

Von der Schweizerischen Akkreditierungsstelle akkreditierte Kalibrierstelle
Laboratoire d'étalonnage accrédité par le Service d'Accréditation Suisse
Calibration Laboratory accredited by the Swiss Accreditation Service

S Akkreditierungs-Nr. **SCS 002**
C No. d'accréditation
S Accreditation No.

**The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates**

Zertifikat Nr.
No. du certificat **9424**
Certificate No.

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KALIBRIER – ZERTIFIKAT CERTIFICATE D'ÉTALONNAGE CERTIFICATE OF CALIBRATION

Instrument
Instrument
Instrument

System DMM

Hersteller
Fabricant
Manufacturer

H P

Typ
Type
Model

3458A

Serien- / Inventar-Nr.
No. de série- / inventaire
Serial- / Inv. No.

Sample

131

Kunde
Client
Customer

Sample Customer

Auftragsnummer
No. de la commande
Order No.

Bemerkungen
Remarques
Remarks

Datum der Kalibrierung
Date de l'étalonnage
Date of calibration

06. Februar 2010

**Dieses Kalibrierzertifikat dokumentiert die Rückverfolgbarkeit auf nationale Normale zur Darstellung der physikalischen Einheiten (SI).
Ce certificat d'étalonnage confirme le raccordement aux étalons nationaux qui matérialisent les grandeurs physiques (SI).
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).**

Messresultate, Messunsicherheiten mit Vertrauensbereich und Messverfahren sind auf den folgenden Seiten aufgeführt und sind Teil des Zertifikats.
Les résultats, les incertitudes avec le niveau de confiance et les méthodes de mesure sont donnés aux pages suivantes et font partie du certificat.
The measurements, the uncertainties with confidence probability and calibration methods are given on the following pages and are part of the certificate.

Stempel und Datum
Timbre et Date
Stamp and date

Leiter der Kalibrierstelle
Chef du laboratoire d'étalonnage
Head of the Calibration Laboratory

Testreport
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Certificate : SCS 9424
Unit under Test : H P 3458A System DMM
Serial No : Sample 3458A
Customer : Sample Customer
Inventory No : 131
Date : 06.02.2010
Operator : J. Stampfli

TRACEABILITY INFORMATION

Instruments used:	Serial No:	Inventory No:	Cal Due Date:
Fluke 732A	352'5009	LAB-112	02.07.2010
Fluke 792A	517'1795	LAB-143	31.03.2010
Fluke 742-100kOhm	485'1231	LAB-145	04.10.2011
Fluke 742-1MOhm	497'6290	LAB-146	04.10.2011
Fluke 742-10MOhm	504'6237	LAB-147	04.10.2011
Fluke 742-10kOhm	539'5003	LAB-149	18.10.2011
Fluke 742-1kOhm	587'0008	LAB-151	04.10.2011
Fluke 742-100Ohm	646'0001	LAB-160	04.10.2011
Fluke 742-1000Ohm	692'0006	LAB-168	10.10.2011
MI 9331/100M	1100022	LAB-297	30.11.2010
MI 4310HR	1100046	LAB-298a	01.12.2010
Fluke 5720A	8930207	LAB-299	27.04.2010

All listed result are direct traceable to the Swiss Federal Office of Metrology, as far as listed in the uncertainty table of the SCS Certificate. Measurements beyond the current accreditation are marked with *.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approx 95%.

SUMMARY OF LAST RECORDED CAL DATA

This certificate records the calibration status.
Points where %Tol exceeds the adjustment threshold are marked with a "M".
Points where %Tol exceeds the specification limit are marked with a "F".

Number of Test Marginal: 0
Number of Test Failed: 0

Testreport
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Unit under Test : H P 3458A System DMM
Serial No : Sample 3458A
Customer : Sample Customer
Inventory No : 131
Date : 06.02.2010
Operator : J. Stampfli

TEST RANGE	UUT INDICATED	SYSTEM ACTUAL	MODIFIER	ERROR	ERROR (%TOL)	EXP. M UNCERT	F
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Actual Ambient Temp. 23.3 ±0.5°C / Humidity 31.4%

Marginal limit 70% of UUT Tol.

HP 3458A Performance Verification

All Tests as per 360 Days Specs of HP3458A Calibration Manual
3458-90016, performed within 1 hour of last "Autocal"

UUT Int. "Temp." @ Test_Start = 36.5Deg.C

UUT Installed FW Revision: 7,2

UUT Int. "CALSTR" @ Begin of Test:

"CAL 06-Feb-10 J. Stampfli ELCAL AG DIETIKON"

DC Voltage Verification

UUT Settings: Guard=LCL, , NPLC 100, Trig=Auto

120mV Range:

4 *	120	-0.00001mV	0.000000mV		-0.000010mV	1	700nV
5	120	100.00027mV	100.000000mV	Zero_Cmp	2.68 ppm	14	1.4uV
6	120	-100.00034mV	-100.000000mV	Zero_Cmp	3.44 ppm	18	1.4uV

1.2V Range:

7 *	1.2	0.00000000V	0.00000000V		0.000000003V	0	700nV
8	1.2	1.00000023V	1.00000000V	Zero_Cmp	0.23 ppm	3	5.7uV
9	1.2	-1.00000082V	-1.00000000V	Zero_Cmp	0.82 ppm	11	5.7uV

12V Range:

10 *	12	-0.0000004V	0.00000000V		-0.00000038V	17	702nV
11	12	0.9999998V	1.00000000V	Zero_Cmp	-0.20 ppm	2	9.0uV
12	12	-1.0000013V	-1.00000000V	Zero_Cmp	1.30 ppm	15	9.0uV
13	12	9.9999942V	10.00000000V	Zero_Cmp	-0.58 ppm	9	36uV
14	12	-10.0000001V	-10.00000000V	Zero_Cmp	0.01 ppm	0	36uV

120V Range:

15 *	120	0.000006V	0.0000000V		0.0000062V	17	907nV
16	120	99.999940V	100.0000000V		-0.60 ppm	7	570uV
17	120	-99.999890V	-100.0000000V		-1.10 ppm	13	570uV

1050V Range:

18 *	1050	-0.00000V	0.000000V		-0.000004V	4	5.8uV
19	1050	1000.00218V	1000.000000V		2.18 ppm	11	6.2mV
20	1050	-1000.00434V	-1000.000000V		4.34 ppm	22	6.0mV

Testreport
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Certificate : SCS 9424
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Serial No : Sample 3458A
Customer : Sample Customer
Inventory No : 131
Date : 06.02.2010
Operator : J. Stampfli

TEST RANGE	UUT INDICATED	SYSTEM ACTUAL	MODIFIER	ERROR	ERROR (%TOL)	EXP. M	UNCERT F
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DC Voltage Linearity Verification

----- 12V Range:

21	12	10.9999918V	10.99999900V	Zero_Cmp	-0.65 ppm	8	39uV
22	12	9.9999934V	9.99999900V	Zero_Cmp	-0.56 ppm	7	36uV
23	12	8.8888835V	8.88888800V	Zero_Cmp	-0.51 ppm	6	33uV
24	12	7.7777747V	7.77777700V	Zero_Cmp	-0.30 ppm	4	29uV
25	12	6.6666636V	6.66666600V	Zero_Cmp	-0.36 ppm	4	26uV
26	12	5.5555525V	5.55555500V	Zero_Cmp	-0.45 ppm	6	23uV
27	12	4.4444422V	4.44444400V	Zero_Cmp	-0.40 ppm	5	19uV
28	12	3.3333327V	3.33333300V	Zero_Cmp	-0.08 ppm	1	16uV
29	12	2.2222214V	2.22222200V	Zero_Cmp	-0.28 ppm	3	13uV
30	12	-2.2222228V	-2.22222200V	Zero_Cmp	0.34 ppm	4	13uV
31	12	-3.3333336V	-3.33333300V	Zero_Cmp	0.19 ppm	2	16uV
32	12	-4.4444433V	-4.44444400V	Zero_Cmp	-0.15 ppm	2	19uV
33	12	-5.5555544V	-5.55555500V	Zero_Cmp	-0.10 ppm	1	23uV
34	12	-6.6666664V	-6.66666600V	Zero_Cmp	0.06 ppm	1	26uV
35	12	-7.7777785V	-7.77777700V	Zero_Cmp	0.19 ppm	2	29uV
36	12	-8.8888877V	-8.88888800V	Zero_Cmp	-0.04 ppm	0	33uV
37	12	-9.9999996V	-9.99999900V	Zero_Cmp	0.06 ppm	1	36uV
38	12	-10.9999993V	-10.99999900V	Zero_Cmp	0.03 ppm	0	39uV

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Certificate : SCS 9424
Unit under Test : H P 3458A System DMM
Serial No : Sample 3458A
Customer : Sample Customer
Inventory No : 131
Date : 06.02.2010
Operator : J. Stampfli

TEST	RANGE	UUT INDICATED	SYSTEM ACTUAL	MODIFIER	ERROR	ERROR (%TOL)	EXP. M	UNCERT F
DC Current Verification								

120nA Range:								
39 *	120	-0.000nA	0.0000nA		-0.0000nA	0	7.0nA	
40	120	99.995nA	100.0000nA	+/-_Avg.	-52.4 ppm	10	7.0nA	
1.2uA Range:								
41 *	1.2	-0.000003uA	0.0000000uA		-0.0000027uA	6	7.0nA	
42	1.2	1.000003uA	1.0000000uA	+/-_Avg.	3.28 ppm	5	7.0nA	
12uA Range:								
43 *	12	-0.000000uA	0.0000000uA		-0.0000000uA	0	7.0nA	
44	12	10.000025uA	10.0000000uA	+/-_Avg.	2.49 ppm	4	7.4nA	
120uA Range:								
45 *	120	-0.000000uA	0.0000000uA		-0.0000000uA	0	7.0nA	
46	120	100.00015uA	100.0000000uA	Zero_Cmp	1.47 ppm	5	11nA	
47	120	-100.00032uA	-100.0000000uA	Zero_Cmp	3.15 ppm	11	11nA	
1.2mA Range:								
48 *	1.2	-0.00000000mA	0.000000000mA		-0.000000001mA	0	7.0nA	
49	1.2	0.99999477mA	1.000000000mA	Zero_Cmp	-5.23 ppm	20	44nA	
50	1.2	-0.99999454mA	-1.000000000mA	Zero_Cmp	-5.46 ppm	21	44nA	
12mA Range:								
51 *	12	-0.000000mA	0.0000000mA		-0.0000000mA	0	7.0nA	
52	12	9.999910mA	10.0000000mA	Zero_Cmp	-8.98 ppm	35	397nA	
53	12	-9.999924mA	-10.0000000mA	Zero_Cmp	-7.60 ppm	29	397nA	
120mA Range:								
54 *	120	-0.00000mA	0.000000mA		-0.000000mA	0	9.1nA	
55	120	19.99983mA	20.000000mA	Zero_Cmp	-8.54 ppm	13	752nA	
56	120	-19.99981mA	-20.000000mA	Zero_Cmp	-9.70 ppm	15	748nA	
57	120	100.00078mA	100.000000mA	Zero_Cmp	7.83 ppm	19	5.5uA	
58	120	-100.00243mA	-100.000000mA	Zero_Cmp	24.3 ppm	59	5.5uA	
1A Range:								
59 *	1	-0.00000163A	0.00000000A		-0.000001632A	16	9.1nA	
60	1	0.99996313A	1.00000000A	Zero_Cmp	-36.9 ppm	31	87uA	
61	1	-0.99998604A	-1.00000000A	Zero_Cmp	-14.0 ppm	12	87uA	

Testreport
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Certificate : SCS 9424
Unit under Test : H P 3458A System DMM
Serial No : Sample 3458A
Customer : Sample Customer
Inventory No : 131
Date : 06.02.2010
Operator : J. Stampfli

TEST	RANGE	UUT INDICATED	SYSTEM ACTUAL	MODIFIER	ERROR	ERROR (%TOL)	EXP. M UNCERT	F
AC Voltage Verification								

UUT Settings: LFILTER ON \ SETACV SYNC \ NPLC 100								
Test Leads : Pomona 1167-18 50cm								
12mV Range:								
62	12	9.99888mV	10.000000mV	@_1kHz	-0.011 %	34	23uV	
63	12	9.99924mV	10.000000mV	@_20kHz	-75.6 ppm	18	23uV	
64	12	9.99331mV	10.000000mV	@_50kHz	-0.067 %	59	23uV	
65	12	9.97505mV	10.000000mV	@_100kHz	-0.250 %	49	28uV	
66	12	9.81800mV	10.000000mV	@_300kHz	-1.854 %	46	40uV	
120mV Range:								
67	120	100.00423mV	100.000000mV	@_1kHz	42.3 ppm	45	15uV	
68	120	100.00239mV	100.000000mV	@_20kHz	23.9 ppm	15	15uV	
69	120	99.99282mV	100.000000mV	@_50kHz	-71.8 ppm	22	21uV	
70	120	99.96219mV	100.000000mV	@_100kHz	-0.038 %	46	59uV	
71	120	99.79837mV	100.000000mV	@_300kHz	-0.202 %	65	95uV	
72	120	99.97673mV	100.000000mV	@_1MHz	-0.023 %	2	295uV	
1.2V Range:								
73	1.2	1.0000377V	1.00000000V	@_1kHz	37.7 ppm	40	91uV	
74	1.2	0.9999699V	1.00000000V	@_20kHz	-30.1 ppm	18	90uV	
75	1.2	0.9999744V	1.00000000V	@_50kHz	-25.6 ppm	8	90uV	
76	1.2	1.0000636V	1.00000000V	@_100kHz	63.6 ppm	8	190uV	
77	1.2	1.0014091V	1.00000000V	@_300kHz	0.141 %	14	465uV	
12V Range:								
78	12	10.000210V	10.0000000V	@_1kHz	21.0 ppm	22	450uV	
79	12	10.000179V	10.0000000V	@_20Hz	17.9 ppm	11	1.3mV	
80	12	9.998819V	10.0000000V	@_50kHz	-0.012 %	34	802uV	
81	12	9.995224V	10.0000000V	@_100kHz	-0.048 %	58	1.4mV	
82	12	9.978563V	10.0000000V	@_300kHz	-0.215 %	69	3.2mV	
83	12	10.095226V	10.0000000V	@_1MHz	0.943 %	62	17mV	
120V Range:								
84	120	100.00053V	100.000000V	@_1kHz	5.27 ppm	2	5.3mV	
85	120	99.99810V	100.000000V	@_20kHz	-19.0 ppm	8	5.3mV	
86	120	99.98557V	100.000000V	@_50kHz	-0.014 %	39	9.0mV	
87	120	99.98359V	100.000000V	@_100kHz	-0.016 %	13	17mV	
1000V Range (750V Max.):								
88	1000	700.0246V	700.00000V	@_1kHz	35.1 ppm	8	51mV	

Testreport
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Certificate : SCS 9424
 Unit under Test : H P 3458A System DMM
 Serial No : Sample 3458A
 Customer : Sample Customer
 Inventory No : 131
 Date : 06.02.2010
 Operator : J. Stampfli

TEST RANGE	UUT INDICATED	SYSTEM ACTUAL	MODIFIER	ERROR	ERROR (%TOL)	EXP. M	UNCERT F
Resistance Verification							

UUT Settings:NPLC 100 \ AZERO ON \ LFILTER ON \ GUARD: LCL							
12Ohms Range:							
89 * 12	-0.00001Ω	0.000000Ω	4W_Front	-0.000005Ω	7	5.9uΩ	
90 * 12	0.01317Ω	0.000000Ω	2W_Rear.	0.013172Ω	5	5.9uΩ	
91 12	10.00007Ω	10.000055Ω	4W_Cmp_on	1.74 ppm	8	23uΩ	
120Ohms Range:							
92 * 120	0.00010Ω	0.000000Ω	4W_Front	0.000100Ω	17	13uΩ	
93 * 120	0.00100Ω	0.000000Ω	2W_Rear.	0.001000Ω	0	13uΩ	
94 120	10.00007Ω	10.000055Ω	4W_Cmp_on	1.62 ppm	2	97uΩ	
95 120	100.00131Ω	100.001050Ω	4W_Cmp_on	2.62 ppm	15	154uΩ	
1.2kOhm Range:							
96 1.2	0.1000014kΩ	0.10000105kΩ	4W_Cmp_on	3.26 ppm	20	197uΩ	
97 1.2	1.0000172kΩ	1.00001400kΩ	4W_Cmp_on	3.22 ppm	30	5.0mΩ	
12kOhm Range:							
98 12	1.000016kΩ	1.0000140kΩ	4W	1.83 ppm	11	5.1mΩ	
99 12	10.000231kΩ	10.0001910kΩ	4W	3.99 ppm	38	50mΩ	
120kOhm Range:							
100 120	10.00024kΩ	10.000191kΩ	4W	4.52 ppm	28	51mΩ	
101 120	100.00534kΩ	100.004880kΩ	4W	4.58 ppm	43	451mΩ	
1.2MOhm Range:							
102 1.2	0.1000054MΩ	0.10000488MΩ	4W	5.34 ppm	14	484mΩ	
103 1.2	1.0000094MΩ	1.00000490MΩ	4W	4.47 ppm	26	3.0Ω	
12MOhm Range:							
104 12	1.000010MΩ	1.0000049MΩ	4W	4.78 ppm	3	3.3Ω	
105 12	10.000360MΩ	10.0004010MΩ	4W	-4.14 ppm	7	66Ω	
120MOhm Range:							
106 120	10.00092MΩ	10.000401MΩ	4W	51.5 ppm	8	80Ω	
107 120	100.0177MΩ	99.99120MΩ	2W	0.026 %	5	564Ω	
1.20GOhm Range:							
108 1.2	0.1000155GΩ	0.09999120GΩ	2W	0.024 %	5	282Ω	
109 1.2	0.9983511GΩ	0.99562000GΩ	2W	0.274 %	55	1.7MΩ	

Testreport
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Certificate : SCS 9424
Unit under Test : H P 3458A System DMM
Serial No : Sample 3458A
Customer : Sample Customer
Inventory No : 131
Date : 06.02.2010
Operator : J. Stampfli

TEST	RANGE	UUT INDICATED	SYSTEM ACTUAL	MODIFIER	ERROR ERROR	EXP. M (%TOL) UNCERT	F
AC Current Verification							

120uA Range:							
110	120	99.9836µA	100.00000µA	@_40Hz	-0.016 %	9	31nA
111	120	99.9820µA	100.00000µA	@_1kHz	-0.018 %	19	31nA
1.2mA Range:							
112	1.2	0.999950mA	1.0000000mA	@_40Hz	-50.3 ppm	3	203nA
113	1.2	1.000084mA	1.0000000mA	@_1kHz	83.5 ppm	16	203nA
12mA Range:							
114	12	9.99947mA	10.000000mA	@_40Hz	-53.2 ppm	3	1.8uA
115	12	10.00080mA	10.000000mA	@_1kHz	79.7 ppm	15	1.8uA
120mA Range:							
116	120	100.0000mA	100.00000mA	@_40Hz	0.09 ppm	0	22uA
117	120	100.0147mA	100.00000mA	@_1kHz	0.015 %	27	22uA
1.2A Range:							
118	1.2	0.999847A	1.0000000A	@_40Hz	-0.015 %	8	336uA
119	1.2	1.000057A	1.0000000A	@_1kHz	57.1 ppm	5	336uA
Frequency Verification							

120		9.999872Hz	10.0000000Hz	@_1V_Sine	-12.8 ppm	26	1.0mHz
121		9.999871MHz	10.0000000MHz	@_1V_Sine	-12.9 ppm	13	1.0kHz

UUT Int. "Temp." @ Test_End = 36.5Deg.C

UUT Int. "CALSTR" @ Test_End:

"CAL 06-Feb-10 J. Stampfli ELCAL AG DIETIKON"

End of H P 3458A: C/L Manufacturing Verification