

point-of-use temperature  
control systems for the  
semiconductor industry



# point-of-use (POU) temperature control systems

the Noah POU strategy...



## The benefits of Noah POU temperature control systems:

- dynamic temperature control
- smallest footprint in the industry enables POU installations
- low power consumption
- sub-floor tile mount capability
- zero temperature drift
- reliable solid-state operation – only one moving part
- multi-platform interfacing capability
- only 1 gallon of coolant required

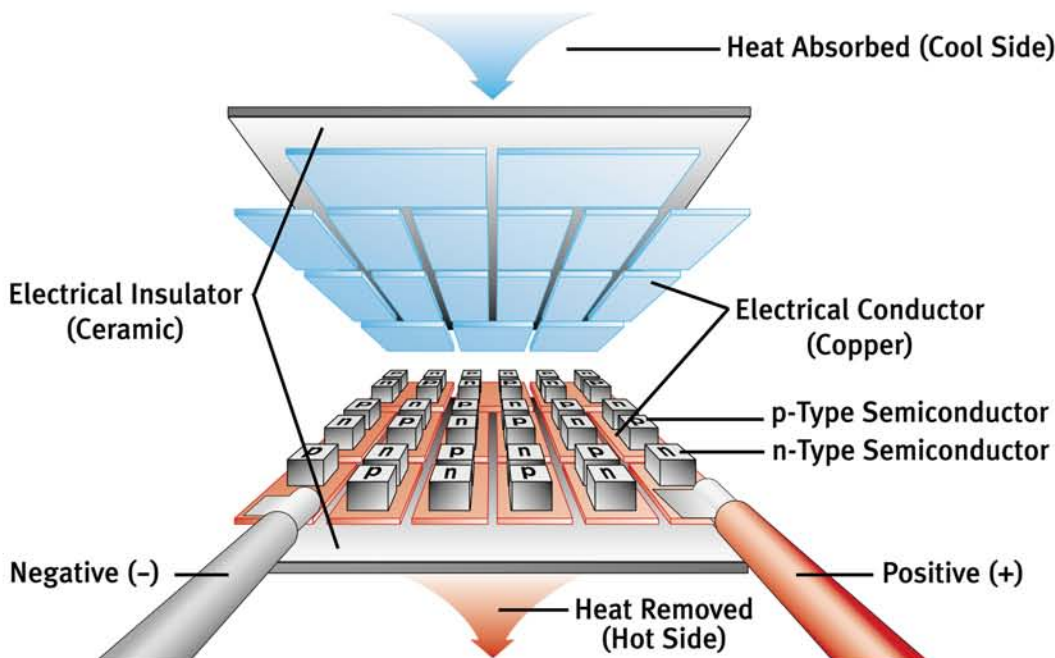
15 years ago, Noah Precision pioneered the integration of thermoelectric devices into temperature control systems for use in critical semiconductor wafer processing applications.

Shrinking device geometries and new, more demanding processes require fast and accurate temperature control. Noah is the leading provider of temperature control systems for advanced devices with reduced operating costs and improved reliability.



## thermoelectric (TE) overview

Noah Precision POU thermoelectric temperature control systems are based on the proven and well-known principles of heat transfer used in Peltier devices. These devices are solid-state heat pumps that provide the ability to rapidly change temperature of a surface.



### Peltier Effect Device

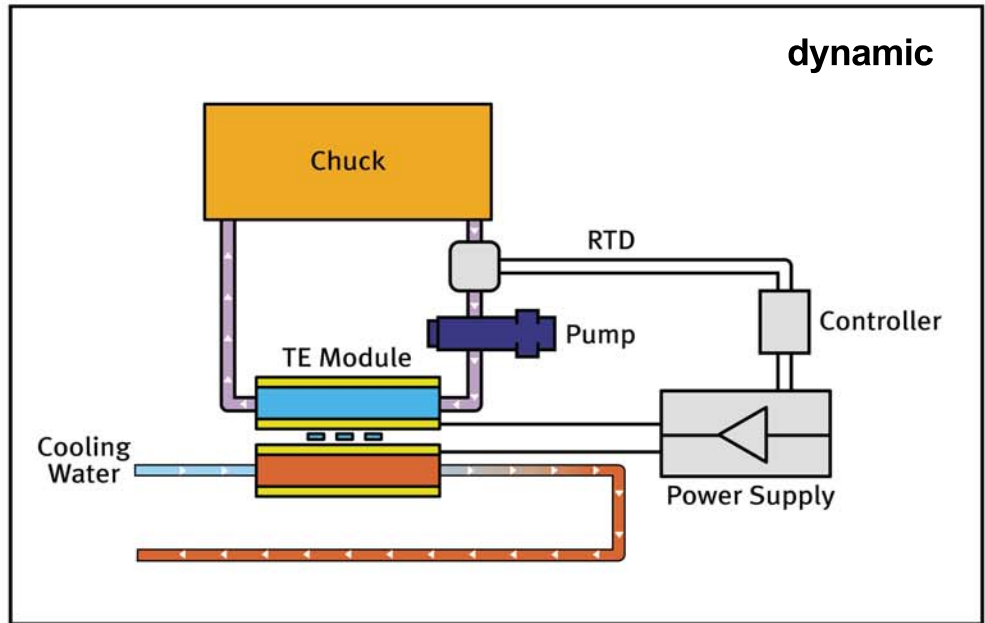
- small & stable
- no moving parts
- no noise
- temperature control within 0.1° C
- no CFCs



Noah's dynamic control POU systems improve through-the-lot & chamber-to-chamber wafer processing uniformity.

This is accomplished by sensing the temperature of the fluid returned from the chamber and varying the temperature of the fluid supplied to the chamber to compensate for changing process conditions in real-time.

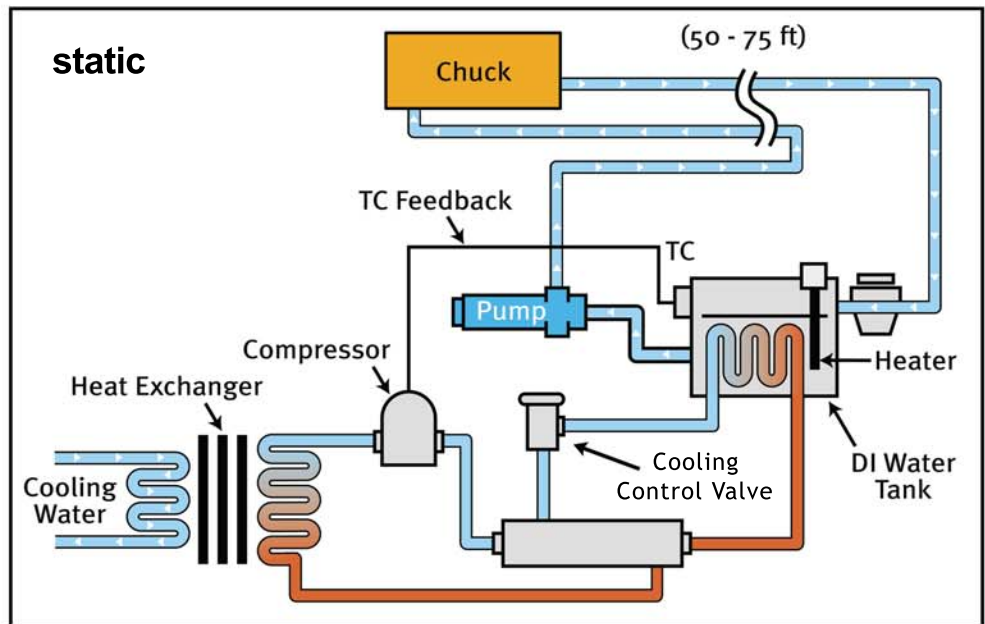
- dynamic temperature control at the point-of-use
- rapid ramp rates = greater chamber productivity
- compressor-free POU system consumes ~50% less power



- entire system has one (1) moving part = high reliability
- use of perfluorinated fluids = no filters or DI components required
- zero footprint capability with sub-floor mount
- modular system design = simplified troubleshooting and fast MTTR

Static units maintain the temperature setpoint in the reservoir by cycling heaters and cooling control valves on & off, thus consuming about 50% more power than a Noah POU system. The fluid is pumped to the chamber from the static unit's remote location. This can result in large ambient losses that will tend to vary from chamber-to-chamber, depending upon hose length, hose type and routing, air flow, and ambient conditions.

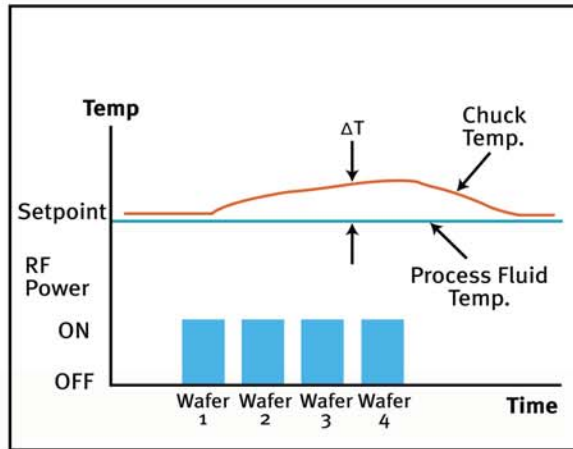
The **wafer chuck** will eventually reach a new equilibrium temperature since the static unit is not designed to compensate for changing process conditions.



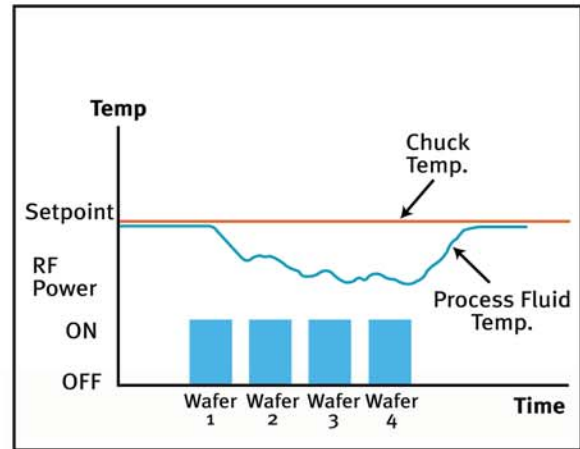
- large footprint consumes valuable fab tool space
- static temperature control typically in remote location adds cost – decreases efficiency
- compressors & large pumps require frequent maintenance
- compressor-based systems have higher power consumption



### static



### dynamic



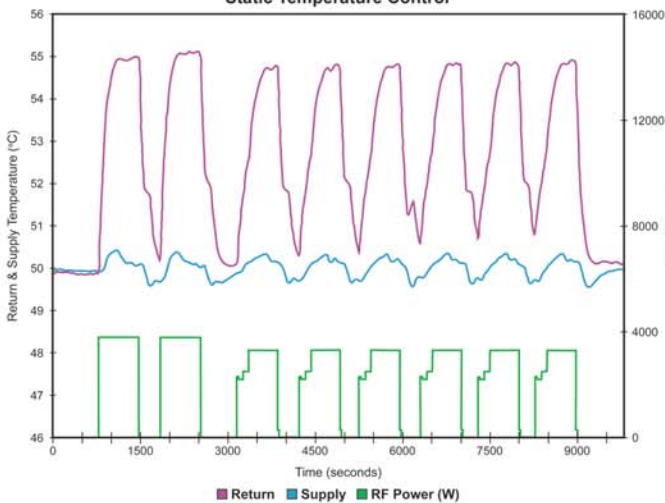
#### temperature drift

- negative effect on side wall passivation
- wafer-to-wafer temperature instability
- reservoir fluid temperature constant
- chuck temperature varies
- unstable etch rates

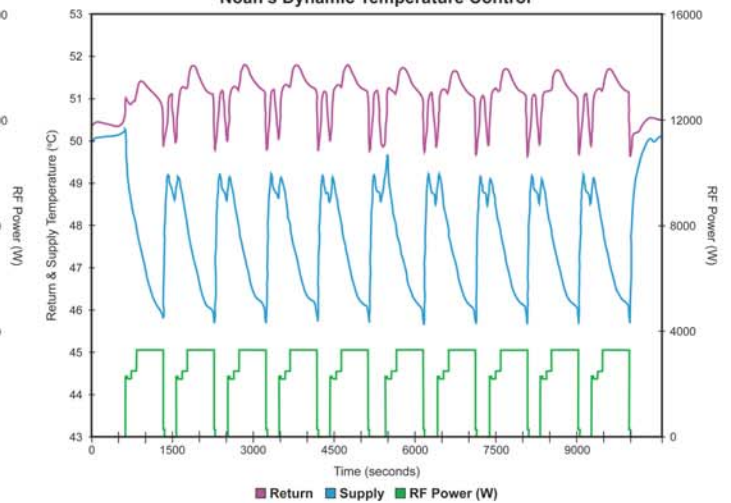
#### improved control

- fluid supplied temperature varies
- chuck temperature constant
- reduced 'First Wafer Effect'
- wafer-to-wafer stability
- improved CD bias
- stable etch profile

Static Temperature Control

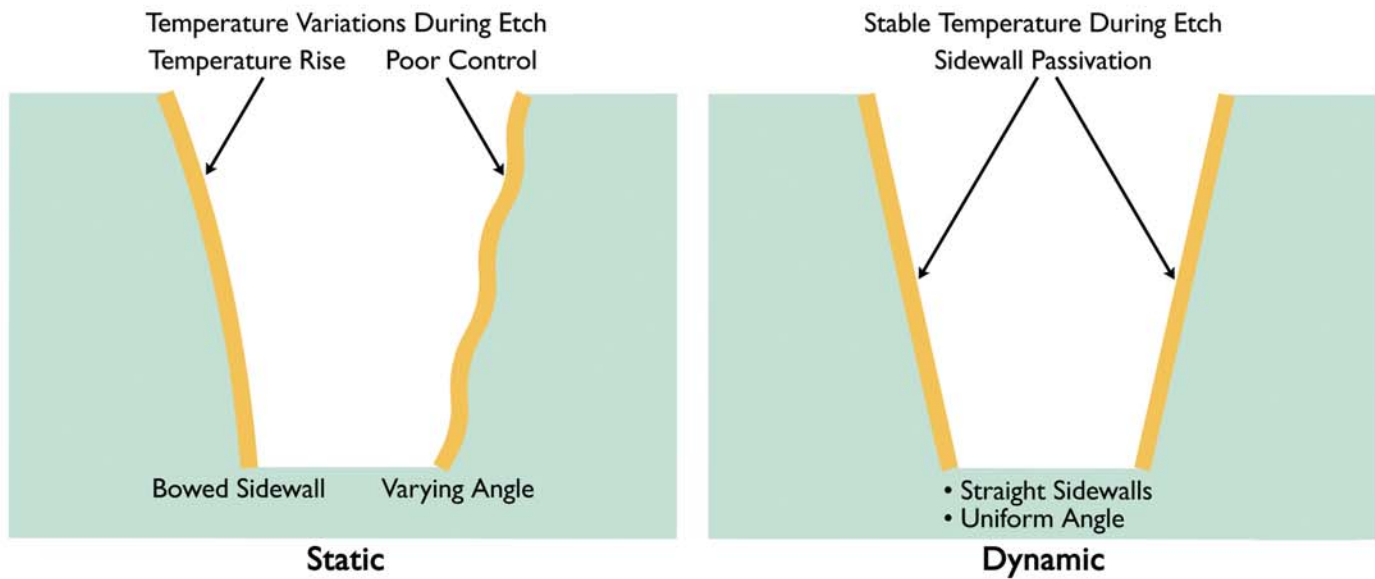


Noah's Dynamic Temperature Control

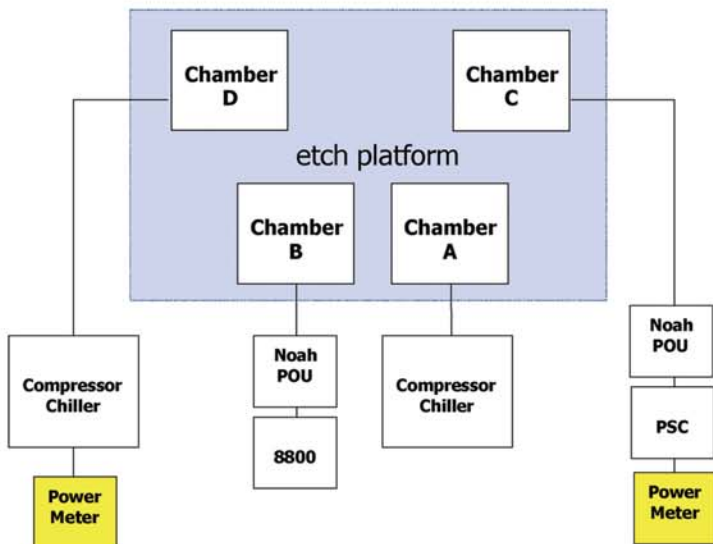


The 300mm chamber temperature profile comparison above illustrates the performance of Noah's dynamic POU system vs. a static unit on an etch process. Perhaps the most compelling aspects of this data set are the temperature uniformity and rapid response times accomplished under these extremely high RF power conditions.

Today's processes demand state-of-the-art temperature control. Noah Precision's dynamic POU systems are field-proven, providing unparalleled performance and efficiency as demonstrated above.



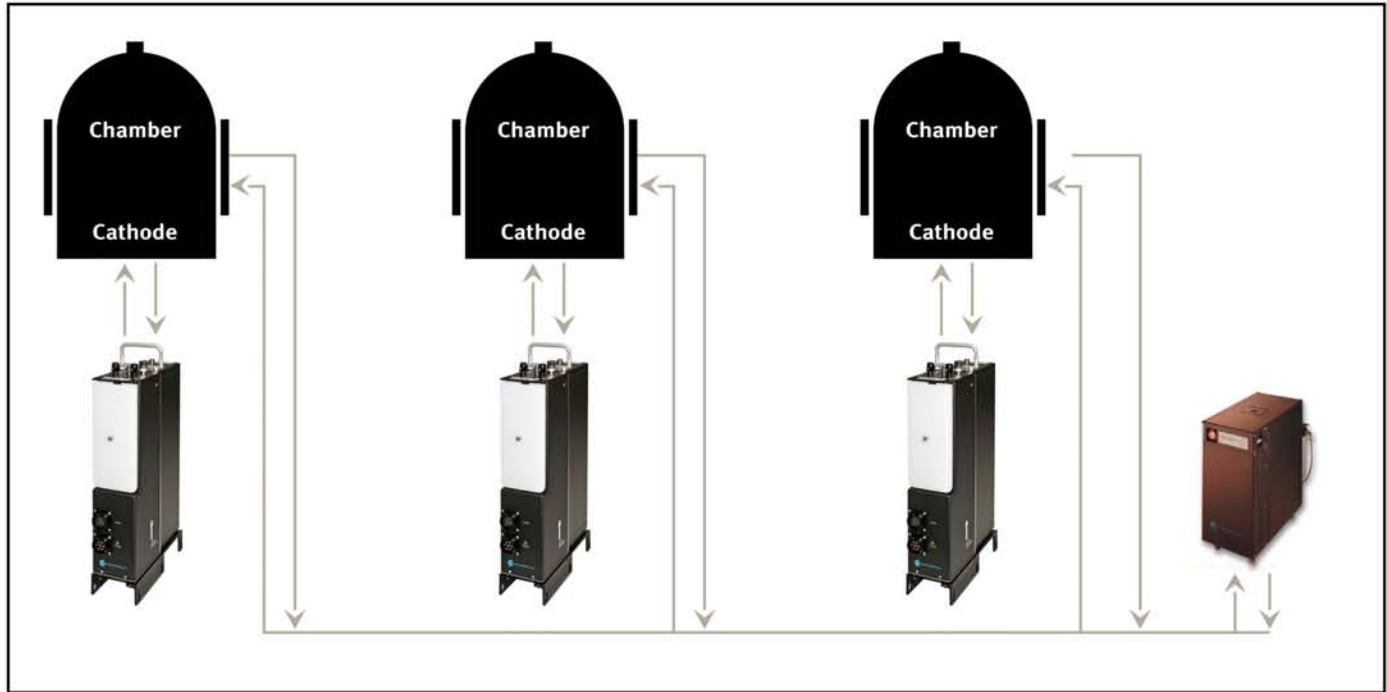
**POU power consumption - "a compressor-free system"**



By design, the Noah TE device only consumes power while under a load. This results in a reduction of power consumed, as evidenced by this field data.

Similar comparative field data averages 50% less power consumed in most etch applications.

	Noah 3300	Compressor
Total Wafers	1791	1450
Total Power (kWh)	532	1531
kWh/wafer	0.30	1.06



This figure illustrates a typical multi-chamber tool configuration. Each chamber has one dynamic POU module providing independent temperature control for the cathode / wafer chuck. Chamber wall temperature control is also an option with the Noah POU system, however, typical installations (shown above) can use one Noah model 2015 Heat Exchanger to control the temperature of up to three chamber walls in parallel. This configuration provides excellent temperature stability in a more cost effective configuration.

**NOTE: All Noah temperature control systems are "compressor-free"**

### POU specifications

Model	3300 POU	3500 POU	4400 PSC*	8800 PSC
temperature range	-20 °C to 90 °C	-20 °C to 90 °C	3300 POU only	3300 & 3500 POU
cooling capacity	1200W @ 20 °C	2500W @ 20 °C	-	-
process cooling fluid flow	4 GPM @ 30 psig	4 GPM @ 30 psig	-	-
electrical requirements	-	-	208 Vac, 50-60 Hz, 15A	208 Vac, 50-60 Hz, 30A
dimensions (cm – H x W x D)	56 x 11.56 x 30	54.4 x 19.4 x 30	13.34 x 48.26 x 64.77	13.34 x 48.26 x 64.77
weight	25 kg (55 lbs)	38 kg (84 lbs)	24.6 kg (54 lbs)	30 kg (66 lbs)

\* power supply controller

### Experience the POU evolution



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