At Metriguard, we bend, pull, stress, strike, and even destroy wood products to measure design properties such as modulus of elasticity, bending strength, shear strength, tensile strength, stress wave propagation time, and defect detection.

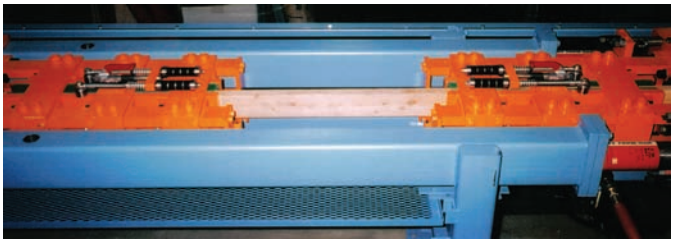
Model 401 Tension Proof Tester

A Model 401 Tension Proof Tester can test lumber as large as a 2x6 (38x140 mm) with tensile loads up to 100,000 pounds (440 kN).

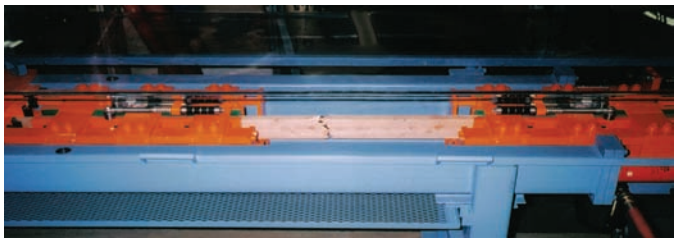
- **Patented wedge-grip design releases without binding**
- **Precise failure load measurement with optional electronic force measurement system**
- **Works as off-line quality control machine for MSR lumber production**
- **Most compact of Metriguard's tension proof testers**

Model 401 with a 2x4 clamped in the bending section; shown here with the optional, adjustable gauge length frame. The standard frame provides a fixed gauge length.

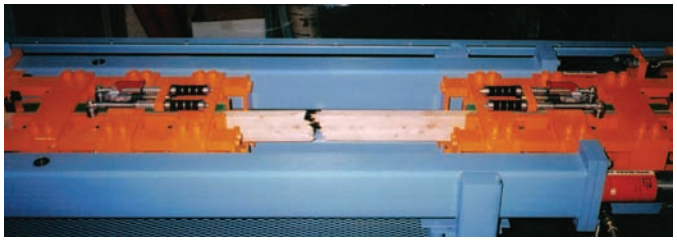
Description



Step 1: Clamp a 2x4 specimen in the Model 401.



Step 2: Pull the board until the weakest point fails. (Make sure machine guards are closed for this step!)



Steps 3 & 4: Read the failure force data and remove the board.

- Least expensive Metriguard Tension Proof Tester
- Designed for accurate, low-cost evaluation of lumber sizes up to 2x6 in (38x140 mm)
- Patented wedge-grip design, with two clamp assemblies, securely holds the specimen inside the steel frame
- Basic machine set to operate on a fixed gauge length. Length may be increased with optional push-rods, push-rod extensions or with an optional frame (shown above) which provides eight fixed gauge lengths.
- Material inserted on-edge from either end of the machine
- Initial clamping force provided by a hand-actuated toggle or an optional pneumatic system. Two hydraulic cylinders, powered by a hydraulic pump, apply the tensile load.
- Applied load and the force at which lumber failure occurs are measured with optional force measurement systems.
- The hydraulic gauge is the most economical way to measure tensile force, while the electronic load cell force measuring system is the most accurate and versatile method.

Specifications

General

The Model 401 Tension Proof Tester grips the test specimen, applies a test load with hydraulic cylinders, and measures the load applied. Maximum load attained while the specimen is loaded to failure is displayed. Polycarbonate shields protect personnel from injury. Endwise loading allows testing of material of any length. The standard Model 401 accomodates material from 3/4 in (19 mm), or from 1.25 in (32 mm) to 2.00 in (51 mm) thick. Modified clamps can accommodate other thickness ranges.

Test Gauge Length	24 in (610 mm), or specified
Maximum Tensile Force	100,000 lb (440 kN), via hydraulic pressure
Tensile Force Measurement	Select from options
Tensile Force Actuation	10,000 psi (69 MPa) hydraulic cylinders
Maximum Tensile Stroke	2 in (51 mm)
Clamp Force Actuation	From tensile force via split inclined plane
Initial Clamp Force	Hand-actuated toggles; one on each clamp
Clamp Grip Length	23 in (584 mm)
Vertical Centering in Clamps	Provided for material widths 1.5, 2.5, 3.5, and 5.5 in (38, 64, 89, and 140 mm)

Test Material Size Range

Width	Up to 5.9 in (150 mm)
Thickness	1.25 to 2.00 in (32 to 51 mm)
Length	>70 in (1780 mm) for full grip coverage and standard gauge length. Shorter specimens allowed with shorter gauge length or reduction in maximum force

Power

Electric Power	115 Vac 50/60 Hz, 7.6 amp (approx.)
Hydraulic Pump	1/2 horsepower pump (standard) HYD-PUM-1001

Pump Specifications

Maximum pressure	10,000 psi (69 MPa)
Oil flow at max pressure	17 in^3/min (280 ml/min)
Valve positions	retract, hold, metered advance, and full advance
Electric control	Pendant on/off switch
Electric power	1/2 hp, 50/60 Hz, single phase, 115 Vac standard, 220 Vac 50 Hz motor available
Reservoir capacity	1155 in^3 (18.9 l)
Usable capacity	1150 in^3 (18.8 l)
Weight	45 lbs (20 kg) (without oil)
Duty Cycle	Heating restrictions limit continuous testing to 30 boards followed by a 60% duty cycle

System Dimensions

Length	101 in (2565 mm)
Width	17 in (432 mm)
Height	16 in (406 mm)
Shipping Weight	1300 lbs (590 kg)

Options

Standard Frame

Includes either standard or metric electronic force measurement system, pedestal, and 1/2-horsepower hydraulic pump. (401-BAS-1501)

Optional Frame

Includes the adjustable gauge length machine frame with either the standard or metric electronic force measurement system, pedestal, and 1/2 horsepower hydraulic pump. (401-BAS-1502)

Force Measurement

See Table on Page 42 for list of optional force measurement systems.

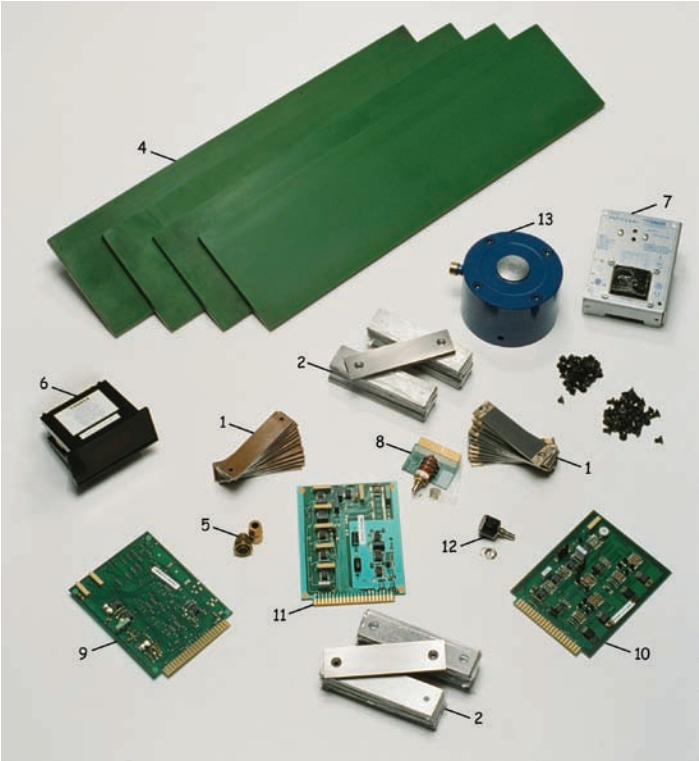
Test Gauge Length

Push rod extensions available for testing material at gauge lengths from 2 ft (610 mm) to 8 ft (2440 mm) in 2 ft (610 mm) increments.

Tension Calibration Link

Includes two wood-faced steel paddles for insertion into the clamps; a tension load cell with steel pins for attachment to the paddles; and a readout unit with gauges. The tension calibration link, when inserted into the Model 401 Tension Proof Tester and brought up to load, gives a completely independent measurement of force for checking the force calibration up to 100,000 lbs (440 kN). (SYS-ASM-1001)

Spare Parts



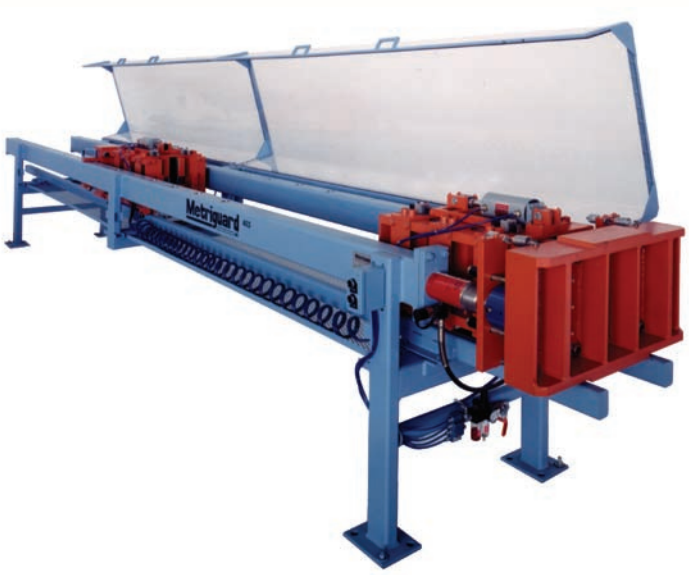
401 Spares Kit - English Version Shown (401-KIT-1006)
Metric Unit Version Available (403-KIT-1007)

Item	Description	Part Number	Qty
1	Bearing plates with bolts	401-KIT-1001	1
2	Bearing wear plates with bolts	401-KIT-1002	1
3	Grip plates, hard/orange (set of 4, not shown)	401-KIT-1003	0
4	Grip plates, soft/green (set of 4)	401-KIT-1004	1
5	Load cell connector, 6-pin socket	CON-PLU-1030	1
6	Panel meter, 3.5 digit LED 1/8DIN	DIS-PAN-1004	1
7	Power supply +15/-15	POW-DCO-1003	1
8	Switch, 12-position, with stops	PRN-A1MF	1
9	Peak track board (x10 gain)	PRN-B2PT	1
10	Load cell oscillator board	PRN-C2LO	1
11	Load cell amplifier board, 100k, English	PRN-T2LA	1
12	Potentiometer, 10K 10T 3/8-inch bushing mount	RES-POT-1005	1
13	Load cell, 50k compression	SEN-STR-1006	1

Model 403 Tension Proof Tester

Our most popular tension proof tester. The Model 403 tests lumber up to 2x12 in (38x286 mm) with tensile loads up to 100,000 lbs (440 kN). This machine can satisfy most of your tensile strength testing needs for structural lumber and composite materials.

- **Largest tension proof tester with the patented wedge grip**
- **Flexible and easily changed gauge lengths**
- **Unlimited maximum specimen length**
- **Provides tensile quality control in MSR lumber production, qualifying the product for tensile strength rating marks in its grade stamp**



Model 403 Tension Proof Tester

Description

The electronics unit for the Model 403 is clearly labeled and very easy to use. This unit requires a 115 Vac power source.

- The Model 403 is our most popular tension proof tester for dimensional lumber.
- Tension tests lumber up to 2x12 in (38x286 mm) with up to 100,000 pounds (440 kN) of tensile force
- Patented wedge-grip clamps hold massive jaws which squeeze tight as the tensile force is increased
- Clamps have open ends so the length of the tested board is only limited by space in the room.
- Testing span from 1 ft (305 mm) to 12 ft (3660 mm) between the clamps.
- Custom testing spans may be specified at the time of order
- Set end clamp is easily moved by hand to increase or decrease gauge length
- Test material is inserted on-edge from either end of the machine
- Pneumatic closure system provides initial clamping force
- Two frame-mounted hydraulic cylinders provide tensile load
- Options are available for displaying the maximum load attained while the specimen is loaded to failure.

Model 403 Tension Proof Tester

Specifications

General

The Model 403 Tension Proof Tester grips the test specimen at its ends, applies a test load by means of hydraulic clyinders, and measures the load applied. Each of the two clamps in the Model 403 contains a pair of polymer-surfaced steel grip plates, for a total of 4 grip plates. There are differences in the friction characteristics of the wood/grip interface for the different wood species and different polymer grip coatings. The hard orange polymer lasts longer than the soft green polymer, but the friction characteristics of the soft polymer are better. Polymer life has been found quite acceptable for the Model 403 even with the soft polymer, and new machines are provided with soft polymer grip plates unless specified otherwise at time of order. The grip plates are interchangeable and can be recoated with either hard or soft polymer.

Test Gauge Lengths	1 to 12 ft in 1 ft increments (305 to 3660 mm in 305 mm increments) between grips for 16 ft machine. 1 to 16 ft in 1 ft increments (305 to 4877 mm in 305 mm increments) between grips for 20 ft machne.(Other gauge lengths available by special order.)
Maximum Tensile Force	100,000 lb (440 kN)
Tensile Force Actuation	10,000 psi (69 MPa) hydraulic cylinders
Maximum Tensile Stroke	4 in (102 mm)
Clamp Force Actuation	From tensile force via split inclined plane
Initial Clamp Force	Air cylinder; one on each clamp
Clamp Grip Length	24 in (610 mm)
Vertical Centering in Clamps	Provided for material widths 1.5, 2.5, 3.5, 4.5, 5.5, 7.25, 9.25, and 11.25 in (38, 63.5, 89, 114, 140, 184, 235, and 286 mm)
Material Feed	From either end of machine
Lumber Centerline Height	34 in (864 mm)

Test Material Size Range

Width	Up to 11.75 in (290 mm)
Thickness	Approx. 1.25 to 2.00 in (32 to 51 mm)
Length	Greater than 5 ft. (1524 mm) for full grip coverage (gauge length) + 2 x (grip length). Unlimited maximum length. Shorter lengths allowed with reduction in maximum force

Power

Force Measurement System	115 Vac 50/60 Hz 2 amp (230 Vac available)
Pneumatic	Clean shop air at 90 psi, 0.1 cubic ft/cycle
Hydraulic Power Unit	1/2-horsepower electric pump with gauge, pressure-compensated flow control valve, and a steel reservoir

Pump Specifications

Maximum pressure	10,000 psi (69 MPa)
Oil flow at max pressure	17 in^3/min (280 mL/min)
Valve positions	retract, hold, metered advance and full advance.
Electric control	Pendant on/off switch
Electric power	1/2-hp, 50/60 Hz, single phase, 115 Vac standard, 230 Vac 50 Hz motor
Duty Cycle	Heating restrictions limit continuous testing to 30 boards followed by a 60% duty cycle.

Options

Standard Frame

Model 403 with 16-ft frame (4877 mm), 1/2-horsepower pump, and force measurement system. (403-BAS-1501)

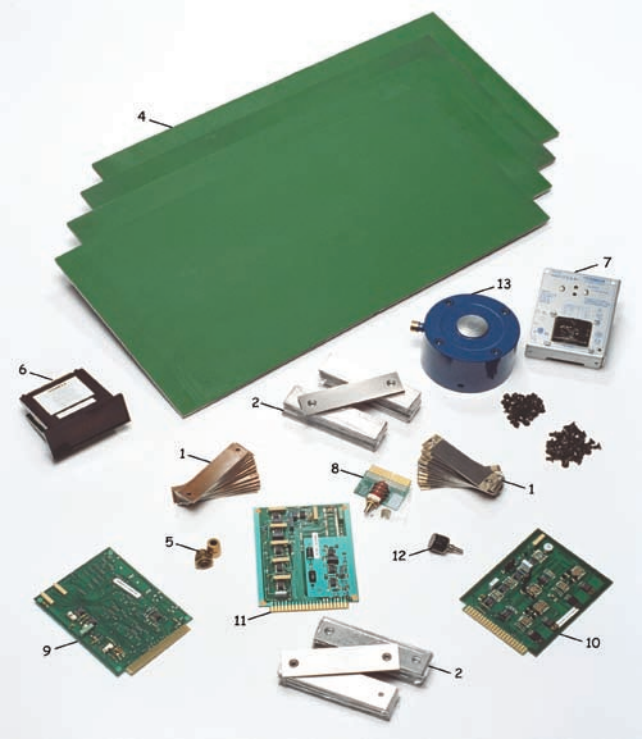
Optional Frame

Model 403 with 20-ft frame (6096 mm), 1/2-horsepower pump, and force measurement system. (403-BAS-1502)

Tension Calibration Link

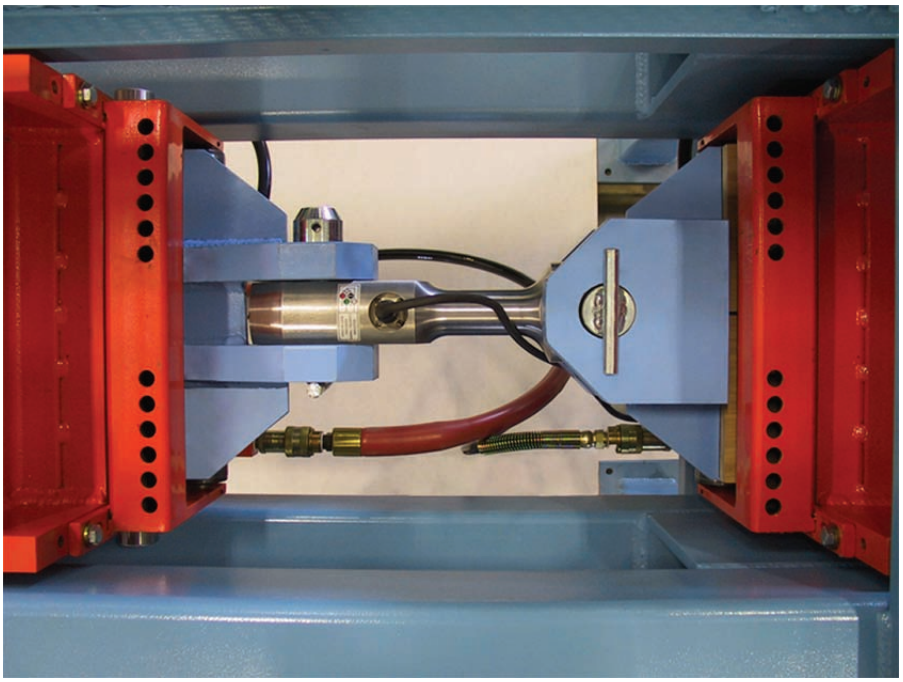
Includes two wood-faced steel paddles for insertion into the clamps; a tension load cell with steel pins for attachment to the paddles; and a readout unit. The tension calibration link, when inserted into the Model 403 Tension Proof Tester and brought up to load, gives a completely independent measurement of force for checking the force calibration up to 100,000 lbs (440 kN). (SYS-ASM-1005)

Spare Parts



403 Spares Kit English Units Version Shown (403-KIT-1004), Metric Unit Version Available (403-KIT-1005)

Item	Description	Part Number	Qty
1	Bearing plates with bolts	401-KIT-1001	1
2	Bearing wear plates with bolts	401-KIT-1002	1
3	Grip plates, hard/orange (set of 4, not shown)	403-KIT-1001	0
4	Grip plates, soft/green (set of 4, standard)	403-KIT-1002	1
5	Load cell connector, 6-pin socket	CON-PLU-1030	1
6	Panel meter, 3.5 digit LED 1/8DIN	DIS-PAN-1004	1
7	Power Supply +15/-15	POW-DCO-1003	1
8	Switch, 12-position with stops	PRN-A1MF	1
9	Peak track board (x10 gain)	PRN-B2PT	1
10	Load cell oscillator board	PRN-C2LO	1
11	Load cell amplifier board, 100k English	PRN-T2LA	1
12	Potentiometer, 10K 10T 3/8-inch Bushing mount	RES-POT-1005	1
13	Load cell, 50k compression	SEN-STR-1006	1



Top View of a Tension Calibration Link Assmebly Installed.

Includes:

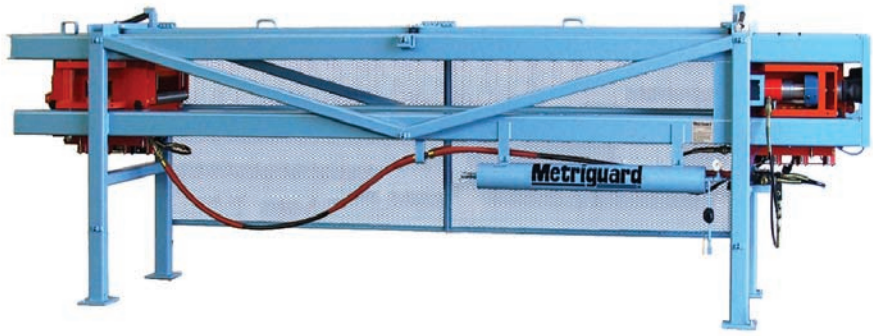
Two wood-faced steel paddles for insertion into the clamps, a tension load cell with steel pins for attachment to the paddles, and a readout unit.

(SYS-ASM-1005)

Models 412 & 422 Tension Proof Testers

Some customers demand more versatility and greater capacity—these two machines each deliver the ability to apply tensile force and clamp force independently.

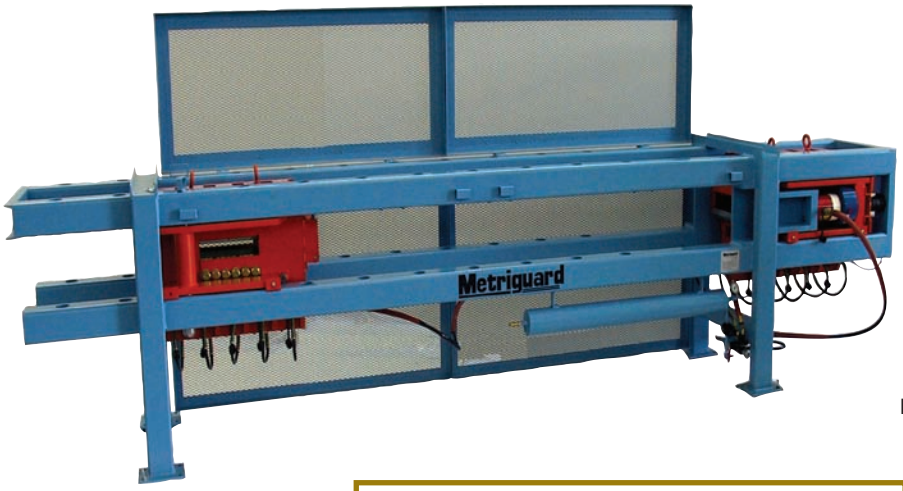
- **Features separate hydraulic cylinder groups to clamp and apply tensile forces**
- **Features the greatest capacity of Metriguard's off-line tension proof testers**
- **Ensures conformance to tensile strength design values**
- **Provides excellent quality control for MSR lumber production**



Model 412 Tension Proof Tester

Description

- Applies tensile force to verify tensile strength in dimension lumber
- Model 412 force range to 100,000 lbs (440kN)
- Model 422 force range to 200,000 lbs (890kN)
- Welded steel frames hold two clamp assemblies
- "Set end" clamp is on rollers and is easily moved by hand and pinned into position to accommodate a range of test gauge lengths.
- "Power end" clamp moves with respect to the frame under hydraulic power to provide tensile load to the lumber.
- Clamps open at ends to allow testing long pieces without trimming.
- Both systems contain two sets of hydraulic cylinders, one set to provide clamping force, the other to provide tensile load.
- Hydraulic pressure from a single electric hydraulic pump is applied to the clamps and, when sufficient clamp pressure is attained, a valve is activated and tensile force is applied.
- Guards are provided to protect personnel from flying pieces when a test specimen fails.
- Electronic load cell force measurement system measures and displays both applied tensile load and ultimate tensile load if lumber failure occurs.
- Hydraulic clamping provides opportunity for independent control of clamping force.



Model 422 Tension Proof Tester

Models 412 and 422 Tension Proof Testers

Both Tension Proof Testers grip the test specimen at its ends, apply a test load by means of hydraulic cylinders, and measure the load applied. Means are provided for displaying the maximum load attained while the specimen is loaded to failure. Guards are provided to protect personnel from injury by flying pieces when the specimen fails. Convenient adjustment of test gauge length is a feature which allows testing of random material lengths.

Specifications: 412

General

Test Gauge Lengths	1 to 12 ft by 1 ft steps (305 to 3658 mm by 305mm steps)
Maximum Tensile Force	100,000 lb (440 kN)
Tensile Force Measurement	Electronic load cell with digital readout and peak track
Tensile Force Actuation	10,000 psi (69 MPa) hydraulic cylinders.
Maximum Tensile Stroke	2 in (51 mm)
Clamp Force Actuation	10,000 psi (69 MPa) hydraulic cylinders
Initial Clamp Force	Hydraulic sequence valve
Clamp Grip Length	23 in (584 mm)
Horizontal Centering in Clamps	Provided for material widths 2.5, 3.5, 5.5, 7.25, 9.25, and 11.25 in (64, 89, 140, 184, 230, and 290 mm)
Material Feed	From either end of machine

Material Size Range

Width	2.5 in to 11.25 in (64 to 300 mm)
Thickness	1.25 in to 2.75 in (32 to 69 mm). Spacer plates allow testing of material down to zero thickness
Length	Greater than 70 in (1780 mm)
Electric Power	115 Vac 50/60 Hz single phase, 3A for electronic unit, 230 Vac 50/60 Hz single phase, 11A for hydraulic power unit

Machine Dimensions

Length	16 ft 9 in (5110 mm)
Width	2 ft 6 in (762 mm)
Height	3 ft 9 in (1143 mm)
Weight	4000 lb (1800 kg)

Specifications: 422

General

Test Gauge Lengths	1 to 11ft by 1ft steps (305 to 3353 mm by 305 mm steps)
Maximum Tensile Force	200,000 (880 kN)
Tensile Force Measurement	Electronic load cell with digital readout and peak track
Tensile Force Actuation	10,000 psi (69 MPa) hydraulic cylinders
Maximum Tensile Stroke	2 in (51 mm)
Clamp Force Actuation	10,000 psi (69 MPa) hydraulic cylinders
Initial Clamp Force	Hydraulic sequence valve
Clamp Grip Length	30 in (762 mm)
Horizontal Centering in Clamps	Provided for material widths 2.5, 3.5, 5.5, 7.25, 9.25, and 11.25 in (64, 89, 140, 184, 230, and 290 mm)
Material Feed	From either end of machine

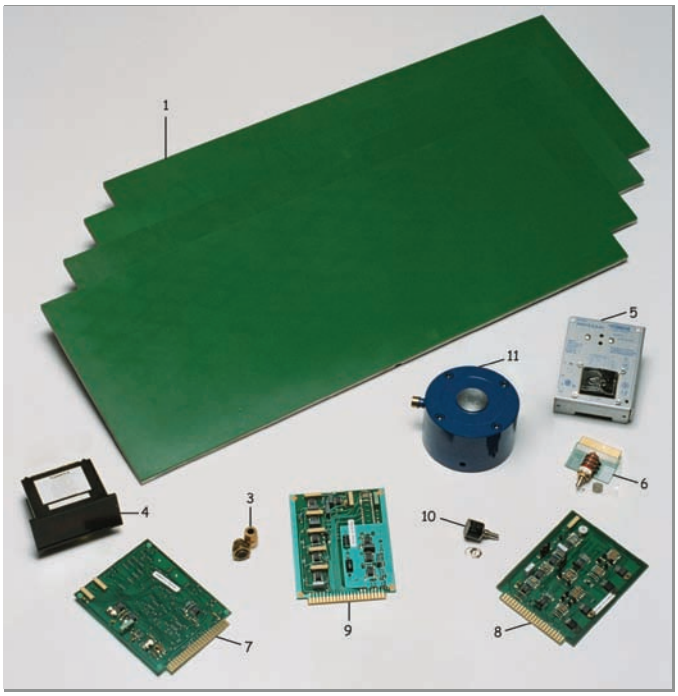
Material Size Range

Width	Up to 11.8 in (300 mm)
Thickness	1.25 to 2.75 in (32 to 70 mm)
Length	Greater than 72 in (1830 mm)
Electric Power	See Model 412 specifications listed above

Machine Dimensions

Length	16 ft 9 in (5110 mm)
Width	3 ft (914.4 mm)
Height	4 ft (1219 mm)
Weight	6,400 pounds (2900 kg)

Spare Parts



422 Spares Kit - English Version Shown (422-KIT-1003)
Metric Unit Version Available (422-KIT-1004)

422-KIT-1003 Spare Parts for a Model 422			
Item	Description	Part Number	Qty
1	Grip plates, green	422-KIT-1001	4
2	Grip plates, orange (not shown)	422-KIT-1002	4
3	Connector load cell 6-pin socket	CON-PLU-1030	1
4	Panel Meter, 3.5 digit LED, 1/8DIN	DIS-PAN-1004	1
5	Power Supply +15/-15	POW-DCO-1003	1
6	Switch, 12-position with stops	PRN-A1MF	1
7	Peak track circuit board (x10 gain)	PRN-B2PT	1
8	Load cell oscillator circuit board	PRN-C2LO	1
9	Load cell amplifier board, 200k	PRN-T4LA	1
10	Potentiometer, 10K 10T 3/8-inch bushing mount	RES-POT-1005	1
11	Load cell, 100k compression	SEN-STR-1010	1

Comparison Chart: Metriguard Tension Testers

MODEL		Thickness Range (in) 0 2 4	Width Range (in) 0 2 4 6 8 10 12 14	Maximum Force (lbf)	Gauge Lengths	Grip Closure	Orien-tation	Comments
401	OFFLINE	(Option) (Option)		100 k	2 feet (extenders to 8 feet)	Hand Toggle (Pneumatic)		Wedge Grip
403		(Option) (Option)		100 k	1 – 12 feet (in 1-foot increments)*	Pneumatic		
412				100 k	1 – 12 feet (in 1-foot increments)*	Hydraulic		Hydraulic Grip
422				200 k	1 – 11 feet (in 1-foot increments)*	Hydraulic		
4100	INLINE			24 k	8 – 60 feet 1/2 inch increments	Hydraulic		Automatic Control (Feedworks)
4120				35 k	8 – 40 feet Continuous	Hydraulic		
4130				225 k	8 – 40 feet Continuous	Hydraulic		

* (Other gauge lengths optional.)

Over the years we have built a number of highly specialized tension proof testers. Customers have presented us with specific needs and we designed and built solutions for them. The following machines illustrate some of our capabilities.

Description: Model 4100

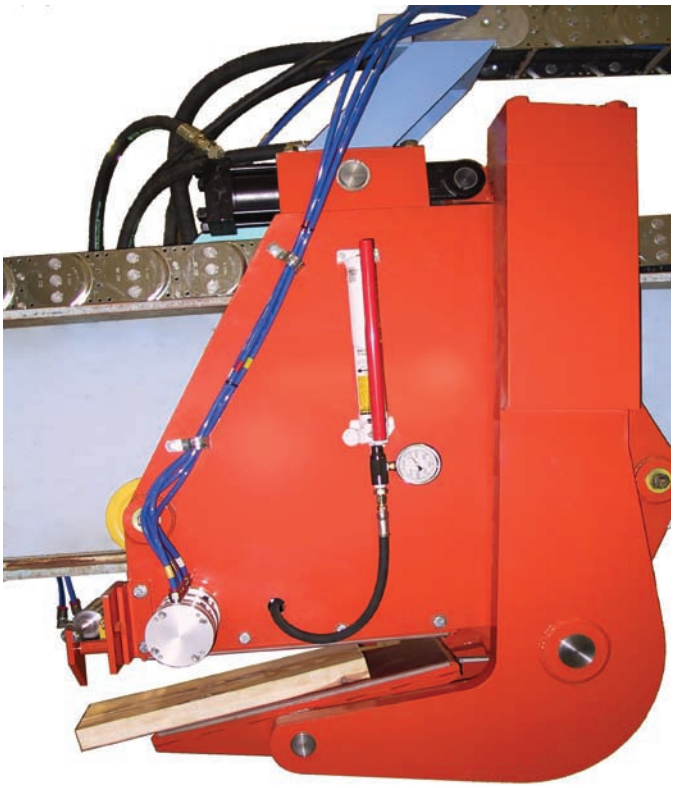
- **Verifies the tensile strength of lumber, parallel to the grain**
- **Accommodates 2x3 through 2x6 inch (38x64 mm through 38x140 mm) lumber at a specified length**
- **A tensile force up to 24,000 pounds (107 kN)**
- **Can test up to eight pieces of lumber per minute**

A horizontal transverse conveyor (not included) feeds pieces of lumber into the jaws of the Model 4100. Pneumatically-controlled mechanical stops position the piece in the clamps prior to tensile loading.

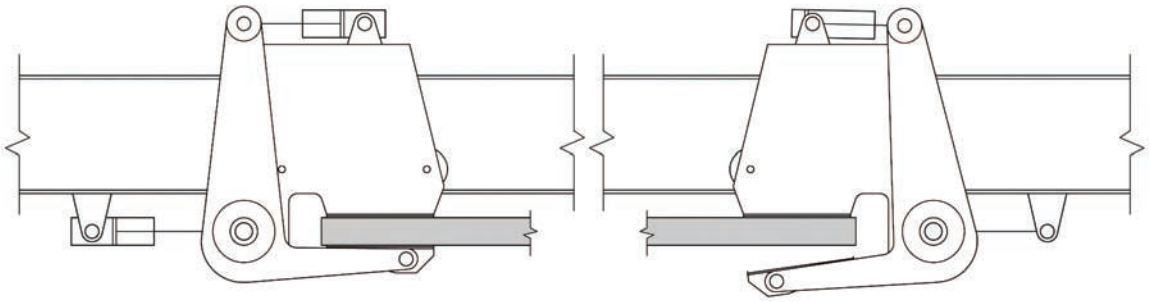
An automatic control system sequences the hydraulic clamps and applies a preset tensile load for a preset amount of time. The tensile load is then released, the clamps open, and the piece continues downstream on the transverse conveyor.

The Model 4100 includes a machine frame with two clamp assemblies, a hydraulic pump and control unit, a programmable controller, and a control console.

The Models 4120 and 4130 are specialized evolutions of the Model 4100. All are in-line models and all test the tensile strength of lumber. They differ in the sizes of lumber they can measure, the force at which they measure that lumber, how they deal with broken pieces, and options available.



Open set-end clamp of Model 4100 Tension Proof Tester, mounted on its support frame, with a small piece of lumber placed on the lower grip plate.



Schematic diagram of an inline tension proof tester. The power-end clamp is on the left, shown closed with a test piece clamped. The set-end clamp is on the right, shown open. In use, the system automatically opens and closes both clamps at the same time.

Specifications: Model 4100

General

The Model 4100 applies a tensile proof test to lumber specimens to verify tensile strength, parallel to grain. Specimens are fed to the machine on a horizontal transverse conveyor (not included). Pneumatic-controlled mechanical stops position the test specimen in the clamp jaws. An automatic control system sequences hydraulic-actuated clamps. Tension load is applied to a preset force level and held for a preset time, after which the tension load is released, the clamps are opened, and the specimen travels downstream on the transverse conveyor.

The Model 4100 system includes a machine frame with two clamp assemblies, a hydraulic pump and control unit, a programmable controller, and a control console.

Test Gauge Lengths	8 – 30 ft (2.4 to 9.1 m) in (approx) 0.5 in (12.7 mm) increments over the length range
Maximum Tensile Force	24,000 lb (107 kN)
Tensile Force Detection	Hydraulic pressure gauge, pressure sensor, and adjustable thresholds
Tensile Force Control	Pressure reducing valve.
Maximum Tensile Stroke	6 in (152 mm)
Clamp Force Actuation	Hydraulic cylinders 2.5 in (63.5 mm)
Clamp Grip Length	19 in (483 mm)
Horizontal Centering in Clamps	Provided by manually adjustable test zone stops for material widths 2.5, 3.5, and 5.5 in (63.5, 89, and 140 mm)
Failed test indication	Signal provided in response to tensile stroke limit switch Can be used to control board diverter
Controller	Programmable logic controller (included)

Test Material Size Range

Width	2.5 to 5.5 in (63.5 to 140 mm)
Thickness	1.5 in (38 mm) +/- 0.3 in (8 mm)
Length	8 to 30 ft (2.4 to 9.1 m)

Power

Hydraulic Power Unit (HPU)	20 hp (15 kw), 10 gpm (38 liters/min), 2000 psi (14 MPa) hydraulic system for lumber clamping and tensile force application. Electric: 460 Vac 3 phase for hydraulic power unit. Motor starters and fuse disconnects furnished by customer
Clamp Hydraulics	Hand hydraulic pump for set end clamp lock.
Pneumatic	Clean shop air at 90 psi (620 kPa)
Electric	Single phase, 115 Vac, 10 amp for control system

Machine size

(Not including hydraulic power unit or electronic unit)

Length	Depends on length range.
Height	100in (2540 mm)
Width	67in (1701 mm)

Shipping Dimensions

Weight estimate	8,000 lb (3,600 kg) to 10,000 lb (4540 kg) (depends on length range)

Options: Model 4100

Optional Frame

The length range of tested material can be adjusted to fit individual requirements and can include lengths up to 60 ft (18.2 m) long. Call for details.

Tension Calibration Link

Includes two wood-faced steel paddles, a tension load cell with steel pins for attachment to the paddles, and a readout unit. SYS-ASM-1004

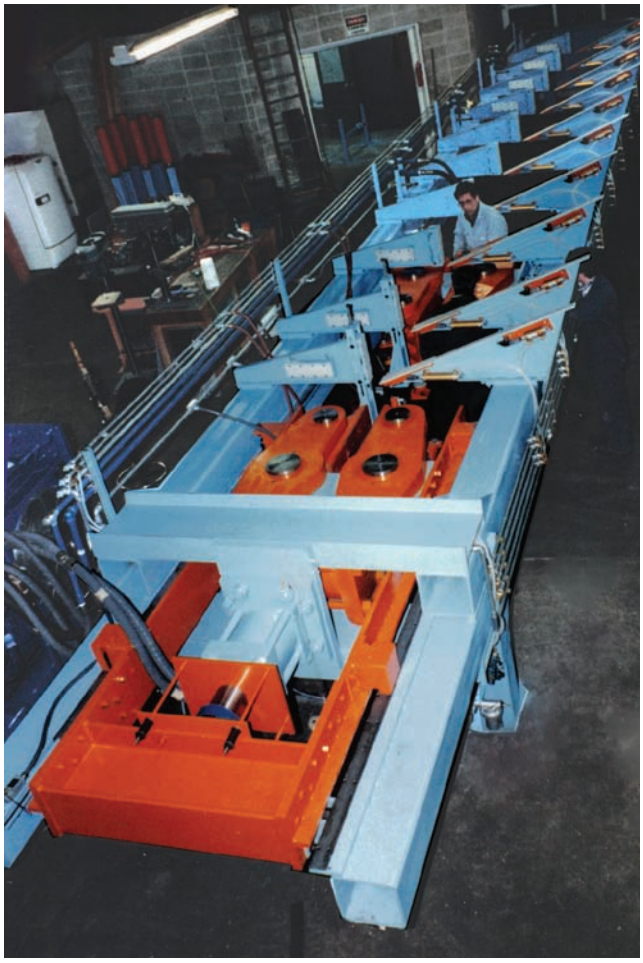
Description: Model 4120 In-Line Tension Proof Tester

- Measures the tensile strength of 2x4 to 2x12 inch (38x89 mm to 38x286 mm) lumber at a maximum force of 33,000 lbs (147 kN)
- Can test up to ten pieces of lumber per minute

The Model 4120 guides a piece of lumber transversly into the machine. The lumber is held in position, clamped, tested, and either passed or rejected. The machine applies a preset amount of force to each piece. If the piece fails (breaks), a conveyor (not included) removes the debris.

Description: Model 4130 In-Line Tension Proof Tester

- The Model 4130 has the largest capacity of all our tension proof testers.
- Tests material between:
  1.5 and 3.5 in (38x89 mm) thick
  3.5 and 15 in (89x381 mm) wide
  8 and 40 feet (2.4 to 12 m) long.
- Maximum tensile force: 225,000 lb (1000 kN)
- *This machine means business!*



A Model 4130 Tension Proof Tester under construction.

Note manufacturing personnel for scale.

Schematic drawing of the top view of a Model 4130, showing a test specimen clamped. Set-end clamp is shown on the left and the power-end clamp is on the right.