

Refrigeration Compressor Oil Selection — POE, PAG, PAO and Mineral Oils by Refrigerant

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Which lubricant class belongs with which refrigerant — polyolester (POE) with HFC/HFO, PAG with ammonia and R290 in specific designs, mineral and alkylbenzene with legacy fluids, and the special oils for transcritical CO₂ — with the Fuchs Reniso and Emkarate grades carried in the catalogue and the handling rules that keep ester oils dry.

Matching oil class to refrigerant

A refrigeration lubricant must stay miscible with the refrigerant across the operating envelope so oil leaving the compressor returns from the evaporator. The practical pairings are:

Refrigerant | Oil class | Catalogue grades |

HFC / HFO (R134a, R404A, R448A, R513A...) | Polyolester (POE) | Reniso SE 55, SE 170, Emkarate RL 68H |

CO₂ (R744), subcritical and transcritical | POE formulated for CO₂ | Reniso C55E, C85E, C85E 5 L |

Ammonia (R717), R290 in specific designs | PAG (per OEM specification) | Reniso PG 68 |

Legacy R22 plants / specified mineral duty | Mineral / special | Reniso SP 46 |

The controlling document is always the compressor maker's approved-oil list: the OEM names the chemistry, the ISO VG grade and often the exact brands. Mixing chemistries is not acceptable; mixing brands of the same chemistry and grade is normally tolerated but should follow the OEM's position.

Viscosity grades

The number in the grade is the ISO VG kinematic viscosity at 40 °C in cSt. Small hermetics typically specify VG 22–32; commercial semi-hermetics VG 46–68 (Reniso SE 55, Emkarate RL 68H); screw compressors and high-temperature duty VG 170 (Reniso SE 170 10 L). CO₂ machines commonly specify VG 55–85 CO₂-grade esters — hence C55E and C85E. Using a lighter grade than specified thins further under refrigerant dilution and wipes bearings; a heavier grade impairs oil return at low temperature.

Why POE handling discipline matters

Polyolester oil is strongly hygroscopic: open to air it pulls moisture to several hundred ppm within hours, and water in a POE system hydrolyses the ester into acids that attack motor insulation and copper-plate bearings. The rules: buy container sizes that are consumed in one service (hence 1 L, 5 L, 10 L listings), keep the can sealed until the minute of use, never top up from an opened can stored weeks, pull a deep vacuum after any oil work, and run a generously sized liquid-line filter drier. Verify oil condition in service with an acid test — ETK for ester oils or the universal TKO kit — and after any burn-out follow the drier regime described in the filter drier guide.

Oil management hardware

On parallel racks and remote-condenser plants the oil system is as important as the oil: a helical separator in the discharge (Henry S-5185CE and sizes up to 2 1/8"), a reservoir (Henry S-9108CE, 15.1 L), differential-pressure valves (S-9104H, 1.4 bar) and an electronic level regulator per compressor (Henry Optronic OP-02). The oil charge of such a system lives mostly outside the compressors — size the reservoir for the longest line run, and log the make-up volume: steadily rising consumption is a leak or a velocity problem, not a compressor fault.

Change-out practice

Drain hot where design allows, measure and record the removed volume, inspect for discolouration (dark amber upward on POE indicates thermal or acid stress) and metal glitter, and dispose as waste oil. On ammonia and R290 PAG systems follow the OEM's purge procedure before opening. After refilling, run the plant to temperature and recheck the level against the sight glass — sight glasses and their O-rings are consumables and are stocked as spares.

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