

Service Provider

2F,NO.17,Lane 171,Jiu Zong Rd., Sec.2 Taipei 11494

# Calibration Certificate for METTLER TOLEDO Titrators Titration Excellence T5/T7/T9

## Customer

Company: 瑞士商梅特勒-托利多股份有限公司台灣分公司  
Address: 內湖區舊宗路二段171巷17號2樓  
City: 台北市 Zip/Postal: 114  
State/Province: Cust. ID No.: 97171937

## Device

Certified Titrator: T5  
Serial No.: C244167529 Firmware Ver.: 5.4.0  
Main Board Chip ID: 012BEFEC1D0000C7 MB Firmware Ver.: 1.2  
Asset Number:

## Procedure

The equipment detailed in this document has been calibrated and certified according to the METTLER TOLEDO certification guideline. The certification guideline document is METTLER TOLEDO's internal document, intended for exclusive use by METTLER TOLEDO service specialists.

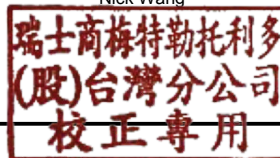
The measurements were carried out under ambient conditions and the results on the following pages of this certificate were obtained under the conditions prevailing at the time of the calibration. The values in this certificate are reported in SI units and traceable to a National or International Metrology Institute.

Building  
Floor  
Room  
Date: 23-08-2023  
Next Certificate Date: 22-08-2024

Service Technician:

*Nick Wang*

Nick Wang



## Acceptance Summary

Overall Result: Passed

Type	Slot	Chip ID	FW Ver.	As Found	As Left
Analog Board	1	01CF84FB1D0000ED	1.4		N/A
Internal Burette Drive		01ABEEEC1D0000E0	1.5		N/A

**Analog Board - As Found**

Chip ID

01CF84FB1D0000ED

**pH Sensor Input - As Found**

**Impedance Table**

Voltage	Measured Value [mV]	
	Sensor Input 1 [ $\Omega$ ]	Sensor Input 2 [ $\Omega$ ]
500 mV		
Voltage measured w/o resistor [mV]	499.73	499.69
Voltage measured w/250 M $\Omega$ resistor [mV]	499.64	499.66
$\Delta$ voltage [mV]	-0.09	-0.03
Max. permissible error [mV]	0.5	0.5
Result	✓	✓

**Sensor Input 1**

Nominal Value [mV]	Sensor Input 1			Result
	DVM Value [mV]	Sensor Value [mV]	MPE [mV]	
-1900.00	-1899.90	-1899.89	0.2	✓
-1000.00	-999.00	-998.99	0.2	✓
0.00	0.00	0.00	0.2	✓
1000.00	999.10	999.06	0.2	✓
1900.00	1900.10	1900.06	0.2	✓

**Sensor Input 2**

Nominal Value [mV]	Sensor Input 2			Result
	DVM Value [mV]	Sensor Value [mV]	MPE [mV]	
-1900.00	-1899.90	-1899.85	0.2	✓
-1000.00	-999.00	-998.99	0.2	✓
0.00	0.00	-0.03	0.2	✓
1000.00	999.10	999.06	0.2	✓
1900.00	1900.10	1900.04	0.2	✓

**Polarized Voltametric Sensor - As Found**

**Current Source**

Certified Value of Resistor [ $\Omega$ ]	Measured at Target Current [ $\mu$ A]	Positive Voltage Value* [mV]	Negative Voltage Value* [mV]	Measured Current [ $\mu$ A]	Target Current [ $\mu$ A]	MPE [ $\mu$ A]	Result
10002.6	10.00	100.49	-100.47	10.05	10.00	1.00	✓
	20.00	199.95	-199.97	19.99	20.00	1.00	✓

**Sensor Input**

Measured at Target Current [ $\mu$ A]	Average Voltage [mV]	Voltage Sensor Input [mV]	Difference Found [mV]	MPE [mV]	Result
10.00	100.48	100.50	-0.02	2.00	✓
20.00	199.96	200.00	-0.04	2.00	✓

\* Reading from the DVM

**Polarized Amperometric Sensor - As Found**

**Voltage Source**

Certified Value of Resistor [ $\Omega$ ]	Measured at Target Voltage [mV]	Positive Voltage Value* [mV]	Negative Voltage Value* [mV]	Average Voltage [mV]	MPE [mV]	Result
10002.6	1000.00	1006.30	-1007.40	1006.85	10.00	✓
	2000.00	2001.60	-2002.90	2002.25	10.00	✓

**Sensor Input**

Measured at Target Voltage [mV]	Average Current [µA]	Current Sensor Input [µA]	Difference Found [µA]	MPE [µA]	Result
1000.00	100.66	100.74	-0.08	0.2	✓
2000.00	200.17	200.29	-0.12	0.2	✓

\* Reading from the DVM

**Temperature Sensor Input Pt1000 - As Found**

Pt1000 [°C]	Measured Value [°C]	Difference [°C]	MPE [°C]	Result
0	-0.03	-0.03	0.2	✓
130	129.99	-0.01	0.2	✓

**Stroke of the Burette Drive As Found**

Serial Number: C244167529

**Measured Values at 10% Burette Stroke**

Measured	Zero Point [µM]	Max Value [µM]	Actual Value [µM]	Set Value [µM]	Deviation [µM]
1	0	5002	5002	5000	2
2	-1	5000	5001	5000	1
3	-1	4999	5000	5000	0
$\bar{x}$	-0.67	5000.33	5001.00	5000	1.00

**Measured Values at 30% Burette Stroke**

Measured	Zero Point [µM]	Max Value [µM]	Actual Value [µM]	Set Value [µM]	Deviation [µM]
1	-2	15000	15002	15000	2
2	-1	15000	15001	15000	1
3	-1	15000	15001	15000	1
$\bar{x}$	-1.33	15000.00	15001.33	15000	1.33

**Measured Values at 50% Burette Stroke**

Measured	Zero Point [µM]	Max Value [µM]	Actual Value [µM]	Set Value [µM]	Deviation [µM]
1	-1	24992	24993	25000	-7
2	-2	24992	24994	25000	-6
3	-3	24992	24995	25000	-5
$\bar{x}$	-2.00	24992.00	24994.00	25000	-6.00

**Measured Values at 100% Burette Stroke**

Measured	Zero Point [µM]	Max Value [µM]	Actual Value [µM]	Set Value [µM]	Deviation [µM]
1	-3	49981	49984	50000	-16
2	-3	49982	49985	50000	-15
3	-3	49981	49984	50000	-16
$\bar{x}$	-3.00	49981.33	49984.33	50000	-15.67

These values are transferred to "Summary of the burette stroke measurements." In the summary, deviation values are shown as absolute values and two digits are added to the computed mean value to reduce rounding errors.

**Summary of Burette Stroke Drive Measurements As Found**

Burette Drive	10%	30%	50%	100%
Set Stroke [ $\mu\text{M}$ ]	5000	15000	25000	50000
Actual Stroke [ $\mu\text{M}$ ]	5001.00	15001.33	24994.00	49984.33
Absolute Deviation [ $\mu\text{M}$ ]	1.00	1.33	6.00	15.67
Volume error calculated for 10mL burette [ $\mu\text{L}$ ]	0.20	0.27	1.20	3.13
Max. Permissible Error [ $\mu\text{M}$ ]	15	15	25	50
Result	✓	✓	✓	✓

## Test Equipment

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### Digital Voltmeter

Serial No:	78260089	Certificate No:	A112-03-201-01
Model Type:	187	Last Certification Date:	02-03-2023
Supplier	FLUKE		

### KF Resistor Unit

Serial No:	TC02A0130	Certificate No:	66208
Supplier	METTLER TOLEDO	Last Certification Date:	07-10-2022

### Micrometer

Serial No:	7Z 006 00	Certificate No:	193393
Model Type:	DIGICO 2	Last Certification Date:	06-10-2022
Supplier	TESA		

### mV Sensor Resistor

Serial No:	TC01A0030	Certificate No:	66214
Supplier	METTLER TOLEDO	Last Certification Date:	07-10-2022

### Temperature Resistors PT100 & PT1000

Serial No:	A4098	Certificate No:	66211
Supplier	METTLER TOLEDO	Last Certification Date:	07-10-2022

### Test Unit

Serial No:	5129350029	Certificate No:	N/A
Supplier	METTLER TOLEDO	Firmware Version:	1.0
Chip ID:	01347082120000B		

## Remarks

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NA

This document is issued to record completion of the work performed by METTLER TOLEDO on the subject device in accordance with agreed standards. It does not guarantee the continued performance of the subject device. Any measurements recorded are based on the subject device's performance at a given time as tested by METTLER TOLEDO and, except where explicitly stated otherwise, do not express an opinion as to the sufficiency of any customer designed procedures used to test the device. This document is not a warranty, either implied or express. METTLER TOLEDO expressly disclaims any liability arising from the use of the information in this document for any purpose other than as specified herein.