Controller Inputs and Outputs

In this Chapter...

Control Input Types

Thermocouple or RTD Input

The SOLO temperature controller can accept input from eleven types of thermocouples and two types of Platinum RTD sensors. Select the sensor type by using the parameter Input Type (InPt, P3-1).

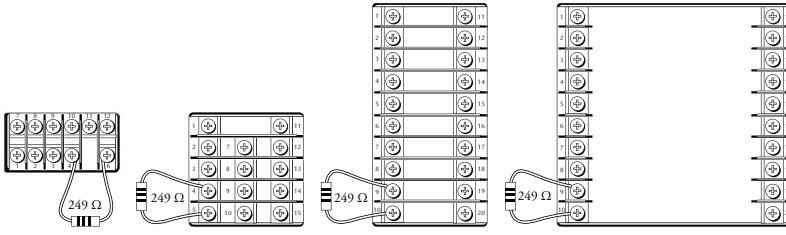
Thermocouple* Type and Temperature Range		
Input Temperature Sensor Type	**LED Display**	**Temperature Range**
Thermocouple TXK type	tXK	-328 ~ 1472°F (-200 ~ 800°C)
Thermocouple U type	U	-328 ~ 932°F (-200 ~ 500°C)
Thermocouple L type	L	-328 ~ 1562°F (-200 ~ 850°C)
Thermocouple B type	b	212 ~ 3272°F (100 ~ 1800°C)
Thermocouple S type	S	32 ~ 3092°F (0 ~ 1700°C)
Thermocouple R type	r	32 ~ 3092°F (0 ~ 1700°C)
Thermocouple N type	n	-328 ~ 2372°F (-200 ~ 1300°C)
Thermocouple E type	E	32 ~ 1112°F (0 ~ 600°C)
Thermocouple T type	t	-328 ~ 752°F (-200 ~ 400°C)
Thermocouple J type	J	-148 ~ 2192°F (-100 ~ 1200°C)
Thermocouple K type	K	-328 ~ 2372°F (-200 ~ 1300°C)
RTD Type and Temperature Range		
Input Temperature Sensor Type	**LED Display**	**Temperature Range**
Platinum Resistance (Pt100)	Pt	-328 ~ 1112°F (-200 ~ 600°C)
Platinum Resistance (JPt100)	JPt	-4 ~ 752°F (-20 ~ 400°C)
***Note - Use only ungrounded thermocouples**		

Analog Input

The SOLO temperature controller can accept input from the following analog input sources. Select the output type by using the parameter Input Type (InPt, P3-1).

Voltage Input Type and Input Range		
Voltage Input Type	**LED Display**	**Temperature Range**
0~50mV Analog Input	50	-999 ~ 9999
0V~10V Analog Input	0.10	-999 ~ 9999
0V~5V Analog Input	0.5	-999 ~ 9999
Current Input Type and Input Range*		
Current Input Type	**LED Display**	**Temperature Range**
4~20mA Analog Input	4A4	-999 ~ 9999
0~20mA Analog Input	4A0	-999 ~ 9999

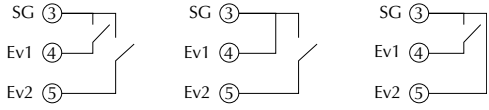
**Note: For Current Input operation, the supplied 249 Ω resistor should be installed as shown on page 4-3.*



SL4824 Series SL4848 Series SL4896 Series SL9696 Series

Event Inputs

The SL4896 and SL9696 series SOLO controllers support two Event inputs, Event 1 and Event 2. When an Event input is not connected to anything (open), the status of the Event input is off. When the Event input terminal is connected to the signal ground terminal (SG), the status of the Event input is on.



Event 1 and Event 2 are off

Event 1 is on. Event 2 is off.

Event 1 is off. Event 2 is on.

Event 1 and Event 2 have different functions.

Event 1 Input

Once the Event 1 input is turned on, both control outputs OUT1 and OUT2 are turned off. This does not effect the status of the alarm outputs. If an alarm output is on when the Event 1 input is turned on, the alarm output remains on as long as the condition of the alarm is true.

This Event 1 input can be used to shut down the control outputs quickly with an external input like a pushbutton or sensor.

Event 2 Input

All SOLO controllers support four PID parameter groups. The SL4896 and SL9696 series SOLO controllers support an additional PID parameter group. When the Event 2 input is on, the SOLO controller uses the additional PID parameter group.

SL4824 / SL4848
PID Parameter group 0
PID Parameter group 1
PID Parameter group 2
PID Parameter group 3

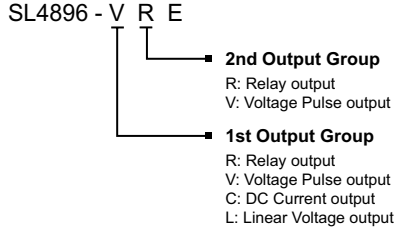
SL4896 / SL9696
PID Parameter group 0
PID Parameter group 1
PID Parameter group 2
PID Parameter group 3
PID Parameter group (Event 2 is on)

Note: The additional PID parameter group can be accessed only when the Event 2 input is on. To edit the PID Parameter group for Event 2 input, Event 2 input must be on.

The Event 2 input can be used to force the Process Value (PV) to reach the predefined Set Value (SV) when an external input is turned on, but still using the PID control.

Control Output Types

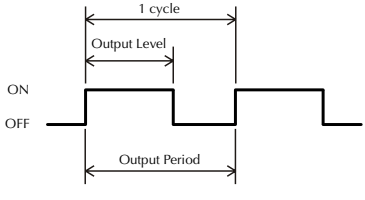
The SOLO temperature controller supports four types of control outputs depending on the model chosen. The available outputs are Relay, Voltage Pulse, Current and Linear Voltage as shown in the controller part number.



Relay Output

The relay used for the relay output in model SL4824 is rated at a maximum 250 VAC and 3A resistive load. The relay used for the relay output in models SL4848, SL4896 and SL9696 is rated at a maximum 250 VAC and 5A resistive load. The electrical life expectancy is 100,000 operations.

The operation cycle of the Relay output is controlled by two factors, Output Level and Output Period.



For example, when the Output Level is 60% and the Output Period is 10 seconds, the output relay is turned on for 6 seconds in the cycle.

There are five parameters that define these two factors.

Output Level

Output 1 Level (oUt1, P2-11) Range: 0.0 to 100%
Output 2 Level (oUt2, P2-12) Range: 0.0 to 100%

Output Period

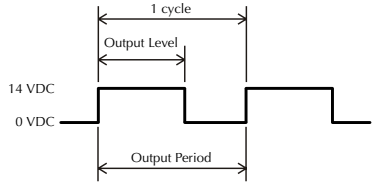
Output 1 Heating Period (HtPd, P1-11) Range: 0.5 to 99 seconds
Output 1 Cooling Period (CtPd, P1-12) Range: 0.5 to 99 seconds
Output 2 Period (HCPd, P1-13) Range: 0.5 to 99 seconds

Note: The electrical life expectancy of the relay output is 100,000 cycles. To maximize the life of the relay output, set a longer time value for the Output Period.

Voltage Pulse Output

The Voltage Pulse output generates 40 mA pulses. The pulse high level is 14 VDC and the low level is 0VDC.

The operation cycle of the Voltage Pulse output is controlled by two factors, Output Level and Output Period.



For example, when the Output Level is 60% and the Output Period is 10 seconds, the Voltage Pulse output is turned on for 6 seconds in the cycle.

There are five parameters that define these two factors.

Output Level

Output 1 Level (Out1, P2-11) Range: 0.0 to 100%
Output 2 Level (Out2, P2-12) Range: 0.0 to 100%

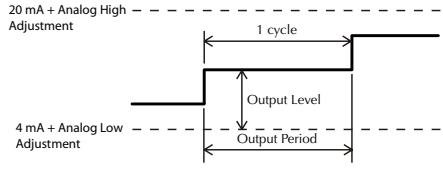
Output Period

Output 1 Heating Period (HtPd, P1-11) Range: 0.5 to 99 seconds
Output 1 Cooling Period (CtPd, P1-12) Range: 0.5 to 99 seconds
Output 2 Period (HCPd, P1-13) Range: 0.5 to 99 seconds

Current Output

The Current output generates analog DC current with a range of 4-20 mA. The maximum load resistance is 600 Ω

The output current is controlled by four factors, Analog High Adjustment, Analog Low Adjustment, Output Level and Output Period.



The Analog High Adjustment value may be changed to adjust the output current when the Output Level is 100%. The adjustment needs to be done in the Manual mode.

The Analog Low Adjustment value may be changed to adjust the output current when the Output Level is 0%. The adjustment also needs to be done in the Manual mode.

The Output Level determines the output current level between "20mA + Analog High Adjustment" and "4mA + Analog Low Adjustment". The output current will be 10 mA in the following example.

20mA + Analog High Adjustment = 18mA
4mA + Analog Low Adjustment = 2mA
Output Level = 50%

The Output Period sets how often the SOLO controller updates the output value.

There are five parameters that define these four factors.

Analog High Adjustment

Analog High Adjustment (CrHi, P1-17)

Analog Low Adjustment

Analog Low Adjustment (CrLo, P1-18)

Output Level

Output 1 Level (Out1, P2-11) Range: 0.0 to 100%

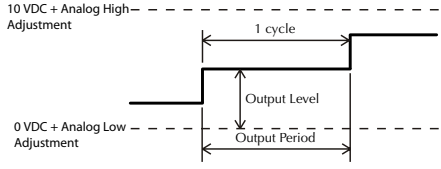
Output Period

Output 1 Heating Period (HtPd, P1-11) Range: 0.5 to 99 seconds
Output 1 Cooling Period (CLPd, P1-12) Range: 0.5 to 99 seconds

Linear Voltage Output

The Linear Voltage output generates analog voltage from 0-10 VDC. The minimum load resistance is 1kΩ.

The output voltage is controlled by four factors, Analog High Adjustment, Analog Low Adjustment, Output Level and Output Period.



The Analog High Adjustment value may be changed to adjust the output voltage when the Output Level is 100%. The adjustment needs to be done in the Manual mode.

The Analog Low Adjustment value may be changed to adjust the output voltage when the Output Level is 0%. The adjustment needs to be done in the Manual mode.

The Output Level determines the output voltage level between "10 VDC + Analog High Adjustment" and "0VDC + Analog Low Adjustment". The output voltage will be 4 VDC in the following example.

10 VDC + Analog High Adjustment = 7VDC
0VDC + Analog Low Adjustment = 1VDC
Output Level = 50%

The Output Period sets how often the SOLO controller updates the output value.

There are five parameters that define these two factors.

Analog High Adjustment

Analog High Adjustment (CrHt, P1-17)

Analog Low Adjustment

Analog Low Adjustment (CrLo, P1-18)

Output Level

Output 1 Level (out1, P2-11) Range: 0.0 to 100%

Output Period

Output 1 Heating Period (HtPd, P1-11) Range: 0.5 to 99 seconds
Output 1 Cooling Period (ClPd, P1-12) Range: 0.5 to 99 seconds

Alarm Outputs

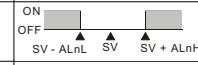
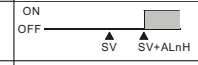
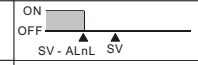
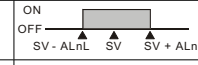
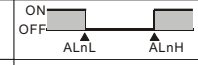
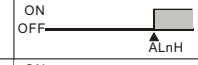
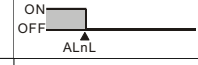
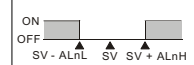
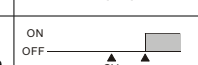
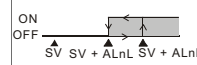
The SL4848, SL4896 and SL9696 series SOLO controllers support three alarm output groups (ALA1, ALA2, ALA3) and one system alarm output (SALA). The SL4824 series SOLO controller supports one alarm output group (ALA1) and one system alarm output (SALA). ALA1 and ALA2 are both SPST normally open relay outputs. ALA3 uses the same output as Output 2 and is the same type of output.

Note: The system alarm does not have a dedicated output that can be used only for the system alarm. One of the alarm outputs can be used for the system alarm. See page 4-11.

Note: When Output 2 is used, ALA3 is disabled. ALA3 is available only when single output control is selected.

See the Alarm Output Chart on the following page.

Alarm Output Types

Set Value	Alarm Type	Alarm Output Operation
0	Alarm function disabled	Output is OFF
1	Deviation upper and lower limit: This alarm output activates when the PV value is higher than the setting value SV + ALnH or lower than the setting value SV - ALnL.	
2	Deviation upper-limit: This alarm output activates when the PV value is higher than the setting value SV + ALnH.	
3	Deviation lower limit: This alarm output activates when the PV value is lower than the setting value SV - ALnL.	
4	Reverse deviation upper and lower limit: This alarm output activates when the PV value is in the range of the setting value SV+ ALnH and the setting value SV - ALnL.	
5	Absolute value upper and lower limit: This alarm output activates when the PV value is higher than the setting value ALnH or lower than the setting value ALnL.	
6	Absolute value upper-limit: This alarm output activates when the PV value is higher than the setting value ALnH	
7	Absolute value lower limit: This alarm output activates when the PV value is lower than the setting value ALnL	
8	Deviation upper and lower limit with standby sequence: After the PV reaches the SV once, this alarm output activates when the PV value reaches the set point (SV value) and the reached value is higher than the setting value SV + ALnH or lower than the setting value SV - ALnL.	
9	Deviation upper limit with standby sequence: After the PV reaches the SV once, this alarm output activates when the PV value reaches the set point (SV value) and the reached value is higher than the setting value SV+ ALnH.	
10	Deviation lower limit with standby sequence: After the PV reaches the SV once, this alarm output activates when the PV value reaches the set point (SV value) and the reached value is lower than the setting value SV - ALnL.	
11	Hysteresis upper-limit alarm output: This alarm output activates when the PV value is higher than the setting value SV + ALnH. This alarm output is OFF when the PV value is lower than the setting value SV + ALnL.	
12	Hysteresis lower-limit alarm output: This alarm output activates when the PV value is lower than the setting value SV- ALnH. This alarm output is OFF when the PV value is higher than the setting value SV - ALnL.	
13	N/A	
	Ramp / Soak Program Alarms	
14	This alarm activates when the Ramp / Soak program has ended.	
15	This alarm activates while the program is in RAMP UP status.	
16	This alarm activates while the program is in RAMP DOWN status.	
17	This alarm activates while the program is in SOAK status.	
18	This alarm activates while the program is in RUN status.	

Note: ALnH includes AL1H, AL2H and AL3H. ALnL includes AL1L, AL2L and AL3L.

System Alarm Output

The system alarm can be used to indicate the following system error.

System Error: The SOLO controller checks the control outputs for correct operation by monitoring the PV value. If the heating output is on but the PV keeps dropping for two minutes, the system alarm turns on. Or, if the cooling output is on but the PV continues to increase for two minutes, the system alarm turns on.

Note: The SOLO controller checks the PV every 15 seconds. If the PV continues increasing / decreasing eight times when the controller checks the PV, the system alarm turns on. (15 seconds x 8 = 2 minutes). If the PV does not increase / decrease when the controller checks it, the controller resets the counter. The PV would have to increase / decrease for an additional two minutes to activate the alarm.

On series SL4848, SL4896 and SL9696 controllers, the system alarm can be assigned to one of the alarm outputs 1 - 3. Series SL4824 supports only one alarm output. Use the System Alarm Parameter (SALA, P3-11) to set the alarm output number. The system alarm can be disabled by setting the System Alarm (SALA, P3-11) to OFF.

When the system alarm output is on, the corresponding Alarm Output is on and the PV display on the controller starts flashing.