

Agile Temperature Sample Mount Heat Load Map

Applicable Products	ATSM		
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Purpose

This document is intended to explain the heat load curve, thermal resistance, and temperature stability capabilities of the Agile Temperature Sample Mount (ATSM).

Background

The ATSM allows users of Montana Instruments cryostats to vary the temperature of their sample with minimal changes in the temperature of the surrounding sample chamber. This allows for faster times to temperatures above base and better stability at higher temperatures, without any of the tradeoffs associated with varying the temperature of the entire system, such as poor temperature stability or the possibility of condensation forming at higher temperatures.

Applicable Theory

The data presented here was collected from ATSM acceptance tests performed prior to system shipment. Each ATSM was installed in the sample chamber of a fully functional CryoAdvance system, cooled to base temperature below 4 K, and tested using an automated acceptance test Python script.

The Python script incrementally increased temperature from 4 K to 340 K. After a one-minute stabilization period at each setpoint, the script recorded average temperature, temperature stability, and applied heater power. In parallel, the test effectively verified PID temperature-control performance across the full operating range.

Heat Load

The resulting Heat Load Curve in Figure 1 shows an approximately linear increase in the heater power required to maintain a stable ATSM temperature. Required heater power increases from 30 mW at 4 K to 1.8 W at 340 K.

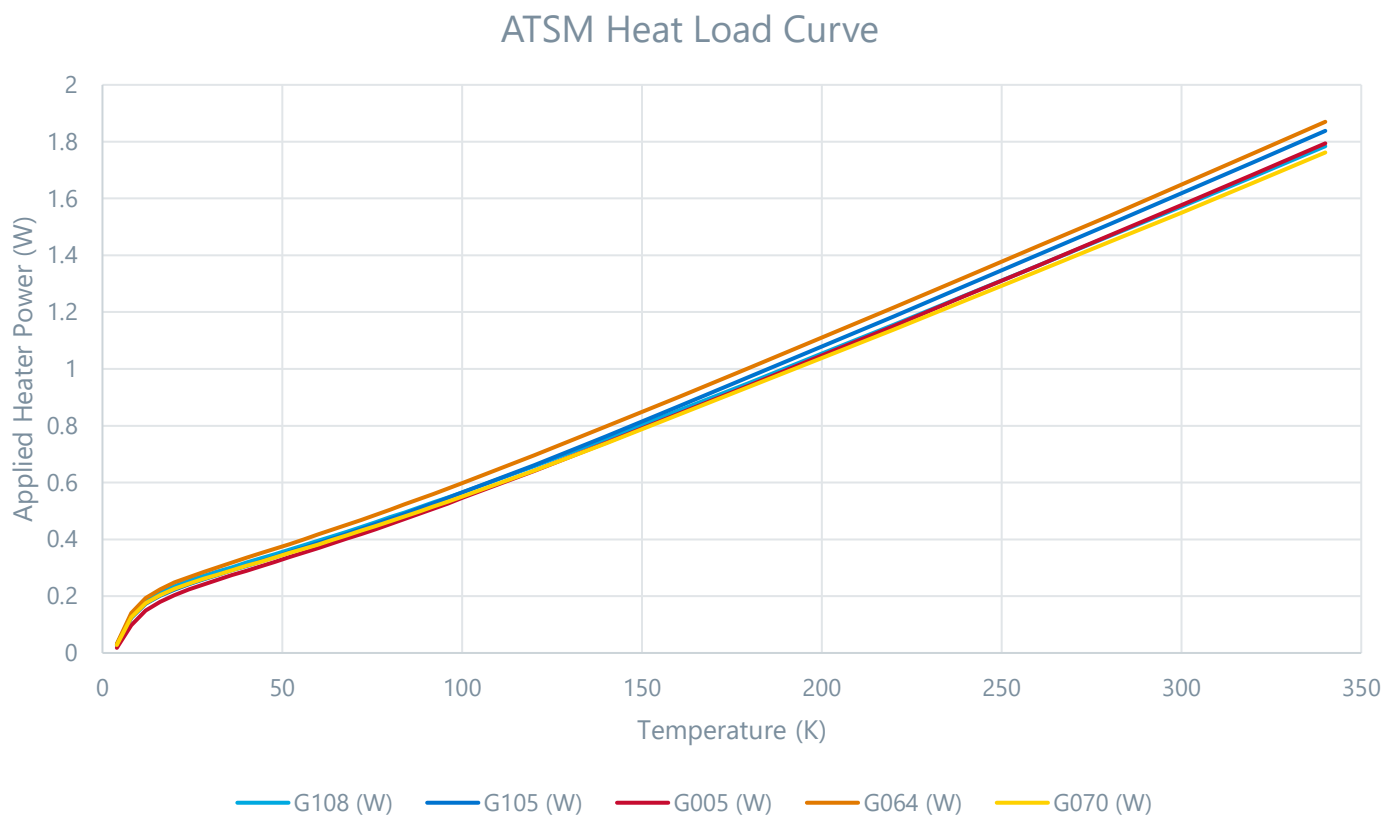


Figure 1: ATSM Heat Load Curve

Temperature Stability

Temperature stability typically peaks at approximately 20 mK near the 12 K setpoint. Stability quickly improves to 1-3mK and maintains this throughout the remainder of the temperature range, as shown in Figure 2.

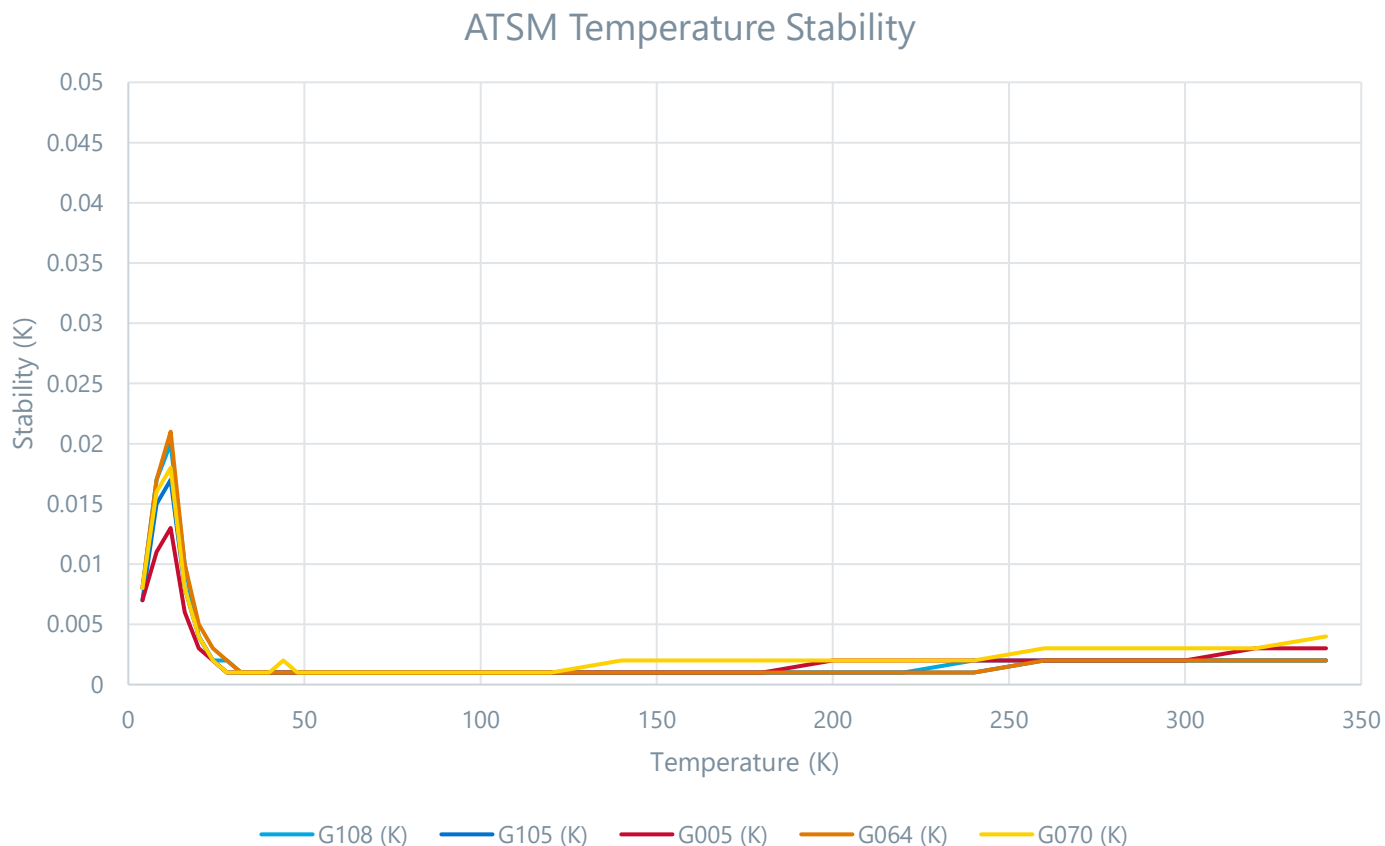


Figure 2: ATSM Temperature Stability Curve

All stability measurements are still well below the specification of <50mK temperature stability, shown here as the upper limit of the graph in Figure 2.

Summary

The ATSM allows for more flexibility in experimental setups that require varying temperatures, without compromising system performance. To learn more about the ATSM and how it could benefit your experimental setup, visit the [ATSM product page](#) or [contact](#) a Montana Instruments sales engineer.