

# Sonic Belt Tension Tester

AT-180S



# User's Manual

Thank you for purchasing the product. To make it convenient for you to use the product, this manual offers a brief introduction to its various functions. Please read the manual carefully before using the product.

## **Overview**

This instrument can be used to measure the vibration frequency (unit: Hertz) of the transmission belt when it is hit or moving fast. The tester uses a microphone mounted at the end of the measuring probe for measurement. After measuring in Hertz, the tester can use this data to calculate the belt tension in newtons.

**NOTE:** The operation of the is reliant on the correct belt information being inputted. Please ensure the correct belt manufacturers' data is used.

## **Matters needing attention**

- Avoid impact; any impact may cause instrument damage.
- Avoid splashing water, solvent or any other liquid on the instrument.
- Avoid placing the instrument in a dusty environment.
- Keep away from excessive heat. Do not expose it to strong direct sunlight.
- Don't wash the instrument with volatile solvents.
- The probe is tubular structure. Do not use the probe bent into acute Angle.

## **Features**

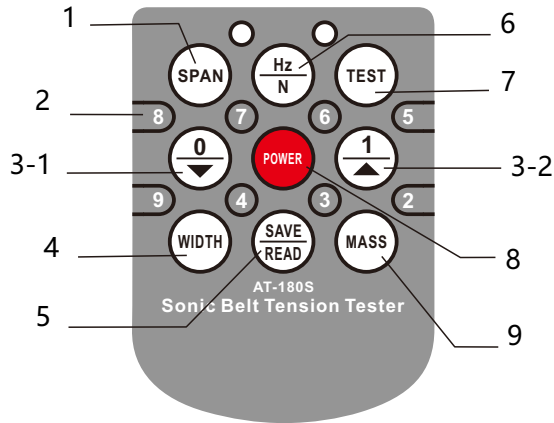
- Adjustable directional probe
- Stores up to 20 set frequency readings
- Maximum frequency: 680Hz
- Automatically powers-off after if not used for 5 minutes. Note: User can power-off by pressing On/Off switch for 2s.
- Power source: 4 x AAA batteries. Install in the back of the instrument.

**Panel shows:**

As shown in the figure below



**Components**



Ref	Description
1	Span Button (use to enter belt span in mm)
2	Numbers 2 to 9 Buttons
3	3-2 up /3-1 down roll
4	Width Button (use to enter belt width in mm, ribs or strands)
5	Save/preview button (on the start screen, short press the stored reading, according to measurement history - to long scroll history, please press the button 1 or 0) 1
6	Hertz Button (use to switch between hertz and tension (N))
7	Measure Button (use to start measurement)
8	on/Off Button (press & hold)
9	Mass Button (use to enter belt mass g/m)

**NOTE:**

The total tension of multiple ribs/strands is the product of the number of belts and the tension of a single belt.

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

**CALIBRATION  
User Calibration**

NOTE: for user calibration a tuning fork or sound generator will be required. Frequency generators are available free to download for mobile devices from your mobile apps provider.

1. Press and hold the Power Button (POWER) to switch on the power, then press the Hertz Button (Hz/N) to enter the frequency measurement.
2. Press the Measure Button (TEST) to enter the test mode, and use the tester to measure the calibration source (e.g. tuning fork or tone generator).
3. Press Number Buttons 7 and 9 at same time, "CAL" will appear on the top left corner of the LCD screen. Enter the calibration frequency being used in Hertz (frequency must be between 10 to 680Hz).
4. Press the Measure Button (TEST) to save the calibration.

**Restore Factory Calibration**

1. Press and hold the Power Button (POWER) to switch on the power, then press the Hertz Button (Hz/N) to enter the frequency measurement.
2. Press the Measure Button (TEST) to enter the test mode.
3. Press Number Buttons 7 and 9 at same time to enter the calibration mode, and "CAL" will appear on top left of the LCD screen.
4. Press the Select Button (SAVE/READ) to restore the factory calibration setting.

**Switching Between User and Factory Calibration**

1. Press and hold the Power Button (POWER) to switch on the power, then press the Hertz Button (Hz/N) to enter the frequency measurement.
2. Press the Measure Button (TEST) to enter the testing mode, press Number Buttons 7 and 9 at same time to enter the calibration mode, and "CAL" will appear on top left of the LCD screen.
3. Press the Save/Preview (SAVE/READ) to use Factory Calibration, or press the Hertz Button (Hz/N) to use User Calibration figure.
4. If the meter is set to User Calibration mode, a capital "U" will appear on the top left of the LCD screen.

**Battery Replacement**

The instrument will auto power-off after 5 minutes without any operation. The battery capacity is shown on the top right of the screen. It indicates the remaining battery power.

Full-dark icon means the battery capacity is full. Empty icon means battery power is low.

## Synchronous Timing Belts

Unit: g/m x mm<sup>2</sup>

### HTD belt type

5M (9mm)	36.9
8M (20mm)	128.2
14M (40mm)	428.9

### STPD

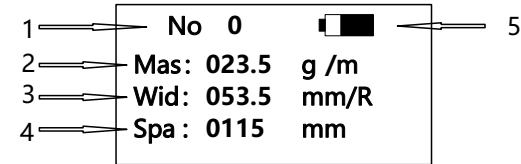
S8M (20mm)	110.9
S14M (40mm)	462

### 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

Single Belt	V-Ribbed	g/m
SPC (200mm)	354	394
3V (61mm)	76	99
5V (171mm)	223	272
8V (315mm)	504	654
SPZ-XP (56mm)	79	n\a
SPA-XP (71mm)	122	n\a
SPB-XP (107mm)	202	n\a
SPC-XP (200mm)	350	n\a
3V-XP (61mm)	79	n\a
5V-XP (171mm)	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
Vx (55mm)	76	102
Vx (110mm)	223	252

## Switch on LCD Display



Ref	说明
1	No = A total of 20 some belt data:
2	Mas - mass of belt
3	wid = width of belt
4	Spa = span of belt being used for reading
5	Battery Capacity

### Operation

#### IMPORTANT NOTE:

The belt information must be entered in to the instrument to obtain accuratetension readings. The belt information can be obtained from the belt or vehicle manufacturer.The frequency will still be measured even if the wrong information has beenentered, however the tension value in N will be wrong. If the calculatedtension value is outside the display range of the screen, ERROR and a redlight will show on the ddisplay panel.

#### Belt Mass:

Mas = XXX Xg/m.Please refer to belt manufacturer,vehicle manufacturer or the data tableprovided.Press Mass Button (MASS)then enter the value.Please ensure the decimal point vallue is correctly entered.Press Save/Preview (SAVE/READ) to return to the initiall screen.lInput range:000.1g to 999.9g.

#### Belt Width & Number of Ribs/Strands:

Wid - XDOX.XmmR,Enter the value from 000.1mm to 9999mm.For synchronous (timing) belts,please input the belt wiith (mm).For V-belts,enter the number of ribs or strands of the belt to be measured.NOTE: refer to the belt manufacturers data for rib/strand value.For example:f the width of HDT timing belt is 20mm, enter "020.0".If it"s a single strand V-belt,enter "001.0".For the measurement of multiple single belts or banded belts, please enterthe correct number of ribs or strands of belt.

#### Span Length

Spa = xxxXmm.The span length is the tangent length between 2 adjacent pulleys.The distance can be measured directly by measuring from the contact pointon one pulley to the contact point on the second. Input range: 000.1 to9999mm.

For more accurate results the span length can be calculated using the following formula

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

where:

s = span of tangent line (mm)

cD = distance between two gears (mm)

D = diameter of big pulley (mm)

d = diameter of small pulley (mm)

**Note: Data Storage and Restore**

Commend tester can store 20 groups of belt data: yesterday the king. The stored data can be reviewed by a long press of the Save/Preview (SAVE/READ) from the opening screen. To scroll through the saved data repeatedly press the Save/Preview (SAVE/READ) until the required data is shown or use the number buttons. The data shown can be changed by pressing the Width/Mass/Span Buttons and entering the new value.

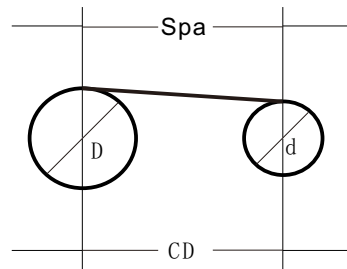
**Taking a Measurement**

NOTE: for newly fitted belts please turn the belt system at least 3 rotations to settle the belt before measuring.

1. Place the probe within 10mm of the belt and press the Measure Button (TEST).
2. Tap the belt to make it vibrate while maintaining the 10mm or less gap. Do not allow the probe to touch the belt.
3. The will show "Testing" on the screen..
4. "Calculating" will be shown on the screen when a reading has been taken.
5. The measured results will be shown when the buzzes once and shows a green LED. Note: if the screen shows a red LED this indicates the measured frequency or calculated tension is over the specified range.
6. For best results always take the average of 3 measurements.
7. To view the frequency or tension readings press the Hertz Button (Hz/N).

**Error**

If the 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 has been inputted correctly and repeat the measurement until the tension has appeared. Please obtain 3 measurements at least, for contrast. If the 3 results are close to each other, the measurement is correct.



In low tension ranges, a bigger vibration may be generated more easily, which may cause measurement errors. If the tension value cannot be obtained, the belt may be too loose to make a clear frequency signal. For more accurate tension values, try to tighten the belt.

**Measurement tips:**

**Minimum Span Length**

When measuring a synchronous belt, the span length must be more than 20 times the length of the pitch of the teeth.

when measuring a V-belt, the span length has to be more than 30 times of top width of the belt.

**New Belt Installation**

For newly installed belts, please rotate the pulley system by hand several times before taking any measurement.

**Windy Environment**

The noise from a windy environment may affect the sensor, please avoid windy environments.

**Non-Standard Belt Measurement**

Since the instrument is designed for standard belts, measurement of some non-standard belts (for example: belts with thicker backs or made from other materials) may cause incorrect results. For such conditions, the user will need to calibrate the frequency and tension of the belt.

To calibrate, the user will need to place the belt on a fixture with a known span length. By hanging different weights on the belt, the user can vary the tension with known tension values. By repeating this procedure, the user will be able to collect the information of frequency vs tension with various span lengths. By referring to this information, the user will know the corresponding tension with the frequency measured from the instrument. Be aware, the user must use the same span length as the test fixture.

**THEORY**

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

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

Where:

T = tension of span length (N)

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

S = span length (mm)

F = frequency (Hz)