### Categories of surface roughness

Definitions and indicators for surface roughness parameters for industrial products are specified. They are arithmetical mean roughness (Ra), maximum height (Ry), ten-point mean roughness (Rz), mean spacing of profile irregularities (Sm), mean spacing of local peaks of the profile (S) and profile bearing length ratio (bp). Surface roughness is given as the arithmetical mean value for a randomly sampled area. (Mean center line roughness (Rc) is defined in the annexes of JIS B 0301 and JIS B 0861).

### Typical ways of obtaining surface roughness

**Arithmetical mean roughness (Ra)**

A section of standard length is sampled from the mean line on the roughness chart. The mean line is laid on a Cartesian coordinate system whereby the mean line runs in the direction of the x-axis and magnification is the y-axis. The value obtained with the formula on the right is expressed in micrometer (μm) when y = 1 (μm).

**Maximum peak (Ry)**

A section of standard length is sampled from the mean line on the roughness chart. The distance between the peaks and valleys of the sampled line is measured in the y direction. The value of Ry is expressed in micrometer (μm).

**Ten-point mean roughness (Rz)**

A section of standard length is sampled from the mean line on the roughness chart. The average of the peaks and valleys of the sampled line is measured in the y direction. Then, the average peak is obtained among 5 highest peaks (Ypp), and the average valley among 5 lowest valleys (Yvl). The sum of these two values is expressed in micrometer (μm).

### Reference

**Arithmetical mean roughness / Ra and conventional symbols**

<table>
<thead>
<tr>
<th>Arithmetic mean roughness</th>
<th>Ra</th>
<th>Indication of surface finish in drawings</th>
<th>Preferred number series</th>
<th>Re-run mean roughness</th>
<th>Standard length of Ry / Rz (μm)</th>
<th>Triangular indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0.010 to 0.10]</td>
<td>0.25</td>
<td>0.25 (inches)</td>
<td>1.6</td>
<td>0.25</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>[0.020 to 0.05]</td>
<td></td>
<td>0.125 (inches)</td>
<td>0.8</td>
<td>0.125</td>
<td>0.125</td>
<td>0.125</td>
</tr>
<tr>
<td>[0.025 to 0.05]</td>
<td>0.30</td>
<td>0.18 (inches)</td>
<td>0.8</td>
<td>0.18</td>
<td>0.18</td>
<td>0.18</td>
</tr>
<tr>
<td>[0.050 to 0.15]</td>
<td>0.60</td>
<td>0.10 (inches)</td>
<td>0.8</td>
<td>0.10</td>
<td>0.10</td>
<td>0.10</td>
</tr>
<tr>
<td>[0.15 to 0.5]</td>
<td></td>
<td>0.05 (inches)</td>
<td>0.8</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>[0.25 to 0.5]</td>
<td></td>
<td>0.03 (inches)</td>
<td>0.8</td>
<td>0.03</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>[0.5 to 2]</td>
<td></td>
<td>0.005 (inches)</td>
<td>0.8</td>
<td>0.005</td>
<td>0.005</td>
<td>0.005</td>
</tr>
</tbody>
</table>

- The evaluation length of Ry, Ry and Rz: Five times the cut-off value standard length respectively.

### Positions of respective indicating symbols relative to indicating symbol of surface

Each grain surface position is indicated as shown in Fig. 1. This includes surface roughness, cut-off value or reference length, processing method, symbol of direction of lay, surface waviness, etc.

**Symbol**

- **Legend:**
  - a: Value of Ra
  - b: Processing method
  - c: Cut-off value, Evaluation length
  - d: Reference length, Evaluation length
  - e: Symbol of direction of lay
  - f: Parameter other than Ra (With tp, parameter/condition level)

**Note:** Items other than a and f are added as necessary.

**Reference:** The location of lay of Ra in Fig. 1 is given as the finish allowance in ISO 1302.

**Example indicating surface texture on drawing**

- Indicating symbol of surface

- Indicating symbol of surface requiring removal press

- Indicating symbol in which removal process is permitted

- Examples indicating the upper limits of Ra

- Examples indicating direction of lay

- Examples indicating the upper limit and lower limit of Ra

- Examples indicating processing method