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# BOLT-Tester User Manual

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# BOLT-Tester User Manual

## Safety Precautions

Thank you very much for purchasing BOLT-Tester. Before using the instrument, please read this user manual carefully to use BOLT-Tester properly.

### Regarding Symbols

This user manual shows following symbols to prevent harm and damages for users and others. Please read this user manual after understanding definitions of symbols.

 <b>Warning</b>	Disregarding this symbol and improper usage may result in death, severe injury or damages to yourself and others.
 <b>Attention</b>	Disregarding this symbol and improper usage may result in injury or damages to yourself and others.

### Examples of Symbols

Symbol  demonstrates prohibited acts. In some cases, a specific content of prohibition is written in or near Figures.

#### ● Handling

 <b>Warning</b>	
	Do not put BOLT-Tester close to fire. It may cause a fire or damages because heat-sensitive material such as polyvinyl chloride, is used for BOLT-Tester.
	Do not put BOLT-Tester at any places where is at risk of spilling water, oil, chemicals etc. It may cause a fire or failure of the instrument.
	Do not throw BOLT-Tester into a fire. It may cause a fire or injuries by explosion.
 <b>Attention</b>	
	Do not put the instrument on unstable place. It may result in an injury by dropping.

## ● Usage

 <b>Warning</b>	
	The hammer is made of metal. Improper usage may result in injury and damages.
	Do not disassemble the instrument. It may result in injury and failure of the instrument. The warranty does not cover disassembled instrument.
	Do not use the instrument at any places where is at risk of spilling water, chemicals etc. It may cause a fire or other disasters.
	Do not use the instrument where gas is ignited. It may cause fire or explosion.
 <b>Attention</b>	
	Stop immediately using the instrument if it starts to smoke or smell oddly. Turn the power of the instrument off, remove the batteries and contact manufacturer.

## ● Maintenance

 <b>Attention</b>	
	Do not wipe exterior parts with liquid that contains benzin or thinner. It may be hurmful to the surface of the instrument.

●Other

1. Contents of specifications of the instrument and the user manual may change without prior notice.
2. Reproduction of any parts or entirety of the instrument and the user manual is strictly prohibited.
3. Contents of the user manual were prepared carefully to give accurate information. However, if you have any questions or suspicions, please contact the distributors.
4. Our company is not responsible for any loss of profits or estimated lost earnings by using the instrument, regardless of what is written above. Please consent to this in advance.
5. This instrument is not designed for use on an equipment or an instrument that involves human lives or that requires a high reliability. Our company cannot take any responsibilities for damages to property, accidents, or physical injuries caused by using the instrument.
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**※Please read this User Manual carefully prior to use BOLT-Tester**

Thank you very much for purchasing BOLT-Tester. Before usage of the instrument, please read this user manual carefully in order to deliver superior performance of BOLT-Tester and to ensure long-lasting use. After reading, please keep this user manual and the certificate close to the area of first use for quick access when needed.

## 1. Outline of Instrument

### 1.1 Name of Parts

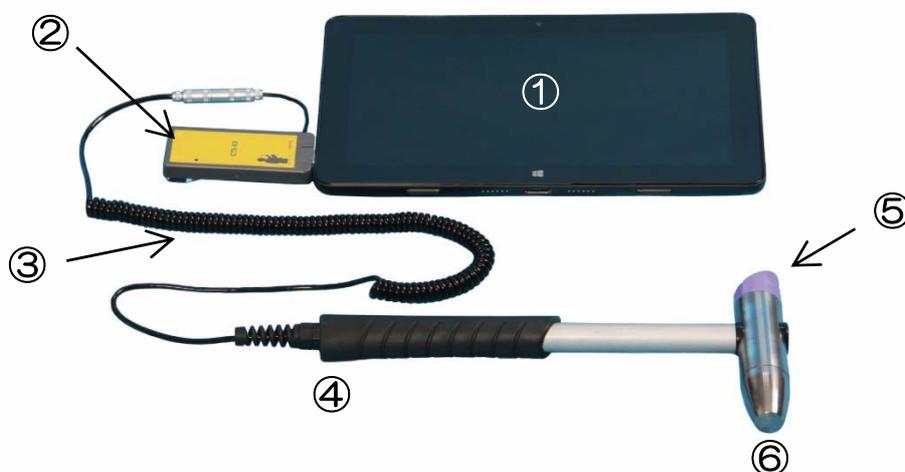


Table 1-1 Names of Parts

No.	Name	Description
①	Control PC	Measurement is operated by PC or Tablet. Please refer to the PC user manual for its operation.
②	CTS-03 Device	CTS-03 is an AD converter. Measurement data is transferred to the PC through this device.
③	Connection Cable	Connecting the Hammer unit and CTS-03 Device.
④	Grip	Please hold the grip for proper measurement.
⑤	Endcap	The endcap protects an accelerometer mounted on the hammer unit. <b>DO NOT HIT WITH THE ENDCAP.</b>
⑥	Striking surface	Please hit the test object with this side.

## 1.2 Outline of Instrument

BOLT-Tester is a Non-destructive testing equipment for chemical anchor bolt, mechanical anchor bolt and nut torque.

## 1.3 Specifications of BOLT-Tester

Table 1.3-1 Specifications of BOLT-Tester

Name	BOLT-Tester (BTS-02)
Hammer	420g
Sampling Clock	0.5 $\mu$ s
Measuring Time	2ms
Power Supply	USB Bus Powered (Battery life is depending on PC)
Memory	Depending on PC

## 1.4 Precautions for use

- The striking surface of the hammer shall be eventually scratched with the measurement, but it will not affect to the measurement results unless the hammer is hardly damaged. Usually, the measurement can be done with light impact force. **Please do not hit too strong.** It may result in damages to the sensor.
- The opposite side of the striking surface is a safety cap (Purple-colored plastic cap) of the sensor. **Please do not hit with the cap for the measurement.** It may result in damages to the sensor.
- BOLT-Tester is **not waterproof or water resistant product.** Please do not use the instrument during rainfall or at an area of extreme high humidity. It may result in damages to the sensor.
- Please lightly grip the hammer when striking. The instrument cannot produce accurate results by holding the shaft or hammerhead.
- Please hit test object as much as at a right angle. Diagonal impact will not produce accurate results. There is no problem if the impact is made within 10° from the right angle.
- Battery life time of BOLT-Tester is depending on the battery of PC. Please prepare spare batteries of PC as needed.
- Do not bend or pull the connection cable. It will lead damages of the wire disconnection or short circuit. Please hold the connection parts to pull out the cable.
- BOLT-Tester is **a precision instruments.** It is not “a hammer”. Please handle the instrument with care. Also, please avoid storing under high humidity or extremely high or low temperature.

## 2. Set-up

BOLT-Tester is consist of CTS-03 device (High speed AD converter with amplifier) and dedicated hammer. Measurement is controlled by PC or Tablet. CTS-03 can be operated by Windows XP, VISTA, 7 and 8. CTS-03 is not validated with Windows 10 at this moment.

### 2.1 Installing Device Driver

Device driver is stored in the file folder of “TUSBOE40” in the CD-ROM. Please startup “Install.exe” in “DRIVER” folder. Install program will automatically start installing proper device driver for your computer.

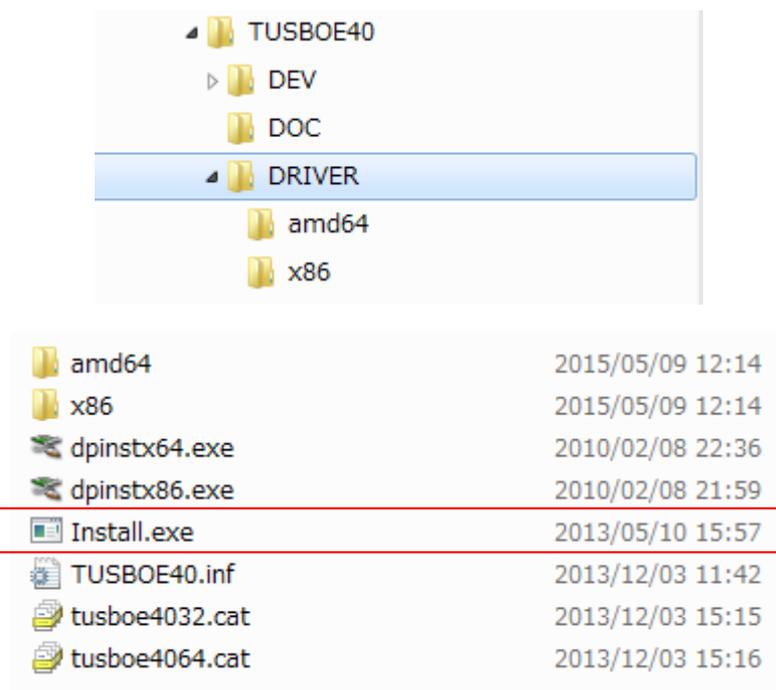


Figure2.1-1 Install program for device driver

### 2.2 Copying Application

BOLT-Tester application is included in the CD-ROM. **Please copy “CTS-BLT.exe” and “SetUp.txt” in the same folder.** “CTS-BLT.exe” is BOLT-Tester application, and “SetUp.txt” includes information which is required to run the application. Please note that the application may not run properly without “SetUp.txt” file.

## 3. Operating Instructions for BOLT-Tester Application

### 3.1 Preparation

- Please connect CTS-03 device and PC before startup the application. LED lamp will be turned on when the device and PC is connected. If the lamp is not turned on, please check the device is properly connected to PC, or install device driver again.
- After connecting CTS-03 device and PC, please connect CTS-03 device and Hammer unit.



Table 3.2-1 Names of button and description

No.	Name	Description
①		Setup parameters and criteria for the measurement.
②		Exit BOLT-Tester application. Setup parameters will be renewed.
③		Measurement result will be captured and saved as JPEG file in the selected driver with this button.
④		Measurement data will be saved with this button. If “SAVE ALL” is not selected at the setup, please click this button to save the data as needed.
⑤		Start the measurement with this button. Please click this button when the measurement is ready. Button name will be changed from “MES” to “HIT”. Please click this button again to quit the measurement, and button name will be changed from “HIT” to “MES”. Please confirm that the button name is “MES” to change measurement parameters.
⑥		Delete unnecessary or unexpected data.

\*In case the application does not recognize CTS-03 device, the dialog below will pop up.  
(Figure 3.2-2)

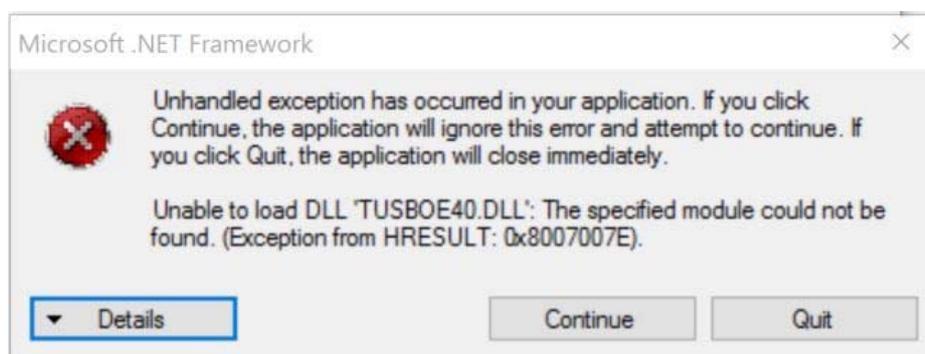


Figure3.2-2 Message Dialog

### 3.3 Set-up of Parameters

- Click “SET UP” button (①) on Home screen. (Figure 3.2-1)
- Set-up window will pop up. (3.3-1)
- All the parameters can be set at this window. After parameters are set, please click “SET” button to keep the settings. Click “EXIT” button if parameters does not need to be kept.

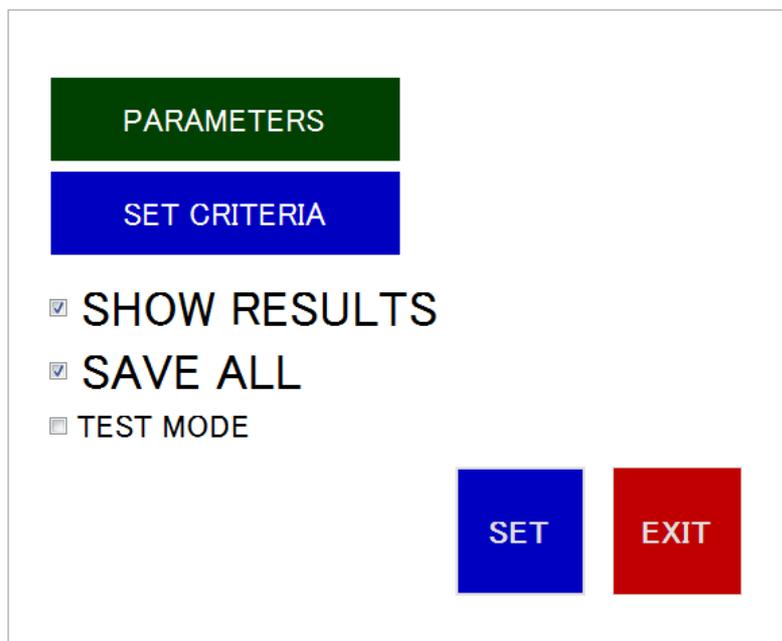


Figure 3.3-1 Set-up window

- There are 2 buttons and 3 checkboxes in the Set-up window. Please click “PARAMETERS” button to change parameter settings, and click “SET CTITERIA” button to change the criteria. Each checkboxes means as shown in Table 3.3-1.

Table 3.3-1 Description of the checkbox

SHOW RESULTS	Check to show the result on Measurement result table. (Figure 3.2-1)
SAVE ALL	Check to save all measured waveform automatically.
TEST MODE	Check to show the differential waveform between impact force and rebound force.

### 3.3.1 Set-up of Parameters

- Click “PARAMETERS” to set parameters. (Figure 3.3.1-1) Please do not change “HAMMER MASS”, “ACC. Sensitivity”, “POWER” and “CAL Value”.
- Click “HARD” to change hardware settings. (Figure 3.3.1-2)

PARAMETERS	
DRIVE	D:¥
SITE NAME	TEST
BOLT NAME	003
Bolt LENGTH	200
Bolt TYPE	CHEMICAL
HAMMER MASS	420
ACC. Sensitivity(mV/G)	0.51
POWER	1.2
CAL Value	1.5

HARD
SET
EXIT

DRIVE	Select the hard disk drive for saving measurement data
SITE NAME	Enter any given name or number of the site. The name will be shown as “SUBJECT NAME” on the Home screen.
BOLT NAME	Enter any given name or number of measurement target.
Bolt LENGTH	Enter the length of measurement target.
Bolt TYPE	Select the type of bolt. (chemical or mechanical)

Figure 3.3.1-1 Parameter setting window and description

ADC CONDITION

Sampling Clock(micro s) 0.5 ▾

Pretrigger Length(%) 10 ▾

Trigger Level(%) 20 ▾

Amp. Gain 2 ▾

MA Frequency(kHz) 20.0 ▾

SET
EXIT

Sampling Clock	Select the sampling duration
Pretrigger Length	Select the data length before the measurement trigger.
Trigger Level	Select level of signal to start the measurement. Large value will require more large impact.
Amp. Gain	Select the amplification level.
MA Frequency	Select the setting of Low-pass filter. Set the value as much as higher within waveform is smooth.

Figure 3.3.1-2 Setting window of hardware and description

- Hardware setting is the basic conditions of the measurement. Default settings are assigned assuming that the measurement is implemented on typical anchor bolt. These values can be changed by users as needed. Please make sure to assign appropriate values in case changing the values by yourself.

### 3.3.2 Set-up of Criteria

- Measurement results will be plotted in the Evaluation results area (Figure 3.3.2-2). X-axis shows Delay Rate, and Y-axis shows Rebound Rate.
- Green area means “Very good”, pink area means “Loose” and yellow area means “Good”. Users can assign the values for their criteria through the setting window (Figure 3.3.2-1) as needed.

SET UP	STANDARD	UPPER LIMIT	LOWER LIMIT
FORCE	0.6	1.5	0.05
REBOUND	1	2	0.05
TIME DELAY	0.5	1	0.25

SET
EXIT

Figure 3.3.2-1 Setting window of criteria

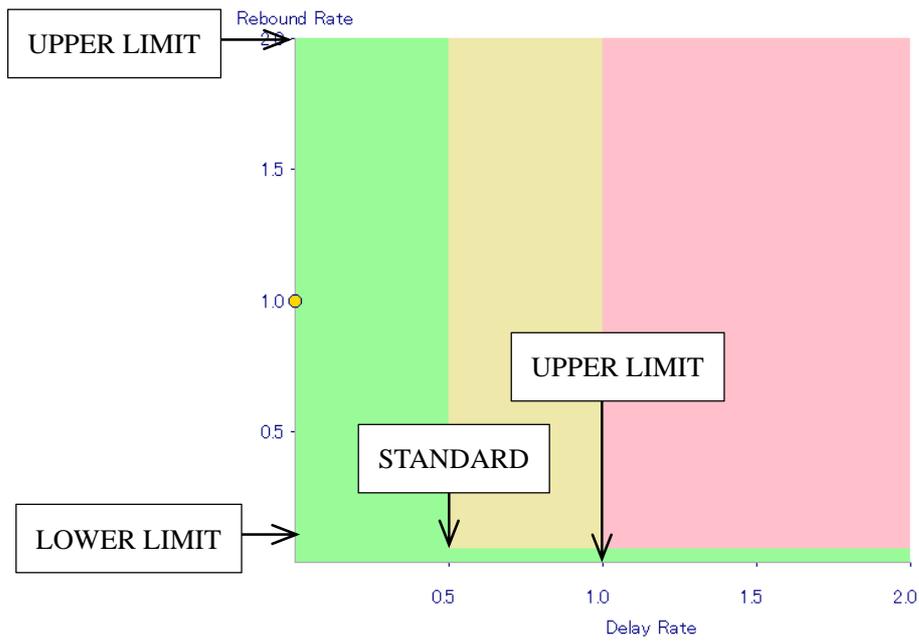


Figure 3.3.2-2 Plotting measurement result

#### 4. Measurement

- Please start the measurement after all the setting is ready. Click “MES” button and the button name will be changed to “HIT”. Also, please confirm “Waiting” is appeared on the bottom left (Figure 4-1), then start the measurement. For the bolt testing, please hit the test object at a right angle. For the nut testing, please hit side face of the test object. Measurement can be done in quick succession.

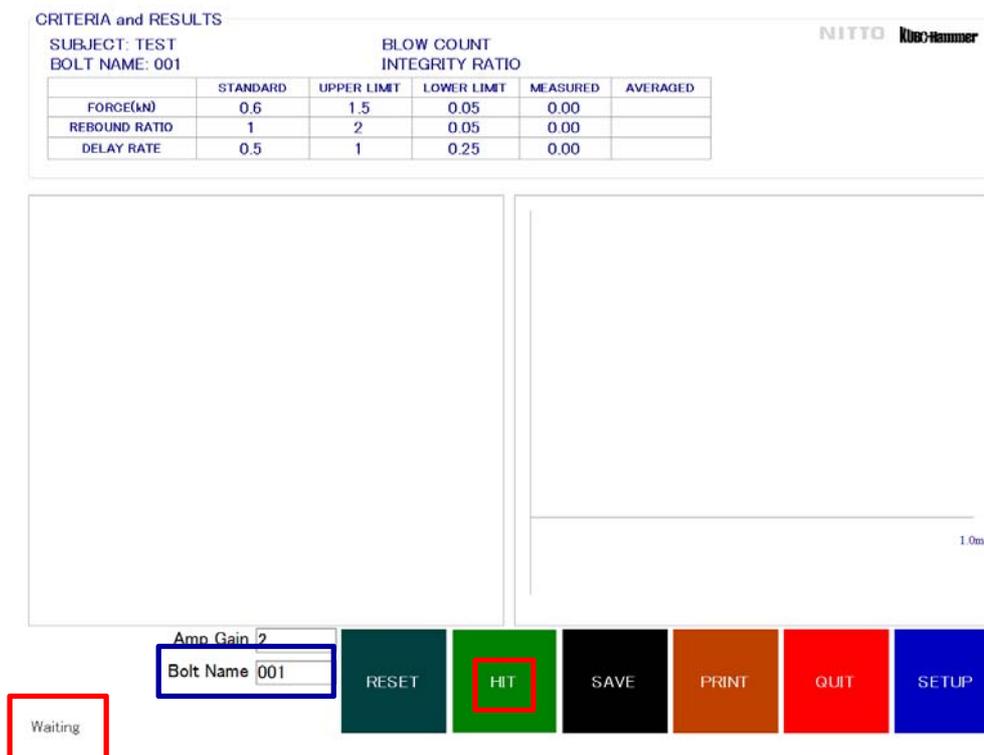


Figure4-1 Waiting screen



Figure4-2 After measurement

- After the measurement, Home screen will show the result as shown in Figure 4-2. Condition of test object can be determined by measured waveform in the right side, and the yellow point plotted in the left colored area. Relationship between the shape of waveform and the condition of test object is shown in Table 4-1.

Table 4-1 Type of Waveform and Evaluation

Very good (健全)	One peak, most likely symmetry.
Good (やや健全)	One peak, but wide.
Loose (非健全)	Two or multiple peaks.

#### 4.1 Save the measurement point

- Edit the “Bolt Name” when the measurement target is changed. Please click “HIT” button and confirm the button becomes “MEAS”. “Waiting” shown on the bottom left becomes “Stopping” at the same time. Then click the “Bolt Name” (blue line in Figure 4-1) on Home screen and dialog box as shown in Figure 4.1-1 will pop up. Change the name and click “SET” button to complete.

**BOLT**

Name

Length  mm

Diameter  mm

Bolt Type

Figure 4.1-1 Bolt Name edit dialog box

#### 4.2 Save the measured waveform

- All the measured waveform will be automatically saved when “SAVE ALL” is selected at the parameter setting. In case “SAVE ALL” is not selected, it is needed to click the “SAVE” button on Home screen each time after the measurement.
- Measurement results will be automatically saved regardless of the setting.

#### 5. Measurement data

- All the measurement data will be saved in “CTS\_BOLT” folder in the selected drive at the parameter setting.
- For example, if the site name is “TEST” and Bolt Name is “001”, a folder named “TEST” will be created in “CTS\_BOLT” folder. As shown in Figure 5-1, measurement results will be created as csv file with date of the measurement. Waveform data will be saved in the folder corresponding to its Bolt Name. Contents of the csv file is as shown in Figure 5-2.

Name	Date Modified	Type	Size
001	2015/12/25 17:52	ファイル フォル...	
002	2015/12/25 17:53	ファイル フォル...	
003	2015/12/25 17:53	ファイル フォル...	
2015-12-25-17-52-32.csv	2015/12/25 17:54	Microsoft Excel ...	4 KB

Figure 5-1 Saved data

	A	B	C	D	E	F	G
1	設定条件	#####					
2	SampleClo	0.5					
3	PretriggerL	10					
4	TriggerLev	20					
5	AccGain	0.51					
6	HammerMe	420					
7	VelcPow	1.2					
8	CalValue	1.5					
9	DriveName	D#					
10	SiteName	TEST					
11	BoltName	1					
12	ForceSTD	0.6					
13	TimeDelay	0.5					
14	RBNDSTD	1					
15	ForceUL	1.5					
16	ForceLL	0.05					
17	TimeDelay	1					
18	TimeDelay	0.25					
19	RBNDUL	2					
20	RBNDLL	0.05					
21	AmpGain	2					
22	MA_LEN	100					
23	No.	ForceMax	Rebound R	Time Delay	Rate		
24	1	10.04883	1	0	健全		
25	2	10.89608	1	0	健全		
26	3	8.984835	1	0	健全		
27	4	11.03401	1	0	健全		
28	5	15.52642	1	0	健全		
29	Bolt name was changed to :002						
30	1	12.43296	1	0	健全		
31	2	11.50689	1	0	健全		
32	3	11.90097	1	0	健全		
33	4	10.62023	1	0	健全		
34	5	10.02912	0.321694	1.710803	非健全		
35	Bolt name was changed to :003						
36	1	12.29504	1	0	健全		
37	2	13.14229	1	0	健全		
38	3	13.89103	1	0	健全		
39	4	11.46749	1	0	健全		
40	5	15.68405	1	0	健全		
41	Screen shot was hard copied						
42	Tested bolt 2						
43	No.	Type	Name	Rebound	DelayTime	Force	Integrity
44	1	2	C	1	0	11.29804	1
45	2	3	C	0.864339	0.342161	11.29804	0.8
46	3	3	C	1	0	13.29598	1
47							
48							

Figure 5-2 Contents of csv file

## 6. FAQ

Q: Measured waveform contains many ripples.

A: To make waveform smoother, lower MA frequency is recommended. Please note that too low MA frequency makes waveform too flat, and the result of the evaluation may changes to unsound side.

Q: Beginning of the waveform cannot be measured.

A: Please make the “Pretrigger length” longer or make lower the “Trigger Level”.

Q: Measurement data cannot be obtained by normal impact and need to hit stronger.

A: Please make the “Amp. Gain” larger or make the “Trigger Level” lower.

Q: Measurement starts unintentionally with weak impact.

A: Please make the “Amp. Gain” smaller or make the “Trigger Level” higher.

Q: Measurement results are not stable.

A: Please check the measured waveform. If there is an obvious deformation in the waveform, the hammer head may be loose. In this case, please contact the manufacturer for the repair. Another reason may be inappropriate MA frequency is set for the measurement. Please check and set the appropriate MA frequency for the measurement.

Q: Measurement count increases automatically without impact before the first measurement.

A: Trigger may be automatically actuated by previous data that remains in the data buffer. Please click the “RESET” button to delete the unnecessary waveforms after the device becomes stable.

Q: A dialog box says “No Device Error”.

A: Please check CTS-03 device is connected to the PC, or please check if the hammer unit is appropriately connected to CTS-03 device.

**Manufacturer**

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