INSTALLATION · COMMISSIONING · MAINTENANCE MANUAL

YLW / YGL / YY(Q)W Thermal Oil Heaters

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This manual covers installation, commissioning, operation and maintenance of the YLW, YGL, YY(Q)W and YDW thermal oil heater families, from 0.5 MW to 7.0 MW, for coal, biomass, oil, gas and electric heat sources. It is written for the plant engineer, the boiler operator on shift and the maintenance fitter who keeps the closed loop, the circulation pump and the expansion tank in service. Read the whole document before first firing.

Document code **YX-MAN-THO** Revision **1.0** Issue date **2026-11**
Applies to **YLW-1400MA to YLW-7000MA; YGL-700MA; YY(Q)W-700Y to YY(Q)W-2800Y; YDW-500**
Language **English**

1. Scope and model coverage

All models are forced-circulation, closed-loop heat transfer oil heaters. The coil is a single or double-pass serpentine; the oil leaves at 300–320 °C and returns 20–30 K cooler. Design pressure is 0.8 MPa for the smaller coils and 1.0 MPa for YLW-4200MA and above, keeping loop pressure above the oil vapour pressure at full film temperature. Maximum film temperature is 340 °C in every case. Thermal efficiency is 85–90% for coal and biomass units, 88–92% for oil and gas units, and 98% for the YDW electric unit.

Model	Capacity	Design pressure / outlet	Fuel	Typical duty
YLW-1400MA	1.4 MW (1.2 Gcal/h)	0.8 MPa / 320 °C	Coal or biomass, chain grate	Single reaction vessel, 8 h/day
YLW-2800MA	2.8 MW (2.4 Gcal/h)	0.8 MPa / 320 °C	Coal or biomass, chain grate	Dryer line, two-shift
YLW-4200MA	4.2 MW (3.6 Gcal/h)	1.0 MPa / 320 °C	Coal or biomass, chain grate	Continuous process, 24 h
YLW-7000MA	7.0 MW (6.0 Gcal/h)	1.0 MPa / 320 °C	Coal or biomass, chain grate	Multi-user loop, continuous

Model	Capacity	Design pressure / outlet	Fuel	Typical duty
YGL-700MA	0.7 MW (0.6 Gcal/h)	0.8 MPa / 310 °C	Biomass, vertical hopper feed	Small press or calender
YY(Q)W-700Y / 1400Y	0.7 / 1.4 MW	0.8 MPa / 320 °C	Light oil or natural gas	Skid-mounted package, indoor
YY(Q)W-2800Y	2.8 MW (2.4 Gcal/h)	1.0 MPa / 320 °C	Light oil or natural gas	Continuous, low-manning plant
YDW-500	0.5 MW (0.43 Gcal/h)	0.8 MPa / 300 °C	Electric resistance	Clean duty, night tariff

Excluded: site electrical works beyond the control cabinet terminals, structural design of the boiler house, the user's process heat exchangers, and pump head sizing for a loop longer than 150 m. Those items are covered by the project drawings. Burner and pump manuals take precedence for their internal adjustments.

2. Site and utility requirements before delivery

Confirm the following before delivery. A heater landed on an unprepared floor costs more in lost days than the civil works. See the capacity and site planning pages for worked examples of clearance and load data.

Item	Requirement	Tolerance / notes
Foundation	Reinforced concrete plinth, 150 mm above finished floor	Level within 2 mm/m; mass ≥ 1.5 × heater wet mass
Rear clearance	1.2 m for coil access doors and tube cleaning	Measured from the rear door face, door swing included
Burner swing	0.8 m in front of the burner flange	Plus 0.6 m for burner removal on rails
Boiler house ventilation	6 air changes per hour, inlet low and outlet high	Combustion air 1.1 × stoichiometric at full load
Oil charge	Mineral or synthetic heat transfer oil rated to 320 °C	Flash point ≥ 180 °C closed cup; water ≤ 300 mg/kg
Loop pressure	0.6–0.8 MPa at the pump discharge	Above vapour pressure of the oil at 320 °C
Gas supply	20–50 kPa at the burner inlet, stable	Regulator sized for 1.2 × rated flow
Light oil supply	0.1–0.3 MPa at the burner, 4–8 mm²/s viscosity	Day tank within 30 m of the burner

Item	Requirement	Tolerance / notes
Chimney draught	−20 to −50 Pa at the flue outlet	Measured at full load; natural or induced draught
Electrical supply	380/400 V, 3-phase, 50 Hz, separate neutral	Voltage within ±5%, earth resistance ≤ 4 Ω
Drainage	Blowdown and drain pit, 2 m³ minimum	Oil-tight, with a bunded oil storage area

Keep the pipe trench dry: a flooded trench rusts cladding from outside and hides leaks until the fire risk is real.

3. Installation sequence

1. Unload with the lifting lugs only, using a four-leg sling of equal length. Set the heater on the plinth and check level within 2 mm/m before grouting. Acceptance: no distortion of the shell, all anchor bolt holes aligned.
2. Grout the base frame after a 24 h settling check. Acceptance: no rocking under a 200 kg test load at each corner.
3. Install the expansion tank above the highest point of the loop, with the vent line rising continuously at 1:200. Acceptance: no horizontal pocket where vapour can trap.
4. Erect the circulation pump on its own foundation, aligned to the heater inlet flange. Acceptance: coupling offset ≤ 0.05 mm, angular ≤ 0.02 mm/100 mm.
5. Fit the deaerator or oil degasser on the return line at the highest practical point, with its vent piped to a safe outdoor location. Acceptance: vent discharge clear of air intakes.
6. Weld the loop in accordance with the approved isometric, using butt welds and long-radius bends. Acceptance: 10% radiographic or 100% visual plus dye-penetrant on the root.
7. Install the oil filter and the permanent strainer upstream of the pump. Acceptance: filter element rated 40 mesh, differential gauge fitted both sides.
8. Fit the safety valve on the coil outlet, set at or below design pressure. Acceptance: set pressure stamped and lead-sealed, discharge piped to a safe point.
9. Insulate all hot lines with 80 mm mineral wool and aluminium cladding, leaving flanges and valve bonnets removable. Acceptance: surface temperature ≤ 60 °C at 320 °C oil.
10. Install the flue with a draught gauge and a sampling port 1.5 diameters downstream of the outlet. Acceptance: no leakage at joints under a smoke test.
11. Fill the loop with filtered oil through a 40 mesh screen, venting at the highest point. Acceptance: expansion tank level at one third when cold.
12. Pressure-test the loop at 1.5 × design pressure with water, or with oil at 1.25 × design pressure where water is unacceptable. Acceptance: 30 min hold, no visible drop, no seepage at any joint.

13. If water was used, drain, then purge with dry air and dry nitrogen until the dew point is below −20 °C. Acceptance: moisture in the first oil charge below 300 mg/kg.
14. Connect the control cabinet, earth the frame and the pump, and prove rotation direction with the coupling removed. Acceptance: correct rotation, insulation resistance ≥ 1 MΩ.

Lifting and rigging

Never lift the heater by the coil headers, the burner flange or the pipe stubs. A 7 MW unit weighs 18–24 t wet; a sling on a nozzle will tear the coil and cannot be repaired in place. Use the four marked lugs, keep the load level, and bar the area under the load for the whole lift.

Expansion and anchors

Hot oil lines grow about 1.2 mm per metre between 20 °C and 320 °C. Fit expansion loops or bellows where the drawing shows them, and never clamp a line between two rigid anchors. Slide shoes on the trench floor, fixed points only at the marked brackets. A locked line will crack a coil header weld within a few heat cycles.

4. Commissioning and handover

Hydrostatic test at 1.5 × design pressure — 1.2 MPa for 0.8 MPa coils, 1.5 MPa for 1.0 MPa coils — held for 30 minutes with no pressure loss, following GB/T 16508 and TSG G0001 practice. Third-party inspection can be arranged on request. After the test, dry the coil as described in step 13; residual water in a hot oil loop turns to steam at 150 °C and cavitates the pump.

Filling and venting: pump oil in slowly at the lowest point, keep the vent open at the highest point, and run the circulation pump cold for two hours. Check every flange with a torch and a dry cloth. Then heat in stages: raise the outlet at 20 K/h to 105 °C and hold for four hours with the degasser venting, which boils off the last water. Continue at 30 K/h to 200 °C, hold two hours, then at 50 K/h to the design outlet. Never exceed 340 °C film temperature during the drying stage.

Interlock	Simulated condition	Expected result
Low oil flow	Throttle the loop valve to 80% of design flow	Burner trips within 5 s, alarm at panel, pump keeps running
High outlet temperature	Raise the set point simulator to 330 °C	Burner off at 325 °C, alarm, no pump stop
Low expansion tank level	Close the make-up valve, drain 20 L	Alarm at low level, burner trip at low-low
High expansion tank temperature	Simulate 80 °C at the tank sensor	Alarm, burner trip, vent fan start if fitted
Burner flame failure	Close the manual gas cock during firing	Flame safeguard locks out in ≤ 3 s, no unburnt fuel

Interlock	Simulated condition	Expected result
Low gas pressure	Reduce inlet to 50% of setting	Burner trip, lockout, alarm
Pump failure	Stop the pump contactor with the burner firing	Burner trip within 2 s, dump cooler valve opens
Emergency stop	Press the E-stop button	Fuel shut off, burner fan off, pump continues

Trial runs: four hours at full load recording outlet and return temperature, flow, stack temperature, flue O_2 and CO, pump current and vibration every 30 minutes; then 24 hours at the duty the plant actually needs, with a full oil sample taken at the end. Handover documents: this manual, the as-built isometrics, the coil material certificates, welder qualifications, the hydrostatic test record, interlock test sheets, the burner and pump manuals, the oil certificate of analysis, and the signed trial run log.

5. Normal operation

Start-up from cold. Confirm the expansion tank level and that the vent is open. Start the circulation pump and prove flow before any heat input: the flow switch must show at least the nameplate minimum. Fire the burner at low load and raise the outlet at no more than 50 K/h below 120 °C and 80 K/h above. A cold loop shocked with full firing will warp the coil and crack refractory.

Start-up from hot standby. With the loop above 150 °C, start the pump first and wait for stable pressure, then light the burner. Never light the burner with the pump stopped, even briefly, to "warm the coil" — that is the single most common cause of coked oil and a ruptured tube.

Routine log. Record the following every two hours; the normal bands are the acceptance criteria.

Parameter	Normal band	Action if outside
Outlet temperature	300–320 °C, within ±5 K of set point	Check flow, burner modulation, sensor
Return temperature	280–300 °C, ΔT 20–30 K	Investigate a user drawing more or less heat
Loop pressure at pump	0.6–0.8 MPa, steady	Check expansion tank level and nitrogen pressure
Flow	100% of design, never below 90%	Clean strainer, check pump, open bypass
Stack temperature	Baseline ± 30 K	Rising trend means soot on the coil
Flue O_2 / CO	3–5% / below 100 ppm	Re-tune the burner
Expansion tank level	1/3 to 2/3 of the sight glass	Make up oil, find the loss
Pump current	Below nameplate FLA, steady	Check for blockage or bearing wear

Normal shutdown. Reduce the burner to low fire, stop firing, and keep the circulation pump running until the outlet temperature falls below 80 °C — typically 40–60 minutes for a 4 MW unit. Close the vent only

when the loop is below 60 °C. Do not drain the oil unless the unit is being opened for inspection.

Emergency shutdown. Press the E-stop, which cuts fuel and keeps the pump running. If the pump has failed or power is lost, open the dump cooler valve manually and let the oil thermosyphon to the cold oil tank; the nitrogen blanket prevents air ingress. Never restart the pump into a static hot coil before the oil is below 120 °C; cold oil entering a hot coil can flash and hammer the loop.

Lay-up. For stops over 30 days, wet lay-up: keep the loop full, circulate for 30 minutes weekly, and hold the expansion tank under 0.02–0.05 MPa nitrogen. Dry lay-up: drain at 80 °C, purge with dry nitrogen, and seal all openings. Record which method was used, because a wet-lay-up loop must be re-dried before the next heat-up.

6. Maintenance schedule

The schedule below is the core of this manual. Every row has a numeric acceptance where one exists. Use the manual library to download a printable log sheet for each interval.

6.1 Daily (each shift)

Task	What to check / acceptance	Tool or reference	Who
Walk the loop for leaks	No drip at flanges, valve stems or pump seal; no oil smell	Torch, dry cloth	Operator
Read pump condition	Current below FLA, discharge pressure steady within ±0.05 MPa, no cavitation noise	Clamp meter, panel gauge	Operator
Check expansion tank	Level 1/3–2/3, oil temperature below 70 °C	Sight glass, thermometer	Operator
Record temperatures	Outlet 300–320 °C, ΔT 20–30 K	Panel display, logger	Operator
Record stack temperature	Within 30 K of the clean baseline	Flue thermometer	Operator
Check burner flame or coal bed	Stable flame, no pulsation; even bed, no holes or slag	Observation port	Operator
Scan the alarm panel	No active alarms, no bypassed interlocks	HMI event list	Operator
Log oil make-up	Record litres added; any make-up over 5 L/day is investigated	Log sheet	Operator

6.2 Monthly

Task	What to check / acceptance	Tool or reference	Who
Clean the oil strainer and filter	Differential pressure below 0.05 MPa after cleaning	Differential gauge, 40 mesh element	Fitter
Inspect the pump mechanical seal	Seepage below 3 drops/min; no scoring on the shaft sleeve	Visual, dial indicator	Fitter
Measure pump vibration	Below 4.5 mm/s RMS at the bearing housing	Vibration meter	Fitter
Test low-flow interlock	Burner trips within 5 s at 80% flow, pump keeps running	Valve throttle, stopwatch	Engineer
Test high-temperature cut-out	Burner off at 325 °C, alarm recorded	Simulated signal	Engineer
Check nitrogen blanket	Regulator outlet 0.02–0.05 MPa, cylinder above 1 MPa	Pressure gauge	Fitter
Inspect insulation and cladding	Surface below 60 °C, no torn cladding, no oil-soaked wool	Contact thermometer	Fitter
Lubricate fan and grate bearings	Grease to the lube chart, no purging of old grease past the seal	Grease gun, chart	Fitter

6.3 Quarterly / semi-annual

Task	What to check / acceptance	Tool or reference	Who
Full oil analysis — every 6 months	Viscosity at 40 °C within ±20% of fresh; acid value ≤ 0.5 mg KOH/g; flash point ≥ 100 °C and no more than 20% below fresh; insolubles ≤ 0.5% m/m; moisture ≤ 500 mg/kg	Accredited laboratory, sample from the return line	Engineer
Oil change decision	Any single limit exceeded means a partial or full change within 30 days	Lab report, oil specification	Engineer
Clean the fire-side coil	Stack temperature returns to within 15 K of baseline after soot blowing	Soot blower, brush, inspection door	Fitter
Inspect burner nozzle or coal feeder	Nozzle wear within 0.1 mm; feeder clearance per drawing	Vernier, burner manual	Fitter
Test the safety valve	Lifts at set pressure, reseats without leak; set pressure ≤ design pressure	Lifting lever, gauge	Engineer
Electrical inspection	Terminals torqued, insulation ≥ 1 MΩ, earth continuity below 0.1 Ω	Torque wrench, insulation tester	Electrician

6.4 Annual shutdown inspection

Task	What to check / acceptance	Tool or reference	Who
Open the coil and inspect internally	No coke layer above 0.5 mm, no bulging, no hot spots	Borescope, inspection door	Engineer
Ultrasonic wall thickness	Minimum wall ≥ design wall plus 0.5 mm allowance	UT gauge, grid map	Inspector
Hydrostatic or hydraulic test	1.5 × design pressure held 30 min, no drop	Test pump, calibrated gauge	Inspector
Replace service gaskets and seals	Graphite or spiral-wound gaskets, new pump seal, no reuse	Torque table	Fitter
Recalibrate the safety valve	Certificate within 12 months, set pressure stamped	Approved valve shop	Engineer
Repair refractory and insulation	No cracks wider than 3 mm, no loose brick, cold-face below 60 °C	Visual, contact thermometer	Fitter
Full control sequence test	Every interlock in section 4 proven, all trips logged	Test sheet	Engineer
Clean the flue and chimney	Draught restored to −20 to −50 Pa at full load	Draught gauge	Fitter
Combustion re-tune	O_2 3–5%, CO below 100 ppm, efficiency 85–90%	Flue gas analyser	Engineer

Records

Keep every log sheet and laboratory report for three years — longer where the local inspector requires it. File the oil analysis next to the interlock sheets so a rising acid value can be read against the operating hours that caused it. Escalate any repeat anomaly to the plant engineer in writing the same shift, and to the manufacturer after two consecutive samples show the same trend.

7. Troubleshooting

Symptom	Likely cause	Check	Remedy
Outlet temperature falls below set point	Low flow, air lock or fouled coil	Flow reading, pump pressure, stack temperature	Vent the loop, clean the strainer and coil, restore design flow

Symptom	Likely cause	Check	Remedy
Stack temperature 30 K above baseline	Soot or coke on the fire side	Inspection door, flue gas CO	Soot blow, then brush or water-wash the coil
Pump noisy, pressure fluctuating	Cavitation from low tank level or hot tank	Tank level, tank temperature, suction strainer	Make up oil cold, cool the tank, clean the strainer
Acid value rising faster than 0.1 per 1000 h	Film temperature above 340 °C from low flow	Flow, outlet temperature, coke layer	Restore flow, reduce set point, change oil
Flash point dropped below 100 °C	Contamination with light fuel or cracked oil	Lab report, burner fuel leak into coil	Stop firing, find the leak, replace the oil charge
Burner locks out on start	Dirty flame scanner, low gas pressure	Scanner window, inlet pressure, electrodes	Clean the scanner, reset the regulator, set the electrodes
Oil weep at a flange	Gasket incompatible or heat-cycled flat	Joint temperature, gasket type	Replace with graphite gasket, re-torque cold
Expansion tank overflows	Overfill, water ingress or failed nitrogen regulator	Level before heat-up, oil moisture	Drain to one third cold, dry the oil, replace the regulator
High CO with normal O_2	Poor atomisation or short flame	Nozzle, oil pressure, air damper	Clean or replace the nozzle, re-tune the burner

Any leak reaching hot insulation is a fire risk: shut down, isolate and let the coil cool below 120 °C before opening a joint.

8. Spare parts and service

Hold the following for the first year. Consumables and wear parts are shown with the recommended quantity for one heater.

Part	Recommended stock	Notes
Pump mechanical seal kit	2 sets	Match the shaft sleeve size on the nameplate
Coil and flange gaskets	2 full sets	Graphite or spiral-wound, 340 °C rated
Oil filter elements	6	40 mesh, differential gauge fitted
Burner nozzle or coal feeder wear plate	2	Per burner manual
Flame scanner and ignition electrode	1 each	Keep the scanner window clean
Thermocouples and pressure gauges	2 each	Calibrated, range 0–400 °C and 0–1.6 MPa
Grate bars (coal and biomass units)	1 row set	Per grate width

Part	Recommended stock	Notes
Heat transfer oil	10% of loop charge	Same brand and grade as the fill

Order by model, serial number and drawing number; all three appear on the nameplate and in the handover file. Spares for the burner, pump and control cabinet can be quoted against the burner range, the pump range and the control cabinet range. Service response: remote diagnosis within one working day, site attendance within five working days for mainland China, and a commissioning engineer on request for the first start-up.

9. Document control

Rev	Date	Change
1.0	2026-11	First issue for the YLW, YGL, YY(Q)W and YDW families
—	—	Reserved for the next revision

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For fuel and efficiency comparisons across the range, see the energy consumption data . The design basis follows GB/T 16508 and TSG G0001; the oil condition limits are consistent with the heat transfer fluid classification in ISO 6743-12.

Need the manual for your exact serial number? Send the model, serial and drawing number from the nameplate and Henan Yongxing Special Equipment Co., Ltd. will issue the site-specific version, including the as-built loop drawing and the coil test record.

Request the site-specific manual · Thermal oil heater range