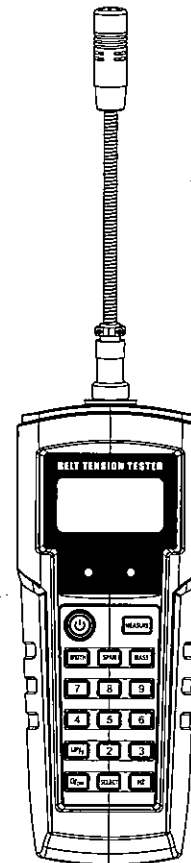


### ***Non-standard Belt Measurement***

- Since the instrument is design for standard belt, measurement of some non-standard belt (for example: thicker back or other materials) may cause incorrect measured result. For such condition, user will need to calibrate the frequency and tension of the belt.  
To calibrate, user needs to put belt on a fixture with a known span length.  
By hanging different weights, user can vary the tension with known tension value.  
By repeating this procedure, user will be able to collect the information of frequency VS tension with various span lengths.  
By referring this information, user is able to know the corresponding tension with the frequency measured from the instrument. Be aware, user must use same span length as the contrast.

# **Sonic Belt Tension Meter**



The sonic belt tension meter is able to measure the vibration of the belt from the microphone in the front.

The meter will then use the mathematical calculation to convert the tension from the vibration of the belt, which is helpful for installation or tuning of any belts.

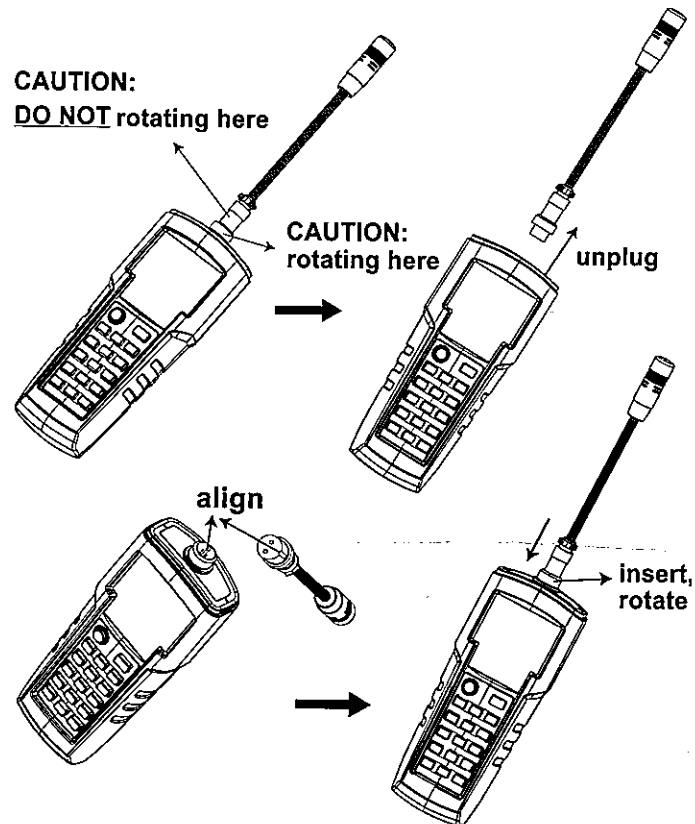
### Please read the instruction before any operation.

- Avoid the impact; any impact may cause instrument damage.
- Avoid splashing water, solvent or any other liquid on the instrument.
- Avoid placing the instrument in dusty environment.
- Keep away from heat. Don't put the instrument in car or expose it to strong sunshine directly.
- Don't wash the instrument with volatile solvent.
- Don't use the instrument in sparking environment, or it may cause explosion.
- Don't pull out the wires that connected with the probe.
- To prevent lightning strike, please don't operate the instrument outdoor when there is thunderstorm.
- Portable probe is tube structure. Don't bend the probe to acute angle, don't bend the tip or the two ends.

- Portable Probe
- 20 sets Frequency Storage
- Frequency Range: 10 ~ 600Hz
- Automatically Power-off: The instrument will automatically power off when no operation for 5 minutes. User can also make the instrument power off by pressing On/Off switch for 2s.
- Power Source: 2 AAA Battery, please install it in the back of the instrument.
- Background light (always on).

## 1. PROBE INSTALLATION

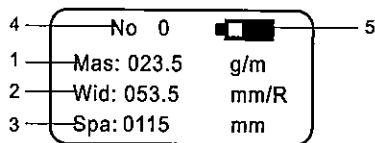
Tightly connect the notch of probe to the convex point of instrument and then completely screw the outer nut.



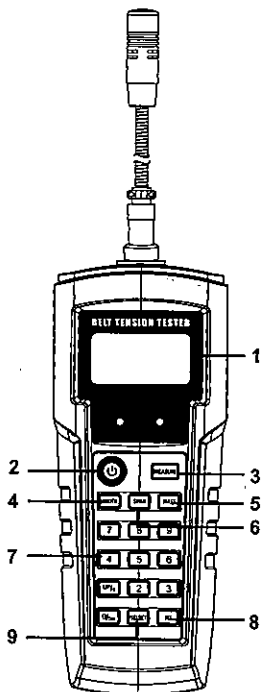
## 2. LCD DISPLAY

Long press the **POWER** button, the following content will be displayed on LCD:

1. **Mas** : the mass of belt
2. **Wid** : the width of belt
3. **Spa**: the span of tangent line
4. **No** : the storage number
5. Battery capacity



## 3. PRODUCT DESCRIPTION



1. LCD Display
2. **POWER** Button - Press and hold to switch on/off the power.
3. **MEASURE** Button - Press this button to start the measurement.
4. **WIDTH** Button - Press this button to enter the belt width.
5. **MASS** Button - Press this button to enter the belt mass.
6. **SPAN** Button - Press this button to enter the belt span length.
7. **Number 0-9** Buttons - Press these buttons to enter the value or the number. **Number 1 and 0 are also page up and down.** On the initial screen, user is able to set up the storage number by typing numbers directly.
8. **HZ** Button - Switch between frequency (Hz) and tension (N).
9. **SELECT** Button - On the initial screen, short press **SELECT** to page down the storage number; long press to check measurement history. On any other screen, press **SELECT** to return to initial screen. User is able to page up and down the history by pressing number "1" and "0" button when they check the history.

## 4. CALIBRATION

### A. USER CALIBRATION

1. Long press **POWER** button to switch on the power, then press **HZ** button to enter the frequency measurement.
2. Press **MEASURE** button to enter the test mode, and use the tester to measure the calibration source (e.g. tuning fork or tone generator).
3. Press **NUMBER 7** and **9** button at same time, "CAL" will appear on the top left corner of the LCD.

If user uses 256Hz tuning fork as the calibration source, enter value 256.0Hz, and then press button to **MEASURE** save the calibration.

**NOTE** : The calibration frequency has to be 100 ~ 600Hz

### B. RESTORE FACTORY CALIBRATION

1. Long press **POWER** button to switch on the power, then press **HZ** button to enter the frequency measurement.
2. Press **MEASURE** button to enter the testing mode, then press **NUMBER 7** and **9** button at same time to enter the calibration mode, and "CAL" will appear on top left of the LCD. Eventually, press **SELECT** button to restore factory calibration.

### C. SWITCH BETWEEN USER AND FACTORY CALIBRATION

1. Long press **POWER** button to switch on the power, then press **HZ** button to enter the frequency measurement.
2. Press **MEASURE** button to enter the testing mode, and press **NUMBER 7** and **9** button at same time to enter the calibration mode, and "CAL" will appear on top left of the LCD.
3. Press **SELECT** button to use **FACTORY CALIBRATION**, or press **HZ** button to use **USER CALIBRATION**.
4. If the meter is under **USER CALIBRATION** mode, capital "U" will appear on the top left of the LCD.

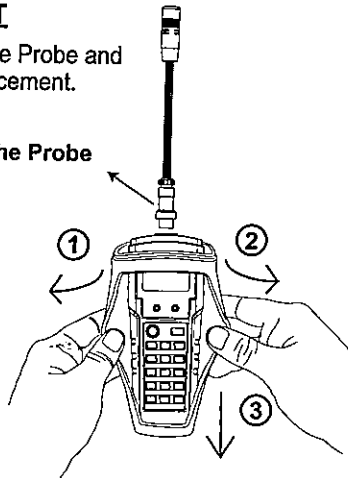
**NOTE**: Make sure user has done the **USER CALIBRATION** before operation, otherwise please use **FACTORY CALIBRATION**.

## 5. BATTERY REPLACEMENT

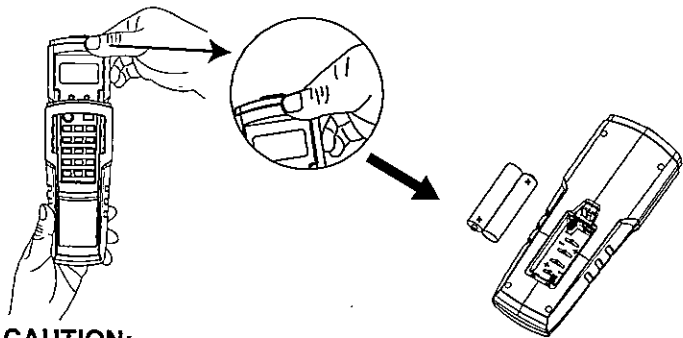
Please turn off the power, remove the Probe and the Soft Rubber before battery replacement.

### Step1. Remove the Probe

**Step2. Remove the Soft Rubber**  
Please follow the sequence as icon.



**Step3. Hold the top of the device & pull-up**



### CAUTION:

1. The instrument will auto power off after 5 minutes without any operation.
2. Battery capacity icon is shown on the top right of the display. If it is full-black, it is full power. If it is empty, it is low power.
3. Please replace the battery if the device is low power.

## 6. OPERATION

Press the **ON/OFF** button, the following data will be displayed on initial screen:

1. Mas: the mass of belt
2. Wid: the width of belt
3. Spa: the span length of belt

### NOTE:

The belt information must be entered to the instrument. User can get the information from data sheet or the belt manufacturer or the datasheet. Frequency will still be measured if wrong information has entered, but the tension value will be

### ERROR:

If the calculation of tension value is higher than the displayed value on screen, the red light will show on the panel.

### Belt Mass:

Mas= XXX.X g/m

Please refer the datasheet from the belt manufacturer or the mass table. Press **MASS** then enter the value. Please ensure the decimal point value is correctly entered. Press **SELECT** will return to the initial screen. The input range is 000.1g to 999.9g.

### Belt Width & Number of Ribs or Strands

Wid=XXX.X mm/R

Enter the value from 000.1mm to 999.9mm.

If it is synchronous belt, please input the belt width (mm).

If it is v-belt, please enter the number of strands of measured belts

### For example:

If the width of HiDT belt is 20mm, enter "020.0".

If it's a single strand V-Belt, enter "001.0".

For the measurement of multiple single belt or banded belt, please enter the correct number of ribs or strands of belts, and make sure the correct mass data is being entered. The instrument will automatically calculate the results.

### For example:

A v-belt pulley uses 4 3V belts. If enter 1 as width (WIDTH button); the static tension of single belt will be displayed. For this case, user needs to make sure all other belts will not interfere during the measurement. However, for the same pulley, if user wants to measure the total static tension of 4 belts, user needs to enter 4 as the width.

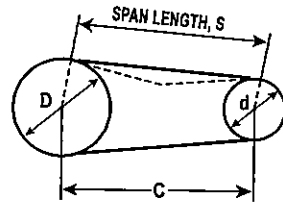
### Span Length

Spa=XXXXmm

000.1mm to 999.9mm input is available. It is the tangent length of the contact point between the adjacent two pulley gears. The distance can be measured directly or calculated by following formula. The accurate result can be offered with calculating the tangent length. The formula of tangent length calculation

$$S = \sqrt{C^2 - \frac{(D-d)^2}{4}}$$

S=Span of Tangent-Line (mm)  
C=Distance between two gears (mm)  
D=Diameter of big pulley  
d=Diameter of small pulley



DISTANCE BETWEEN TWO GEARS, CD

### Data Storage and Restore

The instrument can store 20 sets data of mass, width and span length. The stored data can be reviewed by long pressing the **SELECT** button on the initial screen. The register number of storage is showed on the top left of the screen; 3 records will be displayed once. User can fix any data by pressing **WIDTH**, **SPAN** and **MASS** button and get a new data. The new data will be automatically store if the record is changed or the instrument is power off.

### Frequency Range

10-600Hz

### Measurement

Pressing the MEASURE button, tapping the belt to make it vibrate, putting the probe apart from the belt about 1mm (0.4ft) and please don't touch the belt; "Testing" will be displayed on the screen. "Calculating" will appear on the display after the instrument receives the signal. The measured results will come with buzzing once and green LED indication. If the measured frequency or calculating tension is over the specified range, the red LED will light up to indicate the measured value may be error.

### Frequency Display

F= XXX.X HZ

The tension or frequency will be displayed by pressing Hz button.

### Measurement Error

If calculated tension or measurement is over the specified range, the red LED will light up and Error indication will be displayed on screen.

Please check mass, width, span length with the datasheet and repeat the measurement until the tension is appeared.

Please obtain 3 measurements at least for contrast.

If the 3 results are close to each others, it means the measurement is correct.

In low tension of belt, the bigger vibration may be generated easily, which may cause measurement error.

If tension value can't be

obtained, the belt may be too loose to make a clear frequency signal. For more accurate tension value, please make the belt tighter.

### 7. THEORY

The calculation and measurement is based on "transverse vibration of a string" theory. The instrument will capture the vibration of the belt, and transfer it as frequency. By entering the mass, width, span length, the relationship between frequency and tension can be built by below formula.

$$\text{Formula } T = 4 \times M \times W \times S^2 \times F^2 \times 10^{-9}$$

T= tension of span length (N)

W= width (mm) or number of ribs or strands

S= span length (mm)

F= frequency (Hz)

## Belt Mass Table

### Belt Mass Table

Timing Belt

Unit: g/m

HiTD	g/m
5M (9mm).....	36.9
8M (20mm).....	128.2
14M (40mm).....	428.9

STPD	g/m
S8M (20mm).....	110.9
S14M (40mm).....	462

Wrapped V, wedge and banded belts

Single Belt Banded Belt

	g/m
Z (40mm) .....	51.....n/a
A (75mm) .....	115.....150
B (105mm) .....	193.....260
C (175mm) .....	320.....417
D (305mm).....	669.....870
SPZ (56mm).....	76.....n/a
SPA (71mm).....	134.....155
SPB (107mm).....	223..... 272

Wrapped V, wedge and banded belts

Single Belt V-Ribbed Belt

	g/m
SPC (200mm) .....	354.....394
3V (61mm) .....	76.....99
5V (171mm) .....	223.....272
8V (315mm) .....	504.....654
SPZ-XP (56 mm)....	79.....n/a
SPA-XP (71 mm)....	122..... n/a
SPB-XP (107 mm)..	202..... n/a
SPC-XP (200 mm)..	350..... n/a
3V-XP (61 mm).....	79..... n/a
5V-XP (171 mm)....	202..... n/a
ZX (40mm) .....	51.....n/a
AX (75mm) .....	115..... 153
BX (85mm) .....	193..... 225
CX (175mm) .....	320..... 398
XPZ (56mm) .....	76.....n/a
XPA (71mm) .....	134.....156
XPB (107mm) .....	223..... 279
XPC (200mm) .....	354.....548
3VX (55mm) .....	76.....102
5VX (110mm).....	223.....252

- Total tension of multiple ribs/strands is the product of number of belts and tension of single belt.
- The mass of multiple ribs/strands is the product of number of the belts and mass of single belt if user is going to measure total tension of multiple ribs/stands at once.

## 8. MEASUREMENT TIPS

Below are some tips to obtain more accurate result.

### Repeat the measurement

- Make sure correct belt data are entered, then do at least 3 measurements to ensure the result is consistent and not affected by noise.

### Minimum Span Length

- When measuring the synchronous belt, the span length has to be more than 20 times the length of the tooth pitch. Otherwise, the measured value will be higher than actual one because of the stiffness of the belt.
- When measuring the v-belt, the span length has to be more than 30 times of top width. Otherwise, the measured value will be higher than actual one because of the stiffness of the belt.

### Minimum Belt Tension

- When user installing the belt, there is a minimum belt tension stated on the datasheet or the application note. Low belt tension may cause incorrect measurement, please increase the tension before another measurement.

### New Belt Installation

- For newly installed belt, please turn and rotate the pulley by hand several times before any measurement. This is to make sure sprocket, groove ... etc. and the transmission system are properly fit with the belt.
- If the results vary significantly, please check the installation, and take average between high and low value as the result.

### Windy Environment

- The noise from the windy environment may affect the sensor to capture the vibration of the belt, please avoid the windy environment.