STELLRAM

Radius Value / Surface Finish

The radius of the insert has a significant role to play in the quality of the surface finish, which is directly in relation to the feed rate (fn). With a larger radius, better surface finishes can be maintained at higher feeds. The use of a larger radius gives a larger surface contact area and causes an increase in power and cutting force.

For roughing operations, it is preferable to choose a large radius to ensure corner strength of the insert. However, for some materials it is preferable to use a smaller radius to maintain a softer cut. The insert is more fragile but can qualify for operations that are sensitive to vibration.

Generally an insert is used with a maximum feed equal to half its radius. The minimum feed is related to edge preparation or to the start of its chip control. An increase in cutting speed can also contribute to surface quality.

Formula

The formula to calculate the feed rate:

$$f = \sqrt{\frac{R_a \times r_\varepsilon}{50}}$$

$$R_{max} = \frac{f^2}{8 \times r_\varepsilon}$$

The mean value Ra, can be calculated with following formula:

$$R_a = \frac{f^2 \times 50}{r_\varepsilon}$$

Average value of feed for each radius

Radius (mm)	0,4	0,8	1,2	1,6	2,4
f (mm/turn)	0,12-0,25	0,25-0,5	0,36-0,7	0,5-1	0,7-1,6

In finishing operations the insert radius and the feed effect the superficial roughness and the dimensional accuracy.

Rmax = profile depth

r_ε = nose radius

f_n = feed

Surface finishing		Radius of insert				
Ra	Rt	0,4	0,8	1,2	1,6	2,4
µm	µm	f mm/r				
0,60	2	0,07	0,10	0,12	0,14	0,17
1,60	4	0,11	0,15	0,19	0,22	0,26
3,20	10	0,17	0,24	0,29	0,34	0,42
6,30	16	0,22	0,30	0,37	0,43	0,53
8,00	25	0,27	0,38	0,47	0,54	0,66

Surface finishing		Diameter of round inserts				
Ra	Rt	10	12	16	20	25
µm	µm	f mm/r				
0,60	2	0,25	0,28	0,32	0,36	0,40
1,60	4	0,40	0,44	0,51	0,57	0,63
3,20	10	0,63	0,69	0,80	0,89	1,00
6,30	16	0,80	0,83	1,01	1,13	1,26
8,00	25	1,00	1,10	1,26	1,42	1,51

Summary: Value of Ra & Rt based on the radius value and feed.