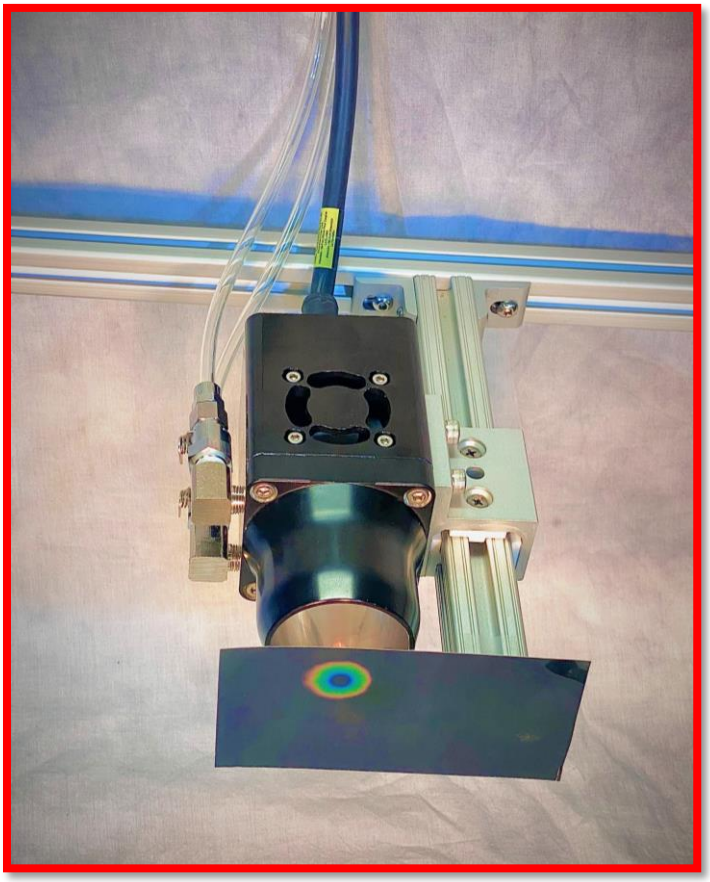
SpotIR INFRARED HEATERS

Infrared Heaters For Controlled Concentrated Heating

Model 4160



FAST. FOCUSED. CONTROLLED.

Infrared Heat. Instantaneous Results.

The SpotIR Model 4160 is designed for use in any application that requires clean, non-contact heat on a small target or object. The 4160 is a single lamp and reflector heating system that focuses energy on a small diameter target. Depending on the model selected and material being heated, the Model 4160 can maintain target surface temperatures of above 2500°F under continuous operation in high temperature applications. All while maintaining touch-safe heater surface temperatures.

Applications

- Metal annealing
- Brazing
- Soldering and desoldering electronic components
- Solder termination
- Filament winding
- Activating thermo transfer
- Bonding
- Thermoforming
- Welding
- Heat Sinking

RESEARCH INC.
PROVIDING CONTROLLED ENERGY
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Rev. Sep 2022

Spot IR INFRARED HEATERS

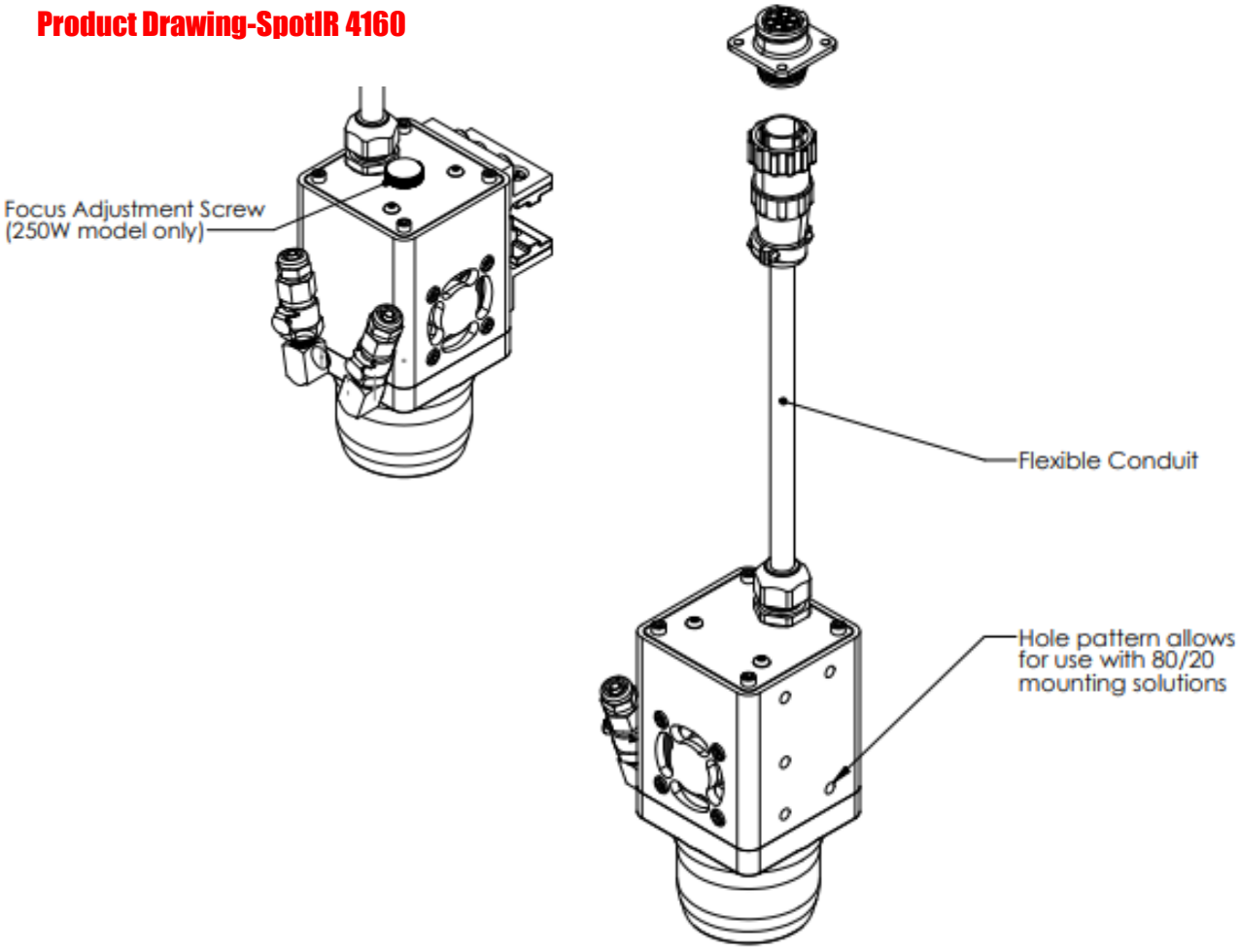
Infrared Heaters For Controlled Concentrated Heating.

FAST. FOCUSED. CONTROLLED

Features and Benefits-SpotIR 4160

- Two heater models, providing options for either a 250W bulb or 575W bulb allow for distinct heat profiles and temperature zones.
- Lamps reach 90 percent of full operating temperature within three seconds of a cold start.
- Localized heat focuses only on the desired area without heating the rest of the product.
- Operation with liquid and air cooling allows the heaters to withstand continuous high temperature operation.
- Non-contact heat source does not come in contact with product being heated.
- The infrared energy emitted from these heaters can be adjusted to match the heating requirements of a variety of applications.
- Repeatable results can be achieved for consistent process outputs.
- Research Inc. manufactures a complete line of process control instruments and SCR power controllers to control the operation of these heaters.

Product Drawing-SpotIR 4160



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Phone 952.949-9009 • Fax 952.949-9559 • www.researchinc.com

Product Description- SpotIR 4160

Heater Construction

Metal Housing

The Model 4160 has an aluminum housing to protect electrical components and connections. A fan with venting provisions provides the internal components with cooling air. Both 250W and 575W heater models feature a water-cooled reflector to keep all external surfaces touch-safe.

Reflector

A computer optimized aluminum reflector backs the heater lamp, and efficiently directs a spot of high-density heat towards the target. The 250W model 4160 heater features a focus adjustment screw at the back of the aluminum housing to allow the user to make fine tuned focus adjustments.

Mounting

The aluminum housing has (qty. 5) 1/4-20 tapped holes for module mounting. The heater can be mounted on both vertical or horizontal supports by fastening 10 series 80/20 mounts either perpendicular or parallel to the heater body. Mounting hole pattern outlined in figure 1 to allow the end user to machine custom mounting solutions for the heater if desired.

Heater Construction cont.

Infrared Lamps

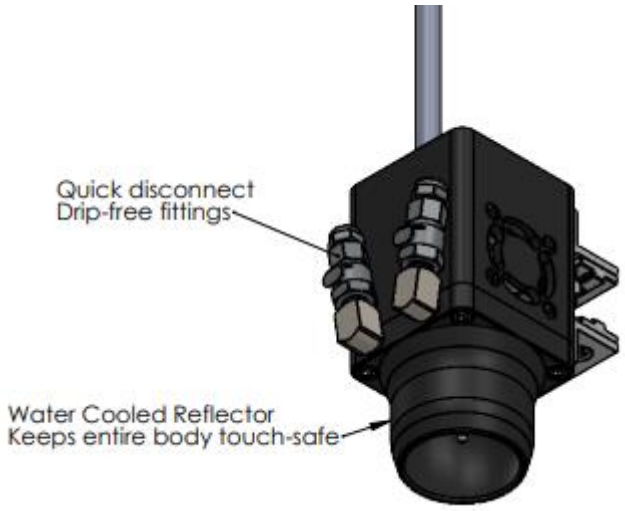
Short Wavelength Lamp

Tungsten filament lamps are generally used in applications where a product is to be heated or cured. These lamps may be operated in horizontal or vertical orientations. Typical short wavelength applications include:

- Heat treating metals
- Localized softening of plastics for bending, forming, or adhering
- Curing of paints, adhesives, inks, thermally responsive materials.
- Annealing metals
- Non-contact soldering of electrical components

*Limitations

Absorption of short wavelength is affected by product color. Black and dark colors absorb well. Heating lighter colors may be more readily achieved with medium wavelength lamps.



HEATER SPECIFICATIONS – SpotIR 4160

Description	4160-250	4160-575
Lamp part number	063534-010 (1 included)	057541-112 (1 included)
Coolant flow (min.)	.25gpm .95l/m	.5gpm 1.9l/m
Power	250W, 115V, 1 phase, 2.25A	575W, 115V, 1 phase, 5A
Interconnect wiring	6 pin latching connector pair with 18" flexible conduit.	
Dissipated heat flux density At focal point	Focused: 20.9 KW/in2 (3.62 kW/cm2) Non-Focused: .134 KW/in2 (.023 KW/cm2)	11.8 KW/in2 (2.03 kW/cm2)
IR Focus Diameter At .25" From Reflector	Focused: 0.100 in (0.254 cm) Non-Focused: 1.250 in (3.175 cm)	0.200 in (0.508 cm)
Overall Heater Dimensions (L x W x H)	6.25" x 2.6" x 3.5" (15.2cm x 6.4cm x 8.9cm)	6.25" x 2.6" x 3.5" (15.2cm x 6.4cm x 8.9cm)
Weight	2.15lb (1.8kg)	2.15lb (3.2kg)

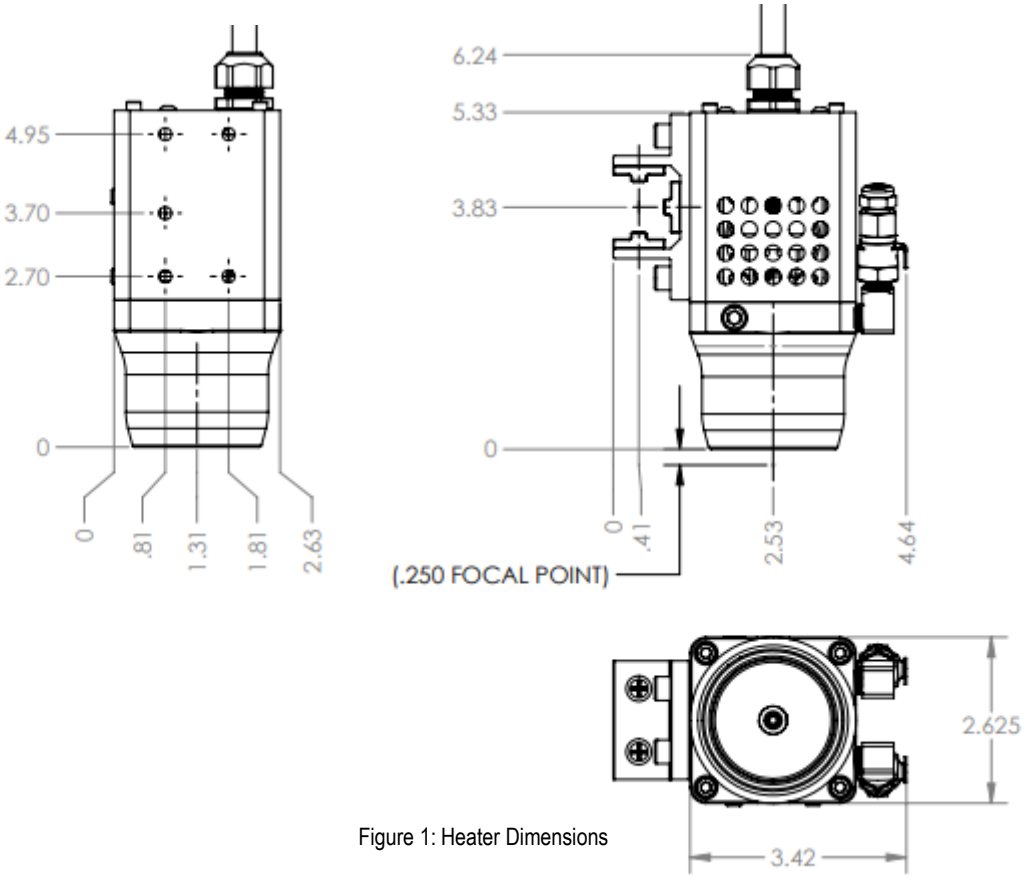


Figure 1: Heater Dimensions

Product Description- SpotIR 4160 Control Options

Controls

The model 4160 heater is designed to be powered by one of the standard Research Inc. control units. The model of the controller required depends on (1) desired user control inputs, and (2) the type of temperature control required for the process. Custom power control systems are also available for automated processes requiring multiple heater modules and/or set-point temperature control.

The model 5420 controllers, as well as model 5620 series controller are our recommended lines of modular control for your 4160 SpotIR heater. Using our specialized control units, single phase power from a standard 120v 15A circuit can be applied to your heater to produce variety of manually or electronically controlled output.

Check our website or click the two links below to view full datasheets for our model 5420 and 5620 control units.

ControlIR Model 5420 Data Sheet

ControlIR Model 5620 Data Sheet

Power Controller Chart for Model 4160

This chart shows the control panels that are available for all options of the Model 4160 SpotIR heater.

Heater Module	Power Controller Option			
Model 4160-250	Model 5420-120	Model 5420E-120	Model 5420mA-120	Model 5620-1-1
Model 4160-575				

Included Control Functions

All power controller options have an operator interface that allows the heater to be controlled in any one of three modes depending on which model controller is selected.

Manual Operation – Model 5420

Analog control is used to set the percent output of the lamps from 0 to 97% via a manual potentiometer to precisely adjust voltage through a phase angle fired Solid State Relay.

Timed Output Control – Model 5420E

An off/on switch, a manual potentiometer that will vary the output voltage from 0% to 97% of the line voltage and a timer. The timer has a 50-increment dial and may be set to adjust the voltage and time. The timer has a 50-increment dial and may be set to adjust the voltage from 0 to 5.0 seconds, 0 to 50 seconds, 0 to 5.0 minutes, 0 to 50 minutes, 0 to 5 hours, or 0 to 50 hours.

Digital Control – Model 5420mA

Digital control via an off/on switch and a receptacle/plug to accept a 4 to 20mA control signal from an external source to regulate the output voltage from 0% to 97% of the line voltage.

All-in-one Control – Model 5620

A stand-alone single-phase power controller designed specifically for Research Inc. heating products. The 5620 is ideal for the test lab, small production setting, and prototype development areas. Model 5620 features the functionality of all 5420 models, as well as introduces an idle adjustment setting to further customize heat profiles in applications like heat treating processes and more.

Custom Power Control System

Custom designed power control system to match a specific production process or application. Features can include:

Automatic-Temperature Control

The controller takes the input from a type “K” thermocouple or IR sensor and regulates the lamp output so the product temperature will match the preset value.

Automatic-Line Speed

The controller will take the output from a 0 to 10 VDC line that references line speed and vary the lamp output from 0 to 100% proportionally.

Example Test Cases – SpotIR 4160

Test 1 Set-Up: 250W focused – Thin Stainless + Thick Mild Steel

A single 250W 4160 spot heater is placed 0.25" above two different test specimens in separate test cases. Test specimen 1 being a 3" x 3" x 0.018" piece of stainless steel, weighing .73 oz. Test specimen 2 is a 4" x 4" x 0.1875" piece of mild steel, weighing .81 lbs. (Image 5 and 6 display test sample comparison.) The heater is set to its fully focused mode, a 0.100" spot of high-density IR. A series of four thermocouples (TC1, 2, 3, 4) were placed on the bottom surface of the test samples to monitor temperature. The four thermocouples were placed at concentric radii of .25" increments, to measure a total 1.5" diameter surface area, with the center thermocouple placed within the focal point of the IR heat. The 4160-250 is turned on to 100% output and temperature data is taken until the temperature increase becomes insignificant. The ideal output of this test is to see a large temperature increase at the center focal point proportional to the temperature at the edge of the heated zone. Temperature results will vary depending on the material being heated, material thickness, reflectivity of the material, as well as thermal conductivity of the material.

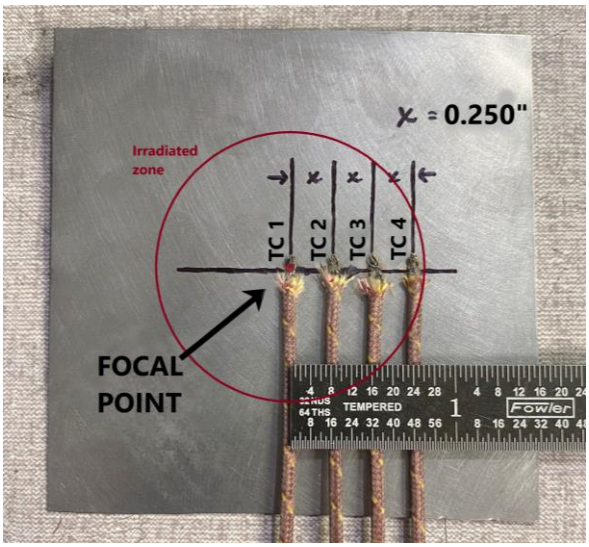


Image 1: Test sample

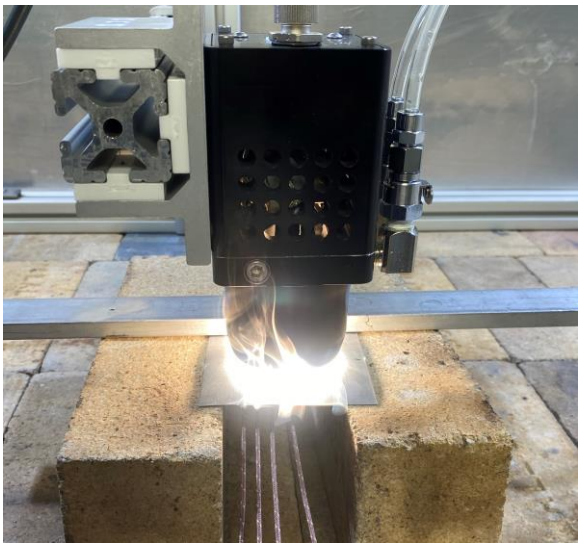


Image 2: Test being performed

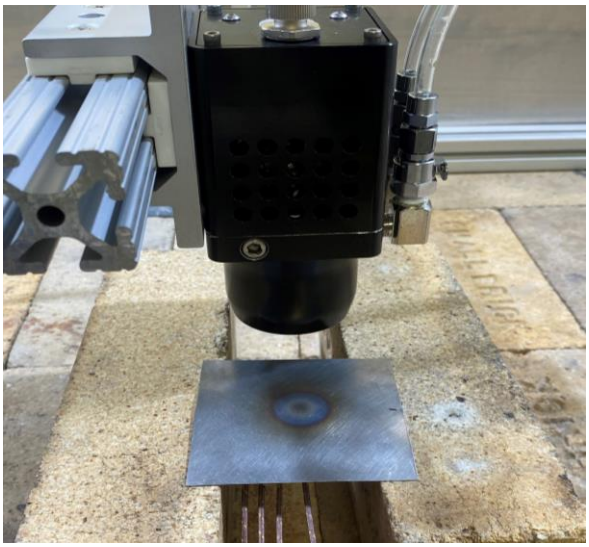


Image 3: Sample post- test

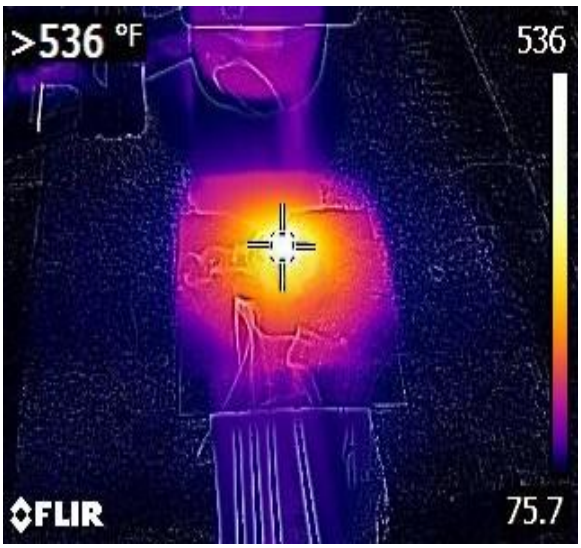


Image 4: Thermal image of sample immediately after test

Example Test Cases – SpotIR 4160

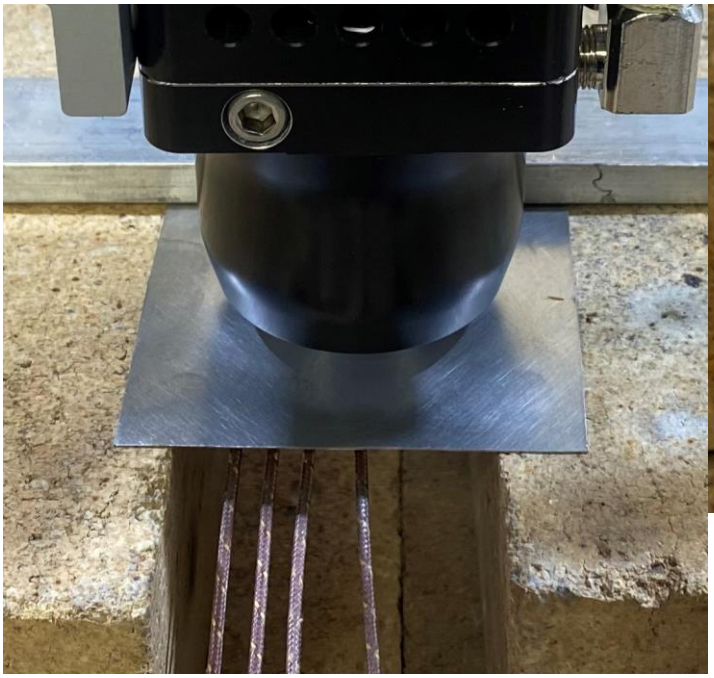
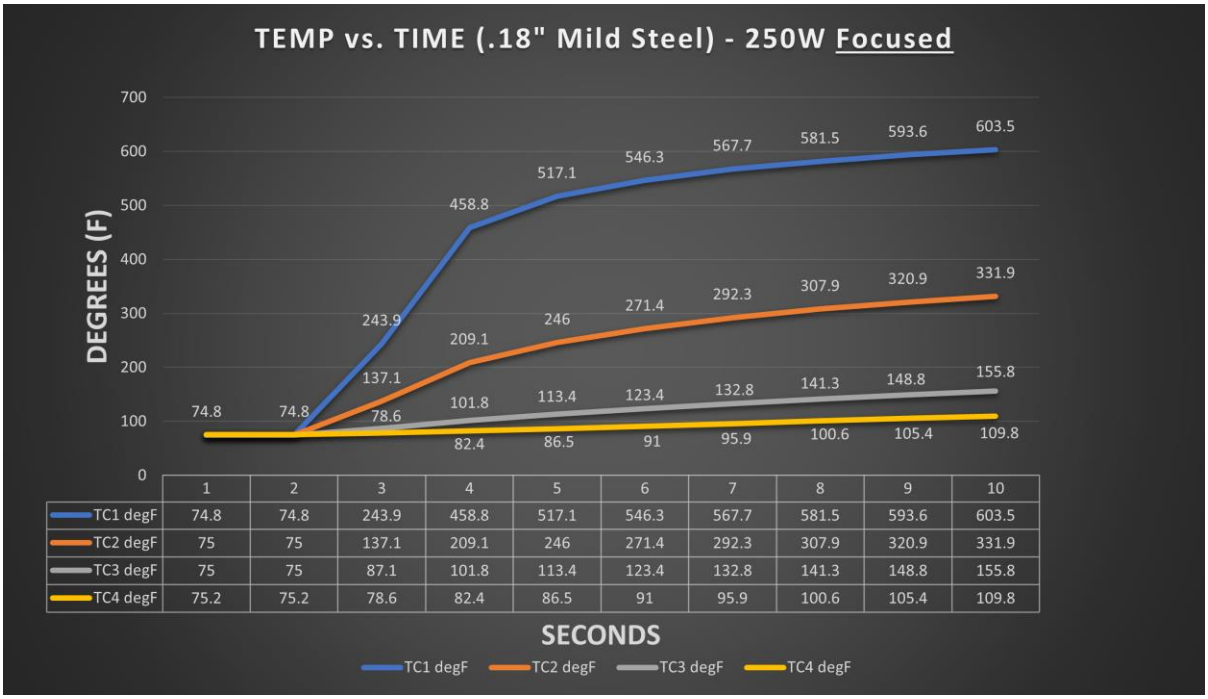


Image 5: Test specimen 1

Image 6: Test specimen 2

Example Test Cases – SpotIR 4160

Test 1 Results Summary – Thick Mild Steel



	1	2	3	4	5	6	7	8	9	10
TC1 degF	74.8	74.8	243.9	458.8	517.1	546.3	567.7	581.5	593.6	603.5
TC2 degF	75	75	137.1	209.1	246	271.4	292.3	307.9	320.9	331.9
TC3 degF	75	75	87.1	101.8	113.4	123.4	132.8	141.3	148.8	155.8
TC4 degF	75.2	75.2	78.6	82.4	86.5	91	95.9	100.6	105.4	109.8

Image 7: Thick Mild Steel test 1 results over 10 seconds

Temperature rise at focal point within 5 seconds = **492.9 °F**

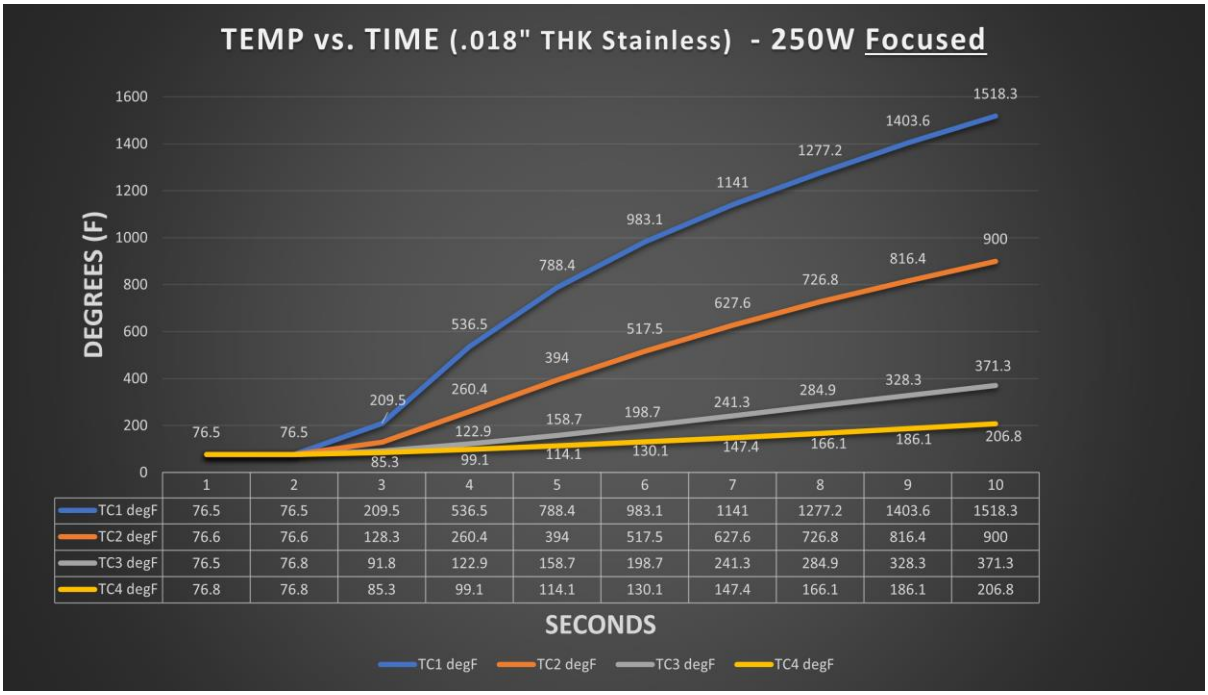
Temperature rise at .25” from focal point within 5 seconds = **217.3 °F**

Temperature rise at .50” from focal point within 5 seconds = **57.8 °F**

Temperature rise at .75” from focal point within 5 seconds = **20.7 °F**

Example Test Cases – SpotIR 4160

Test 1 Results Summary – Thin Stainless Steel



	1	2	3	4	5	6	7	8	9	10
TC1 degF	76.5	76.5	209.5	536.5	788.4	983.1	1141	1277.2	1403.6	1518.3
TC2 degF	76.6	76.6	128.3	260.4	394	517.5	627.6	726.8	816.4	900
TC3 degF	76.5	76.8	91.8	122.9	158.7	198.7	241.3	284.9	328.3	371.3
TC4 degF	76.8	76.8	85.3	99.1	114.1	130.1	147.4	166.1	186.1	206.8

Image 8: Thin Stainless test 1 results over 10 seconds

Temperature rise at focal point within 5 seconds = **1064.5 °F**

Temperature rise at .25” from focal point within 5 seconds = **551.1 °F**

Temperature rise at .50” from focal point within 5 seconds = **164.5 °F**

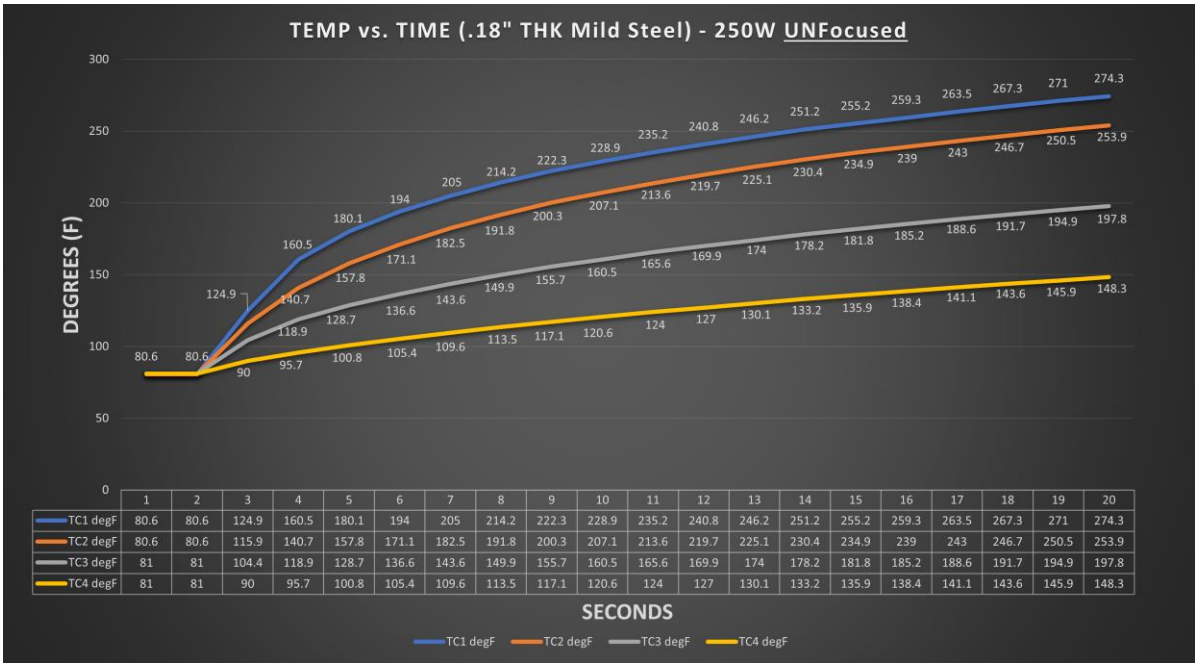
Temperature rise at .75” from focal point within 5 seconds = **70.6 °F**

Example Test Cases – SpotIR 4160

Test 2 Set-Up: 250W UN-Focused

The same 250W 4160 spot heater is placed 0.25" above the two previous samples from Test 1. The heater is adjusted to its least focused mode, a 1.250" spot of IR heat. The heater is centered above the test samples then turned on to 100% output. Temperature data is taken for a duration of about 20 seconds. The ideal output of this test is to see a more even temperature distribution across the irradiated zone. Results will vary depending on the material being heated, material thickness, reflectivity of the material, as well as thermal conductivity of the material.

Test 2 Results Summary – Thick Mild Steel



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
TC1 degF	80.6	80.6	124.9	160.5	180.1	194	205	214.2	222.3	228.9	235.2	240.8	246.2	251.2	255.2	259.3	263.5	267.3	271	274.3
TC2 degF	80.6	80.6	115.9	140.7	157.8	171.1	182.5	191.8	200.3	207.1	213.6	219.7	225.1	230.4	234.9	239	243	246.7	250.5	253.9
TC3 degF	81	81	104.4	118.9	128.7	136.6	143.6	149.9	155.7	160.5	165.6	169.9	174	178.2	181.8	185.2	188.6	191.7	194.9	197.8
TC4 degF	81	81	90	95.7	100.8	105.4	109.6	113.5	117.1	120.6	124	127	130.1	133.2	135.9	138.4	141.1	143.6	145.9	148.3

Image 9: Thick mild steel test 2 results over 20 seconds

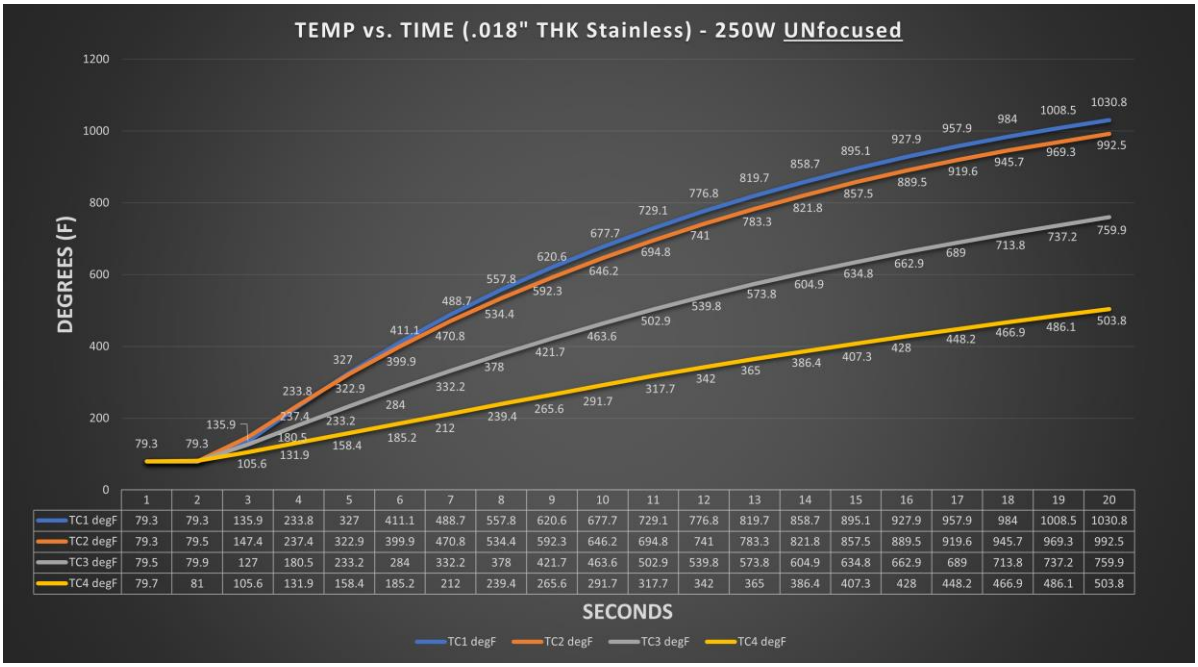
Temperature difference between TC1 and TC2 after 10 seconds = **21.1°F**

Temperature difference between TC2 and TC3 after 10 seconds = **49.8°F**

Temperature difference between TC3 and TC4 after 10 seconds = **42.9°F**

Example Test Cases – SpotIR 4160

Test 2 Results Summary – Thin Stainless



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
TC1 degF	79.3	79.3	135.9	233.8	327	411.1	488.7	557.8	620.6	677.7	729.1	776.8	819.7	858.7	895.1	927.9	957.9	984	1008.5	1030.8
TC2 degF	79.3	79.5	147.4	237.4	322.9	399.9	470.8	534.4	592.3	646.2	694.8	741	783.3	821.8	857.5	889.5	919.6	945.7	969.3	992.5
TC3 degF	79.5	79.9	127	180.5	233.2	284	332.2	378	421.7	463.6	502.9	539.8	573.8	604.9	634.8	662.9	689	713.8	737.2	759.9
TC4 degF	79.7	81	105.6	131.9	158.4	185.2	212	239.4	265.6	291.7	317.7	342	365	386.4	407.3	428	448.2	466.9	486.1	503.8

Image 10: Thin Stainless test 2 results over 20 seconds

Temperature difference between TC1 and TC2 after 10 seconds = **35.8°F**

Temperature difference between TC2 and TC3 after 10 seconds = **201.2°F**

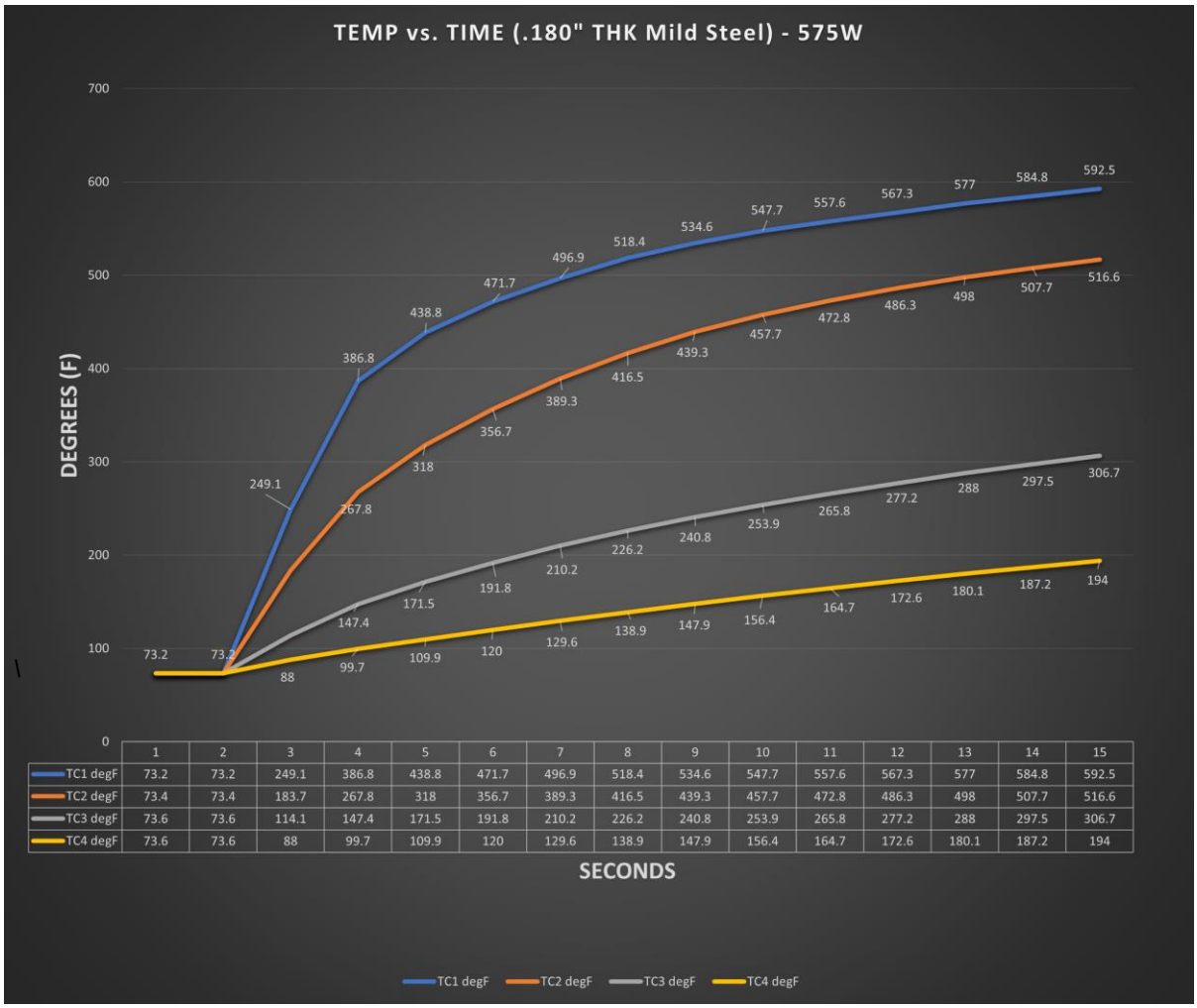
Temperature difference between TC3 and TC4 after 10 seconds = **197.8°F**

Example Test Cases – SpotIR 4160

Test 3 Set-Up: 575W – Thin Stainless + Thick Mild Steel

A single 575W 4160 spot heater is placed 0.25" above the same test specimens from Test 1 and Test 2. The 4160-575 heater features a fixed focus bulb, which produces a 0.200" spot of high-density IR. The heater is centered over TC1 then turned on to 100% output. Temperature data is taken until the temperature increase becomes insignificant. The ideal output of this test is to see a large temperature increase at the center focal point proportional to the temperature at the edge of the heated zone. Temperature results will vary depending on the material being heated, material thickness, reflectivity of the material, as well as thermal conductivity of the material.

Test 3 Results Summary – Thick Mild Steel



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
TC1 degF	73.2	73.2	249.1	386.8	438.8	471.7	496.9	518.4	534.6	547.7	557.6	567.3	577	584.8	592.5
TC2 degF	73.4	73.4	183.7	267.8	318	356.7	389.3	416.5	439.3	457.7	472.8	486.3	498	507.7	516.6
TC3 degF	73.6	73.6	114.1	147.4	171.5	191.8	210.2	226.2	240.8	253.9	265.8	277.2	288	297.5	306.7
TC4 degF	73.6	73.6	88	99.7	109.9	120	129.6	138.9	147.9	156.4	164.7	172.6	180.1	187.2	194

Image 11: 575W temperature rise test results over 15 seconds (thick steel)

Temperature rise at focal point within 5 seconds = **423.7°F**

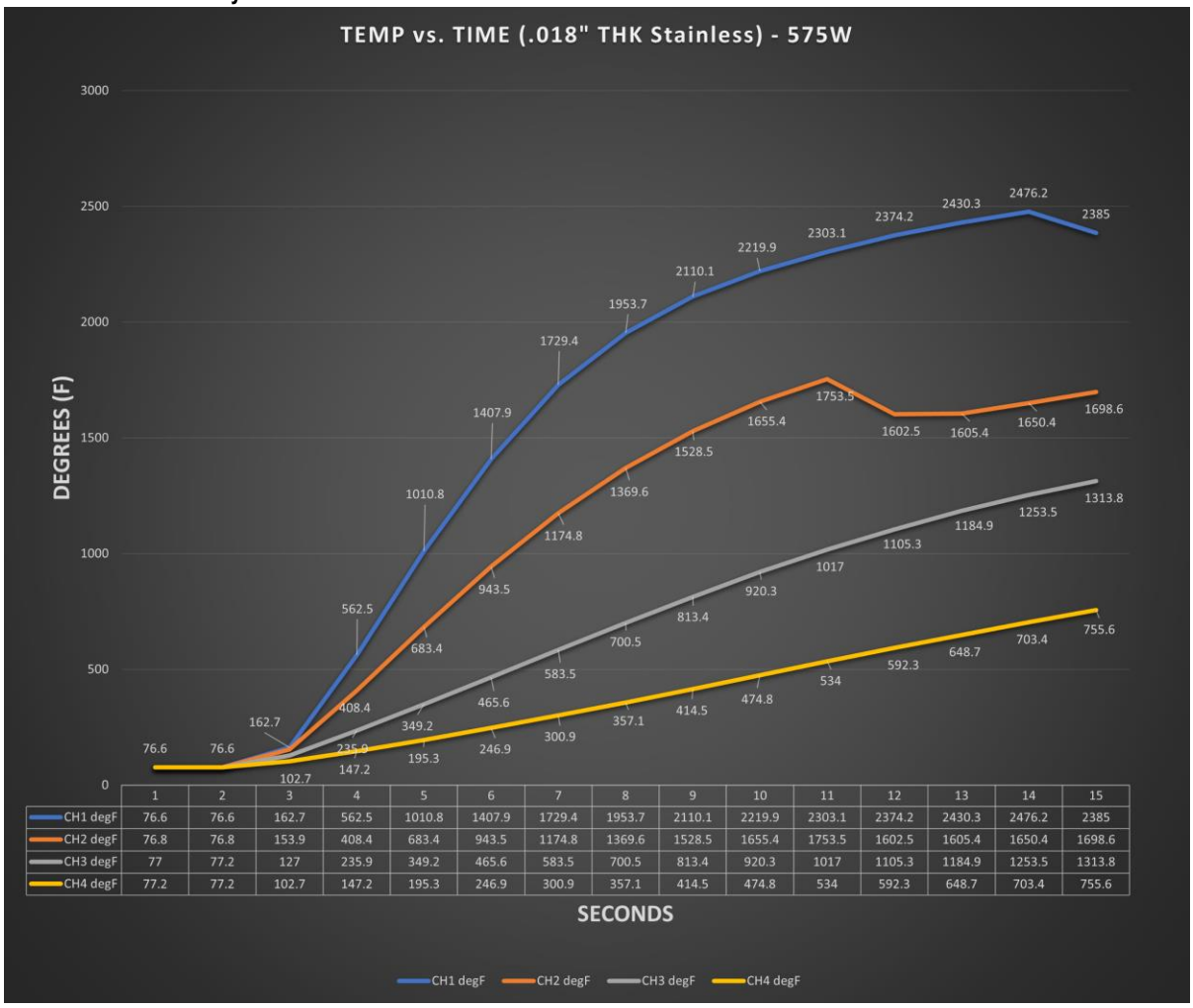
Temperature rise at .25" from focal point within 5 seconds = **315.9°F**

Temperature rise at .50" from focal point within 5 seconds = **136.6°F**

Temperature rise at .75" from focal point within 5 seconds = **56.4°F**

Example Test Cases – SpotIR 4160

Test 3 Results Summary – Thin Stainless Steel



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CH1 degF	76.6	76.6	162.7	562.5	1010.8	1407.9	1729.4	1953.7	2110.1	2219.9	2303.1	2374.2	2430.3	2476.2	2385
CH2 degF	76.8	76.8	153.9	408.4	683.4	943.5	1174.8	1369.6	1528.5	1655.4	1753.5	1602.5	1605.4	1650.4	1698.6
CH3 degF	77	77.2	127	235.9	349.2	465.6	583.5	700.5	813.4	920.3	1017	1105.3	1184.9	1253.5	1313.8
CH4 degF	77.2	77.2	102.7	147.2	195.3	246.9	300.9	357.1	414.5	474.8	534	592.3	648.7	703.4	755.6

Image 12: 575W temperature rise test results over 15 seconds (thin stainless)

Temperature rise at focal point within 5 seconds = **1652.8°F**

Temperature rise at .25” from focal point within 5 seconds = **1098.2°F**

Temperature rise at .50” from focal point within 5 seconds = **506.3°F**

Temperature rise at .75” from focal point within 5 seconds = **223.7°F**

Example Test Cases – SpotIR 4160

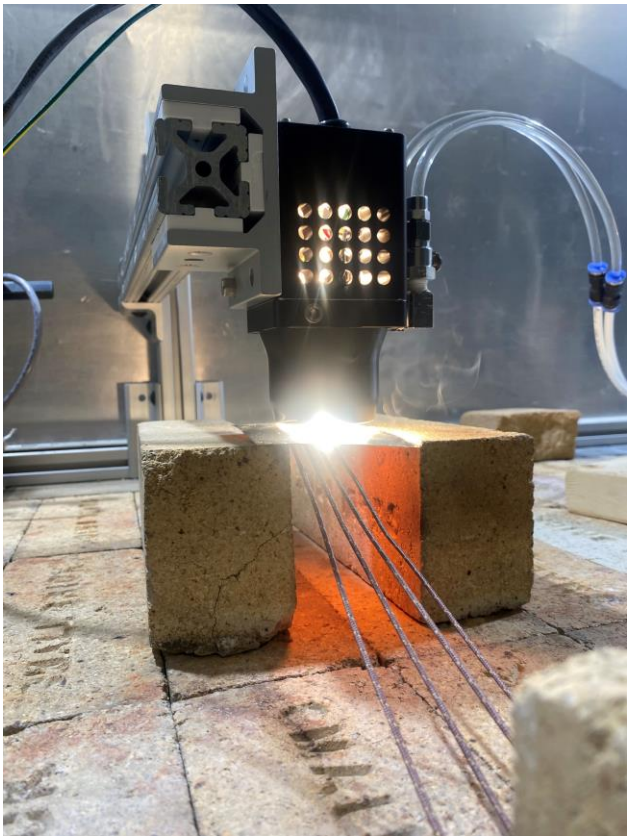


Image 13: Test 3 575w heater

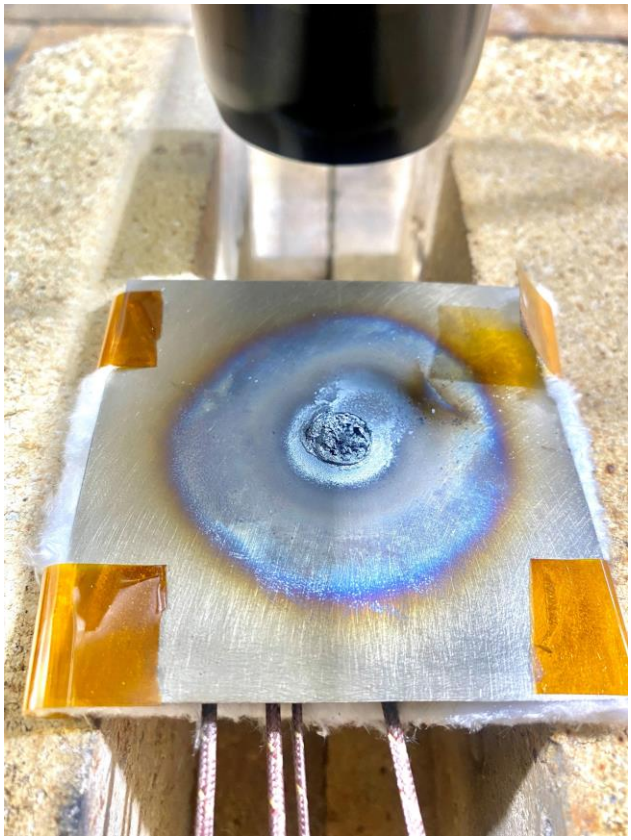


Image 14: Test sample following test 3 completion

Infrared Heaters For Controlled Concentrated Heating.

How to Order – SpotIR 4160

1. First Specify the Heater Module

PRODUCT DESCRIPTIONS SpotIR Model 4160	
Model	**Description**
4160	High Watt Density Spot Heater Module
Code	Bulb Power Output (watts)
250 575	250 Watt 575 Watt
Code	Custom Options
00 01	None Include 80/20 Brand Linear Bearing

* Example: 4160-250-00

2. Second – Specify the Power Controller

Heater Module	Power Controller Option			
Model 4160-250	Model 5420-120	Model 5420E-120	Model 5420mA-120	Model 5620-1-1
Model 4160-575				

3. Third – Order the Heater Module and Control Panel

* Example: Model 4160-250-01 SpotIR and Model 5420E-120 Power Controller

Products Available from

Research, Inc.

Research, Inc. is the industry leader in the design, development and manufacture of electric infrared heating components and integrated heating systems. Our products are designed to meet a wide variety of process requirements including the drying, heating, curing, soldering, bonding and annealing of many different materials.

Whether it's one of our standard products or a custom heating system, we are committed to providing solutions to meet our customer's most demanding heating needs. The following types of heaters are available:

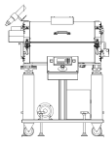
ControlIR® INFRARED HEATERS

All Model 5420 ControlIR®s have a power cable and plug to connect to a wall receptacle and a terminal block to terminate the wires coming from the heater. They all use a phase angle fired SCR to control voltage.

DryIR® INFRARED HEATERS

An aluminum reflector and either medium or short-wave lamps provide a band of heat from .5" - 4" wide. Can be used for water-based drying, solvent-based drying and adhesive curing.

ExtrudeIR® INFRARED HEATERS

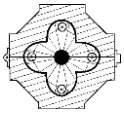


The Model 4069E ExtrudeIR curing System uses high intensity infrared lamps and polished aluminum reflectors to deliver heat precisely where it is needed for many curing and drying applications on extrusion lines.

LampIR® INFRARED HEATERS

Research Inc. specifies tungsten filament halogen lamps in most of its heaters. Halogen gas is added to the inert lamp gas to increase the life of the lamp. As the heater operates, tungsten slowly evaporates from the filament and is combined with the halogen to create a tungsten halide.

ChamberIR® INFRARED HEATERS

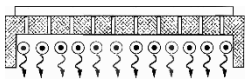


The Research, Inc. chamber heater can be ordered in many different sizes for your specific application.

LineIR® INFRARED HEATERS

A lamp and formed reflector that concentrates heat precisely on a .25" wide line. Excellent for forming plastic, local heat treating and drying ink

PanelIR® INFRARED HEATERS



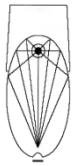
Designed with either ceramic or aluminum reflectors, the heater can provide consistent heat over a large area. Used for most drying and curing applications.

ProfileIR® INFRARED HEATERS

The Model 4069 ProfileIR® curing system uses high intensity infrared lamps and polished aluminum reflectors to deliver heat precisely where it is needed to cure irregularly shaped profiles.

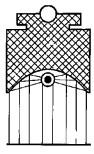
It can instantaneously give a surface cure that eliminates marks that occur when uncured rubber rubs on a conveyor.

SpotIR® INFRARED HEATERS



A single lamp and reflector heating system that focuses energy on a small (.25") target. Instant on/instant off capability makes it ideal for applications such as soldering, localized heat treating, and stress relieving.

StripIR® INFRARED HEATERS



A lamp and formed reflector that provides even heat distribution across a 1.7" wide strip. Can be used for curing, drying and precise heating.

RESEARCH INC.
PROVIDING CONTROLLED ENERGY
DRYING ▲ CURING ▲ HEATING

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