



Series 48 Filter Housing Heater User's Guide

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Table of Contents

Package Contents	4
Symbols Used in this Manual	5
Safety Precautions	6
Cleaning	6
General Specifications	7
Examples of Applications for Series 48 Heaters	8
About the Series 48 Heater System	9
Installing Series 48 Heaters	10
Controller Operations and Visual Signals (Base Model)	17
LED Indications Chart	18
Display/Adjust & Communication Control Upgrades	19
Operating Parameters Chart	21
Accessories/Part Replacement	22
Troubleshooting	23
Modbus Register Assignments	24
Mounting Hole Template	25
Limited Product Warranty	26

Package Contents

Before unpacking your Series 48 Filter Housing Heater system, check all surfaces of the packing material for shipping damage.

Be sure that your Series 48 Filter Housing Heater system contains these items:

- Series 48 Filter Housing Heater.
- Series 48 controller housed in a NEMA 4X enclosure.
- Main power cable.
- CE Declaration of Conformity.

Inspect the components for visible evidence of damage during shipment. If anything has been damaged, notify the carrier immediately. Keep all shipping materials and packaging for claim verification. Do not return the product to MKS.



If any items are missing from the package, call MKS/HPS Customer Service at 1-303-449-9861 or 1-800-345-1967.

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Symbols Used in this Manual



CAUTION: Risk of electrical shock.



CAUTION: Refer to manual. Failure to heed message could result in personal injury, serious damage to the equipment, or both.



Failure to heed message could result in damage to the equipment.



Calls attention to important procedures, practices, or conditions.



Class 2 Construction. Ungrounded equipment with double or reinforced electrical insulation.

Safety Precautions



Do not use in an explosive environment.
Ignition of explosive vapors is possible.



Heaters are intended for use with metal piping.
Heater operating temperatures may exceed the melting point of other materials. Check material specifications and ensure that control parameters do not exceed those specifications.



Do not immerse the satellite controllers, cables, or heaters in water or liquid of any kind.
Electrical shock may result. Permanent equipment damage may also occur.



Ground piping system according to U.S. National Electric Code or local requirements or both.
A Ground Fault Equipment Leakage Circuit Interrupter (GFELCI) should be used. Although grounded piping is not required, the performance of the GFELCI is enhanced and risk of electrical shock is further reduced when the piping is grounded. The heaters themselves are double-insulated devices and do not require a ground.



Heaters must be secured to piping before operation.
Heaters may overheat, resulting in permanent damage, if not attached to piping. Also, heaters should only be used on piping which matches a heater's internal diameter and shape.



Follow hazardous chemical safety procedures specified by the chemical supplier when heating vacuum piping designed to conduct hazardous chemicals.

Cleaning

Clean base station, satellite controllers, cables and heaters with damp cloth and mild detergent.





Do not immerse in water. There is a risk of electrical shock and damage to the equipment.



Do not use solvents. Some of the plastic enclosures may be attacked.

General Specifications

Electrical rating	100 – 120 V~, 50/60 Hz, 5 A 200 – 240 V~, 50/60 Hz, 5 A
Electric duty cycle	6% to 85% depending on temperature set point and supply voltage
Pollution Degree	1
Over-voltage category	II
Environment	Indoor use only
Relative humidity	0% to 90 % non-condensing
Pipeline temperature	Adjustable 0-185°C, in 1 degree increments
Heater exterior surface	0-80°C, depending on temperature set point
Materials	<u>Heater:</u> molded silicone foam, fiberglass-reinforced silicone fabric, Teflon [®] insulated wire <u>Controller:</u> polycarbonate enclosure <u>Controller Housing:</u> ABS base, polycarbonate lid <u>Power Cable:</u> TPE insulated copper stranded wire
Weight	Satellite controller: 0.05 kg Heater: 0.1 to 2.5 kg
Safety Agency Testing	 UL US LISTED UL Listed File E52951 2JR  CE 89/336/EEC EMC Directive 73/23/EEC LV Directive

Examples of Applications for Series 48 Heaters

Semiconductor Industry Applications

- **Prevent solidification of ammonium chloride** (NH_4Cl) in a silicon nitride LPCVD system
- **Prevent solidification of aluminum chloride** (AlCl_3) in an aluminum etching system
- **Reduce solid buildup in other semiconductor processes**, such as titanium nitride, tungsten, and TEOS CVD
- **Maintain uniform temperature environments** in downstream semiconductor and related processes and equipment
- **Maintain gas temperature** in gas delivery systems

Biopharmaceutical Industry Applications

- **Prevent vapor condensation** in sterile vent filters and piping systems
- **Maintain or promote** preferred material viscosities

Custom and R&D Applications

- **Heaters for custom and R&D applications** can be engineered to meet specific requirements. Contact the MKS/HPS engineering group at 1-800-345-1967 for assistance.

About the Series 48 Heater System

The Series 48 Filter Housing Heater System is an integrated, electronically controlled line of heater products. They have been designed to meet a variety of application requirements while emphasizing personnel safety and equipment preservation. These heaters reduce contamination; increase system uptime and product yield; and decrease scheduled maintenance.

The Series 48 Filter Housing Heater System has been certified by an independent third-party laboratory to comply with NEMA 4X standards. It is resistant to the ingress of water and dust, damage from ice buildup, and corrosion.

Series 48 Filter Housing Heaters are designed to be easy to install, operate, and customize to meet the needs of modern manufacturing processes. Each of the controlling parameters of the heater can be individually adjusted for complete heating customization and control. Adjustments such as operating temperature, safety limit, alert parameters, etc., can be made quickly and easily. Control settings can be modified “on the fly” without the need to interrupt power to the system.

The system can be operated and controlled locally, remotely, or both can be done simultaneously. Optional communications feature allows remote control, or interface with a PC or PLC. User-friendly software has been created to allow the adjustment of any of the control parameters, data logging, and heater diagnostics.

Controlling devices such as thermostats, switches, and fuses, are subject to premature degradation and failure due to exposure to high temperatures. They are typically installed within the heater in close proximity to that which is being heated, resulting in component degradation and premature failure. These devices do not exist in Series 48 heaters. All controlling and safety functions are located within the control housing. This ensures that the user can expect the longest possible lifetime from a heater. Over-temperature protection is performed within the controller; the limit temperature is user adjustable and the circuit re-settable. This ensures that those process components that are susceptible to damage from extreme heat (for example, polypropylene filters) are protected from it, thereby protecting the expensive products and processes of the biopharmaceutical industry. In case of an over-temperature event, the heater is not rendered useless. The operator simply re-sets the heater control by cycling power, and normal operation resumes.

The molded silicone foam thermal insulation prevents heat loss and maintains the external temperature within safe limits while the internal temperature is as high as 185°C. From room temperature, the heaters typically reach their set temperatures in less than 30 minutes.

All materials used in the heaters and insulators are suitable for clean room use. Based on Class 1 clean room tests conducted at HPS[®], Series 48 heaters emit less than ten 0.7µ particles per cubic foot per minute.

Installing Series 48 Heaters

1. Installation Overview

- 1.1. Inspect pipe system and heater.
- 1.2. Install heater.
- 1.3. Controller installation.
- 1.4. Connect heater interface cable to controller.
- 1.5. Connect power cable to controller.
- 1.6. Connect power cable to power supply.
- 1.7. Connect RJ45 communications cable (if applicable).
- 1.8. Apply power to heater.



2. Detailed Installation Instructions

- 2.1. Inspect system and heaters for damage. Make sure that there are no burrs or other protrusions on components to be heated that could cut the heater and expose a live heater element wire.

- 2.2. Install the heaters on the system. Make sure to match the heater to the part being heated. These are molded heaters specifically designed to heat components of matching dimensions. The fit should be snug to ensure good thermal contact between the heater and the part to be heated. Only moderate insulation compression is needed. Do not use any other device to hold a heater in place.



- 2.3. Controller installation:** Select a convenient location for the controller that will allow easy viewing and access in the event that control parameter adjustment is desired.



The controller can be secured to the selected location via mounting holes in the housing base. If it is to be mounted to a flat surface, a hole-drilling template is provided on page 27. Removal of the clear polycarbonate lid will reveal access to the mounting holes, located in the bottom of the threaded holes for the lid fasteners. Be sure to create the proper hole for the mounting fasteners to be used. #8 or 4mm screws are recommended.



Once the base is secured in the desired location, re-install the clear polycarbonate lid. **DO NOT** over-tighten the lid fasteners – rotate them only to compress the lid’s seal and seat the lid on the base. Over-tightening can break the fasteners and prevent the seal from protecting the controller from ingress of water and dust.

2.4. Connect heater interface cable to controller. This must be done PRIOR to applying power to the heater controller. Failure to do so will result in a controller error, which will require that power be interrupted and the heater interface connector installed first. (The controller will then recognize that all is well and begin operating at its pre-programmed parameters.)

Unless otherwise specified, standard Series 48 Filter Housing Heaters are normally equipped with a 240" (20 foot) interface cable, the end of which is equipped with a water-resistant connector to mate with the panel-mount connector of the controller housing. The mating connectors are keyed so that an improper connection cannot be made.

There is no need for tools to mate the connectors. As shown in the below photos, align keys of heater plug connector with keyways of controller's panel-mount receptacle. Slide the connectors together completely so that the front face of the plug meets the o-ring of the receptacle. Finally, install the threaded locking ring so as to ensure a seal between the locking ring and the outer o-ring of the panel mount connector housing. Do not over-tighten as it can damage the connectors or the outer o-ring.



Use only factory-supplied cables. Failure to do so may result in heater or controller damage or failure.

- 2.5. Connect power cable to controller.** Unless otherwise specified, standard Series 48 Filter Housing Heater kits include a 240" (20 foot) power cable, the end of which is equipped with a water-resistant connector very similar to that of the aforementioned heater interface cable. Again, this connector and its mating panel mount connector are keyed to prevent improper connection.

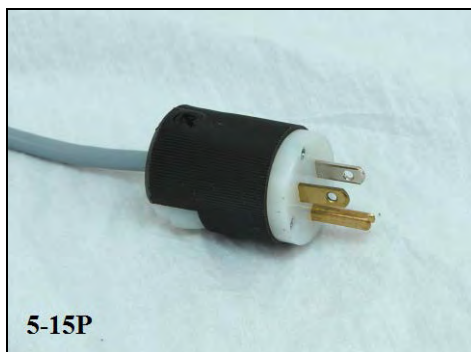
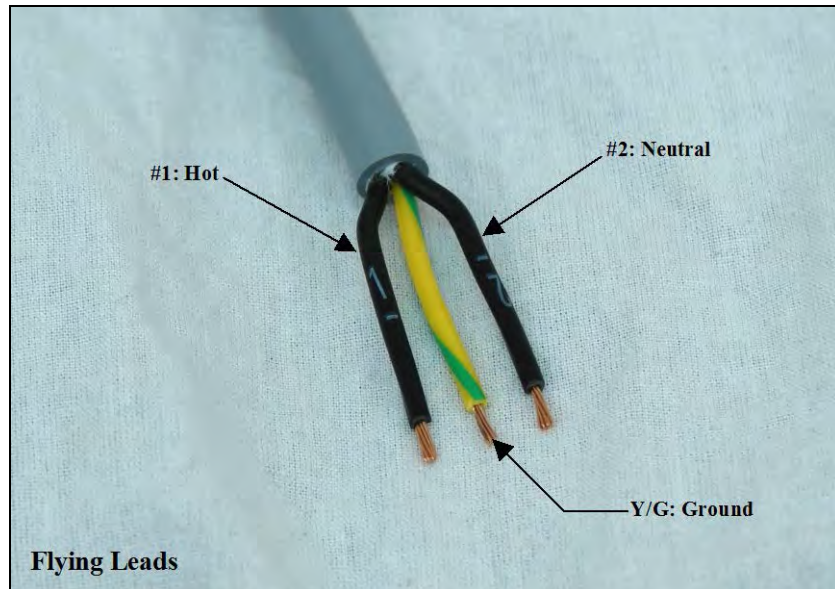
There is no need for tools to mate the connectors. As shown in the below photos, align keyways of the power cable's receptacle connector with the keys of the controller's panel mount plug. Slide the connectors together completely so that the front face of the plug meets the o-ring of the receptacle. Finally, install the threaded locking ring so as to ensure a seal between the locking ring and outer o-ring of the panel mount connector housing. Do not over-tighten as it can damage the connectors or the outer o-ring.



Use only factory-supplied cables. Failure to do so may result in heater or controller damage or failure.

- 2.6. Connect power cable to power supply:** Unless otherwise specified, a standard Series 48 Filter Housing Heater kit's power cable is terminated in one of three ways: Flying leads, an NEMA 5-15P (wall outlet) connector, or a NEMA L5-15P water-resistant twist-lock connector. All are pictured below. **A circuit protected by a Ground Fault Circuit Interrupter (GFCI) is strongly recommended.**

Conductor assignments for flying leads: These are intended for hard wiring into the heater's intended power supply such as, for example, a PLC, breaker or junction box, or a customer-supplied connector, etc. The power conductors of the cable are not color-coded. They are, however marked individually on the outside of their black insulation with a number 1 or 2. Conductor 1 is the hot lead, and conductor 2 neutral. The yellow/green-insulated wire is for the ground connection.



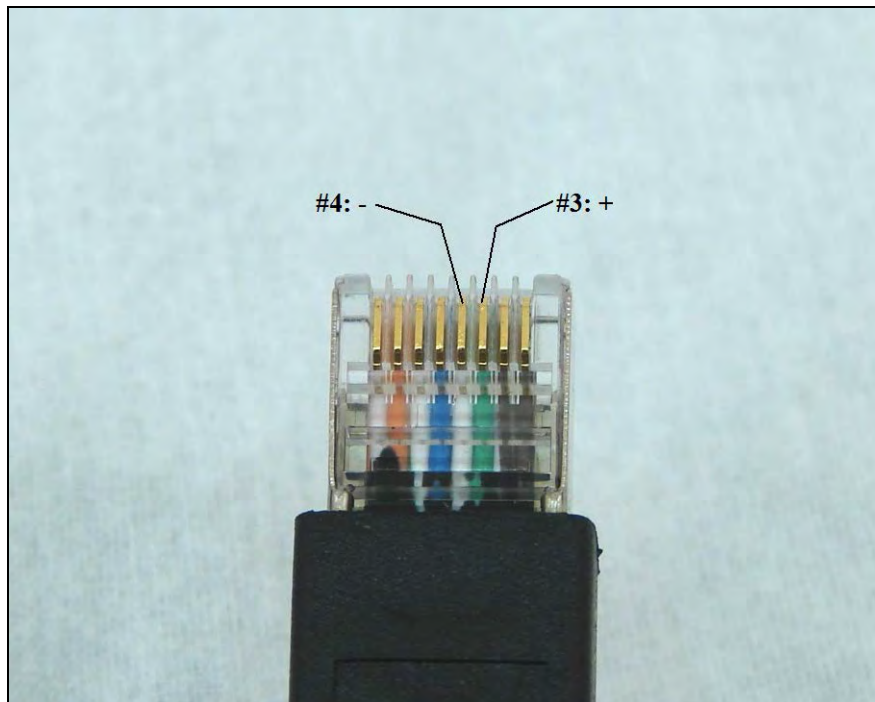
Use only factory-supplied cables. Failure to do so may result in heater or controller damage or failure.

- 2.7. Connect RJ45 communications cable, if applicable.** These cables are only supplied with a controller that is equipped to accept it. If so equipped, the cable does not need to be used in order for the controller to operate properly. The cable can be installed at any time, including during heater operation.

There is no need for tools to mate the connectors. As shown below, remove the white protective cap from the data cable end. (Pull straight, do not twist or damage to the cable can occur). Next, remove the threaded sealing cap from the controller's panel mount RJ45 data connector. Align cable plug & controller receptacle and insert. Secure the connection by threading the locking ring of the cable onto the panel mount connector housing. Again, to prevent damage to the connectors, do not over-tighten.



Important data communications information: The controller uses 2-wire communications. The photo below shows which of the two wires conductors in the RJ45 plug are used for this purpose:



Controller Operations and Visual Signals

Base Model, #4800-1150

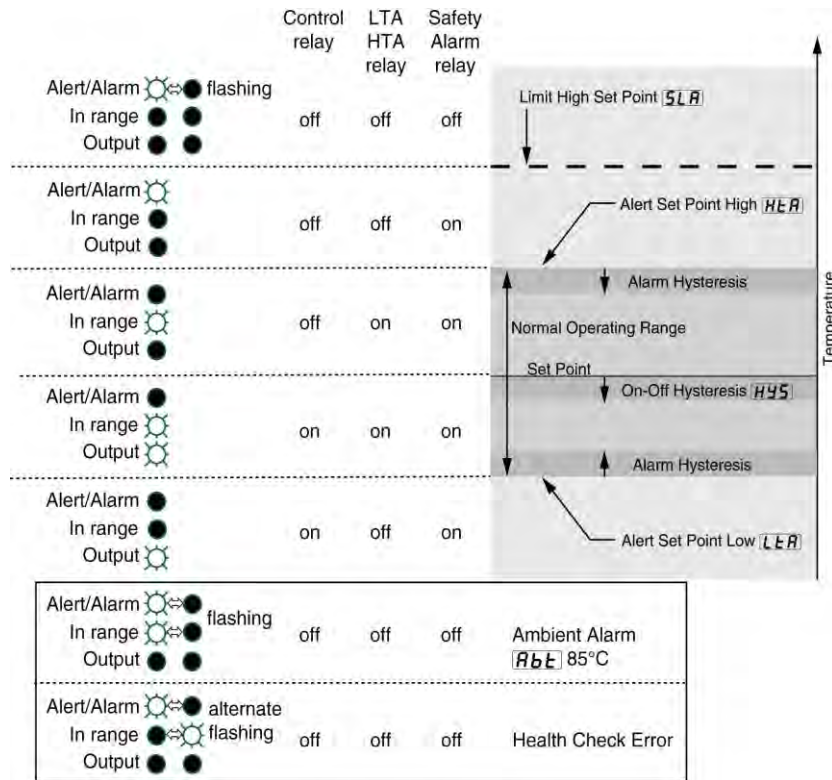


Base Controller: 4800-1150

- 1. Control Structure:** The Series-48 heater control unit contains two microprocessors. One is dedicated to controlling and operation of the heater within specified (modifiable – see “**Control Upgrades**” section) parameters, while the other is dedicated to safety. The control circuitry and safety circuitry operate independently of each other, with the exception of comparing data to ensure that both circuits are operating normally. Any discrepancies outside of pre-determined tolerance will cause an automatic heater shutdown. The main purpose of the safety circuitry is protection from an over-temperature event. If an unlikely malfunction were to occur and cause an overheating condition, the safety circuit will interrupt the power to the heater element via latching relay. This relay will remain open until power to the heater is cycled (turned off and on) and conditions are such that the latching relay should be closed once again. It is important to note that conditions external of the heater and controller are the usual cause of such an event (i.e. high temperature purge, cleaning cycle, etc.). Each microprocessor has its own temperature sensor dedicated to it (two thermocouples embedded within the heater), and therefore the controlling circuits are completely independent and redundant.
- 2. HTA/LTA alert function:** The High Temperature Alert/Low Temperature Alert function provides a notification that a heater is outside an acceptable operating temperature window about the set point. Both the HTA and the LTA values are independently adjustable, and are set as incremental values to be computed from the set point temperature. Default settings are: HTA = 20; LTA = 20. This means if the set point temperature is 95°C, the acceptable operating range will be 75°C – 115°C. If the heater’s temperature is determined by the control microprocessor to be within this operating range, the amber “In Range” LED will illuminate. If it is outside of acceptable range, the “In Range” LED will be off and the heater’s condition can be interpreted from the LED signals. (See “**LED Indications Chart**” below.)

3. **LED Signals:** The visual signals of the three LED's on the controller's front panel can convey a great deal of information regarding a heater's or controller's operating status. "Output" (green) indicates that line voltage is being supplied to the heater. "In Range" (amber) indicates that the heater's temperature is determined to be in the acceptable operating range (as described above). "Alert/Alarm" (red) indicates that there is a condition that should be investigated. The below chart should be used to interpret the controller's LED indications.

LED Indications Chart



Display/Adjust & Communications Control Upgrades

Local User Interface - #4800-0001 & #4800-0003



Standard Series 48 Filter Housing Heater kits are equipped with one of the two above factory-installed control upgrades, depending upon which kit is ordered. Since the controllers and upgrades are used in more than one MKS product, a full overview is provided below. The following information is important to obtain a full understanding of their function, and in the event that it ever may need replacement.

- 1. Removal/Installation of upgrade modules:** A control module upgrade is a “plug-and-play” device. Installation and/or removal of upgrade modules can be performed at any time without interrupting power or heater/controller function. To remove an upgrade module from the base control unit (#4800-1150), use a coin or other appropriate tool in the slot between the upgrade and base control. Installation of a control upgrade module is performed by snapping it into the place from which the upgrade was previously removed. A small amount of pressure will be required in order to snap the retention tabs into the base controller.
- 2. Initial function of upgrade:** If the upgrade module is installed while the heater/controller is operating, the display will immediately illuminate. For three seconds the upgrade will read the programmed operating parameters of the base control, during which the display will read “EHG”. When the module has completed this task, it will automatically display the heater’s current (sensed) temperature. If power is not supplied to the heater when the upgrade is installed, the upgrade module will perform the above steps when power is applied and after the base controller performs a normal self-diagnostic. The diagnostic will not take a noticeable amount of time.
- 3. Adjusting operating temperature:** The most commonly adjusted parameter, operating temperature, is the most easily accessible parameter. To access it, press the middle teal-colored button. A small decimal point will illuminate in the

bottom-right corner of the display to advise that the set-point value is being displayed rather than the measured heater temperature. To adjust this value, press either the up or down arrow button once, which notifies the upgrade that a change in value is desired. Press the up or down arrow button again to begin adjusting the value. The adjustment can be performed in increments by pressing and releasing the button, or adjusted quickly (scrolled) for large changes by pressing and holding the button. Once the adjustment is completed, press the middle button to finish and the heater's sensed temperature will once again be displayed. If the middle button is not pressed, the upgrade will return to normal operation using the new value after 5 seconds.

4. **Adjusting other operating parameters:** All other operating parameters can be accessed by pressing and holding both the up and down arrow buttons for three seconds. At this point the display will read "SLA", which means "Set Point High Limit Alarm", or more commonly referred to as "Safety Limit Temperature". This particular parameter is the temperature at which, regardless of cause, the controller will open its latching relay and cease operation pending operator intervention. To view this value, press either the up or down arrow. To modify this value, press the up or down arrow again. To return and advance to the next parameter, press the middle teal button. All parameters (except operating temperature) are adjusted in this manner. See "**Operating Parameters Chart**" for a full listing of all parameters and information accessible from these user interface modules.
5. **Important note about upgrade modules with local adjustment capability:** When an upgrade module is used to adjust a controller's operating parameters, the information is written to the base controller's non-volatile memory. The upgrade module can therefore be removed from the base controller, and the controller will continue to operate within the parameters specified. This is even true if the heater controllers are completely powered down and re-started. It is therefore possible to use a single upgrade module to set the operating parameters of any number of heater controllers, or to remove the upgrade module to prevent unauthorized changes. (For those controllers equipped with communications capability, removal of the upgrade module will cause communications to terminate.)
6. **Modbus Address Assignment:** For Filter Housing Heater kits so equipped, default Modbus address for the control is 1. If more than one heater is to be monitored on a common communications circuit, then each controller on that circuit must be given a unique address. Addresses can be assigned via the steps described in #4 above, using the "Adr" parameter.

Operating Parameters Chart

Display	Parameter Name and Description	Range	Default	Access type
	Operating Set Point Temperature	0 to 185°C (32 to 365°F)	150°C (302°F)	read/write
SLA	Set Point: High Limit Alarm Safety limit temperature, disables heater pending operator intervention.	105 to 220°C (221 to 428°F)	200°C (392°F)	read/write
HtA	High Temperature Alert Triggers alert if temperature exceeds acceptable operating range.	+1 to +99°C (+2 to +178°F) Incremental value from operating set point temperature	+20°C (+36°F)	read/write
LTA	Low Temperature Alert Triggers alert if temperature is below acceptable operating range.	-5 to -99°C (-9 to -178°F) Incremental value from operating set point temperature	-20°C (-36°F)	read/write
Cnt	Control Mode Control method	onF(on/off) or Pid (P.I.D.)	onF (on/off)	read/write
HYS	On-Off Hysteresis Temperature drop from operating set point at which heater is turned on.	3 - 50°C (5.4 - 90°F)	3°C (5.4°F)	read/write
Pb	Proportional Band	0 to 67°C (0 to 122°F)	0°	read/write
Int	Integral Value	0 to 999	0	read/write
dEv	Deviation Value	0 to 999	0	read/write
Ct	Cycle Time Value	5 to 60	10	read/write
Abt	Ambient Temperature View the controller's internal temperature			read only
Adr	Modbus Device Address View or modify controller's Modbus address	1 to 247	1	read/write
bAU	Modbus Baud Rate	9,600; 19,200; 38,400	9,600	read/write
tU	Temperature Units	C; F	C	read/write
bru	Base Release Version View the base controller's release version.			read only
bPu	Base Prototype Version View the base controller's prototype version.			read only
bbu	Base Build Number View the base controller's build number			read only
dru	Interface Release Version View the interface's release version.			read only
dPu	Interface Prototype Version View the interface's prototype version.			read only
dbu	Interface Build Number View the interface's build number.			read only

Accessories/Part Replacement

Description	Part Number
Controller Assembly, without communication option	100015411
Controller Assembly, with communication option	100015572
Controller, Base Model*	4800-1150
Controller Upgrade, Display/Adjust	4800-0001
Controller Upgrade, Display/Adjust/Communication	4800-0003
Cable, Power, Flying Leads, 20' (120 & 240V)	100015472
Cable, Power, 120V, 5-15P, 20' (US Standard Wall Outlet)	100015453
Cable, Power, 120V, L5-15P, 20' (Water-resistant Twist-Lock)	100015562
Cable, Data, RJ45, 16'	100015577

*: Base model controller is not pre-set for use with Filter Housing Heaters. Proper adjustments need to be made to the control parameters to protect polypropylene filters or other items vulnerable to damage by heat.

General Troubleshooting

Problem	Probable Cause	Remedy
System will not turn on	<ul style="list-style-type: none"> • No power at source • System not plugged in • Ground Fault Equipment Leakage Circuit Interrupter (GFELCI) has tripped • Bad connection between power cable connector and controller assembly. 	<ul style="list-style-type: none"> • Restore power • Plug system in • Reset GFELCI. If GFELCI immediately trips again, there is a ground fault that needs to be isolated. • Check connection for possible damage.
Red & Amber LED's flashing alternately	<ul style="list-style-type: none"> • Bad connection between controller and heater • Controller Self-Check Error 	<ul style="list-style-type: none"> • Check connection between controller and heater • Contact HPS for steps to diagnose problem
Red & Amber LED's flashing simultaneously	<ul style="list-style-type: none"> • Ambient environment is above 85°C (185°F) 	<ul style="list-style-type: none"> • Cool or vent the controller's environment
Red LED flashing	<ul style="list-style-type: none"> • Temperature safety limit has been exceeded. 	<ul style="list-style-type: none"> • Allow heater to cool below the limit setting and cycle power. These errors are usually caused by a heat source external to the heater. This needs to be confirmed.
Heater will not heat	<ul style="list-style-type: none"> • Improper parameter values • Heater circuit is open 	<ul style="list-style-type: none"> • Check parameter values • Try to install controller onto an alternate heater. If it heats, replace bad heater. If it doesn't, replace controller.

Modbus Register Assignments

Register	Description	Attribute	Register	Description	Attribute
0	Reserved	Read Only	50	BASE BUILD NUMBER	Read Only
1	Reserved	Read Only	51	SPECIAL FUNCTION	Read / Write
2	Reserved	Read Only	52	Reserved	Read Only
3	Reserved	Read Only	53	DISPLAY ONE	Read Only
4	Reserved	Read Only	54	DISPLAY TWO	Read Only
5	Reserved	Read Only	55	Reserved	Read Only
6	Reserved	Read Only	56	Reserved	Read Only
7	Reserved	Read Only	57	Reserved	Read Only
8	Reserved	Read Only	58	Reserved	Read Only
9	Reserved	Read Only	59	Reserved	Read Only
10	Reserved	Read Only		Limit Module	
11	HMI RELEASE VERSION	Read Only	60	SENSOR PROCESS VALUE	Read Only
12	HMI PROTOTYPE VERSION	Read Only	61	Reserved	Read Only
13	HMI BUILD NUMBER	Read Only	62	Reserved	Read Only
14	Reserved	Read Only	63	HEALTH STATUS	Read Only
15	BUS ADDRESS	Read / Write	64	AMBIENT PROCESS VALUE	Read Only
16	BAUD RATE	Read / Write	65	SENSOR PROCESS PEAK	Read Only
17	TEMP UNITS	Read / Write	66	AMBIENT PROCESS PEAK	Read Only
18	TEST REGISTER	Read / Write	67	ERROR LOG	Read Only
19	COMMUNICATIONS ERROR	Read Only	68	Reserved	Read Only
	Control Module		69	Reserved	Read Only
20	SENSOR PROCESS VALUE	Read Only	70	Reserved	Read Only
21	CONTROLLER STATUS	Read Only	71	Reserved	Read Only
22	INDIRECT POWER	Read Only	72	ERROR INDEX	Read Only
23	HEALTH STATUS	Read Only	73	Reserved	Read Only
24	AMBIENT PROCESS VALUE	Read Only	74	Reserved	Read Only
25	SENSOR PROCESS PEAK	Read Only	75	Reserved	Read Only
26	AMBIENT PROCESS PEAK	Read Only	76	Reserved	Read Only
27	ERROR LOG	Read Only	77	Reserved	Read Only
28	CURRENT PROPORTIONAL TERM	Read Only	78	Reserved	Read Only
29	CURRENT INTEGRAL TERM	Read Only	79	Reserved	Read Only
30	CURRENT DERIVATIVE TERM	Read Only	80	Reserved	Read Only
31	ALERT STATUS	Read Only	81	Reserved	Read Only
32	ERROR INDEX	Read Only	82	Reserved	Read Only
33	Reserved	Read Only	83	Reserved	Read Only
34	CONTROL SETPOINT	Read / Write	84	Reserved	Read Only
35	ALERT SETPOINT HIGH	Read / Write	85	Reserved	Read Only
36	ALERT SETPOINT LOW	Read / Write	86	Reserved	Read Only
37	PID PROPBAND	Read / Write	87	Reserved	Read Only
38	PID INTEGRAL	Read / Write	88	Reserved	Read Only
39	PID DERIVATIVE	Read / Write	89	Reserved	Read Only
40	CYCLE TIME	Read / Write	90	Reserved	Read Only
41	ONOFF HYSTERESIS	Read / Write	91	Reserved	Read Only
42	INDIRECT METHOD	Read / Write	92	Reserved	Read Only
43	LIMIT HIGH SETPOINT	Read / Write	93	Reserved	Read Only
44	PING DEVICE	Read / Write	94	Reserved	Read Only
45	CLEAR PEAK DETECT	Read / Write	95	Reserved	Read Only
46	CLEAR METRICS	Read / Write	96	Reserved	Read Only
47	FULL DEFAULTS	Read / Write	97	Reserved	Read Only
48	BASE RELEASE VERSION	Read Only	98	Reserved	Read Only
49	BASE PROTOTYPE VERSION	Read Only	99	Reserved	Read Only

Mounting Hole Template



This page can be printed and used as a drilling template for mounting holes.
Important: Be sure to choose “No scaling” or “Do not scale” option when printing.

Limited Product Warranty

MKS Instruments, Inc., warrants the HPS® Products Series 48 Heater System and its accessories to be free from defects in materials and workmanship for a period of one (1) year from the date of shipment by HPS® or authorized representative to the original purchaser (PURCHASER). Any product or parts of the product repaired or replaced by HPS® under this warranty are warranted only for the remaining unexpired part of its one (1) year original warranty period. After expiration of the applicable warranty period, the PURCHASER shall be charged HPS® current prices for parts and labor, plus any transportation for any repairs or replacement.

ALL EXPRESSED AND IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE WARRANTY PERIOD. NO WARRANTIES, EXPRESSED OR IMPLIED, WILL APPLY AFTER THIS PERIOD.

Warranty Service

The obligations of HPS® under this warranty shall be at its option: (1) to repair, replace, or adjust the product so that it meets the applicable product specifications published by HPS®; or (2) to refund the purchase price.

What Is Not Covered

The product is subject to the above terms only if located in the country of the seller from whom the product was purchased. The above warranties do not apply to:

- I. Damages or malfunctions due to failure to provide reasonable and necessary maintenance in accordance with HPS® operating instructions
- II. Damages or malfunctions due to chemical or electrolytic influences or use of the product in working environments outside the specification.
- III. Fuses and all expendable items, which by their nature or limited lifetime may not, function for one (1) year. If such items fail to give reasonable service for a reasonable period of time within the warranty period of the product; they will, at the option of HPS®, be repaired or replaced.
- IV. Defects or damages caused by modifications and repairs effected by the original PURCHASER or third parties not authorized in the manual.
- V. Improper Use or Operation:
 - a. Ripping or tearing of heater.
 - b. High temperature usage, either by high set point or external heat source, causing heater to operate above recommended temperatures and resulting in heater damage.
 - c. Poor thermal contact of heater on stainless.
 - d. Punctures or cuts in heater.
 - e. Chemical contamination.
 - f. Tampering with control electronics, power cords, or warranty tags.
 - g. Removing or cutting the snaps, straps, or connectors.
 - h. Incorrect voltage supply.
 - i. Changes to the heater prior to return to the factory for failure analysis.
 - j. Return of heaters that have failed during the warranty period, but not reported or returned to HPS during the warranty period.
 - k. This list should not be construed to be all-inclusive.

Condition of Returned Products

HPS® will not accept for repair, replacement, or credit any product which is asserted to be defective by the PURCHASER, or any product for which paid or unpaid service is desired, if the product is contaminated with potentially corrosive, reactive, harmful, or radioactive materials, gases, or chemicals. When products are used with toxic chemicals, or in an atmosphere that is dangerous to the health of humans, or is environmentally unsafe, it is the responsibility of the PURCHASER to have the product cleaned by an independent agency skilled and approved in the handling and cleaning of contaminated materials before the product will be accepted by HPS® for repair and/or replacement.