



# Surtronic 25

## *User's Guide*

**K505/125-01 Issue 4**

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## Chapter 1 Introduction to Surface Texture terminology and definitions .....1-1

### Surface Texture Definitions ..... 1-1

### Parameter Definitions ..... 1-3

*Ra* ..... 1-3

*Rp* ..... 1-3

*RSm* ..... 1-3

*Rz* ..... 1-3

*Rz1max* ..... 1-3

*Rt* ..... 1-4

*Rmr* ..... 1-4

*RPC* ..... 1-4

*Rsk* ..... 1-4

*Rda* ..... 1-5

## Chapter 2 Description .....2-1

### The Equipment ..... 2-2

Traverse Unit ..... 2-2

Pick-up Mounting Components ..... 2-3

<i>Mounting Bracket</i> .....	2-4
<i>Adjustable Support</i> .....	2-5
<i>Pick-up holder</i> .....	2-5
<i>Connector</i> .....	2-6
<i>Pick-up</i> .....	2-6
Mounting .....	2-8

## **Chapter 3 Getting Started ..... 3-1**

<b>Battery</b> .....	<b>3-1</b>
----------------------	------------

<b>Connecting the Pick-up</b> .....	<b>3-1</b>
-------------------------------------	------------

<b>Making a measurement</b> .....	<b>3-2</b>
-----------------------------------	------------

Switching the Surtronic 25 ON .....	3-2
-------------------------------------	-----

To cancel a measurement .....	3-4
-------------------------------	-----

<b>Using the Surtronic 25 with a PC</b> .....	<b>3-4</b>
---	------------

<b>Printing</b> .....	<b>3-4</b>
-----------------------	------------

<i>To cancel print:</i> .....	3-5
-------------------------------	-----

## **Chapter 4 Menu Settings ..... 4-1**

<b>Main Menu</b> .....	<b>4-1</b>
------------------------	------------

<i>Cut off</i> .....	4-1
----------------------	-----

<i>Evaluation length</i> .....	4-1
--------------------------------	-----

<i>Parameters</i> .....	4-1
-------------------------	-----

<i>Range:</i> .....	4-4
---------------------	-----

---

Range Selector Table .....	4-4
<i>Print Settings:</i> .....	4-4
<i>Units:</i> .....	4-4
<i>Filter:</i> .....	4-4
<i>Dump Mode:</i> .....	4-5
Dump Mode (Using your Surtronic 25 with a PC) .....	4-5
 <b>SPC Mode</b> .....	 4-5
 <b>Language Settings</b> .....	 4-6
 <b>Chapter 5 Making Measurements - Technical Considerations</b> .....	 <b>5-1</b>
 <b>Operating Notes</b> .....	 5-1
On a horizontal surface .....	5-1
On other surfaces .....	5-2
Cut off: .....	5-2
Evaluation Length: .....	5-3
Table of Cut-off values .....	5-3
 <b>Operating Error Indications</b> .....	 5-4
 <b>Specification</b> .....	 5-6
 <b>RS232 Output</b> .....	 5-7
Printer Configuration .....	5-7

Specification for Data Dump ..... 5-8

## **Chapter 6 Accessories ..... 6-1**

Alternative standard pick-up (112/1503) .. 6-1

Small bore pick-up, 5mm (200min) stylus  
tip radius (112/1504) ..... 6-1

Small Bore Pick-up (112/2673) ..... 6-1

Narrow Gauge Stylus (155/P11610) ..... 6-2

Right Angle Pick-up, 5mm (200min) stylus  
tip radius (112/1505) ..... 6-2

Recess pick-up, 5mm (200min) stylus tip  
radius (112/1506) ..... 6-3

Recess pick-up (112/2672) ..... 6-4

Chisel edge pick-up (112/1524) ..... 6-4

Side-skid pick-up (112/1531) ..... 6-5

Shoe Pick-up (112/1599) ..... 6-6

Detachable Skid (112/1191) ..... 6-7

Extension rod (112/1533) ..... 6-7

<b>Portable Printer 112/3469-01 .....</b>	<b>6-8</b>
<b>Replica Kit (112/727) .....</b>	<b>6-9</b>
<b>Portable base (137/1734) .....</b>	<b>6-10</b>
<b>Chapter 7 Maintenance .....</b>	<b>7-1</b>
<b>Calibration .....</b>	<b>7-1</b>
Reference Standard .....	7-1
Sensitivity Check and Adjustment .....	7-1
Pick-up with Chisel Edge Stylus .....	7-2
<b>Cleaning the Stylus .....</b>	<b>7-2</b>
<b>Pick-up Skid .....</b>	<b>7-2</b>





# Chapter 1

## Introduction to Surface Texture terminology and definitions

### Surface Texture Definitions

Every components surface has some form of texture which varies according to its structure and the way it has been manufactured. These surfaces can be broken down into three main categories: Surface roughness, Waviness and Form. In order to predict a components behaviour during use or to control the manufacturing process, it is necessary to quantify these surface characteristics. This is done by using surface texture parameters.

Surface texture parameters can be separated into three basic types: Amplitude, Spacing and Hybrid.

**Amplitude Parameters.** are measures of the vertical characteristics of the surface deviations.

**Spacing Parameters.** are measures of the horizontal characteristics of the surface deviations.

**Hybrid Parameters.** are combinations of spacing and amplitude parameters.

**Mean Line.** the mean line is a least squares line of nominal form fitted through the primary profile where the areas of the profile above and below this line are equal and kept to a minimum separation. Profile filters as detailed in ISO11562 define the mean lines for the roughness and waviness profiles.

**Cut-off.** A cut-off length (or sampling length) is a filter that uses either electronic (2CR) or mathematical (Gaussian) means to

## Surtronic S25

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remove or reduce unwanted data in order to look at wavelengths in the region of interest.

**Bandwidth.** Bandwidth is the ratio of the upper Cut-off ( $L_c$ ) to the lower Cut-off ( $L_s$ ).

**Sample Length.** The profile is divided into sample lengths  $l$ , which are long enough to include a statistically reliable amount of data. For roughness and waviness analysis, the sample length is equal to the selected cut-off ( $l_c$ ) wavelength. The sample length is also known as the cut-off length.

**Evaluation Length.** The length in the direction of the X axis used for assessing the profile under evaluation. The evaluation length may contain one or more sample lengths. For the primary profiles the evaluation length is equal to the sample length.

*Note: almost all parameters are defined over one sample length, however in practice more than one sample length is assessed (usually five) and the mean calculated. This provides a better statistical estimate of the parameters measured value.*

ISO 3274-1996, ISO 4287-1997, ISO 4288-1996, ISO 11 562 and other International Standards are followed where appropriate by Taylor Hobson equipment.

More detailed information on surface texture in general and on stylus-type measuring instruments in particular is covered in the book 'Exploring Surface Texture', published by Taylor Hobson.

## Parameter Definitions

Surface texture is quantified by parameters which relate to certain characteristics of the texture. The Surtronic 25 offers the following parameters:

Ra, Rp, Rsm, Rz, Rt, Rmr, R<sub>Pc</sub>, Rz1max, Rsk, Rda

Additional parameters can be analysed by downloading results to optional software.

**Ra.** Ra is the universally recognised, and most used, international parameter of roughness. It is the arithmetic mean of the absolute departures of the roughness profile from the mean line.

**Rp.** Maximum Profile Peak Height

Mathematically, the Largest Peak Deviation of the Roughness Profile from the Mean Line within a Sampling Length.

When more than one Sampling Length is analysed Rp is the mean value of the individual Rp values for each sample.

**RSm.** RSm is the mean spacing between profile peaks at the mean line, measured within the sampling length. (A profile peak is the highest point of the profile between an upwards and downwards crossing of the mean line).

**Rz.**  $Rz = Rp + Rv$  and is the maximum peak to valley height of the profile within a sampling length

When more than one Sampling Length is analysed Rz is the mean value of the individual Rz values for each Sampling Length.

**Rz1max.** Maximum Height of Profile

Highest peak to valley within a sampling length. When measured over several sampling lengths the largest individual sampling length value is taken.

Also known in the past as R<sub>ymax</sub>, R<sub>y</sub>, R<sub>max</sub> or R<sub>ti</sub>

## Surtronic S25

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**Rt.** Total Height of the Profile.

Rt is the Maximum Peak to Valley Height of the Profile in the Assessment (evaluation) Length (ln).

**Rmr.** Material Ratio is the length of bearing surface (expressed as a percentage of the evaluation length ln) at a depth below the highest peak.

Replaces tp% - Bearing Ratio as defined in ISO 4287 - 1984

**RPc.** Peak Count

The number of local peaks which project through a selectable band centred about the mean line or a line parallel to it. The count is determined only over the evaluation length though the results are given in peaks per cm (or per inch)

Known as Pc before 1997

**Rsk.** Skewness

Rsk is a measure of the symmetry of the profile about the mean line.

This parameter indicates whether the spikes on the surface are predominately negative or positive or if the profile has an even distribution of peaks and valleys.

**Rda.** R Delta a or Rda or RDa - Arithmetical Mean Slope

Arithmetical Mean Slope of the Profile within the Sampling Length.

Further details are included in the Taylor Hobson booklet 'A Guide to Surface Texture Parameters'.



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## Chapter 2 Description

The Surtronic 25 is a portable, self-contained instrument for the measurement of surface texture and is suitable for use in both the workshop and laboratory. Parameters available for surface texture evaluation are:

- $R_a$ ,  $R_z$ ,  $R_t$ ,  $R_p$ ,  $R_{mr}$ ,  $R_{Pc}$ ,  $R_v$ ,  $R_{z1max}$ ,  $R_{sk}$ ,  $R_{da}$

An explanation of the surface texture parameters evaluated by this instrument is given in Chapter 1, and in the publication *A Guide to Surface Texture Parameters*.

The parameter evaluations and other functions of the instrument are microprocessor based. The measurement results are displayed on an LCD screen and can be output to an optional printer or computer for further evaluation.

The instrument is normally powered by an alkaline non-rechargeable battery. If preferred, a mains adaptor can be used, (code 112/1551 - UK, 112/1595 - Euro, B112/1594 - US).

*Figure 1*



### The Equipment

The standard Surtronic 25 M112/3522-01 includes:

- 1 off Traverse unit: 112/3522-01
- 1 off Standard Pickup: 112/1502
- 1 off Reference Specimen: 112/1534
- 1 off Pickup cable: 112/1257
- 1 off Screwdriver: QA 0001
- 1 off Battery: QB 0016

*Note: certain items described in this handbook are optional and may not form part of your particular system.*

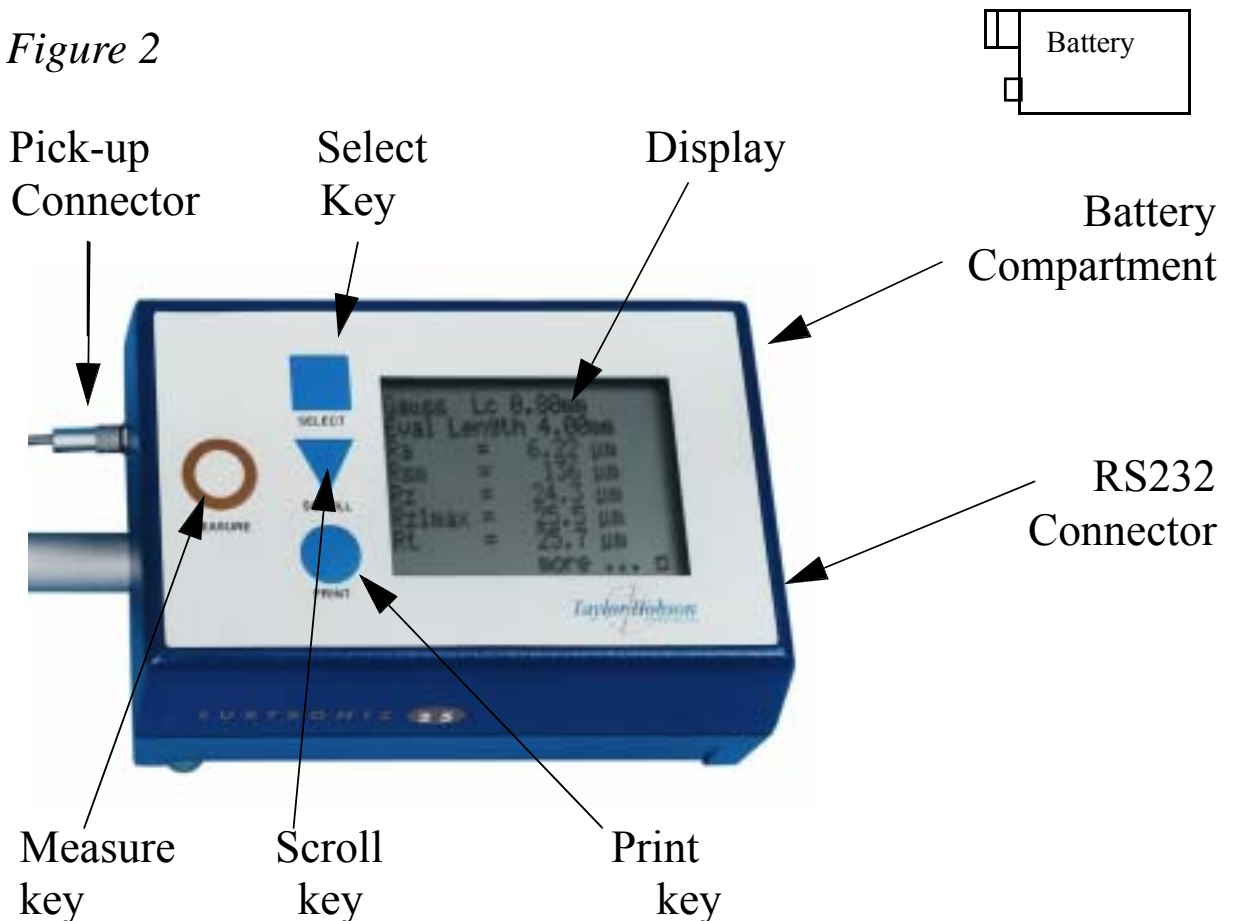
### Traverse Unit

The top panel of the traverse unit carries a membrane type control panel and a liquid crystal display. The unit houses the electronics for controlling the measurement sequence, computing the measurement data and outputting the results to the display, or to the RS232 port for use with a printer (when included) or to a computer, for further analysis.



The unit also contains a drive motor which traverses the pickup across the surface to be measured. The measuring stroke always starts from the extreme outward position. At the end of the measurement the pickup returns to this position ready for the next measurement. The traverse length is determined from selections of cut-off or length.

Figure 2

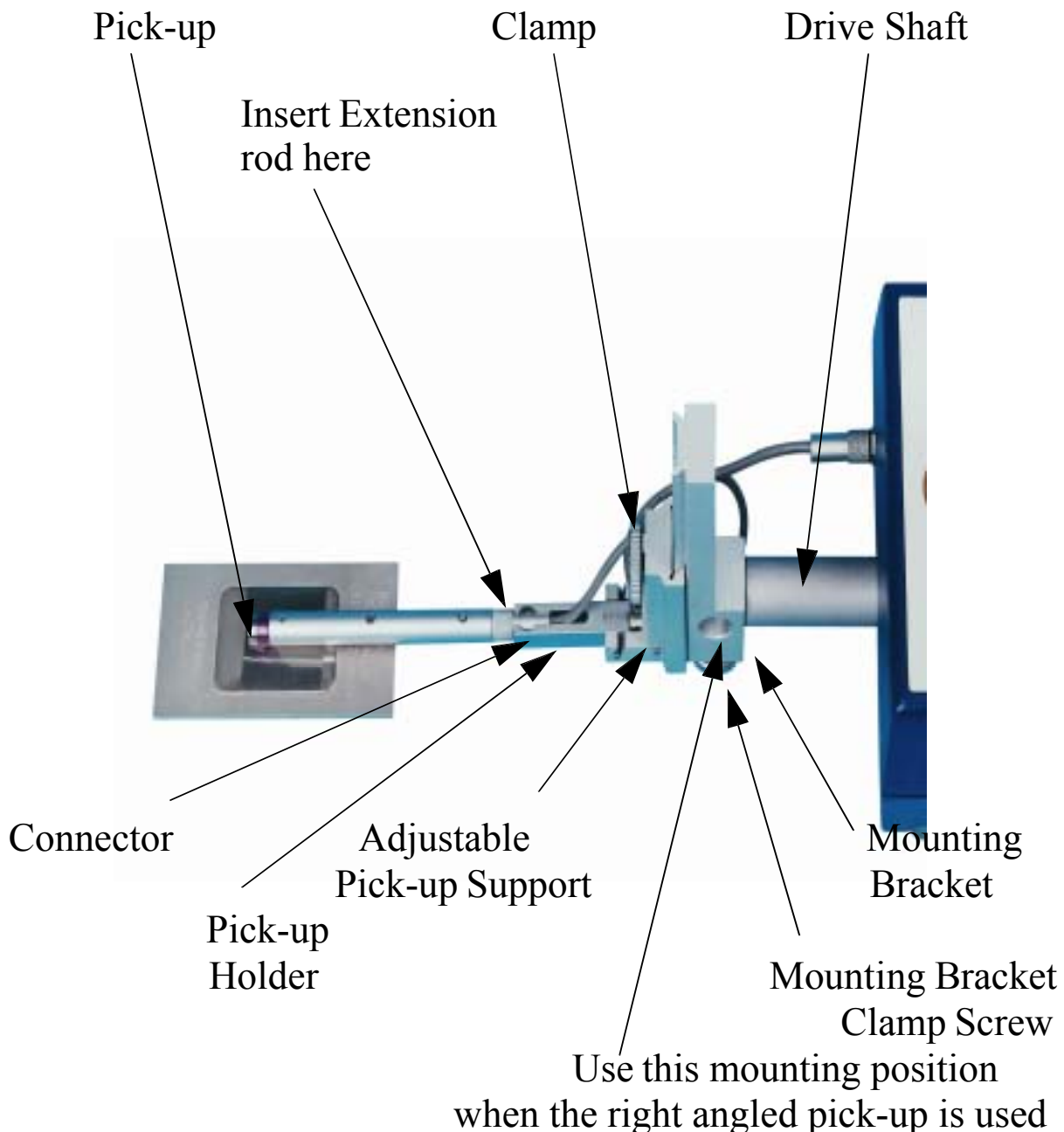


## Pick-up Mounting Components

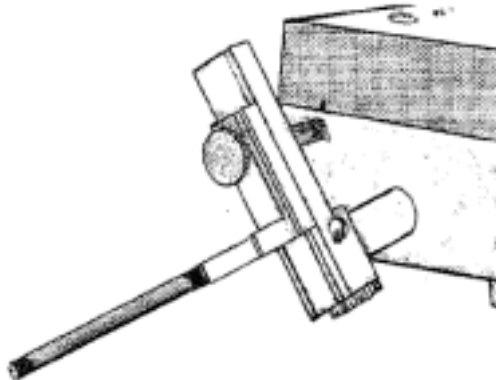
The pick-up is fastened to the drive shaft by the following means:

**Mounting Bracket.** This is clamped to the drive shaft by means of a knurled knob. Although normally used upright, as shown in figure 3, it can be turned to angle the pick-up or to take it off the centre line, as shown in figure 3a. It can also be mounted sideways on the drive shaft, when the right angle pick-up is in use.

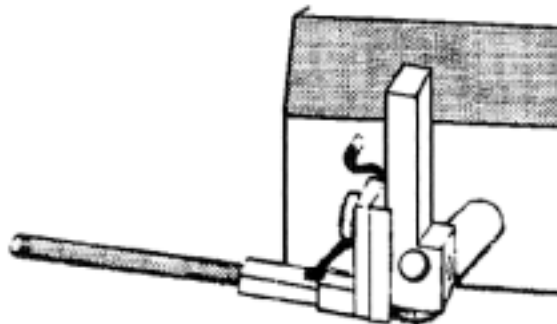
*Figure 3: pick up mounting*



*Figure 3a*



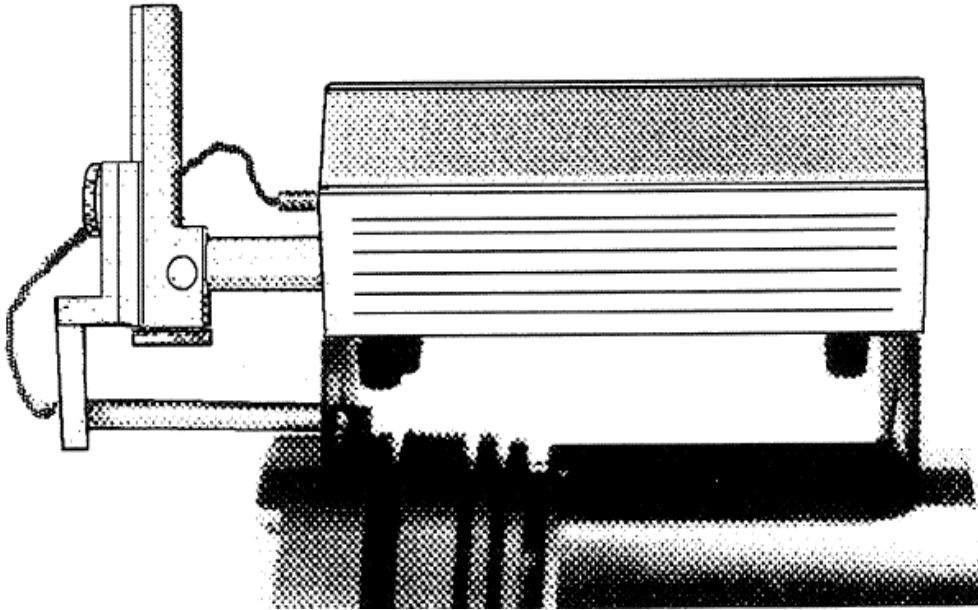
*Figure 3b*



**Adjustable Support.** This can be clamped at any position on the slide of the mounting bracket to provide pick-up height adjustment.

**Pick-up holder.** This fits into the crutch of the pick-up support and is held in place by a spring plunger. A biased holder, when used as shown in figure 3, exerts a biasing force on the pick-up (depending on which way the holder is inserted into the support crutch). It can also be used to position the pick-up directly underneath the display unit, as shown in figure 4.

*Figure 4*



The holder will hold the pick-up at right angles to the drive shaft when it is pivoted away from the surface (eg while changing the work piece).

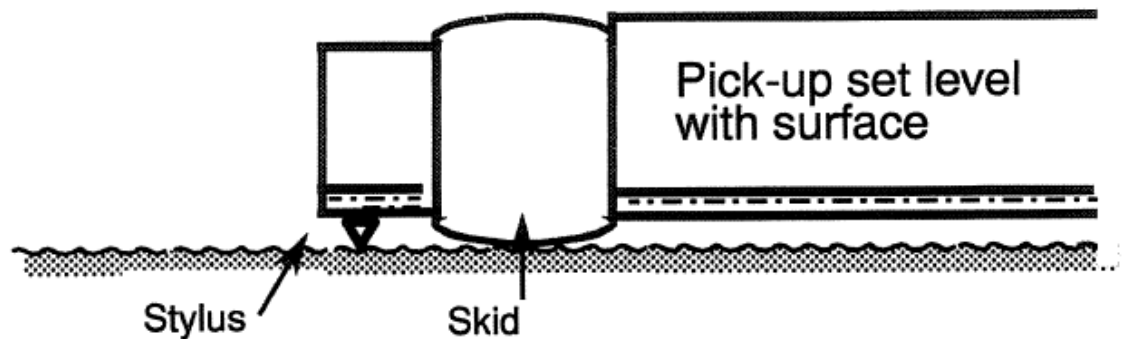
**Connector.** The connector of the pick-up lead is screwed into the end of the pick-up and is then inserted into the end of the pick-up holder, with the lead coming out through the slot in the holder. It is advisable to connect the lead to the display-traverse unit first and then the pick-up. To connect the pick-up to the display-traverse unit: the pick-up has 2 threaded ends with location pins. Insert the location pin securely into the Surtronic body and tighten the threaded collar.

When the extension rod is used, the short pick-up lead is not required and the end of the rod itself is inserted into the holder.

**Pick-up.** The pick-up is a variable inductive type transducer, which is supported on the surface to be measured by a skid, a curved support projecting from the underside of the pick-up in the vicinity of the stylus. As the pick-up traverses across the surface,

movements of the stylus relative to the skid are detected and converted into a proportional electrical signal. The radius of curvature of the skid is much greater than the roughness spacing. This enables it to ride across the surface almost unaffected by the roughness, and provide a datum representing the general form of the surface. Even so, where the waviness is widely spaced it will be necessary to use the pick-up with shoe, in conjunction with the 2.5mm (0.1in) cut-off.

*Figure 5: the pickup is supported on the workpiece by the skid*

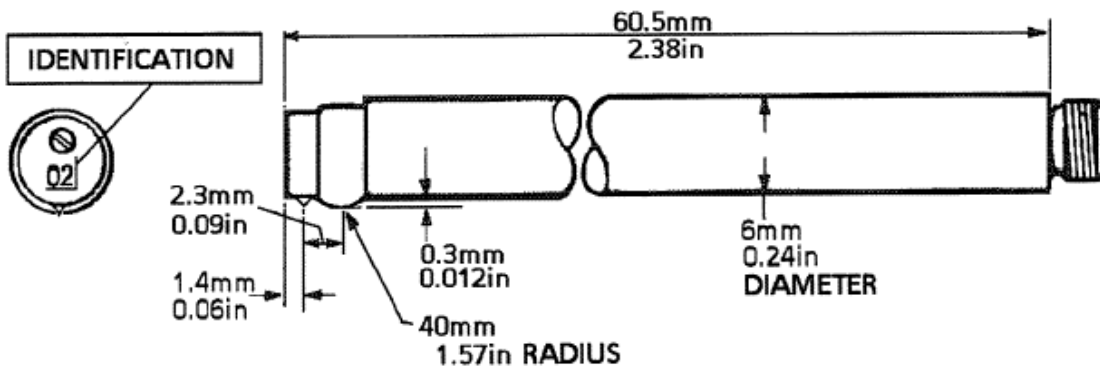


## Surtronic S25

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There are several different types of pickup available designed for different applications, details are given in the Accessories section of this handbook. They differ only in the stylus tip radius, the dimensions of the housing or position and the shape of the skid. The stylus material in all the pickups is diamond for low wear. The skids of the standard pickups are of red ruby.

*Figure 6. Standard pick-up dimensions*

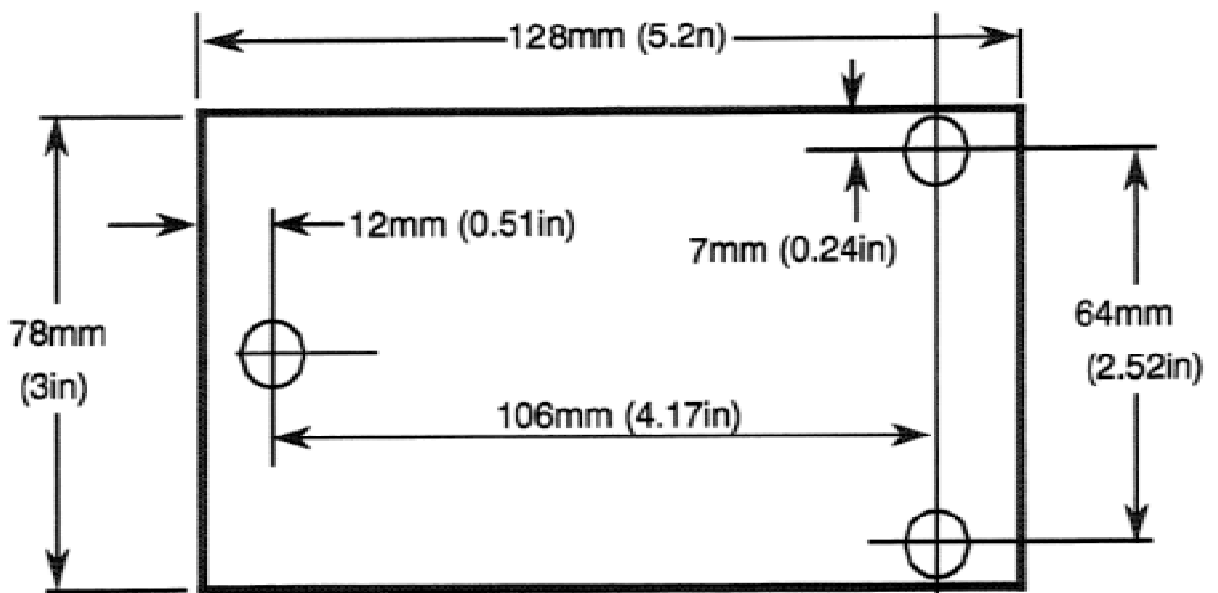


## Mounting

On a flat surface the display-traverse unit can be supported on its three feet. If the unit is to be used on a roll or in a large bore, unscrew the three feet and use them to fasten an optional roll and bore plate to the bottom of the unit; make sure that the feet are correctly located within the holes of the plate.

If a user wishes to make his own mounting bracket for the unit, the dimensions of the fixing holes are shown in figure 7.

Figure 7



Diameters of clearance holes:  
 8.2mm (0.32in) for feet  
 3.2mm (0.13in) for screw  
 Foot screws M3 thread.





## Chapter 3

# Getting Started

### Battery

To insert a battery, open the compartment by sliding the door to the right and remove the door from the unit. Insert the battery, with the terminals positioned as shown in the diagram on the floor of the battery compartment.

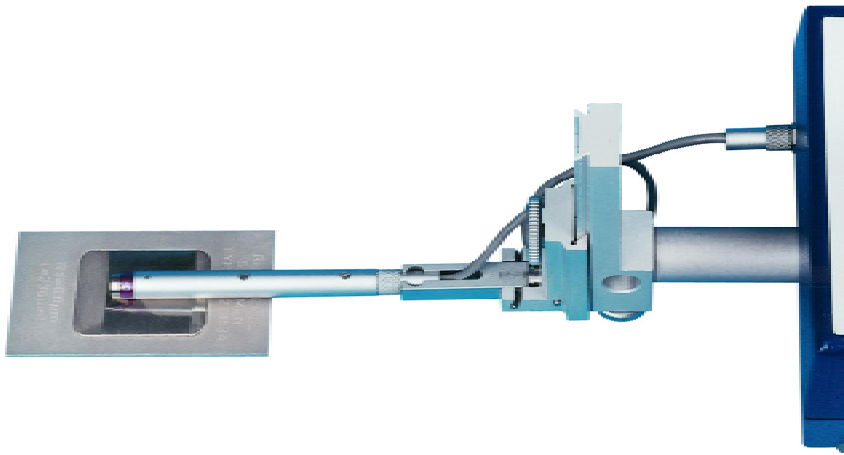
### Connecting the Pick-up

Plug the lead into the socket on the front of the unit and mount the pick-up as follows: The connector of the pick-up lead is screwed into the end of the pick-up and is then inserted into the end of the pick-up holder, with the lead coming out through the slot in the holder. It is advisable to connect the lead to the display-traverse unit first and then the pick-up. To connect the pick-up to the display-traverse unit: the pick-up has 2 threaded ends with location pins. Insert the location pin securely into the Surtronic body and tighten the threaded collar.

Rotate the pick-up to bring the stylus vertical; this can conveniently be done with reference to the identity number engraved at the end of the pick-up.

Position the Pickup stylus on the component to be measured, with the stylus parallel to the component (see figure 8 below). Ensure that the stylus tip is in contact with the surface (this can be verified by checking that the identity number engraved at the end of the

pick-up is vertical). The skid should also be in contact with the surface.



*Figure 8*

### **Making a measurement**

*Note 1: If the pickup has been changed or the instrument is being used for the first time, the instrument should be calibrated (see Chapter 7).*

*Note 2: Successful use of the Surtronic 25 will only be possible if it is operated on a surface free from external vibration - see also operating notes in Chapter 5.*

### **Switching the Surtronic 25 ON**

Pressing the SCROLL  $\nabla$  key brings the display on and the previously selected set-up is displayed (provided power has been continuously present). The display is automatically turned off if the instrument is not used for 30 seconds.

If the battery is dead or has been removed, the previously selected set-up is lost. When a battery has been replaced and the SCROLL  $\nabla$  key is pressed, the message "Welcome to Surtronic 25" is displayed for 2 seconds and the default settings are restored.

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The default settings are:

Parameter	:	Ra
Cut-off	:	0.8mm
Evaluation length	:	4.0mm
Range	:	100 $\mu$ m
Data dump evaluation length	:	4.0mm
Data dump range	:	100 $\mu$ m

No parameter/graph selected for printout

Language	English
Filter	Gaussian

If the user wishes to change any of these settings, this can be carried out using the Scroll  $\nabla$  and Select  $\square$  keys (see Chapter 4 for more detail)

Press the MEASURE button. When the measurement is completed the pickup returns and the results are displayed on the screen (see example below):

GaussLc		0.80mm
Eval Length		25.0mm
Ra	=	0.00 $\mu$ m
Rz	=	0.00 $\mu$ m
Rt	=	0.00 $\mu$ m
Rp	=	0.00 $\mu$ m
RSmm	=	0.00 $\mu$ m
		more... >

If multiple parameters have been selected they may not fit on the display. To continue viewing the remaining results, click on the select  $\square$  button.

### **To cancel a measurement**

If Measure is pressed during a traverse, a stop and reversal without measurement will occur and Measurement Cancelled is displayed.

### **Using the Surtronic 25 with a PC**

If the Surtronic 25 is connected to a PC then measurements will be taken in dump mode, which is selected using the Scroll and Select keys from the main menu (see next chapter for full set-up details). Position the Pickup stylus on the component to be measured. Measurements are then activated from the software on the PC. When the measurement is completed the pickup returns and the results are dumped directly to the PC. During transfer of the measurement data the message Data Dumping is displayed.

When the data dump is completed, the dump menu still remains active. From the displayed menu, values of evaluation length and range can be changed and further measurements for data dump can be made (see next chapter for further details).

### **Printing**

- PRINT KEY:pressing this key causes the evaluated measurement data to be output to the RS232 port. When a printer is connected, a printout of all the parameters selected in the print menu is made.

If SPC has been selected (see chapter 4) the heading is disabled.

Where the profile is longer than 80cm the printout will stop after 80cm. Pressing PRINT key can print the next 80cm. The printout will start from the beginning of the profile if SELECT is activated.

If no legal surface data is stored, the error message "Measure before print" is displayed.

**To cancel print:** Pressing the PRINT key during printout (before display has updated to Main menu state) stops the printout and "Printer cancelled" is displayed for 2 seconds. The normal update to Main-state then continues.



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## Chapter 4

# Menu Settings

The operation of the Surtronic 25 is based on making selections from menus presented on the liquid crystal display. Two menu states exist, these are: Main Menu and Data Dump Menu. The Data Dump menu is accessed via the Main Menu and is used when connecting to a PC.

### Main Menu

The Main Menu (accessed by pressing the Scroll  $\nabla$  key) is used to make the following selections:

CUT-OFF  
EVALUATION LENGTH  
PARAMETERS  
RANGE  
PRINT SETTINGS  
UNITS  
FILTER  
DUMP MODE

The Scroll  $\nabla$  key is used to cycle through these options and the Select  $\square$  key is used to confirm the set up screen required. For a chart of default settings see Chapter 3.

**Cut Off:** To select the cut-off required, select the Cut-off option from the main menu. Press the Scroll  $\nabla$  key to toggle through the cut-off options until the required cut-off is highlighted on the screen, then press the Select  $\square$  key. See chart in chapter 5 for further information.

**Evaluation Length.** To select the evaluation length required, select this option from the main menu. Press the Scroll  $\nabla$  key to

## Surtronic S25

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toggle through the evaluation length options until the required length is highlighted on the screen, then press the Select  key. The evaluation length options are determined by the cut-off length selected.

**Parameters:** select the Parameters option from the main menu. A list of the parameters available will appear on the screen (see below). Press the Scroll  key left to right across the columns then press the Select  key for each parameter required (multiple selections can be made). The Select key is also used to de-select a parameter.

	✓	RSm
	Ra	Rz1max
✓	Rt	Rsk
	Rp	Rda
	Rmr >>>	settings
	Rpc >>>	settings
		Exit

When selecting the Rmr and Rpc parameters, additional settings need to be specified. Scroll onto "Settings" then click on the Select key. The following screen will appear:

Rmr	settings
Mr	% + Offset
Mean	line + Offset
	Exit



The SCROLL  $\nabla$  key will cycle through 'Mr% + Offset', 'Mean line + Offset' and 'Exit'. The SELECT  $\square$  key will allow the alteration of one of the 2 settings or, if Exit is highlighted, will return to the main parameter selection screen.

Pressing SCROLL  $\nabla$  will step the cursor (or highlighted character) through the 3 decimal digits of the percentage, then the sign and 3 decimal digits of the offset and then to OK. Pressing SELECT will change the sign/digit - keep pressing SELECT until the required figure is reached. Pressing SCROLL saves the change and moves the cursor along to the next decimal digit. When complete Select the OK button to return to the previous menu.

Rmr	Settings
	Mr% 001%
	Offset +00.0 $\mu$ m
	OK

The following screen is displayed for Rpc settings and is amended in the same way as above.

Rpc	Bandwidth
	00.0 $\mu$ m
	OK

## Surtronic S25

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**Range:** Allows the user to scroll through the range options. For optimum performance it is advised to recalibrate after changing range. The most common settings are as follows:

For surfaces <10 micron peak to valley- select range of 10 $\mu$ m

For surfaces <100 micron peak to valley- select range of 100 $\mu$ m

For surfaces <300 micron peak to valley- select range of 300 $\mu$ m

### Range Selector Table

Parameter	Resolution at 10 $\mu$ m range	Resolution at 100 $\mu$ m range	Resolution at 300 $\mu$ m range
Ra	0.01 $\mu$ m	0.01 $\mu$ m	0.1 $\mu$ m
Rp	0.01 $\mu$ m	0.1 $\mu$ m	1.0 $\mu$ m
Rz	0.01 $\mu$ m	0.1 $\mu$ m	1.0 $\mu$ m
Rz1max	0.01 $\mu$ m	0.1 $\mu$ m	1.0 $\mu$ m
Rt	0.01 $\mu$ m	0.1 $\mu$ m	1.0 $\mu$ m
Rmr	0.1%	0.1%	0.1%
RPc	1 decimal point	1 decimal point	1 decimal point
Rsk	0.001 $\mu$ m	0.001 $\mu$ m	0.001 $\mu$ m
Rda	0.1 deg	0.1 deg	0.1 deg
Rsm	1.0 $\mu$ m	1.0 $\mu$ m	1.0 $\mu$ m

**Print Settings:** Allows selection of print options. User can choose to print any combination of graph, parameters and header information. The scale of the graph can also be selected. Scroll through and press the Select button for each item required - a tick will appear alongside the item.

**Units:** Allows imperial or metric units to be selected.

**Filter:** Allows filter options of either Gaussian or 2CR (see explanation in Chapter 1).

**Dump Mode:** This menu mode is used if connecting the Surtronic 25 to a PC (see below)

## **Dump Mode (Using your Surtronic 25 with a PC)**

If using the Surtronic 25 with a PC you will need to select the DUMP MODE option from the main menu. Scroll to Dump mode ON. Each time the Surtronic 25 is switched on, the following dump mode menu options will be available:

EVALUATION LENGTH  
RANGE  
UNITS  
FILTER  
DUMP MODE

All other settings are carried out via the PC.

## **SPC Mode**

If SPC is required, this can be switched on by pressing the PRINT  $\circ$  AND SCROLL  $\nabla$  buttons down simultaneously. The following warning screen will appear:

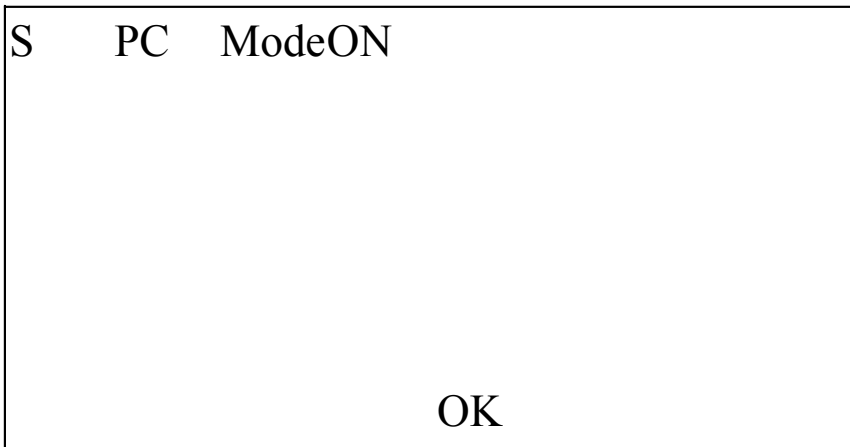
Warning	
Changes to the following settings are for advanced functions only	
Quit	OK

Selecting OK displays the Select language and select SPC mode screen. Select the SPC Mode using the SELECT  $\square$  key, then SCROLL  $\nabla$  will toggle the mode between ON and OFF. When

## Surtronic S25

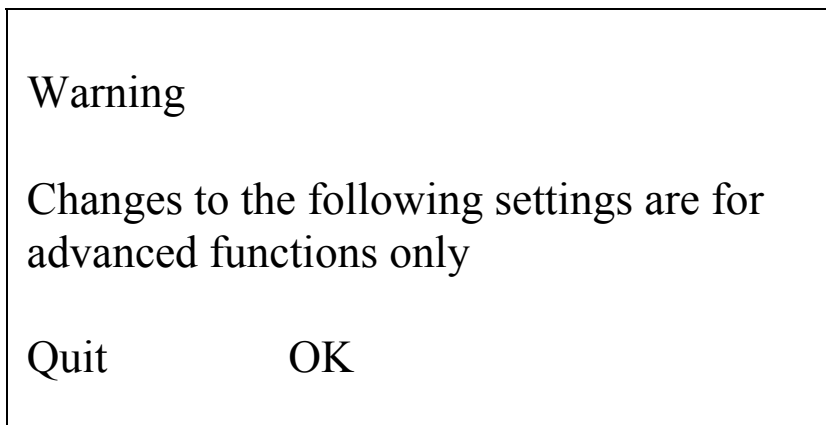
---

SELECT  is pressed with OK selected the previous screen will be shown again.



## Language Settings

The default on the Surtronic 25 is English Language. If the user wishes to select other languages, press the PRINT  AND SCROLL  buttons down simultaneously. The following warning screen will appear:



---

Selecting OK displays the Select language and select SPC mode screen

Select	Language
Select	SPCmode
Quit	

Scroll down the options with  and click  to select

Select	Language
	English
	Français
	Deutsch
	Italiano
OK	

Scroll down the list of languages with and click to select

This selection will remain as the default unless power is lost (eg battery is removed).



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# Chapter 5

## Making Measurements - Technical Considerations

### Operating Notes

Before measurements are made, there are a few general points of procedure which should be observed.

1. The surface to be measured must be free from vibration and the instrument must be completely steady during a measurement.
2. Always turn the pick-up so that the stylus is visibly perpendicular to the surface to be measured.
3. Set the display-traverse unit so that the traverse is made parallel to the surface being measured.
4. After a measurement, the traverse unit can be removed from the surface as soon as the pick-up completes its return stroke. The display will remain visible.
5. Where the texture of a surface has a predominant directional character (LAY), it is usual to traverse across the lay, not along it.

### On a horizontal surface

1. Use the biased pick-up holder on the display-traverse unit
2. Clean the surface to be measured, so that it is free from abrasive material, grease, suds etc. This is necessary to ensure accurate readings and to reduce wear on the skid.

## Surtronic S25

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3. Make the cut-off/length and parameter selections required
4. Position the display-traverse unit and pick-up so that the stylus contacts the surface and the pick-up is approximately parallel to the surface. Make sure that the length of surface is sufficient for measurement, remembering that the traverse motion is inwards towards the display-traverse unit.
5. Press the Measure key. When the traverse is completed, the results are displayed and the pick-up returns to its extreme outward position.
6. If an error message is displayed, identify the cause, correct it and repeat the measurement.

### On other surfaces

On a cylindrical surface: fit the optional roll and bore plate

On a vertical surface: If necessary, hold the display-traverse unit by hand on the surface, making sure that it does not move during the measurement

In a small deep bore: Fit the optional extension rod between pick-up and holder.

### Cut off

A few trial measurements made on different surfaces will soon demonstrate that on some, the results obtained are very dependent upon the cut-off selected. This shows that it is important to choose the cut-off to suit the surface. In general, fine surfaces require short cut-offs and rough surfaces a longer one. The table on the following page gives some guidance on suitable cut-offs.



## Evaluation Length

A long evaluation length is mainly for use on sheet metal and similar materials, where a longer surface is required to be representatives of the material being examined.

## Table of Cut-off values

If not otherwise indicated on a drawing, the following should be used to determine the cut-off  $\lambda_c$  (ISO4288)-1996.

Recommended Cut-off ISO 4288-1996

Periodic Profiles	Non-periodic Profiles		Cut-offs	Sampling Length/ Evaluation Length
	Spacing Distances $S_m$ (mm)	Rz( $\mu\text{m}$ )		
>0.013 to 0.04	(0.025) to 0.1	(0.006) to 0.02	0.08	0.08/0.4
>0.04 to 0.13	>0.1 to 0.5	>0.02 to 0.1	0.25	0.25/1.25
>0.13 to 0.4	>0.5 to 10	>0.1 to 2	0.8	0.8/4
>0.4 to 1.3	>10 to 50	>2 to 10	2.5	2.5/12.5
>1.3 to 4	>50 to 200	>10 to 80	8	8/40

### Operating Error Indications

During a measurement a message may be displayed which indicates that an error condition has occurred. The messages and the probable causes for their display are as follows:

Display	Reason for message
Motor Error	Motor fault
Pick-up Error	Response at pick-up level error or faulty connection
Over range	Selected range too small
E	Can occur in front of a measured value due to excessive slew rate for a single data point (large spike). May also occur if the pick-up is lifted off the surface
Data transmit error	Printer connected at start of transmission but later detected as not connected (printer off line)
Battery low	When battery voltage $<6.4V$ : key push operations are disabled and display is off.  When the instrument is in the sleep mode and the Measure key is pressed, then "Battery low" is displayed for 2 seconds, followed by the normal display or operation.  Stored surface profile is erased  Renew or recharge battery

Measure before print	pressing PRINT key before measurement
No parameter selected	pressing PRINT key before selecting printout parameters
Printer not connected	pressing PRINT key when printer not connected or no computer connected to receive dump data.
Printing cancelled	pressing PRINT key during data transmission to printer (stop printing). Message displayed for 2 second.
Measurement cancelled	Pressing MEASURE key during traverse (stop traverse)
Measure before data dump	Attempted data dump before measurement

### Specification

Battery            Alkaline: minimum 600 measurements of 4mm measurement length  
                      Ni-Cad: minimum 200 measurements of 4mm measurement length

Size: 6 LR 61 (USA/Japan), 6 F 22 (IEC)  
Fixed battery / external charger  
External charger (Ni-cad only): 110/240V,  
THP No 112/1591 50/60Hz

Traverse Speed: 1mm/sec

Measurement: metric/inch  
units

Cut-off values: 0.25mm, 0.8mm and 2.5mm  
(0.01in, 0.03in and 0.1in)

Traverse lengths: 0.25-25mm  
(0.05-0.98in)

Display:            LCD-matrix, 8 lines x 20 characters,  
                      alphanumeric

Language:        English, German, Italian, French

Keyboard:        Membrane switch panel tactile

Filter:             Digital Gauss filter or 2CR filter (ISO)

Parameters:     Ra, Rz, Rt, Rp, Rmr, Rpc, Rsm, Rz1max,  
                      Rsk, Rda

Calculation time: Less than reversal time or 2 sec whichever is the longer

Accessory : 9 pin D-connector female. Containing:  
socket RS232 hardwired handshake (RS232 level).  
Transmit function only hardware implemented.  
Remote start (5V logic)  
Remote start: short to ground  
Constant power on instrument (5V logic)  
When connected to Ground, constant power is on.

## **RS232 Output**

### **Printer Configuration**

Is SPC is on, then:

Baud rate: 4800 Baud  
Parity: Even  
Data bit length: 7 bits  
Printer head disabled

If SPC is off, then:

Baud rate: 9600 Baud  
Parity: Odd  
Data bit length: 8 bits  
Printer head enabled

Output to printer (in ASCII characters) or pre-selected parameters and provided that G is pre-selected, a readout of dc corrected surface profile.

Language of printout same as language of display

## Surtronic S25

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The printout heading is shown below:

Taylor Hobson Limited  
Surtronic 25  
Operator: .....  
Date: .....  
Object: .....

Cutoff = xxx mm  
Evaluation length = xxx mm  
Filter = xxx

## Specification for Data Dump

The following format is used for data dump from Surtronic 25 to a PC.

Transmission set up is as follows:

Baud rate: 9600 Baud  
Number of data bits: 8  
Start bit: 1  
Stop bit: 1  
Parity: None

Resolution	Horizontal	Vertical
	0.5mm for Evaluation Length 8mm	10nm
	1.0mm for Evaluation Length >8mm	
Evaluation length: selectable	0.25mm, 0.8mm, 1.25mm, 2.5mm, 4.00mm, 8.0mm, 12.5mm, 25.0mm.	

Range selectable: 10  $\mu$ m, 100  $\mu$ m, 300  $\mu$ m

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Transmission: RS232

Transmitted data is unfiltered

No parameters are calculated.

Transmission data:

Data type	Function	Comments
2 bytes	Number of data values	Total number of transmitted data values
1 byte	Ordinate spacing	Number of data values per mm
1 byte	First data value	Resolution 10nm
1 byte	Diff data value	Difference between this and the previous data value
#80	Stop byte	2 stop bytes are sent
#80	Stop byte	making it possible to test for all data values received

The total number of transmitted data bytes are, number of data values +5.

The data value can be calculated from, data value (n) = data value (n-1) + diff data value (n), n1.





## Chapter 6 Accessories

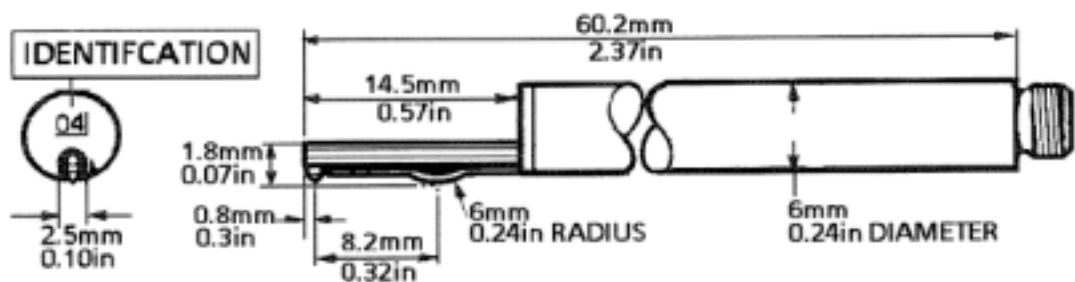
### Alternative standard pick-up (112/1503)

Details as the standard pick-up, see figure 6, page 2-8, but with 10mm (400 $\mu$ m) stylus tip radius. Conforms to US specifications (ANSI B46.1).

### Small bore pick-up, 5 $\mu$ m (200 $\mu$ m) stylus tip radius (112/1504)

For general use in small bores, on narrow surfaces and in grooves, or with the skid supported independently of the surface being measured. On this pick-up the skid is integral with the stylus arm housing and is set further back from the stylus. This enables the pick-up to be used in short bores with the skid supported independently of the surface being measured, eg by the datum support stand.

*Figure 9: The small bore pickup*



### Small Bore Pick-up (112/2673)

As 112/1504 above, but with 2 $\mu$ m (80 $\mu$ m) tip radius

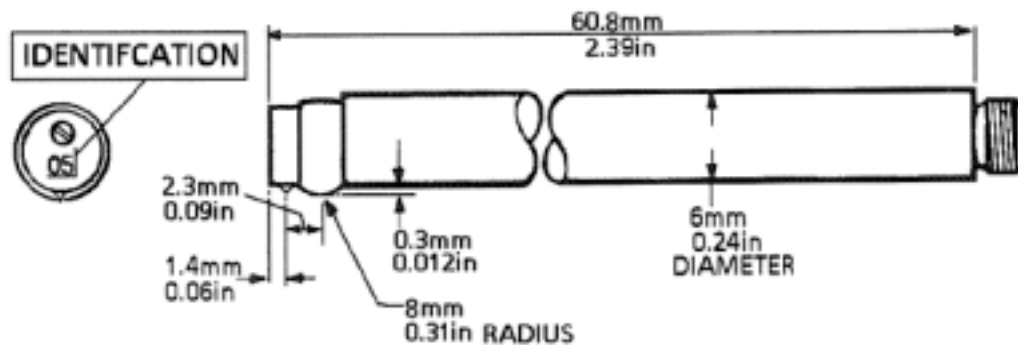
## Narrow Gauge Stylus (155/P11610)

For measuring in 'O' rings and narrow grooves up to a depth of 5.5mm (0.22in).

## Right Angle Pick-up, 5 $\mu$ m (200 $\mu$ in) stylus tip radius (112/1505)

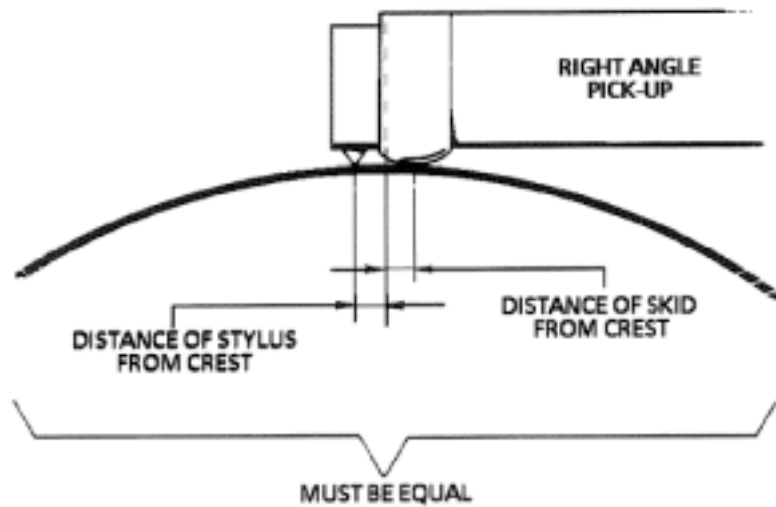
This pick-up is used at right angles to the direction of traverse. Accordingly the skid is set at right angles to its normal position.

*Figure 10: The right angle pickup*



It is particularly useful in grooves or slots where the lay of the surface texture makes it unsuitable for measurement with a standard or small bore pick-up. When used on cylindrical workpieces it is important that the stylus and skid should be equidistant from the crest (see figure 11), and that the work piece is positioned so that the crest is parallel to the line of traverse.

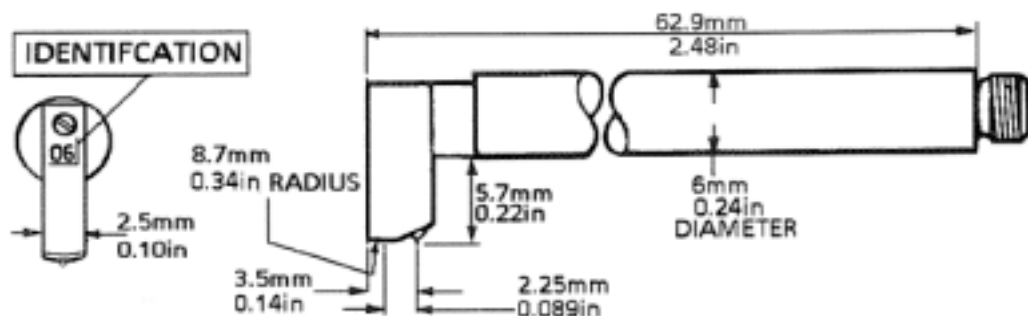
Figure 11 Conditions to be observed when the right angle pick-up is used on a cylindrical work-piece



**Recess pick-up, 5 $\mu$ m (200 $\mu$ in) stylus tip radius (112/1506)**

This pick-up has an extended stylus and skid for measuring at the bottom of a recess, or between shoulders and flanges up to 5.7mm deep. A special deep recess pick-up is available for measuring up to a depth of 25mm.

Figure 12: The recess pickup



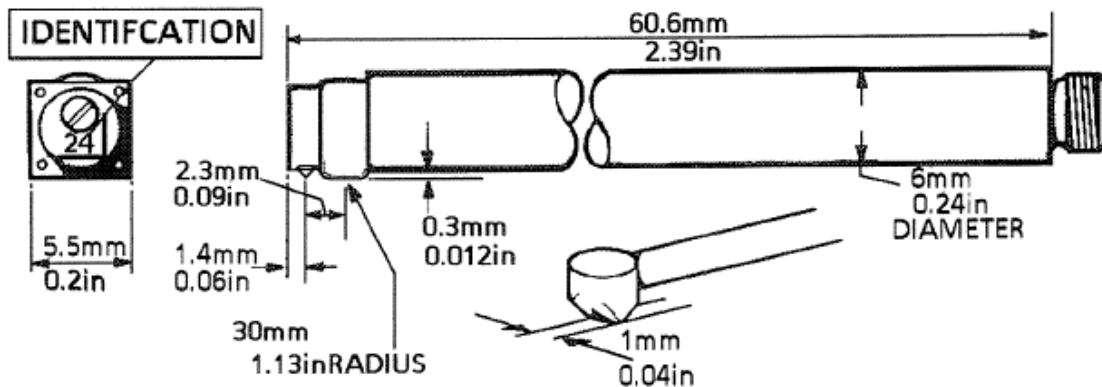
## Recess pick-up (112/2672)

As above, but with  $2\mu\text{m}$  ( $80\mu\text{in}$ ) tip radius

## Chisel edge pick-up (112/1524)

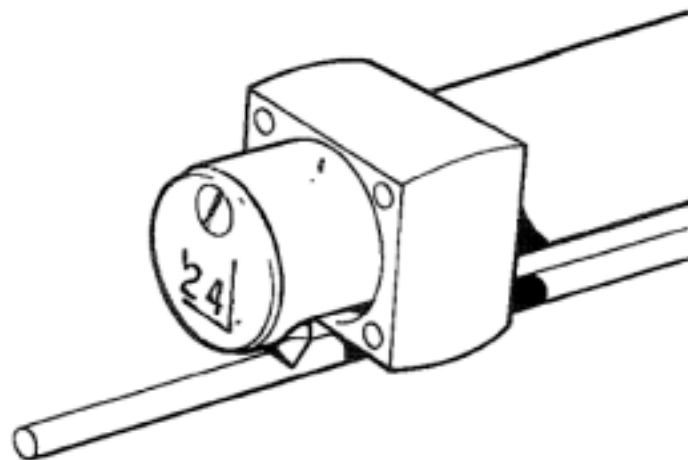
For measuring along a sharp edge or a wire which cannot be traversed with a normal stylus. The pick-up has a rotatable square skid. Not for use on flat surfaces.

Figure 13: The chisel-edge pickup



Stylus tip radius:  $5\mu\text{m}$  ( $200\mu\text{in}$ ).

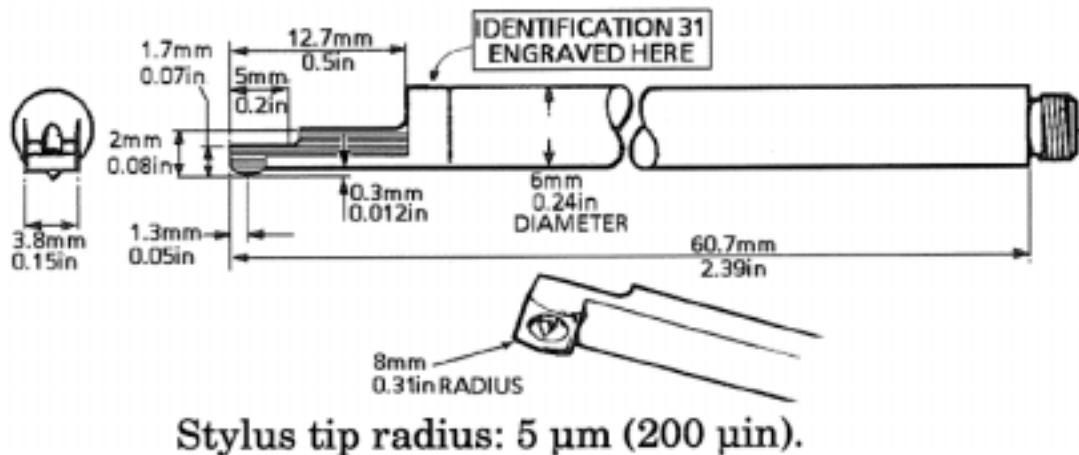
Figure 14: Use of the chisel edge pickup



## Side-skid pick-up (112/1531)

For use on curved surfaces such as gear teeth. The skid surrounds the stylus and the line of contact with the component moves relative to the stylus as it traverses over the crest of the curve.

*Figure 15: The side skid pickup*

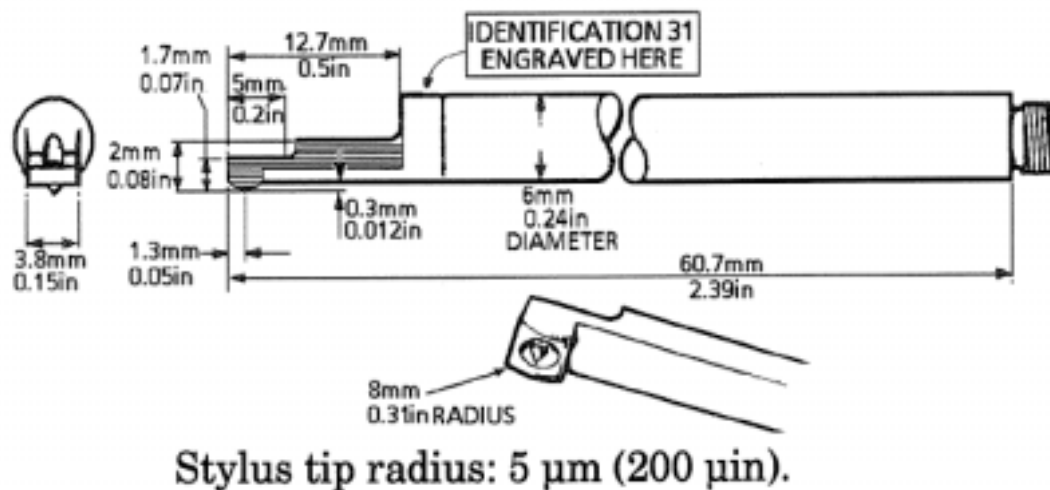


It is very important to position this pick-up so that contact with the surface is made on the centre line (parallel to the axis of the pick-up) of the skid, ie the stylus must be perpendicular to the surface when the pick-up is viewed from the end. This is particularly necessary when the pick-up is used on a concave surface such as a bore, but owing to the form of the skid, this condition is not easy to check. This pick-up cannot be used on concave surfaces having a radius of less than 8mm (0.3in). It must not be used as a right-angle pick-up nor must it be traversed axially along a cylinder.

## Shoe Pick-up (112/1599)

This pick-up has a pivoted flat shoe which will ride across the top of comparatively widely spaced irregularities of a rough surface. Particularly necessary when measurements are made with the 2.5mm (0.1in) cut-off.

Figure 16: shoe pickup



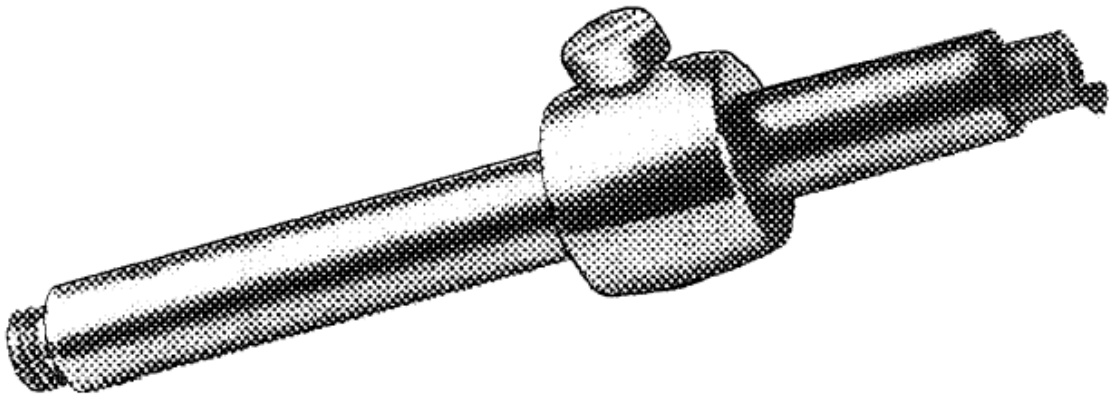
This pick-up should never be used on a smooth surface because the shoe would tend to wring to the surface.

Ideally the pick-up should be parallel to the surface being measured, but in any case, the inclination must not exceed +/- 10° to ensure that the shoe rides flat on the surface.

### Detachable Skid (112/1191)

This accessory can be clamped to the pick-up body, to enable the Datum Support Stand to be used with the standard, recess, right angle and chisel edge stylus pick-ups. The normal skid should be removed by undoing the small screw in the end of the pick-up and taking off the end cap. Take care that the pin next to the skid does not fall out, as it will now be loose. After the end cap has been removed, there will be no protection from the delicate stylus beam, so be very careful particularly when measuring in blind bores; do not allow the beam to foul the work piece.

*Figure 17: pick-up fitted with detachable skid*



### **Extension rod (112/1533)**

100mm long extension with integral lead, fits between the pick-up and carriage.

The extension rod is fitted to the pick-up in the following manner:

1. Disconnect the pick-up lead from the traverse unit and remove the pick-up from the traverse unit carriage.
2. Remove the lead from the pick-up
3. Carefully locate the central pin of the extension rod with the hole in the pick-up and screw the rod and pick-up together.
4. Thread the lead from the extension rod through the hole provided in the back plate of the traverse unit and connect it to the traverse unit socket.
5. Fit the pick-up into the traverse unit carriage, positioned as required.

## Surtronic S25

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### Portable Printer 112/3469-01

A permanent record of selected parameter results and profile graphs can be obtained when this printer is connected to the Surtronic 25. Options can be selected from the Print Settings menu on the Surtronic 25.

The unit contains a rechargeable battery and is fully portable.

The printer comprises:

1 portable printer	112/3469-01
1 paper roll	112/1527
1 interconnecting cable	112/3471-01
1 charger	part of 112/3469-01

The connector is a 9 way D type socket. The interfacing cable for the printer to Surtronic 25 is 112/2471 and is included as standard with the printer. Cable connections shown below are for technical reference only.

Cable connections between Surtronic 25 and printer

Surtronic 3+/25		Seiko 414
2 - Rxd	=====	2 - Txd
3 - Txd	=====	3 - Rxd
5 - Gnd	=====	5 - Gnd
8 - Cts	=====	8 - Rts

Pin 6 MUST BE CUT on the lead at one end.



Note: to comply with EMC regulations, a screened cable and screened connectors must be used for the above lead.

For full instructions on the use of the printer, refer to the manufacturers instructions in the box.

### **Replica Kit (112/727)**

Surfaces inaccessible to the Surtronic pick-up can be measured indirectly if a replica of the surface is made. The replica kit provides prepared quantities of materials for making a replica. On surfaces having an Ra of less than 0.2um (8uin), the Ra of the replica is likely to be higher than that of the original surface, while for surfaces having an Ra greater than 4um (160uin) the roughness of the replica is likely to be lower.

Detailed instructions are included with the kit, but briefly the procedure is as follows. An area not exceeding 400mm<sup>2</sup> is enclosed by a thin wall of the 'plasticine' provided. The solution is then poured onto the area and allowed to harden, which takes about 12-15 minutes. The replica is then removed from the surface and measured with the Surtronic in the usual way. No difficulty is experienced in removing the replica from the surface as this is facilitated by the application of the release agent.

Note: because the surface has been obtained by a replica, the profile will be inverted, however this will not affect the Ra value.

### **Portable base (137/1734)**

The Surtronic 25 can be mounted on a portable base for use in measuring large components in situ. The base is fitted with 3 feet which can be positioned at a number of places on the base, enabling it to be steadied on a variety of components.



# Chapter 7

## Maintenance

### Calibration

#### Reference Standard

The sensitivity of the instrument is checked with the reference specimen supplied. This comprises a ruled surface having an Ra value accurate to within 4% of the value marked on its mount.

A UKAS calibration certificate can be supplied for this standard.

To provide confidence in results, it is recommended that a sensitivity check is made at the beginning of each shift.

#### Sensitivity Check and Adjustment

The procedure for checking and adjusting the pick-up sensitivity is as follows (for the chisel edge stylus type, see the note at the end of this section).

1. Place the reference specimen on a flat surface and set up the instrument to make a traverse across it. Make sure that the traverse unit body is parallel to the surface of the standard and that the stylus traverses at right angles to the lay of the grooves.
2. Select the 0.8mm or 0.03in cut-off and the Ra parameter.
3. Make a measurement of the reference specimen and compare the Ra value from the display with that marked on the specimen.
4. If it differs by more than 2% use the small screwdriver to turn the sensitivity adjuster. This is located through the hole which

## Surtronic S25

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is located in the front panel of the Display Unit, just above the pick-up connector.

5. Repeat the measurement and adjustment, until the measured value is within 2% of the value marked on the specimen.

## Cleaning the Stylus

Occasionally clean the stylus with a camel hair brush moistened with a proprietary cleaning agent.

## Pick-up Skid

To reduce the effect of wear, on pick-ups with a rotatable skid, occasionally turn the skid round to present a new contact surface. The skid is clamped by the screw in the front of the pick-up. When loosening this screw, take care not to let the retaining pin next to the skid fall out. When retightening the screw, ensure that the end cover is correctly positioned with respect to the stylus and that the stylus is free to move.