Sonic Tension Meter
U-507
CAT.512

NEW

Display screen renewed, featuring a lot of new functions. Belt tension meter easier to use.
More user-friendly through great upgrading of functions. Higher functions are realized at an improved cost/performance ratio.

Sonic tension meter by Gates Unitta Asia

Analyzes belt tension with no contact by analyzing acoustic wave. Our innovative tension meter has been further upgraded.

(Patent pending)

Measurement of belt tension, closely related with the life of belt, has so far greatly depended on the measurer's scent, and sometimes involved rather a significant individual difference in measurement result.

Now the sonic belt tension meter has been developed in order to allow anybody to make measurement easily and correctly. Acoustic wave (natural frequency) generated from a belt is captured by sensor, and is processed by high-performance computer. Belt tension is accurately displayed in digital mode.

Upon our customer's request bigger LCD is equipped in U507, which shows extended information. It was developed again more friendly to users. It also incorporates a lot of new features such as improved sensitivity of microphone and extended area of frequency, and further realizes a cost/performance ratio greater than so far.

Measurement principle of belt tension

**Overview**

When the belt stretched between pulleys is subjected to impact, it oscillates first with an irregular waveform containing high-frequency component and impact component, then progresses to a regular waveform intrinsic to the belt. Such oscillation attenuates in a short time, and in addition the oscillation of high order component is generated, therefore it was very difficult so far to capture the cycle of basic waveform. However, a unique data processing system was developed which captures oscillation frequency making full use of microcomputer, which attained this purpose. Calculation formula contained in the program enables display of accurate tension.

**Measurement step**

1. Gain adjustment (automatic canceling of background noise)
   - The unit measures the surrounding noise environment periodically after power-on until pressing of "MEASURE" button, and automatically adjusts the sensitivity of microphone. Press "MEASURE" button to fix the sensitivity of microphone.

2. Detection of vibration waveform
   - The microphone detects sonic wave which was generated by hitting the static belt with a finger.

3. Removal of noise component
   - The microphone automatically removes noise component.

4. Measurement of cycle
   - Cycle measurement circuit measures every cycle of input waveform.

5. Signal processing
   - Measures basic waveform by oscillation pattern which differs from condition to condition by data processing established in simulation.

6. Frequency conversion process
   - Converts continuous stable waveform into frequency.

7. Tension calculation process
   - The unit converts belt tension when unit weight, width, and span length of corresponding belt are input with numeric key.

**Calculation formula:**

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

- M: Unit mass (for belt: 1g, for wire: 1g, for 1m length)
- W: Width (for belt: input the belt width in mm, for wire: input "1" which represents "1 piece")
- S: Measuring span length (mm)
- F: Primary intrinsic frequency of belt (Hz) measured by sensor
New functions

- **Mounting graphic LCD.**
  By mounting a graphic LCD U507 is capable of displaying by far a greater information volume than the conventional unit.

<table>
<thead>
<tr>
<th>Dual displays of measured tension and frequency</th>
<th>Dual display of measured value and standard tension (target value)</th>
<th>Triple display of unit mass, belt width, and span</th>
</tr>
</thead>
<tbody>
<tr>
<td>S No 01 RESULT TEN 28.1 N</td>
<td>S No 01 3GT RESULT RES 31.5 N</td>
<td>S No 01 M 99.9 g/m</td>
</tr>
<tr>
<td>FRO 249 Hz</td>
<td>CAT 29.0 N</td>
<td>W 99.9 mm/R</td>
</tr>
<tr>
<td>Possible to confirm the tension and frequency at the same time.</td>
<td>Comparison between measured value and standard tension (target value) is enabled. (Timing belt only)</td>
<td>S 99.9 mm</td>
</tr>
</tbody>
</table>

- **Backlight Equipped.**
  LCD newly equipped with backlight has further improved workability in darkness, etc.

- **Unit mass of timing belt is preinstalled.**
  Conventional model (U-505) used a system to input unit mass manually for each belt type, but U-507 displays unit mass in a moment when a belt type is specified. (Manual input is also accepted.)

<table>
<thead>
<tr>
<th>S No 01</th>
<th>1</th>
<th>1.5GT 0.9</th>
<th>2</th>
<th>2GT 1.3</th>
<th>3</th>
<th>3GT 2.5</th>
</tr>
</thead>
</table>
| Data is already input of timing belt 30 types and V-belt 16 types.

- **Microphone performance improved.**
  Microphone sensitivity in low frequency range has been improved.
  It is effective in long span of large-size belt, etc.

- **Measurement frequency area extended.**
  Conventional model (U-505) used a measurement frequency up to 1000 Hz at the maximum, but U-506 accepts up to 10000 Hz at the maximum. It is effective in measuring high frequency area of short span of belt, wire, etc.

- **Data selecting function enriched.**
  Data selecting function to save input data is expanded to 20 types. (10 types of conventional model (U-506).)

- **Automatic cancellation of background noise by automatic gain adjustment.**
  Noise environment around is measured and microphone sensitivity adjusted automatically after input of power until "MEASURE" button is pressed.
  Microphone sensitivity is fixed by pressing "MEASURE" button.

- **Basic specification of U-505 remains the same.**
  - Automatic trigger function
  - Protection of input data by mounting EEPROM
  - Saving energy by automatic power-off function (It turns off automatically in about 5 minutes.)

- **Traceability system established.**
  The sonic wave belt tensiometer series compares the change of sonic wave taken from the microphone with the basic transmitter built in the body thereby measuring the frequency (while measurement of absolute for sonic pressure is impossible, which is affected by deterioration of vibration receiving film of microphone). Data is processed digitally. Therefore this model is free from drift of value due to deterioration with time and wear and abrasion associated with use, and requires no periodic inspection in principle. However, traceability system of measuring instrument which is essential for acquiring ISO 9000 is established and system is arranged to issue an inspection result report and traceability certificate. Calibrator is also available to be provided.

- **Ready for measurement in narrow space.**
  Sensor unit (microphone) is a tiny small single microphone, which allows easy measurement in narrow space. (Compatible to U-305 and U-505)

- **Light-weight and compact design for mobility.**
  This model is designed light and compact easy to carry, and uses only usual battery. It allows measurement of tension in various sites, and helps the users keeping maintenance of equipment, etc.
### Specification of Sonic Wave Belt Tension Meter U-507

<table>
<thead>
<tr>
<th>Model</th>
<th>U-507</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Feature</strong></td>
<td>Graphic LCD screen, Equipped with backlight, 46 types of belt, and Unit mass preinstalled. Automatic gain control, 20 types of setting memory, Automatic trigger, and automatic power-off function.</td>
</tr>
<tr>
<td><strong>Measurement range</strong></td>
<td>10Hz~5,000Hz</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>Alkaline dry cell (AAA x 2)</td>
</tr>
<tr>
<td><strong>Outer dimension</strong></td>
<td>597 wide x 26 thick x 160 long (mm)</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td>120g</td>
</tr>
</tbody>
</table>
| **Accessory** | • Sonic wave microphone (flexible arm type)  
• Carrying case  
• Alkaline dry cell (AAA x 2) |

**Example of measurement**
- **Example 1:** Timing belt  
  [For FF type: type x 20 mm wide, span length 180 mm]  
  - Input: 5 ± 0.2 mm/s (unit mass per gram side x m long)  
  - N = 20 (mm wide) S = 150 (mm span length)  
  - Relation between tension (N) and frequency (Hz)
  - 2.0kV / 10 Hz ~ 3.0kV / 600 Hz

- **Example 2:** V-ribbed belt  
  [For micro V-belt section x 6 ribs, span length 250 mm]  
  - Input: 6 ± 0.2 mm/s (unit mass per gram side x m long)  
  - N = 5.0 mm (transfer of belt)  
  - S = 250 (mm span length)  
  - Relation between tension (N) and frequency (Hz)
  - 2.0kV / 10 Hz ~ 3.0kV / 600 Hz

- **Example 3:** Steel wire  
  [For steel wire: diameter 0.5 mm, span length 50 mm]  
  - Input: 1 ± 0.2 mm/s (unit length per gram side x m long)  
  - W = 0.1 kg (Unit mass per gram side x m long)  
  - S = 10 (span length)  
  - Relation between tension (N) and frequency (Hz)
  - 2.0kV / 10 Hz ~ 3.0kV / 100 Hz

**Note:** Tension calculation system and input capacity: T = 4 x M x W x S x F x 10^-3 (M = 0.009 kg/m, W = 0.001 kg/mm, S = 0.001 mm)

**Note in use**
- Read the operation manual carefully for proper use.
- Always make sure that the machine is stopped by turning off motor power or the like before measuring the tension.
- Use this product only for measuring the tension.
- Adhesion of water or grease to this product, or shock given to the unit by dropping may cause failure or malfunction. Use caution well enough in handling the unit.

**OPTION**

<table>
<thead>
<tr>
<th>Model</th>
<th>Tension meter certification device U-305-OS1</th>
<th>Special device for certifying the frequency of sonic wave belt tension meter (oscillation transmitter)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transmission frequency</strong></td>
<td>5 points of 25 Hz, 50 Hz, 100 Hz, and 4 kHz</td>
<td>5 points of 25 Hz, 50 Hz, 100 Hz, and 4 kHz</td>
</tr>
<tr>
<td><strong>Frequency angle</strong></td>
<td>0.1% or below</td>
<td>0.1% or below</td>
</tr>
<tr>
<td><strong>Output waveform</strong></td>
<td>Sine wave</td>
<td>Sine wave</td>
</tr>
<tr>
<td><strong>Distortion factor</strong></td>
<td>Within 1%</td>
<td>Within 1%</td>
</tr>
<tr>
<td><strong>Output voltage</strong></td>
<td>200V (P-P)</td>
<td>15 mA or below (no outputting)</td>
</tr>
<tr>
<td><strong>Current consumption</strong></td>
<td>55 mA (outputting)</td>
<td>5mA or below (no outputting)</td>
</tr>
<tr>
<td><strong>Power supply</strong></td>
<td>Dry cell (AAA x 4)</td>
<td>Dry cell (AAA x 4)</td>
</tr>
<tr>
<td><strong>Outer dimension</strong></td>
<td>155 (W) x 46 (H) x 134 (D) mm</td>
<td>155 (W) x 46 (H) x 134 (D) mm</td>
</tr>
<tr>
<td><strong>Mass</strong></td>
<td>300g</td>
<td>200g</td>
</tr>
</tbody>
</table>
| **Use environment** | -10 to 50°C  
Below 80% (Free from condensation) | -20 to 80°C  
Below 90% (Free from condensation) |

- Cord type microphone  
  Outer diameter of microphone: 12.5 mm / Total length: 1.5m / Measurable frequency band: 10 Hz - 5000 Hz

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**OPTION U-305-OS1**  
Tension certifying device (oscillation transmitter)

Frequency certifying device of U-507, U-505, and U-505 series. Capable of transmitting 5 types of oscillation: 25, 50, 100, 2K, and 4KHz (sine wave)

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Contact the following for inquiry and order.

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