Roughness measuring systems from Jenoptik – Surface parameters in practice

Selection of the cut-off (profile filter) according to ISO 4288:1998 and ISO 3274:1998

The cut-off is selected depending on the workpiece surface either according to the valley spacing or the expected roughness values. If the workpiece does not allow the required traverse length, deviations are necessary. The following applies:

- For periodic profiles:
  - In a periodic profile the maximum width of the profile elements RSm is used. With an RSm between 0.5 and 3 mm the following measuring conditions result:
    - RSm = 2.5 mm
      - lr ≥ 15 mm
      - ln ≥ 5 µm
    - RSm = 0.5 mm
      - lr ≥ 0.5 mm
      - ln ≥ 1 µm

- For aperiodic profiles:
  - Periodic profiles:
    - The cut-off is selected depending on the workpiece surface either according to the valley spacing or the expected roughness values. At the same time the total evaluation length and the corresponding traverse length are defined according to the standards. Deviations are necessary if the workpiece does not allow the required traverse length. See drawing entries.
  - Aperiodic profiles:
    - The cut-off is selected depending on the workpiece surface either according to the valley spacing or the expected roughness values. At the same time the total evaluation length and the corresponding traverse length are defined according to the standards. Deviations are necessary if the workpiece does not allow the required traverse length. See drawing entries.

Periodic profiles

- Average turning, milling
- Measuring conditions:
  - Sampling length
  - Evaluation length
  - Traverse length
  - Cut-off
  - Profile type (filter)
  - Stylus tip radius
  - Digitalization distance * 

Apertidic profiles

- Average turning, milling
- Measuring conditions:
  - The cut-off is also used in this case. A cut-off is set in the equipment menu.

Division of a surface

- Surface profile – total height of the profile
  - The surface profile is measured two-dimensionally using the tracing system.
  - The utilized primary profile (P-profile) is the actual measured surface profile. Filtering it in accordance with ISO 11562/ISO 11563-1 produces the waviness profile (W-profile) and the roughness profile (R-profile). The value for the desired roughness parameter is then determined by filtering the roughness profile and roughness profile elements.
  - Following ISO 4288, all parameter definitions are valid for both the roughness profile as well as for the primary and waviness profiles. The profile type is identified by the capital letter p in the parameter name.
  - The total height of the P-profile is the maximum height between the highest peak and the deepest valley of the evaluation length profile.
  - Evaluation length – cut-off
    - The traverse length (lt) is the total length of the probe movement during the scanning process. It must be greater than the evaluation length in order to be able to form the roughness profile.
  - Semi-peak height: The peak height of the roughness profile is defined as the average deviation of the sampling lengths.
  - The sampling length corresponds to the cut-off.

Evaluation of measurement results

- According to ISO 4288 the surface measurement results made in the actual measured roughness elements are to be evaluated (virtual evaluation).
- Height value rule
  - The surface is considered good when the measured values of a parameter do not exceed the highest maximum value. In this case, the parameter is identified by the suffix ‘max’, e.g., Rt,max.
  - If the suffix ‘max’ is not specified, the 16% rule applies, which states that the surface is considered “good” if not more than 16% of the measured parameter exceed the maximum value. The roughness elements are defined as average deviations of the sampling lengths.

- Special rule VDA
  - Special rule VDA: The 16% rule is not used. VDA 2006 assumes that the dispersion of the parameters is taken into account whenever the 16% rule does not apply. If the suffix ‘max’ is not specified, the 16% rule applies even without the ‘max’ index in the designation.

- The use of the digital filter is prohibited.

- * If Rt ≤ 2 µm the stylus tip radius is ≤ 2 µm, at Rt > 2 µm it is ≤ 5 µm. The distance between two measuring points is ≤ 0.5 µm.

The most important roughness parameters according to ISO 4287, ISO 13565 and EN 10049

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Drawing entries according to ISO 1302:2002

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- Parameters of the material ratio curve
  - Rz – ‘core’ roughness profile – Depth of the roughness profile
  - Rp – reduced peak height – Mean height of the peaks protruding from the roughness profile
  - Rpk – peak height (not included in ISO 13565-2)
  - Rvk – reduced valley depth – The maximum depth of the valley reaching into the material from the core
  - Rmm – ‘maximum valley’ Grinding (M6) and greater Rvk (M10) material ratio (in %) at the limits of the roughness core area

Drawing entries according to VDA 2007 – dominant waviness

- Drawing entries according to VDA 2007 – dominant waviness

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metrology@jenoptik.com

www.jenoptik.com/metrology