Model WAW-500E Computer Control Electro-Hydraulic Servo Universal Testing Machine

Applications:

Model WAW-500E computer control electro-hydraulic servo universal testing machine is a superior version UTM. It is suitable to test various metallic & non-metallic materials for tension, compression, bending and shearing strength. It can be capable of testing the characters of materials on physical & technology properties. Equipped with the computer & Software & printer, it can display, record, process and print the test results, and control test procedures as the set program and can draw test curves automatically in real time. The machine complies with ASTM, DIN, ISO standards. It is simple, easy to operate and widely used in works, laboratories and high schools for material properties research and quality control.

Applied Standard:

- Load meets or exceeds the following standards: ASTM E4, ISO7500-1, EN 10002-2, BS1610, DIN 51221.
- Strain measurement meets or exceeds the following standards: ASTM E83, ISO 9513, BS 3846 and EN 10002-4
- Safety: This machine shall conform to all relevant European CE Health and Safety Directives EN 50081-1, 580081-1, 73/23/EEC, EN 61010-1
- ISO6892: DIN EN 10002-1, JIS Z2241, BS-18, ASTM E8: Metallic Material-Tensile Testing at Ambient Temperature.
- ASTM A370: Standard Test Methods and Definitions for Mechanical Testing of Steel Products

Load Frame

- Compact design with rigid four-column & two-lead screw construction.
- Dual workspace design: upper for tension test (expandable for peel & tear test etc), lower for compression, bending and shearing tests, which is quite convenient for different kinds of tests.
- The frames all incorporate human factor consideration in the design to ensure safety, improve testing efficiency, and reduce operator weariness.
- Cylinder mounted at the bottom of the machine to guarantee the working gravity.
- Test space can be extended according to the length & elongation of specimen and related test requirements.
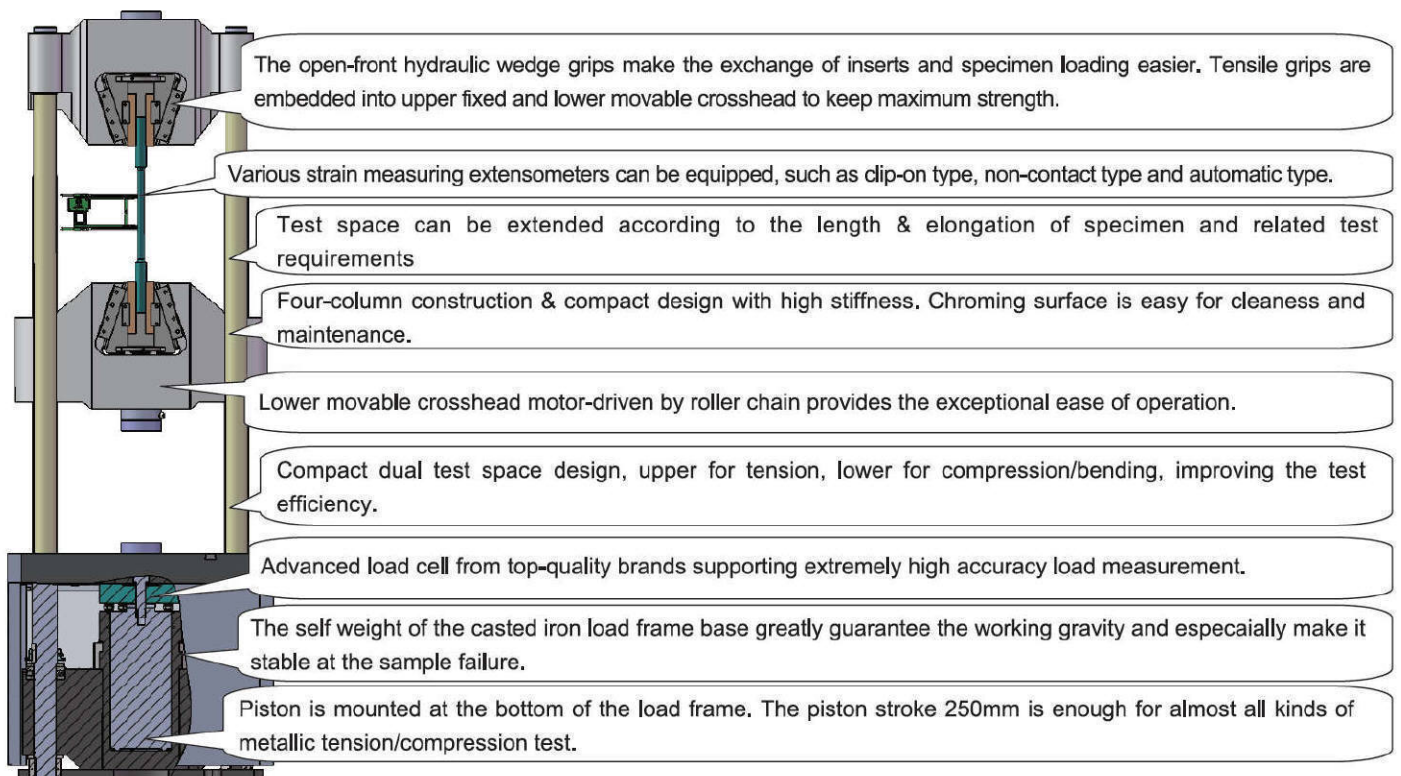
Crosshead

The design of open front hydraulic wedge grips makes the exchange of inserts and specimen loading easier. Tensile grips are embedded into upper fixed and lower movable crosshead to keep maximum strength. Lower movable crosshead motor-driven by roller chain provides the exceptional ease of operation.

Safeguard

- ✧ Overload protection: When the testing load is over 2%-5% of Max. Load, the system will unload.
- ✧ Stroke protection: When the ram arrives at the upper limited position, the motor of oil pump will stop.
- ✧ Multiple protection functions: oil actuator overflow protection, oil pump over-current protection, hydraulic oil overheat protection, overload protection and filter protection.
- ✧ **Full-enclosed safety cover to protect the operator from any damage (optional).**

The open-front hydraulic wedge grips make the exchange of inserts and specimen loading easier. Tensile grips are embedded into upper fixed and lower movable crosshead to keep maximum strength.

Various strain measuring extensometers can be equipped, such as clip-on type, non-contact type and automatic type.

Test space can be extended according to the length & elongation of specimen and related test requirements

Four-column construction & compact design with high stiffness. Chroming surface is easy for cleaness and maintenance.

Lower movable crosshead motor-driven by roller chain provides the exceptional ease of operation.

Compact dual test space design, upper for tension, lower for compression/bending, improving the test efficiency.

Advanced load cell from top-quality brands supporting extremely high accuracy load measurement.

The self weight of the casted iron load frame base greatly guarantee the working gravity and especaially make it stable at the sample failure.

Piston is mounted at the bottom of the load frame. The piston stroke 250mm is enough for almost all kinds of metallic tension/compression test.

**Hydraulic power pack for both main oil cylinder and clamping grip**

- Variable pressure hydraulic power supply provides pressure on demand, reducing heat generation, increasing oil life & eliminating the need for water cooling.
- Double control mode, manual control & PC servo control model. For manual control model, hydraulic pack is for manually loading and clamping specimen hydraulically for high efficiency of test, While test data & curves can displayed on PC, manual control mode is especially suitable for the batch broken load tests on the large scale of specimens; For PC servo control mode, all can be controlled & processed by PC automatically, closed-loop servo control of position, load, stress & strain increasing test efficiency & meeting the data consistency between collection and analysis.
- The pumping units are designed to be located in the lab with lower noise level within 65dBa.
- The oil pump, as the core heart of the oil source, is the power source of the hydraulic system. MARZOCCHI pumps from Italy and the NACHI pumps from Japan are commonly used. The two oil pumps are high pressure gear pump, with low noise and steady performance.
- Air cooling system can be offered upon request to cool down the oil when needed.

Servo valve

The servo valve is an important core part, whose flow rate can be controlled through measuring & control system to realize the precise closed loop control for loading and unloading;

Servo valve from Moog, USA can be offered upon request.
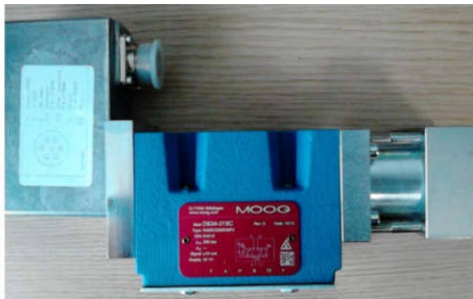
Load measurement:

TE has accumulated great experience in selection of superior core loading weight system in terms of materials, design, construction technology and especially performance & accuracy. Cooperating with top-quality brands from Germany & USA, TE made a special customs design with shielding function so that it can be optimized match with measuring & control system for most accurate test results.

The readability can be from 0.4% to 100% of the rated capacity. Calibration within 0.5% accuracy can be carried

out as per ASTM E4, ISO7500-1, EN 10002-2, BS1610, DIN 51221 standards.

This special load cell provides excellent immunity to impact and side forces, rugged & low-profile measuring body with strictly symmetrical design is optimally suited to ensure high endurance strength. Excellent linearity guarantees highly precise measurement, additional mechanical protection of the strain gage area. It can be set for protections of 105% over range protection, over load capacity of 150% without permanent zero shift and over load projection of 300% of the rated capacity without mechanical damage. This meets the stringent Weights and Measures requirements throughout Europe and the USA.

**Load cell from Celtron or Interface, USA can be ordered upon request**

Position measurement

Wire drawing type encoder is used for measuring the displacement of actuator. Higher precision encoder is applied corresponding with controller request.

Standard is with 2000pulse/turn encoder with position resolution 0.01mm;

Advanced encoder with 40000pulse/turn can achieve better position resolution 0.001mm (upon request).
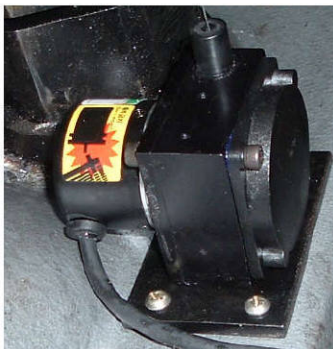
Deformation measurement:

High precision electrical strain gauged extensometer will be applied for deformation measurement. Also, being the exclusive agent of Epsilon extensometers in China, we are also experienced in providing suitable clip-on deformation measurement solutions and non-contact deformation measurement solutions like video extensometer and laser extensometer even under special environment such as furnace, environment chamber etc.

| Standard configuration 50/10 | Epsilon 3542-050M-020-ST(Optional) | 3543-200M-025M-ST (Optional) |

PS: RTTS-100D DIC or EpsilonONE Video Extensometer can be offered on request, see separate catalogs.

Electronics and Control Part:

Standard configuration: PCIE card

Self-developed & most advanced PCIE card for testing machine realizes the functions of real time data collection, communication, measuring and control etc. according to related ASTM, ISO standards. It can be inserted PCI slot of computer and connected with testing machine by data cable, then above functions can be done easily. Effective sampling rate can be up to 50Hz, in addition, the different versions for sampling rate of 200Hz, 500Hz and 10 kHz are available as options to meet special test requirements.
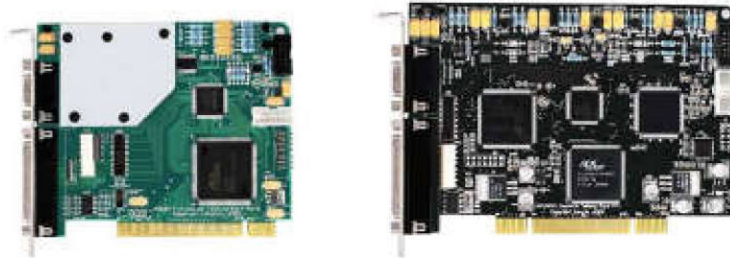
Optional configuration: EDC i20 controller from Doli, Germany:

This series machine are essentially configured with intelligent & powerful EDC controller from Germany for data acquisition and close loop control with features of stable control, fast response, high speed acquisition and exceptional reliability. This controller is with measuring channels for synchronous acquisition of load, position and strain from transducers like load cell, encoder and extensometer and supports additional channels for future expansion. Communicated with intuitive software for all machine control & data acquisition, and sampling rate up to 2.5kHz (optional 5kHz) ensures to obtain more accurate & repeatable test results. With special plug stored sensor data, it can self-identify and auto-calibrate the sensors of load & extensometers configured with testing system. Up to now, it is most reliable device to be used extensively for static and dynamic testing machines.

EDC i20 Intelligent Controller from Doli Germany with sampling rate 2500Hz

Specifications:

- ✧ Sampling rate: 2.5kHz
- ✧ Communication Processor, 100MHz
- ✧ Load, two ranges 2mV/V and 4mV/V and can be extended more if integration time.
- ✧ Drive Interface ±10V analogue command output or digital command output
- ✧ Safety functions like 4DI
- ✧ Two Option slots for second analogue channel for strain gauge extensometer, or two encoder channels for extensometer with one or two encoder.
- ✧ PC communication via USB 2.0 or Ethernet.
- ✧ Internal socket for serial Sensors (COM 1)
- ✧ Internal socket for Debug (COM 2)
- ✧ Self diagnosis function. Whenever any parts out of order such as calibration is due, the system will be reminded. Also any safety and errors will be displayed.

Sensor plugs

To identify and calibrate transducers as load cells, extensometers etc., a small PCB within a plug case (15 pin SUB-D) is available. The advantage here is the use of not calibrated e.g. load cells, because the calibration has to be done in house anyway. The calibration along with other data is stored in the plug.

The EDC reads the data at switch on or at request. The features are:

✧ Reference bridge to adjust the transducer sensitivity

✧ EEPROM to store transducer data

● Remote control box is attached on the column for operating in hands for close/open of grip and up/down movement of crosshead. Both TE remote controller & Germany imported RMC7 can be available.

Touch Screen 24inch Monitor (optional):

Touch screen monitor with software will be installed on the load frame for operator's console to conduct all kinds of tensile and compression tests, together with PC and monitor, it will bring client great convenience and excellent user experience.
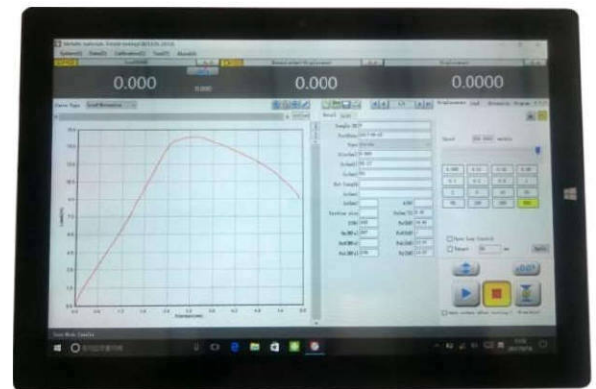
Patent technology of TE---Electric Calibration Modulus:

Application:

The electrical calibration module is designed to allow TE's calibration of load cell and extensometers to be easily transferred to our testing machine electronics. These are available for any strain gauged load cells and extensometers.
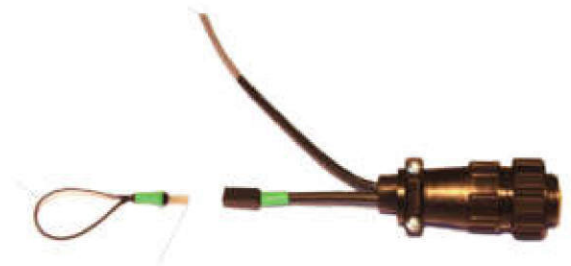
Why choose it?

It is used for the Calibration of Load cell and Extensometers by electrical method, which will make great benefits, partially listed as below

➢ Simple, fast and accurate calibration of the strain gauge load cells and extensometers;

➢ Quick means to check that the machine electronics (load cells & extensometers) is properly set and has not shifted, or damaged.

➢ The calibration can be done by electrical method, rather than the mechanical calibrators. Most of the end users do not have the mechanical calibrators; they have to apply for third party calibration. But now the electrical calibration module provides a more convenient way;

➢ If the machine is for internal QC, this module means that you do not need mechanical calibration any more.

➢ You do not have to apply for the third party calibration. The module can ensure the accuracy, it will greatly save the cost and the time.

Technical specification

Model	WAW-500E
Max. Load(kN)	500
Load measuring range	0.4~100%F.S.
Load accuracy (%)	±0.5
Deformation measuring range	0.4~100%F.S.
Deformation accuracy (%)	±0.5
Displacement position(mm)	0.01
Test loading speed(mm/min)	0.5-50 (0.01-50 if with EDC220 controller & Moog servo valve)
Max. Crosshead moving speed (mm/min)	200
Stress control range	$1\sim60(N/mm2)S^{-1}$
Strain control range	0.00025/s~0.0025/s
Tensile space(mm) (Including piston stroke)	750
Compression space(mm)	620
Piston stroke(mm)	250
Column Distance(mm)	480
Flat jaw (mm)	0-30
Round jaw(mm)	Φ13-Φ40
Jaw length(mm)	90
Jaw width(mm)	90
Platen size(mm)	Φ128x30
Bending span(mm)	30-500
Roller diameter (mm)	Φ30
Roller length (mm)	120
Bending depth (mm)	100
Net weight (kg)	2650
Max. height[2](mm)	2550
Dimension of load frame[3](mm)	770X600X2350
Size of power pack(mm)	550x550x1410
Footprint (L x W)	1350x1350
Gross weight (kg)	2800
Shipping dimension (mm)	3000x1130x1260/980x860x1800
Power supply	3PH, 380VAC, 50H, 3kW

Standard accessories

1. Hydraulic tensile fixture for round sample dia. 13-26, 26-40mm, flat sample: thickness 0-30mm
(Grip jaws for other size of samples are optional)
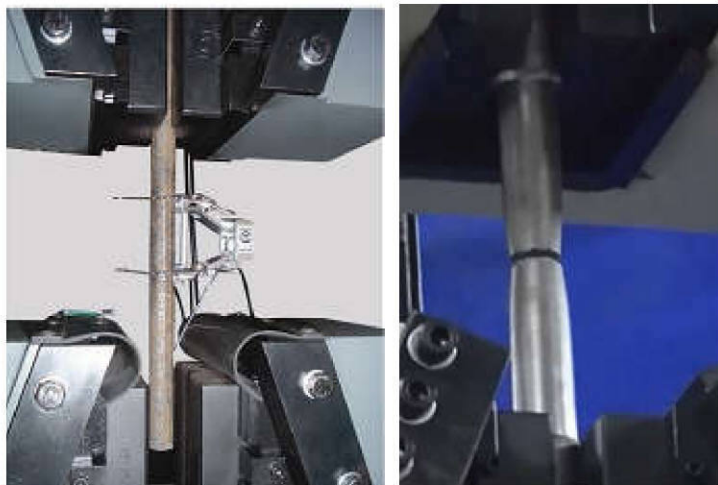
2. Flexure/Bending fixture   1 set

Bending span: 30-500mm, roller dia. 30mm, upper punching head/mandrel: dia. 30mm,
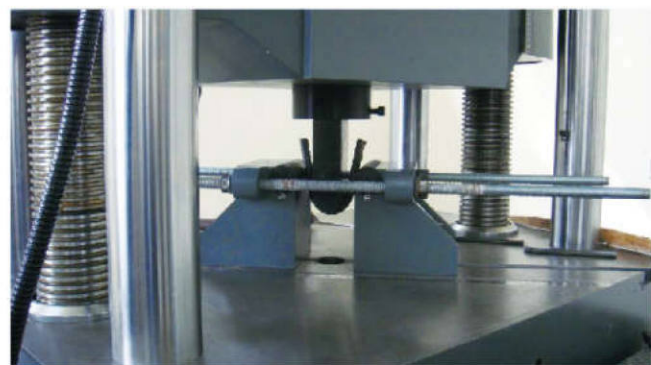
3. Compression fixture dia.128mm, it can be used for both metal and nonmetals   1 set

4. Computer system with software (19in LCD)   1 set

Computer: Dell, with the following configuration: Dell, Intel Pentium G3250 Dual-core (2 Core) 3.20 GHz, 3MB processor, 2GB, DDR3 1600MHz, SATA 7200RPM, HD 500G, 16X DVD-ROM Drive, Windows 10 OS system 64bit with license; 19inch screen LED monitor, photoelectrical mouse, and multiple keyboard;

Software: **English & Customized** Version (For details, please refer **Annex-1**)

Optional fixtures/accessories:

1. Shear test fixture for dia. 10mm sample, for other diameter can be offered on request
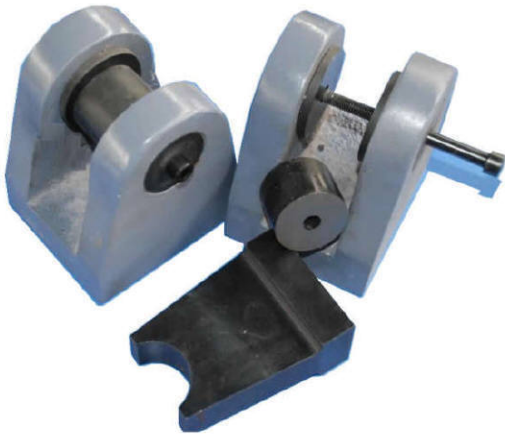
2. Shear Test fixture for Bolt: M6, M7, M8, M10, M12, M14, M16, M18, M20, M22, M24, M27, M30

3. Special tensile grip for fasteners as per ASTM F606 & ISO 898:
M6, M7, M8, M10, M12, M14, M16, M18, M20, M22, M24, M27, M30

Install the specimen   **Specimen is broken**

Specimen is under test   **Specimen is broken**

4. 3-point & 4 point bending fixture for concrete beam: 1 set

5. Tube expansion test fixture punching head 30° and 45°   1 set
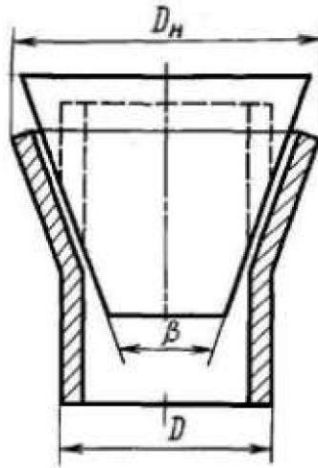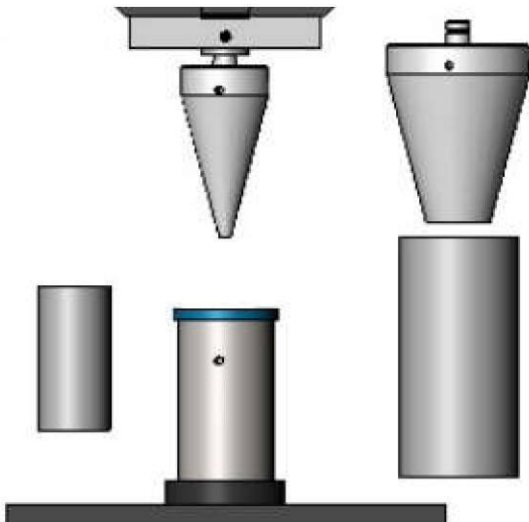
6. Special grip for 7-wire strand dia. 9.5, 12.7, 15.2mm as per ASTM A416 with high pressure power pack
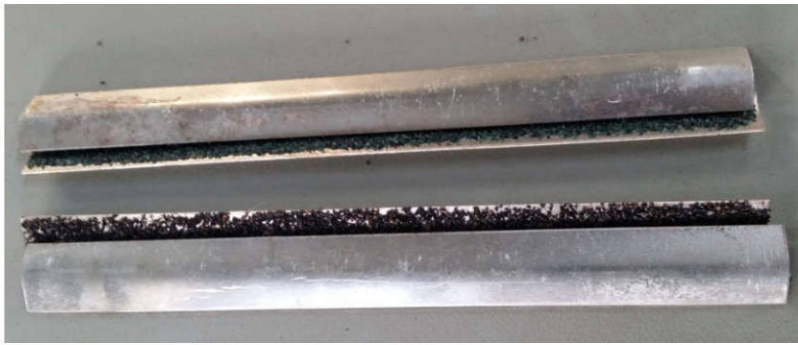
Aluminum sheet with coated carborundum to be used with Strand samples for tensile test
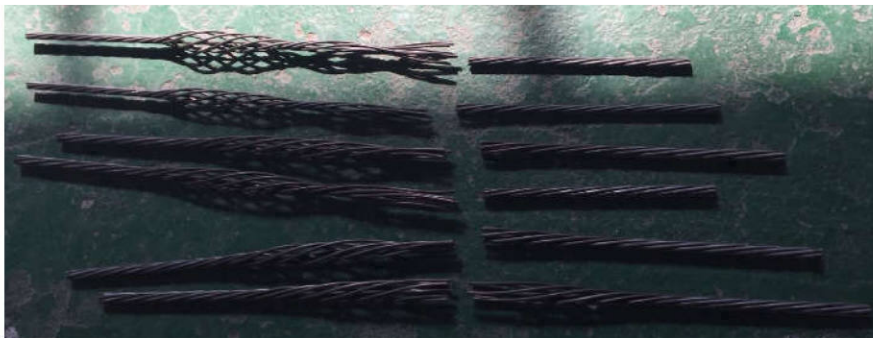
Specimen broken in line

ANNEX-1: Software Introduction

Features of Measuring & Control Software

1. Application & Features:

TE software refers to the software characteristics of the top manufacturers of testing machine in the world and proposals of various testing requirements from the end users, and combines all the advantages of former versions of software with lots of new features as following. Optimized software structure makes the testing operation easy, convenient and powerful.
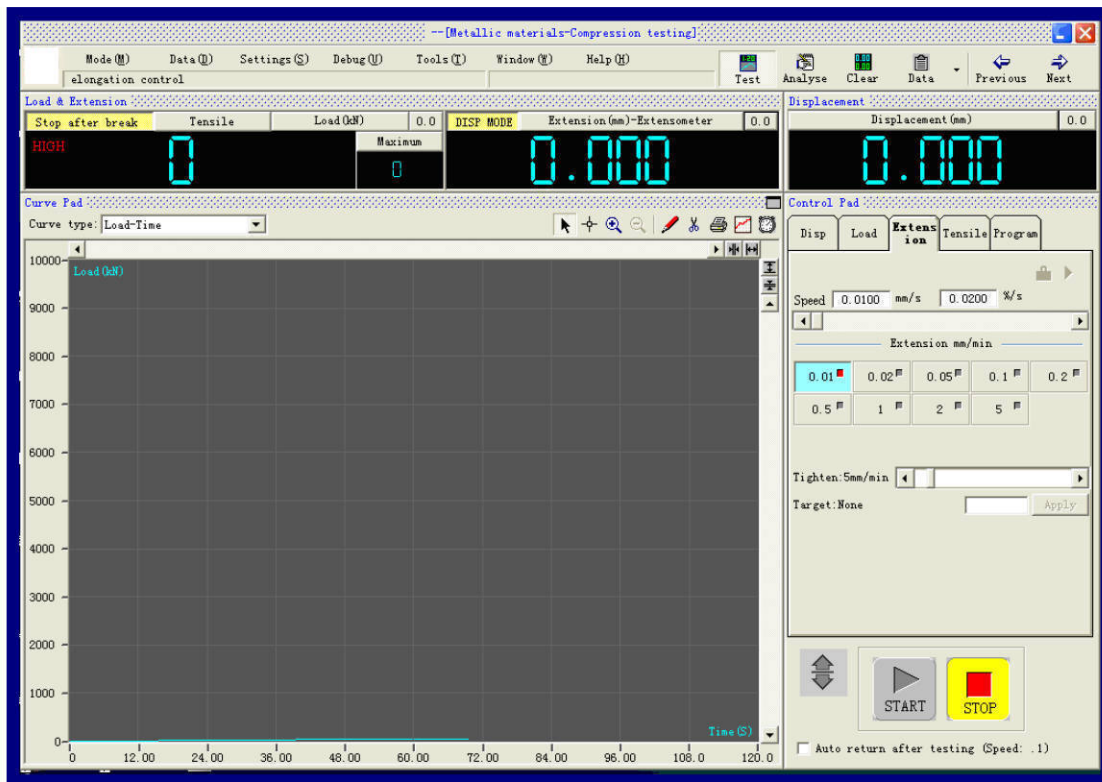
◇ Integrated full digital electro-hydraulic servo close-loop control, data processing with data analysis

◇ Possess multi kinds of full digital close-loop control modes, such as test load, displacement, stress and strain. Different control modes can be switched each other freely and smoothly.

◇ Enjoy strong "programming" function of integrated test procedures, programmable steps can be up to 100 steps, and it can be also extended to complete the compilation of arbitrary complicated and control mode switch test procedures.

◇ Software design aims to rapidity and convenience of test operation. Also adopt special design method to meet batch technology tests.

◇ Software is managed by multi levels, and expert user can use all system parameters, which combined the flexibility of software usage and safety & reliability of the system.

◇ Automatic data processing, processing method complies with multi international standards, such as ISO6892-1998, EN10002-1:2001 and ASTM

◇ Multi international units are adopted, such as SI, metric system unit and British measurement, etc.

◇ Maintain multi language conversion interface, so the system can be applied under conditions of various kinds of languages conveniently (Customized)

◇ Possess function of manual data processing, which fits to various kinds of complicated data processing for customer.

◇ Offer test reports, which can be stored, printed and re-analyzed.

◇ Test data is stored as the form of "text mode", and any general commercial data processing software can reprocess test data.

◇ Rich & perfect assorted test curves

◇ Possess the function of integrated document operating system, for example, test report, test parameter, system parameters can be stored as the form of "text mode".

◇ Compatible with different commercial printers

◇ Control system is based on software system, so upgrade is easy.

2. Interfaces of software:

Various kinds of hydraulic universal testing machine
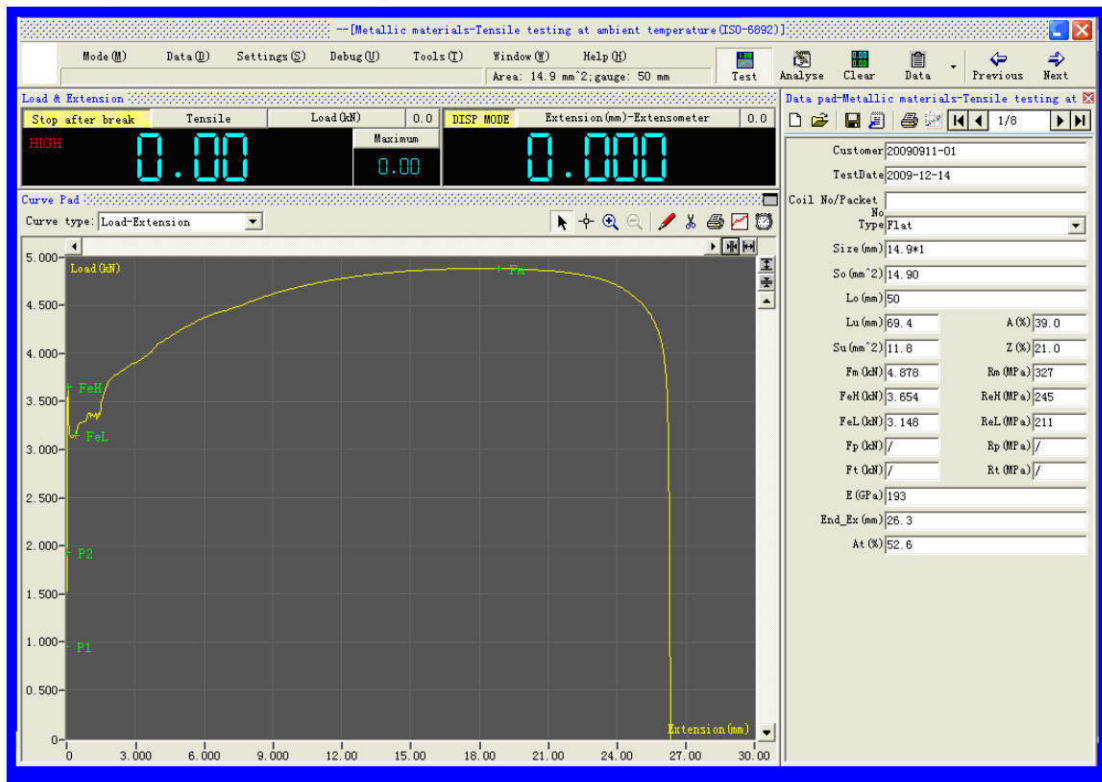
The control modes, test data and curves can be displayed in real time in the main interface and can be shifted at any time.
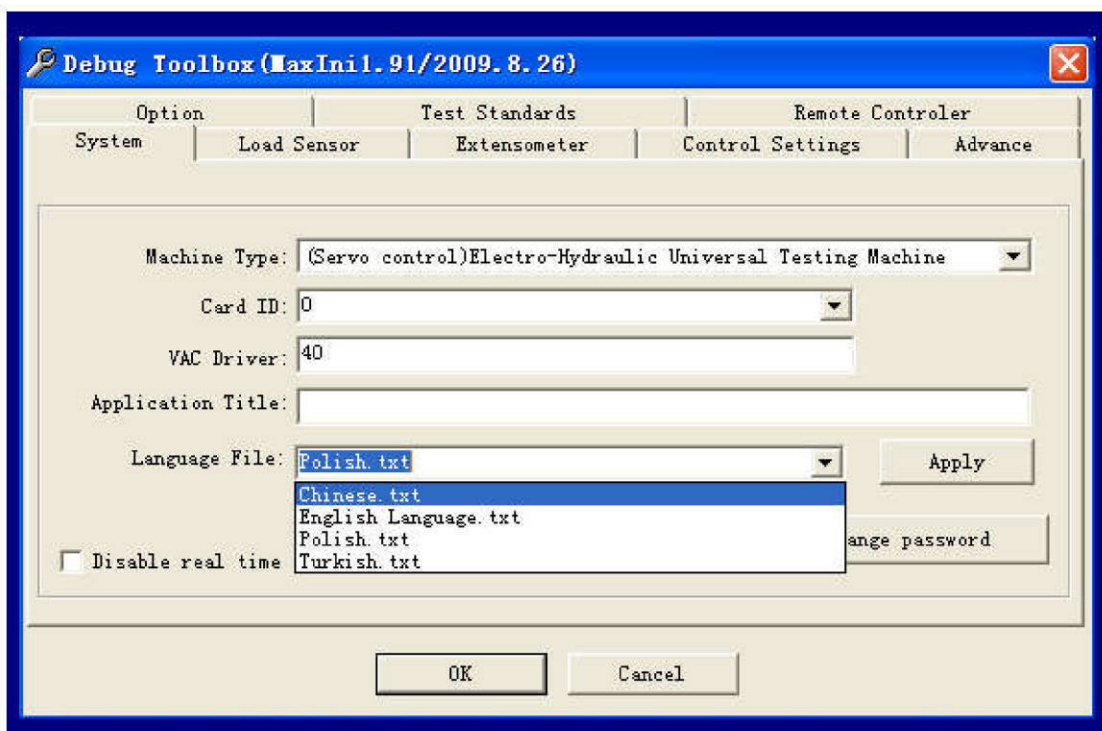
The deep-seated parameters of software are contained in Debug Toolbox

Multi-language function:

With the flexible language edited function, it can support multi-language such as English, Chinese etc. and you can translate the software language into the native language by yourself.

--[Metallic materials-Tensile testing at ambient temperature(ISO-6892)]--

Mode(M)   Data(D)   Settings(S)   Debug(D)   Tools(T)   Window(W)   Help(H)   Test   Analyse   Clear   Data   Previous   Next

Load & Extension
Stop after brake
100kN
Curve Pad
Curve type Load
100.0   Load(kN)
90.00
80.00

Test Methods for Rubber O-Rings(ASTM D 1414-94 Reapproved 2003) O Ring-ASTM,From Tube
Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension1(ASTM D 412-06a) Dumbbell
Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension1(ASTM D 412-06a) O Ring-ASTM,From Tube
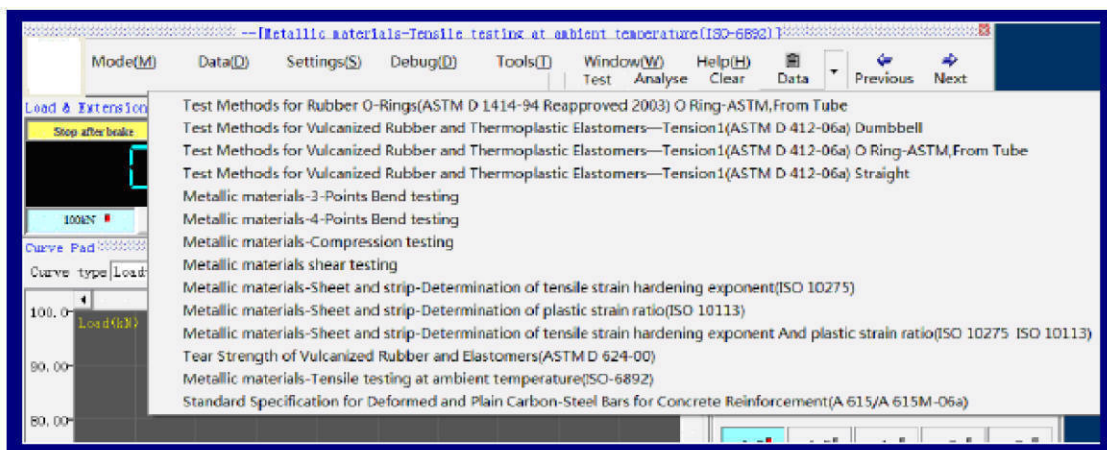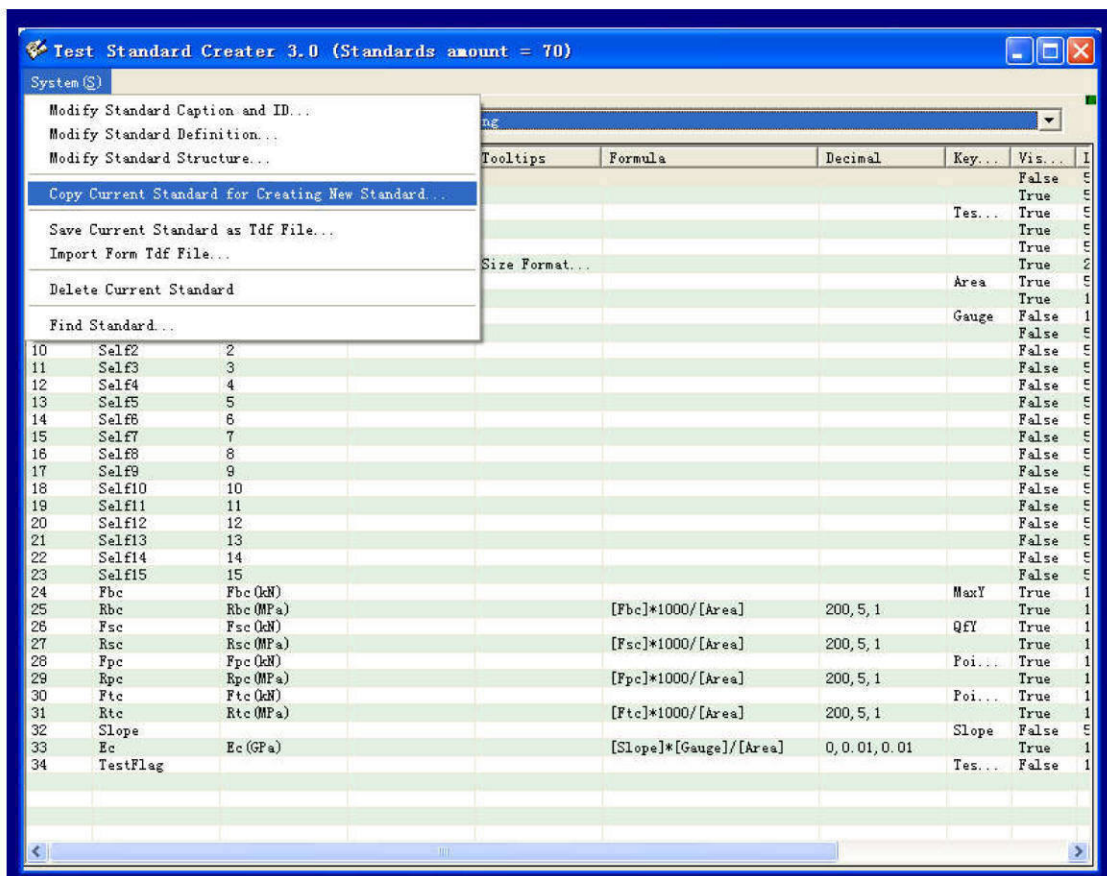Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension1(ASTM D 412-06a) Straight
Metallic materials-3-Points Bend testing
Metallic materials-4-Points Bend testing
Metallic materials-Compression testing
Metallic materials shear testing
Metallic materials-Sheet and strip-Determination of tensile strain hardening exponent(ISO 10275)
Metallic materials-Sheet and strip-Determination of plastic strain ratio(ISO 10113)
Metallic materials-Sheet and strip-Determination of tensile strain hardening exponent And plastic strain ratio(ISO 10275 ISO 10113)
Tear Strength of Vulcanized Rubber and Elastomers(ASTM D 624-00)
Metallic materials-Tensile testing at ambient temperature(ISO-6892)
Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement(A 615/A 615M-06a)

Software supports all kinds of popular testing standards i.e. ISO, ASTM, BS EN, DIN, JIS, GB etc.
Users can modify and add own testing standards and methods.

Test Standard Creater 3.0 (Standards amount = 70)

System (S)

Modify Standard Caption and ID...
Modify Standard Definition...
Modify Standard Structure...
Copy Current Standard for Creating New Standard...
Save Current Standard as Tdf File...
Import Form Tdf File...
Delete Current Standard
Find Standard...

			Tooltips	Formula	Decimal	Key...	Vis...	I
							False	5
							True	5
						Tes...	True	5
							True	5
							True	5
			Size Format...				True	2
						Area	True	5
							True	1
						Gauge	False	1
							False	5
10	Self2	2					False	5
11	Self3	3					False	5
12	Self4	4					False	5
13	Self5	5					False	5
14	Self6	6					False	5
15	Self7	7					False	5
16	Self8	8					False	5
17	Self9	9					False	5
18	Self10	10					False	5
19	Self11	11					False	5
20	Self12	12					False	5
21	Self13	13					False	5
22	Self14	14					False	5
23	Self15	15					False	5
24	Fbc	Fbc(kN)				MaxY	True	1
25	Rbc	Rbc(MPa)		[Fbc]*1000/[Area]	200,5,1		True	1
26	Fsc	Fsc(kN)				QfY	True	1
27	Rsc	Rsc(MPa)		[Fsc]*1000/[Area]	200,5,1		True	1
28	Fpc	Fpc(kN)				Poi...	True	1
29	Rpc	Rpc(MPa)		[Fpc]*1000/[Area]	200,5,1		True	1
30	Ftc	Ftc(kN)				Poi...	True	1
31	Rtc	Rtc(MPa)		[Ftc]*1000/[Area]	200,5,1		True	1
32	Slope					Slope	False	5
33	Ec	Ec(GPa)		[Slope]*[Gauge]/[Area]	0,0.01,0.01		True	1
34	TestFlag					Tes...	False	1

MaxProgram Editor possesses of multiple full digital control modes, i.e Displacement control, Stress (Load) control, Strain (Deformation) control, Low cycle control. User can edit the most complex and logical procedure by MaxProgram Editor. The combination of above functions can meet all kinds of routine test purpose.

Control Pad

| Disp | Load | Extension | Tensile | Program |

Speed 0.500 kN/s   5.00 MPa/s

Load kN/s

| 0.5 | 1 | 2 | 5 | 10 |
| 20 | 50 | 100 | 200 | 500 |

Tighten:5mm/min

Target:None   Apply

Control Pad

| Disp | Load | Extension | Tensile | **Program** |

Program: tidujiazai

Refresh   Goto Next Step (N)

<step 1>
Displacement
Control, speed:3mm/min, target:10mm;
When load reaches 2 kN goto <step 2>

<step 2>
Load Control, speed:.5kN/s, target:60kN;
When keeping time reaches 10 s goto <step 3>

<step 3>
Stress
Control, speed:10MPa/s, target:100MPa;
When displacement reaches 1 mm goto <step 4>

Edit (E)...

Wizard

Brief introduction

the separation

the plastic range

the elastic range

The left graph is a typical curve of metallic materials for tensile test.(Force-Extension Curve). The whole control process includes 3 steps indentified with the different colors in graph).The elastic range(green and red), the plastic range(blue) and fast separation range(black).

<< Previous (P)   >> Next (N)   Cancel (C)

Control Pad

| Disp | Load | Extension | **Tensile** | Program |

The first step
    Tighten speed :3mm/min
    Stress Speed10 MPa/s
    Switch to the second step after the force descend

The second step
    Strain Speed:.02 %/s

    Notice:Don't put down the extensometer!

    Switch to fast separation step when the elongation increment exceed2 mm

The fast separation step
    Speed:25mm/min
   and put down the extensometer

Wizard (W)...

Through the Tensile Program Editor, user can setup test steps according to the requirements of standards.
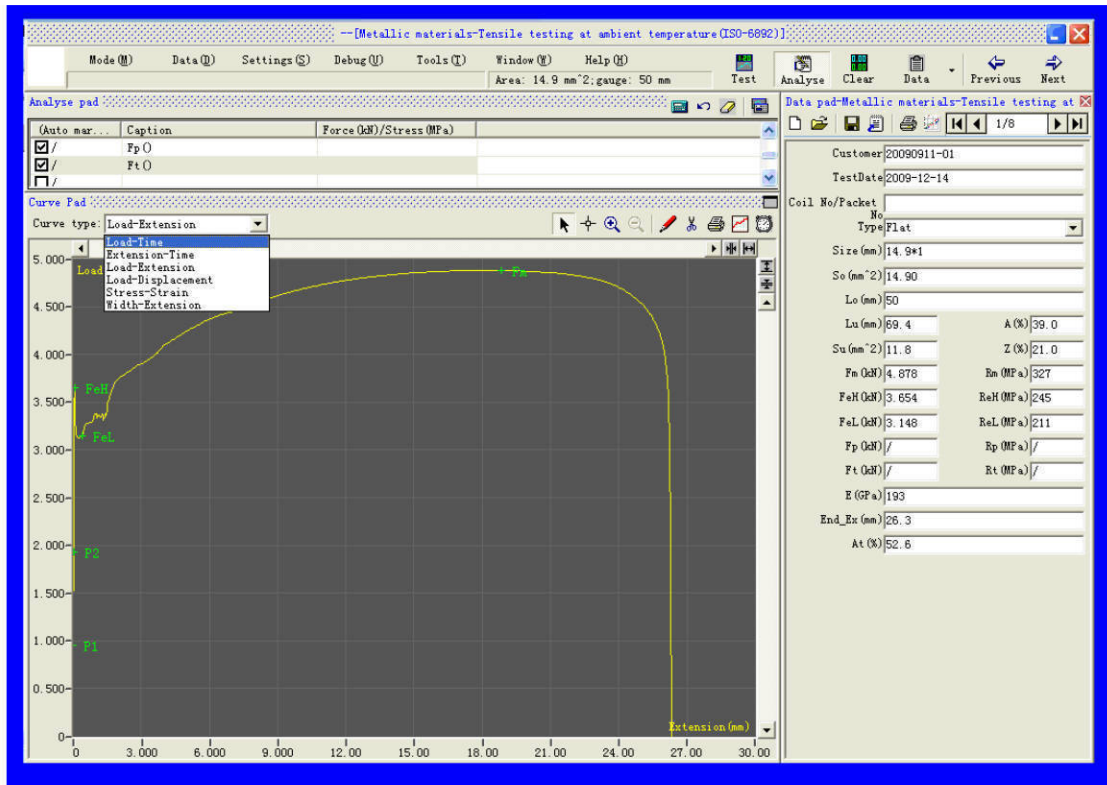
Multiple curves function in real time display including Load-Extension, Load-Displacement, Stress-Strain, Load-Time, Extension-Time, and Width-Extension.

Characteristic points such as Elastic Modulus, Yield points, Rp, Rm etc. can be marked on the curves, for a highlighted and visual observation.

Test result can be obtained automatically and also it can be got from the test curves manually.
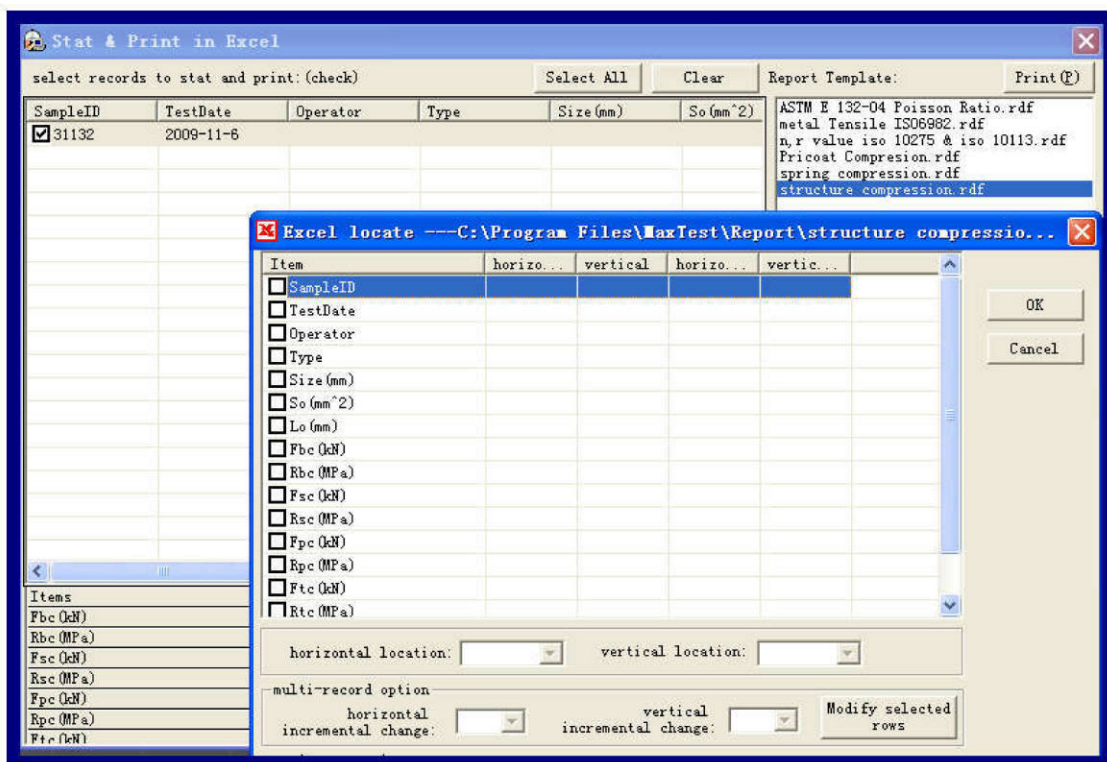
software contains all kinds of Report Templates. Customer can design various testing reports according to the requirements. Test result and curve can be printed in Excel or the auto-creating report template.

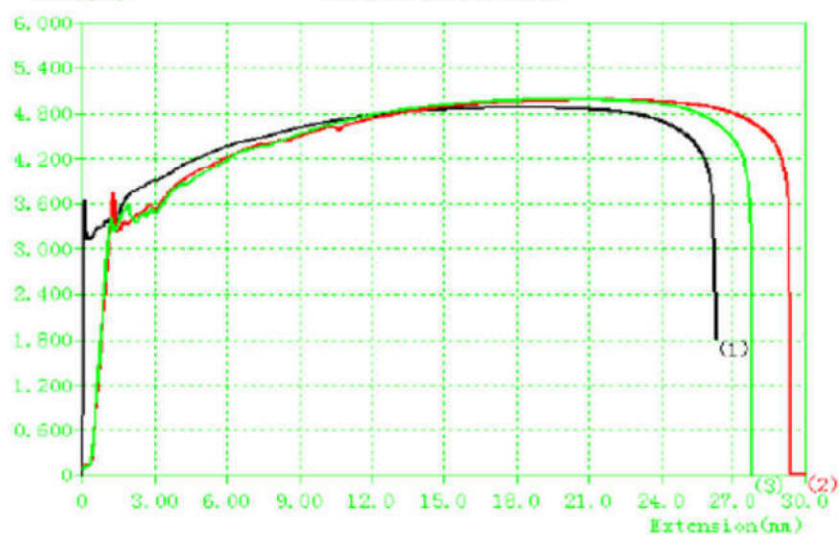## Metallic materials -- Tensile testing at ambient temperature
ISO 6892 : 1998

TestDate	2009-9-11			Operator	LW			
Temperature	20℃			Size(mm)	14.9*1			
Lo(mm)	50			So(mm^2)	14.9			

PrintID	SampleID	Rm(MPa)	ReH(Mpa)	ReL(MPa)	Rp(MPa)	E(GPa)	A(%)	Z(%)
1	QD01	327	245	210	233	193	39	21
2	QD02	334	251	223	234	198	42	23
3	QD03	335	240	229	228	205	38	27
4								
Max value		335	251	229	234	205	42	27
Min value		327	240	210	228	193	38	21
Average value		332	245.3333	220.6667	231.6667	198.6667	39.6667	23.667

Load-Extension Curve

Print Date: 2009-12-8

Beside the clip-on Extensometer, software supports Long Travel Extensometer, Full Automatic Extensometer, video Extensometer, laser Extensometer, and it can be added eight Extensometers at most.

software supports four load cells.