z = number of teeth on pinion
v = belt speed = D × n / 19100
D = effective diameter of pinion (mm)
n = speed of pinion (rpm)
$m \times v^2$ = centrifugal force (related to the speed of 800 rpm)
m = mass of belt (kg/m), as shown in the table 5-1

NOTE!
In addition to the optimal stranding force, the allowable axial load of the bearing shall also be considered, axial load F_A = 2 × stranding force.

INFRARED BELT TENSION TESTER AT-180H5

This Infrared Belt Tension Tester is small in size, light in weight, easy to carry. Although complex and advanced, it is convenient to use and operate. Its ruggedness will allow many years of use if proper operating techniques are followed. Please read the following instructions carefully and always keep this manual within easy reach.

CONTENT

The belt tension meter calculates the tension value of the belt according to the following formula,

$$T = 4 \times m \times L^2 \times f^2$$

Parameters,

T = belt tension N
m = mass of belt kg/m
L = free belt length m
f = belt natural vibration frequency Hz

The following table lists some examples of standard belts,

Ribbed V-belts	PJ = 0.082	PL = 0.320	
	PM = 1.100		kg/m per 10 ribs
V-belts	SPZ = 0.074	SPA = 0.123	
	SPB = 0.195	SPC = 0.377	kg/m per belt
	10 = 0.064	13 = 0.109	
	17 = 0.196	20 = 0.266	
	22 = 0.324	25 = 0.420	
	32 = 0.668	40 = 0.958	kg/m per belt
Power belts	SPZ = 0.120	SPA = 0.166	
	SPB = 0.261	SPC = 0.555	kg/m per rib
	3V/9J = 0.120	5V/15J = 0.252	
	8V/25J = 0.693		kg/m per rib
Polyurethane toothed belts	T 2.5 = 0.015	T 5 = 0.024	
	T 10 = 0.048	T 20 = 0.084	kg/m per 10 mm width
	AT 3 = 0.23	AT 5 = 0.034	
	AT 10 = 0.063	AT 20 = 0.106	kg/m per 10 mm width

Table 5-1

NOTE!

* In order to measure the belt quality more accurately, we suggest to re measure the quality of one meter belt.
* The numerical calculation of Newton or pound contains the square parameter, which will cause higher error.

5.6 Calculating the Tension Setting Value of the Toothed Belt

If the mechanical supplier does not provide the belt tension setting values, the approximate value can be calculated by the following formula,

$$F = \frac{540 \times P \times 1.3}{z \times v} + m \times v^2$$

Parameters,

P = engine power (kW)

5.4 Measuring Belt Tension

5.4.1 Measuring The Frequency Of The Belt

Press the POWER Key to power on the tester, and set the measurement unit to Hz according to the steps in 5.3.

Make sure that the belt is stationary. Align the laser of the measuring probe with the middle position of the belt, and the distance between the probe and the belt shall be within 3~20 mm.

Tap the installed tension belt to make it vibrate at natural frequency, and the screen displays 'process busy'. Then the measuring probe can detect the static natural frequency with pulse light.

When the measured values are displayed in Hz, the belt mass and length are not required to be input.

5.4.2 Measuring Belt Tension

Press the POWER Key to start the tester, set the measurement unit to N / lbf according to the steps in 5.3, and input the belt mass and free length (the belt length between the center points of two driving wheels). The free length L of the belt is as shown in Fig.5-2.

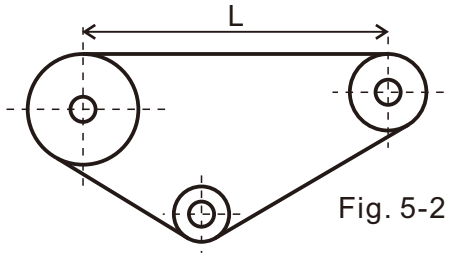


Fig. 5-2

Make sure that the belt is stationary. Align the laser of the measuring probe with the middle position of the belt, and the distance between the probe and the belt shall be within 3~20mm.

Tap the installed tightening belt to make it vibrate at natural frequency, and the screen displays 'process busy'. Then the measuring probe can detect the static belt tension with pulse light.

NOTE!

* The belt tension can only be measured when the belt is stationary.
* In several measurements, the measurement results will fluctuate within ± 10%, which is not caused by measurement error or mistake. In most cases, it is caused by the mechanical tolerance of the driving system.

5.5 Calculate the Tension Value Based on the Natural Vibration Frequency of the Belt

In order to calculate the tension value, it is necessary to input the mass of the belt and the free length of the belt as described in 5.3.

1 SUMMARY & FEATURES

The Infrared Belt Tension Meter can measure the belt tension of motor and other machines quickly.

* Using laser sensor, direct measurement, more convenient than mechanical sensor.
* The size of the split sensor is small, which is suitable for measuring in a narrow space.
* Metric or imperial units can be used to display readings.
* With automatic power off function.

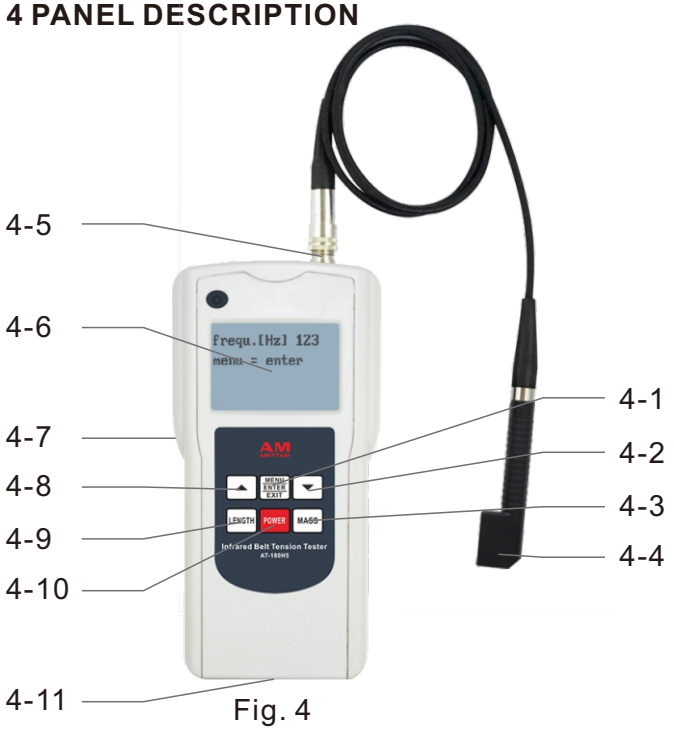
2 MEASURING PRINCIPLE

This tensiometer can measure the natural vibration frequency of the belt through the emission and reception of the laser, and then calculate the tension value of the belt by combining the input belt mass and the free belt length.

3 SPECIFICATIONS

Measurement Range: 10~500 Hz
Input Range: Free Belt Length Max 99.99 m
Belt Mass Max 9.999 kg/m
Digital Sampling Error: < 1%
Display Error: ± 1Hz
Total Error: < 5%
Operating Temperature Range: + 10~50 ° C
Transportation Temperature Range: - 5~70 ° C
Display: LCD
Unit of Measurement: Metric: m, kg/m, N
Imperial: Inch, lbs/foot, lbf
Optical Path Measurement Distance: 3~20 mm
Depth of Split Sensor: About 66mm
Power Supply: 4 x 1.5 V AAA (UM-4) Battery
Size: Main Unit: 140x70x31 mm 5.5x2.8x1.2inch
Sensor: 124x21x12mm 4.9x0.8x0.5inch
Weight: 130 g (Not Including Battery) 4.59oz
Standard Accessories:
Main Unit
Split Sensor
Carrying Case
Instruction Manual

4 PANEL DESCRIPTION



4-1 MENU / ENTER / EXIT Key
4-2 UP Key
4-3 LENGTH Key
4-4 Split Sensor
4-5 Sensor Interface
4-6 Display
4-7 Battery Cover on the Back
4-8 DOWN Key
4-9 MASS Key
4-10 POWER Key
4-11 Integrated Sensor

Fig. 4

5 INITIAL SETTING AND OPERATION PROCEDURE

5.1 Installation And Replacement Of Batteries

When the battery power is insufficient, 'low Battery' indication is displayed, indicating that the battery must be replaced. Measurement error will be caused when the battery power is low. Open the battery cover, remove the batteries. Install new ones, and pay attention to the correct polarity direction of the batteries. Close the battery cover.

Avoid damage caused by battery leakage!

* When the battery power is too low. Please replace the batteries immediately to prevent further leakage.
* When you do not use the tester for a long time, please take the battery out of the tester to avoid damage of battery leakage.

5.2 Power On And Power Off The Tester

5.2.1 Power On

Press the POWER Key to power on the tester, and 'STARTING...' will be displayed.

5.2.2 Power Off

After power on, if there is no key operation within 3 minutes, the instrument will automatically power off. To turn it off manually, press and hold the POWER Key for about 5 seconds.

5.3 Settings Before Measurement

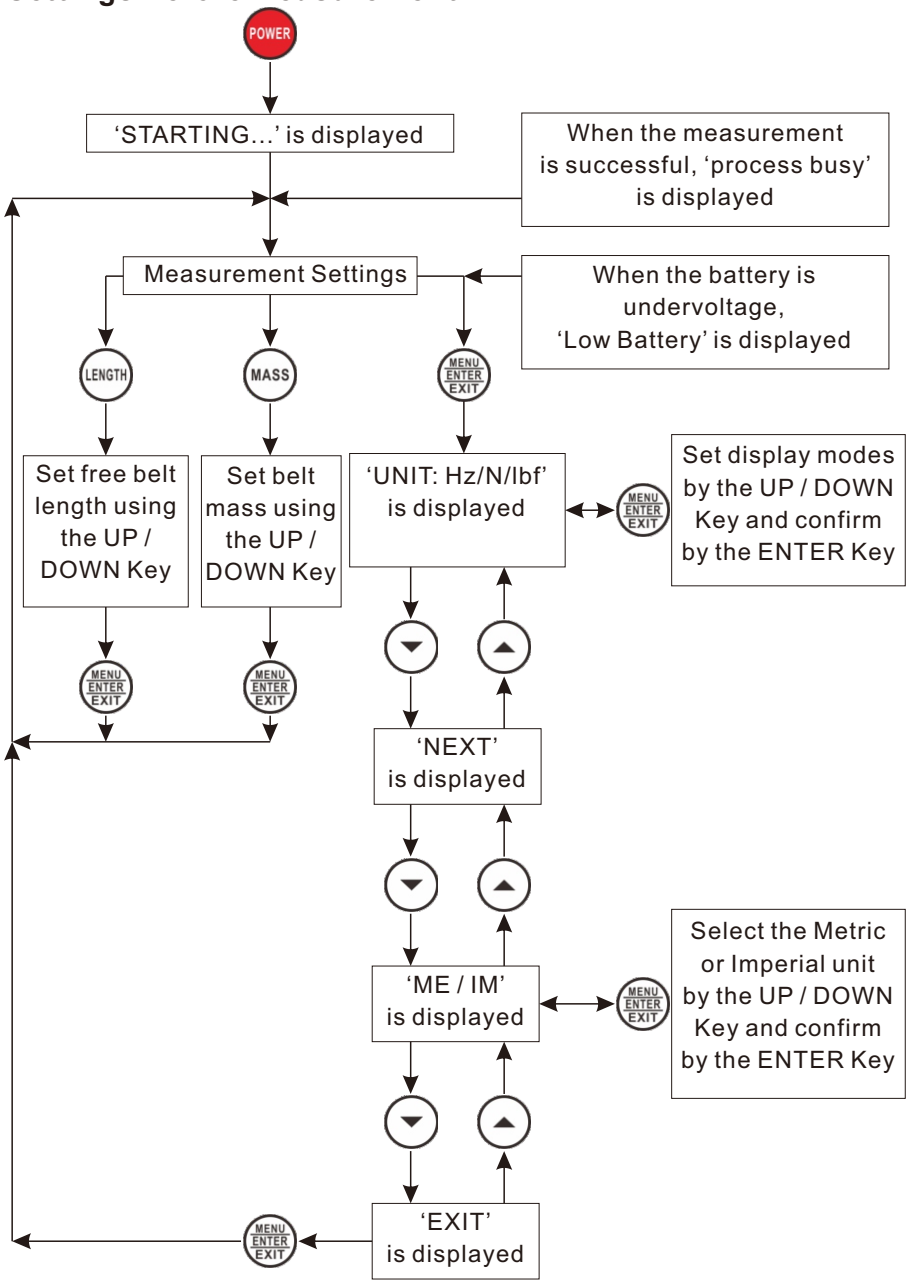


Fig. 5-1