

Lurking danger - dirt in the hydraulic system

Purity class ISO 4406:1999

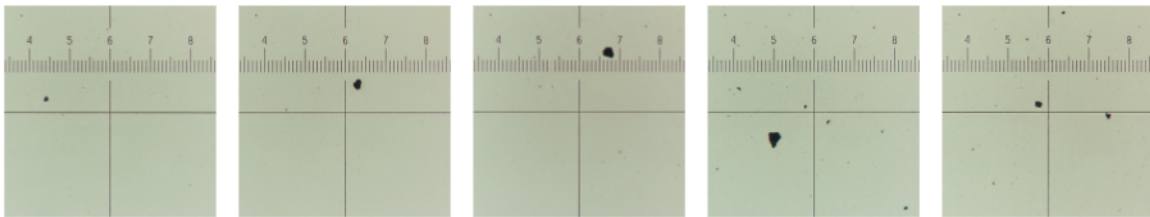
Dirt causes over 70% of hydraulic system problems and failures. So it is essential to keep your hydraulic fluid clean with pressure/return line filters or additional bypass filtration, and check by regular oil analysis. For hydraulic fluid analysis in the PANOLIN laboratory, the ISO 4406:1999 purity class is determined by an automated particle counter as standard practice. Results are noted with a three-digit code on the examination report. In some cases, however, it is necessary to analyze the cleanliness class microscopically (ISO 4406: 1987). In these cases, a two-digit code is shown.

Automatic particle counting according to ISO 4406:1999 detects particle sizes > 4 µm, > 6 µm and > 14 µm. Microscopic analysis only counts particle sizes > 5 µm and > 15 µm. Statistically it is established that the deviation between ISO 4406:1999 and ISO 4406:1987 is at most one cleanliness class. As an approximation, the two methods are comparable for particle ranges > 4 µm/> 5 µm and > 14 µm/> 15 µm so that the identical ISO codes can be used.

Typical cleanliness classes to ISO 4406:1999

Particle count per 100ml

more than	up to and incl.	Ordinal
250 000 000		> 28
130 000 000	250 000 000	28
64 000 000	130 000 000	27
32 000 000	64 000 000	26
16 000 000	32 000 000	25
8 000 000	16 000 000	24
4 000 000	8 000 000	23
2 000 000	4 000 000	22
1 000 000	2 000 000	21
500 000	1 000 000	20
250 000	500 000	19
130 000	250 000	18
64 000	130 000	17
32 000	64 000	16
16 000	32 000	15
8 000	16 000	14
4 000	8 000	13
2 000	4 000	12
1 000	2 000	11
500	1 000	10
250	500	9
130	250	8
64	130	7
32	64	6
16	32	5
8	16	4
4	8	3
2	4	2
1	2	1
0	1	0



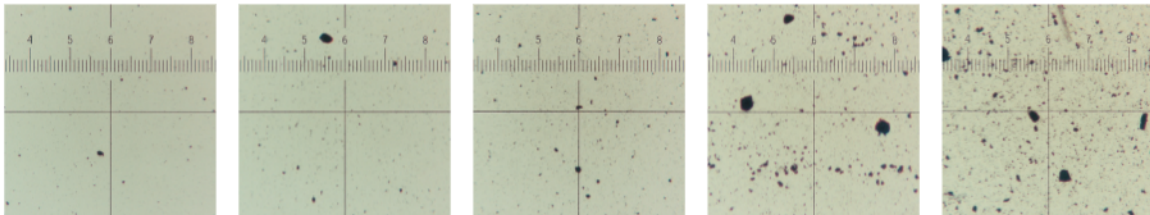
14/12/09

15/13/10

16/14/11

17/15/12

18/16/13



19/17/14

20/18/15

21/19/16

22/20/17

23/21/18

Cleanliness class limits

For trouble-free operation of hydraulic systems, it is essential that the hydraulic fluid does not exceed the recommended particle content limit. Hydraulic systems differ. Decisive for the purity class of the hydraulic fluid is always the most sensitive system component (such as the servo/proportional valve). Tabulated below are the recommended and empirical values used by the PANOLIN laboratory as a basis for analysis assessment.

PANOLIN has defined purity class ISO 21/17/13 as a limiting value. It goes without saying, however, that the manufacturer's regulations take preference in all cases.

Examples:

	16/13/10	17/14/10	18/16/13	21/17/13	21/17/14	20/17/14	20/18/15	—/18/15
PANOLIN laboratory (max. tolerated value)				✓				
Axial piston pumps and motors Bosch Rexroth (source: RD90221/05.10)							✓	
Axial piston pumps and motors , > 90°C Bosch Rexroth (source: RD90221/05.10)						✓		
Servo valves Bosch Rexroth (source: RD90221/05.10)			✓					
Hydraulic, CAT construction machinery (source: SEBU6250-21)								✓
Hydraulic, Liebherr construction machinery (source: LHB/IFR 01-96-40/08)					✓			
Hydraulic, Krauss Maffei injection moulding (source: GX_MC6_V2.8_14.11.14_DEU)		✓						
Hydraulic, Netstal Elion hybrid tank (source: TDK 110.970.0069 Version 00)	✓							