

D HEAT TRANSFER OIL SERIES

D300 / D310 SYNTH / D315–D327

OPERATION AND HANDLING INSTRUCTIONS

Document no.	Revision	Issue date	Release status
MOTTA-D-OHI-EN	REV.05	2026-09-13	Issued for use

Use with the current product TDS, SDS, the heater and system manufacturer's instructions and site fire-safety rules. Issued by MOTTA Lubricants. The current revision of this document is published at motta-lube.com/documents/ — if your copy differs, that list governs.

1 Scope

This document applies to the selection, filling, heat-up, operation, monitoring, shutdown and oil change of MOTTA D Series heat transfer oils in closed, indirect liquid-phase heating systems. For use only by trained personnel on equipment whose condition has been confirmed.

Critical: the maximum bulk temperature and maximum film temperature are not stated on the current D Series data sheets. Obtain both limits for the grade in writing from MOTTA before the system is heated, and set the heater controls and alarms below them. Do not operate on an assumed limit.

Not covered: vapour-phase systems, direct-contact heating, pressurised systems operated above the fluid's boiling range, and food-contact or pharmaceutical duty requiring registered fluids. The heater and system manufacturer's instructions, the product TDS and SDS, site fire-safety rules and local regulations take precedence.

- User responsibility: confirm the grade, the temperature limits, equipment suitability, site risks and personnel qualification.
- Operator responsibility: record batch numbers, fill quantities, operating temperatures, oil-sample results and abnormal events.
- Technical boundary: this document does not replace heater or system design, risk assessment or professional engineering judgement.

MOTTA products covered by this handbook

Product	Grades	Standards and performance levels	Pack sizes
MOTTA D300	Mineral	—	18L / 200L
MOTTA D310 SYNTH	Full synthetic	—	18L / 200L
MOTTA D315	Mineral	DIN 51522	18L / 200L
MOTTA D318	Mineral	DIN 51522	18L / 200L
MOTTA D325	Mineral	DIN 51522	18L / 200L
MOTTA D327	Mineral	DIN 51522	18L / 200L

Grades, standards and pack sizes as published on each product's technical data sheet at motta-lube.com/products/. Where a data sheet and this table differ, the data sheet governs.

DIN 51522 is the performance reference on the D315 to D327 data sheets. Maximum bulk and film temperatures are not stated on the current data sheets; obtain them in writing before use. No heater-manufacturer approval is claimed unless separately documented.

2 Selection and pre-use inspection

Product	Data-sheet type	Selection point
D315, D318, D325, D327	Mineral heat transfer oils, DIN 51522 performance reference	Viscosity rises from D315 to D327 (typical 20 to 490 mm ² /s at 40 °C): heavier grades need confirmed pumpability at the lowest start-up temperature
D300	Mineral thermal transfer oil, several formulations	Confirm which formulation and its data sheet before ordering
D310 SYNTH	Full synthetic, typical pour point –50 °C	Where low-temperature start-up or a wide temperature range is required

- **Product:** verify the full product name, grade, batch number, packaging seal and the corresponding TDS and SDS.
- **System:** check pumps, valves, filters, expansion tank, vent points, low-point drains, instrumentation and interlocks.
- **Cleanliness:** remove welding slag, rust, water, solvent, cleaning-agent residue, old sludge and construction debris.
- **Compatibility:** heat transfer fluids of different chemical types, different brands or unknown origin must not be mixed directly.

3 Filling and cold circulation

- **Preparation:** use a clean, dry, dedicated pump, hose and container.
- **Filling:** introduce the fluid slowly at the designated fill point, preventing the entry of moisture, contaminants or excessive air.
- **Level:** fill to the cold-fill mark and leave room for thermal expansion; do not fill the expansion tank by estimation.
- **Cold circulation:** run the circulation pump before switching on the heat source; check flow, pressure, filter differential pressure, pump noise and leakage.
- **Verification:** after venting, re-check the level and top up in small amounts. Take a new-oil sample and record viscosity, acid number and flash point as the reference.

4 Initial heat-up, dewatering and degassing

Caution: residual water or low-boiling components boil as the system heats, causing pressure surges, pump cavitation, spray-out and level swings. Follow the heater manufacturer's heat-up procedure and the site risk assessment.

- Establish stable circulation first, then increase heat input in stages. Hold near 100–120 °C, or as the system manufacturer specifies, until water has been driven off through the expansion tank vent.
- At each stage, check temperature, pressure, level, pump current, noise and filter differential pressure.
- Keep the designed venting path open; do not open or close hot system components without authorisation.
- If pressure fluctuation, pump noise, level swings or a temperature excursion occurs, reduce or cut heat input while keeping circulation running.
- Proceed to normal operating temperature only when parameters are stable and venting has stopped.

5 Normal operation control

Item	Minimum operating requirement	Key judgement point
Temperature	Record heater outlet, return and key user points	Must stay below the written maximum bulk temperature for the grade and the equipment limit, whichever is lower
Flow and differential pressure	Monitor pump and filter trends	Low flow raises the film temperature in the heater and causes coking
Pressure	Watch for stability and fluctuation	Fluctuation points at gas, moisture, blockage or pump wear
Level	Record against the cold and hot reference	Abnormal change: check for leaks, vaporisation or process-side connection
Expansion tank	Record temperature	Keep it cool — commonly below 60 °C. It is where hot oil meets air and oxidises
Leakage and insulation	Inspect flanges, valves, pump seals and insulation	Oil-soaked insulation can ignite below the oil's flash point — replace it

Key control: low flow, high heat flux and local stagnation must never coincide. The bulk oil temperature does not show the film temperature at the heater tube wall, which is always higher.

6 Service-life management and replacement criteria

No service-life commitment independent of operating conditions is given. Manage service life with a new-oil reference, fixed sampling, trend analysis and defined trigger conditions. The heater manufacturer's, product data or laboratory's limits take precedence.

Baseline and sampling plan

Stage	Recommended minimum arrangement	Control purpose
New oil / initial fill	Retain a representative new-oil sample; record batch, quantity and initial results	Reference for viscosity, acid number, flash point and composition trends
Post-commissioning	Sample 1–3 months after stable normal operation	Confirm dewatering, degassing and cleanliness
Normal operation	Every 6–12 months; every 3–6 months for continuous high-temperature or critical units	Keep the same sampling point, temperature and laboratory method
After an abnormal event or overhaul	Sample promptly after overheating, water ingress, mixing, leakage, cleaning or major repair	Do not resume long-term operation on top-up alone before results are confirmed

Conditions that shorten service life

Factor	Accelerating condition	Management requirement
Heat load	Long periods near the maximum bulk temperature, high film temperature or high heat flux	Halve the sampling interval; check flow and heater surfaces
Circulation	Low flow, stagnation, incorrect bypass setting, pump wear	Correct immediately; stagnation accelerates cracking and coking
Oxygen and water	Hot expansion tank, air ingress, condensation, process-side leakage	Monitor acid number and water more often; free water needs immediate action
Operating pattern	Frequent start-stop, rapid heating or cooling, long hot standby	Shorten the interval; check for low-boiling components and pressure fluctuation

Factor	Accelerating condition	Management requirement
Contamination	Cleaning agents, old oil, a different fluid or solids	Isolate, resample and complete a compatibility and contamination assessment

Test parameters and three-tier judgement

Parameter	Continue in service	Caution / investigate	Action trigger
Kinematic viscosity	Within ± 10 % of new oil	10–20 %: shorten the resampling interval; check temperature and mixing	Above 20 %, or changing fast: act after laboratory confirmation
Acid number	Near the new-oil reference, stable	Rising: resample; check oxidation and the expansion tank	At the laboratory's in-service limit
Flash point / low boilers	Stable	Falling flash point or more low boilers: check for cracking and contamination	A fire or vaporisation risk: stop heating and act
Water content	No free water, stable	Rising: check condensation, cleaning residue and exchanger leaks	Free water or pressure fluctuation: act immediately
Insolubles / carbon residue	Stable, no deposits	Rising, or faster filter loading: check for local overheating	Sludge, coking, repeated blockage or reduced heat transfer: clean or replace

Note: these percentages are a field-screening starting point where no grade-specific limit is available; they are not a product guarantee or a universal scrap criterion. Flash point, low boilers and insolubles should be interpreted by a laboratory experienced in heat transfer fluids.

Recommended methods: kinematic viscosity ASTM D445; acid number ASTM D664; water content ASTM D6304; flash point ASTM D92 (open cup) and ASTM D93 (closed cup); carbon residue ASTM D189; the laboratory may add distillation or gas chromatography for low and high boilers.

7 Top-up, mixing and oil change

- Before topping up, verify grade and batch number; use dedicated tools and record the date, quantity and reason.
- Do not mix fluids because colour, name or viscosity look alike. Any necessary mixing needs a compatibility assessment first.
- Where water, coking or unidentified contamination is severe, deal with the system cause first, then plan cleaning and oil change.
- Before draining, shut down, cool, isolate and depressurise; follow the site permit system. Drain only when the oil has cooled to a safe handling temperature.

8 Shutdown and abnormal-condition handling

Situation	Primary action
Planned shutdown	Cut heat input first and keep circulating while cooling; stop the pump only when the system's allowed temperature is reached
Power loss or pump stop	Stop heat input immediately; start standby circulation or emergency cooling as designed
Pressure fluctuation or pump noise	Reduce heat input; check level, venting, filters and pump inlet
Slow heat-up or rising fuel use	Check temperature difference, flow and differential pressure; sample and assess coking
Leak, smoking insulation or fire	Start the site emergency plan; isolate heat and leak source; firefighting and PPE per the SDS

9 Reference values — indicative, not a MOTTA specification

The figures below are published industry references, given so that a reading can be judged on site when the machine documentation is not to hand. They are screening prompts, not scrap limits. Where the equipment manufacturer, the component manufacturer or your oil analysis laboratory states a figure, that figure governs and this table does not apply.

Specification reference

Reference	What it covers	Published by
DIN 51522	Heat transfer fluids Q — requirements; cited on the D315, D318, D325 and D327 data sheets	DIN
ASTM D92 / ASTM D93	Flash point, open cup and closed cup	ASTM

When a reading is worth investigating

What is measured	Prompt to investigate	Why this figure
Kinematic viscosity at 40 °C	More than ± 10 % from the new-oil reference for that product	Common condition-monitoring screening value; also confirms the correct product is in the system
Flash point	A clear fall from the new-oil value	Thermal cracking forms low-boiling products; a falling flash point is a rising fire risk
Acid number	A rise against the new-oil reference	Oxidation, usually from a hot expansion tank or air ingress
Carbon residue and insolubles	A rise against the new-oil reference	Coke and sludge insulate heater tubes and raise the film temperature further
Expansion tank temperature	Above 60 °C	Commonly used limit: above it, oil in contact with air oxidises quickly
Water content	Above 0.05 % (500 ppm), or any free or emulsified water	Free water attacks additive systems and bearing surfaces at any level

A single result is a reason to look, not a reason to drain. Establish the new-oil reference for the product actually in use, trend against it, and find the cause before changing the oil — changing the oil does not remove a contamination source or a mechanical fault.

10 Storage and waste oil

- Keep in the original sealed container in a cool, dry, ventilated area away from ignition sources, heat, rain and strong oxidisers.
- Store drums under cover, or on their side with the bungs at the 3 and 9 o'clock positions, so water is not drawn in.
- Transfer containers must be clean, dry and clearly labelled; do not use unlabelled containers.
- Waste oil, cleaning residue and oil-soaked insulation must be collected separately and handed to a compliant disposal organisation under local regulations.

Use and document information

Caution: this document provides general operating guidance. It is not heater or system design, a fire-safety procedure, legal advice or a guarantee of results for any specific equipment, process, country or site.

- Conditions of use: confirm the product, the written temperature limits, equipment, materials and regulations before use. Any unconfirmed substitution or mixing requires a written technical assessment first.
- Data and limits: temperatures, viscosities, intervals and screening values are governed by the product data, the SDS, the heater manufacturer's documents and your laboratory. This document sets no general guaranteed values.
- Safety and environment: storage, handling, filling, draining, leaks, fire, first aid and waste disposal must follow the SDS, site rules and local law.
- Limitation: to the extent permitted by applicable law, MOTTA gives no warranty for loss arising from operation above confirmed limits, incorrect selection, unconfirmed mixing, contamination, equipment defects or inadequate maintenance. This does not exclude liability that cannot be excluded or limited by law.

Revision 05: moved to the current MOTTA document format; stated that maximum bulk and film temperatures must be obtained in writing before use; added selection between mineral and synthetic grades, insulation-fire and expansion-tank guidance; added reference values, the table of MOTTA products covered, and the copyright and trademark notice. First Traditional Chinese edition.

Recommended Records to Retain

Record	Details to retain
System	Unit number, heater manufacturer and rating, system volume, written temperature limits for the grade.
Product	Full product name, grade, batch number, fill quantity, new-oil viscosity, acid number and flash point.
Operation	Filling, dewatering, heat-up, shutdown and drain dates, person responsible.
Running	Heater outlet and return temperatures, expansion tank temperature, flow, pressure, level.
Oil analysis	Sampling point, date, results, trend and action.
Abnormal event	Overheating, pump stops, leaks, insulation replacement, contamination, action taken.

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