Instruction Manual

Supplementary Manual for 24V SYL series PID Temperature Controller

Version 1.1 (March 2020)

Caution

- This supplementary manual is for 24V version SYL series PID controllers, including **SYL-2L42-24**, **SYL-2L52**, **SYL-2L72**, **SYL-2L42P**, **SYL-2L52P, SYL-2L72P**.
- Power input for all six mentioned PID controllers is 12 – 24V AC/DC on terminal 9 & 10. Applying 120V/240V AC on terminal 9 & 10 will permanently damage this controller.
- This controller is intended to control equipment under normal operating conditions. If failure or malfunction of the controller may lead to abnormal operating conditions that may result in personal injury or damage to the equipment or other property, 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, N, J, T, B, WRe5/ 26; RTD (Resistance Temperature Detector): Pt100, Cu50 DC Voltage: 0~5V, 1~5V, 0~1V, -100~100mV, -20~20mV, -5~5V, 0.2~1V DC current: 0~10mA, 1~10mA, 4~20mA. (Use external shunt resistor for higher current)
Input range	Please see section 4.7 for detail.
Accuracy	± 0.2% Full scale: RTD, linear voltage, linear current and thermocouple input with ice point compensation or Cu50 copper compensation. 0.2% Full scale or ± 2 ºC: Thermocouple input with internal automatic compensation. Note: For thermocouple B, the measurement accuracy of ± 0.2% can only be guaranteed when input range is between 600~1800 ºC.
Response time	≤ 0.5s (when FILt = 0)
Display resolution	1°C, 1°F; or 0.1°C
Control mode	Fuzzy logic enhanced PID control On-off control Manual control
Output mode	See Table 1 for details
Alarm output	Relay contact (NO): 250VAC/1A, 120VAC/3A, 24V/3A
Alarm function	Process high alarm, process low alarm, deviation high alarm, and deviation low alarm
Manual function	Automatic/Manual bumpless transfer
Power supply	**12~24V AC/DC**
Power consumption	≤ 5 Watt
Ambient temperature	0~50ºC, 32~122ºF
Dimension	48 x 48 x 100mm (W x H x D)
Mounting cutout	45 x 45mm

2. Available Configurations

All the models listed in Table 1 are 1/16 DIN size with dual-alarm outputs.

Table 1. Controller models.

Model	Control output	Output rating	Ramp/soak option
SYL-2L42	Relay output	Relay w/ NO and NC contacts: 7A at 240VAC, 10A at 120VAC, or 10A at 24VDC	No
SYL-2L42P			Yes
SYL-2L52	SSR output	12 VDC for external SSR control	No
SYL-2L52P			Yes
SYL-2L72	Zero crossing SSR	Built-in 2A SSR with zero-crossing switching 20-240VAC	No
SYL-2L72P			Yes

3. Wiring

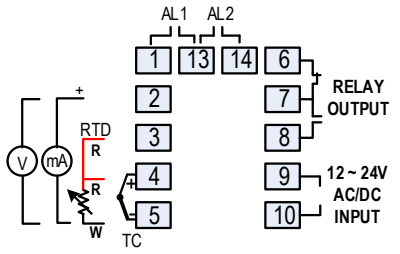

Figure 1. Wiring terminals of **SYL-2L42** and **SYL-2L42P**.

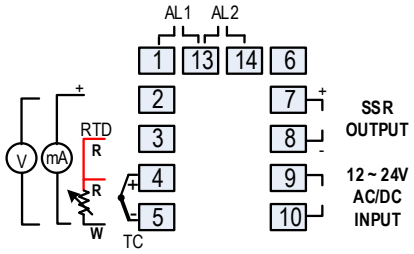

Figure 2. Wiring terminals of **SYL-2L52** and **SYL-2L52P**

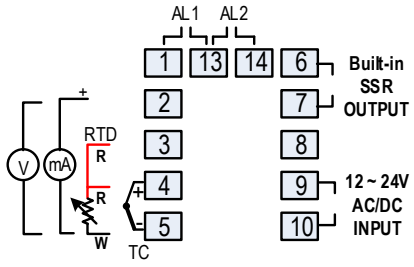

Figure 3. Wiring terminals of **SYL-2L72** and **SYL-2L72P**

Wiring Guide:

1) Power to the controller. **Connect the 12 ~ 24V AC/DC power to terminals 9 and 10.**

2) Control output connection. Main output is on terminal 6, 7 and 8. For details, see wiring terminals above.

3) Sensor connection. For thermocouples, connect the positive wire to terminal 4 the negative to terminal 5. For a three-wire RTD with standard DIN color code, connect the two red wires to terminals 3 and 4, and connect the white wire to terminal 5. For a two-wire RTD, connect the wires to terminals 4 and 5. Then, jump a wire between terminals 3 and 4.

4. Set sensor type
Set Sn to 0 for a K type thermocouple (default), 5 for a J type thermocouple, and 21 for a Pt100 RTD.

5. Switching between automatic and manual mode
Set A-M = 1 to active manual mode. Press the A/M key to switch between automatic and manual mode.

6. Changing the temperature scale from Fahrenheit to Celsius.
Change COOL from 10 to 2 (for heating mode).

7 Setting the controller for cooling control.
For cooling control, set COOL = 11 to display Fahrenheit; set COOL = 3 to display Celsius.

8. Setting target temperature (SV)
(For SYL-2L42, SYL-2L52, SYL-2L72 models only)
Press the ▼ or ▲ key once, and then release it. The decimal point on the lower right corner will start to flash. Press the ▼ or ▲ key to change SV until the desired value is displayed. The decimal point will stop flashing after no key is pressed for 3 seconds. You can press the A/M key to move the flashing decimal point to the desired digit that needs to change. Then press the ▼ or ▲ key to change SV starting from that digit.

9. Auto-tune
You can use the auto-tune function to determine the PID constants automatically.
There are two ways to start auto-tuning:
1) Set At = 2. It will start automatically after 10 seconds.
2) Set At = 1. Then during the normal operation, press the A/M key to start the auto-tune.
The instrument will perform accurate artificial intelligence control after auto tuning is finished.

10. On/off mode
Set At = 0 to active the on/off control mode.
Set the Hysteresis Band parameter Hy to be a desired value.

11. Error Message and trouble shooting
11.1 Display "oral"
This is an input error message. The possible reasons are: the sensor is not connected or not connected correctly; the sensor input setting is wrong; or the sensor is defective. In this case, the instrument terminates its control function automatically, and the output value is fixed according to the parameter OUTL. If this happens when using thermocouple sensor, you can short terminal 4 and 5 with a copper wire. If the display shows ambient temperature, the thermocouple is defective. If it still displays "oral", check the input setting, Sn, to make sure it is set to the right thermocouple type. If the Sn setting is correct, the controller is defective. For RTD sensors, check the input setting first because most controllers are shipped with the input set for thermocouples. Then check the wiring. The two red wires should be connected to terminals 3 and 4. The clear wire should be connected to terminal 5.

11.2 Flashing "04CJ"
At the moment of powering up, the controller will show "04CJ" in the PV window and "808" in the SV window. Next, it will show "8.8.8.8." in both windows briefly. Then the controller will show probe temperature in PV window and set temperature in SV window. If the controller frequently flashes "04CJ" and doesn't show a stable temperature reading, it is being reset due to unstable power line or inductive loads in the circuit. If user connects a contactor to SYL-2L42's terminal 7 and 8, please consider adding a RC snubber across these two terminals.

11.3 No heating
When the controller output is set for relay output, the "OUT" LED is synchronized with output relay. If heat is not output when it is supposed to, check the OUT LED first. If it is not lit, the controller parameter settings are wrong. If it is on, check the external switching device (If the relay is pulled-in, or the SSR's red LED is on). If the external switching device is on, then the problem is either the external switching device output, its wiring, or the heater.
If the external switching device is not on, then the problem is either the controller output, or the external switch device.

11.4 Poor Accuracy
Please make sure calibration is done by immersing the probe in liquid. Comparing the reference in air is not recommended because response time of the sensor depends on its mass. Some of our sensors have response time >10 minutes in the air. When the error is larger than 5 °F, the most common problem is an improper connection between the thermocouple and the controller. The thermocouple needs to be connected directly to the controller unless a thermocouple connector and extension wire is used. Copper wire or a thermocouple extension wire with the wrong polarity connected on the thermocouple will cause the reading to drift more than 5 °F.

11.5 On on/off mode, although hysteresis is set to 0.3, the unit is running 5 degrees above and below.
If the Hy is very small and temperature changes very quickly, users will need to consider the delay of the cycle time (the parameter t). For example, if cycle time is 20 seconds, when the temperature passes the SV+Hy after the beginning of a 20 seconds cycle, the relay will not act until the start of the next cycle 20 seconds later. Users may change the cycle time to a smaller value, such as 2 seconds, to get better precision control.

For compete functions of this PID, please refer to the manuals of standard version PID (powered by 120V AC):

Relay output:
For SYL-2L42, please refer to SYL-2342
For SYL-2L42P, please refer to SYL-2342P

SSR output:
For SYL-2L52, please refer to SYL-2352
For SYL-2L52P, please refer to SYL-2352P

Built-in SSR output:
For SYL-2L72, please refer to SYL-2372
For SYL-2L72P, please refer to SYL-2372P

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