

## Product Guide

# Deadweight Calibrating Machine

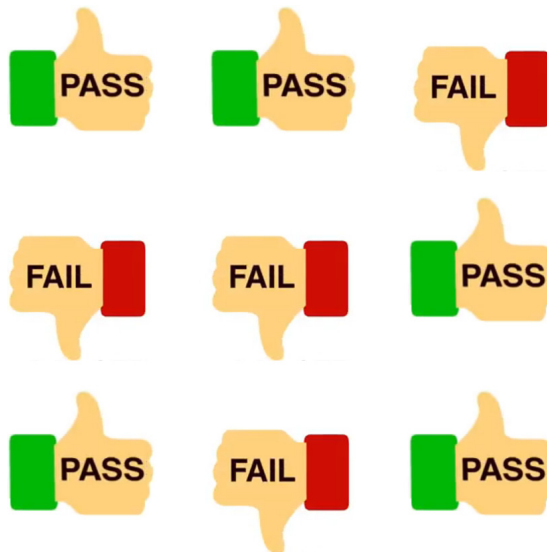




### Common Frustrations

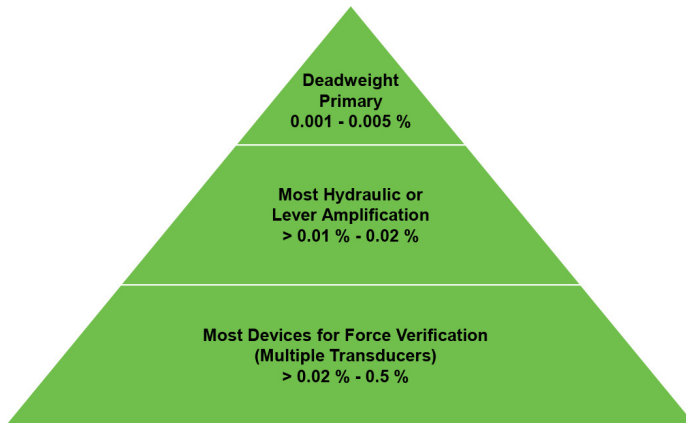
Calibrations don't meet ASTM Class AA or ISO 376 Class 00 Requirements

Not all instruments pass conformity assessments



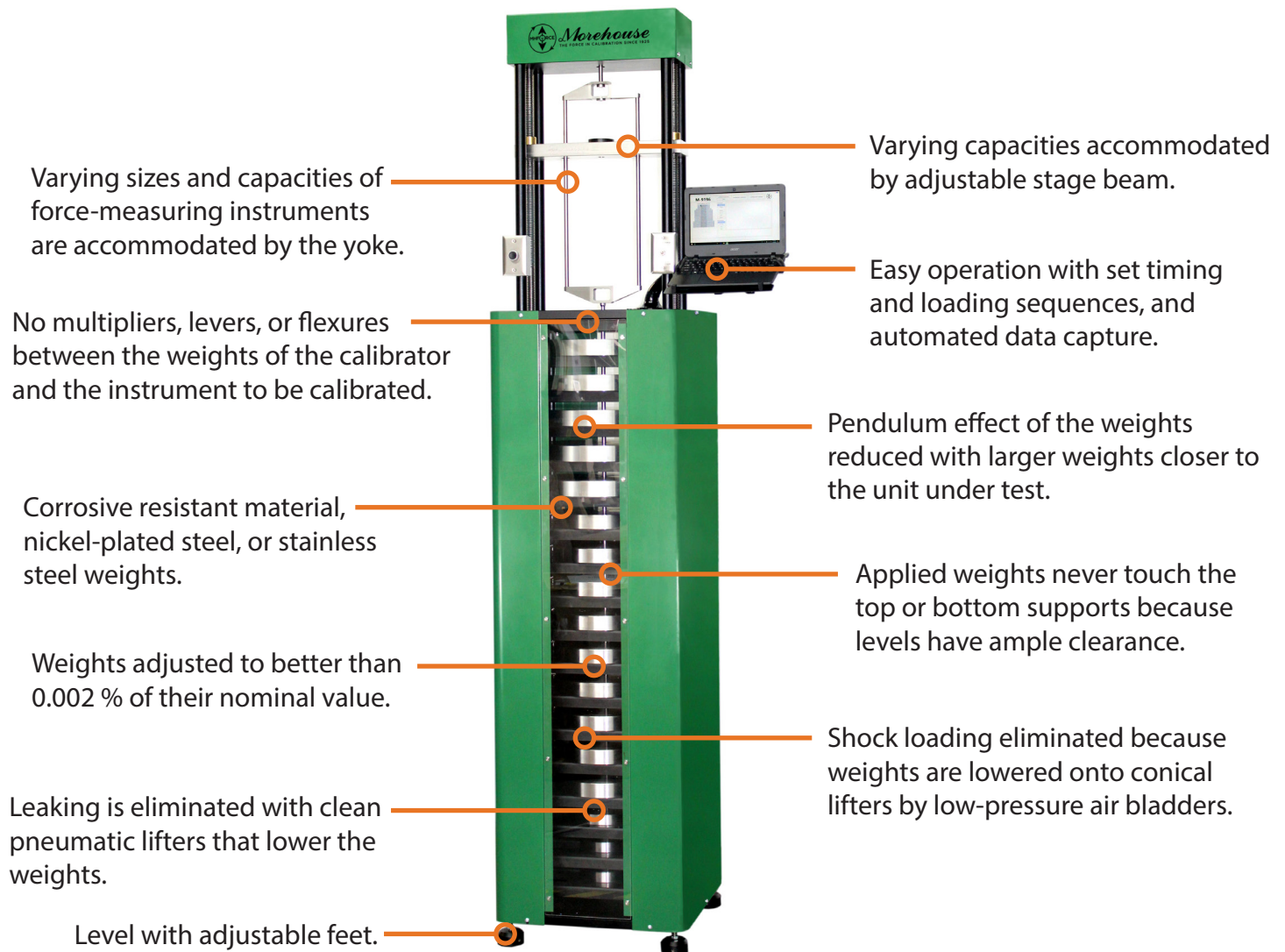
Calibrating multiple instruments is time consuming

High uncertainties impact quality, costs, and risks



## Morehouse Deadweight Calibrating Machine ... The Most Accurate Force Standard!

Made to be plumb, level, square, rigid, and with low torsion.



**Figure 1: Deadweight Calibrating Machine**

## Meet Industry Standards

You can meet ISO 376 Class 00, ASTM E74 Class AA, and AS 2193 Class AA calibration requirements with a Morehouse deadweight calibrating machine because it is the most accurate force calibration standard.

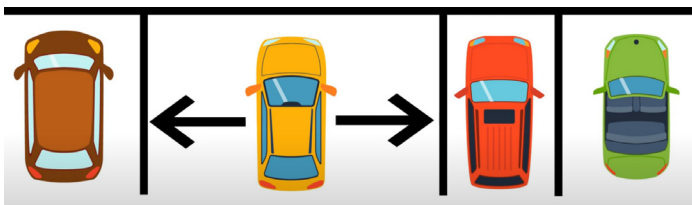
To meet requirements for ISO 376 Class 00, the time interval between two successive loadings must be uniform and the reading must be taken after 30 seconds of the start of the force change. The Morehouse deadweight calibrating machine has timing profiles that can be set and automation routines that are easy to program.

To assign an ASTM Class AA verified range of forces, the calibration must be done by primary standards with an expanded uncertainty better than 50 ppm. A Morehouse deadweight calibrating machine exceeds the requirements with expanded uncertainties of better than 0.002 % of the applied force.

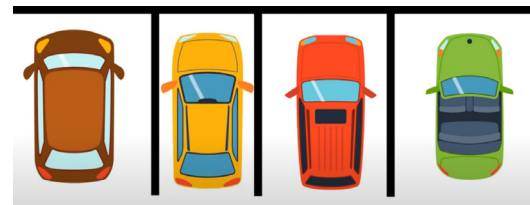
## More Instruments Pass Conformity Assessments

When you make a conformity assessment, you are more likely to fail an instrument with a larger measurement uncertainty. Morehouse deadweight calibrating machines have uncertainties better than 0.002 % of applied force, 10 to 50 times less than labs using secondary standards.

A deadweight calibrating machine helps you maintain a 4:1 Test Uncertainty Ratio (TUR) on force-measuring instruments with a 0.05 % or better tolerance.



**Figure 2: Small Uncertainty =  
More Range to Pass Instrument**



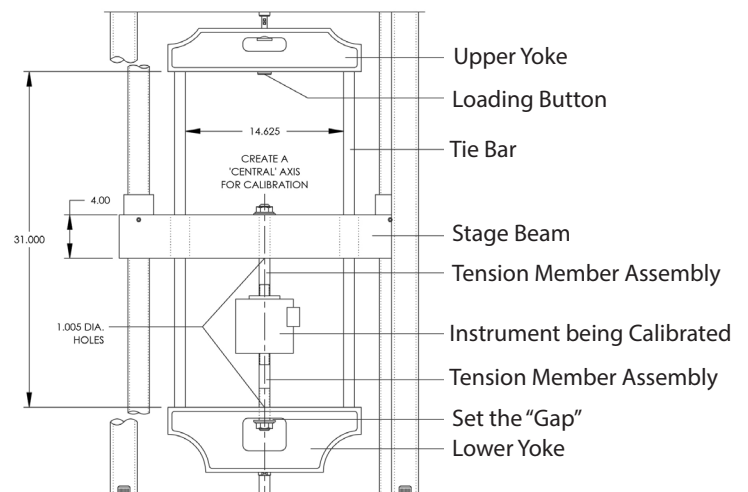
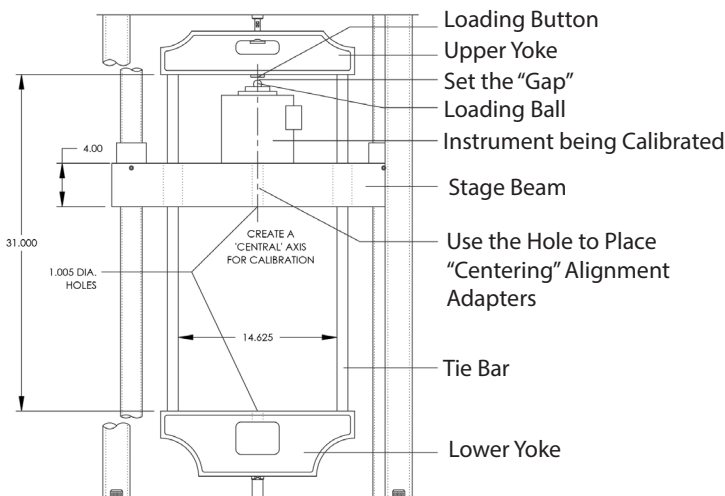
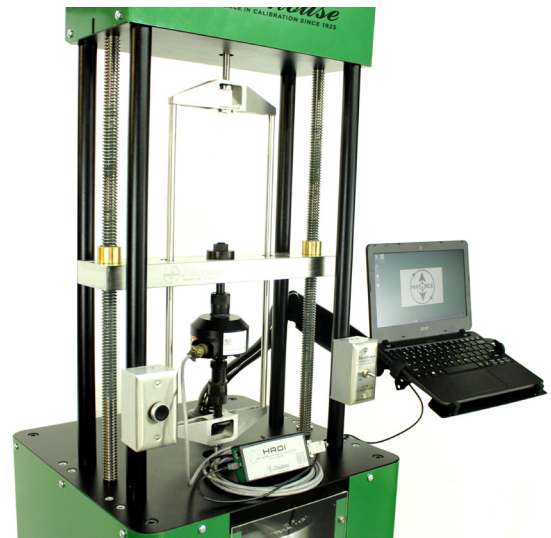
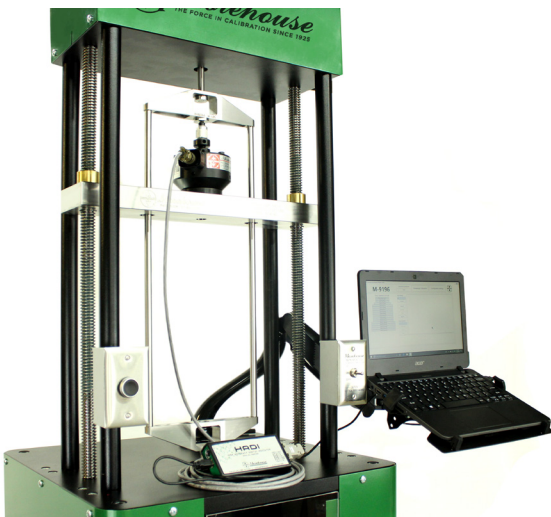
**Figure 3: Large Uncertainty =  
Less Range to Pass Instrument**

## Calibrate Multiple Instruments

You can quickly and easily calibrate a wide range of instruments in compression and tension. The machine is sized to accommodate the calibration of force-measuring devices such as load cells, proving rings, crane scales, force gauges, dynamometers, and several other force-measuring devices that require the utmost accuracy.

For compression calibration, set the instrument on top of the stage beam. Adjust the stage beam as needed and align the instrument to the top part of the yoke.

For tension calibration, mount the instrument under the stage beam. Adjust the stage beam as needed and attach the instrument to the lower part of the yoke.



**Figure 4: Compression Calibration**

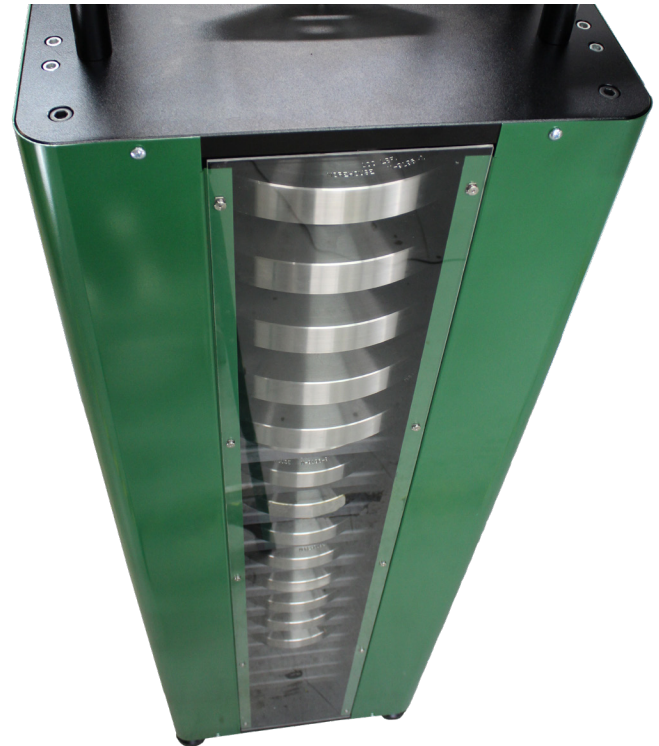
**Figure 5: Tension Calibration**



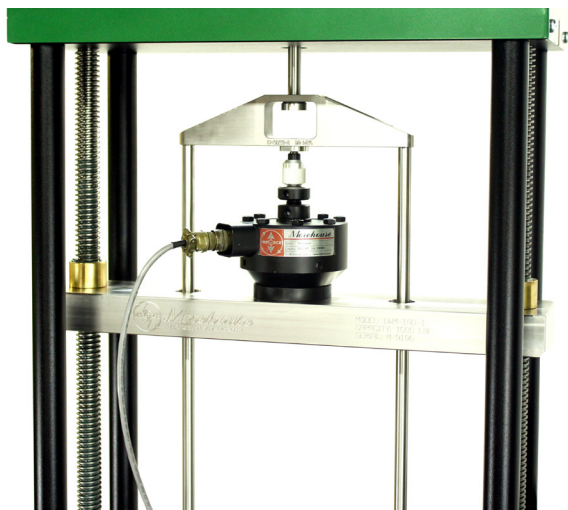
## Trouble-Free Calibration

A Morehouse deadweight calibrating machine includes a set of calibrated weights at different sizes. The weights are individually calibrated to primary force standards requirements, and calibrations are directly traceable to the International System of Units (SI). We recommend NIST calibration if it's in your budget. If not, we will work with you to find a solution without sacrificing too much uncertainty.

To perform a calibration, a deadweight force is applied directly to the unit under test, without intervening mechanisms such as levers, hydraulic multipliers, or the like. The operator can choose any combination of weights through the control system and apply the force to the instrument under test. Calibration can be performed automatically with the Morehouse Deadweight Calibration System (DCS) software.



**Figure 6: Hanging Weights**



**Figure 7: Load Cell on Stage Beam for Compression Calibration**

## Generate Test Points with Flexibility

You have the flexibility to generate test points needed because each machine is designed with a customized weight combination. The number and size of weights in the machine are based on the user's calibration requirements. A higher number of weights provides the operator with more flexibility in terms of generating test points. The machine is versatile, fast, and easy to operate because each weight after the yoke can be applied independently from any other weight.

## Increase Efficiency and Accuracy with Automation

Operators can control the forces applied or removed during calibration to increase efficiency and accuracy with easy-to-use software. The Morehouse Deadweight Calibration System (DCS) software obtains and records readings from the indicator and load cell pair. These readings are combined with applied force from the deadweight calibrating machine.

The software communicates with a Morehouse controller to control mechanical inputs. The calibration data can be used to write the calibration directly to a supported meter, saved to the database, or exported via files.

The software can also be used to automate a calibration. This allows calibration technicians to focus on other tasks for the duration of the calibration.



**Figure 8: Control and Automate with the Deadweight Calibration System (DCS)**

## Pricing

Deadweight calibrating machines start at \$70,000. Pricing depends on a variety of factors, such as:

1. Size of the machine (capacity)
2. Number of weights
3. Material of weights
4. Calibration of the weights (ISO/IEC 17025 accredited lab or NIST)
5. Engineering customization

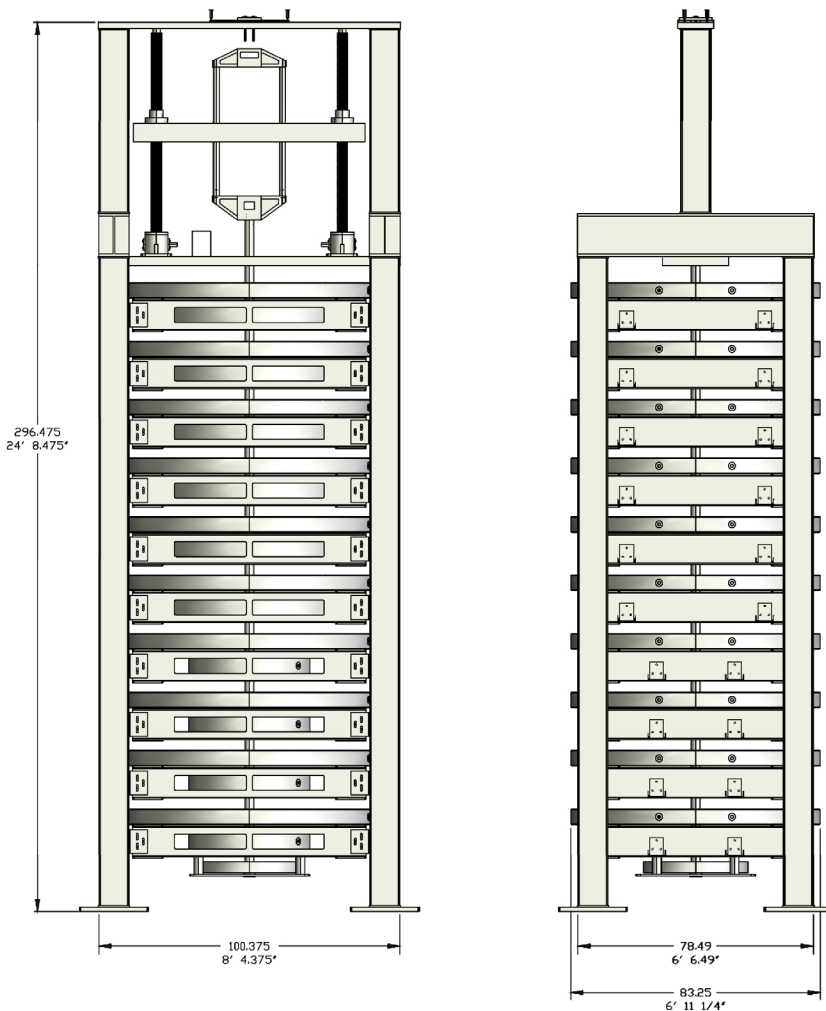
Typical pricing is around \$25 - \$50 per 1 lbf (5N) for higher capacity machines.

When the accuracy of deadweight is not required, our [Universal Calibrating Machine \(UCM\)](#) with accuracies of better than 0.02 % of applied force, is a good alternative for a fraction of the cost.

## Technical Specifications

Standard capacities for the deadweight calibrating machine are 2,000 lbf, 5,000 lbf, 10,000 lbf, 20,000 lbf, 25,000 lbf, 50,000 lbf, and 120,000 lbf, or the approximate equivalent in kgf/Newton. Machines can be custom-designed from 25 lbf (111 N) to 225,000 lbf (1 MN). Larger sizes are available but those sizes present several logistic challenges. Contact us to discuss possible solutions.

The weights are applied and removed using a pneumatic system of weight-lifter assemblies and pneumatic solenoid valves connected to a manifold, which is distributing air to all the weight levels. The pneumatic system needs an operating air pressure of 10-15 psi.



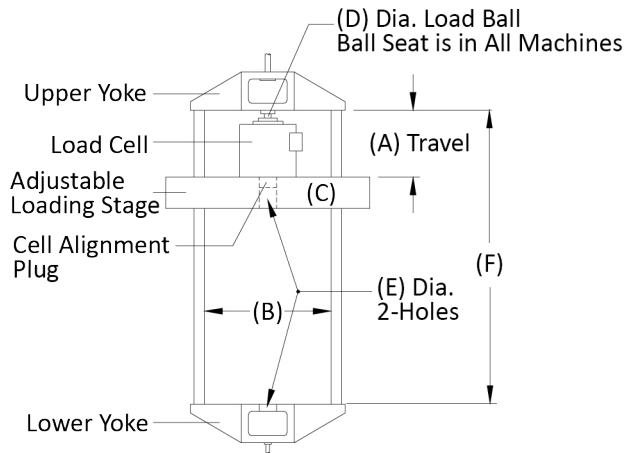
**Figure 9: 100,000 lbf Capacity Deadweight Calibrating Machine**



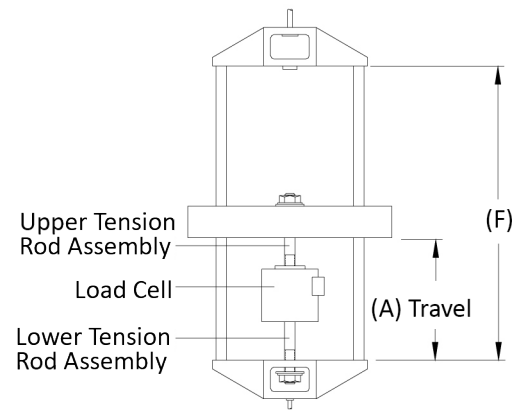
**Figure 10: Pneumatic System Removes or Applies Weights**



## Specifications (100-10,000 lbf Capacity)



**Compression Mode**



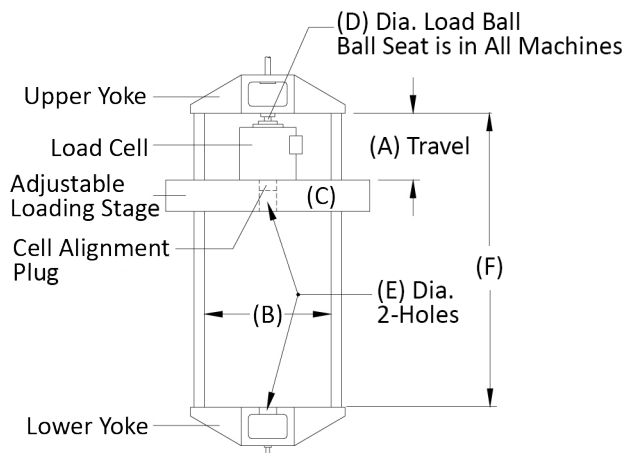
**Tension Mode**

		Machine Capacity (lbf)										
		100		1,000		2,000		5,000		10,000		
Yoke Assembly	Dimension A	10 in		18 in		19.5 in		21.5 in		24.5 in		
	Dimension B	4.5 in		8 in		10 in		14.5 in		14.5 in		
	Dimension C	1.5 in		1.8 in		3.0 in		4.0 in		4.0 in		
	Dimension D	0.38 in		0.44 in		0.44 in		0.44 in		0.44 in		
	Dimension E	0.375 in		0.75 in		0.75 in		1.00 in		1.00 in		
	Dimension F	11.5 in		19.8 in		22.5 in		25.5 in		28.5 in		
Full Machine	Height	70 in		82 in		92 in		150 in		150 in		
	Base	18 x 18 in		22 x 18 in		24 x 24 in		32 x 32 in		37 x 37 in		
	Total Weight	700 lb		2,100 lb		3,400 lb		7,700 lb		14,000 lb		
	Standard Weight Complements		Qty	lbf	Qty	lbf	Qty	lbf	Qty	lbf	Qty	lbf
		Yoke	2.5	Yoke	10	Yoke	20	Yoke	50	Yoke	100	
		1	2.5	2	10	9	20	9	50	9	100	
		7	5	1	20	9	200	9	500	9	1,000	
6		10	9	50								
			5	100								

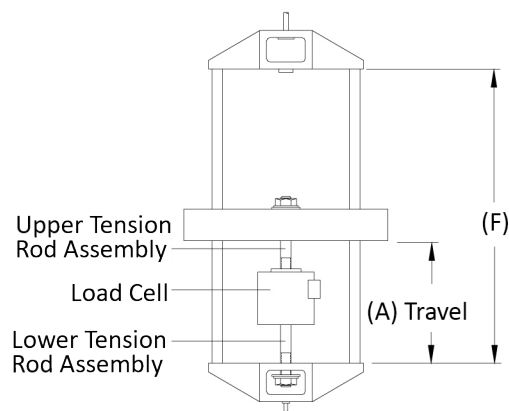
The dimensions of the machine's yoke assembly may be varied to accommodate individual requirements with respect to overall dimensions of load cells or other instruments to be calibrated in both tension and compression.



## Specifications (20,000-120,000 lbf Capacity)



**Compression Mode**



**Tension Mode**

		Machine Capacity (lbf)										
		20,000		30,000		50,000		100,000		120,000		
Yoke Assembly	Dimension A	21.5 in		29.5 in		23 in		36 in		36 in		
	Dimension B	12.6 in		14.7 in		14.7 in		20 in		20 in		
	Dimension C	4.0 in		6.0 in		4.0 in		6.0 in		6.0 in		
	Dimension D	0.44 in		0.44 in		0.63 in		0.88 in		0.88 in		
	Dimension E	1.00 in		1.00 in		1.50 in		1.50 in		1.50 in		
	Dimension F	25.5 in		35.5 in		27.5 in		42 in		42 in		
Full Machine	Height	180 in		204 in		210 in		280 in		280 in		
	Base	43 x 43 in		57 x 57 in		60 x 60 in		110 x 110 in		110 x 110 in		
	Total Weight	33,000 lb		40,000 lb		67,000 lb		130,000 lb		155,000 lb		
	Standard Weight Complements		Qty	lbf	Qty	lbf	Qty	lbf	Qty	lbf	Qty	lbf
		Yoke	100	Yoke	200	Yoke	1,000	Yoke	1,000	Yoke	1,000	
		5	100	2	100	4	1,000	1	1,000	1	1,000	
		2	200	8	200	5	2,000	4	2,000	4	2,000	
		2	500	14	2,000	5	3,000	5	4,000	6	5,000	
	8	1,000			5	4,000	5	6,000	10	8,000		
	5	2,000					5	8,000				

The dimensions of the machine's yoke assembly may be varied to accommodate individual requirements with respect to the overall dimensions of load cells or other instruments to be calibrated in both tension and compression.



Drawings

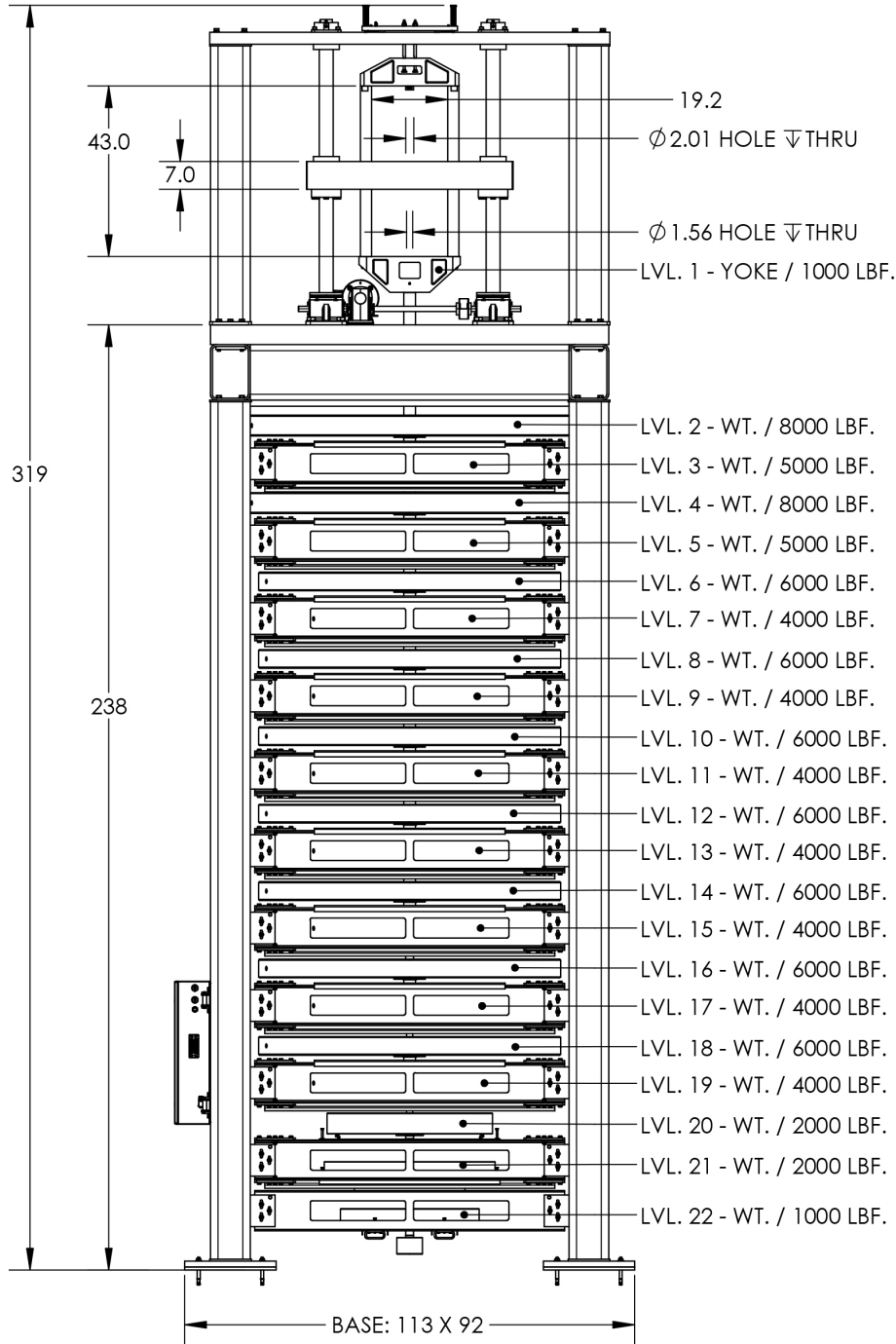
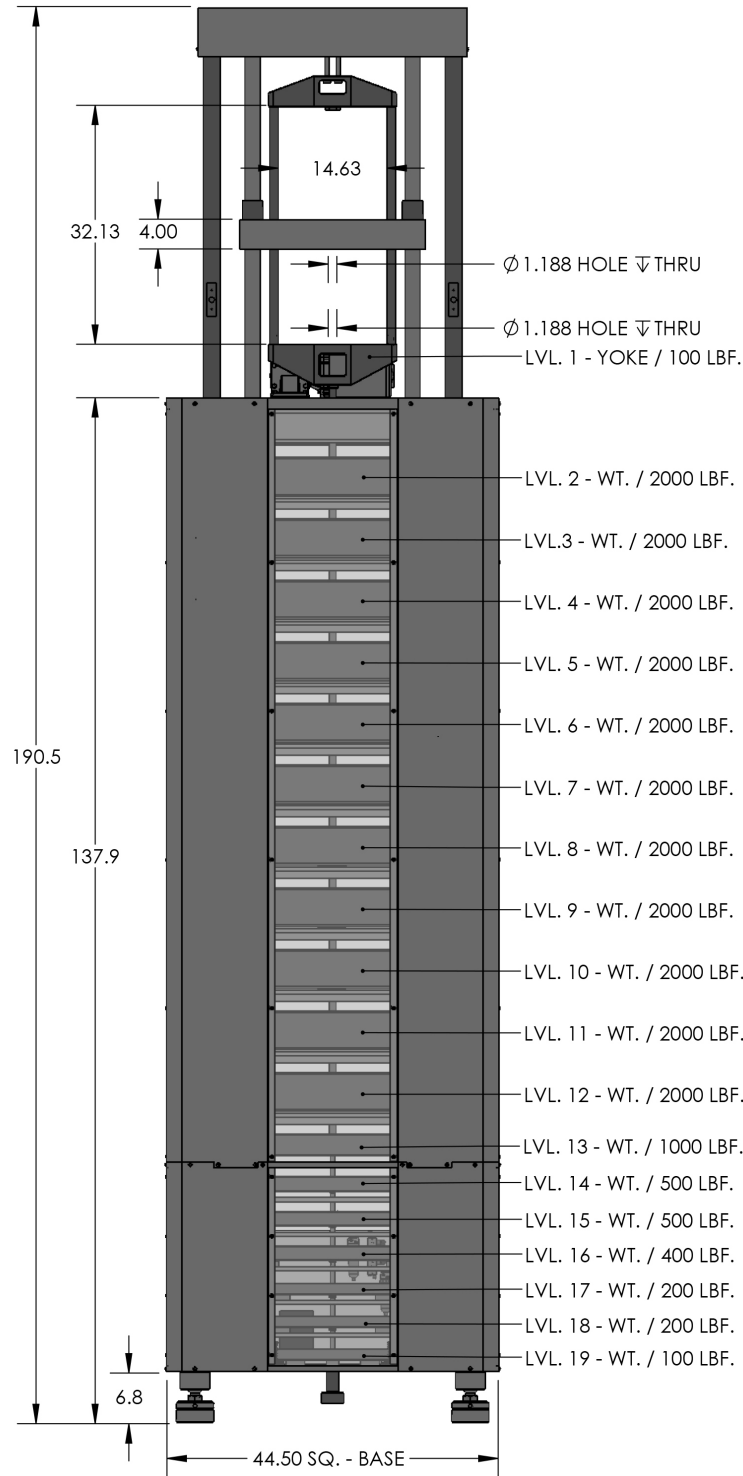


Figure 11: 102,000 lbf Capacity Deadweight Calibrating Machine

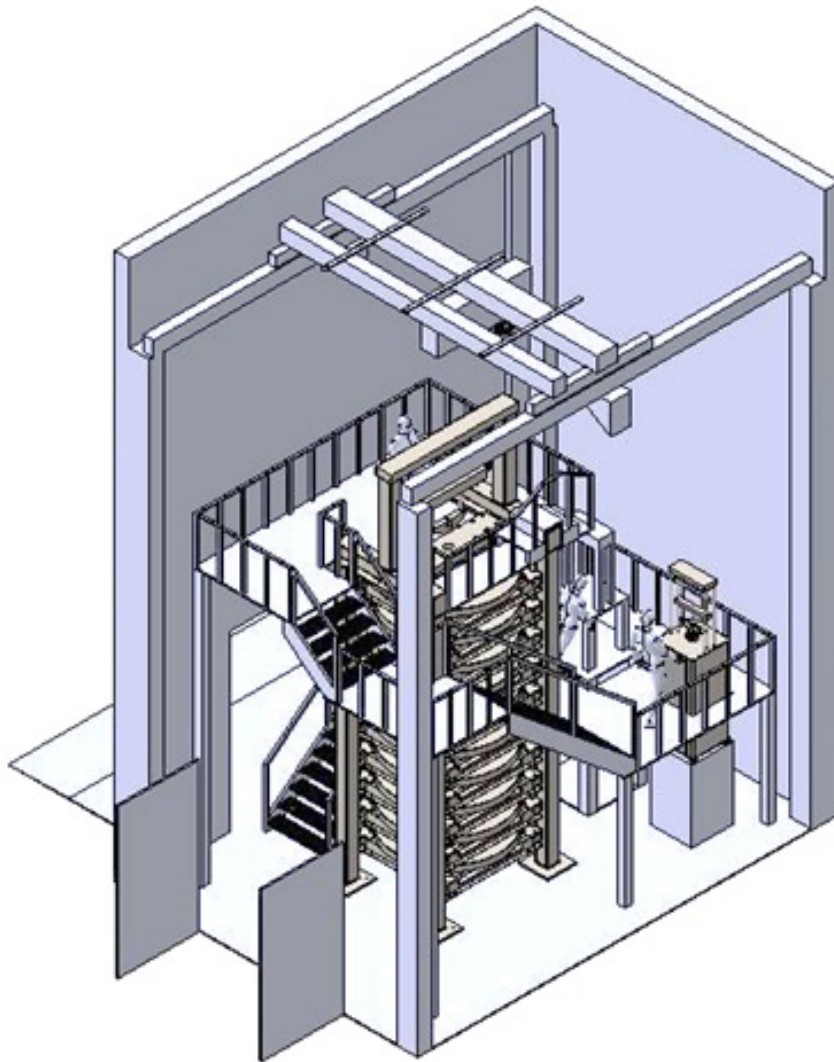


**Figure 12: 25,000 lbf Capacity Deadweight Calibrating Machine  
Drawing DWM-25AD-010-90**



## Custom Designs

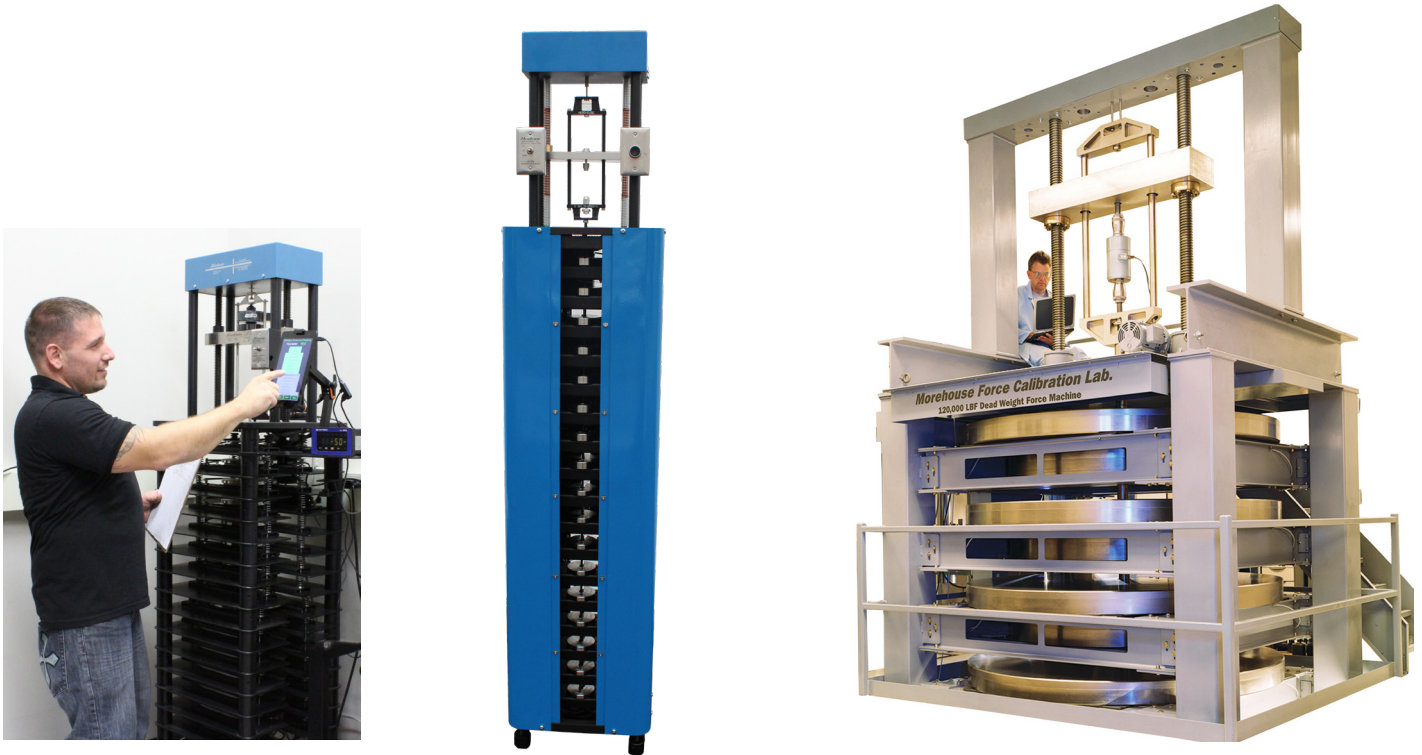
Morehouse can design machines to fit your laboratory requirements and limitations. The Morehouse Engineering department can lay out a machine or several machines in your existing laboratory or help with the layout of a new laboratory. The layout below includes a 2,000 lbf, 25,000 lbf, and 100,000 lbf machine in a force measurement laboratory. Our Engineering team put the layout together in an existing building and created the support structures, steps, and decking. Higher capacities or custom machines are available upon request.



**Figure 13: Custom Design of Morehouse Deadweight Calibrating Machines**



# Reduce your uncertainties



Deadweight calibrating machines have a proven record of high reliability and stability and are designed to provide low uncertainties. Morehouse has manufactured numerous deadweight calibrating machines at various capacities ranging from 25 lbf to 120,000 lbf, which are used by the most reputable laboratories worldwide.

Due to the high accuracy required for these machines, many are custom designed and manufactured for the user's specific needs and requirements. We welcome the opportunity to answer your questions and our technical experts are here to help design your deadweight calibrating machine.

To raise your standards, contact us:

(717) 843-0081

[sales@mhforce.com](mailto:sales@mhforce.com)

[www.mhforce.com](http://www.mhforce.com)

Learn more:

Watch [Morehouse Deadweight Machine – The most accurate way to calibrate a load cell](#)

Read [Automatic Deadweight Load Cell Calibration Instrument for Improved Force Calibration Results](#)