

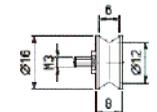
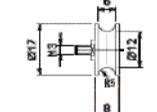
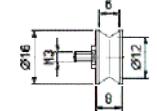
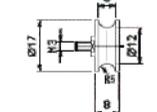
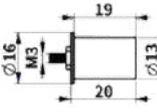
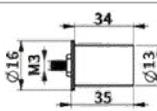
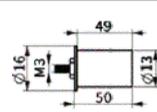
testing shaft from the external impact.

G. This gauge is a high-precision integrated electronic gauge with the LCD.

Do not impact or extrude.

H. Do not disassemble or repair the machine by yourself, which may cause permanent fault of the gauge.

# DIGITAL TENSION METER

Line tensiometer accessories reference		
Image	size	configuration
 SUS1201		standard configuration Standard Roller
 SUS1205		opention configuration Standard Roller
 POM1201		opention configuration Plastic Roller
 POM1205		opention configuration Plastic Roller
 TR1320		opention configuration Tape Roller
 TR1335		opention configuration Tape Roller
 TR1350		opention configuration Tape Roller



This Digital Tension Meter is small in size, light in weight, easy to carry. Although complex and advanced, it is convenient to use and operate. Its ruggedness will allow many years of use if proper operating techniques are followed. Please read the following instructions carefully and always keep this manual within easy reach.

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## 17. SECURITY AND CAUTIONS

### 17.1 Cautions

- A. If the operation is incorrect, it is possible to damage the gauge or cause serious accident. In the manual, the important items of accident prevention and measurement procedure of the gauge are pointed out. Please read this manual carefully before measurement, keep it properly after reading, in preparation to read again.
- B. If it is to test the impact load, please select models with safe load at least double as large as the impact load.

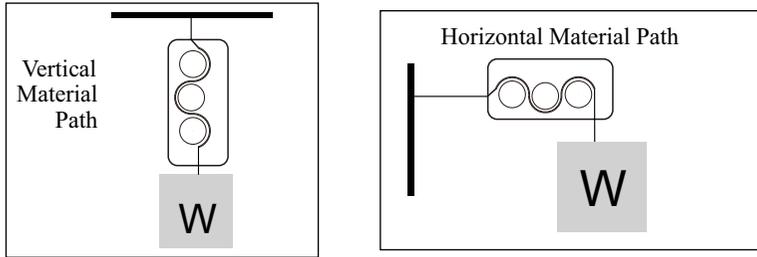
### 17.2 Warning

- A. In destructive testing, protective masks and gloves should be worn to prevent the occurrence of the damage to the human body because of material splashing during testing.
- B. Do not use fixtures which have been damaged or severely bent. For users, please refer to the relevant specifications in this manual when using a self-made fixture (various types of fixtures are provided for customers to select according to need).
- C. Do not test force exceeding the maximum range of the gauge. Otherwise it may cause damage to the sensor, or even an accident.
- D. When the tested force exceeds 110% of the range, a continuous buzzer alarm comes out. In this case, please remove the load quickly, or reduce the load.

### 17.3 Security Items

- A. When using the power adapter, the voltage of power supply should be the same as the rated voltage, or it may cause electric shock or fire.
- B. Do not pull out or insert the plug with wet hands, or it may lead to electric shock.
- C. Don't pull the cable of the power adapter to pull the plug, to avoid wire broken and electric shocks.
- D. Please use a soft cloth to clean the gauge. Soak the cloth in the water with cleaning agent, wring it out, and then use it to remove the dust and dirt. Note: do not use volatile chemicals to clean the gauge (such as volatile agents, thinner, alcohol, etc.)
- E. Do not use the gauge in the following environment,
  - 1. Wet environment
  - 2. Dusty environment
  - 3. The place where with the use of chemicals or oil
  - 4. The place where with vibration source
- F. After use, please put the force gauge into the portable box, to protect the

display a value equal to (or within quoted accuracy specification) of the known Weight “W”. If not, adjust the compensation coefficient.



#### 14. SPECIAL CALIBRATION

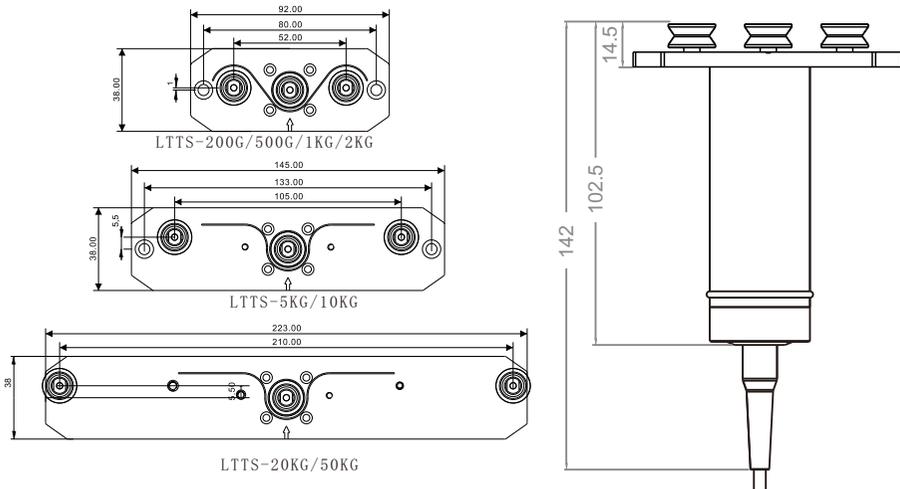
If the standard Checking Calibration does not provide the desired accuracy, a Special Calibration can be ordered. A 25 cm sample of the process material must be provided for calibration purposes.

#### 15. MOUNTING HOLES

The LTTS is supplied with two threaded holes for on-line mounting in a fixed position when performing measurements over an extended period. The thread size is M5 (Metric), as follows.



#### 16. THE SIZE OF THE SENSOR



### 1. INTRODUCTIONS

The LTTS Digital Tension Meter is a hand-held device which accurately measures the running as well as static tensions of a wide variety of process materials including yarns, fibers, wires, optical fibers, etc.

It employs the "three-roller principle" of tension measurement where the outer two reference rollers are fixed to create a known angle of wrap over the middle sensing roller. The middle roller is part of a precision strain gauge sensing system which accurately measures the resulting force on the roller. This value is converted into a highly accurate and repeatable tension value using proprietary computer calibration formulas which correct for different material diameters, gravity and other critical parameters.

The digital force gauge has a number of models with different force range for the user to choose, the user can select the appropriate model according to the force of tested products. The scientific test method is to use 10%~100% of the full test range. The measurement department recommends not to use <1% of the full test range. Before testing, when the instrument and the test object have been in place, press ZERO key to clear the load of the fixture.

### 2. FUNCTIONS AND FEATURES

- \* High accuracy and high resolution.
- \* Digital display with no guessing or errors.
- \* With 4 measurement unit for selection and conversion, N, kg, lb, g.
- \* Power is supplied by 4xAAA alkaline battery.
- \* The Meter takes 62 tension measurements per second and displays the average of these measurements over a user-selected interval of 0.5, 1.0, 2.0 or 4.0 seconds, the Display Update Rate.
- \* Current Value, Max. Value, Peak Value, Min Value can be displayed at the same time.
- \* Optional data output function. Measurement data can be transmitted to computer by USB cable or Bluetooth adapter for various analysis.
- \* With 10 minutes auto power off and manual power off.

### 3. TECHNICAL PARAMETERS

Model	LTTS-200	LTTS-500	LTTS-1K	LTTS-2K	LTTS-5K	LTTS-10K	LTTS-20K	LTTS-50K
Tension Range	0~0.2kgf	0~0.5kgf	0~1.0kgf	0~2.0kgf	0~5.0kgf	0~10.0kgf	0~20.0kgf	0~50.0kgf
	0~200gf	0~500gf	0~1000gf	0~2000gf	0~5000gf			
	0~1.96N	0~4.9N	0~9.8N	0~19.6N	0~49N	0~98N	0~196N	0~490N
	0~0.44Lbf	0~1.1Lbf	0~2.2Lbf	0~4.4Lbf	0~11Lbf	0~22Lbf	0~44Lbf	0~110Lbf
Resolution	0.001kgf	0.001kgf	0.001kgf	0.001kgf	0.01kgf	0.01kgf	0.01kgf	0.01kgf
	1gf	1gf	1gf	1gf	1gf			
	0.001N	0.001N	0.001N	0.01N	0.1N	0.1N	0.1N	0.1N
	0.001Lbf	0.001Lbf	0.001Lbf	0.001Lbf	0.01Lbf	0.1Lbf	0.1Lbf	0.1Lbf
Accuracy	±1.0% or better		±1.5% or better					
Gear spacing	52mm			105mm		210mm		
Unit	kgf, gf, N, Lbf							
Measuring Principle	Strain gauge							
Measuring Frequency	16 msec (62.5 samples/sec)							
Sensing Roller	Deflection of Sensing Roller (max.) 0.2mm							
Overload Capacity	150% of Full Scale							
Temperature Coefficient	Zero: less than +0.3% FS/°C Span: less than +0.01% FS/°C							
Display	Blue Back light LCD							
Display Update Rate	0.5, 1.0, 2.0 or 4.0 seconds, dip-switch selectable							
Memory System	Current Value, Max. Value, Peak Value, Min Value							
Overrange Indicator	Buzzer Alarm							
Power Off	10 Minutes Auto Power Off, Manual Power Off							
Data Output	USB, Bluetooth (Optional)							
Roller Material	Stainless Steel (Standard) Plastic (Optional)							
Maximum Speed	2000m/min							
Power Supply	4x1.5 AAA(UM-4) Battery							
Operation Temperature	0~40°C							
Operation Humidity	<80%							
Weight	400g							
Size	Main Unit: 149x70x30mm Sensor: 102x81x34mm							

→ Click ‘System Settings’, select the correct port, such as ‘COM1’, ‘COM3’, ‘COM5’. Select ‘Tension Meter’, Click ‘Save (A)’, then click ‘Exit (E)’.

→ Click ‘Data Collection’, then click ‘Begin/Continue’. Press the Send/Minus Key, the present measurement data will be transmitted into the computer, for further processing.

#### 10. UNIT CONVERSION FUNCTION

Press the Clear/Plus Key and the Adjust Key at the same time for measurement unit conversions.

#### 11. SETTING OF AUTO POWER OFF

When the gauge is powered on, press and hold the Power/Menu Key for about 9 seconds. Release the key when the indicator ‘**AUTO**’ (AUTO) comes out on the display.

A figure, ‘**10**’ or ‘**0**’, comes out on the display. Respectively indicating auto power off in 10 minutes with no key operations and non-auto power off. Press the Clear/Plus Key or the Send/Minus Key to convert between these two settings. Press the Power/Menu Key to quit.

#### 12. BATTERY REPLACEMENT

12.1 When it is necessary to replace the battery, the battery symbol will appear on the Display.

12.2 Slide the Battery Cover away from the gauge and remove the batteries.

12.3 Install new batteries correctly into the case.

12.4 If the gauge is not to be used for any extended period, remove batteries.

#### 13. CHECKING CALIBRATION

It is important to check the calibration of the LTTS frequently to insure that the gauge continues to perform within factory specifications. Implementing a periodic calibration check will help identify when (and if) the gauge goes out of calibration due to unreported damage, overload, or other unknown reason. The procedures of checking calibration are as follows.

13.1 Suspend a known weight “W” from the process material in either a vertical or horizontal direction, best simulating the orientation that will be used during actual measurement. Fix the process material at one end. When fixing the process material horizontally, use a roller (or other free-rotating guide) prior to fixing the known weight. Refer to sketches. Select a weight within the expected operating tension range of the the application.

13.2 Zero calibrate the meter in the installed direction of material.

13.3 Arrange the material correctly into the sensor, The LTTS should

Diameter (mm)	Tension	Percentage Deviation (%)	Compensation Coefficient (%)
1	500	0	00
0.8	470	-6	06
0.7	460	-8	08
0.6	430	-14	14
0.5	422	-16	16
0.4	420	-16	16
0.3	418	-16	16
0.2	414	-17	17

After the determination of the Compensation Coefficient, press and hold the Adjust Key for about 3 seconds, a beep comes out. Release the key to enter the Material Diameter Compensation Coefficient Adjusting Mode. The Material Diameter Compensation Coefficient blinks on the display. Press the Clear/Plus Key or the Send/Minus Key to adjust the Compensation Coefficient. Press the Adjust Key to confirm and quit. The Material Diameter Compensation Coefficient can be set as any integer from -20 to 20.

#### 8. THE INSTALLATION OF CONNECTION SOFTWARE

A CD for installation of the connection software is provided, software installation steps are as follows, for details, please refer to the demo video and documentation in the CD.

- Run the CD, open the compressed folder, double click the 'Test Setup. Cn'.
- Click 'Next'.
- Click 'Browse', select the installation position, click 'OK'.
- Click 'Next'.
- Click 'Install'.
- Click 'Finish'.

#### 9. REAL TIME DATA TRANSMISSION FUNCTION

After the installation of connection software, plug in the USB Data Cable or the Bluetooth Adapter, then install the device on the computer. For the installation steps of device, please refer to the demo video and documentation in the CD.

- Open the 'TestRS232(En)' on the desktop of the computer.

### 4. STRUCTURE DESCRIPTION

#### 4.1 Overall Structure



Fig 1 Overall Structure

#### 4.2 Display

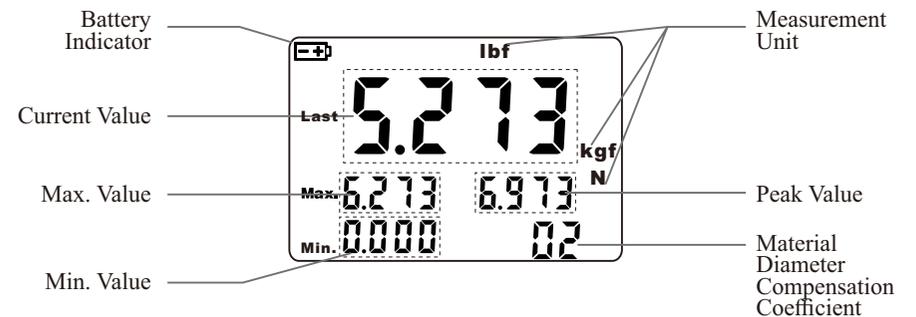


Fig 3 Display

### 4.3 Description Of Key Functions

Key	Description of Functions
Power Key	It is the key for power on/off. Press it to power on the meter, or press and hold it for about 3 seconds to power off the meter.
Clear/Plus Key	Press this key to clear all the datas in the meter (Including the Max. Value, the Peak Value, the Min. Value). When adjusting the Material Diameter Compensation Coefficient, press it to increase the coefficient. When adjusting the Display Update Rate, press it to increase the rate. When adjusting the Auto Power Off Function, press it for conversion.
Send/Minus Key	When the meter is connected with the computer, press this key to send the current value to the computer. When adjusting the Material Diameter Compensation Coefficient, press it to decrease the coefficient. When adjusting the Display Update Rate, press it to decrease the rate. When adjusting the Auto Power Off Function, press it for conversion.
Adjust Key	Press and hold it for about 3 seconds, release it after the beep comes out to enter the Compensation Coefficient Adjusting Mode. Press the Clear/Plus Key or the Send/Minus Key for adjustment. Then press this key to quit.
Power/Menu Key	It is the key for power on/off. Press it to power on the meter, or press and hold it for about 3 seconds to power off the meter. Press and hold it for about 6 seconds to enter the Display Update Rate Adjusting Mode. Press and hold it for about 9 seconds to enter the Auto Power Off Adjusting Mode.
Clear/Plus Key + Adjust Key	Press the Key Combination for measurement unit conversion.
Send/Minus Key + Adjust Key	Press the Key Combination for Zero Calibration.

## 5. QUICK START INSTRUCTION

### 5.1 Zero Calibration

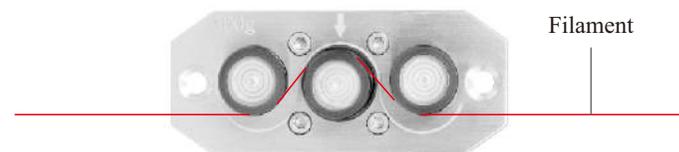
Turn the unit on by pressing the Power Key or the Power/Menu Key. Display should show zero when unit is in measuring position. If the gauge does not display zero, press Send/Minus Key + Adjust Key for zero calibration.

### 5.2 Setting The Material Diameter Compensation Coefficient

To set the Material Diameter Compensation Coefficient according to the material diameter. For detailed procedure please refer to 7 The Material Diameter Compensation Coefficient.

### 5.3 Setup

Arrange the filament according to the indication on the sensor, and hold the sensor in the position of zero calibration.



### 5.4 Reading

After the correct installation of filament, the Current Value, the Max. Value, the Peak Value, the Min. Value of tension will be displayed.

### 6. ADJUSTING THE DISPLAY UPDATE RATE

The LTTS takes 62 tension measurements per second and displays the average of these measurements over a user-selected interval of 0.5, 1.0, 2.0 or 4.0 seconds, the Display Update Rate. This permits the user to determine the extent of averaging (or damping) required to "stabilize" the tension readings, making them much easier to read and eliminating the undesirable 'bouncing needle'.

Press and hold the Power/Menu Key for about 6 seconds, an indicator of 'RATE' comes out on the display. Release the key to enter the Display Update Rate Adjusting Mode. To adjust the Display Update Rate, just press the Clear/Plus key or the Send/Minus Key. Then press the Power/Menu Key to exit. The display update rate can be set as one of the following values, 0.5, 1.0, 2.0 4.0.

### 7. THE MATERIAL DIAMETER COMPENSATION COEFFICIENT

When using the "three-roller" principle of tension measurement, an decrease in material diameter will result in an decreased tension reading even when the line tensions are unchanged.

So, a Compensation Coefficient is necessary for measurement. For different materials the relationship between the Material Diameter and the Compensation Coefficient are different. See the following relationship between the Material Diameter and the Compensation Coefficient of Fishing Line as an example.