

(1, 67.0), (1, 67.0), (1, 67.0), (1, 78.0), (1, 88.0), (1, 88.0), (1, 14.0)]

Destructive overloads?

78, DESTRUCTIVE OVERLOADS valid 2941

Reference

Long-Belden

DUT Condition

PostCal 3-meter

Test procedure : \$Id: hp3458a.py | Rev 753 | 2018/07/16 08:13:47 clu \$

Source procedure : \$Id: f5700a.py | Rev 757 | 2018/07/18 06:32:55 tin_fpga \$

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	0.000000E+00	2.27 µV	0.75 µV	-0.910 µV	0.910 µV	N/A	0.16 µV	FAIL
Short 0.0 VDC	0.000000E+00	2.54 µV	0.75 µV	-0.900 µV	0.900 µV	N/A	0.15 µV	FAIL
Short 00.0 VDC	0.000000E+00	2.31 µV	0.75 µV	-1.070 µV	1.070 µV	N/A	0.32 µV	FAIL
Short 000.0 VDC	0.000000E+00	-19.26 µV	0.75 µV	-14.750 µV	14.750 µV	N/A	14.00 µV	FAIL
Short 0000.0 VDC	0.000000E+00	-22.53 µV	0.75 µV	-41.750 µV	41.750 µV	N/A	41.00 µV	PASS
DCV Test	0.1V-1000V	DUT	Source unc.	Low Limit	Hi limit	Measured	24h spec	Result
0.1 VDC (0.10 Range)	0.1000000	0.09999976	7.27 ppm	0.099998723	0.10000128	-0.236 ppm	5.50 ppm	PASS 1.85 %
-0.1 VDC (0.10 Range)	-0.1000000	-0.1000001	7.27 ppm	-0.10000128	-0.099998723	0.974 ppm	5.50 ppm	PASS 7.62 %
0.1 VDC (1.00 Range)	0.1000000	0.10000045	7.27 ppm	0.099999093	0.10000091	4.497 ppm	1.80 ppm	PASS 49.58 %
0.2 VDC (1.00 Range)	0.2000000	0.20000053	3.86 ppm	0.19999887	0.20000113	2.653 ppm	1.80 ppm	PASS 46.87 %
1.0 VDC (1.00 Range)	1.0000000	1.0000009	3.86 ppm	0.99999434	1.0000057	0.872 ppm	1.80 ppm	PASS 15.41 %
-0.1 VDC (1.00 Range)	-0.1000000	-0.099999941	7.27 ppm	-0.10000091	-0.099999093	-0.588 ppm	1.80 ppm	PASS 6.49 %
-0.2 VDC (1.00 Range)	-0.2000000	-0.20000009	3.86 ppm	-0.20000113	-0.19999887	0.468 ppm	1.80 ppm	PASS 8.27 %
-1.0 VDC (1.00 Range)	-1.0000000	-1.0000006	3.86 ppm	-1.0000057	-0.99999434	0.580 ppm	1.80 ppm	PASS 10.24 %
1.0 VDC (10.00 Range)	1.0000000	1.0000011	3.86 ppm	0.99999559	1.0000044	1.060 ppm	0.55 ppm	PASS 24.04 %
2.0 VDC (10.00 Range)	2.0000000	2.0000004	2.77 ppm	1.9999934	2.0000066	0.205 ppm	0.55 ppm	PASS 6.16 %
10.0 VDC (10.00 Range)	10.0000000	9.9999995	2.73 ppm	9.9999672	10.000033	-0.051 ppm	0.55 ppm	PASS 1.57 %
-1.0 VDC (10.00 Range)	-1.0000000	-1.0000004	3.86 ppm	-1.0000044	-0.99999559	0.407 ppm	0.55 ppm	PASS 9.23 %
-2.0 VDC (10.00 Range)	-2.0000000	-1.9999999	2.77 ppm	-2.0000066	-1.9999934	-0.044 ppm	0.55 ppm	PASS 1.33 %
-10.0 VDC (10.00 Range)	-10.0000000	-9.9999985	2.73 ppm	-10.000033	-9.9999672	-0.147 ppm	0.55 ppm	PASS 4.49 %
10 VDC (100.00 Range)	10.0000000	10.000034	2.77 ppm	9.9999443	10.000056	3.391 ppm	2.80 ppm	PASS 60.88 %
20 VDC (100.00 Range)	20.0000000	20.000035	3.73 ppm	19.999869	20.000131	1.772 ppm	2.80 ppm	PASS 27.14 %
100 VDC (100.00 Range)	100.0000000	99.999982	3.73 ppm	99.999347	100.00065	-0.184 ppm	2.80 ppm	PASS 2.81 %
-10 VDC (100.00 Range)	-10.0000000	-9.9999963	2.77 ppm	-10.000056	-9.9999443	-0.374 ppm	2.80 ppm	PASS 6.72 %
-20 VDC (100.00 Range)	-20.0000000	-20	3.73 ppm	-20.000131	-19.999869	0.009 ppm	2.80 ppm	PASS 0.13 %
-100 VDC (100.00 Range)	-100.0000000	-99.999935	3.73 ppm	-100.00065	-99.999347	-0.654 ppm	2.80 ppm	PASS 10.01 %
100 VDC (1000.00 Range)	100.0000000	99.999977	3.73 ppm	99.999367	100.00063	-0.233 ppm	2.60 ppm	PASS 3.67 %
200 VDC (1000.00 Range)	200.0000000	199.99982	3.73 ppm	199.99873	200.00127	-0.879 ppm	2.60 ppm	PASS 13.88 %
1000 VDC (1000.00 Range)	1000.0000000	1000.0002	5.45 ppm	999.97995	1000.02	0.182 ppm	2.60 ppm	PASS 0.91 %
-100 VDC (1000.00 Range)	-100.0000000	-99.999968	3.73 ppm	-100.00063	-99.999367	-0.316 ppm	2.60 ppm	PASS 4.99 %
-200 VDC (1000.00 Range)	-200.0000000	-199.99976	3.73 ppm	-200.00127	-199.99873	-1.179 ppm	2.60 ppm	PASS 18.63 %
-1000 VDC (1000.00 Range)	-1000.0000000	-1000.0004	5.45 ppm	-1000.02	-999.97995	0.412 ppm	2.60 ppm	PASS 10.42 %

Additional test for **combined DUT+MFC** DC Voltage Integral Linearity (INL) using fixed 10V range. Integral linearity is a measure of the device's deviation from ideal linear behaviour.

DCV Linearity	10V Range	DUT	Source unc.	Low Limit	Hi limit	Measured	24h spec	Result
10.999999	10.999999	10.9999993	2.73 ppm	10.99996	11.00004	0.03 ppm	0.55 ppm	PASS 0.95 %
10.101010	10.101010	10.1010105	2.73 ppm	10.10098	10.10104	0.05 ppm	0.55 ppm	PASS 1.44 %
10.000000	10.000000	10.0000008	2.73 ppm	9.999967	10.00003	0.08 ppm	0.55 ppm	PASS 2.51 %
9.999999	9.999999	9.9999999	2.73 ppm	9.999966	10.00003	0.09 ppm	0.55 ppm	PASS 2.78 %
9.000000	9.000000	9.0000013	2.73 ppm	8.99997	9.00003	0.14 ppm	0.55 ppm	PASS 4.33 %
8.888888	8.888888	8.8888889	2.73 ppm	8.888859	8.888917	0.11 ppm	0.55 ppm	PASS 3.21 %
8.000000	8.000000	8.0000011	2.73 ppm	7.999974	8.000026	0.14 ppm	0.55 ppm	PASS 4.18 %
7.777777	7.777777	7.7777782	2.73 ppm	7.777751	7.777803	0.16 ppm	0.55 ppm	PASS 4.75 %
7.000000	7.000000	7.0000012	2.73 ppm	6.999977	7.000023	0.17 ppm	0.55 ppm	PASS 5.29 %
6.666666	6.666666	6.6666673	2.73 ppm	6.666644	6.666688	0.20 ppm	0.55 ppm	PASS 6.16 %
6.000000	6.000000	6.0000013	2.73 ppm	5.99998	6.00002	0.22 ppm	0.55 ppm	PASS 6.83 %
5.555555	5.555555	5.5555567	2.73 ppm	5.555537	5.555573	0.31 ppm	0.55 ppm	PASS 9.46 %
5.000000	5.000000	5.0000013	2.73 ppm	4.999984	5.000016	0.26 ppm	0.55 ppm	PASS 7.85 %
4.444444	4.444444	4.4444455	2.73 ppm	4.444429	4.444459	0.33 ppm	0.55 ppm	PASS 9.95 %
4.000000	4.000000	4.0000013	2.73 ppm	3.999987	4.000013	0.33 ppm	0.55 ppm	PASS 10.09 %
3.333333	3.333333	3.3333346	2.73 ppm	3.333322	3.333344	0.47 ppm	0.55 ppm	PASS 14.33 %
3.000000	3.000000	3.0000014	2.73 ppm	2.99999	3.00001	0.46 ppm	0.55 ppm	PASS 13.96 %
2.222222	2.222222	2.2222233	2.73 ppm	2.222215	2.222229	0.56 ppm	0.55 ppm	PASS 17.18 %

2.000000	2.000000	2.0000011	2.73 ppm	1.999993	2.000007	0.56 ppm	0.55 ppm	PASS 17.18 %
1.111111	1.111111	1.1111121	2.73 ppm	1.111107	1.111115	1.02 ppm	0.55 ppm	PASS 31.12 %
1.000000	1.000000	1.0000011	3.86 ppm	0.9999956	1.000004	1.13 ppm	0.55 ppm	PASS 25.64 %
0.555555	0.555555	0.5555561	7.27 ppm	0.5555507	0.5555593	1.91 ppm	0.55 ppm	PASS 24.39 %
-0.555555	-0.555555	-0.5555542	7.27 ppm	-0.5555593	-0.5555507	-1.47 ppm	0.55 ppm	PASS 18.75 %
-1.000000	-1.000000	-0.9999992	3.86 ppm	-1.000004	-0.9999956	-0.79 ppm	0.55 ppm	PASS 17.83 %
-1.111111	-1.111111	-1.1111102	2.73 ppm	-1.111115	-1.111107	-0.71 ppm	0.55 ppm	PASS 21.73 %
-2.000000	-2.000000	-1.9999990	2.73 ppm	-2.000007	-1.999993	-0.52 ppm	0.55 ppm	PASS 15.96 %
-2.222222	-2.222222	-2.2222210	2.73 ppm	-2.222229	-2.222215	-0.44 ppm	0.55 ppm	PASS 13.36 %
-3.000000	-3.000000	-2.9999991	2.73 ppm	-3.00001	-2.99999	-0.30 ppm	0.55 ppm	PASS 9.16 %
-3.333333	-3.333333	-3.3333322	2.73 ppm	-3.333344	-3.333322	-0.25 ppm	0.55 ppm	PASS 7.55 %
-4.000000	-4.000000	-3.9999989	2.73 ppm	-4.000013	-3.999987	-0.27 ppm	0.55 ppm	PASS 8.24 %
-4.444444	-4.444444	-4.4444430	2.73 ppm	-4.444459	-4.444429	-0.22 ppm	0.55 ppm	PASS 6.59 %
-5.000000	-5.000000	-4.9999991	2.73 ppm	-5.000016	-4.999984	-0.19 ppm	0.55 ppm	PASS 5.78 %
-5.555555	-5.555555	-5.5555541	2.73 ppm	-5.555573	-5.555537	-0.16 ppm	0.55 ppm	PASS 5.01 %
-6.000000	-6.000000	-5.9999994	2.73 ppm	-6.00002	-5.99998	-0.10 ppm	0.55 ppm	PASS 3.04 %
-6.666666	-6.666666	-6.6666645	2.73 ppm	-6.666688	-6.666644	-0.22 ppm	0.55 ppm	PASS 6.84 %
-7.000000	-7.000000	-6.9999988	2.73 ppm	-7.000023	-6.999977	-0.17 ppm	0.55 ppm	PASS 5.29 %
-7.777777	-7.777777	-7.7777759	2.73 ppm	-7.777803	-7.777751	-0.14 ppm	0.55 ppm	PASS 4.36 %
-8.000000	-8.000000	-7.9999987	2.73 ppm	-8.000026	-7.999974	-0.16 ppm	0.55 ppm	PASS 4.76 %
-8.888888	-8.888888	-8.8888868	2.73 ppm	-8.888917	-8.888859	-0.13 ppm	0.55 ppm	PASS 4.02 %
-9.000000	-9.000000	-8.9999986	2.73 ppm	-9.00003	-8.99997	-0.16 ppm	0.55 ppm	PASS 4.88 %
-9.999999	-9.999999	-9.9999972	2.73 ppm	-10.00003	-9.999966	-0.18 ppm	0.55 ppm	PASS 5.46 %
-10.000000	-10.000000	-9.9999987	2.73 ppm	-10.00003	-9.999967	-0.13 ppm	0.55 ppm	PASS 4.00 %
-10.101010	-10.101010	-10.1010087	2.73 ppm	-10.10104	-10.10098	-0.13 ppm	0.55 ppm	PASS 4.01 %
-10.999999	-10.999999	-10.9999972	2.73 ppm	-11.00004	-10.99996	-0.16 ppm	0.55 ppm	PASS 4.96 %
DCV Linearity	100V Range	DUT	Source unc.	Low Limit	Hi limit	Measured	24h spec	Result
100.99999	100.99999	100.9999775	2.73 ppm	100.99966	101.00032	-0.12 ppm	0.55 ppm	PASS 2.76 %
100.10101	100.10101	100.1009735	2.73 ppm	100.10068	100.10134	-0.36 ppm	0.55 ppm	PASS 8.14 %
100.00000	100.00000	99.9999522	2.73 ppm	99.999672	100.00033	-0.48 ppm	0.55 ppm	PASS 14.56 %
99.99999	99.99999	99.9999365	2.73 ppm	99.999662	100.00032	-0.54 ppm	0.55 ppm	PASS 16.32 %
90.00000	90.00000	89.9999601	2.73 ppm	89.999705	90.000295	-0.44 ppm	0.55 ppm	PASS 13.53 %
88.88888	88.88888	88.8888400	2.73 ppm	88.888588	88.889172	-0.45 ppm	0.55 ppm	PASS 13.73 %
80.00000	80.00000	79.9999755	2.73 ppm	79.999738	80.000262	-0.31 ppm	0.55 ppm	PASS 9.33 %
77.77777	77.77777	77.7777494	2.73 ppm	77.777515	77.778025	-0.26 ppm	0.55 ppm	PASS 8.06 %
70.00000	70.00000	69.9999851	2.73 ppm	69.99977	70.00023	-0.21 ppm	0.55 ppm	PASS 6.51 %
66.66666	66.66666	66.6666548	2.73 ppm	66.666441	66.666879	-0.08 ppm	0.55 ppm	PASS 2.39 %
60.00000	60.00000	59.9999961	2.73 ppm	59.999803	60.000197	-0.06 ppm	0.55 ppm	PASS 1.96 %
55.55555	55.55555	55.5555463	2.73 ppm	55.555368	55.555732	-0.07 ppm	0.55 ppm	PASS 2.03 %
50.00000	50.00000	50.0000056	2.73 ppm	49.999836	50.000164	0.11 ppm	0.55 ppm	PASS 3.42 %
44.44444	44.44444	44.4444488	2.73 ppm	44.444294	44.444586	0.20 ppm	0.55 ppm	PASS 6.05 %
40.00000	40.00000	40.0000092	2.73 ppm	39.999869	40.000131	0.23 ppm	0.55 ppm	PASS 7.01 %
33.33333	33.33333	33.3333458	2.73 ppm	33.333221	33.333439	0.48 ppm	0.55 ppm	PASS 14.49 %
30.00000	30.00000	30.0000157	2.73 ppm	29.999902	30.000098	0.52 ppm	0.55 ppm	PASS 15.97 %
22.22222	22.22222	22.2222417	2.73 ppm	22.222147	22.222293	0.97 ppm	0.55 ppm	PASS 29.71 %
20.00000	20.00000	20.0000216	2.73 ppm	19.999934	20.000066	1.08 ppm	0.55 ppm	PASS 32.97 %
11.11111	11.11111	11.1111307	2.73 ppm	11.111075	11.111147	1.78 ppm	0.55 ppm	PASS 54.12 %
10.00000	10.00000	10.0000212	3.86 ppm	9.9999559	10.000044	2.12 ppm	0.55 ppm	PASS 48.05 %
9.87654	9.87654	9.8765638	7.27 ppm	9.8764658	9.8766202	2.11 ppm	0.55 ppm	PASS 26.94 %
-9.87654	-9.87654	-9.8765101	7.27 ppm	-9.8766202	-9.8764658	-3.33 ppm	0.55 ppm	PASS 42.59 %
-10.00000	-10.00000	-9.9999683	3.86 ppm	-10.000044	-9.9999559	-3.17 ppm	0.55 ppm	PASS 71.86 %
-11.11111	-11.11111	-11.11107784	2.73 ppm	-11.111147	-11.111075	-2.98 ppm	0.55 ppm	PASS 90.98 %
-20.00000	-20.00000	-19.9999634	2.73 ppm	-20.000066	-19.999934	-1.83 ppm	0.55 ppm	PASS 55.80 %
-22.22222	-22.22222	-22.2221837	2.73 ppm	-22.222293	-22.222147	-1.64 ppm	0.55 ppm	PASS 49.86 %
-30.00000	-30.00000	-29.9999573	2.73 ppm	-30.000098	-29.999902	-1.42 ppm	0.55 ppm	PASS 43.42 %
-33.33333	-33.33333	-33.3332868	2.73 ppm	-33.333439	-33.333221	-1.30 ppm	0.55 ppm	PASS 39.54 %
-40.00000	-40.00000	-39.9999507	2.73 ppm	-40.000131	-39.999869	-1.23 ppm	0.55 ppm	PASS 37.54 %
-44.44444	-44.44444	-44.4443882	2.73 ppm	-44.444586	-44.444294	-1.17 ppm	0.55 ppm	PASS 35.52 %
-50.00000	-50.00000	-49.9999435	2.73 ppm	-50.000164	-49.999836	-1.13 ppm	0.55 ppm	PASS 34.44 %
-55.55555	-55.55555	-55.5554859	2.73 ppm	-55.555732	-55.555368	-1.15 ppm	0.55 ppm	PASS 35.16 %
-60.00000	-60.00000	-59.9999321	2.73 ppm	-60.000197	-59.999803	-1.13 ppm	0.55 ppm	PASS 34.53 %
-66.66666	-66.66666	-66.6665870	2.73 ppm	-66.666879	-66.666441	-1.09 ppm	0.55 ppm	PASS 33.36 %
-70.00000	-70.00000	-69.9999196	2.73 ppm	-70.00023	-69.99977	-1.15 ppm	0.55 ppm	PASS 35.03 %
-77.77777	-77.77777	-77.7776846	2.73 ppm	-77.778025	-77.777515	-1.10 ppm	0.55 ppm	PASS 33.46 %
-80.00000	-80.00000	-79.9999122	2.73 ppm	-80.000262	-79.999738	-1.10 ppm	0.55 ppm	PASS 33.47 %
-88.88888	-88.88888	-88.8887835	2.73 ppm	-88.889172	-88.888588	-1.09 ppm	0.55 ppm	PASS 33.10 %
-90.00000	-90.00000	-89.9999022	2.73 ppm	-90.000295	-89.999705	-1.09 ppm	0.55 ppm	PASS 33.12 %
-99.99999	-99.99999	-99.9998682	2.73 ppm	-100.00032	-99.999662	-1.22 ppm	0.55 ppm	PASS 37.14 %
-100.00000	-100.00000	-99.9998764	2.73 ppm	-100.00033	-99.999672	-1.24 ppm	0.55 ppm	PASS 37.69 %
-100.10101	-100.10101	-100.1008909	2.73 ppm	-100.10134	-100.10068	-1.19 ppm	0.55 ppm	PASS 57.25 %
-100.99999	-100.99999	-100.9998696	2.73 ppm	-101.00032	-100.99966	-1.19 ppm	0.55 ppm	PASS 57.64 %

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	1.0000056	0.99997844	27.0 ppm	9.9997060E-01	1.0000406E+00	-27.163 ppm	8.0 ppm	PASS 77.61 %
1.9 Ω	1.8997773	1.8997363	20.0 ppm	1.8997241E+00	1.8998305E+00	-21.606 ppm	8.0 ppm	PASS 77.16 %
10 Ω	9.999694	9.9997157	4.0 ppm	9.9995740E+00	9.9998140E+00	2.168 ppm	8.0 ppm	PASS 18.07 %
19 Ω	18.998219	18.998257	3.5 ppm	1.8998039E+01	1.8998399E+01	2.018 ppm	6.0 ppm	PASS 21.25 %
100 Ω	99.9981	99.998118	1.6 ppm	9.9997340E+01	9.9998860E+01	0.181 ppm	6.0 ppm	PASS 2.39 %
190 Ω	189.9883	189.98819	1.6 ppm	1.8998758E+02	1.8998902E+02	-0.578 ppm	2.2 ppm	PASS 15.22 %
1.0 kΩ	999.9402	999.93823	1.6 ppm	9.9993640E+02	9.9994400E+02	-1.972 ppm	2.2 ppm	PASS 51.89 %
1.9 kΩ	1899.892	1899.8898	1.6 ppm	1.8998848E+03	1.8998992E+03	-1.165 ppm	2.2 ppm	PASS 30.67 %
10 kΩ	9999.589	9999.5714	1.6 ppm	9.9995510E+03	9.9996270E+03	-1.762 ppm	2.2 ppm	PASS 46.37 %
19 kΩ	18999.152	18999.094	1.6 ppm	1.8999080E+04	1.8999224E+04	-3.063 ppm	2.2 ppm	PASS 80.61 %
100 kΩ	99992.8	99992.561	1.6 ppm	9.9992420E+04	9.9993180E+04	-2.385 ppm	2.2 ppm	PASS 62.77 %
190 kΩ	189998.23	189998.8	1.6 ppm	1.8999584E+05	1.9000062E+05	3.022 ppm	11.0 ppm	PASS 23.98 %
1.0 MΩ	999879	999877.38	2.0 ppm	9.9986600E+05	9.9989200E+05	-1.621 ppm	11.0 ppm	PASS 12.47 %
1.9 MΩ	1899902.9	1899920.4	2.5 ppm	1.8997937E+06	1.9000121E+06	9.219 ppm	55.0 ppm	PASS 16.03 %
10 MΩ	9998114	9998008.2	8.0 ppm	9.9974841E+06	9.9987439E+06	-10.585 ppm	55.0 ppm	PASS 16.80 %
19 MΩ	18998350	18998383	16.0 ppm	1.8988357E+07	1.9008343E+07	1.725 ppm	510.0 ppm	PASS 0.33 %
100 MΩ	1.000034E+08	99987818	40.0 ppm	9.9948398E+07	1.0005840E+08	-155.811 ppm	510.0 ppm	PASS 28.33 %

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
10 Ω	Range -0.000026 Ω	5.000e-05 Ω	-5e-05	5e-05	N/A	8.0000e-06 Ω	PASS
100 Ω	Range -0.0000571 Ω	5.500e-04 Ω	-0.00055	0.00055	N/A	2.2000e-06 Ω	PASS
1.0 kΩ	Range -0.0000562 Ω	5.500e-03 Ω	-0.0055	0.0055	N/A	2.2000e-06 Ω	PASS
10 kΩ	Range 0.0003607 Ω	5.500e-02 Ω	-0.055	0.055	N/A	2.2000e-06 Ω	PASS
100 kΩ	Range -0.0093457 Ω	5.500e-01 Ω	-0.55	0.55	N/A	2.2000e-06 Ω	PASS
1.0 MΩ	Range 0.0208721 Ω	5.500e+00 Ω	-5.5	5.5	N/A	2.2000e-06 Ω	PASS
10 MΩ	Range -0.1446783 Ω	5.500e+01 Ω	-55	55	N/A	2.2000e-06 Ω	PASS
100 MΩ	Range 12.4132984 Ω	5.500e+02 Ω	-550	550	N/A	2.2000e-06 Ω	PASS
1 GΩ	Range -1.0087607 Ω	5.500e+03 Ω	-5500	5500	N/A	2.2000e-06 Ω	PASS
OHM ZERO 2W	DUT	Source unc.	Low Limit	Hi limit	Measured	24h spec	Result
10 Ω	Range 0.4429959 Ω	5.000e-05 Ω	-5e-05	5e-05	N/A	8.0000e-06 Ω	FAIL
100 Ω	Range 0.4427002 Ω	5.500e-04 Ω	-0.00055	0.00055	N/A	2.2000e-06 Ω	FAIL
1.0 kΩ	Range 0.4419129 Ω	5.500e-03 Ω	-0.0055	0.0055	N/A	2.2000e-06 Ω	FAIL
10 kΩ	Range 0.4378580 Ω	5.500e-02 Ω	-0.055	0.055	N/A	2.2000e-06 Ω	FAIL
100 kΩ	Range 0.4276964 Ω	5.500e-01 Ω	-0.55	0.55	N/A	2.2000e-06 Ω	PASS
1.0 MΩ	Range 0.9877696 Ω	5.500e+00 Ω	-5.5	5.5	N/A	2.2000e-06 Ω	PASS
10 MΩ	Range 6.0799056 Ω	5.500e+01 Ω	-55	55	N/A	2.2000e-06 Ω	PASS
100 MΩ	Range 6.3664182 Ω	5.500e+02 Ω	-550	550	N/A	2.2000e-06 Ω	PASS
1 GΩ	Range 6.2245878 Ω	5.500e+03 Ω	-5500	5500	N/A	2.2000e-06 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	0.99979139	129.09	0.99955091	1.00044909	VAC	-208.606 ppm	320.0 ppm	PASS 46.45 %
1.0 VAC @ 1.0 MHz	1.0	1.0091039	0.2500 %	0.9874	1.0126	VAC	0.9104 %	1.0100 %	PASS 72.25 %
10 VAC @ 10 Hz	10	9.9842186	73.18	9.9981682	10.0018318	VAC	-1578.143 ppm	110.0 ppm	FAIL 861.53 %
10 VAC @ 200 Hz	10	10.001003	73.18	9.9983682	10.0016318	VAC	100.255 ppm	90.0 ppm	PASS 61.44 %
10 VAC @ 500 Hz	10	10.000973	73.18	9.9983682	10.0016318	VAC	97.307 ppm	90.0 ppm	PASS 59.63 %
10 VAC @ 50.0 kHz	10	9.9972736	129.09	9.9955091	10.0044909	VAC	-272.639 ppm	320.0 ppm	PASS 60.71 %
10 VAC @ 1.0 MHz	10	10.108491	0.3000 %	9.869	10.131	VAC	1.0849 %	1.0100 %	PASS 82.82 %

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
0.01 V AC+DC @ 10 Hz	0.010002433	312.27	0.009991	0.010009	243.292 ppm	600.0 ppm	PASS 26.67 %
0.01 V AC+DC @ 20 Hz	0.010001788	312.27	0.009991	0.010009	178.825 ppm	600.0 ppm	PASS 19.60 %
0.01 V AC+DC @ 40 Hz	0.010001819	312.27	0.009991	0.010009	181.945 ppm	600.0 ppm	PASS 19.94 %
0.01 V AC+DC @ 100 Hz	0.010001064	312.27	0.009994	0.010006	106.421 ppm	310.0 ppm	PASS 17.10 %
0.01 V AC+DC @ 1.0 kHz	0.010001385	312.27	0.009994	0.010006	138.505 ppm	310.0 ppm	PASS 22.26 %
0.01 V AC+DC @ 10.0 kHz	0.010002596	312.27	0.009993	0.010007	259.589 ppm	410.0 ppm	PASS 35.94 %
0.01 V AC+DC @ 20.0 kHz	0.010002123	312.27	0.009993	0.010007	212.262 ppm	410.0 ppm	PASS 29.39 %
0.01 V AC+DC @ 50.0 kHz	0.010001224	0.0312 %	0.009986	0.010014	0.0122 %	0.1110 %	PASS 8.61 %
0.01 V AC+DC @ 100.0 kHz	0.0099897125	0.0312 %	0.009946	0.010054	-0.1029 %	0.5110 %	PASS 18.97 %
0.01 V AC+DC @ 300.0 kHz	0.0098440055	0.0447 %	0.009594	0.010406	-1.5599 %	4.0200 %	PASS 38.38 %
0.01 V AC+DC @ 500.0 kHz	0.0096376447	0.0773 %	0.006787	0.013213	-3.6236 %	32.0500 %	PASS 11.28 %
0.01 V AC+DC @ 1.0 MHz	0.0087107207	0.1500 %	0.006780	0.013220	-12.8928 %	32.0500 %	PASS 40.04 %
0.1 V AC+DC @ 10 Hz	0.10000686	1500	0.099839	0.100161	68.600 ppm	110.0 ppm	PASS 4.26 %

0.1 V AC+DC @ 20 Hz	0.1000068	2500	0.099739	0.100261	6.761 ppm	110.0 ppm	PASS 0.26 %
0.1 V AC+DC @ 40 Hz	0.09998978	4000	0.099589	0.100411	-10.220 ppm	110.0 ppm	PASS 0.25 %
0.1 V AC+DC @ 100 Hz	0.09997718	121.36	0.099979	0.100021	-22.821 ppm	90.0 ppm	PASS 10.80 %
0.1 V AC+DC @ 1.0 kHz	0.09998806	121.36	0.099979	0.100021	-11.941 ppm	90.0 ppm	PASS 5.65 %
0.1 V AC+DC @ 10.0 kHz	0.09998215	121.36	0.099972	0.100028	-17.852 ppm	160.0 ppm	PASS 6.34 %
0.1 V AC+DC @ 20.0 kHz	0.09994773	121.36	0.099972	0.100028	-52.272 ppm	160.0 ppm	PASS 18.58 %
0.1 V AC+DC @ 50.0 kHz	0.09999301	121.36	0.099956	0.100044	-69.898 ppm	320.0 ppm	PASS 15.84 %
0.1 V AC+DC @ 100.0 kHz	0.099963914	121.36	0.099906	0.100094	-360.857 ppm	820.0 ppm	PASS 38.33 %
0.1 V AC+DC @ 300.0 kHz	0.099809966	0.0121 %	0.099678	0.100322	-0.1900 %	0.3100 %	PASS 58.99 %
0.1 V AC+DC @ 500.0 kHz	0.099652873	0.0121 %	0.098978	0.101022	-0.3471 %	1.0100 %	PASS 33.96 %
0.1 V AC+DC @ 1.0 MHz	0.099598471	0.0121 %	0.098978	0.101022	-0.4015 %	1.0100 %	PASS 39.28 %
1.0 V AC+DC @ 10 Hz	1.0001573	256.36	0.999634	1.000366	157.335 ppm	110.0 ppm	PASS 42.95 %
1.0 V AC+DC @ 20 Hz	1.0000852	590.91	0.999299	1.000701	85.212 ppm	110.0 ppm	PASS 12.16 %
1.0 V AC+DC @ 40 Hz	1.0000758	963.64	0.998926	1.001074	75.835 ppm	110.0 ppm	PASS 7.06 %
1.0 V AC+DC @ 100 Hz	1.0000767	963.64	0.998946	1.001054	76.659 ppm	90.0 ppm	PASS 7.28 %
1.0 V AC+DC @ 1.0 kHz	1.0001081	1500	0.998410	1.001590	108.051 ppm	90.0 ppm	PASS 6.80 %
1.0 V AC+DC @ 10.0 kHz	1.0001829	3000	0.996840	1.003160	182.874 ppm	160.0 ppm	PASS 5.79 %
1.0 V AC+DC @ 20.0 kHz	1.0001399	49.55	0.999790	1.000210	139.857 ppm	160.0 ppm	PASS 66.74 %
1.0 V AC+DC @ 50.0 kHz	1.0001776	49.55	0.999630	1.000370	177.642 ppm	320.0 ppm	PASS 48.07 %
1.0 V AC+DC @ 100.0 kHz	1.0002086	49.55	0.999130	1.000870	208.566 ppm	820.0 ppm	PASS 23.99 %
1.0 V AC+DC @ 300.0 kHz	1.0011079	0.0050 %	0.996850	1.003150	0.1108 %	0.3100 %	PASS 35.18 %
1.0 V AC+DC @ 500.0 kHz	1.0026182	0.0050 %	0.989850	1.010150	0.2618 %	1.0100 %	PASS 25.80 %
1.0 V AC+DC @ 1.0 MHz	1.0087169	0.0050 %	0.989850	1.010150	0.8717 %	1.0100 %	PASS 85.88 %
10.0 V AC+DC @ 10 Hz	10.001503	49.55	9.997105	10.002895	150.342 ppm	240.0 ppm	PASS 51.92 %
10.0 V AC+DC @ 20 Hz	10.000873	49.55	9.997105	10.002895	87.323 ppm	240.0 ppm	PASS 30.16 %
10.0 V AC+DC @ 40 Hz	10.000736	49.55	9.997105	10.002895	73.569 ppm	240.0 ppm	PASS 25.41 %
10.0 V AC+DC @ 100 Hz	10.00067	85.45	9.996945	10.003054	66.960 ppm	220.0 ppm	PASS 21.92 %
10.0 V AC+DC @ 1.0 kHz	10.000795	138.18	9.996418	10.003582	79.547 ppm	220.0 ppm	PASS 22.21 %
10.0 V AC+DC @ 10.0 kHz	9.9996109	425.45	9.993545	10.006455	-38.905 ppm	220.0 ppm	PASS 6.03 %
10.0 V AC+DC @ 20.0 kHz	9.9991542	425.45	9.993545	10.006455	-84.585 ppm	220.0 ppm	PASS 13.10 %
10.0 V AC+DC @ 50.0 kHz	9.9989052	1100	9.985300	10.014700	-109.482 ppm	370.0 ppm	PASS 7.45 %
10.0 V AC+DC @ 100.0 kHz	9.9958866	0.1800 %	9.969800	10.030200	-0.0411 %	0.1220 %	PASS 13.62 %
10.0 V AC+DC @ 300.0 kHz	9.9835342	0.0048 %	9.958518	10.041482	-0.1647 %	0.4100 %	PASS 39.69 %
10.0 V AC+DC @ 500.0 kHz	9.99127	0.0048 %	9.848518	10.151482	-0.0873 %	1.5100 %	PASS 5.76 %
10.0 V AC+DC @ 1.0 MHz	10.088457	0.0048 %	9.848518	10.151482	0.8846 %	1.5100 %	PASS 58.39 %
100.0 V AC+DC @ 1.0 kHz	100.00738	48.18	99.953182	100.046818	73.812 ppm	420.0 ppm	PASS 15.73 %
100.0 V AC+DC @ 10.0 kHz	99.998965	48.18	99.933182	100.066818	-10.354 ppm	620.0 ppm	PASS 1.55 %
100.0 V AC+DC @ 20.0 kHz	99.993579	48.18	99.933182	100.066818	-64.212 ppm	620.0 ppm	PASS 9.61 %
100.0 V AC+DC @ 50.0 kHz	99.995657	0.0048 %	99.873182	100.126818	-0.0043 %	0.1220 %	PASS 3.42 %
100.0 V AC+DC @ 100.0 kHz	99.98931	0.0048 %	99.693182	100.306818	-0.0107 %	0.3020 %	PASS 3.48 %
700.0 V AC+DC @ 1.0 kHz	699.95424	48.18	699.672274	700.327726	-65.378 ppm	420.0 ppm	PASS 13.72 %

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 µADC	0	1.2755831E-10	71.82 ppm	0	0	Z-check	410 ppm	INFO
50 nADC	5E-08	5.0120699E-08	71.82 ppm	4.997591E-08	5.002409E-08	2413.984 ppm	410 ppm	INFO
100 nADC	1E-07	1.0015989E-07	71.82 ppm	9.995182E-08	1.000482E-07	1598.918 ppm	410 ppm	FAIL 331.85 %
-100 nADC	-1E-07	-9.9889034E-08	71.82 ppm	-1.000482E-07	-9.995182E-08	-1109.656 ppm	410 ppm	FAIL 230.31 %
-50 nADC	-5E-08	-4.9873086E-08	71.82 ppm	-5.002409E-08	-4.997591E-08	-2538.275 ppm	410 ppm	INFO
Zero µADC	0	1.5788671E-10	71.82 ppm	0	0	Z-check	410 ppm	INFO
0.5 µADC	5E-07	5.001244E-07	71.82 ppm	4.999391E-07	5.000609E-07	248.794 ppm	50 ppm	FAIL 204.23 %
1.0 µADC	1E-06	1.0001525E-06	71.82 ppm	9.998782E-07	1.000122E-06	152.534 ppm	50 ppm	FAIL 125.21 %
-1.0 µADC	-1E-06	-9.998834E-07	71.82 ppm	-1.000122E-06	-9.998782E-07	-116.604 ppm	50 ppm	PASS 95.72 %
-0.5 µADC	-5E-07	-4.9992188E-07	71.82 ppm	-5.000609E-07	-4.999391E-07	-156.243 ppm	50 ppm	FAIL 128.26 %
Zero 00 µADC	0	8.972021E-11	71.82 ppm	0	0	Z-check	410 ppm	INFO
5 µADC	5E-06	5.0001389E-06	71.82 ppm	4.999556E-06	5.000444E-06	27.772 ppm	17 ppm	PASS 31.27 %
10 µADC	1E-05	1.000008E-05	71.82 ppm	9.999112E-06	1.000089E-05	8.049 ppm	17 ppm	PASS 9.06 %
-10 µADC	-1E-05	-9.9997719E-06	71.82 ppm	-1.000089E-05	-9.999112E-06	-22.809 ppm	17 ppm	PASS 25.68 %
-5 µADC	-5E-06	-4.9998039E-06	71.82 ppm	-5.000444E-06	-4.999556E-06	-39.220 ppm	17 ppm	PASS 44.16 %
Zero 000 µADC	0	5.9490823E-11	71.82 ppm	0	0	Z-check	410 ppm	INFO
50 µADC	5E-05	5.000025E-05	71.82 ppm	4.999561E-05	5.000439E-05	5.004 ppm	16 ppm	PASS 5.70 %
100 µADC	0.0001	9.9999811E-05	71.82 ppm	9.999122E-05	0.0001000088	-1.888 ppm	16 ppm	PASS 2.15 %
-100 µADC	-0.0001	-9.9998378E-05	71.82 ppm	-0.0001000088	-9.999122E-05	-16.221 ppm	16 ppm	PASS 18.47 %
-50 µADC	-5E-05	-4.9998818E-05	71.82 ppm	-5.000439E-05	-4.999561E-05	-23.631 ppm	16 ppm	PASS 26.91 %
Zero mADC	0	5.4993488E-11	33.64 ppm	0	0	Z-check	410 ppm	INFO
0.5 mADC	0.0005	0.00049999082	33.64 ppm	0.0004999762	0.0005000238	-18.368 ppm	14 ppm	PASS 38.56 %
1.0 mADC	0.001	0.00099997774	33.64 ppm	0.0009999524	0.001000048	-22.258 ppm	14 ppm	PASS 46.72 %
-1.0 mADC	-0.001	-0.00099996858	33.64 ppm	-0.001000048	-0.0009999524	-31.422 ppm	14 ppm	PASS 65.96 %
-0.5 mADC	-0.0005	-0.00049998269	33.64 ppm	-0.0005000238	-0.0004999762	-34.612 ppm	14 ppm	PASS 72.65 %
Zero 00 mADC	0	2.4230469E-11	32.27 ppm	0	0	Z-check	410 ppm	INFO

5 mADC	0.005	0.0049999439	32.27 ppm	0.004999769	0.005000231	-11.229 ppm	14 ppm	PASS 24.27 %
10 mADC	0.01	0.0099998779	32.27 ppm	0.009999537	0.01000046	-12.213 ppm	14 ppm	PASS 26.40 %
-10 mADC	-0.01	-0.0099998559	32.27 ppm	-0.01000046	-0.009999537	-14.409 ppm	14 ppm	PASS 31.14 %
-5 mADC	-0.005	-0.0049999275	32.27 ppm	-0.005000231	-0.004999769	-14.502 ppm	14 ppm	PASS 31.34 %
Zero 000 mADC	0	3.7595293E-11	53.32 ppm	0	0	Z-check	410 ppm	INFO
50 mADC	0.05	0.049998211	53.32 ppm	0.04999588	0.05000412	-35.782 ppm	29 ppm	PASS 43.47 %
100 mADC	0.1	0.09999617	53.32 ppm	0.09999177	0.1000082	-38.303 ppm	29 ppm	PASS 46.53 %
-100 mADC	-0.1	-0.09999682	53.32 ppm	-0.1000082	-0.09999177	-31.803 ppm	29 ppm	PASS 38.63 %
-50 mADC	-0.05	-0.049998576	53.32 ppm	-0.05000412	-0.04999588	-28.486 ppm	29 ppm	PASS 34.60 %
Zero ADC	0	4.5785661E-11	115.22 ppm	0	0	Z-check	410 ppm	INFO
0.5 ADC	0.5	0.49999482	115.22 ppm	0.4998874	0.5001126	-10.357 ppm	110 ppm	PASS 4.60 %
1.0 ADC	1	0.99996365	115.22 ppm	0.9997748	1.000225	-36.348 ppm	110 ppm	PASS 16.14 %
-1.0 ADC	-1	-0.99995352	115.22 ppm	-1.000225	-0.9997748	-46.480 ppm	110 ppm	PASS 20.64 %
-0.5 ADC	-0.5	-0.49997878	115.22 ppm	-0.5001126	-0.4998874	-42.449 ppm	110 ppm	PASS 18.85 %

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
10 µA AC @ 50 Hz	1e-05	1.0049974E-05	0.0165 %	9.9893455e-06	1.00106545e-05	4997.371 ppm	0.0900 %	INFO
100 µA AC @ 50 Hz	0.0001	9.999694E-05	0.0165 %	9.9893455e-05	0.000100106545	-30.596 ppm	0.0900 %	PASS 2.87 %
1.0 mA AC @ 50 Hz	0.001	0.0010000507	0.0165 %	0.00099903455	0.00100096545	50.673 ppm	0.0800 %	PASS 5.25 %
10 mA AC @ 50 Hz	0.01	0.010000701	0.0165 %	0.0099903455	0.0100096545	70.091 ppm	0.0800 %	PASS 7.26 %
100 mA AC @ 50 Hz	0.1	0.10000777	0.0138 %	0.099906182	0.100093818	77.743 ppm	0.0800 %	PASS 8.29 %
1.0 A AC @ 50 Hz	1.0	0.99994877	0.0138 %	0.99886182	1.00113818	-0.0051 %	0.1000 %	PASS 4.50 %
10 µA AC @ 60 Hz	1e-05	1.0033684E-05	0.0138 %	9.9896182e-06	1.00103818e-05	3368.436 ppm	0.0900 %	INFO
100 µA AC @ 60 Hz	0.0001	0.00010001286	0.0138 %	9.9896182e-05	0.000100103818	128.599 ppm	0.0900 %	PASS 12.39 %
1.0 mA AC @ 60 Hz	0.001	0.0010000696	0.0134 %	0.00099906636	0.00100093364	69.585 ppm	0.0800 %	PASS 7.45 %
10 mA AC @ 60 Hz	0.01	0.010001022	0.0134 %	0.0099906636	0.0100093364	102.207 ppm	0.0800 %	PASS 10.95 %
100 mA AC @ 60 Hz	0.1	0.10001093	0.0308 %	0.099889182	0.100110818	109.326 ppm	0.0800 %	PASS 9.87 %
1.0 A AC @ 60 Hz	1.0	0.99998416	0.0308 %	0.99869182	1.00130818	-0.0016 %	0.1000 %	PASS 1.21 %
10 µA AC @ 1.0 kHz	1e-05	1.0048699E-05	0.0165 %	9.9893455e-06	1.00106545e-05	4869.911 ppm	0.0900 %	INFO
100 µA AC @ 1.0 kHz	0.0001	9.9989884E-05	0.0165 %	9.9893455e-05	0.000100106545	-101.158 ppm	0.0900 %	PASS 9.49 %
1.0 mA AC @ 1.0 kHz	0.001	0.0010001401	0.0165 %	0.00099933455	0.00100066545	140.149 ppm	0.0500 %	PASS 21.06 %
10 mA AC @ 1.0 kHz	0.01	0.010001551	0.0165 %	0.0099933455	0.0100066545	155.122 ppm	0.0500 %	PASS 23.31 %
100 mA AC @ 1.0 kHz	0.1	0.10001743	0.0138 %	0.099936182	0.100063818	174.281 ppm	0.0500 %	PASS 27.31 %
1.0 A AC @ 1.0 kHz	1.0	1.0001496	0.0138 %	0.99866182	1.00133818	0.0150 %	0.1200 %	PASS 11.18 %

Test completed

Test date	24 July 2018 07:14
UUT Internal TEMP?	29.3
Destructive overloads?	80, DESTRUCTIVE OVERLOADS valid 2941

Lab temperature maintained +24°C ±2°C

Internal use only

Not validated

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