Product Data Sheet

Belt Tension Meter
Type 7 Acoustic (10-600Hz)



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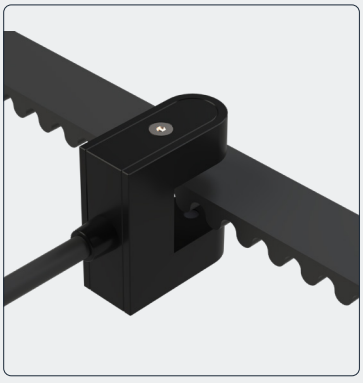
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ACO **ACOUSTIC** SENSOR HEAD

The Type 7 Acoustic Belt Tension Meter comes with a ACO T03 sensor head as standard. Different type of sensor heads are available upon request.









Belt Tension Meter - Type 7 Acoustic (10-600Hz)

The Type 7 Acoustic Belt Tension Meter is suitable for measuring frequencies in all types of power transmission belts, ranging from toothed timing belts to poly-vee belts.

The Type 7 Acoustic Belt Tension Meter has the function to operate in Newtons (N) and Pounds (Lbs) as well as Hertz (Hz). The Newtons and Pounds values is calculated from the belt span and belt mass data, which is entered into the meter. Up to 3 sets of data may be stored in the meter for easy recall. The display may be changed from Hertz, Newtons, and Pounds by the press of a single key.

Based upon the measured belt frequency, the meter can calculate belt tensions up to 9,990 N (2,200 lbs).



10Hz to 600Hz

The Type 7 Acoustic Belt Tension Meter has a frequency measurement range of 10Hz to 600Hz and uses an acoustic sensor head. This meter is useful where there is a requirement to measure tension in a variety of belts, some vibrating at low frequencies.

The acoustic sensor head uses a Clavis patented technique for detecting the belt vibration signal whilst minimising ambient noise.

The acoustic sensor is particularly suitable for belts which vibrate poorly or where the amplitude of belt vibration is very small. The 'jaws' of the sensor should be positioned over the centre of the belt and placed mid length of the belt span. The sensor should not be allowed to touch the belt as this will reduce the belt vibration signal.

A range of sensors are available to suit belts of differing widths.



Compatability

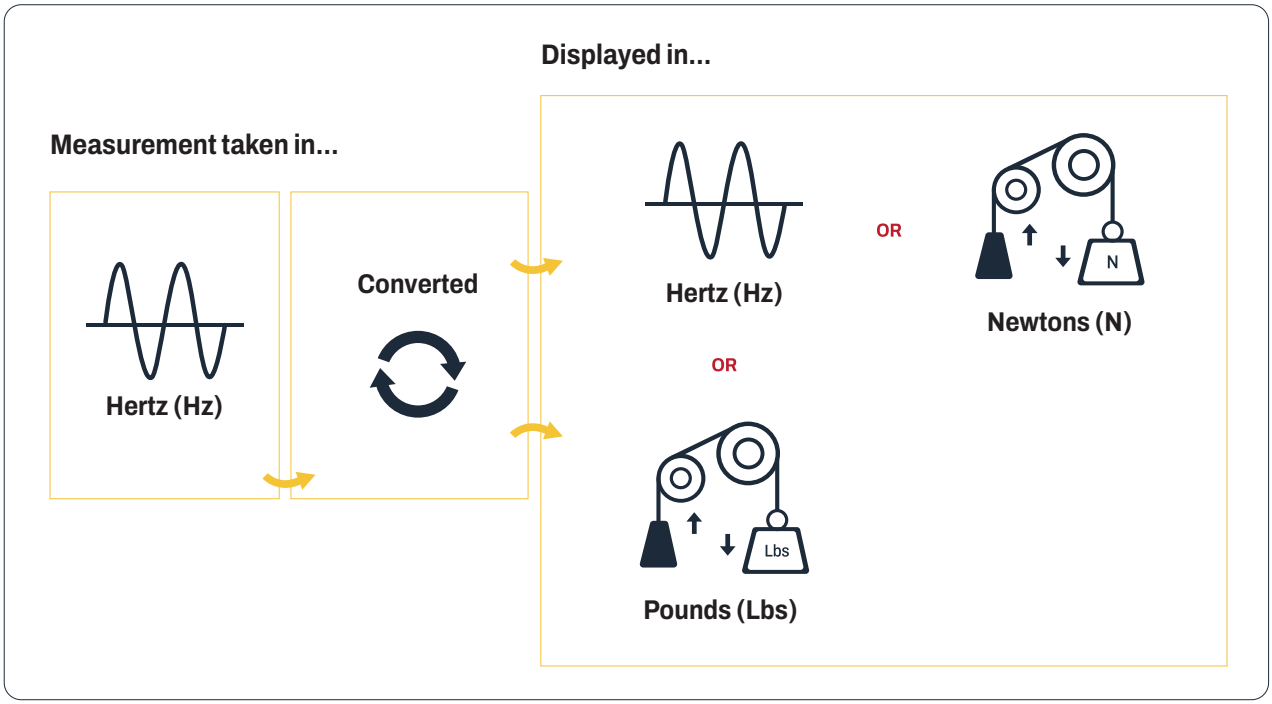
This belt meter is compatible with the following sensor heads:

Type	Product Code	Description
Acoustic	SH_ACO T01	Sensor Head - Acoustic - ACO T01
Acoustic	SH_ACO T02	Sensor Head - Acoustic - ACO T02
Acoustic	SH_ACO T03	Sensor Head - Acoustic - ACO T03
Acoustic	SH_ACO T04	Sensor Head - Acoustic - ACO T04
Acoustic	SH_ACO T05	Sensor Head - Acoustic - ACO T05
Acoustic	SH_ACO T06	Sensor Head - Acoustic - ACO T06
Acoustic	SH_ACO T07	Sensor Head - Acoustic - ACO T07
Acoustic	SH_ACO T08	Sensor Head - Acoustic - ACO T08
Acoustic	SH_ACO T09	Sensor Head - Acoustic - ACO T09
Acoustic	SH_ACO T10	Sensor Head - Acoustic - ACO T10
Acoustic	SH_ACO T11	Sensor Head - Acoustic - ACO T11
Acoustic	SH_ACO T12	Sensor Head - Acoustic - ACO T12
Magnetic Pickup	SH_MAG_T01	Sensor Head - Magnetic Pickup - MAG T01

Measurement & Theory of Operation

The Type 7 Acoustic Belt Tension Meter is suitable for measuring frequencies in all types of belts and outputting measurements in Newtons (N), Pounds (Lbs), and Hertz (Hz). The internal programming of the meter is able to report the belt tension in units of force (Newtons/pounds-force) provided the operator has entered the belt mass and span length using the manually operated keypad. The meter is capable of calculating belt tensions up to 9,990 N (2,200 lbs).

IMPORTANT NOTE: Belt span and belt mass are required entries if tension results in force units (newtons or pounds-force) are desired. Entries must be in SI units (meters and kg/meter.).



The vibrational frequency of a bulked string is dependent upon the level of tension, the string's unit mass, and the vibrating length. The same logic applies to power transmission belts. Investigations show that power transmission belts behave similarly.

Data indicates that there is a direct relationship between belt tension and the vibration frequency. However, belt stiffness also plays a part especially in short spans measuring less than 250 mm. The relationship between belt tension and frequency is:

$$T = 4ml^2 f^2$$

Where;

T = belt tension in newtons (N)

m = mass per unit length expressed as kilograms/meter (kg/m)

l = span length in meters (m)

f = vibration frequency in hertz (Hz)

Notes:

- String theory ignores flexural stiffness. Belts do possess some stiffness, therefore the calculated tension can be greater than the actual tension by up to 30%, especially with very short spans (< 0.25 m). The above equation will yield results within 10% of the actual values, sometimes in excess of that within in a practical application, but the required inputs are generally too cumber some for field use.
- The Belt Tension Meter is a dual function tool. The sensor head uses an optical sensor beam or an acoustic transducer to record the belt's vibration.
- The integral calculator determines the frequency and displays it while performing all necessary calculations.
- The Belt Tension Meter may be used with all power transmission belts, regardless of type or construction.

Serial (RS-232) Communication

Each time a reading is taken the value is transmitted through the RS232 serial port. The following protocol is employed; Baud Rate 9600, 8 data bits, 1 stop bit. The value string is terminated by a 'CR', (Decimal 13). Output is through a 9-way D' type plug, (Pin 5 common, Pin 3 Transmit). Handshaking is not employed.

The RS232 serial port will only transmit values using ASCII characters in the format shown below.

An example of the serial output below:

CLAVIS TYPE 7 - REV 7.010699

51.6 HZ<CR>

51.6 HZ<CR>

1040 N<CR>

1040 N<CR>

0242 LBS<CR>

0242 LBS<CR>



Charging Batteries

The Belt Tension Meter is compatible with user-supplied rechargeable batteries and recharging unit. A convenient 3.5mm, positive centre charging socket is located on the bottom end of the meter body adjacent to the sensor cable plug-in port.

The built-in circuit of the meter controls the charging current, automatically providing a fast and a trickle charge. Charging current is internally limited to 100 mA. Charging time is typically 12-14 hours for a full charge.

Rechargeable batteries provide 30 hours of continuous operation. Automatic power off occurs 2 minutes from the last use of the meter.

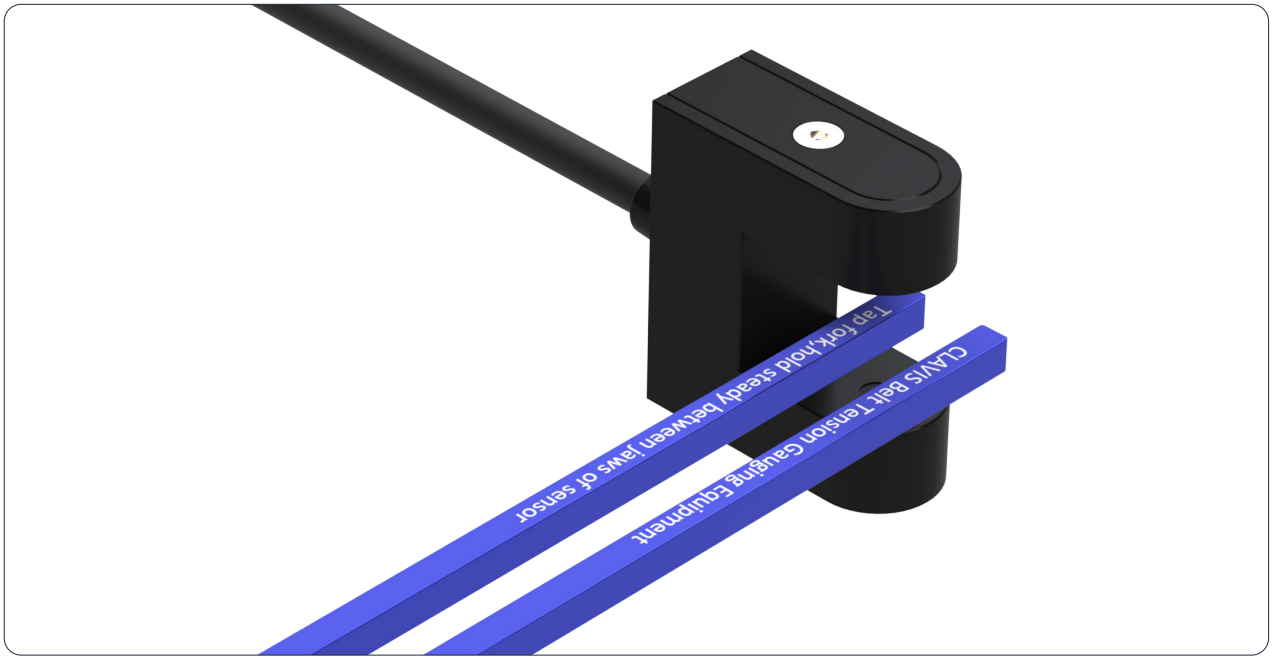
Calibration

Every Clavis meter is supplied with a precision mechanical resonator (tuning fork) for simple calibration validation by the user. If you have additional calibration requirements, Clavis can supply a Sonic Calibration Meter.



The measurement system of the Belt Tension Meter is based upon a very stable quartz crystal that should never wander. However, a precision mechanical resonator (tuning fork) is included with the meter so that a calibration check at a spot frequency of 250Hz may be performed at any time.

Tap the tip of the tuning fork on a hard surface and then hold steady in between the jaws of the acoustic sensor. The meter should measure a frequency of 250Hz, demonstrating that it is in calibration.

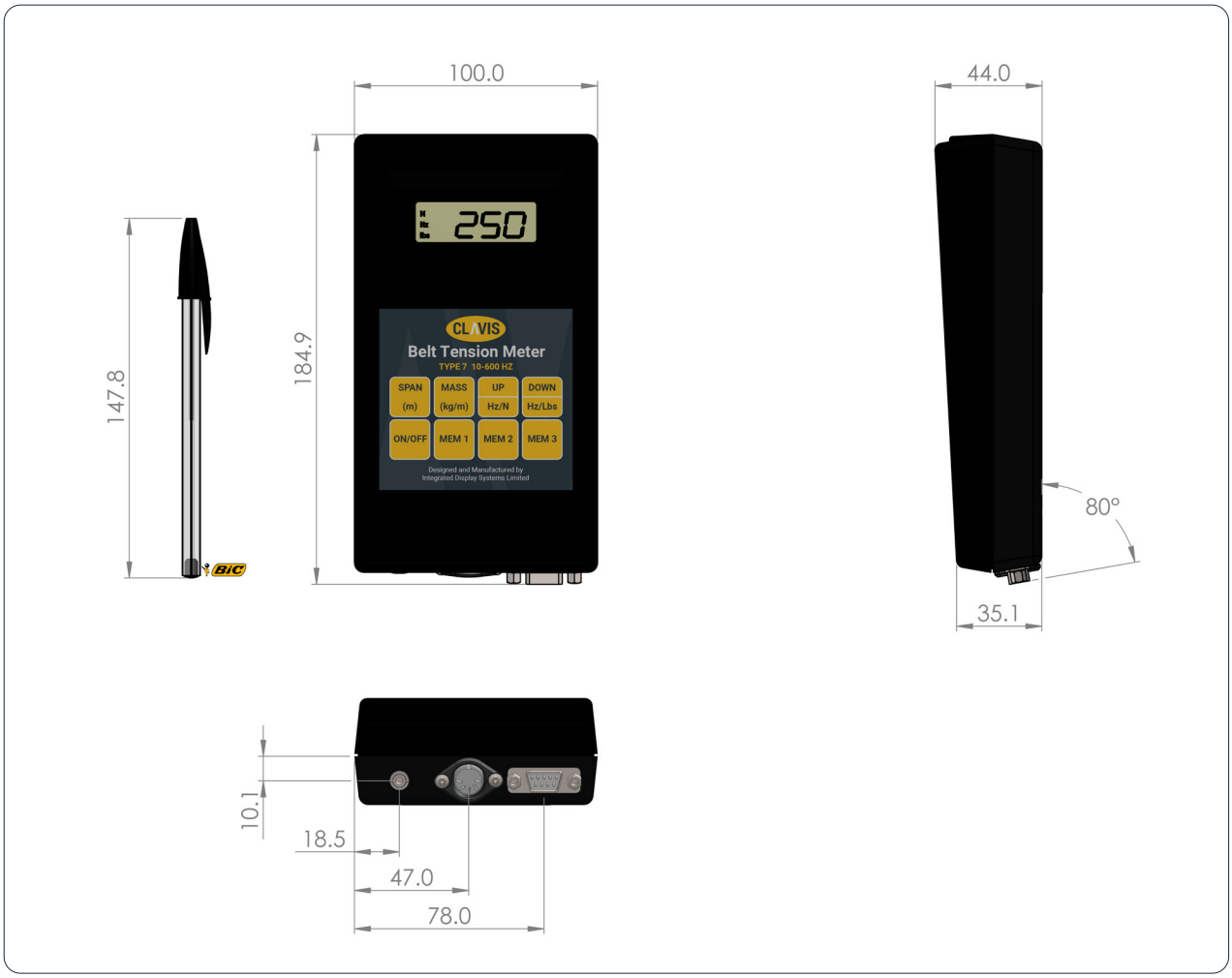


Results within +/- 1% are acceptable. There is no adjustment possible. If greater variance is experienced, meter should be returned for recalibration.

Technical Specification

Measurement Range	
Frequency Range Acoustic	10Hz to 600Hz
Measurement Accuracy	
Below 100Hz	+/- 1 significant digit
Above 100Hz	+/- 1%
Environment Conditions	
Operating Temperature	+10°C to +50°C +50°F to +122°F
Shipment & Storage Temperature	+5°C to +70°C +23°F to +158°F
Protection Class	IP54
Sensor	
Belt Size (Max Width)	10mm
Housing	Machined Aluminium (Anodised Black)
Cable length	1m
Power Supply	
Battery Type	AA (1.5V) Alkaline (Optional rechargeable - see below)
Number	4
Expected life	30 hrs
Compartment Location	Back of meter
Optional Rechargeable Batteries	
Battery Type	AA (1300 mAh minimum)
Charger	12 to 15 V DC output
Socket/polarity	3.5mm positive centre

Dimensions



Equipment

You can expect each device to have the following;

- Detachable Sensor Head
- Carrying Case
- Technical Manual
- Tuning Fork (Calibration Check)
- Calibration Certification
- Battery Charger (Choice of Insert)
- Rechargeable Batteries

