

Fluid cleanliness is critical to establishing equipment reliability and there is a direct correlation between oil cleanliness and component life.

When a wear condition advances, the size and concentration of wear particles in the oil increases. The best method for measuring particle size and concentration is particle count testing. Results are reported in particles per milliliter or particles per 100 milliliters (depending on the lab) at a given size (microns) and ISO Cleanliness Code. The ISO Cleanliness Code was developed for measuring fluid cleanliness and is widely used for determining particle counts in lubricants. It specifies the size of particles measured and the method for coding the level of contamination.

The ISO 4406 standard utilizes a three number system to classify system cleanliness — example: 19/16/13. The first number represents the number of particles present measuring greater than 4µm. The second represents particles greater than 6µm and the third represents those greater than 14µm. Consider the particle count data shown in Table 1 below. Use the ISO range codes in Table 2 to determine the system's ISO Cleanliness Code.

Size	Particles / mL
4µ	2852
6µ	541
10µ	198
14µ	56
21µ	11
38µ	1
70µ	0
100µ	0



ISO/Range Code	Min. particles /mL	Max particles /mL
1	0	0.02
2	0.02	0.04
3	0.04	0.08
4	0.08	0.15
5	0.15	0.3
6	0.3	0.6
7	0.6	1.3
8	1.3	2.5
9	2.5	5
10	5	10
11	10	20
12	20	40
13	40	80
14	80	160
15	160	320
16	320	640
17	640	1,300
18	1,300	2,500
19	2,500	5,000
20	5,000	10,000
21	10,000	20,000
22	20,000	40,000
23	40,000	80,000
24	80,000	160,000
25	160,000	320,000
26	320,000	640,000
27	640,000	1,300,000
28	1,300,000	2,500,000
29	2,500,000	5,000,000
30	5,000,000	10,000,000



The ISO Cleanliness Code for the test data shown in Table 1 would be 19/16/13. Because the number of 4 μ m particles is between 2,500 and 5,000, the corresponding ISO code is 19. Because the number of 6 μ m particles is between 320 and 640, the corresponding ISO code is 16. Because the number of 14 μ m particles is between 40 and 80, the corresponding ISO code is 13.

Work with the OEM, your lubricant and filter suppliers and your oil analysis laboratory to determine acceptable ISO cleanliness code limits for machinery by application.