



# ISO Cleanliness Guidelines for Hydraulic & Lube Oils

ISO 4406

	Low/Medium Pressure Under 2000 psi (moderate conditions)		High Pressure 2000 to 2999 psi (low/medium with severe conditions*)		Very High Pressure 3000 psi and over (high pressure with severe conditions*)	
	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings
<b>Pumps</b>						
Fixed Gear or Fixed Vane	20/18/15	20	19/17/14	10	18/16/13	5
Fixed Piston	19/17/14	10	18/16/13	5	17/15/12	3
Variable Vane	18/16/13	5	17/15/12	3	not applicable	not applicable
Variable Piston	18/16/13	5	17/15/12	3	16/14/11	3**
<b>Valves</b>						
Check Valve	20/18/15	20	20/18/15	20	19/17/14	10
Directional (solenoid)	20/18/15	20	19/17/14	10	18/16/13	5
Standard Flow Control	20/18/15	20	19/17/14	10	18/16/13	5
Cartridge Valve	19/17/14	10	18/16/13	5	17/15/12	3
Proportional Valve	17/15/12	3	17/15/12	3	16/14/11	3**
Servo Valve	16/14/11	3**	16/14/11	3**	15/13/10	3**
<b>Actuators</b>						
Cylinders, Vane Motors, Gear Motors	20/18/15	20	19/17/14	10	18/16/13	5
Piston Motors, Swash Plate Motors	19/17/14	10	18/16/13	5	17/15/12	3
Hydrostatic Drives	16/15/12	3	16/14/11	3**	15/13/10	3**
Test Stands	15/13/10	3**	15/13/10	3**	15/13/10	3**
<b>Bearings</b>						
Journal Bearings	17/15/12	3	—	—	—	—
Industrial Gearboxes	17/15/12	3	—	—	—	—
Ball Bearings	15/13/10	3**	—	—	—	—
Roller Bearings	16/14/11	3**	—	—	—	—

\* Severe conditions may include high flow surges, pressure spikes, frequent cold starts, extremely heavy duty use, or the presence of water.  
 \*\* Two or more system filters of the recommended rating may be required to achieve and maintain the desired Target Cleanliness Level.

The guidelines shown in the chart above are based on the internationally recognized standards for achieving the cleanliness level required to ensure the longest life and lowest cost for operating hydraulic system components. Each 3-digit ISO code corresponds to a specific component and recommended micron rating. These ISO codes and micron ratings can be used universally (ISO 16889) when comparing the realistic performance of various filter elements.

### Finding the Cleanliness Level Required by a System:

- Starting at the left hand column, select the most sensitive component used in the system.
- Move to the right to the column that describes the system pressure and conditions.
- Here you will find the recommended ISO class level, and recommended element micron rating.

### Achieving the Appropriate Cleanliness Level in a System:

The only way to achieve and maintain the appropriate cleanliness level in a hydraulic or lubrication system, is to implement a comprehensive filtration program. HYDAC offers all of the products that are needed to do just that! - They include:

#### Solid Contamination:

- pressure filters
- return line filters
- offline filtration carts and skids
- oil transfer units for precleaning of new oil
- portable and online contamination monitors
- reservoir breathers and filler/breathers

#### Water Content:

- water saturation sensors
- reservoir breathers with silica gel desiccant
- dehydration units for water removal
- water removal elements

#### Fluid Analysis:

- bottle sampling kits
- complete analysis kits

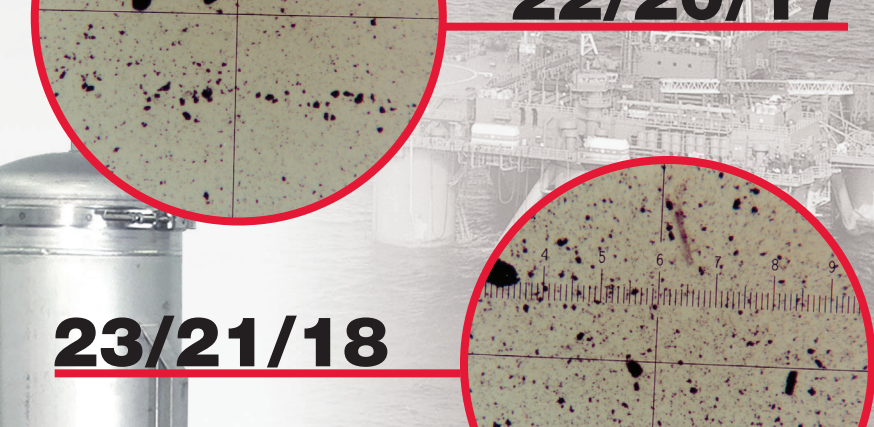
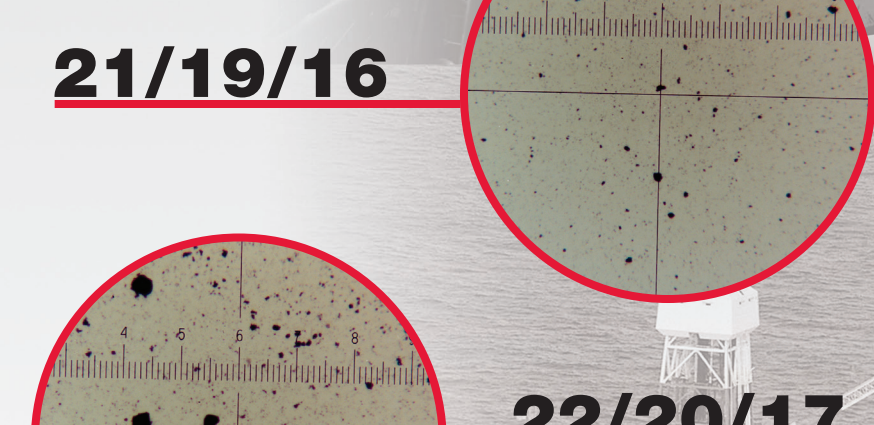
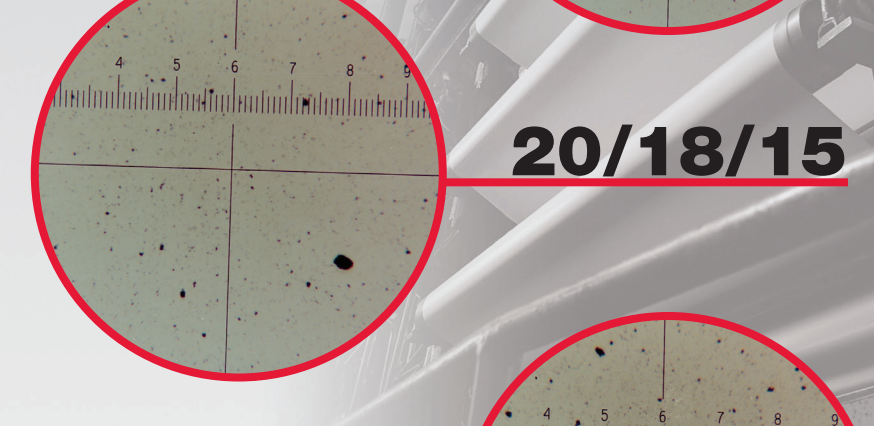
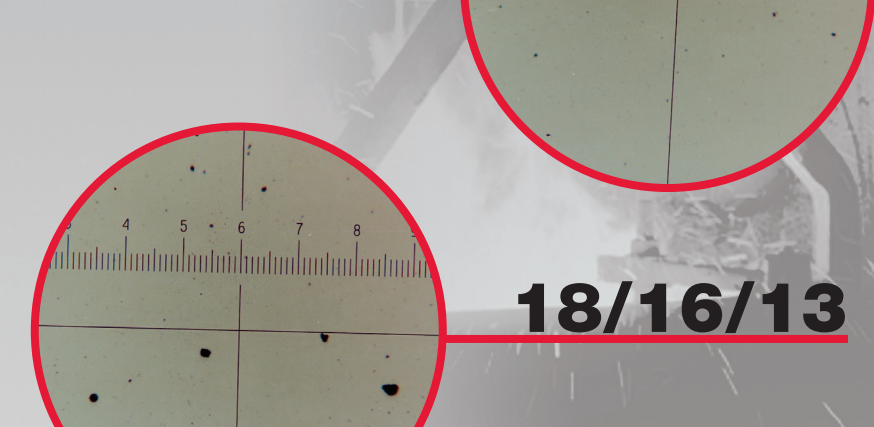
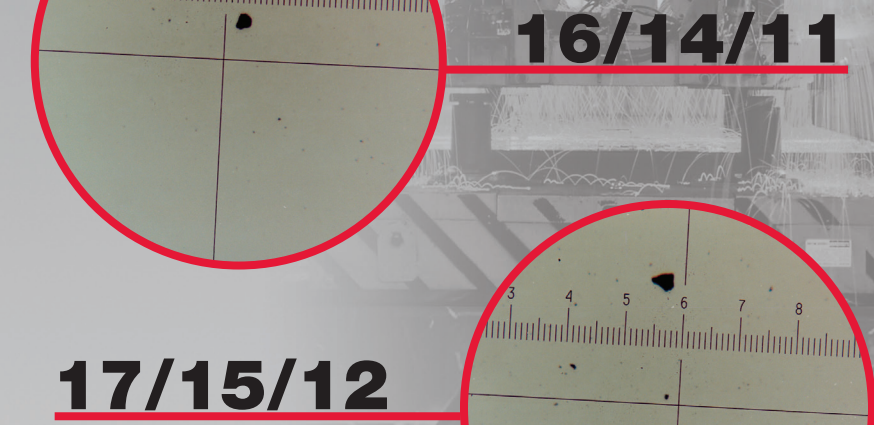
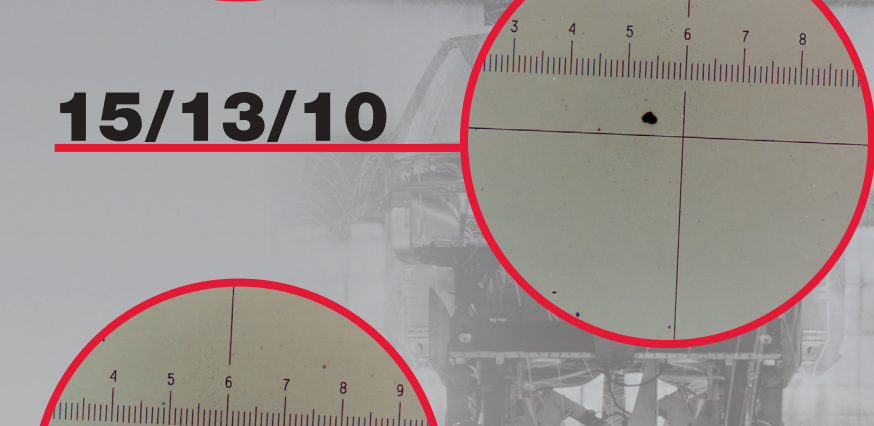
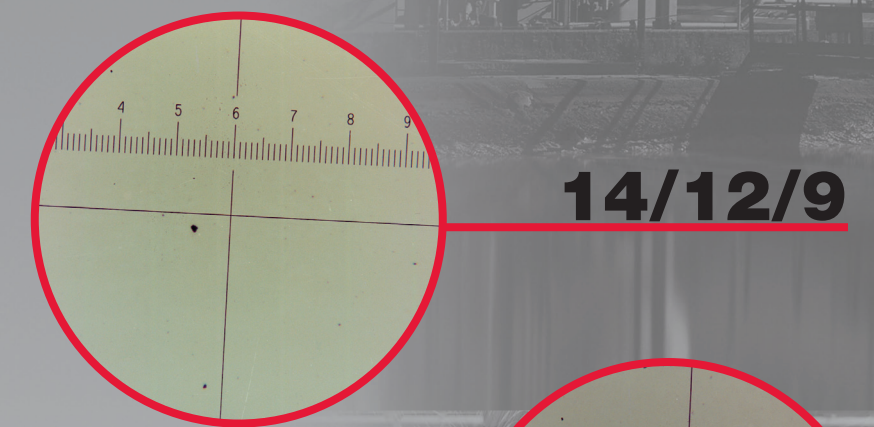
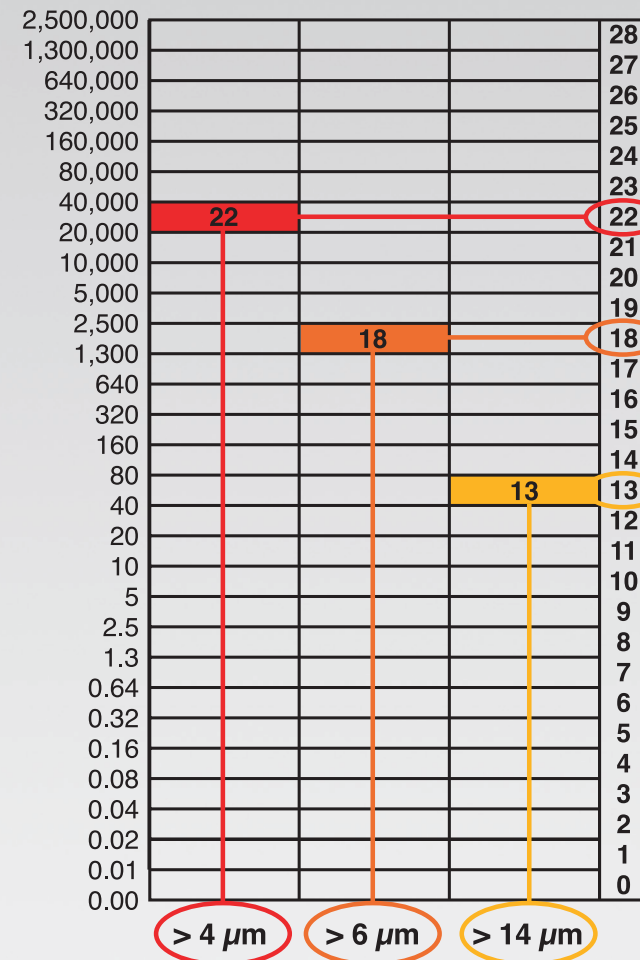
### How the ISO 4406 Code works:

Cleanliness levels are defined by three numbers divided by slashes (/). These numbers correspond to 4, 6, and 14 micron, in that order. Each number refers to an ISO Range Code, which is determined by the number of particles for that size (4, 6, & 14µm) and larger present in 1 ml of fluid. Each range is double the range below. Refer to the chart below to see the actual ranges.

### Example:

larger than 4µm = 22,340  
 larger than 6µm = 1,950  
 larger than 14µm = 43

ISO Code = 22 / 18 / 13



www.hydac-na.com • 1.877.GO.HYDAC