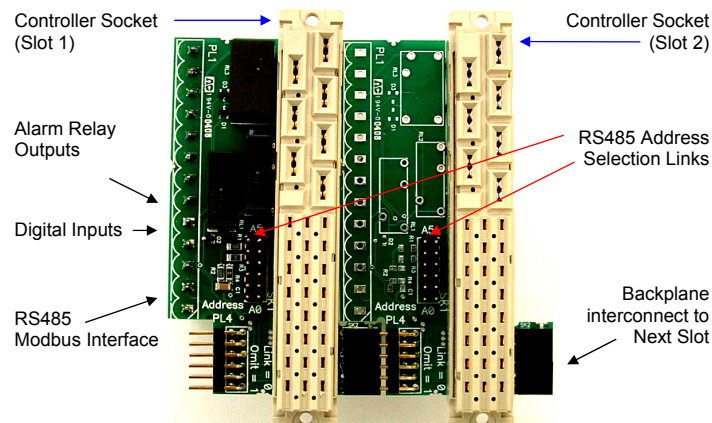


# HPS-C-Slot CONTROLLER CONCISE PRODUCT MANUAL

**CAUTION:** Installation should be only performed by technically competent personnel. Local Regulations regarding electrical installation & safety must be observed.

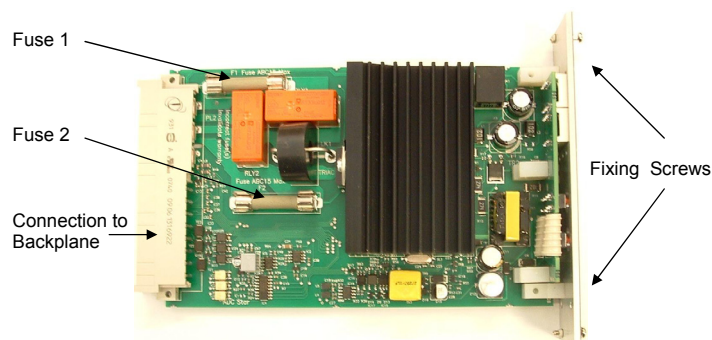
## 1. INSTALLATION

### Backplane Modules



Two modules shown. They are installed left to right in a 3U high Euro Rack. There is only one terminating (relay) module allowed per rack and is always installed on the left, standard (non relay) modules are installed to the right of the terminating module. Alarm relay outputs, Digital inputs and RS485 connections are made only to the terminating module. Each module requires a unique RS485 address. This sets an upper limit of 63 devices on a single bus. Backplane modules can be interconnected up to a maximum according to the size of the Euro enclosure, power available and maximum internal ambient temperature.

### Slot Controller



### Rack-Mounting

The slot controller must only be operated within a Euro-Rack Enclosure that has been designed for use with the slot controller and Backplane modules. The front panel of each slot controller is a standard 3U high and 8HP wide.



**CAUTION:**

Fuses: 250V ac – 15 amp type ABC15

UNUSED MODULE POSITIONS MUST BE FITTED WITH A BLANKING PLATE AND ALL SLOT POSITIONS FIXED IN PLACE BY SCREWS. NOT DOING SO WILL UNDERMINE THE SAFETY OF THE PRODUCT.

A SWITCH OR CIRCUIT BREAKER, MARKED AS THE EQUIPMENT DISCONNECTING DEVICE, MUST BE INCLUDED IN THE INSTALLATION IN CLOSE PROXIMITY TO THE SLOT CONTROLLER AND WITHIN EASY REACH OF THE OPERATOR.

CAUTION: ENSURE POWER IS REMOVED FROM PANEL BEFORE ADDING OR REMOVING SLOT CONTROLLERS. DANGEROUS VOLTAGES ARE PRESENT ON THE PCB!

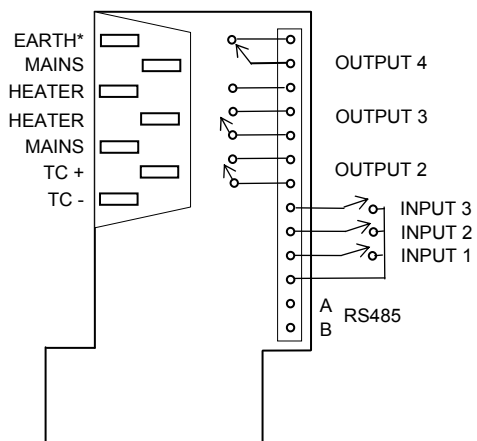
TAKE CARE WHEN HANDLING THE SLOT CONTROLLER. THERE MAY BE SHARP EDGES AND COMPONENT LEADS ON THE PCB!



## Rear Terminal Wiring

USE COPPER CONDUCTORS (EXCEPT FOR T/C INPUT)

It is the responsibility of the OEM to ensure suitable conductors are used and that required isolation is maintained.



Faston terminals are provided for mains supply input and heater output. A phoenix type 0.1" pitch header is provided for relay outputs 2 – 4, digital inputs and the RS485. Digital inputs are intended for connection to simple switches only and are not isolated from each other or the TC input of the first slot position.

\* This connection is to the Heat Sink. Normally no connection is required to meet CE requirements but if the mains supply is subject to "heavy industrial" unsuppressed transients it is recommended that this connection is completed to a good local earth.

## 2. OPERATOR MODE

The operator screens are active from power on, or can be accessed from Select mode (see section 4).

**Note:** Displays shown are depending on the configured operation strategy. The units are preconfigured to match the hotrunner application needs. If you intend to change the configuration you should do this before starting normal operations.

Press to scroll through the parameters, then press or to set the required value. The following table is showing the sequence of screens.

**Note:** Default operation strategy is 2

Upper Display	Lower Display	Visible when	Description
PV Value	Active SP Value	always	PV and target value of selected SP <i>SP1, SP2 adjustable when active</i>
PV Value	Heater Current	always	PV and heater current value <i>---A shown while initializing</i>
PV Value	Output	always	Actual output power in %
SP1 Value	<i>_SP1</i>	always	Adjustable target value of SP1 <i>_lit if SP1 active</i>
SP2 Value	<i>_SP2</i>	Strategy 2 only	Adjustable target value of SP2 <i>_lit if SP2 active</i>
bSP Value	<i>_bSP</i>	Strategy 2 only	Adjustable boost offset to SP1 <i>_lit if boost (SP1+bSP) active</i>
Selected SP	<i>SP5</i>	If selected in setup <i>SSEn = EnAb</i>	Adjustable target setpoint selection SP1, SP2 or bSP
Actual SP Value	<i>SPrP</i>	If selected in setup <i>SPr = EnAb</i>	Actual (ramping) value of SP <i>Read only</i>
Soft Start Time Remaining	<i>SSrE</i>	Only visible when soft start is running	The time remaining until soft start finishes
Active Alarm Status	<i>ALSt</i>	When one or more alarms are active.  <b>AL</b> indicators will also flash	<ul style="list-style-type: none"> <li> Alarm 2 active</li> <li> Alarm 1 active</li> <li> Loop Alarm active <b>L</b> / Short</li> <li> Circuit Alarm <b>S</b></li> <li> High HB Alarm <b>H</b> /</li> <li> Low HB Alarm <b>L</b></li> </ul>

The button is used to abort from close loop control. On OFF the control output goes to 0% and a relay cuts the mains from the heater output. The lower display of the initial screen shows **OFF**.

If manual control is enabled you can exit from **OFF** to manual state with the button. You can directly press or to change the output to the heater. If you decrease the output value to 0% **OFF** mode becomes active again. By pressing the button you go back to close loop control

## 3. MESSAGES & ERROR INDICATIONS

These messages indicate that an error has occurred or there is a problem with the process variable input signal or its wiring.

**Caution:** Do not continue with the process until the issue is resolved.

Parameter	Upper Display	Lower Display	Description
Input Sensor Break	<i>OPEN</i>	Normal	Break detected in process variable input sensor or wiring
Input Over Range	<i>[HH]</i>	Normal	Process variable input > 5% over-range
Input Under Range	<i>[LL]</i>	Normal	Process variable input > 5% under-range
Instrument parameters are not set	<i>GoTo</i>	<i>Conf</i>	Configuration & Setup required. Press  to enter the Configuration Mode.
Automatic Loop Alarm Overridden	<i>AErr</i>	<i>LAEn</i>	Loop Alarm set for <b>Auto</b> but <b>Pb_P</b> is set to 0.0% (ON/OFF control). Loop Alarm uses the manual Loop Alarm Time until PID control is restored. Ensure <b>LAEn</b> is set correctly

## 4. SELECT MODE

Select mode is used to access the configuration and setup menu functions.

It can be accessed at any time by holding down and pressing . In select mode, press or to choose the required mode, press to enter.

An unlock code is required to prevent unauthorised entry to Configuration, & Setup modes. Press or to enter the unlock code and then press to proceed.

Mode	Upper Display	Lower Display	Description	Default Unlock Codes
Operator	<i>OPtr</i>	<i>SLCt</i>	Normal operation	None
Set Up	<i>SEtP</i>	<i>SLCt</i>	Tailor settings to the application	<b>10</b>
Configuration	<i>ConF</i>	<i>SLCt</i>	Configure the instrument for use	<b>20</b>
Product Info	<i>inFo</i>	<i>SLCt</i>	Check manufacturing information	None
Auto-Tuning	<i>Autun</i>	<i>SLCt</i>	Invoke Pre-Tune or Self-Tune	<b>0</b>

**Note:** The instrument will always return automatically to Operator mode if there is no key activity for 2 minutes.

## 5. CONFIGURATION MODE

First select Configuration mode from Select mode (refer to section 4).

Press to scroll through the parameters, then press or to set the required value. Press to accept the change, otherwise parameter will revert to previous value. To exit from Configuration mode, hold down and press , to return to Select mode.

**Note:** Parameters displayed depend on how instrument has been configured. Parameters marked \* are repeated in Setup Mode.

Parameter	Lower Display	Upper Display	Adjustment range & Description	Default Value	
Input Range/Type	<i>inPt</i>		See following table for possible codes	<b>JC</b>	
Code	Input Type & Range	Code	Input Type & Range	Code	Input Type & Range
JC	J: -200 - 1200 °C	KC	K: -240 - 1373 °C	LC	L: 0 - 762 °C
JF	J: -328 - 2192 °F	KF	K: -400 - 2503 °F	LF	L: 32 - 1403 °F
Scale Range Upper Limit	<i>rUL</i>		Scale Range Lower Limit +100 to Range Maximum	<b>500</b>	
Scale Range Lower Limit	<i>rLL</i>		Range Minimum to Scale Range Upper Limit -100	<b>0</b>	

continued on next page...

Parameter	Lower Display	Upper Display	Adjustment range & Description	Default Value
Alarm 1Type	<i>AL1</i>	<i>P_H</i>	Process High Alarm	<b>bAnd</b>
		<i>P_Lo</i>	Process Low Alarm	
		<i>dE</i>	Deviation Alarm	
		<i>bAnd</i>	Band Alarm	
		<i>nonE</i>	No alarm	
High Alarm 1 Value*	<i>PhA1</i>		Range Minimum to Range Maximum in display units	Range Max
Low Alarm 1 Value*	<i>PLA1</i>			Range Min
Band Alarm 1 Value*	<i>bAL1</i>		1 LSD to span from setpoint in display units	<b>10</b>
Dev. Alarm 1 Value*	<i>dAL1</i>		+/- Span from setpoint in display units	<b>10</b>
Alarm 1 Hysteresis	<i>AHY1</i>		1 LSD to full span in display units	<b>1</b>
Alarm 2 Type*	<i>AL2</i>			<b>dE</b>
High Alarm 2 Value*	<i>PhA2</i>		Options as for alarm 1	Range Max
Low Alarm 2 Value*	<i>PLA2</i>			Range Min
Band Alarm 2 Value*	<i>bAL2</i>			<b>10</b>
Dev. Alarm 2 Value*	<i>dAL2</i>			<b>-10</b>
Alarm 2 Hysteresis	<i>AHY2</i>			<b>1</b>
Loop Alarm Time Type	<i>LAEn</i>		<b>dISA</b> (disabled), <b>Auto</b> (2x <b>ArSt</b> time) or <b>MmAn</b> ( <b>LAEn</b> time value)	<b>dISA</b>
Manual Loop Alarm Time	<i>LAEt</i>		<b>0.01</b> to <b>99.99</b> (1s to 99m 59s)	<b>99.99</b>
Alarm Inhibit	<i>Inh1</i>	<i>nonE</i>	No alarms inhibited	<b>AL1</b>
		<i>AL1</i>	Alarm 1 inhibited	
		<i>AL2</i>	Alarm 2 inhibited	
		<i>both</i>	Alarm 1 and alarm 2 inhibited	
Output 2 Usage	<i>USE2</i>	<i>A1_d</i>	Alarm 1, Direct	<b>A1_d</b>
		<i>A1_r</i>	Alarm 1, Reverse	
		<i>A2_d</i>	Alarm 2, Direct	
		<i>A2_r</i>	Alarm 2, Reverse	
		<i>LP_d</i>	Loop Alarm, Direct	
		<i>LP_r</i>	Loop Alarm, Reverse	
		<i>Or_d</i>	Logical Alarm 1 OR 2, Direct	
		<i>Or_r</i>	Logical Alarm 1 OR 2, Reverse	
		<i>And_d</i>	Logical Alarm 1 AND 2, Direct	
		<i>And_r</i>	Logical Alarm 1 AND 2, Reverse	
		<i>hb_d</i>	Heater Break Alarm Direct	
		<i>hb_r</i>	Heater Break Alarm Reverse	
Output 3 Usage	<i>USE3</i>		As for output 2	<b>hb_d</b>
Output 4 Usage	<i>USE4</i>		As for output 2	<b>EnAP</b>
Display Strategy	<i>dSP</i>		<b>1, 2</b> (refer to section 2)	<b>2</b>
Serial Communication Protocol	<i>Prot</i>	<i>Mmbn</i>	Modbus with no parity	<b>Mmbn</b>
		<i>MmbE</i>	Modbus with Even Parity	
		<i>Mmbo</i>	Modbus with Odd Parity	
Serial Communication s Bit Rate	<i>bAud</i>	<b>1.2</b>	1.2 kbps	<b>19.2</b>
		<b>2.4</b>	2.4 kbps	
		<b>4.8</b>	4.8 kbps	
		<b>9.6</b>	9.6 kbps	
		<b>19.2</b>	19.2 kbps	
Comms Address	<i>Addr</i>		1...63 from backplane	
Comms Write	<i>CoEn</i>	<i>r_Ww</i>	Read/Write	<b>r_Ww</b>
		<i>r_0</i>	Read only	
Digital Input 1	<i>dIG1</i>		Select SP1 / SP2 (StandBy)	<b>EnAb</b>
Digital Input 2	<i>dIG2</i>		Select SP1 / SP1+bSP (Boost)	<b>EnAb</b>
Digital Input 3	<i>dIG3</i>		Controller On / Off	<b>EnAb</b>
Configuration Lock Code	<i>CLoc</i>		0 to 9999	<b>20</b>

## 6. SETUP MODE

Note: Configuration must be completed before adjusting Setup parameters.

First select Setup mode from Select mode (refer to section 4). Press to scroll through the parameters,

then press or to set the required value.

To exit from Setup mode, hold down and press to return to Select mode.

Note: Parameters displayed depend on how instrument has been configured.

Parameter	Lower Display	Upper Display Adjustment Range & Description	Default Value
Input Filter Time Constant	F <sub>ILT</sub>	OFF or 0.5 to 100.0 secs	2.0
Proportional Band	P <sub>b_P</sub>	0.0% (ON/OFF) and 0.5% to 999.9% of input span	10.0
Integral Time (Automatic Reset)	A <sub>rSt</sub>	1 sec to 99 mins 59 secs and OFF	5.00
Derivative Time (Rate)	r <sub>dTE</sub>	00 secs to 99 mins 59 secs	1.15
Manual Reset (Bias)	b <sub>iAS</sub>	0% to 100%	25
Primary ON/OFF Differential	d <sub>iFP</sub>	0.1% to 10.0% of input span centered about the setpoint. (Entered as a percentage of span)	0.5
Setpoint Upper Limit	SP <sub>UL</sub>	Current Setpoint to Scale Range max	R. max
Setpoint Lower limit	SP <sub>LL</sub>	Scale Range min to Current Setpoint	R. min
Primary Output Power Limit	OP <sub>UL</sub>	0% to 100% of full power	100
Output 1 Cycle Time	C <sub>t1</sub>	0.5, 1, 2, 4, 8, 16, 32, 64, 128, 256 or 512 secs.	0.5
High Alarm 1 Value	PhA1	Range Minimum to Range Maximum	R. max
Low Alarm 1 Value	PLA1	Range Minimum to Range Maximum	R. min
Deviation Alarm 1 Value	dAL1	±Span from SP in display units	10
Band Alarm 1 Value	baL1	1 LSD to span from setpoint	10
High Alarm 2 Value	PhA2	Range Minimum to Range Maximum	R. max
Low Alarm 2 Value	PLA2	Range Minimum to Range Maximum	R. min
Deviation Alarm 2 Value	dAL2	±Span from SP in display units	-10
Band Alarm 2 Value	baL2	1 LSD to span from setpoint	10
Manual Loop Alarm Time	LAL <sub>t</sub>	0.01 to 99.59 (1s to 99m 59s)	99.59
Auto Pre-tune	APt	EnAb (disabled) or EnAb (enabled)	EnAb
Auto/Manual Control Selection	PoEn	d, SA (disabled) or EnAb (enabled)	EnAb
Setpoint Select Shown in Operator Mode	SSEn	d, SA	d, SA
Setpoint Ramp Adjustment Shown In Operator Mode	SP <sub>r</sub>	d, SA (disabled) or EnAb (enabled)	d, SA
SP Ramp Rate Value	rP	1 to 9999 units/hour or Off (blank)	Off
Setpoint Increment Value	SP <sub>in</sub>	0 to +input span	1
Programmable Sensor Break	PSb	d, SA (disabled) or EnAb (enabled)	EnAb
Preset Power Output	PPo	0% to 100%	0
Low Heater Break Alarm Value	L <sub>hb</sub>	0 to 15.0	0.1
High Heater Break Alarm Value	H <sub>hb</sub>	0 to 15.0	15.0
Short Circuit Heater Break Alarm	S <sub>hb</sub>	d, SA (disabled) or EnAb (enabled)	EnAb
Soft Start Setpoint	SSSP	Setpoint upper limit to setpoint lower limit*	85
Soft Start Time	SS <sub>t</sub>	0 to 99min 59secs	3.00
Soft Start Output Power Limit	SSOL	0 to Output Power Limit	50
Boost Setpoint	BoSP	0 to 50 in display units	20
Boost Time	Bo <sub>t</sub>	0 to 99min 59secs	5.00
Setup Lock Code	S <sub>Loc</sub>	0 to 9999	10

\*Note: Soft start will not run if the process variable is greater than the soft start setpoint. Soft start will be held if Pre-tune does not complete by the soft start time. The Soft start setpoint is limited by the current target setpoint

## 7. AUTOMATIC TUNING MODE

First select Automatic tuning mode from Select mode (refer to section 4).

Press to scroll through the modes, then press or to set the required value.

To exit from Automatic tuning mode, hold down and press to return to Select mode.

Pre-tune is a single-shot routine and is thus self-disengaging when complete.

If APt in Setup mode = EnAb, Pre-tune will attempt to run at every entry to close loop control (i.e. power up)\*.

Parameter	Lower Display	Upper Display	Default Value
Pre-Tune	Ptun	On or OFF. Indication remains OFF if automatic tuning cannot be used at this time*	OFF
Self-Tune	Stun		
Tune Lock	tLoc	0 to 9999	0

\* Note: Automatic tuning will not engage if the proportional band = 0. Also, Pre-tune will not engage if setpoint is ramping or the PV is less than 5% of input span from the setpoint.

## 8. PRODUCT INFORMATION MODE

First select Product information mode from Select mode (refer to section 4).

Press to view each parameter. To exit from Product Information mode,

hold down and press to return to Select mode.

Note: These parameters are all read only.

Parameter	Lower Display	Upper Display	Description
Firmware Type	F <sub>LJ</sub>		Value displayed is firmware type number
Firmware Issue	ISS		Value displayed is firmware issue number
Product Revision Level	P <sub>rL</sub>		Value displayed is Product Revision level
Date Of Manufacture	d <sub>OM</sub>		Manufacturing date code (mmyy)
Serial Number 1	S <sub>n1</sub>		First four digits of serial number
Serial Number 2	S <sub>n2</sub>		Middle four digits of serial number
Serial Number 3	S <sub>n3</sub>		Last four digits of serial number

## 9. SOFT START FEATURE

Soft start is used when a gentle start-up phase is required before going to full working temperature. During soft-start a dedicated soft start setpoint (SSSP) is used to control the process to a lower temperature than normal. The period for which this soft start set point is applied is set by Soft Start Time (SS<sub>t</sub>). During the soft start time the output power is limited by the Soft Start Output Power Limit (SSOL) and setpoint ramping is inhibited.

Start-up Setpoint:	Bounded by range maximum and range minimum. Setpoint point ramping is not applied
Time Remaining:	0 (Soft start disabled) – 99mins 59secs in 1 sec increments
Soft Start Power Limit:	Primary output power limit used by soft start -100% to 100%
Cycle Time:	Cycle time used during soft start equals ¼ displayed cycle time but never less than 0.5s.

## 10. PROGRAMMABLE SENSOR BREAK

When the Programmable Sensor Break feature is enabled, and a sensor break is detected, the output is set to an average power value calculated by the instrument. When the Programmable Sensor Break (PSb) feature is disabled, and a sensor break is detected, the output is set to the Preset Power Output value (PPo).

## 11. ENABLE PRODUCTION

This feature indicates that temperatures are above the minimum requirement for production. It uses the terminating backplane Output 4 NC relay contact to provide an open contact when:

- Process temperature is more than 10 degrees below SP1
- Controller is in standby mode (SP2 is active)
- Controller is off (via interface signal)

Typically, to configure this feature, set parameters as follows:

Out put 4 Usage = EnAP  
Alarm 2 type = dE  
Alarm 2 Value = -10

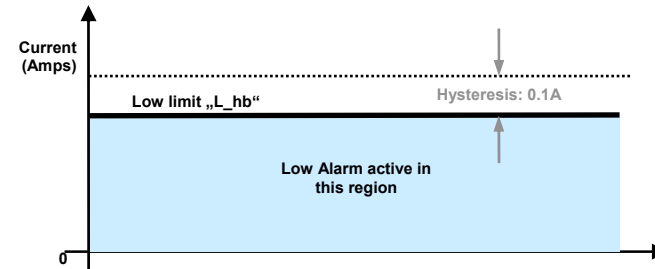
Note: Selecting Off mode by the front panel key indicates a not used loop. Those loops indicate always they are ready for production.

## 12. HEATER BREAK ALARMS

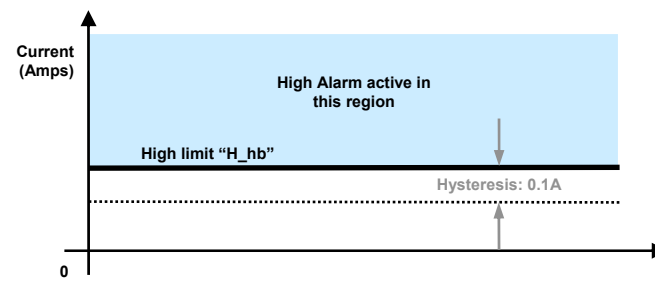
The heater current monitor is used to diagnose faults in the heater elements. A low heater break alarm is typically used for early detection of heater element failure; it detects whether the heater current is lower than it should be. A High heater break alarm can sometimes be useful for detecting partial shorts between heater elements, etc; it detects whether the heater current is higher than it should be. Short Circuit Heater Break Alarm is typically used to detect if the heater control device is stuck ON - welded relay contacts etc. This alarm is based on heater currents acquired whilst the Output is off.

Note: On very low output power combined with fast output cycle times a valid heater current reading may not be possible. If this occurs the display indicates \_\_\_A

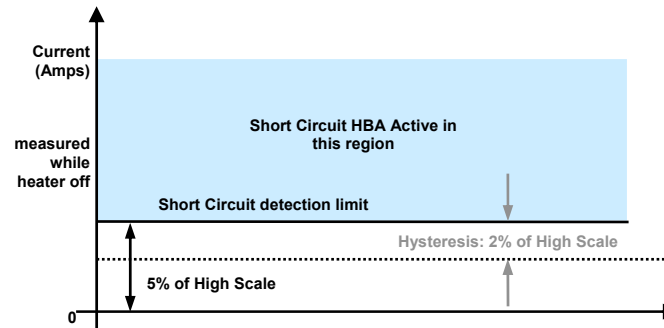
Low Heater Break Alarm



High Heater Break Alarm



Short Circuit Heater Break Alarm



## 13. SERIAL COMMUNICATIONS

An RS485 interface is provided for serial communications. The Modbus RTU protocol is provided with 0 based parameter numbers. The following Modbus parameters are likely to be useful, but many more are available. Contact your supplier if the parameter required is not listed here.

Parameter	Register	Type	Data
Process value	1	Word RO	Measured temperature
Actual Setpoint	21	Word RO	Current setpoint
Output Power	3	Word R/W	Read Only if not in manual control. 0% to 100% for one output.
Setpoint 1	34	Word R/W	Setpoint 1 (Operating Setpoint)
Setpoint 2	29	Word R/W	Setpoint 2 (Standby Setpoint)
Setpoint boost	3610	Word R/W	Offset to SP1 while boost
Setpoint Select	3200	Word R/W	1 = SP2, 2 = SP1, 3 = Sp1+bSP
Auto / Off	3620	Word R/W	1 = trigger auto, 0 = trigger off
Output Off	3621	Word RO	1 = isolation relay open

## 14. TECHNICAL ASSISTANCE

EWIKON Heißkanalsysteme  
GmbH & Co. KG  
Siegener Straße 35  
35066 Frankenberg

Tel.: ++49-(0)6451-501-0  
Email: info@ewikon.com

## 15. SPECIFICATIONS

### UNIVERSAL INPUT

Thermocouple: ±0.1% of full range, ±1LSD (±1°C for Thermocouple CJC).  
Calibration: BS4937, NBS125 & IEC584.  
Sampling Rate: 4 per second.  
Impedance: >10MΩ resistive.  
Sensor Break Detection: Control outputs go to a calculated average power value or to the programmable output power.  
Isolation: Isolated from all other inputs and outputs except for first module in rack where the digital inputs are not isolated from the thermocouple input. Digital inputs are intended to be connected to floating switches only.  
Universal input must not be connected to operator accessible circuits if digital inputs are powered from backplane supply and are connected to a hazardous voltage source.

### HEATER CURRENT MEASUREMENT

Accuracy: ±2% of input range ±1 LSD.  
Sampling Rate: 2 per second.  
Heater current span: 0 to 15.0A

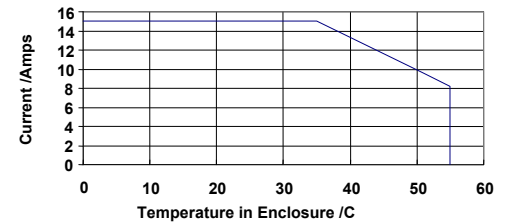
### DIGITAL INPUTS

Self-energised contact closure: > 47Kohm: Open  
< 100ohm: Closed  
Isolation: Reinforced safety isolation from inputs and other outputs.

### OUTPUTS

#### Control Output Triac

Operating Voltage: 120..240VAC  
Current Rating: 1A to 15A (full cycle rms on-state @ 25°C);  
See Output Current derating chart below for operation above this temperature.



Isolation: Reinforced safety isolation from inputs and other outputs.

#### Output 2 and 3

Contact Type & Rating: Single pole (SP); 2A resistive at 120/240VAC.

Lifetime: >100,000 operations at rated voltage/current.

Isolation: Isolated from input and other outputs.

#### Output 4

Contact Type & Rating: Single pole Change Over (SPDT); 2A resistive at 120/240VAC.

Lifetime: >100,000 operations at rated voltage/current.

Isolation: Isolated from input and other outputs.

### SERIAL COMMUNICATIONS

Physical: RS485, at 1200, 2400, 4800, 9600 or 19200 bps.

Protocols: Modbus/RTU.

Isolation: Reinforced safety isolation from all inputs and outputs.

Cable: Screened twisted pair is recommended for optimum communication. The screen should be connected to a solid ground at each end.

### OPERATING CONDITIONS (FOR INDOOR USE)

Ambient Temperature: 0°C to 55°C (Operating), -20°C to 80°C (Storage).

Relative Humidity: 20% to 95% non-condensing.

Supply Voltage and Power: 100 to 240VAC ±10%, 50/60Hz 15A Max.

Power: 100 to 240VAC ±10%, 50/60Hz 15A Max.

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