cal equipment

REF-DMM

Manufacturer	HEWLETT-PACKARD	Calibration date	March 06 2018
Model Number	3458A	Ambient Temperature	21.56 °C
Serial	MY45040325	Relative Humidity	58.81 %
ID Number	HP3458B	Pressure	1017.88
Notes	Pre-cal check GPIB2	Test type	PERFVAL

This note is test dummy text block for further use. It allow to include user information for further reference

Reference standard	Mfg	Model	Options	Serial / Unc	CEID	Calibration date	Due date
TEST MFC	Fluke	5700A	None	x26	ID02	10/03/2013	10/03/2014
DMM	HP	3458A	001,X02	MY45040325	XD2	01/05/2017	01/05/2018
DMM	Keithley	2002	MEM2	0603805	XD4	02/25/2018	02/25/2019
DMM	Keithley	2002	1801	XXX	XD6	01/05/2017	01/05/2018
STDR	xDevs.com	1GOhm	1.0 GΩ	XXX	MR00	08/23/2016	08/23/2017
DC STD	xDevs.com	792X[2]	10.000009 VDC	± 2.2ppm	XD01	02/16/2018	08/16/2018

MFC last calibrated	2255.0 days ago	MFC since DCV ZERO	7.0 days ago
MFC since WBFLAT	0.0 days ago	MFC since WBGAIN	0.0 days ago
MFC Confidence level	**24h 95%**	MFC Calibrate date	2013-10-03 00:00:00
MFC Calibrate date Zero	2019-03-01 00:00:00	Calibrate date WB Flatness	1988-10-01 00:00:00
Calibrate date WB Gain	1988-10-01 00:00:00	CAL CONST 6.5V reference voltage	6.53722425884
CAL CONST 13V reference voltage	13.0725878729	CAL CONST 22V range positive zero	398.18762
CAL CONST 22V range negative zero	398.18688	CAL CONST DAC Linearity	0.295316643473
CAL CONST 10KOHM true output resistance	9999.58094647	CAL CONST 10KOHM standard resistance	9999.79242649
CAL CONST, Zero calibration temperature	23.0	CAL CONST, All calibration temp	23.0

This note is test MFC dummy text block for further use.
Calibrator was warmed up >8 hours.

Meter Info	HP3458A	Last calibration date	1/8/2017
Next calibration date	1/8/2018	Test date	06 March 2018 16:31
DUT Internal TEMP?	38.3	DUT Calibrations number?	177
Self-test result?	Not tested	ACAL ALL result?	0,"NO ERROR"
Firmware	9,2	Options	0,0
CAL? 72	0.982328574	CAL? 1,1	39999.2111
CAL? 2,1	7.07034233	CAL? Res 73	0.982502798
CAL 0 TEMP	36.09	CAL 10V TEMP	36.53
CAL 10KOhm TEMP	37.03	CAL? DCI	0.981150994

Service information

CAL DUMP
[(1, 39999.2111), (1, 7.07034233), (1, -1.29881999e-06), (1, -1.71312747e-06), (1, -1.33009205e-06), (1, -1.76259875e-06), (1, -1.87107879e-06), (1, -2.30779474e-06), (1, -5.70318382e-05), (1, -5.70318382e-05), (1, -0.000107562526), (1, -0.000107562526), (1, 0.311410109), (1, 0.310586107), (1, 0.310306114), (1, 0.298867228), (1, 0.275650689), (1, -0.118583703), (1, -4.02460097), (1, -2.65911135), (1, -2.65911135), (1, 0.315723221), (1, 0.3144994), (1, 0.314217446), (1, 0.29833222), (1, 0.270045696), (1, -0.140144376), (1, -3.59339372), (1, -4.99481727), (1, -4.99481727), (1, -0.00019695488), (1, -0.00189544283), (1, -0.00193078137), (1, -0.019031317), (1, -0.0515228217), (1, -0.503082376), (1, -5.53382633), (1, -4.74327971), (1, -4.74327971), (1, -0.000194060316), (1, -0.00198206928), (1, -0.00206485193), (1, -0.0198342776), (1, -0.0492592668), (1, -0.488708593), (1, -5.31822271), (1, -5.74942996), (1, -5.74942996), (1, 317.0), (1, 31.0), (1, 3.0), (1, 0.0), (1, 0.0), (1, 0.0), (1, 0.0), (1, 0.0), (1, 0.0), (1, 36.0875674), (1, 36.5337523), (1, 37.0288235), (1, 108.0), (1, -7.50191516e-12), (1, 9.61697835e-12), (1, 1.25142104e-10), (1, 9.16004699e-10), (1, 6.64381897e-09), (1, 6.77538068e-08), (1, 5.71248985e-07), (1, 7.32800386e-06), (1, 0.979566932), (1, 0.982392913), (1, 0.982328574), (1, 0.982502798), (1, 0.982438451), (1, 0.997130534), (1, 0.997141107), (1, 1.00001779), (1, 1.00025477), (1, 0.999884966), (1, 1.00002445), (1, 1.00001003), (1, 1.00001003), (1, 1.00001003), (1, 0.997130537), (1, 0.997141137), (1, 1.00001782), (1, 1.00025438), (1, 0.999885557), (1, 1.00002445), (1, 1.00001003), (1, 1.00001003), (1, 1.00001003), (1, 0.981150994), (1, 0.979561253), (1, 0.978854475), (1, 0.978848657), (1, 0.979074837), (1, 0.977345307), (1, 0.981541374), (1, 0.997798039), (1, 83.0), (1, 116.0), (1, 4.93484595), (1, 2.88002268e-11), (1, -6.67479078e-11), (1, 9998522.27), (1, -0.00843033995), (1, -0.0172927853), (1, 0.999999276), (1, 0.999999972), (1, 1666.99777), (1, 16666.9869), (1, 5154.0), (1, 5139.0), (1, 5139.0), (1, 5138.0), (1, 5139.0), (1, 61848.0), (1, 61668.0), (1, 61668.0), (1, 61656.0), (1, 61668.0), (1, 5023.0), (1, 5023.0), (1, 5009.0), (1, 5007.0), (1, 2504.0), (1, 2504.0), (1, 2504.0), (1, 12522.0), (1, 22769.0), (1, 60276.0), (1, 60276.0), (1, 60108.0), (1, 60084.0), (1, 30048.0), (1, 30048.0), (1, 30048.0), (1, 150264.0), (1, 273228.0), (1, 5023.0), (1, 5023.0), (1, 5009.0), (1, 5007.0), (1, 2504.0), (1, 2504.0), (1, 2504.0), (1, 12522.0), (1, 22769.0), (1, 60276.0), (1, 60276.0), (1, 60108.0), (1, 60084.0), (1, 30048.0), (1, 30048.0), (1, 30048.0), (1, 150264.0), (1, 273228.0), (1, 280.0), (1, 280.0), (1, 280.0), (1, 280.0), (1, 280.0), (1, 280.0), (1, 280.0), (1, 280.0), (1, 280.0), (1, 3360.0), (1, 3360.0), (1, 3360.0), (1, 3360.0), (1, 3360.0), (1, 3360.0), (1, 3360.0), (1, 3360.0), (1, 38.3577374), (1, 38.4428196), (1, 38.4396817), (1, 143.0), (1, 144.0), (1, 144.0), (1, 141.0), (1, 144.0), (1, 144.0), (1, 143.0), (1, 144.0), (1, 143.0), (1, 141.0), (1, 144.0), (1, 144.0), (1, 147.0), (1, 147.0), (1, 147.0), (1, 147.0), (1, 147.0), (1, 2174.0), (1, 2165.0), (1, 2177.0), (1, 2246.0), (1, 2472.0), (1, 2477.0), (1, 123.0), (1, 126.0), (1, 126.0), (1, 126.0), (1, 124.0), (1, 126.0), (1, 126.0), (1, 126.0), (1, 126.0), (1, -0.00120571214), (1, -0.0118931582), (1, -0.118711658), (1, -1.21237418), (1, -11.9545899), (1, -118.95777), (1, -0.00128774238), (1, -0.0119813712), (1, -0.115213748), (1, -1.21271942), (1, -11.9511682), (1, -119.108283), (1, 1.00577325), (1, 1.01037178), (1, 0.998623934), (1, 1.02270495), (1, 1.01083773), (1, 1.01038956), (1, 60811.4597), (1, 10.3465689), (1, 0.993343469), (1, 0.997967579), (1, 0.986363962), (1, 1.01014934), (1, 0.998427817), (1, 0.997985148), (1, 2.15753114e-06), (1, 2.2222101e-05), (1, 0.00022222101), (1, 0.0022222101), (1, 0.022222101), (1, 0.22222101), (1, 1.02695263), (1, 1.00020582), (1, 0.999862347), (1, 1.00000267), (1, 86.0), (1, 29.0), (1, 29.0), (1, 29.0), (1, 38.0), (1, 50.0), (1, 50.0), (1, 12.0)]
Destructive overloads?
236, DESTRUCTIVE OVERLOADS valid 2941
Reference
F5700 pre-cal MAR test
DUT Condition
Front terminals used 4W, pre-cal DMM

Test procedure : $Id: hp3458a.py | Rev 593 | 2018/03/06 10:07:27 tin_fpga $

Source procedure : $Id: f5700a.py | Rev 580 | 2018/03/04 11:10:30 clu $

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	Units	Deviation	DUT Spec	Test Status
Short 0 mVDC	0.0000000E+00	**0.0000005**	0.5 ppm	0.000000	0.000001	VDC	N/A	0.16 µV	FAIL
Short 0.0 VDC	0.0000000E+00	**0.0000005**	0.5 ppm	0.000000	0.000001	VDC	N/A	0.15 µV	FAIL
Short 00.0 VDC	0.0000000E+00	**0.0000011**	0.5 ppm	0.000001	0.000002	VDC	N/A	0.32 µV	FAIL
Short 000.0 VDC	0.0000000E+00	**0.0000044**	0.5 ppm	-0.000026	0.000034	VDC	N/A	14.00 µV	PASS
Short 0000.0 VDC	0.0000000E+00	**0.0000701**	0.5 ppm	-0.000030	0.000170	VDC	N/A	41.00 µV	FAIL
DCV Test	**0.1V-1000V**	**DUT**	**Source unc.**	**Low Limit**	**Hi limit**	**Units**	**Measured**	**24h spec**	**Result**
0.1 VDC (0.10 Range)	0.1000000	**0.099999657**	7.27 ppm	0.099998723	0.100001277	VDC	-3.434 ppm	5.50 ppm	PASS 26.89 %
-0.1 VDC (0.10 Range)	-0.1000000	**-0.099999786**	7.27 ppm	-0.100001277	-0.099998723	VDC	-2.138 ppm	5.50 ppm	PASS 16.74 %
0.1 VDC (1.00 Range)	0.1000000	**0.10000037**	7.27 ppm	0.099999093	0.100000907	VDC	3.696 ppm	1.80 ppm	PASS 40.75 %
0.2 VDC (1.00 Range)	0.2000000	**0.20000062**	3.86 ppm	0.199998868	0.200001132	VDC	3.076 ppm	1.80 ppm	PASS 54.36 %
1.0 VDC (1.00 Range)	1.0000000	**1.0000018**	3.86 ppm	0.99999434	1.00000566	VDC	1.838 ppm	1.80 ppm	PASS 32.47 %
-0.1 VDC (1.00 Range)	-0.1000000	**-0.10000015**	7.27 ppm	-0.100000907	-0.099999093	VDC	1.515 ppm	1.80 ppm	PASS 16.70 %
-0.2 VDC (1.00 Range)	-0.2000000	**-0.20000041**	3.86 ppm	-0.200001132	-0.199998868	VDC	2.030 ppm	1.80 ppm	PASS 35.87 %
-1.0 VDC (1.00 Range)	-1.0000000	**-1.0000015**	3.86 ppm	-1.00000566	-0.99999434	VDC	1.531 ppm	1.80 ppm	PASS 27.05 %
1.0 VDC (10.00 Range)	1.0000000	**1.0000024**	3.86 ppm	0.99999559	1.00000441	VDC	2.446 ppm	0.55 ppm	PASS 55.46 %
2.0 VDC (10.00 Range)	2.0000000	**2.0000029**	2.77 ppm	1.99999336	2.00000664	VDC	1.461 ppm	0.55 ppm	PASS 44.01 %
10.0 VDC (10.00 Range)	10.0000000	**9.9999989**	2.73 ppm	9.9999672	10.0000328	VDC	-0.109 ppm	0.55 ppm	PASS 3.31 %
-1.0 VDC (10.00 Range)	-1.0000000	**-1.0000011**	3.86 ppm	-1.00000441	-0.99999559	VDC	1.060 ppm	0.55 ppm	PASS 24.04 %
-2.0 VDC (10.00 Range)	-2.0000000	**-2.0000014**	2.77 ppm	-2.00000664	-1.99999336	VDC	0.680 ppm	0.55 ppm	PASS 20.50 %
-10.0 VDC (10.00 Range)	-10.0000000	**-9.9999956**	2.73 ppm	-10.0000328	-9.9999672	VDC	-0.438 ppm	0.55 ppm	PASS 13.36 %
10 VDC (100.00 Range)	10.0000000	**10.00002**	2.77 ppm	9.9999443	10.0000557	VDC	1.961 ppm	2.80 ppm	PASS 35.21 %
20 VDC (100.00 Range)	20.0000000	**20.000017**	3.73 ppm	19.9998694	20.0001306	VDC	0.874 ppm	2.80 ppm	PASS 13.39 %
100 VDC (100.00 Range)	100.0000000	**100**	3.73 ppm	99.999347	100.000653	VDC	0.028 ppm	2.80 ppm	PASS 0.43 %
-10 VDC (100.00 Range)	-10.0000000	**-9.999983**	2.77 ppm	-10.0000557	-9.9999443	VDC	-1.702 ppm	2.80 ppm	PASS 30.55 %
-20 VDC (100.00 Range)	-20.0000000	**-19.999973**	3.73 ppm	-20.0001306	-19.9998694	VDC	-1.369 ppm	2.80 ppm	PASS 20.96 %
-100 VDC (100.00 Range)	-100.0000000	**-99.999937**	3.73 ppm	-100.000653	-99.999347	VDC	-0.625 ppm	2.80 ppm	PASS 9.58 %
100 VDC (1000.00 Range)	100.0000000	**100.00006**	3.73 ppm	99.999367	100.000633	VDC	0.612 ppm	2.60 ppm	PASS 9.67 %
200 VDC (1000.00 Range)	200.0000000	**199.99993**	3.73 ppm	199.998734	200.001266	VDC	-0.358 ppm	2.60 ppm	PASS 5.66 %
1000 VDC (1000.00 Range)	1000.0000000	**1000.0014**	5.45 ppm	999.97995	1000.02005	VDC	1.437 ppm	2.60 ppm	PASS 7.17 %
-100 VDC (1000.00 Range)	-100.0000000	**-99.99998**	3.73 ppm	-100.000633	-99.999367	VDC	-0.204 ppm	2.60 ppm	PASS 3.22 %
-200 VDC (1000.00 Range)	-200.0000000	**-199.99982**	3.73 ppm	-200.001266	-199.998734	VDC	-0.924 ppm	2.60 ppm	PASS 14.59 %
-1000 VDC (1000.00 Range)	-1000.0000000	**-1000.0015**	5.45 ppm	-999.99605	-1000.00395	VDC	1.478 ppm	2.60 ppm	PASS 37.42 %

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	10.9999990	**10.9999964**	2.73 ppm	10.999962920	11.000035080	-0.24 ppm	0.55 ppm	PASS 7.19 %
10.10101	10.1010100	**10.1010087**	2.73 ppm	10.100976869	10.101043131	-0.13 ppm	0.55 ppm	PASS 3.98 %
10.0	10.0000000	**9.9999985**	2.73 ppm	9.999967200	10.000032800	-0.15 ppm	0.55 ppm	PASS 4.61 %
9.999999	9.9999990	**9.9999977**	2.73 ppm	9.999966200	10.000031800	-0.13 ppm	0.55 ppm	PASS 3.86 %
9.0	9.0000000	**8.9999997**	2.73 ppm	8.999970480	9.000029520	-0.03 ppm	0.55 ppm	PASS 0.98 %
8.888888	8.8888880	**8.8888876**	2.73 ppm	8.888858844	8.888917156	-0.05 ppm	0.55 ppm	PASS 1.44 %
8.0	8.0000000	**8.0000000**	2.73 ppm	7.999973760	8.000026240	0.00 ppm	0.55 ppm	PASS 0.04 %
7.777777	7.7777770	**7.7777772**	2.73 ppm	7.777751489	7.777802511	0.02 ppm	0.55 ppm	PASS 0.73 %
7.0	7.0000000	**7.0000004**	2.73 ppm	6.999977040	7.000022960	0.06 ppm	0.55 ppm	PASS 1.75 %
6.666666	6.6666660	**6.6666664**	2.73 ppm	6.666644133	6.666687867	0.06 ppm	0.55 ppm	PASS 1.73 %
6.0	6.0000000	**6.0000006**	2.73 ppm	5.999980320	6.000019680	0.09 ppm	0.55 ppm	PASS 2.85 %
5.555555	5.5555550	**5.5555559**	2.73 ppm	5.555536778	5.555573222	0.15 ppm	0.55 ppm	PASS 4.69 %
5.0	5.0000000	**5.0000003**	2.73 ppm	4.999983600	5.000016400	0.07 ppm	0.55 ppm	PASS 2.02 %
4.444444	4.4444440	**4.4444445**	2.73 ppm	4.444429422	4.444458578	0.12 ppm	0.55 ppm	PASS 3.54 %
4.0	4.0000000	**4.0000008**	2.73 ppm	3.999986880	4.000013120	0.20 ppm	0.55 ppm	PASS 6.07 %
3.333333	3.3333330	**3.3333339**	2.73 ppm	3.333322067	3.333343933	0.28 ppm	0.55 ppm	PASS 8.66 %
3.0	3.0000000	**3.0000007**	2.73 ppm	2.999990160	3.000009840	0.24 ppm	0.55 ppm	PASS 7.41 %
2.222222	2.2222220	**2.2222229**	2.73 ppm	2.222214711	2.222229289	0.39 ppm	0.55 ppm	PASS 11.78 %
2.0	2.0000000	**2.0000007**	2.73 ppm	1.999993440	2.000006560	0.37 ppm	0.55 ppm	PASS 11.17 %
1.111111	1.1111110	**1.1111122**	2.73 ppm	1.111107356	1.111114644	1.07 ppm	0.55 ppm	PASS 32.49 %
1.0	1.0000000	**1.0000008**	3.86 ppm	0.999995590	1.000004410	0.75 ppm	0.55 ppm	PASS 17.08 %
-1.0	-1.0000000	**-0.9999991**	3.86 ppm	-1.000004410	-0.999995590	-0.85 ppm	0.55 ppm	PASS 19.37 %
-1.111111	-1.1111110	**-1.1111102**	2.73 ppm	-1.111114644	-1.111107356	-0.69 ppm	0.55 ppm	PASS 20.91 %
-2.0	-2.0000000	**-1.9999988**	2.73 ppm	-2.000006560	-1.999993440	-0.61 ppm	0.55 ppm	PASS 18.50 %
-2.222222	-2.2222220	**-2.2222210**	2.73 ppm	-2.222229289	-2.222214711	-0.43 ppm	0.55 ppm	PASS 13.16 %
-3.0	-3.0000000	**-2.9999987**	2.73 ppm	-3.000009840	-2.999990160	-0.42 ppm	0.55 ppm	PASS 12.78 %
-3.333333	-3.3333330	**-3.3333318**	2.73 ppm	-3.333343933	-3.333322067	-0.36 ppm	0.55 ppm	PASS 10.90 %
-4.0	-4.0000000	**-3.9999983**	2.73 ppm	-4.000013120	-3.999986880	-0.42 ppm	0.55 ppm	PASS 12.90 %
-4.444444	-4.4444440	**-4.4444420**	2.73 ppm	-4.444458578	-4.444429422	-0.45 ppm	0.55 ppm	PASS 13.82 %
-5.0	-5.0000000	**-4.9999976**	2.73 ppm	-5.000016400	-4.999983600	-0.48 ppm	0.55 ppm	PASS 14.69 %
-5.555555	-5.5555550	**-5.5555524**	2.73 ppm	-5.555573222	-5.555536778	-0.47 ppm	0.55 ppm	PASS 14.19 %
-6.0	-6.0000000	**-5.9999971**	2.73 ppm	-6.000019680	-5.999980320	-0.49 ppm	0.55 ppm	PASS 14.95 %
-6.666666	-6.6666660	**-6.6666626**	2.73 ppm	-6.666687867	-6.666644133	-0.50 ppm	0.55 ppm	PASS 15.39 %
-7.0	-7.0000000	**-6.9999964**	2.73 ppm	-7.000022960	-6.999977040	-0.51 ppm	0.55 ppm	PASS 15.68 %
-7.777777	-7.7777770	**-7.7777729**	2.73 ppm	-7.777802511	-7.777751489	-0.53 ppm	0.55 ppm	PASS 16.19 %
-8.0	-8.0000000	**-7.9999964**	2.73 ppm	-8.000026240	-7.999973760	-0.45 ppm	0.55 ppm	PASS 13.78 %
-8.888888	-8.8888880	**-8.8888842**	2.73 ppm	-8.888917156	-8.888858844	-0.43 ppm	0.55 ppm	PASS 13.20 %
-9.0	-9.0000000	**-8.9999962**	2.73 ppm	-9.000029520	-8.999970480	-0.42 ppm	0.55 ppm	PASS 12.95 %
-9.999999	-9.9999990	**-9.9999945**	2.73 ppm	-10.000031800	-9.999966200	-0.45 ppm	0.55 ppm	PASS 13.69 %
-10.0	-10.0000000	**-9.9999961**	2.73 ppm	-10.000032800	-9.999967200	-0.39 ppm	0.55 ppm	PASS 11.86 %
-10.10101	-10.1010100	**-10.1010063**	2.73 ppm	-10.101043131	-10.100976869	-0.36 ppm	0.55 ppm	PASS 11.03 %
-10.999999	-10.9999990	**-10.9999950**	2.73 ppm	-11.000035080	-10.999962920	-0.37 ppm	0.55 ppm	PASS 11.23 %

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	1.00001600E+00	**9.99990682E-01**	85.00 ppm	9.9992300E-01	1.0001090E+00	-25.318 ppm	8.00 ppm	PASS 27.22 %
1.9 Ω	1.89980340E+00	**1.89971688E+00**	85.00 ppm	1.8996267E+00	1.8999801E+00	-45.543 ppm	8.00 ppm	PASS 48.97 %
10 Ω	9.99970600E+00	**9.99968024E+00**	23.00 ppm	9.9993960E+00	1.0000016E+01	-2.576 ppm	8.00 ppm	PASS 8.31 %
19 Ω	1.89982410E+01	**1.89982645E+01**	23.00 ppm	1.8997690E+01	1.8998792E+01	1.238 ppm	6.00 ppm	PASS 4.27 %
100 Ω	9.99981100E+01	**9.99983472E+01**	10.00 ppm	9.9996510E+01	9.9999710E+01	2.372 ppm	6.00 ppm	PASS 14.82 %
190 Ω	1.89988300E+02	**1.89988421E+02**	10.00 ppm	1.8998598E+02	1.8999062E+02	0.640 ppm	2.20 ppm	PASS 5.24 %
1.0 kΩ	9.99939700E+02	**9.99938832E+02**	8.00 ppm	9.9992950E+02	9.9994990E+02	-0.868 ppm	2.20 ppm	PASS 8.51 %
1.9 kΩ	1.89989040E+03	**1.89989051E+03**	8.00 ppm	1.8998710E+03	1.8999098E+03	0.059 ppm	2.20 ppm	PASS 0.58 %
10 kΩ	9.99958100E+03	**9.99957241E+03**	8.00 ppm	9.9994790E+03	9.9996830E+03	-0.859 ppm	2.20 ppm	PASS 8.42 %
19 kΩ	1.89991350E+04	**1.89991098E+04**	9.00 ppm	1.8998922E+04	1.8999348E+04	-1.327 ppm	2.20 ppm	PASS 11.85 %
100 kΩ	9.99927700E+04	**9.99921076E+04**	9.00 ppm	9.9991650E+04	9.9993890E+04	-6.624 ppm	2.20 ppm	PASS 59.15 %
190 kΩ	1.89998150E+05	**1.89997319E+05**	9.00 ppm	1.8999435E+05	1.9000195E+05	-4.375 ppm	11.00 ppm	PASS 21.87 %
1.0 MΩ	9.99878800E+05	**9.99869311E+05**	16.00 ppm	9.9985180E+05	9.9990580E+05	-9.490 ppm	11.00 ppm	PASS 35.15 %
1.9 MΩ	1.89990310E+06	**1.89990220E+06**	17.00 ppm	1.8997663E+06	1.9000399E+06	-0.472 ppm	55.00 ppm	PASS 0.66 %
10 MΩ	9.99810400E+06	**9.99753599E+06**	33.00 ppm	9.9972242E+06	9.9989838E+06	-56.812 ppm	55.00 ppm	PASS 64.56 %
19 MΩ	1.89983600E+07	**1.89987281E+07**	43.00 ppm	1.8987854E+07	1.9008866E+07	19.377 ppm	510.00 ppm	PASS 3.50 %
100 MΩ	1.00002310E+08	**9.99964108E+07**	100.00 ppm	9.9941309E+07	1.0006331E+08	-58.991 ppm	510.00 ppm	PASS 9.67 %

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	**1.0000787**	129.09	0.99955091	1.00044909	VAC	78.718 ppm	320.0 ppm	PASS 17.53 %
1.0 VAC @ 1.0 MHz	1.0	**1.0115585**	0.2500 %	0.9874	1.0126	VAC	1.1558 %	1.0100 %	PASS 91.73 %
10 VAC @ 200 Hz	10	**10.000708**	73.18	9.9983682	10.0016318	VAC	70.786 ppm	90.0 ppm	PASS 43.38 %
10 VAC @ 500 Hz	10	**10.000678**	73.18	9.9983682	10.0016318	VAC	67.758 ppm	90.0 ppm	PASS 41.52 %
10 VAC @ 50.0 kHz	10	**10.000124**	129.09	9.9955091	10.0044909	VAC	12.365 ppm	320.0 ppm	PASS 2.75 %
10 VAC @ 1.0 MHz	10	**10.089427**	0.3000 %	9.869	10.131	VAC	0.8943 %	1.0100 %	PASS 68.26 %

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 VAC @ 10 Hz	**0.0099998487**	312.27	0.009991	0.010009	-15.128 ppm	600.0 ppm	PASS 1.66 %
0.01 VAC @ 20 Hz	**0.0099995296**	312.27	0.009991	0.010009	-47.042 ppm	600.0 ppm	PASS 5.16 %
0.01 VAC @ 40 Hz	**0.009999372**	312.27	0.009991	0.010009	-62.801 ppm	600.0 ppm	PASS 6.88 %
0.01 V AC+DC @ 100 Hz	**0.0099995083**	312.27	0.009994	0.010006	-49.166 ppm	310.0 ppm	PASS 7.90 %
0.01 V AC+DC @ 1.0 kHz	**0.0099995155**	312.27	0.009994	0.010006	-48.449 ppm	310.0 ppm	PASS 7.79 %
0.01 V AC+DC @ 10.0 kHz	**0.010001298**	312.27	0.009993	0.010007	129.835 ppm	410.0 ppm	PASS 17.98 %
0.01 V AC+DC @ 20.0 kHz	**0.010000006**	312.27	0.009993	0.010007	0.584 ppm	410.0 ppm	PASS 0.08 %
0.01 V AC+DC @ 50.0 kHz	**0.010000133**	0.0312 %	0.009986	0.010014	0.0013 %	0.1110 %	PASS 0.93 %
0.01 V AC+DC @ 100.0 kHz	**0.0099875112**	0.0312 %	0.009946	0.010054	-0.1249 %	0.5110 %	PASS 23.03 %
0.01 V AC+DC @ 300.0 kHz	**0.0098380539**	0.0447 %	0.009594	0.010406	-1.6195 %	4.0200 %	PASS 39.84 %
0.01 V AC+DC @ 500.0 kHz	**0.0096287228**	0.0773 %	0.006787	0.013213	-3.7128 %	32.0500 %	PASS 11.56 %
0.01 V AC+DC @ 1.0 MHz	**0.0087268002**	0.1500 %	0.006780	0.013220	-12.7320 %	32.0500 %	PASS 39.54 %
0.1 VAC @ 10 Hz	**0.1000035**	1500	0.099839	0.100161	34.968 ppm	110.0 ppm	PASS 2.17 %
0.1 VAC @ 20 Hz	**0.099997629**	2500	0.099739	0.100261	-23.715 ppm	110.0 ppm	PASS 0.91 %
0.1 VAC @ 40 Hz	**0.099996714**	4000	0.099589	0.100411	-32.858 ppm	110.0 ppm	PASS 0.80 %
0.1 V AC+DC @ 100 Hz	**0.099995866**	121.36	0.099979	0.100021	-41.344 ppm	90.0 ppm	PASS 19.56 %
0.1 V AC+DC @ 1.0 kHz	**0.099997525**	121.36	0.099979	0.100021	-24.750 ppm	90.0 ppm	PASS 11.71 %
0.1 V AC+DC @ 10.0 kHz	**0.099998074**	121.36	0.099972	0.100028	-19.256 ppm	160.0 ppm	PASS 6.84 %
0.1 V AC+DC @ 20.0 kHz	**0.099992612**	121.36	0.099972	0.100028	-73.875 ppm	160.0 ppm	PASS 26.26 %
0.1 V AC+DC @ 50.0 kHz	**0.099987641**	121.36	0.099956	0.100044	-123.592 ppm	320.0 ppm	PASS 28.00 %
0.1 V AC+DC @ 100.0 kHz	**0.099946077**	121.36	0.099906	0.100094	-539.231 ppm	820.0 ppm	PASS 57.28 %
0.1 V AC+DC @ 300.0 kHz	**0.099835528**	0.0121 %	0.099678	0.100322	-0.1645 %	0.3100 %	PASS 51.06 %
0.1 V AC+DC @ 500.0 kHz	**0.099654425**	0.0121 %	0.098978	0.101022	-0.3456 %	1.0100 %	PASS 33.81 %
0.1 V AC+DC @ 1.0 MHz	**0.099466257**	0.0121 %	0.098978	0.101022	-0.5337 %	1.0100 %	PASS 52.22 %
1.0 VAC @ 10 Hz	**1.0001027**	256.36	0.999634	1.000366	102.731 ppm	110.0 ppm	PASS 28.04 %
1.0 VAC @ 20 Hz	**1.0000376**	590.91	0.999299	1.000701	37.577 ppm	110.0 ppm	PASS 5.36 %
1.0 VAC @ 40 Hz	**1.0000227**	963.64	0.998926	1.001074	22.733 ppm	110.0 ppm	PASS 2.12 %
1.0 V AC+DC @ 100 Hz	**1.0000161**	963.64	0.998946	1.001054	16.109 ppm	90.0 ppm	PASS 1.53 %
1.0 V AC+DC @ 1.0 kHz	**1.000032**	1500	0.998410	1.001590	31.991 ppm	90.0 ppm	PASS 2.01 %
1.0 V AC+DC @ 10.0 kHz	**0.99997307**	3000	0.996840	1.003160	-26.928 ppm	160.0 ppm	PASS 0.85 %
1.0 V AC+DC @ 20.0 kHz	**0.99993029**	49.55	0.999790	1.000210	-69.708 ppm	160.0 ppm	PASS 33.27 %
1.0 V AC+DC @ 50.0 kHz	**0.99998701**	49.55	0.999630	1.000370	-12.995 ppm	320.0 ppm	PASS 3.52 %
1.0 V AC+DC @ 100.0 kHz	**0.99998615**	49.55	0.999130	1.000870	-13.855 ppm	820.0 ppm	PASS 1.59 %
1.0 V AC+DC @ 300.0 kHz	**1.0017493**	0.0050 %	0.996850	1.003150	0.1749 %	0.3100 %	PASS 55.54 %
1.0 V AC+DC @ 500.0 kHz	**1.00306**	0.0050 %	0.989850	1.010150	0.3060 %	1.0100 %	PASS 30.15 %
1.0 V AC+DC @ 1.0 MHz	**1.006115**	0.0050 %	0.989850	1.010150	0.6115 %	1.0100 %	PASS 60.25 %
10.0 VAC @ 10 Hz	**10.001084**	49.55	9.997105	10.002895	108.366 ppm	240.0 ppm	PASS 37.43 %
10.0 VAC @ 20 Hz	**10.000551**	49.55	9.997105	10.002895	55.078 ppm	240.0 ppm	PASS 19.02 %
10.0 VAC @ 40 Hz	**10.000386**	49.55	9.997105	10.002895	38.581 ppm	240.0 ppm	PASS 13.32 %
10.0 V AC+DC @ 100 Hz	**10.000303**	85.45	9.996945	10.003054	30.267 ppm	220.0 ppm	PASS 9.91 %
10.0 V AC+DC @ 1.0 kHz	**10.000476**	138.18	9.996418	10.003582	47.633 ppm	220.0 ppm	PASS 13.30 %
10.0 V AC+DC @ 10.0 kHz	**9.9997527**	425.45	9.993545	10.006455	-24.730 ppm	220.0 ppm	PASS 3.83 %
10.0 V AC+DC @ 20.0 kHz	**9.9995723**	425.45	9.993545	10.006455	-42.774 ppm	220.0 ppm	PASS 6.63 %
10.0 V AC+DC @ 50.0 kHz	**9.9993768**	1100	9.985300	10.014700	-62.315 ppm	370.0 ppm	PASS 4.24 %
10.0 V AC+DC @ 100.0 kHz	**9.9962036**	0.1800 %	9.969800	10.030200	-0.0380 %	0.1220 %	PASS 12.57 %
10.0 V AC+DC @ 300.0 kHz	**9.9932762**	0.0048 %	9.958518	10.041482	-0.0672 %	0.4100 %	PASS 16.21 %
10.0 V AC+DC @ 500.0 kHz	**9.9953911**	0.0048 %	9.848518	10.151482	-0.0461 %	1.5100 %	PASS 3.04 %
10.0 V AC+DC @ 1.0 MHz	**10.042695**	0.0048 %	9.848518	10.151482	0.4269 %	1.5100 %	PASS 28.18 %
100.0 V AC+DC @ 1.0 kHz	**100.00138**	48.18	99.953182	100.046818	13.837 ppm	420.0 ppm	PASS 2.95 %
100.0 V AC+DC @ 10.0 kHz	**99.999408**	48.18	99.933182	100.066818	-5.924 ppm	620.0 ppm	PASS 0.89 %
100.0 V AC+DC @ 20.0 kHz	**99.996408**	48.18	99.933182	100.066818	-35.915 ppm	620.0 ppm	PASS 5.38 %
100.0 V AC+DC @ 50.0 kHz	**99.999948**	0.0048 %	99.873182	100.126818	-0.0001 %	0.1220 %	PASS 0.04 %
100.0 V AC+DC @ 100.0 kHz	**99.988402**	0.0048 %	99.693182	100.306818	-0.0116 %	0.3020 %	PASS 3.78 %
700.0 V AC+DC @ 1.0 kHz	**700.05739**	48.18	699.672274	700.327726	81.980 ppm	420.0 ppm	PASS 17.20 %

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		**-5.8341175E-11**				Z-check		INFO
50 nADC	5E-08	**4.9932405E-08**	71.82 ppm	4.997591E-08	5.002409E-08	-1351.898 ppm	410 ppm	INFO
100 nADC	1E-07	**9.9874151E-08**	71.82 ppm	9.995182E-08	1.000482E-07	-1258.493 ppm	410 ppm	FAIL 261.20 %
-50 nADC	-5E-08	**-5.0085308E-08**	71.82 ppm	-5.002409E-08	-4.997591E-08	1706.152 ppm	410 ppm	INFO
-100 nADC	-1E-07	**-1.00096E-07**	71.82 ppm	-1.000482E-07	-9.995182E-08	960.013 ppm	410 ppm	FAIL 199.25 %
Zero µADC		**-9.1566306E-11**				Z-check		INFO
1 µADC	1E-06	**9.9991764E-07**	71.82 ppm	9.998782E-07	1.000122E-06	-82.357 ppm	50 ppm	PASS 67.61 %
1.1 µADC	1.1E-06	**1.0999601E-06**	71.82 ppm	1.099866E-06	1.100134E-06	-36.274 ppm	50 ppm	PASS 29.78 %
-1 µADC	-1E-06	**-1.0000325E-06**	71.82 ppm	-1.000122E-06	-9.998782E-07	32.475 ppm	50 ppm	PASS 26.66 %
-1.1 µADC	-1.1E-06	**-1.1001043E-06**	71.82 ppm	-1.100134E-06	-1.099866E-06	94.858 ppm	50 ppm	PASS 77.87 %
Zero 00 µADC		**-1.2499344E-10**				Z-check		INFO
10 µADC	1E-05	**9.9996616E-06**	71.82 ppm	9.999112E-06	1.000089E-05	-33.837 ppm	17 ppm	PASS 38.10 %
11 µADC	1.1E-05	**1.0999653E-05**	71.82 ppm	1.099902E-05	1.100098E-05	-31.583 ppm	17 ppm	PASS 35.56 %
-10 µADC	-1E-05	**-9.9999404E-06**	71.82 ppm	-1.000089E-05	-9.999112E-06	-5.956 ppm	17 ppm	PASS 6.71 %
-11 µADC	-1.1E-05	**-1.0999866E-05**	71.82 ppm	-1.100098E-05	-1.099902E-05	-12.183 ppm	17 ppm	PASS 13.72 %
Zero 000 µADC		**-3.1660388E-11**				Z-check		INFO
100 µADC	0.0001	**9.9997904E-05**	71.82 ppm	9.999122E-05	0.0001000088	-20.957 ppm	16 ppm	PASS 23.86 %
110 µADC	0.00011	**0.00010999769**	71.82 ppm	0.0001099903	0.0001100097	-20.975 ppm	16 ppm	PASS 23.88 %
-100 µADC	-0.0001	**-9.999829E-05**	71.82 ppm	-0.0001000088	-9.999122E-05	-17.098 ppm	16 ppm	PASS 19.47 %
-110 µADC	-0.00011	**-0.00010999798**	71.82 ppm	-0.0001100097	-0.0001099903	-18.369 ppm	16 ppm	PASS 20.92 %
Zero mADC		**-1.2698464E-10**				Z-check		INFO
-1.0 mADC	0.001	**0.00099998417**	33.64 ppm	0.0009999524	0.001000048	-15.829 ppm	14 ppm	PASS 33.23 %
1.1 mADC	0.0011	**0.0010999833**	33.64 ppm	0.001099948	0.001100052	-15.200 ppm	14 ppm	PASS 31.91 %
-1.0 mADC	-0.001	**-0.00099998633**	33.64 ppm	-0.001000048	-0.0009999524	-13.670 ppm	14 ppm	PASS 28.70 %
-1.1 mADC	-0.0011	**-0.0010999844**	33.64 ppm	-0.001100052	-0.001099948	-14.225 ppm	14 ppm	PASS 29.86 %
Zero 00 mADC		**-7.944917E-11**				Z-check		INFO
10 mADC	0.01	**0.0099998507**	32.27 ppm	0.009999537	0.01000046	-14.934 ppm	14 ppm	PASS 32.28 %
11 mADC	0.011	**0.010999839**	32.27 ppm	0.01099949	0.01100051	-14.642 ppm	14 ppm	PASS 31.64 %
-10 mADC	-0.01	**-0.0099998691**	32.27 ppm	-0.01000046	-0.009999537	-13.085 ppm	14 ppm	PASS 28.28 %
-11 mADC	-0.011	**-0.010999852**	32.27 ppm	-0.01100051	-0.01099949	-13.420 ppm	14 ppm	PASS 29.00 %
Zero 000 mADC		**-1.5995326E-10**				Z-check		INFO
100 mADC	0.1	**0.099996135**	53.32 ppm	0.09999177	0.1000082	-38.655 ppm	29 ppm	PASS 46.96 %
110 mADC	0.11	**0.1099949**	53.32 ppm	0.1099909	0.1100091	-46.343 ppm	29 ppm	PASS 56.30 %
-100 mADC	-0.1	**-0.099996346**	53.32 ppm	-0.1000082	-0.09999177	-36.538 ppm	29 ppm	PASS 44.39 %
-110 mADC	-0.11	**-0.1099956**	53.32 ppm	-0.1100091	-0.1099909	-40.007 ppm	29 ppm	PASS 48.60 %
Zero ADC		**-1.3546247E-10**				Z-check		INFO
1.0 ADC	1	**0.99996537**	115.22 ppm	0.9997748	1.000225	-34.634 ppm	110 ppm	PASS 15.38 %
1.1 ADC	1.1	**1.099962**	115.22 ppm	1.099752	1.100248	-34.520 ppm	110 ppm	PASS 15.33 %
-1.0 ADC	-1	**-0.9999821**	115.22 ppm	-1.000225	-0.9997748	-17.896 ppm	110 ppm	PASS 7.95 %
-1.1 ADC	-1.1	**-1.0999734**	115.22 ppm	-1.100248	-1.099752	-24.172 ppm	110 ppm	PASS 10.73 %

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	Units	Measured	24h spec	Result, % spec
10 µA AC @ 0.05 kHz	1e-05	**1.0024326E-05**	0.0165 %	9.9893455e-06	1.00106545e-05	AAC	2432.556 ppm	0.0900 %	INFO
100 µA AC @ 0.05 kHz	0.0001	**9.9997093E-05**	0.0165 %	9.9893455e-05	0.000100106545	AAC	-29.075 ppm	0.0900 %	PASS 2.73 %
1.0 mA AC @ 0.05 kHz	0.001	**0.0010000463**	0.0165 %	0.00099893455	0.00100106545	AAC	46.298 ppm	0.0900 %	PASS 4.35 %
10 mA AC @ 0.05 kHz	0.01	**0.010000047**	0.0165 %	0.0099893455	0.0100106545	AAC	4.656 ppm	0.0900 %	PASS 0.44 %
100 mA AC @ 0.05 kHz	0.1	**0.10000302**	0.0138 %	0.099896182	0.100103818	AAC	30.182 ppm	0.0900 %	PASS 2.91 %
1.0 A AC @ 0.05 kHz	1.0	**0.99994597**	0.0138 %	0.99896182	1.00103818	AAC	-54.033 ppm	0.0900 %	PASS 5.20 %
10 µA AC @ 0.06 kHz	1e-05	**1.0024774E-05**	0.0138 %	9.9896182e-06	1.00103818e-05	AAC	2477.448 ppm	0.0900 %	INFO
100 µA AC @ 0.06 kHz	0.0001	**0.00010000845**	0.0138 %	9.9896182e-05	0.000100103818	AAC	84.463 ppm	0.0900 %	PASS 8.14 %
1.0 mA AC @ 0.06 kHz	0.001	**0.0010007301**	0.0134 %	0.00099896636	0.00100103364	AAC	730.137 ppm	0.0900 %	PASS 70.64 %
10 mA AC @ 0.06 kHz	0.01	**0.010000321**	0.0134 %	0.0099896636	0.0100103364	AAC	32.140 ppm	0.0900 %	PASS 3.11 %
100 mA AC @ 0.06 kHz	0.1	**0.10000568**	0.0308 %	0.099879182	0.100120818	AAC	56.809 ppm	0.0900 %	PASS 4.70 %
1.0 A AC @ 0.06 kHz	1.0	**0.9999744**	0.0308 %	0.99879182	1.00120818	AAC	-25.596 ppm	0.0900 %	PASS 2.12 %
10 µA AC @ 1000.0 Hz	1e-05	**1.0023164E-05**	0.0165 %	9.9893455e-06	1.00106545e-05	AAC	2316.375 ppm	0.0900 %	INFO
100 µA AC @ 1000.0 Hz	0.0001	**9.9986428E-05**	0.0165 %	9.9893455e-05	0.000100106545	AAC	-135.719 ppm	0.0900 %	PASS 12.74 %
1.0 mA AC @ 1000.0 Hz	0.001	**0.0010001294**	0.0165 %	0.00099893455	0.00100106545	AAC	129.426 ppm	0.0900 %	PASS 12.15 %
10 mA AC @ 1000.0 Hz	0.01	**0.010000888**	0.0165 %	0.0099893455	0.0100106545	AAC	88.797 ppm	0.0900 %	PASS 8.33 %
100 mA AC @ 1000.0 Hz	0.1	**0.10001201**	0.0138 %	0.099896182	0.100103818	AAC	120.053 ppm	0.0900 %	PASS 11.56 %
1.0 A AC @ 1000.0 Hz	1.0	**1.0001322**	0.0138 %	0.99896182	1.00103818	AAC	132.242 ppm	0.0900 %	PASS 12.74 %

Test completed

Test date	06 March 2018 22:18
UUT Internal TEMP?	38.7
Destructive overloads?	238, DESTRUCTIVE OVERLOADS valid 2941

Lab temperature maintained +24°C ±2°C

Internal use only

Not validated