



MOTORIZED TEST STANDS



DIGITAL FORCE GAGES

FMM FRAME OVERVIEW

FMM digital force testers are compact and ideal for high volume, lean manufacturing production. FMM Digital Force Testers may be used manually, with a DFG or DFC digital force gage, or any of the Lx software versions, L1, S1, L2, S2, L2Plus and L3.

FMM testers are available in three capacities: 110lbf (500N), 330lbf (1500N) and 550lbf (2500N). Two travel lengths are available for all capacities: standard travel at 20" (508mm) and extended travel at 30" (762mm). Crosshead speeds are controlled locally and can be set from 0.002 to 40 inch/min (0.05 to 1016mm/min). Quiet even when operating at full speed. Easily upgrade from force gage control to computer based operating using Lx software.

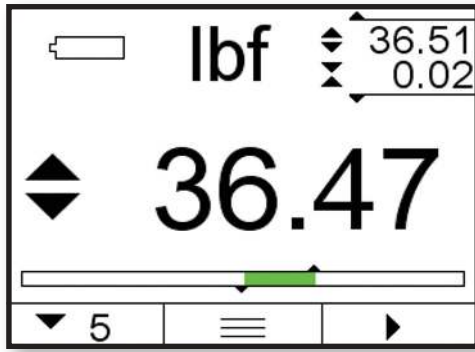


TEST FRAMES

FMM SERIES ECONOMY DIGITAL FORCE TESTERS

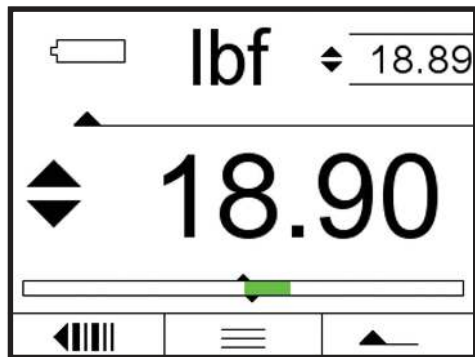
FMM Series Test Frames										
Model		Short Travel			Standard Travel			Extended Travel		
		FMM-110S	FMM-330S	FMM-550S	FMM-110	FMM-330	FMM-550	FMM-110X	FMM-330X	FMM-550X
Load Capacity	N	500	1500	2500	500	1500	2500	500	1500	2500
	kgf	50	150	250	50	150	250	50	150	250
	lbf	110	330	550	110	330	550	110	330	550
Minimum Speed	mm/min	0.05								
	in/min	0.00								
Maximum Speed	mm/min	1000								
	in/min	40								
Max Distance Resolution ¹	mm	0.02								
	in	0.00								
Vertical Test Space ²	mm	400	400	400	559	559	559	813	813	813
	in	15.6	15.6	15.6	22	22	22	32	32	32
Total Crosshead Travel	mm	305	305	305	508	508	508	762	762	762
	in	12	12	12	20	20	20	30	30	30
Throat	mm	100								
	in	3.9								
Axial Frame Stiffness	kN/mm	2.5	2.6	2.7	2.5	3.1	3.1	2.2	2.5	2.5
	lbf/in	14,200	14,800	15,400	14,200	17,700	17,700	12,500	14,200	14,200
Accuracy Load Measurement		Load Cell Dependent								
Accuracy Position Measurement		±0.001in (20µm) or 0.1% of travel (whichever is greater)								
Accuracy Strain Measurement		N/A								
Accuracy Crosshead Speed		±0.1% of set speed								
Compatible Software		L1, S2, L2, S2, L2Plus, L3, and DFC Control								
Data Sampling	Hz									
Digital I/O		0 - 24Vdc (independent, configurable)								
Extensometer Connections		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Analog Inputs		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Electrical Phase		1								
Power Requirements		100, 120, 220, 230, 240VAC 10%; 47-63Hz Self-identifying								
Operating Temperature	°C	+5° to +43°C								
	°F	+40° to +110°F								
Storage Temperature	°C	+5° to +43°C								
	°F	+40° to +110°F								
Humidity		+10% to +90%, non-condensing								
Base Plate Threads	mm	#10-32, 5/16-18, 1/4-28, 1/2-20 (optional)								
	in	M4 x 0.7, M6 x 1, M10 x 1.5, M12 x 1.75 (standard)								
Total Height	mm	733			940			1194		
	in	28.9			37			47		
Total Width	mm	292								
	in	11.5								
Total Depth	mm	419								
	in	16.5								
Weight	kg	31.8			36.3			95		
	lb	70			80			43		

1. Total vertical space is the distance from the top surface of the base plate to the bottom surface of the crosshead, excludes load cell and fixtures
2. Resolution configurable in L3, L2Plus, and L1, fixed in L2, S2, and DFC control



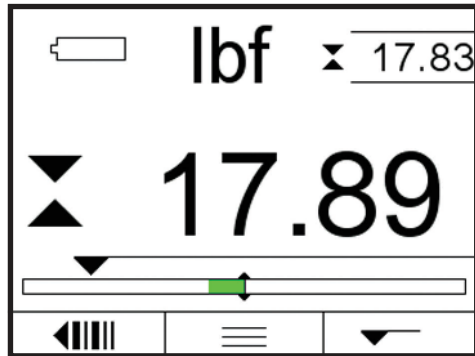
Real Time View

Primary window shows active load being applied to the load cell. The secondary windows shows the measured peak in tension made - 36.51lbf.



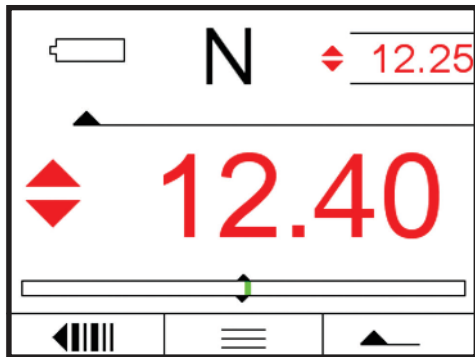
Tension Peak View

Shows maximum load measured in primary window. Secondary window shows real time load.



Compression Peak View

Shows maximum load measured in primary window. Secondary window shows real time load.



Tolerance View

When a tolerance is used, out-of-tolerance results display in red.

DFG DIGITAL FORCE CONTROLLER

The DFG is our basic force gage. The gage measures force at an accuracy of better than 0.2% full scale.

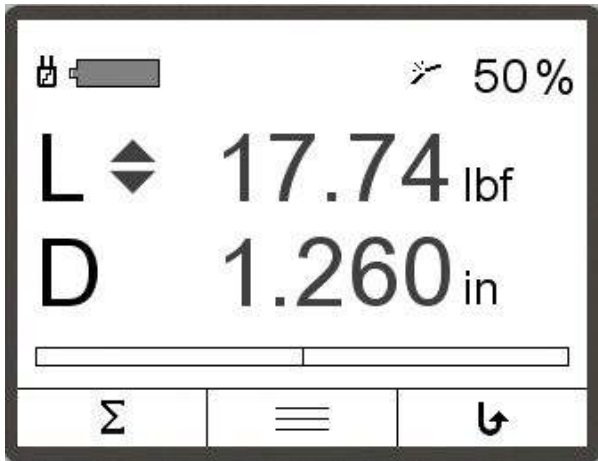
The DFG is ideal for basic tensile and compression testing. Test setup and operation is fast, efficient and easy for anyone. The DFG display shows the test direction and dynamic load during testing. Results are displayed at the completion of testing, including "Pass-Fail" when tolerance is applied. The gage will display statistics when results are saved to the gage's internal memory. Store up to 50 test results in local memory.



DFC DIGITAL FORCE CONTROLLER

The DFC is our advanced force gage. The gage measures force to an accuracy of better than 0.1% of full scale.

In addition to the DFG features, the DFC supports Bluetooth® output, 99 results saved in memory, and can be used to control the Starrett FMM motorized test for basic load distance and break testing.



DIGITAL FORCE GAGES

FEATURES

- Use as handheld instrument or mount to Starrett test frames: FMM, MTL and MTH.
- Excellent display resolutions:
 - DFC 10,000:1
 - DFG 5,000:1
- Precise and accurate load measurements:
 - DFC 0.1% full scale
 - DFG 0.2% full scale
- Load sensors have safe overload rating of 200%
- High-resolution OLED color display with adjustable backlight and Auto Off feature
- Supplied with NIST-traceable Certificate of Calibration
- 3-year warranty
- Metric threads for screw-on attachments. Can be fitted with clevis adapters that fit hundreds of Starrett test fixtures.
- A primary and secondary display window shows your results. Out-of-tolerance results display in red.
- Adjustable sampling rates help you capture peak loads. Filters can be applied to peak and display values.
- Multiple display languages.
- Battery provides more than 30 hours of continuous operation. Charge battery using USB cable.
- Change display (Flip feature) orientation without having to expose electronics.
- Easy-to-use multi-function keypad. Softkeys are programmable to your most used functions.
- Programmable sounds for alarms, such as an out-of-tolerance result
- Cast-aluminum housing
- Comfort grip for handheld testing applications.



The USB connection is used for charging the battery or for transmitting data to a personal computer. The RS-232 cable is used for connection to the FMM Digital Tester. The DFC also has Bluetooth®.



DIGITAL FORCE GAGES

SPECIFICATIONS

Digital Force Gages		
Specification	DFC	DFG
Accuracy, Full Scale	0.1%	0.2%
Data Sampling (Hz)	25,000	10,000
Display Resolution	10,000:1	5,000:1
Safe Overload, Full Scale	200%	200%
Maximum Tare	10%	10%
Communications		
Bluetooth®	Yes	No
USB 2.0	Yes	Yes
RS-232	Yes	Yes
Digital I/O	2 channels	No
Memory, maximum results saved in gage	99	50
Operating Mode		
Machine Control ¹	Yes	No
Real Time	Yes	Yes
Peak Compression	Yes	Yes
Peak Tension	Yes	Yes
Load Limit	Yes	Yes
Break Limit	Yes	No
Load Average	Yes	No
Load-Time Average	Yes	No
Cyclic Count (99,999 maximum)	Yes	No
Cyclic Duration (27 hours)	Yes	No
Hold Duration (27 hours)	Yes	No
Contact Closure	Yes	No
Power, Environmental		
Battery Type	Lithium Ion	
Battery Life, typical @ 20% brightness	>30 hours	
Charge Time, using 110/240V Mains	<3 hours	
Display	OLED High Resolution	
Operating Temperature	40°F to 110°F (4°C to 43°C)	
Thread, for adapters	Metric M6, M10	
Instrument Weight (approx.)	3lbs (1.36kgs)	

NOTES

1. Machine control is exclusive to the DFC. When connected to the FMM Digital Force Tester, configuration of force gage and tester is performed through the gage.

ACCESSORY KITS

The DFC and DFG Force Gages are supplied with a complete accessory kit. The kit includes a hook, notch, chisel, flat, and point adapter. A 6" extension rod is included. Adapter materials are stainless steel. Aluminum is used for 2lbf (10N) and 10lbf (50N) capacities.

Included with the force gage is a carrying case, USB cable, a set of testing accessories, a Quick Reference Guide and NIST-traceable Certificate of Calibration.



Force gage standard accessories

DFC - Advanced Force Controller

Model No.	Load Capacity					Safe Overload % Full Scale	Full Scale Deflection		Thread mm	Accessory Kit
	N	KGF	LBF	OZF	GF		in	mm		
DFC-2	10	1	2	32	900	200	0.013	0.33	M6 x 1-6H	SPK-FG-A
DFC-5	20	2	5	80	2200	200	0.007	0.18	M6 x 1-6H	SPK-FG-A
DFC-10	50	5	10	160	5000	200	0.006	0.15	M6 x 1-6H	SPK-FG-S
DFC-20	100	10	20	320	10,000	200	0.008	0.20	M6 x 1-6H	SPK-FG-S
DFC-50	250	25	50	800	25,000	200	0.015	0.39	M6 x 1-6H	SPK-FG-S
DFC-100	500	50	110	1600	50,000	200	0.024	0.60	M6 x 1-6H	SPK-FG-S
DFC-200	1000	100	225	-	-	200	0.021	0.54	M6 x 1-6H	SPK-FG-M
DFC-500	2500	250	550	-	-	200	0.028	0.70	M10 x 1.5-5H	SPK-FG-L

NOTES

Load measurement accuracy is $\pm 0.1\%$ of load cell capacity. Display resolution is 10,000:1.

DFG - Basic Force Controller

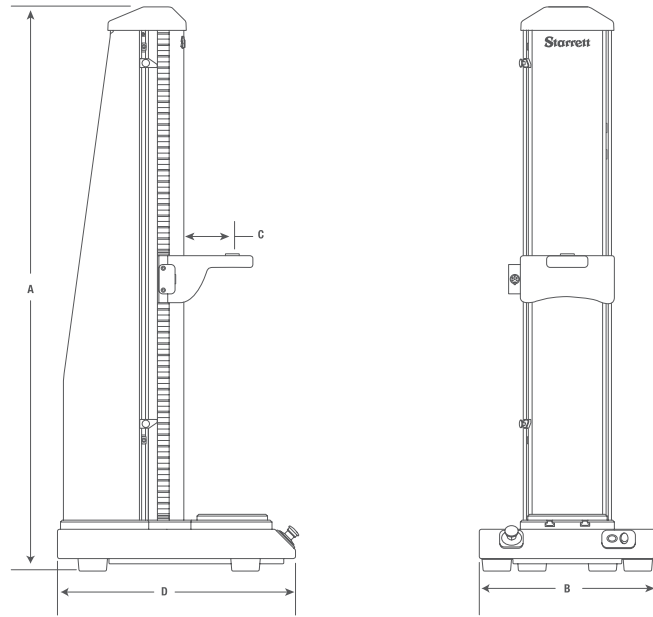
Model No.	Load Capacity					Safe Overload % Full Scale	Full Scale Deflection		Thread mm	Accessory Kit
	N	KGF	LBF	OZF	GF		in	mm		
DFG-10	50	5	10	160	5000	200	0.006	0.15	M6 x 1-6H	SPK-FG-S
DFG-20	100	10	20	320	10,000	200	0.008	0.20	M6 x 1-6H	SPK-FG-S
DFG-50	250	25	50	800	25,000	200	0.015	0.39	M6 x 1-6H	SPK-FG-S
DFG-100	500	50	110	1600	50,000	200	0.024	0.60	M6 x 1-6H	SPK-FG-S
DFG-200	1000	100	225	-	-	200	0.021	0.54	M6 x 1-6H	SPK-FG-M
DFG-500	2500	250	550	-	-	200	0.028	0.70	M10 x 1.5-5H	SPK-FG-L

NOTES

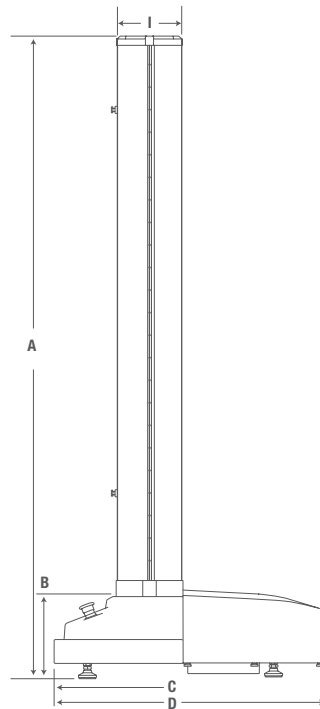
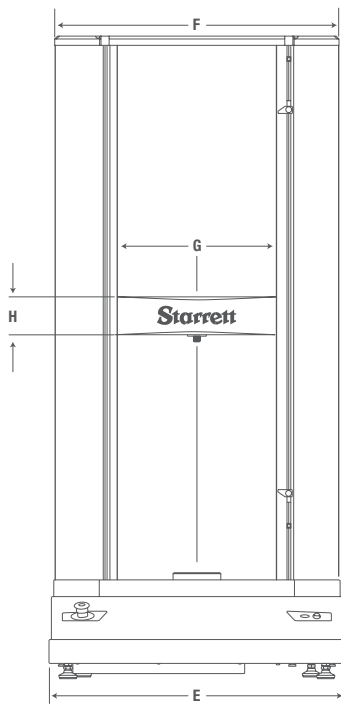
Load measurement accuracy is $\pm 0.2\%$ of load cell capacity. Display resolution is 5,000:1.

TEST FRAMES

DIMENSIONS



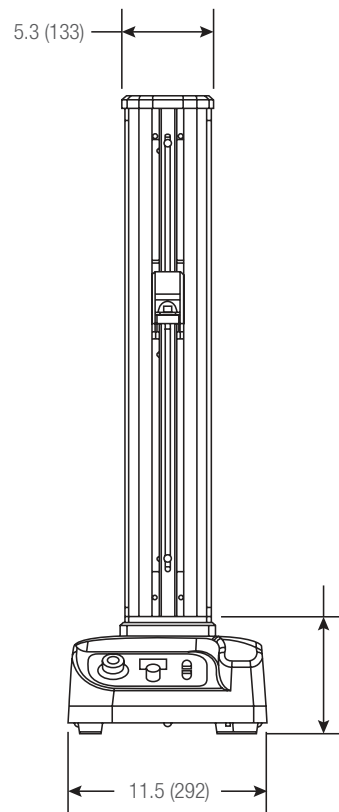
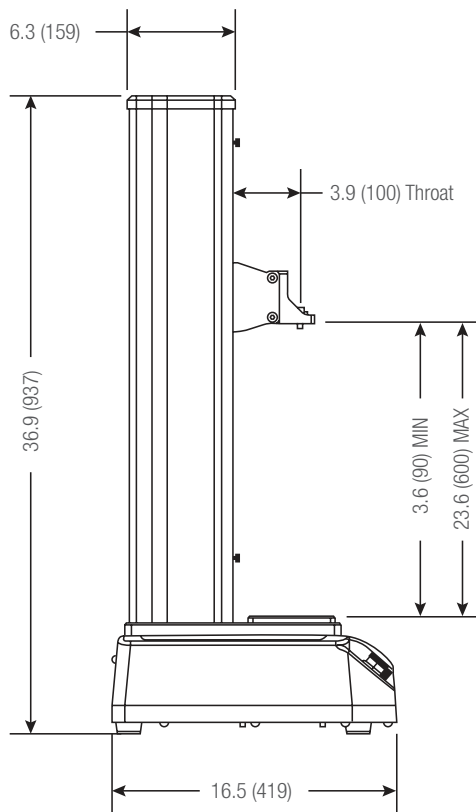
Dimensions				
Single Column Test Frames	A	B	C	D
MMS/FMS-1000 Test Frame	47.9 in 1218mm	15.0 in 381mm	4.1 in 105mm	20.3 in 514mm
MMS/FMS-2500 Test Frame	61.9 in 1573mm	15.0 in 381mm	4.1 in 105mm	20.3 in 514mm
MMS/FMS-5000 Test Frame	61.9 in 1573mm	15.0 in 381mm	4.1 in 105mm	20.3 in 514mm



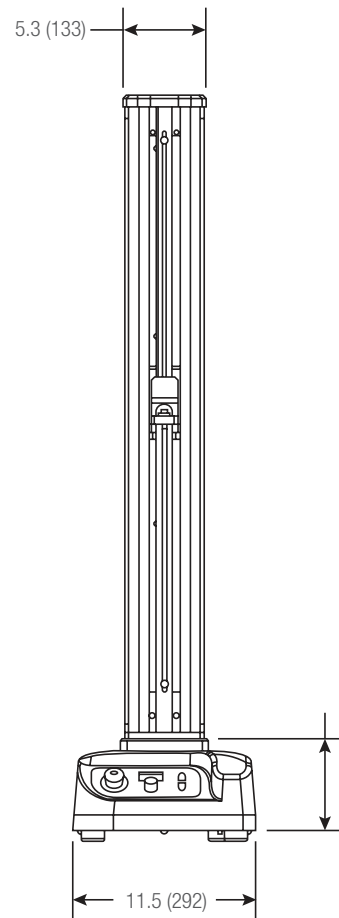
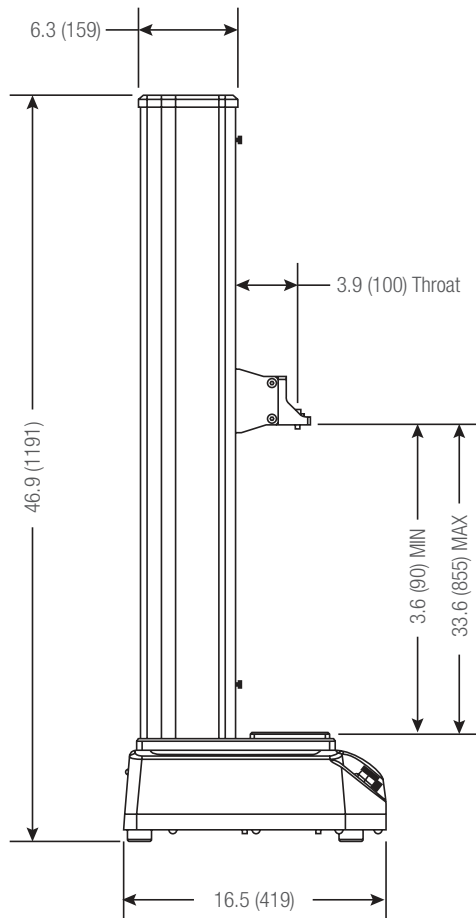
Dimensions									
Dual Column Test Frames	A	B	C	D	E	F	G	H	I
MMD/FMD-10K Test Frame	66.4 in 1685mm	9.4 in 238mm	10.0 in 254mm	28.5 in 724mm	31.0 in 787mm	29.7 in 754mm	16.7 in 424mm	3.0 in 76mm	6.7 in 170mm
MMD/FMD-30K Test Frame	67.4 in 1711mm	10.4 in 263mm	10.0 in 254mm	28.5 in 724mm	31.0 in 787mm	29.7 in 754mm	16.7 in 424mm	4.0 in 102mm	6.7 in 170mm
MMD/FMD-50K Test Frame	67.4 in 1711mm	10.4 in 263mm	10.0 in 254mm	28.5 in 724mm	31.0 in 787mm	29.7 in 754mm	16.7 in 424mm	5.0 in 127mm	6.7 in 170mm

DIMENSIONS

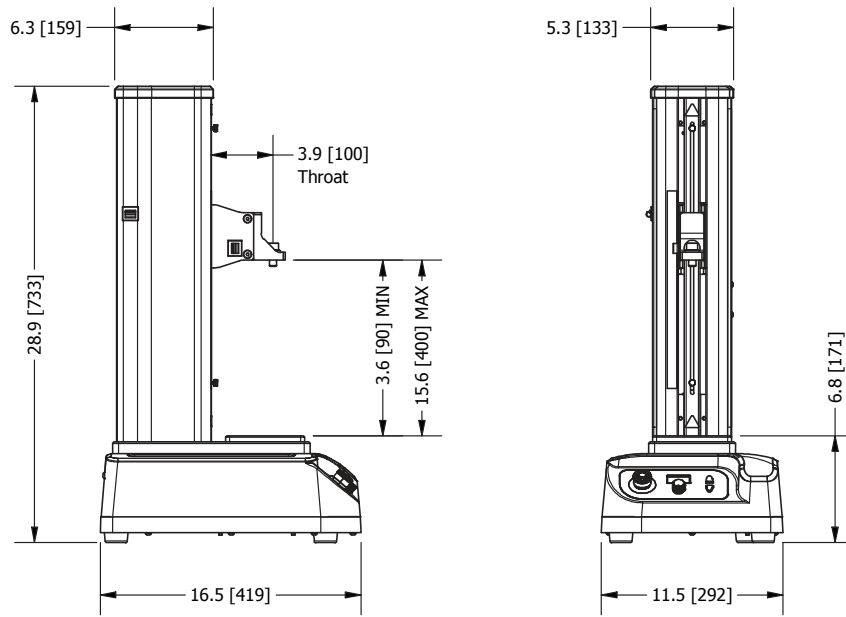
STANDARD TRAVEL



EXTENDED TRAVEL

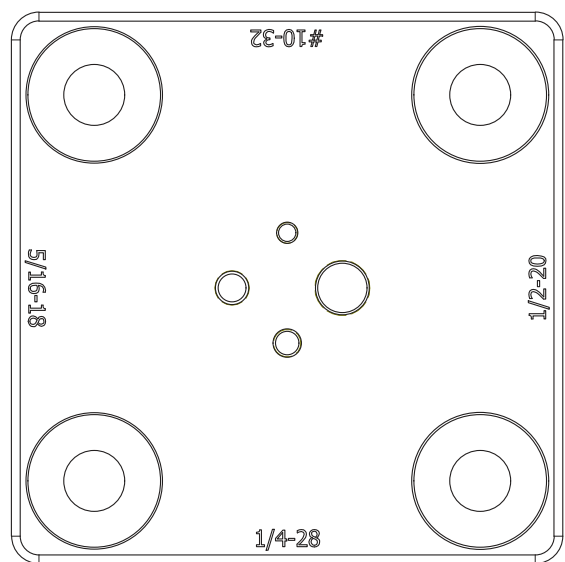
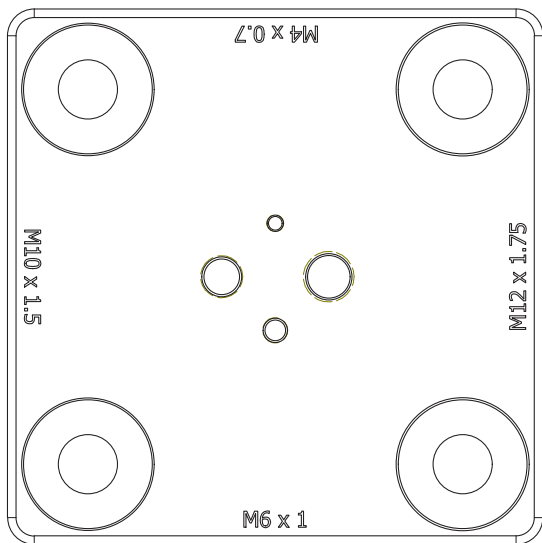


SHORT TRAVEL



The L1-Base-M is included standard on all FMM motorized test stands. Access the M4x0.7, M6x1, M10x1.5, or M12x1.75 threads by rotating the baseplate 90 degrees.

The L1-Base-US is an optional accessory. Access the #10-32, 1/4-28, 5/16-18, or 1/2-20 threads by rotating the baseplate 90 degrees.



CREATE. TEST. ANALYZE. REPORT.

SOFTWARE



L3 SOFTWARE

L3 Systems are optimized for users involved with material testing and characterization- the research engineer, the design engineer, the quality control technician, the test technician and others.



L2 PLUS SOFTWARE

L2 Plus Systems provide engineering and quality personnel with an easy-to-use, yet comprehensive solution for complex force analysis and measurement.



L2 SOFTWARE

L2 Systems are ideal for demanding force measurement testing. Create complex testing methods or use our standard test templates for all types of force measurement applications.



L1 SOFTWARE

L1 Systems are great for quality control and incoming inspection. They are engineered to meet the requirements for fast, efficient, high-volume production testing. Combining functionality with affordability.



S2 SOFTWARE

S2 Systems are application-specific solutions for testing compression and extension springs. Measure spring rate, spring constant, initial tension, free length and more.- fast and efficiently.



S1 SOFTWARE

S1 Systems represent our most basic digital testing solution for compression and extension springs. S1 systems are ideal for high-volume production testing and individuals looking for more consistent testing results.



DFC CONTROL

The DFC control option utilizes the DFC hand held force gages universal interface for basic load, distance and break testing. A great entry level economic solution.

Lx Software Product Comparisons and Capabilities							
Target Applications	L3	L2 Plus	L2	L1	S2	S1	DFC
Use for Stress, Strain and Material Testing applications	○						
Use for Advanced Load, Distance and Force Analysis applications	○	○					
Use for Basic Load, Distance and Force Measurement applications	○	○	○	○			
Use for Advanced Extension and Compression Spring applications	○	○					
Use for Basic Extension and Compression Spring applications					○	○	
User Interface							
All-In-On Computer Workstation, Windows® OS	○	○					
Tablet Computer, Windows® OS			○	○	○	○	
Force Gage							○
Software Applications							
Test Builder	○	○	○		○		
Force Quick Test Templates			○	○			
Spring Quick Test Templates					○	○	
Formula Builder	○	⊕	⊕		⊕		
Automation Builder	⊕	⊕	⊕		⊕		
Measurement Methodology							
Measure results using the graph	○	○					
Measure results using a List of Value menu	○	○	○		○		
Create Test Setups using Graphical Test Methods (No programming)	○	○	○		□		
Create Test Setups using Quick-Test Templates			○	○	○	○	
Test Methods							
Tensile Testing, Load, Distance, Break, Rate	○	○	○	○	□		○
Compression Testing, Load, Distance, Break, Rate	○	○	○	○	□		○
Hold Testing, Load, Distance for Duration or Event	○	○	○	○	□		
Cyclic Testing for Duration, Count, Loop or Event	○	○	○	○	□		
Shear Testing	○	○					
Flexural Testing	○	○					
Peel Testing	○	○					
Coefficient of Friction Testing	○	○					
Spring Testing	○	○			○	○	
Measurement Capabilities							
Measure Stress, Strain, Elongation, Strengths	○						
Measure Offset Yield	○						
Measure Modulus (Elastic, Chord, Tangent)	○						
Measure Strain and Elongation using Extensometer(s) (requires MMx test frames)	○						
Measure Energy, Work, Resilience	○	○					
Create Mathematical Expressions using Algebraic, Trigonometric and Logarithmic functions	○	▽					
Create Basic Expressions using Add, Subtract, Multiple and Divide	○	▽	▽		▽		
Use Digital I/O	▽	▽	▽		▽		
Use Analog I/O (requires MMx test frames)	▽	▽					
Use Command and Conditional Logic	▽	▽	▽		▽		
Measure Load, Distance, Time	○	○	○	○	○		○
Measure Minimum, Maximum and Averages	○	○	○	○	○		
Measure Slopes and Intersections	○	○					
Measure Peaks, Valleys, Counts, Averages	○	○					
Measure Break, Rupture	○	○	○	○	□		○
Measure Delta between results within a test	○	○	○				
Measure results within multiple test runs simultaneously (multiview)	○	○					
Measure Spring Rate, Spring Constant, Free Length	○	○			○	○	
Reporting and Exporting Data							
Print using standard reports, graph, batch, tolerance, statistics	○	○	○	○	○	○	
Export results/data in .csv for custom reporting	○	○	○	○	○	○	
Export results/data in .csv for integration with SPC software	○	○	○	○	○	○	
Include tolerances on any result	○	○	○	○	○	○	○

- = Standard
- ⊕ = Optional
- = Requires Test Builder application
- ▽ = Requires Automation Builder application