
Technical Material Specification: AW46 Hydraulic Fluid (Anti-Wear, ISO VG 46)

1.0 Material Overview & Common Uses

AW46 (Anti-Wear 46) hydraulic fluid is a high-performance, petroleum-based hydraulic oil formulated with anti-wear additives, typically zinc dialkyldithiophosphate (ZDDP), to protect hydraulic system components under high pressure and moderate to heavy loads. It meets ISO Viscosity Grade 46 (VG 46) classification, with a kinematic viscosity of approximately 46 cSt at 40°C. This fluid is designed for use in industrial and mobile hydraulic systems, including injection molding machines, presses, excavators, forklifts, and other equipment requiring reliable lubrication and wear protection.

- Primary applications: hydraulic power units, gear pumps, vane pumps, piston pumps, and hydraulic cylinders in manufacturing, construction, and agriculture.
- Commonly used in systems operating at pressures up to 3000 psi (207 bar) and temperatures ranging from -20°C to 80°C.
- Compatible with most elastomer seals (NBR, FKM, HNBR) and standard hydraulic system materials (steel, cast iron, brass, bronze).

2.0 Core Technical Properties & Sizing

- Kinematic viscosity: 46 cSt at 40°C (ISO 3104); 6.8 cSt at 100°C (typical).
- Viscosity index: 100 minimum (ASTM D2270).
- Density: 0.87 g/cm³ at 15°C (ASTM D1298).
- Flash point: 220°C minimum (ASTM D92, Cleveland open cup).
- Pour point: -30°C maximum (ASTM D97).
- Total acid number (TAN): 0.1 mg KOH/g maximum (ASTM D974).
- Water content: 0.05% maximum (ASTM D6304, Karl Fischer).
- Demulsibility: 30 minutes maximum to 3 mL emulsion at 54°C (ASTM D1401).
- Foam tendency/stability: Sequence I, II, III ≤ 50/0 mL (ASTM D892).
- Standard packaging: 20 L pails, 205 L drums, 1000 L IBC totes.
- Shelf life: 5 years from date of manufacture when stored in sealed, original containers at temperatures between 5°C and 40°C.

3.0 Processing, Machinability & Application

AW46 hydraulic fluid is not a solid material and is not machined or welded in the traditional sense. However, it is processed through hydraulic systems and requires careful handling during filling, filtration, and system commissioning. The following guidelines apply to its use in industrial hydraulic circuits.

- Filtration: Use 10-micron absolute ($\beta_{10} \geq 200$) or finer filters for new fluid fill; maintain system cleanliness to ISO 4406 18/16/13 or better.

- System flushing: Before commissioning, flush the system with a low-viscosity flushing oil (ISO VG 10-22) at 1.5x normal flow rate for 2-4 hours, then drain completely before filling with AW46.
- Filling procedure: Use a dedicated, clean pump and hose; avoid introducing air or contaminants. Fill through a 10-micron filter cart.
- Operating temperature range: -20°C to 80°C continuous; short-term peaks up to 90°C acceptable.
- Compatibility: Not compatible with polyurethane seals (PU) or natural rubber (NR). Use NBR, FKM, or HNBR seals only.
- Mixing: Do not mix with other hydraulic fluid types (e.g., water-glycol, phosphate ester, or biodegradable fluids) unless explicitly approved by the equipment manufacturer.

4.0 Common Defects & Quality Control

- Reject if fluid appears hazy, cloudy, or contains visible water droplets (free water > 0.1% by volume).
- Reject if fluid has a strong rancid or burnt odor, indicating thermal degradation or oxidation.
- Reject if particulate contamination exceeds ISO 4406 20/18/15 (e.g., visible sediment or sludge in container).
- Reject if kinematic viscosity at 40°C deviates by more than $\pm 10\%$ from 46 cSt (i.e., outside 41.4 to 50.6 cSt).
- Reject if total acid number (TAN) exceeds 0.2 mg KOH/g, indicating acid buildup from oxidation.
- Reject if demulsibility test shows > 30 minutes to separate water, indicating additive depletion or contamination.
- Reject if flash point is below 200°C, suggesting contamination with low-flash solvents or fuels.

5.0 Storage, Handling & WHMIS Guidelines

AW46 hydraulic fluid is classified as a combustible liquid under WHMIS 2015 (Hazard Class: Flammable Liquids – Category 4). It poses minimal acute toxicity but can cause skin irritation and environmental harm if released. Proper storage, handling, and disposal are mandatory.

- Store in a cool, dry, well-ventilated area away from heat sources, open flames, and direct sunlight. Maximum storage temperature: 40°C.
- Keep containers tightly sealed when not in use to prevent moisture ingress and contamination.
- Use FIFO (First-In, First-Out) inventory rotation; do not use fluid beyond its 5-year shelf life from manufacture date.
- WHMIS hazard statements: H304 (May be fatal if swallowed and enters airways), H315 (Causes skin irritation), H336 (May cause drowsiness or dizziness), H411 (Toxic to aquatic life with long-lasting effects).
- Precautionary statements: P102 (Keep out of reach of children), P210 (Keep away from heat/sparks/open flames), P273 (Avoid release to the environment), P280 (Wear protective gloves/protective clothing/eye protection), P301+P310 (IF SWALLOWED: Immediately call a POISON CENTER or doctor), P331 (Do NOT induce vomiting).
- Mandatory PPE: Nitrile or neoprene gloves (0.4 mm minimum thickness), safety glasses with side shields, and chemical-resistant apron during handling and transfer operations.
- Spill response: Contain with inert absorbent material (e.g., sand, vermiculite, universal pads). Dispose of absorbed material as hazardous waste per local regulations.
- Disposal: Do not pour down drains or into waterways. Collect used fluid in labeled containers and recycle through a licensed oil recycler or dispose as hazardous waste.

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