

Instruction Manual

SYL-1507 PID Temperature Controller Instruction Manual

Version 1.1 (February 09, 2026)



Caution

- This controller is intended to control equipment under normal operating conditions. If failure or malfunction of it could lead to an abnormal operating condition that could cause personal injury or damage to the equipment or other property, other devices (limit or safety controls) or systems (alarm or supervisory) intended to warn of or protect against failure or malfunction of the controller must be incorporated into and maintained as part of the control system.
- Installing the rubber gasket supplied will protect the controller front panel from dust and water splash (IP54 rating). Additional protection is needed for higher IP rating.
- This controller carries a 90-day warranty. This warranty is limited to the controller only.

1. Specifications

Input Type	Thermocouple (TC): K, E, S, R, J, T, B, WRe3/25 RTD (Resistance Temperature Detector): Pt100, Cu50
Input Range	See Table 2
Display	One line, four digits, 0.28"
Temp. Resolution	1°C, 1°F; or 0.1°C, 0.1°F with PT100
Accuracy	± 0.2% or ± 1 unit of full input range
Control Mode	PID, ON/OFF.
Power Output	< 250 W at 85 ~ 260 VAC
Output Voltage	Matches the input voltage
Power Consumption	< 6 W (controller)
Power Input	85 ~ 260 V AC / 50 ~ 60 Hz
Dimension	24 x 48 x 75 mm (1/32 DIN)
Mounting Cutout	22 x 45 mm

2. Front Panel and Operation

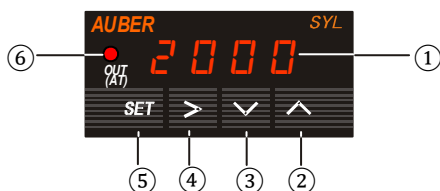


Figure 1. Front panel.

- Display window. The temperature of the probe (Process Value, or PV) is displayed during operation. The target temperature (Set Value or SV) is displayed when flashing (by press the ^ or V key once). The parameters value is displayed during controller set up.
- Value increment/Select next parameter.
- Value decrement /Select previous parameter.
- Auto tuning /Digit shift.
- Set/Confirm/Control start (For limit control mode, press it for 5 seconds)
- OUT - output indicator /(AT) - blinking during auto-tuning process.

3. Terminal Wiring (back view)

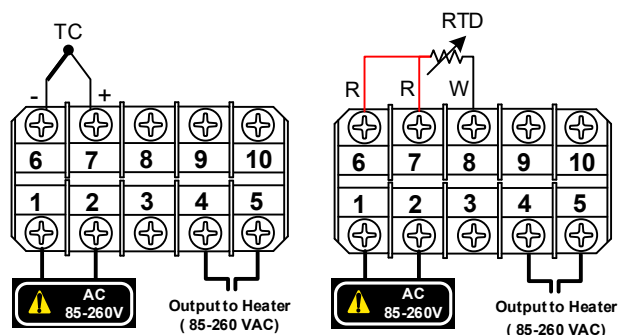


Figure 2. Terminal assignment of SYL-1507, with the thermocouple input on the left and the RTD input on the right.

3.1 Sensor Connections

3.1.1 Thermocouple

The thermocouple should be connected to terminals 6 and 7, with terminal 7 being the positive and 6 being the negative. If a thermocouple is connected in the reversed polarity, the temperature reading will decrease as actual temperature increases. There are two commonly used color codes for the type K thermocouple: the US color code uses yellow (positive) and red (negative). Imported DIN color code uses red (positive) and green/blue (negative).

3.1.2 RTD Sensor

For a three-wire RTD sensor with standard DIN color code, the two red wires should be connected to the terminals 6 and 7. The white wire should be connected to terminal 8. For a two-wire RTD, the wires should be connected to terminals 7 and 8. Add a jump wire between terminals 6 and 7. Set controller input type "INTY" to "P100" (with a 1° resolution) or "P10.0" (with a 0.1° resolution).

3.2 Power to the Controller

The power cables should be connected to terminals 1 and 2. Connecting the AC power to the wrong terminals can damage the controller. Please identify the power input terminals on the factory sticker as shown in Figure 3. This controller can be powered by 85 ~ 260 V AC power source. For the sake of consistency with the wiring example described later, we suggest you connect the live (hot) wire to terminal 1; and connect neutral wire to terminal 2. Since the controller is in a plastic shell, ground wire is unnecessary.

3.3 Output Connection

This controller can provide AC power through terminals 4 and 5 to drive a small load directly. The output voltage is the same as the input voltage. **Terminal 1 and Terminal 4 are connected internally.** If the live wire from the power supply is connected terminal 1, then terminal 4 will be the AC live wire of the output power. The controller has a built-in TRIAC, equivalent to a small solid-state relay (SSR),

that can switch a small load that draws less than 250 Watts. Please refer to Section 8 for wiring examples.



Figure 3. Power input terminals 1 and 2 are labelled on the bottom sticker.

4. Parameter Settings

For safety reasons, the parameters are divided into three groups with different pass codes. Only those who are familiar with the operation of the controller and the meanings of each parameter should attempt to adjust the parameters.

Access Code	Sub-menu details
0089	System Configuration
0036	PID Control Configuration
0001	Set Value (SV)

To access a parameter in a menu:

- (1) Short-press the SET key to bring up the screen for entering the access code.
- (2) When the screen shows "0000" with the left digit flashing, press the Right Arrow key (>) to shift the flashing digit to the digit you want to edit. Then use the Up and the Down Arrow keys to adjust the code the desired value.
- (3) Press the SET key to confirm the access code, then the screen should show the first parameter in the menu.
- (4) Use the Up or the Down Arrow key to scroll to the desired parameter in the menu; press the SET key to check the value of a parameter; use the Up or the Down Arrow key to adjust the value, then press the SET key to save the new value and return to the parameter list in the menu. If the SET key is not pressed, the new value will not be saved or take effect.
- (5) Scroll to "END" and press the SET key to exit from the menu. If the controller is idled in menu mode for 30 seconds, it will return to the normal operating mode automatically.

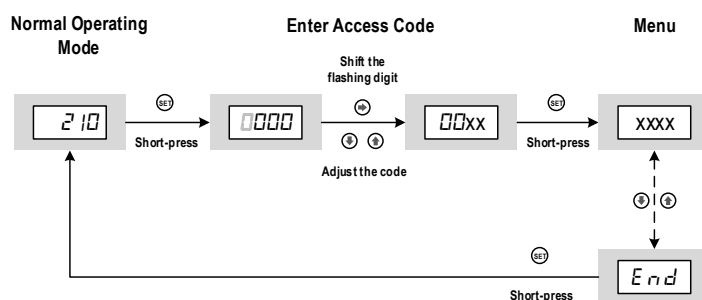


Figure 4. How to access the menu with an access code.

4.1 System Configuration Parameters (Code 0089)

Parameters for system configuration are listed in Table 1. To access these parameters, press the SET key, enter the code "0089", and press the SET key again.

Table 1. System Configuration Parameters.

Code	Description	Range	Initial	Note
INTY	Inty	Input Sensor Type	See Table 2	1
OUTY	Outy	Control Output Mode	2, 3	2
HY	Hy	Hysteresis Band	0 ~ 9999	3
PSb	Psb	Input Offset	-100 ~ 100 (degrees)	4
Rd	Rd	Reverse Direction	0: heating, 1: cooling	5
CorF	CorF	Temperature Unit	0: °C; 1: °F	6
End	End	Exit		

Note 1. Input Sensor Type (INTY). The INTY parameter specifies the input sensor type. By default, the controller is configured for a Type K thermocouple. To use other sensor types, adjust the INTY value according to Table 2, which lists accepted sensor types and their corresponding codes.

Table 2. Accepted Sensor Type.

Code	Description	Working Temperature Range
T	TC, Type T	-200 ~ 400°C; -320 ~ 752°F
R	TC, Type R	-50 ~ 1600°C; -58 ~ 2900°F
J	TC, Type J	-200 ~ 1200°C; -320 ~ 2200°F
WRE	TC, WRe3/25	0 ~ 2300°C; 32 ~ 4200°F
B	TC, Type B	350 ~ 1800°C; 660 ~ 3300°F
S	TC, Type S	-50 ~ 1600°C; -58 ~ 2900°F
K	TC, Type K	-200 ~ 1300°C; -320 ~ 2400°F
E	TC, Type E	-200 ~ 900°C; -320 ~ 1650°F
P10.0	RTD, Pt100	-99.9 ~ 600.0°C; -99.9 ~ 999.9°F
P100	RTD, Pt100	-200 ~ 600°C; -320 ~ 1100°F
Cu50	RTD, Cu50	-50.0 ~ 150.0°C; -60 ~ 300°F

Note 2. Control Output Mode (OUTY). The OUTY parameter defines the output mode. For the SYL-1507 model, OUTY can be set to 2 and 3; other settings (0, 1, and 4) are invalid.

OUTY = 2, the controller operates in PID control mode.

OUTY = 3, the controller operates in ON/OFF control mode.

Note 3. Hysteresis Band (Hy). The Hy parameter, also known as the dead band or differential, is used in ON/OFF control mode. It is measured in degrees (°C or °F).

- For heating: The output turns off when the process value (PV) exceeds the set value (SV) and turns on again when PV falls below SV minus Hy ($PV < SV - Hy$).
- For cooling: The output turns off when PV falls below SV and turns on again when PV exceeds SV plus Hy ($PV > SV + Hy$).

Note 4. Input Offset (PSb). The PSb parameter is the calibration offset, used to correct small errors in the system's input readings. For example, if a sensor reads 1°C in a well-prepared ice/water mixture (which should be 0°C), setting PSb to "-1" adjusts the display to 0°C. To enter a negative value, move the flashing digit to the leftmost position and press the Down Arrow key until "-" appears.

Note 5. Reversed Direction (RD). The RD parameter determines whether the controller operates in heating or cooling mode. By default, RD is set to "0" for

heating mode, suitable for controlling a heating device. When RD is set to "1", the controller operates in cooling mode, suitable for controlling a cooling device.

Note 6. Temperature Unit (CorF). The CorF parameter sets the temperature unit. By default, CorF is set to "0" to display temperatures in Fahrenheit. Set CorF to "1" to show temperatures in Celsius.

4.2 PID Control Configuration (Code 0036)

Parameters for PID control configuration are listed in Table 3. To modify these parameters, press the SET key, enter the code "0036", and press the SET key again.

The P, I, and D parameters are critical for achieving optimal response time, accuracy, and system stability. For first-time users, the Auto-tune function is recommended to automatically determine these parameters. If the auto-tuning results are unsatisfactory, you can manually adjust the PID constants to improve performance.

Table 3. PID Configuration Parameters.

Code		Description	Range	Initial	Note
P	p	Proportional Constant	0.1 ~ 99.9 (%)	5.0	7
I	I	Integral Time	2 ~ 1999 (Sec)	100	8
d	D	Derivative Time	0 ~ 399 (Sec)	20	9
SouF	SouF	Damp Constant	0.1 ~ 1.0	0.2	10
OT	OT	Cycle Rate	2 ~ 199 (Sec)	2	11
FILt	FILt	Digital Filter Strength	0 ~ 3	0	12
End	End	Exit			

Note 7. Proportional Constant (P). The P parameter, also known as the proportional band, is expressed as a percentage of the temperature range. For example, with a Type K thermocouple (control range: 1500°C), setting P to 5 results in a proportional band of 75°C (1500 × 5%). If the set temperature (SV) is 200°C and both integral (I) and derivative (D) actions are disabled, the controller's output power decreases from 100% to 0% as the temperature rises from 125°C to 200°C. A smaller P value increases the controller's response strength for a given temperature difference between the set value (SV) and process value (PV).

Note 8. Integral Time (I). The I parameter adjusts the output to bring the process value (PV) closer to the set value (SV) by accounting for the magnitude and duration of the error (SV - PV). A smaller I value increases response speed but reduces system stability. A larger I value slows the response but enhances stability. Setting I to 0 disables integration, resulting in a PD controller, which is suitable for very slow systems.

Note 9. Derivative Time (D). The D parameter responds to the rate of change of the process value (PV), allowing the controller to compensate proactively before the error (SV - PV) becomes too large. A larger D value strengthens this effect. Setting the D value too small or too large reduces system stability, potentially causing oscillation or non-convergence. Typically, D is set to one-quarter of the I value.

Note 10. Damp Constant (SouF). The SouF parameter enhances PID control quality by using artificial intelligence to reduce temperature overshoot. A value that is too low may cause the system to overshoot, while a value that is too high may result in over-damping.



Figure 5. Damp constant.

Note 11. Cycle Rate (OT). The OT parameter defines the time period (in seconds) used by the controller to calculate its output. For example, if OT is set to 2 and the controller output is 10%, the output will be turned on for 0.2 seconds and off for 1.8 seconds in each 2-second cycle. A smaller OT value provides more precise control. For a small resistive load, such as a small heating coil, OT is typically set to 2. For mechanical relays or contactors, set OT to 20 ~ 30 seconds to prevent premature wear of contacts.

Note 12. Digital Filter (Filt). The Filt parameter controls the digital filtering effect: Filt = 0 disables filtering; Filt = 1 applies weak filtering; Filt = 3 applies the strongest filtering. Stronger filtering increases display stability but introduces greater delay in responding to temperature changes.

4.3 Temperature Setting and Alarm Setting (Code 0001)

The parameter for setting the Set Value (SV) is listed in table 4. To modify this parameter, press SET key, enter the code "0001", and press SET again.

Table 4. Temperature and Alarm Parameters.

Code		Description	Initial Setting	Note
SV	SV	Set Value (Target Temperature)	Arb.	12
AH1	AH1	Alarm 1 On Temperature	800	13
AL1	AL1	Alarm 1 Off Temperature	900	
End	END	Exit		

Note 12. Set Value (SV). The parameter SV is the target temperature you want to reach. There are two ways to set the SV.

a. In normal operation mode, press the Up Arrow key or Down Arrow key once to switch the display from PV to SV. The display will start blinking. Press the Up Arrow key or Down Arrow key again to increase or decrease the SV. When finished, wait 8 seconds for the setting to take effect automatically (the display will stop blinking). This is suitable for making small adjustments to the SV.

b. Follow the flowchart shown in Figure 6. This method is easier for large temperature changes. If no key is pressed after confirming the SV, the controller will return to normal operation mode automatically after 1 minute.

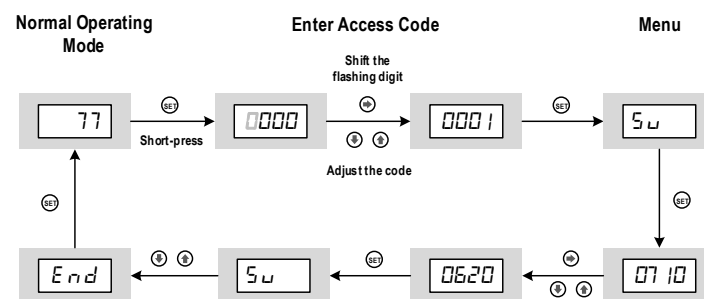


Figure 6. Adjust SV in the 0001 menu.

Note 13. Alarm Settings (AH1, AL1). The AH1 and AL1 parameters are legacy settings and do not apply to this model.

5. Auto-Tuning

The Auto-Tuning function (also known as self-tuning) automatically optimizes the PID parameters for the system. During auto-tuning, the controller uses on/off mode to heat the system until it exceeds the set point, then allows it to cool down. This process repeats approximately three times. Based on the system's response time, the built-in artificial intelligence program calculates and sets the

PID parameters for the controller. For systems with a very slow response, auto-tuning may take a long time.

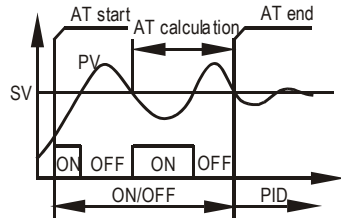


Figure 7. Auto-tuning.

5.1 Activating Auto-Tuning

To activate auto-tuning, press and hold the Right Arrow (>) key until the "AT" indicator starts blinking, indicating that auto-tuning is in progress. When the "AT" indicator stops blinking, auto-tuning is complete, and the newly calculated PID parameters are set and used for the system. Note that auto-tuning is available only in PID control mode (when OUTY is set to 1 or 2).

5.2 Stopping Auto-Tuning

To stop auto-tuning, press and hold the Right Arrow (>) key until the "AT" indicator stops blinking. The previous PID parameter values will then be restored.

6. ON/OFF Control Mode

On/off control mode is less precise than PID control mode but is necessary for inductive loads such as motors, compressors, and solenoid valves that are incompatible with pulsed power. It functions like a mechanical thermostat: when the process value (PV) exceeds the set value (SV), the controller turns the load off; when the PV falls below the SV minus the Hysteresis Band (Hy), the controller turns the load on again.

To enable on/off control mode, set the OUTY parameter to 3. Then, set the Hy parameter to the desired range based on control precision requirements. A smaller Hy value results in tighter temperature control but increases the frequency of on/off actions. In the PID parameters menu (code 0036), only the OT (Cycle Rate) and Filt (Digital Filter) parameters are applicable; P, I, D, and SouF parameters are not applicable in on/off control mode.

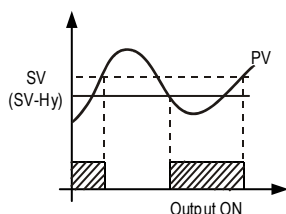


Figure 8. ON/OFF control mode.

7. Application Examples

7.1 Use SYL-1507 to control a small 120VAC coil heater of 100 Watt. In this example, type K thermocouple is used to detect the temperature, so the sensor input type INTY should be set to "K".

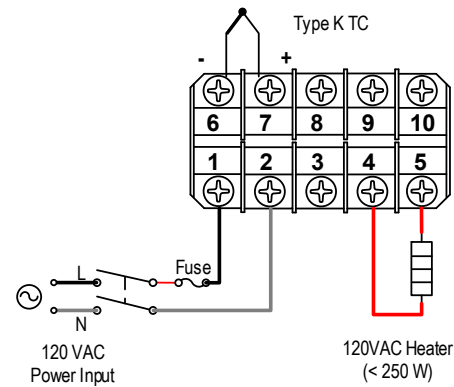


Figure 9. Wiring diagram of using SYL-1507 to directly control a small heater with 120VAC power.

7.2 Use SYL-1507 to control a small 240VAC heating lamp in a small chamber to maintain temperature around 40°C. In this case, a PT100 RTD sensor is connected, so the sensor input type INTY should be set to "P100".

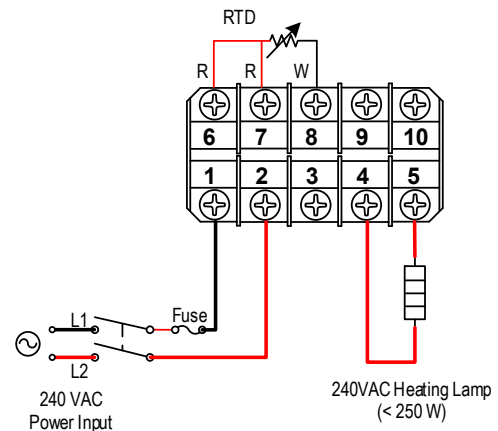


Figure 10. Wiring diagram of using SYL-1507 to drive a heating lamp with 240VAC power.

8. Error Message and Troubleshooting

8.1 Error Code "EEEE"

The "EEEE" error message indicates an input error. Possible causes include:

- The sensor is not connected correctly.
- The input setting (INTY) is configured for the wrong sensor type.
- The sensor is defective.

For Thermocouple Sensors:

If this error occurs with a thermocouple sensor, short terminals 6 and 7. If the display shows the ambient temperature, the thermocouple is defective. If the display still shows "EEEE," verify that the INTY setting matches the correct thermocouple type. If the INTY setting is correct and the error persists, the controller may be defective.

For RTD Sensors:

First, verify the INTY setting, as most controllers are shipped with the input configured for a thermocouple. Then, check the wiring: the two red wires should be connected to terminals 6 and 7, and the white or clear wire should be connected to terminal 8.

8.2 Testing the Output

The status of the output is indicated by the red OUT indicator located to the left of the display window on the front panel. The OUT indicator may be off, pulsing, or solid, reflecting whether power is being sent through terminals 4 and 5. The output voltage across terminals 4 and 5 should match the input voltage connected to terminals 1 and 2.

- When the OUT indicator is off, no voltage (120V or 240V AC) should be present between terminals 4 and 5.
- When the OUT indicator is solid, a steady 120V or 240V AC voltage should be present between terminals 4 and 5.
- When the OUT indicator is pulsing, the output voltage between terminals 4 and 5 will also be pulsing.

If the status of the OUT indicator does not correspond to the voltage measured between terminals 4 and 5, the controller may be malfunctioning.

8.3 Sensor Reading Accuracy

To calibrate a sensor or compare its reading with another sensor, immerse the probe in a liquid medium. Calibration or comparison in air is not recommended, as the sensor's response time depends on its mass, and some sensors may have a long response time in air.

If the sensor reading error exceeds 5°F, the most common issue is an improper connection between the thermocouple sensor and the controller. The thermocouple must be connected directly to the controller unless a proper thermocouple connector or correct extension wire is used. Using a copper connector, copper wire, or thermocouple extension wire with incorrect polarity will cause the reading to drift by more than 5°F.

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