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5910-HZ5K

Sonic Belt Tension Meter
Operation Manual

1.Safety Precautions for Use

● Do not collide, any impact may cause damage to this product.
● Do not spill water, solvents or any other liquids on this product.
● Do not place this product in a dusty environment.
● Avoid exposing this product to heat, such as in a car or direct light.
● Do not use volatile solvents to clean this product.
● Do not use the product where there are sparks, as this may cause an explosion.
● Do not use this product outside in a thunderstorm, turn off the power and find a safe place to use it, otherwise it may be struck by lightning.
● The portable probe is a tubular structure, do not bend the probe at an acute angle, do not bend it 20mm (3/4 inch) at either end and at the tips of the ends.

2. Outline and confirmation of measurement defects

The sonic belt tension meter provides non-contact, easy and accurate measurement of installed belt tension, and by analyzing the sonic waveform graph the function of the belt in question can be analyzed. The sonic waveform is obtained by tapping the installed belt, and the data obtained through the sensor can be transferred to a computer where the belt tension value can be read directly.

Confirmation of measurement defects

Item	Appearance	Reasons	Solution
The display shows “Error” or the measurement mode is uncertain or the LED lights up red.	No display of measured value after 3 or more measurements (at the frequency HZ state).	Zero input values (MASS, WIDTH, SPAN)	Check that the input values are correct.
		Measured value more than 100000(including 100000)	Although the number of cycles is displayed, the tension value is not measured.
		Measurement of peripheral wave number range error	Changing the perimeter wave number range (from standard S to high H)
		Measurement of circumferential waveforms over 5000 Hz	Check if the number of circumferential waves exceeds 5000 Hz
		Lack of power	Check the battery level (top right shows the level LOW.BATT)
Output value varies too much	All measurements are varies too much	Whether the microphone is in contact with the belt during test	One close measurement without the microphone touching the belt.
	Numerical values are more sensitive to changes in peripheral noise than measured values	Insufficient automatic gain adjustment	After turning off the power in the measuring position and installing the microphone probe, press the “MEASURE” button for more than 1 second and turn on the power again.

If the above method still fails to solve the problem, you need to contact the factory or supplier.

3. Sonic Tension Meter Measuring Principle

Expanded belts vibrate when shocked between pulleys, and the initial high frequency waveforms show irregular vibration waveforms due to the shock (Figure 1), but soon show regular vibration waveforms.

The sonic belt tensiometer is based on the above phenomenon, but the vibration waveforms of the belt or wire will diminish in a very short period of time, and there is no simple device that can capture these basic waveforms. With the full use of microcomputers, the capture of the weekly waveforms gave rise to a method of processing the number of vibration cycles so that the period of such waveforms could be easily found. This system is used to capture the vibration waveforms generated by the microphone and the microcomputer processes the data and waveform characteristics during the process. The tension value is converted by processing the intrinsic vibration number. (Converted by the following formula)

Formula: $TO=4\times M\times W\times S^2\times F^2\times 10^{-9}$

TO: Tension(N)

M: MASS(g/mm(WIDTH)/m(length),Refer to 6.1)

W: Belt width or number of ribs (or number of wires, refer to 6.2)

S: Measuring belt span length (length in mm)

F: the intrinsic vibration number

●Belt and metal wire have rigidity, which is different from some of its wire, therefore, under the influence of this situation, the sonic belt tension meter readings will be slightly higher than the actual tension value, the following figure 2 is the measured value and the actual tension value of the relationship between the graph:

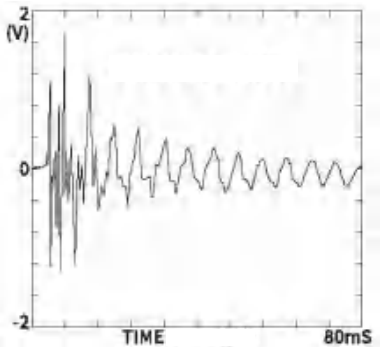


Fig. 1 Vibration attenuation state of a toothed drive belt

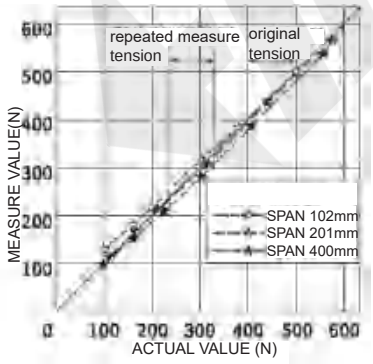
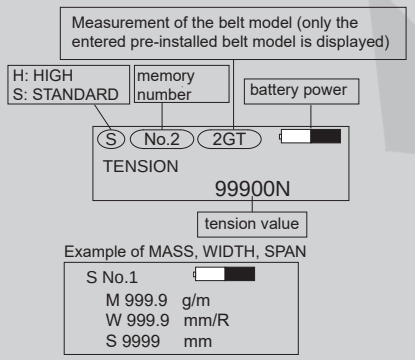
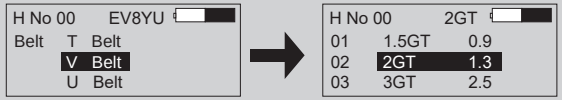
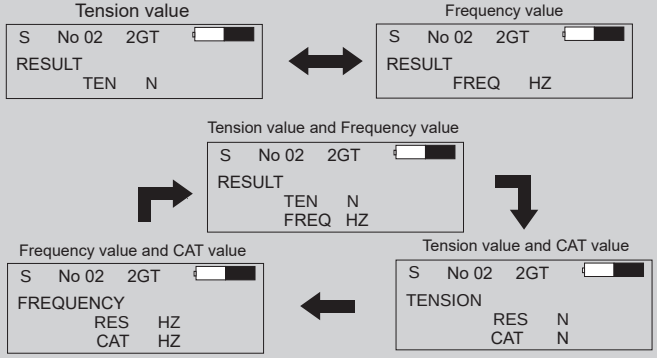


Fig. 2 Relationship between measured and actual tension values

4 Description of the parts of the sonic belt tension meter

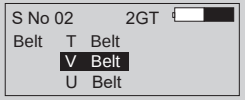
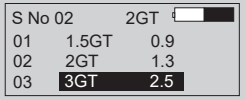
PART	INSTRUCTION
1 Standard microphone probe (with bendable arm)	The standard microphone probe is a 12.5mm diameter system with a flexible arm (bendable tube) that can be operated with one hand, or used in places where the main unit cannot be easily placed. It can be used for measurements in all ranges of frequency from 10 to 5000 Hz. Note: Do not twist the microphone to ensure proper connection of the connecting parts.
2 Connection parts	There is a small marking for inserting the pin into the joint, and when removing it, it is easy to pull it out by holding the strip ring and pulling it out toward the probe.
3 Power switch	Press the power switch to turn on the instrument, if it is to be turned off, press the power switch continuously for about 1 second. If the instrument is not used for more than 5 minutes, it will be turned off automatically. If the instrument is turned off during measurement, press the power button again.
4 LCD screen (with background light)	-Displays tension values, etc. -Tension values between 0.1 and 99900 in 3 lines. -Frequency numbers between 10.0 and 5000 HZ for circumference values, 3-line display. -When the tension value exceeds the standard specification, the “LED” will show a red light and “ERROR” will be displayed. After the measurement result is displayed, when the tension value exceeds the measurement range, the last two measurements will be displayed, and a “beep” sound will be emitted if further measurements are taken. -The battery level is displayed when the battery is depleted. (If the battery is low, the battery mark flashes and “LOW BATT” flashes.) -The backlight is always on. However, the backlight turns off after 1 minute of non-use, and turns on again when measuring again. **The LCD display screen is as follow:** 

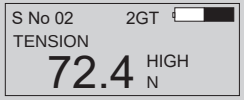
PART	INSTRUCTION
5 Select keys View data keys	-When the power is on, press the SELECT key to select the desired number, from No.0 to 39, a total of 40 memory data selection function. ★Press the “SELECT” key and the number you want to select will appear, if you need to select more than 10 numbers, you have to press the number continuously. ★Long press for more than 1 second to view the latest 500 groups of test results, can be viewed through the “UP” and “DOWN” keys to view the record of measurement results, over the edge of the 500 groups are covered in turn from 001.
6 MASS, up and down keys	Belt mass selection method: -When pressing the “MASS” key for more than 1 second, it will display T, V, U three kinds of belt models and unit mass, use the “UP” and “DOWN” keys to select the desired belt model, select and then press the “MEASURE” key (see page 9 preset unit mass). Use the “UP” and “DOWN” keys to select the desired belt model, and then press the “MEASURE” key (see page 9 for the preset unit mass). The unit of display: g/m. 
7 WIDTH key	-Select the “WIIDTH” key and use the numeric keys to enter the value of the bandwidth. Allowable input range: 000.1-999.9mm/R ★Enter the number of ribs of the V-belt.
9 Unit switch (frequency value Hz and tension value N)	-Press the “HZ” key to switch between the tension measurement display and the frequency measurement display. ★The display changes each time this key is pressed. -Press and hold down the “HZ” key to bring up the dual display: tension value and frequency value. However, the CAT value may be displayed when a preset data value is entered. (Only for synchronous belts) ★The CAT tension value and frequency value displayed for cogged belts may differ slightly from the standard installation tension value (see page 11), and these data are used as a rough standard. 

PART	INSTRUCTION
10 0 key (frequency range selection key)	Press the “0” key for 1 second or longer to select the measured range of the measured frequency. High HIGH--500~5000HZ Standard STADARD--10~600HZ  Use “UP” and “DOWN” to select the range, select and then press the “MEASURE” key, to select the range above 600HZ you need to select HIGH, determine and then press “MEASURE” key.
11 MEASURE key	1. Press the “MEASURE” key to set the automatic measurement mode. ★The internal display status is ⊢—⊣ Measurement starts when a signal is received from the sensor. ★Displayed during measurement is ∿∿ ★After the power is turned on, an interval of 1 second or more is allowed as an adjustment for automatic measurement before pressing the “MEASURE” key. 2.If the belt model changes, press the “MEASURE” key again to start measurement. 3. If the frequency range changes, press the “MEASURE” key again to start measurement, and the value within the new frequency range.

5 Operating Instructions

No.	DETAIL	OPERATION	DISPLAY
5.1	Connect microphone probe	Connect and secure the microphone probe to the main unit.	
5.2	Power on	Press the “POWER” key.	
5.3	Use the numeric keys to enter the selected number. Example: Selecting a number from NO.0 to NO.2	Press the “SELECT” key. Each time the “SELECT” key is pressed, the numbers change in sequence from 0 to 39. 0→1→2→.....39→0→1→2, and you can also enter the desired number by using the numeric keys. 1, select the method: Press the “SELECT” key 1 time, and then press the “SELECT” key 2 times. 2. Selection method Press the “2” key. In the following programs (unit mass, belt width, span length input and measured value display), press the “SELECT” key and the number in use will be displayed.	NO.0→NO.1 NO.0→NO.2 NO.0→NO.2

No.	DETAIL	OPERATION	DISPLAY
5.4.1	In the case of manual entry of MASS. Example: Entering a belt 2.5g/mm (refer to 6.1)	Press the “MASS” key. Use the numeric keys to input the value of unit mass (g/mm width/m length) in the blank box displayed on the screen, if the value is wrong, then press “MASS” key to start inputting. Press “0” key Press “0” key Press “2” key Press “5” key	M=000.0g/m Allowed input values: 0.1~999.9g/m M=000.0g/m M=000.0g/m M=002.0g/m M=002.5g/m
5.4.2	Enter the MASS from the belt type, e.g. select 3GT.	Press the “MASS” key and hold it for more than 1 second.T, V, U three kinds of belt model will be displayed, use “UP” and “DOWN” key to select the belt model, select the T type, press the “MEASURE” key to confirm. Press the “DOWN” button to widen the position of 3GT. Press the “MEASURE” key to select. 3GT is displayed on the screen.	 
5.5	Input belt width e.g. Enter 25.4mm (refer to 6.2)	Press the “WIDTH” key (same as above). Enter the start input status Press “0” key Press “2”. Press “5”. Press “4”.	W=000.0mm/R Allowed input values: 0.1~999.9mm/R W=000.0mm/R W=020.0mm/R W=025.0mm/R W=025.4mm/R
5.6	Input span (refer to 6.3)	Press the “SPAN” key (same as above). Enter the start input status	S=0000mm Allowed input values: 1~9999mm
5.7	Measuring	1 Put the microphone near the center of the measured belt, the closer the degree of contact the better, remember not to touch. 2 Press the “MEASURE” key, the LED green light display, LCD screen display: ⊢—⊣ 3 Tap the belt with a hammer or play the belt by hand to produce vibration, LCD display: ∿∿ For the second measurement, the “MEASURE” key is not used. When the microphone receives sound, the measurement is performed as follows: Measurement starts when the microphone receives sound, if there is a certain sound source or noise nearby, then the measurement will also start, after receiving the vibration sound of the belt, the measurement result will be displayed, there will be a “beeping” sound, and the green LED will light up for 1.5 seconds.	∿∿ For the second or subsequent measurements, the previous data will be displayed first, and the current data will be displayed with the “beep” sound.

No.	DETAIL	OPERATION	DISPLAY
5.8.1	Display of the tension value	When the belt vibration sound is received, the result is displayed with the “beep” sound, and the LED turns green for about 1.5 seconds. ★If the red light is on, refer to page 3 for confirmation.	Please keep the tension value matching the frequency (Hz).
5.8.2	Display of the frequency: Frequency is displayed after the tension value is measured.	Press the “HZ” key. The frequency corresponding to the tension value is displayed. When the “HZ” key is pressed again, the display returns to the tension value mode.	 HIGH: Higher than the set upper limit GOOD: within the set range LOW: below the set lower limit
5.9	Recording of measure-ment results	Long press the “SELECT” key for more than 1 second, you can view the latest 500 groups of test results, through the “UP” and “DOWN” keys to view the measurement results record, more than 500 groups are covered in order from 001. If there are more than 500 groups, it will be overwritten from 001.	

6 Input Methods

No.	INPUT	CLASSIFICATION	METHOD
6.1	Input MASS	Synchronized flat drive belts, toothed belts	The MASS value is the mass of weight g/width (mm)/length (m) in units of “g/mm width/m length”, with values from 000.1 to 999.9 g/mm width/m length. The values range from 000.1 to 999.9 g/mm width/m length. 3 integers and 1 significant digit after the decimal point total 4 digits.
		Synchronous V-belts, toothed belts	Keep the “MASS” key pressed (for 1 second or more), the belt model will be displayed on the screen, use the “UP” and “DOWN” keys to select the desired belt model, then press the “MEASURE” key to confirm.
		V-shaped multi-groove tapes and metal wires	Enter the unit mass value “g/m length” from 000.1 to 999.9 g/m in 3 integer places and 1 place after the decimal point and, in the case of V-belts or metal wires, enter the unit mass value for each V-belt.
6.2	Input belt width or number of belts, number of ribs	Synchronized flat drive belts, toothed belts	The belt width value is entered as 4 valid digits, 3 integers, 1 decimal place, ranging from 000.1mm to 999.9mm.
		V-shaped multi-groove tapes and metal wires	V-Band or Wire Enter the number of grooves or wires of a V-shaped multigroove band.
6.3	Input SPAN	The span is the distance between the two pulleys and can be calculated by the following formula so that it can be easily measured from the distance between the contact points.	

$$S = \sqrt{C^2 - \frac{(Dp - dp)^2}{4}}$$

S=SPAN(mm)
C=Distance between two axes (mm)
Dp=Large pulley tooth O.D.(mm)
dp=Small pulley tooth O.D.(mm)

7 Synchronous belt MASS table

Synchronous belt mass: in g/mm width/m length, range from 0.1-999.9g/mm width/m length. Valid numbers are 4 digits, 1 decimal place.

7.1 synchronous belt

ITEM	MXL	XL	DXL	L	DL	H	DH	XH	XXH
Tooth height (mm)	2.032	5.080	5.080	9.525	9.525	12.700	12.700	22.225	31.750
MASS	1.2	2.1	1.9	3.1	3.3	3.8	4.4	11.1	14.8

7.2 HTD belt

ITEM	3M	D3M	5M	D5M	8M	D8M	EV14M	EV14M2
Tooth height (mm)	3	3	5	5	8	8	14	14
MASS	2.4	2.3	3.8	4.2	6.1	6.3	8.7	8.3

ITEM	14M	D14M	20M
Tooth height (mm)	14	14	20
MASS	10.0	11.9	12.8

7.3 GT belt

ITEM	1.5GT	2GT	3GT	D3GT	5GT	D5GT	EV5GT	EV5GTC
Tooth height (mm)	1.5	2	3	3	5	5	5	5
MASS	0.9	1.3	2.5	2.5	4.0	4.3	4.0	3.8

ITEM	8YU	8YUF	D8YU	EV8YU	EV8YUC	EV8YU2
Tooth height (mm)	8	8	8	8	8	8
MASS	5.2	6.1	5.4	5.1	5.1	5.1

7.4 Chain GT2 Belt

ITEM	8MGT	14MGT
Tooth height (mm)	8	14
MASS	4.7	8.0

8 V-belt MASS table

V-belts are more rigid and the measured value differs very little from the actual value, so it is required to use the weight value obtained by multiplying the tension correction factor by the unit mass value.
M (g/m length) = single groove mass (g/m length) × tension correction factor

8.1 HC Type

ITEM	3VX	3VXPB	5VX	5VXPB	8VX
TYPE	3VX Single	3VX Power Band	5VX Single	5VX Power Band	8VX Single
MASS	68.0×0.88=59.8	87.0×0.87=75.7	182.0×0.91=165.6	237.0×0.89=210.9	657.0×0.80=525.6

8.2 Polyflex Type

ITEM	5MPF	7MPF	11MPF
TYPE	5M	7M	11M
MASS	11.0×0.95=10.5	27.0×0.95=25.7	56.0×0.93=52.1

8.3 Micro V-belt

ITEM	J(V)	PK(V)	L(V)
TYPE	J section	PK section	L section
MASS	9.0×0.95=8.6	21.0×0.95=20.0	32.0×0.95=30.4

8.4 V-belt

ITEM	A(V)	B(V)	C(V)	D(V)	E(V)
TYPE	A	B	C	D	E
MASS	120.0×0.86=103.2	200.0×0.83=166.0	360.0×0.83=298.8	660.0×0.81=534.6	1020.0×0.72=734.4

9 U-belt MASS table

The mass of U-belt is tabulated as follows:

ITEM	XL-K	L-K	H-K	T5-K	T10-K	XL-S	L-S	H-S	T5-S	T10-S
MASS	1.9	3.0	3.2	2.0	3.6	2.1	3.5	3.9	2.2	4.3

ITEM	AT10	AT20	5M-S	8M-S	14M-S	8YU-S
MASS	5.6	9.9	4.1	5.9	10.7	5.2

10 Precautions for Use

10.1 Before measuring the tension of a new belt installation, you need to come back and forth a few times to familiarize yourself with the surroundings, abnormal drive shafts or irregular belt teeth, etc. will affect the belt tension during operation.
10.2 After the correct belt parameters are entered into the instrument, use at least 3 measurements to determine whether the results are consistent (not affected by noise).
10.3 In the measurement of synchronous belt, please use more than 20 times the pitch of the tangent length; in the measurement of the triangle belt, use more than 30 times the top width of the tangent length, otherwise it will lead to the measurement result is higher than the actual, mainly because of its not easy to bend the characteristics.
10.4. Never measure at the lowest tension, as this will cause errors or provide incorrect results. If the tension is low, try to raise the belt tension and measure again.
10.5 Measuring the tension of non-standard belts, such as thickening the back or using other materials, will result in inaccurate standard belt measurements. In such cases, this can be eliminated with a simple checking process. By measuring the belt at a known tangent length and a known tension, frequency and tension data can be derived by measuring the frequency at different tensions.

This data can also be used in charts or formulas to convert tangent vibration frequencies to yield accurate belt tensions. This approach can be used in any field, but cannot be applied to drive systems with different tangent lengths, and is best used to measure non-standard belt tensions based on frequency.