

SECTION 4

Troubleshooting

This section describes the troubleshooting procedure and possible errors and remedies when the E5ZE is not operating properly. When performing troubleshooting follow the order in which information is provided in this section.

4-1	Troubleshooting Procedure
4-2	Communications Errors
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4-5	Output Errors
4-6	HB Alarm and HS Alarm Errors

4-1 Troubleshooting Procedure

If the E5ZE has an error, refer to the following items to find the possible cause of the error and take corrective measures.

1, 2, 3... 1. Indicators

Check the operating status of the E5ZE using the indicators.

If the ERR indicator is lit, turn the E5ZE OFF and ON. If the ERR indicator is not lit after the E5ZE is turned ON, it may mean that the E5ZE is being influenced by noise. Find the source of the noise and provide adequate protection against it.

2. Switch, Selectors, and Wiring

Check if the switch and selector settings of the E5ZE, the wiring of the E5ZE and devices connected to the E5ZE are correct.

a) Power Supply

- Check that the power supply connected to the E5ZE is turned ON.
- Check whether the supply voltage at the power supply terminals is within the allowable voltage range of the E5ZE.

b) Switch and Selectors

Check that the switch and selectors of the E5ZE are correctly set according to the system.

c) Wiring

- Check that the terminals and connectors are wired together correctly.
- Check that the terminal block wiring is correct.
- Check that the polarity of each wire connected to the E5ZE is correct.
- Check if any wire is disconnected.
- Check if a wire or cable is cut or short-circuited.
- Check that the wiring-reduction devices connected to the E5ZE are the correct designated ones.

d) Communications Conditions

Check that the communications conditions of the E5ZE are compatible with the host device connected to the E5ZE.

Check the above items and remedy any problems listed above. If the error persists after error processing, perform further checks through communications.

3. Checking through Communications

- Check the end code and error code with the response returned from the E5ZE.
- Check the status of the E5ZE with the Status Read Command.
- Check if the functions used with the E5ZE have any operating restrictions.
- Check if the set data items of the communication commands used for the E5ZE are correct.

Troubleshoot problems on the basis of the data read with the E5ZE.

4. Troubleshooting Based on Error Symptoms

If the cause of the error is still unknown after checking all the previously mentioned items, find the cause by isolating the symptoms of the error while referring to the tables in this section, and remedy accordingly.

4-2 Communications Errors

Communications Not Possible or No Response

	Probable cause	Remedy
Communications conditions	Baud rate of the E5ZE is different from that of the host device.	Set the same rate.
	Communications method of the E5ZE is different from that of the host device.	Set the host device's communications conditions as follows: <ul style="list-style-type: none"> • Stop bits: 2 • Parity: Even • Bit length: 7 bits
Connections	Excessive number of E5ZE Units are connected in parallel.	Do not connect an excessive number of E5ZE Units. <ul style="list-style-type: none"> • Do not connect the host device directly to more than one E5ZE through RS-232C communications. • The number of E5ZE Units that can be connected to the host device for RS-422 or RS-485 communications is 16 max.
	Transmission path is too long.	The transmission path must be within the permissible range. <ul style="list-style-type: none"> • The maximum RS-232C transmission path is 15 m. • The maximum RS-422 or RS-485 transmission path is 500 m in total.
	Same unit number has been assigned more than once on the same transmission path.	Make sure that different numbers are assigned to all the E5ZE Units that communicate with the host device.
	Communications data error due to ambient noise.	<ul style="list-style-type: none"> • Move the communications cable away from the source of noise. • Use shielded communication cables. • Use an Optical Interface. • Write a program that makes it possible for the host device to detect a response error for any command that the host device transmits and to re-transmit it again.
	Mistake in the use of the Optical Interface and Link Adapter Units.	Refer to the datasheets of the Optical Interface and Link Adapter Units used.

Probable cause		Remedy
Program	System begins communications without any interval after the E5ZE Units are turned ON.	Write a program so that the system starts communications with an interval of 5 s min. after the E5ZE Units are turned ON.
	Unstable signal of the E5ZE, which is generated when the E5ZE is turned ON or OFF, is read as data by the host device.	Initialize the reception buffer of the host device at the following stages. <ul style="list-style-type: none"> • Before the host device transmits the first command. • After the E5ZE is turned OFF.
	Host device sends commands to the E5ZE before receiving any response from the E5ZE.	Write a program enabling the host device to read the response after the host device sends any command.
	Interval between the time the host device receives a response and sends a command is too short.	The interval between the time the host device receives a response and sends a command must be 20 ms minimum.
	Program of the host device is incorrect.	<ul style="list-style-type: none"> • Correct the program. • Check the command with the line monitoring function. • Run a sample program with the host device.
Settings	Unit numbers set with the selectors are different from those set using the commands of the host device.	The unit numbers must coincide.
	Pin 8 of the FUNCTION switch on the E5ZE is ON.	Turn OFF pin 8 of the FUNCTION switch on the E5ZE.
	E5ZE is in hardware test mode.	The E5ZE must be in control mode.
	Termination resistance settings for RS-422 or RS-485 communications are incorrect.	The E5ZE or host device located on both ends of the E5ZE system must have termination resistances.
	RS-422 or RS-485 settings are incorrect.	Correct the communications switch settings.

4-3 Temperature Sensing Errors

Temperature Sensing Not Possible or Abnormal

Probable cause		Remedy
Connections	Polarity or wiring of a temperature sensor is incorrect.	Correct the wiring of the temperature sensor.
	Temperature sensor is not an applicable one.	Replace the temperature sensor with an applicable one.
	Leads of a temperature sensor are disconnected, short-circuited, or deteriorated.	Replace the temperature sensor.
	Temperature sensors are not used.	Use temperature sensors.
	Thermocouple does not use applicable compensating conductors.	<ul style="list-style-type: none"> • Replace the thermocouple with another thermocouple with long leads. • Connect applicable compensating conductors for the thermocouple.
	Thermocouple is connected to the E5ZE with a device using a metal that is different in type from the metal of the thermocouple or that of the compensating conductors.	Connect a thermocouple-dedicated device between the thermocouple and the E5ZE.
	A screw of the terminal block of the E5ZE is loosened and improper contact is resulting.	Tighten the screw.
	Leads or compensating conductors of a thermocouple are too long and leads or compensating conductors have resistance.	<ul style="list-style-type: none"> • Use sufficiently thick compensating conductors. • Change the location of the thermocouple so that the length of the leads or compensating conductors can be shortened.
	The resistance of the conductors for the 3 terminals is different from the resistance of the temperature sensor connected to the E5ZE.	Use conductors that are the same in resistance for the two B terminals and the A terminal.
Installation	Noise is affecting the E5ZE.	<ul style="list-style-type: none"> • Separate the E5ZE from the source of the noise. • Connect a surge absorber or noise filter to the device generating the noise.
	Inductive noise generated from power lines is affecting the leads of a temperature sensor.	<ul style="list-style-type: none"> • Separate the leads from the power lines. • Wire the leads in a separate conduit or duct. • Do not wire the leads alongside power lines. • Shorten the leads. • Shield the leads.
	Thermal response of a temperature sensor connected to the E5ZE is slow because the temperature sensor is located far from the temperature controlling position of the E5ZE.	Locate the tip of the protective tubing of the temperature sensor at the temperature controlling position.
	Ambient operating temperature of the E5ZE is not within the allowable ambient operating temperature range of the E5ZE.	The ambient operating temperature range of the E5ZE must be between 0°C and 55°C.
	Radio transmitter is being used near the E5ZE.	Shield the E5ZE.
	E5ZE is affected by heat radiation from Peripheral Devices and the temperature of the terminal block of the E5ZE is not even.	Install the E5ZE in a location where it will not be affected by heat radiation.
	Terminal block of the E5ZE is affected by wind.	Protect the terminal block of the E5ZE against wind.

Probable cause		Remedy
Settings	Selector settings for the input type of temperature sensor are incorrect.	Correct the INPUT selector setting.
	Celsius-Fahrenheit designation of the E5ZE is incorrect.	Correct the FUNCTION switch setting.
	The process value appears to be incorrect due to the input shift setting.	Set the input shift to 0.0.
	E5ZE FUNCTION switch is not set correctly for the E5ZD-SDL Setting Display Unit connected to the E5ZE.	Correct the FUNCTION switch setting.
	Data setting unit is incorrect.	Change the program of the host device.
Operation	Program of the host device is incorrect.	Change the program of the host device.
	Temperature sensor input terminals of the E5ZE thermocouple input model have been short-circuited.	Connect a thermocouple to the temperature sensor input terminals.
	Temperature sensor connected to the E5ZE has been replaced or the switch or selector settings of the E5ZE have been changed while the power is ON.	Turn OFF the power to the E5ZE, and then turn ON again.

Simple Method for Checking Temperature Sensors

Platinum Resistance Thermometer

- 1, 2, 3...**
1. Connect a 100-Ω resistor between the A and B temperature sensor input terminals and short-circuit the B terminals.
 2. If the temperature sensed by the E5ZE is 0.0°C or 32.0°F, the E5ZE is operating normally.

Thermocouple

- 1, 2, 3...**
1. Short-circuit the temperature sensor input terminals of the E5ZE.
 2. If the E5ZE senses the temperature of the terminal block of the E5ZE, the E5ZE is operating normally.

4-4 Temperature Control Errors

Temperature Does Not Rise

Probable cause		Remedy
Connections	Process value of the E5ZE is abnormal.	Refer to 4-3 <i>Temperature Sensing Errors</i> for appropriate troubleshooting.
	Load is not connected to the control output terminal of the E5ZE.	Connect a load.
	Polarity or wiring of a load is incorrect.	Correct the wiring of the load.
	A screw of the terminal block of the E5ZE is loosened and improper contact is resulting.	Tighten the screw.
	Power is not supplied to heaters.	Supply power to the heaters.
	Heaters are burnt out or have deteriorated.	Replace the heaters.
	Heat capacity of the heater is too small.	<ul style="list-style-type: none"> • Replace the heater with one having a larger heat capacity. • If more than one heater is used and some are burnt out, replace the heaters.
	Overheating prevention device for the E5ZE is operating.	The set value of the overheating prevention device must be larger than the set value of the E5ZE.
Settings	E5ZE is in reverse operation mode, instead of direct operation mode, or vice versa.	Correct the operation mode setting.
	PID constants of the E5ZE are incorrect.	<ul style="list-style-type: none"> • Execute auto-tuning. • Set the PID constants of the E5ZE to appropriate values.
	E5ZE has not started temperature control.	Start the temperature control.
	Control output value of the E5ZE does not increase because of the restrictions of the set output limit value.	<ul style="list-style-type: none"> • Set the output limit value of the E5ZE to an appropriate value.
	Control output value of the E5ZE does not increase because of the restrictions of the set output change rate limit.	<ul style="list-style-type: none"> • Disable the output change rate limit function of the E5ZE by setting to 0000. • Set the output change rate limit of the E5ZE to an appropriate value.
	Cooling fan is operating.	Turn OFF the cooling fan.

Process Value Exceeds Set Point

Probable cause		Remedy
Connections	Process value of the E5ZE is abnormal.	Refer to 4-3 <i>Temperature Sensing Errors</i> for appropriate troubleshooting.
	Load is connected to the incorrect control point of the E5ZE and is controlling the heaters with the control output of the incorrect control point.	Correct the wiring of the load.
	Relay driven by control output has contact weld.	Replace the relay.
	SSR is short-circuited.	Replace the SSR.
	SSR leakage current is flowing into the heaters.	Connect a bleeder resistance to the SSR to prevent operation with the SSR leakage current.
Settings	E5ZE is in reverse operation mode, instead of direct operation mode, or vice versa.	Correct the operation mode setting.
	PID constants of the E5ZE are incorrect.	<ul style="list-style-type: none"> • Execute auto-tuning. • Set the PID constants of the E5ZE to the values suitable to the system.
	Control output value of the E5ZE does not increase because of the restrictions of the set output limit value.	<ul style="list-style-type: none"> • Set the output limit value of the E5ZE to an appropriate value.
	Control output value of the E5ZE does not increase because of the restrictions of the set output change rate limit value.	<ul style="list-style-type: none"> • Disable the output change rate limit function of the E5ZE by setting to 0000. • Set the output change rate limit value of the E5ZE to an appropriate value.
	E5ZE is outputting in manual operation.	Interrupt the manual operation of the E5ZE.
Operation	Controlled object is radiating heat.	Execute heating and cooling control.
	Controlled object is influenced by large overshooting.	Refer to the following table regarding overshooting and undershooting for appropriate troubleshooting.

Overshooting or Undershooting

Probable cause		Remedy
Connections	Process value of the E5ZE is abnormal.	Refer to 4-3 <i>Temperature Sensing Errors</i> for appropriate troubleshooting.
	General-purpose temperature sensor with slow thermal response characteristics is being used to sense a controlled object with quick thermal response characteristics.	Change to a sheath-type temperature sensor.
Settings	E5ZE has a narrow proportional band and small P constant.	<ul style="list-style-type: none"> • Increase the P constant keeping within the range where the response delay caused by the P constant can be allowed. • Execute auto-tuning.
	E5ZE has a short integral time or small I constant.	<ul style="list-style-type: none"> • Increase the I constant keeping within the range where the response delay caused by the I constant can be allowed. • Execute auto-tuning.
	E5ZE has a short derivative time or small D constant.	<ul style="list-style-type: none"> • Increase the D constant keeping within the range where the D constant will not have an undesirable influence on temperature stability. • Execute auto-tuning.
	E5ZE is executing ON and OFF control with a P constant of 0.	Execute P or PID control.
	Control period is too long when the E5ZE controls the temperature of an object with quick thermal response characteristics.	Shorten the control period.
	Dead band instead of an overlap band is set with the E5ZE in heating and cooling control operation.	Set the overlap band of the E5ZE.

Hunting

For troubleshooting problems with connections and settings, refer to the same probable causes and remedies as provided for overshooting and undershooting.

Probable cause		Remedy
Operation	Heat capacity of a heater controlling the temperature of an object is too large for the object.	Use a heater with a heat capacity suited to the object.
	Heat capacity of a controlled object changes due to periodical external disturbances.	Take appropriate measures to prevent the periodical external disturbances.
	E5ZE is executing auto-tuning.	Hunting will not occur if auto-tuning is completed.

4-5 Output Errors**Control Output or Alarm Output Does Not Turn ON**

Probable cause		Remedy
Connections	Process value of the E5ZE is abnormal.	Refer to <i>4-3 Temperature Sensing Errors</i> for appropriate troubleshooting.
	Polarity of the load or connected terminals are wired incorrectly.	• Correct the wiring.
	Connectors are not connected to the correct terminal blocks.	• Connect the connectors correctly.
	Load exceeding the output ratings of the E5ZE is connected.	• Connect a load that does not exceed the output ratings to the E5ZE. • Request repair of the E5ZE if it is malfunctioning.
	Load power supply is not connected to alarm output or cooling control output.	Provide a power supply satisfying the output ratings of the E5ZE and suitable for the load.
	Polarity of the load power supply for alarm output or cooling control output is incorrect.	Correct the wiring.
	Power is not being supplied to the wiring-reduction device.	Supply power required to satisfy the ratings of the device.
	The wiring-reduction device is not connected to the E5ZE using Connecting Cable.	Use the Connecting Cable specified in <i>2-6 Wiring CT Inputs and Control/Alarm Outputs</i> .

Probable cause		Remedy
Settings	Pin 5 of the FUNCTION switch is OFF (control operation OFF).	<ul style="list-style-type: none"> • Transmit Control Operation Start from the host device after turning the E5ZE ON. • Set pin 5 of the FUNCTION switch to ON (control status continues even after E5ZE is turned OFF).
	E5ZE has not started control operation.	Transmit Control Operation Start from the host device.
	Control point designation is incorrect.	Set the correct control point numbers.
	Set point of the E5ZE is set incorrectly.	Correct the set point settings.
	The parameters for the specified memory bank are not set.	<ul style="list-style-type: none"> • Set the parameters. • Switch to the correct memory bank.
	Incorrect memory bank of E5ZE is designated.	Set the correct memory bank.
	All the control points of the E5ZE are controlled by a single memory bank because the memory bank was designated with contact input.	Set the FUNCTION switch of the E5ZE to communications so that different memory bank numbers can be designated for each control point.
	When designating a memory bank with contact input, the ON or OFF status of the contact is not kept on hold.	Set the E5ZE so that the ON or OFF status of the contact is kept on hold while designating the memory bank with the contact input.
	E5ZE attempts memory bank designation with communications when memory bank contact input designation is selected.	Correct the memory bank designation method setting.
	Alarm mode of the E5ZE is set to 00 (no alarm function).	Set the correct alarm mode.
	Alarm mode of the E5ZE is set to alarm with standby sequence.	Use alarms without a standby sequence.
	Deviation value and absolute value are incorrect for the alarm mode set.	Set the correct alarm mode.
	CompoBus/D communications are being used, but the RUN/STOP Bit is not turned ON at the host device.	Turn ON the RUN/STOP Bit at the host device.
	CompoBus/D communications are being used, but the set point is incorrectly set at the host device.	Set the correct set point in the applicable data area at the host device using 16-bit signed binary format.

4-6 HB Alarm and HS Alarm Errors

HB Alarm and HS Alarm Errors: Heater Burnout Detection or SSR Failure Detection Function Not Possible

Probable cause		Remedy
Connections	Current Transformer is not connected.	Connect a Current Transformer to the E5ZE.
	Current Transformer is wired to an incorrect control point of the E5ZE.	Wire the Current Transformer to the correct control point.
	Heaters are controlled directly with an alarm output.	Change the wiring so that the CT input is connected to the correct control output.
Settings	E5ZE has not started control operation.	Start the control operation.
	Control output of a control point is ON for less than 100 ms.	The HB alarm will operate if the control output of any control point of the E5ZE is turned ON for 100 ms or more.
	Control output of a control point is OFF for less than 100 ms.	The HS alarm will operate if the control output of any control point of the E5ZE is turned OFF for 100 ms or more.
	HB alarm and HS alarm are disabled (set to 0).	Enable the HB alarm and HS alarm by setting to 1.
	HB alarm and HS alarm are enabled before the heaters are turned ON.	Turn ON the heaters before enabling the HB alarm and HS alarm.
	Heaters are turned ON after the E5ZE starts control operation.	Turn ON the heaters before starting the E5ZE control operation.
	Heater burnout detection current value of the E5ZE is set to 0.0 or 50.0 A.	Set the heater burnout detection current value to an appropriate value between 0.1 and 49.9 A.
	Heater burnout detection current value of the E5ZE is set to the rated current.	Determine the heater burnout detection current value from the actual current consumption of the heaters.
	Heater burnout detection current value obtained from the actual current consumption of the heaters is incorrect.	Reset the heater burnout detection current value by considering the voltage range of the power supply for the heaters and any error in measurement of the current.
Operation	Total current consumption of the heaters connected to the E5ZE exceeds 50.0 A.	Set the heater current to 50.0 A maximum.
	Heaters connected are supplied with DC, or the E5ZE is a current output type model.	The HB alarm and HS alarm do not operate under these conditions.
	Pure metal heaters are being used.	Determine the heater burnout detection current value from the actual current consumption of the heaters.