SPECIFICATION
[TH1]TEMPRYTE LT-HRE-1650-9650-WC-DC-SX-DI-AM-S2
For Applied Materials

1. DIMENSIONS: 24" W x 29.5" D x 62" H (*with 2 standard & 2 locking casters*)

2. WEIGHT: 750 lb.

3. ELECTRICAL REQUIREMENTS:

Nominal Voltage:	208-230V ± 10% *(i.e. 187-253 V)*60Hz, 3 Phase, 30 amps, 200-220V ±10% *(i.e. 180-242V)*50Hz, 3 Phase, 30 amps
Phase / Frequency:	3 Phase Delta, 50/60 Hertz
Circuit Breaker Disconnect:	30 amps
Power Cord:	25' 4 conductor, 6 AWG SO cord with strain relief

CHILLER

1. COOLANT SPECIFICATION:

Compressor:	Low Temperature Copeland Scroll, Fully Hermetic utilizing SUVA environmentally safe HP-62 refrigerant
Coolant:	Ethylene glycol / DI water (*50/50*), Warning label near fill ports on top panel

Reservoir Coolant Temperature:
a) Control Range -15°C to + 10°C (*1-5 Volts*)
b) Stability within ± 1°C

Flow Rate: 3 - 4 GPM via Isochem gear pump

Pressure: 60 psi, internally adjustable 0 - 60 psi

2. DISPLAY:

Display Includes:
a) Temperature Set Point (*via digital meter*)
b) Actual Coolant Temperature as it leaves reservoir (*via digital meter*)

NOTE: Values will correspond within $\pm$ 1°C of each other

c) Alarms (*LED's on front panel*)
   i) Coolant low flow alarm - red light (*B/C Chamber & A/D Chamber*)
   ii) Resistivity Alarm - low resistivity - red light set to 3 meg ohm (*non-temperature compensated*) high resistivity - green light; low resistivity - red light
   iii) Low coolant level alarm - red light
   iv) System failure (*loss of cooling water, high refrigerant pressure, loss of refrigerant, high compressor discharge temperature, pump motor overload, extremely low coolant level*) - red light
   v) Unit running - green light
   vi) Power on - green light
   vii) Coolant temperature high - red light
   viii) Incorrect phase - red light

d) Coolant pressure 0 - 100 psi via liquid filled pressure gauge

3. HEAT REMOVAL:

Under all operating conditions (*i.e. specified voltage/frequency and facility variations*) chiller will remove 5000 watts minimum at a circulating coolant temperature of -10°C.

4. FACILITY WATER SPECIFICATION:

Minimum Water Flow:	6 GPM required under load
Temperature Range:	40 - 70°F (5 - 30°C)
Maximum Supply Pressure:	80 psi max (*label next to facilities water inlet*)
Minimum Return Pressure:	10 psi

5. REMOTE INTERFACE

CONNECTOR: D-CONNECTOR, 25 POSITION PLUG, *(male pins crimp style)*

PIN ASSIGNMENT:

PIN 1 - VENDOR CHASSIS GND
PIN 2 - CHILLER ON/OFF N.O.
PIN 3 - N/C
PIN 4 - CHILLER TEMPERATURE SET POINT RTN *(analog)*
PIN 5 - N/C
PIN 6 - CHILLER STATUS ALARM N.O.
PIN 7 - CHILLER RESERVOIR TEMPERATURE SIGNAL *(analog)*
PIN 8 - N/C
PIN 9 - CHILLER INTERLOCK STATUS ALARM COM
PIN 10 - CHILLER FLOW ALARM N.O. B/C CHAMBER
PIN 11 - N/C
PIN 12 - CHILLER FLOW ALARM N.O. A/D CHAMBER
PIN 13 - CHILLER FLOW ALARM COM A/D CHAMBER
PIN 14 - CHILLER ON/OFF COM

PIN 15 - CHILLER TEMPERATURE SET POINT SIGNAL *(analog)*
PIN 16 - N/C
PIN 17- 15VDC FROM AMAT FOR ANALOG ISOLATION AMPLIFIERS
PIN 18 - CHILLER FLOW ALARM COM B/C CHAMBER
PIN 19 - CHILLER RESERVOIR TEMPERATURE FEEDBACK RTN (*analog*)
PIN 20 - +15VDC FROM AMAT FOR ANALOG ISOLATION AMPLIFIERS
PIN 21 - N/C
PIN 22 - CHILLER RESISTIVITY ALARM N.O.
PIN 23 -CHILLER RESISTIVITY ALARM COM.
PIN 24 - N/C
PIN 25 - N/C

6. COOLANT LOW FLOW SWITCH:

a) Location:	Return line of each coolant loop
b) Operating Environment:	-15°C with specified coolant
c) Low Flow Alarm Trip Point:	1 GPM (*B/C Chamber & A/D Chamber*)
d) Remote Interface:	Vendor provides normally open contact on the remote connector (*pins 10 & 18, B/C Chamber*), (*pins 12 & 13, A/D Chamber*)
e) Alarm Logic:	Closed = Non-alarm condition Open = Alarm condition
f) Theory:	A flow switch, located in each coolant return line, shall alarm if the coolant flow rate drops below 1 GPM.

7. RESISTIVITY:

a) DI Cartridge/Canister:	Resistivity of coolant shall be >3M OHM*CM (*non-temperature compensated*)
b) Low Resistivity Alarm Trip Point:	3M OHM*CM (*non-temperature compensated*)
c) Remote Interface:	Vendor shall provide normally open contact on the remote connector (*pins 22 & 23*)
d) Alarm Logic:	Closed = Non-alarm condition Open = Alarm condition

8. CHILLER INTERLOCK STATUS ALARM:

a) Alarm Condition:	Low coolant level system failure (*cooling water low, pump motor overload, high refrigerant discharge temperature, high refrigerant pressure, or loss of refrigerant and fluid leak)*

Note: When Drip pan fluid level reaches 2/3 of its full capacity alarm level will be set

b) Remoter Interface:	Vendor shall provide normally open contact on the remote connector (*pins 6 & 9*)

c) Logic: Closed = Non-alarm condition
Open = Alarm condition

d) Theory: If the coolant level is low, or the condenser lost cooling water or the system has lost refrigerant, or the compressor discharge temperature is too high, or the pump motor overload relay has tripped then an alarm shall occur. The unit will automatically turn off. High refrigerant pressure caused from lack of facilities water and/or pump motor overload requires manual reset.

9. CHILLER ON/OFF:

a) Remote Interface: Controlled by normally open contact through remote connector (*pins 2 & 14*)

b) Logic: closed = on
open = off

c) Theory: The chiller shall be turned "ON" and "OFF" via a single set of contacts.

d) Local/Remote: Chiller may be operated locally via front panel local remote switch.

10. CHILLER TEMPERATURE SET POINT:

a) Range: -15°C to 10°C

b) Remote Interface: 1 to 5 Volt analog signal provided by AMAT through the remote connector (*pins 4 & 15*). Electrical isolation, in the form of an isolation amplifier, shall be provided by the vendor. Power (*±15V & 15VTRN*) for the AMAT side of the isolation amp will be provided through the remote connector (*pins 17 & 20*).

c) Theory: A specific control set point for the coolant temperature, represented by an analog signal, will be sent to the chiller.

11. CHILLER RESERVOIR TEMPERATURE:

a) Range -20°C to 30°C

b) Remote Interface: 1 to 5 Volt analog signal provided by vendor through the remote connector (*pins 19 & 7*). Electrical isolation, in the form of an isolation amplifier, shall by provided by the vendor. Power

(±15V & 15VRTN) for the AMAT side of the isolation amp will be provided through the remote connector (*pins 17 & 20*)

c) Theory: The reservoir temperature, represented by an analog signal, shall be sent by the chiller.

12. CHILLER/HEAT EXCHANGER EMERGENCY OFF:

CONNECTORS: AMP CPC connectors part numbers 206061, and 206430-1

PIN ASSIGNMENTS:

PIN 1 OF 206061- JUMPER TO PIN 1 OF 206430-1
PIN 2 OF 206061- JUMPER TO PIN 3 OF 206061
PIN 4 OF 206061- CONNECT TO PIN 2 OF EMO SWITCH ON FRONT PANEL OF CHILLER
PIN 2 OF 206430-1 - JUMPER TO PIN 3 OF 206430-1
PIN 4 OF 206430-1- CONNECT TO PIN 1 OF EMO SWITCH ON FRONT PANEL

13. CHILLER/HEAT EXCHANGER EMERGENCY OFF

a) Remote Interface: Supplies a normally closed contact to remote connectors

b) Logic: pushed = open
pulled = closed

c) Theory: The chiller shall be turned "ON" and "OFF" via a single set of contacts (it is Applied Materials responsibility to remove power from the Bay Voltex unit in the event that the EMO button is pushed).

14. SAFETY FEATURES

1) Adjustable coolant over-temperature switch and warning light (*measured at pump suction*).
2) Reservoir coolant level low light.
2) Reservoir coolant early warning level low light
3) 30 amp circuit protector.(*with metal protection cover and lockout bracket*).
4) ON / OFF switch (*may be set for remote disabling of local operation*)
5) Thermal protection of compressor motor with automatic reset. (*shuts off compressor and allows for restart upon cool down*)
6) Thermal and short circuit protection of chiller and heat exchanger pumps with manual reset (*reset buttons located inside high voltage electrical box)*
7) High and low refrigerant pressure protection with manual reset. (*loss of cooling water flow: will open chiller status alarm pins 6 & 9*).
8) Separate high and low voltage electrical boxes.
9) Front panel EMO switch with head guard.
10) Low flow switches - located on return line (*trip 1 gpm*) B/C Chamber & A/D Chamber

11) Low resistivity switch set to 3 meg ohm cm. (*non-temperature compensated; sensor located on the To Equipment line*).
12) All switches to be low profile style.
13) Individual circuit breakers for transformer, resistivity board and incorrect phase pcb
14) Sound insulation to keep sound below 75 decibels at 3 feet.
15) No quick connects to be used for high voltage (*ring lug wire terminals and ferule crimp connectors*)
16) A removable drip pan with drain plug with moisture sensor will be provided (volume to be 110 % of chiller side fluid capacity).
17) Incorrect Phase Relay, and warning light
18) System to be SEMI S2 Certified and CE certifiable
19) Labels adjacent to all components inside electrical boxes to match designators on electrical prints.
20) Earthquake mounts to meet seismic requirements.

15. SERVICE FEATURES

1) Easily removable panels for service (*accessible from all except right sides*).
2) Drain on reservoir for easy fluid changes on preventative maintenance (*1/2" MPT on front*)
3) Quick "O" ring type fittings on pump and most serviceable components to facilitate ease of exchange.
4) Easy access to reservoir fill.

16. SPECIAL QUALITY POINTS:

1) No compression fittings or hose clamps used.
2) "O" ring feedthroughs in tank to eliminate chances of a leak.
3) A minimum of thread seals to be used.
4) Molded tank to prevent leaks.
5) High reliability adjustable over temperature switch.
6) Low temperature insulation.
7) All welded frame for shipping strength.
8) Single safety circuit relay board with multipost connector for reliability and ease of service.
9) Platinum RTDs for accurate temperature control.
10) "O" ring couplers used throughout for ease of service.
11) Clamping Devices on DI and Filter Housing for stability.
12) Frame mounted on 4 casters (two locking)

17. FITTINGS:

4 - 1/2" Brass quick connect with shutoff on TO B/C Chamber, To A/D Chamber, From B/C Chamber and From A/D Chamber (B/C Chamber Female - A/D Chamber Male)

18. DI WATER COMPATIBILITY:

System to be compatible with circulation of deionized water (3 meg ohm cm, non-temperature compensated), with a fixed flow of 0.5 gpm @ 60 psi and by-pass line to deionization cartridge.
NOTE: Pressurized DI cartridge on return line utilizing triple bed cartridge and oxygen removal to minimize dissimilar metal corrosion. 20 micron panel mounted particle filter in return line.

HEAT EXCHANGER

1. COOLANT SPECIFICATION:

Coolant:	DI Water / Ethylene glycol (*50/50*)
Reservoir Temperature:	20°C to 40°C
Temperature Feedback:	0°C to 100°C (*0-10 Volts*)
Factory Set:	70 - 75°F w/ 50 - 60°F or cooler tap water
Flow Rate:	8 GPM via 3 - 4 GPM via Isochem gear pump
Pressure:	60 psi internally adjustable 0 - 60 psi

2. DISPLAY: Fault Warning LED's (*LED's on front panel*)

i) Facilities water flow alarm - red LED
ii) Resistivity Light - Resistivity good light, set point to 1 meg ohm (*good - green; bad - amber located on D.I. cartridge*)
iii) Low coolant level LED - red LED
iv) Unit running - green LED
v) Power On - green LED
vi) Coolant temperature high - red LED
vii) Pump Motor Overload - red LED

3. HEAT REMOVAL:

Under all operating conditions (*i.e. specified voltage/frequency and facility variations*) heat exchanger will remove 28,000 watts minimum at a circulating coolant temperature of 20°C.

4. FACILITY WATER SPECIFICATION:

Minimum Water Flow:	8 GPM
Temperature Range:	10°C maximum for full cooling capacity
Maximum Supply Pressure:	80 psi maximum (label next to facilities water inlet)
Minimum Return Pressure:	10 psi

Maximum Supply Pressure: 80 psi maximum (label next to facilities water inlet)
Minimum Return Pressure: 10 psi

5. REMOTE INTERFACE:

CONNECTOR: D-CONNECTOR, 15 POSITION PLUG (*male pins crimp style*)

PIN 1: N/C
PIN 2: RESERVOIR LEVEL LOW CONTACT CLOSURE IN SERIES WITH TEMPERATURE HIGH CONTACT CLOSURE
PIN 3: N/C
PIN 4: N/C
PIN 5: REMOTE PUMP ON SIGNAL IN
PIN 6: LOW FLOW CONTACT CLOSURE
PIN 7: COOLANT TEMPERATURE: 0-10V + 0 to 100°C (*approved range 2-4V, 20 to 40°C*)
PIN 8: N/C
PIN 9: 24 VRTN
PIN 10: + 24V
PIN 11: 15 VRTN
PIN 12: +15V FROM APE
PIN 13: -15V FROM APE
PIN 14: N/C
PIN 15: N/C

5. COOLANT LOW FLOW SWITCH:

a) Location: Drain or Facilities return
b) Operating Environment: 20°C with specified coolant
c) Low Flow Alarm Trip Point: 0.5 GPM
d) Remote Interface: Vendor provides normally open contact on the remote connector (*pins 6 & 9*)
e) Alarm Logic: Closed = Non-alarm condition
Open = Alarm condition
f) Theory: A flow switch, located in the facilities return line, shall alarm if the facilities water flow rate drops below 0.5 GPM.

6. RESISTIVITY:

a) DI Cartridge/ Canister: Resistivity of coolant shall be >1M OHM*CM
b) Low Resistivity Lamp Trip Point: 1.0M OHM*CM
c) Theory: Resistivity indicator shall illuminate red if the resistivity of the coolant drops below 1.0M OHM*CM. If resistivity is above 1.0M OHM, the resistivity indicator shall illuminate green.

7. HEAT EXCHANGER STATUS ALARM SIGNAL:

a) Alarm Condition:	Low coolant level; high reservoir temperature
b) Remote Interface:	Vendor shall provide normally open contact on the remote connector (*pins 2 & 9*)
c) Logic:	Closed = Non-alarm condition Open = Alarm condition
d) Theory:	If the coolant level is low, if the reservoir temperature is above 45°C then an alarm shall occur.

8. HEAT EXCHANGER ON/OFF:

a) Remote Interface:	Controlled by normally open contact through remote connector (*pins 5 & 10*)
b) Logic:	Energized = On Open = Off
c) Theory:	The heat exchanger shall be turned "ON" and "OFF" via a 24 VDC supplied by customer.

9. HEAT EXCHANGER RESERVOIR TEMPERATURE:

a) Range:	20°C to 40°C
b) Remote Interface:	0 to 10 Volt (0 - 100°C) analog signal provided by vendor through the remote connector (*pins 11 & 7*). Electrical isolation, in the form of an isolation amplifier, shall be provided through the remote connector (*pins 12 & 13*).
c) Theory:	The reservoir temperature, represented by an analog signal, shall be sent by the heat exchanger.

10. SAFETY FEATURES:

1) Coolant over-temperature switch and warning light (*interlock shut down measured at reservoir*).
2) Reservoir coolant Early Warning level low light
2) Reservoir coolant level low warning light (*interlock shut down*).
3) Thermal protection of pump motor (*interlock shut down*).
4) Separate high and low voltage electrical boxes.
5) Low flow switch - located on facilities return or drain (*trip 0.5 gpm*)
6) Low resistivity switch set to 1 meg ohm cm (*sensor located on the DI cartridge*).
7) Primary side circuit protection for transformer.

8) All switches to be low profile style.
9) Individual circuit breakers for resistivity power supply and pressure relief solenoid.
12) No quick connection to be used for high voltage (*only ring lug terminals and ferule crimp connectors*).

11. SERVICE FEATURES:

1) Drain on reservoir for easy fluid changes on preventative maintenance.

2) Quick "O" ring type fittings on pump and most serviceable components to facilitate ease of exchange.
3) Easy access to reservoir fill and 3" fill port.

12. SPECIAL QUALITY POINTS:

1) Welded stainless steel reservoir with "Push Lok" fittings to eliminate chances of leaks.
2) High reliability over-temperature switch (*set to 45°C*).
3) All welded frame for shipping strength.
4) Single safety circuit relay board with multipost connector for reliability and ease of service.
5) Platinum RTD's for accurate temperature readout.
6) Minimum of threaded seals to be used.
7) No compression fittings or hose clamps used.
8) "O" ring couplers used throughout for ease of service.
9) Clamping devices on DI and filter housings for stability.
10) Frames mounted on 4 casters (*two locking*).

13. FITTINGS:

4 - 1/2" Brass quick connects: To B/C Loop and To A/D Loop (*male*), From B/C Loop and From A/D Loop (*female*)
2 - 3/4" Brass quick connects on Facilities Water In (*female*), and Facilities Water Out (*male*)
1 - 1/2" MPT Brass Bulkhead on Reservoir Drain

14. DI WATER COMPATIBILITY:

Conversion to compatibility for circulation of deionized water and by-pass line to deionization cartridge.
NOTE: Pressurized DI cartridge on return line utilizing triple bed cartridge and oxygen removal to minimize dissimilar metal corrosion. (*Flow preset to 0.5 gpm @ 60 psi) 20 Micron panel mounted particle filter on return line.*

15. LEVEL LOW INTERLOCK (*heat exchanger interlock status alarm*):

The level low switch will violate when fluid level in reservoir drops enough to effect unit performance. When activated, the heat exchanger interlock status alarm signal will

be in alarm condition. The heat exchanger pump will automatically turn off, and manual reset is required.

16. TEMPERATURE HIGH INTERLOCK:

The temperature high switch will violate when the circulation fluid temperature exceeds 45°C. When activated, the heat exchanger interlock status alarm signal will be in alarm condition. The heat exchanger pump will automatically turn off, and manual reset is required.

17. PUMP MOTOR OVERLOAD INTERLOCK:

The pump motor overload will violate when the amperage of the pump motor exceeds the rated load by 125%, the heat exchanger interlock status alarm signal will be in alarm condition. The heat exchanger pump will automatically turn off, and manual reset is required.