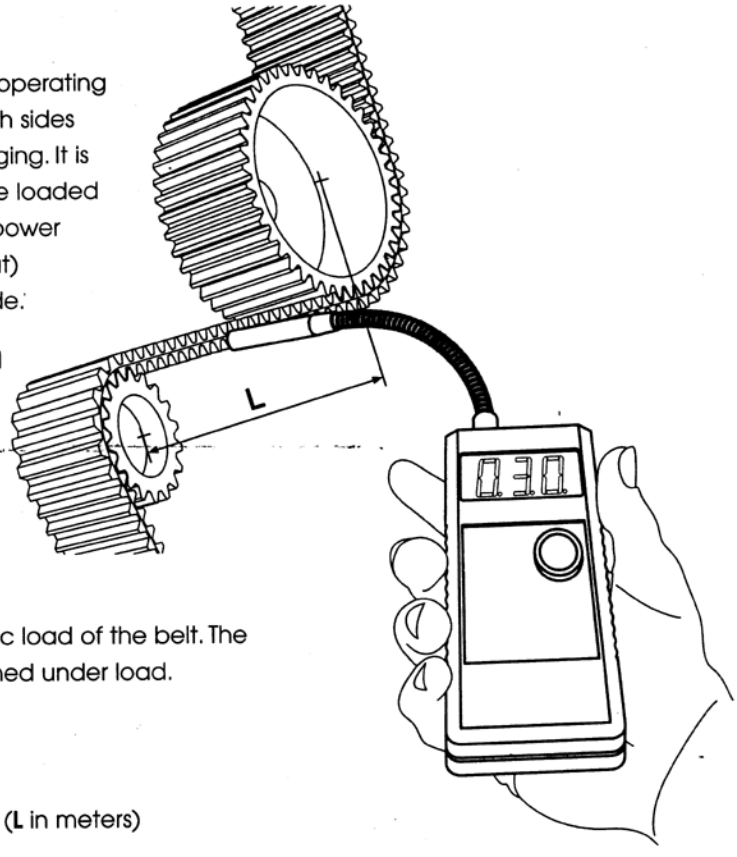
SM3 – TENSION METER

PRE-TENSION

The pre-tension F_v is determined by the maximum operating force F_u. The purpose for pre-tension is to allow both sides of the belt between the pulleys to run without sagging. It is important to recognize the difference between the loaded (taut) and unloaded (slack) side of a drive when power is applied. The tension increases in the loaded (taut) side and decreases proportionately in the slack side.

The pre-tension is correctly set when the unloaded (slack) side of the belt always remains taut under the maximum operating load. Any sag or flap may indicate too low a pre-tension.



MEASURING WITH SM3

The tension meter is designed to measure the static load of the belt. The natural frequency of vibration of a belt is determined under load.

The natural frequency is a function of:

- The static load (F_v in N)
- The center distance between two fixed points (**L** in meters)
- The belt width in millimeters (**b** in mm)
- The constant **K** specific to each belt type (see table — opposite page)

CALCULATION

Calculating the pre-tension F_v using the frequency **f** taken from the **SM3**:

$$F_{V(N)} = \frac{K \cdot b_{(mm)} \cdot L^2_{(m)} \cdot f^2_{(Hz)}}{100}$$

Example:

A 25AT10 belt with a center distance of L=0.8m. If the measured frequency is 40Hz, it indicates that the belt is tensioned at:

$$F_V = \frac{2.5 \cdot 25 \cdot 0.8^2 \cdot 40^2}{100} = 640 \text{ N.}$$

Calculation of the required frequency value **f** as a function of the tension F_v:

$$f_{(Hz)} = \sqrt{\frac{100\ F_{V(N)}}{K \cdot b_{(mm)} \cdot L^2_{(m)}}}$$

Example:

A linear drive belt 50ATL20 is to accelerate a load of 1500 N. A pre-tension F_v of 1500 N is presumed. The carriage is positioned at a distance L=1m. The tensioning clamp should be tightened to allow a frequency of:

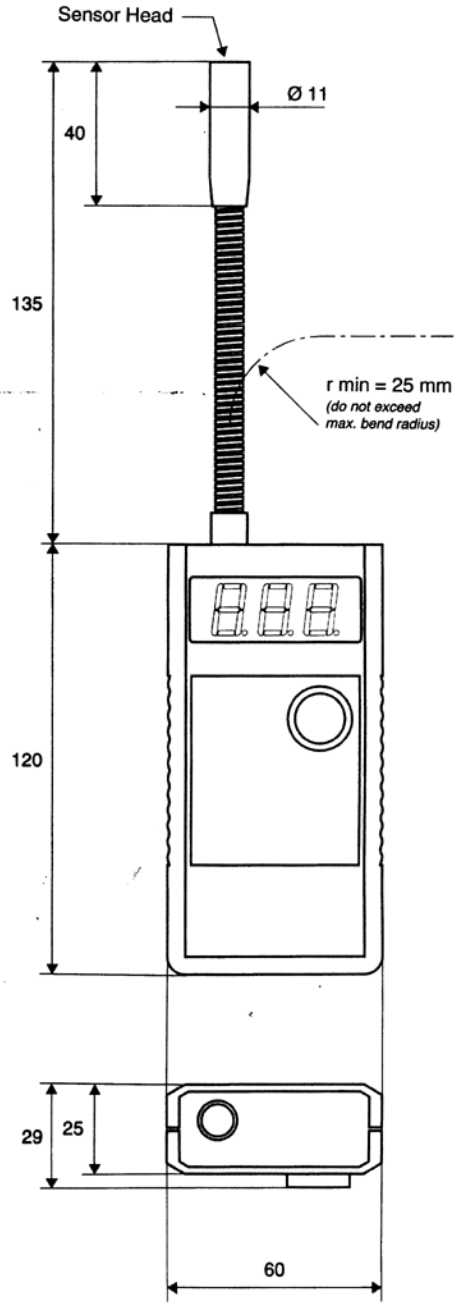
$$f = \sqrt{\frac{150\,000}{4.3 \times 50 \times 1^2}} = 26 \text{ Hz.}$$

TABLE OF CONSTANT "K"
SPECIFIC TO EACH BELT TYPE

BELT TYPE	SINGLE SIDED "K" standard* steel tension members	DOUBLE SIDED-DL "K" standard* steel tension members
T2	0.40	
T2.5	0.60	0.64
AT3	0.90	
T5	0.90	1.20
AT5	1.35	1.40
ATL5	1.45	
T10	1.90	2.30
AT10	2.50	2.80
BAT10	2.50	
SFAT10	2.50	
ATL10	2.70	
T20	3.00	4.00
AT20	4.25	
ATL20	4.30	
M(2.032)	0.40	
T 1/5" (XL)	1.00	
T 3/8" (L)	1.50	
T 1/2" (H)	1.70	1.90
T 7/8" (XH)	4.20	

* For timing belts with non-standard tension members (i.e. increased tension member or Kevlar®) contact BRECOflex Engineering Department toll free at 1-888-463-1400. For "TK", "HK" and "ATK" versions, increase coefficient "K" by 0.25.

SM3 MEASUREMENTS



OPERATING INSTRUCTIONS

- On a static drive, gently tap the belt between two fixed points using a finger or a small object such as a screwdriver.
- Simultaneously hold the sensor head a few millimeters from the belt, then press and hold the red button.
- The display shows the frequency of vibration in hertz.
- To repeat the reading, release the button and repeat the process.
- It is recommended that several readings are taken to obtain an average value in order to eliminate possible errors due to harmonic interference frequencies.
- With Kevlar® reinforced belts, attach a ferrous/magnetic object to the belt in order to obtain a reading. (please consult our engineering department)

SPECIFICATIONS OF THE SM3

- Frequency range: from 8Hz to 300Hz
- Accuracy: +/- 5%
- Supplied with a 9V long-life alkaline battery.
- Operating from 9V to 7.5V. Below this, reading may become erratic.

BRECOflex CO., L.L.C.

High Precision Timing Belts

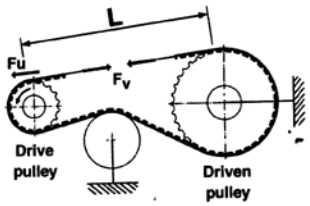
RECOMMENDED PRE-TENSION

PERIPHERAL FORCE IS KNOWN

F_V is a function of F_U (F_U = peripheral force to be transmitted) - see the ~~following~~ tables:

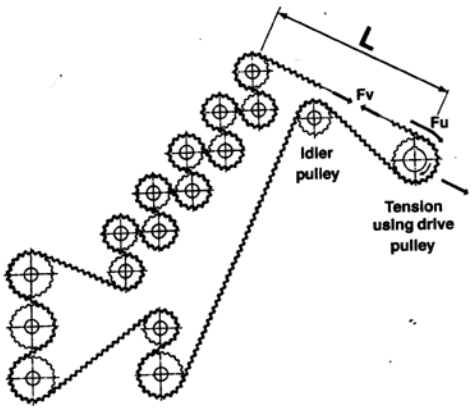
Two pulley drive:

Number of Teeth on the Belt Z_B	Static Tension F_V
$Z_B < 60$	$F_V = 1/3\ F_U$
$60 \leq Z_B < 150$	$F_V = 1/2\ F_U$
$150 \leq Z_B$	$F_V = 2/3\ F_U$



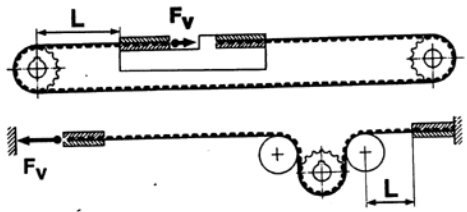
Multiple pulley drive:

Center Distance	Static Tension F_V
Taut Side ≤ Slack Side	$F_V = F_U$
Taut Side > Slack Side	$F_V > F_U$



Linear drive:

Center Distance	Static Tension F_V
Any	$F_V = F_U$



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