


Temperature Control Diagnostic Codes


Temperature control diagnostic codes appear on temperature display.

These alarms turn off heat. E99 clears automatically when communication is regained. Codes E03 through

E06 can be cleared by pressing . For other codes,

turn main power OFF  then ON  to clear.

Code	Code Name	Alarm Zone	Corrective Action page
01	High fluid temperature	Individual	11
02	High zone current	Individual	12
03	No zone current with hose heater on	Individual	13
04	FTS not connected	Individual	13
05	Board overtemperature	Individual	13
06	Communication cable unplugged from module	Individual	13
99	Loss of communication	ALL	19



 For hose zone only, if FTS is disconnected at startup, display will show hose current 0A.

E01: High fluid temperature

Causes of E01 Errors

- Thermocouple A or B (310) senses a fluid temperature above 230°F (110°C).
- Fluid temperature sensor (FTS) senses a fluid temperature above 230°F (110°C).
- Overtemperature switch A or B (308) senses a fluid temperature above 230°F (110°C) and opens. At 190°F (87°C) the switch closes again.
- Thermocouple A or B (310) fails, is damaged, is not touching the heater element (307), or has a poor connection to the temperature control board.
- Overtemperature switch A or B (308) fails in the open position.
- The temperature control board fails to turn off any heat zone.
- Zone power wires or thermocouples are switched from one zone to another.
- Failed heater element where thermocouple is installed.
- Loose wire
- On 6.0 and 10.2 kW heater models only: Jumper wire on J1 connector, between module (3) and display (4), is loose or incorrectly wired.

Checks

				
<p>Troubleshooting this equipment requires access to parts that may cause electric shock or other serious injury if work is not performed properly. Have a qualified electrician perform all electrical troubleshooting. Be sure to shut off all power to the equipment before repairing.</p>				

Check which zone is displaying the E01 error.

1. Check that connector B is firmly plugged into temperature control board (see FIG. 5, page 40).
2. Clean and re-plug connections.
3. Check connections between the temperature control board and overtemperature switches A and B (308), and between temperature control board and thermocouples A and B (310) or FTS (21) [depending on which zone is displaying E01]. See Table 5, page 40. Ensure that all wires are securely connected to connector B.

Electric Reactors - Troubleshooting - Error Codes

Temperature Control Diagnostic Codes

- Remove connector B from temperature control module, and check continuity of overtemperature switches A and B, thermocouples A and B, or FTS by measuring resistance across the pins on the plug end; see TABLE 1.


 Before doing the following checks, note which zone (A, B, FTS, or all) has high fluid temperature.



Table 1: Sensor Connector Continuity Checks

Pins	Description	Reading
1 & 2	OT switch A	nearly 0 ohms
3 & 4	OT switch B	nearly 0 ohms
5 & 6	Thermocouple A	4-6 ohms
8 & 9	Thermocouple B	4-6 ohms
11 & 12	FTS	approximately 35 ohms per 50 ft (15.2 m) of hose, plus approximately 10 ohms for FTS
10 & 12	FTS	open


- Verify fluid temperature, using an external temperature sensing device.
 - If temperature is too high (sensor reading is 229°F [109°C] or above):**
- Check if thermocouples A and B are damaged, or not contacting the heater element, page 44.
- To test that temperature control module turns off when equipment reaches temperature setpoint:
 - Set temperature setpoints far below displayed temperature.
 - Turn zone on. If temperature rises steadily, power board is failing.
 - Verify by swapping with another power module. See **Replacing Temperature Control Assembly Modules**, page 41.
 - If the swapped module does not fix the problem, the power module is not the cause.
- Verify continuity of heater elements with an ohmmeter, see page 42.

E02: High zone current




- Turn main power OFF .
- Relieve pressure, page 26.
 -  Disconnect whip hose.
- Disconnect hose connector (D) at Reactor.
- Using an ohmmeter, check between the two terminals of the connector (D). There should be no continuity.
- Exchange zone module with another one. Turn zone on and check for error. If error disappears, replace faulty module.

For hose zone: If error still occurs, perform **Transformer Primary Check** and **Transformer Secondary Check** starting on page 48.

 When there is a high current error, the LED on that zone's module will turn red while the error is displayed.

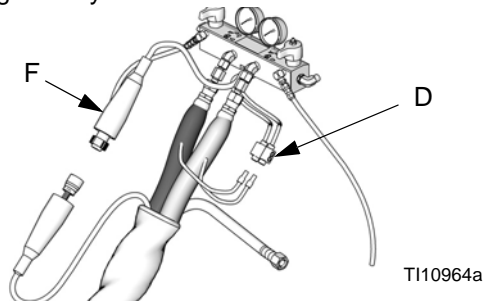
E03: No zone current

1. Check for tripped circuit breaker inside electrical cabinet or at power source for that zone. Replace circuit breaker if it trips habitually.
2. Check for loose or broken connection at that zone.
3. Exchange zone module with another one. Turn zone on and check for error (see page 41). If error disappears, replace faulty module.
4. If E03 occurs for all zones, the contactor may not be closing. Verify wiring from heater control to contactor coil.
 - a. *Hose zone*: test hose continuity, page 45.
 - b. Perform **Transformer Primary Check** and **Transformer Secondary Check**, starting on page 48.

 When a no current error occurs, the LED on the specific zone's module turns red when the error is displayed.


E04: Fluid Temperature Sensor (FTS) or thermocouple disconnected

1. Check temperature sensor connections to long green connector (B) on temperature control module, page 40. Unplug and re-plug sensor wires.
2. Test fluid temperature sensor continuity with ohmmeter, page 11.
3. If an error occurred for the hose zone, check FTS connections at each section of hose.
4. If an error occurred for the hose zone, test FTS by plugging directly into machine.



5. To verify heater control module is not causing the problem, use a wire to short-circuit the two pins corresponding to the FTS (red and yellow for A or B zone, red and purple for hose). The display will show the control heater module temperature.
6. If an error occurred for the hose zone, temporarily use the current control mode. Refer to Reactor Operation manual 312062.

E05: Circuit board overheated

 Each module has an on-board temperature sensor. Heat is turned off if module temperature exceeds 185°F (85°C) within the heater module.

1. Check that fan above electrical cabinet is operating.
2. Check that electrical cabinet door is properly installed.
3. Check for obstructions blocking cooling holes in bottom of electrical cabinet.
4. Clean heatsink fins behind heater control modules.
5. Ambient temperature may be too high. Allow Reactor to cool by moving to a cooler location.

E06: Communication cable unplugged

1. Unplug and re-plug cable that connects heater control module to heater module.
2. Replace communication cable if problem persists.

Motor Control Diagnostic Codes

Motor control diagnostic codes E21 through E29 appear on pressure display.

There are two types of motor control codes: alarms and warnings. Alarms take priority over warnings.

Alarms

Alarms turn off Reactor. Turn main power OFF



then ON



to clear.




Alarms can also be cleared, except for code 23, by

pressing



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Warnings

Reactor will continue to run. Press  to clear. A warning will not recur for a predetermined amount of time (varies for different warnings), or until main power

is turned OFF



then ON



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Code	Code Name	Alarm (A) or Warning (W)	Corrective Action page
21	No transducer (component A)	A	16
22	No transducer (component B)	A	16
23	High fluid pressure	A	16
24	Pressure imbalance	A/W (to select, see page 37)	16
25	High line voltage	A	18
26	Low line voltage	A	18
27	High motor temperature	A	18
28	High current	A	29
29	Brush wear	W	19
30	Momentary loss of communication	-	19
31	Motor control failure	A	18
32	Motor control overtemperature	A	19
99	Loss of communication	-	19

E21: No component A transducer

1. Check transducer A connection at J3 on motor control board, page 37, and clean contacts.
2. Reverse A and B transducer connections. If error moves to transducer B (E22), replace transducer A, page 39. If error does not move, replace motor control board, page 37.

E22: No component B transducer

1. Check transducer B connection at J8 on motor control board, page 38, and clean contacts.
2. Reverse A and B transducer connections. If error moves to transducer A (E21), replace transducer B, page 39. If error does not move, replace motor control board, page 37.

E23: High fluid pressure

1. Relieve pressure. Verify low pressure with analog

gauges. Turn main power OFF  then ON



. If error persists, do checks below.

1. Check the jumpers and the wiring. Check jumper on motor control board J10 for E20 and E-XP1, or J7 for E30 and E-XP2, pins 7-10, page 37.

2. Remove, clean and re-install the pressure transducer leads

If the jumpers and the wiring are in good working condition and you still have the error, then you will need to replace the “A” and “B” pressure transducers.

3. To determine if it’s the “A” or the “B” transducer, you will need a known good Reactor pressure transducer to use as a “test” transducer. The test is done without removing the existing pressure transducers from the fluid manifold.


- a. Unplug the “A” transducer from the Motor control board socket (page 39) and replace with “test” transducer.


- b. Turn on the Reactor master power.

- If the error is gone, turn off the Reactor main power, remove test transducer, and replace “A” transducer.
- If the error persists, unplug the “test” transducer from the “A” socket, and reinstall the “A” pressure transducer back into the “A” socket. Repeat this test procedure on the “B” side.

4. If the error persists and no root cause is found through the above testing, replace the motor control board, page 37.

E24: Pressure Imbalance

 If the pressure difference between components A and B exceeds 500 psi (3.5 MPa, 35 bar), an E24 will occur. This default value is adjustable; see the operation manual.

 E24 can be an alarm or a warning, as desired. Set DIP switch on motor control board ON for alarm, OFF for warning. See page 37.

Fast E24 Errors

Fast E24 errors occur:

- within 10 seconds of turning the pumps on, or
- as soon as you trigger the gun.

Causes of Fast E24 Errors


- one side of the gun is plugged.
- a pressure transducer has failed.
- damaged pump seals or check valve.
- no feed pressure or empty material drum
- plugged heater.
- plugged hose.
- plugged manifold.
- one PRESSURE RELIEF/SPRAY valve is leaking or

is set to PRESSURE RELIEF/CIRCULATION 

Electric Reactors - Troubleshooting - Error Codes

Motor Control Diagnostic Codes

Checks for Fast E24 Errors

 If a fast E24 error occurs, first check the readings of the analog gauges.

If gauge pressures are very close

1. Clear the error and run the unit.
2. Check plug J10 (E20/E-XP1) or J7 (E30/E-XP2) or the jumpers 7 to 8, or 9 to 10 on the motor control board.
3. Check pressure transducer performance:

The digital display on a Reactor always shows the higher of the two pressures. As soon as the higher analog pressure drops below the lower analog pressure the digital display will switch to the new highest reading. Determine which transducer is performing poorly.

1. For testing purposes only, find the dip switches labeled SW2 on the motor control board, page 38. Set dips with 3 to OFF. This will allow the Reactor to run with a pressure imbalance alarm.
2. Run the unit to build up some pressure (1000 – 1200 psi). Shut down the unit, clear the alarm and power back up. Do not depressurize the unit.
3. Check the analog gauges to see which pressure is higher. Check if the display pressure matches, indicating that the motor control board “sees” that transducer. If not, the motor control board does not “see” that transducer. Check the wire connections and or replace the transducer.
4. With the pump zone off, use the pressure relief valves to slowly relieve the “high” side pressure, while watching the digital display and the analog gauges. Once the higher analog gauge drops below the lower analog pressure the motor control board should start reading the “new” high side pressure (because it is now the higher of the two). Continue dropping the original “high” side pressure - the digital display should stop dropping. Repeat the process to check the other pressure transducer.

The last test determines if the pressure transducer has failed or if the socket on the pressure control board has gone bad.

1. Swap the transducer plug-ins on the motor control board. (J3 and J8 for the E-20 and E-XP1. J3 and J5 for the E30 and E-XP1).
2. Repeat above test.
3. If the problem stays with the same side as before, then the pressure transducer is bad.
4. If the problem switches to the other transducer, then the problem is in the motor control boards socket.

If the gauge readings are *not* equal.

1. Clear the error and balance the pressures using the dump valves.
2. If you cannot get the pressures to balance:
 - Check for pump failure.
 - Check for adequate material.
 - Using the feed pump to push fluid out through the gun manifold, check for a plugged fluid path.
 - Run the unit.
 - Check and clean the gun inlet screens.
 - Check and clean the mix chamber “A” and “B” impingement ports a well as the center port. **Note: Some mix chambers have counter bored holes, and require two drill sizes to clean impingement ports completely.**

“Slow” E24:

- When spraying, gradual pressure imbalance and eventual E24.

Possible Causes:

- One side of the Gun is partially blocked.
- The “A” or the “B” pump on the Reactor has failed.
- The “A” or the “B” feed pump has failed.
- The “A” or the “B” feed pump pressure is set too high.
- The “A” or the “B” inlet screen is plugged.
- The hose is not heating properly.
- Kinked supply hose.
- Bottom of the drum is damaged causing a blockage to the inlet of the feed pump.
- The drum is not vented properly.

E25: High line voltage

Supply voltage too high. Check Reactor voltage requirements, page 75.

E26: Low line voltage

Supply voltage too low. Check Reactor voltage requirements, page 75.

E27: High Motor Temperature

1. Motor temperature too high. Reduce pressure, gun tip size, or move Reactor to a cooler location. Allow one hour for cooling.
2. Check fan operation.
3. Ensure there is no obstruction around the fan area that would cause lack of airflow; ensure the motor/fan shroud is installed.
4. Ensure the unit is being operated with the front cover on.
5. Ensure the brush wear/over temp switch wire assembly is plugged into J7 (E-20/E-XP1) or J6 (E-30/E-XP2) of the motor control board.
6. With the main power off, unplug the wire harness from J7 (E-20/E-XP1) or J6 (E-30/E-XP2) on the motor control board and install a jumper wire on pins 1 and 2. Turn the main power back on.

If E27 is gone:

If the E27 error is gone and the motor is truly not overheated, then the problem can be in the motor/motor wire harness assembly. Measure the resistance between the two yellow wires that go to pins 1 and 2 of the motor connector. If there is an open connection, the thermal overload switch is open or there is a broken wire inside the motor, or a broken wire in the motor harness.

If the E27 error code is still there, double check if pins 1 and 2 are jumpered properly. If jumpered properly, then it would appear that the problem is with in the motor control board.

E28: High current in motor

Check motor control board:

1. Turn the master power off.
2. Disconnect socket J4 (E-20/E-XP1) J1 (E-30/E-XP2) on the motor control board.
3. Turn the master power back on.
4. If the E28 error did not go away then there is a problem with the motor control board. Replace board, page 37.

Check motor:

1. Check to see if the motor rotates freely.
2. Check to see if the brushes are damaged.
3. Check that the voltage going to the motor is good.
4. Check the three wire (yellow, yellow, orange) motor connector to the motor board. A gentle tug on each wire individually at the connector should identify the loose wire. If a wire pulls out, bend the locking tab on the crimp end, insert the wire until it seats and repeat gentle tug.
5. If the above does not resolve the problem, replace the motor, page 36.

E29: Brush Wear

CAUTION
Prolonged operation of motor after a brush wear warning may result in failure of motor and motor control board.

1. Check for normal brush wear, which causes the brush sensor to come in contact with the motor commutator. Replace the brushes, page 33.
2. Check spade plug. The spade plug inside the motor housing may be twisted and contacting the commutator side of the brush sensor assembly, causing a false alarm. Follow the orange wire coming from J7 (E-20/E-XP1), or J6 (E-30/E-XP2), up to the spade connector on the motor. Using a flashlight, ensure the spade plug assembly is **not** making contact with the metal housing of the brush assembly.


Electric Reactors - Troubleshooting - Error Codes

Motor Control Diagnostic Codes

3. Check wiring. The orange brush sensor wire coming out of the brush may be routed online with the commutator wiring (thick red wire), causing a false alarm. Reroute the orange wire coming out of the brush, away from the commutator wiring.
4. Check motor control board.
 - Remove the plug in J7 (E-20/E-XP1), or J6 (E-30/E-XP2). (This will cause an E27 alarm).
 - To remove the E27 alarm, use a jumper wire on the motor control board, across the two pins that the two yellow wires plug into. Then turn the unit on.
 - The E27 as well as the E29 alarm should be gone. If the E27 alarm is not gone double-check your jumper.
 - If the jumper is installed correctly and the E29 alarm is still there, replace the motor control board, page 37.



E31: Motor Control Failure (E-30 and E-XP2 only)

The E31 error code represents a motor drive error. This indicates that the 24G881 motor control board has malfunctioned and needs to be replaced. A motor control board failure may also be indicated by the motor starting up immediately upon the application of power to the sys-

tem, without pressing . This is an indication that the output drivers of the motor control have shorted out and are delivering full power to the motor at all times.

The cause of the failure may be one of the following conditions: motor failure, capacitor failure, shorted or frayed wiring, or inadequate power supply. Perform the following procedure before replacing the motor control board.

1. Turn main power OFF . Disconnect power supply.

				
Wait 5 minutes for stored voltage to discharge (E-30 and E-XP2 models only).				

2. Relieve pressure, page 26.
3. Perform the following inspections.
 - a. **Motor failure:** Inspect the motor commutator by removing the top brush (see Brush Removal, page 33). Rotate the motor, inspecting the whole commutator for burns, pocking, or shorts between poles. Continue rotating the motor for a complete pump cycle, up and down, to ensure that there is no mechanical interference or restriction in the pump lower or gear drive system.
 - b. **Capacitor failure:** Inspect and test the motor start capacitor, following the Capacitor Test instructions on page 35.
 - c. **Shorted or frayed wiring:** Inspect all wiring connected to the motor control board and the motor, for shorts or frayed insulation. Replace any compromised wires with wire of the same gauge, color, and temperature rating.
 - d. **Inadequate power supply:** Verify that the power source is of the correct voltage and current rating for the system, and that all phases are properly connected. Ensure that the power does not dip or surge during operation.

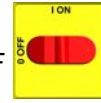
Prior to shutting down the generator, ensure that the motor has stopped and the main disconnect is opened. If the generator is stopped during operation, even due to running out of fuel, the drop in supply voltage may cause a motor drive failure.

E32: Motor Control Overtemperature

The E32 error code indicates a high temperature condition within the motor control board (701). This could be caused by an abnormally high ambient temperature in the work location, blockage of cooling vents in the cabinet, or the failure of the cooling fan inside the cabinet.

1. Relieve pressure, page 26. Verify low pressure with analog gauges.

2. Turn main power OFF



then ON



If error still remains, identify cause of the overtemperature condition and remedy.

Communication Diagnostic Codes

E30: Momentary loss of communication

Communications between the display and the motor control board or the temperature control board have been momentarily lost. Normally, when communication is lost, the corresponding display will show E99. The corresponding control board will register E30 (The red LED will flash 30 times). If communications are reconnected, the display can show the E30 for a short time (no more than about two seconds). It should not be possible for E30 to be shown continuously, unless there is a loose connection causing the display and the board to continuously lose and regain communication.

Check all wiring between the display and the corresponding control board.

E99: Loss of communication

Communications between the display and the motor control board or the temperature control board has been lost. When communication is lost, the corresponding display will show E99.

1. Check all wiring between the display and the corresponding control board. Pay close attention to the wire crimping on plug J13 for each board.

Step 2 measures line voltage and should be done by a qualified electrician. If work is not performed properly it may cause electric shock or other serious injury.				

2. Measure the incoming voltage to the board (it should be ~ 230Vac).
3. If it was only receiving 1 leg of the 230Vac the board may light up, and still not function properly. Correct the incoming voltage problem.