

Scratch / Dig Optical Surface Specifications

This document defines surface quality on optical components per MIL-O-13830.

Terms and Definitions:

Scratch	Any marking or tearing of the part surface
Dig	A small rough spot on the part surface similar to a pit in appearance. A bubble is considered a dig.
Sleek Scratch	A hairline scratch.
Crush or Rub Scratch	A surface scratch or a series of small scratches.

Method: The size of a defect is to be measured through the use of an optical comparator: Surface quality is to be specified by a number such as 60/40. The first digit relates to the maximum width allowance of a scratch as measured in microns. The next digit indicates the maximum diameter allowance for a dig in hundredths of a millimeter. As can be seen from the table below, a surface quality callout of 60/40 would permit a scratch width of .06 mm (60 micron, or 0.0024”) and a dig diameter of .40 mm (400 micron, or 0.0158”).

Scratch or Dig Number	Maximum Scratch Width		Maximum Dig or Bubble Diameter		Dig or Bubble Separation Distance	
	mm	inch	mm	inch	mm	inch
#						
120	0.12	0.0047	1.20	0.0473	20	0.787
80	0.08	0.0031	0.80	0.0315	20	0.787
60	0.06	0.0024	0.60	0.0236	20	0.787
50	0.05	0.0020	0.50	0.0196	20	0.787
40	0.04	0.0016	0.40	0.0158	20	0.787
30	0.03	0.0012	0.30	0.0118	20	0.787
20	0.02	0.0008	0.20	0.0079	20	0.787
15	0.015	0.0006	0.15	0.0059	20	0.787
10	0.010	0.0004	0.10	0.0039	1.0	0.040
5	0.005	0.0002	0.05	0.0020	1.0	0.040
3	0.003	0.00012	0.03	0.0012	1.0	0.040

Scratch / Dig Guide

Scratch / Dig standards were developed to standardize the U.S. Optical requirements for surface defects. There are two different methods used for calling out scratch / dig. One is by the use of letters, and the other is by the use of numbers. Both are the same with respect to the sizes of the scratches and the digs. The chart below shows both letter and number callouts. Sizes are shown in both millimeters (mm) and inches (in.)

Scratch Identification			
Letter	Number	Scratch Widths	
		mm	in.
A	5	0.005	0.000197
B	10	0.01	0.000394
C	20	0.02	0.000787
D	40	0.04	0.001575
E	60	0.06	0.002362
F	80	0.08	0.003150

Dig Identification			
Letter	Number	Dig Diameter	
		mm	in.
A	5	0.005	0.000197
B	10	0.01	0.000394
C	20	0.02	0.000787
D	30	0.03	0.001181
E	40	0.04	0.001575
F	50	0.05	0.001969

Examples of common scratch / dig callouts are:

F / F equals 80 / 50

C/B equals 20 / 10

Note: The Scratch callout is always the first letter or number. There is also a formula to integrate a number of scratches and digs involving an averaging of the defect quantity.