

## Shape Descriptors

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**History** 02/06/03: First version

02/09/06: Added option to display single particle shape descriptors

04/02/22: Added the solidity and convexity descriptors (as given by the convex hull algorithm implemented by Wayne Rasband in IJ 1.31g) (v. 1a)

04/03/26: Added new option to display a polar/rose plot based on the particle orientations (v. 1b). Added option to include solidity and convexity values. Changes to the dialog box.

04/06/05: Added option to consider particles having a given form factor

05/05/16 Expanded the shape options to include min and max values (v. 1e) Some modifications to the dialog box. Particles not having the specified shape options are removed from the original image. The outline images shows the particle number corresponding to the single result table (v.1g)

05/10/17 Fixed a small NullPointerException bug (1h)

05/11/07 Included a "Include edge particle" option. Included the major and minor axis in the result table. Changes to the outline window display (v.1j)

06/02/25 Option to include/exclude holes in particles.

070405 Fixed a bug in the classifyOrientations method. The plot weighs the area in pixels, not calibrated units. (v. 1p)

070613 Requires IJ 138t.

080319 Included the angles for selecting particles within a given interval (v. 1r)

090721 Included the Feret diameter. Changes to the dialog box. Outlines are given by default. Convexity is temporarily deactivated (v.1t).

090722 Verifies if the images use an inverted LUT (V. 1u).

**Requires:** ImageJ 1.43c or later

**Source:** [Shape Descriptor1u](#)

**Installation:** Download [Shape\\_Descriptor1u.class](#) to the plugins folder and restart ImageJ.

**Acknowledgement** If you find this plugin useful you may want to refer to the following paper:  
Syverud, K., Chinga, G., Johnssen, P.O., Leirset, I. and Wiik, K.: "Analysis of lint particles from full-scale printing trials". *Appita J.* 60(4): 286-290 (2007).

**Description:** This plugin calculates shape descriptors. The mean and standard deviation of shape values are given for every image in a stack. The definitions are given according to Russ, 1999 (*The image processing Handbook*). The following descriptors are given:

**Form factor:**  $4\pi \cdot \text{area} / \text{sqr}(\text{perimeter})$

**Roundness:**  $4 \cdot \text{area} / \pi \cdot \text{sqr}(\text{major axis})$

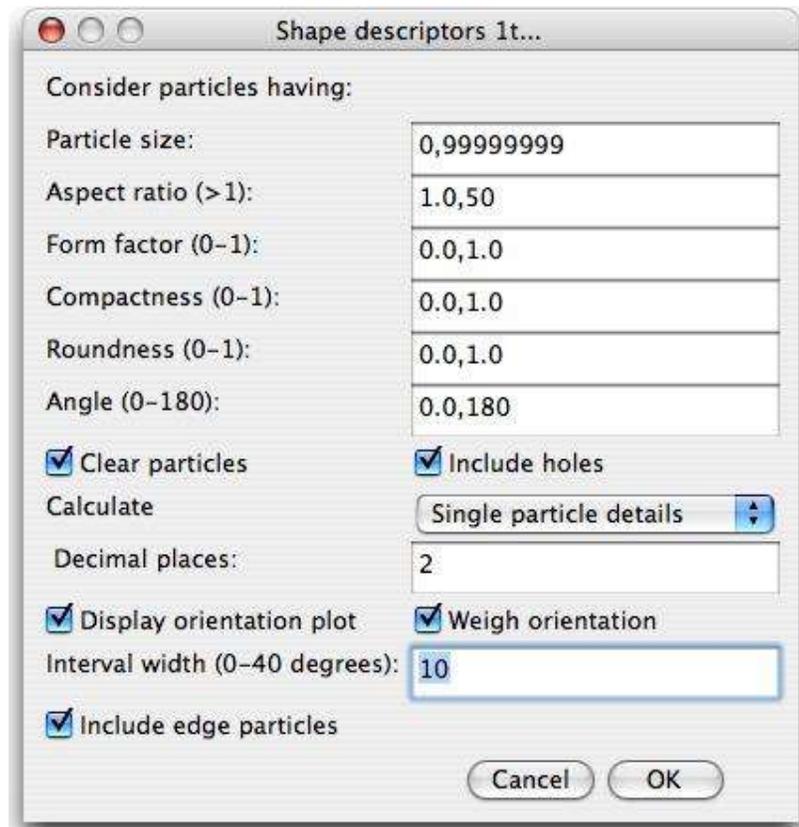
**Compactness:**  $\text{sqr}((4/\pi) \cdot \text{area}) / \text{major axis}$

**Aspect ratio:** major axis/minor axis

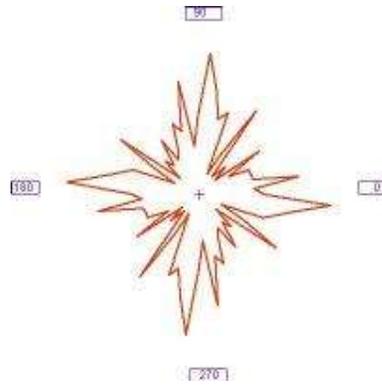
**Effective diameter:**  $\text{sqr}(\text{area} / \pi) \cdot 2$

**Solidity:** area/convex area

**Convexity:** convex perimeter/perimeter



Particles may be removed depending on the particle shape. Note that small particles (approx. 1-5 pixels) may give form factors larger than 1 and may not be considered in the analysis.



Check **Display particle polar plot** to generate a polar/rose plot based on the single particle orientations. The generated plot may also be **weighed** by using the single particle areas, i.e. for a given orientation large particles will have a major significance than small particles. The particle orientations are grouped in classes. The width of each class/interval may be determined in the **Polar plot interval width**. Small values yield a more detailed plot.

The plugin requires binary images.

**DISCLAIMER**