Mass Calibration Report

Report No: MC2311061

Mettler-Toledo (S) Pte Ltd

Address	1 Clementi Loop #02-03A, Singapore 129808
Telephone	65 6890 0011
Facsimile	65 6890 0012

Customer Information

Name of customer	:	Mettler-Toledo Pac Rim AG Taiwan Branch (Switzerland)
Customer Address	:	Jiu Zong Rd Neihu District 17 Lane 171 Sec 2 Taipei Taiwan R.O.C.11494 Taiwan

Customer's Weight Information

Customer Weight Serial No/ ID	:	158856 / SVC-W052
Customer's Weight Range	:	1mg - 1kg
Customer's Weight Class	:	E Class
Customer Weight Manufacturer	:	Mettler-Toledo

Calibration Location

METTLER TOLEDO Mass Calibration Laboratory
1 Clementi Loop #02-03A, Singapore 129808

Calibration Information

Calibration Date	:	11-Nov-23
Report Issue Date	:	24-Nov-23
Work Order No.	:	220720349
Equipement Type	:	Mass Comparator
Manufacturer	:	Mettler Toledo

Details of Mass Comparators can be found on Pg 2

Environment Conditions

Atmospheric Pressure, hPa	:	1012.1
Ambient Temperature, °C	:	20.3
Relative Humidity, %RH	:	52.4

Cheng Yu Xiang
Calibration Officer

Sun Xueyang
Approved Signatory

Accredited Laboratory
SAC-SINGLAS
LA-2005-0329-C

METTLER TOLEDO

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Method of Calibration

The calibration procedure is performed according to Mettler-Toledo quality procedure reference no. QP-SVC-9-020 and using Standard mass set serial number C314945270 traceable to international standards with callibration report number C314945270.

The calibration was performed by comparison with the reference weights of the Calibration Laboratory in a controlled environment by using substitution weighing method (ABA) on a mass comparator. The conventional mass values were determined.

Reference

Conventional density of the weights	:	8000	kg/m³
Mean air density :	:	1.20	kg/m³

Reference standards instrument :

Instrument	OIML Class	Model	Serial No.	Certificate No.	Due Date
Mass comparator	N/A	XP205CDR	B321363756	SG0114-027-071723-ACC-SG	17-Jul-24
Mass comparator	N/A	XP2004S	B323399156	SG0036-046-071723-ACC-SG	17-Jul-24
Mass comparator	N/A	XP26003L	B323399155	SG0036-047-071723-ACC-SG	17-Jul-24
Mass comparator	N/A	XPE26C	B502454763	SG0036-048-071823-ACC-SG	18-Jul-24
Mass comparator	N/A	XPE505C	B502465607	SG0114-028-071723-ACC-SG	17-Jul-24
METTLER TOLEDO Weight Set	E1	1mg to 2kg	C314945270	C314945270	19-Apr-24

The results reported herein have been performed in accordance with the laboratory's term of accreditation under Singapore Accreditation Council - Singapore Laboratory Accreditation Scheme.

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Cheng Yu Xiang
Calibration Officer

METTLER TOLEDO Calibration Service

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Results of Calibration

Nominal Value	Marking /Serial No.	OIML Class	Conventional Mass Correction g	Measured Conventional Mass g	Expanded Uncertainty g	OIML Tolerance g	Within Class Tolerance? (Y/N)
1mg		E2	0.000002	0.001002	0.000002	0.000006	Y
2mg		E2	0.000000	0.002000	0.000002	0.000006	Y
2mg	*	E2	0.000001	0.002001	0.000002	0.000006	Y
5mg		E2	0.000001	0.005001	0.000002	0.000006	Y
10mg		E2	0.000001	0.010001	0.000003	0.000008	Y
20mg		E2	0.000002	0.020002	0.000003	0.000010	Y
20mg	*	E2	0.000003	0.020003	0.000003	0.000010	Y
50mg		E2	-0.000002	0.049998	0.000004	0.000012	Y
100mg		E2	0.000000	0.100000	0.000005	0.000016	Y
200mg		E2	0.000001	0.200001	0.000007	0.000020	Y
200mg	*	E2	0.000002	0.200002	0.000007	0.000020	Y
500mg		E2	0.000000	0.500000	0.000008	0.000025	Y
1g		E2	0.000004	1.000004	0.000010	0.000030	Y
2g		E2	0.000002	2.000002	0.000013	0.000040	Y
2g	*	E2	0.000008	2.000008	0.000013	0.000040	Y
5g		E2	0.000014	5.000014	0.000017	0.000050	Y
10g		E2	0.000019	10.000019	0.000020	0.000060	Y
20g		E2	-0.000011	19.999989	0.000027	0.000080	Y
20g	*	E2	0.00003	20.00003	0.00003	0.00008	Y
50g		E2	-0.00005	49.99995	0.00003	0.00010	Y
200g	*	E2	-0.00005	199.99995	0.00010	0.00030	Y
200g	*	E2	-0.00005	199.99995	0.00010	0.00030	Y
500g		E2	0.00013	500.00013	0.00027	0.00080	Y
1kg		E2	-0.0003	999.9997	0.0005	0.0016	Y

Note : Asterisk mark " * " denotes weights with marking or bent tip.

The calibration results apply only on the above calibrated item and was found accurate as shown on date and place of calibration.

The associated expanded uncertainty of measurement were estimated at a level of confidence of approximately 95% with a coverage factor of k = 2.

The user should determine the suitability of the weight(s) for its intended use.

Cheng Yu Xiang
Calibration Officer

METTLER TOLEDO Calibration Service

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SINGAPORE LABORATORY ACCREDITATION SCHEME

Accredited Laboratory SAC-SINGLAS

Schedule

Mettler-Toledo (S) Pte Ltd
1 Clementi Loop
#02-03A
Singapore 129808

Certificate No. : LA-2005-0329-C

Issue No. : 19

Date : 06 November 2023

Expiry of Certificate : 12 June 2026

FIELD OF TESTING : Calibration and Measurement

MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED		METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
MECHANICAL			
1. Weighing Balances and Scales			
On-site calibration		QP-SVC-9-011, Rev.:18 27 May 2019	
Range	Resolution		
0 to 2.1 g	0.000 1 mg		0.030 mg
0 to 5.1 g	0.000 1 mg		0.035 mg
0 to 22 g	0.001 mg	i) Off-center errors	0.06 mg
0 to 52 g	0.001 mg	ii) Hysteresis	0.065 mg
0 to 220 g	0.1 mg	iii) Repeatability	0.2 mg
0 to 220 g	0.01mg	iv) Accuracy and Linearity	0.16 mg
0 to 520 g	0.1 mg		0.5 mg
0 to 1 210 g	0.001 g	Environmental Conditions:	0.002 g
0 to 2 300 g	0.001 g	Temperature : 18 °C to 29 °C	0.006 g
0 to 8 100 g	0.01 g	Relative Humidity : 45 % to 73 %	0.02 g
0 to 10 100 g	0.01 g	Air pressure: 1005 hPa to 1030 hPa	0.02 g
0 to 32 000 g	0.1 g		0.1 g
0 to 150 000 g	0.1 g		0.4 g

MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED		METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
2. Weighing Balances and Scales (ACC) On-site calibration		QP-SVC-9-024, Rev.:03 13 September 2019 (Euramet Cg-18)	
2A. Balance			
Range	Resolution	Uncertainty contributions:	
≤ 20mg	0.000 1 mg	i) Rounding error at load	0.0019 mg
> 20mg … ≤ 50mg	0.000 1 mg	ii) Rounding error at no load	0.0025 mg
> 50mg … ≤ 100mg	0.000 1 mg	iii) Error due to eccentricity	0.0030 mg
> 100mg … ≤ 200mg	0.000 1 mg	iv) Error due to repeatability	0.0036 mg
> 200mg … ≤ 500mg	0.000 1 mg	v) Uncertainty of reference mass	0.0048 mg
> 500mg … ≤ 1g	0.000 1 mg	vi) Correction of air buoyancy	0.0059 mg
> 1g … ≤ 2g	0.000 1 mg	vii) Correction of drift of weights	0.0071 mg
> 2g … ≤ 5g	0.000 1 mg	viii) Correction of convection	0.0094 mg
> 5g … ≤ 6g	0.000 1 mg		0.0150 mg
> 6g … ≤ 10g	0.00 1 mg		0.020 mg
> 10g … ≤ 20g	0.00 1 mg		0.030 mg
> 20g … ≤ 50g	0.00 1 mg		0.062 mg
> 50g … ≤ 100g	0.0 1 mg		0.14 mg
> 100g … ≤ 150g	0.0 1 mg		0.22 mg
> 150g … ≤ 200g	0.0 1 mg		0.25 mg
> 200g … ≤ 300g	0.0 1 mg		0.38 mg
> 300g … ≤ 400g	0.0 1 mg		0.48 mg
> 400g … ≤ 500g	0.0 1 mg		0.61 mg
> 500g … ≤ 700g	0. 1 mg		2.1 mg
> 700g … ≤ 1000g	0. 1 mg		3.0 mg
> 1kg … ≤ 1.5kg	0. 1 mg		4.5 mg
> 1.5kg … ≤ 2kg	0. 1 mg		5.9 mg
> 2kg … ≤ 2.3kg	0. 1 mg		7.0 mg
> 2.3kg … ≤ 3kg	1 mg		9 mg
> 3kg … ≤ 4kg	1 mg		12 mg
> 4kg … ≤ 5.1kg	1 mg		15 mg
> 5.1kg … ≤ 6kg	1 mg		25 mg
> 6kg … ≤ 7kg	0.0 1 g		0.027 g
> 7kg … ≤ 8kg	0.0 1 g		0.029 g
> 8kg … ≤ 10kg	0.0 1 g		0.035 g

MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
2B. Scale		
Range / Resolution		
> 10kg … ≤ 15kg / 0. 1 g		0.19 g
> 15kg … ≤ 20kg / 0. 1 g		0.19 g
> 20kg … ≤ 30kg / 0. 1 g		0.20 g
> 30kg … ≤ 40kg / 0. 1 g		0.25 g
> 40kg … ≤ 50kg / 0. 1 g		0.26 g
> 50kg … ≤ 60kg / 0. 1 g		0.28 g
> 60kg … ≤ 64kg / 0. 1 g		0.29 g
> 64kg … ≤ 150kg / 1 g		1.6 g
> 150kg … ≤ 300kg / 1 g		2.8 g
> 300kg … ≤ 600kg / 10 g		38 g
> 600kg … ≤ 1000kg / 10 g		180 g
3. Piston Operated Devices (Ex)		
Accuracy and Precision Test In-house only	QP-SVC-9-018, Rev.: 13 09 May 2022	
3A Single & Multi-Channel Air Displacement (Type A), (Ex)		
Range		
0uL < V ≤ 2uL		0.0044 µl
2uL < V ≤ 10uL		0.0057 µl
10uL < V ≤ 20uL		0.016 µl
20uL < V ≤ 50uL		0.027 µl
50uL < V ≤ 100uL		0.034 µl
100uL < V ≤ 200uL		0.082 µl
200uL < V ≤ 300uL		0.085 µl
300uL < V ≤ 1000uL		0.16 µl
1000uL < V ≤ 1200uL		0.34 µl
1200uL < V ≤ 2000uL		0.67 µl
2000uL < V ≤ 10 000uL		1.1 µl
10 000uL < V ≤ 20 000uL		4.6 uL

MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
3B Single Channel, Positive Displacement Type D (Ex)		
Range		
0uL < V ≤ 10uL		0.0019 uL
10uL < V ≤ 25uL		0.018 uL
25uL < V ≤ 50uL		0.027 uL
50uL < V ≤ 100uL		0.039 uL
100uL < V ≤ 250uL		0.098uL
250uL < V ≤ 500uL		0.17 uL
500uL < V ≤ 1000uL		0.20 uL
3C Multiple Type Delivery Systems (Ex)		
Range		
0uL < V ≤ 2uL		0.0087 uL
2uL < V ≤ 10uL		0.017 uL
10uL < V ≤ 20uL		0.018 uL
20uL < V ≤ 100uL		0.023 uL
100uL < V ≤ 200uL		0.11 uL
200uL < V ≤ 1 000uL		0.19 uL
1 000uL < V ≤ 5 000uL		0.48 uL
5 000uL < V ≤ 10 000uL		0.92
10 000uL < V ≤ 50 000uL		4.70 uL
3D Single Channel, Repetitive (Ex)		
Range		
0uL < V ≤ 10uL		0.0019 uL
10uL < V ≤ 20uL		0.0023 uL
20uL < V ≤ 100uL		0.0077 uL
100uL < V ≤ 200uL		0.023 uL
200uL < V ≤ 1 000uL		0.091 uL
1 000uL < V ≤ 2 000uL		0.18 uL
3E Bottle Top Dispenser (Ex)		
Range		
0mL < V ≤ 5mL		1.9 uL
5mL < V ≤ 10mL		2.1 uL
10mL < V ≤ 12.5mL		7.1 uL
12.5mL < V ≤ 25mL		10 uL
25mL < V ≤ 50mL		13 uL
50mL < V ≤ 100mL		17 uL
3F Bottle Top Burette (Ex)		
Range		
0mL < V ≤ 25mL		2.4uL

MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
4. Standard Weights (Lab) (Class F and below) In-house calibration	QP-SVC-9-020, Rev.: 07, 19 September 2019	
<u>Range</u>		
1 mg		0.003 mg
2 mg		0.003 mg
5 mg		0.003 mg
10 mg		0.003 mg
20 mg		0.004 mg
50 mg		0.005 mg
100 mg		0.007 mg
200 mg		0.007 mg
500 mg		0.01 mg
1 g		0.02 mg
2 g		0.02 mg
5 g		0.02 mg
10 g		0.03 mg
20 g		0.04 mg
50 g		0.05 mg
100 g		0.06 mg
200 g		0.11 mg
500 g		0.3 mg
1 kg		0.6 mg
2 kg		0.7 mg
5 kg		3 mg
10 kg		4 mg
20 kg		6 mg

MEASURED QUANTITIES/ INSTRUMENT/ RANGE TO BE CALIBRATED	METHOD	CALIBRATION AND MEASUREMENT CAPABILITY (CMC*)
5. Standard Weights (Lab) (Class E2 ONLY) In-house calibration	QP-SVC-9-020, Rev.: 07, 19 September 2019	
<u>Range</u>		
1 mg		0.001 mg
2 mg		0.002 mg
5 mg		0.002 mg
10 mg		0.002 mg
20 mg		0.002 mg
50 mg		0.002 mg
100 mg		0.002 mg
200 mg		0.003 mg
500 mg		0.004 mg
1 g		0.005 mg
2 g		0.006 mg
5 g		0.010 mg
10 g		0.016 mg
20 g		0.019 mg
50 g		0.020 mg
100 g		0.02 mg
200 g		0.05 mg
500 g		0.13 mg
1 kg		0.30 mg
2 kg		0.50 mg
6. Standard Weights (IND) (Class M2 and below) In-house calibration	WI-SVC-MAS-001, Rev.:00 02 August 2016	
<u>Range</u>		
1000 kg		0.06 kg

*CMC is expressed as an expanded uncertainty estimated at a level of confidence of approximately 95%

Schedule

Accredited Laboratory SAC-SINGLAS

Certificate No. : LA-2005-0329-C Issue No. : 19

Date : 06 November 2023 Page : 7 of 7

Approved Signatories:

Mr Lee Yong Yee	· For all items
Mr Chua Wen Feng	· For all items
Mr James Ng	· For items 1 & 2B
Mr Antonius Christian	· For items 1 & 2A
Mr Sun Xueyang	· For items 3, 4, 5 & 6

Note:

This laboratory is accredited in accordance with the recognised International Standard ISO/IEC 17025. A laboratory's fulfilment of the requirements of ISO/IEC 17025 means the laboratory meets both the technical competence requirements and **management system requirements** that are necessary for it to consistently deliver technically valid calibration results. The **management system requirements** in ISO/IEC 17025 are written in language relevant to laboratory operations and operate generally in accordance with the principles of ISO 9001.