SURFPK®-SJ /SV/PRO is a dedicated software for Mitutoyo Surftest surface roughness testing instruments. It utilizes the Windows® OS, and provides advanced data processing capabilities — an intuitive graphical interface speed, calculation and display of measurement results, etc. for surface texture analysis. The SURFPK® Series software includes a variety of evaluation parameters conforming to most of the world’s standards, analysis graphs, and digital filters. In addition, the optional printer allows reports to be generated at the time of measurement.
Surface texture-analyzing program

SURFPAK®-SJ, SURFPAK®-SV

- Enhanced with various control functions to support automatic measurement.
- Equipped with a variety of evaluation parameters conforming to most of the world standards and various analyzing functions.
- Allows the operator to perform a complicated measurement easily and speedily with mouse.
- SURFPAK®-SJ is an optional software package for Mitutoyo Sj-201/301/401 Surftest.
- SURFPAK®-SV is the standard software package provided for Mitutoyo SV-Series Surftest.

Assessed profile window:
The size of the assessed profile display can be freely changed.

Measurement result window:
Provides a great variety of parameters conforming to most of the world’s standards.

Measuring condition setting window

Analysis graph window:
Various analysis graphs can be created.

Evaluation conditions window:
For various recalculations of the measured data.

Easy operation with mouse
• The arrangement of machine control icons differs depending upon the Surftest measuring unit to be used with.
Data communication with Surftest SJ-201/301/401

- The assessed profiles, calculation results, measuring conditions, and comments can be freely laid out and printed out as reports.
- Cut and paste-up not only the measurement data but also image files, bit map to create unique reports with photos and company logos.

RS-232C Connecting Cables

- The RS-232C Connecting Cables connect the Surftest SJ-201, SJ-301, or SJ-401 with the external PC.
- Compatible with the RS-232C interface.
- By using the software, SURFPACK®-SJ, measurement results and measuring conditions can be output to the PC. It also allows the operator to operate the Surftest from the PC.

<table>
<thead>
<tr>
<th>Order No.</th>
<th>12AAA208</th>
<th>12AAA882</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicable Surftest</td>
<td>SJ-201</td>
<td>SJ-301, SJ-401</td>
</tr>
<tr>
<td>Connector type</td>
<td>D-SUB (9-pin)</td>
<td></td>
</tr>
<tr>
<td>Cable length</td>
<td>2m (6.56 feet)</td>
<td></td>
</tr>
</tbody>
</table>

Memory Card

- For storing the evaluation, sampling, and statistical analysis result data acquired with the Surftest SJ-301 and SJ-401.
- Can store the maximum of 20 measuring conditions.
- The optional card reader allows the data collected at the measurement site with the SJ-301 or SJ-401 to be brought into the laboratory, etc. where the data can be analyzed using SURFPACK®-SJ.

<table>
<thead>
<tr>
<th>Order No.</th>
<th>12AAA841</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data storage media</td>
<td>COMPACTFLASH™</td>
</tr>
<tr>
<td>Data capacity</td>
<td>8MB</td>
</tr>
</tbody>
</table>

SURFPACK®-SJ and SURFPACK®-SV Specifications


Assessed profiles
- P (primary profile), R (roughness profile), WC, WEA, DIN4776 profile, E (envelope residual profile), R-motif (roughness motif), W-motif (waviness motif)
- Ra, Rq, Rz, Rz(JIS), Ry, Ry(DIN), Rc, Rpi, Rpmax, Rvi, Rv, Rvmx, Rt, Rzli, Rzii, Rzy, S, Pc, Sm, HSC, m_r, δ_c, plateau ratio, mrd, Rk, Rpk, Rvk, Mr1, Mr2, ∆a, ∆q, λ_a, λ_q, Sk, Ku, Lo, Lr, A1, A2

Evaluation parameters
- Ra, Rq, Rz, Rz[ISI], Ry, Ry(DIN), Rc, Rpi, Rp, Rpmax, Rvi, Rv, Rvmx, Rt, Rzli, Rzii, Rzy, S, Pc (Ppi), Sm, HSC, m_r, δ_c, plateau ratio, mrd, Rk, Rpk, Rvk, Mr1, Mr2, ∆a, ∆q, λ_a, λ_q, Sk, Ku, Lo, Lr, A1, A2

Analysis graphs
- ADC, BAC1, BAC2, power spectrum chart, auto-correlation chart, Walsh power spectrum chart, Walsh auto-correlation chart, slope distribution chart, local peak distribution chart, parameter distribution chart

Digital filter
- 2CR-75%, 2CR-50%, 2CR-75% (phase corrected), 2CR-50% (phase corrected), Gaussian-50% (phase corrected)

Cutoff length
- λc: 0.025mm, 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm or arbitrary value (.001", .003", .01", .03", .1", .3", 1" or arbitrary value)
- fl: 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm or arbitrary value (.003", .01", .03", .1", .3", 1" or arbitrary value)
- fh: 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm or arbitrary value (.003", .01", .03", .1", .3" or arbitrary value)

Sampling length (L)*
- 0.025mm, 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm or arbitrary value (.001", .003", .01", .03", .1", .3", 1" or arbitrary value)

Data compensation
- Tilt compensation, R-plane (curved surface) compensation, ellipse compensation, parabola compensation, hyperbola compensation, quadratic curve automatic compensation, polynomial compensation, polynomial automatic compensation

Data deletion function
- Data deletion to avoid an over-range error
- Data deletion in a specific range to perform recalculation
- Automatic data deletion (according to a condition preset)

Recording magnifications
- Vertical: 100X - 500,000X
- Horizontal: 1X - 10,000X

Special functions for report generation
- Bit-map image paste-up function
- Multiple data layout function

OS requirement
- Windows® NT4.0/Windows® 2000/Windows® XP

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*Arbitrary value can be specified in the following range: SURFPACK®-SJ — from 0.3mm (.012") to the maximum traverse length. SURFPACK®-SV — from 0.025mm (.001") to the maximum traverse length.

†Not available on SURFPACK®-SJ

Order No. | 12AAA208 | 12AAA882 |
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
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Order No. | 12AAA841 |
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<tr>
<td>Data capacity</td>
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</tr>
</tbody>
</table>

12AAA841 12AAA882 12AAA208
Conforming to the World’s Standards

- Conforming to the world surface roughness standards including DIN, ISO, JIS, Motif, etc.
- Combinations of a variety of evaluation profiles and parameters satisfy various needs for surface roughness evaluations.

Various Types of Analysis Graphs

- Provides various types of analysis graphs, such as BAC (material ratio curve), ADC (profile height amplitude curve), power spectrum chart, etc. for diverse evaluations of surface textures.
- The graph profiles help visual assessment of the surface texture of workpiece.

Easy Calibration Operation

- Calibration can be easily performed by measuring a reference roughness specimen the reference value of which was entered with the ten-key.

Straightness Compensation Function

- Improves the mechanical straightness of the X-axis drive unit.
- Eliminates straightness error from the measured data, based on the drive unit error data obtained from the measurement of a master plain such as an optical flat.
**Recalculation Function**

- Once the measured data is stored in the hard disk, the operator is able to perform recalculation on the measured data by changing evaluation range, cutoff length, etc. or adding evaluation parameters and analysis graphs as required.
- Measurement conditions once set can be easily retrieved.

**Unnecessary Data Deletion**

- Deletes unnecessary data points, then recalculates the data or resets the evaluation length and the evaluation range.
- Automatically deletes unnecessary data points when conditions are set at the time of measurement. (The workpiece surface, as shown below, can be automatically evaluated with the groove excluded, for example.)

**Data Compensation Function**

- Tilt compensation: Compensates tilt in the measured data. In addition to the compensation of the entire data, the compensation of a desired area is also possible.
- R-plain compensation: Compensates the measured data to eliminate curvature in the measurement of the surface texture of R (curved surface such as cylinder or sphere), processing the data as those of a flat surface.
- Equipped with polynomial automatic compensation function for the elimination of irregular surface texture elements, etc.

**Report Generation Function**

- The assessed profiles, calculation results, measuring conditions, and comments can be freely laid out and printed out as reports.
- Cut and paste-up not only the measurement data but also image files (bit map) to create unique reports with photos and company logos.
- Create one layout and use it also for other measurements.
- Reports can be printed on large size paper or in color using the optional color printer.

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**Evaluation conditions setting windows**

**Effective range**

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**Report Generation Function**

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**Printout examples**

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**Layout edit window**

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**Bit-map image past-up function**
SURFPAK®-PRO provides a variety of graphics methods and evaluation parameters for various surface texture evaluations from the three-dimensional topography data.

- A desired topographic profile can be analyzed two-dimensionally, thus allowing the evaluation of fine contour and fine texture at the same time.

SURFPAK®-PRO is the standard software package provided for Mitutoyo Surftest SV-3000•3D.
Can be used with 3-D Auto-leveling Table

The 3-D auto-leveling table, which is a standard accessory for Mitutoyo Surftest SV-3000 3D, adjusts the level of the measuring surface of the workpiece automatically. This relieves the operator from the time-consuming manual adjustment that a conventional type machine would require, thus greatly improving work efficiency.

SURFPAK®-PRO Specifications

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessed profiles</td>
<td>P (primary profile), R (roughness profile), WC, WCA, WEA, DIN4776 profile, E (envelope residual profile), R-motif (roughness motif), W-motif (waviness motif)</td>
</tr>
<tr>
<td>Two-dimensional evaluation parameters</td>
<td>P, R, WC, WCA, WE, WEA, DIN4776, E</td>
</tr>
<tr>
<td></td>
<td>Ra, Rq, Rz, Rq(DIN), Ry, Ry(DIN), Rr, Rp, Rpmax, Rv, Rvmax, Rti, Rt, Rti, Rz, Rny, S, Pc (Pp), Sm, Hsc, mr, Sc, plateau ratio, mrd, Rk, Rpk, Rvk, Mr1, Mz, Sa, aq, la, Iq, Sk, Ku, Lo, Lr, A1, A2</td>
</tr>
<tr>
<td>R-motif</td>
<td>Rx, R, AR, SR, SAR, NR, NCRX, CPM</td>
</tr>
<tr>
<td>W-motif</td>
<td>Wte, Wx, Wl, AW, SW, SAW, NW</td>
</tr>
<tr>
<td>Three-dimensional evaluation parameters</td>
<td>(Can be obtained from a dense group of assessed profiles — primary profiles, roughness profiles, or waviness profiles)</td>
</tr>
<tr>
<td></td>
<td>Sa (arithmetic mean deviation), Sq (root-mean-square deviation), Sz (ten-point height of irregularities), Sp (maximum profile height), Sv (maximum profile valley depth), St (total height), S3y (third maximum peak-to-valley height), Spc (peak count), Svc (valley count), Spd (peak density), Svd (valley density), Ssk (skewness), Sku (kurtosis), Ssq (root-mean-square slope), Sr (root-mean-square wavelength), S3y (third maximum peak-to-valley height)</td>
</tr>
<tr>
<td>Topographic profile sampling function</td>
<td>A desired cross-section which is included in a three-dimensional topography data can be analyzed two-dimensionally.</td>
</tr>
<tr>
<td>Analysis graphs</td>
<td>Two-dimensional ADC, BAC1, BAC2, power spectrum chart, auto-correlation chart, Walsh power spectrum chart, Walsh auto-correlation chart, slope distribution chart, local peak distribution chart, parameter distribution chart</td>
</tr>
<tr>
<td></td>
<td>Three-dimensional 3-D topography display, 3-D topography (contour line) display, topographic profile (cross-section) analysis, ADC, BAC1, BAC2, power spectrum chart, probability distribution chart, local peak distribution chart, parameter distribution chart, slope enhancement</td>
</tr>
<tr>
<td>Digital filter</td>
<td>Two-dimensional 2CR-75%, 2CR-50%, 2CR-75% (phase corrected), 2CR-50% (phase corrected), Gaussian-50%</td>
</tr>
<tr>
<td></td>
<td>Three-dimensional Moving average filter, Gaussian filter</td>
</tr>
<tr>
<td>Cutoff length*</td>
<td>( \lambda_c: 0.025\text{mm}, 0.08\text{mm}, 0.25\text{mm}, 0.8\text{mm}, 2.5\text{mm}, 8\text{mm}, 25\text{mm or arbitrary value} )</td>
</tr>
<tr>
<td></td>
<td>( \lambda_f: 0.08\text{mm}, 0.25\text{mm}, 0.8\text{mm}, 2.5\text{mm}, 8\text{mm}, 25\text{mm or arbitrary value} )</td>
</tr>
<tr>
<td></td>
<td>( \lambda_h: 0.08\text{mm}, 0.25\text{mm}, 0.8\text{mm}, 2.5\text{mm}, 8\text{mm}, 25\text{mm or arbitrary value} )</td>
</tr>
<tr>
<td>Sampling length (L)*</td>
<td>0.025mm, 0.08mm, 0.25mm, 0.8mm, 2.5mm, 8mm, 25mm or arbitrary value</td>
</tr>
<tr>
<td>Data compensation (Two-dimensional)</td>
<td>Tilt compensation, R-plane (curved surface) compensation, ellipse compensation, parabola compensation, hyperbola compensation, quadric curve automatic compensation, polynomial compensation, polynomial automatic compensation</td>
</tr>
<tr>
<td>Trend compensation (Three-dimensional)</td>
<td>Plane compensation, sphere compensation, cylinder compensation, polyhedron compensation</td>
</tr>
<tr>
<td>Data deletion function</td>
<td>• Data deletion to avoid an over-range error</td>
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<tr>
<td>Special functions for report generation</td>
<td>• Bit-map image paste-up function</td>
</tr>
<tr>
<td></td>
<td>• Multiple data layout function</td>
</tr>
<tr>
<td>OS requirement</td>
<td>Windows® NT4.0, Windows® 2000, Windows® XP</td>
</tr>
</tbody>
</table>

*Arbitrary value can be specified in the range from 0.025mm (.001") to the maximum traverse length.
Various Contour Evaluation Commands
- By combining contour elements such as point, line, circle, and coordinates, various evaluations can be performed, including the length measurement of step and pitch, the area calculation, etc.

Data Processing Function
- Allows assessed profile filtration, deletion of data, data cut-off, and combination of data from multiple measurements.

Data Compensation Function
- Circular error compensation function: Compensates circular-movement error of the stylus to reduce distortion, thus obtaining the data that is closest to the actual contour data.
- Stylus-tip diameter compensation: Offsets the measured data for the stylus-tip diameter.

Report Generation Function
- Just like the SURFPAK® series software, FORMPAK®-SV allows measurement results to be freely laid out and printed out as report. This program also supports the optional color printer.
Contour tolerancing function
- This function compares measured form data with nominal data, displays the deviation, and then stores it. Form data is different from dimensional measurement of angle, radius, etc. In addition to values obtained from an ideal contour in a CAD drawing, nominal values can also be created by converting the measured data of a master.

External output function
- Calculation results and tolerancing results can be output in a readable format to commercial spreadsheet software. This function increases processing capabilities including statistical calculation, saving, and management of measurement results. It also allows measured point group data to be output in a text format.

Icon editing function
- Measurement icons can be rearranged or replaced as desired. It is also possible to enlarge the icons for greater visibility.

FORMPAK®-SV Specifications

<table>
<thead>
<tr>
<th>Compatible SURFPAK® Series</th>
<th>SURFPAK®-SV, SURFPAK®-PRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation commands</td>
<td>Point measurement: Point, peak, contact, intersection, bisector-point (between elements/between pieces of measured data)</td>
</tr>
<tr>
<td>Line measurement: Line, tangent line, perpendicular, parallel line, bisector</td>
<td></td>
</tr>
<tr>
<td>Circle measurement: Circle (multi-point/range/center and radius), contact circle</td>
<td></td>
</tr>
<tr>
<td>Position/difference: Coordinate difference, true position judgment</td>
<td></td>
</tr>
<tr>
<td>Distance/angle: Distance, groove width, step pitch, angle, reference setting (point/line/circle)</td>
<td></td>
</tr>
<tr>
<td>Coordinate system setting: Origin setting, coordinate system rotation</td>
<td></td>
</tr>
<tr>
<td>Calculation/statistics: Arithmetic calculation, absolute value, square root, maximum value, minimum value, mean, sum, standard deviation, unbiased standard deviation, area, automatic circle/line definition</td>
<td></td>
</tr>
<tr>
<td>Editing of measured points: Data deletion, translation, rotation, mirror image, positioning, combination, separation, projection, offsetting, idealizing</td>
<td></td>
</tr>
</tbody>
</table>

Contour tolerancing
- Nominal data creation: Function specification (line/circle/aspheric surface, etc.), CAD data input (IGES/DXF), measured data conversion, text file conversion
- Tolerancing direction setting: Normal direction, X-axis direction, Z-axis direction
- Reference coordinate system translation/rotation
- Best-fit: X-axis translation, Z-axis translation, rotation, combination of several motions
- Nominal data tolerancing
- Result display: Lists, graphics

Special functions
(i) Sub-part program: Calculation procedure can be registered as a sub-part program. The sub-part program can be integrated into a part program, facilitating measurement of a batch of workpieces.
(ii) Measured data/condition saving: Measured data and analysis procedure can be saved in the hard disk.
(iii) Report creation function: Recorded profiles, measurement results and measurement conditions can be arranged in a form and laid out as desired. This function allows an original result report to be created and printed out.
(iv) External output of data: Analysis results (numerical values) can be output in the CSV format, and therefore, can be easily accessed by spreadsheet software on the market. Also, measured data (multi-point data) can be output in the ASCII code.
(v) Part program creation: Measurement procedures complete with measurement, analysis, contour tolerance judgment, print, and save as a file, can be registered as a part program. The part program can be used for automatic measurements.
(vi) Polar coordinate development display: Develops a circular form on to the polar coordinate system, where the range for circle calculation can be specified.

OS requirement | Windows®NT4.0/Windows®2000/Windows®XP
**P: Primary profile**
The primary profile is a profile obtained by intersecting a surface with a plane normal to the nominal surface. It is a representation of the real profile (a profile of the real surface) obtained by a Surftest.

**R: Roughness profile**
The roughness profile is an assessed profile which is obtained from the primary profile by filtering longer waves (waviness components) as specified by cutoff length \( \lambda_c \).

**W: Filtered waviness profile**
The filtered waviness profile is a profile resulting from a primary profile that has its shorter wavelength components and longer wavelength components removed through filtering.

**WEA: Filtered center line waviness profile**
The filtered center line waviness profile is an assessed profile which is obtained from the primary profile by filtering longer waves (waviness components), as specified by \( \lambda_c \), and shorter waves (roughness components), as specified by \( \lambda_h \), while passing mid-range waves.

**WE: Rolling circle waviness profile**
A rolling circle waviness profile is the locus of points formed by the center of a circle with a given radius that rolls over the workpiece surface (while removing roughness components). This circle is called the rolling circle.

**E: Envelope residual profile**
An envelope residual profile is a profile of the residual (deviation) of a calculated rolling circle waviness profile from the primary profile.

**Surftest Terminology**
For surfaces to be measured having deep valleys with respect to the irregularity on the surface, the position of the mean line may be calculated to the position shifted from the position where it is supposed to be for surface roughness evaluation. However, by using the DIN4776 profile calculating procedure, those negative effects can be avoided to a certain extent.

**Cutoff filter**
Cutoff filter rejects data in a particular range (or ranges) of wavelengths from the primary profile.

**WCA: Filtered center line waviness profile**
A rolling circle center line waviness profile is the profile that results from a rolling circle waviness profile that has its longer wavelength components (called "waviness components") filtered out.

**Cutoff length**
The cutoff length is a sampling length (e.g. wavelength: \( \lambda_c \)) to be used to filter the primary profile. The cutoff length to reject long wavelength (or low frequency) data to obtain the roughness profile is known as \( \lambda_c \); the cutoff length to reject short wavelength (or high frequency) data to obtain the waviness profile is known as \( \lambda_h \); and the cutoff length used together with \( \lambda_h \) to reject long wavelength (or low frequency) data to obtain the filtered center line waviness profile is \( \lambda_f \).

**DIN4776 profile**
For surfaces to be measured having deep valleys with respect to the irregularity on the surface, the position of the mean line may be calculated to the position shifted from the position where it is supposed to be for surface roughness evaluation.
**SURFTEST TERMINOLOGY**

**Sampling length (L)**
The sampling length is the minimum evaluation length used to obtain an evaluation value from an assessed profile, according to the selected parameter. The sampling lengths of roughness and waviness profiles are identical to cutoff length λc and fh, respectively. The sampling length of WCA corresponds to fl.

**Traverse length (lt)**
The traverse length equals the sum of the evaluation length, pre-travel length, and post-travel length.

**Marginal length (pre-travel and post-travel)**
In addition to the start-up travel of the Surftest detector itself, a pre-travel and post-travel are also required for data filtering.

**Evaluation length (ln)**
The evaluation length is the sum of n (successive integers) pieces of sampling lengths. (Usually an evaluation length comprises five sampling lengths.) In general evaluation of surface texture, all of the data logged in each sampling length is averaged throughout the evaluation length, yielding the evaluation value (such as Ra, Rq, Ry, Pc, Sm, HSC, and S). However, depending on the parameters, the evaluation value may use the maximum value in the entire evaluation length (e.g. Ry(DIN), Rp, Rv, and Rt).

**Mean line**
The mean line is a reference line for parameter calculation. It uses the filtered waviness profile of an assessed profile, which is determined by eliminating surface roughness components shorter than the specified wavelength from the primary profile using a high-pass filter.

**Effect of data filtering**
Different roughness profiles will be obtained from the same primary profile according to the different cutoff lengths of the filter.

**Roughness analysis parameters**

- **Ra**: Arithmetic mean deviation of the profile
  
  Ra is the arithmetic mean of the absolute values of the profile deviation Yi from the mean line. Ra(ANSI) is defined over the entire evaluation length.

- **Rq**: Root-mean-square deviation of the profile
  
  Rq is the square root of the arithmetic mean of the squares of profile deviations Yi from the mean line. Rq(ANSI) is defined over the entire evaluation length.

- **Rz(JIS)**: Ten-point height of irregularities
  
  Rz(JIS) is the sum of the mean height of the five highest profile peaks and the mean depth of the five deepest profile valleys measured from a line parallel to the mean line.

- **Ry(JIS)**: Maximum height of the profile
  
  Ry(JIS) is the sum of height Yp of the highest peak from the mean line and depth Yv of the deepest valley from the mean line.

- **Rc**: Mean peak-to-valley height of the profile
  
  Rc is the distance between the average of all peak heights from the mean line and the average of all valley depths from the mean line.

- **Rz**: Maximum height of the profile
  
  Ry(DIN) is the maximum value of all Zi’s over the evaluation length. Ry(DIN) is the maximum value of all Zi’s over the evaluation length.

- **Rp, Rpmax**: Maximum profile height
  
  Obtain the sum Zi of profile peak height Pi and profile valley depth Vi for each sampling length. Rp is the mean value of all Zi’s over the evaluation length. Rp(ANSI) (=Rpmax) is the maximum value of the Rp’s obtained over the evaluation length.
Rv, Rvmax: Maximum profile valley depth
Obtain the profile valley depth Rv for each sampling length of the assessed profile. Rv is the mean of the Rv's obtained over the evaluation length. Rv(ANSI) (= Rvmax) is the maximum value of the Rv's obtained over the evaluation length.

Rt: Total height of the profile
Rt is the sum of the maximum profile peak height Rpmax and the maximum profile valley depth Rv obtained over the evaluation length.

R3z, R3y: Third maximum peak-to-valley height
Obtain, for each sampling length, the sum (3zi) of the height of the third highest profile peak above the mean line and the depth (3zi) of the height of the third deepest profile valley below the mean line. R3z is the arithmetic mean of the all 3zi's obtained over the evaluation length. R3y is the maximum value of the 3zi's obtained over the evaluation length.

HSC: High spot count
On the assessed profile provided a line (called a "count level") which is parallel to and located above the mean line. A profile peak that projects above the count level line and has a local peak* is called a "peak for high spot count". HSC (high spot count) is the number of these peaks per 1cm or 1 inch.

*S a local peak is the highest point of a convex portion of an assessed profile, which has concavities on both sides. The distance between adjacent concavities should be more than 1% of L, or the depth of the concavities should be more than 10% of Rz.

S: Mean spacing of local peaks of profile
S is the arithmetic mean of peak-to-peak distances of the local peaks.

mr, mrd: Material ratio of the profile
oc (plateau ratio): Profile section height difference
The material ratio of the profile is the ratio of the bearing length to the evaluation length. It is represented as a percentage (%). The bearing length is the sum of section lengths obtained by cutting the profile with a line (slice level) drawn parallel to the mean line at a given level. The ratio is assumed to be 0% if the slice level is at the highest peak, and 100% if it is at the deepest valley. Parameter mr determines the percentage of each bearing length ratio of a single slice level or 19 slice levels which are drawn at equal intervals (5%) with Rt; parameter oc (or plateau ratio) determines the distance (µm or µinch) between the two slice levels which are represented by two different mr values (%); and parameter mrd determines the mr value (%) of a slice level each time it is moved down at equal intervals from a given level in the profile.

BAC1, BAC2: Material ratio curve of the profile
The material ratio curve is the graph obtained by plotting mr values (%) of the assessed profile on the X coordinate against their corresponding slice level depths or heights on the Y coordinate. BAC1 is the graph that shows the relative depths of the slice level (100% down to 0% of Rt) on the Y coordinate; BAC2 is the one that shows the actual heights (µm or µinch) on the Y coordinate.

Pc (Pci): Peak count
Pc (or Pci) is the number of peak-valley pairs (= cycles) per unit length 1cm (or 1 inch) along the mean line of the profile within the sampling length. Two lines (count levels) that are parallel to the mean line are drawn at equal distances above and below the mean line. Each profile cycle between intersections of the profile and the mean line, between which a peak projects above the upper count level and an adjacent valley drops below the lower count level, is counted as one peak-valley cycle.

Sm: Mean width of the profile elements
Sm is equal to the mean wavelength of the peak-valley cycles. It is the reciprocal of the Pc (peak count) value.

Rk: Core roughness depth
Assume that a straight line (function) passes through two points that pinpoint the 40% difference in mr and the minimum difference in height on the BAC2 graph. The core roughness depth Rk is the difference between the heights of the slice level at 0% of mr and at 100% of mr on this straight line.

Rpk: Reduced peak height
Rpk: Reduced valley height
A1: Peak area
A2: Valley area
Mr1: Material portion 1
Mr2: Material portion 2
These parameters, along with Rk, are obtained from the BAC2 graph.
**SURFTEST TERMINOLOGY**

**ADC: Profile height amplitude curve**
Assume that the assessed profile is divided by lines parallel to the mean line at constant intervals and the ratio of each area (which is determined by summing the sampling dots) between two adjacent lines to the area over the evaluation length is defined as the amplitude density. The **ADC** (profile height amplitude curve) is created by plotting the level (µm) of each of the parallel lines on the Y coordinate and the amplitude density (%) corresponding to the depth on the X coordinate.

![ADC Chart](Image 42x704 to 553x789)

**Sk: Skewness of the profile**
Sk is the degree of bias of an amplitude distribution curve either above or below the mean line.

![Skewness Chart](Image 42x704 to 553x789)

**Ku: Kurtosis**
Ku is the degree of concentration around the mean value of an amplitude distribution curve.

![Kurtosis Chart](Image 42x704 to 553x789)

**Δa: Arithmetic mean slope of the profile**
Δa is the arithmetic mean of the absolute values of the local slope (dz/dx) of the assessed profile.

![Arithmetic Mean Slope Chart](Image 42x704 to 553x789)

**Δq: Root-mean-square slope of the profile**
Δq is the square root of arithmetic mean of the squares of the local slope (dz/dx) of the assessed profile.

![Root-Mean-Square Slope Chart](Image 42x704 to 553x789)

**Δa: Average wavelength of the profile**
Δa is an average wavelength that can be calculated from Ra (µm or µinch) and Δa (degree) using the following formula.

\[ \Delta a = \frac{2\pi R}{\Delta a} \]

**Δq: Root-mean-square wavelength**
Δq is a wavelength that can be calculated from Rq (µm or µinch) and Δq (degree) using the following formula.

\[ \Delta q = \frac{2\pi Rq}{\Delta q} \]

**Lo: Developed profile length**
Lo is the length of a straight line which is obtained by developing an assessed profile. It is the ratio of a developed profile length Lo to the sampling length. It represents the degree of profile irregularities.

**Rw: Parameters calculated from a waviness motif**
Rw is the maximum value of waviness motif heights. Rx is the maximum value of roughness motif heights. AR is the mean of roughness motif heights. SR is the standard deviation of roughness motif heights. SAR is the standard deviation of roughness motif widths. NR is the number of roughness motifs. NCRX is the number of vertexes of concavities extracted before the composition of roughness motifs. CPM is the average number of valleys per roughness motif.

![Waviness Motif Chart](Image 42x704 to 553x789)

**Auto-correlation chart**
The auto-correlation function represents the degree of consistency between two points apart from a definite distance on the entire profile. If a height (depth) appears again in a definite distance, the value of the correlation function will be 1. Generally, the correlation function will take a large value at a periodic interval, which is equal to the wavelength of the primary component of the profile. Therefore, the primary wave component of the profile can be seen from the variation of the auto-correlation function values.

**Power spectrum chart**
Assuming that the profile is a sum of wave components with different wavelengths, it can be characterized by the distribution pattern of the wavelengths. A power spectrum chart is created plotting the wavelength (mm) or spatial frequency (c/mm) on the X coordinate and the intensity (amplitude) on the Y coordinate to display the distribution of wave components. A power spectrum and an auto-correlation share the same information in the spatial field and the wavelength field, respectively. In other words, they represent the same information in different formats.

**Slope distribution chart**
Divide the profile into sections at a constant width and obtain the angle of inclination of a line that connects the start point and the end point of the profile in each section. A slope distribution chart is created by plotting the angles on the X coordinate and the ratio (%) of slope distributions on the Y coordinate.

**Local peak distribution chart**
Assume that the assessed profile is divided by lines parallel to the mean line at constant intervals and count the number local peaks at each slice level. A local peak distribution chart is created by plotting the number of local peaks per 1mm on the X coordinate and the depths of the slice level (100% downward to 0% of Rr) on the Y coordinate.

**Parameter distribution chart**
To obtain the continuous distribution of a roughness parameter, set an evaluating span with a definite length, shorter than the evaluation length of the profile, and shift it at a predetermined length along the sampling direction in order to calculate the parameter value at each position. A parameter distribution chart is created by plotting the distance in the shift direction on the X coordinate and the parameter values on the Y coordinate. One of the following 22 parameters can be specified at a time: Ra, Rq, Ry, Rz, Rv, Rz, S, Pc, Sm, SHS, δa, δq, λa, λq, Sk, Ku, Lo, Ir, Rrmax, Rvmax, Rr, Rz3. y, Rz3.
**Data Management**

- All the SURFPAK® Series surface roughness-analyzing programs have high operability, and they can exchange data with each other. SURFPAK®-SJ is the software for the portable type model, SURFPAK®-SV for use in the inspection room, and SURFPAK®-PRO for models with three-dimensional surface measuring. (Control method for the machine differs, depending on the model.)
- SURFPAK® Series software makes it easier to manage data, from the manufacturing site to the laboratory, as the same format can be used in the surface roughness measurement and the storage and analysis of the measured data.
- Optional program FORMPAK®-SV is available to evaluate the fine texture of workpiece surfaces.

**Part Program Creation and Execution**

- SURFPAK® Series software greatly reduces the amount of manual operations by easy mouse-operation, the on-screen instruction on the operation procedures, and the repeat measurement by automatic execution of a part program.

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