Stable Laser Systems

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Instructions manual for VH6010-4

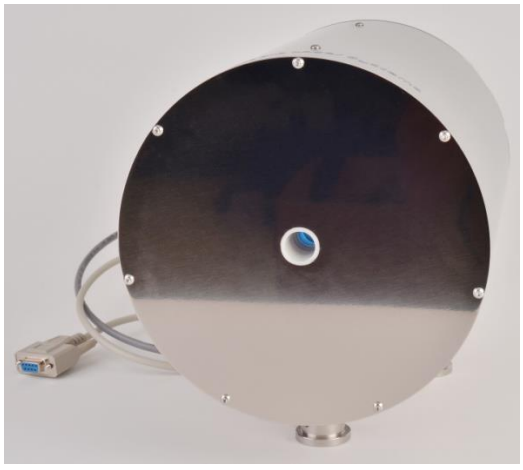
Use Latex or Nitrile gloves when working with materials that go inside of and the internal surfaces of the vacuum can.

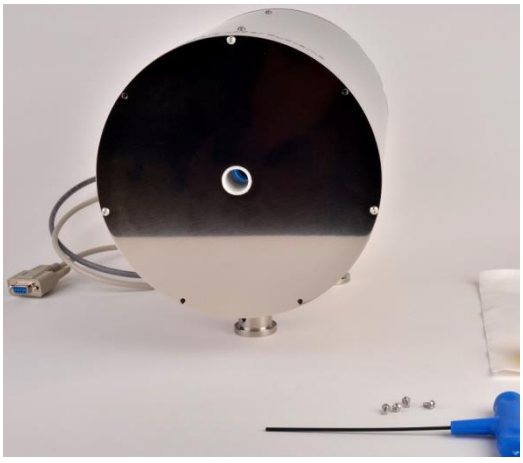
Be very careful with the vacuum surfaces. Aluminum is soft, and radial scratches in the area of the O-ring are detrimental to the sealing surface of the can. Please work on a soft surface covered in lint free cleanroom wipes, and keep all tools and other hard materials well clear of the aluminum surfaces.

To open a flange with an indium seal, two M4 jack screw holes are provided to lift off the flange after the bolts have been removed. Please place a 3 mm ball bearing in the jack-screw hole prior to threading in the jack-screw.

1 To load the vacuum chamber:

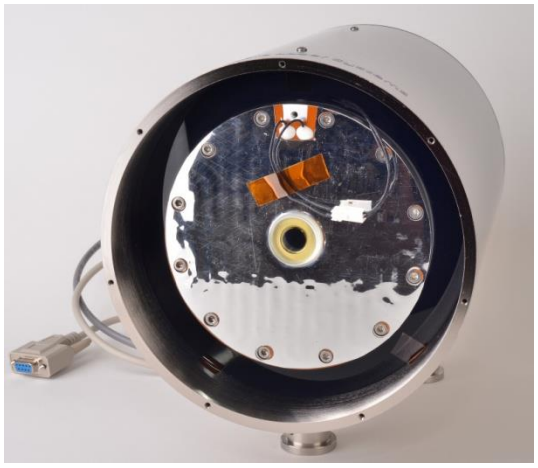
Place the vacuum housing close to the location where it will be used to avoid having to move the assembly with the cavity installed. It is recommended that the clamping forks provided are used to secure down the vacuum housing before loading the cavity. Unscrew the M3 x 6 button head screws and remove the front thermal shell endcap. (The one nearest the Stable Laser Systems logo)



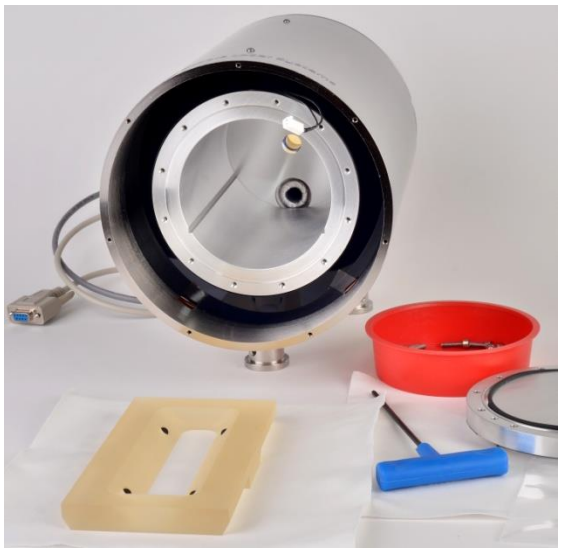


Remove the loose white thermal insulation. Be sure to get the two annular rings of thermal insulation around the can. Leave the black plastic insulation stop in place to keep the insulation around the tube from falling into the can while loading the cavity.

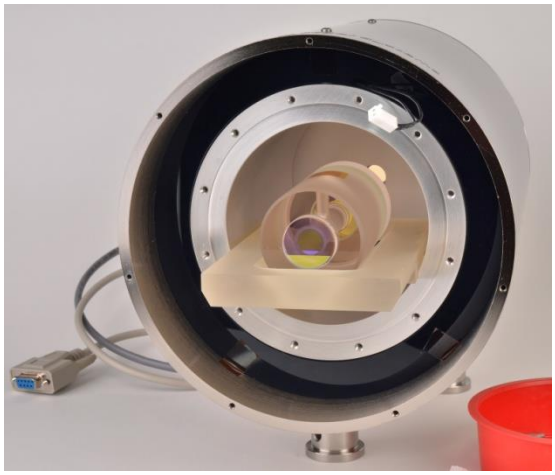
Disconnect the front heater (there will be a white connector that attaches the flange heater to the body). Unscrew (with a 3 mm metric Allen T wrench) and remove the vacuum chamber flange, taking particular care to hold the flange while the last screw is removed so it doesn't scratch the sealing surface while moving against the can. Place the flange O-ring side up on a clean cleanroom wipe, taking care not to damage the window.

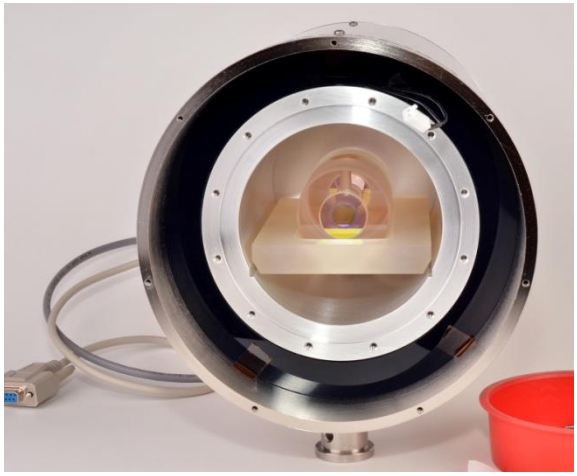


Load the cavity onto the Zerodur mounting block, using the Viton balls provided. Place the 4 viton balls in the machined holes in the mounting block. Center the cavity in the cutout and lower it into the support. Remove the kapton tape covering the vent hole prior to loading the cavity.



Load the Zerodur mounting block into the can by sliding the block into the grooves in the chamber. Try to align the block so that there is an equal gap on each side with respect to the vacuum chamber.





Replace the vacuum end flange, and fasten the screws in a diametric pattern (that is, a pattern that would follow the points of a clock, first 12 o'clock, then 6 o'clock, 3 o'clock, then 9 o'clock, and repeat this diametric pattern for the two other sets of four bolts. Repeat tightening three or four times until all the bolts are secure, using only moderate torque on each bolt.

Reconnect the heater and replace the thermal insulation. Then reattach the thermal shell end cap.

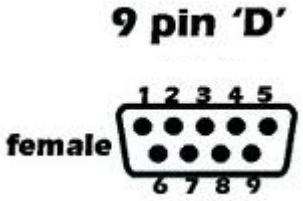
2 Connection to a temperature controller

The thermistors are General Electric MC65F103B, and a data sheet is attached. Please consider the self-heating of the thermistor when measuring absolute temperature.

The heater resistance is close to 5.5 Ohms.

Connector pin-out for the 9 pin D-sub. There is also an additional cable that has a read out from a test thermistor.

Pin Number	
1	Heater
2	Heater
4	Thermistor
5	Thermistor



3 Baking the vacuum housing

Stable Laser Systems recommends baking the vacuum can while pumping with a system such as a turbo-molecular pumping station. This is best done without the cavity, as Advanced Thin Films does not recommend baking their cavities, as it may change the nature of the mirror/spacer optical contact. A bake temperature of 80-85 C is acceptable, for a period of 2 days or more.

The vacuum chamber can be vented with very clean (oil-free) air or gas, such as nitrogen, and a small positive pressure can be maintained while the cavity is being loaded.

4 Evacuating the VH-6010-4

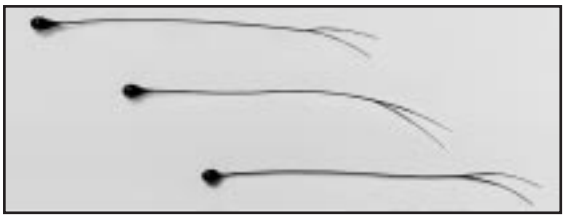
Pumping air out of the vacuum can, or re-admitting gas to the vacuum housing, should be done extremely slowly. Please plan to pump very slowly from atmospheric pressure to a pressure of a few Torr. This reduces the chance that particulates will be stirred up and deposited on the cavity mirrors. An in-line filter is recommended to slow the pumping speed.

NTC THERMISTORS: TYPE MC65

INSULATED LEAD INTERCHANGEABLE CHIP THERMISTOR

DESCRIPTION:

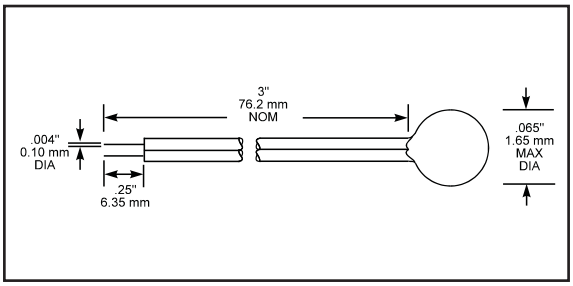
Epoxy Coated interchangeable chip thermistors with heavy isomid insulated Nickel lead-wires.



FEATURES:

- Precision, solid state temperature sensor
- Interchangeability down to ±0.05 °C
- Suitable for use over the range of –40°C to +105°C
- High sensitivity greater than –4%/°C at 25°C
- Suitable for temperature measurement, control and compensation
- High reliability and stability over interchangeable range
- Special tight tolerances in the clinical range for Medical applications
- Most popular R-vs-T curves are available
- Fully insulated
- Resin coated for good mechanical strength and resistance to solvents
- .004" (.1 mm) dia. heavy isomid insulated Bifilar Nickel lead-wires

DIMENSIONS:



Select appropriate part number below for resistance and temperature tolerance desired

$R_{25°C}$	MATERIAL SYSTEM	± .05°C; 35°C to 39°C ± .075°C; 39°C to 42°C ± .10°C; 20°C to 45°C ± .15°C; 0°C to 50°C	± .1°C; 35°C to 39°C ± .15°C; 20°C to 45°C ± .2°C; 0°C to 50°C	± .15°C; 35°C to 39°C ± .2°C; 20°C to 45°C ± .25°C; 0°C to 50°C
2252	F	MC65F232A	MC65F232B	MC65F232C
3000	F	MC65F302A	MC65F302B	MC65F302C
5000	F	MC65F502A	MC65F502B	MC65F502C
10000	F	MC65F103A	MC65F103B	MC65F103C
10000	Y	MC65Y103A	MC65Y103B	MC65Y103C
30000	H	MC65H303A	MC65H303B	MC65H303C
50000	G	MC65G503A	MC65G503B	MC65G503C
100000	Y	MC65Y104A	MC65Y104B	MC65Y104C
100000	G	MC65G104A	MC65G104B	MC65G104C

OPTIONS:

Consult factory for availability of options:

- Other resistance values in the range of 100Ω - 100kΩ
- Other tolerances or ranges
- Other lead wires or lengths
- Non standard R-vs-T curves
- Controlled dimensions

DATA:

THERMAL AND ELECTRICAL PROPERTIES:

Dissipation constant:.....(still air) .5 mW/°C
(stirred oil) 4 mW/°C

Thermal time constant:.....(still air) 8 sec.
(stirred oil) .5 sec.

Maximum power at 25°C 25mW
(derated from 100% at 25°C to 0% at 100°C)

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967 Windfall Road
St. Marys, Pennsylvania 15857-3397 USA
Tel +1 (814) 834 9140
Fax +1 (814) 781 7969

MATERIAL TYPE: F

AVAILABLE PRODUCTS:

HM, C100, EC95, DC95, MC65, MF65, SC30, SC50

Data for material type : F

Temp Range (°C)	Ratio	Beta
0 to 50	9.08	3895
0 to 70	18.64	3917
25 to 50	2.78	3933
25 to 85	9.30	3969
25 to 100	14.64	3981
25 to 125	29.05	3999
37.8 to 104.4	9.67	4000

To calculate Rt/R25 at temperatures other than those listed in the table, use the following equation:

$Rt/R25 = \exp\{A + B/T + C/T^2 + D/T^3\}$

where T = temperature in K

where K = °C + 273.15

Temp Range (°C)	A	B	C	D
-50 to 0	-1.4122478E+01	4.4136033E+03	-2.9034189E+04	-9.3875035E+06
0 to 50	-1.4141963E+01	4.4307830E+03	-3.4078983E+04	-8.8941929E+06
50 to 100	-1.4202172E+01	4.4975256E+03	-5.8421357E+04	-5.9658796E+06
100 to 150	-1.6154078E+01	6.8483992E+03	-1.0004049E+06	1.1961431E+08

To calculate the actual thermistor temperature as a function of the thermistor resistance, use the following equation:

$1/T = a + b(\ln Rt/R25) + c(\ln Rt/R25)^2 + d(\ln Rt/R25)^3$

Rt/R25 range	a	b	c	d
68.600 to 3.274	3.3538646E-03	2.5654090E-04	1.9243889E-06	1.0969244E-07
3.274 to 0.36036	3.3540154E-03	2.5627725E-04	2.0829210E-06	7.3003206E-08
0.36036 to 0.06831	3.3539264E-03	2.5609446E-04	1.9621987E-06	4.6045930E-08
0.06831 to 0.01872	3.3368620E-03	2.4057263E-04	-2.6687093E-06	-4.0719355E-07

†The deviation resulting from the tolerance on the material constant, Beta. The deviation must be added to the resistance tolerance of the part as specified at 25°C.

Temperature (°C)	Rt/R25 nominal	Temp Coef α (%/°C)	β Deviation† (±%)
-50	68.60	7.21%	2.30%
-45	48.16	6.96%	2.68%
-40	34.23	6.71%	2.87%
-35	24.62	6.48%	2.92%
-30	17.91	6.26%	2.86%
-25	13.17	6.05%	2.71%
-20	9.782	5.85%	2.50%
-15	7.339	5.66%	2.25%
-10	5.558	5.47%	1.97%
-5	4.247	5.30%	1.68%
0	3.274	5.13%	1.37%
5	2.544	4.97%	1.07%
10	1.992	4.81%	0.78%
15	1.572	4.67%	0.50%
20	1.250	4.53%	0.24%
25	1.000	4.39%	0.00%
30	0.8056	4.26%	0.21%
35	0.6530	4.14%	0.40%
40	0.5326	4.02%	0.56%
45	0.4369	3.91%	0.69%
50	0.3604	3.80%	0.80%
55	0.2989	3.69%	0.87%
60	0.2491	3.59%	0.92%
65	0.2087	3.49%	0.93%
70	0.1756	3.40%	0.92%
75	0.1485	3.31%	0.88%
80	0.1261	3.23%	0.81%
85	0.1075	3.14%	0.72%
90	0.09209	3.06%	0.59%
95	0.07916	2.99%	0.45%
100	0.06831	2.91%	0.28%
105	0.05916	2.85%	0.08%
110	0.05141	2.77%	0.12%
115	0.04483	2.70%	0.36%
120	0.03922	2.64%	0.61%
125	0.03442	2.57%	0.87%
130	0.03030	2.51%	1.16%
135	0.02675	2.47%	1.46%
140	0.02369	2.41%	1.82%
145	0.02103	2.35%	2.14%
150	0.01872	2.35%	2.46%

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