COLORADO
Department of Agriculture
Division of Laboratory Services

Metrology Laboratory
300 S. Technology Court
Broomfield, CO 80021
P 303.869.9240 F 303.869.9223
www.colorado.gov/ag/ics

CALIBRATION CERTIFICATE # 19-169A

Customer Name	Tensitron, Inc.
Customer Address	733 South Bowen Street, Longmont CO 80501-6302
Submitted By	Mike Brockman
Certificate Date	August 2, 2019
Calibration Date(s)	August 1, 2019
Calibration Due	N/A
Serial Number(s)	See table on page 2
Manufacturer	unmarked
Description	Class F, 5 kg cast iron weight 2 kg to 5 g hanging weights, calibrated to NIST Class F tolerances
Condition Received	good
Procedure Used	National Institute of Standards and Technology (NIST) NISTIR 6969 (Rev. Date: May 2019) SOP 8, Weighing by Modified Substitution

Traceability This certificate has been issued under the authority of the Commissioner of the Colorado Department of Agriculture, Inspection and Consumer Services Division, pursuant to the State of Colorado Revised Statute Title 35 Article 14:2018. Standards used for comparison are traceable to the International System of Units (SI) through standards at NIST, by way of the certificate number above.

Uncertainty The combined standard uncertainty of the measurements is multiplied by the coverage factor *k* listed in the table on page 2 (based on available degrees of freedom) to give an expanded uncertainty which defines an interval having a level of confidence of 95.45 %. The expanded uncertainty presented in this report was calculated according to the BIPM JCGM 100:2008 *Evaluation of measurement data – Guide to the expression of uncertainty in measurement* (GUM 1995 with 2008 minor corrections). Uncertainty components evaluated may include, but are not limited to, standard deviation of the process, mass standard uncertainties, the uncertainty for magnitude of the air buoyancy correction and/or for any uncorrected errors associated with air buoyancy corrections, uncertainties associated with densities of the standards and test items, and a component to account for any observed deviations from mass standard values that are less than surveillance limits.

Magnetism None of the weights used for this calibration have been tested for magnetic properties, and no magnetism components are included in the uncertainty budget.

Metrologist(s) performing calibration

Diane C Wise

Diane Wise, Metrologist
Authorized Signatory

Environmental Conditions at Time of Calibration

	minimum	units	maximum	units
Temperature:	19.6	°C	20.2	°C
Barometric Pressure:	626.4	mmHg	626.8	mmHg
Relative Humidity:	53.3	%	55.2	%

MS Invoice # 3589

CO Dept. of Agriculture, Metrology Laboratory
Calibration Certificate # 19-169A
Tensitron, Inc.
Certificate Date: August 2, 2019

Serial Number	Nominal Value g	Conventional Mass Correction mg	Tolerance ± mg	Uncertainty ± mg	*k*
Troemner 5 kg	5000	322	500	63	2.09
2 KILO	2000	16	200	32	2.03
2000 M	2000	- 2	200	32	2.03
1500 N	1500	- 1	200	22	2.13
B	1000	29	100	13	2.13
F	1000	- 76	100	13	2.13
500 U	500	- 0.6	70	8.7	2.13
500 V	500	- 2.6	70	8.7	2.13
250 S	250	6.6	60	6.2	2.13
250 T	250	- 3.4	60	6.2	2.13
200 W	200	- 1.5	40	5.0	2.13
100 P	100	5.4	20	2.5	2.03
100 Q	100	- 1.3	20	2.5	2.03
100 R	100	6.0	20	2.5	2.03
50 X	50	1.7	10	1.2	2.03
50 Y	50	0.6	10	1.2	2.03
50 Z	50	- 2.5	10	1.2	2.03
10 •	10	0.69	2	0.25	2.03
10 ••	10	0.73	2	0.25	2.03
10 •••	10	0.23	2	0.25	2.03
none	5	- 0.16	1.5	0.18	2.02
•	5	0.37	1.5	0.18	2.02

Supplemental Information:
All items were left "as found", no adjustments were made. The item(s) were found at time of test, or adjusted, to meet the tolerances stated in NIST Handbook 105-1:1990, *Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures (NIST Class F)*, and are approved for use in the State of Colorado.

END OF DOCUMENT

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CALIBRATION CERTIFICATE # 19-169B

Customer Name	Tensitron, Inc.
Customer Address	733 South Bowen Street, Longmont CO 80501-6302
Submitted By	Mike Brockman
Certificate Date	August 2, 2019
Calibration Date(s)	August 1 and 2, 2019
Calibration Due	N/A
Serial Number(s)	See table on page 2
Manufacturer	unmarked
Description	3 lb to 1 lb aluminum weights with hanger, calibrated to NIST Class F tolerances 10 lb steel plate weights with hanger, calibrated to NIST Class F tolerances
Condition Received	good
Procedure Used	National Institute of Standards and Technology (NIST) NISTIR 6969 (Rev. Date: May 2019) SOP 8, Weighing by Modified Substitution

Traceability This certificate has been issued under the authority of the Commissioner of the Colorado Department of Agriculture, Inspection and Consumer Services Division, pursuant to the State of Colorado Revised Statute Title 35 Article 14:2018. Standards used for comparison are traceable to the International System of Units (SI) through standards at NIST, by way of the certificate number above.

Uncertainty The combined standard uncertainty of the measurements is multiplied by the coverage factor *k* listed in the table on page 2 (based on available degrees of freedom) to give an expanded uncertainty which defines an interval having a level of confidence of 95.45 %. The expanded uncertainty presented in this report was calculated according to the BIPM JCGM 100:2008 *Evaluation of measurement data – Guide to the expression of uncertainty in measurement* (GUM 1995 with 2008 minor corrections). Uncertainty components evaluated may include, but are not limited to, standard deviation of the process, mass standard uncertainties, the uncertainty for magnitude of the air buoyancy correction and/or for any uncorrected errors associated with air buoyancy corrections, uncertainties associated with densities of the standards and test items, and a component to account for any observed deviations from mass standard values that are less than surveillance limits.

Magnetism None of the weights used for this calibration have been tested for magnetic properties, and no magnetism components are included in the uncertainty budget.

Metrologist(s) performing calibration

Diane C Wise

Diane Wise, Metrologist
Authorized Signatory

Environmental Conditions at Time of Calibration

	minimum	units	maximum	units
Temperature:	19.6	°C	20.3	°C
Barometric Pressure:	626.4	mmHg	627.2	mmHg
Relative Humidity:	53.4	%	55.1	%

Conversion Factors from NIST Special Publication 811:2008, *Guide for the Use of the International System of Units (SI)*
1 pound (avoirdupois) (lb) = 0.45359237 kilogram (kg)

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Calibration Certificate # 19-169B
Tensitron, Inc.
Certificate Date: August 2, 2019

Serial Number	Nominal Value lb	Conventional Mass Correction mg	Tolerance ± mg	Uncertainty ± mg	*k*
3 LB	3	45	140	24	2.13
2 lb hanger*	2	- 1194	91	12	2.13
1 1/2 LB	1.5	13	80	18	2.13
1 1/2 LB •	1.5	36	80	18	2.13
1 LB	1	2.5	70	5.6	2.13
1 LB •	1	9.5	70	5.6	2.13
A	10	- 37	450	57	2.09
B	10	82	450	57	2.09
C	10	- 46	450	57	2.09
D	10	- 74	450	57	2.09
E	10	43	450	57	2.09
F	10	113	450	57	2.09
G	10	- 10	450	57	2.09
H	10	45	450	57	2.09
I	10	82	450	57	2.09
J	10	185	450	57	2.09
K	10	87	450	57	2.09
L	10	216	450	57	2.09
M	10	- 169	450	57	2.09
N	10	15	450	57	2.09
O	10	- 17	450	57	2.09
P	10	159	450	57	2.09
Q	10	214	450	57	2.09
R	10	49	450	57	2.09
S	10	144	450	57	2.09
10 lb hanger*	10	1190	450	57	2.09

*The 10 lb and 2 lb hangers share hardware. Both are out of tolerance and not adjustable

Supplemental Information:
All items were left "as found", no adjustments were made. The item(s) were found at time of test, or adjusted, to meet the tolerances stated in NIST Handbook 105-1:1990, *Specifications and Tolerances for Reference Standards and Field Standard Weights and Measures (NIST Class F)*, and are approved for use in the State of Colorado.

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