



CALIBRATION REPORT

ORDER No. _____

JANUARY 13, 2021

PAGE 1 OF 6

MANUFACTURER: OHM-LABS
 DESCRIPTION: MULTIPLE CURRENT SHUNT
 MODEL: MCS
 SERIAL:

PROCEDURE: CS CAL
 LAB ENVIRONMENT: 24.3 °C / 25 %RH
 CALIBRATION DATE: 13/JAN/2021

STANDARDS USED

ID	DESCRIPTION	MAKE & MODEL	CAL DUE
AS3195	RESISTANCE STANDARD	OHM-LABS 2001	31/MAR/2021
AS3001	RESISTANCE STANDARD	OHM-LABS 200	31/MAR/2021
AS3012	RESISTANCE STANDARD	OHM-LABS 201	31/MAR/2021
AS3021	RESISTANCE STANDARD	OHM-LABS 202	31/MAR/2021
AS3403	RESISTANCE BRIDGE	GUILDLINE 9975	28/FEB/2021
AS3407	RANGE EXTENDER	GUILDLINE 9923	28/FEB/2021
AS3519	MULTIMETER	AGILENT 34401A	07/OCT/2021

COMMENTS:

OHM-LABS, INC. CERTIFIES THAT THIS CALIBRATION IS TRACEABLE TO THE NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST), OR ANOTHER RECOGNIZED NATIONAL MEASUREMENT INSTITUTE, OR DERIVED BY A RATIO TYPE SELF-CALIBRATION TECHNIQUE, AND IS ACCREDITED TO ISO/IEC 17025:2017. OHM-LABS' QUALITY CONTROL SYSTEM MEETS THE REQUIREMENTS OF ANSI/NCSL Z540-1-1994. THE REPORTED UNCERTAINTIES REPRESENT EXPANDED UNCERTAINTIES EXPRESSED AT A CONFIDENCE LEVEL OF APPROXIMATELY 95 %, USING A COVERAGE FACTOR OF K=2. THIS UNCERTAINTY IS AT THE TIME OF TEST ONLY AND DOES NOT TAKE INTO ACCOUNT TRANSIT, USAGE, DRIFT OVER TIME, OR OTHER FACTORS AFFECTING STABILITY. THIS DOCUMENT RELATES ONLY TO THE ITEMS IDENTIFIED HEREIN, AND IS IN COMPLIANCE WITH ALL REQUIREMENTS OF THE ABOVE REFERENCED PURCHASE ORDER. THE CALIBRATION PERFORMED WAS IN ACCORDANCE WITH THE CURRENT REVISION LEVEL OF OHM-LABS' QUALITY CONTROL SYSTEM. TRAINED AND QUALIFIED PERSONNEL PERFORMED THE CALIBRATIONS IN ACCORDANCE WITH THE REQUIREMENTS OF ISO/IEC 17025:2017. THIS CERTIFICATE SHALL NOT BE REPRODUCED, EXCEPT IN FULL, WITHOUT WRITTEN PERMISSION OF OHM-LABS, INC.

PERFORMED BY

REVIEWED BY:



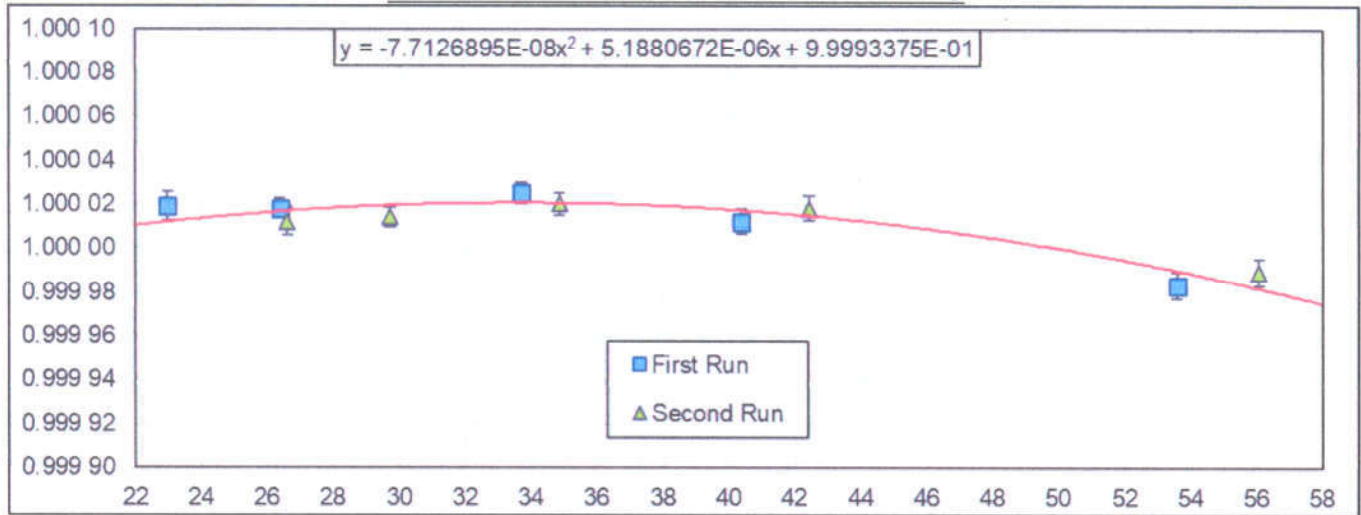
MANUFACTURER: OHM-LABS

MODEL: MCS

SERIAL:

MEASUREMENT DATA – 1 Ω / 3 A			
As FOUND / As LEFT			
APPLIED CURRENT	MEASURED VALUE		UNCERTAINTY
0.6 A	1.000 015 9 Ω		6.5 μΩ/Ω
1.2	1.000 016 4		4.4
1.8	1.000 022 9		5.1
2.4	1.000 015 4		5.8
3.0	0.999 986 4		5.8
THERMISTOR	THERMISTOR UNCERTAINTY	TEMPERATURE	TEMPERATURE UNCERTAINTY
10.111 KΩ	1 Ω	24.8 °C	2.8 °C
8.870	1	28.1	2.6
6.944	1	34.3	1.1
5.312	1	41.4	1.7
3.291	1	54.8	2.0

RESISTANCE IN OHMS VS. TEMPERATURE IN °C



EQUATION IN ABOVE CHART WAS USED TO CALCULATE VALUES IN BELOW TABLE.

TABLE OF TEMPERATURE VS. RESISTANCE

°C	Ω	°C	Ω	°C	Ω	°C	Ω
20	1.000 006 7	30	1.000 020 0	40	1.000 017 9	50	1.000 000 3
21	1.000 008 7	31	1.000 020 5	41	1.000 016 8	51	0.999 997 7
22	1.000 010 6	32	1.000 020 8	42	1.000 015 6	52	0.999 995 0
23	1.000 012 3	33	1.000 021 0	43	1.000 014 2	53	0.999 992 1
24	1.000 013 8	34	1.000 021 0	44	1.000 012 7	54	0.999 989 0
25	1.000 015 2	35	1.000 020 9	45	1.000 011 0	55	0.999 985 8
26	1.000 016 5	36	1.000 020 6	46	1.000 009 2	56	0.999 982 4
27	1.000 017 6	37	1.000 020 1	47	1.000 007 2	57	0.999 978 9
28	1.000 018 5	38	1.000 019 5	48	1.000 005 1	58	0.999 975 2
29	1.000 019 3	39	1.000 018 8	49	1.000 002 8	59	0.999 971 4

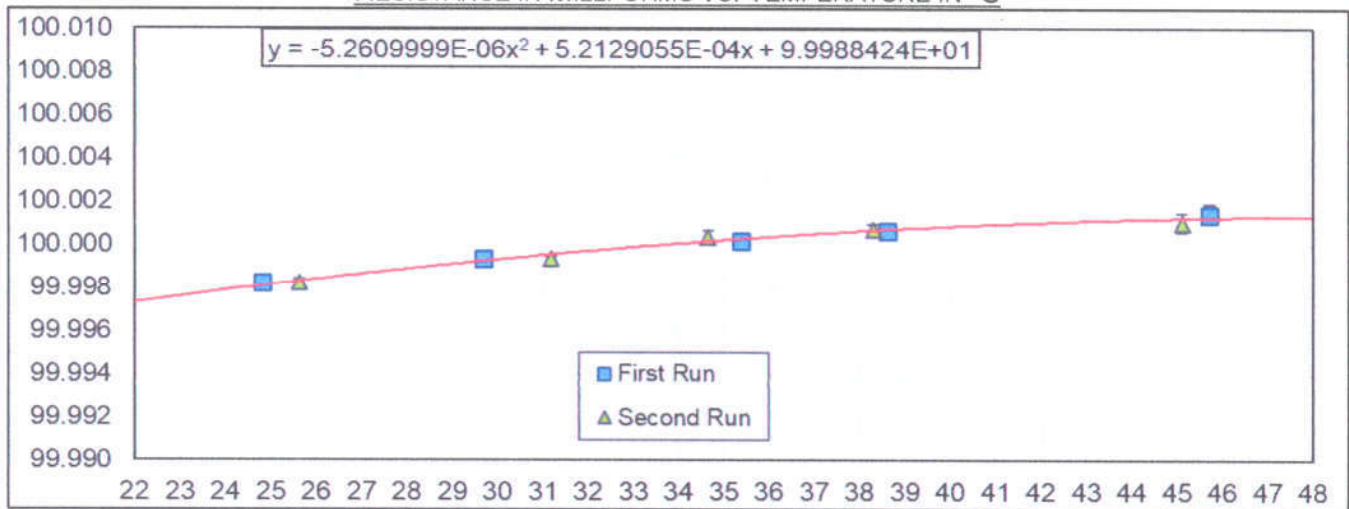
MANUFACTURER: OHM-LABS

MODEL: MCS

SERIAL:

MEASUREMENT DATA – 0.1 Ω / 10 A			
AS FOUND / AS LEFT			
APPLIED CURRENT	MEASURED VALUE		UNCERTAINTY
2 A	99.998 25 mΩ		1.8 μΩ/Ω
4	99.999 34		1.5
6	100.000 29		3.0
8	100.000 69		2.3
10	100.001 24		4.4
THERMISTOR	THERMISTOR UNCERTAINTY	TEMPERATURE	TEMPERATURE UNCERTAINTY
9.908 KΩ	1 Ω	25.2 °C	0.8 °C
8.060	1	30.4	1.3
6.748	1	35.0	0.8
5.921	1	38.5	0.5
4.583	1	45.4	0.7

RESISTANCE IN MILLI-OHMS VS. TEMPERATURE IN °C



EQUATION IN ABOVE CHART WAS USED TO CALCULATE VALUES IN BELOW TABLE.

TABLE OF TEMPERATURE VS. RESISTANCE

°C	mΩ	°C	mΩ	°C	mΩ
20	99.996 75	30	99.999 33	40	100.000 86
21	99.997 05	31	99.999 53	41	100.000 95
22	99.997 35	32	99.999 72	42	100.001 04
23	99.997 63	33	99.999 90	43	100.001 11
24	99.997 90	34	100.000 07	44	100.001 18
25	99.998 17	35	100.000 22	45	100.001 23
26	99.998 42	36	100.000 37	46	100.001 27
27	99.998 66	37	100.000 51	47	100.001 30
28	99.998 90	38	100.000 64	48	100.001 32
29	99.999 12	39	100.000 75	49	100.001 34

MANUFACTURER: OHM-LABS

MODEL: MCS

SERIAL: _____

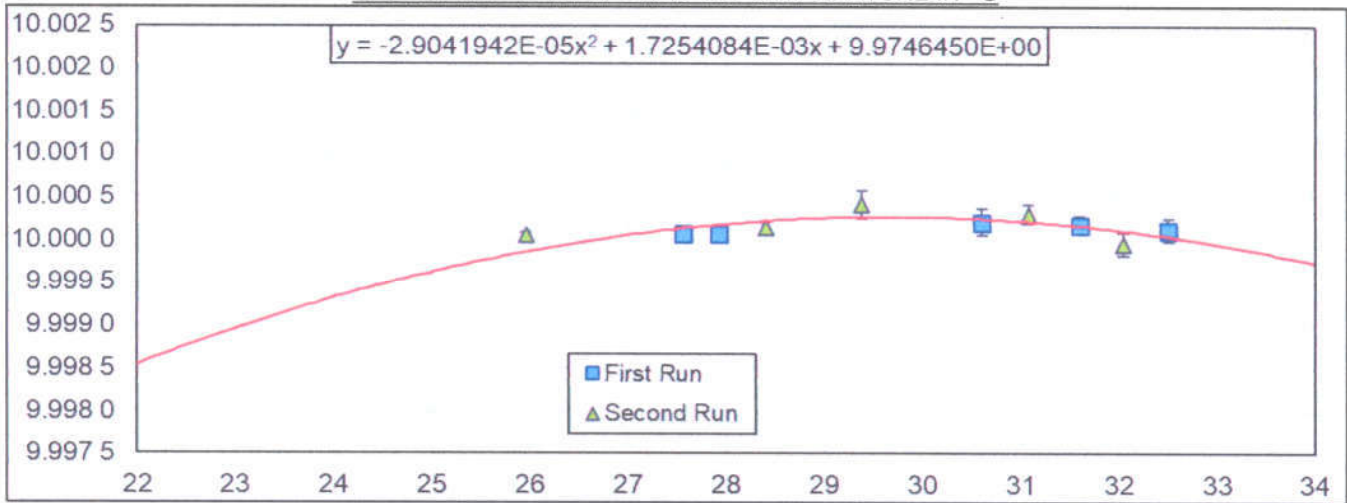
MEASUREMENT DATA – 0.01 Ω / 30 A

AS FOUND / AS LEFT

APPLIED CURRENT	MEASURED VALUE	UNCERTAINTY
6 A	10.000 06 mΩ	4 μΩ/Ω
12	10.000 11	7
18	10.000 31	17
24	10.000 24	11
30	10.000 04	14

THERMISTOR	THERMISTOR UNCERTAINTY	TEMPERATURE	TEMPERATURE UNCERTAINTY
9.322 KΩ	1 Ω	26.8 °C	1.4 °C
8.812	1	28.2	0.6
8.199	1	30.0	1.1
7.777	1	31.3	0.6
7.499	1	32.3	0.6

RESISTANCE IN MILLI-OHMS VS. TEMPERATURE IN °C



EQUATION IN ABOVE CHART WAS USED TO CALCULATE VALUES IN BELOW TABLE.

TABLE OF TEMPERATURE VS. RESISTANCE

°C	mΩ	°C	mΩ	°C	mΩ	°C	mΩ
20.0	9.997 54	25.0	9.999 63	30.0	10.000 27	35.0	9.999 46
20.5	9.997 81	25.5	9.999 76	30.5	10.000 25	35.5	9.999 30
21.0	9.998 07	26.0	9.999 87	31.0	10.000 22	36.0	9.999 12
21.5	9.998 32	26.5	9.999 97	31.5	10.000 18	36.5	9.998 93
22.0	9.998 55	27.0	10.000 06	32.0	10.000 12	37.0	9.998 73
22.5	9.998 76	27.5	10.000 13	32.5	10.000 05	37.5	9.998 51
23.0	9.998 97	28.0	10.000 19	33.0	9.999 96	38.0	9.998 27
23.5	9.999 15	28.5	10.000 23	33.5	9.999 85	38.5	9.998 03
24.0	9.999 33	29.0	10.000 26	34.0	9.999 74	39.0	9.997 76
24.5	9.999 49	29.5	10.000 27	34.5	9.999 60	39.5	9.997 49



CALIBRATION REPORT
ORDER NO.

JANUARY 13, 2021
PAGE 5 OF 6

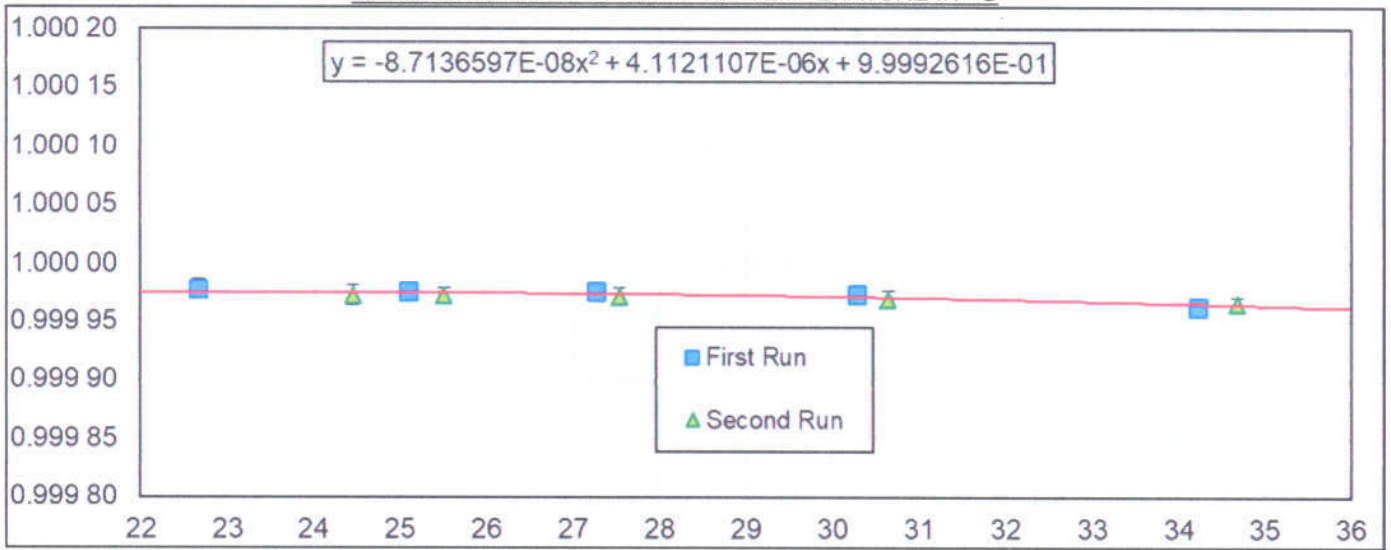
MANUFACTURER: OHM-LABS

MODEL: MCS

SERIAL:

<u>MEASUREMENT DATA – 0.001 Ω / 100 A</u>			
As FOUND / As LEFT			
APPLIED CURRENT	MEASURED VALUE		UNCERTAINTY
20 A	0.999 975 2 mΩ		8.3 μΩ/Ω
40	0.999 973 7		6.2
60	0.999 973 2		6.9
80	0.999 971 2		6.9
100	0.999 964 2		5.5
THERMISTOR	THERMISTOR UNCERTAINTY	TEMPERATURE	TEMPERATURE UNCERTAINTY
10.607 KΩ	1 Ω	23.6 °C	1.5 °C
9.880	1	25.3	0.5
9.083	1	27.4	0.4
8.047	1	30.5	0.5
6.896	1	34.5	0.6

RESISTANCE IN MILLI-OHMS VS. TEMPERATURE IN °C



EQUATION IN ABOVE CHART WAS USED TO CALCULATE VALUES IN BELOW TABLE.

TABLE OF TEMPERATURE VS. RESISTANCE

°C	mΩ	°C	mΩ	°C	mΩ	°C	mΩ
20.0	0.999 973 5	25.0	0.999 974 5	30.0	0.999 971 1	35.0	0.999 963 3
20.5	0.999 973 8	25.5	0.999 974 4	30.5	0.999 970 5	35.5	0.999 962 3
21.0	0.999 974 1	26.0	0.999 974 2	31.0	0.999 969 9	36.0	0.999 961 3
21.5	0.999 974 3	26.5	0.999 973 9	31.5	0.999 969 2	36.5	0.999 960 2
22.0	0.999 974 5	27.0	0.999 973 7	32.0	0.999 968 5	37.0	0.999 959 0
22.5	0.999 974 6	27.5	0.999 973 3	32.5	0.999 967 8	37.5	0.999 957 8
23.0	0.999 974 6	28.0	0.999 973 0	33.0	0.999 967 0	38.0	0.999 956 6
23.5	0.999 974 7	28.5	0.999 972 6	33.5	0.999 966 1	38.5	0.999 955 3
24.0	0.999 974 7	29.0	0.999 972 1	34.0	0.999 965 2	39.0	0.999 954 0
24.5	0.999 974 6	29.5	0.999 971 6	34.5	0.999 964 3	39.5	0.999 952 6

MANUFACTURER: OHM-LABS

MODEL: MCS

SERIAL: _____

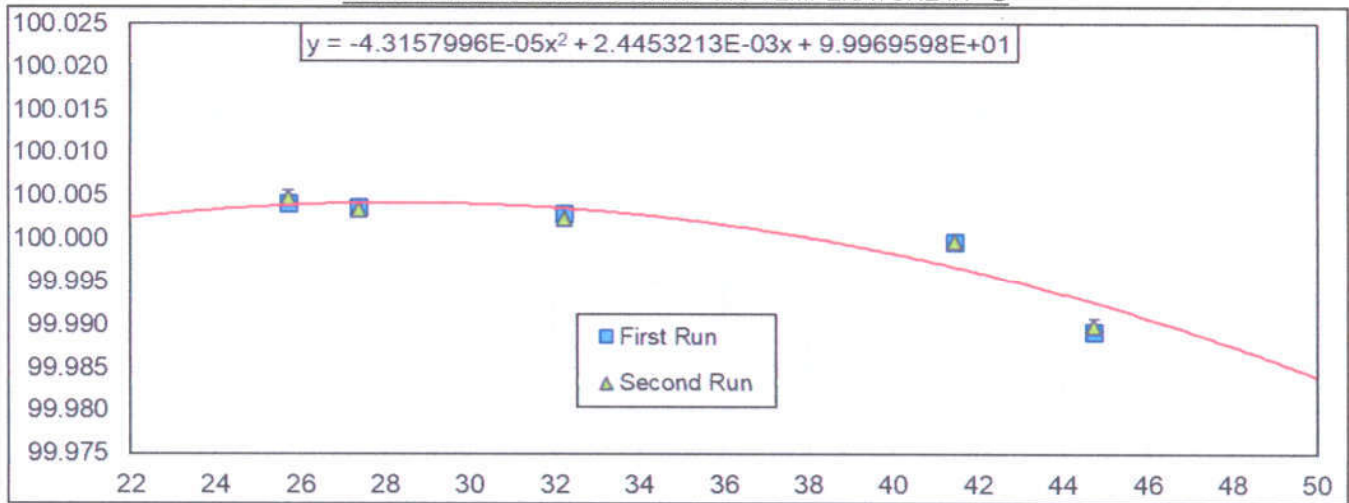
MEASUREMENT DATA – 0.000 1 Ω / 300 A

AS FOUND / AS LEFT

APPLIED CURRENT	MEASURED VALUE	UNCERTAINTY
60 A	100.004 5 μΩ	9 μΩ/Ω
120	100.003 7	7
180	100.002 7	9
240	99.999 8	5
300	99.989 4	9

THERMISTOR	THERMISTOR UNCERTAINTY	TEMPERATURE	TEMPERATURE UNCERTAINTY
9.993 KΩ	1 Ω	25.0 °C	1.2 °C
9.163	1	27.2	0.5
7.566	1	32.1	0.5
5.648	1	39.8	2.6
4.425	1	46.5	2.7

RESISTANCE IN MICRO-OHMS VS. TEMPERATURE IN °C



EQUATION IN ABOVE CHART WAS USED TO CALCULATE VALUES IN BELOW TABLE.

TABLE OF TEMPERATURE VS. RESISTANCE

°C	μΩ	°C	μΩ	°C	μΩ	°C	μΩ
20	100.001 2	30	100.004 1	40	99.998 4	50	99.984 0
21	100.001 9	31	100.003 9	41	99.997 3	51	99.982 1
22	100.002 5	32	100.003 7	42	99.996 2	52	99.980 1
23	100.003 0	33	100.003 3	43	99.994 9	53	99.978 0
24	100.003 4	34	100.002 8	44	99.993 6	54	99.975 8
25	100.003 8	35	100.002 3	45	99.992 2	55	99.973 5
26	100.004 0	36	100.001 7	46	99.990 8	56	99.971 2
27	100.004 2	37	100.001 0	47	99.989 2	57	99.968 8
28	100.004 2	38	100.000 2	48	99.987 5	58	99.966 2
29	100.004 2	39	99.999 3	49	99.985 8	59	99.963 6

END OF REPORT