

Sonic Belt Tension Analyser

ET5794

User's Manual



1. Precautions

1. Before using the product, please read the instructions carefully and use them correctly, and please keep the manual handy after reading.
2. Do not use in an environment where fire or explosion may occur.
3. Do not attempt to disassemble and modify the product.
4. Do not use solvents (thinner, gasoline, etc.) to clean this product.
5. Be sure to turn off the power supply after confirming that the machine is stopped, before perform a belt tension test.
6. When using outdoors, if there's thunder sounds, turn off the power immediately and move to a safe place.
7. Do not store in a humid, dusty, or high temperature place.
8. Avoid tearing or twisting the probe and hose, and avoid bending the hose at sharp angles.
9. If not in use for a long time, remove the battery

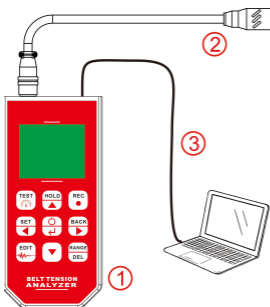
2. Abstract

When a longitudinal impact is applied to the belt between the pulleys, a certain frequency of vibration will be formed due to the elasticity of the belt itself, and the vibration frequency will vary depending on the belt type, density, width and span. On the premise of determining the belt type, density, width and span, the belt tension analyser can simply and accurately measure the installation tension related to the belt performance in a non-contact way by analysing the belt vibration sound waves. When the belt is stationary, the sensor compensates for the sound waves generated by the belt span runout and displays the tension value of the belt through digital calculation and processing.

3. Product features

- TFT color screen display
- 10 levels of backlight brightness adjustment
- Indication of remaining battery power
- Single/continuous measurement mode
- Support setting the trigger intensity
- Support a variety of theme style display
- Support spectrum graphic display
- Built-in data quick selection
- Support user-defined data, up to 999 groups
- 50 sets of scratching data settings
- Record up to 500 sets of historical measurement data
- Lower brightness at 1 min idle, and power off after 5 min idle







4. Product structure



①	Main Unit
②	Sensor
③	USB Cable

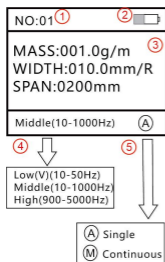
4.1 Keypad definitions

	Test Button After editing/selecting the correct parameters, short press this button, put the probe close to the belt to be measured(vertically to the surface of the belt but no contact), and give a force to the belt to generate vibration, and the tension of the belt can be measured.
	Lock/Up Button On the main interface, you can switch between the user's temporary parameters, and the current parameter serial number is displayed on the upper left corner of the screen. On the test page, if in continuous test mode, press this button to lock the current test result and the product will not accept new test results.
	Record Button On the test interface, the current test results are automatically stored after the test. On the main interface, short press to switch to the record page.

	<p>Settings/Left Button</p> <p>Enter the system settings interface, including language switching, display style, test mode and other parameter settings.</p>
	<p>Power/Confirm Button</p> <p>Press and hold this button to perform power-on/off operations. Short press this button to confirm the change of the current setting.</p>
	<p>Back/Right Button</p> <p>Exit to the parent directory or the main interface. On the edit screen, move the cursor to the next editable field.</p>
	<p>Edit Button</p> <p>Press this button to set the parameters of the belt to be measured. Use the Set/Left Button and Back/Right Button to adjust the current cursor position, use the Lock/Up Button and Down Button for data entry, and press the Power/Confirm Button to confirm the modified result. Press and hold this button to query and recall the built-in data.</p>
	<p>Down button</p> <p>On the Settings/Browse screens, move the cursor to the next option. On the main page, toggle the user temporal parameters. On the edit page, modify the value.</p>
	<p>Range/Delete buttons</p> <p>On the main interface, change the response frequency range. On the Records Browse interface, press to delete the current record, and press and hold to delete all records.</p>

5. Display interface and operation

5.1 main interface

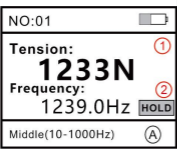



①	The sequence number of the staged record. By press the Locking/Up Button / Down Button to flip the staging index, and the Editing Area ③ will display the data of the current staging index.
②	Power display, when using USB to connect to a computer or an external 5V power supply, a plug-in symbol will appear. When the battery level turns red, you need to replace new batteries.
③	This editing area will display the data of the current data index, you can edit the data and update the data of the current index by pressing the edit button. Press and hold the edit button to invoke the data in the built-in database and update the data with the current staging index. Please refer to the "Data Entry" section for data entry methods.
④	The currently selected measurement frequency range. Pressing the Range/Delete Button to select the appropriate range, to exclude sound frequency interference which is not in the measured frequency range.
⑤	Press the Settings/Left Button to enter the settings menu, in which you can set the measurement mode. The continuous mode would continuously measures and updates the measurement data. In the one-time test mode, after one test is over, you need to press the Test Button again to start a new test. All the test results would be stored in the Record List.

5.2 Test Interface

Press the **Test Button** to start the test.

Note: After the belt's installed, please run the belt several times to make sure the belt is in a stable state.

 <p>NO:01 </p> <p>Tension: 1233N ①</p> <p>Frequency: 1239.0Hz ② HOLD</p> <p>Middle(10-1000Hz) Ⓐ</p>	<p>① Tension value display. The tension value is calculated based on the frequency and belt data. Each measurement is automatically stored in the record list. You can press and hold the Record button to query the stored records.</p>
	<p>② In continuous mode, if you need to lock the data, you can press the Lock/Up Button to pause the device.</p>

5.3 Record List interface

Record	
001:	6528N 2020.0Hz
002:	7474N 2160.0Hz
003:	Error 11.0Hz
004:	7474N 2016.0Hz
005:	3030N 201.0Hz

Press and hold the **Record Button** to enter this interface.

You can view the most recent test records.

Short press the **Range/Delete Button** to delete the currently selected records, and long press to delete all records.

5.4 Belt Type

Belt Type
T Belt
V Belt
U belt
User Defined

In the main interface, press and hold the **Edit Button** to enter this interface.

This interface displays the contents of the built-in database of the system, which can be selected as needed.

"User Customized" contains customizes data, and data can be edited and deleted by connecting the product to a computer. For details, refer to the section "User-defined data".

5.5 Setting

Setting
1. Measure Mode
2. Sensitivity
3. Backlight
4. Display Theme
5. 语言设置

Press the **Settings/Left Button** while on the main interface to enter this setting page.

It is possible to change the measurement mode, probe sensitivity, backlight brightness, modify the display style, change the language of the display content, and system calibration.

5.5.1 Calibration

Due to the special mechanism of the design, calibration would merely required even when change a sensor.

5.5.1.1 Make sure the place is quite,

5.5.1.2 Prepare a 1000Hz sound source,

5.5.1.3 Enter the 'calibration' page, click 'Power/Confirm Button' to finish calibration.

* at the 'calibration' page, click 'Down Button' to restore factory calibration.

6.Data Entry

6.1 MASS input <Refer to the unit mass tables on appendix >

Usually, the belt supplier could provide the belt parameters, or the corresponding parameters will be marked on the belt, and it can be used directly.

6.1.1 Tooth & Flat timing belt

The unit mass entered is width (mm) × length (m), in g/mm width × m length, and the data capacity is 000.1~999.9g/mm width × length (m).

6.1.2 V, V-ribbed belt and wire

Input the mass per meter of length in "g/m length" for unit mass. Able to input by four significant digits, i.e. three digits of integer and one digit below decimal point from 000.1 up to 999.9 g/m L. Unit mass corresponds to one piece for V-belt and wire, and one rib for V-ribbed belt.

	MASS	WIDTH	SPAN
Flat timing belt	g/mm W ×mL	mm	mm

V-ribbed belt	g/Ribbed×mL	Number of ribbed	mm
V belt	g/one belt ×mL	1	mm
Wire	g/one belt×mL	1	mm

6.2 How to input the belt width or the number of belts (ribs)

6.2.1 Timing or Flat belt

To put the data is for belt width is 000.1mm ~ 999.9mm, three digits of integer and one digit below decimal point in mm.

6.2.2 V, V ribbed belt, Wire

For V belt and Wire, put one piece. For V ribbed belt, put the number of ribs of V-ribbed belt.

6.3 How to put the value of span length

Span length is a distance between contacts with pulley, and can be calculated by the following calculating formula. Alternatively, measure the distance between pulley contacts with a tape measure and put.

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

S : Span length (mm)

C: Distance between axes (mm)

Dp: Large pulley pitch outer diameter (mm)

dp: Small pulley pitch outer diameter (mm)

7. Product parameters

- Display mode: TFT LCD screen
- Battery type: two AAA batteries
- Frequency acquisition range: 10Hz~5000Hz
- Operating temperature range: -10°C~50°C
- Operating humidity range: 15-80%RH (non-condensing)
- Detection technology: acoustic wave analysis
- Size: L26 x W61.5 x H130 mm
- Accessories: Vertical Test Probe (BTA-108-01) x 1, USB-TypeC Cable x 1

8.General fault diagnosis

Symptom	Possible Cause	Solution
could not get test result	<ul style="list-style-type: none"> ● The entered items do not match (the input values of unit mass, width, span are not reasonable) ● Exceed the frequency range of the test ● Insufficient battery 	<ul style="list-style-type: none"> ● Check the contents of the entered items ● Change the test frequency range ● Replace the batteries if the battery is low
Test result not correct	<ul style="list-style-type: none"> ● During the measurement process, the probe is in direct contact with the belt 	<ul style="list-style-type: none"> ● Avoid contact between the probe and the belt.
The measured values are biased & unstable	<ul style="list-style-type: none"> ● Environmental noise impact 	<ul style="list-style-type: none"> ● Measure in a relatively quiet environment

9. User-defined Data

The product supports connecting to a computer via a USB-TypeC cable. Use Excel software to edit and add custom data.

9.1 Data Entry Steps:

9.1.1. Use USB-TYPEC cable to connect the device to the computer;

9.1.2. Using Microsoft Excel to open "DATA.CSV" file;

9.1.3. Instructions and precautions should be followed when modifying parameters;

9.1.4. After the modification is completed, close and save the file, and the file name and format cannot be modified when saving;

9.1.5. Restart the device after saving to update.

9.2 Data Format Description:

NAME: You can use uppercase and lowercase letters, digits, decimal places, spaces, "-", "()", and the device can display up to 9 characters.

MASS (mass): range 0.1-999.9 in g/m

WIDTH: Range: 0-999.9, in mm

SPAN (span): range 0-9999, unit mm

ENABLE: "n" is disabled, and "y" is enabled

Note:

1. If the data format is wrong and cannot be recognized after the device is restarted, the device will automatically use a blank data table to overwrite

the modified data table, which cannot be recovered.

2. It is recommended to copy the DATA.CSV to the computer before editing, after the editing is completed.
3. The data needs to be entered using English input method;
2. The data entered shall in strict format accordance with the template;
3. Do not store other files in this storage space;
4. Do not disconnect the USB connection while saving the file to avoid data loss;
5. The database support up to 999 sets of data.

10. Warranty

The product main unit entitles 12 months warranty.

The probe sensor assembly is consumable, and no warranty applies.

Appendix 1: Pre-installed Data, Tooth and V Belt List

Tooth shape belt (Standard construction) (unit:g/mm width x m length)							
Item	Unit Mass	Item	Unit Mass	Item	Unit Mass	Item	Unit Mass
1.5GT	0.9	8YU F	6.1	3M	2.4	MXL	1.2
2GT	1.3	EV8YU	5.1	D3M	2.3	XL	2.1
3GT	2.5	EV8YUC	4.8	5M	3.8	DXL	1.9
D3GT	2.5	EV8YU2	5.1	D5M	4.2	L	3.1
5GT	4.0	D8YU	5.4	8M	6.1	DL	3.3
EV5GT	4.0	8MGT	4.7	D8M	6.3	H	3.8
EV5GTC	3.8	14MGT	8.0	14M	10.0	DH	4.4
D5GT	4.3	EV14M	8.7	D14M	11.9	XH	11.1
8YU	5.2	EV14M2	8.3	20M	12.8	XXH	14.8

V belt unit mass: Mass per meter length of one rib(g/m length)				Gates TPU belt (Long length urethane belt) (unit:g/mm width x m length)			
Item	Unit Mass	Item	Unit Mass	Item	Unit Mass	Item	Unit Mass
3VX	59.8	D (V)	534.6	XL-K	1.9	T10-S	4.3
5VX	165.6	E (V)	734.4	L-K	3.0	AT10	5.6
8VX	525.6	3VXPB	75.7	H-K	3.2	AT20	9.9
J (V)	8.6	5VXPB	210.9	T5-K	2.0	5M-S	4.1
PK (V)	20.0	5MPF	10.5	T10-K	3.6	8M-S	5.9
L (V)	30.4	7MPF	25.7	XL-S	2.1	14M-S	10.7
A (V)	103.2	11MRF	52.1	L-S	3.5	8YU-S	5.2
B (V)	166.0	(E) PJ	7.5	H-S	3.9		
C (V)	298.8			T5-S	2.2		

Note:

Item	Belt Type	Item	Belt Type
EV5GTC	EV5GT Carbon	5 VXPB	5VX Powered band
8YU F	8YU Fluorine	5MPF	Polyflex5M
EV8YUC	EV8YU Carbon	7MPF	Polyflex7M
EV8YU2	EVII8YU	11MPF	Polyflex11M
8MGT	Polychain8MGT	* -S	Aramid (Kevlar) cord Gates TPU belt
14MGT	Polychain14MGT		
EV14M2	EVII14M	* -K	Steel cord Gates TPU belt
3VXPB	3VX Powered band		

Appendix 2: Unit Mass Table of Unitta Tooth Timing Belt Timing Belt

(Pitch: mm, Unit Mass: g/mm width×m Length)

Tooth Shape	Pitch	Unit Mass	Tooth Shape	Pitch	Unit Mass
MXL	2.032	1.2	DL	9.525	3.3
XXL(50)	3.175	1.4	H	12.700	3.8
XL	5.080	2.1	DH	12.700	4.4
DXL	5.080	1.9	XH	22.225	11.1
L	9.525	3.1	XXH	31.750	14.8

HDT Belt

(Pitch: mm, Unit Mass: g/mm width×m Length)

Tooth Shape	Pitch	Unit Mass	Tooth Shape	Pitch	Unit Mass
3M-HTD	3.000	2.4	EV14M	14.000	8.7
D3M-HTD	3.000	2.3	EV14M2	14.000	8.3
5M-HTD	5.000	3.8	14M-HTD	14.000	10.0
D5M-HTD	5.000	4.2	D14M-HTD	14.000	11.9
8M-HTD	8.000	6.1	20M-HTD	20.00	12.8
D8M-HTD	8.000	6.3			

GT Belt

(Pitch: mm, Unit Mass: g/mm width×m Length)

Tooth Shape	Pitch	Unit Mass	Tooth Shape	Pitch	Unit Mass
1.5GT	1.500	0.9	EV5GTC	5.000	3.8
2GT	2.000	1.3	8YU	8.000	5.2
3GT	3.000	2.5	8YUF	8.000	6.1
D3GT	3.000	2.5	D8YU	8.000	5.4
5GT	5.000	4.0	EV8YU	8.000	5.1
D5GT	5.000	4.3	EV8YU2	8.000	5.1
EV5GT	5.000	4.0	EV8YUC	8.000	4.8

Polychain GT Carbon Belt

Tooth Shape	Pitch(mm)	Unit Mass:(g/mm width×m Length)
8M-GT	8	4.7
14M-GT	14	8

Gates TPU Belt

Tooth	Pitch (mm)	Steel		Aramid	Tooth	Pitch (mm)	Steel		Aramid
		E/C~	F~				E/C~	F~	
XL	5.080	2.1	-	1.9	AT10	10.000	5.6	5.7	-
L	9.525	3.5	-	3.0	AT20	20.000	9.9	-	-
H	12.700	3.9	-	3.2	5M	5.000	4.1	-	-
T5	5.000	2.2	2.2	2.0	8M	8.000	5.9	-	-
T10	10.000	4.3	4.0	3.6	14M	14.000	10.7	-	-
WT10	10.000	-	-	3.9	8YU	8.000	5.2	-	-
AT5	5.000	3.5	3.5	-					

Special Pitch Belt

(Pitch: mm, Unit Mass: g/mm width×m Length)

Tooth	Pitch	Unit Mass	Tooth	Pitch	Unit Mass
101	1.5875	1.0	109	2.1167	1.1
102	2.0320	1.3	181	2.8222	0.9
103	2.1167	1.3	25	6.3500	1.7
104	2.8222	1.0	9109	15.4473	3.0
111	1.4111	1.1			

Appendix 3: Unit Mass Table of Gates V Belt

The V belt has high comparative rigidity, the gap of revision is necessary for the actual and measured tension value in the range of the standard installation tension. Therefore, it should be adopted as WEIGHT level which is calculated by the following;

[M (g/m length) = Mass per meter length of one rib (g/m length) x Tension correction factor]

Super HC Type

Input item	3VX Single	3VX Power band	5VX Single	5VX Power Band	8V Single
Mass x compensati on	68.0x0.8 8 =59.8	87.0x0.8 7 =75.7	182.0x0. 91 =165.6	237.0x0.8 9 =210.9	657.0x0. 8 =525.6

Polyflex Type

Input item		5M	7M	11M
Mass compensation	x	$11.0 \times 0.95 = 10.5$	$27.0 \times 0.95 = 25.7$	$56.0 \times 0.93 = 52.1$

Micro V Type

Input item		J section	PK section	L section
Mass compensation	x	$9.0 \times 0.95 = 8.6$	$21.0 \times 0.95 = 20.0$	$32.0 \times 0.95 = 30.4$

Standard V Type

Input item		A	B	C	D	E
Mass compensation	x	$120.0 \times 0.86 = 103.2$	$200.0 \times 0.83 = 166.0$	$360.0 \times 0.83 = 298.8$	$660.0 \times 0.81 = 534.6$	$1020.0 \times 0.72 = 734.4$

Appendix 4: The standard installation tension table of the GUA timing belt Timing Belt

Width mm	tooth→	MXL	XL	L	H	XH	XXH
3.2	Width(shape type) mm↓	2.9N					
4.8		5.1N					
6.4	025	7.6N	13.7N				
7.9	031	10.3N	19.6N				
9.5	037	11.8N	24.5N				
12.7	050			52.0N			
19.1	075			87.3N	222N		
25.4	100			123.0N	312N		
38.1	150				486N		
50.8	200				668N	909N	1120N
76.2	300				1050N	1430N	1750N
101.6	400					2020N	2480N
127.0	500						3210N

GT&HTD Belt

Tooth	1.5GT	2GT	3GT/3M	5GT/5M	EV5GT	8YU/8M	EV8YU	14M	EV14M
Width mm									
1.5	2.3N								
2.0	3.4N	4.3N							

2.5	4.4N	5.2N								
3.0	5.6N	6.4N								
4.0	7.8N	9.4N	20N							
6.0		15.8N	29N							
9.0		25.2N	44N	55N	71N					
12		34.6N	59N		98N					
15		44.1N	74N	96N	125N		210N			
20			98N	137N	178N	235N	280N			
25				178N	232N	294	350N			
30				220N	286N	343	410N	441N	560N	
40				302N	393N	500N	600N	618N	740N	
50						637N	760N	775N		
55								902N	1100N	
60						765N	920N		1200N	
70						892N	1100N	1190N	1400N	
85						1100N	1300N	1470N	1800N	
100									2100N	
115									2090N	2500N
130										2900N
150										3400N
170									3190N	3800N

Pollychain GT Carbon Belt 8MGT

Width mm	12	15	20	21	25	30	36	40	50	60	62	70	80
MIN N	190	240	320	340	400	480	580	640	800	970	1000	1130	1290
MAX N	260	330	430	460	540	650	780	870	1080	1300	1340	1520	1730

Pollychain GT Carbon Belt 14MGT

Width mm	20	30	37	40	50	60	68	70	80	90	100	115	125
MIN N	820	1230	1520	1640	2050	2460	2790	2870	3280	3690	4100	4720	5130
MAX N	1100	1670	2050	2220	2780	3330	3770	3890	4440	5000	5550	6380	6940

Gates TPU Belt

Width mm	12.7	19.1	25.4	50.8	101.6
Width(shape)mm	050	075	100	200	400

Tooth					
XL	25N	37N	49N	97N	193N
L	44N	67N	88N	177N	353N
H		162N	216N	431N	863N

Tooth	T5	T10	AT5	AT10	AT20	5M	8M	14M	8YU
Width mm									
10	20N		60N			60N			
15	29N	129N	99N	183N					
20	39N	173N	137N	235N		137N	235N		235N
25	49N	216N	178N	294N					294N
30	59N	259N	220N	343N		220N	343N		343N
40								618N	500N
50	98N	431N	376N	637N	775N	376N	637N		637N
55								902N	
60									765N
80									1020N
85								1470N	
100	196N	863N		1301N	1792N		1301N	1792N	1275N