

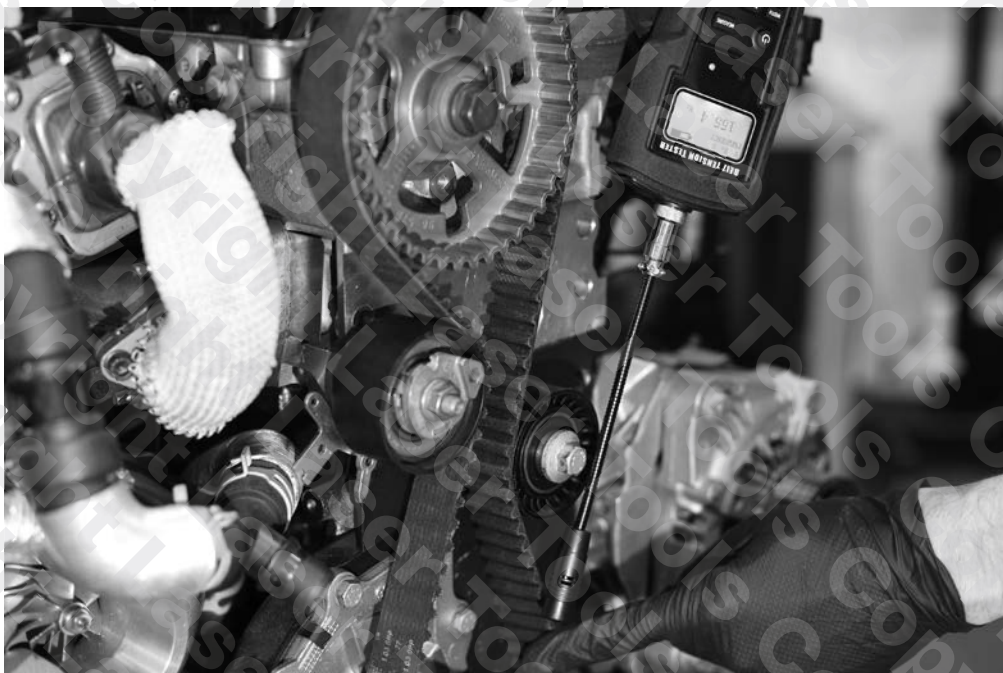
LASER[®]

Part No. 7893

Sonic Belt Tension Tester

Frequency range: 10 - 600Hz

Instructions



RoHS
Compliant



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Introduction

The 7893 sonic belt tension tester is designed to measure the frequency (in Hertz (Hz)) at which a drive belt vibrates when struck or flicked. The 7893 does this using a microphone which is mounted on the end of the measurement probe. Once the measurement is taken in Hertz the 7893 can then use the figure to calculate the load in Newtons that the belt has been tensioned to.

NOTE: The operation of the 7893 is reliant on the correct belt information being inputted. Please ensure the correct belt manufacturers' data is used.

Please read before use:

- 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.
- Don't pull out the wires that are connected with the probe.
- Portable probe is a tubular structure. Do not bend the probe to an acute angle.

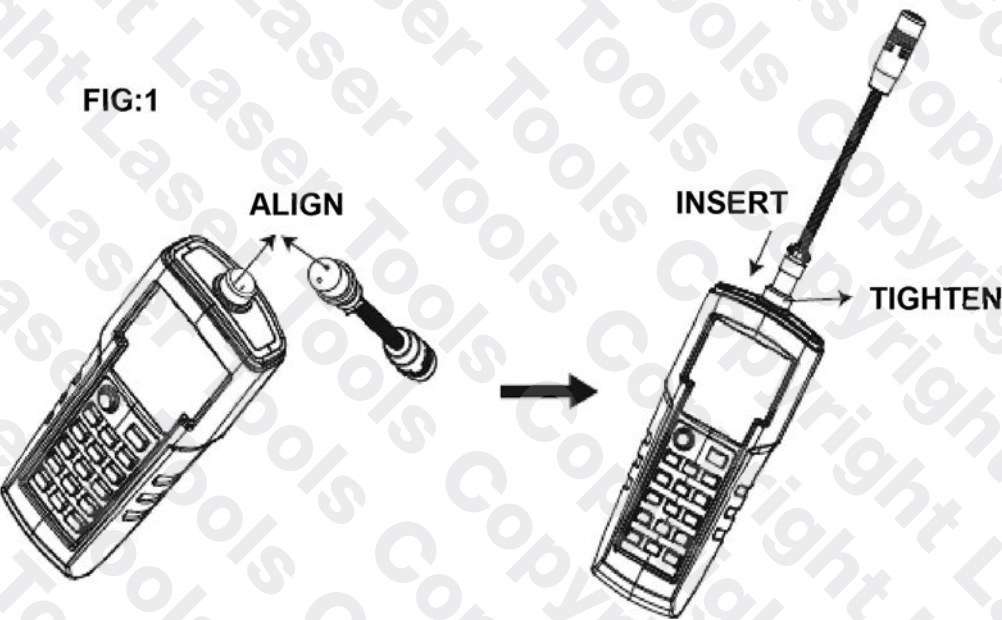
Features:

- Removable probe
- Stores up to 20 set frequency readings
- Maximum frequency: 600Hz
- Automatically powers-off after if not used for 5 minutes. Note: User can power-off by pressing On/Off switch for 2s.
- Power source: 2 x AAA batteries. Install in the back of the instrument.

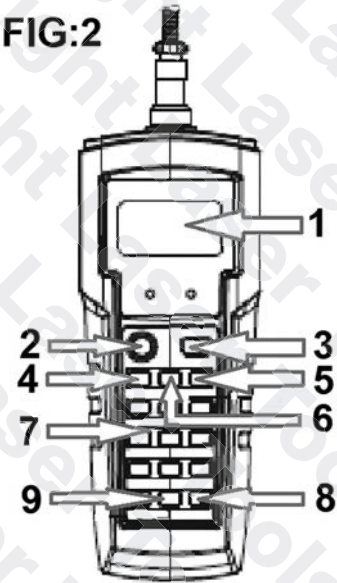
Instructions

Probe Installation:

Fit the probe to the top connection point on the main handset by aligning the notch on the probe with the socket and insert the probe into the socket. Hand tighten the fixing collar. See figure 1.



Components



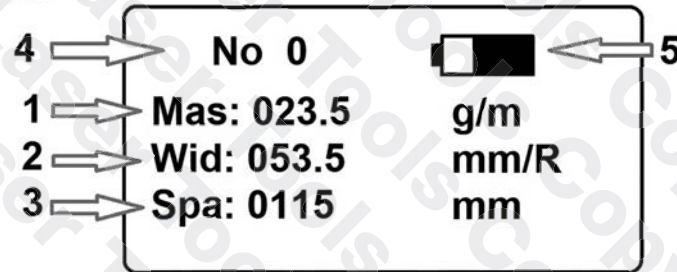
| Ref. | Description |
|------|--|
| 1 | LCD display |
| 2 | On/Off Button (press & hold) |
| 3 | Measure Button (use to start measurement) |
| 4 | Width Button (use to enter belt width in mm, ribs or strands) |
| 5 | Mass Button (use to enter belt mass g/m) |
| 6 | Span Button (use to enter belt span in mm) |
| 7 | Numbers 0 to 9 Buttons |
| 8 | Hertz Button (use to switch between hertz and tension (N)) |
| 9 | Select Button (from start screen, short press = stored reading, long press = check measurement history - to scroll through history press 1 or 0 buttons) |

Instructions

Switch on LCD Display

Refer to figure 2: Press and hold the Power Button (2). The following information (See figure 3) will be displayed on the LCD screen (1).

FIG: 3



| Ref. | Description |
|------|---|
| 1 | Mas = mass of belt |
| 2 | Wid = width of belt |
| 3 | Spa = span of belt being used for reading |
| 4 | No = number of stored readings |
| 5 | Battery Capacity |

Instructions

Operation

IMPORTANT NOTE:

The belt information must be entered in to the instrument to obtain accurate tension 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 been entered, however the tension value in N will be wrong. If the calculated tension value is outside the display range of the screen, ERROR and a red light will show on the display panel.

Belt Mass:

Mas = XXX.Xg/m

Please refer to belt manufacturer, vehicle manufacturer or the data table provided.

Press Mass Button (5) then enter the value.

Please ensure the decimal point value is correctly entered.

Press Select Button (9) to return to the initial screen.

Input range: 000.1g to 999.9g.

Belt Width & Number of Ribs/Strands:

Wid = XXX.Xmm/R

Enter the value from 000.1mm to 999.9mm.

For synchronous (timing) belts, please input the belt width (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:

If 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 enter the 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 point on one pulley to the contact point on the second. Input range: 000.1 to 999.9mm.

Instructions

For more accurate results the spa length can be calculated using the following formula - see figure 4.

FIG:4

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

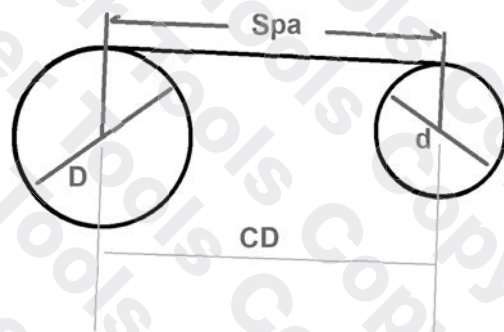
Where:

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

The 7893 can store 20 sets of data. The stored data can be reviewed by a long press of the Select Button (9) from the opening screen. To scroll through the saved data repeatedly press the Select Button (9) 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.

Instructions

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 (3).
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 7893 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 7893 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 (8).

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.

Instructions

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.

Instructions

THEORY

The calculation and measurement is based on “transverse vibration of a string” theory. The 7893 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)

Synchronous Timing Belts

Unit: g/m x mm²

| HTD belt type | 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 |

Instructions

| 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\ |
| SPA-XP (71 mm) | 122 | n\ |
| SPB-XP (107 mm) | 202 | n\ |
| SPC-XP (200 mm) | 350 | n\ |
| 3V-XP (61 mm) | 79 | n\ |
| 5V-XP (171 mm) | 202 | n\ |
| ZX (40mm) | 51 | n\ |
| AX (75mm) | 115 | 153 |
| BX (85mm) | 193 | 225 |
| CX (175mm) | 320 | 398 |
| XPZ (56mm) | 76 | n\ |
| XPA (71mm) | 134 | 156 |
| XPB (107mm) | 223 | 279 |
| XPC (200mm) | 354 | 548 |
| 3VX (55mm) | 76 | 102 |
| 5VX (110mm) | 223 | 252 |

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.

Instructions

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 (2) to switch on the power, then press the Hertz Button (8) to enter the frequency measurement.
2. Press the Measure Button (3) 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 100 to 600Hz).
4. Press the Measure Button (3) to save the calibration.

Restore Factory Calibration

1. Press and hold the Power Button (2) to switch on the power, then press the Hertz Button (8) to enter the frequency measurement.
2. Press the Measure Button (3) 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 (9) to restore the factory calibration setting.

Switching Between User and Factory Calibration:

1. Press and hold the Power Button (2) to switch on the power, then press the Hertz Button (8) to enter the frequency measurement.
2. Press the Measure Button (3) 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 Select Button (9) to use Factory Calibration, or press the Hertz Button (8) 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.

Instructions

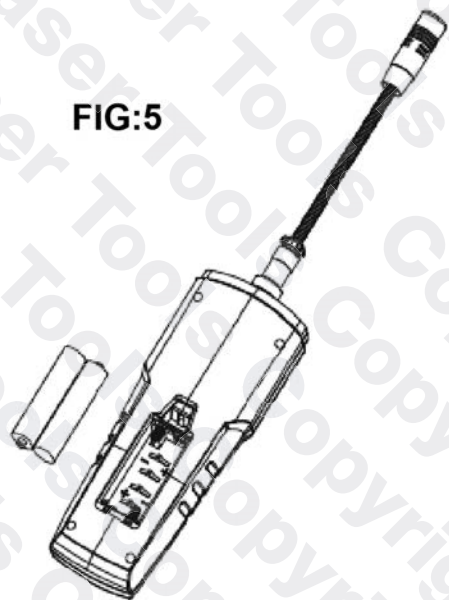
Battery Replacement (see figure 5)

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.

FIG:5



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Distributed by The Tool Connection Ltd

Kington Road, Southam, Warwickshire CV47 0DR
T +44 (0) 1926 815000 F +44 (0) 1926 815888

info@toolconnection.co.uk www.toolconnection.co.uk

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