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PID Plug & Play Heater Control System

USER MANUAL



PIDC-08152024 - V 1.2.0.0

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1. SAFETY

Thank you for purchasing this equipment from Ideal Vacuum Products.

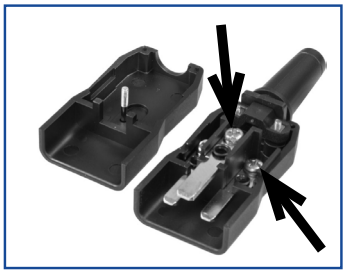
- **Read this manual and all associated equipment manuals before installing or operating this equipment. Failure to follow the warnings and instructions may result in serious injury or equipment damage.**
- **Keep this manual in a safe location for future reference.**
- **This equipment should only be installed and operated by trained, qualified personnel wearing appropriate protective equipment.**
- **Follow all codes that regulate the installation and operation of this equipment.**
- **When the controller is supplying maximum current, the enclosure will get warm. This is normal.**
- **No user serviceable parts inside.**

2. EASY START

1. Locate the heater control on a table top, or panel mount it (1/4 DIN cutout is 92mm square).
2. Connect heater wires to the 2 outside terminals of the supplied C19 plug (P1011284). Use a #1 Phillips to open the plug and a #2 Phillips to make the connections.

   AC Heater wires are not polarized.

   Heater and controller input voltage must be the same.



3. Plug in the heater, K type thermocouple, and input power cable into the controller.



4. Turn on the controller.

   The PID has two LED numeric displays. The upper red PV (Process Value) number shows the current thermocouple temperature. The lower green SV (Set point Value) number shows the desired (target) temperature for the heater to maintain. The SV is initially set to 0.0.

5. Program the SV (Set point Value):
6. Press the **UP or DOWN ARROW** button. The green SV number will flicker. Press the **UP** or **DOWN** button to change the SV. Press the **SET** button to save.

   The heater will begin to heat as soon as the SV exceeds the current temperature. The SV is retained when the controller is powered down. When the controller is turned back on, the heater will immediately start warming.



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3. OVERVIEW

The Ideal Vacuum (IVP) PID heavy duty, single zone, heater control system (the controller) is designed to accurately measure and control the temperature of our conflat flange ThinBand nozzle heaters, Ideal Vacuum Cube heater plates, Ideal Spectroscopy reference cell furnaces and heaters, and other heater and chiller units in real time. The controller operates at 100-240 VAC, 50/60Hz, and can handle one or more heaters up to a 20A total. The controller uses a K Type thermocouple (sold separately).

The system is based on the Solo® 4848-RR PID temperature control module and is housed in a strong and attractive 1/4 DIN brushed aluminum enclosure. Hardware is included for table top use or for panel mounting. Cutout for DIN panel mounting is 92mm x 92 mm (3.62x3.62 in.).

Heater temperature is controlled by a user programmable set point. The system has two switched output relays, wired through the system's back mounted DB9 connector. These relays can be used to control auxilliary equipment (i.e., solenoid valves) based on the set point and relay settings.

Temperature is monitored either directly on the controller's front panel, or via RS485/MODBUS (DB9 female connector) remotely by a computer.

Safety features include an over temperature audible alarm, and a thermal circuit breaker incorporated into the main power switch.

The system has considerable programmability and many relay configurations, all of which can be manually configured according to the user's requirements. See the Solo 4848 Quick Start Guide or the Solo User Manual for details. The system can also be configured using free SL-Soft software available on our website.

The system includes a robust 12 gauge input power cable with a 5-20P (20A) 110 VAC plug. The package also includes a C19 power entry plug (male C19) for the user to wire to a heater. Additional C19 power entry plugs are available (P1011284) to connect to different heaters without rewiring. A splitter kit (P1011285) is also available (C19 male plug to dual C20 female connectors), which allows the simultaneous connection of two heaters to the system (2400W total @120 VAC, 4800W total @240 VAC).

Please see part number P1011963 for a 15A, 10 ft. long power Cord with NEMA 5-15P plug (standard 110V plug). Do not exceed the 5-15p plug's 15A maximum capacity.

This system may be powered on 208/240 VAC (50/60 Hz). Heaters must be rated for the same voltage as the input voltage. At 240 VAC, the total allowable heater load is 20A (4800W). For 240 VAC use, the user must supply their own power cord.

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4. PARAMETERS

Settings can be changed to suit the user's requirements manually via the controller's display or through the SL-Soft free controller software, downloadable at: https://www.idealvac.com/files/manuals/slsoft_v2.2.1.1.zip. Settings can be changed at any time.

Four controller buttons are used to manually change all parameters and their values. These include **SET**, **ROTATE**, and **UP** and **DOWN ARROW** buttons.



Figure 1 - Controller buttons

To access and change the value of most parameters:

1. Press **SET** for five seconds.
2. Press **ROTATE** to scroll through the parameters (shown in the PV red line).
3. When you see the parameter you want to change, press the **UP** or **DOWN ARROW**. This changes the SV green display line.
4. Once the value you want is shown in the SV line, press **SET** to save.

Refer to the Solo 4848 Quick Start Guide or the Solo User Manual for complete information about all controller parameters and settings.

Table 1 below shows the parameters and settings that are programmed upon delivery.

On Controller		In Solo Software		
Parameter	**Value**	**Parameter**	**Description**	**Setting**
CoSH	on	P3-12	On-Line Configuration	Enable
InPt	J	P3-1	Input Type	K Type
tPUn	C	P3-2	Unit	C
tP-H	999.9	P3-3	Range High	999.9
tP-L	-199.9	P3-4	Range Low	-199.9
CtrL	PId	P3-5	Control Mode	PID
S-HC	HEAt	P3-7	Heating/Cooling	Heating
			SV (Set Point)	0.0
r-S	run	P2-1	Run/Stop	Run
At	oFF	P1-1	Auto Tuning	Stop
ALA3	9	P3-10	Alarm 3	9 Standby Dev. upper limit

Table 1 - IVP Settings

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4.1 CHANGING SET POINT (TARGET) TEMPERATURE

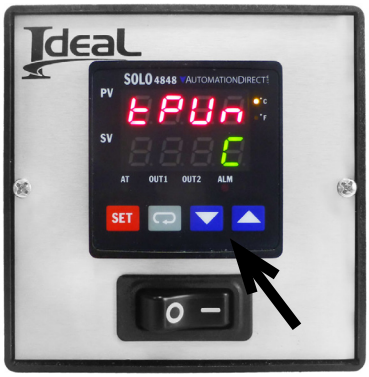
The SV (Set point Value) is the target temperature that you want the heater or furnace to reach and maintain.



1. Press the **UP ARROW**. The green SV value will flicker.
2. Press and hold the **UP ARROW** to increase the target temperature. Press the **DOWN ARROW** to decrease the target temperature.
3. Press **SET** to save and store the new value.

4.2 CHANGING TEMPERATURE UNITS

To change the temperature units between °C and °F:



1. Press and hold **SET** for 5 seconds.
2. Press **ROTATE** once. You will see tPUn.
3. Press the **DOWN ARROW** for °F.
4. Press the **UP ARROW for** °C.
5. Press **SET** to save and store the new value.

4.3 AUTO TUNING

Auto Tuning is used to optimize temperature control. It decreases overshoot and decreases ripple (variation) in the temperature once the target temperature is reached. We auto tune the controller for 100°C before shipping. This is a good general tuning for most situations. To more accurately tune the controller to your particular heater or furnace, auto tune it for the temperature and environment in which it will be used. The heater and thermocouple must be plugged in and the controller on:



1. Press **SET**. The PV value will change to At, the SV value will read oFF.

   If At does not appear, the r-S parameter is set to StoP and must be changed to rUn. Refer to Sec. 4.4, Run/Stop to change the r-S parameter.

2. Press the **UP ARROW** to change the SV value to on.
3. Press **SET**.

   *This initiates the autotune process. The AT LED below the numeric display will illuminate. Press **SET** during auto tuning to show PV and SV values.*

4. Once the AT LED goes off, the system is auto tuned and optimized. This procedure needs to be completed only once for any system configuration.

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4.4 RUN/STOP

It can be useful to turn off heating temporarily. Normally, as soon as the controller is turned on or the set point value is increased above the current heater temperature (whether the set point has been saved or not), a connected heater will begin to heat. To better control when the heater starts to warm up (i.e., to pre-program a set point temperature for later use) use the r-S parameter to turn the heater on and off at any time.

1. Press **ROTATE**.
2. The r-S parameter is displayed. The controller is set for run when delivered.
3. To stop the heater from heating, press the **DOWN ARROW**.
4. The value will change to StoP.
5. Press **SET** to save and store the new value.
6. To start heating, press **ROTATE.**
7. Press the **UP ARROW**.
8. Press **SET**.



4.5 RESET TO FACTORY DEFAULTS

If it becomes necessary to reset the controller to factory settings, refer to Section 10 in the Solo 4848 Quick Start Guide.

Note that IVP setting are different from the factory Solo defaults. If the controller is reset, some or all of the IVP settings will need to be re-entered. Most importantly and for your safety, the overtemperature alarm, controlled by the ALA3 parameter, must be reset to 9.

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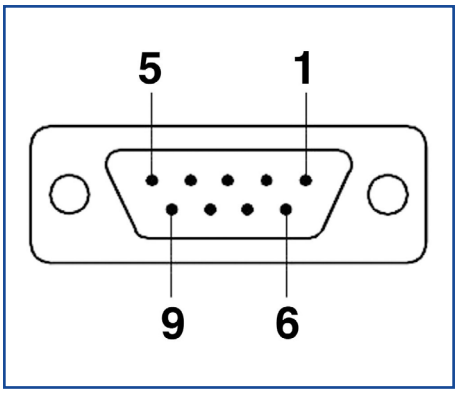
5. SET POINT RELAYS

The system has two switched output relays (ALA1 and ALA2), and a third (overtemperature) alarm relay (ALA3) preset at 4° C above SV.

ALA1 and ALA2 can be used to control auxilliary equipment (i.e., solenoid valves). There are many relay configurations available which provide the user the flexibility needed to customize the operation of outboard equipment.

See Section 13 of the Solo 4848 Quick Start Guide or the Solo User Manual for complete details about relay settings and functionality.

The relays are rated for 1A @ 240 VAC max. Use a 1/2A inline fuse to protect these relays. They are wired through the system's back mounted DB9 connector. Table 2 shows the wiring pinouts.



DB9 female connector

DB9 Pinout	
Pin	**Function**
1	RS485, D-
2	RS485, D+
3	--
4	--
5	--
6	--
7	Relay 1/2 Com
8	Relay 1
9	Relay 2

Table 2 - DB9 wiring pinouts

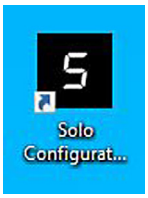
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5. MODBUS RS485 COMMUNICATION

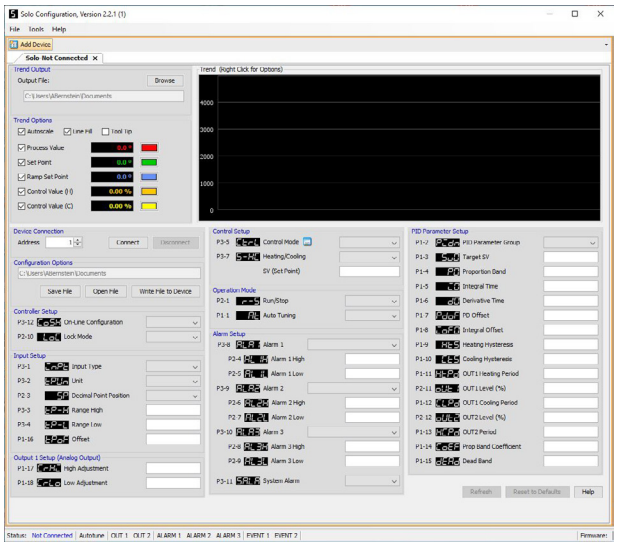
5.1 SOLO CONFIGURATION SOFTWARE: SL-SOFT

The controller can be operated remotely via RS485 MODBUS. It requires an RS485 to USB cable (P1012591) to connect to a computer, and software. The SL-Soft Solo Configuration software, available for free download, allows you to change most parameters and is capable of data logging.

1. Download the software and connect the RS485 cable. Turn the controller on.

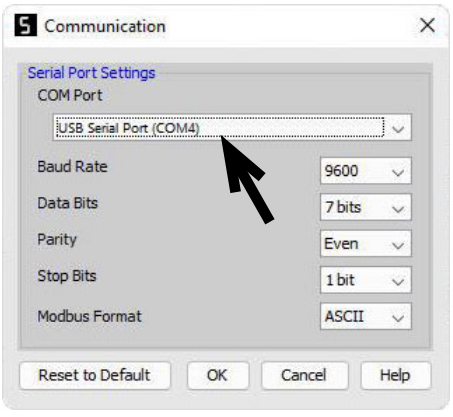


2. Open the software. The parameters will be grayed out (unavailable).



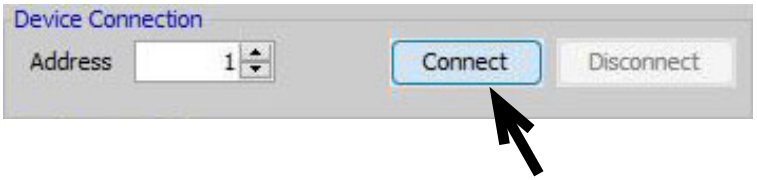
3. Select **Tools/Communications...**

4. In the **COM Port** field of Serial Port Settings, **USB Serial Port (COM#)** should appear. If not, find the COM port in the Device Manager that the controller is on. Paste that port into the COM Port field. Press **OK**.



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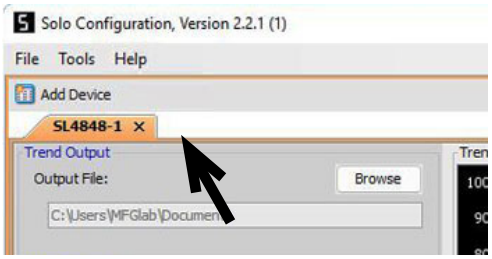
5. In the **Device Connection** field, press **Connect**.



6. If you receive an error message, check the COM port. If that does not solve the issue, go to Chapter 6 MODBUS configuration.



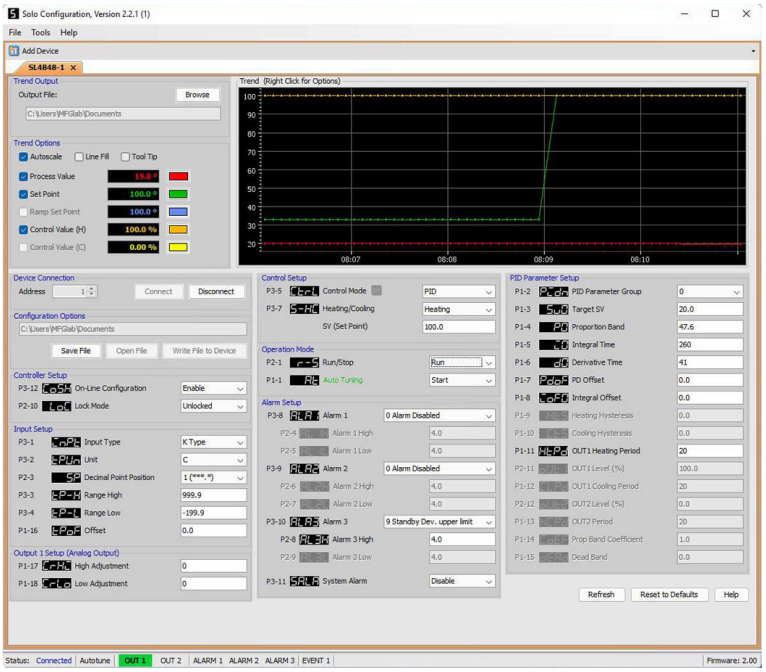
6. When the controller is connected, you will see **SL4848-x** at the top left of the screen.



7. Once the controller is connected, the parameters become available for selection. First change the P3-12 [CoSH] parameter to Enable. Then all other parameters may be changed.

   The software may appear to be a bit slow since every time a parameter is changed it updates the controller immediately.

   Please see Section 5.2 to change the RS485 mode from ASCII to RTU.



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5.1 CHANGING RS485 MODES

The controller has two RS485 communication modes available: ASCII and RTU. It is delivered set to ASCII mode. Changing modes MUST be done on the controller. This is because changing the mode while the controller is connected to the software would break the communication.

To change the mode to RTU:

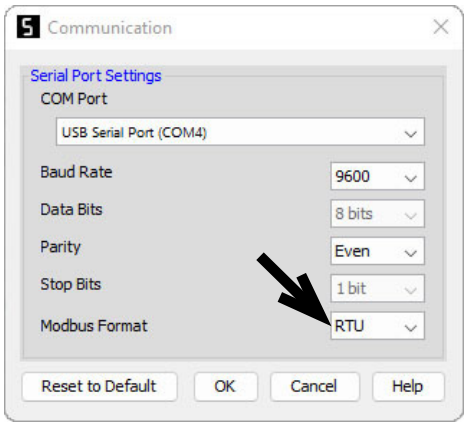
1. Press and hold **SET** for 5 seconds.
2. Press **ROTATE** several times until you see C-SL in red and ASCII in green.



3. Press the **UP ARROW** to change to rtU. Press **SET** to save the change.



4. Go to the Solo software. Select **Tools/Communications...**
5. Change **MODBUS Format** to **RTU**. Press **OK**. The controller will now communicate using RTU mode.



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6. MODBUS CONFIGURATION

This chapter descibes step-by-step how to modify the MODBUS parameters on the controller. This allows the user to check the configuration on the controller to make sure it matches the SOLO software default communication settings. It is also useful for setting up the controller for automation needs.

When the controller is first powered on, the display will read no , Cont if no thermocouple is connected, or the **PV** (thermocouple temperature) and the programmed **SV** (setpoint) temperatures.



1. To check parameters or to change them, hold down the **SET** button for at least **5 seconds**. The display will change to InPt , P.



2. Press the **ROTATE** button **eleven times** (11). You will see C-SL , ASCII or C-SL , rtU.



Press the **UP ARROW** or **DOWN ARROW** to switch modes. The default is ASCII.

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3. Press the **ROTATE** button. The display will change to  , .

   This is the MODBUS address. The default is 1.

   Use the **UP ARROW** or **DOWN ARROW** to change the address.



4. Press the **ROTATE** button. The display will change to  , .

   This is the baud rate. The default is 9600.

   Use the **UP ARROW** or **DOWN ARROW** to change the speed.



5. Press the **ROTATE** button. The display should be  , .

   This is the data bits. The default is 7. Use the **UP ARROW** or **DOWN ARROW** to change it.



   Note that if the controller is in RTU mode, the value is 8 and cannot be changed.

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6. Press the **ROTATE** button. The display should be PrtY , EuEn.

   This is the parity. The default is even.



7. Press the **ROTATE** button. The display should be StoP , 1.

   This is the number of stop bits. The default is 1.



8. Press the **SET** button to exit and return to the home display.



OR



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