



High Temperature High Pressure Cell Controller

User Manual



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2I-614-166 Issue 13

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HIGH TEMPERATURE HIGH PRESSURE CELL CONTROLLER (FOR P/N'S GS05850 AND GS05855)

USER MANUAL

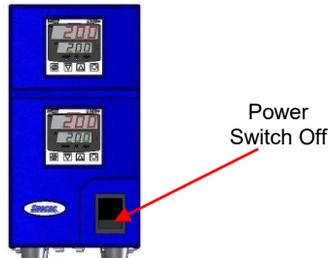
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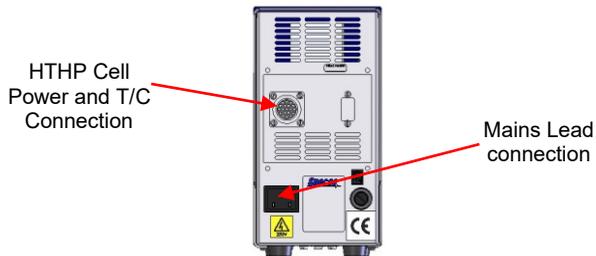
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Quickstart Guide

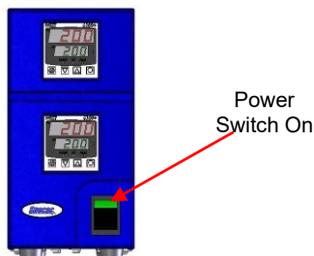
1. On front panel check power switch is off. (Green tab upper part is not showing.)



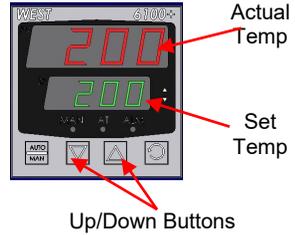
2. Make necessary connections from the HTHP Cell to controller and mains lead to controller.



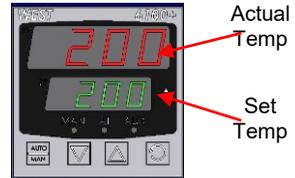
3. Switch power on at mains. Switch power on at controller. (Green tab upper part is showing). Wait for start up messages to clear. Temperature values shown in upper and lower displays for cell sample heater (upper) and window heaters (lower) WEST unit.



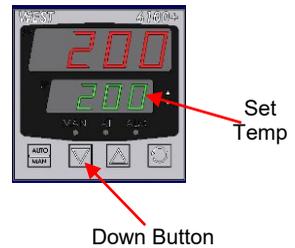
4. Set required temperature in lower display by using up/down buttons. When up/down buttons are released, after a short time the temperature begins to rise in the upper display (actual temperature).



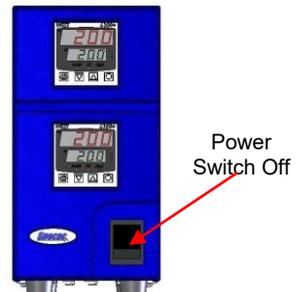
5. Wait until the temperature is steady (stabilizes) before making any measurements. (The actual temperature and set temperature are the same).



6. Before shutdown, return lower display temperature (set temp) to ambient e.g. 20°C to prevent accidental heating on next power-up. (Use down button).



7. To shut down, press power switch to off. Allow accessory to cool if necessary and disconnect from controller. Remove mains lead. Store carefully.



1. Introduction

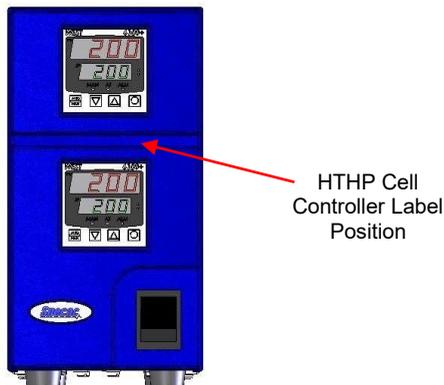
Thank you for purchasing a Specac product.

This instruction manual for the High Temperature High Pressure (HTHP) Cell Controller is to be used in conjunction with the instruction manual for the HTHP Cell, 2I-05850-17.

The controller for the HTHP Cell consists of two separate WEST 6100+ temperature controlling units for independent heating control of the sample heating post (heater block assembly) and heating of the pressurised window assemblies on the cell body. The upper WEST controller is for heating of the heater block assembly and the lower WEST controller is for heating of the HTHP Cell body. The HTHP Cell accessory connects to the rear of the temperature controller via a single lead which incorporates the separate power lines and thermocouples (T/C) for control of the heaters in the heater block assembly and the cell body.

The HTHP Cell controller is identified on its **rear panel** from an appliance label for the part number of the HTHP Cell (P/N GS05850 or GS05855) and a serial number. The name of the HTHP Cell is shown on the **front panel** of the controller.

Important! *Do not use the 4000 Series temperature controller with an accessory having a different part number to that indicated.*



2. Safety Considerations

List of Safety Symbols

Safety Symbol	Meaning
	Caution (Reference ISO 7000-0434B, 2004-01)
	Caution – Hot Surface (Reference IEC 60417-5041, 2002-10)
	Caution – Possibility of Electric Shock
	Indoor Use Only

General Safety

It is important to read any associated safety information before use of any Specac accessory and/or the 4000 Series temperature controller.



Caution! *This user instruction manual should be read in conjunction with the manual provided with the intended Specac accessory for which this controller was supplied.*



Caution! *For indoors use only. Do not subject to dripping or splashing. Not for use in wet location.*

Electrical Safety



Caution! *If the inlet fuse requires replacement, replace only with the correct fuse type as indicated on the rating label of the controller.*

Whenever it is likely that the safety protection has been impaired the controller shall be made inoperative and be secured against unintended operation. The protection is likely to be impaired if for example the controller:

- Shows visible damage.
- Fails to perform the intended measurements.
- Has been subjected to prolonged storage under unfavorable conditions.
- Has been subjected to severe transport stresses.



Caution! *This equipment is intended to be connected to an earthed mains socket outlet. Protection provided by this equipment will be impaired if the earth connection is not present.*

Only use the mains cord set supplied with the controller. If an alternative cord set needs to be used, replace only with an equivalent type of the same rating which is acceptable for the country for which the controller is to be used.

Do not use this equipment with any accessory it has not been specifically designed or configured to operate. Contact your local authorized Specac dealer or sales team for further information regarding the compatibility of the controller with other devices and 3rd party accessories.

Do not position the equipment so that it is difficult to access the disconnecting device (Mains plug and/or appliance coupler) when in use.

User Manual

No user serviceable parts within. Contact Specac and/or your local Specac authorised agent for service and repair requirements.

Disconnect the device from the mains supply before cleaning. Only clean with a soft, lightly dampened cloth. Do not use harsh and/or abrasive cleaners on any Specac product. Consult Specac or their authorized agent if in any doubt.

If this equipment is used in a manner not specified within this manual the protection provided by the equipment may be impaired.

Do not block or cover the ventilation holes on the rear, and base of the unit. It is recommended to leave at least 100mm spacing surround the 4000 series controller and to ensure it is place on a stable, flat surface.

End of Lifetime Equipment Use



If or when the 4000 Series temperature controller and any associated accessory that is powered by the controller have reached their limit of lifetime and need to be replaced, use appropriate WEEE and other local regulations for the safe disposal of electrical equipment and toxic chemicals.

3. Specifications

The 4000 Series temperature controller is designed for connection to an AC supply rated 110/230 VAC 50/60 Hz, depending on intended country of use.

Dimensions: 502(d) x 110(w) x 210(h) mm.
Weight: 4.5 kg.

Rated working voltage input: 110/230VAC 50/60Hz 3A
Maximum working voltage tolerances: +/-10%
Protection Class: Class I (Earthed)
Insulation Category: CAT II

Rated output voltage: 30 VDC max
Rated output current: 10A(300W) / 10A(300W)
Controller temperature range: ambient to +250°C
Temperature set steps: 1°C
Temperature stability: ±1°C

Rated operating & Storage Temperatures;
Normal: 5 to 40°C (0% to 80% relative humidity and noncondensing)
Storage: -20 to 55°C (0% to 95% relative humidity and noncondensing)

4. Unpacking and Checklist

On receipt of your HTHP Cell Controller please check that the following have been supplied.

- HTHP Cell Cell Controller (labelled for use with the HTHP Cell).
- Mains Lead.
- Instruction Manual for HTHP Cell controller.
- RS232, RS485 or USB Communications connectivity (if ordered).

Unpack the HTHP Cell Controller and check that the input voltage on the silver appliance label (1) at the rear of the controller is compatible with your mains voltage.

At the end of this manual (pages 27 and 28) you will see a diagram of the rear panel for the HTHP Cell Controller showing the type of connections used and a blank appliance label. It would be useful at this stage to note the appliance label information from your specific controller on page 28 of this manual.

5. Operation

Set up and operation of the HTHP Cell Controller with the HTHP Cell accessory is as follows.

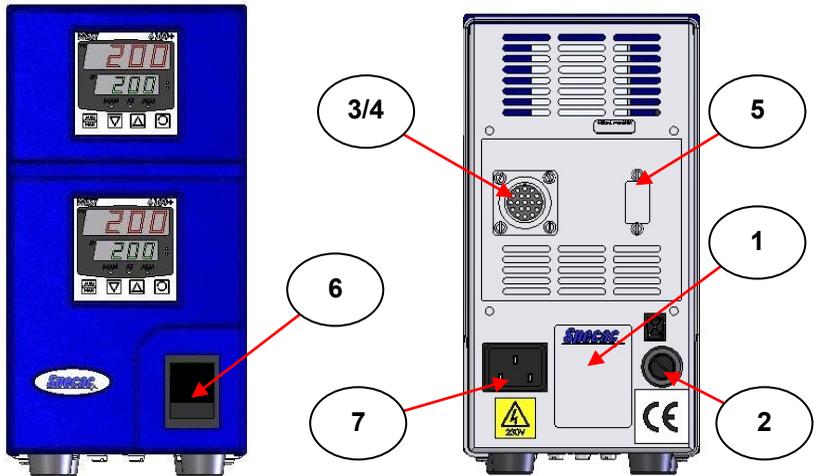


Fig 1. Front and Rear Views of the HTHP Cell Controller

- 4.1 Make the connection from the HTHP Cell to the rear of the temperature controller using the single 19 way plug and power cable. The plug is connected to the power output (3) and thermocouple port (4) 19 way socket and is made secure by clockwise rotation of the outer screw connection ring until it clicks into position. Connection to the RS232 port (5) (if fitted) can also be made if automatic operation by software control is required.
- 4.2 Check that the power switch (6) on the front of the controller is off. The power switch (6) has the markings O and 1. The switch is off when O is pressed level with the surface of the panel.
- 4.3 Connect the mains lead to the controller (7) and switch power on at the mains.

- 4.4 Stand the controller on a flat surface to allow good ventilation for operation. Turn the controller on by the power switch (6) at the front of the controller. (1 is pressed level with the surface of the panel). The upper edge of the switch (6) shows a green color when in the on position.
- 4.5 When power is supplied to the HTHP Cell Controller and the HTHP Cell is also connected, the controller undergoes a self-test routine. The routine follows the procedure below as indicated on the digital displays of the two WEST 6100+ temperature controllers (see Fig 2.).

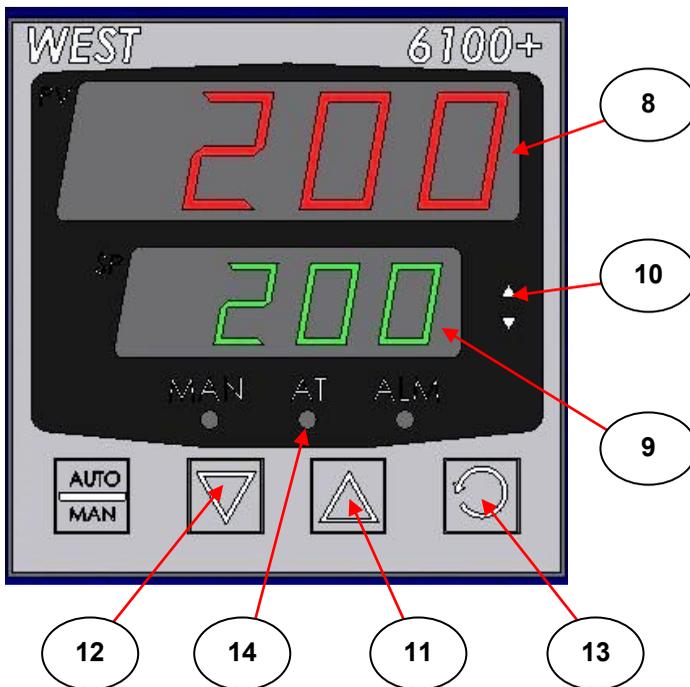


Fig 2. WEST 6100+ Temperature Controller Digital Display

- a) 8888 is shown in red in the upper digital display (8) for a few seconds.
- b) All display segments are then illuminated. 8888 is shown in both the upper display (8) in red color and lower display (9) in green color. The MAN, AT and ALM buttons illuminate red as do the up and down arrow indicators.
- c) The lights stay illuminated for approximately 5 seconds before the controller changes to display the **actual** temperature in the upper display (8) in red and the **set** temperature in the lower display (9) in green. The temperature units are in degrees Centigrade.
- d) If the set temperature value in the lower display (9) is **greater than** the actual temperature in the upper display, the up arrow (10) light is illuminated in red. This indicates that power is being supplied by the controller to the heater of the HTHP Cell accessory. Controlled power will be applied to the accessory until the last set temperature is reached. If the set temperature is **less than** or equal to the actual temperature displayed, the up arrow light (10) will not be illuminated.

The self-test routine is now complete.

Note: *If the sequence for the start up does not follow the steps a) to d) and the display indicates an **OPEN** message displayed in red in the upper display (8), check that the cable connection(s) to the rear of the controller is/are correct. An **OPEN** message indicates that there is a problem with the thermocouple. It may be broken or is not making sufficient contact through its connection.*

- 4.6 The up (11) and down (12) arrow touch buttons may be used to increase or decrease the set temperature. Use these buttons accordingly to set the temperature required. Note that the longer the button is depressed, the faster the temperature will change. Wait until the set (9) and actual (8) temperatures register the same value on both displays before performing any experimental measurements.

Important: *It is highly recommended that the set temperature (lower display) (9) is reduced to ambient temperature, e.g. 20°C after using the controller before the power is switched off (6). This will avoid immediate, unwanted or accidental heating of the HTHP Cell when powering on at the start of an experiment, since the last set temperature is maintained in the memory of the HTHP Cell Controller even when mains power is removed.*

- 4.7 The upper digital display (8) records the **actual** temperature of the thermocouple used in the heater block assembly (upper West 6100+ unit) and the window assemblies (lower WEST 6100+ unit), whilst the lower digital display (9) indicates the **set** or required temperature for the heater block assembly and the window assemblies from their respective upper and lower WEST 6100+ controlling units. The up arrow indicator (10) (power delivery indicator) will not be lit if the set temperature (lower display (9)) is several degrees lower than the actual temperature (upper display (8)). Alternatively, the up arrow indicator (10) will pulsate if the two temperatures are within a few degrees centigrade of each other or stay permanently lit if the set temperature (lower display (9)) is several degrees higher than the actual temperature (upper display (8)).
- 4.8 The rate at which power is fed to the HTHP Cell depends on the temperature difference between the set (9) and actual (8) temperatures. The up arrow indicator (10) will be constantly illuminated, pulsate or unlit depending on whether power is being fed to the accessory or not. The proportional, integral and differential (PID) time constant parameters which dictate the heating rate and stability of the control process have been factory set for optimum performance in most applications.

Note: *If you wish to change the parameter settings for your application refer to the parameter listing found in the HTHP Cell instruction manual 2I-05850-15. Specac recommend use of the “tuning” facility of the HTHP Cell Controller to change a parameter setting. Instructions how to do this are found in the Tuning Section for the HTHP Cell Controller (Section 6), page 18).*

Settings on the HTHP Cell Temperature Controller

The HTHP Cell temperature controller will be supplied with appropriate operating parameter settings on the upper and lower WEST 6100+ controlling units specific for the separate heating control of the heater block assembly and the cell body for the pressure certified window assemblies of its dedicated HTHP Cell accessory.

As supplied, the HTHP Cell accessory has a maximum temperature operation of 800°C for the heater block assembly under vacuum conditions and so the factory set parameters on the two WEST 6100+ controllers (accessible through the SetP function – see Section 5) will allow for the most efficient operation at this maximum value.

If you wish to operate the accessory for most of the time at an alternative temperature to the maximum, then certain parameters may need adjusting on the **upper** WEST 6100+ unit that controls the power to the heater block assembly. Change of the parameters for appropriate control in operation is best achieved via the Pre Tune function (see Section 6).

Note: *When using the ramp rate (rP) facility to alter the rate of heat that is applied to the accessory, the performance cannot be exceeded to heat the HTHP Cell accessory faster than when at its factory specified maximum ramp rate (rP) setting.*

Ramp Rate Notes

The Ramp Rate Parameter (rP)

The rate of heating to the heater block assembly and the cell body heaters of the HTHP Cell accessory is dependent upon a set ramp rate (rP) value. The value for rP set on the controller unit is shown when the “cycle” button (**13**) is pressed twice from the temperature display mode.

The rP parameter is shown in the lower display (**9**) in green and its value is shown in the upper display (**8**) in red. The units are displayed in degrees Centigrade per hour e.g. 600 degrees/hour. This represents a typical rate rise of 10 degrees/min.

If you wish to change the ramp rate rP, whilst the parameter value is displayed, use the up (**11**) or down (**12**) arrow buttons. (e.g. for a 5 degrees/min rate rise set the rP parameter to indicate 300.)

If you do not wish to adjust the ramp rate rP parameter, push the cycle button (**13**) once to return to the temperature display. If no action is taken within 2 minutes the controller will automatically default back to display of the set and actual temperature indicators.

The Setpoint Ramp Rate Parameter (SPrP)

Before being able to access the ramp rate rP parameter to change its value, when the cycle button (**13**) is pressed once, the set point ramp rate SPrP function will be displayed. This is a **non-changeable** displayed controller parameter and is the rate at which the **actual** temperature value will move towards the **set** temperature value when the set temperature value (SP parameter) is adjusted or changed.

With ramping in use (ON), the initial value of the SPrP parameter at power up will be equal to the current process variable value. The actual SPrP parameter value will rise/fall at the ramp rate (rP) value set until it reaches the target SPrP value. SPrP ramping is used to protect the process from rapid changes at the actual display temperature.

The display code for SPrP is the value set for rP (the ramp rate).

6. Parameter Settings

The HTHP Cell Controller is factory set for its control functions (parameters) on the two WEST 6100+ controller units that relate specifically for operation of the HTHP Cell. Your experimental requirements may mean that the HTHP Cell is to be operated over a specified temperature range and so the parameters of the HTHP Cell Controller can be changed to suit the operating conditions for best control.

Using a tuning function (see Tuning in Section 6) can alter the performance of the HTHP Cell over a specific temperature range. However certain operating parameters will be changed from their factory settings. To change the parameters back to their factory settings after a Tuning function and subsequent operation (if this is desired), they are accessed through the SEtP function.

Warning: *Manually changing a parameter from its factory setting instead of use of a Tuning Function (Pre Tune or Self Tune), will alter the performance and workings of the accessory. The accessory may be seriously compromised from any manual changes to the parameter settings causing overheating to the accessory and its parts. When manually inputting a parameter value it should **always** be the factory set value.*



Access to Parameter Listing

The parameters that have been factory set on the two WEST 6100+ controller units used in the HTHP Cell Controller are accessible using the SetP function. Only a few of the 21 parameters that are listed may be affected by the Pre Tune function (see section 6 on Pre Tuning), but all of the parameters and their descriptions are listed for reference purposes.

To enter the SEtP mode and gain access to the parameter list hold down the cycle button (**13**) and press the up (**11**) arrow button. OPtr in red and SLcT in green are displayed. Press the up (**11**) arrow button once to access the SEtP function. SEtP in red and SLcT in green are displayed.

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Press the cycle (**13**) button once. 0 (zero) in red and ULoc in green is displayed. An unlock code needs to be entered to gain access to the parameter list. Using the up (**11**) arrow button select the value 10, which will be displayed in red.

When the unlock code value has been input, press the cycle (**13**) button in succession to scroll through each displayable parameter. Change the setting of a particular parameter value using the up (**11**) arrow or down (**12**) arrow buttons. The current value remains fixed when you scroll onto the next parameter in the list via the cycle (**13**) button.

If you wish to exit the SEtP function and parameter list at any stage hold down the cycle (**13**) button and press the up (**11**) arrow button once. SEtP in red and SLcT in green are displayed.

To return to the temperature display continue to push the up (**11**) arrow button four times. The display will scroll through ConF, inFo, Atun to reach OPtr in red and SLcT in green. Press the cycle (**13**) button once to show the temperature display.

Alternatively, if no selection (button pushes) are made for up to two minutes, the controller will automatically default to the temperature display.

Note: *The last input value of a parameter would be accepted if the controller was allowed to stand for two minutes with no further operation and then automatically defaulted to the temperature display.*

Displayable Parameters

The table on the following page is a list of the 21 control parameters that can be accessed through the SetP function. The parameter is shown how it appears on the lower display of the WEST 6100+ controller, its name and a brief description for its function. A corresponding list of the parameters with the factory set values for the HTHP Cell are found in the HTHP Cell instruction manual 2I-05850-17 on pages 79 and 80.

Lower Display	Parameter Name	Parameter Function Description
FILt	Input Filter Time Constant	This is used to filter out extraneous impulses on the process variable.
OFFS	Process Variable Offset	This is the variable to be measured by the primary input (the thermocouple) of the accessory being controlled.
PPL _U	Primary (Heat) Output Power	This is the power level of the primary outputs supply.
Pb_P	Primary Output Proportional Band	This is the portion of the input span over which the Primary (Heat) Output Power level is proportional to the process variable value.
ArSt	Automatic Reset (Integral Time Constant)	This is used to automatically bias the proportional output(s) to compensate for process load variations.
rAtE	Rate (Derivative Time Constant)	This specifies how the control action responds to the rate of change in the process variable.
biAS	Manual Reset (Bias)	This is expressed as a percentage of output power to help reduce any overshoot at the set temperature value.
SPuL	Setpoint Upper Limit	This is the maximum limit for setpoint adjustment.
SPLL	Setpoint Lower Limit	This is the minimum limit for setpoint adjustment.
OPuL	Primary (Heat) Output Upper Power Limit	This is used to limit the power level of the primary output and may be used to protect the process being controlled.
Ct I	Output 1 Cycle Time	This is for time proportioning outputs and is used to define the time period over which the average on vs. off time is equal to the required PID output level.
PhAl	Process High Alarm	This defines the process variable value above which an Alarm will be active.
AHy1	Alarm 1 Hysteresis	This is the percentage range of the alarm band that the process variable must pass through before the alarm will change state.
PLA2	Process Low Alarm	This defines the process variable value below which an Alarm will be active.
AHy2	Alarm 2 Hysteresis	This is the percentage range of the alarm band that the process variable must pass through before the alarm will change state.
APt	Auto Pre-Tune enable/disable	When enabled this allows for automatic functioning of the Pre Tune facility on power up of the controller.
PoEn	Manual Control select enable/disable	This determines whether operator selection of manual control is enabled or disabled.
SPr	Setpoint Ramping enable/disable	When enabled, a Setpoint Ramp Rate can be set which limits the rate at which the actual setpoint temperature value can move towards the target (actual) temperature value.
rP	Setpoint Ramp Rate Value	The rate at which the setpoint temperature value will move towards the target (actual) temperature value if Setpoint Ramping is enabled.
SP	SP Value	This is the target temperature value at which the controller will attempt to maintain by adjustments to the power output level.
SLoc	Set-up Lock Code	Code for gaining access to the set up parameter listing.

7. Tuning Facility

What is Tuning?

In tuning you match the characteristics of the HTHP Cell Controller to that of the HTHP Cell itself to obtain good control. Good control means:

- Stable 'straight line' control of the temperature at Setpoint without fluctuation.
- Acceptable overshoot or undershoot of the temperature Setpoint.
- Quick response to deviations from the Setpoint caused by external disturbances, thereby restoring the temperature rapidly to the Setpoint value.

Tuning involves self calculation by the WEST 6100+ controller unit in the setting of the various PID parameters for operation. (See SetP parameter listing in Section 5.)

Note: *You should take measurements only when the **actual** temperature is stabilized with the **set** temperature.*

The WEST 6100+ controlling units on the HTHP Cell Controller have two types of tuning function – Pre Tune (Ptun) and Self Tune (Stun).

Pre Tuning (Ptun)

Automatic tuning of the operating parameters (SetP) is achieved by using the Pre Tune facility.

The HTHP Cell Controller will be initially supplied with factory set parameter values suitable for a maximum operating temperature of circa 800°C under vacuum conditions. If the HTHP Cell is to be operated for a specific temperature range lower than this maximum value achievable, the controller parameter values can be changed to

best match this operating temperature by invoking the Pre Tune procedure. After Pre Tuning the factory PID parameter settings will be changed. If you wish to restore them back to their factory settings, after any use of the HTHP Cell accessory at the new Pre Tuned parameter conditions, use the parameter values found in the HTHP Cell instruction manual 2I-05850-17 on pages 79 and 80.

Note: *Before the Pre Tune procedure can be used the ramp rate (rP), parameter value must be switched to off. (Set blank). This is achieved by pressing the cycle button (13) twice to access the (rP) value and then hold the up (11) arrow button until the upper display (8) progresses towards the value 9999 and then turns blank.*

Tuning is to be carried out at a **specified set temperature** input for the parameter (SP). For the tuning to be effective, the **actual (8)** temperature of the HTHP Cell at the time of tuning must be at least 5% lower in value than the **set (9)** temperature value for tuning. (e.g. to tune at 300°C temperature set the tuning set point (SP) to 300°C, but the accessory must be less than 285°C displayed for the **actual (8)** temperature)

Note: *When tuning for higher temperatures (e.g. at 700°C), ensure that the HTHP Cell accessory is operating reasonably close in **actual** temperature value to the tuning SP value, but is still at least 5% lower than the **set** temperature value. (e.g. to tune at 700°C, set the tuning set point (SP) to 700°C, but the accessory must be at about 650°C.)*

To change the tuning set point (SP) temperature, whilst in the routine to switch off the ramp rate (rP) value and when the upper display (8) is blank, press the cycle button (13) once. The actual temperature will be displayed in red in the upper indicator (8) and the set temperature in green in the lower indicator (9).

AT THIS STAGE, NOW CHANGE THE SET TEMPERATURE PARAMETER (SP) TO THE VALUE FOR TUNING USING THE UP (11) OR DOWN (12) ARROW BUTTONS.

Switching On Pre Tune

From the previous steps in turning the (rP) function off and changing the (SP) parameter to the value for tuning, hold down the cycle button (13) and then press the up (11) arrow button once. OPtr in red and SLct in green are displayed.

Press the up (11) arrow button four times to reach the Atun function which will be displayed in red in the upper indicator (8).

Note: *To reach the Atun function, successive presses of the up (11) arrow button will have displayed SetP, ConF and inFo in red in the upper indicator (8), whilst SLct remains in green in the lower display indicator (9).*

Whilst the upper display is showing Atun, press the cycle button (13) once. An unlocking code Uloc is displayed in green in the lower indicator. Use the up (11) arrow button to select the value 40 to gain access to the Pre Tune (Ptun) function.

Press the cycle button (13) once and Ptun is displayed in green in the lower indicator (9). OFF in red will be displayed in the upper indicator (8). Press the up (11) arrow button once to switch Ptun to ON.

Once Pre Tuning has begun the AT (Auto Tuning) indicator light (14) will begin to flash.

To observe the changes being made whilst the Pre Tune function is operating, hold down the cycle button (13) and then press the up (11) arrow button once. The Pre Tune menu is exited and Atun in red and SLct in green are displayed.

Press the up (11) arrow button once and OPtr in red and SLct in green are displayed. Finally, press the cycle button (13) once to bring the controller back to the set and actual temperature display modes.

When the controller has been successfully Pre Tuned, the AT indicator light (14) will stop flashing and remain switched off.

Resetting of the Ramp Rate (rP)

A value for the ramp rate function (rP) can now be reset after the Pre Tune procedure has been completed.

Press the cycle button (**13**) once. The ramp rate parameter rP only will be displayed in green. By use of the down (**12**) arrow select a value for the ramp rate. A value to set will start from blank and then count down from 9999, but the **maximum** value that can be set will be found from the factory set parameter value for (rP) of the HTHP Cell accessory from its own instruction manual 2I-05850-17 on pages 79 and 80. Any rP values that are **lower** than the maximum factory value can be set for operation.

Self Tuning (Stun)

The Self Tune (Stun) function is for setting a more accurate fixed temperature without fluctuation about the set temperature point. To use the Stun function the accessory **MUST** be heated to the **actual** temperature of operation and allowed to stabilise at this **set** temperature. (The rP parameter does not need to be switched off.)

Switching On Self Tune (Stun)

To select the Stun function, hold down the cycle button (**13**) and then press the up (**11**) arrow button once. OPtr in red and SLCT in green are displayed.

Press the up (**11**) arrow button four times to reach the Atun function which will be displayed in red in the upper indicator (**8**).

Note: *To reach the Atun function, successive presses of the up (**11**) arrow button will have displayed SetP, ConF and inFo in red in the upper indicator (**8**), whilst SLCT remains in green in the lower display indicator (**9**).*

Whilst the upper display is showing Atun, press the cycle button (**13**) once. An unlocking code Uloc is displayed in green in the lower indicator. Use the up (**11**) arrow button to select the value 40 to gain access to the Stun function.

Press the cycle button **(13)** twice. From the first press Ptun is displayed in green in the lower indicator **(9)**. On the second press Stun is displayed in green in the lower indicator **(9)**. OFF in red will be displayed in the upper indicator **(8)**. Push the up **(11)** arrow button once to switch Stun to ON. Once Stun has begun the AT (Auto Tuning) indicator light **(14)** will be switched on and stays illuminated until Stun is switched OFF. (Press the down **(12)** arrow button once to switch OFF the Stun function.)

To return to the temperature display, hold down the cycle button **(13)** and then press the up **(11)** arrow button once. The Stun menu is exited and Atun in red and SLCT in green are displayed.

Press the up **(11)** arrow button once and OPtr in red and SLCT in green are displayed. Finally, press the cycle button **(13)** once to bring the controller back to the set and actual temperature display modes.

Manual Changing of PID Parameter Values

The Ptun and Stun functions when switched on will enable the WEST 6100+ controller unit to automatically adjust the value of certain parameters that have been factory set on the SetP listing.

If you wish to set a specific parameter value (manual setting) outside of any tuning function for the individual proportional (P), integral (I) and derivative (D) values then this can be done by accessing the parameter listing as described on page 17.

Principally, the parameters to adjust that affect the power delivery to any heaters and their overall stability for fine temperature control are:-

(P) Pb-P – Primary Output Proportional Band

This is a temperature band expressed in % of a full scale or the degrees of temperature within which the controller's action takes place. The wider the proportional band (higher value) the greater the area around the setpoint temperature in which the proportional **(P)** action occurs.

(I) ArSt – Automatic Reset Integral Time Constant

Integral control, also known as reset, is a function which adjusts the **(P)** proportional bandwidth with respect to the setpoint to compensate for offset (droop) from the setpoint. Essentially it is a function to adjust the controlled temperature to the setpoint after the system stabilises.

(D) rAtE – Rate Derivative Time Constant

Derivative control, also known as rate, senses the rate of rise or fall of the system temperature and automatically adjusts the **(P)** proportional bandwidth to minimise overshoot or undershoot about the setpoint temperature.

If you wish to alter these PID parameter values manually, as stated in the **Warning** on page 14 you must be careful that the values you enter do not affect the performance of the HTHP Cell accessory whereby damage could occur to the unit.

Note: *Specac recommends that the above PID parameters are changed and used for control of an accessory with the setpoint ramp rate value parameter rP set to **OFF**.*

Note on the Process High Alarm Function (PhAI Parameter)

In respect of the Process High Alarm (PhAI parameter) operation on the temperature controller for the HTHP Cell, the high alarm parameter for the cell body window heaters has been set to 240°C as standard. In operation of the HTHP Cell, if the heater block assembly is set to operate at a temperature to 800°C and the body and windows heaters are set to operate at their maximum of 240°C, it may be that the local temperature of the body and/or windows will be higher than the 240°C maximum **set (9)** temperature and is indicated on the lower WEST 6100+ controller for the **actual (8)** temperature. If an **actual** temperature condition above 240°C for the cell body occurs (any temperature between 240°C and 300°C has been measured), the raised temperature alarm light will turn on to indicate this condition.

User Manual

However, the alarm light is merely an indication of an “over-maximum” event for the **set** temperature and the HTHP Cell accessory has been designed to work safely in this way, should this event arise. The alarm light will go out when the actual temperature falls below 240°C again. If for any reason the local temperature of the HTHP Cell body and/or windows exceeds 300°C, the thermal safety fuse fitted will be activated to cut **all power** to the HTHP Cell sample holder and body/window heaters. (See Safety Point (4), Page 18 of the HTHP Cell instruction manual 2I-05850-17).

7. Automatic Control of the HTHP Cell Temperature Controller by Computer

The HTHP Cell Temperature Controller can be factory fitted with serial communications that allows a personal computer, running appropriate software, to read and write data to the **specific** WEST 6100+ controller unit for the sample heating post (upper WEST6100+ unit of the two fitted).

If you have ordered your 4000 Series™ Temperature Controller with RS232, RS485 or USB connectivity it will already be fitted. Please note if the USB connectivity option (P/N GS28001) has been ordered, a CD for the software driver to use should be provided with the controller and parts. If this CD is missing then the information can be downloaded from the following website page:

<http://www.mev.co.uk/pages/Support/Downloads.html>

The communications protocol is: MODBUS or ASCII

Note: *The communications protocol supplied by Specac is MODBUS. Please contact your local WEST representative for change to ASCII.*

The parameter addresses for the key parameters are given in the table below.

Parameter Name	Parameter Address (MODBUS)	Parameter Address (ASCII)	Read/Write (R/W)
Temperature	1	M	R
Setpoint	2	S	R/W
Output	3	W	R/W
Proportional Band	6	P	R/W
Integral Time	8	I	R/W

Derivative Time	9	D	R/W
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Software for WEST 6100+ Controlling Units

Specac uses the WEST 6100+ controlling unit in our 4000 Series temperature controllers for powering appropriate heatable accessories.

<http://www.west-cs.com/products/models/6100-single-loop-controller/>

The software available from WEST enables the internal control or display parameters to be modified; these do not normally need to be adjusted by the user and should not be done without consultation with Specac.

This WEST software **does not** allow the user to set, for example, the temperature from a computer, as can be set by the physical buttons on the control unit.

At the time of writing, the above link also offers a page where the WEST software and instructions can be downloaded at no charge.

Additional Control

If a user wishes to modify temperature settings automatically from computer (PC/Laptop, etc) control having an RS232, RS485 or USB communications option port fitted to the 4000 Series controller, additional controlling software can be obtained from ISC Inc.; this is an independent company to WEST or Specac. This software also has other features such as temperature logging, but does have to be purchased.

<http://iseinc.com/>

At the time of writing, a trial version can be downloaded from:

http://instrumentation-central.com/Pages/commander_supervisory_software.htm

Only Use:

Commander Supervisory Software for communication, data logging and graphing of your process; Version 4.2.20.

Important Notes

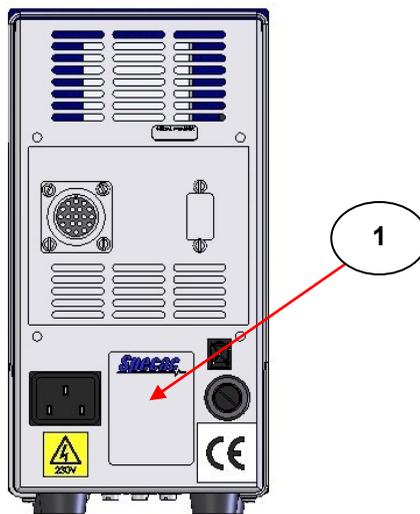
1. A table of original display parameters set on the WEST 6100+ controlling unit used with the Specac 4000 Series controller for powering of the specific Specac accessory is supplied in the appropriate Specac User Instruction Manual for the accessory..
2. The software from either WEST or ISC is manufactured and supplied by them; any questions or requests for help and assistance must be directed to the respective company.
3. The software from either WEST or ISC may not integrate with other software such as the spectrometer/spectra acquisition software.

8. Identification of your HTHP Cell Controller

On the rear of the HTHP Cell Controller there is a Specac appliance label (1). This label includes the part number (GS05850 or GS05855), the serial number, the voltage, max power and fuse rating of your HTHP Cell Controller. The name of the HTHP Cell accessory is shown on the front panel of the controller.

Please make a note of the numbers to copy into the blank appliance label on the next page. This information will be useful should you need to contact Specac about your HTHP Cell accessory and its controller system.

Important! *On no account should the HTHP Cell Controller be used with an accessory having a different part number to that shown on the rear panel of the controller.*



Specac

Part No

Serial No

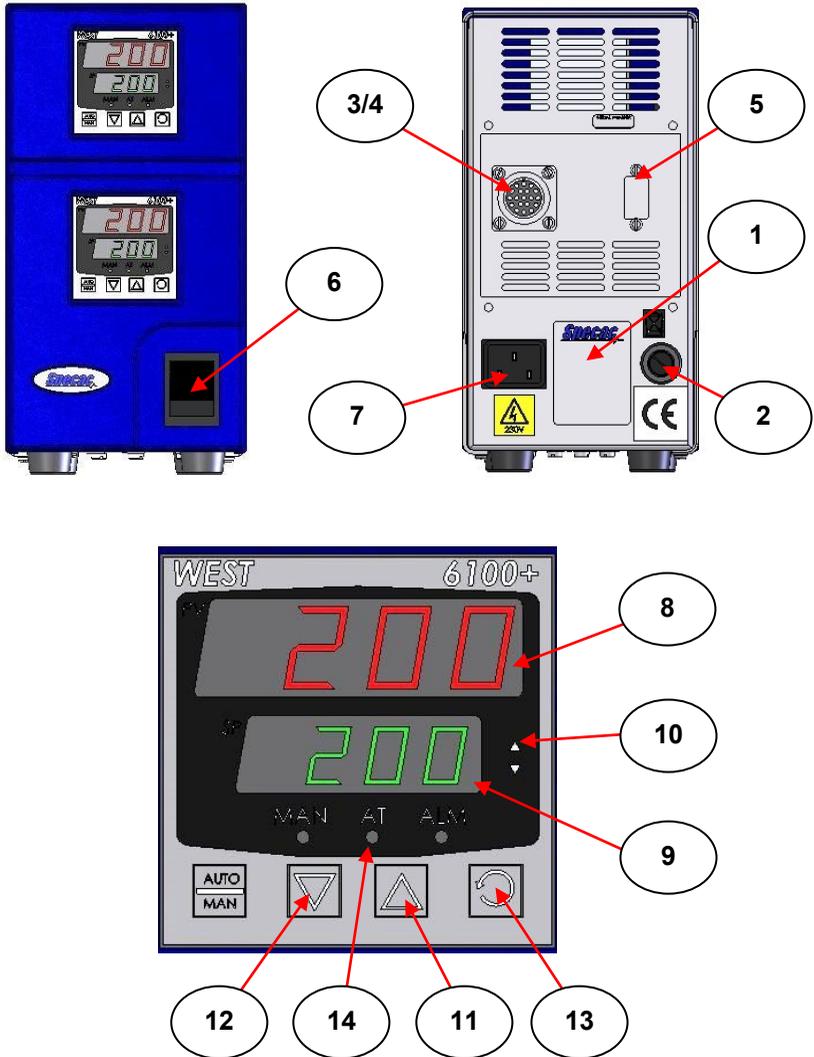
Voltage

Max Power

Fuse Rating

KENT ENGLAND

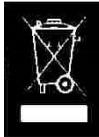
9. Key Features



10. Legend to Key Features

- (1) Appliance Label
- (2) Fuse for appliance
- (3) HTHP Cell power connection
- (4) HTHP Cell Thermocouple connection
- (5) RS232 port connection (if fitted).
- (6) Power switch
- (7) Mains lead connection
- (8) Upper digital display
- (9) Lower digital display
- (10) Up arrow heating indicator
- (11) Up arrowed button
- (12) Down arrowed button
- (13) Cycle button
- (14) AT (Auto Tuning) indicator

WEEE Directive for Equipment Disposal



The symbol (above) on the back of the controller indicates that this product complies with the Waste Electrical and Electronic Equipment Directive (WEEE). If this product is in use and was purchased within the European Union, please contact your local sales agent or Specac to make arrangements for disposal of this equipment.

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