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19/17/14

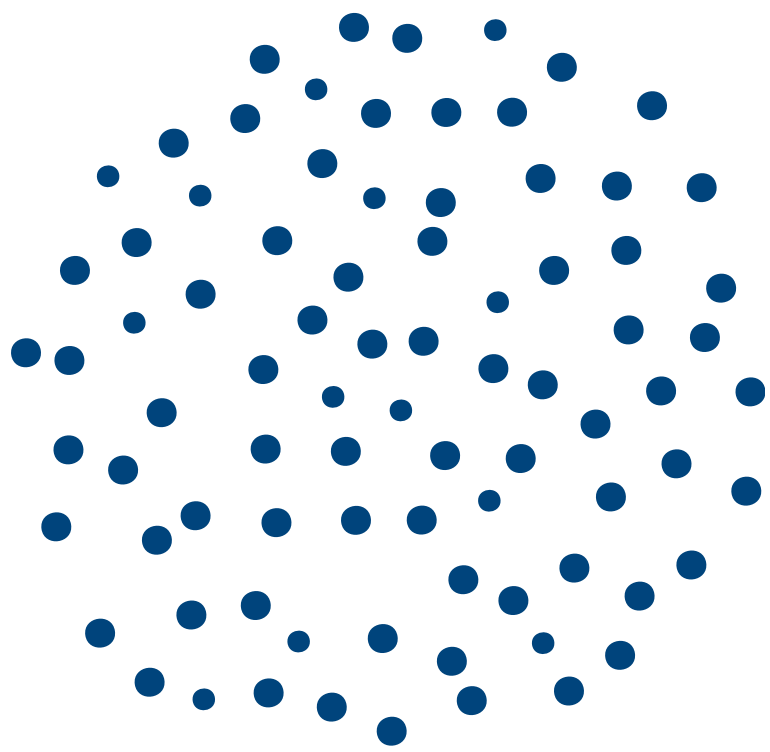
ISO CODE CHEAT SHEET

Understand ISO Codes and Help Protect Your Equipment

WHAT ARE ISO CODES?

ISO 4406 codes measure oil cleanliness.

They reflect how many particles are circulating in your system.



HOW TO READ THEM

A code looks like this: 19/17/14

19	17	14
Particle Size	**Particle Size**	**Particle Size**
≥ 4 µm	≥ 6 µm	≥ 14µm
# of Particles	**# of Particles**	**# of Particles**
2,500-5,000	640-1,300	80-160

Each number of the code reflects:

the number range of particles for that particle size, per ML of fluid.

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WHY ONE NUMBER MATTERS

Each +1 doubles the quantity range of particles for that size.

ISO **18**/17/14
1,300-2,500 particles ≥ 4 µm

ISO **19**/17/14
2,500-5,000 particles ≥ 4 µm

➡ Roughly **2x more particles** larger than or equal to 4 microns.

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WHY ONE NUMBER MATTERS

Each number increase is a significant increase in contamination and risk of damage.

- Component wear
- Unplanned downtime
- Frequent filter changes and fluid replacement

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KNOW YOUR CODES, PROTECT YOUR SYSTEMS

Hydraulic component and bearing manufacturers set ISO code limits.

These limits are the maximum tolerance for fluid contamination under which predictable performance and life can be maintained.

Using the upper limit target means that you are operating with no room for error.

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Donaldson Hy-Pro can help set cleanliness targets for more reliable systems.

Our ISO code recommendations are **stricter than industry standards.**

Improving by only a few ISO codes, you can substantially increase the lifespan of your components and equipment.

Recommended* Upper Limit ISO Cleanliness Codes per Component by Pressure Rating

	Pressure <2000 psi (138 bar)	
	Industry Standard	Donaldson Hy-Pro Recommended
Pumps		
Fixed gear	20/18/15	≤ 17/15/12
Fixed piston	19/17/14	≤ 16/14/11
Fixed vane	20/18/15	≤ 17/15/12
Variable piston	18/16/13	≤ 16/14/11
Variable vane	18/16/13	≤ 16/14/11
Valves		
Cartridge	18/16/13	≤ 16/14/11
Check valve	20/18/15	≤ 17/15/12
Directional (solenoid)	20/18/15	≤ 17/15/12
Flow control	19/17/14	≤ 17/15/12
Pressure control (modulating)	19/17/14	≤ 17/15/12
Proportional cartridge valve	17/15/12	≤ 15/13/10
Proportional directional	17/15/12	≤ 15/13/10
Proportional flow control	17/15/12	≤ 15/13/10
Proportional pressure control	17/15/12	≤ 15/13/10
Servo valve	16/14/11	≤ 14/12/9
Bearings		
Ball bearing	15/13/10	≤ 15/13/10
Gearbox (industrial)	17/16/13	≤ 15/13/10
Journal bearing (high speed)	17/15/12	≤ 15/13/10
Journal bearing (low speed)	17/15/12	≤ 15/13/10
Roller bearing	16/14/11	≤ 15/13/10
Actuators		
Cylinders	17/15/12	≤ 16/14/11
Vane motors	20/18/15	≤ 17/15/12
Axial piston motors	19/17/14	≤ 16/14/11
Gear motors	20/18/14	≤ 17/15/12
Radial piston motors	20/18/15	≤ 17/15/12
Other		
Test stands	15/13/10	≤ 15/13/10
Hydrostatic transmissions	17/15/13	≤ 16/14/11
High pressure fuel injector	18/16/13	≤ 16/14/11

*Depending upon system volume and severity of operating conditions a combination of filters with varying degrees of filtration efficiency might be required (I.e. pressure, return, and off-line filters) to achieve and maintain the desired fluid cleanliness.

Pressure 2000-3000 psi (138-207 bar)		Pressure >3000 psi (207 bar)	
Industry Standard	Donaldson Hy-Pro Recommended	Industry Standard	Donaldson Hy-Pro Recommended
Pumps			
19/17/15	≤ 16/14/11	-	-
18/16/13	≤ 15/13/10	17/15/12	≤ 15/13/10
19/17/14	≤ 16/14/11	18/16/13	≤ 15/13/10
17/15/13	≤ 15/13/10	16/14/12	≤ 15/13/10
17/15/12	≤ 15/13/10	-	-
Valves			
17/15/12	≤ 15/13/10	17/15/12	≤ 15/13/10
20/18/15	≤ 17/15/12	19/17/14	≤ 16/14/11
19/17/14	≤ 16/14/11	18/16/13	≤ 15/13/10
18/16/13	≤ 16/14/11	18/16/13	≤ 16/14/11
18/16/13	≤ 16/14/11	17/15/12	≤ 15/13/10
17/15/12	≤ 15/13/10	16/14/11	≤ 14/12/9
17/15/12	≤ 15/13/10	16/14/11	≤ 14/12/9
17/15/12	≤ 15/13/10	16/14/11	≤ 14/12/9
17/15/12	≤ 15/13/10	16/14/11	≤ 14/12/9
16/14/11	≤ 14/12/9	15/13/10	≤ 13/11/8
Bearings			
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
Actuators			
16/14/11	≤ 15/13/10	15/13/10	≤ 15/13/10
19/17/14	≤ 16/14/11	18/16/13	≤ 15/13/10
18/16/13	≤ 15/13/10	17/15/12	≤ 15/13/10
19/17/13	≤ 16/14/11	18/16/13	≤ 15/13/10
19/17/14	≤ 16/14/11	18/16/13	≤ 15/13/10
Other			
15/13/10	≤ 15/13/10	15/13/10	≤ 15/13/10
16/14/11	≤ 15/13/10	16/14/11	≤ 15/13/10
18/16/13	≤ 15/13/10	18/16/13	≤ 15/13/10

Hydraulic Component Life Extension

Current ISO Code	New ISO Code			
	2 x Life	3 x Life	4 x Life	5 x Life
28/26/23	25/23/21	25/22/19	23/21/18	22/20/17
27/25/22	25/23/19	23/21/18	22/20/17	21/19/16
26/24/21	23/21/18	22/20/17	21/19/16	21/19/15
25/23/20	22/20/17	21/19/16	20/18/15	19/17/14
24/22/19	21/19/16	20/18/15	19/17/14	18/16/13
23/21/18	20/18/15	19/17/14	18/16/13	17/15/12
22/20/17	19/17/14	18/16/13	17/15/12	16/14/11
21/19/16	18/16/13	17/15/12	16/14/11	15/13/10
20/18/15	17/15/12	16/14/11	15/13/10	14/12/9
19/17/14	16/14/11	15/13/10	14/12/9	13/11/8
18/16/13	15/13/10	14/12/9	13/11/8	–
17/15/12	14/12/9	13/11/8	–	–
16/14/11	13/11/8	–	–	–
15/13/10	13/11/8	–	–	–
14/12/9	13/11/8	–	–	–

Roller Contact Bearing Life Extension

Current ISO Code	New ISO Code			
	2 x Life	3 x Life	4 x Life	5 x Life
28/26/23	25/23/19	22/20/17	20/18/15	19/17/14
27/25/22	23/21/18	21/19/16	19/17/14	18/16/13
26/24/21	22/20/17	20/18/15	18/16/13	17/15/12
25/23/20	21/19/16	19/17/14	17/15/12	16/14/11
24/22/19	20/18/15	18/16/13	16/14/11	15/13/10
23/21/18	19/17/14	17/15/12	15/13/10	14/12/9
22/20/17	18/16/13	16/14/11	14/12/9	13/11/8
21/19/16	17/15/12	15/13/10	13/11/8	–
20/18/15	16/14/11	14/12/9	–	–
19/17/14	15/13/10	13/11/8	–	–
18/16/13	14/12/9	–	–	–
17/15/12	13/11/8	–	–	–
16/14/11	13/11/8	–	–	–
15/13/10	13/11/8	–	–	–
14/12/9	13/11/8	–	–	–

More Donaldson Hy-Pro Resources:

- Acquiring a Proper Oil Sample
- Is New Oil Clean?

Contact Us:

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