Mastering the fine art of testing

SERVO COMPUTERIZED

UNIVERSAL TESTING MACHINE

With Load Rate & CHT Rate Controls, With Front open Crossheads & Hydraulic Grips

UNIVERSAL TESTING MACHINE

With Front open Crossheads & Hydraulic Grips

Common Features (For Servo Computerized, Computerized & Analogue Models)

Application : Universal Testing Machines have a wide range of applications. A number of materials & metals in different forms & shapes can be tested for a variety of tests like Tension, Compression, Transverse, Bend Re-bend, 180° Bend, Shear, Brinell, Pullout, etc. Special attachments are also available for testing of Flat belts, Chain links, Wire ropes, Nut-bolts, etc.

Construction :

Loading frame : The base has a hydraulic cylinder at its center, and two main screws at both ends. The middle cross head is mounted on screws through main nuts. The middle cross head can be moved up or down through chain transmission and geared motor to adjust the initial tensile / compression clearance. On the piston rests an assembly of upper crosshead, lower crosshead and two columns. The individually lapped cylinder piston assembly ensures smooth transfer of force with minimum friction.

Hydraulic system : Hydraulic circuit consists of hydraulic power pack having a directly driven radial plunger pump, which gives a continuous non pulsating flow of oil pressure upto 210 bar. Oil filter, Oil strainer, Air breather, Oil level Indicator, Drain plug are provided on the power pack. A pressure compensated needle type flow control valve is provided to control the oil flow to cylinder thereby achieving desired piston speed. Infinitely variable speeds can be obtained with the help of valves.

Electrical system : A separate switch box and electrical panel is provided. Both the hydraulic pump motor and the geared motor are interlocked. Limit switches is provided to stop the hydraulic pump motor, if the piston stroke is exceeded.

Special & Important Features (For Servo Computerized, Computerized & Analogue Models)

Front Open Crossheads : This is an important feature which facilitates easy insertion of tensile specimen from the front. This is extremely useful especially for heavy specimens and bigger capacity machines. In this type of machine the jaws and the inserts also can be easily removed by just pulling from the front. When the jaws and inserts are heavy, it is very difficult to remove them from the machine from upper or lower side. Hence this is an important feature from the point of view of easy operation.

Hydraulic grips : Normally for standard Universal Testing Machines the jaw opening and specimen clamping is effected manually. But this becomes more and more difficult for the operator for higher capacity machines. Also the specimen clamping becomes operator specific in this case. Hence it is a better choice to go for hydraulic operation of jaws (closing and opening). In this hydraulic griping method, separate double acting hydraulic cylinders operate the jaws and the cylinder operation is just by pressing a push button. So the operator has to operate only push buttons, which are conveniently located on the machine, to operate the jaws. A power pack with oil tank, pump, motor, oil filler cum breather, oil level indicator, filter, relief valve is provided along with an electric motor to drive the hydraulic pump.

In case of Conventional UTM, the specimens falls down after its failure during a test. However for the machine with Hydraulic grips, the specimen remains in clamped condition even after test is conducted. Operator can remove both the pieces from respective cross heads by pressing the push buttons.

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Salient Features

- Electronically controlled sophisticated imported pressure and flow control valves along with their dedicated controller are used and they are controlled in closed loop with PID looping.
- Load accuracy as high as ± 1 % of indicated load value.
- Variable load rates and Cross head travel rates can be selected through computer to suit the wide range of materials.
- On line graph and user defined printable reports enables the study of behaviour of the material.
- Simplicity in reading because of digital (LCD) Display.
- Wide range of standards.
- Special Optional Accessories can be used like : Bend Re bend fixture, Nut Bolt Testing fixture, Pull out Test (1 Sensor or 3 Sensors) attachments, etc. to cover the complete range of materials.
- Easy change from plain to threaded and screwed specimens.
- Fully protected and enclosed pressure transducer and rotary encoder capable to work in dusty environment.
- The Data Acquisition system (DAS) supplied with the machine can be connected to any new generation computer (PC or Laptop) using USB port.

Principle of Operation (Load Measuring System)

- Here Pressure Control Valve and Flow Control Valve are controlled by electronic circuitry in closed loop system to get the desired Loading Rate and Cross Head Travel Rate (CHT Rate).
- Following control modes are available : Standard Manual Control, Load Rate Control Mode, Cross Head Travel Rate Control Mode, Load Hold Mode, Load Rate and Cross Head Travel Rate in single test (one at a time). Control Range & Accuracy : Mentioned in below table.
- Load is applied by hydrostatically lubricated Ram. Main cylinder pressure is transmitted to the Pressure Transducer housed in control panel. The Pressure Transducer generates the proportional signal corresponding to Load created by Ram and is given to Electronic Display Unit (DAS Panel). Simultaneously the Optical Digital Rotary Encoder fitted on the straining unit (Lower cross head) gives the mechanical displacement (Cross head travel).

Features of Electronic Control Panel (Data Acquisition Unit / DAS Panel)

- It is equipped with 32 bit Micro controller for basic Universal Testing Machine operation and close loop servo control for controlling and executing the LOAD RATE and CROSS HEAD TRAVEL RATE Control Operations.
- Panel is having USB Port for interfacing with PC.
- 4 Lines x 20 character LCD display and Membrane Keyboard for data entry.
- All the data with graph is stored on computer Hard Disk.
- Attractive and Elegant Aluminium Panel is provided for heat dissipation.
- Maximum of ± 5,00,000 counts resolution (optional) can be provided to display the load value.

Features of "Win UTM" Software

- .NET based software suitable for Win XP Service Pack 2 or higher version, Windows 7 - 32 bit.
- Real time graphs like : Load – Elongation, Load – Extension, Stress – Strain, Load – Time.
- User friendly software.
- Zooming and magnification of required portion of graph is available.
- Graph super imposition, Graph comparison, Point tracing facility are available as added features.
- User configurable Test Report generation and printing.
- Special Reports as per customers requirement can also be generated at an extra cost.
- Different units can be selected for Load and Elongation. For Load in - kN, kg, lb, N. For Displacement in - mm, inch.
- Statistical Analysis - Calculates : Minimum value, Maximum value, Mean value, Variance, Standard Deviation
  Statistical Graphs : Water fall diagram, Mean Deviation, Frequency Distribution, Skew Diagram, Histogram.
- Evaluation of wide range of user selectable parameters such as -
  % elongation, % reduction in area, Young's Modulus, Yield Stress, Proof stress.
- Different specimen shapes can be tested such as - Round, Rectangular, Hollow round, Hollow rectangular, TMT bars (Torrsteel).
- Complete Test Data and Test Results can be transferred to Excel Sheet for further analysis.
- Optional software packages for - Extensometer, Shear Test, Bend Test, Rubber Testing, Textile product Testing, Wire Mesh Testing, etc. can be given at an extra cost.

Accuracy and Calibration

- All our Servo Computerised Universal Testing Machines are closely controlled for sensitivity, accuracy, repeatability and calibration during every stage of manufacturing.
- Every Machine is then calibrated over each of its measuring ranges in accordance with the procedure laid down in BS :1610 : Part 1 : 1992 & IS : 1828 : Part 1 : 1991.
- All our machines comply with Grade "A" of BS : 1610 : Part 1 : 1992 & Class 1 of IS : 1828 : Part 1 : 1991.
- An accuracy of ± 1 % of indicated load value is guaranteed from 2 % to 100 % of the maximum load capacity of the machine.

Load Rate & Crosshead Travel Rate Controls (Servo Controls for various capacities)

Loading Rate

Machine Capacity	**Control Range :** 5% to 100% of machine Capacity **Accuracy :** ± 5% of Loading rate selected	
	Minimum	Maximum
400 kN	15 kN/min	800 kN/min
600 kN	25 kN/min	1200 kN/min
1000 kN	40 kN/min	2000 kN/min
1200 kN	60 kN/min	2400 kN/min
2000 kN	100 kN/min	4000 kN/min

Crosshead Travel Rate (C.H.T. Rate)

Machine Capacity	**Control Range :** 5% to 100% of machine Capacity **Accuracy :** ± 5% of C.H.T. rate selected	
	Minimum	Maximum
400 kN	1.5 mm/min	150 mm/min
600 kN	1 mm/min	100 mm/min
1000 kN	0.5 mm/min	80 mm/min
1200 kN	0.5 mm/min	80 mm/min
2000 kN	0.5 mm/min	45 mm/min

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Principle of Operation (Load measuring system)

- The oil pressure in the main cylinder is also transferred to an electronic pressure transducer which gives a proportionate signal to the Data Acquisition Unit.
- Both, the motor for hydraulic operation and cross head motion, are controlled by push buttons and they have interlocks to prevent simultaneous working of the motors.
- The electrical panel is fixed on the control panel.
- Displacement measurement is carried out by means of a Rotary Encoder. Encoder signal is fed to the Data Acquisition Panel to get displacement in mm.
- Fully protected and enclosed (dust proof) high precision Sensors and Encoders are used for Load and Cross Head travel measurements.

Features of Electronic Control Panel (Data Acquisition Unit / DAS Panel)

- Attractive and elegant Aluminium panel is provided for heat dissipation.
- A Micro-controller based data acquisition system for data acquisition and indication.
- 4 Lines x 20 Characters LCD display for displaying Load & Crosshead travel values.
- Simplicity in reading because of digital (LCD) display.
- Membrane keyboard for data entry.
- Auto-detection of over-load, over-travel & specimen break. On detection of any of these conditions, the hydraulic motor is automatically switched off.
- Load is indicated with resolution of 0.005% of machine capacity for the entire measuring range (in other words, with a resolution of 0.02 kN for 400 kN capacity machine, Model : TUF-C-400 kN).
- Elongation is indicated with a resolution of 0.01 mm.
- Tare Load and Reset Elongation facilities available.

Features of "WinUTM" Software

- **.**NET based software suitable for Windows XP Service Pack-2, Vista or Windows 7 32-bit operating system.
- The WinUTM Software can run a variety of mechanical tests, recall data from previous test and prepare test report.
- Menu driven software for easy of use.
- Test reports and graphs can be sent directly to the printer via parallel port or USB Port of PC.
- Storage and retrieval of test parameters.
- Specific software for Tensile, Compression, Shear, Bend, Torsteel (TMT) & other tests.
- The Load and Crosshead travel values will be displayed continuously during the test with the on-line graph (Load Vs Crosshead travel).
- If Extensometer * is used during the testing, then Load, Elongation and Extension values will be displayed with two independent graphs (Load Vs Crosshead Travel & Load Vs Extension).

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- User can choose different options for on-line graph. Eg. : Load Vs Time, Crosshead travel Vs Time, Stress Vs Strain, etc. The graphs are auto scaled graphs.
- Zooming and magnification of required portion of graph is available.
- Point tracing facilities are available as added features.
- Different units can be selected for Load and Elongation. **For Load in -** kN, kg, lb, N & **For Displacement in -** mm, inches.
- User defined break detection facility.
- Load is indicated with a resolution of 0.005% of machine capacity for the entire measuring range of 2% to 100% of machine capacity.
- Elongation with a resolution of 0.01 mm.
- Provision of auto-zeroing of Elongation at set pre-load.
- Tare Load and Reset Elongation facility.
- Auto-detection of over-load, over-travel and specimen break. On detection of any of these conditions, the hydraulic motor is automatically switched off.
- Large storage capacity for storing data on the computer as per the hard-disc capacity of PC.
- Provision for calculations of parameters such as Load and Elongation at yield, Peak load at break, Yield stress, Ultimate stress, etc. The parameters like Young's modulus, Modulus of Resilience, Strain values in %, Percentage of Elongation, % Reduction in cross-section area, are user selectable.
- Test conditions, test input data & test results are stored in a specific file based on a unique file structure.
- Built-in facility for printing the test results and test graph from PC. A printer copy of consolidated test results conducted on a particular date can also be obtained. Graphs of Load Vs Crosshead travel, Load Vs Time, Crosshead travel Vs Time, Load Vs Extension, Stress Vs Strain, etc are available.
- User can add or remove the material type with its shape, customer name, etc.
- User defined printable report generation, which enables to study the behavior of the material.
- User can replay the complete test which is already conducted. Also user can transfer the total test data to excel sheet for further analysis.
- After completion of the test, user can view the graph in different units, i.e. in kN, kg, lb, N, etc.
- Special reports as per customers requirement can also be generated at an extra cost.
- Special optional software for : Extensometer, Shear test, Bend test, Bend Re-bend test, Nut-bolts test, Pull-out test (1-Sensor & 3-Sensor), Brinell test, Rubber testing, Textile product testing, Wire Mesh testing, etc can be given at an extra cost.
- Following extra facilities (at an extra cost) will be provided in the software-
  a) Statistical Analysis, b) Statistical Report, c) Compare graph facility, d) Graph super imposition.
  Statistical Analysis : Calculates minimum value, maximum value, Mean value, Variance, Standard Deviation.
  Statistical Graphs : Water fall diagram, Mean Deviation, Frequency Distribution, Skew Diagram, Histogram.
- If an Electronic Extensometer * is used, software prompts the user to remove the extensometer. Two graphs i.e. Load Vs Crosshead travel (CHT) and Load Vs Extension will be parallely displayed on PC in on-line test mode. Both the graphs are auto scaled and stored independent of each other.
  (Important Note : * Electronic Extensometer, Model : FEE-5 can be offered at extra cost).

Accuracy and Calibration

- All our Computerized Universal Testing Machines are closely controlled for sensitivity, accuracy repeatability and calibration during every stage of manufacturing.
- Every Machine is then calibrated over each of its measuring ranges in accordance with the procedure laid down in BS:1610-1992 & IS:1828-1991.
- All our machines comply with Grade "A" of BS:1610-1992 & Class 1 of IS:1828-1991.
- An accuracy of ± 1% of indicated load value is guaranteed from 2% to 100% of the maximum load capacity of the machine.

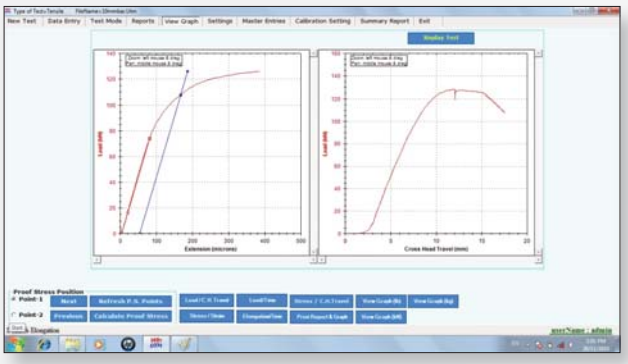
Every Servo Computerised or Computerised Universal Testing Machine is supplied without Computer, UPS and Printer. It is to be procured by Customer. But we supply with requisite software, conditioning system and the interfaces. Machine ordered with the computer are supplied with computer and its operating system at an extra cost.

Minimum Computer Specifications required (For Servo Computerised UTM) : Any Latest Generation Computer which should be Branded (Make : HP, Dell, etc.) and Preloaded with Genuine Windows Operating System (Windows-XP Service pack-2 OR Higher Version, Windows 7- 32 bit) with minimum 2 Nos of USB Ports. All the Drivers of the Mother Board (for Eg : USB drivers, Display drivers, etc) should be pre-loaded before installation of Win UTM Software supplied with the machine. Computer should be preloaded with Genuine Antivirus software. For loading the UTM software the computer should be equiped with CD drive also.

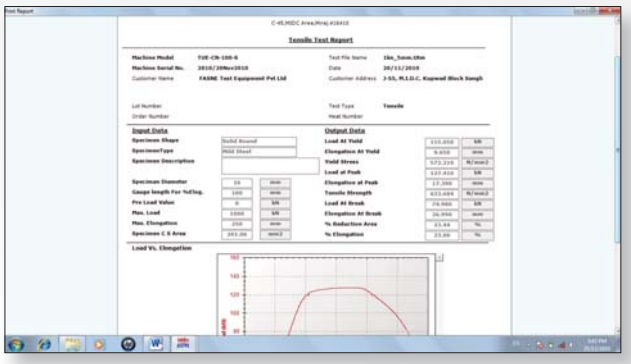
Minimum Computer Specifications required (For Computerised UTM) : Any Latest Generation Computer Pre-loaded with Genuine Windows Operating System (Windows-XP Service pack-2 or Windows-7 or Windows-Vista) with Serial Port (RS-232). Also the computer should have Anti-Virus protection.

Screen Shots of “WinUTM” Software

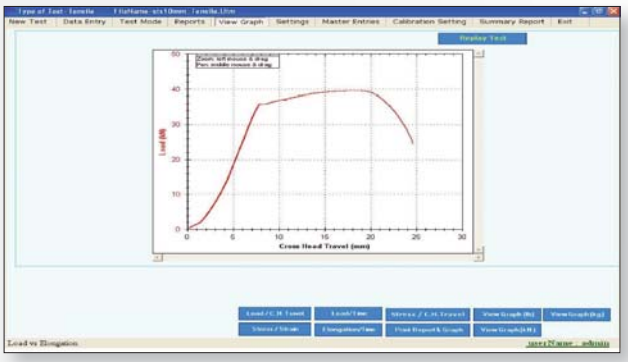
Typical Graph with Electronic Extensometer



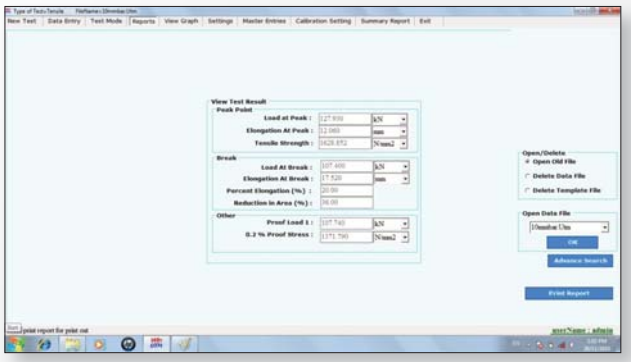
Upper Part of Test Report



Graph for Load Vs Crosshead Travel

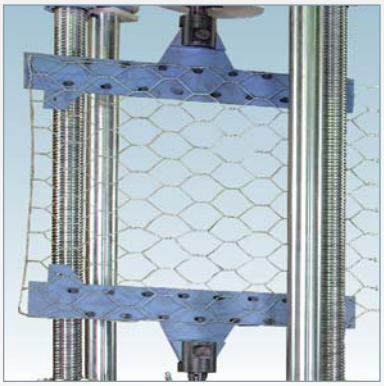


Test Report



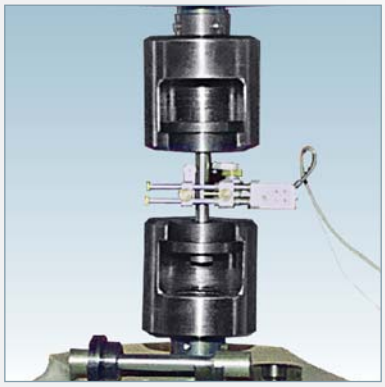
Special Attachments / Accessories of Universal Testing Machine (with Extra cost)

Common Bend Re-Bend & 180° Bend Test Attachment with various diameter mandrels

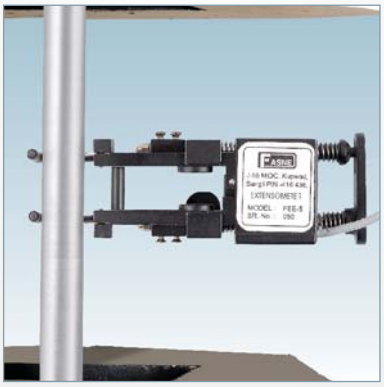


Wire Mesh Testing Fixture

Special Attachment For Short Specimens/ Nut-Bolts



Shouldered Test Attachment



Electronic Extensometer (Model: FEE-5)

Special Attachment For Compression Spring

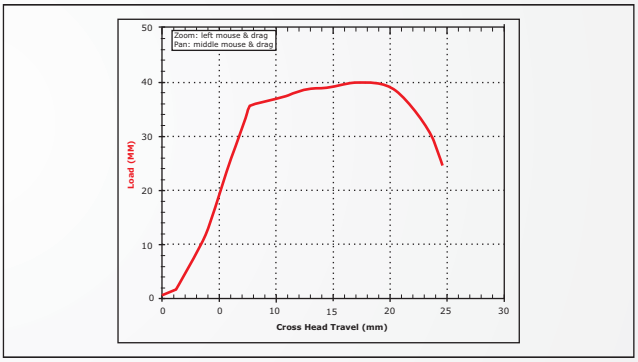
Sample Test Report with Graph (For Computerised Versions)

COMPANY NAME
Company Address
Tensile Test Report

Machine Model	**: TUE-C-100**	**TestFile name**	**: sts10mm_Tensile.Utm**
Machine Serial No.	**: 2010/36**	**Date**	**: 05/01/2011**
Customer Name	**: XYZ**	**Customer Address**	**: ABC**
Lot Number	:	**Test Type**	**: Tensile**
Order Number	:	**Heat Number**	:

Input Data			**Output Data**		
Specimen Shape	**: Solid Round**		Load At Yield	**: 34.85**	**kN**
Specimen Type	**: Mild Steel**		Elongation at Yield	**: 7.660**	**mm**
Specimen Description	:		Yield Stress	**: 443.723**	**N/mm2**
			Load at Peak	**: 39.515**	**kN**
Specimen Diameter	**: 10**	**mm**	Elongation at Peak	**: 18.460**	**mm**
Gauge length for % Elog.	**: 100**	**mm**	Tensile Strength	**: 503.119**	**N/mm2**
Pre Load Value	**: 0**	**kN**	Load at Break	**: 24.535**	**kN**
Max. Load	**: 100**	**kN**	Elongation at Break	**: 24.660**	**mm**
Max. Elongation	**: 150**	**mm**	% Reduction Area	**: 0.00**	**%**
Specimen C S Area	**: 78.54**	**mm2**	% Elongation	**: 10.00**	**%**

Load Vs Crosshead travel



Tested By **systemAdmin**

ANALOGUE UNIVERSAL TESTING MACHINE

With Front Open Crossheads & Hydraulic Grips

Analogue Control Panel

Load measuring system

The oil pressure in the main cylinder is transferred to the small dynamometer cylinder. The dynamometer piston is kept rotating at a slow speed to ensure dynamic friction condition. The piston exerts a force proportionate to the pressure on the hanger connected to one arm of the pendulum, through an auto range selecting lever system. This force deflects the pendulum. The range selection can be effected by simply turning a knob, provided outside of the panel. An effective damping arrangement is provided to ensure slow return of the pendulum after sudden fracture of the test specimen.

Load indicating arrangement

The pendulum lever pushes rack which slides over two pulleys. The rack movement is proportionate to the load. A pinion in engagement with the rack rotates and moves the pointer fixed to its shaft. The pointer moves over a large dial indicating the load. A window type dial is provided for easy and clear change of the load range.

Recording System

A continuous roll type load elongation recorder is provided for plotting a load - elongation graph. Load is plotted by the horizontal movement of the rack. Elongation is plotted on the vertical axis and is equal to the movement of the main piston. Elongation ratio of 1:2 & 1:5 can be obtained.

Accuracy and calibration

All measuring ranges of the machine are calibrated within an accuracy of ± 1 % from 20% to 100% of each range as per IS : 1828 and BS : 1610.

ANALOGUE cum COMPUTERIZED / SERVO COMPUTERISED UNIVERSAL TESTING MACHINE

With Front Open Crossheads & Hydraulic Grips

Analogue cum Computerised / Servo Computerised Control Panels

- Both Analogue and Computerised / Servo Computerised control panels are provided together which work exactly same as per described above for Analogue and Computerised / Servo Computerised control panels.
- The direction control valve is provided which directs oil flow either to Analogue control panel or Computerised / Servo Computerised control panel. One can use one system at a time.
- When order is placed for Analogue cum Computerised or Analogue cum Servo Computerised Universal testing machine, accordingly control panels will be supplied with direction flow control valve (Computer, UPS, Printer & Computer table is not in our scope of supply. It is to be procured by customer).

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ANALOGUE

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ANALOGUE cum
COMPUTERISED / SERVO COMPUTERISED

UNIVERSAL TESTING MACHINE

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Technical Specifications for Analogue Versions

Analogue Models	TUF-400 kN	TUF-600 kN	TUF-1000 kN	TUF-1200 kN	TUF-2000 kN
Measuring Capacity (kN)	400	600	1000	1200	2000
1'st Range (kN)	0-400	0-600	0-1000	0-1200	0-2000
Least Count (kN)	0.8	1	2	2	4
2'nd Range (kN)	0-200	0-300	0-500	0-600	0-1000
Least Count (kN)	0.4	0.5	1	1	2
3'rd Range (kN)	0-100	0-120	0-250	0-300	0-500
Least Count (kN)	0.2	0.2	0.5	0.5	1
4'th Range (kN)	0-40	0-60	0-100	0-120	0-200
Least Count (kN)	0.08	0.1	0.2	0.2	0.4

Technical Specifications for Computerised & Servo Computerised Versions

Computerised Models	TUF-C-400 kN	TUF-C-600 kN	TUF-C-1000 kN	TUF-C-1200 kN	TUF-C-2000 kN
Servo Computerised Models	**TUF-C-400 kN (SERVO)**	**TUF-C-600 kN (SERVO)**	**TUF-C-1000 kN (SERVO)**	**TUF-C-1200 kN (SERVO)**	**TUF-C-2000 kN (SERVO)**
Measuring Capacity (kN)	400	600	1000	1200	2000
Measuring Range (kN)	0-400	0-600	0-1000	0-1200	0-2000
Least Count (kN) For Computerised Versions	0.02	0.03	0.05	0.06	0.10
Least Count (kN) For Servo Computerised Versions	0.01	0.01	0.01	0.01	0.01
Resolution of Piston Movement (mm)	0.01	0.01	0.01	0.01	0.01
Load Range in kN with accuracy of measurement ± 1%	8-400	12-600	20-1000	24-1200	40-2000

Technical Specifications for Analogue cum Computerised & Analogue cum Servo Computerised Versions

Analogue cum Computerised Models	TUF-CN-400 kN	TUF-CN-600 kN	TUF-CN-1000 kN	TUF-CN-1200 kN	TUF-CN-2000 kN
Analogue cum Servo Computerised Models	**TUF-CN-400 kN (SERVO)**	**TUF-CN-600 kN (SERVO)**	**TUF-CN-1000 kN (SERVO)**	**TUF-CN-1200 kN (SERVO)**	**TUF-CN-2000 kN (SERVO)**
Measuring Capacity (kN)	400	600	1000	1200	2000
Analogue System					
1'st Range (kN)	0-400	0-600	0-1000	0-1200	0-2000
Least Count (kN)	0.8	1	2	2	4
2'nd Range (kN)	0-200	0-300	0-500	0-600	0-1000
Least Count (kN)	0.4	0.5	1	1	2
3'rd Range (kN)	0-100	0-120	0-250	0-300	0-500
Least Count (kN)	0.2	0.2	0.5	0.5	1
4'th Range (kN)	0-40	0-60	0-100	0-120	0-200
Least Count (kN)	0.08	0.1	0.2	0.2	0.4
Computerised / Servo Computerised System					
Measuring Range (kN)	0-400	0-600	0-1000	0-1200	0-2000
Least Count (kN) For Computerised Versions	0.02	0.03	0.05	0.06	0.10
Least Count (kN) For Servo Computerised Versions	0.01	0.01	0.01	0.01	0.01
Resolution of Piston Movement (mm)	0.01	0.01	0.01	0.01	0.01
Load Range in kN with accuracy of measurement ± 1%	8-400	12-600	20-1000	24-1200	40-2000

Common Specifications for all Versions

Analogue Models	**TUF-400 kN**	**TUF-600 kN**	**TUF-1000 kN**	**TUF-1200 kN**	**TUF-2000 kN**
Computerised Models	**TUF-C-400 kN**	**TUF-C-600 kN**	**TUF-C-1000 kN**	**TUF-C-1200 kN**	**TUF-C-2000 kN**
Servo Computerised Models	**TUF-C-400 kN (SERVO)**	**TUF-C-600 kN (SERVO)**	**TUF-C-1000 kN (SERVO)**	**TUF-C-1200 kN (SERVO)**	**TUF-C-2000 kN (SERVO)**
Analogue cum Computerised Models	**TUF-CN-400 kN**	**TUF-CN-600 kN**	**TUF-CN-1000 kN**	**TUF-CN-1200 kN**	**TUF-CN-2000 kN**
Analogue cum Servo Computerised Models	**TUF-CN-400 kN (SERVO)**	**TUF-CN-600 kN (SERVO)**	**TUF-CN-1000 kN (SERVO)**	**TUF-CN-1200 kN (SERVO)**	**TUF-CN-2000 kN (SERVO)**
Measuring Capacity (kN)	400	600	1000	1200	2000
Maximum Tensile clearance at fully descended piston position (mm)	50-650	50-650	50-650	50-750	50-750
Maximum clearance for Compression Test (mm)	0-650	0-650	0-650	0-750	0-750
Distance between columns (mm)	500	600	750	750	850
Piston stroke (mm)	200	250	250	250	300
Maximum straining speed at no load (mm/min)	150	100	80	80	45
Middle Cross head travel speed (mm/min)	400	400	400	300	300
Power supply	3 Phase, 415 Volts, 50 Hz, AC				
H.P. approx. (Total)	3	3	5	7	7.5
Standard Accessories (For all Versions) :					
Pair of Compression plate dia (mm)	120	120	160	180	220
Tension Test Jaws -					
For round specimen dia (mm)	10-20	10-25	12-30	12-30	12-30
For round specimen dia (mm)	20-30	25-40	30-46	30-50	30-48
For round specimen dia (mm)	30-40	40-55	46-60	50-60	48-66
For round specimen dia (mm)	-	-	-	-	66-84
Tension Test Jaws -					
For flat specimen thickness (mm)	0-10	0-15	0-20	0-15	0-18
For flat specimen thickness (mm)	10-20	15-30	20-40	15-30	18-36
For flat specimen thickness (mm)	20-30	-	40-60	30-45	36-54
For flat specimen thickness (mm)	-	-	-	45-60	54-72
Maximum Width of Flat specimen tested (mm)	70	80	90	100	100
Transverse Test Attachment -					
Adjustable roller support of width (mm)	150	160	160	160	200
Diameter of roller (mm)	30	50	50	50	70
With Maximum adjustable clearance (mm)	500	600	800	800	900
Punch tops of radius (mm)	12	16	16	16	30
Punch tops of radius (mm)	16	22	22	22	40
Overall dimensions approx. (L) x (D) x (H) (mm)	2050 x 1310 x 2200	2200 x 1330 x 2400	2500 x 1400 x 2600	2800 x 2000 x 3100	3100 x 2600 x 3700
Machine weight approx. (kg)	2500	3600	5000	7500	10000

We can also supply : Analogue & Computerised Universal Testing Machines, Hardness Testers (Rockwell, Brinell, Vickers), Spring Testing Machines, Compression Testing Machines, Tensile Testing machines, Dynamic Balancing Machines, Dynamic Portable Digital Hardness Testers & Custom Built Testing Machines.

INDIAN TECHNOLOGIES

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