

# ***Force Measurement Testing Systems***



# **Starrett®**

***The Better Solution***





# *Starrett Innovation. Helping You Make Your Products Better.*

Our new Starrett force measurement systems exemplify the craftsmanship and quality synonymous with all Starrett products. Since 1880, Starrett has helped leading global manufacturers make better products through innovation, advanced measurement technologies and a commitment to customer satisfaction.

Starrett force measurement systems are optimized for demanding, high-volume manufacturing environments. Our systems are designed to help you improve your testing while increasing productivity, production yields and product quality.



**FMS500**

**FMS2500**

**FMS1000**

**FMS5000**



# The Better Solution for Force Measurement.

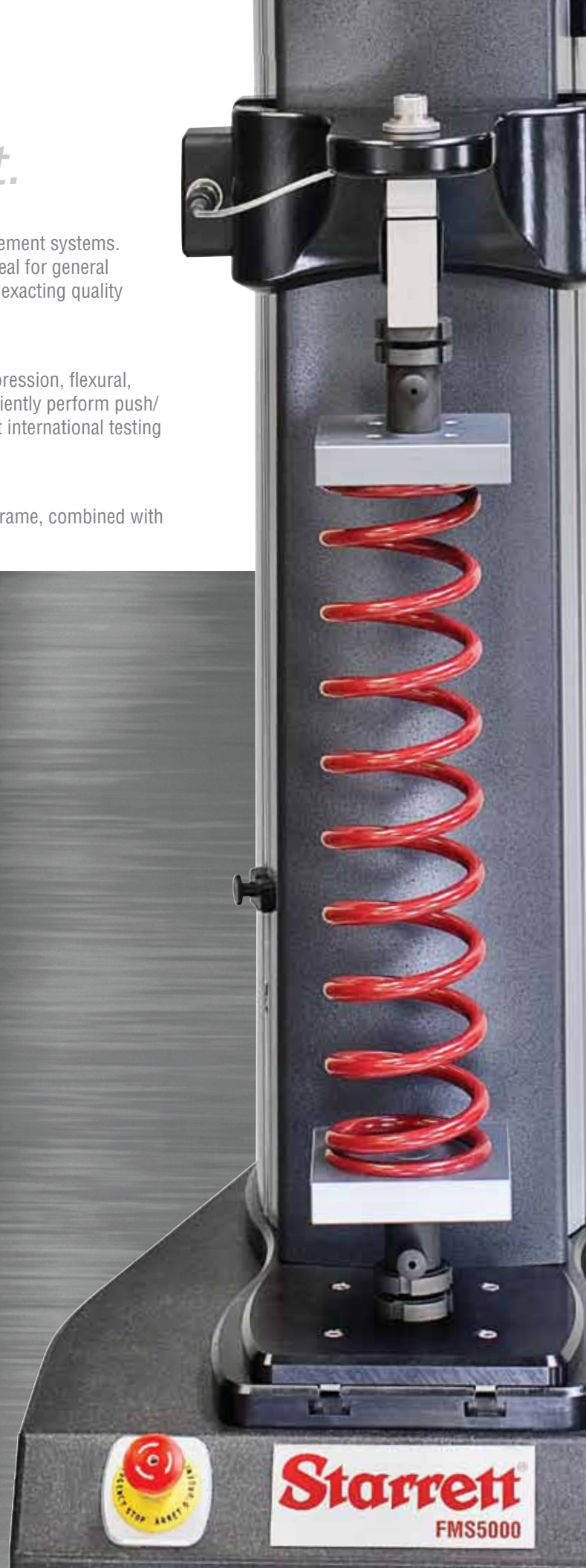
The Starrett FMS Series is a family of new and innovative force measurement systems. Available in four load capacities, these universal testing systems are ideal for general purpose force testing, demanding high-volume production testing, and exacting quality control testing.

Starrett force measurement systems are your solution for tensile, compression, flexural, shear, coefficient of friction, and cyclic testing. You can easily and efficiently perform push/pull testing, break testing, constant hold testing or tests that must meet international testing standards from ASTM, ISO, BS, DIN and others.

The FMS Series consist of a single-column electro-mechanical testing frame, combined with our L2 Series digital controller and a Starrett load cell sensor.

## Features & Specifications

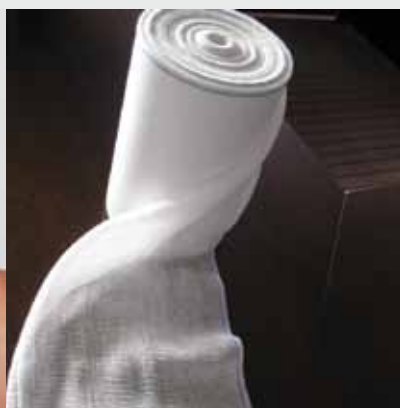
- Universal Testing
  - Tension, Compression, Cyclic, Flexural, Shear, Creep, Peel, COF
  - Four Load Capacities: 500N, 1kN, 2.5kN and 5kN
  - 0.001 to 50.0 in/min (0.02 to 1270mm/min) Test Speed
- Outstanding Measurement Accuracies
  - Better than 0.1% Load Measurement Accuracy
  - Smart Load Cell Sensors per IEEE 1451-4
  - Better than 0.2% Speed Rate Accuracy
  - Meets or Exceeds ASTM E4
- Innovative User Interface
  - Multi-touch Color Tablet PC Operation
  - Test Templates for Simple Testing
  - Advanced Test Builder for Complex Testing
- Test to Internationally Recognized Test Methods
  - ASTM Test Methods
  - BS Test Methods
  - DIN Test Methods
  - ISO Test Methods
- Lean Manufacturing & System Integration
  - Compact Footprint
  - Interface with I/O Devices
- CE Compliant



# FMS500

500N, 112lbf, 50kgf

Specifications		FMS500
Load Capacity	N	500
	kgf	50
	lbf	112
Maximum Test Speed	inch/min	50
	mm/min	1270
Minimum Test Speed	inch/min	0.001
	mm/min	0.02
Max. Load @ Max. Speed	N	500
	kgf	50
	lbf	112
Max. Speed @ Max. Load	inch/min	50
	mm/min	1270
Crosshead Travel Distance	inch	15
	mm	381
Crosshead Vertical Space	inch	22
	mm	559
Crosshead Throat Distance	inch/min	4
	mm/min	100
Test Frame Height	inch	32
	mm	813
Test Frame Width	inch	15
	mm	381
Test Frame Depth	inch	20.25
	mm	514
Test Frame Weight	lbs	135
	kg	61





# Precision...

## for Medical Device Manufacturers.

Advances in medical devices increase life expectancy and improved the way we live and recreate. Medical device researchers are continually evaluating products and materials.

Medical adhesives, syringes, artificial skin, foam orthotics, stents, medical gloves and other products require critical and exacting measurements prior to commercialization.

Starrett FMS Series can be used to test medical devices for their form, fit and function. Because of their ease of use and ability to create sophisticated test methods using our L2 Series software, FMS Series systems are ideal for medical device manufacturers. The ability to measure, analyze and collect data for exporting to quality control applications or to a network, make the FMS Series a cost-effective solution for medical device manufacturers around the world.

### *FMS Series solve these testing problems and more...*

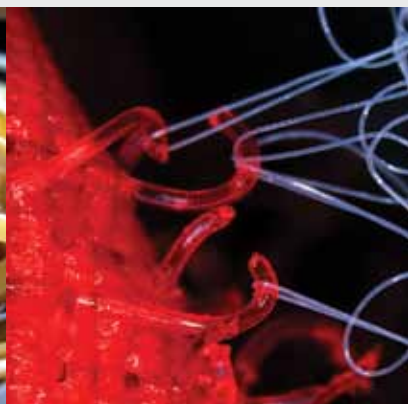
- Syringe Test
- Plunger Force Test
- Tissue Test
- Adhesive Strength Packaging
- Tissue Adhesive
- Needle Insertion
- Tubing
- Stent Dislodgement
- Catheters
- ASTM F88 - Seal Strength
- ASTM F382 - Metallic Bone Plates
- ASTM F451 - Bone Cement Strength
- ASTM F564 - Metallic Bone Staples
- ASTM F1828 - Ureteral Stents
- ASTM F1839 - Foam Devices
- ASTM F1874 - Sutures Bend Test
- ASTM F2009 - Dissassembly Force Taper Connects
- ASTM F2079 - Stents Tensile Strength
- ASTM F2132 - Puncture Resistance
- ASTM F2183 - Punch Testing
- ASTM F2255 - Lap Shear Testing
- ASTM F2256 - Tissue Adhesives
- ASTM F2258 - Tissue Adhesives
- ASTM F2392 - Burst Strength Sealant
- ASTM F2458 - Closure Strength
- ASTM F2477 - Stents Strength
- ASTM F2502 - Plates & Screws
- ASTM F2516 - Tensile Nitinol Wire
- ASTM F2606 - Bend Vascular Stent
- ASTM D6319 - Medical Gloves
- BS EN 455-2 - Medical Gloves
- ISO 7886-1 - Hypodermic Syringe
- ISO 14879 - Tibial Trays
- ISO 11193 - Medical Glove



# FMS1000

1000N, 225lbf, 100kgf

Specifications		FMS1000
Load Capacity	N	1000
	kgf	100
	lbf	225
Maximum Test Speed	inch/min	50
	mm/min	1270
Minimum Test Speed	inch/min	0.001
	mm/min	0.02
Max. Load @ Max. Speed	N	1000
	kgf	100
	lbf	225
Max. Speed @ Max. Load	inch/min	50
	mm/min	1270
Crosshead Travel Distance	inch	30
	mm	762
Crosshead Vertical Space	inch	37.5
	mm	953
Crosshead Throat Distance	inch/min	4
	mm/min	100
Test Frame Height	inch	50
	mm	1270
Test Frame Width	inch	15
	mm	381
Test Frame Depth	inch	20.25
	mm	514
Test Frame Weight	lbs	170
	kg	77



# *Simplicity...*

# *for Packaging Manufacturing.*

Packaging is as much of an art as it is a science. Combining creativity with mechanical integrity are important considerations for today's packaging designers and manufacturers. Packaging concepts range from ensuring consumer health and safety to enhancing a product's marketability.

FMS Series force measurement systems are ideal solutions for testing packaging- from concept, to manufacture, to validation from a 3rd-party supplier. Top load testing, crush strength testing, seal strength testing, snap on/off testing are all easily accomplished using the FMS Series. FMS Series help you test your packaging products and materials to your own testing requirements or to internationally accepted testing standards from ASTM, ISO, TAPPI and others.

Whether in the R&D laboratory or on your high-volume production floor, FMS Series can help you test your packaging products efficiently and accurately.

### *FMS Series solve these testing problems and more...*

- T-Peel
- 90° Peel
- 180° Peel
- Solder Paste Tackiness
- ASTM F1140 - Burst Strength
- ASTM D2659 - Top Load
- ASTM F88 - Seal Strength
- EN 868-5 - Seal Strength Pouches
- ASTM C633 -Adhesion Spray Coating
- ASTM D1335 - Tuft Binding Floor Covering
- ASTM D903 - Adhesive Bond
- ASTM D1876 - Peel Resistance
- ISO 36 - Rubber Adhesion
- ISO 2411 - Adhesion Plastic
- ISO 4587 - Lap Shear Strength
- ISO 11339 - Flexible Bond Assembly
- EN 1465 - Lap Shear Strength
- EN 1719 - Tack Measurement
- EN 1939 - Peel Adhesion
- FINAT Test Method 2 - 90° Peel





# FMS2500

2500N, 560lbf, 250kgf

Specifications		FMS2500
Load Capacity	N	2500
	kgf	250
	lbf	560
Maximum Test Speed	inch/min	50
	mm/min	1270
Minimum Test Speed	inch/min	0.001
	mm/min	0.02
Max. Load @ Max. Speed	N	2500
	kgf	250
	lbf	560
Max. Speed @ Max. Load	inch/min	50
	mm/min	1270
Crosshead Travel Distance	inch	40
	mm	1016
Crosshead Vertical Space	inch	49.5
	mm	1257
Crosshead Throat Distance	inch/min	4
	mm/min	100
Test Frame Height	inch	62
	mm	1575
Test Frame Width	inch	15
	mm	381
Test Frame Depth	inch	20.25
	mm	514
Test Frame Weight	lbs	195
	kg	88





# Accuracy...

## for Component Manufacturing.

Connectors, fittings, tubing, fasteners, wire, screws, springs, etc. are components used in everyday products. Measuring their ability to meet their physical requirements are important to the quality and life-cycle expectations for a product.

FMS Series systems can determine break strengths and the sample's characteristics at load and extension limit values and provide you with immediate pass/fail indication. Tensile, flexural, puncture and compression testing are important measurements that can help determine a component's ability to meet its intended application.

### *FMS Series solve these testing problems and more...*

- Compress (Load/Extension)
- Compress (Stress/Strain)
- Indentation (Load/Extension)
- Indentation (Stress/Strain)
- Spring Rate
- Spring Force
- Spring Height
- Compression Test
- Tensile Test
- Tensile Strength
- ASTM D3039 - Tensile Carbon Fiber
- ASTM D3846 - Shear Strength
- ASTM D7269 - Aramid Cords
- ASTM D6484 - Compressive Strength
- ASTM D1055 - Flex Resistance
- ASTM D3574 - Indention Deflection
- ASTM D3574 - Foam Deflection
- EN 14509 - Shear Strength
- ISO 527-4 - Tensile Isotropic/Orthotropic
- ISO 14125 - Flexural Properties
- ISO 14126 - In-plane Compression
- TAPPI - 404 - Tensile Break Strength
- TAPPI 220 - Burst Strength
- TAPPI 456 - Wet Paper Strength
- TAPPI 457 - Pull to Rupture
- TAPPI 494 - Tensile Energy Absorbing



# FMS5000

5000N, 1124lbf, 500kgf

Specifications		FMS5000
Load Capacity	N	5000
	kgf	500
	lbf	1124
Maximum Test Speed	inch/min	50
	mm/min	1270
Minimum Test Speed	inch/min	0.001
	mm/min	0.02
Max. Load @ Max. Speed	N	5000
	kgf	500
	lbf	1124
Max. Speed @ Max. Load	inch/min	50
	mm/min	1270
Crosshead Travel Distance	inch	40
	mm	1016
Crosshead Vertical Space	inch	47.5
	mm	1206
Crosshead Throat Distance	inch/min	4
	mm/min	100
Test Frame Height	inch	62
	mm	1575
Test Frame Width	inch	15
	mm	381
Test Frame Depth	inch	20.25
	mm	514
Test Frame Weight	lbs	195
	kg	88





# Efficiency...

## for High-Volume Manufacturing.

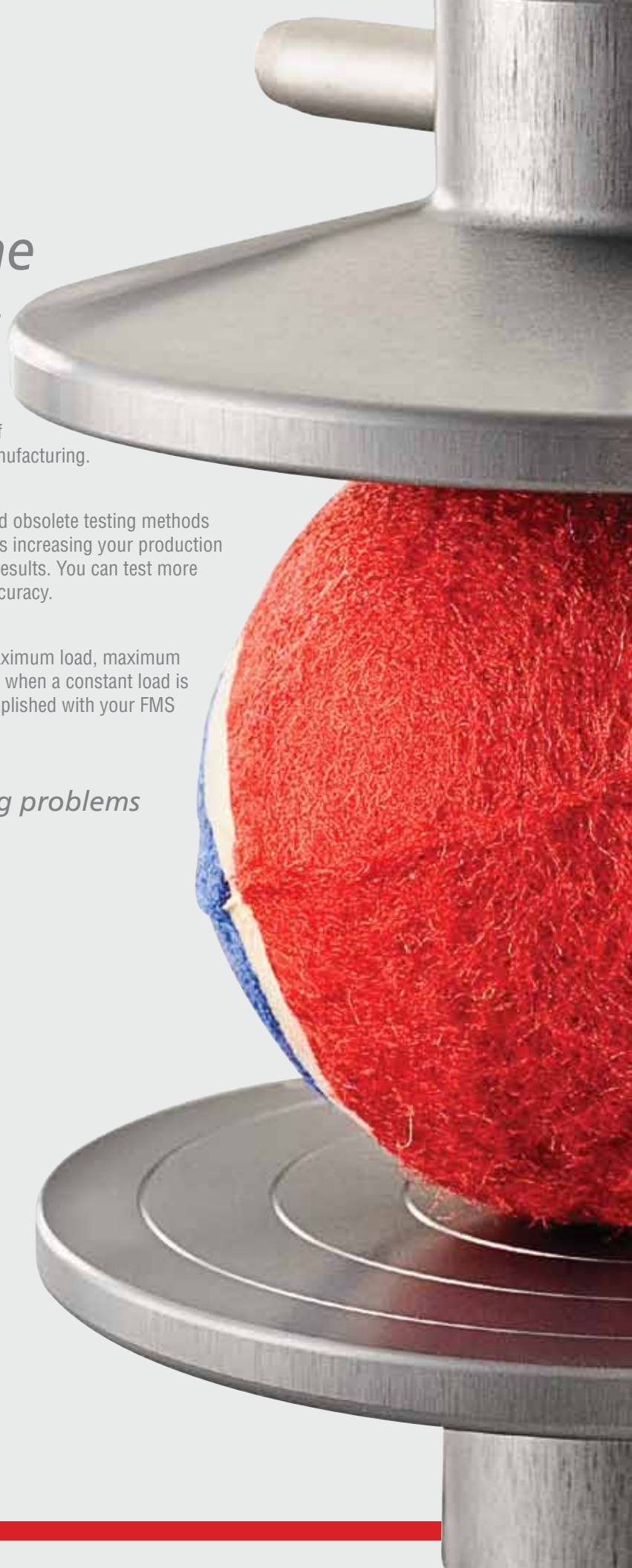
Production efficiency and throughput, improved manufacturing yields, lower manufacturing costs and improved utilization of assets and resources are critical for today's manufacturing.

The Starrett FMS Series can replace existing and obsolete testing methods operations can be performed with minimal steps increasing your production without compromising your measurements or results. You can test more products, more efficiently and with a greater accuracy.

Common test methods such as determining maximum load, maximum deflection, average loads or how product reacts when a constant load is applied for a specified period of time are accomplished with your FMS Series system.

### *FMS Series solve these testing problems and more...*

- Cyclic
- Pull/Push to Limit
- Pull/Push to Break
- First Peak
- Average Value (Peaks & Troughs)
- Average Value (Peaks)
- Average Value (Troughs)
- Snap On/Off
- Insertion/Extraction
- Creep/Relaxation (Extension)
- Creep/Relaxation (Load)



# L2 Controller

## Test Setup and Operation... Just a Touch Away.

Simplicity without compromise. This design objective is exemplified in our L2 digital controller. You can setup and perform tests quickly and confidently. Tests can be created in as few as two steps or you can create more sophisticated, multi-stage tests that comply with international testing standards from ASTM, ISO, DIN, BS and others.

Touch targets, menus, lists of values and intelligent prompts guide you through your controller's operation. Test results are displayed in a large format for easy viewing. Results are displayed in tabular and graphical formats. Tolerances can be used to determine pass/fail results. You can even view statistical analysis for your results.

With our L2 software, you create your test graphically using icons that represent how you want your tester to operate. Icons for tension, compression, constant hold, cycling and more are used to create your test's operation. You can define limits, break conditions, pre- and post-test functions, and how you want results to be used. The software even supports communication to I/O devices so based on a result, you can send a signal to a device such as an annunciator.

And we support a variety of display languages including English, Spanish, Portuguese, French, German, Italian, Chinese, Korean and more.







Our L2 controller is a tablet computer featuring a 10-inch (254mm) color, touchscreen display. The controller is both WiFi® and Bluetooth® compatible with two USB 2.0 ports. Exporting your results to a network device is simple, seamless and transparent.



# Load Cells

Choose the Correct Sensor...

*Accurate. Repeatable. Reliable.*

Starrett FLC Series load cell sensor are full-bridge sensors designed for force measurement applications. Our load cells are temperature compensated and have a measurement accuracy of  $\pm 0.1\%$  full scale throughout the entire range of the sensor's rated capacity.

All Starrett load sensors are supplied with a NIST-traceable Certificate of Calibration. All sensor types are "plug & play" and comply with IEEE 1451.4. All sensors meet or exceed ASTM E4, BS 1610, DIN 51221, ISO 7500-1 EN10002-2 and AFNOR A03-501 standards when calibrated on-site by an authorized Starrett service representatives.



## FLC-P

### "Premium" Series

Starrett premium FLC Series load cell sensors feature a 1000% safe overload protection. Capacities range from 5N (1 lbf) to 250N (56 lbf).

#### PREMIUM FLC Series Load Cells

Model	Capacity
FLC-5P	5N / 1lbf / 0.5kgf
FLC-10P	10N / 2lbf / 1kgf
FLC-25P	25N / 5lbf / 2.5kgf
FLC-50P	50N / 11lbf / 5kgf
FLC-100P	100N / 22lbf / 10kgf
FLC-250P	250N / 56lbf / 25kgf

Resolution is 10,000:1

## FLC-S

### "Sealed" Series

These Starrett sensors are environmentally sealed making them more suitable for applications where dirt, dust or other environmental conditions may be present. Capacities range from 200N (50 lbf) to 5kN (1124 lbf).

#### SEALED FLC Series Load Cells

Model	Capacity
FLC-500	500N / 112lbf / 50kgf
FLC-1000	1000N / 225lbf / 100kgf
FLC-2KN	2000N / 450lbf / 200kgf
FLC-5KN	5000N / 1125lbf / 500kgf

Resolution is 10,000:1

## FLC-E

### "Economy" Series

Starrett economy sensors are ideal for most force measurement applications. Available in capacities up to 5000N (1124 lbf), they have a safe overload of 150% full scale.

#### ECONOMY FLC Series Load Cells

Model	Capacity
FLC-50E	50N / 11lbf / 5kgf
FLC-100E	100N / 22lbf / 10kgf
FLC-200E	200N / 44lbf / 20kgf
FLC-500E	500N / 112lbf / 50kgf
FLC-1000E	1000N / 225lbf / 100kgf
FLC-2000E	2000N / 450lbf / 200kgf
FLC-5000E	5000N / 1124lbf / 500kgf

Resolution is 10,000:1

## Features & Specifications

- $\pm 0.1\%$  Measurement Accuracy
- Temperature Compensated
- TEDs Identification per IEEE 1451.4
- Supplied with NIST Certificate of Calibration
- Safe Overloads up to 1000% Capacity
- Low Creep
- May be Calibrated to ASTM E4 and ISO 7500



# Test Fixtures

*Choose the Correct Test Fixtures...*

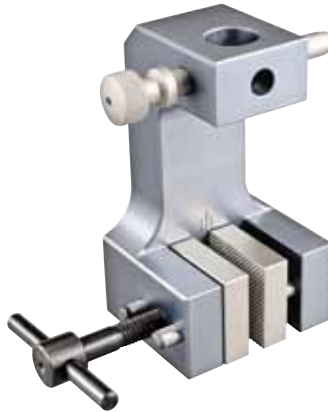
*A Wide Assortment Available for You.*

Starrett offers a wide variety of testing fixtures for force measurement and material testing applications. These test fixtures are mechanically compatible to load cell sensors and to the base fittings on all FMS Series force testers. Most use a standard 15.9mm clevis, with locking ring and grip pin for fast and simple installation.

And we can supply custom fixtures, including fixtures that meet ASTM, DIN, BS and other recognized testing standards.



*Wedge-action*



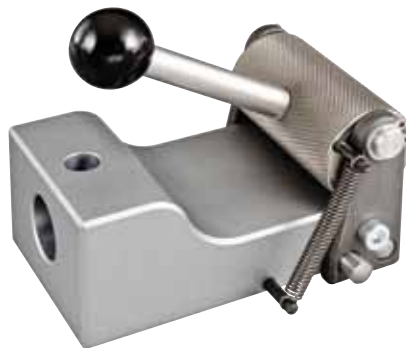
*Vise-action*



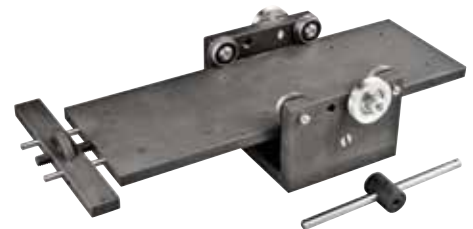
*Scissor-type*



*Pneumatic*



*Roller-type*



*Peel & Friction*



*Rope*



*Terminal*



*Platens*



*The L.S. Starrett Company  
Bulletin 1800 - Force Measurement  
Specifications Subject to Change  
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2.5M/Q 09/11*