SLE

A KOMAX GROUP COMPANY

Original Instruction Manual

Crimp Force Monitor
SL Starlite

Dokumenten-Nr.: 176 4 0120_e
Revision: 1.2
Stand: 05/2014
s/w-Version Starlite: 1.00
s/w-Version Sequenzer 2.xx

Quality Management
ISO 9001:2008
Environmental
Management
ISO 14001:2004
▶ Voluntary participation
in regular monitoring
DEKRA Certification
DEKRA
certified

SLE quality engineering GmbH & Co. KG

Josef-Buchinger-Str. 9 | D-94481 Grafenau
Tel.: +49 8552 96 40-0 | Fax: +49 8552 96 40-40
info@sle-electronic.com | www.sleqe.com

C O N T E N T S

1. Introduction

1.1 Product Definition

The SL Starlite is a fully integrated double channel Crimp Quality Monitor System developed based on the foundation of the SL MMI. With the user interface built into the double channel Crimp Quality unit, the system is able to achieve a high performance to cost ratio. Like the SL MMI, the SL Starlite will monitor the crimping process to ensure the production of high quality crimped products.

1.2 Features

The SL Starlite Crimp Force Monitor System is equipped with the following state-of-the-art features that meet the needs of modern day wire harnessing industries:

- ✓ Designed for manual and automatic machines
- ✓ Great flexibility, suitable for every crimp applicator
- ✓ Applicable to inspection of all wire sizes from AWG 4 to AWG 32
- ✓ Accurate high speed force signal analysis
- ✓ Optically isolated I/O signals
- ✓ Built-in online Statistical Process Control
- ✓ Adaptive Process Control
- ✓ Absolute force measurement in Newton (N) or Pounds (lbs)
- ✓ Easy installation, greatly reduces machine set-up time
- ✓ Superb contrast graphical LCD
- ✓ State-of-Art Jog Shuttle for ergonomic operation
- ✓ Icon and menu driven user interface

The SL Starlite Crimp Force Monitor system is specially designed for the detection of the following crimp defects:

- ✓ Missing strands of wires
- ✓ Inaccurate crimp height
- ✓ Insulation in wire barrel
- ✓ Wire partially inserted in wire barrel
- ✓ Inaccurate wire gauge
- ✓ Insufficient insulation strip length
- ✓ Missing terminal

1.3 Working Principles

From the data supplied by the positional sensor and force sensor, a crimp curve is captured, calculated and evaluated for the following criteria:

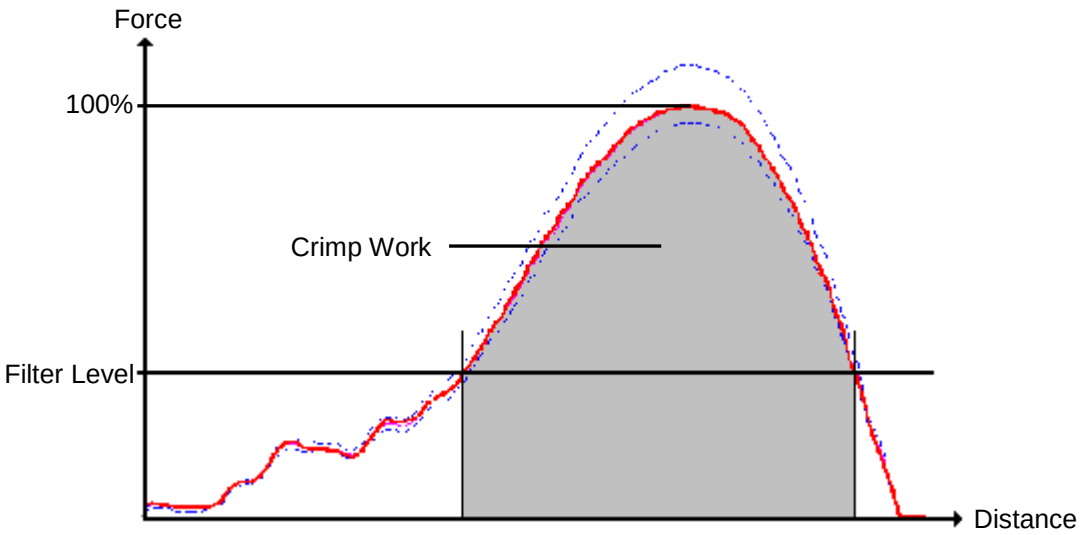
- Crimp Work (Area)
- Crimp Shape
- Evaluation Range

Crimp Work (Area)

The work necessary for crimping a contact with a cable is calculated by the following formula:

*Work Done = Force * Distance*

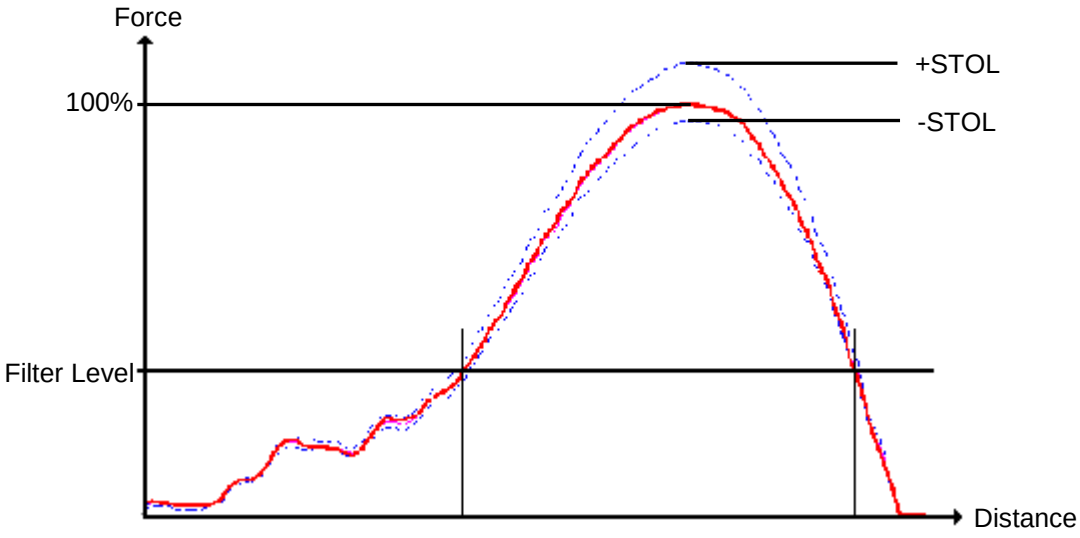
A typical force curve generated by crimping a contact with a cable is shown in Graph 1a.



Graph 1a

ATOL± sets the limits within which the calculated work (area) may vary without the crimp being considered “BAD”.
The default value of ATOL+ is 5% and ATOL– is 3%.

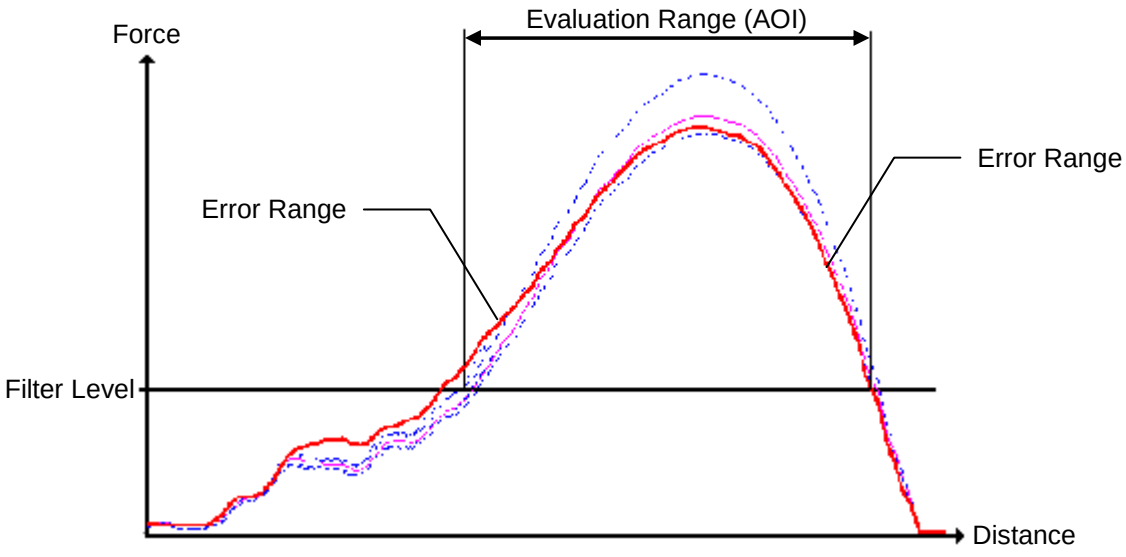
Crimp Shape



Graph 1b

The tolerance shape determines the positive and negative limits of the crimp as shown in Graph 1b.

Evaluation Range



Graph 1c

Evaluation range defines the range of the area of the crimp force used to determine if the crimp made is a “Good” or a “Bad” crimp as shown in Graph 1c.

For example, if the above Evaluation Range (or Area Of Interest, AOI) consists of 100 measuring points.
In this case a tolerance setting with AOIE (Area Of Interest Error) values of ± 20% means:
If more than 20 points (≅ 20%) exceed the tolerance curve, the crimp is considered as “BAD”.
The default value of AOIE+ is 20% and AOIE– is 20%.

1.4 Functional Keys Identification

The SL Starlite system forms the display unit of the Crimp Force Monitor system. It is able to provide crimp information and statistics of the Crimping process.

The SL Starlite system is shown in Figure 1.

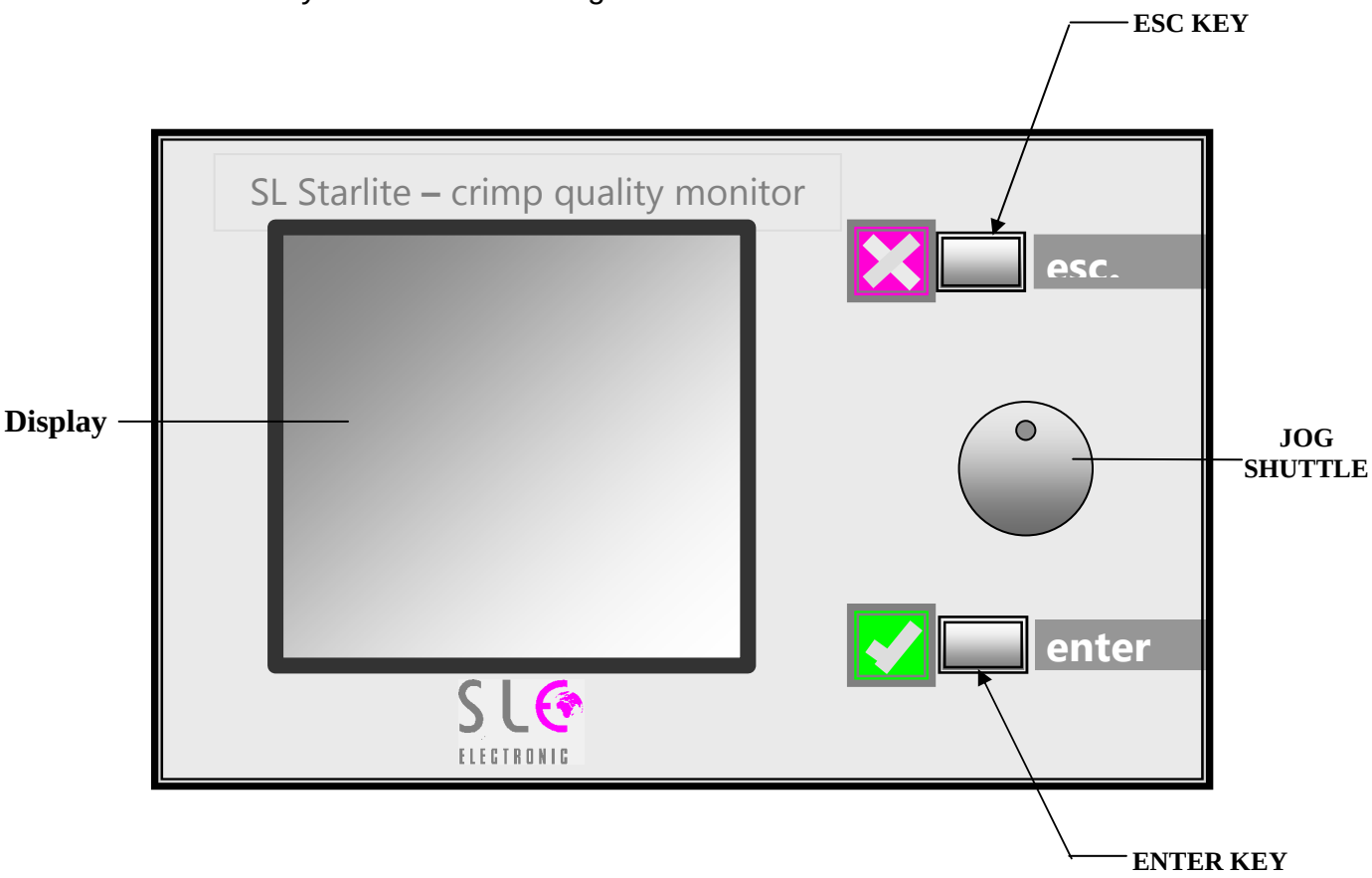


Figure 1

Represents the ENTER key

Represents the ESC key

Represents the JOG SHUTTLE

1.4.1 Switching Between Different Views

The SL Starlite has two channels of press inputs, enabling it to connect to two crimping presses. It provides flexibility to the user, as the system is able to switch to either ***1 CH VIEW*** or ***2 CH VIEW*** such that it will display the status of the presses individually or both at the same time.

Differences between 1 CH VIEW and 2 CH VIEW

1 CH VIEW

Provide the four essential views as follows:
View 1: Operation
View 2: Curve
View 3: Working Tolerance
View 4: Learn

Upon selecting the desired view, the user is able to see the individual status of the press P1 followed by P2 respectively on the screen displayed by jogging the  knob in clockwise direction.

2 CH VIEW

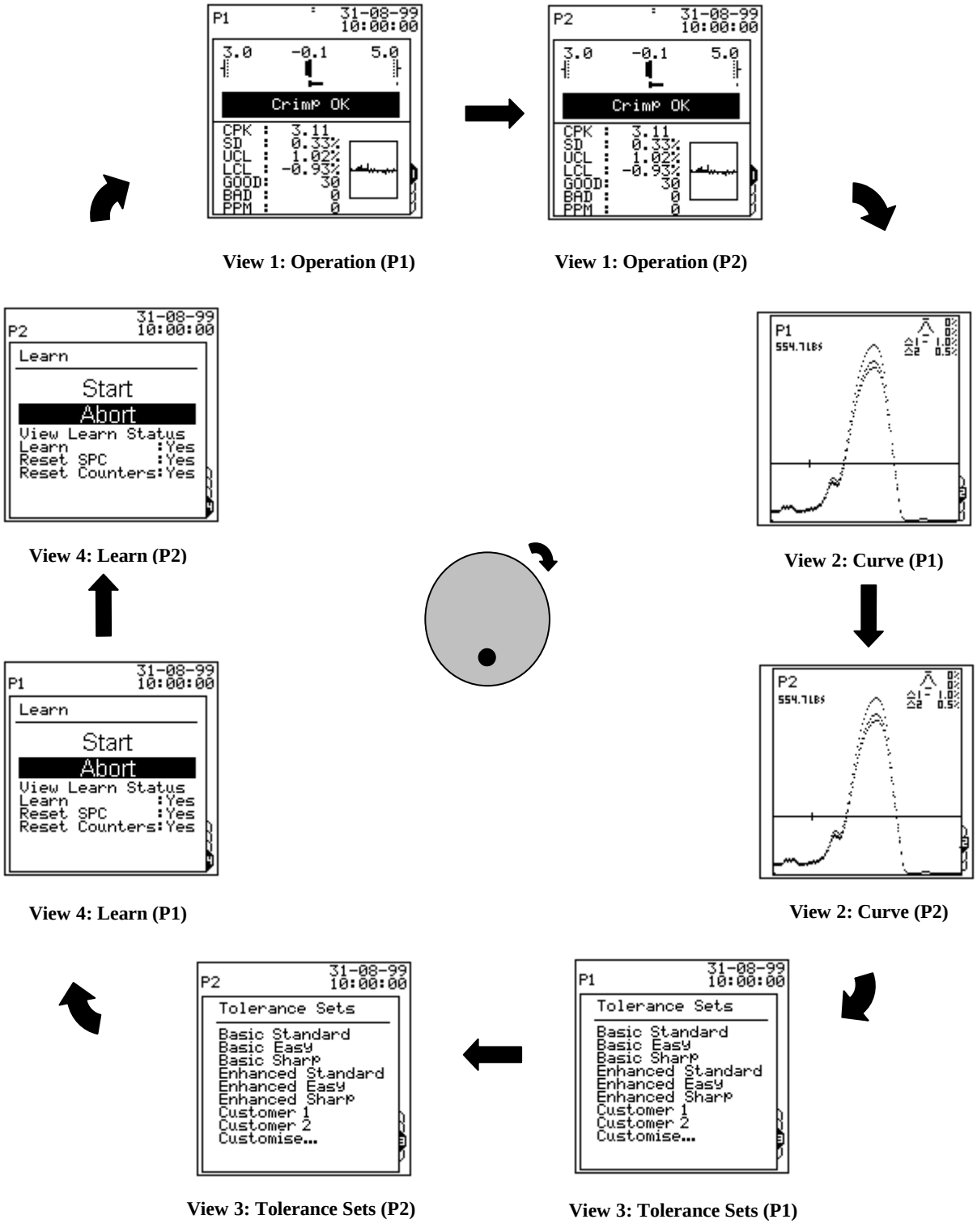
Provide the four essential views as follows:
View 1: Crimp Information
View 2: Production Statistics
View 3: Curve
View 4: Working Tolerance
View 5: Learn

Upon selecting the desired view, the user is able see the status of **both** of the presses for view 1, 2 & 3 by jogging the  knob.

As for View 4: Working Tolerance and View 5: Learn, the status of the press P1 and P2 will be displayed respectively.

1 CH VIEW

Rotating the knob in the clockwise direction, the side-tab shows the user the current viewing mask, the viewing sequence will start from View1 then followed by View2 -> View3 -> View4 and back to View1 again.



View 1: Operation (P1) **View 1: Operation (P2)**

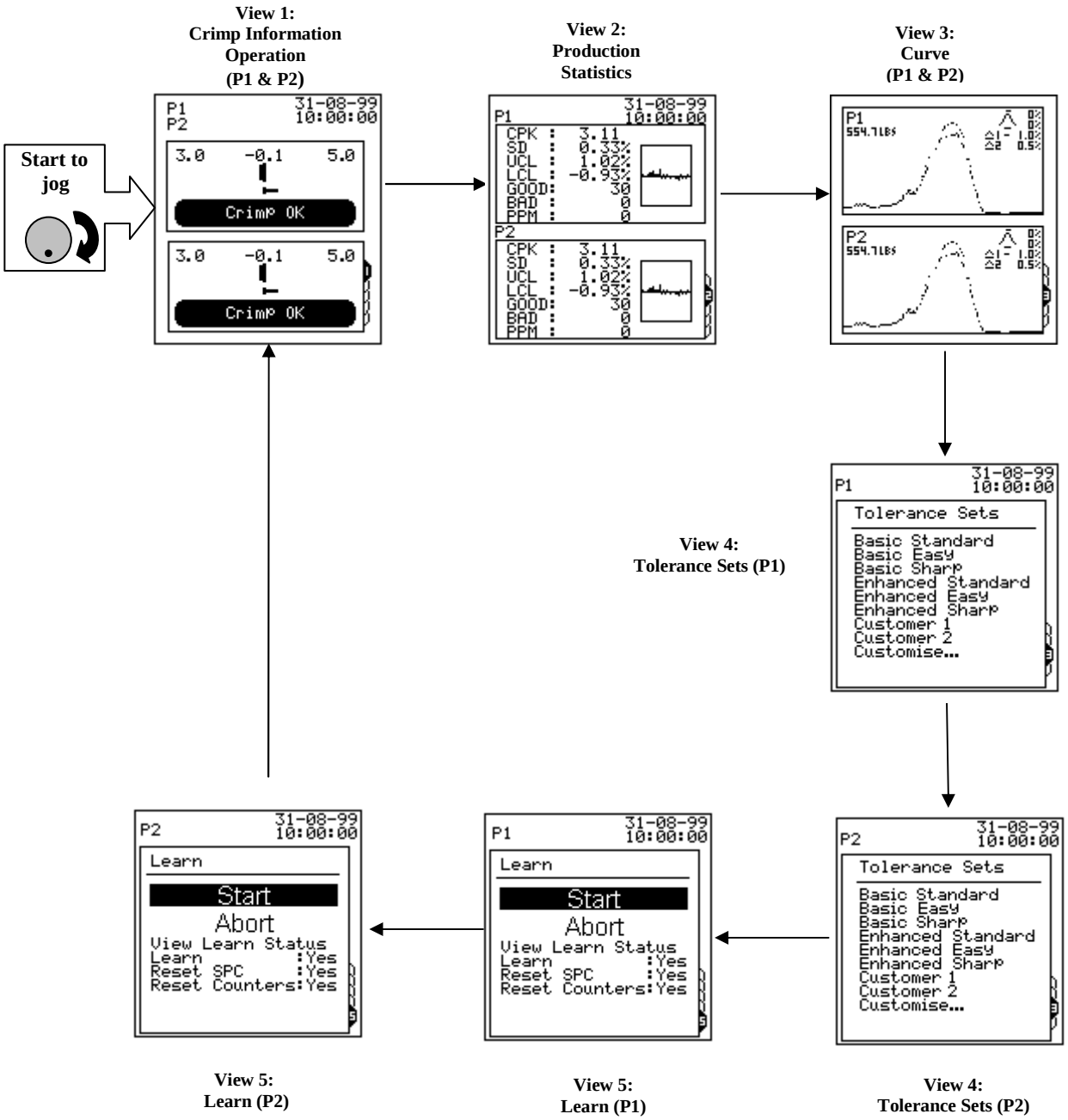
View 4: Learn (P2) **View 2: Curve (P1)**

View 4: Learn (P1) **View 2: Curve (P2)**

View 3: Tolerance Sets (P2) **View 3: Tolerance Sets (P1)**

2 CH VIEW

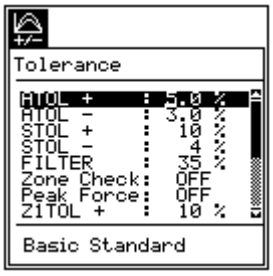
Rotating the knob in the clockwise direction, the side-tab shows the user the current viewing mask, viewing sequence will start from View1 then followed by View2 -> View3 -> View4->View5 and back to View1 again.



1.4.2 Editing a Parameter

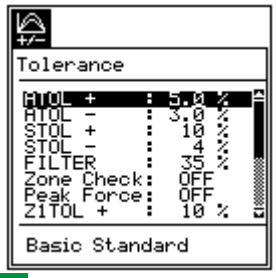
This section shows how to use the Jog shuttle, Enter and Esc keys to change the parameters of the Crimp Quality Monitor.

For example, to change the Positive Area Tolerance, ATOL+, use the jog shuttle to navigate the Tolerance Sets menu and press enter. The first item “Basic Standard” in the Tolerance Set menu will be highlighted. Then, turn the jog shuttle to select “Customise…” and press enter. The Tolerance menu will be displayed. Use the jog shuttle to select the ATOL+ field and press enter to go to the editing mode. A blinking cursor appears as shown in the figure below, indicating that a change can now be made.



Use the jog shuttle to adjust the desired numerical value and press enter once to confirm the value selected.

If the parameter has a decimal part, the blinking cursor then appears at the decimal part of the ATOL+ as shown below. Use the jog shuttle to adjust to the desired



decimal value and press enter to confirm the selection.

To exit the Tolerance menu and apply the changes, press escape once. In order to restore the existing value without changing, press escape once while the blinking cursor is present. The changes will be aborted.

1.5 Security Features

The SL Starlite system allows the user to set different access levels for accessing to different settings of the system.

Users are able to choose Password Access, infoTOUCH or Dongle Access as their preferred security option.

1.5.1 Password Access

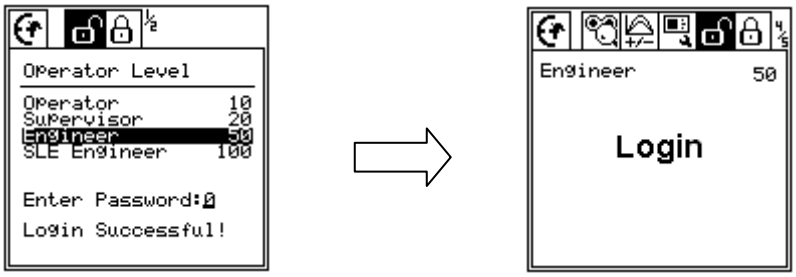
When using the ***Password Access as the Security Feature***, the user is required to login as an authorised user prior to change the settings of the Crimp Quality Monitor System.

For example, if user would like to change the parameters in the Default Tolerance Settings, upon pressing enter once, the following mask appears.

To login, select unlock as highlighted and press enter once. The following mask appears displaying the available Operator Levels.

Select the required Operator Level and press enter once to confirm. The following message appears prompting for the access password.

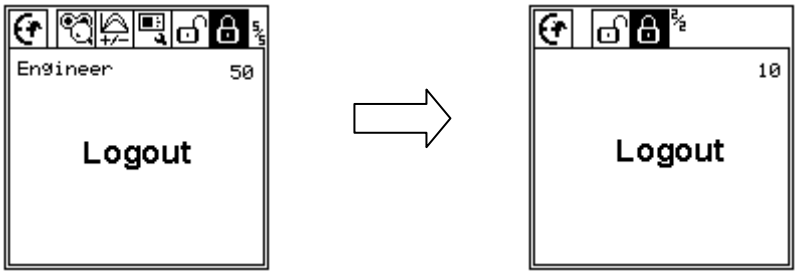
Then, key in the access Password required for the selected Operator Level and press enter once to confirm. Upon successful login, the following message appears and the information of the login user is displayed as shown.



The Default Tolerance settings are now accessible.

Once the required Default Tolerance settings had been set, it is advisable for the user to logout to prevent any unauthorised user from making changes to the system settings.

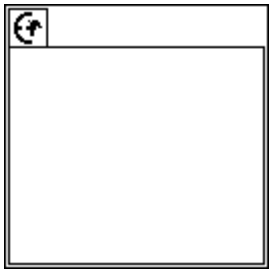
To logout, select lock as highlighted and press enter once to confirm.



Before Logging out **After Logging out**

1.5.2 InfoTOUCH/Dongle Access

The two types of Authentication devices available are the ***Touch Probe*** and the ***Dongle***. Refer to *Programming Guide ~ System Setup ~ infoTOUCH* on how to enable authentication option.
If the Authentication option is enabled, an Authentication device is required in order to gain access to the settings of the Crimp Quality Monitor system.
For example, if user would like to change the Default Tolerance settings, upon pressing enter once, the following mask appears.

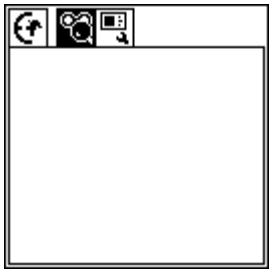


When the ***Touch Probe is used as the Authentication Device***, in order to enter the Default Tolerances, use the Touch Probe that is connected to the RS232 port of the SL Starlite system, to touch the iButton with the entitled access level to access the Default Tolerances.

The Touch Probe can be released from the iButton once a Welcome message appears on the display.

When the ***Dongle is used as the Authentication Device***, in order to enter the Default Tolerances, insert the Dongle to the RS232 port of the SL Starlite system.

The following mask appears indicating the Default Tolerances mask is now accessible.



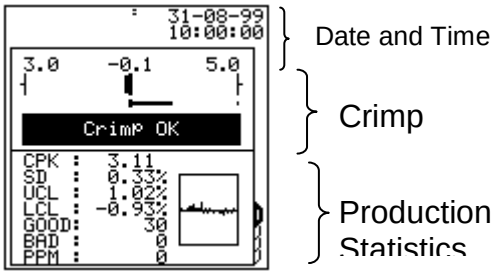
2. Operation Guide

2.1 Operation Mode

When the power is switched on, the system displays the company logo for three seconds before entering the operation mode.

2.1.1 Operation View

At the operation mode, the operation mask appears.
The following operation mask displays the crimp details and the production statistics for 2 crimp presses (P1 & P2) connected directly to the system respectively, with the tolerance of the crimp force determined by the Upper and Lower Tolerance.

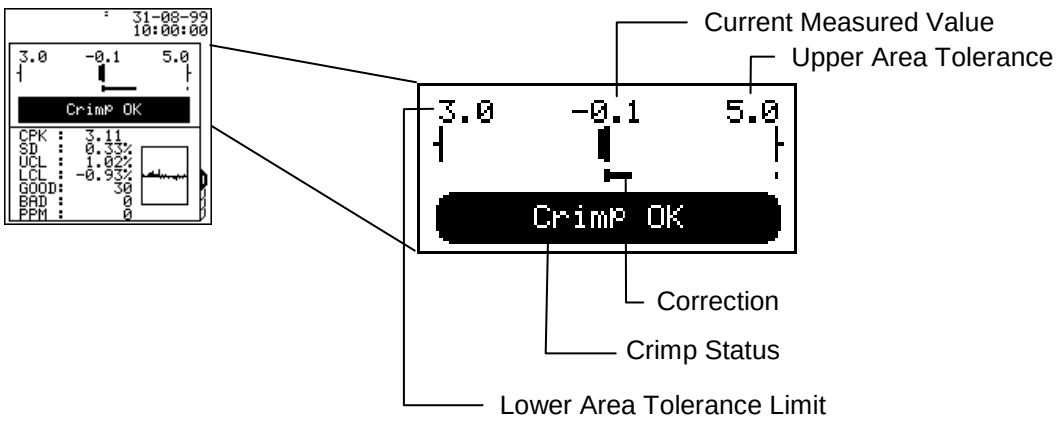


If 2-CH View is selected, it will be able to display the crimp details and the production statistics of both the crimp presses.

To view the display of **2-Channel View** in Operation View, refer to Starlite System Set-up (Changing the Viewing Options).

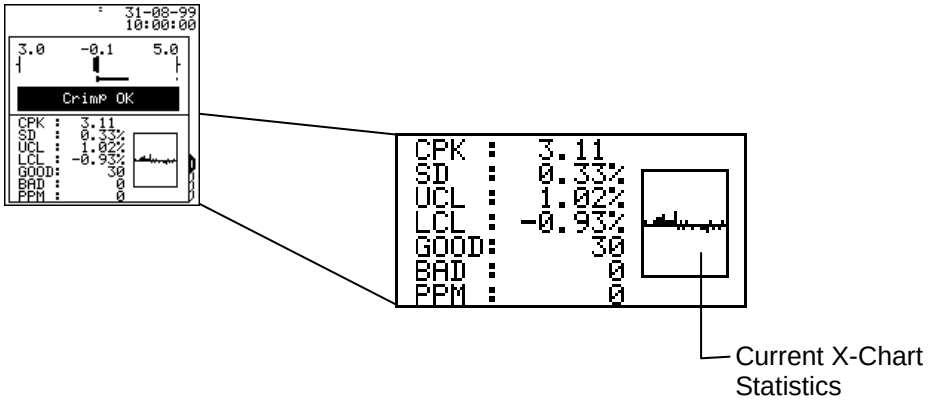
Crimp Information

The detailed information of each crimp is displayed in the operation mask.



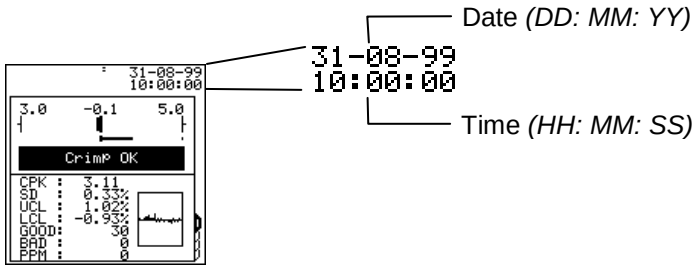
Statistics

The statistics of the crimping process is evaluated in real time and displayed as shown below.



Parameter	Description
CPK	The Process Capability Index (CPK value) of the current production
SD	The Standard Deviation of the current production
UCL	The Upper Control Limit of the current production
LCL	The Lower Control Limit of the current production
GOOD	Number of GOOD crimps in the current production
BAD	Number of BAD crimps in the current production
PPM	Defective Parts Per Million

Date and Time

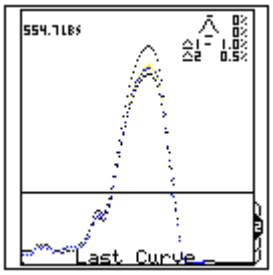


To change the date and time, please refer to the section *Programming Guide ~ System Setup ~ Date & Time*.

2.1.2 Curve View

In addition to the crimp information and the SPC data, the force curve of the current crimp process for crimp presses P1 followed by P2, known as the **Last Curve**, will also be displayed respectively.

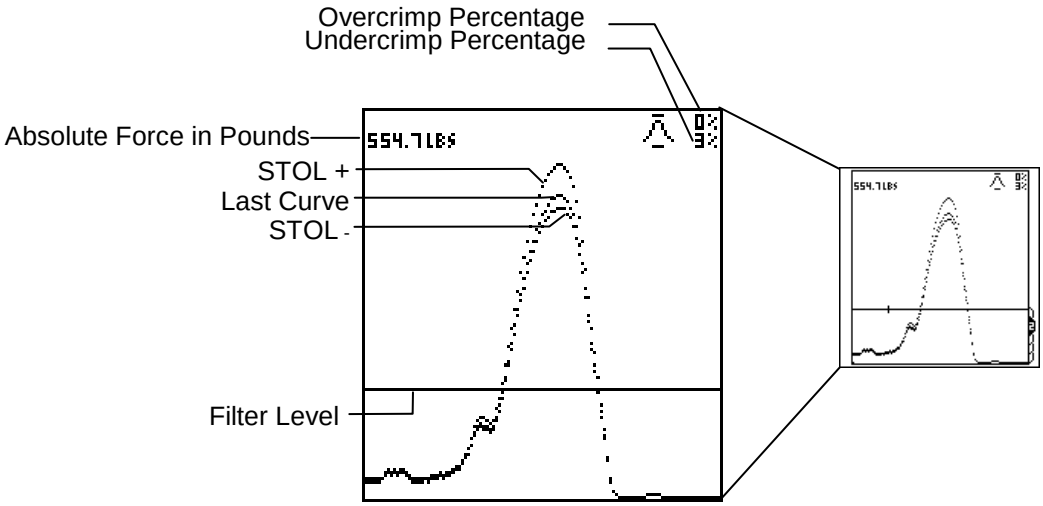
In order to obtain the detailed view of the Last Curve, rotate the jog shuttle  one step in the clockwise direction. The detailed view of the last curve is shown below.



Depending on the analysis mode selected for the production process, additional information is also displayed together with the Last Curve.

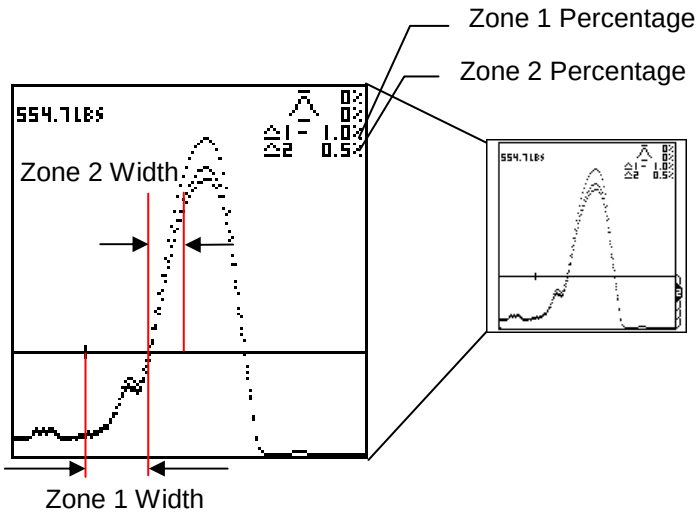
In **2-Channel View**, it will be able to display the **Last Curve** of both the crimp presses.
To view the display of **2-Channel View** in Curve View, refer to **STARLITE SYSTEM SETUP** (Changing the Display Options).

Standard Analysis Mode is the default analysis mode used for the crimp force analysis during the production process. The curve information display for the Standard analysis mode is shown below.



During the production process, the undercrimp and overcrimp percentages of each crimp are evaluated based on the Crimp Shape analysis method and displayed at the top right hand corner of the curve.

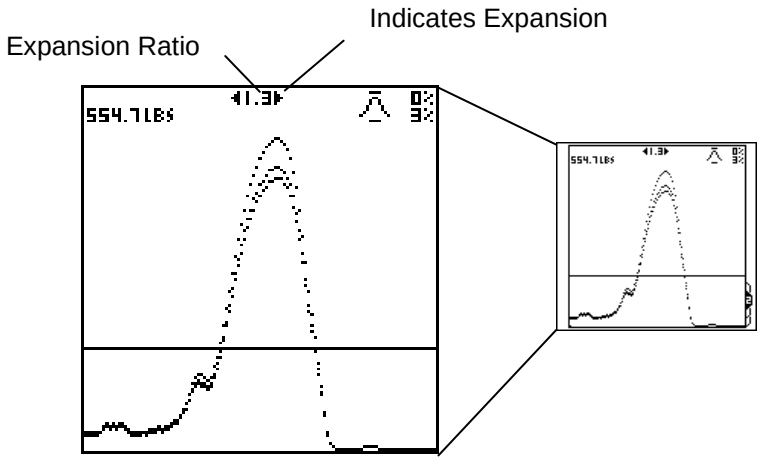
When the ***Zone Check Mode*** is enabled, in addition to the standard analysis mode, the two zones are also checked and indicated as shown below.

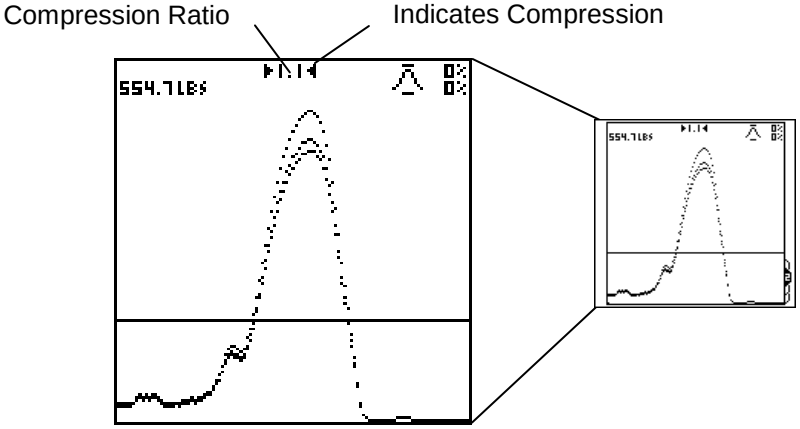


The Zone 1 and Zone 2 values shown are expressed in percentage.

When the ***Speed Correction Mode*** is enabled, an expansion or compression could be done to the captured force signal so as to compensate the speed variation of the crimping press.
This feature is available if Force or Proximity is chosen to be the triggering mode.

The compression or expansion ratio will be displayed only if compression or expansion occurs. They are shown below.





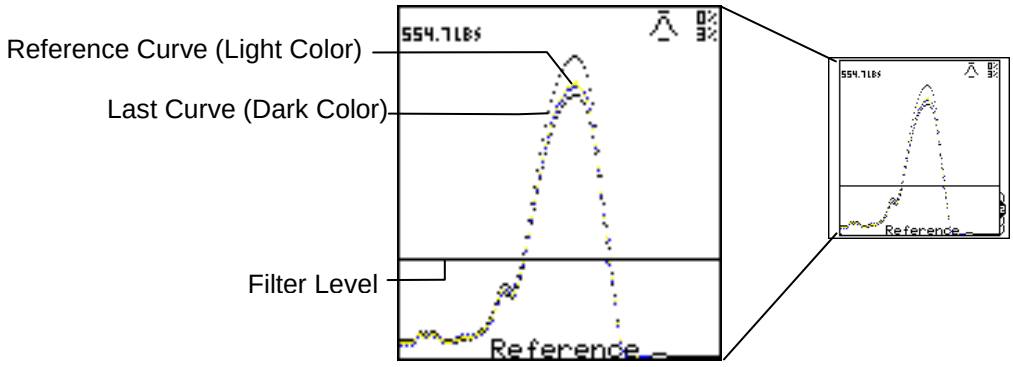
2.1.3 Curve Compare View

The Curve Compare view provides the viewing of the Reference curve such that a comparison can be made between the Reference curve and the Last Curve.

This feature is especially useful upon detecting a bad crimp and when it is required to compare the Reference curve with the Last curve of a bad crimp.

The Curve Compare feature is available at both the Operation and Curve view in the Operation mode.

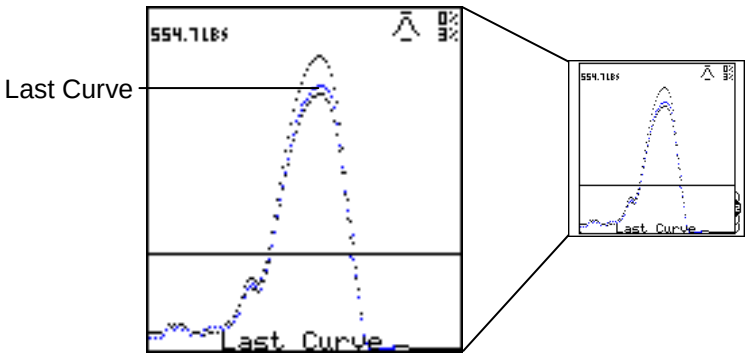
To view the Reference curve, press escape once and the reference curve is shown below.



The normal operation mask is restored after the Reference curve is displayed for three seconds.

Alternatively, to return to Operation mode, press enter once.

To view the Last Curve, press escape once followed by rotating the jog shuttle one step in the clockwise or counter-clockwise direction. The Last Curve will be displayed as shown below.



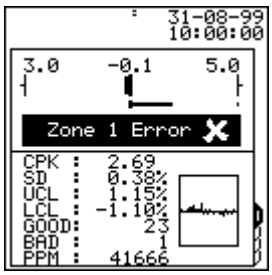
To toggle between the Last Curve and the Reference Curve view, rotate the jog shuttle one step in the clockwise or counter-clockwise direction.

NOTE:
Depending on the *Display Options* settings (*see Programming Guide ~ System Setup ~ Display Options*), the Reference curve will be superimposed onto the last curve if the *Always Show Sig* option is activated, else only the Reference curve will be shown.

2.1.4 Resetting an Error

During operation, if an error occurs, an error message will be displayed on the SL Starlite system.

For example, if a Zone 1 error is detected during operation, it will be displayed as shown below.



If the Crimp Quality Monitor system is being programmed to stop at every fault detected, the STOP output relay will be opened to stop the crimping press or the automatic cutting machine. To run the production again, the error occurred in the press needs to be reset.

If Authentication is enabled, resetting of the error depends on the setting of the Access Control option (*see Programming Guide ~ System Setup ~ Access Control*) and Device Type selected (*see Programming Guide ~ System Setup ~ infoTouch*), the error can be reset by the following ways:

If using ***Password*** or ***Touch Probe*** for Authentication purpose, when the access level to reset error during operation is equivalent to the Default Access Level setting, press enter ✓ once to reset the error occurred.

When the access level to reset error during operation is greater than the Default Access Level setting:

For ***password*** users, the user has to login at an Operator Level of the specified access level or higher to reset the error. Then press enter ✓ once to reset the error occurred.

For ***Touch Probe*** users, use the probe to touch the iButton with the specified access level or higher to reset the error.
If using ***Dongle*** for Authentication purpose, insert the Dongle in the RS232 port and press enter ✓ once to reset the error and the production will resume.

NOTE: To run the production, errors of both presses **MUST** be reset.

2.2 Tolerance Sets

The Tolerance Sets feature provides pre-programmed sets of tolerance values that are adopted for quality control in the current production.

It should be noted that:
This set of tolerance values is made applicable to the current production.
Once a LEARN is performed, if *Existing Tolerance Mode* is used, the working Tolerance will remain the same.
(see Programming Guide ~ Parameter Setup ~ Default Tolerance)

There are 8 Tolerance Sets available, of which 6 have already been pre-defined for immediate use. However, each of the 8 Tolerance Sets can still be modified and renamed by the user.

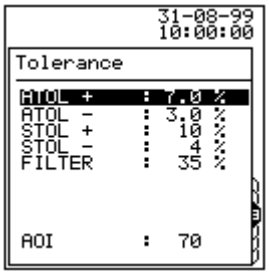
If the user is at P1 display, the system will always prompt whether to apply changes to P2 as well. Jog the to select **Y (Yes)** or **N (No)** and press once to confirm selection.

If the user is at P2 display, the changes will only apply to P2.

To select and activate one of the tolerance sets, use the jog shuttle and press enter. The selection will be shown by "*" as shown in the figure.

Tolerance Set	Description
Basic Standard	Basic analysis of Area and Signature using standard tolerance settings.
Basic Easy	Basic analysis of Area and Signature using easy tolerance settings.
Basic Sharp	Basic analysis of Area and Signature using tight tolerance settings.
Enhanced Standard	Enhanced analysis of Area, Signature, Zones and Peak Force using standard tolerance settings.
Enhanced Easy	Enhanced analysis of Area, Signature, Zones and Peak Force using standard tolerance settings.
Enhanced Sharp	Enhanced analysis of Area, Signature, Zones and Peak Force using standard tolerance settings.
Customer 1	Customer defined tolerance settings 1.
Customer 2	Customer defined tolerance settings 2.

To make changes to the tolerance for the current production, select "Customise…" using the jog shuttle and enter. Tolerance mask will appear as shown below.

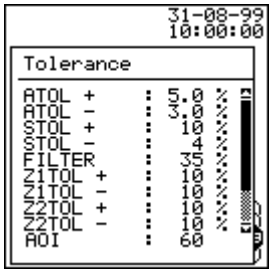


Select the parameter using the jog shuttle , Press enter once to access the editing mode.
The feature “Customise…” enable the user to change the value of the parameters according to the requirements of each product.

Parameters of Tolerance Sets

The Tolerance Sets mask is shown in the figure.

Parameter	Description
ATOL +	Positive Area TOLerance
ATOL -	Negative Area TOLerance
STOL +	Positive Signature TOLerance
STOL -	Negative Signature TOLerance
FILTER	FILTER Level
Z1TOL +	Positive Zone 1 TOLerance
Z1TOL -	Negative Zone 1 TOLerance
Z2TOL +	Positive Zone 2 TOLerance
Z2TOL -	Negative Zone 2 TOLerance
ZONE 1	Zone 1 width, expressed in terms of number of points
PTOL +	Positive Peak TOLerance
PTOL -	Negative Peak TOLerance
AOI	Area Of Interest expressed in terms of number of points



The maximum values of the tolerance parameters are limited by the User’s Limits (*see Programming Guide ~ Parameter Setup ~ User’s Limits*).

2.3 Learn

To perform a Learn for the current production, set to Learn Mode as shown below and press enter  once to enter the *Learn* mode.

Options on Learn Mode

The options available in the Learn mask are shown in the figure.

Parameter	Description
View Learn Status	Display the Learn Status menu
Learn	Select whether to perform Learn when Start is activated
Reset SPC	Select whether to Reset SPC calculation when Start is activated
Reset Counters	Select whether to Reset Good and Bad Counters when Start is activated

Changing the Options for the Learn mode

By default, all options in the Learn mode are activated.
To perform a Learn without resetting the present SPC data, make sure that the **Yes** field of the Reset SPC option is highlighted.

Press enter ✓ once to toggle to **No** in order to deactivate the **Reset SPC** option as shown below.

Similar steps can be taken to deactivate the Reset Counters option.

Performing a Learn without resetting the SPC data and the Good and Bad counters, allows a Learn process to be performed in the midst of a production.
Once the Learn process is completed, the collection of SPC data and the counting of the Good and Bad counters continue from their respective values accumulated before the Learn is conducted.

To reset the SPC data or the Good and Bad crimps counters for the production, while a Learn process is not required, select the LEARN option. Press enter ✓ once to deactivate the LEARN option.

After the required option is selected, go to the START position and press enter ✓ once to apply the required Learn option.

If the user is at P1 display, the system will always prompt whether to apply to P2 as well.

Jog the ● to select **Y (Yes)** or **N (No)** and press ✓ once to confirm selection.

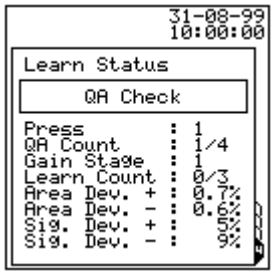
If the user is at P2 display, the changes will only apply to P2.

Performing a Learn

Once the Learn option is applied to the Crimp Quality Monitor, the Learn process is carried out and the Learn status of each Crimp Quality Monitor is updated online as shown in the figure.

To view individual learn status for the required presses, jog the knob.

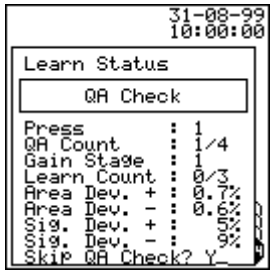
Parameter	Description
QA Count	Number of crimps that has been made during the QA check
Gain Stage	Gain stage used for the incoming force signal
Learn Count	Number of crimps that has been made during the Learn stage
Area Dev. +	Positive Area Deviation obtained during Learn
Area Dev. -	Negative Area Deviation obtained during Learn
Sig. Dev. +	Positive Signature Deviation obtained during Learn
Sig. Dev. -	Negative Signature Deviation obtained during Learn



Once Learn is completed, press enter once to return to Operation mode view. If no buttons are pressed within three seconds upon Learn completion, the mask automatically changes back to the Operation mode view.

Skipping the QA Check Stage

During the QA Check stage of the Learning process, to skip the QA Check stage, press enter ✓ once and the following mask appears as shown below.



Select Y (Yes) or N (No) and press enter ✓ to confirm selection. To abort the QA Check Skip action, press escape ✗ once.

Aborting a Learn

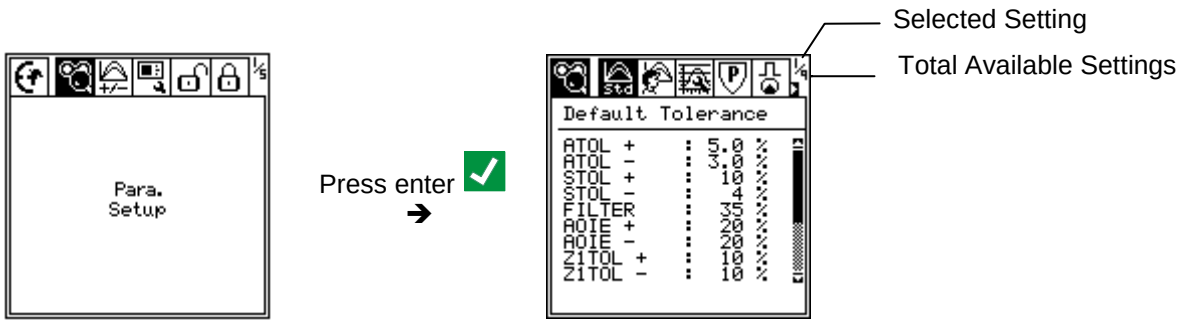
To abort Learn, return to the Learn Mode mask as shown below, select ABORT and press enter ✓ once to confirm aborting process.

NOTE: The previous reference will be restored if the Learn process is aborted.

3. Programming Guide

3.1 Parameters Setup

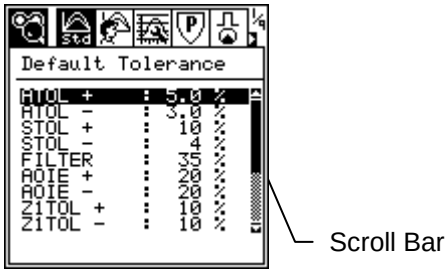
To make changes to the settings of the System Parameters press enter once to enter the programming mode and select Para. Setup as shown below.



Option Selection mask For System Parameters

3.1.1 Default Tolerance Settings

To change the Default Tolerance settings, select default tolerance as highlighted. Press enter once to access the parameters in the Default Tolerance Settings. The first field of Default Tolerance will be highlighted as shown below.



The Default Tolerance settings provide a default set of working tolerances that is used for quality assurance purposes in the production after a Learn is performed.

To view all fields for the Default Tolerance settings, select the desired field. The scroll bar moves indicating the position of the field currently highlighted.

Parameter	Default	Description
ATOL +	5.0 %	Default Positive Area TOLerance
ATOL -	3.0 %	Default Negative Area TOLerance
STOL +	10 %	Default Positive Signature TOLerance
STOL -	4 %	Default Negative Signature TOLerance
FILTER	35 %	Default FILTER Level
AOIE +	20 %	Default Positive Limit for Area Of Interest Error
AOIE -	20 %	Default Negative Limit for Area Of Interest Error
Z1TOL +	10 %	Default Positive Zone 1 TOLerance
Z1TOL -	10 %	Default Negative Zone 1 TOLerance
Z2TOL +	10 %	Default Positive Zone 2 TOLerance
Z2TOL -	10 %	Default Negative Zone 2 TOLerance
ZONE 1	20 points	Default width of Zone 1, expressed in number of points
PTOL +	10.0 %	Default Positive Peak TOLerance
PTOL -	10.0 %	Default Negative Peak TOLerance
Tol. Mode	Fixed	Tolerance Modes: Fixed, Equation, Existing

By default, the *Mode* is selected to be *Fixed.*
In this mode, the tolerance of the process is controlled based on the default ATOL± and STOL± values set in the ATOL± and STOL± fields.

If the Mode selected is *Equation*, the tolerance of the process is controlled using the following formulae:

ATOL± = A. DEV ± ATOL (DEFAULT AREA TOLERANCE)
STOL± = S. DEV ± STOL (DEFAULT SIGNATURE TOLERANCE)

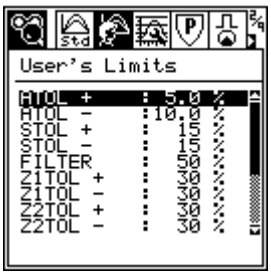
If *Existing* tolerance *Mode* is selected, the current working tolerance will always be used even when a new learn is performed.

3.1.2 User's Limits Settings

The User's Limits settings specify the maximum adjustable limits allowed for the set of fields found in Working Tolerance being set-up by the operators.

To change the values for the User's Limits, select user's limits  as highlighted. Press enter  once so that the first field of the User's Limit will be highlighted as shown in the figure.

Parameter	Description
ATOL +	Positive Area TOLerance
ATOL -	Negative Area TOLerance
STOL +	Positive Signature TOLerance
STOL -	Negative Signature TOLerance
FILTER	FILTER Level
Z1TOL +	Positive Zone 1 TOLerance
Z1TOL -	Negative Zone 1 TOLerance
Z2TOL +	Positive Zone 2 TOLerance
Z2TOL -	Negative Zone 2 TOLerance
ZONE 1	Width of Zone 1, expressed in terms of number of points
PTOL +	Positive Peak TOLerance
PTOL -	Negative Peak TOLerance



3.1.3 Learn Settings

To make changes to the Learn settings, select learn settings as highlighted. Press enter once to access the fields in the Learn Settings. The first field will be highlighted as shown in the figure.

Parameter	Default	Description
QA Check	On	Specifies whether Quality Assurance Check is required before the learn process
QA Size	4	The number of crimps for Quality Assurance Check
Learn Size	3	The number of crimps required for Learn
A. Dev +/-	3%	The Area Deviation allowed among the crimps
S. Dev +/-	15%	The Signature Deviation allowed among the crimps

3.1.4 Protection Settings

The Protection settings specify the actions that are to be taken when an error occurs. To make changes to the Protection settings, select protection as highlighted and press enter once to access to the fields of the Protection settings.

The first field of the Protection settings is highlighted as shown in the figure.

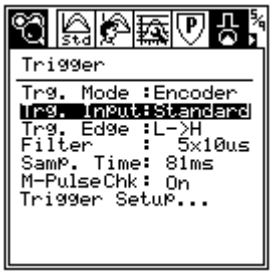
Parameter	Default	Description
Cons Fault	1	The number of Consecutive Faults occur before the stop Output is triggered to stop the crimp press or automatic cutting machine
Overload	ON	Specifies whether the crimp press or applicator is protected against Overload error. With Overload protection, the crimp press will be stopped immediately if an Overload error occurs regardless of Cons Fault setting
Underload	ON	Specifies whether the crimp press or applicator is protected against Underload error. With Underload protection, the crimp press will be stopped immediately if an Underload error occurs regardless of the Cons Fault setting
Zone Check	OFF	Indicates whether the Zone Check is enabled
Peak Force	OFF	Indicates whether the Peak Force is enabled
Speed Corr	OFF	Indicates whether the Speed Correction is enabled This option is applicable to ONLY the Force and Proximity triggering mode.
Up To Peak	OFF	Indicates whether to perform crimp analysis up to peak only

3.1.5 Trigger Settings

To make changes to the Trigger settings, select trigger as highlighted and press enter once to access the fields in Trigger settings.

The first field of the Trigger option will be highlighted as shown in the figure.

Parameter	Default	Description
Trg. Mode	Encoder	The type of trigger used which includes: Encoder, Force, Servo, Disc, Proximity
Trg. Input	Standard	The type of Trigger Input used for triggering purposes. Standard refers to Standard input; Diff. refers to Differential input
Trg. Edge	L->H	The edge used for trigger
Filter	200us	The Filter duration for triggering pulse
Samp. Time	50ms	The sampling time
M-Pulse Chk	On	Indicates whether the m-pulse check is enabled
Trigger Setup…	-	Activates trigger setup



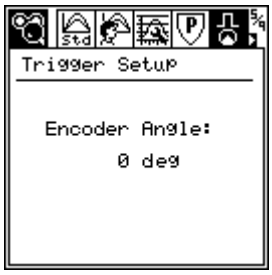
In order to change the type of trigger input, select **Trg. Input** option and press enter ✓ to select **Standard** or **Diff.** triggering. To select the type of triggering mode required, select the **Trg. Mode** field and press enter ✓ once to select the required triggering mode.

The required M-Pulse **Filter** value is automatically updated with the type of triggering mode selected.

3.1.5.1 Performing a Trigger Set-up

To perform a Trigger set-up for the selected triggering mode, select until **Trigger Set-up** is highlighted and press enter ✓ once.

Following is the trigger setup mask when the ***Encoder*** is selected as the trigger mode.



At the Trigger Set-up mode, the triggering edge of the Encoder is automatically detected. Auto-detection of the triggering edge is available for both the Servo and Disc triggering modes.

To verify that the Encoder is properly installed, make a crimp at the selected press, the encoder angle of the current crimp press will be displayed. The encoder angle gives the top stop position of the press. This angle should be about 0 degrees with a tolerance ± 10 degrees.

Adjust the encoder **in the direction of** the crimping motion if the desired encoder angle is not obtained. To verify whether the encoder is correctly positioned, make a crimp again after the encoder adjustments have been done and observe the displayed angle.

To exit Trigger Set-up, press escape once.

Following is the trigger setup mask when the ***Disc*** is selected as the trigger mode.

To perform a trigger set-up for the Disc, make a crimp at the selected press, the number of disc slots will be displayed. The ideal number of disc slots obtained should be 110 or 115, to enable correct capturing of the force signals. If the desired disc slots not obtained, please consult SLE Engineers for advice.

To exit Trigger Set-up, press escape once.

Following is the trigger setup mask when the ***Servo*** is selected as the trigger mode.

This trigger set-up designed specially for the servo encoder installed in Megomat APE300 press.

To perform a trigger set-up for the Servo, make a crimp at the selected press, the servo triggering angle of the current crimp will be displayed. The correct servo triggering angle is 90 degrees. If the incorrect servo triggering is obtained, please consult SLE Engineers for advice.

To exit Trigger Set-up, press escape once.

Following is the trigger setup mask when the ***Proximity*** is selected as the trigger mode.

Here, the **Trig. I/P Level (Triggering Input Level)** of Proximity is detected. Once the triggering input level is obtained, the trigger set-up is completed.

To exit Trigger Set-up, press escape once.

The **Force** option can be used as a triggering mode when there is no trigger connected to the Crimp Quality Monitors.

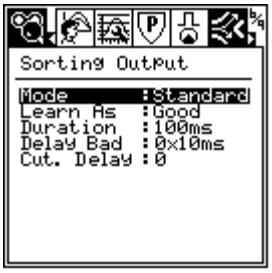
Sampling of the incoming force signal begins once the force signal is detected.

NO trigger set-up is required if the **Force** is selected as the triggering mode.

3.1.6 Sorting Output Settings

The Sorting Output settings specify the behaviour of the sorting output for good and bad crimps. To make changes to the Sorting Output settings, select sorting output as highlighted. Press enter once and the first field of the Sorting Output will be highlighted as shown in the figure.

Parameter	Default	Description
Mode	Standard	The sorting mode for the type of machine integration Standard: The Standard sorting mode STD INV. – standard interface (inverted), CLK-Stop – 2x clock outputs are used as STOP relay for each channel (double channel system). Other modes available are: MEGOMAT, KIRSTEN, TR10/20, TRD111, KOMAX, FCI and Sumitomo
Learn As	Good	Specifies how the crimps made during Learn process are to be sorted during the Learn process Good: The crimps made are sorted to the GOOD bin Bad: The crimps made are sorted to the BAD bin
Duration	10ms	The duration of the sorting signal
Delay Bad	0x10ms	Delay duration before activating the BAD output.
Cut Delay	0	Delay specified number of strokes before activating cutter. Cutter should be connected to BAD output.



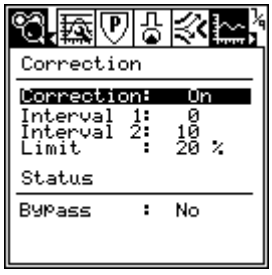
3.1.7 Control Settings

To make changes to the Control settings, select correction as highlighted.

3.1.7.1 Correction Settings

Press enter once to access the option in Control Settings. The first field of Correction option will be highlighted as shown in the figure.

Parameter	Default	Description
Correction	On	The selection of the Tool Drift Correction option
Interval 1	0	The number of crimp leading to first correction after learn is completed. This is useful to obtain a stable reference when learn crimp size is small
Interval 2	10	The number of crimps leading to a correction
Limit	20	The maximum correction limit
Bypass	No	If in bypass, temporary de-activation of the monitoring function of the Crimp Quality Monitor



3.1.7.2 Status Settings

The Status option determines whether the status of the Crimp Quality Monitor connected to the selected crimp press.

To change the Status option, select until the field of the Status is highlighted as shown below.

Temporary de-activation of the monitoring function of the Crimp Quality Monitor can be achieved by setting the Crimp Quality Monitor to **Bypass** mode.
To edit the **Bypass** option, select until the required field is highlighted. Press enter to toggle between the **Yes** and **No** selections.

3.1.8 SPC Settings

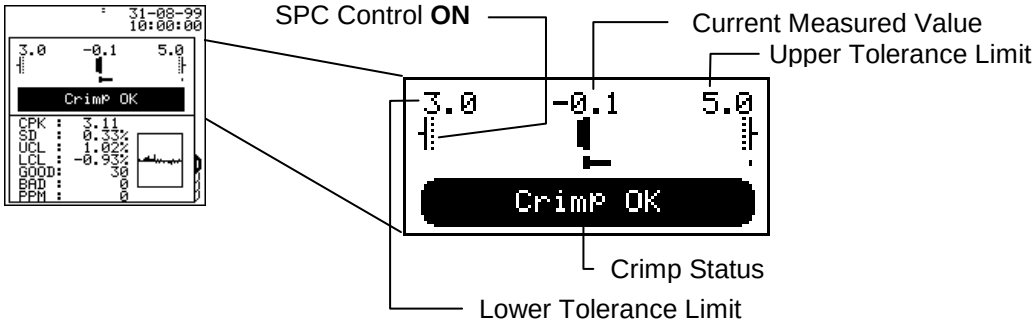
During the production process, the SPC Control settings enables adaptive tolerance control using the UCL and LCL obtained from the statistical process computation.
To make changes to the SPC Control settings, select SPC as highlighted. Press enter once and the first field of the SPC is highlighted as shown below.

Parameter	Default	Description
U/LCL Ctrl	Off	Selects to use UCL / LCL as ATOL+/-
Fix Ctrl	0	Fix SPC Control Limits after specified number of crimps.
UCL Sigma	3	The positive deviation allowed from mean in terms of sigma
LCL Sigma	3	The negative deviation allowed from mean in terms of sigma
Excl. Bad	Off	When enabled, CPK calculation is based on good crimps ONLY.

If **U/LCL Ctrl (UCL & LCL Control)** option is selected, the area evaluation of the crimping force will be **based on** the tolerance given by the UCL and LCL of the statistical process computed.

However, the values of the UCL and LCL would not be greater than the ATOL+ and ATOL- values of the Working Tolerance.

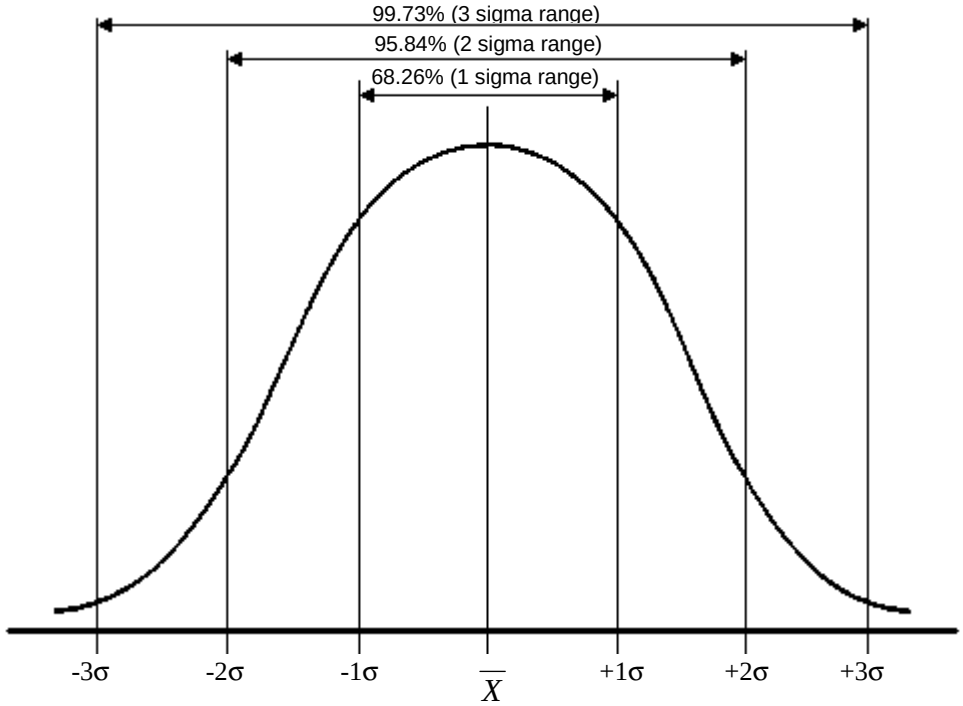
Once the SPC Control is activated, the following operation mask will appear.



If **Fix Ctrl (SPC Control)** option is selected, the UCL and LCL values used for area evaluation will be kept constant after the number of crimps specified in the **Fix Ctrl** field occurs.
The range of the **Fix Ctrl** is between 25 and 100.

For example, suppose the Fix Ctrl is set to be 50.
This means that after 50 crimps, the UCL and LCL values obtained will be used as the tolerance values for the area evaluation of the crimping force for the rest of the production.

The acceptance region defined by the **UCL Sigma** and **LCL Sigma** values are defined as shown in Graph 1d.

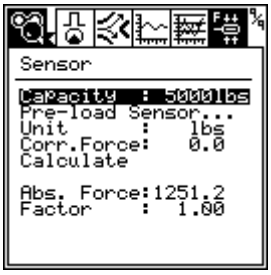


Graph 1d

3.1.9 Force Sensor Settings

To make changes to the Force Sensor settings, select sensor as highlighted and press enter once to access to the fields in Force Sensor Settings. The first field will be highlighted as shown in the figure.

Parameter	Default	Description
Capacity	5000lbs	The capacity of the force sensor in Lbs.
Unit	lbs	The measurement unit for the crimping force
Corr. Force	-	The Corrected Force obtained using the Calibration System
Abs. Force	-	The Absolute Force measured by the force sensor installed in the crimp press
Factor	1.0	The Factor between the correct force and absolute force The Factor is calculated as follows: **New Factor = Old Factor * Corrected Force ÷ Absolute Force**



Due to the pivot construction of the baseplate where the piezo force sensor is installed, the force measured by the sensor may only be a fraction of the actual force.

Owing to the linear relationship between the actual force and the force sensed by the sensor, calibration can be done so that the absolute value of the crimping force can be evaluated.

Using the Calibration system consisting of the Calibration tool, the actual force is acquired. The Corrected Force signal reflects the absolute value of the crimping force.

Enter this force as the Corrected Force in the **Corr. Force** field.

In order to edit **Corr. Force** field, select until it is highlighted. Press enter once to enter the editing mode.

Please refer to Section 1.4.2 Editing a Parameter for information on how to edit the required field.

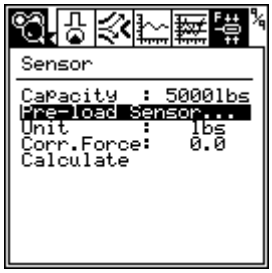
Rotate the jog shuttle until the **Calculate** is highlighted; press enter to compute the Correction Factor.

The **Correction Factor** is automatically updated once the calculation process is completed.

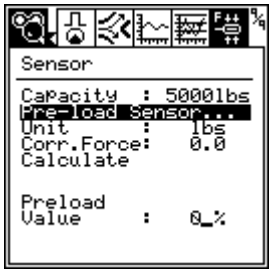
In order to edit **Unit** field, select until it is highlighted and press enter to toggle between **Lbs**. and **N**.

The **Pre-load Sensor** option enables the pre-loading of the force sensor installed either on the Ramp or Baseplate.

To perform a pre-loading, select until the **Pre-load Sensor** is highlighted as shown below.



Ensure that the force sensor is free of stress or load. Unscrew any screws that might have directly or indirectly exerted any force or load on the force sensor. Then, press enter once to begin the pre-loading process, the mask appears is as shown below.



At this instant, the Crimp Quality Monitor records the current stress condition as the reference stress or load and assign a zero value to it. Any additional tension or extension force will then be recorded relatively and the relative percentage will be updated and shown on the display as the pre-load value for the sensor.

It is recommended that the force sensor be pre-loaded between 5% and 15%.

To exit the Pre-load mode, press escape once.

3.2 Tolerance Setup

The settings of the Tolerance setup display can be changed accordingly to suit the user's requirements.

To change the Tolerance setup settings, press enter once from the operation mode to enter the programming mode. Select working tolerance as shown below to go to the Working Tolerance setup.

Tolerance Setup mask

Then, use the jog shuttle to select the tolerance level from the 8 given levels. Press enter once to go to the Tolerance mask. Use jog shuttle to select a parameter and press enter once again to go to the edit mode.

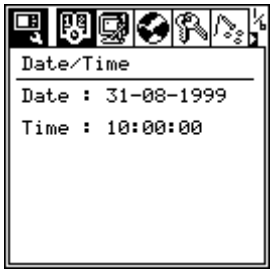
Tolerance Sets	Pre-defined Tolerance													
	ATOL+	ATOL-	STOL+	STOL-	Filter	Zone Check	Peak Force	Z1TOL+	Z1TOL-	Z2TOL+	Z2TOL-	ZONE1	PTOL+	PTOL-
Basic Standard	5.0%	3.0%	10%	4%	35%	OFF	OFF	-	-	-	-	-	-	-
Basic Easy	7.0%	5.0%	10%	8%	35%	OFF	OFF	-	-	-	-	-	-	-
Basic Sharp	4.0%	2.0%	5%	3%	35%	OFF	OFF	-	-	-	-	-	-	-
Enhanced Standard	5.0%	3.0%	10%	4%	35%	Z1&Z2	ON	10%	10%	10%	10%	15	5.0%	3.0%
Enhanced Easy	7.0%	5.0%	10%	8%	35%	Z1&Z2	ON	15%	15%	15%	15%	15	7.0%	7.0%
Enhanced Sharp	4.0%	2.0%	5%	3%	35%	Z1&Z2	ON	7%	7%	7%	7%	15	4.0%	4.0%
Customer 1	5.0%	3.0%	10%	4%	35%	OFF	OFF	-	-	-	-	-	-	-
Customer 2	5.0%	3.0%	10%	4%	35%	Z1&Z2	ON	10%	10%	10%	10%	15	5.0%	5.0%

3.3 System Setup

The settings of the SL Starlite display unit can be changed accordingly to best suit the needs of every user.

To change the Starlite settings, from the operation mode, press enter once to enter programming mode, select until Starlite setup is highlighted as shown below.

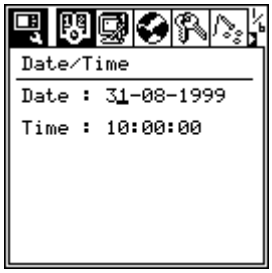
Press enter



Option Selection mask For Settings

3.3.1 Changing the Date and Time

In order to change the date and time of the system, select until Date/Time is highlighted. Then, press enter once to edit the date and time. (Refer to figure shown below)



The current date is expressed as *DD: MM: YY.*
The current time is expressed as *HH:MM: SS.*

To edit Date and Time, press enter until the blinking cursor appears at the field required for editing. Tune until the required value is obtained. To apply the changes, press enter until the Date and Time mask disappears.

To abort the changes, press escape once.

3.3.2 Display Options

The display options enable user to customise the curve view of the operation mask.

To change the Display Options for the system, select display options as highlighted. Then, press enter once to confirm. The following mask appears as shown in the figure.

Parameter	Default	Description
Show Tol. Limits	Yes	The STOL+ and STOL- curves are displayed at all times together with the last curve
Show Filter	Yes	The filter level is displayed together with the last curve
Always Show Sig	Yes	The last curve is displayed together with the reference during the Curve Compare view
Show CPK	Yes	The CPK value is displayed on operation screen
SPC Comms. Chk.	No	When enabled, it checks for SPC communication flow and reports communication error when no communication occurs after 5s timeout.

To exit from the Display Options settings, press escape once.

3.3.3 Language Options

To change the language options for the system, select language as highlighted. Then, press enter once to confirm. The following mask appears as shown in the figure.

Parameter	Description
English	English
Deutsch	German
Espanol	Spanish
简体中文	Simplified Chinese

To change to the desired language, select until the required language is highlighted and press enter to confirm the option. To abort, press escape once.

3.3.4 Access Control

To change the access level settings of the system, select access control as highlighted and press enter once to enter the following mask as shown in the figure.

Parameter	Description
Default Access	Default Access level Functions whose authority level is less than or equal to the default access level can be accessed without the use of a Dongle or Touch Probe
Reset Error	Access level required to Reset an Error during Operation
Reset SPC/Ctr	Access level required to reset SPC calculation and GOOD/BAD counters
Select Tol. Set	Access level required to select Tolerance Sets
Perform Learn	Access level required to perform Learn
Sequencer Setup	Access level required for Sequencer Setup
Parameter Setup	Access level required for Parameter Setup
System Setup	Access level required for System Setup
Tolerance Setup	Access level required for Tolerance Setup
Access Setup	Access level required for Access Level Setup
infoTOUCH Setup	Access level required for infoTouch Setup
P/W-Operator	Access password for the Operator
P/W-Supervisor	Access password for the Supervisor
P/W-Engineer	Access password for the Engineer
P/W-SLE Engr.	Access password for the SLE-Engineer

To exit the Access Control option, press escape once.

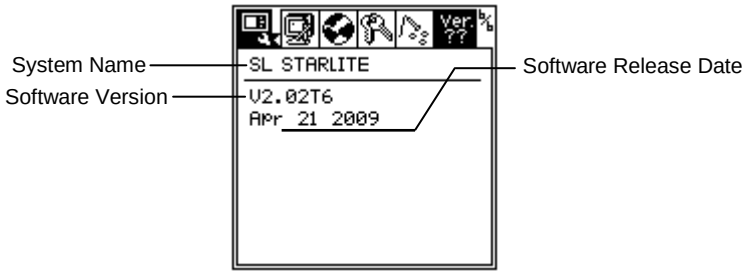
3.3.5 InfoTouch

The infoTouch option describes the authentication options when the Touch Probe or Dongle is used for authentication purposes. SLE Engineers have set the required settings.

Please consult the SLE Engineers for customisation on this option.

3.3.6 Version Information

In order to check the versions of the Crimp Quality Monitors, select until version Ver ?? is highlighted and press enter to enter the following mask as shown below.



The software information for the SL Starlite is displayed.

To exit, press escape once.

Possible Error Messages

Error message	Comments
< Peak Force	The peak force is smaller than the –PTOL limit.
> Peak Force	The peak force is larger than the +PTOL limit.
Area Dev Error	The area deviation among the Learn crimps is NOT within the specified A. Dev limits.
Area Error	The area of the crimping force is NOT within the specified ATOL limits.
Battery Low	The voltage of the storage battery is too low. Contact Service Centre.
Correction Err	Tool drift correction has reached its limit.
Invalid Ref	Reference curve is not present. A Learn process needs to be performed.
Learn Aborted	A Learn process is aborted.
M – Pulse Error	General error at the coding system. Force signal present, but coding signal missing.
Max Gain Error	The force signal is too weak, and therefore cannot be amplified sufficiently. In most cases, the cause might be due to the incorrect cycle sensor settings.
Min Gain Error	The force signal is too strong, and therefore cannot be amplified correctly.
Overcrimp xx%, Undercrimp xx%	The crimp force might be out of the AOIE and STOL limits.
Overload Error, Underload Error	The area of the crimp force is out of the ATOL limits by more than 30%.
Sensor Error	Force sensor might be unconnected, or the force sensor might be faulty.
Sig. Dev Error	The shape deviation among the Learn crimps is NOT within the specified S. Dev limits.
Sig. Too Early	Cycle sensor switches too early.
Sig. Too Late	Cycle sensor switches too late.
Zone 1 Error	Zone 1 values are NOT within the Z1TOL Limits.
Zone 2 Error	Zone 2 values are NOT within the Z1TOL Limits.
Comms Error	Communication with SPC software (SL SPC, SL Softscope, etc) fails. Check serial cable connection. Ensure system ID and PC comms. port is set correctly.
Stay On Error	This has OFF/ON/SEQ1 options. With SEQ1 selected, "specifies whether to jump to sequence 1 when crimp error occurs".

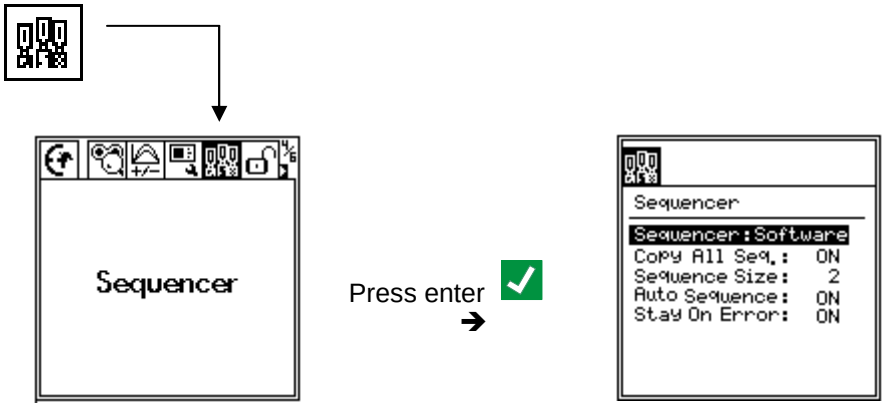
4. Sequencer

The purpose of a *Sequence*r is to provide convenience when crimping with different wires or terminals in sequence.

Different combinations of wires and terminals will result in different force signatures. With the sequencer, it will not be necessary to perform a Learn again when switching to a different connector.

It is possible to store up to 10 sets of reference signatures and tolerances in the *Sequencer*.

To activate the sequencer, select the Sequencer icon from the main menu as highlighted below.



While highlighting the desired option as shown above, changes can be made by pressing enter once.

Sequencer Option

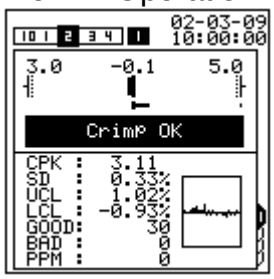
Parameter	Default	Description
Sequencer	OFF	Sequencer mode. Select between OFF, Software Control or External Hardware Control.
Copy All Seq.	ON	When enabled, successful teach-in reference, tolerance, sampling time, pre-trigger and quick information is copied to all sequences.
Sequence Size	2	The number of different connectors to be crimped in sequence. Set between 2 to 10.
Auto Sequence	ON	Sets the running sequence mode to automatic or manual by toggling ON or OFF.
Stay On Error	ON	This has OFF/ON/SEQ1 options and specifies whether to stay on the same sequence upon detecting an error. Applicable only when the auto sequence is set to ON.

Upon making changes to the Sequencer option, press escape once to exit to the main menu.

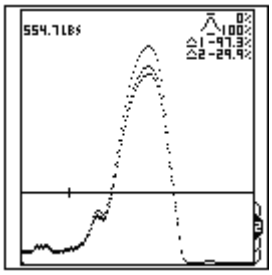
Operation Mode

To enter the operation mode, click escape once. Upon entering to the operation mode, it is able to provide essential information of various connectors depending on the user's preferences. In the operation mode, the information displayed is as follows:

View 1: Operation View



View 2: Curve View

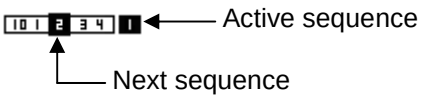


View 3: Tolerance Sets

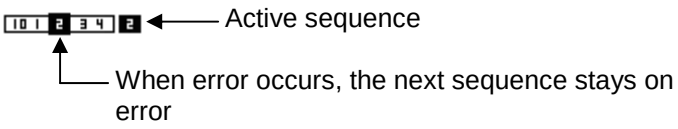
View 4: Learn

The figure shown below indicates that the *Sequencer* is enabled.

Crimp Ok



Error



Set Sequence

The user is able to select the desired sequence by clicking escape once in View 1: Operation View. The cursor will blink indicating that changes can be made.

The desired sequence can be selected by using the jog shuttle. Upon making selection, press enter once to confirm.

If the user is at View 3, upon making changes to the desired tolerances, the system will always prompt whether to apply to **All** sequences as well. Toggle to select Y (Yes) or N (No). Press enter to confirm.

5. EC Certificate of Conformity

pursuant to Low Voltage Directive 2006/95/EC

SLE
A KOMAX GROUP COMPANY

SLE quality engineering GmbH & Co. KG
Josef-Buchinger-Straße 9
94481 Grafenau
Germany

hereby declares that the following product

Model:	Crimp force monitoring system
Serial number:	176 _ _ _ _ _ _
Series / type designation:	SL Starlite 1-channel system
	SL Starlite 2-channel system

conforms to the directive(s) mentioned above, including any changes valid at the time this declaration is issued.

Following harmonized standards have been applied:

DIN EN 60204-1	Safety of machinery - Electrical equipment of machines – Part 1: General requirements
DIN EN 61000-6-3:	Störaussendung für Wohnbereich, Geschäfts- und Gewerbebereiche sowie Kleinbetriebe

Following EU directives have been applied:

EMC-Directive 2004/108/EC
RoHS-Directive 2011/65/EG

Authorized person for the compilation of technical documentation:

Manfred Friedl (CE-Manager)

Grafenau, 26th May 2014 ppa. W. Frey

ppa. Werner Frey

Function of the undersigned: Technical Management CT

Any constructive modifications that have impact on the technical data and the intended purpose of the devices therefore change the device, invalidate this Declaration of Conformity!