E-05	**-1.99994E-05**	71.82 ppm	-2.00032E-05	-1.99968E-05	-30.000 ppm	88 ppm	PASS 18.77 %
Zero 000 µADC	0	**4.8E-10**						INFO
100 µADC	0.0001	**0.00010000052**	71.82 ppm	9.998402E-05	0.000100016	5.200 ppm	88 ppm	PASS 3.25 %
200 µADC	0.0002	**0.00020000018**	71.82 ppm	0.000199968	0.000200032	0.900 ppm	88 ppm	PASS 0.56 %
-100 µADC	-0.0001	**-9.999973E-05**	71.82 ppm	-0.000100016	-9.998402E-05	-2.700 ppm	88 ppm	PASS 1.69 %
-200 µADC	-0.0002	**-0.00019999938**	71.82 ppm	-0.000200032	-0.000199968	-3.100 ppm	88 ppm	PASS 1.94 %
Zero mADC	0	**2.8E-09**						INFO
-1.0 mADC	0.001	**0.0010000128**	33.64 ppm	0.0009998824	0.001000118	12.800 ppm	84 ppm	PASS 10.88 %
2.0 mADC	0.002	**0.0020000248**	33.64 ppm	0.001999765	0.002000235	12.400 ppm	84 ppm	PASS 10.54 %
-1.0 mADC	-0.001	**-0.001000015**	33.64 ppm	-0.001000118	-0.0009998824	15.000 ppm	84 ppm	PASS 12.75 %
-2.0 mADC	-0.002	**-0.0020000293**	33.64 ppm	-0.002000235	-0.001999765	14.650 ppm	84 ppm	PASS 12.45 %
Zero 00 mADC	0	**2.8E-08**						INFO
10 mADC	0.01	**0.010000212**	32.27 ppm	0.009998827	0.01000117	21.200 ppm	85 ppm	PASS 18.08 %
20 mADC	0.02	**0.02000039**	32.27 ppm	0.01999765	0.02000235	19.500 ppm	85 ppm	PASS 16.63 %
-10 mADC	-0.01	**-0.010000206**	32.27 ppm	-0.01000117	-0.009998827	20.600 ppm	85 ppm	PASS 17.57 %
-20 mADC	-0.02	**-0.020000405**	32.27 ppm	-0.02000235	-0.01999765	20.250 ppm	85 ppm	PASS 17.27 %
Zero 000 mADC	0	**1.6E-07**						INFO
100 mADC	0.1	**0.10000224**	53.32 ppm	0.09998307	0.1000169	22.400 ppm	116 ppm	PASS 13.23 %
200 mADC	0.2	**0.19999638**	53.32 ppm	0.1999661	0.2000339	-18.100 ppm	116 ppm	PASS 10.69 %

-100 mADC	-0.1	**-0.1000025**	53.32 ppm	-0.1000169	-0.09998307	25.000 ppm	116 ppm	PASS 14.76 %
-200 mADC	-0.2	**-0.19999755**	53.32 ppm	-0.2000339	-0.1999661	-12.250 ppm	116 ppm	PASS 7.23 %
Zero ADC	0	**1.1E-06**						INFO
1.0 ADC	1	**1.0000264**	115.22 ppm	0.9993648	1.000635	26.400 ppm	520 ppm	PASS 4.16 %
2.0 ADC	2	**1.9998177**	115.22 ppm	1.99873	2.00127	-91.150 ppm	520 ppm	PASS 14.35 %
-1.0 ADC	-1	**-0.9999625**	115.22 ppm	-1.000635	-0.9993648	-37.500 ppm	520 ppm	PASS 5.90 %
-2.0 ADC	-2	**-1.99981**	115.22 ppm	-2.00127	-1.99873	-95.000 ppm	520 ppm	PASS 14.96 %

Procedure for all test points that verify Gain of the AC Current ACI function. Three frequency band points are tested, 50 Hz, 60 Hz and 1 kHz. 2-wire connection at LO and DCI is used between DMM and MFC.

ACI Test	200µA-2A	DUT	Source unc.	Low Limit	Hi limit	Measured	24h spec	Result, % spec
100 µA AC @ 50 Hz	0.0001	**9.99643E-05**	0.0165 %	9.9893455e-05	0.000100106545	-357.000 ppm	0.0900 %	PASS 33.51 %
150 µA AC @ 50 Hz	0.00015	**0.0001499496**	0.0165 %	0.0001498401825	0.0001501598175	-336.000 ppm	0.0900 %	PASS 31.54 %
200 µA AC @ 50 Hz	0.0002	**0.0001999227**	0.0165 %	0.00019978691	0.00020021309	-386.500 ppm	0.0900 %	PASS 36.28 %
1.0 mA AC @ 50 Hz	0.001	**0.0009996217**	0.0138 %	0.00099896182	0.00100103818	-378.300 ppm	0.0900 %	PASS 36.44 %
2.0 mA AC @ 50 Hz	0.002	**0.0019997827**	0.0138 %	0.00199792364	0.00200207636	-108.650 ppm	0.0900 %	PASS 10.47 %
10 mA AC @ 50 Hz	0.01	**0.009996381**	0.0138 %	0.0099896182	0.0100103818	-361.900 ppm	0.0900 %	PASS 34.86 %
20 mA AC @ 50 Hz	0.02	**0.019998052**	0.0138 %	0.0199792364	0.0200207636	-97.400 ppm	0.0900 %	PASS 9.38 %
100 mA AC @ 50 Hz	0.1	**0.09995925**	0.0134 %	0.099896636	0.100103364	-407.500 ppm	0.0900 %	PASS 39.42 %
200 mA AC @ 50 Hz	0.2	**0.19996708**	0.0134 %	0.199793272	0.200206728	-164.600 ppm	0.0900 %	PASS 15.92 %
1.0 A AC @ 50 Hz	1.0	**0.9996298**	0.0308 %	0.99879182	1.00120818	-370.200 ppm	0.0900 %	PASS 30.64 %
2.0 A AC @ 50 Hz	2.0	**1.9996633**	0.0308 %	1.99758364	2.00241636	-168.350 ppm	0.0900 %	PASS 13.93 %
100 µA AC @ 60 Hz	0.0001	**0.000100021**	0.0165 %	9.9893455e-05	0.000100106545	210.000 ppm	0.0900 %	PASS 19.71 %
150 µA AC @ 60 Hz	0.00015	**0.0001498574**	165.45	0.0001498401825	0.0001501598175	-950.667 ppm	0.0900 %	PASS 89.23 %
200 µA AC @ 60 Hz	0.0002	**0.0001999671**	0.0165 %	0.00019978691	0.00020021309	-164.500 ppm	0.0900 %	PASS 15.44 %
1.0 mA AC @ 60 Hz	0.001	**0.0009997522**	0.0138 %	0.00099896182	0.00100103818	-247.800 ppm	0.0900 %	PASS 23.87 %
2.0 mA AC @ 60 Hz	0.002	**0.0020000211**	0.0138 %	0.00199792364	0.00200207636	10.550 ppm	0.0900 %	PASS 1.02 %
10 mA AC @ 60 Hz	0.01	**0.009997126**	0.0138 %	0.0099896182	0.0100103818	-287.400 ppm	0.0900 %	PASS 27.68 %
20 mA AC @ 60 Hz	0.02	**0.019998222**	0.0138 %	0.0199792364	0.0200207636	-88.900 ppm	0.0900 %	PASS 8.56 %
100 mA AC @ 60 Hz	0.1	**0.09996431**	0.0134 %	0.099896636	0.100103364	-356.900 ppm	0.0900 %	PASS 34.53 %
200 mA AC @ 60 Hz	0.2	**0.19997138**	0.0134 %	0.199793272	0.200206728	-143.100 ppm	0.0900 %	PASS 13.84 %
1.0 A AC @ 60 Hz	1.0	**0.9996634**	0.0308 %	0.99879182	1.00120818	-336.600 ppm	0.0900 %	PASS 27.86 %
2.0 A AC @ 60 Hz	2.0	**1.999882**	0.0308 %	1.99758364	2.00241636	-59.000 ppm	0.0900 %	PASS 4.88 %
100 µA AC @ 1.0 kHz	0.0001	**9.99729E-05**	0.0165 %	9.9893455e-05	0.000100106545	-271.000 ppm	0.0900 %	PASS 25.44 %
150 µA AC @ 1.0 kHz	0.00015	**0.000149961**	0.0165 %	0.0001498401825	0.0001501598175	-260.000 ppm	0.0900 %	PASS 24.40 %
200 µA AC @ 1.0 kHz	0.0002	**0.0001999431**	0.0165 %	0.00019978691	0.00020021309	-284.500 ppm	0.0900 %	PASS 26.70 %

1.0 mA AC @ 1.0 kHz	0.001	**0.000999757**	0.0138 %	0.00099896182	0.00100103818	-243.000 ppm	0.0900 %	PASS 23.41 %
2.0 mA AC @ 1.0 kHz	0.002	**0.00200004**	0.0138 %	0.00199792364	0.00200207636	20.000 ppm	0.0900 %	PASS 1.93 %
10 mA AC @ 1.0 kHz	0.01	**0.00999824**	0.0138 %	0.0099896182	0.0100103818	-176.000 ppm	0.0900 %	PASS 16.95 %
20 mA AC @ 1.0 kHz	0.02	**0.020001661**	0.0138 %	0.0199792364	0.0200207636	83.050 ppm	0.0900 %	PASS 8.00 %
100 mA AC @ 1.0 kHz	0.1	**0.09998038**	0.0134 %	0.099896636	0.100103364	-196.200 ppm	0.0900 %	PASS 18.98 %
200 mA AC @ 1.0 kHz	0.2	**0.20000859**	0.0134 %	0.199793272	0.200206728	42.950 ppm	0.0900 %	PASS 4.16 %
1.0 A AC @ 1.0 kHz	1.0	**0.9998557**	0.0308 %	0.99879182	1.00120818	-144.300 ppm	0.0900 %	PASS 11.94 %
2.0 A AC @ 1.0 kHz	2.0	**2.0000195**	0.0308 %	1.99758364	2.00241636	9.750 ppm	0.0900 %	PASS 0.81 %
50 µA AC @ 10.0 kHz	5e-05	**4.98681E-05**	1400	4.986e-05	5.014e-05	-0.2638 %	0.1400 %	PASS 94.21 %
100 µA AC @ 10.0 kHz	0.0001	**9.98701E-05**	0.1400 %	9.972e-05	0.00010028	-0.1299 %	0.1400 %	PASS 46.39 %
150 µA AC @ 10.0 kHz	0.00015	**0.0001498079**	0.1400 %	0.00014958	0.00015042	-0.1281 %	0.1400 %	PASS 45.74 %
200 µA AC @ 10.0 kHz	0.0002	**0.0001997342**	0.1400 %	0.00019944	0.00020056	-0.1329 %	0.1400 %	PASS 47.46 %
1.0 mA AC @ 10.0 kHz	0.001	**0.0009997082**	0.1400 %	0.0009972	0.0010028	-0.0292 %	0.1400 %	PASS 10.42 %
2.0 mA AC @ 10.0 kHz	0.002	**0.0019997125**	0.1400 %	0.0019944	0.0020056	-0.0144 %	0.1400 %	PASS 5.13 %
10 mA AC @ 10.0 kHz	0.01	**0.009998241**	0.1300 %	0.009973	0.010027	-0.0176 %	0.1400 %	PASS 6.51 %
20 mA AC @ 10.0 kHz	0.02	**0.019999129**	0.1300 %	0.019946	0.020054	-0.0044 %	0.1400 %	PASS 1.61 %
100 mA AC @ 10.0 kHz	0.1	**0.10002273**	0.1100 %	0.09975	0.10025	0.0227 %	0.1400 %	PASS 9.09 %
200 mA AC @ 10.0 kHz	0.2	**0.20006377**	0.1100 %	0.1995	0.2005	0.0319 %	0.1400 %	PASS 12.75 %
1.0 A AC @ 10.0 kHz	1.0	**0.9974495**	0.6100 %	0.9925	1.0075	-0.2551 %	0.1400 %	PASS 34.01 %
2.0 A AC @ 10.0 kHz	2.0	**1.9914366**	0.6100 %	1.985	2.015	-0.4282 %	0.1400 %	PASS 57.09 %

Test completed

Test date	17 July 2022 02:41

Lab temperature maintained +23°C ±2°C

Internal use only

Not validated for external use