



Calibration Certificate 15825

Missouri Department of Agriculture

Weights, Measures & Consumer Protection Division, Metrology Laboratory

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Certificate Expires

February 2023

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 unit, 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 $\pm$ the uncertainty is less than the $\pm$ 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

NOTE: The weight surface finish is visually compared to a *Flexbar Surface Roughness Standards Comparator* and the finish is considered adequate for the tolerance class listed unless otherwise noted in the Remarks section. This document shall not be reproduced except in full or used to claim product endorsement by this laboratory without written approval from the Missouri Department of Agriculture. The results listed in this report only apply to the items calibrated and the certificate number shall only be used to reference metrological traceability for those items calibrated below.

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

Ace Scale Company Cert No. 15825

Weight
used

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