LAUDA

THERMOELECTRIC PROCESS THERMOSTATS

°FAHRENHEIT. °CELSIUS. °LAUDA.

LAUDA Semistat

Thermoelectric process thermostats from −20 to 90 °C for the semiconductor industry

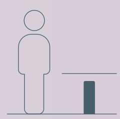
−20 °C 90 °C

Fast and precise temperature control for demanding processes
Based on the tried-and-tested principles of heat transfer used for Peltier elements, the LAUDA Semistat thermoelectric systems offer reproducible temperature control for plasma etching applications. The dynamic temperature control of the electrostatic wafer chuck (ESC) makes it possible to use devices with all types of etching processes. Energy-efficient and space-saving, with stable temperature control, these clever systems make it perfect for consistent wafer-to-wafer fabrication of ever-smaller device geometries.

Three compact LAUDA Semistat models for reliable and accurate temperature control for wafer etching applications

Important functions and advantages
- High reliability and low operating costs
- Smallest footprint in the semiconductor industry
- Extremely low volume of heat transfer fluid
- Improved accessibility and minimal cleanroom use
- Compressor and refrigerant-free system with low energy consumption
- Dynamic, stable temperature control at the point of use
- Temperature drift prevention for stable etching profiles
- Improved wafer-to-wafer stability
- Locally exchangeable modules for easy troubleshooting
- Use of perfluorinated fluids
- No filters or DI components required

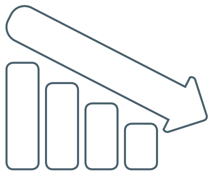
LAUDA Semistat
Compact design and optional underfloor installation at the point of use ensure minimal cleanroom use.



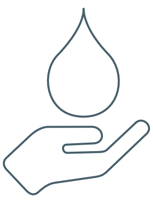
Low Total Cost of Ownership (TCO)

Less power consumption
LAUDA Semistat devices only consume power while under a load. This results in a reduction of power consumed. Similar comparative field data averages 50 % less power consumed in most etch applications.

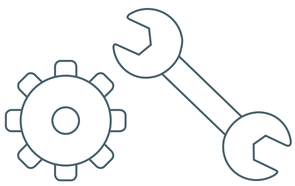
Less use of heat transfer liquid
With an extremely low filling volume of heat transfer liquid significant cost reductions are possible (only 1.3 – 2.8 L use of perfluorinated liquid).



Less process cooling water (PCW)
Adjusted cooling power demands lead to less consumption and costs of cooling water.



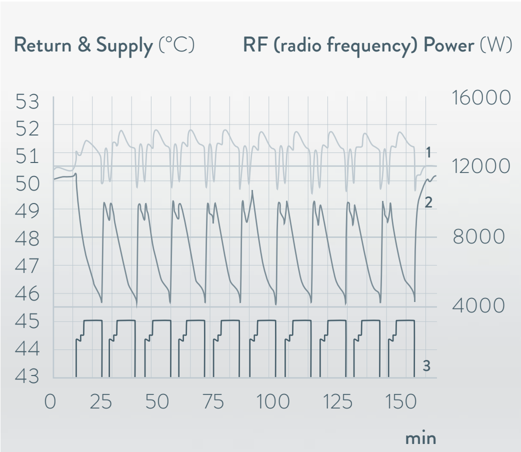
Less maintenance
Entire system comprised of field replaceable modules. Higher MTBF (Mean Time Between Failures): up to 25.000 hours



High performance and low space requirements

Reliability

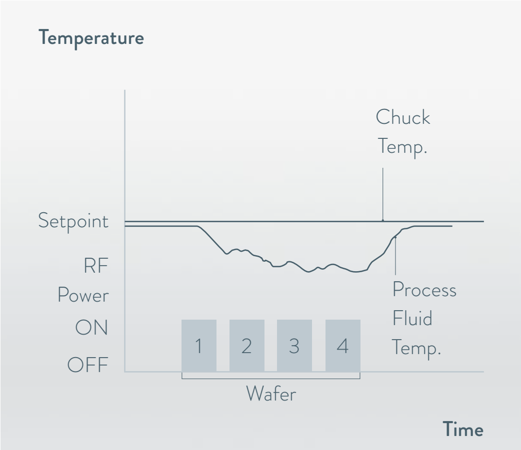
In etching processes, it is important to have high uptime. The thermoelectric design of the Semistat units provide very reliable operation. With only one moving part (pump) the Mean Time Between Failure (MTBF) is very high (up to 25.000 hours) and guarantees high process stability.



High accuracy over the entire temperature range.
1 Return
2 Supply
3 RF Power (W)

Stable temperature control

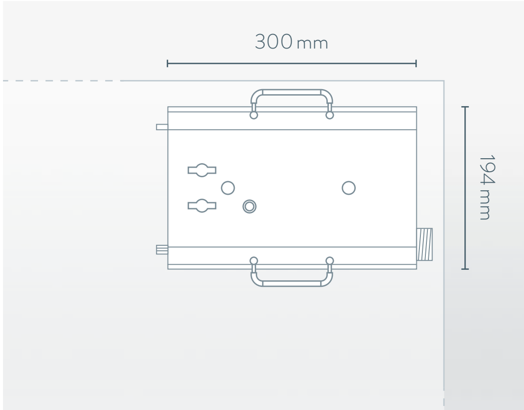
LAUDA Semistat systems employ thermoelectric devices which do both heating and cooling as needed, to the fluid pumped to the target (chamber). The Semistat system senses the chamber's return fluid temperature in real time and keeps the return temperature fluid at the requested setpoint temperature. The TE devices are thusly used much more efficiently, as they only work according to the actual chamber demand.



The most compelling aspects of this data set are the temperature uniformity and rapid response times accomplished under these extremely high RF power conditions.

Low space requirements

The LAUDA Semistat units have the smallest footprint in the semiconductor industry. The compact design and optional underfloor installation ensure minimal cleanroom space.

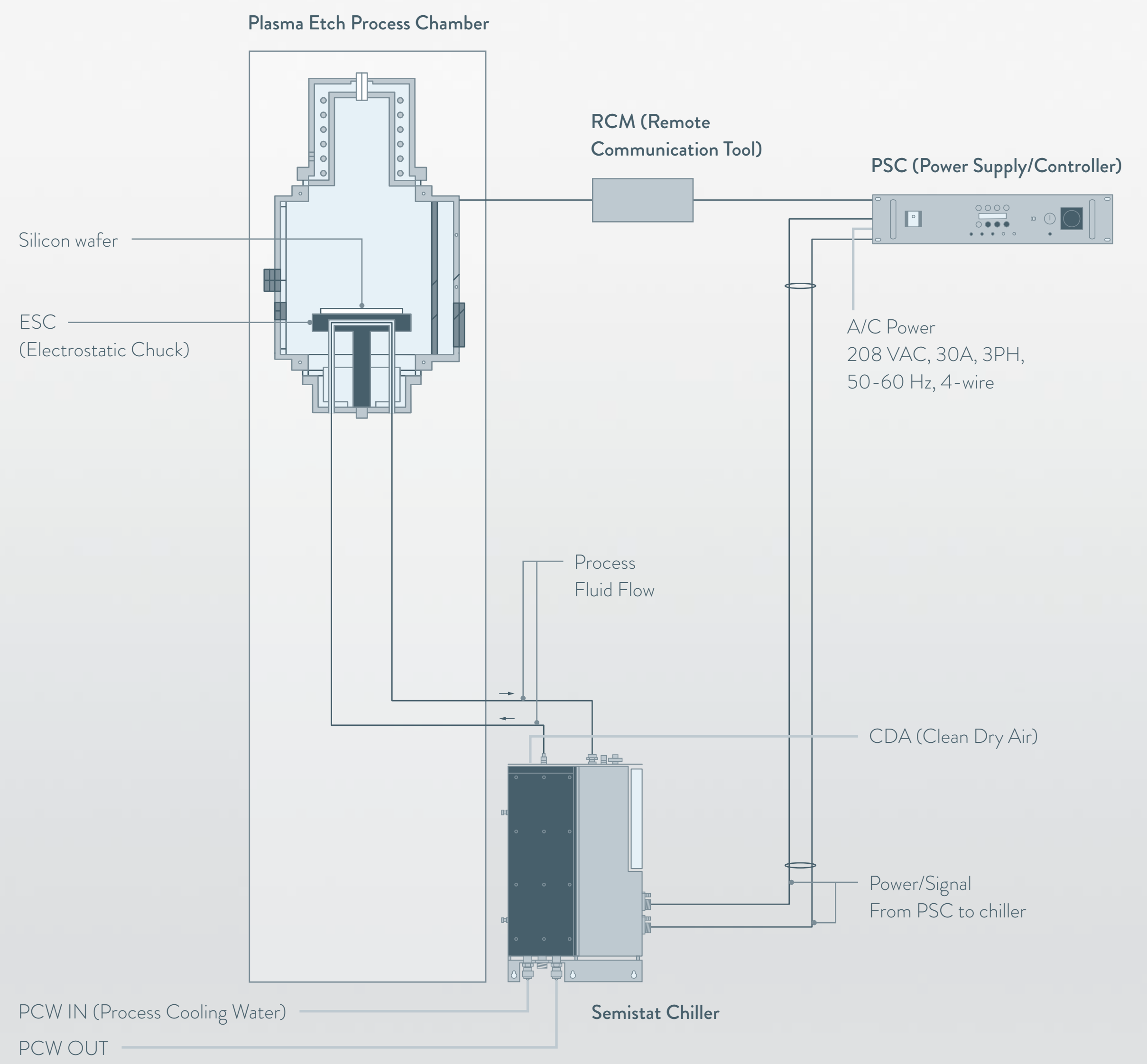


(Picture shows the LAUDA Semistat 1200)

LAUDA Semistat set up and operation

System configuration

Customized solutions can be assembled and installed by means of an individual system configuration with proven modules. Each individual LAUDA module has been proven many times over and undergoes continuous further development, guaranteeing a high quality standard.



The Power Supply Controller (PSC) is designed to provide power to the thermoelectric devices, pump and a closed loop temperature controller.

The PSC is controlled through an integrated temperature controller and can be remotely controlled by a host system through an interface compatible with the applicable communication protocol. The controller user interface includes front panel switches for system start/stop, setpoint control, remote/local mode selection, and alarm acknowledgement.

Depending on the output capacity of the Semistat units there are three different models of PSCs. In the following table the compatibility of the PSC with the according Semistat unit is shown:

- PSC 1200: S 1200
- PSC 2400: S 2400
- PSC 4400: S 4400

All three PSC models are certified to meet critical industry-specific SEMI-S2 and SEMI-F47 standards, as well as meeting broader industry UL 61010-1 safety and CE Mark compliance.

Dynamic, stable temperature control

The Remote Communication Modules (RCM) are interfacing components installed close to the host equipment. The manufacturer and platform-type of the host equipment determines whether an RCM is required for communications. The controller communicates with the RCM through RS-485 digital protocol. The RCM then converts communication data into the protocol of the host equipment.

LAM (analog):
RCM-PM2
RCM2

TEL:
RCMT

LAM (digital):
RCMe

For the host equipment AMAT / PlasmaTherm there is no RCM required

Thermoelectric process thermostats

Technical data according to DIN 12876

Device type	Working temperature range °C	Temperature stability ±K	Heat discharge of cooling unit	Cooling capacity kW				
				20 °C	10 °C	0 °C	−10 °C	−20 °C
LAUDA Semistat								
S 1200	−20 ... 90	0.10	Water	1.20	0.90	0.60	0.35	0.08
S 2400	−20 ... 90	0.10	Water	2.45	1.93	1.40	0.88	0.35
S 4400	−20 ... 90	0.10	Water	4.40	3.50	2.60	1.65	0.70

Application matrix

The application matrix shows the most important OEM tools in which LAUDA Semistat systems have been installed. It shows the chamber and platform types for the specific semiconductor manufacturing process (oxide, metal, poly and others) as well as the process temperatures.

Chambers	Platforms	Process	Loops	Temperature range °C	Typical temperature °C	Semistat
Applied Materials						
ASP (+)	Centura 5200 – Centura 2 & 300 mm	Strip	Wall	20 ... 80	60	1200
DPS, DPS II	Centura 5200 – Centura 2 & 300 mm	Si	Cathode	20 ... 60	55	1200
			Wall	20 ... 90	80	1200
		Metal	Cathode	20 ... 60	45	1200
			Wall	20 ... 90	80	1200
		Nitridation	Cathode	20 ... 60	55	1200
			Wall	20 ... 90	65	1200
e Max, e Max (CT)	Centura 5200 – Centura 2 & 300 mm	Oxide	Cathode	0 ... 80	20	1200/2400
			Liner	20 ... 80	40	1200
HART(+), HART 3	Centura 300 mm	Si – DT	Cathode lid	20 ... 80	50 & 75	1200/2400
			Wall	20 ... 80	60	1200
		Si – DT	Cathode – In/Out	20 ... 105	80 & 90	1200
			Wall	20 ... 90	60	1200
HeWEB / W × P	P5000 – Centura 5200 – Centura 2	Tungsten	Cathode	20 ... 60	20	1200
			Wall	20 ... 80	60	1200

Max. discharge pressure bar	Max. flow rate L/min	Pump connection thread	Min. filling volume L	Filling volume L	Dimensions (W x D x H) mm	Weight kg	Device type
2.8	22	1/2"	1.00	1.30	116 × 232 × 500	15	S 1200
2.8	22	1/2"	1.25	1.60	116 × 300 × 560	25	S 2400
2.8	27	1/2"	2.50	2.80	194 × 300 × 560	38	S 4400

Chambers	Platforms	Process	Loops	Temperature range °C	Typical temperature °C	Semistat
Applied Materials						
M × P(+), e M × P+	P5000 – Centura 5200 – Centura 2	Si	Cathode	10 … 60	40	1200
			Wall	20 … 65	60	1200
		Metal	Cathode	10 … 60	40	1200
			Wall	20 … 90	60	1200
		Oxide	Cathode	0 … 60	20	1200
			Wall	20 … 60	40	1200
PVD	Endura 5500 – Endura 2 (300 mm)	Al – TiN	Platen	−20 … 95	20	1200/2400
Semitool	Raider	B/S Clean	Chem. Tank	10 … 50	20	1200/2400
			IPA-Loop	10…50	18	1200
Super e	Centura 5200 – Centura 2	Oxide	Cathode	−20 … 40	15	1200/2400
			Wall	0 … 60	15	1200

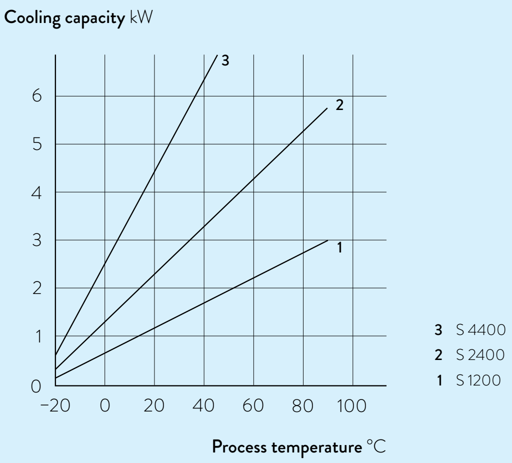
Thermoelectric process thermostats
Application matrix

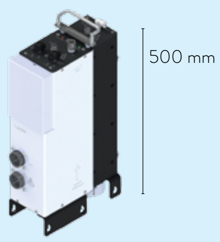
Chambers	Platforms	Process	Loops	Temperature range °C	Typical temperature °C	Semistat
Lam Research						
4400, 4400XLe™	Standalone – Alliance	Si	Upper electrode	10 … 60	30	1200
			Lower electrode	0 … 40	10	1200
4500, 4500i, 4500XLe™	Standalone – Alliance	Oxide	Upper electrode	10 … 60	40	1200
			Lower electrode	−20 … 40	10	1200/2400
4700, 4700XLe™	Standalone – Alliance	Metal	Upper electrode	10 … 80	40	1200
			Lower electrode	0 … 60	20	1200
DSiE	Alliance	Si (MEMs)	Lower electrode	0 … 60	20	1200/2400
Exelan® (HPT/Flex/D Series)	Alliance – 2300	Oxide	Upper electrode	0 … 40	30	2400/4400
			Lower electrode	−10 … 60	20	2400/4400
Kiyo	2300	Si	Lower electrode	−20 … 70	20	2400/4400
Kiyo 45	2300	Si	Lower electrode	−20 … 70	20	2400/4400
Kiyo C Series	2300	Si	Lower electrode	−10 … 70	20	4400
Kiyo E Series	2300	Si	Lower electrode	−10 … 70	20	4400
Syndion	2300	Oxide	Lower electrode	−20 … 40	10	2400/4400
TCP® 9100	Alliance	Oxide	Lower electrode	−20 … 40	10	1200/2400
TCP® 9400 SE / DFM	Standalone – Alliance	Si	Lower electrode	0 … 60	20	1200
TCP® 9600 SE(2) / DFM	Standalone – Alliance	Metal	Lower electrode	20 … 70	60	1200
Versys (Star T)	2300	Si	Lower electrode	10 … 80	20	4400
Versys (Tunable L/M)	2300	Metal	Lower electrode	−10 … 80	20	2400/4400
Mattson						
ICPsm	Aspen II (200 mm)	Strip / Poly	Platen	40 … 80	60	1200
Alpine	Aspen III (300 mm-BE)	Strip / Poly	Platen	20 … 80	25	1200
eHighlands	Aspen III (300 mm-FE)	Strip / Poly	Platen	20 … 80	25	1200
Novellus						
Iridia	PEP (200 mm)	Surface Prep.	Platen	20 … 90	70	1200
Sierra	Sierra (300 mm)	Surface Prep.	Platen	20 … 80	60	1200

Chambers	Platforms	Process	Loops	Temperature range °C	Typical temperature °C	Semistat
TEL						
DRM	Unity® II(e) – Unity® M(e) – TELIUS (SP)	Oxide	Bottom electrode	−20 … 70	40	1200/2400
		DT	Bottom electrode	20 … 105	90	1200
SCCM	Unity® II(e) – Unity® M(e) – TELIUS (SP)	Poly	Top electrode	20 … 105	60	1200
			Bottom electrode	−20 … 80	20	1200/2400
		Oxide	Top electrode	20 … 105	60	1200
			Bottom electrode	−20 … 60	10	1200/2400

Characteristics

COOLING CAPACITY dependent on process temperature and PCW flow rate





S 1200

S 2400

S 4400

LAUDA DR. R. WOBSER GMBH & CO. KG
Laudaplatz 1 • 97922 Lauda-Königshofen • Germany
www.lauda.de

3-518-e-5/11.23