Sensata
Technologies

G311P641/02
SPACE-FLIGHT THERMOSTATS

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S-311-P641/02 QUALIFIED M2 SERIES, NARROW DIFFERENTIAL, ½" HERMETIC

Introduction

Thermal engineers count on the reliability of Sensata KLIXON® M2 thermostats for the demanding environments required on satellites, launch vehicles, and manned space vehicles. For over sixty years, the tight set point temperatures , as well as exceptional vibration and shock resistance, enabled precise thermal control on satellites such as GPS III, JCSAT-9/-10, the Hubble Space Telescope, SPACE-X Dragon and many others . Each M2 Series Narrow Differential thermostat is vacuum baked and backfilled with inert dry nitrogen atmosphere prior to final sealing to prevent condensation at low temperatures or possible contact contamination at high temperatures.

All Sensata space-flight thermostats are assembled in a Class 100/ISO 5 cleanroom and undergo Group A Inspection per Table I of NASA S-311-P641. Inspections include pre-cap visual inspection, millipore cleaning, run-in, vibration, particle impact noise detection (PIND) in addition to the standard tests for calibration, creepage, seal, dielectric withstand voltage, insulation resistance, and contact resistance. Each individual thermostat is serialized and shipped with all inspection/screening test data included in the end item data package.

Features

- Narrow differential provides tight control signal for temperature control
- Single pole/single throw (SPST) bi-metallic snap disc design
- Preset temperature set points, non-adjustable calibration
- Vacuum backed and back-filled with dry nitrogen atmosphere
- Hermetically sealed to maximum leak rate of 1x10^-8 cc He/second
- Qualified to MIL-PRF-24236/20
- 100% screened to NASA S-311-P641

Applications

- Battery systems
- Propulsion lines, thrusters, & rocket motors
- Optics, instrumentation, & electronic modules
- Hydraulic/pneumatic actuators
- Cold plates
- Electric motor pre-heaters & robotic arm controls

SPECIFICATIONS

Requirements

Switching action	Single Pole, Single Throw (SPST)
Storage temperature range	-65ºF to +335ºF (-53.9ºC to +168.3ºC)
Operating temperature range	-40ºF to +235ºF (-40ºC to +112.8ºC), depending on calibrated temperature. Exposure is limited to 100°F above temperature for close on rise devices or 100°F below operating temperature for open on rise devices.
Contact rating, Resistive Load	2.0 amperes at 30Vdc/120Vac, 250,000 cycles 3.0 amperes at 31Vdc, 50,000 cycles
Contact resistance	0.025 ohms maximum, per MIL-STD-202, Method 307 initially and 0.050 ohms maximum after endurance testing
DWV	1250 VAC, rms, 60 cycles for 1 minute, terminal to case, per MIL-STD-202, Method 301
Vibration	10-2000 Hz, 10G, per MIL-STD-202, Method 204, Condition D (monitored)
Shock	100G, 6 milliseconds, per MIL-STD-202, Method 213
Seal, Hermetic	1 X 10-8 atm cc/sec. maximum, per MIL-STD-202, Method 112, Condition C
Finish	0.0003 - 0.0004 inches Ni per AMS-QQN-290 over 0.0002 - 0.0003 inches Cu per MIL-C-14550
Weight	5.4 grams (average)
Operating temperature	Temperature at which contacts close.
Differential	Subtract (for close on rise) or add (for open on rise) the differential from the closing temperature to determine the temperature at which the contacts will open.
Qualification	Qualification listing to MIL-PRF-24236/20 required.
Screening	Switches shall be subjected to 100% Group A screening inspection per S-311-P-641, Table 1, Test Nos. 1 – 12, with the following exception: PIND per manufacturer's GSFC approved internal test procedure; for PIND testing at temperatures below 0°F, consult factory.

Standard operating characteristics, differential and tolerances.

Closing Temperature Range °F [°C]	Opening Temperature Differential °F [°C]	Closing Temperature Tolerance °F [°C]
-40ºF to +235ºF (-40ºC to 112.8ºC)	2 to 5ºF (1.1 to 2.8ºC)	±4ºF (±2.2ºC)

DIMENSIONS

All dimensions are in millimeters

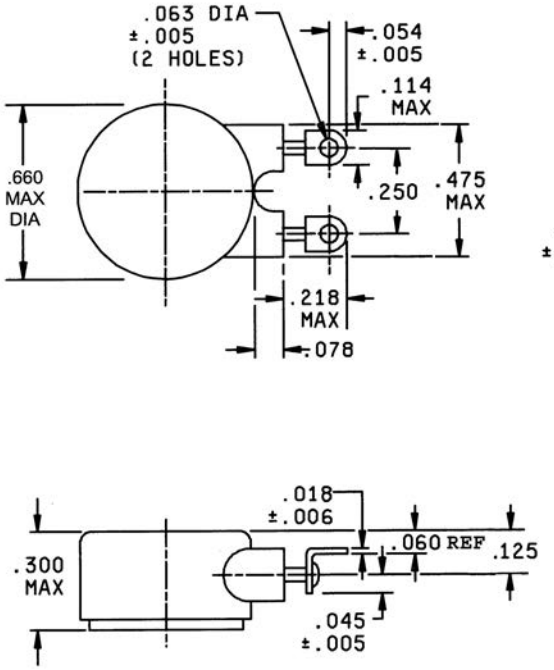

Figure 1
(G311P641/0211XXXXXXXXXX)

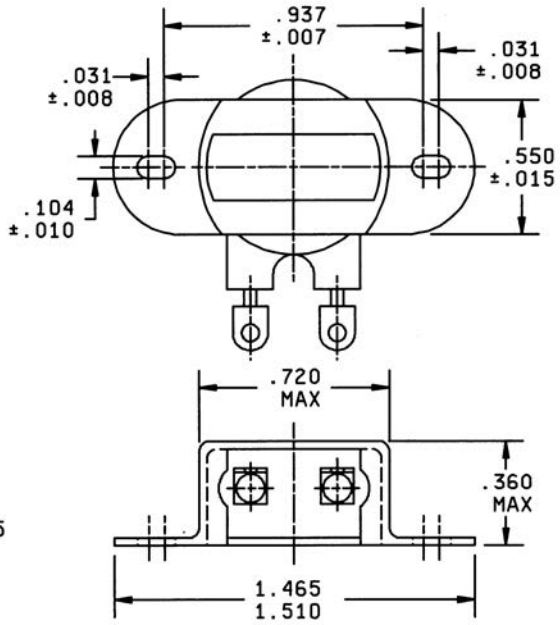

Figure 2
(G311P641/0221XXXXXXXXXX)

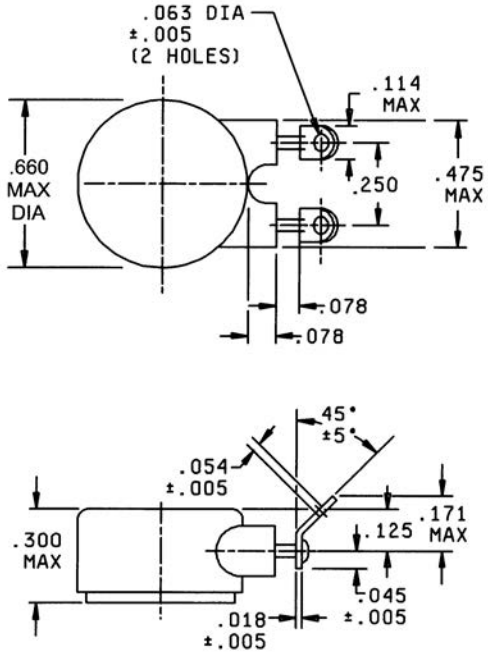

Figure 3
(G311P641/0212XXXXXXXXXX)

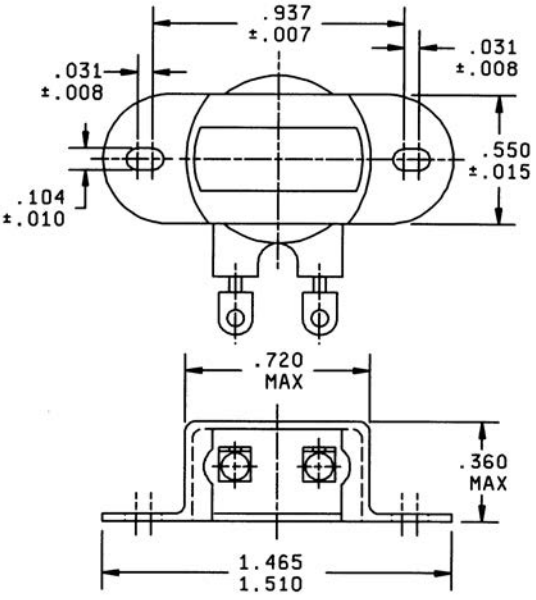

Figure 4
(G311P641/0222XXXXXXXXXX)

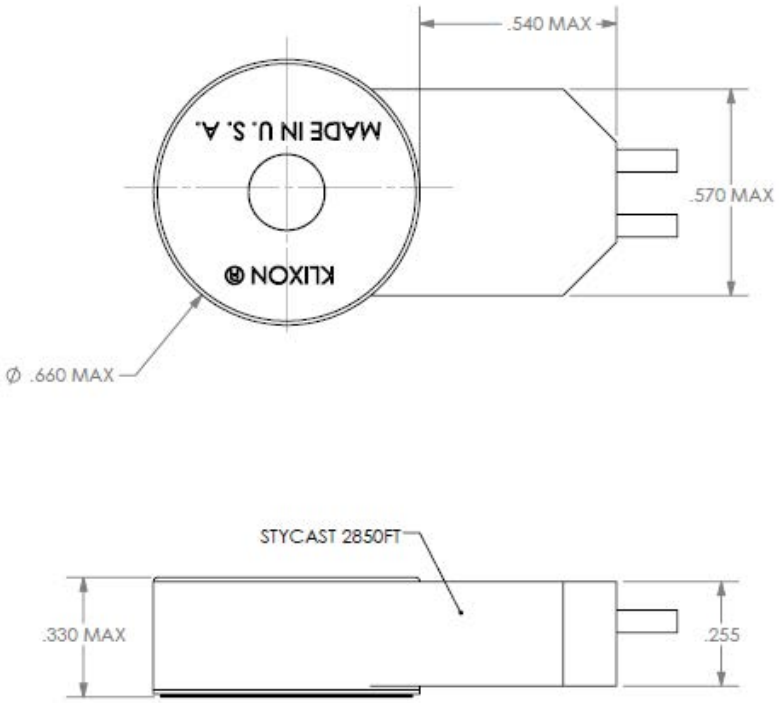

Figure 5 = Plain cup with wire leads and
STYCAST overmold strain relief
(G311P641/0211XXXXXXXXXX / X)

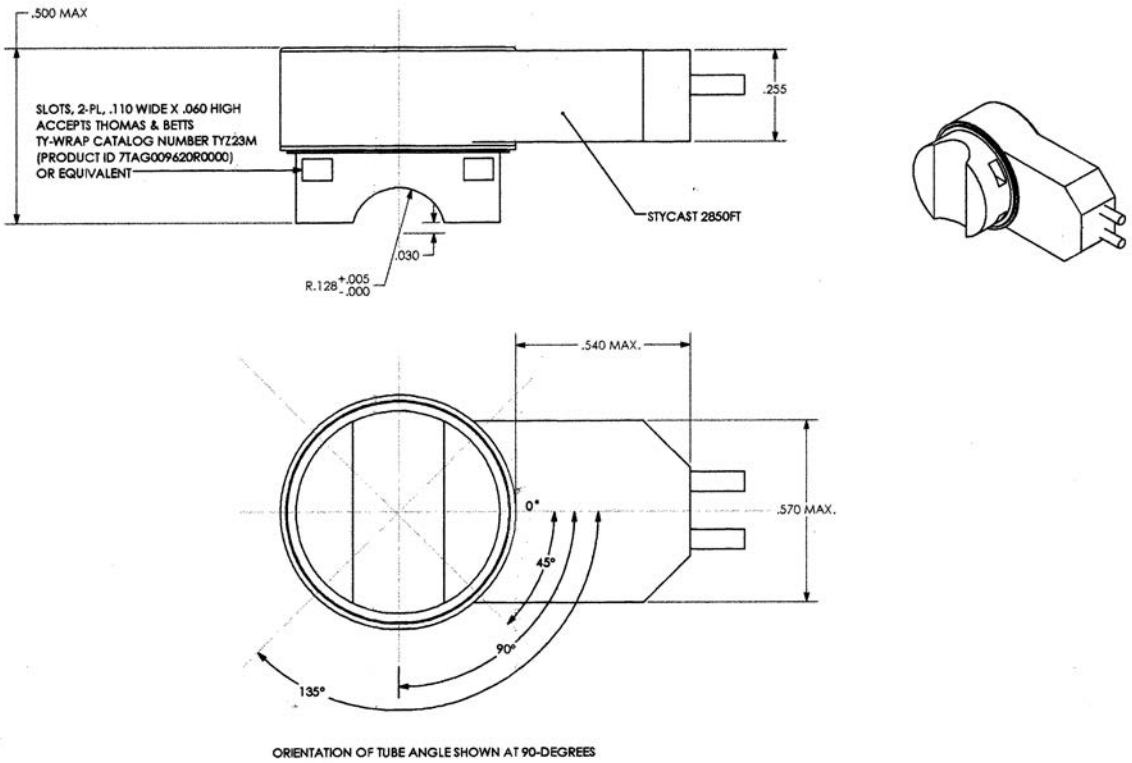

Figure 6
1/4" DIAMETER TUBE MOUNT

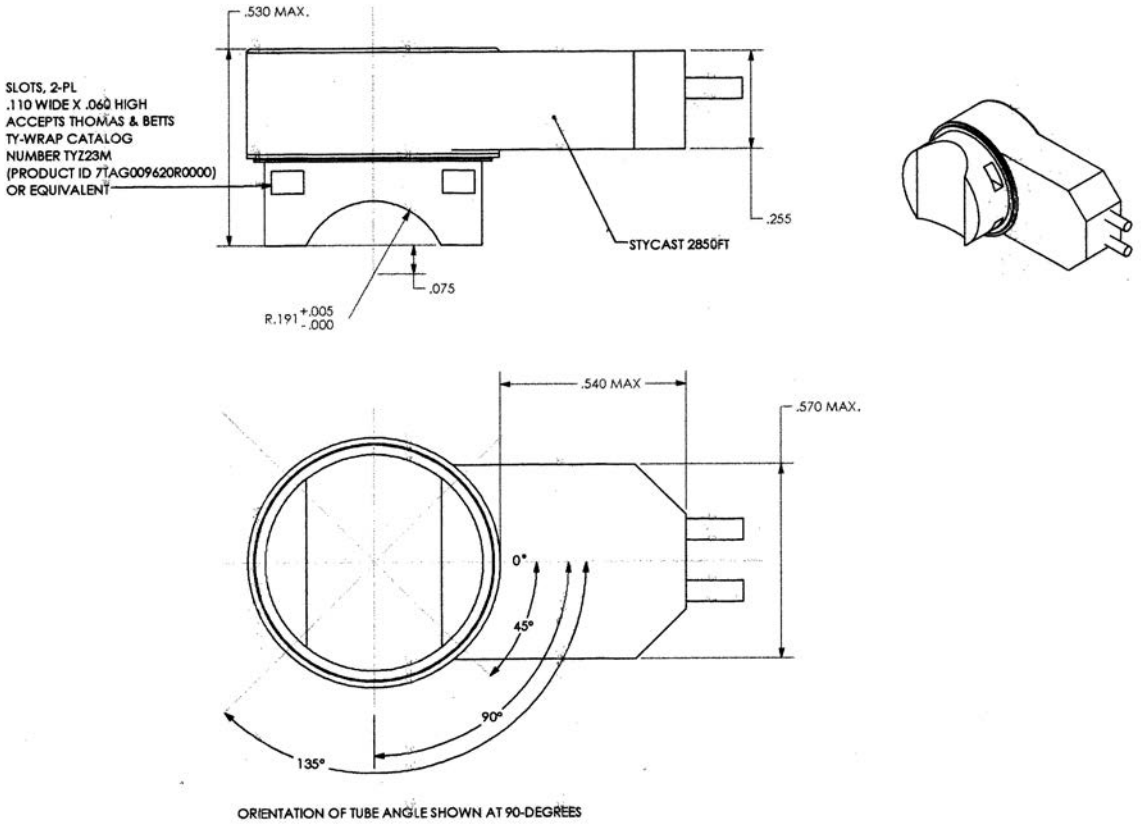

Figure 7
3/8"DIAMETER TUBE MOUNT

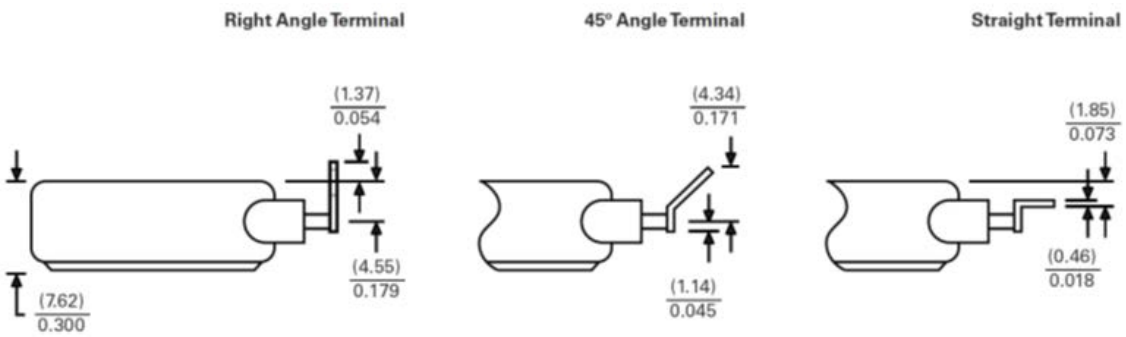

Figure 8
Available Terminal Configurations

ORDERING OPTIONS

Example : G311P641/0211L163030521/AA1

G311P641/02	1	1	L	163	03	05	2	1	/	A	A	1

GSFC Prefix

Bracket

1 = No Bracket
2 = Loose Bracket

Terminal

1 = Straight
2 = 45°
3 = Right Angle

Operation

L = Open on rise
F = Close on rise

Closing Temperature

Use 3 digits (°F)

Tolerance

03 = ±3
04 = ±4
05 = ±5

Differential

04 = 2 to 4°F
05 = 2 to 5°F
07 = 3 to 7°F
09 = 5 to 9°F

Plating

2 = Copper-nickel

Contacts

1 = Silver
2 = Gold plated

Wire Lead

See table shown below

Tube Mount Adapter Size

See table shown below

Tube Mount Adapter Orientation

See table shown below

WIRE LEAD & TUBE MOUNT ADAPTER OPTIONS

Wire Lead Ordering Code	Wire Type	Lead Length +/-10% Inch (mm)	Stycast Overmold (See Figure 5)
A	M22759/11-22-0	59.0 (1500)	STYCAST 2850FT
B	M22759/33-22-0	59.0 (1500)	
C	M22759/43-22-0	59.0 (1500)	

Tube Mount Size Ordering Code	Tube Mount Adapter Diameter Inch (mm)
A	.256 +.010/-.000 (6.50 +.25/-.000)
B	.381 +.010/-.000 (9.68 +.25/-.000)

Tube Mount Orientation Ordering Code	Tube Mount Adapter Mounting Angle (+/-10°)
1	0° (Terminal Orientation Parallel To The Tube Direction)
2	45°
3	90°
4	135°

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