TERCO

Material Testing Laboratory

MATERIAL TESTING LABORATORY

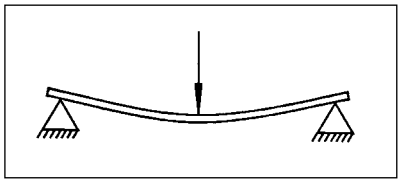
EQUIPMENT FOR TESTING STRENGTH OF MATERIALS

The equipment is of a conveniently small size which reduces costs. This makes it possible for schools and colleges to buy complete sets of equipment instead of only being able to afford one or two items. Large number of students can thus follow courses which were previously only available to a privileged few.

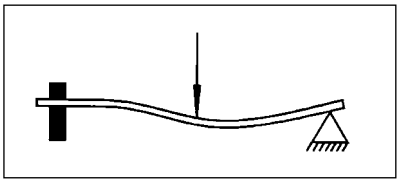
Terco reserves the right to make changes in the design and modifications or improvements of the products at any time without incurring any obligations

MT 3005 Twist and Bend Testing Machine

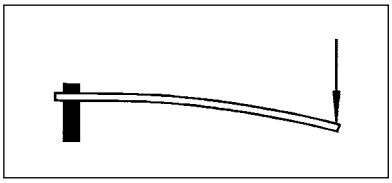
MT 3005 Twist and Bend Testing Machine



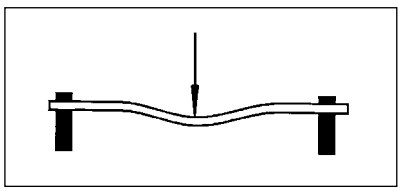
Freely supported in both ends



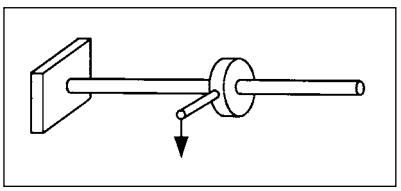
One end fixed and one end freely supported



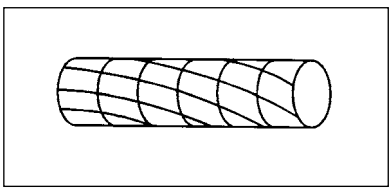
One end fixed



Both ends fixed



Twisting



Twist diagram

MT 3005 is a combined twist and bend testing machine. It can be used both in laboratory exercises, and in conjunction with theoretical work on twist and bending. Its size and weight makes it easy to carry between classrooms.

Twist
You use twist tests to determine and compare the modulus of rigidity for different materials and to demonstrate the deformation formula.

Bending
You use bending tests to determine the modulus of elasticity of different materials. You also use them to demonstrate, for example, the relation between load, moment of inertia, distance between supports, modulus of elasticity, and deflection.
The test pieces for bending tests are of different dimensions, so you can determine the relation between moment of inertia and dimension of a material.

Exemples of experiments
- Investigate the relationship between load, span, dimensions and deflection of a beam.
- Ascertain the coefficient of elasticity for steel, brass, aluminium and wood.
- Investigate the relationship between the torsional moment, clamping length and torsional angle of a shaft.
- Determine the shear modulus of steel, brass, and aluminium.
- Investigate the difference of having one end of the test piece fixed, both ends fixed, and no end fixed.

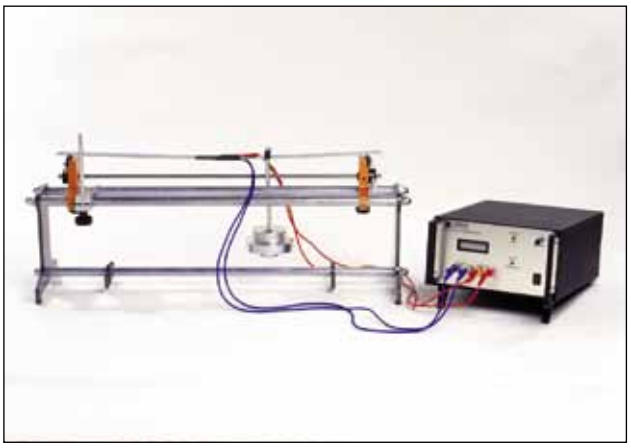
The equipment
- Twist and Bend Testing Machine
- Two loading devices (0.25 Kg)
- Two 1 kg weights
- Four 0.5 kg weights
- One dial gauge
- Seven steel test pieces of rectangular cross-section
- One wood test piece of rectangular cross-section
- Three test pieces, diameter 8 mm, of resp. steel, aluminium, and brass
- Two end fixtures
- Laboratory manual

Technical data

Max distance between supports	600 mm	Dimensions	790x225x345 mm
Accuracy of bending	0.01 mm	Weight	13 kg
Accuracy of twisting	0.01 mm (degrees)		

MT 3004-E Strain Gauge Bridge with PC Interface

MT 3004-E Strain Gauge Bridge



MT 3004-E connected to MT 3005

MT 3004 is a measuring bridge for the study of deflection and load variations, suitable for use in combination with the Twist and Bend Testing Machine MT 3005 and the test pieces of steel and aluminium. The two included test pieces are provided with two strain gauges (120 Ω) each, connecting cables and contacts. The gauges are protected against the ingress of moisture and against mechanical damage.
The measuring bridge is controlled by a microprocessor. The strain per unit of length (micro strain) is read directly on the instrument. The instrument has very high accuracy and can be used in connection with any strain gauge measurement provided the gauge factor value K is within 1.50 - 2.50. The equipment is equipped with interface for connection to PC and the necessary software is included in the delivery.
Software includes: Save measured data, graphic presentation, and calculations.

The equipment comprises
- Strain Gauge Bridge
- 2 test pieces with strain gauges (2 different steels)
- Connecting cables and contacts (4 mm)
- Manual
- Software

Technical data

Self zeroing	
Adjustable Gauge Factor value	(1.5 < K > 2.5)
Range	+/- 2000 microstrain
Linearity	0.2 %
Accuracy	1 %
Supply Voltage	230 V 50/60 Hz (MT 3004-E)
	110 V 60 Hz (MT 3004-E-116)
Dimensions	250 x 150 x 300 mm
Weight	2 Kg

MT 3017 Tensile and Brinell Testing Machine

MT 3017 Tensile and Brinell Testing Machine

Equipment list for MT 3017

MT 3018 Tensile Equipment. See page 7
- Test piece holders
- Tensile test rod set incl. 4 x 5 pieces: steel, aluminium, brass, and copper

MT 3019-17 Brinell Testing Set. See page 7
- Steel ball indentor (10 mm)
- Brinell test set incl. 4 x 5 testpieces: steel, aluminium, brass, and copper
- Measuring magnifier

Tool Box containing:
- Sliding caliper and above testpieces

Laboratory Manual

MT 3017 is a hydraulic tensile testing machine with a screw-type operating cylinder which results in completely smooth and stepless loading.
The cylinder is operated by a crank designed so only light hand power is required to obtain maximum load.
The pedagogic design of the machine allows the student to observe what is happening throughout the entire process. Its convenient size and sturdy structure make the MT 3017 a highly reliable and safe machine.
The power is shown on a large and clearly visible indicating instrument which is graduated in kN (kilo Newton). The instrument has a maximum value indicator on the test rod which shows the power at failure.

The extension is measured by a gauge with an accuracy of 0.01 mm.
The machine provides extremely fine tensile testing charts where the elastic range, the yield range, and the plastic range are clearly indicated.
The tensile test rods for the MT 3017 are 5 mm in diameter with threaded ends. This makes them very easy to mount and also ensures reliable fastening.

The MT 3017 can also be used for Brinell testing.
A Brinell kit MT 3019-17 and measuring magnifier are included. This machine may also be used for buckling tests.

Test pieces

- MT 3018-1, Tensile Test Rods, steel - 5 pcs
- MT 3018-2, Tensile Test Rods, aluminium - 5 pcs
- MT 3018-3, Tensile Test Rods, brass - 5 pcs
- MT 3018-4, Tensile Test Rods, copper - 5 pcs

- MT 3019-1, Brinell Test Piece, steel - 1 pc
- MT 3019-2, Brinell Test Piece, aluminium - 1 pc
- MT 3019-3, Brinell Test Piece, brass - 1 pc
- MT 3019-4, Brinell Test Piece, copper - 1 pc

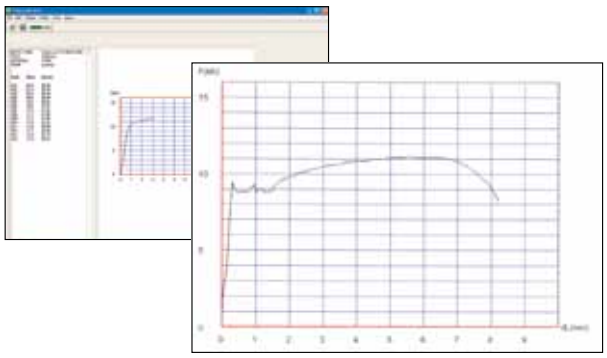
Optional equipment

MT 3037-2 Clamping Jaws. See page 7
MT 3037-3 Compressing Tool Set. See page 7
MT 3007 Bending Test Set. See page 8

Technical data	
Maximum load	20 kN
Max movment of operating cylinder	Approx. 19mm
Dimensions	360x360x820 mm
Weight	24 kg

MT 3047 Computer Measuring Device

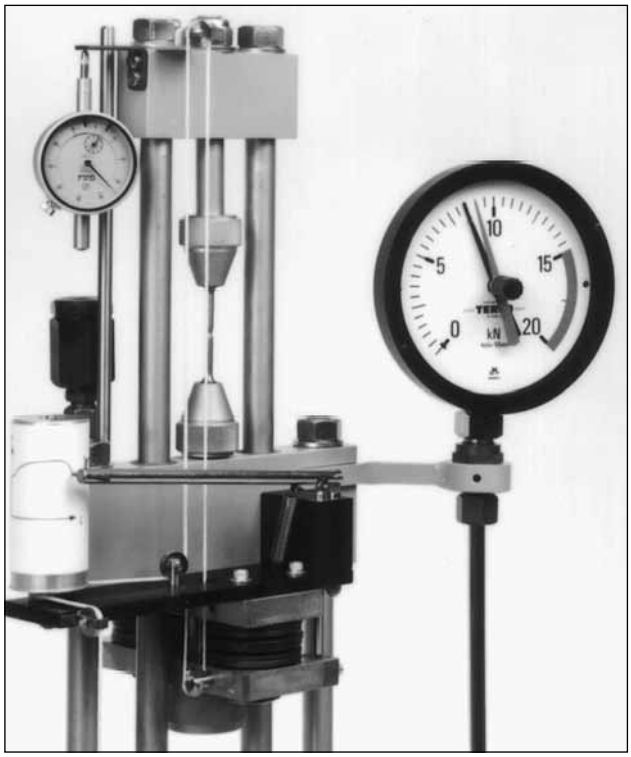
MT 3017 with MT 3047 adapted.



MT 3047 is a kit of components designed to be adapted on the Terco Tensile Testing Machine MT 3017. Together with a computer interface and dedicated software, (the same as for MT 3037), all tests can be recorded by the computer and displayed both as tables and as diagrams. The diagrams can be printed. The kit is very easy to install and no drilling or machining is necessary. A user friendly installation description is included.

MT 3047 comprises:
- Pressure transducer
- Digital dial gauge
- Computer interface
- Software
- Mounting details incl. cables
- Manual
- Adapter 230 V (MT 3047)
  110V (MT 3047-116)

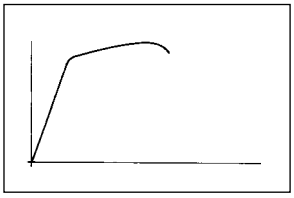
MT 3020 Recorder



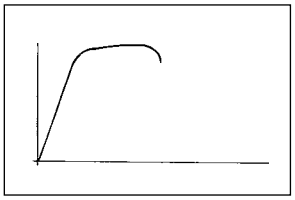
MT 3017 with Recorder MT 3020 adapted

Tensile diagrams for different materials

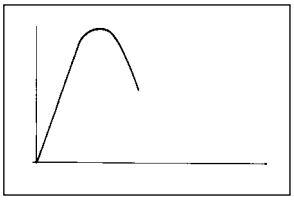
Steel



Aluminium



Brass

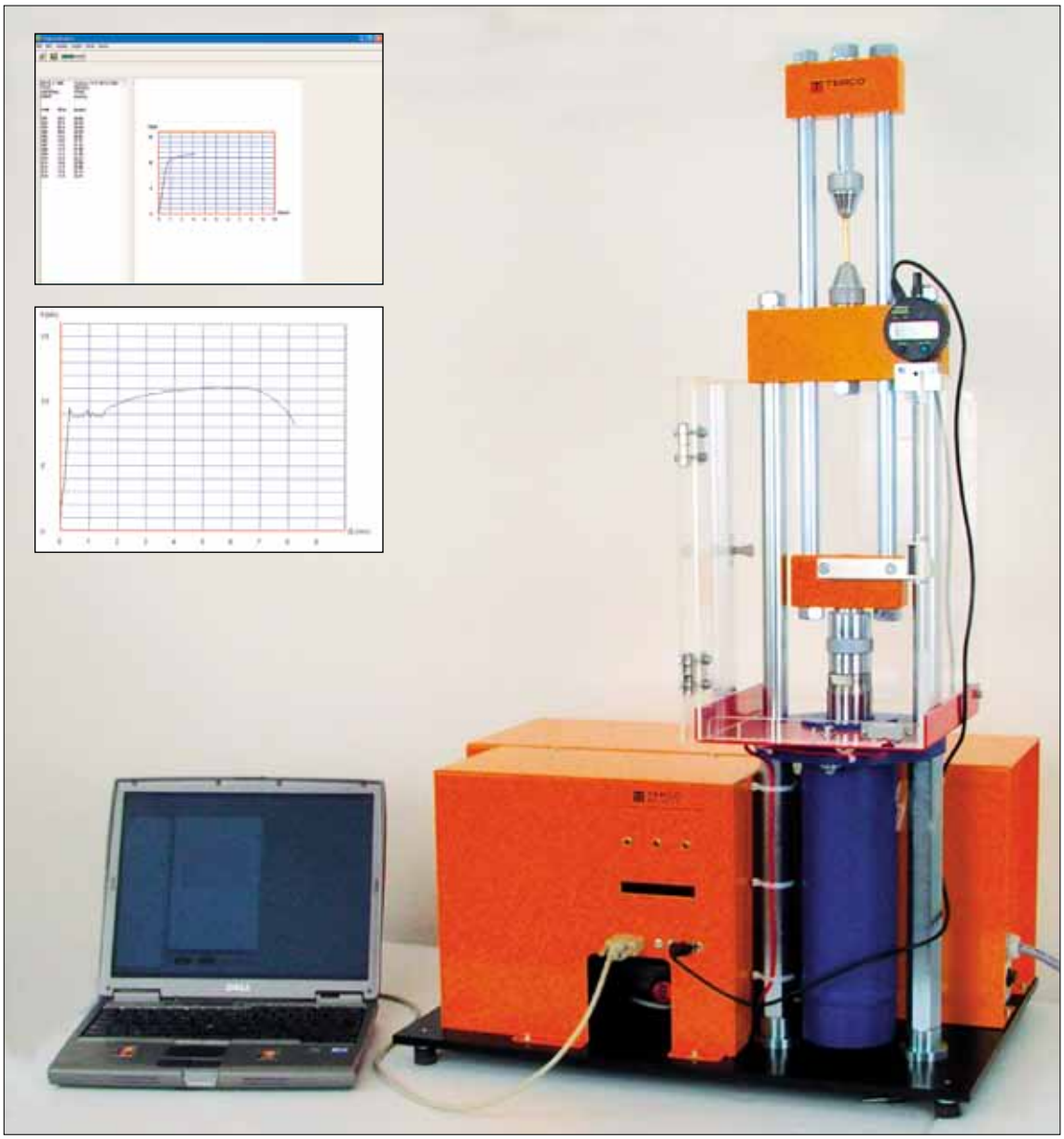


Copper

MT 3020 is a mechanical recorder designed to be attached to our Tensile Testing Machine MT 3017. With this equipment you can easily study, for example, the yield point of steel.
The size of the obtained graph is approximately 50x40mm. The recorder is easily mounted on the tensile tester.

Technical data	
Accuracy	5 % (approx.)
Size	250x130x200
Weight	3 kg

MT 3037 Universal Testing Machine



MT 3037 Universal Testing Machine

MT 3037 Universal Testing Machine

MT 3037 is an universal testing machine capable of a wide range of tensile and compression tests. The machine is specially designed for teaching purpose, and very easy to handle.
With the standard unit different kind of tensile tests can be performed on various metal test pieces as well as compression tests, bending tests and hardness tests according to Brinell.
Using special accessories, folding tests, shearing tests as well as deep drawing tests can be carried out.
The machine is fully automatic and the power is generated by a motor driven hydraulic cylinder. It can be controlled both manually or by computer.
The speed of the cylinder can be manually adjusted to the requirement of the test. The power is transferred extremely smooth and with constant speed, thus giving best possible test results which is important for the tensile tests.
The power as well as the elongation is displayed on the monitor both as digital values and as bar diagrams (see figures). After the test a complete diagram, with values sampled 4 times/sec, is displayed both as tables and as diagrams. The diagrams can be printed out.
For the safety of the users the machine is equipped with a plastic cover.
The cover can be tilted to give complete access to the machine during set up.
It comprises a saftey door, which is equipped with a security lock. The machine can not operate unless this door is closed.

Accessories for MT 3037

MT 3018 Tensile Test Set (standard)
Includes Tensile Test Piece Holders and 5 sets of Tensile Test Rods, each one including one of each of steel, aluminium, brass and copper.
This set is incl. in the code no. MT 3037.

MT 3019-37 Brinell Test Set (optional)
Includes a 12 mm steel ball indentor, magnifying glass and 5 sets of Brinell Test Pieces, each set including one of each of steel, aluminium, brass and copper.
MT 3019-17 has a steel ball of 10 mm and is intended for MT 3017 (see page 4)

MT 3037-2 Clamping Jaws (optional)
To be used for testing of sheet material like metal sheet and plastics. It requires special designed test pieces to avoid breaking inside the jaws.
MT 3037-2 can also be used together with MT 3017.

Technical data	
Maximum speciment thickness	2 mm
Max width of speciment	22 mm
Weight	1.5 kg

MT 3037-3 Compression Test Set (optional)
For compression tests of test rods, to compare the yield point of different materials during tensile and compression tests. The set includes upper and lower holder and 5 sets of Compression Testing Rods, each set including one of each of steel, aluminium, brass and copper.
MT 3037-3 can also be used together with MT 3017.

MT 3007 Bending Test Set (opt. for MT 3017)
MT 3007 Terco Bending Test Set is an easy to use kit for bending tests, and can be used together with our Tensile Testing Machines MT 3017.
The system consists of a study base profile of steel where two supports can be placed in four different fixed positions. The span width is varied between 100 and 200 mm. The test set comprises 5 test pieces of steel with the length of 250 mm.
Dimensions 6x25; 6x35; 6x50; 8x25; 10x25 mm.

Sets of TensileTest Rods

Brinell Test Piece after Brinell Indent

Equipment list for MT 3037

Standard equipment
- Protective Safety Cover
- Tool Box containing
  - Sliding Caliper
  - MT 3018 Tensile Test Set.
- MT 3037-1 Computer Interface incl. cable to PC
- Software
- Manual

Optional equipment
- MT 3019-37 Brinell Test Set
- MT 3037-2 Clamping Jaws for test of thin metal
- MT 3037-3 Compression Test Set
- Additional Test Pieces

Technical data

Max power	50 kN
Max movement	150 mm
Max speed	5 mm/sec
Min speed	0.05 mm/sec
Power supply 3-ph.	380 - 415 V 50-60 Hz (MT 3037)
Power supply 3-ph.	220 - 240 V 50-60 Hz (MT 3037 - 235)
Dimensions	620x450x1050 mm
Weight	80 kg

Specification of test pieces

Tensile Test Rods
Diameter: 5.0 mm
MT 3018-1, Tensile Test Rods, steel - 5 pcs
MT 3018-2, Tensile Test Rods, aluminium - 5 pcs
MT 3018-3, Tensile Test Rods, brass - 5 pcs
MT 3018-4, Tensile Test Rods, copper - 5 pcs
Standard diameter is 5 mm but tensile test rods are also available with 6 mm and 7 mm.

Compression Test Rods
Diameter: 6.0 mm
MT 3037-31, Compression Test Rods, steel - 5 pcs
MT 3037-32, Compression Test Rods, aluminium - 5 pcs
MT 3037-33, Compression Test Rods, brass - 5 pcs
MT 3037-34, Compression Test Rods, copper - 5 pcs
Standard diameter is 6 mm.
5 mm, 7 mm and 8 mm is also available.

Brinell Test Piece
Dimensions: 30x30x10 mm
MT 3019-1, Brinell Test Piece, steel - 1 pc
MT 3019-2, Brinell Test Piece, aluminium - 1 pc
MT 3019-3, Brinell Test Piece, brass - 1 pc
MT 3019-4, Brinell Test Piece, copper - 1 pc

MTH 500 Rockwell Hardness Tester

- Measuring the Rockwell hardness of ferrous and nonferrous metals such as hard alloy, carbon steel, alloy steel, cast iron
- Applied in the factories, scientific research institutes and laboratories of colleges etc.
- Fresh design, easy to use, stable display value, convenient maintenance
- Standards conforming to: BSEN10109-96, ISO 6508.2

Specifications

Pre-load	98.1N (10kgf)
Total load	588.4N (60kgf), 980.7N (100kgf), 1471N (150kgf)
Rockwell scales	HRC: 0-100, HRB: 30-130
Testing range	20~80HRA, 20~100HRB, 20~80HRC
Testing resolution	0.5HR Rockwell unit
Vertical testing space	Max. 200 mm (7.87")
Horzontal testing space	Max. 160 mm (6.30")
Net weight	100 kg
Dimensions	720 x 225 x 790 mm (max)

Standard delivery

• Main unit	1
• Test block HRC incl. certificat	1
• 1/16" ball indenter	1
• 1/16" spare ball	3
• Diamond indenter	1
• Φ 60mm flat anvil	1
• Φ 60mm Vee anvil	1

Note: Only the HRC test block is delivered with the equipment.

MTH 600 Brinell Hardness Tester

- Measuring the Brinell hardness of unquenched steels, cast iron, non-ferrous metals and soft bearing-alloys etc.
- High testing precision, extensive testing range, automatic load system
- High accuracy, wide measuring range.
- Automatic force loading.
- Standards conforming to: ASTM E-10, ISO 6506.2

Specifications

Test force	1839N (187.5kgf), 2452N (250kgf), 7355N (750kgf), 9807N (1000kgf), 29420N (3000kgf)
Indenter ball diameter	2.5 mm, 5 mm and 10 mm
Test force dwell time	6~99s adjustable
Testing range	8~650HBW
Vertical testing space	Max. 230 mm (9")
Horzontal testing space	Max. 120 mm (4.7")
Power supply	220V/110V, 50~60Hz, 2A
Net weight	220 kg
Dimensions	730 x 230 x 890 mm (max)

Standard delivery

• Main unit	1
• Test bock 10/3000 incl. certificat	1
• 20X microscope	1
• Φ 10mm hardened alloy ball indenter	1
• Φ 120mm round flat anvil	1
• Vee anvil	1
• Power supply cable	1
• Dust cover	1

MT 3012-E Fatigue Testing Machine with PC Interface and Software

Rotary bending

With the varying load to which most machines are exposed it is not the static break point but the fatigue limit which decides when a fracture occurs.
Fatigue strength is thus of very great significance in machine design.
MT 3012-E provides a simple way of learning the effect of radius of fillet, surface smoothness, etc. on a material subjected to fluctuating flexural stresses.
The machine is delivered with interface to PC and Software.

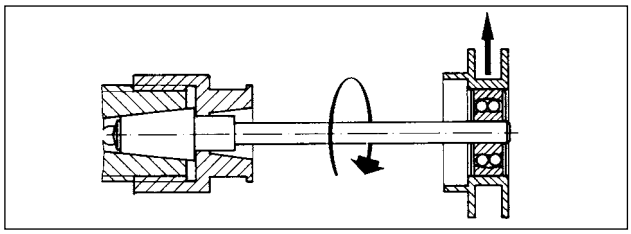
MT 3012-E is driven by a 1-phase asynchronous motor. The number of load changes is read directly on the LCD-display as well as the applied force.
The tapered test pieces is attached to a very stable shaft in two spherical ball bearings.
The force is applied to the test piece with a spring and can be varied between 0 and 255 N
Test can be carried out with

a) Fixed applied force

b) Fixed deviation

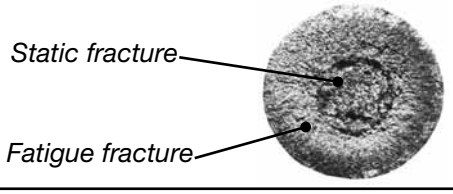
By use of the front panel you can program the test to stop at certain preset values.
This ensure exact measurement and is of great advantage in experiments of a lengthy nature such as recording of a complete Wöhler curves.
By using the included software you can set all parameters and start and stop the machine.
During the test the revolutions, force, limited force and real time diagram will be indicated on the screen.
The events will be recorded and can be printed.

The machine can be used with or without PC.



Working principle

MT 3012-E has a micro-processor which, on the fracture of the test piece, automatically switch-off the voltage to the motor via a relay. This ensures exact measurement and is of great advantage in experiments of a lengthy nature, such as the recording of complete Wöhler curves.



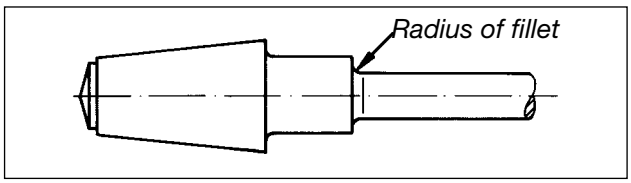
Examples of experiments

- Test the fatigue strength of a material subjected to changes in bending stress
- Investigate the effect of the radius of the fillet and suface smoothness
- Record a simple Wöhler diagram
- Determine a Wöhler diagram for different radii of fillet and for different materials

The equipment

- Fatigue Testing Machine
- Tool box containing all the necessary tools
- 5 test pieces of each (tot. 15 pcs)
- Software
- Laboratory manual

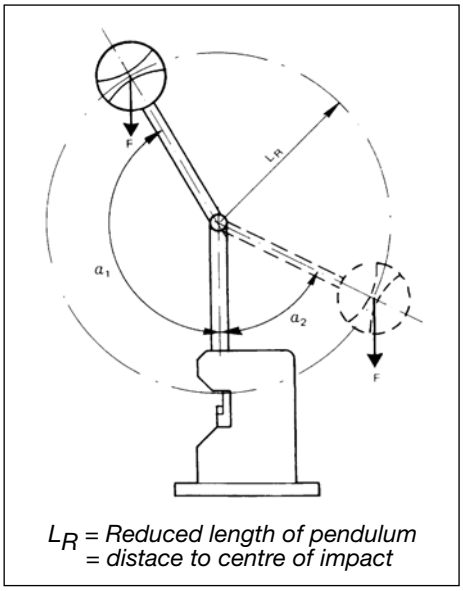
Test piece steel	Radius of fillet	Surface smoothness
1 (MT 3026-1)	0.5 mm	4 µ
2 (MT 3026-2)	2 mm	4 µ
3 (MT 3026-3)	2 mm	25 µ



Technical data	
Test piece diameter	8 mm
Max. load	255 N
Supply voltage	230V 50-60Hz (MT 3012-E) 110V 60Hz (MT 3012-E-116)
Speed (approx)	3000 rpm resp. 3600 rpm
Dimension	980x280x460 mm
Weight	24 kg

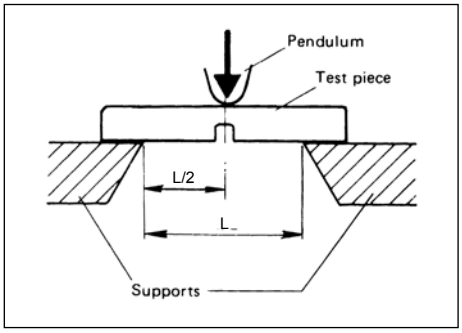
MT 3016 Impact Tester

MT 3016 Impact Tester



L_R = *Reduced length of pendulum*
= distace to centre of impact

Impact strength



MT 3016 is a robust, easily handled bench impact tester (Charpy) made to standard specifications.
It demonstrates in a simple and reliable manner how the impact strength characteristics of a material are affected at, for example, low temperature. This is of great importance for the choice of material in applications subjected to heavy temperature fluctuations.
It is also useful when a teacher wishes to demonstrate how the impact strength of a material is affected by different kinds of heat treatments, e.g. hardening, tempering, and normalizing.
With MT 3016 the student can do his laboratory exercises without difficulty.

Description

The machine has a heavy and stable cast iron mounting with holes for bench attachment. The stand consists of two robust steel bars.
The pendulum is mounted in ball bearings and precision balanced. The test piece supports are hardened and ground. The distance between supports can easily be adjusted. The scale is graduated in joules and shows directly the energy required to break off the test piece. The pendulum is braked with a friction brake.

Examples of experiments

- Investigate the effect of carbon content on impact strength
- Investigate the effect of temperature on impact strength
- Investigate the effect of normalization on impact strength

The equipment

- Impact Tester
- 5 sets test pieces of 3 different steel qualities (Tot 15 pieces)
- Laboratory Manual

Test pieces for MT 3016

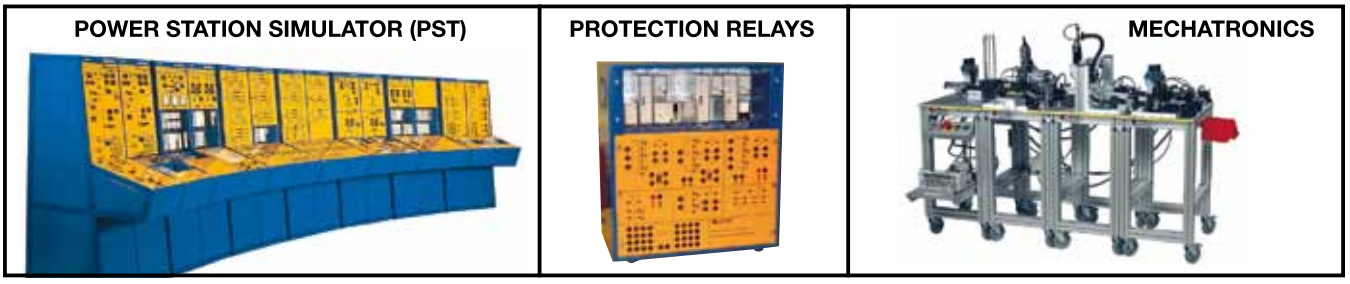
- MT 3027-1, Impact Test Piece 1, red (construction steel)
- MT 3027-2, Impact Test Piece 2, yellow (engineering steel)
- MT 3027-3, Impact Test Piece 3, green (tooling steel)

Technical data

Max. impact energy	15 joule (1 J= 1 Nm)
1 Scale graduation	0.1 joule
L_R	358 mm
Dimensions of test pieces	6x6x44 mm
Dimensions	170x290x615 mm
Weight	30 kg

Terco Headoffice

Terco headoffice and factory outside Stockholm, Sweden.



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