

THERMAL ACTUATORS

SOLID-LIQUID PHASE CHANGE ACTUATORS

BENEFITS

No outside power source is required to produce motion. Temperature change alone can be used to operate a device; e.g.: open or close a valve, move or release a latch, operate a switch. Because the Thermoloid® material operates in both the solid and liquid phase, each of which are essentially incompressible, load changes on the piston (within design limits) have little or no effect on operating temperature. This is in contrast to vapor-filled or liquid to vapor phase change devices, which are generally very sensitive to load changes (changing the load on these devices, e.g., changing spring tension, is used to change the operating temperature range).

Since the operating temperature of solid-liquid phase change actuators is determined by the Thermoloid® material properties (i.e., melting and solidification temperatures), the operating temperature is extremely stable, repeatable, and accurate. The properties of these thermostatic materials are so precise that they are used as primary reference standards by ASTM for instrument calibration. An analogy is the freezing temperature of water at 32°F (0°C) when water changes from liquid to solid: stable, repeatable, and accurate enough for use as a temperature calibration standard (i.e. ice point reference).

DESIGN FEATURES

- Can be made from most machinable materials
- Long, powerful stroke
- Rugged and compact
- Reliable and reproducible
- Wide choice of temperature ranges
- Not affected by shock or vibration
- Can be used in pressure or vacuum, liquid or gas
- Custom mounting configurations available
- Typical temperature change for maximum stroke: 10°F to 20°F (5.5°C to 11.1°C)
- Start to stroke temperatures from about 15°F to 300°F (-9.4°C to 149°C) or higher
- Self-operating, no power or signal required



APPLICATIONS

The precise motion of these thermal actuators can be used to operate a wide variety of devices, limited only by the imagination of the designer. Temperature actuated valves, switches, latches, clamps and control devices are typical applications.

The high heats of fusion and heat capacities of the Thermoloid® material make it an excellent candidate for heat sink applications.

OPERATION

The thermal actuator contains a Thermoloid® material, sealed in the actuator, which changes phase from a solid to a liquid as the temperature increases. As the phase change occurs, the volume of the Thermoloid® material changes significantly, with the liquid volume greater than the solid volume. Since the material is essentially incompressible and encased in a rigid housing, only the piston can move and extend as the volume of the material increases. This motion can be used to operate a wide variety of devices. When the Thermoloid® material cools the volume contracts and allows the piston to retract if a return force is acting on the piston. The piston will not normally retract unless a return force is present.

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DIAPHRAGM TYPE ACTUATOR		SLIDING SEAL ACTUATOR	
	1 - Piston		1 - Piston
	2 - Guide		2 - Guide
	3 - Anti-Chafing Disc		3 - Seal
	4 - Plug		4 - Actuator Body
	5 - Diaphragm		5 - Thermoloid® Material
	6 - Actuator Cup		
	7 - Thermoloid® Material		

DIMENSIONS & CAPACITIES

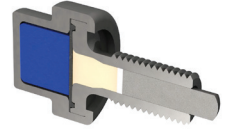
Actuators	D		L		Weight		Active Temperature Range
	in	mm	in	mm	Lb	Kg	
TOT-01 (SS)	0.7	17.7	1.10	27.9	0.04	0.018	15°F to 300°F (-9.4°C to 149°C)
TOT-01 (Brass)					0.041	0.018	
TOT-03 (SS)	0.83	21.0	1.85	47	0.11	0.049	
TOT-03 (Brass)					0.12	0.054	
TOT-04 (SS)	0.5	12.7	2.35	59.6	0.07	0.031	
TOT-04 LONG (SS)			3.35	85.1	0.09	0.040	
TOT-05 (SS)	0.83	21.0	1.75	44.4	0.08	0.036	
TOT-05 (Brass)					0.09	0.040	
TOT-09 (SS)	0.55	13.9	0.94	23.8	0.031	0.014	
TOT-09 (Brass)					0.035	0.015	

MINIMUM/MAXIMUM APPLIED FORCE CHART

Actuators	Retract Force (lbs)	Output Force (lbs)	Retract Force (kg)	Output Force (kg)
	Minimum	Maximum	Minimum	Maximum
TOT-01 (SS)	5	57	2.26	25.85
TOT-01 (Brass)		38		17.23
TOT-03 (SS)	10	147	4.53	66.67
TOT-03 (Brass)		98		44.45
TOT-04 (SS)	10	57	4.53	25.85
TOT-04 LONG (SS)				
TOT-05 (SS)	5	57	2.26	25.85
TOT-05 (Brass)		38		17.23
TOT-09 (SS)	3	37	1.36	16.78
TOT-09 (Brass)		25		11.33

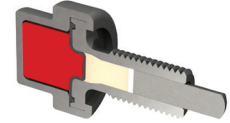
Actuator in “Cold” Position

In the diagram to the right, the Thermoloid® material is a solid at reduced volume. This allows the piston to be returned under spring force to open a direct-acting valve or device.

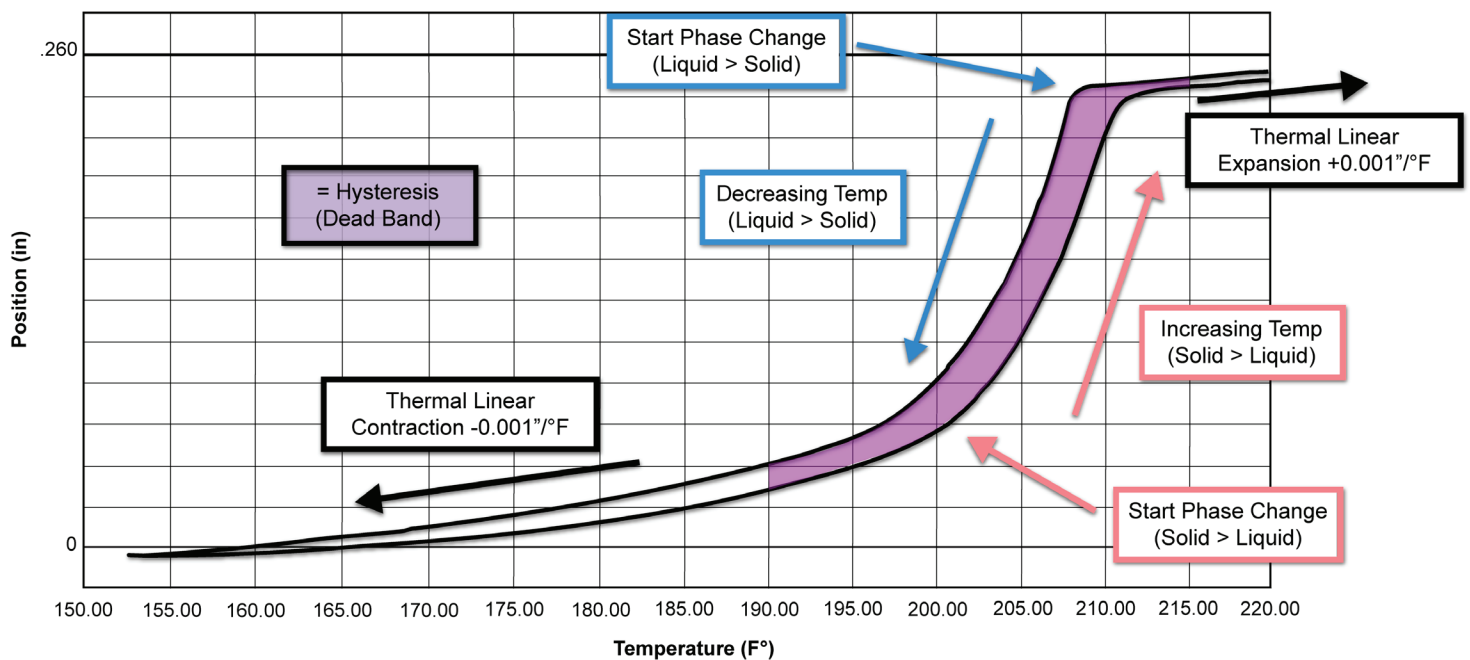


Actuator in “Hot” Position

In the diagram to the right, the Thermoloid® material is a liquid at increased volume. This forces the piston to extend and close a direct-acting valve or device.



ACTUATOR CURVE CHART



MATERIALS

Standard: Brass, 300 series SS

Chemical treatment options: Passivation, Electropolishing, NACE Annealing

Alternatives: Duplex 2205 and 2507 SS, Monel 400, Inconel 625, Hastelloy C-276, and Inconel 625. Other materials can be used but would need to be discussed per application.

CUSTOM MANIFOLDS

The ability to customize valves to suit our customers' needs is one of ThermOmegaTech®'s greatest strengths. If one of our standard valve offerings does not meet your exact requirements, our in-house engineering staff will work with you to design a solution to solve your problem. We can customize opening/closing temperatures, flow rates, threads, materials, as well as the number of ports, including their size and configuration.

Does your application require a small amount of leakage? A manual override to allow for a bypass mode? Lock wires to secure connections against vibration or tampering? A diffuser to oscillate/mix the fluid, or a valve integrated into a manifold? Contact us to help you design your custom offering and provide a prototype that you can evaluate prior to moving forward with your project.

If you are unsure of what you need our versatile team of experienced engineers will be here to provide you with ongoing and responsive customer service at all stages of the product's life cycle. A unique application requires an equally unique valve, and we welcome the challenge.

*ThermOmegaTech® can provide custom designed valves and assemblies for your applications.
Contact our engineers for more information.*

Terms and Conditions

NOTE: Consult factory for pricing and delivery.

PRICES: All prices are subject to change without notice; however, prices quoted within thirty days of quote will be honored at quoted price.

SHIPPING: All Shipments are F.O.B. factory. Freight is prepaid, and added to the invoice.

TERMS:

- Net thirty (30) days
- +2% beyond thirty (30) days of invoice and for each additional thirty (30) days of invoice

GUARANTEE: Every actuator designed and manufactured by THERM-OMEGA-TECH®, INC. is completely factory tested before leaving our facility. This gives you the assurance that the units will perform reliably for a long period of time. We pass that confidence on to you in our eighteen (18) month warranty.

RETURNS: The factory should be consulted and a return authorization number obtained prior to any return being made. No returns will be accepted without an RMA number. Actuators of standard design will be subject to a 25% restocking charge if inspection determines equipment is in first class resalable condition. Any rework required will be deducted from the credit in addition to the 25% restocking fee. Custom designed actuators are not returnable. All returned material should be shipped prepaid to the factory.



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Thermal Actuators
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Because of continuous improvements, ThermOmegaTech®, Inc. reserves the right to change the design and specifications without notice