

# HEATING SYSTEMS

**Thermo**

**Thermo E**

**Thermo S**

**Thermo plus**

**Thermo E+**

**Maintenance plan**

# Maintenance plan

for heaters of type Thermo, Thermo E, Thermo S, Thermo plus and Thermo E+ in buses and railway vehicles



## Periodic heater maintenance

The heater

- 1) should be operated for 10 minutes at least once a month and
- 2) checked by a professional according to the maintenance plan at the start of the heating season at the latest.

Observe the following maintenance intervals. These apply

to normal applications of Spheros heaters.

The vehicle manufacturer's regulations and the relevant regulations of the Federal Railway Authority (EBA) and its technical service also apply.

The relevant workshop manual must be used to carry out the work. If the devices are used in other vehicles or applications, the intervals may be shortened or extended. Please contact your responsible Spheros partner in such cases.

Address of the operator	Date of maintenance		
	Vehicle data		
<b>Heater data</b>			
Type of heater: Ident. no.: Serial no.:	Operating/ control device data acc. to diagnosis DTT (Diagnose Thermo Test)	Date of commission	
Fuel    Diesel fuel <input type="checkbox"/> Biodiesel <input type="checkbox"/> Heating oil EL <input type="checkbox"/> Paraffinic fuels <input type="checkbox"/>			
<b>Check / Maintenance</b>	<b>Important notes</b>	<b>Check result</b>	<b>Measured values, accomplished repairs</b>
<b>1. Electrical connections</b>		OK    not OK	
a) Examine electrical plug connections and the wiring harness for visible damages, replace as required.		<input type="checkbox"/> <input type="checkbox"/>	
<b>2. Heat exchanger</b>	Determine overheating cause as needed (e.g. water circulation system), check overheat protection.		
a) Check for external damage, discoloration caused by overheating and leaks.		<input type="checkbox"/> <input type="checkbox"/>	
b) Clean the heat exchanger inside and outside, remove soot and debris.		<input type="checkbox"/> <input type="checkbox"/>	
<b>3. Fuel system</b>	Ensure connections to fuel flow and return lines are sealed tight!  When using biodiesel and paraffinic fuels, check TI.  Re-tighten screw connections and hose clamps.		
a) Inspect fuel lines and connections for leakage.		<input type="checkbox"/> <input type="checkbox"/>	
b) Replace fuel filter insert with gasket. resp. replaceable filter.		<input type="checkbox"/> <input type="checkbox"/>	

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Subject to modification. For translations the german version is binding. Latest version of this document is provided for download on [www.spheros.com](http://www.spheros.com).

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Check / Maintenance	Important notes	Check result		Measured values, accomplished repairs
		OK	not OK	
c) Fuel pump / fuel hoses <b>Note:</b> Observe technical information if biodiesel or FAME is used!  d) Replace fuel screen with gasket in the pump.	Replace the fuel pump every 5, the fuel hoses every 6 years, if biodiesel is used this interval is shortened  <b>Technical Information Biodiesel / FAME see <a href="http://www.spheros.com">www.spheros.com</a></b>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>4. Burner head</b> a) Inspect combustion air intake opening for clear passage. b) Inspect hood for damage. c) Depending on the version: - Clean the viewing window (disk) of the flame guard or - Check the dust protection tube of the flame guard and the lens of the phototransistor for contamination and clean if necessary, to do this, dismantle the dust protection tube. d) Inspect condition of the ignition electrodes, if required adjust or replace them. e) Replace atomiser nozzle. f) Check solenoid valve for leaks.	Replace damaged parts.      Activate combustion air motor using the diagnostic tool (DTT), solenoid valve must be tight	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>   <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
<b>5. Exhaust system</b> a) Inspect exhaust line for clear passage or damage, clean or replace it as needed. b) Remove combustion chamber from heat exchanger, inspect for damage and contamination, clean and replace as needed. c) Insert combustion chamber and mount burner head. Ensure proper fit and tight connection to the heat exchanger.  d) Combined nuts (M8) for burner head attachment, tightening torque 7.5 +1 Nm, secure them. e) Measurements Target values and procedures are outlined in the workshop manual	Secure them with locking compound  Limits acc. to Regulation ECE-R 122  see technical data heater	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
	Ambient temperature (° C) Exhaust temperature (° C) CO <sub>2</sub> (Vol.-%) at 24V Thermo Thermo E 200 Thermo E 300 Thermo S Thermo plus 160 Thermo plus 230 Thermo plus 300/350 Thermo E+ 120 Thermo E+ 200 Thermo E+ 320	10 ±0.5 9.5 ±0.5 10.0 ±0.5 9.5 +1.5 9.5 +1.0 9.0 +1.5 9.5 +1.5 10.6 ±0.5 9.5 ±0.5 10 ±0.5	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

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<p>CO<sub>2</sub> (ppm) at 19V Rail versions Smoke spot number acc. to Bacharach (all devices) Fuel pump pressure according to Workshop Manual Thermo, Thermo S Thermo E 200, Thermo plus Thermo E 320 Thermo E+</p>	<p>&lt;1000 ≤ 4  10 bar 8 +1 bar 9 +1 bar 9 +0.5 bar</p>	<p><input type="checkbox"/> <input type="checkbox"/>  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p><input type="checkbox"/> <input type="checkbox"/>  <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	
<p><b>6. Water system</b> a) If available, inspect, clean as needed or replace water filter insert.</p>		<input type="checkbox"/>	<input type="checkbox"/>	
<p><b>7. Functional check (1x per month)</b> a) If available, open shut-off valve of the fuel return line and water line. b) Check fault memory, clear it as needed using the diagnostic tool (DTT). c) Check heater functionality.  <b>Attention:</b> During the maintenance, check all screw connections for tightness (for corresponding torque values see Workshop Manual).</p>	<p>after at least 10 min heater operation</p>	<p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	<p><input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/></p>	



