

Munters Drycool Dehumidification System**Dehumidification Equipment Submittal**

**Slidell Memorial Hospital
Slidell, LA**

Project Name: Slidell Memorial

Quotation Number: N&AAL10002

Model Number(s):

HCUc2410AAC-EBCE01M-CNES00G0A0

Rev: 00

Submitted by: Allen Laird

Date: July 30, 2010

Munters Sales Point of Contact

Allen Laird @ 504-833-2700

Munters Service / Start-Up Scheduling

210 249-3836

APPROVAL RETURN SHEET

Munters must have written approval prior to scheduling the unit for production.

Please remove and fax or mail to Munters

Engineer / Contractor

Submittal Review

- Reviewed and Approved.
- Approved as noted, see attached comments.
- Revise and resubmit, see attached comments.
- Rejected, contact me immediately.

By: _____

Date: _____

Unit Description

Slidell Memorial Hospital
Slidell, LA

Project Name: Slidell Memorial

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Munters Project Contact

Allen Laird @ 504-833-2700

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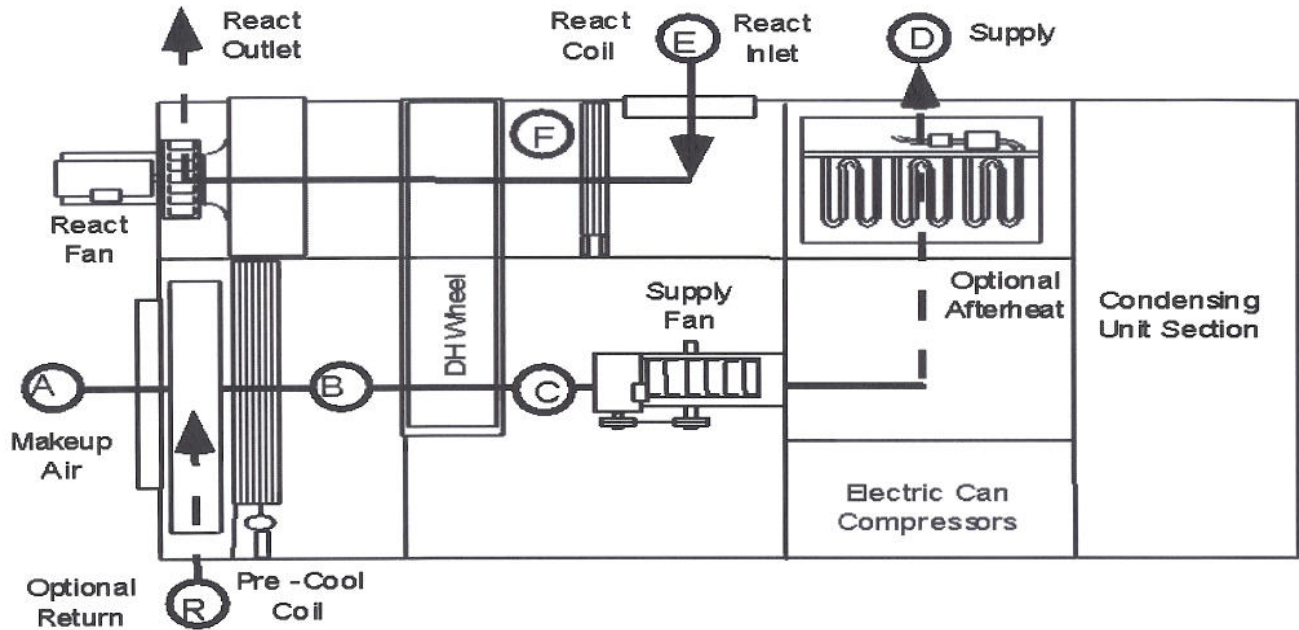
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Unit GA Drawing
Wiring Diagrams
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General Installation Instruction
Equipment Specification
Sequence of Operation
Standard Terms and Conditions of Sale

PERFORMANCE

Model: HCUc2410AAC-EBCE01M-CNES00G0A0
Product Designator: HCU product HCU-2400 1,000 to 2,400 CFM
Unit Tag: DX-1
Project Name: Slidell Memorial
Quote Number: N&AAL10002
Site Altitude: (ft): 0 ft.



Run# 1	DESIGN	R	A	B	C	D	E	F
SUMMER	SCFM	1210	1000	2210	2210	2210	1725	1725
	DB °F	79.2	93	59	71	72	93	118
	WB °F	67.5	80	57.8	58.8	59.3	80	85.6
	GR/LB	83	135	71	55	55	135	135
	LB/HR = 74		Leaving DP (°F) = 50.5			kW = 11.8		EER = 14
WINTER		R	A	B	C	D		
	DB °F	72	25	51	51	65		
NOTES: DH Mode 100% Load 1 Condenser Fan Run								

3.2.0.0T3.05ID0.21dW0.7tb0.44wIP

EQUIPMENT SCHEDULE - HCUC2410AAC-EBCE01M-CNES00G0A0
Tag: DX-1

Base Dimensions (HxWxL) (see drawings)	56-5/8" x 65-1/4" x 111-1/4"
Unit Weight (+/- 10%)	2700 LB
Supply Fan	
Type	Belt Drive Forward Curve
BHP / Motor Size / Fan RPM	1.60 / 2 HP / 1,479
Flow Rate / ESP	2,210 CFM / 1.2 in. WC
Reactivation Fan	
Type / Class	Direct Drive BIA / II
Motor Size	2 HP
Flow Rate	Variable up to 3,000 CFM
Condensing Fan	
Type	Propeller
Motor Size / Qty	2 HP / 1
Compressors	
Nominal Tonnage / Stages of Capacity	10 nominal tons / 3
Refrigerant	R-410a
Refrigerant Charge per Circuit	5 / 6 / 6 lb.
After Heat	
Type	Electric
Capacity / Stages of Capacity	10 kW- / SCR Modulating Electric
Filter	
Type (Supply / Reactivation)	2" Pleated 30% / 2" Pleated 30%
Sizes (Supply / Reactivation)	(4)16in x 20in / (2)20in x 25in
Electrical	
Power	230/3/60
Supply Fan Motor	5.5
Reactivation Fan Motor	5.5
Condensing Fan Motor	6.2
Compressor Each / Crankcase Heater	12.8 / 0.5
Electric Post Heat	25.1
Control Transformer	4.3
FLA	59.9
MCA	63.1
MOP	70
FLA, MCA and MOP calculations assume there is no overlap of compressor and electric heat operation	

SUBMITTAL
Project Name: Slidell Memorial

Quote Number: N&AAL10002
DX-1

Model: HCUc2410AAC-EBCE01M-CNES00G0A0

Item	Feature	Code	Description
0	Product Designator	HCU	HCU product
1	Munters Design Sequence	c	3rd Generation Product
2	Unit Size	24	HCU-2400 1,000 to 2,400 CFM
3	Unit Tonnage or Sequence Number	10	10 nominal tons
4	System Type	A	DX Air-cooled Packaged Condensing Outdoor
5	Refrigerant / CW Circuiting	A	R-410a
6	Voltage	C	230/3/60
7	Air Inlet Options	E	MUA & RA - Fixed Dampers
8	Return Air Location	B	Bottom Return
9	Supply Air Outlet Location	C	Side C Discharge
10	Post Heat Type	E	Electric
11	Post Heat MBH / KW	01	10 kW
12	Post Heat Stages / HW Coil Circuits	M	SCR Modulating Electric
13	Supply Fan Motor / VFD	C	2 HP - High Efficiency TEFC - 2nd Upgrade
14	Coils and Coating	N	Non-Coated Coils
15	BMS Communication / Monitoring	E	Carel-BACnet Ethernet / IP
16	Filters (Supply / Reactivation)	S	2" Pleated 30% / 2" Pleated 30%
17	Accessories	0	Non-Fused Disconnect
18	Customer Options	0	None
19	Unit Control Method	G	Standard I/O Control - Constant
20	VAV Options	0	None
21	Wheel Bypass Damper	A	No Wheel Bypass Damper
22	Customer SPA	0	None
Loose Item: Flat Roof Curb			
Loose Item: Supply and Return Smoke Detector			
Loose Item: Combination T/'H' Thermostat			

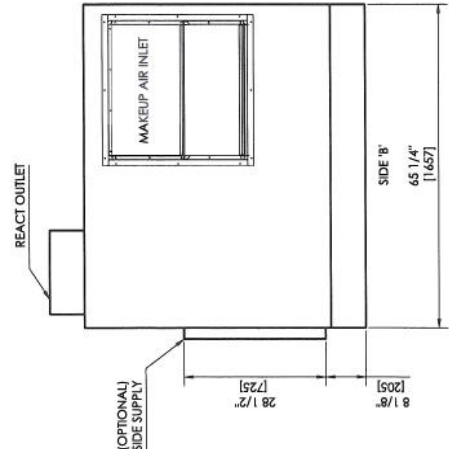
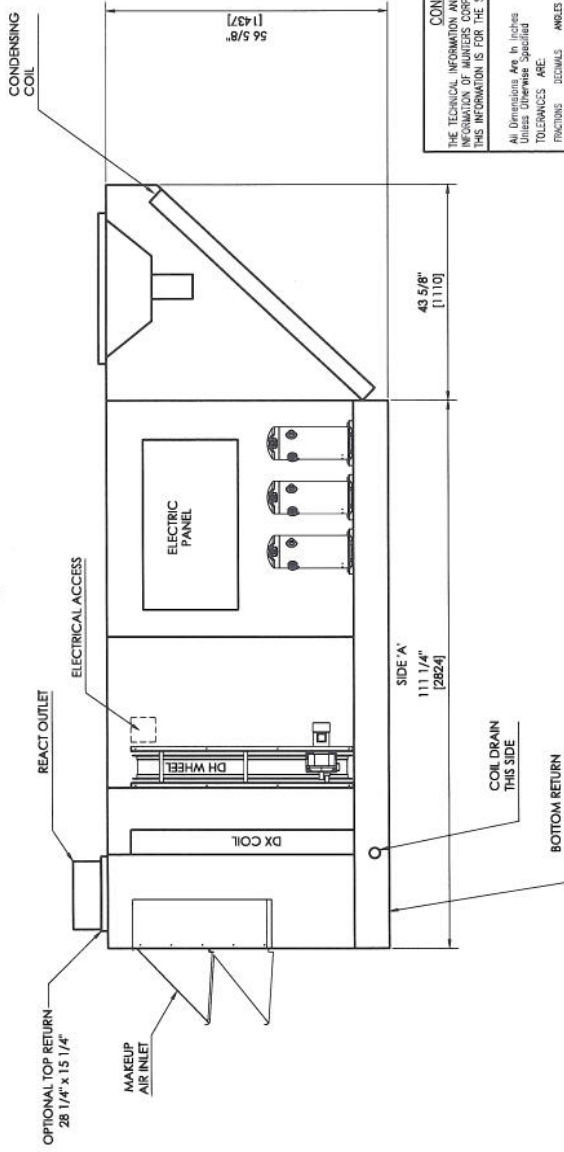
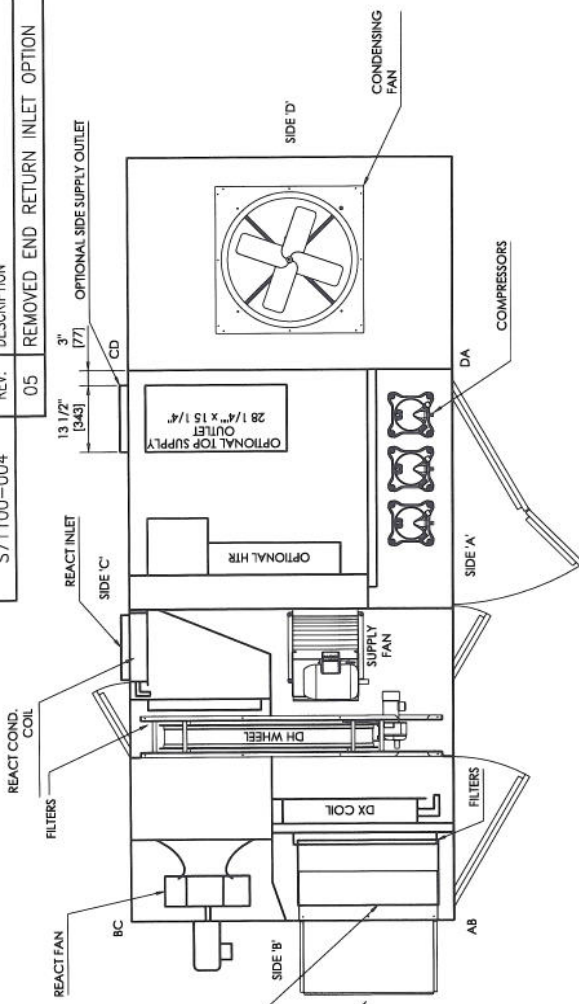
GENERAL ARRANGEMENT LIST

Tag	Model Number	Drawing Name	Roof Curb Information
DX-1	HCUc2410AAC-EBCE01M-CNES00G0A0 HCU product HCU-2400 1,000 to 2,400 CFM	S71100-004 REV 0	14 in. Flat Roof Curb

S71100-004		REV. 05	DESCRIPTION	REV. 05	DESCRIPTION	BY DATE	CHKD DATE	E.O. NO.
S71100-004		05	REMOVED END RETURN INLET OPTION	05	REMOVED END RETURN INLET OPTION	07/15/10		

HEATERS	CORNER WEIGHTS (LB)				UNIT WEIGHT (LB)
	AB	BC	CD	DA	
NONE	642	680	529	599	2450
WITH HEAT	642	680	716	662	2700

HEATERS	CORNER WEIGHTS (kg)				UNIT WEIGHT (kg)
	AB	BC	CD	DA	
NONE	291	308	240	272	1111
WITH HEAT	291	308	325	300	1224



SIDE CLEARANCES:
 SIDE 'A' = 48" [1219]
 SIDE 'B' = 48" [1219]
 SIDE 'C' = 48" [1219]
 SIDE 'D' = 48" [1219]

CONFIDENTIALITY STATEMENT
 THE TECHNICAL INFORMATION AND DESIGN DATA DISCLOSED HEREIN CONSTITUTE PROPRIETARY INFORMATION OF MUNTERS CORPORATION AND ARE TO BE MAINTAINED IN STRICT CONFIDENCE. THIS INFORMATION IS FOR THE SOLE USE OF OUR CUSTOMERS AND END USERS OF OUR EQUIPMENT.

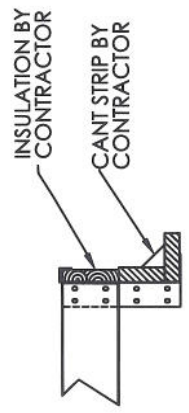
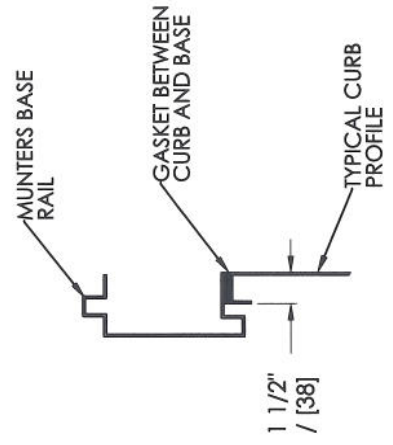
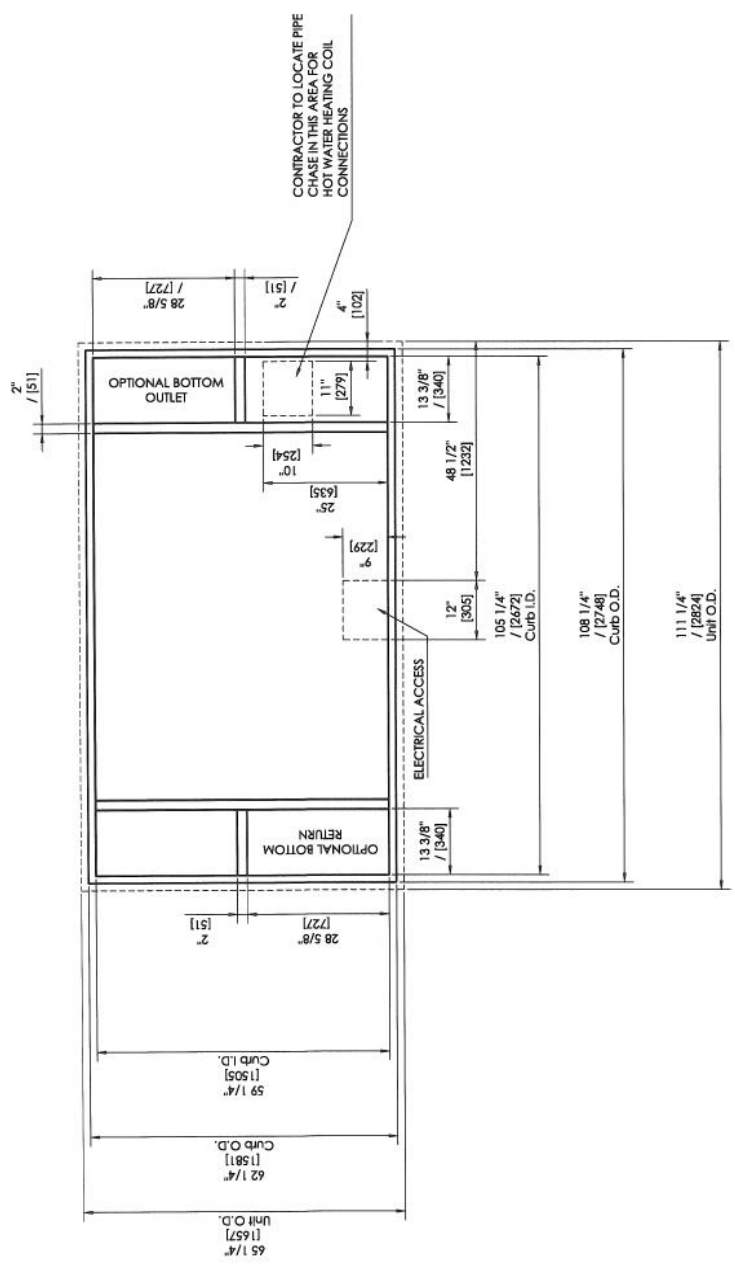
Munters
 DRAWING TITLE: **HCUC 2400 OUTDOOR**
 SOFTWARE: AUTOCAD

All Dimensions Are in Inches Unless Otherwise Specified
 FRACTIONS: DECIMALS
 TOLERANCES: ARE ± 1/32 ± .005 ± 1/2 Deg

Checked By: Date: 10/02/08
 ES
 Drawn By: Date: 10/02/08
 MGY
 Appr. By: Date: 10/02/08
 LF

SHEET: 1 OF 3
 S71100-004

BY	DATE	E.C.O. NO.
	DATE	
S71100-004		DESCRIPTION
REV.		



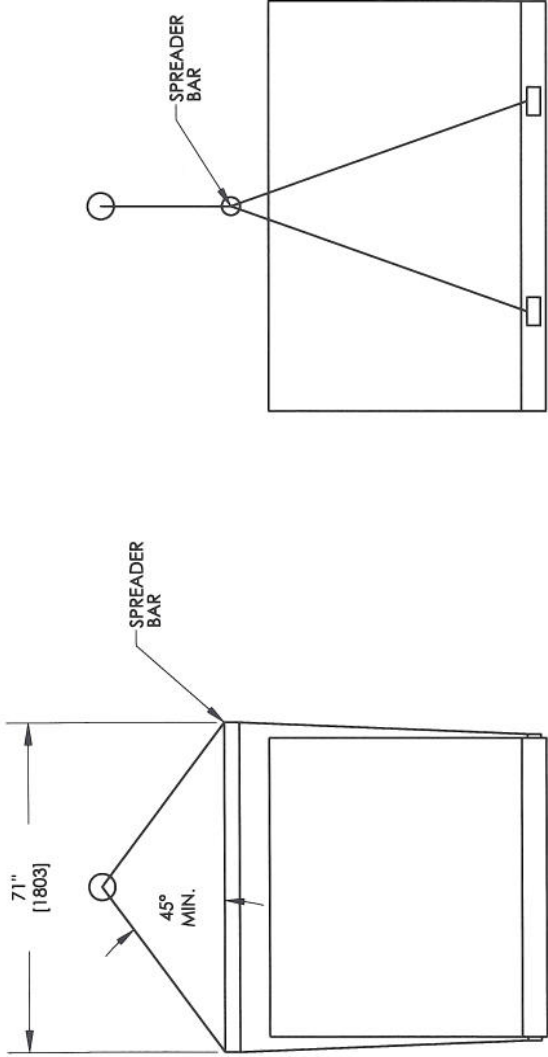
ROOF CURB TO BE BROKEN DOWN FOR SHIPPING UNLESS AUTHORIZED BY CUSTOMER TO BE SHIPPED ASSEMBLED

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Munters	
DRAWING TITLE: ROOF CURB	
SOFTWARE AUTOCAD	
Scale: 10/02/08	DATE: 10/02/08
ES	Ch. By: 10/02/08
MGY	App. By: 10/02/08
LF	DATE: 10/02/08
SHEET: 2 OF 3	PART NUMBER: S71100-004
SIZE: B	

BY	DATE	CHKD	DATE	E.C.O. NO.

REV.	DESCRIPTION
S71100-004	

CAUTION ATTENTION RIGGER



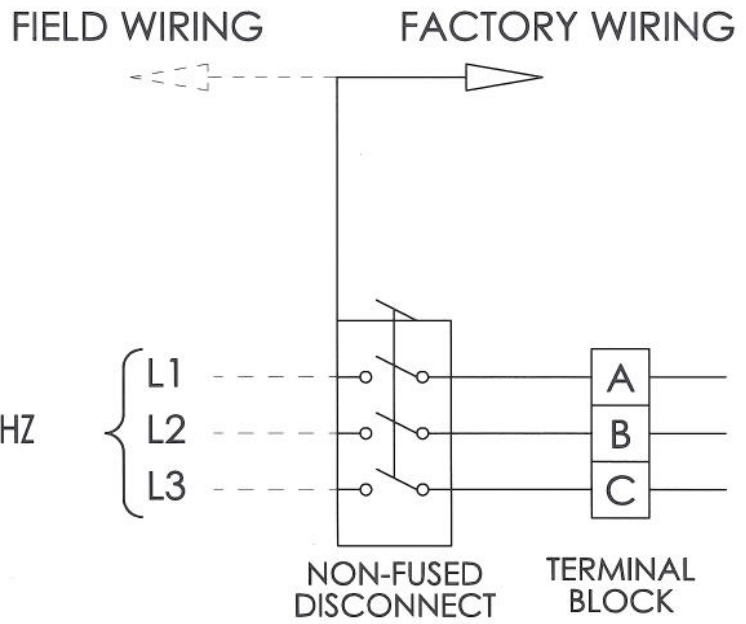
NOTES:
 LIFT ONLY USING SUPPLIED LIFTING LUGS.
 CRANE AND RIGGING MUST BE CAPABLE
 OF HANDLING 2,700 lb [1224 kg] ± 10%.
 SPREADER BAR MUST BE USED TO PREVENT
 RIGGING CABLES FROM SQUEEZING IN TOP
 OF UNIT. SPREADER BAR MUST BE A MINIMUM
 OF 71" [1803] BETWEEN LOWER CABLE ATTACHMENT
 POINTS. UNIT MUST BE RIGGED USING ALL 4
 LIFTING LUGS (2 PER SIDE) OR SEVERE DAMAGE
 MAY RESULT.

CONFIDENTIALITY STATEMENT THE TECHNICAL INFORMATION AND DESIGN DATA DISCLOSED HEREIN CONSTITUTE PROPRIETARY INFORMATION OF MUNTERS CORPORATION AND ARE TO BE MAINTAINED IN STRICT CONFIDENCE. THIS INFORMATION IS FOR THE SOLE USE OF OUR CUSTOMERS AND END USERS OF OUR EQUIPMENT.	
DRAWING TITLE: RIGGING INSTRUCTIONS	
SOFTWARE: AUTOCAD	
All Dimensions Are In Inches Unless Otherwise Specified	SPEC:
TOLERANCES ARE: FRACTIONS DECIMALS ANGLES $\pm 1/32$ $\pm .005$ $\pm 1/2$ Deg	DESIGNED BY: 10/02/08 CHECKED BY: MGY 10/02/08 APPR BY: L.F. 10/02/08
SHEET: 3 OF 3	PART NUMBER: S71100-004
SIZE: B	

UNIT POWER DIAGRAM

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208 - 575 V/3 PH /60 HZ



NOTE 1: USE ONLY COPPER CONDUCTORS

NOTE 2: SEE SEPARATE WIRING DIAGRAM FOR CONTROL WIRING.

NOTE 3: SEE SEPARATE WIRING DIAGRAM FOR OPTIONAL CONVENIENCE RECEPTACLE.

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WIRING: LINE WIRING DIAGRAM - HCUC / DC-ERV - 3 PHASE 60 HZ POWER

DRAWN LPF 05.29.08 DRAWN LPF DRAWN LPF 05.29.08

PART NUMBER 9000-04 REV. 03 SHEET 1 OF 1

SYMBOLS:

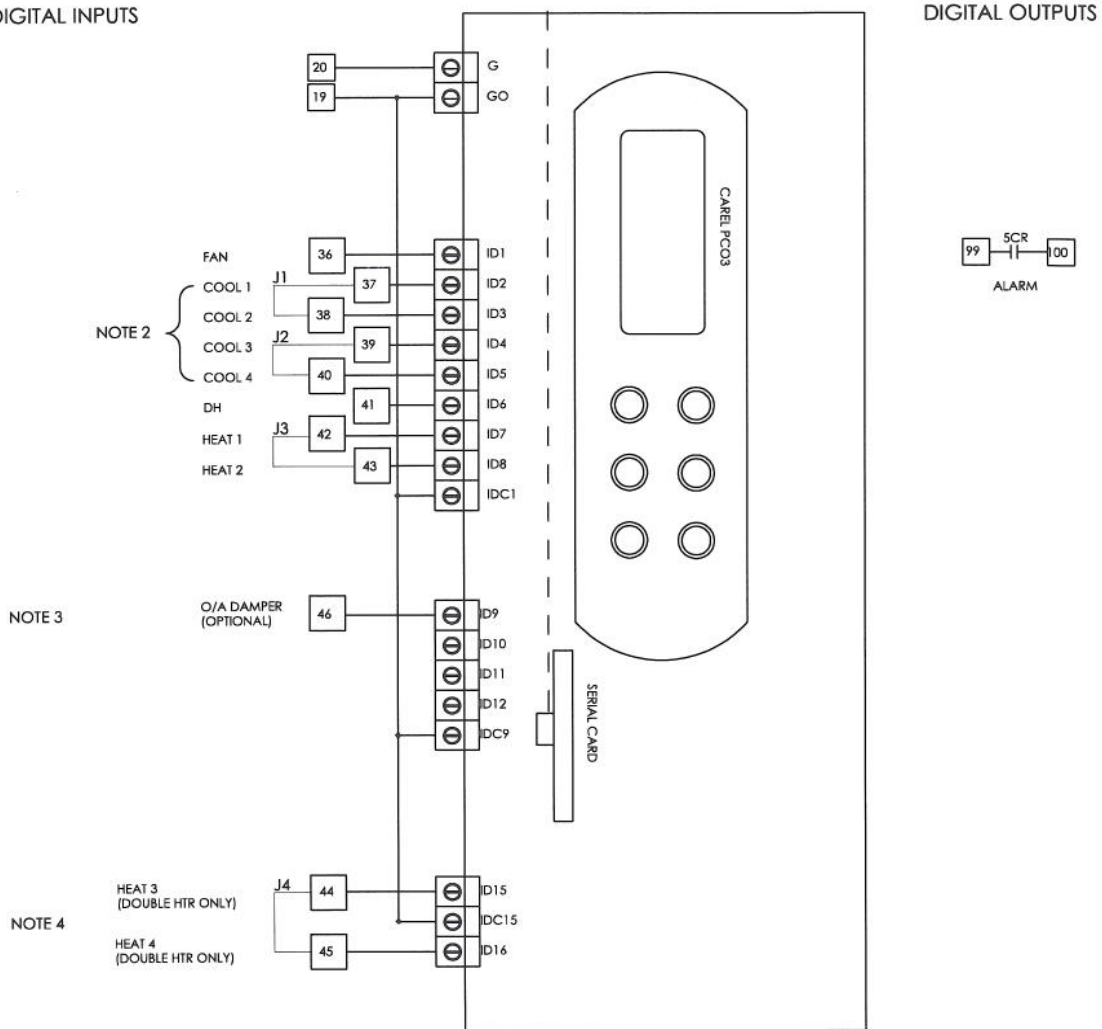
- WIRE TERMINAL
- WIRE (NO TERMINAL)
- FIELD WIRING
- OPTIONAL COMPONENTS

COMMUNICATION CABLE TO BMS (NOTE 1)

DIGITAL INPUTS

DIGITAL OUTPUTS

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NOTE 2

NOTE 3

NOTE 4

NOTE 1: FOR OPTIONAL CONNECTION TO A BUILDING MANAGEMENT SYSTEM (BMS) VIA A COMMUNICATIONS CABLE. THE BMS MAY CONTROL THE UNIT, OR THE BMS MAY MONITOR THE UNIT ONLY, WITH AN EXTERNAL CONTROLLER, SUCH AS A STAT OR I/O BOARD, CONTROLLING THE UNIT.

NOTE 2: INSTALL JUMPERS J1 AND J2 IF EXTERNAL CONTROLLER HAS ONLY TWO COOLING OUTPUTS.

NOTE 3: WIRE TO THIS CONTACT IF UNIT HAS OCCUPIED/UNOCCUPIED CAPABILITY. 100% MAKEUP AIR OR 100% RETURN AIR APPLICATIONS DO NOT NEED TO WIRE TO THIS CONTACT.

NOTE 4: FOR UNITS WITH 4 STAGES OF HEAT ONLY. INSTALL JUMPERS J3 AND J4 IF EXTERNAL CONTROLLER HAS ONLY TWO HEATING OUTPUTS.

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WIRING: HCUC STANDARD I/O CONTROL

DRAWN	LFF 10.17.07	REVISED	PT	APPROVED	PT
PART NUMBER	9000-02	REV.	00	SHEET	1 OF 1

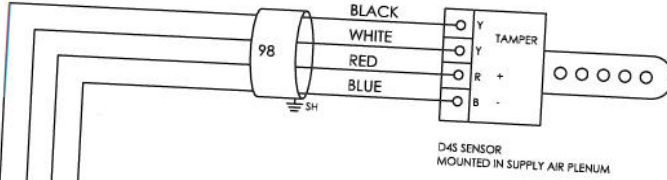
SYMBOLS:

- WIRE TERMINAL
- WIRE (NO TERMINAL)
- FIELD WIRING
- OPTIONAL COMPONENTS

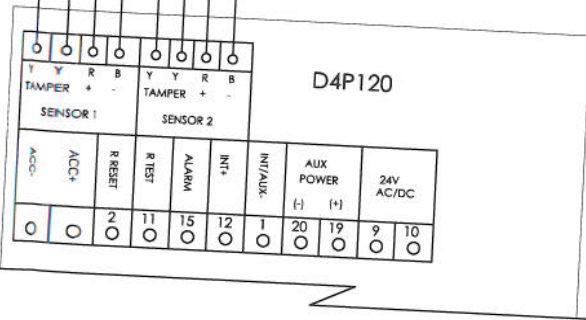
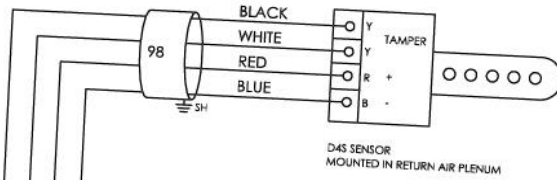
FIELD INSTALLED SMOKE DETECTOR WIRING DIAGRAM

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SUPPLY AIR SMOKE DETECTOR
(OPTIONAL)



RETURN AIR SMOKE DETECTOR
(OPTIONAL)



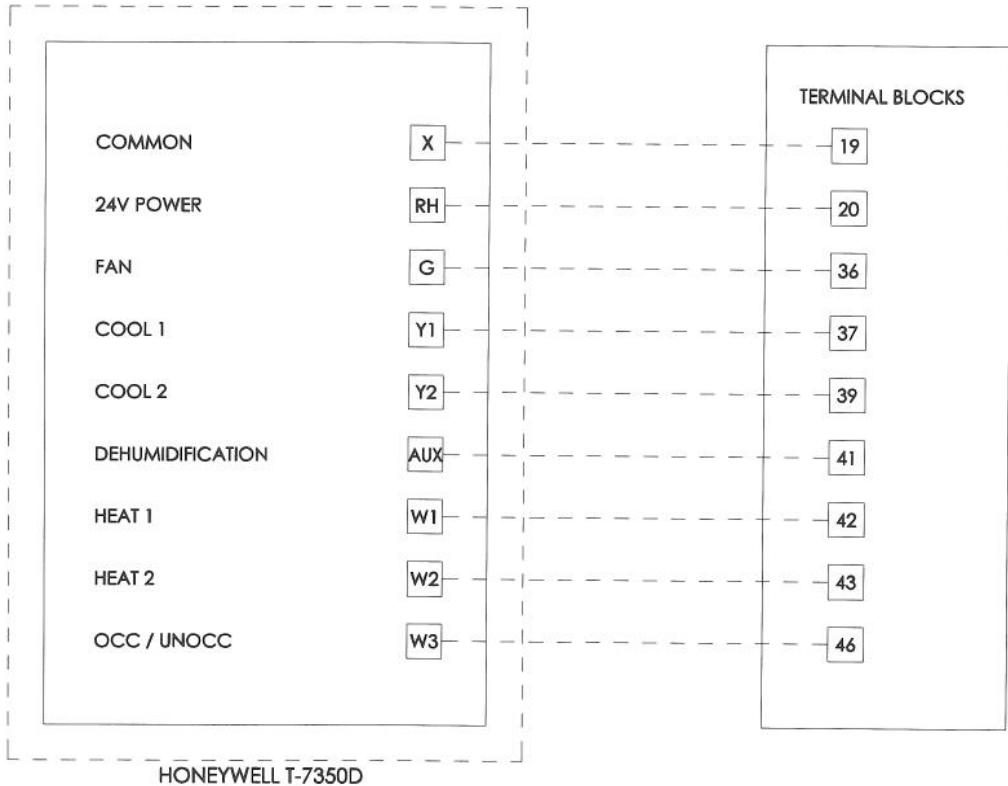
Munters Munters Corporation Dehumidification Division			
WIRING: FACTORY SUPPLIED FIELD INSTALLED SMOKE DETECTORS			
DRAWN	PJT 04.19.10	CHECKED	PT APPROVED PT
PART NUMBER	9000-12	REV.	00 SHEET 1 OF 1

- SYMBOLS:**
- WIRE TERMINAL
 - WIRE (NO TERMINAL)
 - FIELD WIRING
 - OPTIONAL COMPONENTS

WALL MOUNTED DEHUMIDISTAT/THERMOSTAT

FIELD INSTALLED IN SPACE
ADJUST SETPOINT AS REQUIRED

MUNTERS UNIT
MAIN CONTROL CAN



Munters Munters Corporation Dehumidification Division

WIRING: HCUCc COMBINATION DEHUMIDISTAT / THERMOSTAT

DRAWN	LPF 10.23.07	CHECKED	PT	APPROVED	PT
PART NUMBER	9000-11	REV.	OO	SHEET	1 OF 1

SYMBOLS:

- WIRE TERMINAL
- ◇ WIRE (NO TERMINAL)
- - - FIELD WIRING
- - - OPTIONAL COMPONENTS

BacNet Points List, Standard I/O, HCUc with Carel PCO3 Controller

(This list is not for: units controlled by "Autonomous Control" or Water Sourced Heatpump)

BACNet Address	Carel Address	R/W	Name NV	Type	Direction	Description	Units
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Temperature Values - To and from the unit

AV1	1	R	nvo_Amb_Temp	ANL	output	Amb Temperature from AHU	Temp F
AV2	2	R	nvo_Amb_DP	ANL	output	Amb Dewpoint from AHU	DP F
AV3	3	R	nvo_Leaving_Temp	ANL	output	Leaving Temperature from AHU	Temp F
AV4	4	R	nvo_Leaving_DP	ANL	output	Leaving Dewpoint from AHU	DP F
AV5	5	W	nvi_Amb_Temp	ANL	input	Amb temperature from BMS	Temp F
AV6	6	W	nvi_Amb_DP	ANL	input	Amb DP (or RH) from BMS	DP F (or RH)

Setpoints - Adjustable through the BMS

AV13	13	RW	nvi_Amb_DP_On	ANL	input	Amb DH Override Setpoint	DP F
AV14	14	RW	nvi_Am_Cool_On	ANL	input	Amb Cool Override Setpoint	Temp F
AV21	21	RW	nvi_AmT_Ht_St1	ANL	input	Ambient Temp Std Heat Stage 1 Setpoint	Temp F
AV22	22	RW	nvi_AmT_Ht_St2	ANL	input	Ambient Temp Std Heat Stage 2 Setpoint	Temp F
AV23	23	RW	nvi_AmT_Ht_St3	ANL	input	Ambient Temp Std Heat Stage 3 Setpoint	Temp F
AV24	24	RW	nvi_AmT_Ht_St4	ANL	input	Ambient Temp Std Heat Stage 4 Setpoint	Temp F
AV1001	I1	RW	nvi_Stg_On_Delay	INT	input	DH/Cool stage on delay	Minutes
AV1002	I2	RW	nvi_Stg_Off_Delay	INT	input	DH/Cool stage off delay	Minutes

Faults - Feedback from the Unit

BV2	D2	R	nvo_Suply_Fn_Flt	DGT	output	Critical Fault on: Supply Fan	1=Fault
BV3	D3	R	nvo_Comp_Flt	DGT	output	Fault on: Compressor Fail	1=Fault
BV4	D4	R	nvo_Sensor_Fail	DGT	output	Fault on: Non-critical sensor fail	1=Fault
BV5	D5	R	nvo_Heater_Fault	DGT	output	Critical Fault on: Heater	1=Fault
BV6	D6	R	nvo_React_Fn_Flt	DGT	output	Fault on: Reactivation Fan	1=Fault
BV7	D7	R	nvo_Wheel_Flt	DGT	output	Fault on: Desiccant Wheel	1=Fault

Status - Feedback from the Unit

BV9	D9	R	nvo_AFS_Conf	DGT	output	Air flow switch confirmation	1=Active
BV10	D10	R	nvo_CompA_On	DGT	output	Compressor A on	1=Active
BV11	D11	R	nvo_CompB_On	DGT	output	Compressor B on	1=Active
BV12	D12	R	nvo_CompC_On	DGT	output	Compressor C on	1=Active
BV13	D13	R	nvo_CompD_On	DGT	output	Compressor D on	1=Active
BV15	D15	R	nvo_Aux_Ht1_On	DGT	output	Aux Heat Stage 1 on	1=Active
BV16	D16	R	nvo_Aux_Ht2_On	DGT	output	Aux Heat Stage 2 on	1=Active
BV17	D17	R	nvo_Aux_Ht3_On	DGT	output	Aux Heat Stage 3 on	1=Active
BV18	D18	R	nvo_Aux_Ht4_On	DGT	output	Aux Heat Stage 4 on	1=Active
BV19	D19	R	nvo_DH_On	DGT	output	Desiccant Wheel on	1=Active
BV20	D20	R	nvo_React_Fan_On	DGT	output	Reactivation Fan on	1=Active
BV21	D21	R	nvo_OA_Dpr_On	DGT	output	OA Air Damper Open (Optional)	1=Active
AV1004	I4	R	nvo_Supply_Fan_p	INT	output	% Output of Supply Fan (Optional)	Supply Fan %
AV30	A30	R	CompA_Disc	ANL	output	Compressor A Suction Pressure	nnn psig
AV31	A31	R	CompB_Disc	ANL	output	Compressor B Suction Pressure	nnn psig
AV32	A32	R	CompC_Disc	ANL	output	Compressor C Suction Pressure	nnn psig
AV33	A33	R	CompD_Disc	ANL	output	Compressor D Suction Pressure	nnn psig
AV34	A34	R	CompA_Suct	ANL	output	Compressor A Discharge Pressure	nnn psig
AV35	A35	R	CompB_Suct	ANL	output	Compressor B Discharge Pressure	nnn psig
AV36	A36	R	CompC_Suct	ANL	output	Compressor C Discharge Pressure	nnn psig
AV37	A37	R	CompD_Suct	ANL	output	Compressor D Discharge Pressure	nnn psig

Inputs - Calls for Unit Functions

BV1	D1	W	BMS_fan_in	DGT	Input	BMS - Energize Supply Fan (Turn Unit On)	1=Active
BV30	D30	W	BMS_cool1_in	DGT	Input	BMS - Energize Cooling Stage 1	1=Active
BV31	D31	W	BMS_cool2_in	DGT	Input	BMS - Energize Cooling Stage 2	1=Active
BV32	D32	W	BMS_cool3_in	DGT	Input	BMS - Energize Cooling Stage 3	1=Active
BV33	D33	W	BMS_cool4_in	DGT	Input	BMS - Energize Cooling Stage 4	1=Active
BV34	D34	W	BMS_dh1_in	DGT	Input	BMS - Energize Dehumidification Stage 1	1=Active
BV35	D35	W	BMS_heat1_in	DGT	Input	BMS - Energize Afterheat Stage 1	1=Active
BV36	D36	W	BMS_heat2_in	DGT	Input	BMS - Energize Afterheat Stage 2	1=Active
BV37	D37	W	BMS_oa_in	DGT	Input	BMS - Energize Outside Air Damper	1=Active
BV38	D38	W	BMS_heat3_in	DGT	Input	BMS - Energize Afterheat Stage 3	1=Active
BV39	D39	W	BMS_heat4_in	DGT	Input	BMS - Energize Afterheat Stage 4	1=Active
AV1005	I5	RW	nvi_Suply_Fn_Spd	INT	input	Supply Fan Speed (Optional)	Supply Fan %
BV8	D8	W	nvi_Flt_Reset	DGT	input	Fault Reset	1=Reset



General Installation Instructions

Location of the unit

The unit must be set on a flat, level surface and supported around the entire perimeter of the base on either a roof curb or a slab. Proper service clearances must be provided on all four sides of the unit as indicated on the unit General Arrangement (GA) drawing.

Noise Considerations

Noise control issues should be taken into consideration when installing a rooftop or indoor air-handling unit. Modern roof and construction is normally lightweight. Where the air handler is located over noise sensitive areas, noise may be a concern. Generally, the distance between the roof-mounted equipment and the closest occupied spaces below the roof is insufficient to apply standard sound control treatments. Units should be placed above or next to spaces that are not acoustically sensitive and as far as possible from the nearest occupied space.

On curb mounted units, it is recommended that holes be cut through the roof just large enough to accommodate the ducts. The gap around the ducts should be properly sealed with an acoustical sealant after installation of the ducts. Proper duct design will reduce breakout and transition noise. Supply and return ducts should be lined with 1" minimum acoustical duct liner.

Where roof construction is particularly susceptible to vibration transmission, an isolation curb should be used. The curb deflection should be sized to be at least 15 times the deflection of the roof due to the unit weight. (Ex: if the roof deflects 1/8" due to the unit weight, the roof curb should deflect $1/8" \times 15 = 1\ 7/8"$ due to the weight of the unit).

See ASHRAE 2007 HVAC Applications Handbook "Rooftop Mounted Air Handlers" (47.6) for further information.

Indoor Installation

Noise: Units should be placed above or next to spaces that are not acoustically sensitive and as far as possible from the nearest occupied space. Noise sensitive indoor installations should incorporate unit vibration isolation to prevent sound transmission to internal building structure.

Roof Curb (Optional)

The roof curb must be assembled according to the Roof Curb Assembly drawing. The curb must be installed so that it is supported around the entire perimeter.

Drop in duct adapters should be fabricated and installed if the unit is ducted through the curb.

3/8" thick by 1-1/2" wide closed cell gasketing must be installed around the perimeter of the curb and duct openings prior to installation of the unit.

Counter flashing is recommended around the perimeter of the curb to prevent wind blown water from being forced up the curb and seeping into the building between the unit and the curb.

Lifting Unit

Unit must be lifted by crane using all lifting lugs located on the sides of the unit. The crane must be selected to handle the weight shown on the General Arrangement drawing. Spreader bars that are 2" to 4" wider than the unit width must be used to prevent the rigging cables from squeezing the top of the unit. Failure to do so will damage the unit.

The base of the unit is 5" longer and 5" wider than the roof curb. There is a 2" wide rail that must sit over the curb. When setting the unit on the roof curb, insure that the unit sets properly over the curb.

Storage of unit

If the unit must be stored prior to final installation on the roof curb or slab, care must be taken to set the unit on a flat surface. The unit is not designed to support its weight on an uneven surface. Storage on an uneven surface may cause damage to the unit structure. All unit openings shall be sealed for the duration of storage. Unit should be stored in an area protected from weather, or completely covered with a waterproof tarp.

Utility Connections

Electrical:

Most units have a single point electrical hookup. Most units have a control panel with an integral non-fused disconnect. An electrical service must be provided to accommodate the unit MCA (Minimum Circuit Ampacity). It must be suitably protected against short circuit and ground fault by a suitable means using the MOP (Maximum Overcurrent Protection) stated on the nameplate.

Electrical service enters the unit from underneath through a prefabricated hole in the floor panel. If the service is to enter the unit from the side of the unit as on a slab mount, reference the unit GA drawing for location for electrical access. Attach a suitable watertight connector where the electrical service enters the unit.

Control Sensors

Temperature and humidity controls or control sensors are generally mounted in the conditioned space to control cooling, heating and dehumidification functions. The conditioned space sensors should be carefully located so that they are away from supply air outlets to prevent short cycling and inadequate control of conditions in the space. Never locate control sensors in the supply air duct. This will result in short cycling and compressor failure.

Discharge sensors for monitoring

Discharge sensors for monitoring and/or control of modulating heat should be located in the supply ductwork downstream of the unit discharge. In no case shall the sensors be located within the unit or immediately adjacent to the unit discharge. Preferably, the sensor should be located after at least one directional change in the ductwork, or for straight duct runs, at least twenty feet away from the unit discharge. Locating the sensor closer than this may result in inaccurate readings due to inadequate air mixing or radiant heat pickup from heaters.

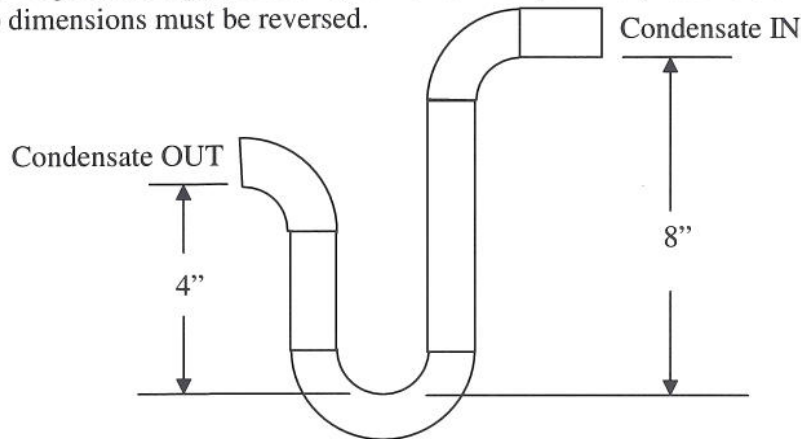
Natural Gas or LPG:

CAUTION! Insure that the type of gas is correct for the heaters.

There are up to three gas connections on the unit on units so equipped. Gas service must be provided to each connection. The gas service must be sized according to the Equipment Data sheet located in the Manual or Submittal, or the unit nameplate located on the electrical control panel. The piping and regulator must be capable of continuously supplying the required BTUH at a pressure of 7 to 15 inches water column (11" to 15" for LPG) with the burner(s) on at full fire. The piping installer must install a proper sediment trap per National Fuel Gas Code NFPA 54 (ANSI Z 223.1) section 5.5, a pressure regulator, and a union. The pressure regulator must be a **lockup type** to prevent excessive pressure buildup during burner off periods.

Cooling Coil Drain Connections:

Cooling coils must be properly trapped. Lack of a proper trap will admit air into the bottom of the condensate drain pan preventing draining of the pan. As water builds up, the entering air will blow water out of the drain pan. The trap must be at least 8" deep with a 4" high drain leg (see below). On units with positive pressure blow-through coils, the trap dimensions must be reversed.



Evaporative Cooler Water and drain connections:

If the unit is equipped with an evaporative cooler, the ½" MNPT WATER connection must be connected to a clean water supply. There is an air break built into the unit to prevent back flow into the building water system in case of water pressure loss. The installer must take proper precautions to prevent freezing of the water line in cold weather. Heat tape and insulation or automatic draining of the line is recommended. There is a 1" MNPT DRAIN connection that should be connected to the sewer.

CAUTION! The unit has a conductivity sensor that automatically drains the evaporative cooler sump. **DO NOT** install a shutoff valve in the drain line. The 1" OVERFLOW should be allowed to drain in a conspicuous location to allow detection. **CAUTION! DO NOT** install a shutoff valve in the overflow line.

Vent connections:

Units equipped with a gas reactivation heater for will have a PVC pipe outlet labeled "REACTIVATION VENT". A small amount of reactivation exhaust will be emitted from this vent when the reactivation fan is running. On outdoor units, this vent should be left open to atmosphere. On indoor units, this vent must be routed to a drain or to a point outside the building. The pipe must be continuously sloped ¼" per foot toward the drain or outlet. If this vent is piped to a drain, it must be sealed to the drain to prevent reactivation exhaust from entering the building.

Steam Coils:

CAUTION! Steam coils are subject to outside air conditions and can quickly freeze and rupture during sub 32F weather if proper steam valves, traps, and piping design are not utilized. Coils controlled by a modulating steam valve are particularly susceptible to freezing.

Each coil must have its own steam trap.

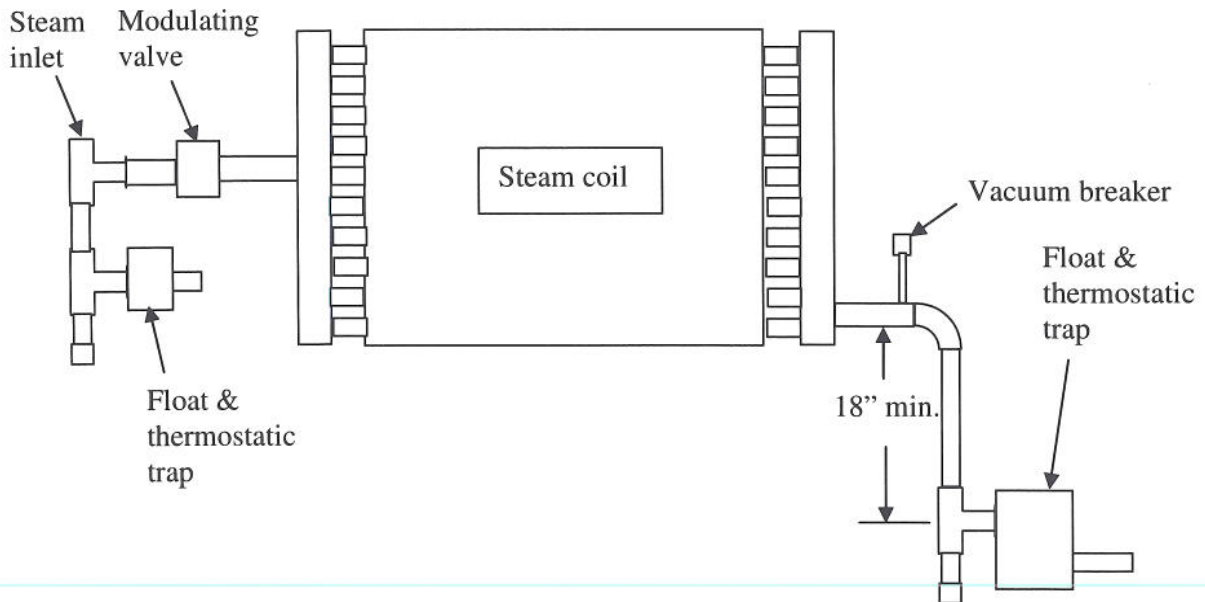
Steam traps must be installed a minimum of 18" below the bottom of the coil. The pipe size leaving the coil should be used to connect the steam trap. A sediment leg must be installed below the pipe tee connecting the trap. Traps must be a **float and thermostatic (F & T)** type. The trap must be sized to accommodate the design condensate flow rate at ½ PSIG.

A **vacuum breaker** must be installed at the top of the coil outlet header to insure proper coil condensate drainage in the event that the steam supply does not keep up with the condensation rate and sub atmospheric pressure would otherwise result. This event can easily occur during startup conditions and especially where a modulating steam valve is used.

The steam supply line must have a trap to insure that only steam enters the coil.

Details on proper steam piping and valving can be found in Chapter 22 of ASHRAE 2009 Fundamentals Handbook and Chapter 10 of ASHRAE 2008 HVAC Systems and Equipment Handbook.

Failure to follow proper guidelines can result in freezing and rupture of the steam coils.



Ducting

Outdoor units

Duct connections for supply and return air are made to the bottom or to the sides of the unit depending upon the option ordered. Duct connections must always be made to the flanges sticking out of the unit, never to the sheet metal on the unit housing. Flexible duct connectors should be installed between the unit duct outlet and the duct. Fans are sized to accommodate 1" total external static pressure (supply + return) from the duct system unless otherwise specified.

On supply discharge ductwork, allow several duct diameters of a single duct run prior to branching of the ductwork into multiple runs to ensure even airflow and temperature/humidity distribution. Details on ducting standards can be found in SMACNA publication "HVAC Systems – Duct Design" and Chapter 18 of 2008 ASHRAE HVAC Systems and Equipment Handbook.

Most units have cooling, heating and dehumidification functions controlled by sensors located in the conditioned space. As the controlled condition reaches the "on" set point, the required function will energize. Wide variations in discharge temperatures can occur. During cooling mode, the discharge temperature may be between 55F and 65F. During dehumidification or heating, temperature may range from 85F to over 100F. Makeup air units may have even greater variations. Discharge registers in the conditioned space should be carefully located to prevent cold or hot air from blowing directly on people and causing uncomfortable conditions.

Indoor Units

Reactivation ducting: Reactivation air must be ducted to the outside of the building away from any air intakes into the building. The duct should be at least the same size as the reactivation outlet and as short as possible. The weather flapper must be removed prior to duct installation. The duct must be insulated on the outside and sloped toward the outside a minimum of ¼" per foot. The duct connections must be sealed so that air does not leak out. The air inside the reactivation duct is very wet and moisture will condense and cause corrosion if the proper material is not selected. The recommended material for the inside of the duct is aluminum or stainless steel. The reactivation vent pipe on the side of the unit must be piped to a drain or outside the building.

Makeup air ducting: Makeup air inlet(s) must be ducted to the outside. Care should be taken to locate the inlet where it will not entrain air from a contaminating source.

HCUC General Engineering Specifications

Furnish and install MUNTERS HCUC unit(s) or approved equal. Sizes, arrangements, capacities and performance shall be as indicated on plans and schedules. Unit manufacturer shall be registered under ISO 9001. Cooling performance shall be rated in accordance with ARI standards. Unit shall be ETL listed. Packaged condensing units shall be factory pre-assembled, tested and shipped complete with all components necessary to maintain humidity and temperature control levels independent of load variations within design limits. Unit(s) shall be designed for year-round 24 hr/day service.

DESICCANT WHEEL

The desiccant wheel media shall be a monolithic, extended-surface contact medium, fabricated entirely of inert, inorganic binders and glass fibers formed into narrow passages in the direction of airflow. The wheel shall be non-toxic. The process and reactivation air streams shall be separated by air seals and internal partitions so that the humid reactivation air does not mix with the dry process air. Acceptable manufacturers must be able to procure replacement wheels within 24 hours or provide a spare stock for each unit size. The proposed equipment shall meet the following minimum requirements:

- A) Wheel Face Seals
The dehumidifier shall have full-face seals on both the process air entering and the process air leaving sides of the wheel. These shall seal the entire perimeter of both air streams as they enter and leave the wheel. Partial seals shall not be acceptable. The seals shall be the silicone rubber bulb-type, with a protective strip of low-friction, abrasive-resistant surface to extend seal life and reduce the force needed to turn the desiccant wheel. Neither wiper-type seals nor brush-type nor any non-contact-type seal shall be acceptable. The seals shall be documented to have a minimum working life of 25,000 hours of normal operation.
- B) Materials
The glass fibers which form the support matrix shall be made from uniform continuous strands larger than five microns in diameter which are non-respirable and are not considered a possible health risk by the International Agency for Research on Cancer (IARC).
- C) Flame spread and smoke generation
The wheel shall be tested according to ASTM E84-90 (Standard Test Method for Surface Burning of Building Materials) and shall achieve the following results:
 - 1) Flame spread index = 0
 - 2) Smoke developed index = 10
- D) Desiccant impregnation
The desiccant shall be evenly impregnated throughout the structure for predictable, consistent performance and for maximum wheel life. Coatings applied on top of the contact medium shall not be acceptable unless the manufacturer can provide independent life tests demonstrating less than a 5% decline in desiccant capacity over a five year period of normal operation.
- E) Desiccant type
The desiccant material used in wheels of HCU units shall be Type III Brunauer isotherm desiccant. The desiccant impregnated into the contact medium shall be a titanium-reinforced silica gel. The HoneyCombe[®] desiccant wheel shall be a fabricated extended

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surface contact media with a multitude of small passages parallel to the airflow. The rotary structure shall be a monolithic composite consisting of inert silicates with microscopic pores designed to remove water in a vapor phase. The desiccant shall be hydro thermally -stabilized silica gel reinforced with titanium for maximum strength and stability over time. The fabricated structure shall be smooth and continuous having a depth of between 95 and 200 millimeters in the direction of airflow without interruptions or sandwich layers which restrict air flow or create a leakage path at joining surfaces. Nominal face velocity shall not exceed 1000 fpm. The HoneyCombe® wheel shall be manufactured in the United States. The manufacturer shall provide documentation to establish that:

- 1) The desiccant retains more than 90% of its original capacity after ten years of continuous operation in clean air, with inlet air conditions up to an including 100% relative humidity.
- 2) The wheel as impregnated with silica gel is capable of withstanding five complete water immersion cleaning cycles while retaining more than 95% of its original adsorption capacity.

DESICCANT WHEEL SUPPORT AND DRIVE ASSEMBLY

Desiccant wheels 60" in diameter and smaller shall be a single piece for fast removal and simple handling. Belt-driven desiccant wheels shall be supported by four rollers at the base of the unit so the wheel can be easily removed by lifting it over the rollers using the drive belt. In addition, the wheel drive assembly shall provide:

- A) Rotation speed
To avoid excessive heat carryover from reactivation to the process air, the wheel rotation speed shall not exceed 8 rph while achieving the required moisture removal rate at the specified conditions.
- B) Drive belt
HCUc-4015 and smaller shall use a V-belt. HCUc-4020 through HCUc-8040 shall use a flat, toothed type belt with aramid fiber reinforcement. HCUc-1260 units and larger shall use direct-drive wheels.
- C) Drive motor
The drive motor shall be fractional horsepower and rated for continuous duty for a period of 20,000 hours under the load conditions imposed by the drive assembly.
- D) Rotation detection
The drive assembly shall be equipped with a rotation detection circuit which shuts down the dehumidifier and signals the operator through an alarm if the wheel is not rotating.

DIRECT EXPANSION (DX) COOLING COILS

Coils shall be sized to provide the full capacity scheduled. Coils shall be arranged to condition the full volume of process air. Refrigerant pressure drop to be between 1.5 psi and 5 psi, and air face velocities shall be 450 fpm or less. Coil circuiting provides for optimum performance with minimum pressure loss. Coil shall be designed for 600 PSI working pressure and factory tested under water at 600 PSI air pressure.

Direct expansion cooling coils are fin and tube type constructed of 3/8" O.D. x 0.012" or 1/2" O.D. x 0.016" wall rifled copper tubes and .006 inch thickness aluminum fins mechanically bonded to tubes. Casing and tube support sheets are 16 gauge galvanized steel formed to provide

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mounting flanges and structural support for the fin-tube assembly. Supply headers consist of an expansion valve and distributor to feed liquid refrigerant through copper tubing to all circuits in the coil equally. Tubes are circuited to insure minimum refrigerant pressure drop and maximum heat transfer. Fin spacing of up to 12 FPI provides adequate transfer area to minimum air pressure drop. Direct expansion coils conform to ARI Standard 410 and are compatible with all other components of the same refrigeration circuit.

DRAIN PANS

The drain pan is to be constructed of welded 304 SS and bolted in place. The cooling coil drain pan shall extend the entire length of the coil and extend a minimum of 4 inches beyond the air leaving side of the coil. The drain pan shall be double-sloped to ensure zero standing water. Drain connection shall extend through unit base. HCUc-8000 and smaller units will have a single 1 inch male NPT connection. HCUc-12000 and larger units will have a single-sloped drain pan and qty. (2) 1 inch male NPT connections.

AIR-COOLED PACKAGED REFRIGERATION CONDENSING UNITS

Condensing units are complete with compressor(s), condenser heat exchanger, and all controls and accessories required to regulate refrigerant pressure, flow rates and temperatures. The condensing unit is piped together with evaporator coil(s) and is sized and controlled to operate at all conditions required. Condensing units manufactured by a separate company and then mounted and piped on a single skid are not acceptable. The refrigeration equipment shall be capable of operation down to an ambient temperature of 50°F.

Compressors are scroll type. Service Access shall be provided around the entire compressor for maintenance. Each compressor shall have its own refrigeration circuit and expansion valve. Tandem compressors sets are not acceptable.

Condenser heat exchanger shall be sized to reject the heat absorbed by the evaporator coil and the work of compression at a low delta T relative to ambient to enhance efficiency. Coil circuiting provides for optimum performance with minimum pressure loss. Coil shall be round tube, plate-fin, or microchannel design. Coil shall be designed for 600 PSI working pressure and factory tested under water at 600 PSI air pressure.

Condenser fans shall be provided with fan guards both on the intake and discharge. Condensing unit section shall be accessed through access doors. Access panels are not acceptable. Condenser coils shall be provided with exterior coil guards to prevent damage.

WEATHER PROTECTION (OUTDOOR UNITS)

The dehumidification system shall be capable of continuous outdoor operation. The air inlets shall be protected from water entry by hoods, louvers, mist eliminators or connected duct work. Consequently, all access panels shall be weather tight, as shall all joints between casing and electrical conduits and between the unit casing and any components mounted in separate enclosures. The roof shall be fabricated using a capped standing seam or single piece style construction.

FANS

Fans provide the specified air volume(s) through the system with adequate static pressure to overcome duct and distribution losses specified.

- A) Fan Blowers
Supply blowers are belt-drive forward curve or belt-drive backward inclined air foil blade type. Condenser fans shall be direct driven propeller type. Reactivation fans shall be direct-driven backward inclined air foil blade type with VFD control. Direct-drive blower fan speed shall not exceed 80% of the fan shaft critical speed. Access shall be provided to the supply and reactivation blower for inspection and servicing. All fans shall be rated in accordance with AMCA Standard 210.
- B) Fan Isolation
Belt-Drive forward curve supply fans shall use rubber-in-shear isolation. Belt-drive backward incline airfoil blade fans shall use 1" spring isolation.
- C) Fan Balancing
Fans shall be balanced such that the maximum displacement in any plane does not exceed 1.5 mils for fans operating at or below 2000 rpm or 1.0 mils for fans operating above 2000 rpm.
- D) High Efficiency TEFC Fan Motors
Supply and reactivation fan motors shall be the totally-enclosed fan-cooled (TEFC), high-efficiency type with a minimum of Class F insulation. Condenser fan motors shall be ODP.
- E) Premium Efficiency TEFC Fan Motors (Optional)
Supply and reactivation fan motors shall be the totally-enclosed fan-cooled (TEFC), premium-efficiency type with a minimum of Class F insulation. Condenser fan motors shall be ODP.

FILTERS

The unit shall include disposable filters with 25% to 30% minimum efficiency with 90% to 92% arrestance minimum as rated by ASHRAE Test Standard 52-76. The filters shall be removable at the inlet of both supply and reactivation air streams. These filters shall be mounted on sliding or lift racks and accessible through access or doors. The entire supply and reactivation air stream shall be filtered.

ELECTRICAL CONTROL CABINET

The electrical control cabinet shall be weather tight to NEMA 3R standards and shall include:

- A) Wiring to comply with the current National Electrical Code with further fuse and wiring sizing to meet or exceed UL 508A Industrial Control Panel.
- B) Wires shall be color-coded or numbered at both ends and all terminal block connection points shall be numbered. These markings shall correspond with the electrical diagram provided in the operating and maintenance manual.
- C) Components shall be UL, ETL or CSA approved where possible.
- D) Operating and maintenance manual
The control cabinet shall include a copy of the O & M manual, mounted in a separate compartment or pocket to allow access to critical information by maintenance personnel after installation.
- E) All units shall come with a non-fused means of disconnecting the unit power.

INDIRECT FIRED POST HEATERS (OPTIONAL)

Heater shall conform to ANSI Z83.9. Unit shall be suitable for operation on natural gas or propane as specified. Unit shall be of down blast or horizontal configuration. Unit shall have an input rating of 100, 200, 320 or 400 MBH on high firing rate and 50, 100, 160, or 200 MBH on low firing rate, respectively. Where input is greater than 400 MBH multiple heaters shall be used. It shall contain tube type heated exchangers, flue gas collector with vent fan, in shot burners, and controls for high and low fire. Unit shall be un-housed and fit within the unit housing envelope dimensions.

Burners shall be die formed in shot type with adjustable air shutters. Burners must be individually removable for cleaning or service. Entire burner assembly must be easily removable as an assembly.

Unit shall have a powered venting system consisting of a collection box, direct drive vent fan and an air proving switch. The collection box shall be made of the same material as the heat exchanger bulkhead plate and shall be removable. The venting fan bearings shall have a minimum L10 bearing life of 24000 hrs. The vent fan shall exhaust the flue gas horizontally out the side of the unit. The unit fan shall operate on 120/1/60 and not exceed 2 FLA.

Tubes shall be permanently attached to a bulkhead plate to form an airtight seal between combustion byproducts and heated air system. Heat exchanger shall be constructed of 18 gauge aluminized tubes with 14 gauge aluminized steel bulkhead plate. Heat exchanger shall be rated for a minimum lifespan of 100,000 cycles.

Gas train shall utilize components certified by AGA. Gas train shall consist of a 24 VAC two stage combination valve (manual on-off, automatic safety shutoff, regulation to handle 0.5 psig input pressure and adjustable pilot valve). The combination valve shall be rated at a flow of 400 MBH. The valve shall feed in shot burners through a manifold with screw in brass orifices sized for either natural gas or propane, as required by unit schedule. The flame controllers shall be solid state module that operates on 24 VAC. It shall have a built in spark igniter and flame sensor with 100% gas shutoff. The pilot shall be ignited during each cycle of operation. After the pilot is proven, the main burner valve shall open. Pilot and main burners shall be extinguished during the off cycle. The thermal disc type high temperature limit switch shall shut off the main and pilot valves if an overheat occurs.

ELECTRIC POST HEATERS (OPTIONAL)

Electric heater shall be Underwriters Laboratories or Applied Research Laboratories listed for zero clearance and shall meet the requirements of 2006 National Electrical Code and U.L. 1996 specifications file #E 50663.

Each heater shall be furnished with one or more automatic resets as an over temperature safety device(s), serviceable and replaceable, that will be de-energized the heater on over temperature.

Each heater shall be furnished with one or more manual resets as a secondary over temperature safety device(s), serviceable and replaceable, that will be de-energized part of the heater on over temperature or failure of the automatic reset(s).

Terminal box and element frame shall be of heavy gauge (minimum of 20 gauge) galvanized steel, sufficiently formed and braced to assure structural rigidity of the entire heater assembly, terminal box and terminal box cover must be totally enclosed and free of any perforation. Terminal box may have a false bottom design for greater cooling effect for the control components on large terminal boxes.

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Heating element(s) shall be high grade nickel-chrome alloy. Heating element(s) shall be held in place with floating steatite bushings. Heating element(s) are field replaceable. For maximum strength, the bracket must completely surround the ceramic bushing and have 1/32 inch total clearance between the bushing and metal. Double threaded stainless steel stud bolts. Each heater shall be furnished with exact wiring diagram on the corner of the terminal box. Internal wiring is stranded copper only wrapped with 105C insulation 600V. Standard contactors per stage shall be 120V control circuit. Terminal block or lugs shall be sizes for installation of 75C copper wire for field wiring. Heaters over 48 amps total shall be sub-divided and circuit fused for protection. Control circuit (120V) shall be wired to the terminal block.

All components are recognized or listed components by UL.

ELECTRO-FIN CORROSION RESISTANT COIL COATING (OPTIONAL)

Coil shall have a flexible epoxy polymer e-coat uniformly applied to all coil surface areas without material bridging between fins. Coating process shall ensure complete coil encapsulation and a uniform dry film thickness from 0.8 – 1.2 mil on all surface areas including fin edges. Superior hardness characteristics of 2H per ASTM D3363-92A and a cross-hatch adhesion of 4B-5B per ASTM B3359-93. Impact resistance shall be up to 160 in/lb per ASTM D2794-93. Humidity and water immersion resistance shall be up to a minimum 1000 and 260 hours respectively (ASTM D2247-92 and ASTM D870-02). Corrosion durability shall be confirmed through testing to no less than 5,000 hours salt spray per ASTM B117-90 using scribed aluminum test coupons.

Coils subjected to ultraviolet (UV) exposure shall receive a spray-applied, UV-resistant polyurethane topcoat to prevent UV degradation of e-coat.

CONTROLS

The unit shall have microprocessor control. Units with a microprocessor shall be capable of communicating with a building management system (BMS) through Modbus, Lonworks or BACnet protocol. Control options include the ability for the HCU to determine stages of heating, cooling and dehumidification required to maintain space conditions when an "enable" command is given via the BMS, or direct control via commands issued from the BMS.

UNIT CONSTRUCTION – HCUC

UNIT BASE

Unit base shall be bolted steel construction with formed heavy gauge galvanized steel channels around the outside perimeter and reinforced with galvanized steel cross members bolted on centers not exceeding 31 inches. Base shall have a minimum of four lifting brackets.

UNIT STRUCTURE

The unit casing shall be constructed using a double wall panel and frame system for torsional rigidity. This includes walls, floors and ceilings. This system shall not contain any through metal. The unit casing shall also meet the following criteria based on ASTM E84-90 (Standard Test Method for Surface Burning of Building Materials), flame spread = 25, smoke index = 50.

The frame system components shall be constructed of fiberglass reinforced plastic (FRP) pultruded members. Horizontal frame members shall be supported along their length by intermediate supports and internal partitions. Through metal systems shall not be allowed. To avoid condensation, heat loss or loss of cooling capacity, each panel shall be 2 inches thick and constructed such that there are no through metal connections between the exterior surface and

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the interior surface. The interior casing shall be 22-gauge galvanized steel. The exterior casing shall be 22-gauge corrosion resistant galvalume. Manufacturers not providing exterior galvalume construction must provide painted galvanized exterior panels. Painted coating must be corrosion resistant exceeding ANSI 2000 hour salt spray standards. Panels shall be foam injected into individual panels with a density of 2-1/2 lb/ft³. The heat transfer rate through casing walls shall be less than 0.0625 Btu/sq. ft./°F equivalent to an R-value of 14. This construction shall be suitable for a 50°F difference as tested between process air dry bulb temperature and the dew point of the air surrounding the plenum. The unit casing shall be manufactured as an air and vapor tight system. There shall be a gasket system which seals the panels to the structure. Fixed panels shall be provided with flat closed cell neoprene and be sealed in place with FDA approved silicon. Doors and plug panels shall be provided with polyvinyl chloride seals.

ACCESS DOORS AND PANELS

Access doors or plug panel doors will be provided as indicated on the drawings. Doors shall be rigid double wall construction and shall use heavy-duty hinges with lockable latches on each door. Doors shall be a minimum of 15" in width. Doors shall be of the same construction as panels. Door latches shall be capable of being fully tightened against gasket surfaces. All major components such as coils, filters, blowers, etc., within the air handling structure shall be easily removable through access panels without dismantling plenums or distributing ductwork. Equipment that requires disassembly of components rather than access through removable or hinged panels shall not be acceptable. The unit casing shall include access panels for inspection and for any maintenance required by the operating and maintenance manual. Panels without gaskets shall not be acceptable.

HCUC Overview

The HCUC is designed to provide an economical way to bring makeup air into a space at room-neutral temperatures and low dewpoints to control space humidity. The makeup air first goes through a cooling coil which cools and dehumidifies the air. The air is then passed through a desiccant wheel which converts the latent heat (moisture) into sensible heat. This raises the air temperature and at the same time lowers the dew point. This prevents overcooling of the space at off-design conditions. The desiccant wheel is reactivated by recycling waste heat from the condenser coil. The HCUC can provide cooling-only by simply turning off the desiccant wheel.

Internal microprocessor control

The internal functions of the HCUC are controlled by a microprocessor. The microprocessor monitors internal pressures, temperatures and humidity as well as outside temperature and dewpoint and optionally space temperature and dewpoint. It sequences internal components to stage dehumidification, cooling, and heating functions and damper operation. It monitors wheel rotation, airflow, and component faults. It controls analog functions to provide correct airflows for reactivation and supply air.

Control Source

The HCUC is controlled by an external control source that gives run commands to the microprocessor. The external control source can be:

- Building Management System (BMS) communicating through Lonworks, BacNet, or Modbus protocol.
- BMS communication via an I/O card mounted in the HCUC control panel.
- Conventional thermostat and de-humidistat (for standard input control).
- A remote programmable terminal. The remote terminal has a time clock and is programmable for each day of the week with night setback. When using the remote terminal, stand alone control is used. Separate temperature and humidity sensors must be mounted in the space. The remote terminal itself may be mounted in the conditioned space or elsewhere.

Control Method

The external control source can control the unit by one of two methods:

1. Stand alone control: the Munters microprocessor monitors space and ambient conditions and controls the unit as necessary to maintain the space dewpoint set point. When dehumidification requirements are satisfied, the unit can also supply supplemental cooling to the space by switching to cooling mode. With optional afterheat, the unit will also bring on stages of heat to temper unit leaving air

**HCUC Control Sequence
Microprocessor Control**
Version 4.0



temperatures during winter. With this method of control, the external controller need only provide a run signal to the HCU.

2. Standard input control: the external controller gives individual signals to the Munters controller to initiate supply fan, stages of cooling, dehumidification, and optional afterheat, and optionally outside air/return air dampers. With standard input control, the external controller will turn on the supply fan and individually dictate each stage of cooling and each stage of heating to energize. It needs to provide only one DH signal. Stages of DH are determined internally by the HCUc by means of stage delays as described in stand alone mode of operation.

Stand Alone Control Sequence of Operation

The HCUc can provide stand alone control based on space and ambient conditions. It can be programmed to override space conditions requirement's for cooling, dehumidification or heating based on ambient conditions to prevent swings in space conditions.

In stand alone mode, the HCUc receives a signal to initiate the supply fan (run signal). The microprocessor then determines whether DH, Cooling or Afterheat is needed.

In stand alone mode of operation, there is a single set point with a dead band for each of cooling, DH and heating. The first stage of DH initiates when the space dew point is greater than the required dew point range. The microprocessor then waits for a stage delay and checks the dew point. If it is still above range, the second stage initiates. After another stage delay, it again evaluates whether an additional stage is required. If the space is within the desired range, the unit maintains status quo. If the dew point has dropped too low, a stage is shut off. This sequence is used for cooling and heating as well.

DH

When space conditions require dehumidification mode, compressor A energizes first and provides all of the required heat for desiccant wheel reactivation. The reactivation fan is modulated to maintain a constant discharge pressure (444psi) to insure proper reactivation temperature. Compressor A heat of rejection/reactivation heat is handled by a separate condenser coil. The entire condenser A airflow is generated by the reactivation fan.

Compressors B, C, and D are energized in that order as required to produce the desired space dewpoint and temperature. The condenser coil for these three compressors is separate from the reactivation (A) condenser coil. The airflow for the B, C, D condenser coil is provided by condenser fans that cycle on discharge pressure to maintain the required condensing temperature at low ambient temperatures.

HCUc Control Sequence
Microprocessor Control
Version 4.0



Ambient Overrides

The microprocessor monitors ambient temperature and dew point. If the ambient dew point is above *Amb DH override* (adjustable), Stage 1 DH will energize. Additional stages of dehumidification can be brought on based on additional increases in ambient humidity (adjustable) to prevent swings in space conditions.

Cooling

When in cooling-only mode of operation (ambient dewpoint is low), compressor D is the primary compressor. Compressors C, B, and A are energized in that order, after stage delays, as required to maintain desired space temperature. The reason for this sequence in cooling-only mode is to conserve condenser/reactivation fan energy.

When the wheel is not required for dew point control, a wheel bypass damper opens to reduce air pressure drop and the supply fan goes to a lower speed to save energy.

Ambient Overrides

The microprocessor monitors ambient temperature and dew point. If the ambient temperature is above the *Ambcool Override* (adjustable), the first stage of cooling will energize. Additional stages of cooling can be brought on based on additional increases in ambient temperature (adjustable) to prevent swings in space conditions.

Heating

Heating may be operated in one of two modes: staged or modulating. DH and heating can be energized at the same time unless locked out. **Note:** If DH and electric afterheat are to be used simultaneously, the electrical service must be sized accordingly.

Staged afterheat

When conditions call for heating, stages of heat energize, after stage delays, as required to maintain desired space temperature. If the leaving air temperature is > 130°F, additional stages of heat will not energize. If the leaving temperature rises to 165°F, one stage of heat will shut off. If a heater fails on a two-heater unit, the other heater will automatically become the lead heater.

Modulating afterheat

When conditions call for heating, afterheat energizes and modulates to the set leaving air temperature.

**HCUC Control Sequence
Microprocessor Control**
Version 4.0



Ambient Overrides

The microprocessor monitors ambient temperature and dew point. If the ambient temperature is below *Ambheat override* (adjustable), the heat operates according to the following sequence. When the ambient temperature drops below *Ht 1* temperature, afterheat stage 1 energizes. If the space temperature rises above *Space heat setpoint on plus Space Temp dead band*, stage 1 de-energizes. When the ambient temperature drops below *Ht 2* temperature, stage 2 afterheat energizes. If the space temperature rises above *Space heat setpoint on plus Space Temp dead band*, stage 2 heat de-energizes. This sequence repeats for stages 3 and 4.

Temperature or Humidity priority

Humidity or Temperature priority may be selected as desired for the application. When humidity priority is selected, the unit will run in DH mode if both temperature and humidity are above set point range. If heating and DH are both being called for by space conditions, DH will run (unless both are allowed to run simultaneously). When in temperature priority, the unit will shut off the desiccant wheel and run cooling only when both cooling and DH are called for simultaneously.

STANDARD TERMS AND CONDITIONS OF SALE

- (1) **GENERAL DEFINITIONS.** Unless otherwise agreed in writing by Munters Corporation ("Munters"), the terms and conditions contained herein with respect to the purchase and sale of goods and services hereunder constitute the entire agreement between Munters and Purchaser with respect to the subject matter hereof, and supersede all prior communications and agreements between the parties. Munters shall not be bound by any additional or different terms whether printed in Purchaser's purchase orders or otherwise, or in any other communications from Purchaser to Munters unless specifically agreed to by Munters in writing. For the avoidance of doubt, any and all provisions contained in Purchaser's terms and conditions are expressly rejected, including, without limitation, any "Pay when Paid" or "Pay if Paid" or like provisions and any indemnification requirements sought to be imposed on Munters. Acceptance by Munters of any purchase order for Munters' goods or services, and Purchaser's acceptance of any quotation or proposal by Munters is expressly limited to and conditioned upon Munters' Standard Terms and Conditions of Sale, which may not be changed or waived except in writing signed by both parties. Notwithstanding the foregoing, any order for extended warranties, services or labor shall be also be subject to Munters' "Additional Terms and Conditions - Service Plans," which shall be provided by Munters to Purchaser if applicable.
- As used herein: (a) "Purchaser" means the person or entity that accepts a proposal or quotation from Munters for the sale of Products or whose order for Products is accepted by Munters; (b) "Conditions" means the standard terms and conditions of sale set out in this document and includes any special terms and conditions agreed in writing between Purchaser and Munters; (c) "Order" means an order for Products placed by Purchaser with Munters, and accepted by Munters; and (d) "Products" means the products and any related services ordered by Purchaser and furnished by Munters and shall include all products, equipment, parts, materials, accessories and any related services furnished to Purchaser by Munters.
- (2) **APPROVAL DOCUMENTATION.** Before Munters commences work, Munters must be in receipt of an Order and Purchaser must have approved in writing all drawings submitted by Munters, if any. Purchaser's failure, refusal or omission to furnish all necessary information, documents and drawings requested by Munters, or to approve all drawings or specifications as requested by Munters, or to promptly respond to inquiries of Munters shall cause an automatic extension of the delivery, and/or completion date equal to at least the number of business days caused to be lost by the Purchaser's action or non-action and a corresponding increase in price to compensate for such conditions.
- (3) **SHIPMENT AND DELIVERY.** Unless otherwise specifically agreed to in writing, Products shall be delivered F.O.B. point of origin. Partial shipments of Products may be made. Unless otherwise agreed to by Munters, all shipping dates are approximate and are contingent upon prompt receipt by Munters of all necessary information. Munters assumes no responsibility for delays, breakage or damage after having made delivery of Products to a carrier, at which time all risk of loss for any cause passes to Purchaser. Notwithstanding any language to the contrary set forth herein, upon the mutual agreement of the parties, the Purchaser may take possession of the Products directly from Munters' facilities and Purchaser shall retain title and risk of loss as of the date that such Products are made available by Munters for pick up by the Purchaser. Unless otherwise provided in the Order, once an Order has been released to manufacturing and a ship date has been communicated to Purchaser, any request by Purchaser to change the date of shipment shall constitute a change order. To delay a shipment, Purchaser must deliver a signed delayed shipment form, in a form reasonably acceptable to Munters, to Munters before the original ship date. At that time, Purchaser shall pay the full invoice amount and title and risk of loss shall pass to Purchaser as of the original ship date. In addition, storage fees, which shall be quoted separately, will apply.
- (4) **CLAIMS FOR SHORTAGES AND SHIPPING DAMAGE.** No claim for shortages in Orders shall be considered by Munters unless presented to Munters in writing within seven (7) days after receipt of Product(s). All claims for breakage or other damage due to shipment or handling shall be made to the common carrier by Purchaser within seven (7) days after receipt of Product(s).
- (5) **PRICE.** The price for Products shall be the price expressly quoted by Munters to Purchaser (the "Purchase Price"). Unless otherwise agreed to in writing, pricing includes standard packaging for domestic shipment, labels and raw material and production costs, but does not include the following, which shall be separately itemized and which Purchaser shall also pay: handling charges; freight charges; special packaging; and any insurance requested by Purchaser. Foreign shipments placed with Munters may require additional charges for documentation and overseas packaging. Such charges shall be clearly identified on Munters' invoices. In the event that Purchaser causes or requests changes to be made that affect delivery, installation, specifications, completion dates or otherwise, Purchaser shall reimburse Munters for any expense incurred by Munters as a result of each such change or delay upon presentation by Munters of a simple invoice.
- The Purchase Price is firm if Product is shipped within one hundred and eighty (180) days of the Order date. Thereafter, the Purchase Price is subject to a one percent (1%) increase for each month or part thereof that shipment is delayed beyond the initial one hundred and eighty (180) day period. Any Order not released for immediate manufacture and shipment by Purchaser within such one hundred and eighty (180) day period, may, at Munters' option, be subject to a new price quotation or cancelled by Munters and subject to the cancellation charges provided in section 8 of these standard terms and conditions of sale. Munters shall exercise its right to adjust the Purchase Price or cancel the Order by providing Purchaser with written notice.
- No payment due Munters shall be withheld or subject to retainage for any reason without Munters' prior written consent, including back charges. Any back charges made by Purchaser prior to Munters' written approval shall be the sole responsibility of Purchaser.
- (6) **PAYMENT AND CREDIT.** Unless otherwise provided in the Order, payment shall be due thirty (30) days from date of invoice. If partial shipments are made, payments for such partial shipments shall become due as shipments are made and invoices rendered. In addition, Munters may require progress payments unless otherwise agreed to by the parties in writing. Munters may, at any time and in its sole discretion, modify the terms of payment originally specified to include payment in advance.
- Munters' acceptance of an Order is subject to Munters' credit review of Purchaser. Any delay resulting from a credit review may result in a delay in shipping, which delay shall not subject Munters to any liability. If Purchaser prepays the full Order price or makes a deposit equivalent to the full price of that Order in some other form acceptable and approved by Munters at the time it places the Order, Munters may determine not to conduct a credit review of Purchaser.
- For Orders outside the Continental United States, Canada or Puerto Rico, Munters requires an irrevocable letter of credit or similar guarantee of payment acceptable to Munters. For all other Orders, Munters reserves the right, in its sole discretion, to require Purchaser to provide letters of credit or similar guarantees of payment acceptable to Munters.
- Munters reserves the right to add a late charge of 1 1/2% of the principal amount due at the end of each month, or the maximum allowable legal interest rate, if a lesser amount, to any account outstanding beyond the due date. If Munters must resort to legal action to collect amounts due, all reasonable costs and expenses, including attorneys' fees and interest, shall be added to the Purchase Price.
- (7) **TAXES.** The Purchase Price does not include, except as expressly stated in the quotation, any present or future sales, use, excise, value added or similar taxes or any increase in such taxes. Consequently, in addition to the Purchase Price specified herein, the amount of any present or future sales, use, excise, value added or similar taxes or increase in such taxes applicable to the sale or use of Product(s) hereunder shall be paid by Purchaser, or in lieu thereof and if acceptable to Munters in its sole discretion, Purchaser may provide Munters with the tax-exemption certificate acceptable to the taxing authorities provided that Purchaser provides such tax-exemption certificate to Munters at least three (3) days prior to the date that Munters would otherwise pay the applicable sales, use, excise, value added or similar taxes.
- (8) **CANCELLATION CHARGES.** An Order is not subject to cancellation or change except on terms acceptable and satisfactory to Munters. If Purchaser cancels without obtaining Munters' consent, such cancellation will be treated as a repudiation making Purchaser immediately liable for loss, expense and other damages, and in that case, it is understood that a cancellation charge shall also be due from Purchaser to Munters, as liquidated damages, and not as a penalty for such cancellation. The cancellation charge shall be at maximum, computed as follows: (a) if Purchaser or Munters cancels the Order after it is placed by Purchaser with Munters but prior to the date that Munters purchases any materials to fill the Order, Purchaser shall pay thirty percent (30%) of the total Purchase Price, (b) if Purchaser or Munters cancels the Order after the date that Munters purchases materials to produce the Product(s) ordered, Purchaser shall pay seventy percent (70%) of the total Purchase Price, and (c) if Purchaser or Munters cancels the Order after Munters commences production of the Product(s) ordered, Purchaser shall pay one hundred percent (100%) of the Purchase Price. The cancellation charge shall be due and payable at the time of receipt of Purchaser's written notice of cancellation at Munters' office or Munters' written notice of cancellation as provided in section 5 of these standard terms and conditions of sale.
- (9) **WARRANTY.** Munters warrants that the Products (other than services and labor) shall be free from defects in workmanship and materials for the lesser of (i) fifteen (15) months from the date of shipment of the Product by Munters; or (ii) twelve (12) months from the date that such Product becomes operational (collectively, the "Warranty"). For purposes of this section 9 of these standard terms and conditions of sale, including for the purpose of defining and describing Purchaser's remedy as provided below in this section 9, the term "Products" shall not include related services or labor. Any extended warranties or warranties for services or labor shall be subject to Munters' "Additional Terms and Conditions - Service Plans," which shall be provided by Munters to Purchaser if applicable.
- The Warranty applies only to Products that are properly installed, maintained and operated under normal conditions with competent supervision in accordance with the instruction manual, good maintenance practice and Munters' recommendations, if any, made by Munters in writing. Without limiting the foregoing, the Warranty shall be void, and Munters shall have no liability for, in the case of any Products that: (a) have been disassembled, repaired or tampered with in any way, except when such work has been done with Munters' prior written approval, (b) have been damaged by use or operation in excess of any maximum pressures, temperatures or rated capacities as specified by Munters in writing, (c) have been damaged by corrosion, or have degradation in performance as a result of dirt, dust, or other foreign material, or (d) are considered consumable.
- Munters' obligation, and Purchaser's sole and exclusive remedy, under the Warranty is limited to repair or replacement at Munters' facility, at Munters' option, of any Products (or parts thereof) determined to be defective in workmanship or material during the applicable warranty period. The Warranty is a parts only warranty, and except as may be provided in "Additional Terms and Conditions - Service Plans," if these Additional Terms are applicable, the Purchaser's remedy under the Warranty does not include services or labor. The warranty period shall not be extended by the performance of warranty repairs or replacements.
- The Warranty shall be voided if payment is not made in accordance with the terms set forth in section (5) of these standard terms and conditions of sale.
- THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, AT LAW OR IN EQUITY, WITH RESPECT TO THE PRODUCTS, ANY RELATED SERVICES OR LABOR OR THEIR CHARACTERISTICS, QUALITY OR PERFORMANCE, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF ANY INTELLECTUAL PROPERTY RIGHTS OF THIRD PARTIES, AND ANY AND ALL SUCH WARRANTIES AND REPRESENTATIONS ARE HEREBY DISCLAIMED. No agent, representative, or dealer, or any other person or entity, is authorized to give on Munters' behalf any representation or warranty as to Product(s) or to assume for Munters any liability pertinent to Product(s) under any circumstances.
- (10) **DISCLAIMER OF DAMAGES AND LIMITATION OF LIABILITY.** IN NO EVENT SHALL MUNTERS BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND ARISING FROM THE USE OF OR FAILURE TO USE THE PRODUCT(S), WHETHER IN CONTRACT, WARRANTY, TORT, NEGLIGENCE, STRICT LIABILITY OR OTHERWISE, INCLUDING BUT NOT LIMITED TO LOSS OF PROFITS OR REVENUE, LOSS OF USE OF PRODUCTS, DELAYS, OR CLAIMS OF CUSTOMERS OF PURCHASER OR OTHER THIRD PARTIES FOR SUCH OR OTHER DAMAGES. MUNTERS' LIABILITY ON ALL CLAIMS, WHETHER IN CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY, OR OTHERWISE FOR ANY LOSS OR DAMAGE ARISING OUT OF, OR CONNECTED WITH AN ORDER, OR FROM THE DESIGN OR MANUFACTURE OF PRODUCTS, SHALL IN NO CASE EXCEED THE PURCHASE PRICE.
- (11) **OWNERSHIP.** All sketches, drawings, designs, patterns, tools, dies, jigs, fixtures or any other special appliance relating an Order that is prepared by Munters shall remain Munters' sole and exclusive property and all rights therein, including but not limited to patent, copyright and trademark, are owned by Munters. Drawings, data and documents submitted to Purchaser by Munters are intended only to describe the scope of the Products and provide information for installation, use and maintenance of the Products supplied. As such, these documents are instruments of the services provided by Munters. They are neither intended or represented to be suitable for any party other than the Purchaser. Any reuse of any such drawings, data and documents without specific written authorization of Munters will subject the user to any and all remedies and proceedings as are available by law and in equity to protect Munters' rights under Federal, state and common law (including, but not limited to, copyright, patent, unfair competition and trade secrets and other reserved rights).
- (12) **NONCONFORMITY AND DEFECTS.** Munters shall not be responsible for any nonconformity or defect in or failure of a product that: (a) is created after such Product is delivered by Munters, including any nonconformity, defect or damage resulting from shipment or handling by the common carrier or from Purchaser's handling, maintenance or storage of such Product; (b) results from materials, specifications or designs provided by Purchaser; or (c) results from modifications to such Product by Purchaser or others.
- (13) **FORCE MAJEURE.** Munters shall not be liable for delays in delivery or failure to manufacture or deliver due to causes beyond its reasonable control, including, but not limited to, acts of God or nature, acts of Purchaser, acts of civil or military authority, fires, strikes, floods, epidemics, war, riot, embargoes, compliance with import or export regulations, delays in transportation or car shortages, defects or delays in the performance of its suppliers or subcontractors, or inability to obtain necessary labor, materials, components or manufacturing facilities. In the event of any such delay, the date of delivery shall be extended for a time period reasonably necessary to compensate for the delay.
- (14) **DEFAULT.** In the event that at any time Purchaser is in default under any terms of any Order arising out of this proposal or any other Order, Munters reserves the right to withhold manufacture or delivery and to cancel and terminate any or all Orders and to hold Purchaser liable for any damages and expense incurred by Munters. Munters also reserves the right to declare all charges and accounts to be immediately due and payable.
- (15) **CLERICAL ERRORS.** Munters reserves the right to correct clerical, arithmetical or stenographic errors or omissions in quotations, Order acknowledgements, invoices, or other documents.
- (16) **CHOICE OF LAW.** The validity and interpretation of these Conditions shall be governed by the laws of the State of New York, without reference to its choice of law principles. The application of the United Nations Convention on Contracts for the International Sale of Goods is expressly excluded.
- (17) **SAVINGS CLAUSE.** In the event any clause contained in these Conditions is declared invalid or unenforceable by any court of competent jurisdiction, all other clauses or parts contained in these Conditions shall remain in full force and effect and shall not be thereby affected.