The CLAVIS hand held Belt Tension Meter (Type 4)

The industry standard meter now has an enhanced specification:-

- 30-600Hz Range
- Clavis Patented sensor
- 160 hour battery life
- Meter calibration checker
- Interchangeable sensors
- Carrying case
- Calibration Certificate

The Clavis hand held beltmeter can be used for all belt tension gauging applications. It produces readings which accurately reflect the tension in the belt, consistently and without operator skill. CLAVIS tension meters were introduced in 1988.

The equipment consists of a small sensing head which is held across the belt to be measured. The belt is then tapped to induce the belt to vibrate at its natural frequency. The vibrations are detected and the frequency of vibration is then displayed on the measuring unit.

The unit is suitable for measuring tension in all types of power transmission belts, ranging from toothed timing belts, poly-vee belts, and simple vee belts. The frequency measurement range is from 30Hz to 600Hz which covers most automotive applications. A general purpose head is supplied. A range of interchangeable sensing heads with differing dimensions is available upon request.

A low frequency range Type 3 beltmeter is also available with a frequency measurement range from 10Hz to 300Hz. This meter is useful for wide belts with large spans. An optical sensor head (which only needs access to one side of the belt from distances of up to 50mm) may be used with this meter to extend the frequency range down to 4Hz.

Theory of operation

The Clavis belt tension meter measures the natural frequency of vibration of a belt span. This frequency is directly related to the tension in the belt. As the tension in the belt is increased the frequency of vibration also increases.

The relationship between the measured frequency and the tension of the belt should be determined from a calibration test on the belt span. A Clavis calibration rig is available for those users of this instrument who wish to perform their own calibrations, or we can undertake your calibration in our laboratory. Alternatively the relationship between belt tension (T) and frequency of vibration (f) may be calculated from knowing the mass per unit length of the belt (m), and the belt span (l), using the expression;

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

Where T is in Newtons, F in Hertz, I in metres, and m in Kg/metre. However as the belt does have some flexural stiffness the predicted tension for a given frequency will be slightly greater than the actual tension. This is most noticeable on short belt spans where the belt bending stiffness is the greatest. For belt spans greater than 250mm a calculation based on the above expression will provide results within 10% of the actual values.

Operational Use

1.Connect the sensing head to the lower central socket, and turn on the unit by pressing the ON/OFF button.

2.Hold the sensing head steady across the belt span.

3.Tap the belt gently near mid span using the handle of a small screwdriver or similar, to cause the belt span to vibrate.

4.The meter will now display the frequency of vibration, and BLEEP to indicate that a valid reading has been taken.

5.If a reading is not obtained check that the sensing head is not touching the belt, and try again.

Rechargeable batteries provide 40 hours of operation (dry batteries provide 160 hours). The meter automatically switches off 10 minutes after the last reading is taken, to prolong battery life. A 'LO BAT' indicator on the display shows when the unit needs recharging. The charging socket is adjacent to the sensing head connector. An overnight charge will fully restore the batteries. During charging the 'LO BAT' indicator will flash. The meter may be powered directly from the charger if required.

Additional notes

The range of the meter is from 30 to 600Hz. Readings below 30Hz will cause the display to flash '030' and then clear to '000'. Readings above 600Hz will cause the display to flash '600' and likewise clear to '000'.

In most applications the meter is used to make comparative tension checks. Often two or three spans may be available on which to take measurements. As the frequency depends upon the span length, the span to be used for measurement must be defined. Normally it is found that the longer spans are easier to vibrate than the very short span lengths. If the belt tension adjuster is on the measurement span, ensure that the variation in span length created by the adjuster will not be significant.

Calibration

The Clavis Belt Tension Meter is based upon a microprocessor using digital signal processing techniques. A 8.0000 MHz quartz crystal provides the fundamental frequency reference which should ensure, for the life of the instrument, an accuracy of;

+ or - 1 digit below 100Hz
+ or - 1% of reading above 100 Hz

A high precision steel resonator is supplied for an easy spot frequency check of calibration. The resonator should be tapped on a hard surface and held steady between the jaws of the sensor. The meter should read 250Hz with a tolerance of + or - 1%. It is important that both the sensor and the fork are held still, otherwise doppler frequency change may occur due to relative motion.

However as with all gauging equipment a more comprehensive calibration check should be made periodically. A Clavis Belt Tension Meter Calibrator is available for this purpose, or the unit may be returned to the manufacturer for a calibration check and the issue of a certificate of calibration.