

Coolant Heater

THERMO 230.060
For MCI Motorcoaches

Operating Instructions
Maintenance Instructions
Troubleshooting Guide
Service Parts Listing

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1. Introduction

ATTENTION!

Read all the information provided in this introduction before operating your Thermo 230.060 coolant heater.

1.1 Scope and Purpose

This manual is intended for use only with Webasto heater model Thermo 230.060 installed on MCI D Model and E Model coaches.

MCI D Model coaches equipped with the Thermo 230.060 coolant heater have a Vehicle Identification Number (VIN) of 52644 and higher.

MCI E Model coaches equipped with the Thermo 230.060 coolant heater have a Vehicle Identification Number (VIN) of 61186 and higher.

For other heater models and coach / bus models, use the corresponding manual. If you are unsure of the heater model installed in your coach / bus, check the identification tag on the heater or contact Webasto Thermosystems Inc. at 1-800-555-4518.

This manual is intended to support authorized Webasto trained distributors, dealers and personnel in the operation and maintenance of the Thermo 230.060 coolant heater for MCI Motorcoaches.

Webasto Thermosystems, Inc. does not recommend the installation and servicing of Webasto products by untrained, unauthorized personnel or end-users.

Operation, installation and servicing of Webasto products by untrained, unauthorized personnel and end-users will release Webasto Thermosystems, Inc. and Webasto authorized distributors, dealers and personnel from responsibility for damage to Webasto products including collateral property damage and personal injury.

Any use, operation, installation, modification or application of the product not described in Webasto manuals, or subjecting the product to extreme or unusual conditions beyond the limits of specified performance characteristics is misuse of the product.

Failure to comply with all instructions is a misuse of Webasto product. The same applies for repairs without using genuine Webasto service parts. This will void the coolant heaters "Official Marks of Conformity."

1.2 Additional Documentation to be Used

This manual contains all of the information and procedures necessary for the operation and maintenance of the Thermo 230.060 coolant heater.

The use of additional documentation is normally not required. Vehicle specific operation guides (when available) may be used as complementary information only.

1.3 General Safety Regulations and Information

The general safety regulations for the prevention of accidents and relevant operating safety instructions must be observed at all times.

The specific safety regulations applicable to this manual are highlighted in the individual chapters by Warning, Caution and Attention headings.

1.3.1 General Safety Notes

The heater may only be installed in vehicles, with a minimum coolant capacity of 10 litres (2.6 US Gal.).

In the vicinity of the coolant heater, a temperature of 85 °C (185 °F) must not be exceeded under any circumstances (e.g. during body paint work). A violation of this temperature limit may cause permanent damage to the electronics.

When checking the coolant level, proceed in accordance with the vehicle manufacturer's instructions.

⚠ WARNING

Due to the danger of poisoning and suffocation, the heater must not be operated in enclosed areas, such as garages or workshops, without an exhaust venting system, not even if the start-up is activated by the timer or remote start device.

At filling stations and fuel depots the heater must be switched off as there is a potential danger of explosions.

Where flammable fumes or dust may build up (e.g. in the vicinity of fuel, coal, wood, cereal grain deposits or similar situations) the heater must be switched off to prevent explosions.

The coolant in the heating circuit of the heater must contain a minimum of 10% of a quality brand glycol based anti-freeze.

Extracting combustion air from the vehicle interior is not permissible under any circumstance.

Exhaust pipes must be routed so that exhaust fumes will not penetrate into the vehicle's interior. Condensation accumulation in the exhaust line must be directly drained. A condensation drain hole is to be provided if required.

Do not route exhaust pipes and components within 100 mm (4 inches) of flammable materials such as polyurethane or similar foam insulation, styrene sheet insulation, fuel tanks and containers, glycol reservoirs, coolant lines, wood and paper products, carpet, tires, electrical wiring, brake and air lines or any materials deemed to be flammable or heat sensitive.

Do not terminate exhaust above flammable materials such as polyurethane or similar foam, insulation, styrene sheet insulation, fuel tanks and containers, glycol reservoirs, coolant lines, wood and paper products, carpet, tires, electrical wiring, brake and air lines or any materials deemed to be flammable or heat sensitive.

The function of any parts vital for vehicle operation must not be impaired.

Electrical lines, switch gear, and control gear of the heater must be located in the vehicle so that their proper function cannot be impaired under normal operating conditions.

The coolant heater may only be operated within the specified operating voltage range designated by type.

The coolant heater may only be operated with the specified fuel (Diesel 1, Diesel 2, Arctic grade, Kerosene and certain military spec. fuels).

For the routing of fuel lines, the following important regulations must be adhered to:

- Fuel lines are to be installed in such a way that they remain unaffected by torsional stresses created by vehicle and engine movement. They must be protected against mechanical damage. Fuel lines must be securely fastened to the vehicle every 30 cm. (12 inches) or less along the total length from heater to fuel tank. Fuel-carrying parts are to be protected against excessive heat and are to be installed so that any dripping or evaporating fuel can neither accumulate nor be ignited by hot components or electrical equipment.

- In buses, fuel lines are not to be located in the passenger area or in the driver's compartment. Fuel supply must not be by means of gravity or pressurization of the fuel tank.
- The fuel tank must either be equipped with a vent cap or be ventilated in another way (ventilation line).
- The operational state of the heater, i.e. an indication "on" or "off", must be clearly visible to the operator.

1.4 Meaning of Warning, Caution, and Attention Headings

Warning, Caution and Attention headings in this manual have the following meaning:

⚠ WARNING

This heading is used to highlight that non-compliance with instructions or procedures may cause injuries or lethal accidents to personnel.

⚠ CAUTION

This heading is used to highlight that non-compliance with instructions or procedures may cause damage to equipment.

ATTENTION!

This heading is used to highlight and draw specific attention to information.

1.5 Important Warning, Caution and Attention Notations

Read and understand all Warning, Caution and Attention notations found here and throughout this manual before operating, troubleshooting or servicing the Thermo 230.060 coolant heater.

⚠ WARNING

Due to the danger of asphyxiation, the heater must not be operated in enclosed spaces such as garages or workshops without adequate exhaust extraction.

⚠ WARNING

Due to the possibility of explosion, the heater must be switched 'OFF' while refueling and at fueling stations.

⚠ WARNING

Due to the possibility of explosion, do not operate any Webasto heater in an area where toxic or explosive materials or fumes may be present.

⚠ WARNING

Due to the possibility of severe burns, when working on the coolant system, allow the engine to cool down and open the radiator cap carefully.

⚠ WARNING

Coolant in the systems to be heated must contain a proper mixture of water and antifreeze to prevent freezing or slushing. Frozen or slushed coolant will restrict the coolant flow and may cause coolant hose to blow off or burst, which could cause equipment damage and personal injury. Refer to engine or coolant manufacturers recommendations for your operating area.

⚠ CAUTION

If welding is to be performed on the vehicle, the heaters main power supply cables must be disconnected from the battery to protect the electronic control unit from electrical damage.

⚠ CAUTION

The Webasto heater relies on coolant flow to transfer heat from the heater to the vehicle's heating system. The coolant pump(s) must be operating and there must be an uninterrupted path for coolant to flow or the heater will overheat.

⚠ CAUTION

To prevent fuel nozzle failure, always use CLEAN fuel from a known CLEAN source for priming fuel systems and filters.

ATTENTION!

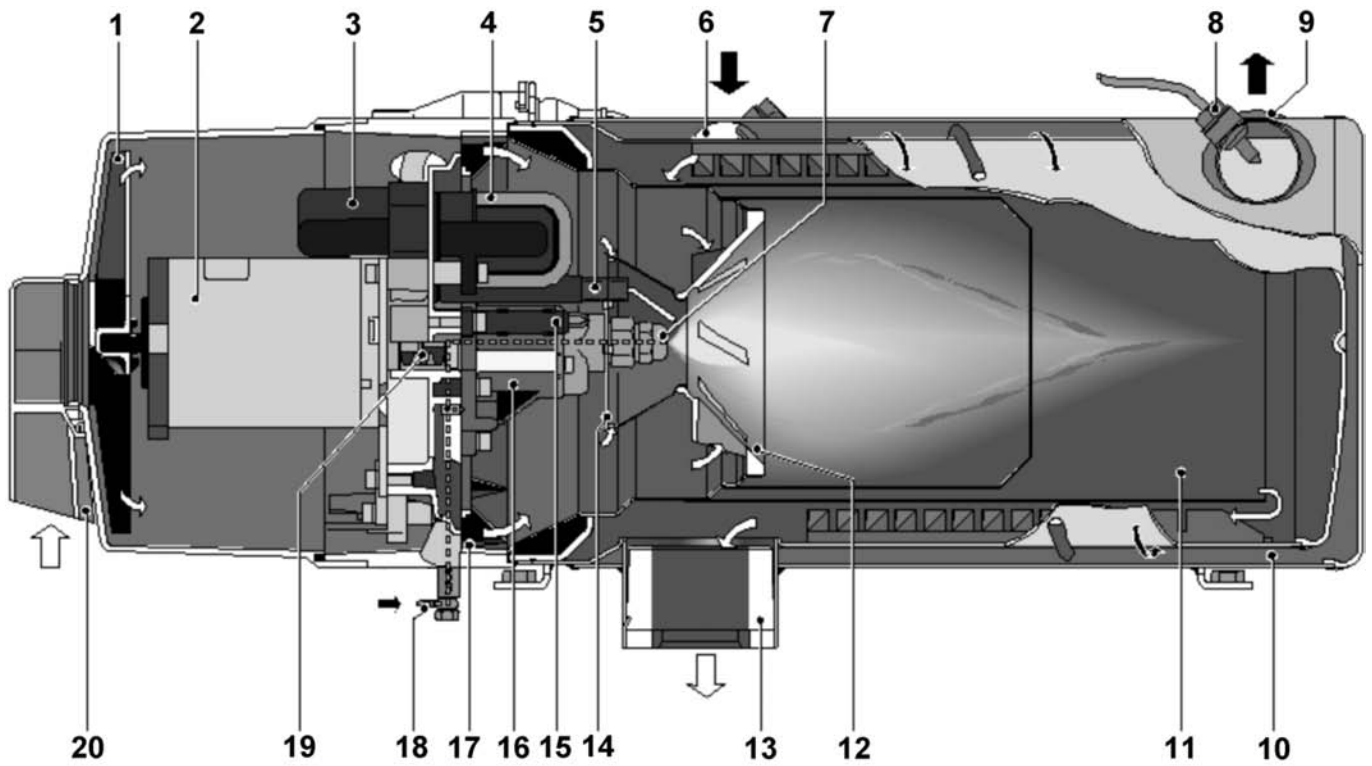
Change the fuel filter at least annually.

ATTENTION!

The Webasto heating system will not perform to your satisfaction with weak batteries.

2. General Description

2.1 Thermo 230.060 Coolant Heater



- | | | | |
|----------------------------|---------------------------|--------------------------------|-------------------------------------|
| 1 Combustion air fan | 7 Fuel nozzle | 13 Exhaust outlet | 17 Combustion air adjusting shutter |
| 2 Motor | 8 Temperature sensor | 14 Disc | 18 Fuel supply line |
| 3 Electronic control unit | 9 Overheat thermostat | 15 Flame detector | 19 Coupler |
| 4 Electronic ignition coil | 10 Heat exchanger | 16 Fuel pump w/ solenoid valve | 20 Combustion air intake |
| 5 Ignition electrodes | 11 Combustion chamber | | |
| 6 Water pipes | 12 Combustion air swirler | | |

Fig. 2-1: Webasto Thermo 230.060 Coolant Heater

Webasto Thermo 230 Coolant Heaters for use on MCI Motorcoaches are designed to:

- Preheat Engine Block** of liquid cooled engines to ensure reliable starting in cold weather and to reduce cold start wear and emissions (white smoke).
- Boost heating levels** with the engine running. The heater will boost the heating system in cold weather when an engine is running at light loads, even at high speeds or while idling. The heat rejection of modern diesel engines to the coolant, especially in buses, is often not adequate to heat the vehicle’s interior.
- Increase Driver Visibility** in poor weather conditions by providing higher levels of heat for quick defrosting/defogging of windshield and side glass.

3. Operating the Webasto Thermo 230.060 Heater

Before switching the Webasto heater on, set vehicle heating system to the ‘heat’ position and open any shut off valves.

3.1 Switching On Using the Timer (D Model Coach Only)

ATTENTION!

For the E Model coach, refer to the MCI Timer Instructions of the MCI Vehicle Operating Manual to activate the Webasto coolant heater.



Fig. 3-1: Electronic 7-Day Timer

Upon actuation of the ‘instant heat’ button, the ‘operation indicator’ on the timer lights up. Refer to timer setting instructions for a full description and explanation beginning on page 5.

The heater motor and coolant circulating pump begin to run. After approximately 10-25 seconds the solenoid valve opens and fuel is sprayed into the combustion chamber. At the same time, the electronic ignition coil produces high voltage (8000 V) and the mixture of fuel and air in the combustion chamber is ignited by a spark produced at the tip of the ignition electrodes.

The flame is detected by the photo cell, then the electronic ignition coil stops producing high voltage and combustion continues by itself (spark on electrodes is only required to ignite the flame). From this point on the heater is working and producing heat.

The Webasto heater will cycle on and off until:

1. The Webasto heater is switched off.
2. Time has elapsed on the timer.
3. The vehicle battery voltage drops below 20.0V.
4. The Webasto heater runs out of fuel.
5. A fault lock out occurs, indicated by the operating indicator light being off during the cool down cycle (i.e. overheat).

3.2 Switching Off

When heating is no longer required, switch the Webasto heater off. The solenoid valve interrupts the fuel supply, combustion stops and the indicator light turns off. The Combustion air fan and the water pump remain on for another 2-3 minutes (after run cycle) cooling the combustion chamber and purging the chamber of any fumes.

ATTENTION!

Restarting the heater during the after-run period is permitted.

3.3 Engine Pre-heating

1. Set the timer 30 min. to 1 hr. before you want to start engine. The heater will start up at set time.
2. When time is elapsed on your timer or engine preheat is no longer required, switch the Webasto heater 'OFF'. The heater will go through the after-run cycle.

3.4 7-Day Electronic Timer Description for D Model Coach

A 7-Day timer providing full control of the heater operation in either manual mode or timed mode.

- 1 Time Display
- 2 Heater On/Off Indicator LED (Green)
- 3 Timer active status LED (Yellow)
- 4 Clock time status LED (red)
This LED will be on during PM time.
- 5 Days of the week LEDs (red)
- 6 Function/setting buttons

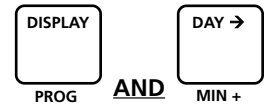


Fig. 3-2: Electronic 7-Day Timer - Description

3.5 Timer Programming and Operation for D Model Coach

3.5.1 Clock Programming (Present Time and Day)

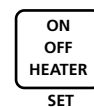
- While pressing and holding 'PROG' button, press 'MIN +' button briefly and release both buttons simultaneously to start clock programming mode.
NOTE – Week day indicating LED will begin to flash.



- Press button 'DAY' to select day of week.



- Press button 'SET' to advance to the time programming mode.



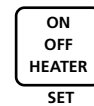
- Press button 'HR +' to select correct hour.
NOTE – The red PM LED will respond.



- Press button 'MIN +' to select correct minute

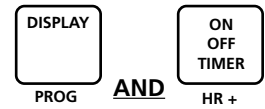


- Press button 'SET' to end clock programming.
NOTE – If 'SET' button is not pressed within 15 seconds, programming function will end automatically.



3.5.2 Timer Programming (Timed Heater Start Setting)

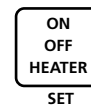
- While pressing and holding 'PROG' button, press 'HR +' button briefly and release both buttons simultaneously to start timer programming mode.
NOTE – The yellow LED will begin to flash.



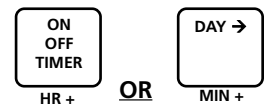
- Press button 'DAY' to select day heater is to come on.



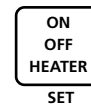
- Press button 'SET' to to advance to the time setting mode.



- Press button 'HR +' or 'MIN +' select heater start time.



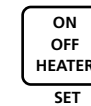
- Press button 'SET' to end timer programming
NOTE – If 'SET' button is not pressed within 15 seconds, programming function will end automatically



3.6 Operational Aspects

3.6.1 Manual Operation

Press button 'ON OFF HEATER' to manually switch the heater on or off. When the heater is on the green LED will be visible. The timer will automatically time out and switch off the heater after one hour.



3.6.2 Timed Operation

Press the 'ON OFF TIMER' button to activate or deactivate the timer. If the timer is active, the timer status LED (yellow) will be made visible and the heater will be activated when the programmed timer setting is reached.



3.6.3 Heater Operation

When in the timer mode, the ignition switch (on or off) will have no effect on heater operation.

For continuous heating with the heater active (heater 'ON') and the ignition on, the timer will not time out or automatically switch the heater off.

When the heater is active (heater 'ON') and the ignition is switched off during heater operation, the heater will also be switched off automatically. This feature prevents inadvertent battery discharge when the vehicle is out of service.

When the heater is switched 'ON' in the manual mode with the ignition off, the timer will automatically switch the heater off after one hour.

3.6.4 Display Blanking

When the ignition is on, the display will be visible.

When the ignition is switched off, the display will disappear or "blank out" after approximately 30 seconds. If at anytime a button is pressed, the display will be visible. If the ignition is off, the display will disappear after approximately 5 minutes.

The green and yellow indicator LEDs are not affected by display blanking. If the timer or heater is active, the appropriate LED will be visible regardless of the state of display blanking.

To view a blanked display, simply press the button labeled 'DISPLAY'.

4. Heater Maintenance

4.1 Annual Maintenance

The Webasto heater requires a minimum of maintenance to operate. To keep your heater in service the following maintenance procedures should be performed annually before each heating season:

Enclosure Area

- clean the heater and enclosure area from any accumulated debris or dust with compressed air.
- inspect all components for wear and damage.

Electrical System

- check wiring harnesses for damage, fix or replace as required.
- check condition of the batteries and connections.
- load test batteries, if necessary, replace.

ATTENTION!

The Webasto heating system will not perform to your satisfaction with weak batteries.

Exhaust System

- check the exhaust system carefully for restrictions or corroded areas. Replace exhaust pipe if necessary.

Fuel System

- change fuel filter and inspect fuel lines for wear and damage. Repair or replace if necessary.

ATTENTION!

Change the fuel filter at least annually.

Burner System

- swing open burner head, clean flame detector (photo eye), pull out combustion chamber and inspect and clean heat exchanger. Replace nozzle if necessary (annually).
- re-install combustion chamber, close up burner head and torque clamp screws to 7.5 - 8.5 Nm.

Operational Test

- run your heating system for at least 15 minutes.
- check water and fuel connections for leakage. Re-tighten clamps and fittings if necessary.

ATTENTION!

For major repairs and service parts, return to your authorized Webasto Thermosystems servicing specialist.

ATTENTION!

To keep your Webasto heater in good operational condition throughout the year, it is recommended that the heater be operated at least once a month for 10 minutes or more during the warmer months when heating may not be required.

5. Basic Troubleshooting

5.1 General Information

⚠ CAUTION

Troubleshooting requires profound knowledge about structure and theory of operation of the heater components and should only be performed by skilled personnel.

This section describes troubleshooting procedures for the Thermo 230.060 coolant heater. Troubleshooting is normally limited to the isolation of defective components.

Before troubleshooting, check for and eliminate these defects:

- **fuel supply (plugged fuel filter)**
- **corrosion on battery terminals**
- **blown fuses**
- **corrosion on electrical wiring, connections and fuses**
- **loose contacts, or improper crimping on connectors**
- **shut down initiated by temperature limiter thermostat (automatic reset)**

ATTENTION!

After any correction of a defect a functional test has to be performed in the vehicle.

ATTENTION!

Coolant temperature must be below 158 °F (70 °C) before the Webasto heater will start up.

5.2 Operational Malfunction Symptoms (Reading the Flash Code)

To obtain operational malfunction diagnostic flash codes from the Webasto Thermo 230.060, a 24 volt test light will be required.

In the event of a malfunction, a diagnostic flash code will be generated and transmitted on the blue wire of the 6 pin electrical connector at the heater harness. To obtain the diagnostic flash code, the harness must be plugged in and the heater switched 'ON'.

In order to make a correct analysis, it's necessary to understand the diagnostic flash code event.

During the diagnostic flash code event, you will see the following:

Five quick flashes followed by a slower sequence of flashes, the slower sequence of flashes is the actual diagnostic code. The first five quick flashes are only an indication that a diagnostic code has been registered and will be displayed. Count only the slower sequence of flashes to obtain the current diagnostic code.

For example (α = 1 flash):

Diagnostic code 7X: ααααα ... α ... α ... α ... α ... α ... α ... α

The diagnostic flash code sequence will be repeated during the heater after-run (cool-down) period and will remain visible once the heater stops in the lock out mode. Once the heater is cycled "OFF" and "ON" the diagnostic flash code will no longer be visible on the indicator light but will be stored in memory.

5.3 Electrical Connections

6-Pin Connector

| PIN | COLOR | FUNCTION |
|-----|------------|------------------------|
| 1 | Black | 'ON' Signal from Timer |
| 2 | Brown | Chassis Ground |
| 3 | Red/Yellow | 24 Volt Positive |
| 4 | Red | 24 Volt Positive |
| 5 | Orange | Burner 'ON' Signal |
| 6 | Blue | Diagnostic Flash Code |

2-Pin Connector

| PIN | COLOR | FUNCTION |
|-----|-------|------------------------|
| 1 | Black | Water Pump 'ON' Signal |
| 2 | Brown | Chassis Ground |

3-Pin connector – for Laptop/PC interface and diagnostics.

ATTENTION!

Diagnostic equipment is intended for use by Webasto trained personnel at authorized Webasto distributor, dealer and end user service facilities.

5.4 Diagnostic Flash Codes for the Thermo 230.060 with Control Unit SG 1572 D

The following table lists the possible malfunctions and subsequent diagnostic code which can be read by a 24 volt test light as outlined in section 5.2. Alternatively, all diagnostic codes can be directly read through the available diagnostics interface kit and a compatible personal computer.

| Diagnostic Flash Code | Probable Cause | Check and Correct |
|---|--|---|
| 1X Flash No combustion after completion of repeated start sequence. | <ul style="list-style-type: none"> - Fuel system - Combustion air - Electronic ignition | <ul style="list-style-type: none"> - Fuel level - Type of fuel being used - Fuel filter - Fuel line connection (air bubbles in fuel line) - Fuel nozzle plugged - Air intake or exhaust, restricted or plugged - Incorrect electrode gap |
| 2X Flashes Flame out during operation. No restart possible. | <ul style="list-style-type: none"> - Fuel supply (shortage of fuel) | <ul style="list-style-type: none"> - Restriction in fuel system - Fuel filter - Fuel line connection (air bubbles in fuel line) - Type of fuel being used |
| 3X Flashes Low voltage for more than 20 seconds. | <ul style="list-style-type: none"> - Electrical system | <ul style="list-style-type: none"> - Load test batteries - Corrosion at connections. - Loose connections. |
| 4X Flashes Flame detector recognizes false flame signal during pre-start or shut-down cycle | <ul style="list-style-type: none"> - Defective flame detector | <ul style="list-style-type: none"> - Replace flame detector |
| 5X Flashes Flame detector | <ul style="list-style-type: none"> - Wiring - Defective flame detector | <ul style="list-style-type: none"> - Damaged wiring, open or shorted circuit - Replace flame detector |
| 6X Flashes Temperature sensor | <ul style="list-style-type: none"> - Wiring - Defective temperature sensor | <ul style="list-style-type: none"> - Damaged wiring, open or shorted circuit - Replace temperature sensor |
| 7X Flashes Fuel solenoid valve | <ul style="list-style-type: none"> - Wiring - Defective fuel solenoid valve | <ul style="list-style-type: none"> - Damaged or corroded wiring, open or short circuit. - Replace fuel solenoid valve |
| 8X Flashes Combustion air fan motor | <ul style="list-style-type: none"> - Wiring - No RPM - Defective combustion air fan motor | <ul style="list-style-type: none"> - Damaged wiring, open or shorted circuit - Replace combustion air fan motor - Replace combustion air fan motor |
| 9X Flashes Circulation pump motor | This feature presently not used in North America. (optional) | |

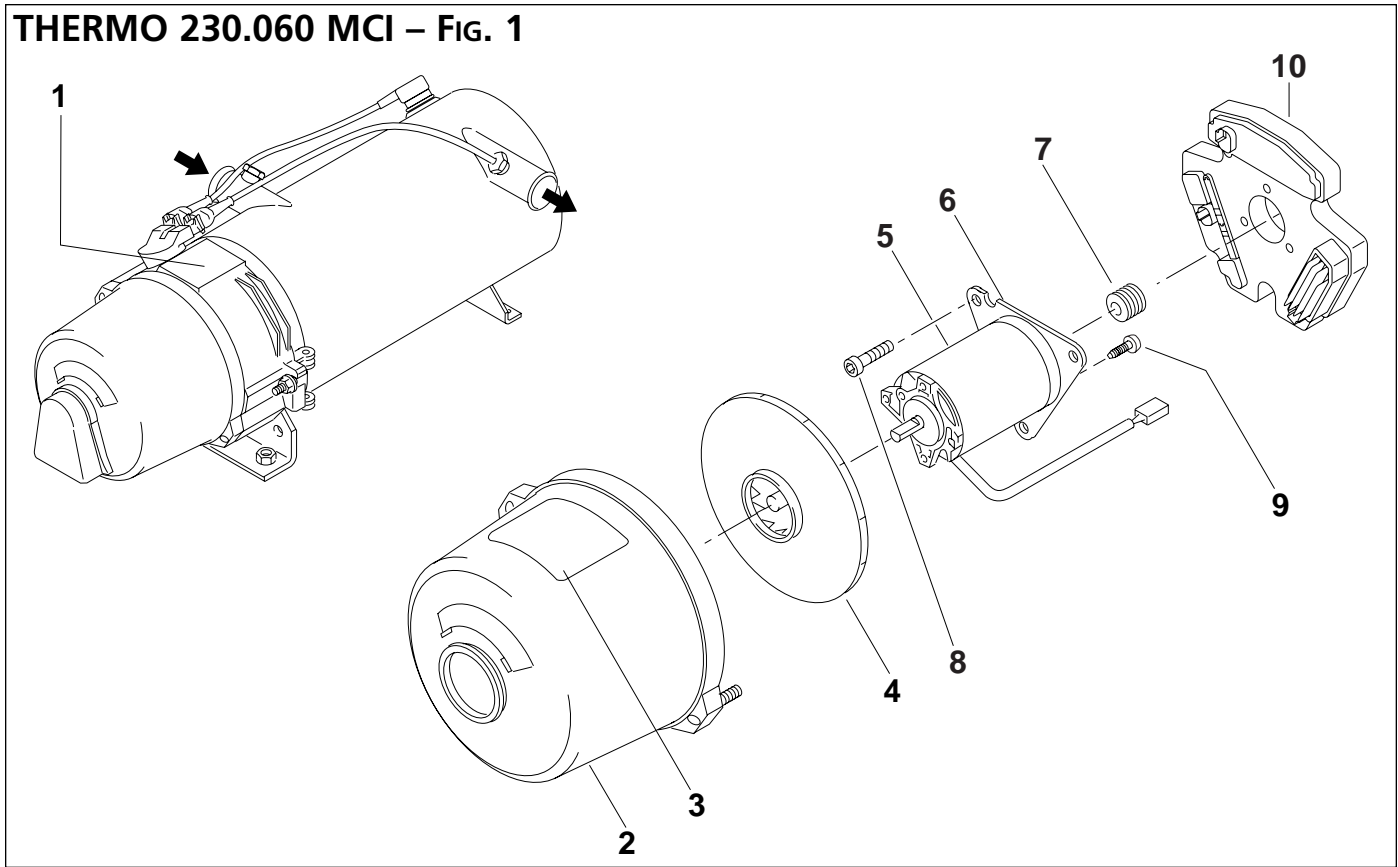
Table 5-1: Diagnostic Flash Code Description

Diagnostic flash code table continued.

| Diagnostic Flash Code | Probable Cause | Check and Correct |
|--|---|---|
| 10X Flashes Temperature limiter | <ul style="list-style-type: none"> - Overheat condition - Lack of coolant flow - Wiring - Defective temperature limiter | <ul style="list-style-type: none"> - Reset temperature limiter (automatic) - Coolant level or flow restriction - Air trapped in coolant circuit - Damaged or corroded wiring, open or short circuit - Replace temperature limiter. |
| 11X Flashes Electronic ignition coil | <ul style="list-style-type: none"> - Wiring - Defective electronic ignition coil | <ul style="list-style-type: none"> - Damaged wiring, open or shorted circuit - Replace temperature sensor |
| 12X Flashes Heater lock out | <ul style="list-style-type: none"> - 3 repeated malfunctions/flame-outs or 5 repeated start attempts. | <ul style="list-style-type: none"> - Re-initialize control unit by switching heater 'ON' and disconnecting and re-connecting heater harness. |

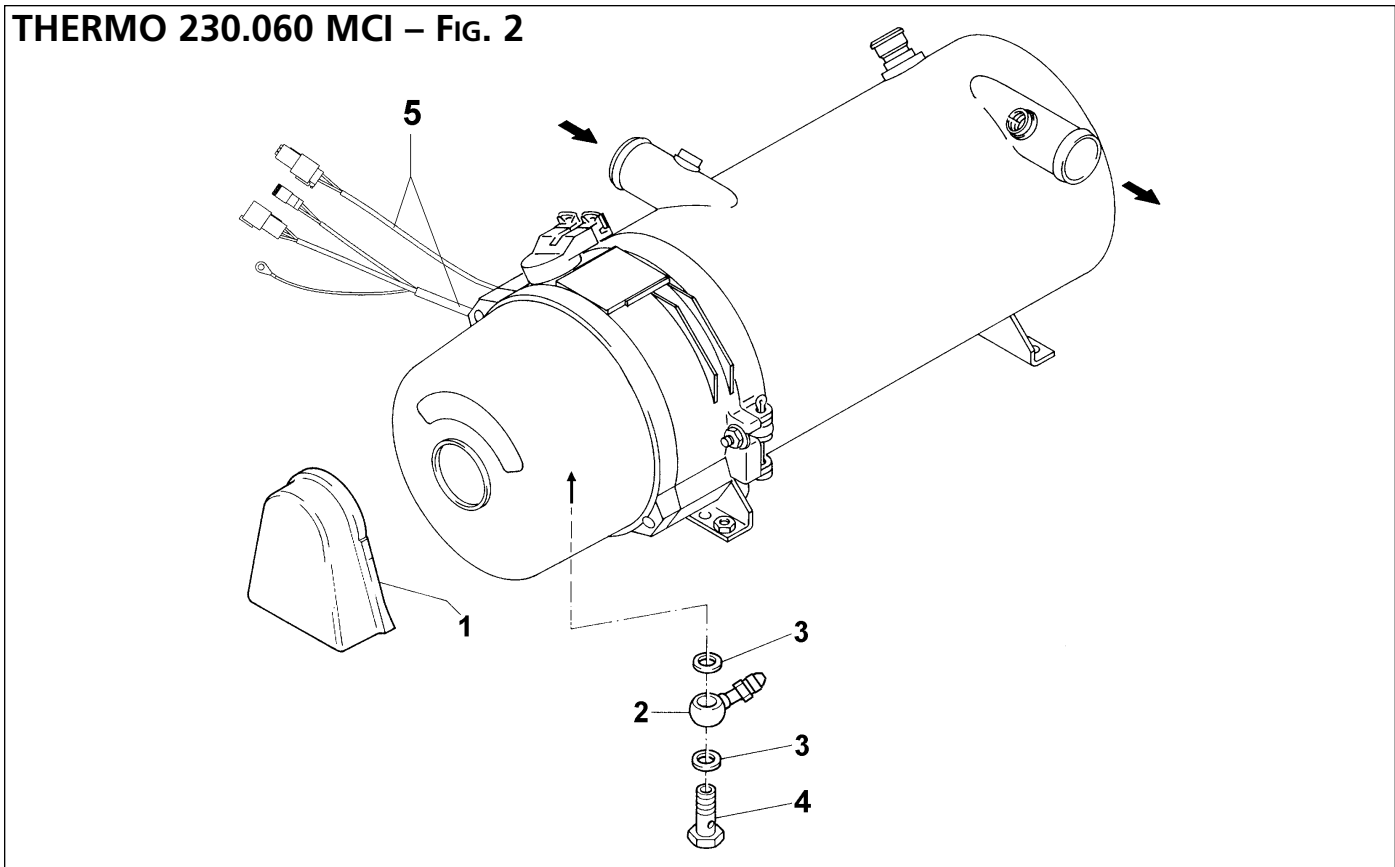
Table 5-1: Diagnostic Flash Code Description (continued)

6. Service Parts Listing



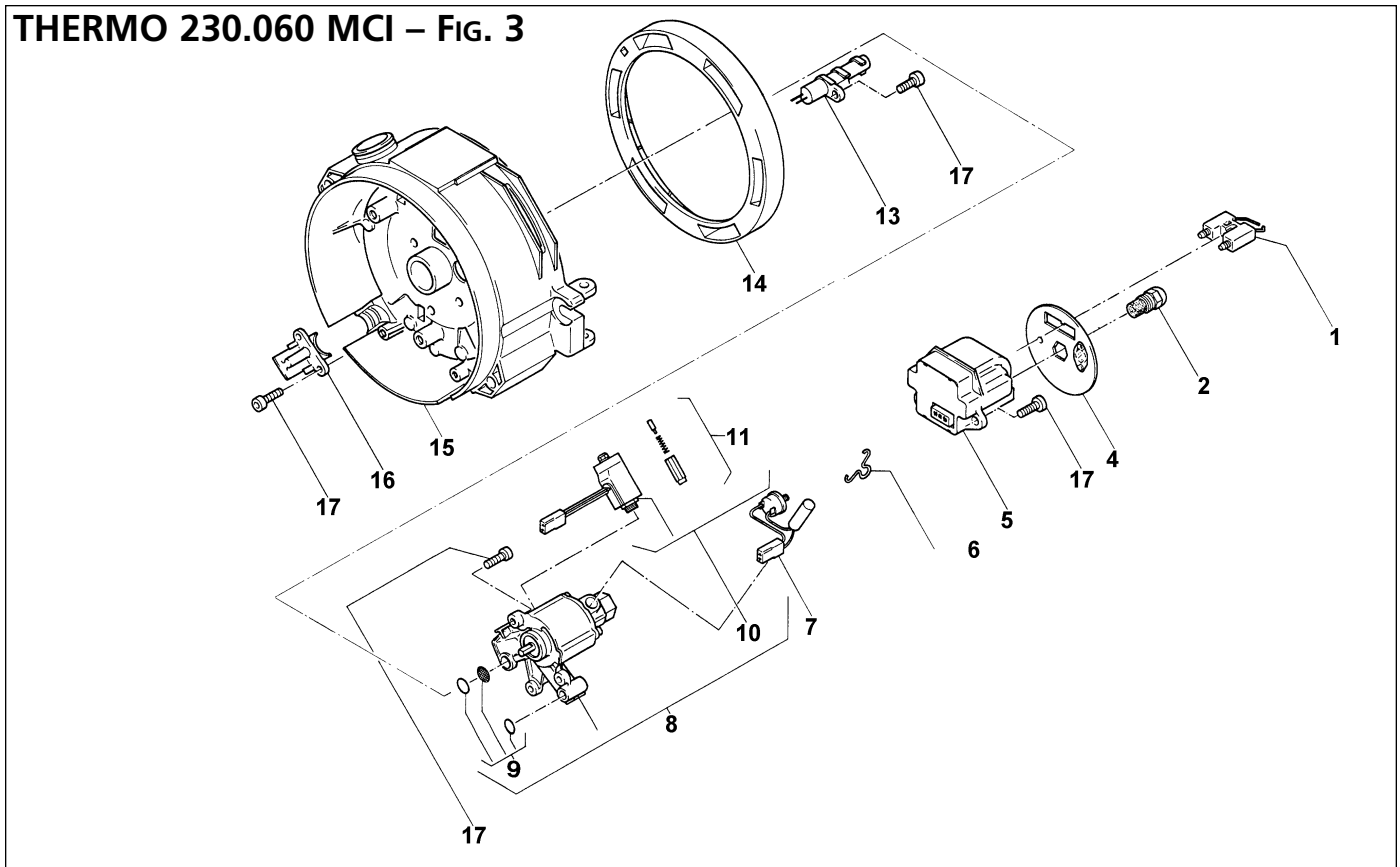
| ITEM | QUANTITY | WEBASTO PART NO. | MCI PART NO. | DESCRIPTION | REMARKS |
|---------|----------|------------------|--------------|----------------------------------|-----------------------------------|
| 1 | X | 88374D | 16L-16-258 | Thermo 230.060 Heater - Complete | Replacement heater |
| no fig. | X | 72102B | 16-16-1172 | Burner Head - Thermo 230.060 | MCI single fuel line |
| no fig. | X | 923153B | 16-16-1102 | Complete Heater Kit | Includes coolant circulating pump |
| 2 | 1 | 20649C | 16-16-1103 | Hood | |
| 3 | 1 | 50101660A | | Warning Label | |
| 4 | 1 | 20641B | 16-16-1104 | Fan | |
| 5 | 1 | 21317A | 16-16-1105 | Motor | |
| 6 | 1 | 20644A | 16-16-1125 | Flange - Motor Support | |
| 7 | 1 | 20654A | 16-16-1106 | Drive Coupling | |
| 8 | 3 | 90770A | 16-16-1108 | Allen Socket Screw - M5 x 16 | |
| 9 | 3 | 378380 | 16-16-1153 | Screw - Motor Support Flange | |
| 10 | 1 | 63482E | 16-16-1107 | Control Unit - SG 1572 D | Full diagnostics features |

THERMO 230.060 MCI – FIG. 2



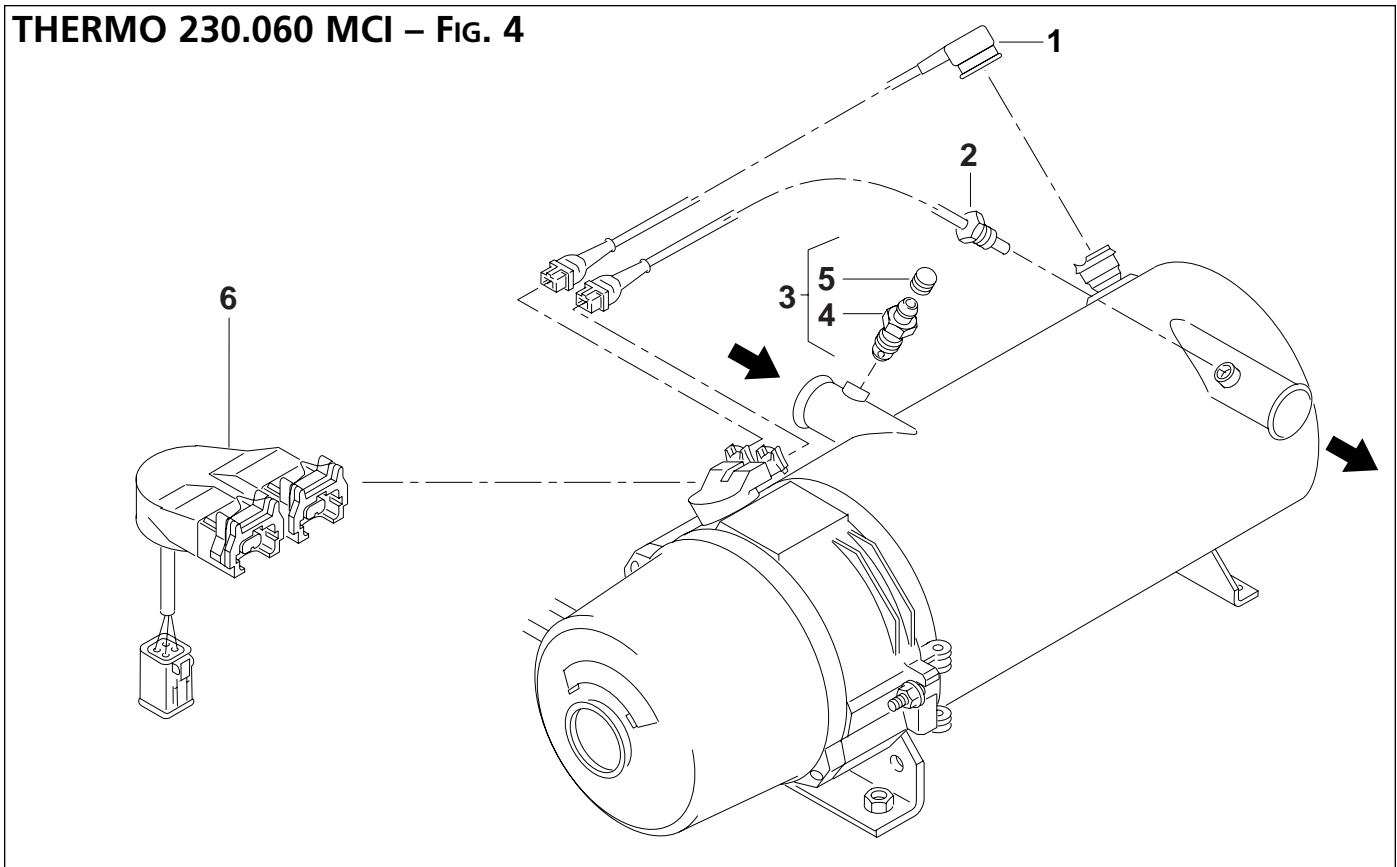
| ITEM | QUANTITY | WEBASTO PART NO. | MCI PART NO. | DESCRIPTION | REMARKS |
|---------|----------|------------------|--------------|-------------------------|---------------------------------|
| 1 | 1 | 20818B | 16-16-1124 | Splash Guard | |
| 2 | 1 | 92222A | 16-16-1126 | Supply Line Fitting | #4 JIC (37° Flare) |
| 3 | 2 | 151157 | 16-16-1127 | Copper Washer - 10 x 14 | |
| 4 | 1 | 150754 | 16-16-1128 | Banjo Bolt | |
| 5 | 1 | 98509A | | Harness | |
| no fig. | 1 | 149314 | | Plug - M10 x 1 | Fuel return |
| no fig. | 1 | | 9L-5-642 | Fuel Check Valve | Installed at filter MCI Part |

THERMO 230.060 MCI – FIG. 3



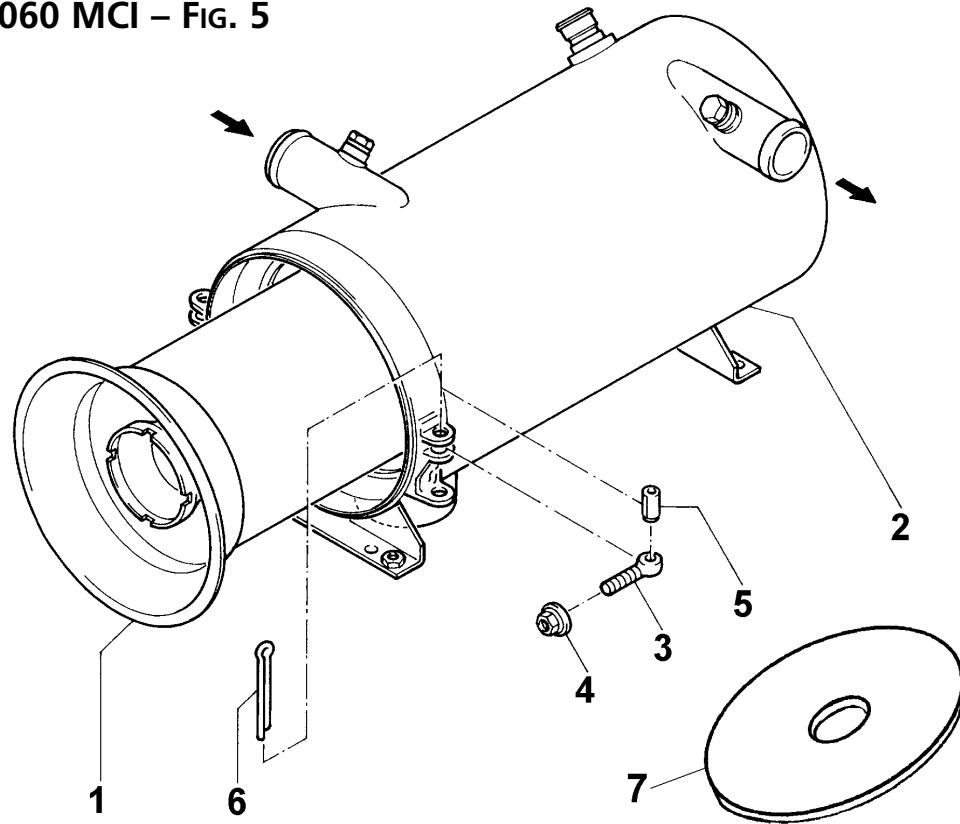
| ITEM | QUANTITY | WEBASTO PART NO. | MCI PART NO. | DESCRIPTION | REMARKS |
|---------|----------|------------------|--------------|-------------------------------------|----------|
| 1 | 1 | 14846B | 16-16-1109 | Ignition Electrodes | |
| 2 | 1 | 470716 | 16-16-1110 | Fuel Nozzle | |
| 4 | 1 | 88678B | 16-16-1111 | Disc | |
| 5 | 1 | 14845C | 16-16-1112 | Ignition Coil | |
| 6 | 1 | 19723B | 16-16-1113 | Retaining Clip - Nozzle Pre-heater | |
| 7 | 1 | 83933B | 16-16-1114 | Preheat Cartridge with Thermostat | |
| 8 | 1 | 97952B | 16-16-1115 | Fuel Pump Assembly - Single Line | |
| 9 | 1 | 19977B | 16-16-1116 | Fuel Pump Seal and Screen Kit | |
| 10 | 1 | 29313A | 16-16-1117 | Solenoid Valve Assembly | |
| 11 | 1 | 386650 | 16-16-1118 | Solenoid Repair Kit | |
| 13 | 1 | 19970A | 16-16-1120 | Flame Detector (Photo Cell) | |
| 14 | 1 | 88674A | 16-16-1121 | Air Adjustment Ring - High Temp. | |
| 15 | 1 | 82206B | 16-16-1122 | Housing | Aluminum |
| 16 | 1 | 20512B | 16-16-1123 | Strain Relief | |
| 17 | 8 | 90770A | 16-16-1108 | Allen Socket Screw - M5 x 16 | |
| no fig. | 1 | 98640A | | Safety Thermostat for Fuel Solenoid | |

THERMO 230.060 MCI – FIG. 4



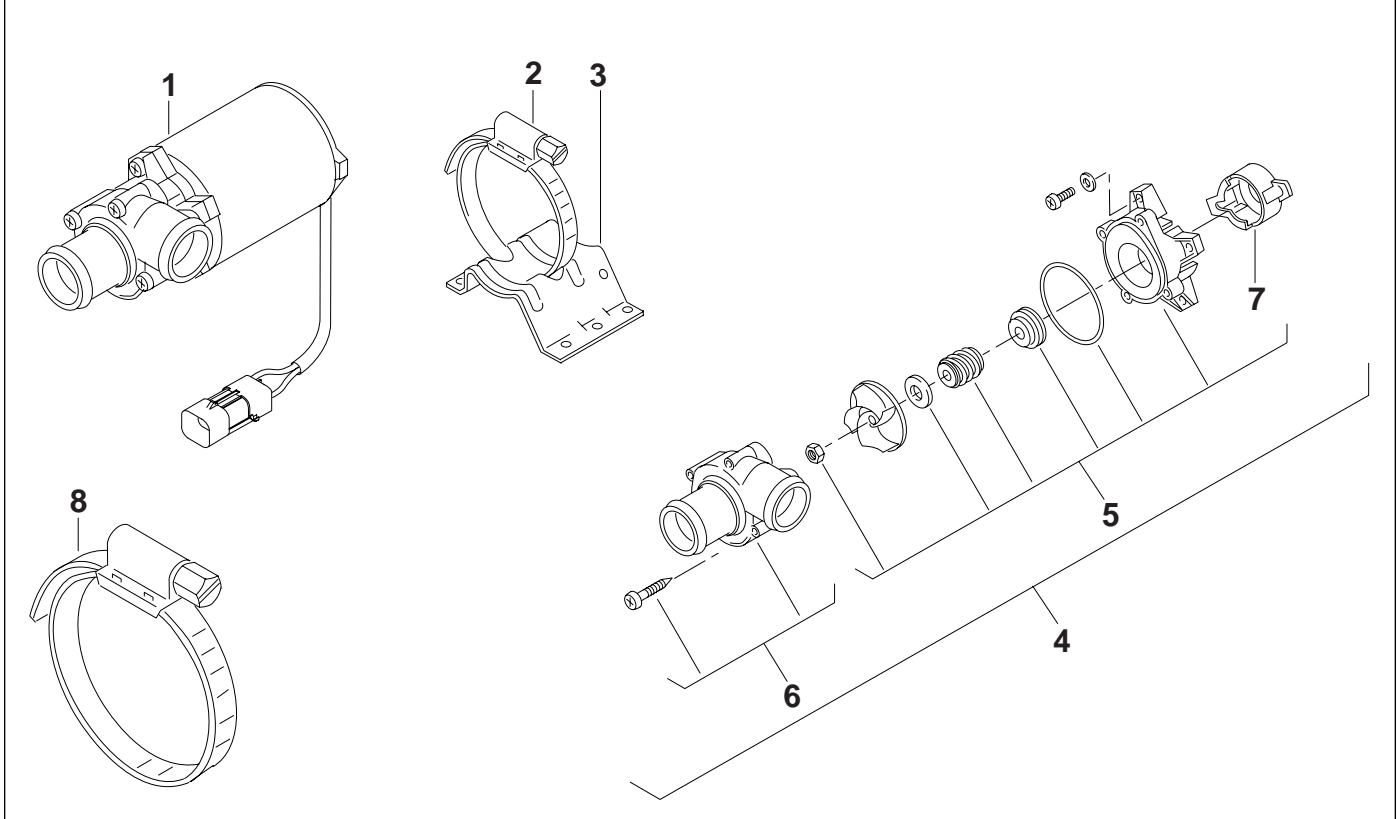
| ITEM | QUANTITY | WEBASTO PART NO. | MCI PART NO. | DESCRIPTION | REMARKS |
|------|----------|------------------|--------------|--------------------------------|------------------------------|
| 1 | 1 | 64182B | 16-16-1129 | Overheat Protection Thermostat | 105 °C |
| 2 | 1 | 14941A | 16-16-1130 | Temperature Sensor | Mounted in water outlet pipe |
| 3 | 1 | 16200A | 16-16-1131 | Air Bleed Valve with Cap | Includes items 4 & 5 |
| 4 | 1 | 21327A | | Air Bleed Valve | |
| 5 | 1 | 112388 | | Cap for Air Bleed Valve | |
| 6 | 1 | 82971C | | Sensor Harness Connector | |

THERMO 230.060 MCI – FIG. 5



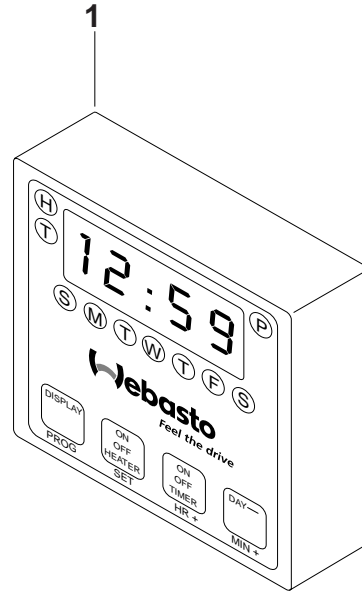
| ITEM | QUANTITY | WEBASTO PART NO. | MCI PART NO. | DESCRIPTION | REMARKS |
|---------|----------|------------------|--------------|----------------------|-------------------------------------|
| 1 | 1 | 44325A | 16-16-1132 | Combustion Chamber | |
| 2 | 1 | 1300127B | 16-16-1133 | Heat Exchanger | |
| 3 | 2 | 15047A | 16-16-1134 | Eye Bolt - 8 x 40 | |
| 4 | 2 | 20826A | 16-16-1135 | Nut with Washer - M8 | |
| 5 | 2 | 15674A | 16-16-1136 | Roll Pin - 8 x 16 | |
| 6 | 1 | 13160A | 16-16-1137 | Cotter Pin | |
| 7 | 1 | 901414A | 16-16-1144 | Friction Plate | E-model only |
| no fig. | 1 | 906114A | 7L-12-3118 | Harness - D Model | From vehicle junction box to heater |

THERMO 230.060 MCI – FIG. 6



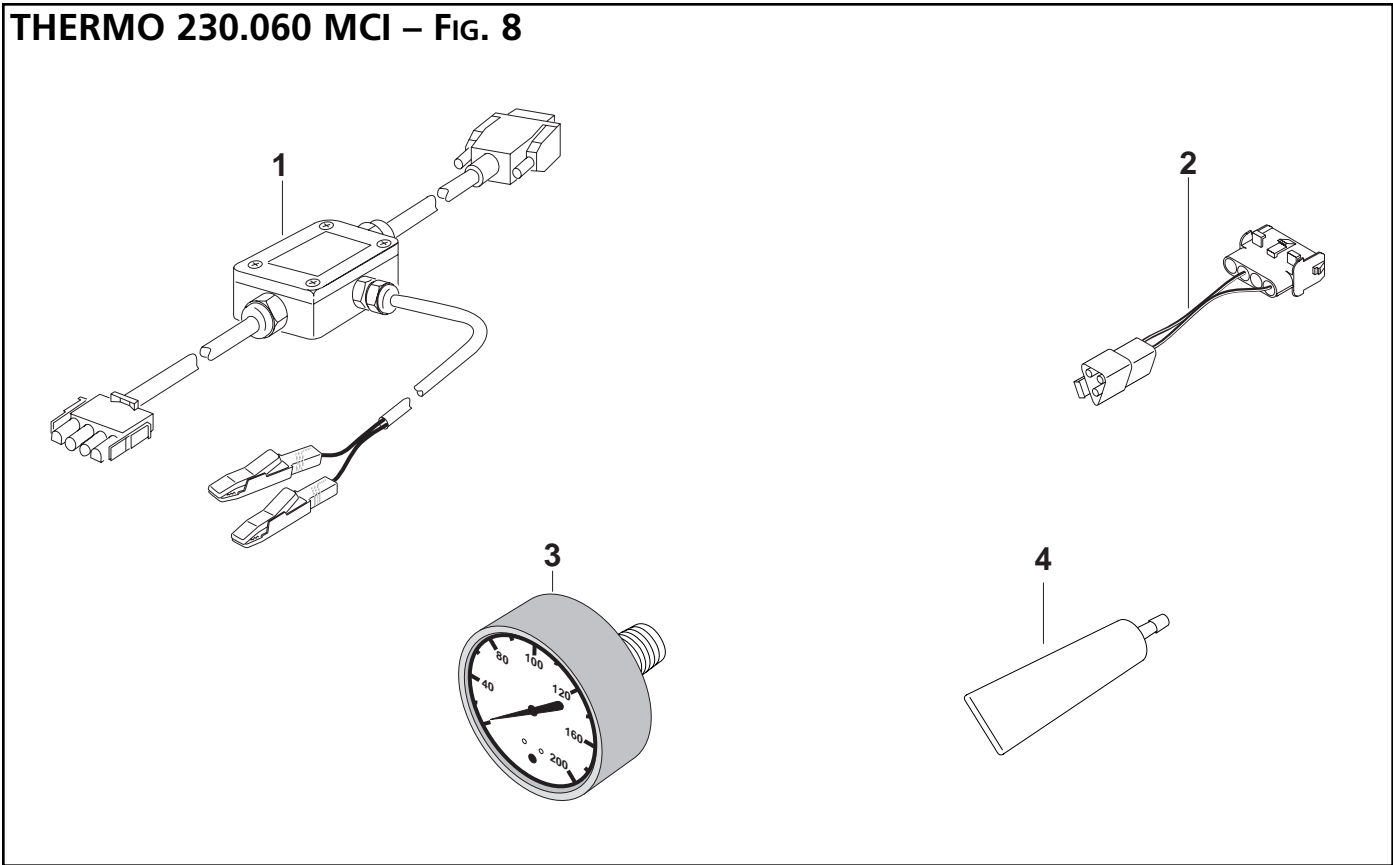
| ITEM | QUANTITY | WEBASTO PART NO. | MCI PART NO. | DESCRIPTION | REMARKS |
|------|----------|------------------|--------------|-------------------------------------|--|
| 1 | 1 | 901300 | 16-16-1101 | Coolant Pump Model U 4814 - 24 Volt | |
| 2 | 1 or 2 | 901288 | 16-16-1139 | Mount Clamp - Pump to Bracket | 1 for D-model 2 for E-model |
| 3 | 1 | 900133 | 16-16-1143 | Pump Mounting Bracket | D-model only |
| 4 | 1 | 5000153A | 16-16-1141 | Coolant Pump Rebuild Kit | Includes items 5,6 & 7 |
| 5 | 1 | 50906084 | 16-16-1142 | Coolant Pump Seal Kit | |
| 6 | 1 | 5097664A | | Coolant Pump Front Housing | |
| 7 | 1 | 30155B | | Splash Guard | |
| 8 | 1 | 901312 | 16-16-1140 | Mounting Clamp | To clamp mounting bracket P/N 900133 to the heater |

THERMO 230.060 MCI – FIG. 7



| ITEM | QUANTITY | WEBASTO PART NO. | MCI PART NO. | DESCRIPTION | REMARKS |
|------|----------|------------------|--------------|------------------------|--------------|
| 1 | 1 | 600590B | 7L-8-3999 | 7-Day Electronic Timer | D-model only |

THERMO 230.060 MCI – FIG. 8



| ITEM | QUANTITY | WEBASTO PART NO. | MCI PART NO. | DESCRIPTION | REMARKS |
|------|----------|------------------|--------------|----------------------------------|---|
| 1 | 1 | 1301728B | | PC Download Kit (IBM) | Includes software |
| 2 | 1 | 97034A | | Adapter Harness for Thermo 230 | Order separately - Required for item 1 |
| 3 | 1 | 600190 | | Fuel Pressure Gauge with Adapter | |
| 4 | 1 | 50000043 | | Dielectric Grease - 2 oz. tube | |



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