Calibration Certificate 15825

Certificate Expires
February 2023

Missouri Department of Agriculture
Weights, Measures & Consumer Protection Division, Metrology Laboratory
Lab Location: 1616 Missouri Blvd., Jefferson City, MO 65109
Mailing Address: PO Box 630 Jefferson City, MO 65102
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Rev(6/19)

Ace Scale Company; 1701 Roseport Rd.; Elwood, KS 66024; Phone: 816-365-5814
Customer Number: 777; Submission Date: 2/3/21; Calibration Date: 2/3/21 to 2/4/21

Test Item(s) Description

4 - 250 kg weights; Material: cast iron; Condition: good
30 - 50 lb weights; Material: cast iron; Manufacturer: Fairbanks; Condition: good
1 - 25 lb weight; Material: cast iron; Condition: good
50 - 20 kg weights; Material: cast iron; Condition: good
2 - 10 kg weights; Material: cast iron; Condition: good

Traceability: Laboratory standards are traceable to the International System of Units (SI) through the *National Institute of Standards and Technology (NIST),* and are part of a comprehensive measurement assurance program for ensuring continued accuracy and measurement traceability within the level of uncertainty reported by this laboratory.

Uncertainty: The uncertainty is the root sum square of the uncertainty of the standard, the standard deviation of the process (obtained using a check standard which characterizes balance performance), a component for balance sensitivity and drift, and an uncorrected systematic error for lack of buoyancy correction, multiplied by a coverage factor (k)[1] according to the measurement *effective degrees of freedom (edf)*[2] associated with a 95.45 % confidence interval calculated according to the *Welch-Satterthwaite equation from G.4.1 in the Guide to the Expression of Uncertainty in Measurement (GUM) 2008.* The (k) factor was calculated using the Excel T.INV.2T function: T.INV.2T(0.0455,edf). Magnetism of the weights and balance eccentricity and linearity were not included in the uncertainty evaluation.

Procedure: Modified Substitution *(NISTIR 6969, SOP 8, 2019).* Weights are not checked for magnetism with this procedure.

Specification: *NIST Handbook 105-1 (1990) Specifications and Tolerances For Field Standard Weights*

Conformance: Weight conforms with the specification unless otherwise noted in the remarks section. Weight is in tolerance if the correction ± the uncertainty is less than the ± tolerance. The uncertainty is consistent with the GUM and less than one third the tolerance. The SI unit for mass is the kilogram (kg) 1 lb = 0.45359237 kg

Test Item Treatment: Before calibration weights, other than painted cast iron, are cleaned with alcohol using anti static lint reducing wipes, painted cast iron weights are cleaned off with a hand brush or soft cloth to remove any foreign material.

Thermal Stabilization: Weights are equilibrated according to *OIML R 111-1 (2004) Table B2 Thermal Stabilization time.*

Remarks

Environmental Conditions During Test: Temperature 21.8 to 21.3 (°C); Relative Humidity 38.7 to 40.3 (%).

Calibrated by: John Bell & Houston Naugher Lab Manager: John Bell Date Calibrated: 2/3/21 - 2/4/21

Conventional Mass: conventional value of the result of weighing a body in air that is equal to the mass of a weight, at reference density 8.0 g/cm³, at reference temperature 20 °C, which balances this body at this reference temperature in normal air density 0.0012 g/cm³. See OIML D28 (2004) link below, "Conventional value of the result of weighing in air."

Links: GUM OIML D28 OIML R111-1 NIST SOPs BIPM (SI) NIST HB105-1 (1990)

Specification: NIST HB105-1 (1990) Class F Tolerances for Field Standard Weights: Tables 2, 3, 4, & 5 respectively

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Nominal Value	Units	Standard Serial/ID	Conventional Mass Correction As Found	Correction If Adjusted	± Tolerance NIST Class F	± Measurement Uncertainty	Uncertainty *k* factor [1]	Effective Degrees of Freedom [2]
250	kg	U483	5.6 g		20 g	2.6 g	2.05	54
250	kg	U481	-2.0 g		20 g	2.6 g	2.05	54
250	kg	U480	11.0 g		20 g	2.6 g	2.05	54
250	kg	U478	12.2 g		20 g	2.6 g	2.05	54
50	lb		0.22 g		2.3 g	0.29 g	2.01	261
50	lb	VDS-250	-0.73 g		2.3 g	0.29 g	2.01	261
50	lb	ACE-C51	-1.30 g	0.07 g	2.3 g	0.29 g	2.01	261
50	lb	ACE-C77	-1.36 g	0.15 g	2.3 g	0.29 g	2.01	261
50	lb	ACE-C9	0.80 g		2.3 g	0.29 g	2.01	261
50	lb	3BUB	-0.92 g		2.3 g	0.29 g	2.01	261
50	lb	17	-1.47 g	-0.05 g	2.3 g	0.29 g	2.01	261
50	lb	ACME-C78	-0.64 g		2.3 g	0.29 g	2.01	261
50	lb	3	6.27 g	0.81 g	2.3 g	0.29 g	2.01	261
50	lb	16	-0.01 g		2.3 g	0.29 g	2.01	261
50	lb	CA 0687	-0.59 g		2.3 g	0.29 g	2.01	261
~~50~~	~~lb~~		1.14 g		2.3 g	0.29 g	2.01	261
50	lb	ACE-C56	-1.75 g	-0.33 g	2.3 g	0.29 g	2.01	261
50	lb	4DMX	3.85 g	0.03 g	2.3 g	0.29 g	2.01	261
50	lb	1	-1.21 g	0.03 g	2.3 g	0.29 g	2.01	261
50	lb	ACE-C17	-0.67 g		2.3 g	0.29 g	2.01	261
50	lb	11246	-1.11 g		2.3 g	0.29 g	2.01	261
50	lb	11301	0.80 g		2.3 g	0.29 g	2.01	261
50	lb	3BU5	1.66 g		2.3 g	0.29 g	2.01	261
50	lb		-2.11 g	0.75 g	2.3 g	0.29 g	2.01	261
50	lb	3BTL	0.09 g		2.3 g	0.29 g	2.01	261
50	lb	ACME-C61	-0.21 g		2.3 g	0.29 g	2.01	261
50	lb	A503	0.48 g		2.3 g	0.29 g	2.01	261
50	lb	ACME-C3	0.06 g		2.3 g	0.29 g	2.01	261
50	lb	89043	-1.05 g		2.3 g	0.29 g	2.01	261
50	lb	3BTV	0.00 g		2.3 g	0.29 g	2.01	261
50	lb	X610	0.76 g		2.3 g	0.29 g	2.01	261
50	lb	ACME-C67	0.07 g		2.3 g	0.29 g	2.01	261
50	lb	A544	0.00 g		2.3 g	0.29 g	2.01	261
50	lb	ACME080	0.10 g		2.3 g	0.29 g	2.01	261
25	lb	ACS1	-3.61 g	0.88 g	1.1 g	0.13 g	2.02	129
20	kg	97	7.77 g	-0.03 g	2 g	0.26 g	2.01	279
20	kg	64	0.23 g		2 g	0.26 g	2.01	279
20	kg	59	4.58 g	0.00 g	2 g	0.26 g	2.01	279
20	kg	69	0.78 g		2 g	0.26 g	2.01	279
20	kg	72	1.09 g		2 g	0.26 g	2.01	279
20	kg	78	3.13 g	0.15 g	2 g	0.26 g	2.01	279
20	kg	94	3.93 g	-0.11 g	2 g	0.26 g	2.01	279
20	kg	83	1.66 g		2 g	0.26 g	2.01	279
20	kg	81	4.48 g	0.44 g	2 g	0.26 g	2.01	279

Weight USED