Full Synthetic CNC Coolant – Technical Material Specification

1.0 Material Overview & Common Uses

Full synthetic CNC coolant is a water-miscible metalworking fluid formulated without mineral oils, relying on synthetic lubricants, corrosion inhibitors, and biocides to provide high-performance cooling and lubrication during machining operations. It is designed for use in CNC lathes, milling machines, and multi-spindle automatics, particularly where high fluid clarity, extended sump life, and low foaming are required.

- Primary applications include high-speed machining of ferrous and non-ferrous metals, including aluminum, steel, stainless steel, cast iron, and titanium alloys.
- Commonly used in automotive, aerospace, medical device, and general precision manufacturing sectors.
- Preferred for operations requiring superior heat dissipation, such as deep hole drilling, tapping, and high-feed milling.
- Suitable for use in central coolant systems and individual machine sumps.

2.0 Core Technical Properties & Sizing

- Appearance: Clear to slightly hazy liquid, typically dyed blue, green, or amber for leak detection.
- pH (concentrate): 9.0 – 10.5 (as supplied).
- pH (working dilution at 5%): 8.5 – 9.5.
- Density (concentrate): 1.05 – 1.15 g/mL at 20°C.
- Viscosity (concentrate): 100 – 500 cSt at 40°C.
- Refractive index (concentrate): 1.400 – 1.450 at 20°C.
- Recommended working concentration: 3% – 10% by volume in water (typically 5% – 7% for general machining).
- Water hardness tolerance: up to 400 ppm $CaCO_3$ (softer water preferred for stability).
- Flash point (concentrate): >100°C (closed cup).
- Standard packaging: 5 L, 20 L, 55 L pails, 208 L drums, 1000 L IBC totes.

3.0 Processing, Machinability & Application

Full synthetic coolant is mixed with water at the specified concentration before use. Proper mixing procedure is critical to ensure emulsion stability and performance. Coolant should be added to water slowly while stirring, never water to concentrate.

- Mixing ratio: 1 part concentrate to 9–19 parts water (5%–10% dilution). Use a refractometer to verify concentration.
- Water quality: Use deionized or softened water to minimize hard water scaling and improve biostability.
- Application method: Flood coolant delivery through nozzles or through-spindle coolant systems at 10–100 psi depending on operation.
- Filtration: Recommended filtration to 50 microns or finer to remove chips and fines and extend sump life.
- Sump life: Typically 6–12 months with proper maintenance (concentration monitoring, pH control, biocide addition).

- Compatibility: Compatible with most elastomers (NBR, Viton, EPDM) and painted surfaces; test with specific materials if in doubt.
- Not recommended for use with magnesium alloys due to fire risk from hydrogen gas generation.

4.0 Common Defects & Quality Control

- Reject concentrate if visible phase separation, sediment, or turbidity is present after gentle agitation.
- Reject if pH of concentrate is below 9.0 or above 10.5 (out of spec).
- Reject if working dilution pH drops below 8.0 (indicates bacterial contamination or depletion of corrosion inhibitors).
- Reject if working dilution develops a foul odor (sulfur, rotten eggs) indicating anaerobic bacterial growth.
- Reject if emulsion appears milky or unstable (improper mixing or water hardness incompatibility).
- Reject if concentration deviates by more than ±0.5% from target as measured by refractometer.
- Reject if foam height exceeds 50 mm after 5 minutes of air sparging at 2 L/min in a 500 mL graduated cylinder.

5.0 Storage, Handling & WHMIS Guidelines

- Store in original sealed containers in a cool, dry, well-ventilated area away from direct sunlight and heat sources.
- Storage temperature range: 5°C to 40°C. Avoid freezing; if frozen, thaw slowly and mix thoroughly before use.
- Shelf life: 12 months from date of manufacture when stored as recommended. Use FIFO rotation.
- WHMIS classification: Class D2B (Toxic) – may cause eye and skin irritation. Some formulations may contain biocides classified as D1A (Very Toxic).
- Mandatory PPE: Safety glasses or face shield, chemical-resistant gloves (nitrile or neoprene), and impervious apron when handling concentrate.
- First aid: In case of eye contact, flush with water for 15 minutes. For skin contact, wash with soap and water. If ingested, do not induce vomiting; seek medical attention immediately.
- Spill management: Contain with inert absorbent material (sand, vermiculite) and dispose of as hazardous waste per local regulations.
- Disposal: Do not discharge to sewers or waterways. Used coolant may be treated as industrial waste; consult local environmental authority.