General Instruction Manual

CRIMP FORCE MONITOR

CFM-Lite

Ver 1.5

UPDATED HISTORY

Version	Date	Updated by	Details
Version 1.0	2017.10.24	Masato Sato	
Version 1.1	2017.11.13	Masato Sato	1. Overview is updated
Version 1.2	2018.12.14	Masato Sato	1.2 description for dongle is updated
Version 1.3	2020.01.22	Suzuki Tomomi	Update functions of CFM-Lite (FW V1.17, SW V1.0.4.5)
Version1.4	2023.4.26	Tatsuya Yanagawa	Update functions of CFM-Lite (FW V1.35, SW V1.0.6.2)
Version1.5	2023.8.16	Tomoe Ishikawa	USB memory spec change

INDEX

1. Overview

1.1. Introduction

Crimp Force Monitor CFM-Lite is integrated into manual crimping machine or semi-automatic crimping machine, to check the crimp quality through monitoring crimping force.

All operations are performed via the LCD touch panel on the main unit. Standard settings and operations are simplified with only crimping force curve display and some buttons on the main screen, so that customers can handle it easily.

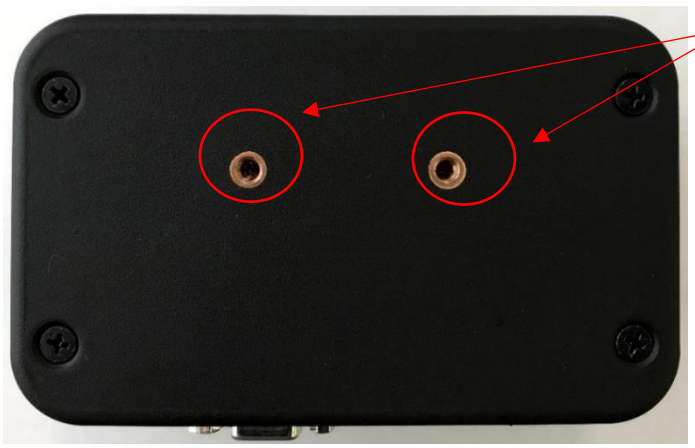
For further parameter settings, it is possible to set up from the PC software.

1.2. Main Unit and Accessories

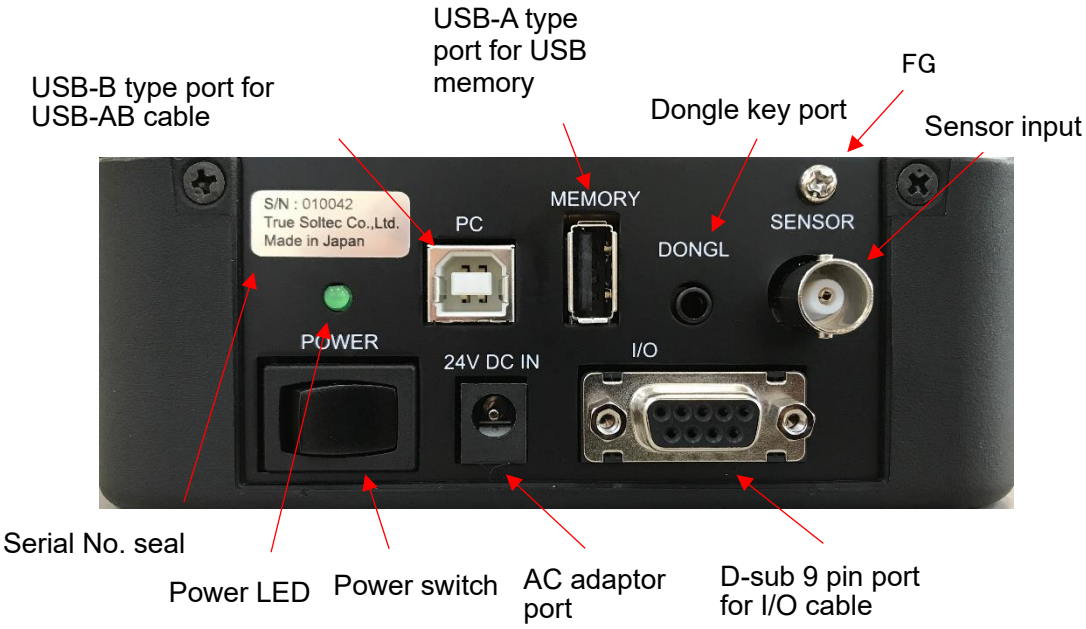
Front

Operations are performed via the LCD touch panel. Only the power switch locates at the bottom of the main unit.

Rear



Bottom



FG (Frame Ground) must be connected firmly to the earth via e.g. the earth terminal of the table tap, crimping machine, the formal earth terminal prepared by the factory in order to prevent the external noise.

Accessories

Packed together	**Non packed together**
CFM-Lite Main Unit	PC software (Download from True Soltec website)
Sensor: ・Standard: PSS type ・Others: FTW or FTC model.	General instruction manual and Installation manual (Download from True Soltec website)
BNC cable for sensor	PC (prepared by users)
I/O cable for control	USB-AB type cable (prepared by users)
AC adaptor	USB memory (prepared by users)
Dongle key (optional item)	
Mounting bracket	
Basic instruction manual (print)	

1.3. CFM-Lite Specifications

Outer dimensions	W 137mm x H 84mm x D 50mm
Analog sensor signal	Resolution 12bit Max sampling rate 20kHz
Sensor	FTW series (ring type force sensor, cable output, 0.1 to 10 ton) PSS series (piezo strain sensor, high /middle / low sensitivity models) FTC series (ring type force sensor, connector output, 2 or 4 ton)
I/O cable	Refer to “1.4. I/O pin assignment”
USB communication	1) PC communication (USB2.0) 2) USB data memory (Applicable connecting USB: FAT32 Max capacity 32GB)
Power	AC adaptor model: SPU16A-108 from SINPRO (Input: 90 ~ 264V, Output: 24V, 0.62A) Do not use any other power supply or adapter because these are out of warranty.
Operating temperature	0～40 degrees C, Humidity 90% or lower but no dew
Circumstances	RoHS regulation is performed.

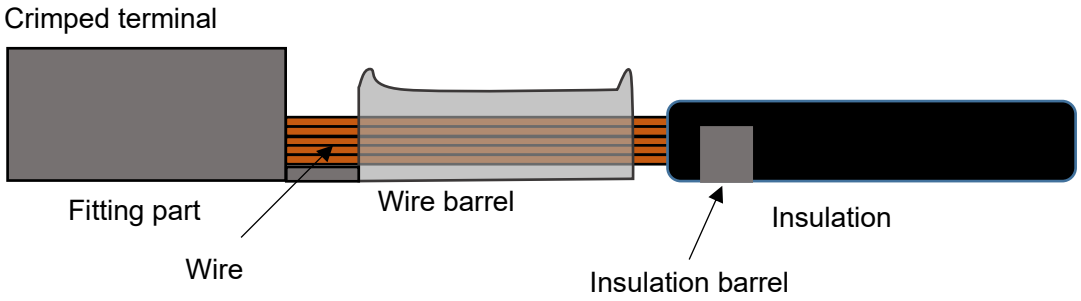
1.4. I/O pin assignment

PIN No.	Description		Wire color
1	Power	24V(output)	Orange/Black 1
2	TRIGGER	External trigger input	Orange /Red 1
3	RESET	External reset input	Yellow/Black 1
4	TEACH	External teach input	Yellow/Red 1
5	STOP	Stop signal (N.O)	Green/Black 1
6	STOP	Stop signal (COM)	Green/Red 1
7	STOP	Stop signal (N.C)	Gray/Black 1
8	EJECT	Eject output	Gray/Red 1
9	GND	Ground	White/Black 1

The above is the relay output of I/O pin assignment when the main unit is powered off.

1.5. Detectable Defects

This section describes all the defects that CFM-Lite can and cannot effectively detect, given the condition that crimping machines, applicators, and tools are in good performance.



Defects that can be detected nearly 100% (major defects)

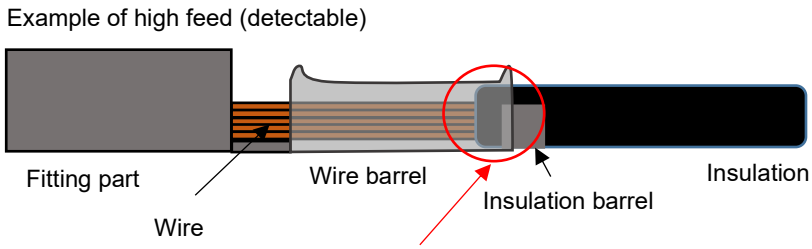
- No wire inside the crimp
- No strip crimp
- Double terminal crimp

Defects that can be detected depending on the working conditions

- Crimp height change +/-0.03mm
- 1 of 7 wire strands being cut or out: depending on the number of wires and wire size.
- High insulation and low insulation (high feed and low feed)

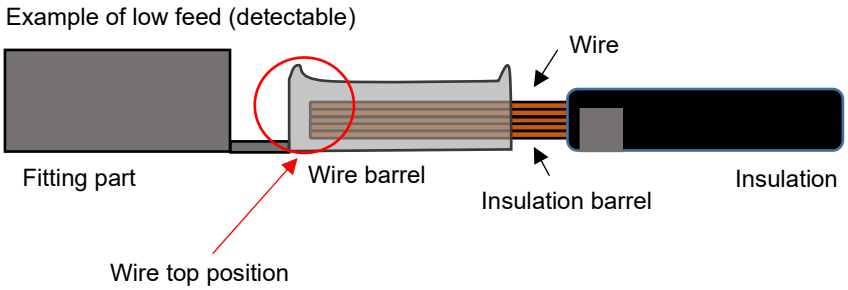
A) Defects that can be detected nearly 100% (major defects)

a) High feed (Wire barrel pinches the insulation)



This is the case where the wire barrel pinches the insulation (deep-feed defect). The total force applied onto the wire barrel increases, which generates a change on the crimping force curve. That's why CFM can detect it.

b) Low feed (Total volume of wire inside the wire barrel decreases)

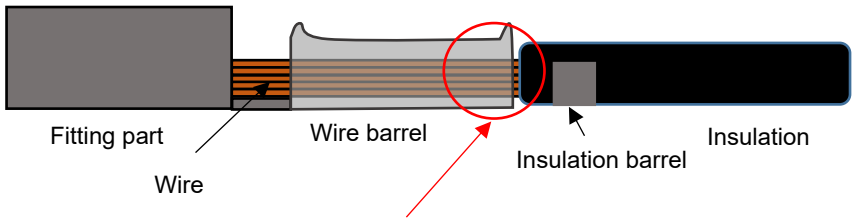


This is the case where the wire top position is pulled down and stays inside the wire barrel (low-feed defect). The total volume of wire inside the wire barrel decreases, which generates a change on crimping force curve. Therefore, CFM can detect it.

B) Defects that are difficult to detect

a) High feed (Wire barrel does not pinch the insulation)

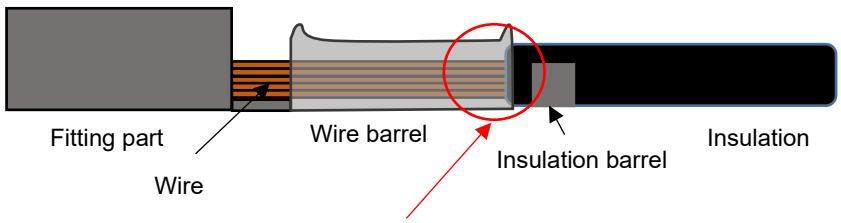
Example of deep feed (hard-to-detect case)



This is the case where the wire barrel does not pinch the insulation (deep-feed defect). The total force applied onto the wire barrel does not change, which means the crimping force curve does not change either. That's why it is difficult to detect.

b) High feed (The insulation is under the bell mouth, but not pinched by the wire barrel)

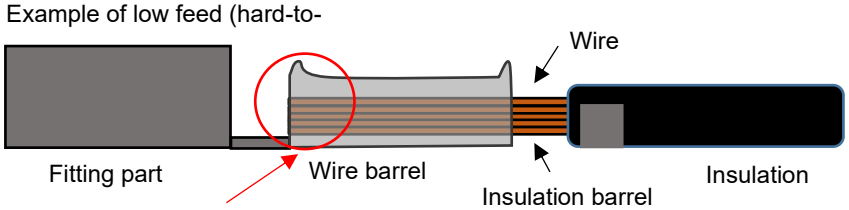
Example of deep feed (hard-to-detect)



This is the case of deeper feed than usual. The insulation looks like being under the bell mouth. It seems easy to detect this kind of deep feed but the insulation is not pinched into the wire barrel. In this case, the total force applied onto the wire barrel does not change. Neither do the crimping force curve. That's why it is difficult to detect.

c) Low feed (The total volume of wire inside the wire barrel does not decrease)

Example of low feed (hard-to-



This is the case of lower feed than usual. The wire top does not appear between the wire barrel and the fitting part window. It seems easy to detect this type of low feed. However, as shown in the above picture, if the total volume of wire inside the wire barrel stays the same, so does the total crimping force. That means the curve also does not change, which is very hard to detect.

d) Deformation of the insulation barrel

Unlike to the wire barrel, the crimping force applied to the insulation barrel is quite small. Therefore, even if the insulation barrel is deformed, the curve does not change significantly.

e) Wire strands are protruded outside the barrel and laid on the terminal

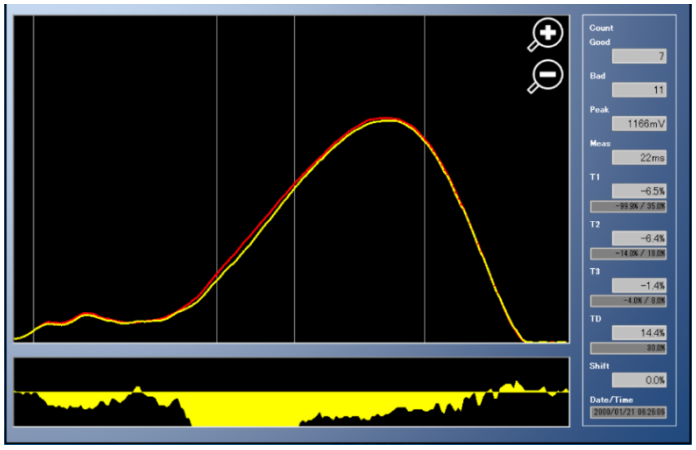
This is a defect where the strands go out of the wire barrel and is crimped on the outside of the barrel. The force curve does not change, because the total amount of pressure on the wire barrel does not change that much.

f) Fitting part defect

This is the defect of the fitting part. It does not make change to the force curve.

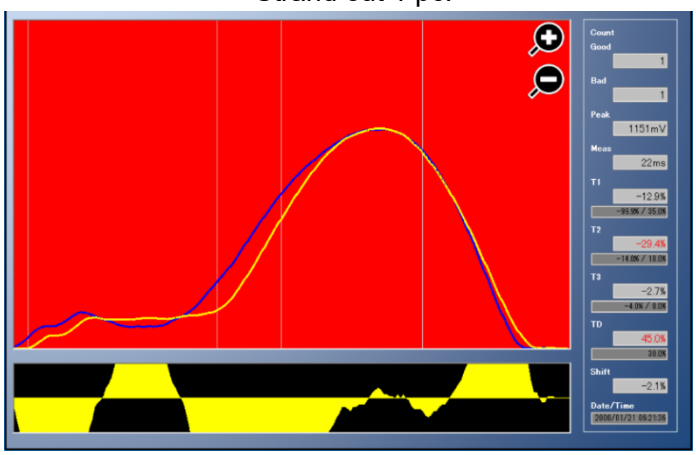
Below are the examples of good/bad crimping force curve with AWG20, 7 strands wire.

Good



This is a normal crimping force curve of a good crimp. The reference force curve (red) and the actual force curve (yellow) are the same in shape and size.

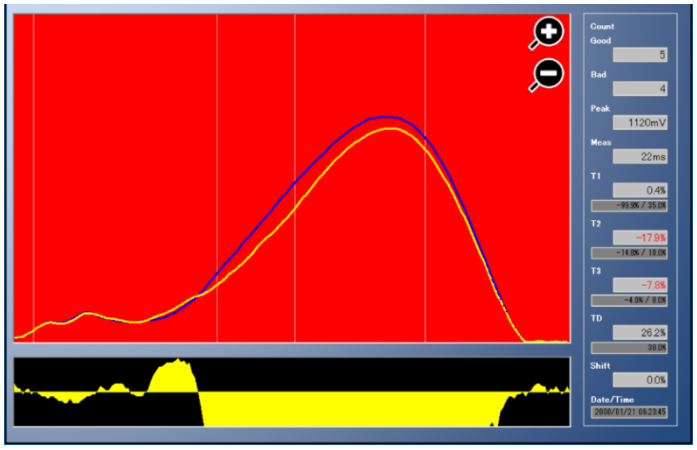
Strand out 1 pc.



The actual force curve is lower at all area, T1/T2/T3.

Crimped terminal sample (wire strand out 1pc.)

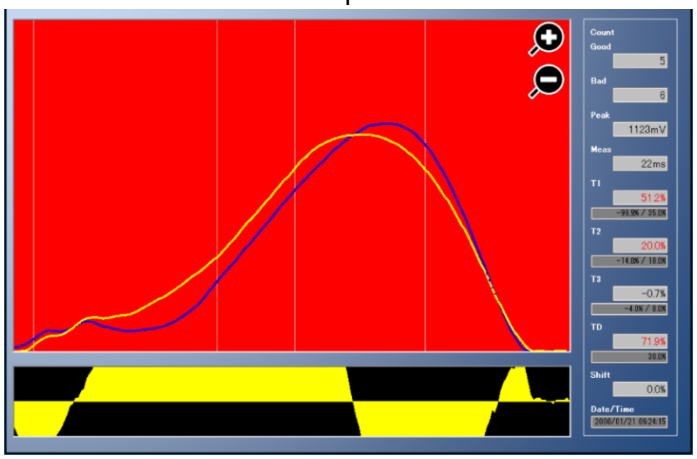
Strand out 2 pcs.



The actual force curve is lower at all area, T1/T2/T3.

Crimped terminal sample (wire strands out 2pc.)

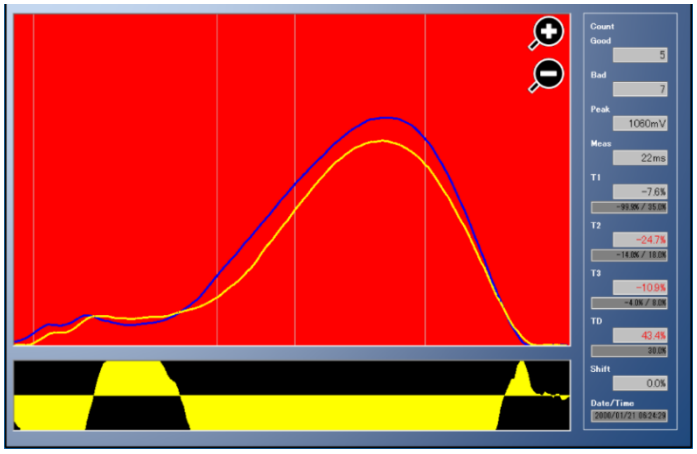
Deep feed



Due to an early touch to the insulation (not to the wire), the beginning of the force curve goes high at T1. Peak is smaller and earlier due to insufficient force on the wire.

Crimped terminal sample (High feed)

Low feed



This curve is of either strand being cut / out, or low feed. The force curve is lower at all areas T1, T2, T3.

Crimped terminal sample (Low feed)

1.6. Wire size

The smallest wire size that CFM-Lite can inspect, is AWG28.

2. Tolerance

CFM-Lite has 5 tolerance levels. No. 1 is the smallest, while No. 5 is the biggest. In each judgement area, if the result value (%) exceeds the +/- limit, CFM-Lite judges this is error.

Tolerance index (initial setting)

	T1+	T1-	T2+	T2-	T3+	T3-	TD
1	25.0	99.9	10.0	5.0	4.0	2.0	25.0
2	30.0	99.9	14.0	7.0	6.0	3.0	30.0
3	35.0	99.9	18.0	9.0	8.0	4.0	30.0
4	40.0	99.9	22.0	11.0	10.0	5.0	40.0
5	OFF	OFF	OFF	OFF	20.0	20.0	OFF

In index No. 5, T1, T2, and TD are initially OFF, only T3 is used for judgement. Specifically, CFM monitors only the peak of force curve at the lower dead point to detect major defects. These % can be changed from the PC software, by directly changing the numbers in the text box. See “3.2.4. Parameter screen (Logging in)”. If it is left in blank, it is set as OFF.

Description of each tolerance number:

1. Smallest tolerance. Recommended if you would like to detect 1 of 7 strands out or break. However, this would increase the number of false alarms (CFM says NG for good crimp).
2. Stricter than the standard. Small defects can be detected.
3. Standard tolerance. This tolerance is set by default. Small defects can be detected, while there are less force alarms. Its target is to detect 2 of 7 strands break or out.
4. Bigger (easier) than the standard. Major defects can be detected, while less force alarm.
5. Biggest tolerance. T1, T2, and TD are OFF, and not used for judgement. Only T3 is used for judgement to monitor the peak force at the lower dead point of the machine. The major defects can be detected and there are least false alarms.

3. CFM-Lite Operation

3.1. Main Unit

3.1.1. Start up

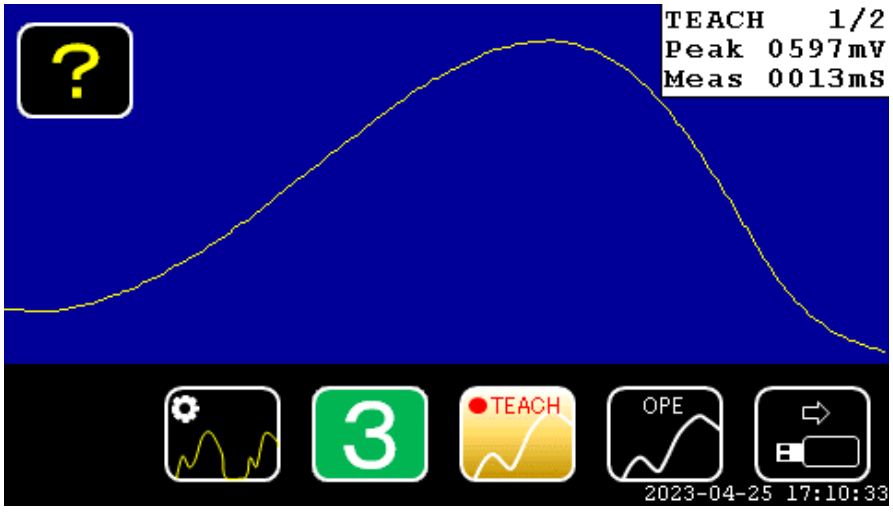
It is shown when the turning on the main unit.

It automatically goes to TEACH screen after 3 seconds.

3.1.2. TEACH

This is TEACH screen.

It switches to OPE screen when TEACH is finished or canceled.



Icon Description

	Help button. The start screen will appear upon tapping it. Press「X」to go back to OPE screen. It is hidden when the fluctuation icon (page 22) is shown.
	Auto Trigger Check button. Check if the current trigger level is suitable for the force curve of an item.
	Show the current Tolerance Number. Tap it to move to tolerance selection screen.
	TEACH button. After turning on, CFM-Lite automatically goes to TEACH mode. Here, CFM-Lite creates a reference force curve by calculating the average crimping force of 2 teaching samples (crimps). The teaching samples can be changed 2 ~ 5 from PC software (page 28). The default setting is 2. This reference curve is then used to compare with the actual curve of each crimp, to judge if this crimp is good or not.
	OPE (operation) mode. It is ON during production. Press this button to cancel TEACH mode and go to OPE screen. At this mode, CFM-Lite judges the crimp quality. If it is defective, CFM-Lite stops the machine operation.

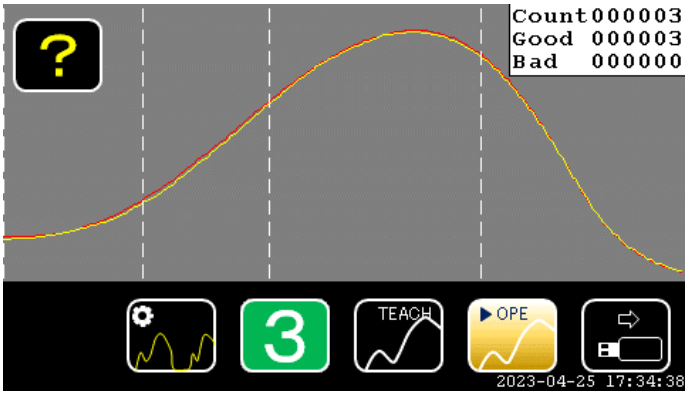
During TEACH: Description

Force curve display	The actual force curve is shown in yellow. The reference curve used for judgement is not showed. The magnification percentage of Y-axis, for adjusting force curve display size to the suitable one, is automatically set by monitoring the height of the first TEACH force curve. The magnification percentage is used until next TEACH.	
Numerical Display - Upper right corner (small window): Tap it to switch	TEACH	The actual crimp number after TEACH comes to the left of "/", the TEACH sample number comes to the right.
	Peak	Show peak force (kg/ kN/ lb). When calibration is 0, the peak value is displayed in mV.

to detailed display	Meas	Show measurement time of the force curve (right to left of the force curve screen) in mSec. This is automatically determined by CFM-Lite at TEACH mode.
Numerical Display - Upper right corner (details): Tap it to switch to simple display	T1:	Show judgement result of T1 When error occurs, it is shown in red.
	T2:	Show judgement result of T2 When error occurs, it is shown in red.
	T3:	Show judgement result of T3 When error occurs, it is shown in red.
	TD:	Show judgement result of TD When error occurs, it is shown in red.
	Shift	Display Shift value (%). This shows how far the actual force curve shifts from the original reference curve (Adaptive function). This figure is not used for judgement. See “3.2.4. Parameter screen (Logged on)” for more details. (page 25)

3.1.3. OPE (Operation)

This is OPE (operation) screen during production.



Description:

	TEACH button. Move to TEACH screen.
	OPE button. Here, CFM is already in OPE mode so this button is deactivated.

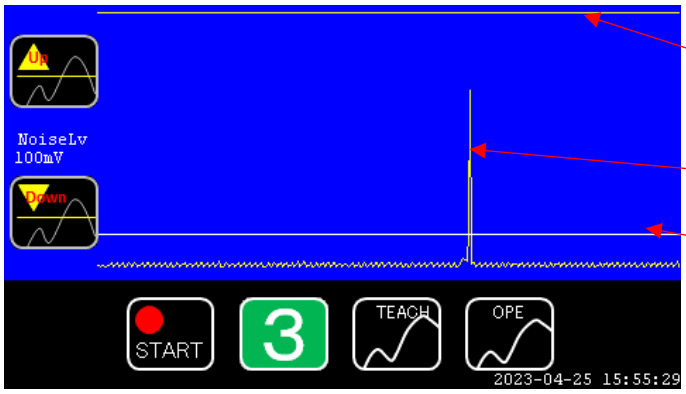
During OPE: Description

Force curve display	The actual force curve is shown in yellow. The reference force curve is shown in red.	
Numerical Display - Upper right corner (small window):	Count	Show the total number of crimps
	Good	Show the total number of good crimps
	Bad	Show the total number of defective crimps
Numerical Display - Upper right corner (details): Tap it to switch to simple display	Peak:	Peak force voltage is shown in mV.
	Meas:	Measurement time of the curve is shown in mSec.
	T1	Show judgement result of T1 When error occurs, it is shown in red.
	T2	Show judgement result of T2 When error occurs, it is shown in red.
	T3	Show judgement result of T3 When error occurs, it is shown in red.
	TD	Show judgement result of TD When error occurs, it is shown in red.
	Shift	Show Shift value

	CPK	Show CPK value. CPK is calculated based on the variation of measured value and tolerance of T2 area.

3.1.4. Auto Trigger Check

When Auto trigger function does not work well, you can check if the Trigger Level is correct.



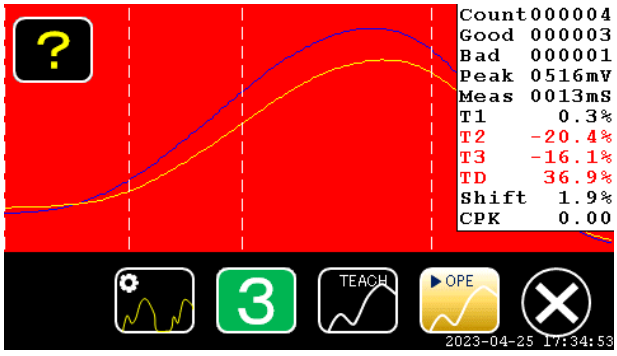
Description:

	CFM starts recording the output from the sensor in 5 seconds. When it is tapped, the voltage record of sensor is shown on the screen.
	CFM is acquiring the output of data from the sensor.
	Increase Trigger Level. It goes up by 20 mv at every tap.
	Decrease Trigger Level. It goes down by 20 mv at every tap.

3.1.5. Error screen

When an error happens, the whole screen turns red.

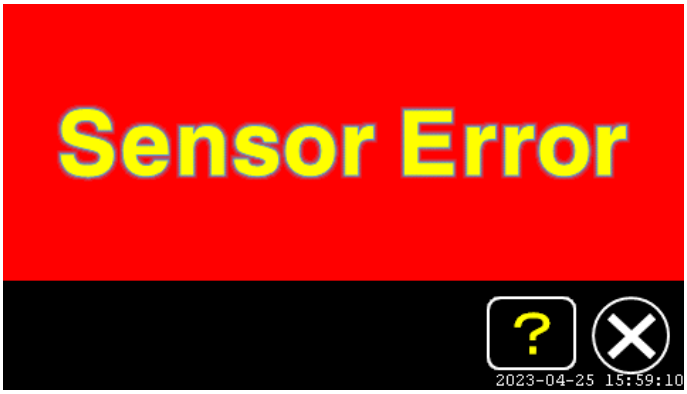
You can reset by pressing “X” button at the lower right of the screen.



3.1.6. Sensor Error

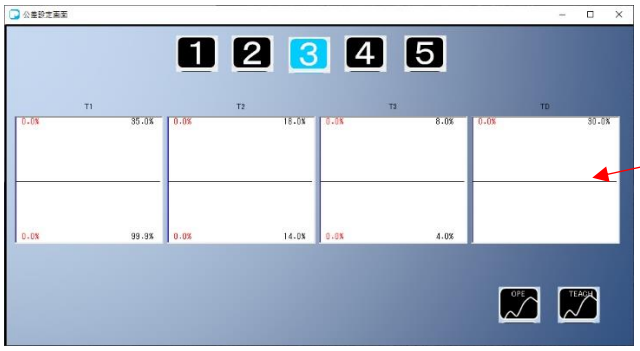
This screen appears when the sensor is not connected to the main unit.

After confirming the sensor connection, press X button at the bottom of the screen to reset it.



3.1.7. Tolerance Setting

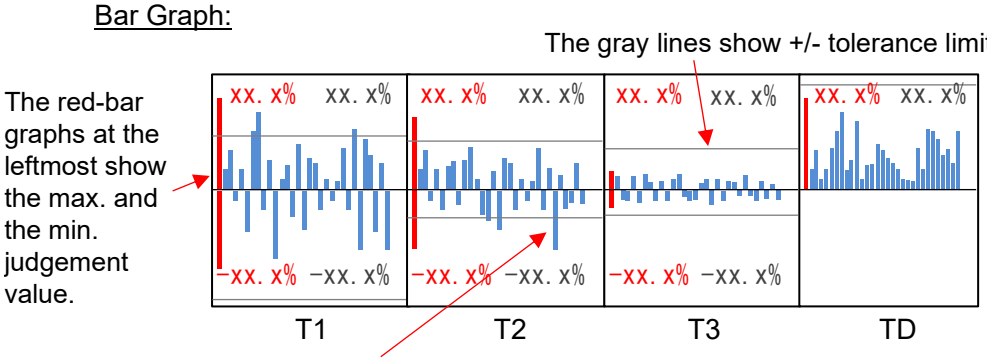
At OPE mode, press the tolerance number at the bottom of the screen to move to tolerance setting screen.



Description:

	Tolerance number button (unselected state) Tap your preferred tolerance number to activate it.
	Tolerance number button (chosen)

Bar Graph:

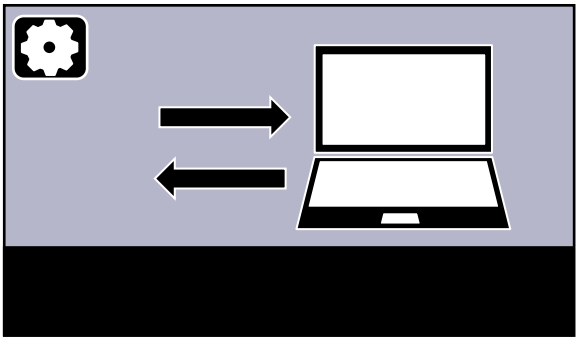


The blue bar graph shows the judgement values (%) of the latest 30 crimps. The graph above the central line represents for positive values, while the graph below this line represents for the negative values.

History of the latest 30 crimps (T1 ~ TD judgement results %) is displayed in the bar graph, which helps choosing a suitable tolerance level. The tolerance limits are displayed by 2 gray lines, and they will change corresponding to the tolerance number. The red graph bars at the leftmost show the max. and the min. % after TEACH. Red numbers are the values (%) of the max. and min limits, while gray figures show tolerance limits. The latest 30 crimps are shown by blue bar graph. "OFF" is shown in an area if that area is in OFF. This graph makes it easy to understand which tolerance number works best.

3.1.8. Parameter Screen

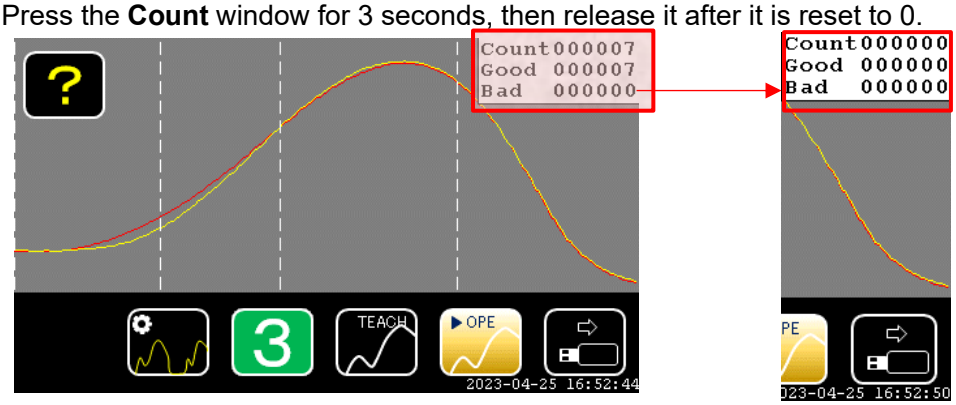
This screen appears when the parameter is opened on PC software. You cannot enter this screen when in OPE mode. It will be closed automatically when the parameter screen on the PC is closed.



3.1.9. Reset Counting

It is possible to reset the total count and Good/Bad count to 0

Press the **Count** window for 3 seconds, then release it after it is reset to 0.



3.1.10. Initialize Parameter

To initialize the parameter of CFM-Lite, press the logo True Soltec on the upper left of the screen for 3 seconds when it starts up.

※All Dongle protections should be on if CFM is initialized by inserting a Dongle key

※All Dongle protections should be off if CFM is initialized without a Dongle key.

Then appears a message of「Parameter initialized」at the bottom of the startup screen. Afterwards, the screen automatically switches to OPE screen.

3.1.11. Other Icons

	Fluctuation icon This icon appears at the same place with “**?**” icon when the Normal dispersion (see 3.2.16. “Head room” – page 39) of the peak force fluctuates over 1%. This is a warning that maintenance for the machine and applicator are needed. This shows the same information as “?” button by tapping it. If the peak force gets stable again, it returns to “?” icon.
	USB icon This icon appears at the same place with “X” button when an USB memory is inserted to the main unit. The USB memory can also be pulled out safely by tapping it.

3.1.12. Other Functions

The data of force curves is automatically saved in the USB memory (in form of a file) when it is inserted to the USB port of CFM-Lite. The file is named as “YYYYMMDDHHMMSS.dat” in the root folder of the USB memory.

YYYYMMDDHHMMSS means Year, Month, Date, Hour, Minute, and Second – the time when the USB memory is recognized by the main unit. When the main unit restarts, a new file is created and then saved to the USB memory. However, if the USB memory is pulled out and then inserted again without restarting the main unit, a new file will not be made, data will only be updated on the existing file. USB 1GB can save approx. 1.1 million crimp data. File size gets bigger when the number of data increases.

3.2. PC software（Pro-Lite）

Pro-Lite is a PC software which is used to control CFM-Lite.

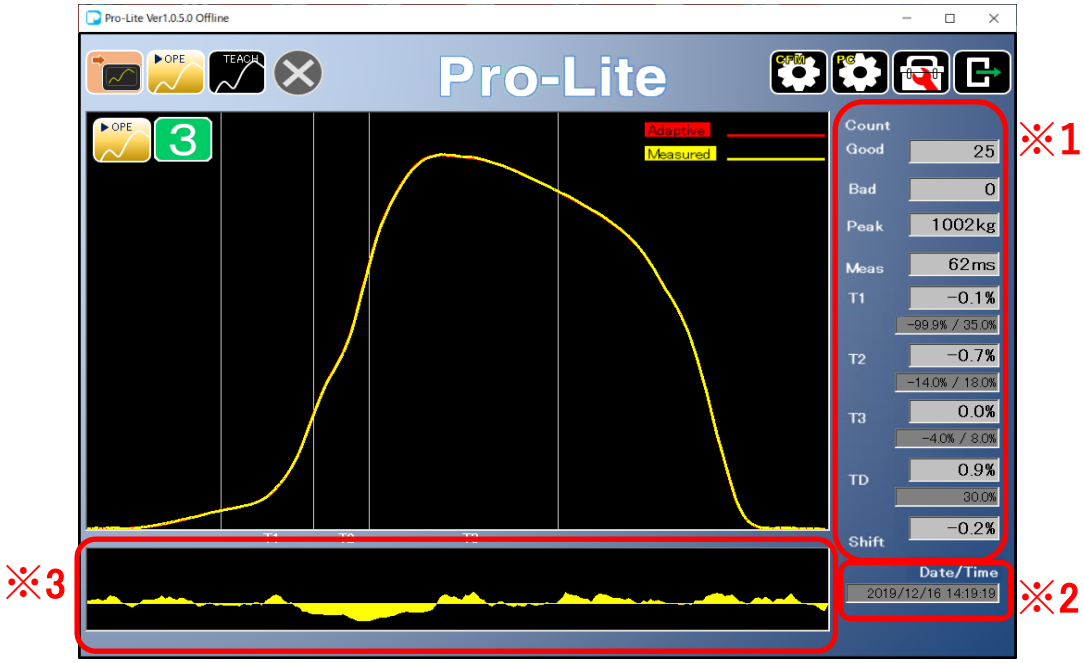
3.2.1. Pro-Lite Start up

Description:

	Connect or disconnect the communication between CFM-Lite and PC.
	OPE mode. Tap it → Both the main unit and PC go to OPE mode.
	TEACH mode. Tap it → Both the main unit and PC go to TEACH mode.

	Reset the main unit when an error happens.
	Move to Parameter screen for setting parameters.
	Open Configuration screen for changing settings of PC software.
	Open Utility screen, where force curve data can be saved or loaded.
	Close Pro-Lite

3.2.2. Example of Force Curve Display



※1 These judgement values are the same as in the main unit.

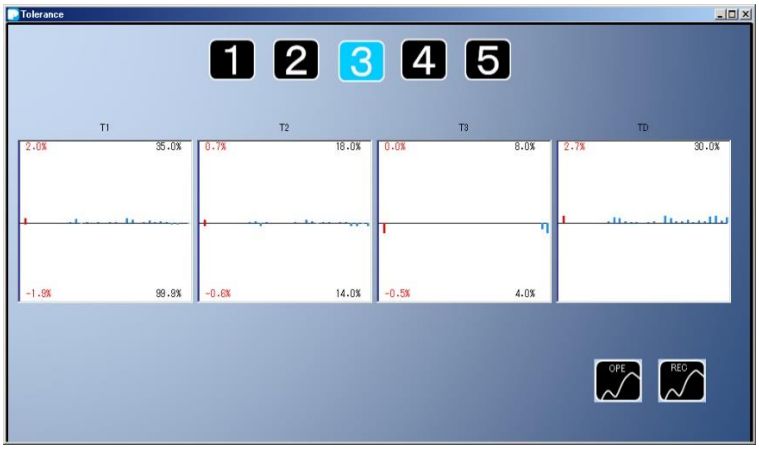
※2 Show the date & time of a force curve when it is captured.

This time is based on the clock in the main unit. If the clock is out of sync with the actual time, you can correct it from the PC software.

※3 This graph shows the difference between the actual force curve and the reference force curve.

	Tolerance number. Press it to move to tolerance setting screen.

3.2.3. Tolerance Setting



This works the same as in the main unit

3.2.4. Parameter Settings (Logged on)

This parameter is set as default in the main unit. It is possible to change it here.

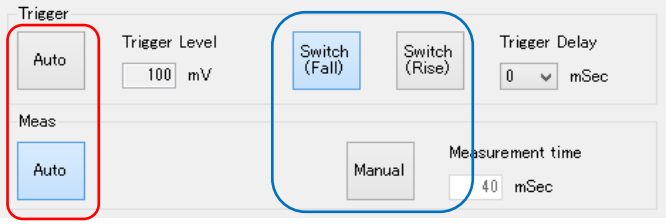
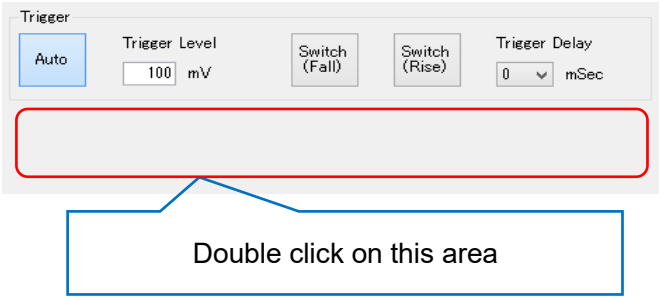
a) Descriptions of buttons

OK	All parameters are sent to the main unit. Then, close the screen.
Close	No parameter is sent to the main unit and close the screen.
Area Modification	Adjust the start and end line of T1, T2 and T3 areas. See 3.2.11 Area Modification (page 34) for details.
Brightness	Adjust the brightness of LCD screen on the main unit.
Preload	This is used for preloading the base plate to fix the base plate type sensor (FTW series), when PSS sensor is not used. For details, see “CFM-Lite installation manual”.

Auto Trigger Check	This is used for checking the possible causes when Auto Trigger does not work well. For details, see 3.2.14 Auto Trigger Check (page 36).
Head room	This can check how accurate the production with CFM works, like detecting error and how stable it is. See “3.2.16 Head room” (page 39) for details.
Download	All parameter settings are saved to PC.
Upload	A parameter file, saved on the PC, is sent to the main unit.

b) Description of parameter

Meas time mode	Adjust the capturing time for a force curve. When Short is chosen, the measuring time is 100ms. This is set as default. When Long is chosen, the measuring time is 500ms. **Long** is normally recommended for such machines with long measuring time, such as hydraulic press machines that have big force.
Trigger	Set the trigger where to start capturing a force curve. ・ Auto: CFM monitors the change of the force and automatically captures the force curve. Auto is recommended and set as default. ・ Switch (Fall): CFM monitors the status of the external trigger sensor to start capturing the force curve when the signal of external trigger sensor goes down. ・ Switch (Rise): CFM monitors the status of the external trigger sensor to start capturing the force curve when the signal of the external trigger sensor goes up. Fall or Rise are only used in special cases when Auto Trigger does not work well.
Noise Level	This becomes effective when Auto is chosen. When the force exceeds the trigger level limit (mV), CFM starts capturing the force curve. This is initially set at 100mV. The range is 20mV - 1000mV.
Trigger Level	When the second peak value (100%) memorized by the first run, the entire waveform is captured.

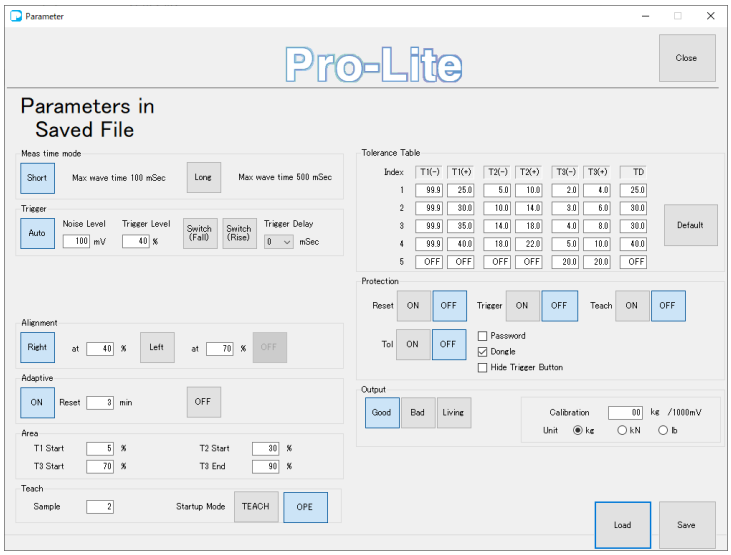
	When set to 0%, waveform acquisition will start with the noise level alone.
Trigger Delay	This becomes effective when Switch (Fall) or Switch (Rise) is selected. It delays the timing of starting capturing the force curve by the number set in mSec. This is used if there is a delay between the fall of machine ram and start of crimping. It can be set from 0/100/200/300mSec.
Meas	・ When Auto is chosen for Trigger, CFM automatically decides the time for capturing a force curve, by monitoring the shape and size of the force curve. Max. 100mSec for Short, and 500mSec for Long. ・ When Switch (Fall) or Switch (Rise) is selected, Manual mode becomes activated. Measurement time can be changed from 10 – 100msec.  To display **Meas**, double click on the below area while holding **Ctrl+Alt+Shift** 
Alignment	The actual force curve and the reference force curve are aligned in the same position to make correct judgement, because the force curve timing always varies, so they need to be aligned at every crimp. The aligning position can be set at right or left. This is initially set at 40% on the right,

	which means 40% of the height of the peak. In case of using servo crimping machine, it is suggested to set at 70% on the left, to make the judgement correctly.
Adaptive	Update the reference force curve during production, as the crimping force starts to change due to thermal elongation of the machine, after it is being used for a while. It works by calculating the average of latest good crimps to update the reference force curve. ・ ON: the reference force curve is updated at every crimp. ・ OFF: the original curve is used until the next TEACH is done. Normally this is set ON.
Reset	It is activated when Adaptive is ON. When the machine stops running for a certain period of time, the reference force curve updated by Adaptive, will be reset. This period can be set manually (Unit: minute). After being reset, the reference force curve returns to the original state (made in the last TEACH). After the machine starts again, the reference force curve is updated again.
Area	Adjust the judgement areas T1, T2, and T3 ※The curve peak's height is consider 100%. T1 Start The start point of T1 area is set by %. CFM searches from the peak to the left. The first point at which the specified % is reached, is defined as T1 start. T2 Start The start point of T2 area is set by %. CFM searches from the peak to the left. The first point at which the specified % is reached, is defined as T2 start. This point is also the end position of T1. T3 Start The start point of T3 area is set by %. CFM searches from the peak to the left. The first point at which the specified % is reached, is decided as T3 start.

	This point is also the end position of T2. T3 End The end point of T3 area is set by %. CFM searches from the peak to the right. The first point at which the specified % is reached, is decided as T3 end. See “4.1. Good/Bad judgement (T1/T2/T3/TD) for details.
TEACH	Set the number of crimps required for TEACH After finishing the number of crimps required for TEACH, CFM automatically goes to OPE mode.
Startup Mode	Switch the startup screen to TEACH or OPE
Tolerance table	Adjust the tolerance ranges / values (+/- for T1 ~ T3, and TD), for each level from 1 to 5. If 0 is set at a particular area (e.g. T2), that area is considered as OFF and the force curve in that area will not be judged. For details, see “2. Tolerance” (page 13)
Default	Reset the tolerance settings to its original state (+/- for T1 ~ T3, and TD)
Protection	This function is used to limit the access to CFM functions, of some specific users, e.g. Reset, Tol (tolerance adjustment). Only supervisor or those who knows the password or has a dongle can get access/ make modifications to all the functions. For instance, Dongle is chosen. TEACH If it is ON, a dongle key is required to activate TEACH on the main unit. Tol If it is ON, a dongle key is required to be able to change the tolerance number on the main unit. Reset If it is ON, it requires a dongle key to be able to reset on the main unit.

	Hide Trigger Button Hides the trigger level on the screen.
EJECT	Set the conditions for outputting the Eject signal. This signal is sent to the crimping machine each time the crimping is completed. Eject signal is 100mSec pulse signal output. ・GOOD: If the judgement is Good, Eject signal is output. ・BAD: If the judgement is Bad, Eject signal is output. ・Living: Outputs an EJECT signal that turns on/off every second.
Calibration	Enter how many kg at which the sensor output 1000mV. Each type of sensor will have different values.
Unit	Select the unit of peak force to display on the screen (kg / kN / lb). When calibration is set at 0, the peak force will be displayed in mV, instead of the load value.
Date Time	Sync the date and time of the PC with the main unit, after clicking the button “Send PC time to Pro”

3.2.5. Parameter Settings (Logged off)



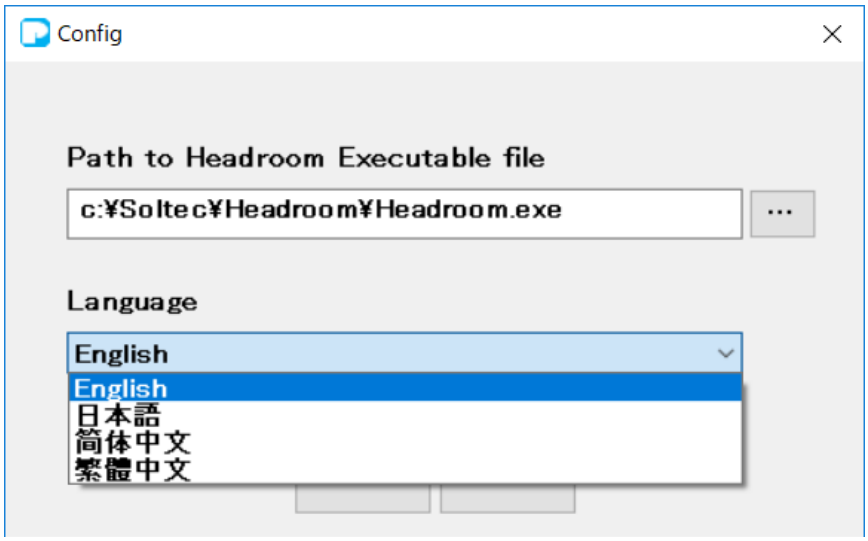
This screen is to view or change the parameter settings saved on the PC.

Description:

Save	Save the current parameter settings on the PC as a file
Load	Upload a file from PC.

※Other buttons work the same with when logged on.

3.2.6. Configuration Settings

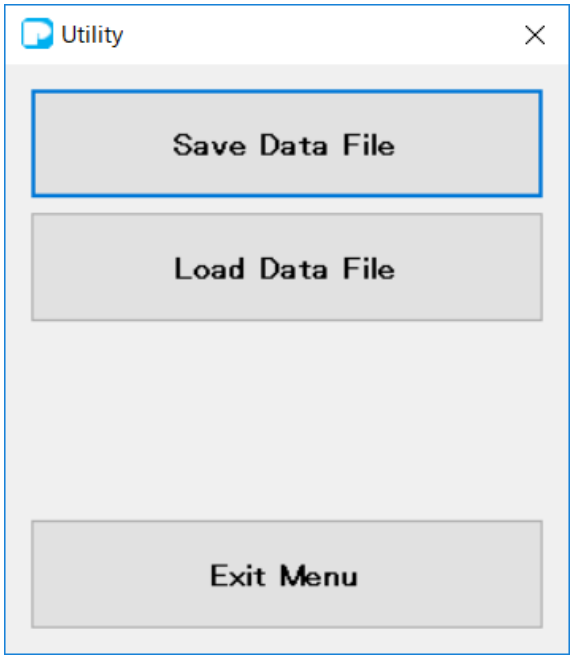


Set the configuration of PC software.

Description:

Path to Head room Executable file	Set the executable file path in the folder where Head room software is installed. Normally this is fixed.
Language	Choose a language to display on Pro-Lite. Japanese, English, and Chinese are available.
OK	Save the current settings, then close the window.
Cancel	Discard the current settings and close the window.

3.2.7. Utility Settings

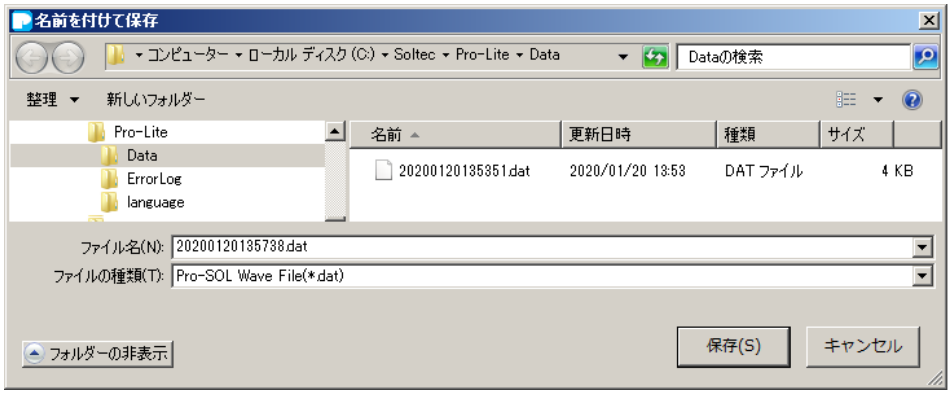


Save Data File	Save the force curve data collected by **Pro-Lite** as a file.
Load Data File	Open the force curve data file saved in PC
Exit Menu	Close Utility screen.

A) Save Data File

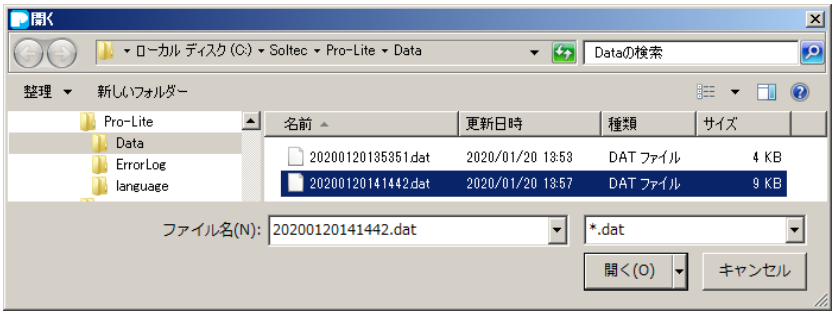
Click「**Save Data File**」button → **Save as** dialog box appears → Choose a location to save the curve data → Enter a name, then press Save

The default file name includes year, month, day, hour, minute, second (YYYYMMDDHHMMSS.dat)

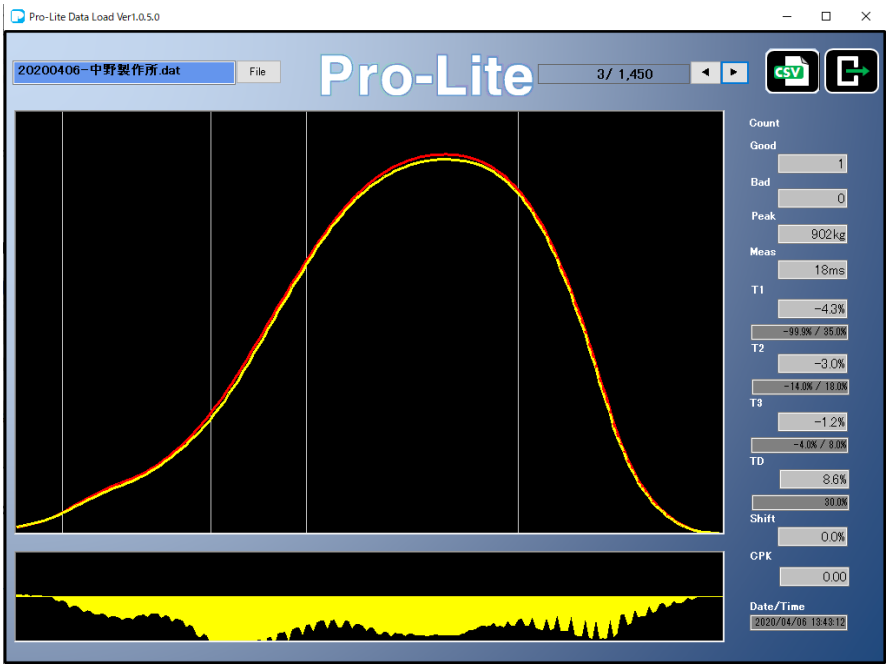


B) Load Data File

Press「**Load Data File**」button → At the popped up window, select the file you want to view and click **Open**.



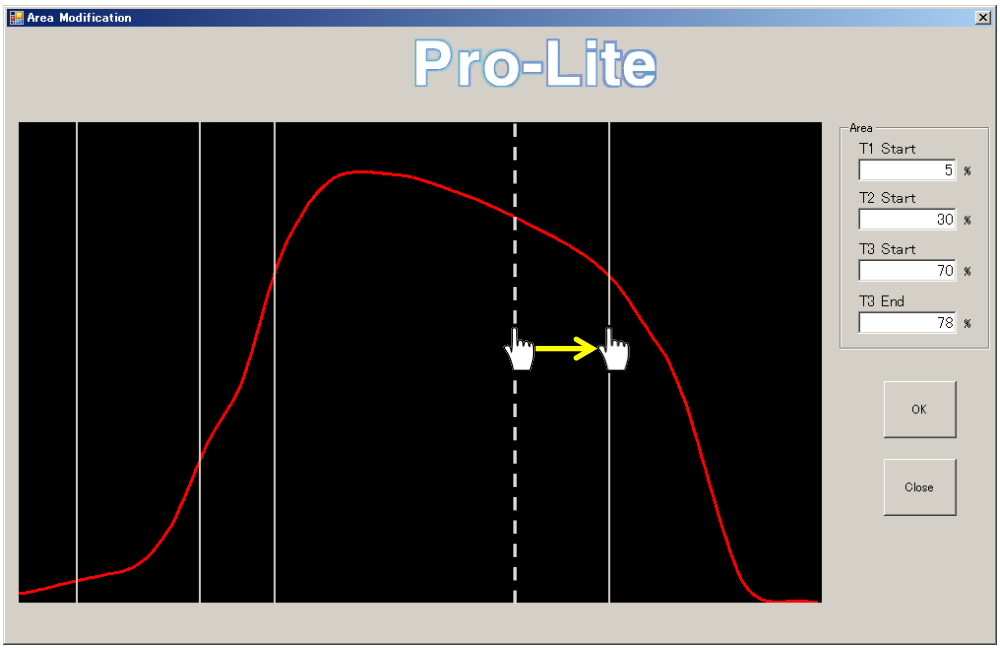
3.2.8. Display Force Curve Data



Description:

File	Reselect the file you want to view
◀ ▶	Move forward or backward
CSV	Save this force curve data file in Excel format Click「CSV」button → **Save as** dialog appears → Choose a location for the file → Enter a name, then press **Save**
	Close this screen

3.2.9. Area Modification



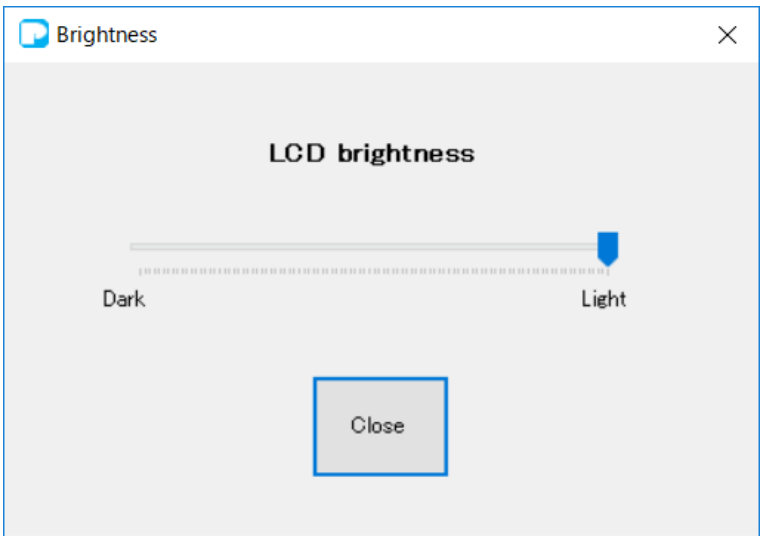
It is possible to adjust the judgement areas T1, T2, T3 by one of the following ways:

- Change the values of each area
- Drag and drop the vertical lines to your preferred positions

Description:

OK	Save the current settings, then close the window
Close	Discard the current settings and close the window

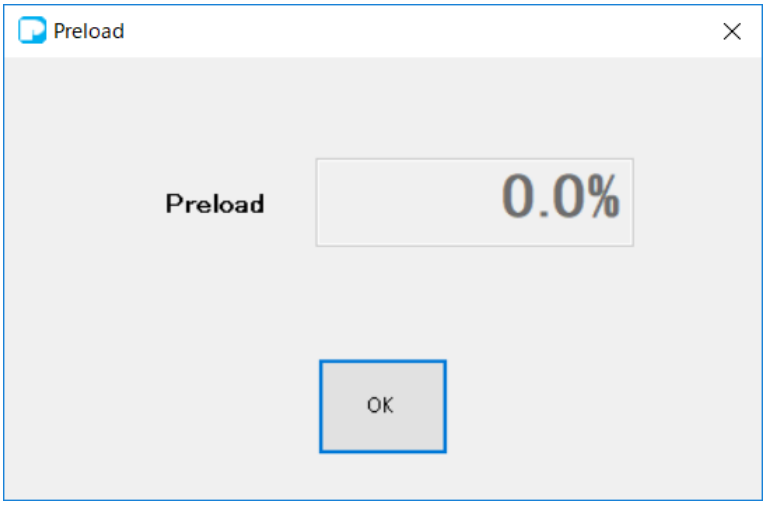
3.2.10. Brightness Adjustment



Brightness of the LCD screen on the main unit can be changed by moving the slider bar.

Close	Save the current setting and close the screen

3.2.11. Preload Setting



This is used for sensor preload.

When this screen is opened, it is ready to preload. Preload value (%) increases when preload is applied to the sensor. When the rate (%) reaches to 10 - 20%, preloading is finished. Each sensor has different certain value.

PSS sensor does not require preloading.

OK	Save the current setting and close the screen

3.2.12. Auto Trigger Check

This function is used for checking Auto Trigger when it does not work correctly, by capturing raw force data.

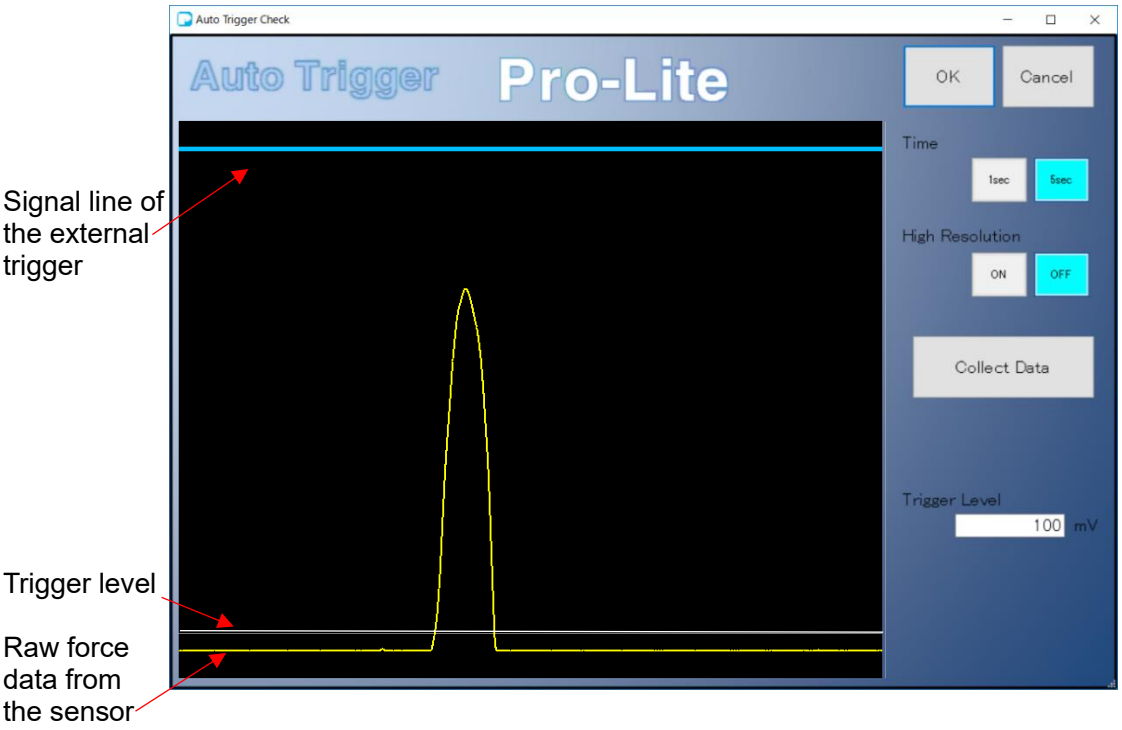
Description:

OK	Save all settings to Parameter and close the window.
Cancel	Discard all settings and close the window.
Collect data	Press this button → CFM starts collecting raw data from the sensor in a certain period of time, which is set at **Time**.

Settings

Time	Set up time to capture raw force data. You can select either 1 sec or 5 sec.
High Resolution	Set the data sampling rate You can choose either ON [5kHz] / OFF [500Hz]
Trigger Level	This is set to draw a line showing Trigger Level to compare with the raw data from the sensor. After clicking OK, this value is automatically reflected in Parameter.

3.2.13. Capture raw force data



Description:

Blue line	This shows the status of the external trigger sensor. It is in open contact of the trigger sensor when this line is on top of the screen It is in close contact of the trigger sensor when it is at a lower position
Yellow line (Force curve)	Show raw force data captured by the sensor.
White line	Show Trigger Level.

First, press「**Collect Data**」button, then do crimping

Usage:

(1) Use an external trigger sensor

Check the position of the upper blue line and the yellow force curve.

If they are far apart from each other, either adjust the external trigger sensor or set appropriate Trigger Delay.

Trigger Delay (mSec) is set in Parameter screen (page 25)

※The width of the screen (right to left) is equivalent to the time set in **Time** (1s or 5s).

(2) Use Auto Trigger

The peak of yellow force curve line must exceed the White line in order to activate Auto Trigger to start capturing the force curve.

→ Set appropriate Trigger Level until the peak of the yellow line passes the white line.

(3) Common Use

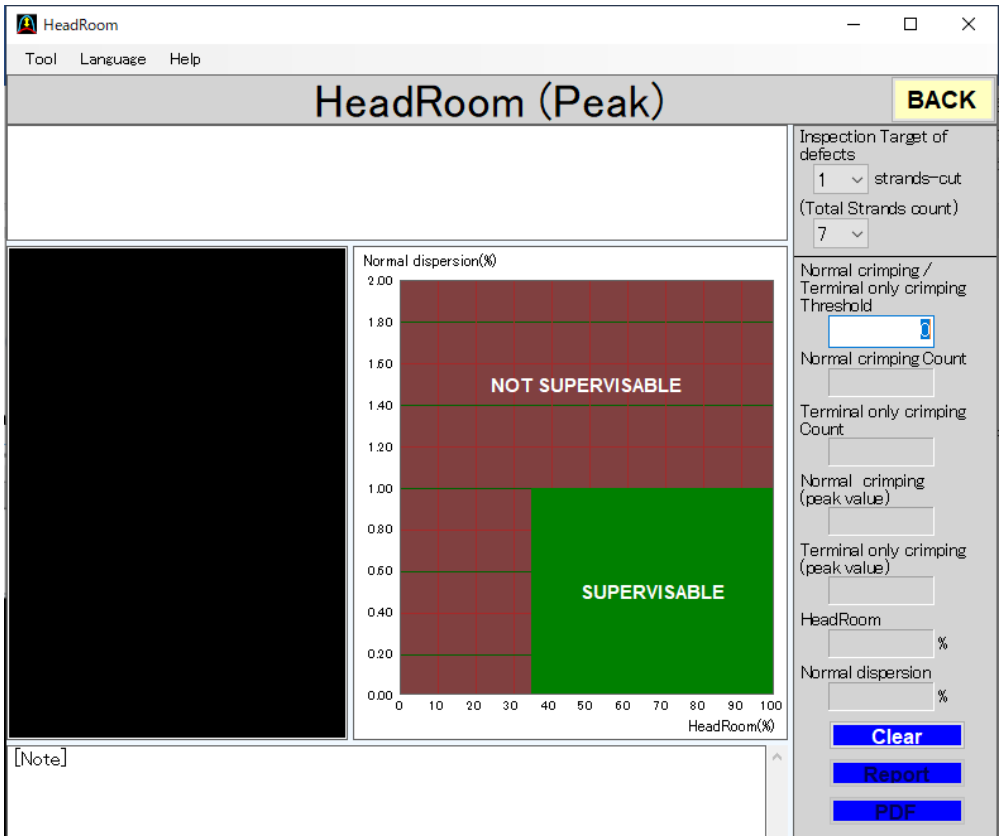
If the yellow line does not show any changes when the terminal is crimped, it may be due to sensor malfunction or miss-installation.

→ Either check the status of the sensor or replace it with a new one if necessary.

Or if the change of the yellow line is so small, the sensitivity of the sensor may probably not match the crimping devices.

→ Replace it with a more sensitive sensor.

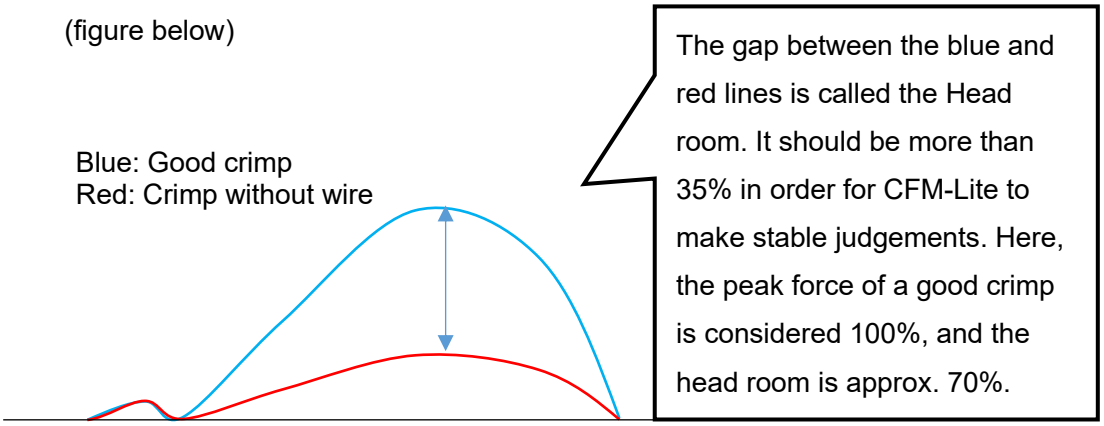
3.2.14. Head Room



The performance (accuracy) of CFM-Lite depends on the combination of the terminal and wire, as well as the condition of the crimping machine and its applicator. In order to inspect how accurate CFM can work as “a monitor”, you can refer to 2 indicators: Head room rate (%), and Normal dispersion rate (%).

Head Room (%)

It shows the difference between “the peak force of a good crimp” and “the peak force of a crimp without wire”. The peak force of the good crimp is considered 100% (figure below)



Normal dispersion (%)

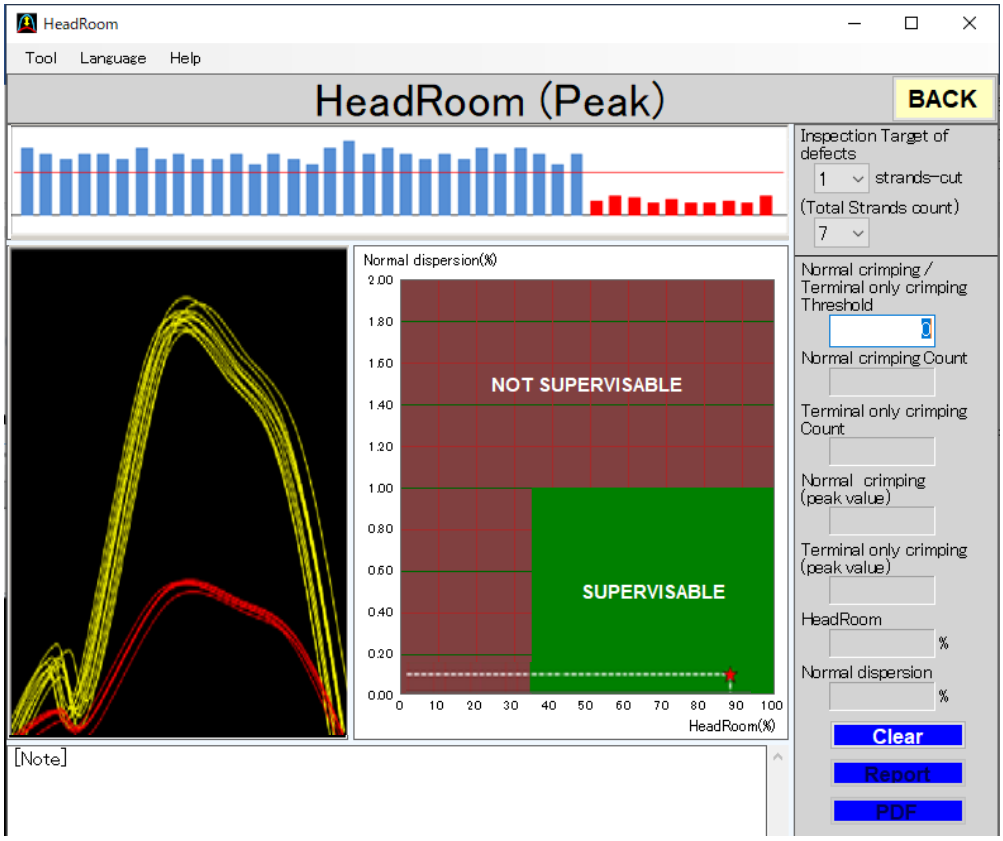
Normal dispersion shows how much the peak force fluctuates. This figure should stay less than 1% in order for CFM to make stable judgements. It works by collecting the peak-force data of 30 good crimps, and then automatically calculating the average of them in %.

At Head room, these 2 indicators are calculated and shown on the screen, which helps customers understand more easily.

1. How to use Hear Room

A) Collect Data

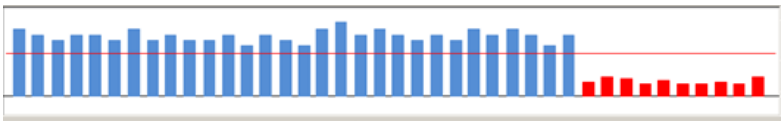
After opening Head Room, makes 30 pcs. of good crimp, and 10 pcs. of crimp without wire. A bar graph and a force curve of each crimp appear after each crimping.



B) Setting Threshold

At the bar graphs, drag the red horizontal line to between the gap of good crimp and crimp without wire.

→ All the graphs over the red line will then turn blue, whereas those below the red line are shown in red (picture below). Make sure the graphs of good crimps are in blue, and of crimp without wire are in red. Now, Head room is ready to use.



C) Check CFM judgement stability

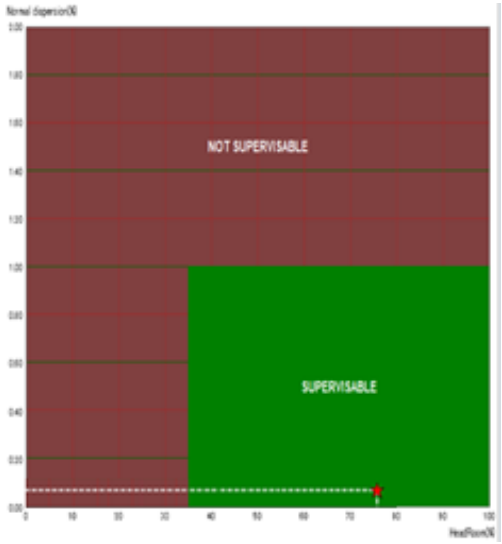
A star mark appears in the matrix of the Normal dispersion (%). Y axis stands for Normal dispersion (%), while X axis stands for Head room (%).

If the star is within the green “Supervisable” area, it implies that CFM can make the stable judgements (below picture). However, if the star is in the red “Not Supervisable” area, CFM may probably make unstable judgement.

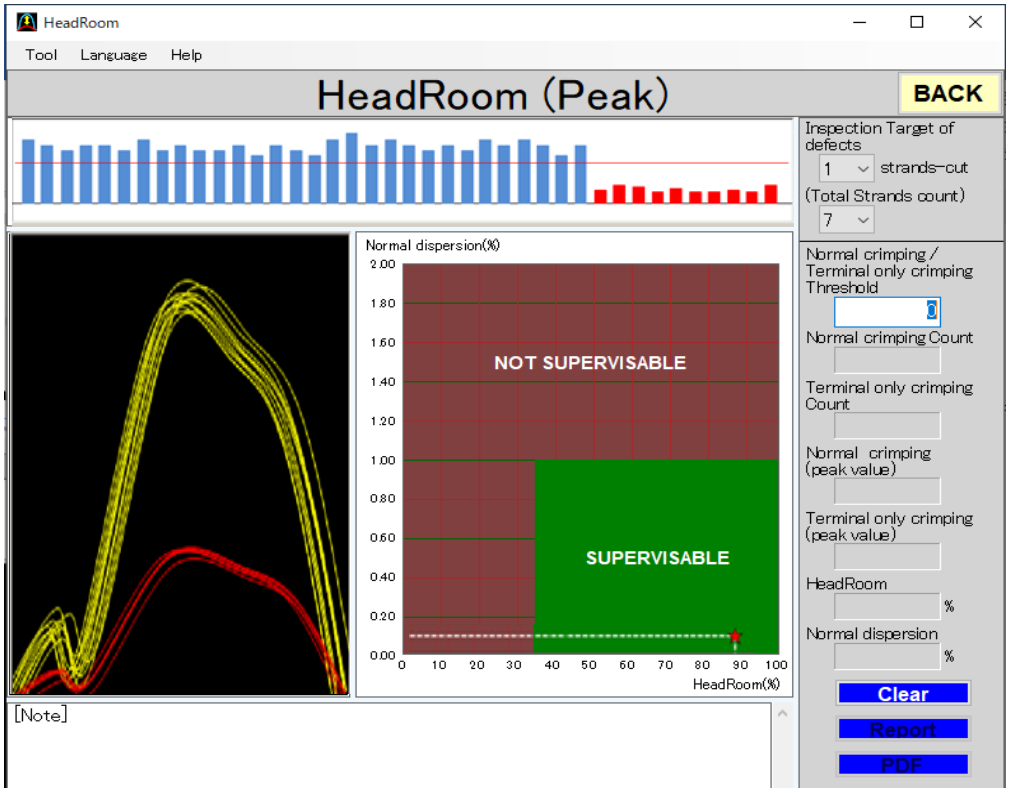
In this case, check the condition of the equipment (e.g. applicator). Then, do the crimping again (30 good crimps and 10 crimps without wire) and confirm whether the star moves to “Superviable” area.

If it doesn’t appear in the green area even after the maintenance, the combination of the terminal and the wire are probably incorrect.

In such cases, the detectable scope is only limited to major defects (no wire, no strip, or double terminal). Also, you should loosen the tolerance to reduce the number of false alarms. Such defects, e.g. low feed or high feed, have to be visually checked by staff.



2. Other Settings



Description

Tool	Select an item to measure in the Head room (Peak/ T1/ T2/ T3) The measuring unit changes according to the selected item.
Language	Choose language
Help	Display software version
Back	Close Head room
Clear	Clear all data on the screen
Report	Print data on the screen

Other Settings

Inspection Target of defects	Choose 1 if you would like to detect 1/7 strands out/ break However, the “Supervisable” area becomes narrower. Increase the figure of wires (e.g. 2/7, 3/7) will expand the “Supervisable” area.
Total Strands count	Select 7 if you prefer to detect 1/7 strands out/ break. Select 19 if you would like to detect 1/19 strands out. In case of 19, the “Superviable” area is smaller than 7.

Normal crimping / Terminal only crimping Threshold (※)	This figure represents the position of the red horizontal line in the bar graph (mV). Either entering a new number or directly dragging the line will change this threshold.
Normal crimping count (※)	Count the number of good crimps, which have the peak force higher than "**Normal crimping/ Terminal only crimping threshold**"
Terminal only crimping count (※)	Count the number of bad crimps, which have the peak force lower than "**Normal crimping/ Terminal only crimping threshold**"
Normal crimping (peak value) (※)	Show average peak force of all good crimps
Terminal only crimping (peak value) (※)	Show average peak force of all crimps without wire
Head Room (※)	Calculate data of all crimps and display Head room rate (%)
Normal dispersion (※)	Calculate data of all good crimps and show Normal dispersion rate (%)
Note	Enter note that you want to keep on the report when printing it.

3.2.15. Communication Error

This dialogue appears when a communication error occurs during logging on

Description

Retry	Try to connect with CFM-Lite again. Check the power of the main unit and the connection of USB cable.
Cancel	“Switched offline as a port error occurs” window pops up. Click OK → Stop the communication with the main unit and log off

Log off message

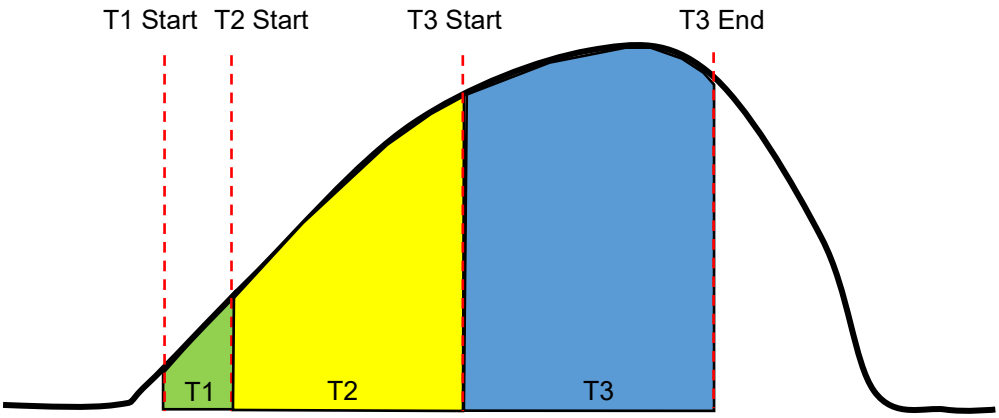
4. Technical Description

In this section, the details of each function will be explained further (e.g. how to maintain the system, how to upgrade the program, etc.)

4.1. Good / Bad Judgement (T1/T2/T3/TD)

After being captured, a force curve is automatically divided into 3 areas: T1, T2, and T3. In each area, this actual force will be compared with the reference force. If it is within the tolerance, this crimp is considered good and vice versa.

Division of the force curve



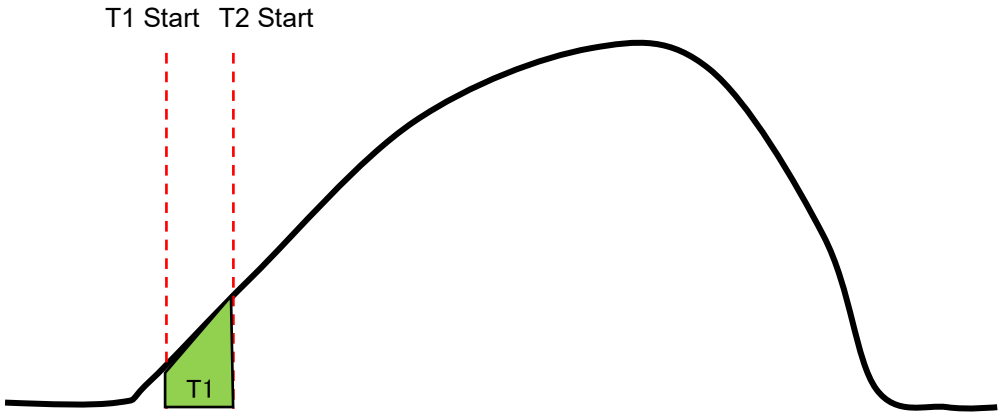
The judgement areas are spitted in the following ways:

A. The peak force's height is considered 100%. CFM searches from the peak to the left. The point that is 5% of the peak is set as T1 Start position.
B. Similar to T1 Start position, CFM searches from the peak to the left. The point that is 30% the peak is set as T2 Start position.
C. Similar to T2 Start position, CFM searches from the peak to the left. The point that reaches 70% of the peak is called T3 Start position.
D. CFM searches from the peak to the right. The point that is 90% of the peak force is T3 End position.

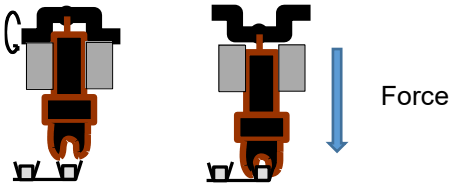
The above division of the force curve is set at TEACH based on the reference force curve, and used during OPE mode till next TEACH is done

T1, T2, and T3 area can be changed by adjusting xx percent of the peak force. See "3.2.4 Parameter screen (Logged on)" for more information.

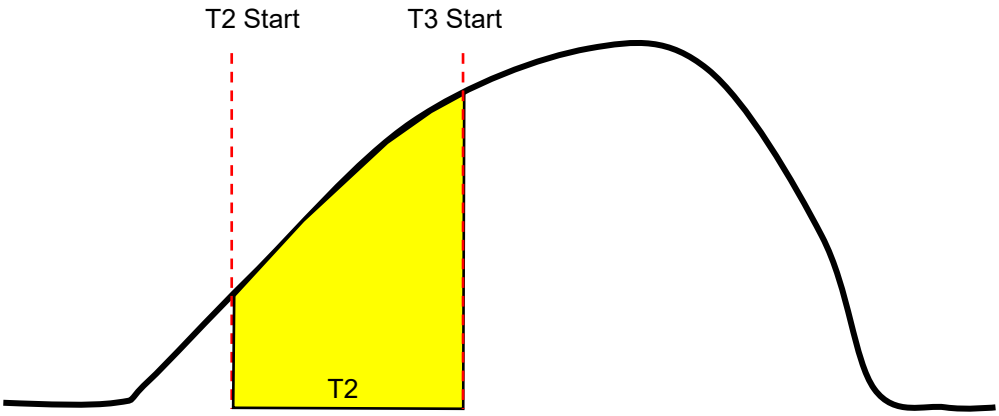
T1 area



T1 area corresponds to the start of crimping the terminal. The crimping tool starts touching the terminal, the wire barrel is pushed down, and the force increases, then the force curve goes up.

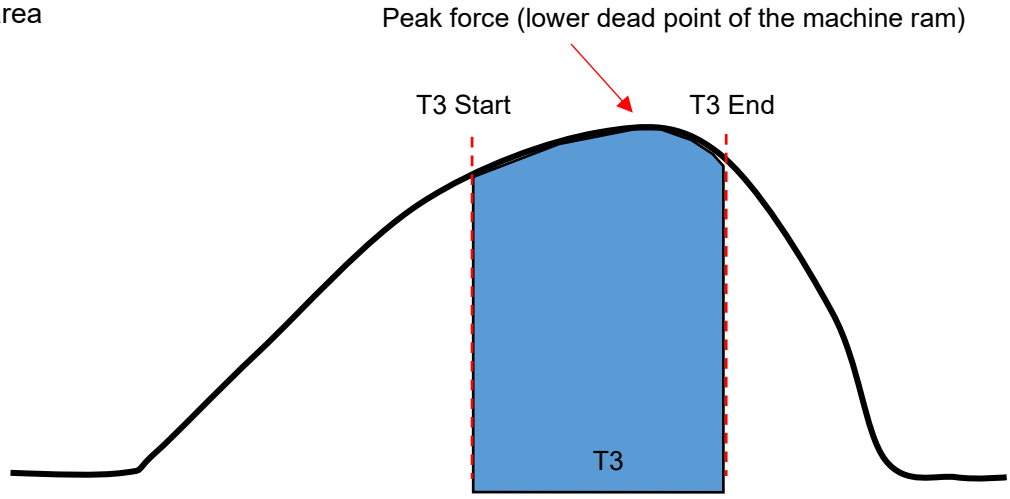


T2 area



T2 area corresponds on the way of crimping the terminal. The crimping tool is touching the terminal, the wire barrel is pushed down, and the wire is being compressed.

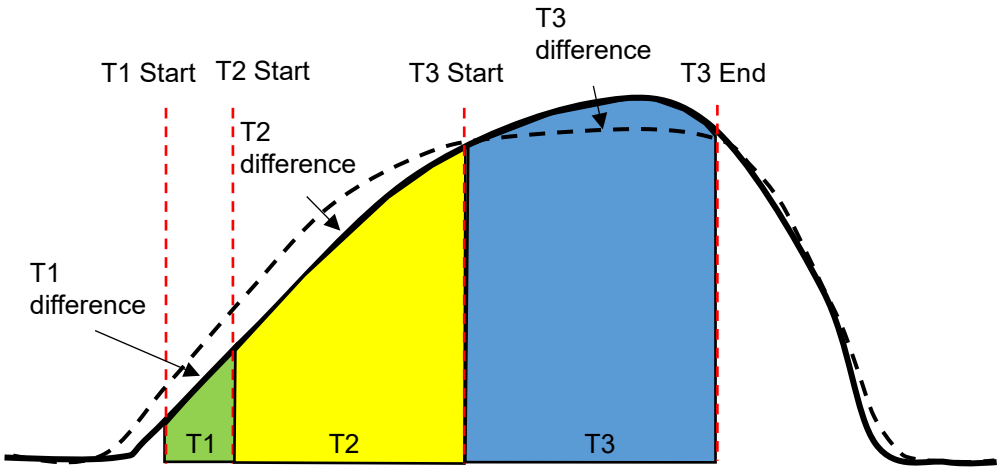
T3 area



T3 area corresponds to the end of pushing the wire barrel down to the lower dead point of the machine ram, and from the lower dead point to the home position of the ram.

TD

TD is the sum of the absolute values of all the differences between the reference force curve and the actual force in each area (T1/T2/T3).



TD is the sum of the absolute values of T1 difference, T2 difference, and T3 difference as shown in the above picture. TD is used for detecting small defects, which cannot be judged in each area because the difference in each area is too small.

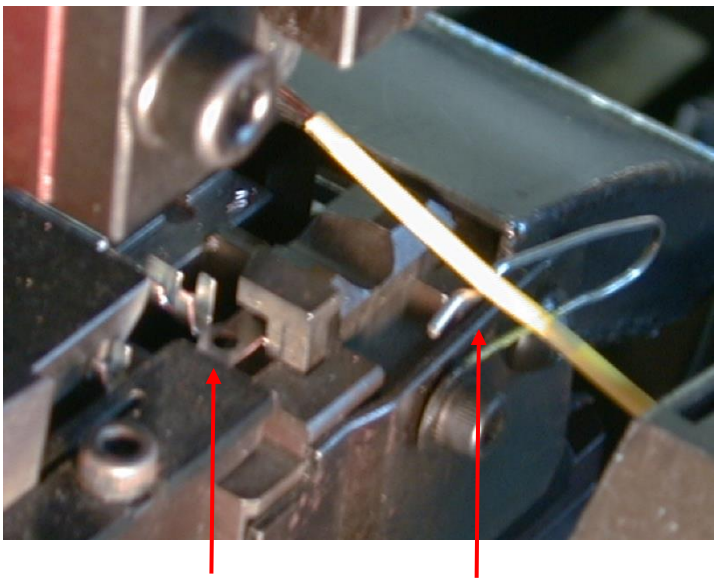
Here is the calculation formula.

TD = |T1| + |T2| + |T3|

4.2. Maintenance for Applicator and Crimping tools.

The role of CFM-Lite in the crimping production is to capture a crimping force and judge whether this crimp is qualified or not, via this force. Therefore, if the crimping force is unstable, CFM-Lite cannot judge it correctly. Below will describe the daily maintenance work that is required for crimping machines, applicators and material (terminal and wire). If these devices are always kept in good condition, the false alarm decreases significantly.

A) Position of terminal and wire transfer under the crimping tool

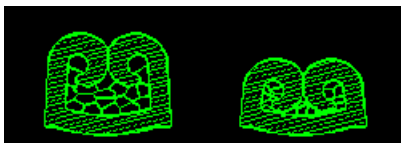


Terminal transfer position

The wire should be straight and in center

The captured force curve varies according to variation of the crimping force of good crimps. The variation makes false alarm, in which CFM mis-judge the good crimp as a defect one. If the tolerance is widened to avoid false alarm, it may cause missing real defects. Therefore, the daily maintenance is very essential. The machine and applicator should be kept in clean condition, the materials should always be in the consistent status. As a result, CFM-Lite can make the best performance.

Good Defect



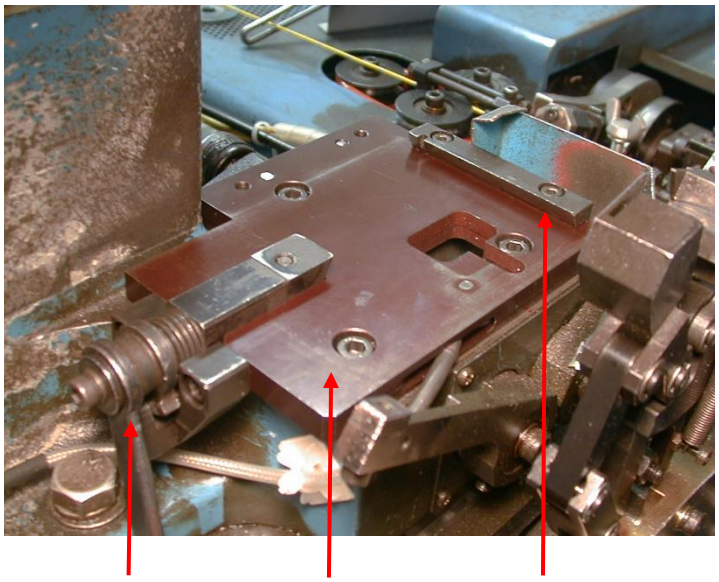
Dull slide cutter causes the terminal rolling so often, resulting in wire barrel bottoming like above picture. CFM-Lite judges it as a defect even if it looks like good crimp.

The wrong transfer position of terminal and wire might cause problems such as terminal rolling, no bell mouth, or wire barrel bottoming. These problems cause significant effect.

If a crimping tool is unstable when it hits the wire barrel of small terminal, it possibly causes one of 2 sides of the bell mouth missing, which lowers the crimping force. It is a defect.

B) Base plate

The maintenance for the base plate is significantly important no matter where the sensor is installed. E.g. PSS sensor is attached to the machine body to get the strain after crimping, base plate type sensor, or machine ram type sensor.



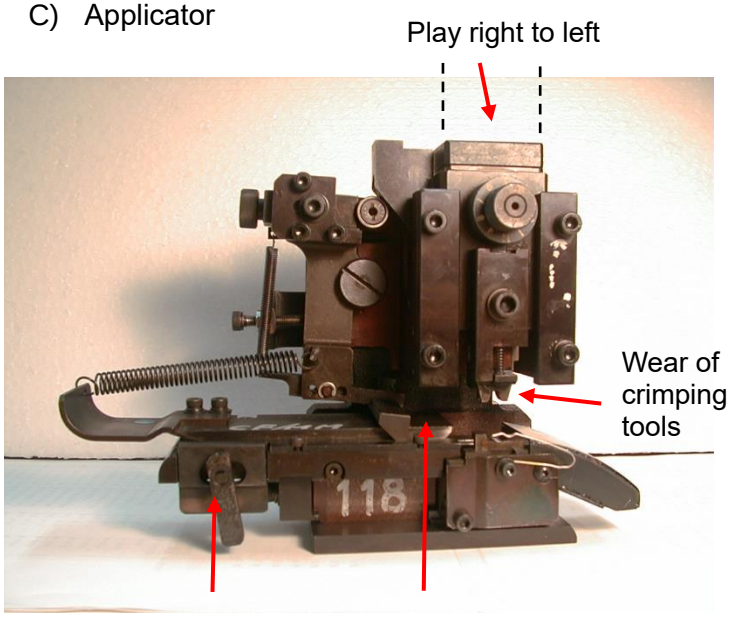
The applicator has to be fix rigidly. Otherwise, the force will be unstable. As mechanical parts of the applicator may shift little by little during the production, the force curve slightly changed accordingly. This results in the change in **Shift** value. The surface of the base plate should be kept clean, the plate itself and the stopper should be fixed rigidly.

Stopper should be fixed

Flatness of the base plate surface

Position of stopper plate

C) Applicator



Check all points shown in the left picture. Also, the fluctuation of the lower dead point of machine ram makes force curve fluctuate.

Lack of conditioning of brake.

Deterioration of springs

Wear of slide cutter

5. Troubleshooting

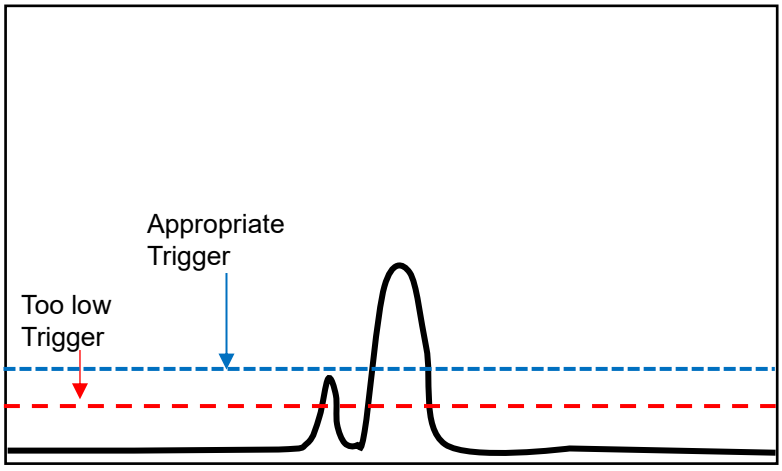
When facing problems with using CFM-Lite, refer to troubleshooting to help to solve problem.

5.1. Major defects which must be detected are not detected

Detecting the major defects, e.g. crimp without wire (terminal only), no strip crimp, or double terminal crimp are absolutely essential. CFM-Lite is designed to detect these defects even with tolerance no. 5, the widest one. If these defects are not detected, the captured force curve is probably incorrect. Below are some possible causes:

Possible cause 1: The sensor is installed incorrectly, which leads to low sensor sensitivity. Refer to “CFM-Lite Installation Manual” for how to install PSS sensor correctly. In case of using the base plate type sensor (FTW series), check if the correct preload is applied on the sensor or not. Refer to “CFM-Lite Installation Manual” for more information of preloading.

Possible cause 2: Capturing force curve by Auto Trigger is incorrect. That means CFM may capture a wrong force curve that comes just right before the actual force curve, e.g. a mechanical noise.



Too low Trigger Level causes CFM to capture a wrong force curve of mechanical noise coming just before the actual force curve. If there is 10mSec interval between the mechanical noise and the actual force curve, CFM-Lite takes the former. Open PC software to change the Trigger Level to appropriate position.

Possible cause 3:

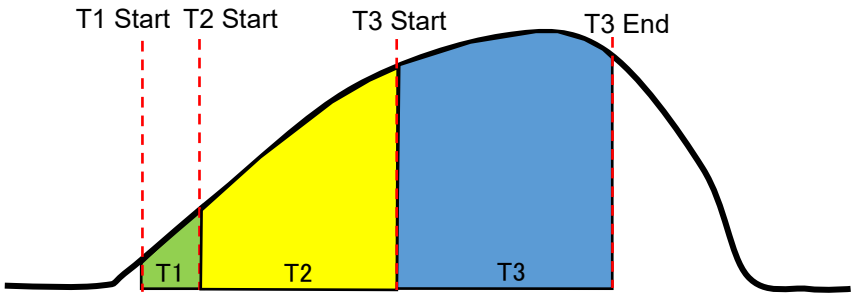
Incorrect area settings of T1, T2, and T3, which causes CFM to make wrong judgement

If the division lines of each judgement area are incorrect as shown below, it possibly makes wrong judgement. The initial value of each division lines are as follows:

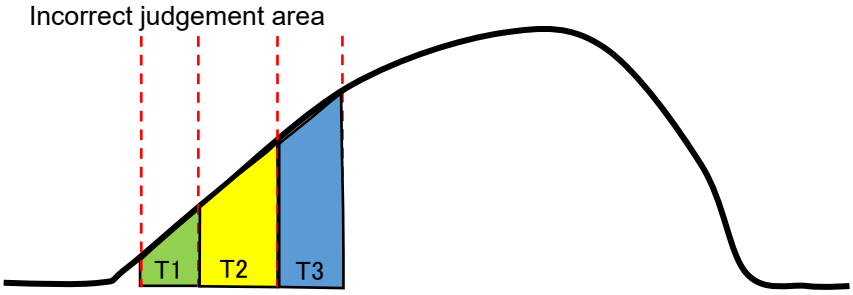
・ T1 Start: 5%, T2 Start: 30%, T3 Start: 70%, and T3 End (Right): 90%.

Refer to “3.2.4. Parameter screen (Logged on)” and open PC software to modify these lines. Also, refer to “4.1. Good / Bad judgement (T1/T2/T3/TD)” for more information about judgement areas.

Correct judgement area



Incorrect judgement area



If the problem cannot be solved even after trying these above solutions, reset all tolerance values and do TEACH again.

5.2. Small defects are not detected

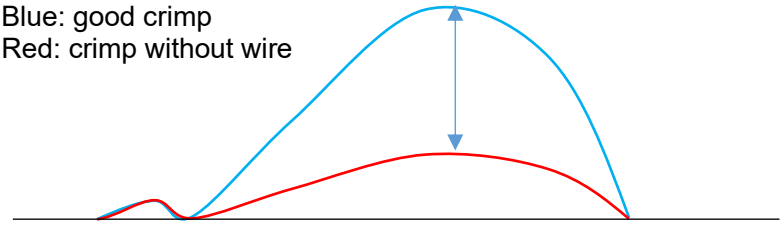
Detecting wire strand out of 1pc or small deep feed depends on the condition of the machine and applicator. Wider tolerance can detect more defects, however it makes more false alarm. Do the test of defect sample which needs to be detected. Set tolerance to detect these defects and check if the false alarm appearance frequency is acceptable with the tolerance.

5.3. Defect of large wire is not detected

The large wire of HV or EV has big terminal with thick material, which covers large area of the force curve. It makes low sensitivity of the force curve when problem happens in wire, such as wire strands cut or out, or high/low feed, because the force from crimping wire covers only small area in whole force curve. To know if the size of the terminal and wire is suitable to detecting defect with CFM-Lite, use Hear Room software.

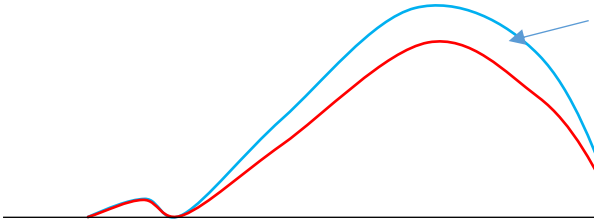
Suitable Head Room for operation with CFM

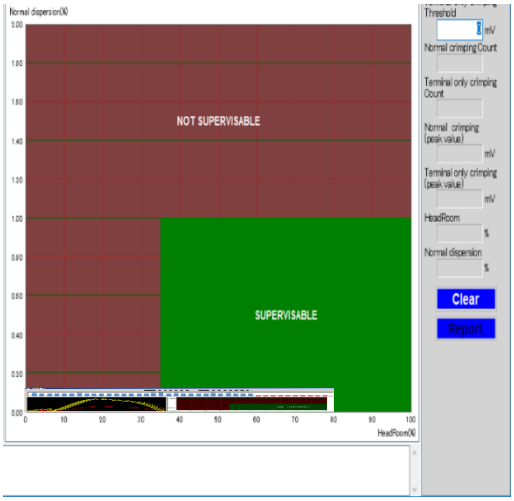
Blue: good crimp
Red: crimp without wire



Unsuitable Head Room for operation with CFM

The force of crimp without wire is so high, the force from the wire crimp force is narrow.





In the graph of the stability of judgement, which uses the Head Room % and the Normal dispersion % on the left, 35% or more Head Room makes stable judgement. If less that it, it is difficult to perform the stable judgement.

5.4. Detecting defect of equal to or smaller wire than AWG30 is unstable

The min. wire size for stable judgement with CFM-Lite is AWG28. Smaller size than it depends on the combination of terminal and wire, or condition of the applicator, which decides the stability of CFM-Lite judgement.

5.5. False alarms occur frequently, which affects the production process.

False alarm stops the production, increases the downtime, which causes low production efficiency. In such cases, it is suggested not to widen the tolerance, as it may cause CFM to miss actual small defects. Below are some of possible causes.

Possible cause 1: The rigidity of the machine is low, or the base table is unstable, the strain of the machine body varies every time.

If the machine expansion varies at every crimp because of the soft machine body, the force curve also varies. The unstable base table, if the machine body is not rigid, makes the same result. PSS sensor series is detecting the strain of the machine. If the machine expansion is unstable to have fluctuating force curve, use the base plate type FTW series. Refer to “CFM-Lite Installation Manual” for details.

Possible cause 2: Applicator is not in good condition or crimping tools wears, which results in the force curve variation.

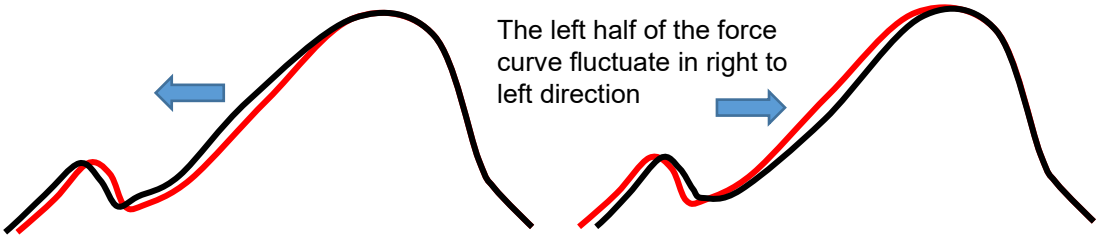
The condition of applicator, the wear of crimping tools, or the terminal and wire transfer position makes variation of the force cure, which causes false alarm. See “4.2. Maintenance for Applicator and crimping tools” for how to avoid it.

Possible cause 3: Adaptive function is OFF.

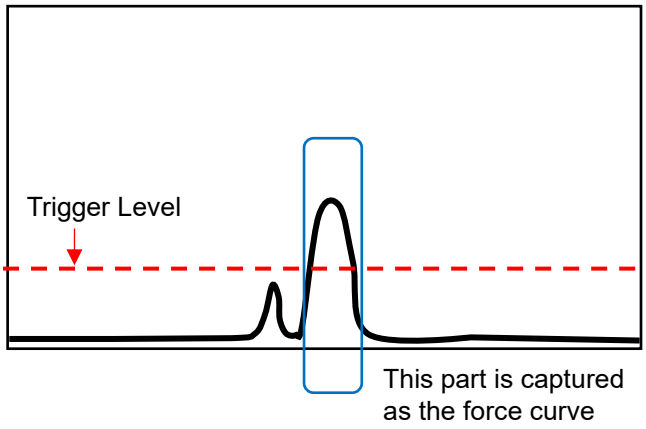
If Adaptive function, which follows the thermal elongation of the machine, is OFF, the difference of the reference force curve and the actual force curve gets bigger, which results in false alarm. See “3.2.4. Parameter screen (Logged on) to turn it ON.

Possible cause 4: Wrong setting of Peak Alignment

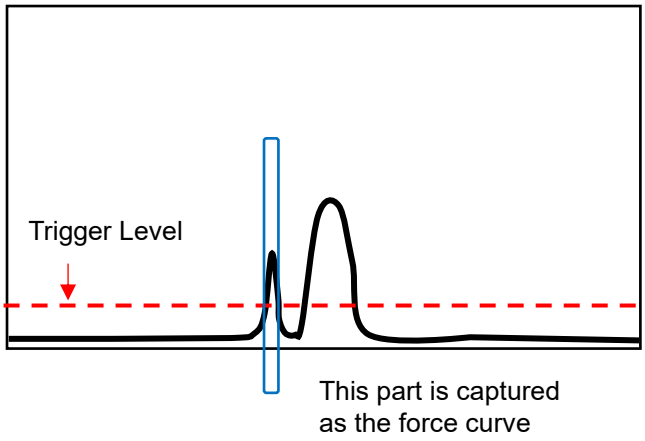
If Peak Alignment is OFF, or the alignment position is incorrect, with Auto Trigger setting, the position of the reference force curve and the actual force curve is possibly in different position. Peak alignment position is usually 40%. If the machine is driven by servo motor, it is possibly better to align at left 70%. See 3.2.4. Parameter screen (Logged on) for how to change Peak Alignment.



Possible cause 5: The force curve includes noise peak, CFM captures incorrect part of force as the force curve.



There is a small noise peak before the actual crimping force curve. It is lower than Trigger Level, CFM can capture the actual force curve.



There is a big noise peak rising before the actual crimping force curve, CFM captures it as the actual force curve by mistake.

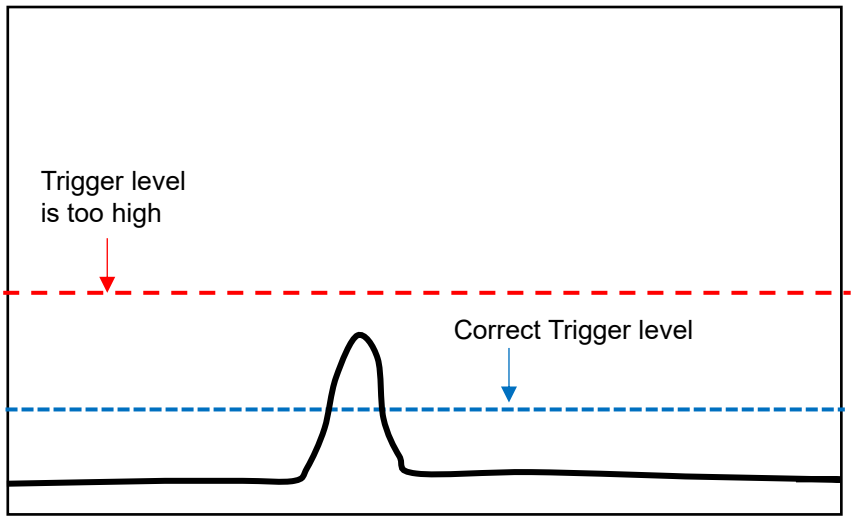
After TEACH, if the same applicator, terminal, and wire are kept using, sometimes such noise peak can happen because of the condition of machine and applicator. The cause of the noise peak is cause by mechanical, electrical problem, or etc. In such case, set an appropriate Trigger Level by Auto Trigger Check screen, or use external trigger with proximity sensor. See the different document “CFM-Lite installation manual” how to install the external trigger.

Checking other points, like if tolerance number is correct, the combination of terminal and wire, or if the crimp height is correct, are necessary.

5.6. No force curve is captured when the terminal is crimped

Even with good crimp, the force curve is not captured, which means CFM-Lite does not react, is possibly caused by the following cause.

Possible cause 1: Incorrect Auto Trigger setting

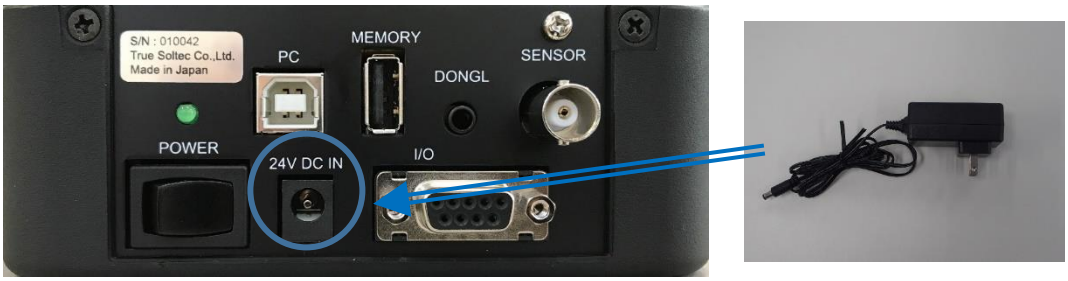


Trigger Level is set too high to capture the force curve. Lower it from PC software. When using external trigger, check the position of it or wiring.

Possible cause 2: Incorrect sensor position or sensor output has problem

After checking with Auto Trigger Check screen, if there is no force peak, check the position of the sensor, or if the sensor set screw is fixed rigidly. See the different document “CFM-Lite installation manual” for more information.

5.7. The power of the main unit does not turn ON when the power switch is ON.
Check if the AC adapter is connected to the main unit and plugged into the outlet.
When the power is ON, LED above the power switch lights up.



5.8. Communication with PC cannot be established.
USB port possibly froze. Plug out USB cable from PC, restart PC software Pro-Lite, and connect the cable again to establish the communication.

5.9. Electrical noise enters and the force curve shows strange behavior.
There are many problems caused by electrical noise in the factory, such as electrical leakage on the machine body, or electrical noise enters into the electrical devices. Bigger noise possibly makes many small peaks on the force curve, or causes noise peak before or after the actual force curve. CFM-Lite is designed to be stronger based on our long experience, however, check if the earth wire is connected to the ground to avoid such trouble. Also, the FG terminal in the bottom of the main unit should be connected to the earth terminal.

5.10. No terminal crimp is detected after crimping
If there is no terminal crimp (wire only) detected by CFM-Lite, the force is too small to reach the Trigger Level, the force is not recognized as the force curve. Adjust the Trigger Level to appropriate number. However, too low Trigger Level makes too sensitive capturing force. Sometimes CFM-Lite may react small vibration.

6. Index

7. Warranty

The warranty period is one year from the shipping date.

If the failure was caused by the reason attributable to faulty design or production problems of our company side, this is covered by the warranty. However, if the failure was caused by the reason attributable to the users such as improper operation, or to something other than True Soltec, this is not covered by the warranty even if within warranty period. True Soltec shall make this judgement.

Example:

- caused by incorrect use of the product, or customized or repaired by user.
- caused by earthquake, flood disaster, lightning strike, or other natural disaster, or abnormal electrical current flow or voltage.
- caused by drops or vibrations, or other incorrect handling.

If it is out of warranty period, basically repair shall be charged.

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