Calibration Certificate ID
NA1134-017-121520-ACC-USL

Mettler Toledo, LLC
1900 Polaris Parkway
Columbus, OH 43240
1.800.METTLER

METTLER TOLEDO

Accredited by the American Association for Laboratory Accreditation (A2LA)
CALIBRATION CERT #1788.01

ISO 17025 Accredited
ANSI/NCSL Z540-1 Accredited

Accuracy Calibration Certificate

Customer

Company:	Houston Forensic Science Center Inc		
Address:	500 Jefferson; 13th Floor		
City:	Houston	**Contact:**	Callan Hundl
Zip / Postal:	77002		
State / Province:	Texas		

Weighing Device

Manufacturer:	Mettler Toledo	**Instrument Type:**	Weighing Instrument
Model:	AB104-S/FACT	**Asset Number:**	342245
Serial No.:	1123241782	**Terminal Model:**	N/A
Building:	500	**Terminal Serial No.:**	N/A
Floor:	18th Floor	**Terminal Asset No.:**	N/A
Room:	1814		

Range	Max. Capacity	Readability (d)
1	110 g	0.0001 g

Procedure

Calibration Guideline:	EURAMET cg-18 v. 4.0 (11/2015)
METTLER TOLEDO Work Instruction:	30260953

This calibration certificate contains measurements for As Found and As Left calibrations.

The sensitivity/span of the weighing instrument was adjusted before As Left calibration with a built-in weight.

	Temperature	
As Found	Start: 20.0 °C	End: 20.0 °C
As Left	Start: 20.0 °C	End: 20.0 °C

Environmental conditions have been verified to ensure the accuracy of the calibration.

This certificate is issued in accordance with the conditions of accreditation granted by A2LA, which is based on ISO/IEC 17025. A2LA has assessed the measurement capability of the laboratory and its traceability to recognized national standards.

As Found Calibration Date:	15-Dec-2020	**Authorized A2LA Signatory:**	Jesus Barrios
As Left Calibration Date:	15-Dec-2020		
Issue Date:	15-Dec-2020		
Requested Next Calibration Date:	31-Dec-2021		

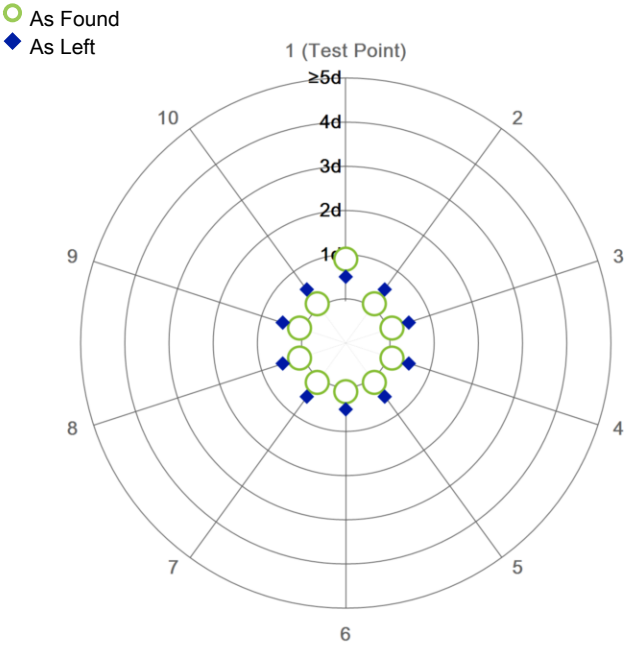
Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0004 g	100.0000 g
2	100.0005 g	99.9999 g
3	100.0005 g	100.0000 g
4	100.0005 g	99.9999 g
5	100.0005 g	100.0000 g
6	100.0005 g	99.9999 g
7	100.0005 g	100.0000 g
8	100.0005 g	99.9999 g
9	100.0005 g	100.0000 g
10	100.0005 g	99.9999 g

Standard Deviation	**0.00003 g**	**0.00005 g**



The "d" in the graph represents the readability of the range/interval in which the test was performed.

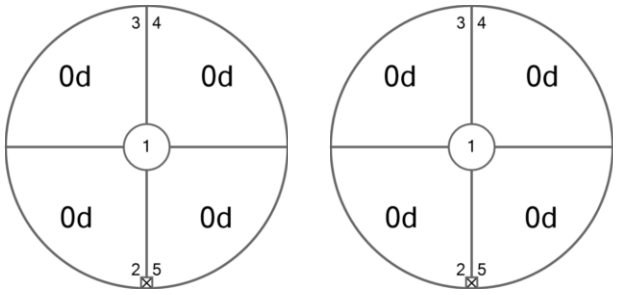
The results of this graph are based upon the absolute values of the differences from the mean value.

Eccentricity

Test Load: 50 g

Position	As Found	As Left
1	0.0000 g	0.0000 g
2	0.0000 g	0.0000 g
3	0.0000 g	0.0000 g
4	0.0000 g	0.0000 g
5	0.0000 g	0.0000 g

Maximum Deviation	**0.0000 g**	**0.0000 g**



As Found **As Left**

The "d" in the graph represents the readability of the range/interval in which the test was performed.

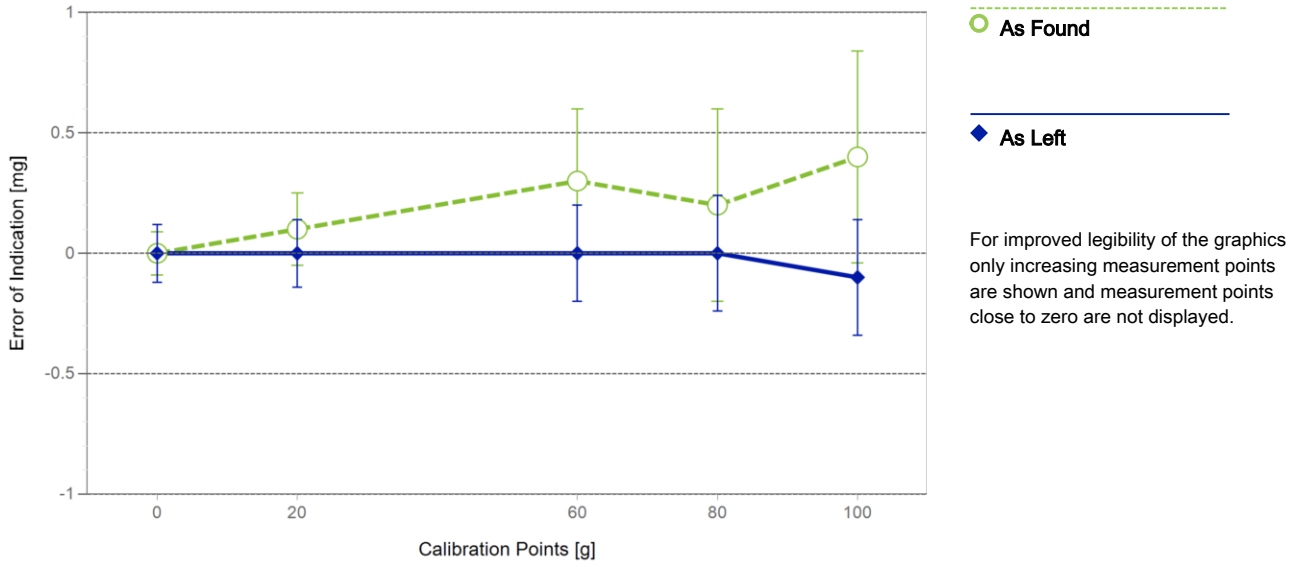
Error of Indication

As Found

	Tare Load	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	N/A	0.0000 g	0.0000 g	0.0000 g	0.09 mg	2
2	0 g	20.0000 g	20.0001 g	0.0001 g	0.15 mg	2
3	20 g	20.0000 g	20.0001 g	0.0001 g	0.15 mg	2
4	40 g	20.0000 g	20.0000 g	0.0000 g	0.15 mg	2
5	60 g	20.0000 g	20.0003 g	0.0003 g	0.15 mg	2
6	80 g	20.0000 g	20.0000 g	0.0000 g	0.15 mg	2
7	N/A	59.9999 g	60.0002 g	0.0003 g	0.30 mg	2
8	N/A	79.9999 g	80.0001 g	0.0002 g	0.40 mg	2
9	N/A	100.0001 g	100.0005 g	0.0004 g	0.44 mg	2

As Left

	Tare Load	Reference Value	Indication	Error of Indication	Expanded Uncertainty	k
1	N/A	0.0000 g	0.0000 g	0.0000 g	0.12 mg	2
2	0 g	20.0000 g	20.0000 g	0.0000 g	0.14 mg	2
3	20 g	20.0000 g	19.9999 g	-0.0001 g	0.14 mg	2
4	40 g	20.0000 g	20.0001 g	0.0001 g	0.14 mg	2
5	60 g	20.0000 g	19.9998 g	-0.0002 g	0.14 mg	2
6	80 g	20.0000 g	20.0000 g	0.0000 g	0.14 mg	2
7	N/A	59.9999 g	59.9999 g	0.0000 g	0.20 mg	2
8	N/A	79.9999 g	79.9999 g	0.0000 g	0.24 mg	2
9	N/A	100.0001 g	100.0000 g	-0.0001 g	0.24 mg	2



For improved legibility of the graphics only increasing measurement points are shown and measurement points close to zero are not displayed.

The uncertainty stated is the expanded uncertainty at calibration obtained by multiplying the standard combined uncertainty by the coverage factor k – which can be larger than 2 according to EURAMET cg-18. The value of the measurand lies within the assigned range of values with a probability of approximately 95%.

The user is responsible for maintaining environmental conditions and the settings of the weighing instrument when it was calibrated.

Test Equipment

All weights used for metrological testing are traceable to national or international standards. The weights were calibrated and certified by an accredited calibration laboratory.

Weight Set 1: OIML E2

Weight Set No.:	304	Date of Issue:	27-Feb-2020
Certificate Number:	01127583-1	Calibration Due Date:	28-Feb-2021

Remarks

BALANCE PASSES ALL FINAL TESTED PARAMETERS.

J.B.

End of Accredited Section

The information below and any attachments to this calibration certificate are not part of the accredited calibration.

Measurement Uncertainty of the Weighing Instrument in Use

Stated is the expanded uncertainty with k=2 in use. The formula shall be used for the estimation of the uncertainty under consideration of the errors of indication. The value R represents the net load indication in the unit of measure of the device.

Temperature coefficient for the evaluation of the measurement uncertainty in use: $2.5 \cdot 10^{-6}$ / K

Temperature range on site for the evaluation of the measurement uncertainty in use: 4 K

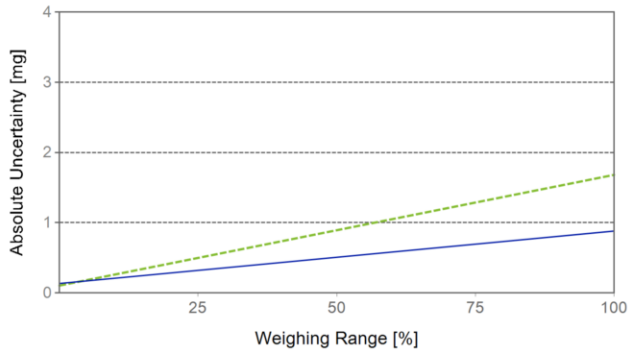
Linearization of Uncertainty Equation

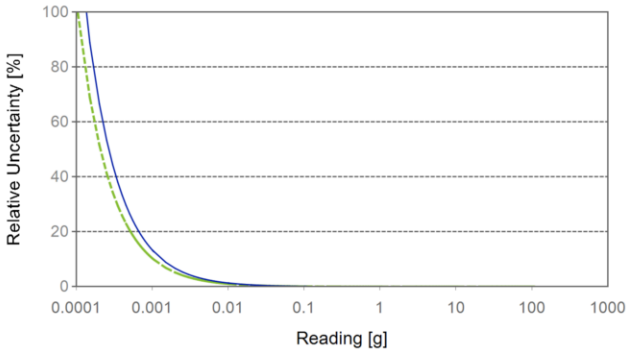
Range			As Found	As Left
	d	Max		
1	0.0001 g	110 g	U_1 = 0.10 mg + 0.0143 mg/g · R	U_1 = 0.13 mg + 0.00679 mg/g · R

To optimize the stability of the linearization, besides of the zero load only increasing measurement points with a test load of 5% of the measurement range or larger are taken for the calculation of the linear equation.

Absolute and Relative Measurement Uncertainty in Use for Various Net Indications (Examples)

Net Indication	As Found		As Left	
0.0110 g	0.10 mg	0.91%	0.13 mg	1.2%
0.1100 g	0.10 mg	0.092%	0.13 mg	0.12%
1.1000 g	0.12 mg	0.011%	0.14 mg	0.012%
11.0000 g	0.26 mg	0.0023%	0.20 mg	0.0019%
110.0000 g	1.7 mg	0.0015%	0.88 mg	0.00080%





As Found As Left

METTLER TOLEDO Service

Manufacturer Tolerance Assessment

Assessment done without considering measurement uncertainty.

The measurements from the attached calibration certificate were assessed against METTLER TOLEDO tolerances defined in SOP 'Test and Measurement Procedures for METTLER TOLEDO balances, Document: 10000018502.

	As Found	As Left
Overall	✓	✓
Repeatability	✓	✓
Eccentricity	✓	✓
Linearity	✓	✓
Sensitivity	N/A	✓

Measurement Results

Repeatability

Test Load: 100 g

	As Found	As Left
1	100.0004 g	100.0000 g
2	100.0005 g	99.9999 g
3	100.0005 g	100.0000 g
4	100.0005 g	99.9999 g
5	100.0005 g	100.0000 g
6	100.0005 g	99.9999 g
7	100.0005 g	100.0000 g
8	100.0005 g	99.9999 g
9	100.0005 g	100.0000 g
10	100.0005 g	99.9999 g

Standard Deviation	**0.00003 g**	**0.00005 g**
Tolerance	**0.00010 g** ✓	**0.00010 g** ✓

Eccentricity

Test Load: 50 g

Position	As Found	As Left
1	0.0000 g	0.0000 g
2	0.0000 g	0.0000 g
3	0.0000 g	0.0000 g
4	0.0000 g	0.0000 g
5	0.0000 g	0.0000 g

Maximum Deviation	**0.0000 g**	**0.0000 g**
Tolerance	**0.00030 g** ✓	**0.00030 g** ✓

The maximum deviation is determined as the absolute value of the largest deviation from the center.

Linearity - Differential Method

As Found

	Preload	Reference Value	Indication	Deviation
2	0 g	20.0000 g	20.0001 g	0.00000 g
3	20 g	20.0000 g	20.0001 g	0.00000 g
4	40 g	20.0000 g	20.0000 g	-0.00010 g
5	60 g	20.0000 g	20.0003 g	0.00010 g
6	80 g	20.0000 g	20.0000 g	0.00000 g
9	N/A	100.0001 g	100.0005 g	N/A

Linearity Deviation	**0.00010 g**	**Sensitivity Deviation**	**0.0004 g**
Linearity Tolerance	**0.0002 g** ✓	**Sensitivity Tolerance**	**N/A**

The As Found Sensitivity Tolerance is only valid if the device has been adjusted before the test.

As Left

	Preload	Reference Value	Indication	Deviation
2	0 g	20.0000 g	20.0000 g	0.00004 g
3	20 g	20.0000 g	19.9999 g	-0.00002 g
4	40 g	20.0000 g	20.0001 g	0.00012 g
5	60 g	20.0000 g	19.9998 g	-0.00004 g
6	80 g	20.0000 g	20.0000 g	0.00000 g
9*	N/A	100.0001 g	100.0000 g	N/A

Linearity Deviation	**0.00012 g**	**Sensitivity Deviation**	**0.0001 g**
Linearity Tolerance	**0.0002 g** ✓	**Sensitivity Tolerance**	**0.0005 g** ✓

The values in column “Deviation” and the “Linearity Deviation” are zero point offset and sensitivity error compensated.

* This point was used to satisfy the sensitivity requirement.