Portable Surface Roughness Gauge

Part No. SRG-4600

Operation Manual

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SRG-4600 OVERVIEW

The SRG-4600 is a portable, lithium-ion battery powered instrument used for checking surface finish with the measured values displayed on a digital readout. This instrument can be utilized in a laboratory setting, a shop inspection area, or wherever on-site surface roughness testing is required.

Note:

Although this instrument is designed and built to withstand the rigors of handling and usage, it is a sensitive precision instrument and should be treated with care to assure measurement accuracy and reliable performance.

Measurement principle: *Skid type surface roughness testers are common instruments used on the shop floor. A diamond stylus is traversed across the specimen and a piezoelectric pickup records all vertical movement. Peaks and valleys are recorded and converted into a known value of a given parameter.*

Features of SRG-4600

- **9 parameters**: Ra, Rq, Rz, Rmax, Rt, Rs, RSm, Rmr, RPc
- High accuracy inductance pickup;
- Four filtering methods of RC, PC-RC, GAUSS and D-P;
- Compatible with four standards of ISO, DIN, ANSI and JIS;
- Can store 20 sets of measurements results
- 128×64 dot matrix LCD displays all parameters and graphs;
- Data processing with high speed and low power consumption;
- Built-in high capacity lithium ion chargeable battery. Consecutive work time is longer than 20 hours;
- Can be connected to your PC printer to print all parameters and graphs;
- Built-in standard USB interface enables communication with PC;
- Automatic switch off, memory and various prompt instructions;
- Optional printer, analysis software and measurement platform.

Measuring range	Z Axis(Vertical)	160μm
	X Axis(Horizontal)	17.5mm
Resolution	Z Axis(Vertical)	0.01μm/±20μm
		0.02μm/±40μm
Measurement item	Parameters	Ra, Rq, Rz, Rmax, Rt, Rs, RSm, Rmr, RPc
	Standard	ISO, ANSI, DIN, JIS
	Graphic	Roughness profile, Material ratio curve, Direct profile
Filter		RC,PC-RC, Gauss, D-P
Sampling length (*lr*)		0.25, 0.8, 2.5mm
Assessment length (*ln*)		*L*n= *l*r×n n=1-5
Pickup	Principle	Differential inductance
	Stylus	Natural Diamond, 90° cone angle, 5μm tip radius
	Force	<4mN
	Skid	Ruby, Longitudinal radius 40mm
	Traversing speed	*l*r=0.25, Vt=0.135mm/s
		*l*r=0.8, Vt=0. 5mm/s
		*l*r=2. 5, Vt=1mm/s
		Return Vt=1mm/s
Accuracy		Less than or equal to ±10%
Repeatability		Less than or equal to 6%
Power supply		Built-in Lithium ion battery, AC adapter 8.4V,800mA
L×W×H		119×47×65mm
Weight		Approx. 380g

Keypad Function:


Press to start measurement.


Up arrow / Parameters key. In the menu interface, press this button to toggle through the parameter selections.


Down arrow / storage key. In the menu interface, press this button to scroll down through parameter choices


Left arrow / graphic key. In the menu interface, press this button to change parameter selected.


The right arrow / Print button. When in menu, press this to scroll through parameter choices. In the main interface, this can be used to send data to printer


Set / Menu button. In the main interface, press the button to display current set Parameters. Press and hold for 3 seconds to enter the main menu interface.


Level Indicator. In main interface this allows you adjust the level of the stylus to the workpiece. The arrow should be pointing at the zero before taking a test.
This is also the “Enter” button when in the menu interface.

Standard Configuration

Name	Qty
SRG-4600 main unit	1
Standard pickup(stylus)	1
Roughness specimen w/Holder	1
Stylus Nose Protector	1
Leveling Plates	1
A/C Adapter	1
Screw Driver	1

Turning On/Off Battery switch

The power switch is on the right side of the instrument. When powering off for an extended period of time, this switch should be placed to the OFF position to cut off power supply. The SRG-4600 will automatically power on when the switch is moved to the ON position.

Battery Charging

There is a battery symbol in the top right corner of the SRG-4600. When all of the bars inside the symbol disappear, the battery is low and the unit must be charged up.
Typically, charging time is approximately 3 hours .

Settings System Information

1) The Main Measure Screen

The Home screen of the SRG-4500 is as shown above. This is the screen that will be on display upon power up. The home screen shows all measuring parameters that have been previously set. Parameters such as sample length, assessment of the length, range, filter and measurement units will be shown.

In the main interface, each button on the keypad will implement a specific function.

2） Main menu

To enter the main menu, press and hold the  Set / Menu button

Use up or down arrows to scroll thru selections shown on the display.

Measure Set
Print Result
Calibration
Memory Data
Language
System Set
About Software

3) Parameter Settings:

While Measure Set is highlighted, Press the button to access and change all of the settings for taking a test.

lr(λc): 0.8mm	(sampling length) selectable
ln:lr*5	(assessment length)selectable
Range: +/-40µm	(range of your application)
Filter: RC	(filters)selectable
Standard: Ansi	(Applicable standards) selectable
Display R: Ra	(Roughness parameter) selectable
C(Rmr): 75%	(material ratio curve) selectable
C(Rpc): 000.00 µm	(material direct profile) selectable
Unit: Metric	(inch/metric selectable)

While Print Result is highlighted, Press the button to access and change all of the settings for printing results. *(Printer must be selected to access some parameters)*

Print Ra, R	will display Ra value on printout
Print R & Prof	will display Ra value & Profile
Print Self R	will display self
Self R.. Set	Choose parameters for printout
PROF: Ordinary	shows standard or detailed profile
Printer Pair	Bluetooth printer set pairing

While Calibration is highlighted, Press the button to access and change the settings range for your calibration.

+/-20 µm:	**00%**
+/-40 µm:	**02%**
+/-80 µm:	**00%**
+/-160 µm:	**00%**

Use the left or right button to adjust the percentage of change needed to calibrate the instrument to a calibrated reference standard.

While Memory Data is highlighted, Press the button to access, view and delete stored data.

Save Mea. Data	Shows all saved data
Load Mea. Data	Choose data to be printed
Del One Group	Delete one saved group
Del All Group	Delete entire memory

While Language is highlighted, Press the button to choose between English & Chinese languages

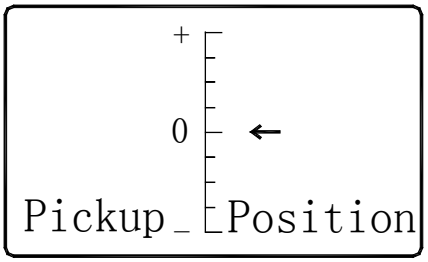
Chinese
English

While System Set is highlighted, Press the button to select and change viewing settings as well as Bluetooth pairing

Key Buz: On	Sound for keypad buttons
Warning Buz: On	Sound for exceeding set limits
Power Save: 3 Min	Shut off display after set time
Auto Off: 10min	Power off entire unit
Clock Set	adjust time and date
Screen Bright	Adjust brightness of display
Noise Redu: Off	Noise reduction
Screen Test	Check for display issues
Remote Pairing	Bluetooth pairing

While About Software is highlighted, Press the button to view Serial Number & Software version

Stylus position



Prior to taking a test, whether on your part or using the calibration reference standard, the stylus position must be leveled on the application. The SRG-4600 has a built-in zero indicator to make this simple and accurate. Position the unit on the supplied reference standard or your work piece and press the Enter button. The leveling indicator will appear on the display. Using the supplied height adjuster on the right side of the unit, raise or lower until the arrow falls on or close to the "0" in the center of the leveling scale. Once achieved, press the Enter button to return to the main measuring screen.

Calibration: using supplied reference standard

Accuracy of the SRG-4600 is +/-10% of actual value

Prior to measurement on your parts, you should verify the accuracy of the unit by performing a quick calibration using the supplied reference standard.

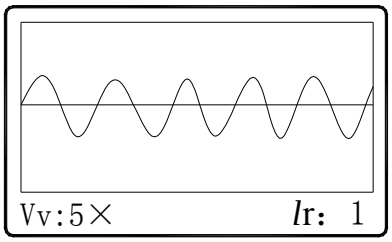
If the difference between the measured value and the specimen value is greater than the scope of equipment requirements, or user requirements are more accurate, you can use that value of the calibration function to correct measurement results.

Starting measurement

1) **Starting measurement**

Once all parameters have been set, you should place the SRG-4600 on your work piece. In the main measuring screen, press start button on the top left corner of the keypad to start measuring .

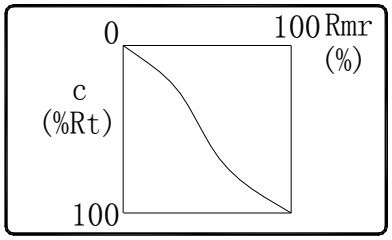
Do not move unit once test has begun!



To view your results in profile, press the LEFT arrow button after test has been taken.

While on this page press the Enter(back arrow) Button to zoom in on the profile.

To view results in the ratio curve, press the left arrow button then press the UP Arrow button. To exit, press the Set/Menu button.



To view your reading in other parameters, press the UP arrow button after your test is complete. You will see all parameters as shown below:

Ra	**=**	**3.655µm**
Rq	**=**	**3.793 µm**
Rz	**=**	**7.014 µm**
Rmax	**=**	**9.198 µm**
Rt	**=**	**9.198 µm**
RS	**=**	**0.0930 µm**
RSm	**=**	**0.0909 µm**
Rmr	**=**	**59.1%**
Rpc	**=**	**110.0cm**

Use of supplied KEYFOB

Press the B button to bring up the Leveling Display. Be sure that the arrow is pointing on or very close to the "0" on the grid. This function same as "enter" on the keypad. Once parameters are set, press the "A" button on the keyfob to start the measurement process.

Saving Test Results

1) **Saving test results**

Once the value is shown on the display, press the MEM button. Now press the Right arrow button to go to the next numerical file that shows "empty" and press the button to save it. The unit will immediately return to the main testing display.

Maintenance:

Stylus:

1) After completion of measuring work, please remove stylus from unit and return to case.
2) The stylus is extremely sensitive. Please don't touch the tip or run it across a surface that hasn't been cleaned. These are also sensitive to high humidity. Please store in dry cool place.

Main Unit:

1) Always keep clean using a soft cloth. Do not use harsh cleaners on this as it will diminish the finish.
2) The SRG-4500 is a precise sensitive instrument and should be handled accordingly.

Battery:

1) Battery power is shown on the top right side of the display when in main measurement screen. When the battery symbol is empty, its time to recharge the unit.
2) Approx. charging time is 3 hours.

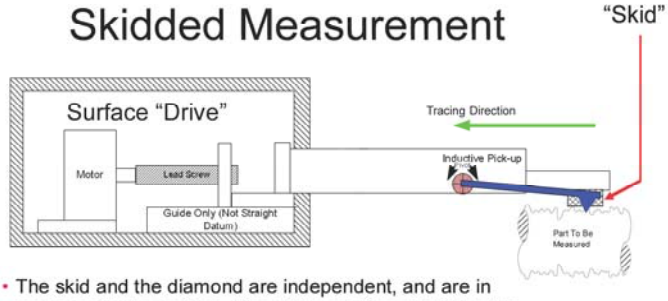
Calibration Reference Standard:

1) Always keep this clean. Store in carry case when not in use.
2) Avoid scratches to the work area surface of the standard

Terms & Helpful Tips

Filtered profile: profile signal after primary profile is filtered to remove waviness.
D-P (direct-profile): adopt central line of Least Square Algorithm.
RC filter: analogue 2RC filter with phase difference.
PC-RC filter: RC filter with phase-correction.
Gauss filter: ISO11562.

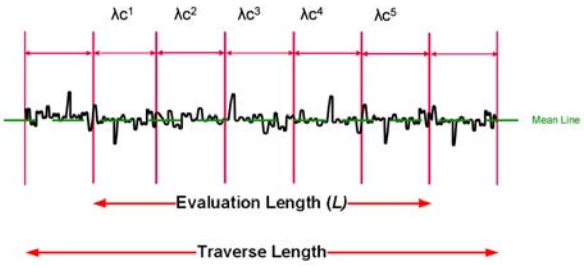
Skidded Measurement



- The skid and the diamond are independent, and are in contact with the surface. The skid and diamond follow the surface during measurement.
- The surface deviations are measured by *the change in the diamond position relative to the plane of the skid.*

- Skidded instruments measure ***only*** Roughness parameters (R**...**)
- Waviness is filtered out by the skid following the surface.
- Most portable instruments are skidded.

Measurement Lengths



- Evaluation length of 5 cutoffs is typical for Roughness parameters

Roughness Filters

- A filter is used to isolate the roughness wavelength band
- Filters are Mechanical and Digital
  - Mechanical filters
- Diamond Radius (valley suppression by diamond radius)
- Skid (greater or lesser skid "bridging" effect of skid on surface valleys, dependent on skid geometry), also filters out waviness
  - Digital Filters
- RC (Simulated old analog electrical "resistor capacitor")
- Gaussian
- The user selects the "Cutoff" setting used by the filter to isolate the roughness wavelength band
- Filters typically have transmission curves
- Filtered data is centered around a mean line

The Role of Roughness "Cutoff" (λc)

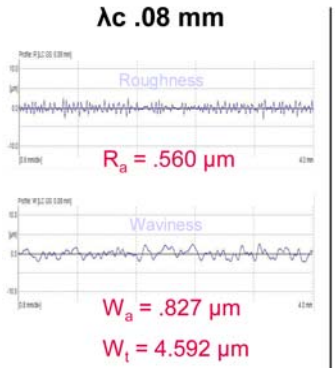
- For roughness, the cutoff value is the longest nominal wavelength to be included in roughness.
- Longer wavelengths are filtered out. Shorter wavelengths are included in roughness.
- Wavelengths longer than the roughness cutoff are usually included in waviness.

Millimeter	Inch
.08	.003
.25	.10
.80	.030
8.0	.300
25.0	1.00

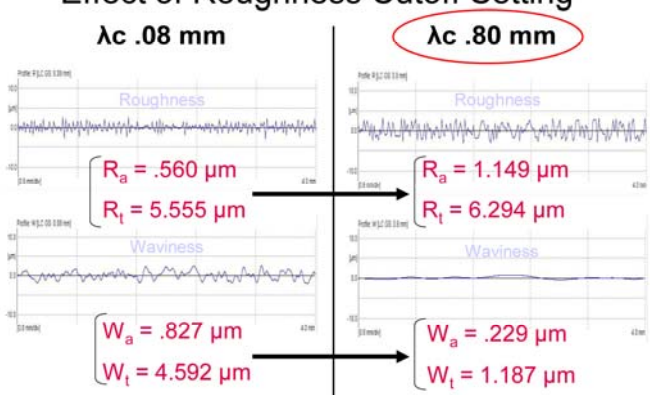
(λc) Roughness Cutoff Lengths

- The cutoff selected must be short enough to exclude long wavelengths (waviness)
- The cutoff selected must be long enough for a valid sample (at least 10 toolmarks per cutoff)
- Lengths are defined in ASME and ISO standards
- Cutoff default formerly was .8 mm, now must be defined on the drawing (ASME)

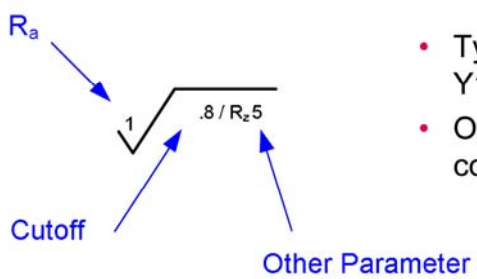
Effect of Roughness Cutoff Setting



Effect of Roughness Cutoff Setting



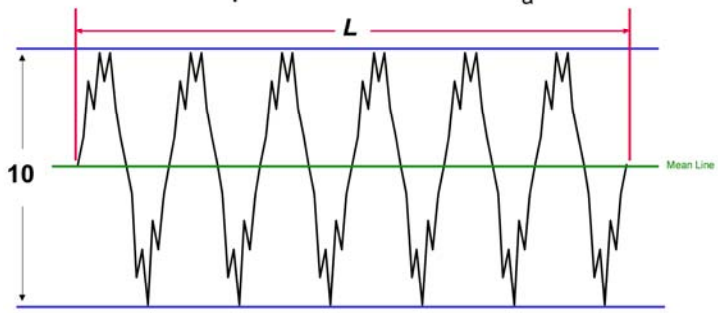
Typical Surface Texture Callout



- Typical of ASME Y14.36M-1996
- Other formats are common

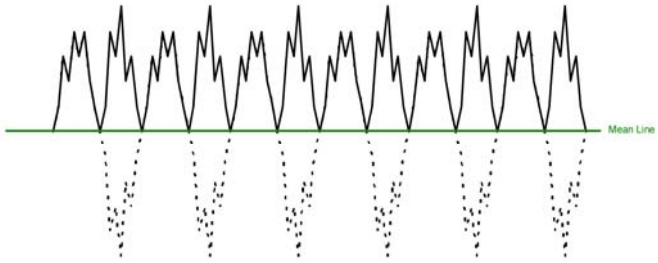
Roughness Average (Ra)
Ra = AA = CLA
Ra ≠ RMS
Rq = RMS
• Ra is the most commonly specified parameter in USA
• Roughness average (Ra) is the arithmetic average of the absolute values of the roughness profile ordinates.

Step 1: Calculation of R_a



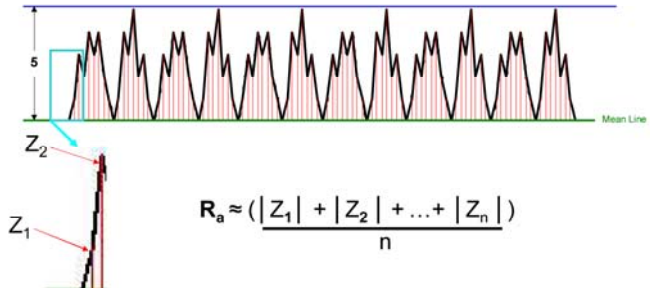
Filtered roughness profile with mean line, peak to valley is 10

Step 2: Calculation of R_a



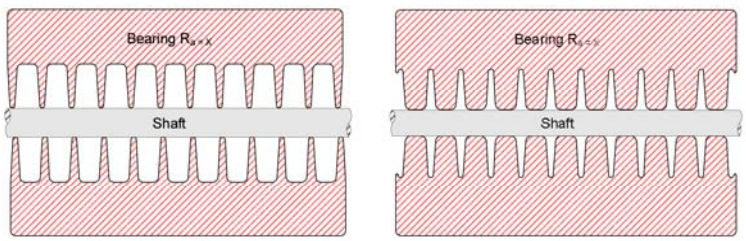
Absolute value is applied to the profile data

Step 3: Calculation of R_a



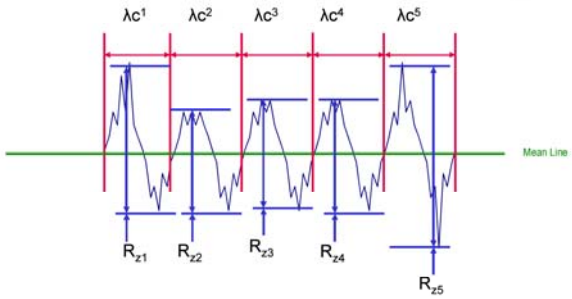
$$R_a \approx \frac{(|Z_1| + |Z_2| + \ldots + |Z_n|)}{n}$$

Different Surfaces, ***Same*** R_a



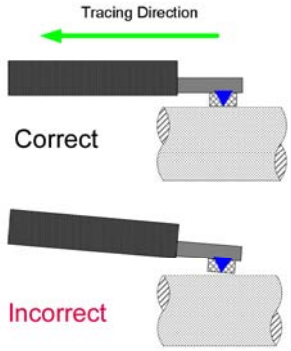
- Surface performance is different due to bearing contact
- R_a is often specified and is valuable for monitoring process stability, other parameters may be needed to monitor for surface function

Calculation of R_z (DIN, ASME)



$$R_z = \frac{(R_{z1} + R_{z2} + \ldots)}{5}$$

Best Practices - Mechanical



- Skid or pickup parallel or level to the surface being measured

Review and Recommendations

- To study surface texture, we filter surface data into wavelength bands.
- The wavelength bands are called Roughness and Waviness
- Skidded stylus instruments measure ***only*** Roughness parameters (R**...**). Most portable instruments are skidded.
- Skidless stylus instruments measure Roughness, Waviness and Profile
- Cutoff default formerly was .8 mm, now must be defined on the drawing.
- Use the same cutoff, number of cutoffs, diamond radius, filter type (Gaussian or RC), and parameter(s) that your customer uses and specifies.
- Be aware of standard authority (JIS, ISO, DIN, ASME). Do not assume that parameters are the same!
- Routinely check calibration ***and*** diamond condition.

Twelve common mistakes to know and avoid
Surface finish determines more than just how parts look and feel. It also influences how they wear, conduct heat, distribute lubrication, accept and hold coatings, resist corrosion--even how they sound. In spite of the capabilities of the new gages, surface finish remains a complex field that is subject to misunderstanding. It is important that gage users and specifying engineers understand what can go wrong to make sure that it doesn't. Here are a dozen common errors to avoid.

1.Not understanding parameters Parameters--the quantitative methods used to describe and compare surface characteristics--are defined by the algorithms used to calculate a numerical value from the raw measurement data. A surface finish requirement without a defined parameter is not specified. For example, a requirement that states "roughness = 50 µ" is not acceptable today, because there are dozens of parameters used to measure roughness. On the other hand, "Ra = 50 µ" or a symbol are acceptable, because the Ra roughness parameter is specified.

The main body of the new ASME B46.1-1995 standard describes more than a dozen parameters, and includes many more in appendices, while new ISO standards describe even more. Even more problematic is the fact that past discrepancies between standards have made some parameters ambiguous. Three different "Rz" parameters may be found on part prints: an old international version (ISO); an old Japanese version (JIS); and a German (DIN) version that is now accepted by ISO and JIS.
Since ISO and JIS dropped their old Rz definitions and adopted the DIN version, there is now only one current version. But there is still opportunity for confusion, if the specification is taken off an older part print, if the specifying engineer relies upon an old standard, or if the inspector uses an old gage.
Confusion between two roughness parameters, Ra and Rq (formerly called AA and RMS, respectively), is another source of error. When measuring a pure sine-wave profile, Rq results are 11 percent higher than Ra results. For this reason, some gage manufacturers used to incorporate a switch on their instruments, which simply applied a multiplication factor to convert AA to RMS (using the old terminology). Some end-users who now own gages that measure only Ra have learned to apply that multiplication factor manually if Rq is required. But whether this conversion is done automatically or manually, it will generate inaccurate results when measuring any profile other than a pure sine wave because there is no simple mathematical relationship between the two parameters. Real-world results on manufactured parts can vary by more than 50 percent between the two parameters.

2.Selecting the wrong gage There are two basic categories of surface finish gages: "skidded" and "skidless" types. In skidded gages, the stylus moves up and down relative to a pad attached to the bottom of the probe that traverses along the surface of the part. Because the skid follows the general profile of the part, the stylus registers only higher-frequency roughness characteristics--in other words, tool marks. Thus, skidded gages are for roughness parameters only. In a skidless gage, the probe moves relative to a reference surface inside the drive mechanism, so that the stylus is free to follow the full profile of the part, including low-frequency geometry characteristics, such as out-of-straightness and waviness, as well as tool marks. Skidded gages may use either a velocity-sensitive or a position-sensitive transducer, while skidless gages use only position-sensitive devices. Mistakes can be made in purchasing, where a gage with inadequate capabilities might be selected in an unwise attempt at economy. ASME B46.1 includes a useful chart that classifies surface finish gages according to their measurement capabilities.
A gray area exists in the measurement of profile straightness, which can be measured by skidless profiling surface finish gages, and by geometry gages with precision slides (i.e., "cylindricity" gages). The larger tip radius of a geometry gage mechanically "filters" out most roughness and some waviness features, while a profiling surface finish gage, with its smaller tip radius, responds to all features (roughness, waviness, and straightness), and can filter out roughness electronically. A straightness callout that does not specify the use of a particular electronic filter could be measured with either type of gage, but results would be different, depending on whether waviness is included.

3.Reliance on default cutoff value The cutoff is the sampling length within which roughness data is collected. The cutoff length must be long enough to provide sufficient data for the measurement, but not so long that part geometry could impose extraneous data. A properly-specified cutoff usually includes 10 to 15 tool marks. For most machined surfaces, this means cutoffs of .010", .030", or .100" (0.25 mm, 0.8 mm, 2.5 mm). Don't confuse cutoff with stroke or traverse length, which is the total distance the probe travels, and may be 2", 12" or even 18" long (50 mm, 300 mm, 450 mm), in order to evaluate waviness and straightness. Detailed information about the choice of cutoffs is found in Chapters 3 and 4 of ASME B46.1.

A typical surface finish callout consists of many elements, all of which may be required because of the complexity of surface finish metrology. Under the old ANSI B46.1-1985 standard, a default value of .030" (0.8 mm) applied to any surface finish callout that did not specify a cutoff. This is an effective cutoff value for many, but not all, roughness measurements. To avoid confusion and lax specifying, the new ASME B46.1-1995 standard abolishes the default and insists that all cutoffs be specified.
It is standard procedure to measure five cutoffs within a single stroke and average the results, although fewer may be used if the surface is too short to include five. Where a manufacturing process is known to be consistent, less than five cutoffs may be sufficient to generate reliable results. When reporting results, the number of cutoffs should be indicated if it is not five. To report the use of four cutoffs, the form shown in the following example would be followed: Ra4 = 25µ".

4.Choosing the wrong signal-processing filter The signal generated by the gage head must be filtered electronically before the data can be converted to a numerical result. The new 50 percent Gaussian filter, which is the default according to ISO, is a better, more accurate filter in metrological terms than the older 2RC filter. Many part prints, however, still specify (or assume) the use of a 2RC filter, because it is more familiar, and because it is available on most gages, including those with old analog technology. Because the two filters will generate different results, design engineers should be sure to specify which filter is intended, and the inspector should follow the specification, or seek clarification if it is absent. For evaluation of some specific surfaces, such as plateau-honed cylinder liners and porous materials, another filter, known as the "Valley Suppression" filter, is used.

Modern skidded roughness gages can be compact, economical, and well-suited to shop-floor inspection tasks. In addition to the possibility that the part might be ruined by scratching it, the measurement could be inaccurate, because the scratch representsa modification of the surface. Plastics, rubber, graphite, copper, aluminum, and many alloys are also subject to deformation at fairly low levels of force, which could also influence profile measurement results. These materials therefore require the use of a probe with the lowest force possible.

5.Using a damaged stylus As with a stylus that is too large, a stylus that is worn or chipped will not penetrate as deeply into fine surface irregularities as one that is in good condition. (Figure 1) The first indication of a worn or broken stylus may be a change in gage readings, or may be found during the calibration process (see Common Error #11). If a problem is suspected, the stylus may be examined with a special test patch or a low-power microscope.
6. Ignoring the lay (measuring in the wrong direction) Most machining processes create tool marks that run in a particular direction across the part surface. When measuring roughness parameters, it is essential that the gage traverse at right angles to the "lay," or pattern of toolmarks, to capture worst-case conditions.
Fig. 1 -Styluses that are worn or broken, or too large for the surface, may generate inaccurate results because they can't reach the bottom of the surface valleys. Some processes, however, such as electrical-discharge machining (EDM) and plastics
molding, do not create unidirectional tool marks. When this is the case, it is advisable to take two measurements at 90 deg. To each other, to check whether there is a distinct lay to the surface. If there is, then the rougher of the two measurements must be used.
7. Including flaws in the measurement Parts may include flaws that are unrelated to the manufacturing process. Parts may also include other features that interrupt the surface, such as a pore in a porous metal. Though surface finish gaging is intended to monitor and ensure the stability of the manufacturing process, it is essential that these irregularities be excluded from the measurement. This can be easily done post-measurement with some computer-driven gages, where software enables the user
to visually identify irregularities on the trace, and exclude them from the calculation. For gages that report roughness only as a numerical result and do not generate a trace, care must be taken to avoid irregularities in the first place. On the other hand, there are some cases where it is desirable to include these irregularities in the measurement: for example, to check if a part meets specifications in spite of a scratch. So irregularities should not be automatically excluded. Each instance must be considered separately.
8.Inattention to leveling This problem applies to skidless gages, where the gage must be level relative to the workpiece. To measure fine surface characteristics at high magnification, the gage must be mechanically pre-leveled, before final electronic leveling can be performed by the computer. To pre-level the gage, a test trace is performed, then software indicates how many turns are required on the leveling knob on the drive mechanism. Once the gage's attitude is within an acceptable range, the
computer performs the final leveling, compensating for any remaining out-of-level condition after the measurement is performed.

9. Ignoring vibration in the gaging environment Many surface finish gages are used on production floors, where vibration from manufacturing equipment may interfere with the measurement signal. Some skidless gages have a built-in "static mode" function to assess this condition. With the traverse motor turned off and the stylus in contact with a surface, any signal generated is the result of ambient vibration. Vibration effects can be reduced or eliminated by relocating the gage near a bearing wall, by isolating the gage with vibration-absorbing rubber pads or a high-density table, or by removing it from the area altogether. It may also be possible to identify and eliminate the source of vibration.

10. Misunderstanding calibration Surface finish gages are verified against test patches or specimens whose surface characteristics are known and certified. If gage results do not agree with the characteristics of the specimen, the gage must be adjusted. The nature of the adjustment differs considerably between simple, non-computer-driven gages, and sophisticated computerized ones. Simple gages are generally checked against a roughness patch with either a triangular or sine-wave profile. If the gage reads other than the patch's calibrated value (usually around Ra 125 μ"), a potentiometer is adjusted to bring results into agreement with the specimen. In this case, it is the "back end" or calculating portion of the gage that is being adjusted. The "front end"--the raw input data--is untouched. The reverse applies to computer-driven gages, where the backend consists of the software algorithms that turn raw data into numerical results. As the algorithms cannot be modified, the way the gage perceives the raw data at the front end must be adjusted. Skidless gages are usually calibrated against a stepheight specimen, then a multiplication factor is entered into the computer to adjust signal gain from the transducer before it reaches the algorithm software. From that point on, all data entering the computer is corrected by the same multiplication factor.

References

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3. Tabenkin, A., : Where do we go wrong in surface finish gaging?, *Quality in Manufacturing.* November/December 1998.
4. Sander, M.: A Practical Guide to the Assessment of Surface Texture, *Feinpruf GmbH, Goettingen* 1989
5. ANSI/ASME B46.1 - 2002 Surface Texture, Surface Roughness, Waviness and Lay, *American Society of Mechanical Engineers* , 2002
6. ANSI/ASME Y14.36M-1996(R2002) Surface Texture Symbols - Metric version, *American Society of Mechanical Engineers,* 1996
7. Nugent, P., MacKenzie D., Developments in Surface (and Form) Measurement Technology (Presentation for Caterpillar), October 2006.
8. Vorburger, T., Raja, J., Surface Finish Metrology Tutorial (NISTIR 89-4088), U.S. Department of Commerce, National Institute of Standards and Technology, June 1990.

Note: *Parameter calculations in this presentation are shown for discussion and purposes of illustration only. Refer to the ANSI/ASME B46.1 - 2002 Surface Texture, Surface Roughness, Waviness and Lay for actual calculations and methods of evaluation*

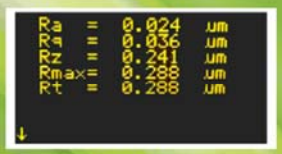
phase II+

"The Source of Quality"

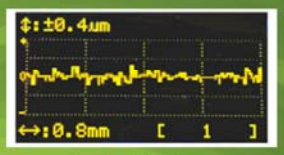
SRG-4600 Surface Roughness Gauge Accessories

Main Screen

Stylus Position



Parameters



Roughness Profile

Ratio Curve

SRG4000-050
Precision Support Stand
Can be used with either 4000, 4500, 4600 series roughness gauges.

SRG4600-200
Deep Groove Stylus
For use on deep grooves with min. width of 3mm and max depth of 10mm. *Must be used with support stand.*

SRG4600-100
Standard 5µm Stylus
For use on flat and slightly curved surfaces.

SRG4600-500
2" Stylus Extension
Adds extra 2" reach for deeper applications.

SRG4600-300
Small Hole Stylus
For use in small holes under 2mm diameter and max depth of 9mm.

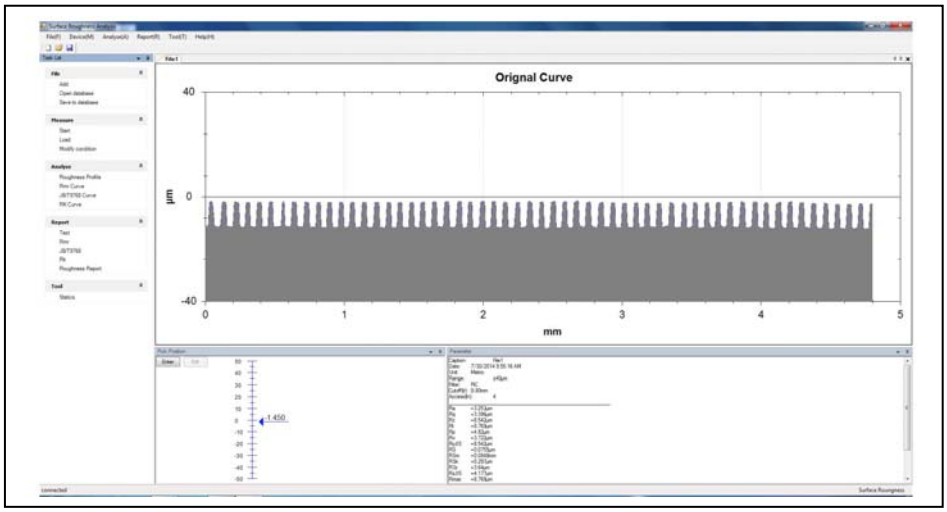
SRG4600-400
Curved Surface Stylus
For use on curved surface with a minimum curvature radius of 3mm. *Must be used with support stand.*

SRG4600-550
5" Stylus Extension
Adds extra 2" reach for deeper applications.

Recommended table of the sampling length

Profile		Cutoff	Sampling/Evaluation Length
Rz (µm)	**Ra** (µm)	**λc** (mm)	**lr / ln** (mm)
Up to .1	**Up to .02**	**.08**	**.08 / .4**
Over .1 up to .5	**Over .02 up to .1**	**.25**	**.25 / 1.25**
Over .5 up to 10	**Over .1 up to 2**	**.8**	**.8 / 4**
Over 10 up to 50	**Over 2 up to 10**	**2.5**	**2.5 / 12.5**
Over 50 up to 200	**Over 10 up to 80**	**8**	**8 / 40**

Optional Data Output Software Screen Shots



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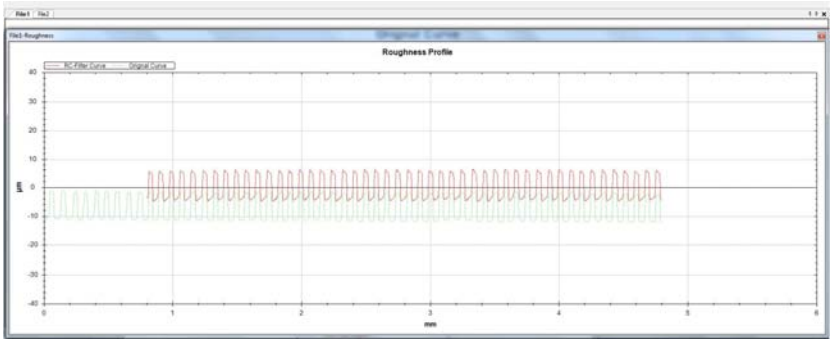
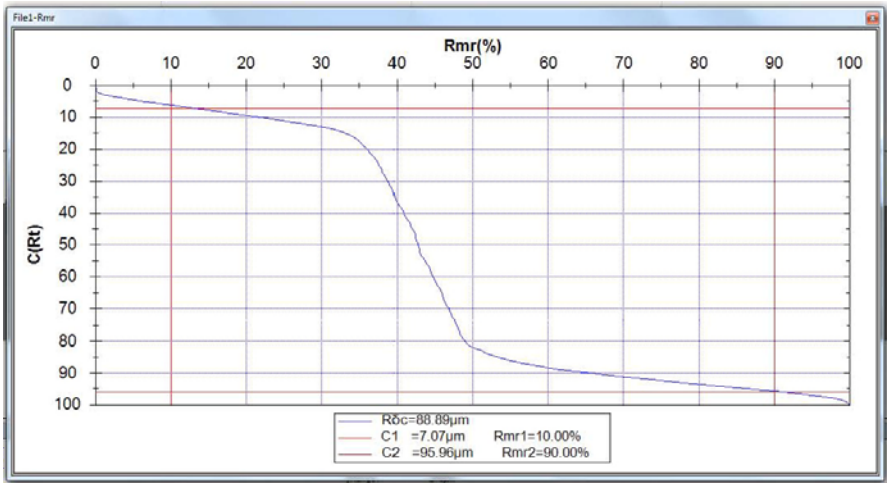
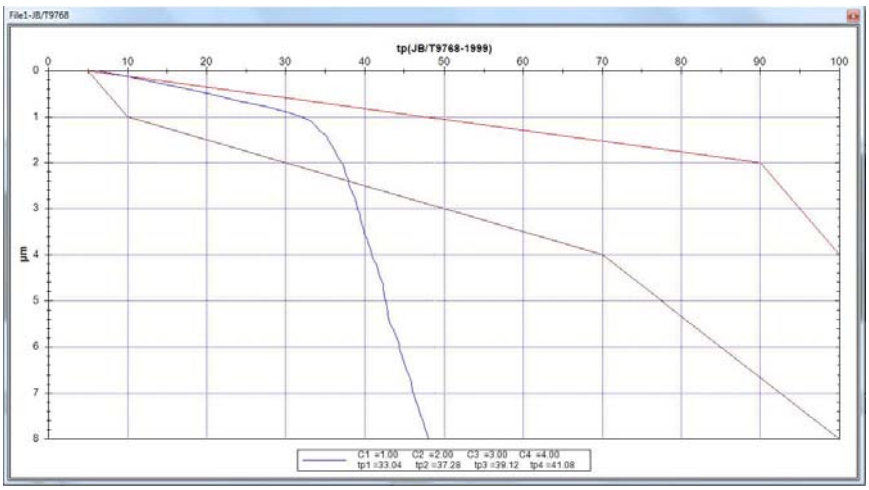
"The Source of Quality"

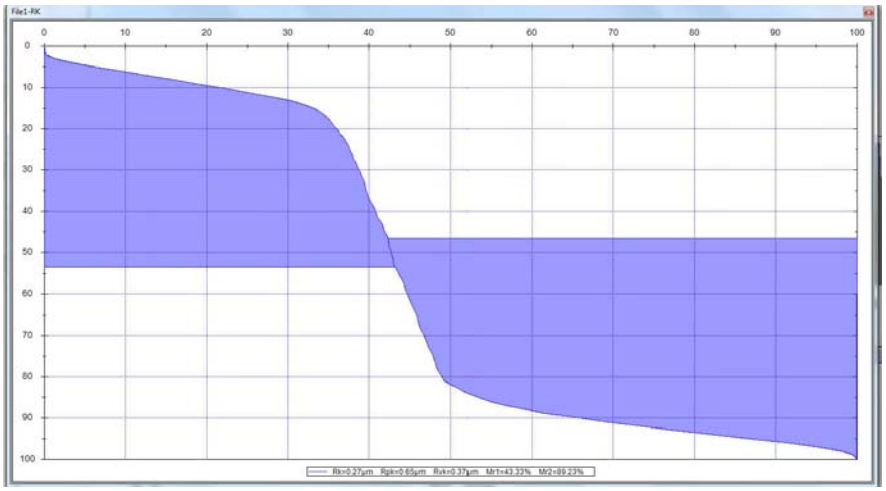


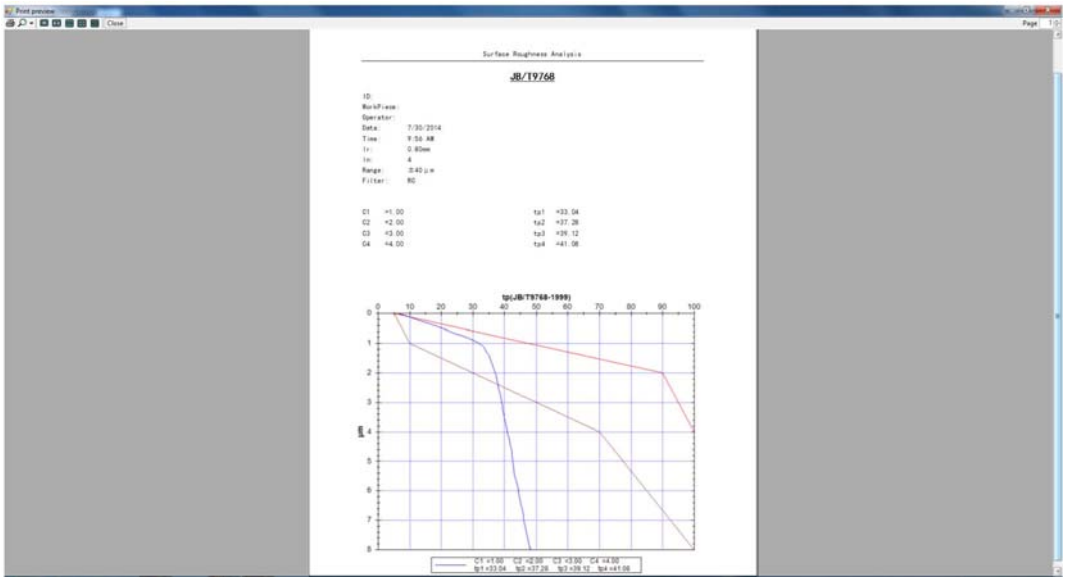




phase II+

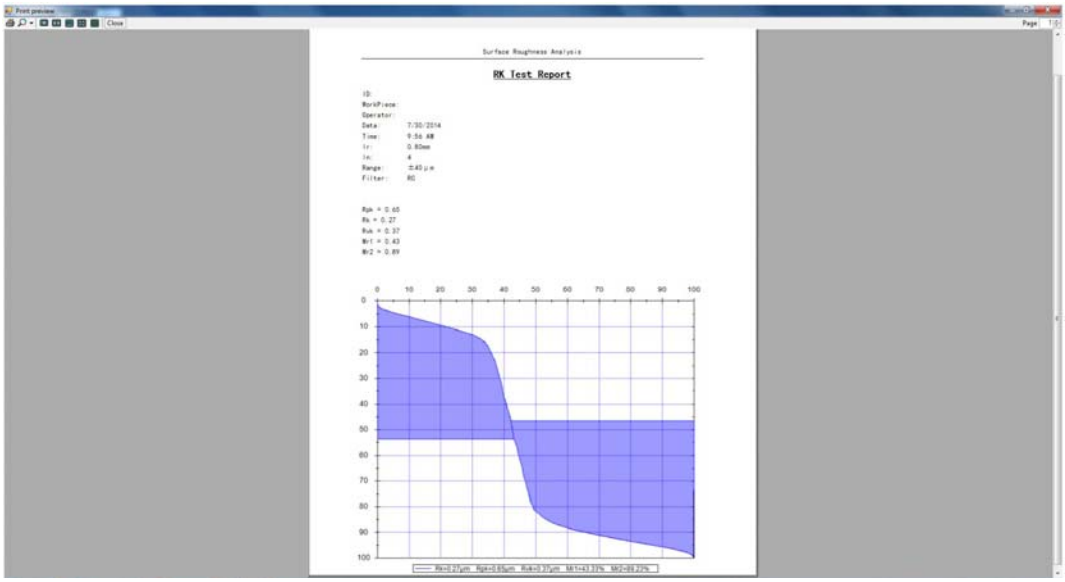
"The Source of Quality"

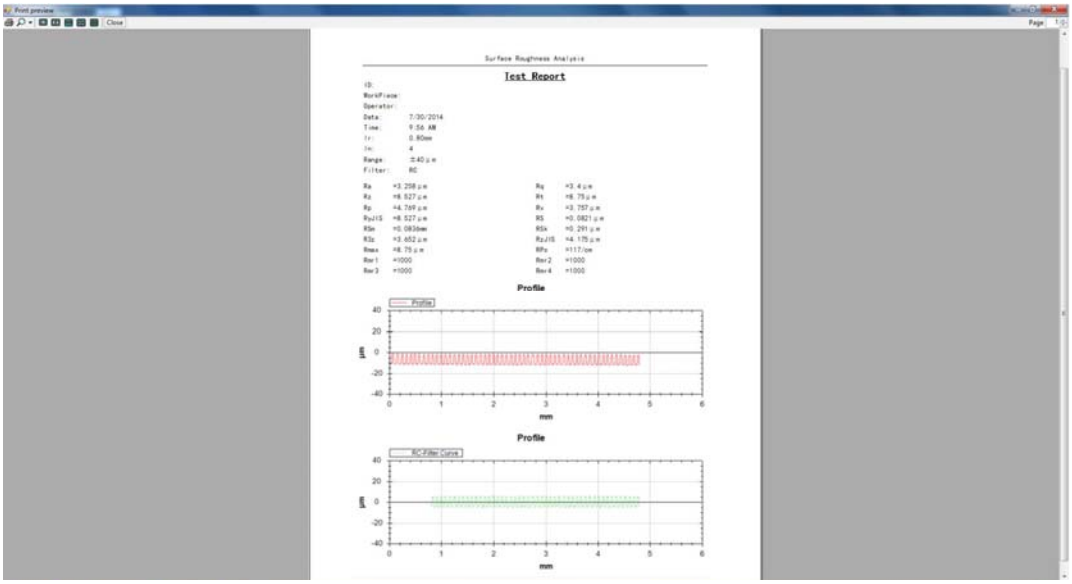




phase II+

"The Source of Quality"





Static Analyze Test Report

Date:	7/30/2014 10:04:16 AM
Unit:	Metric
Range:	±40μm
Filter:	RC
Cutoff(lr):	0.80mm
Access(ln):	4
Count:	2

Paras.	Avg	Min	Max	Stdev
Ra	1.63	0.00	3.26	1.63
Rq	1.70	0.00	3.40	1.70
Rz	4.26	0.00	8.53	4.26
Rt	4.38	0.00	8.75	4.38
Rp	2.38	0.00	4.77	2.38
Rv	1.88	0.00	3.76	1.88
RyJIS	4.26	0.00	8.53	4.26
RS	0.04	0.00	0.08	0.04
RSm	0.04	0.00	0.08	0.04
RSk	0.15	0.00	0.29	0.15
R3z	1.83	0.00	3.65	1.83
RzJIS	2.09	0.00	4.18	2.09
Rmax	4.38	0.00	8.75	4.38
RPc	58.50	0.00	117.00	58.50
Rmr1	500.00	0.00	1000.00	500.00
Rmr2	500.00	0.00	1000.00	500.00
Rmr3	500.00	0.00	1000.00	500.00
Rmr4	500.00	0.00	1000.00	500.00

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