SUBMITTAL REVIEW

SR-01

Project:	SRD Dehumidifier and CO2 Upgrades		
Project No:	2418	Date Received:	2024-12-20
Client:	SRD	Date Returned:	2025-01-14
Prime Contr:	N/A	Reviewed By:	Bryn Cubberley
Sub Contr:	N/A	Phone No:	778.700.1086
Items:	Dehumidifier (DH1) Submittal		

This review is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the Consultant approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same and such review shall not relieve the Contractor of his responsibility for meeting all requirements of the Construction and Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site for information that pertains solely to fabrication processes or to techniques of construction and installation and for the co-ordination of the work of all sub-trades.

☒ Reviewed
☐ Reviewed as Noted
☐ Revise & Resubmit
☐ Not Reviewed

Comments:

1. No comments.

END OF SUBMITTAL REVIEW

EI Solutions inc.

SUBMITTAL DOCUMENT

Client :
Strathcona Regional District
990 Cedar Street
Campbell River, BC V9W 7Z8
Tel. 250-830-6700

Date : December 20th, 2024
Project Number : 214023
Project Name : **Strathcona Rec Complex**
Location : Campbell River, BC
Contact : **EI Solutions Inc.**

Consultant :
Polar Engineering
722 Cormorant Street #300
Victoria, BC V8W 4A5
Tel. 778-700-1086

Jonathan Ruccolo
4621 Louis B. Mayer
Laval, Québec
Tel. 514-920-0021

COPIES: Electronic **Submitted for: Approval** ✓ **Acknowledgement** _____

EI Solutions Desiccant Dehumidifier:

- Product Model A35G (16 000 CFM)

Product Description:

- Double wall extruded aluminum cabinet construction with 1.5” expanded polystyrene foam
- Rain louver module for outside air intake
- 1940mm x 400mm desiccant wheel c/w motorized bypass damper
- 1100MBH direct-fired natural gas reactivation heater
- End supply air and Side C return air duct connections
- AC type direct-drive supply fan blower array c/w VFDs
- AC type direct-drive reactivation fan blower c/w VFD
- Modulating return air and outside air dampers
- Pleated MERV-8 process pre-filters c/w pressure transducer
- Empty section for future field installed post cooling coil complete with aluminum drain pan
- 575V/3Ph/60Hz single point power connection with NEMA 3R non-fused disconnect switch
- ALC microprocessor with BACnet MS/TP communication
- NEMA-4 electrical controls panel with integral HMI
- 120V convenience outlet on independent circuit (field installation and power by others)
- Reactivation air inlet temperature sensor
- Space mount Temperature/RH combo sensor (field installation by others)

Unit Physical & Electrical Characteristics			
Overall Dimensions	**Weight**	**FLA/MCA**	**Recommended Fuse Size**
306” L x 148” W x 130” H	11,050 lbs. +/- 10%	41.4 / 44.5	50A

EI Solutions inc.

Strathcona Gardens Rec Complex RBAA

A – Series (A35G)

Desiccant Dehumidifier

Technical Submittal

24-1202

EI Solutions Inc.
4621 Louis B. Mayer, Laval, Québec, H7P 6G5, Canada
Phone: (514) 920-0021
Version 0.2 - EI Solutions 24-1202 – December 20, 2024

Approval Return Sheet

Engineer / Contractor Submittal Review

[X] **Reviewed and Approved**

[ ] **Approved as noted, see attached comments.**

[ ] **Revise and resubmit, see attached comments.**

By: Bryn Cubberley, Polar Engineering

Date: 2025-01-12

Revisions

Version 0.1: Initial Release – 2024-12-19
Version 0.2: Revised Gas Capacity – 2024-12-20

1. Unit Summary Description

Merv 8 Supply Air Filters

1100 MBH Natural Gas Direct Fired Reactivation Heater

Desiccant Rotor

AC Centrifugal Backward Curved Supply Fan Array

Flat-Blade Backward Inclined Centrifugal Reactivation Fan

Post Cooling Coil Section Includes Aluminum Drain Pan Only

Insulated, Opposed Blade Aluminum Outdoor, Return, & Bypass Air Damper with Modulating Belimo Actuators

ALC Microprocessor Controller with Integral HMI

NEMA-4 Electrical Controls Panel

Mixed, Supply & Outdoor Air Temperature and Humidity Sensors

Reactivation Inlet Air NTC Type II Temperature Sensor

Reactivation Outlet Air NTC Type II Temperature Sensor

Reactivation Rotor Inlet RTD Sensor with Transmitter

Convenience Outlet (Wired by others, separate feed)

Temperature & Humidity Wall Mount Sensor (Shipped Loose)

2. Contacts

Jonathan Ruccolo
514-920-0021 ext. 204
jonathan.ruccolo@eisolutions.ca

3. Table of Contents

Contents

4. Equipment Schedule

DATA SHEET	A35G

DESCRIPTION
Desiccant Dehumidifier

AIR FLOW		
Supply Air Flow	16,000	CFM
Outside Air Flow	0 - 16,000	CFM
External Static Pressure	1.00	INCH WC.
Future Cooling Coil Pressure	0.75	INCH WC.
Total Static Pressure	6.05	INCH WC.

UNIT DIMENSIONS		
Base Frame Length	288	INCHES
Base Frame Width	116	INCHES
Base Frame Height	6	INCHES
Overall Length	306	INCHES
Overall Width	148.03	INCHES
Overall Height	130	INCHES
Estimated Weight (Dry)	11,050	LBS (+/-10%)
Construction	Extruded Aluminum & 1-1/2" Polyurethane Foam	

ELECTRICAL REQUIREMENTS		
Supply Voltage	575 / 3 / 60	V / PH / Hz
FLA	41.4	A
MCA	44.5	A
MOP	57.0	A
Power	41.2	kW
Recommended Fuse Size	50	A

CONNECTIONS	
Return Air Connection	28" x 78"
Supply Air Connection	48" x 34"
Gas Connection	1 " Ø

AIR FILTERS	
Process Air Filters	2" Pleated MERV 8
Filter Size	16" x 20" x 2"
Filter Quantity	18

SUPPLY FAN		
Type	AC Centrifugal Backward Curved Fan	
Manufacturer	Ziehl-Abegg	
Quantity	3	Pcs
Air Flow	5,333	CFM Each
Supply Voltage	460	VAC
Input Power	7.32	kW
Current Draw	12.5	Amps
Power Factor	1.0	
Speed	2,450	RPM

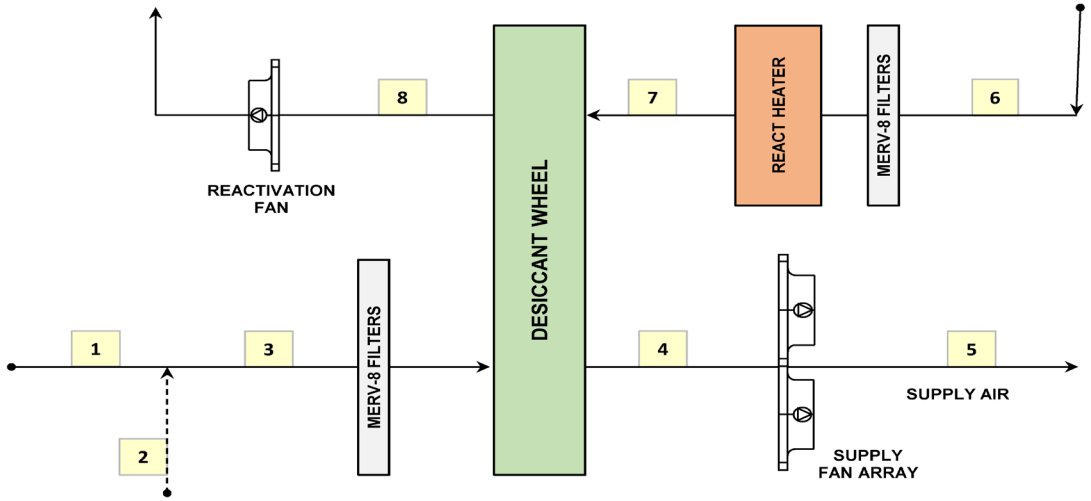
REACTIVATION FAN		
Type	Flat Blade Backward Inclined Centrifugal Fan, Direct Drive	
Quantity	1	
CFM	4,500	CFM
Voltage	575	VAC
Current Draw	8.1	AMPS
Power	10.0	HP
Power Factor	0.89	PF
Speed	3600	RPM
External Static Pressure	1.55	INCH WC.
Total Static Pressure	5.23	INCH WC.

DESICCANT WHEEL		
Size	1940	mm
Thickness	400	mm
Motor Power	0.12	kW
Supply Pressure Drop	2.50	INCH W.C.
React. Pressure Drop	2.51	INCH W.C.
Moisture Removal	497.14	LBS/HR

REACTIVATION HEATER		
Type	Direct Fired Burner, Nat. Gas	
Quantity	1	
Capacity	1100	MBH
Air Pressure Drop	0.68	IN W.C.
Gas Pressure	7 to 14	IN W.C
Turndown Ratio	26:1	
Electrical Rating	115V/6A	

5. Airflow Schematic

AIRFLOW SCHEMATIC

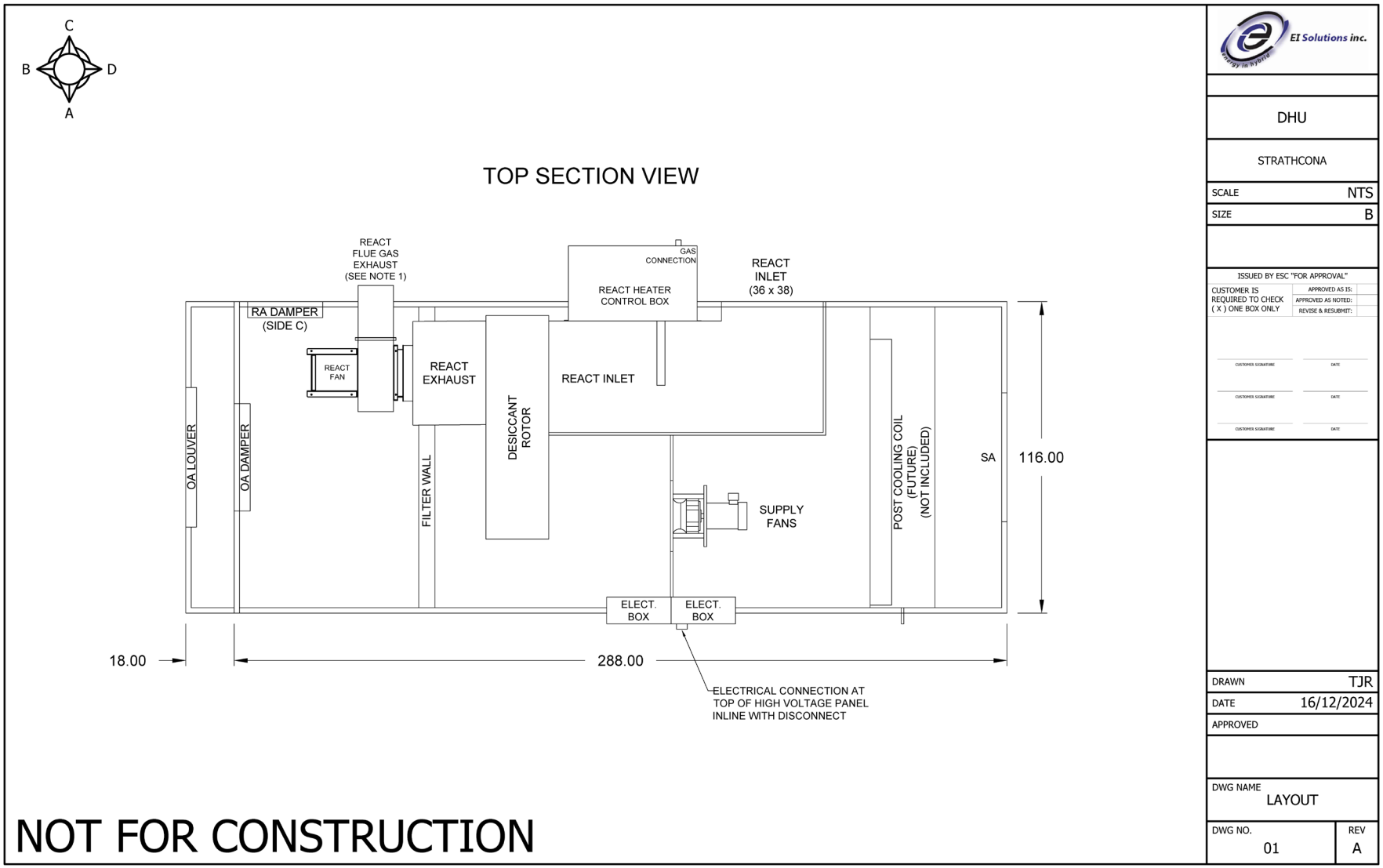


SIMULATION	AIRFLOW SCHEMATIC	FRESH AIR	RETURN AIR	MIXED AIR	WHEEL LVG.	SUPPLY AIR	OUTSIDE AIR	REACT ENT.	REACT LVG.
	POINT	1	2	3	4	5	6	7	8
RUN #1 FALL OPERATING CASE 100% RA	AIRFLOW (CFM)	0	16,000	16,000	16,000	16,000	4,500	4,500	4,500
	TEMP (°Fdb)	67	55	55	94	98	67	258	120
	HUMIDITY (gr/lb)	74	40.4	40.4	6	6	74	74	205
	CAPACITY (MBH)							928.3	
	PERFORMANCE	TOTAL MOISTURE REMOVAL (LBS/HR): 354				SPACE LATENT COOLING (LBS/HR): 354			

SIMULATION	AIRFLOW SCHEMATIC	FRESH AIR	RETURN AIR	MIXED AIR	WHEEL LVG.	SUPPLY AIR	OUTSIDE AIR	REACT ENT.	REACT LVG.
	POINT	1	2	3	4	5	6	7	8
RUN #2 FALL OPERATING CASE 75% OA	AIRFLOW (CFM)	12,000	4,000	16,000	16,000	16,000	4,500	4,500	4,500
	TEMP (°Fdb)	67	55	64	111	115	67	272	108
	HUMIDITY (gr/lb)	74	40.4	65.6	15	15	74	74	253
	CAPACITY (MBH)							996.3	
	PERFORMANCE	TOTAL MOISTURE REMOVAL (LBS/HR): 520				SPACE LATENT COOLING (LBS/HR): 261			

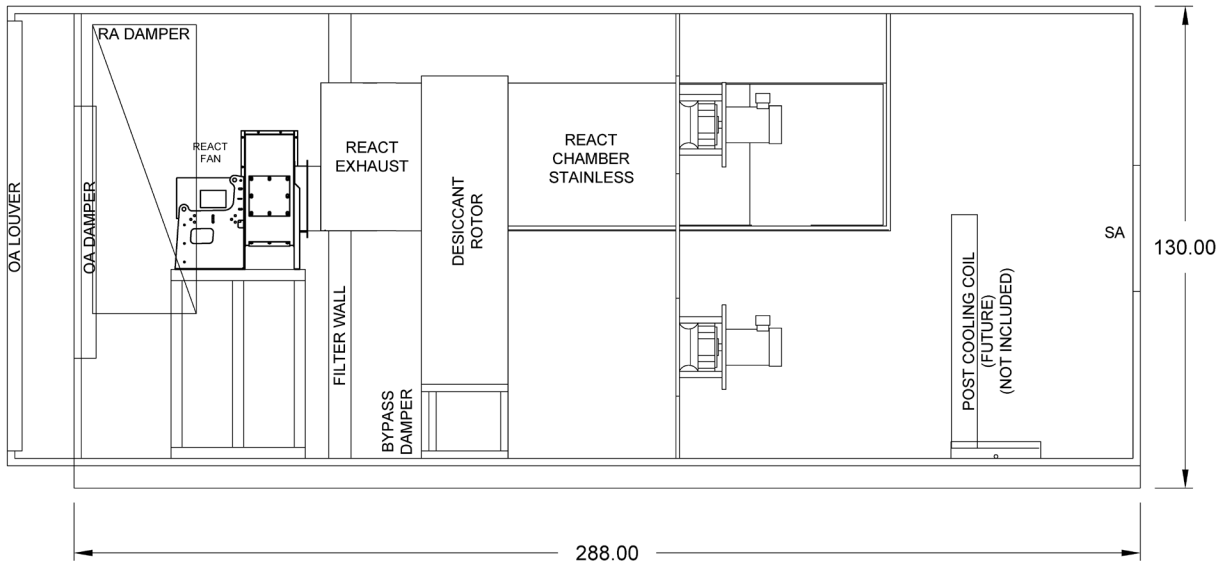
MODEL:	PROJECT NAME:	Prepared by: EI Solutions	Page: 1 of 1
A35G	Strathcona Gardens Rec. Complex (RBAA)	Date: 2024-12-06	Rev: 0

6. Unit Drawings



C
B D
A

SIDE A SECTION VIEW



NOT FOR CONSTRUCTION

EI Solutions inc.

DHU

STRATHCONA

SCALE NTS

SIZE B

ISSUED BY ESC "FOR APPROVAL"

CUSTOMER IS REQUIRED TO CHECK (X) ONE BOX ONLY

APPROVED AS IS:

APPROVED AS NOTED:

REVISE & RESUBMIT:

CUSTOMER SIGNATURE DATE

CUSTOMER SIGNATURE DATE

CUSTOMER SIGNATURE DATE

DRAWN TJR

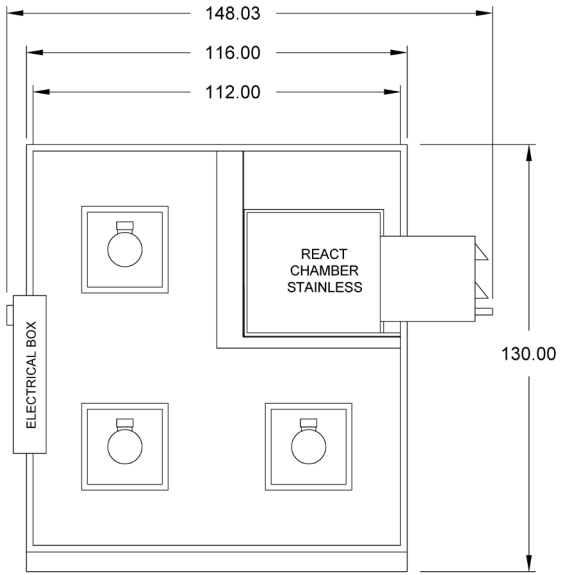
DATE 16/12/2024

APPROVED

DWG NAME LAYOUT

DWG NO. 02

REV A



NOT FOR CONSTRUCTION

EI Solutions inc.

DHU

STRATHCONA

SCALE NTS

SIZE B

ISSUED BY ESC "FOR APPROVAL."

CUSTOMER IS REQUIRED TO CHECK (X) ONE BOX ONLY

APPROVED AS IS:

APPROVED AS NOTED:

REVISE & RESUBMIT:

CUSTOMER SIGNATURE DATE

CUSTOMER SIGNATURE DATE

CUSTOMER SIGNATURE DATE

DRAWN TJR

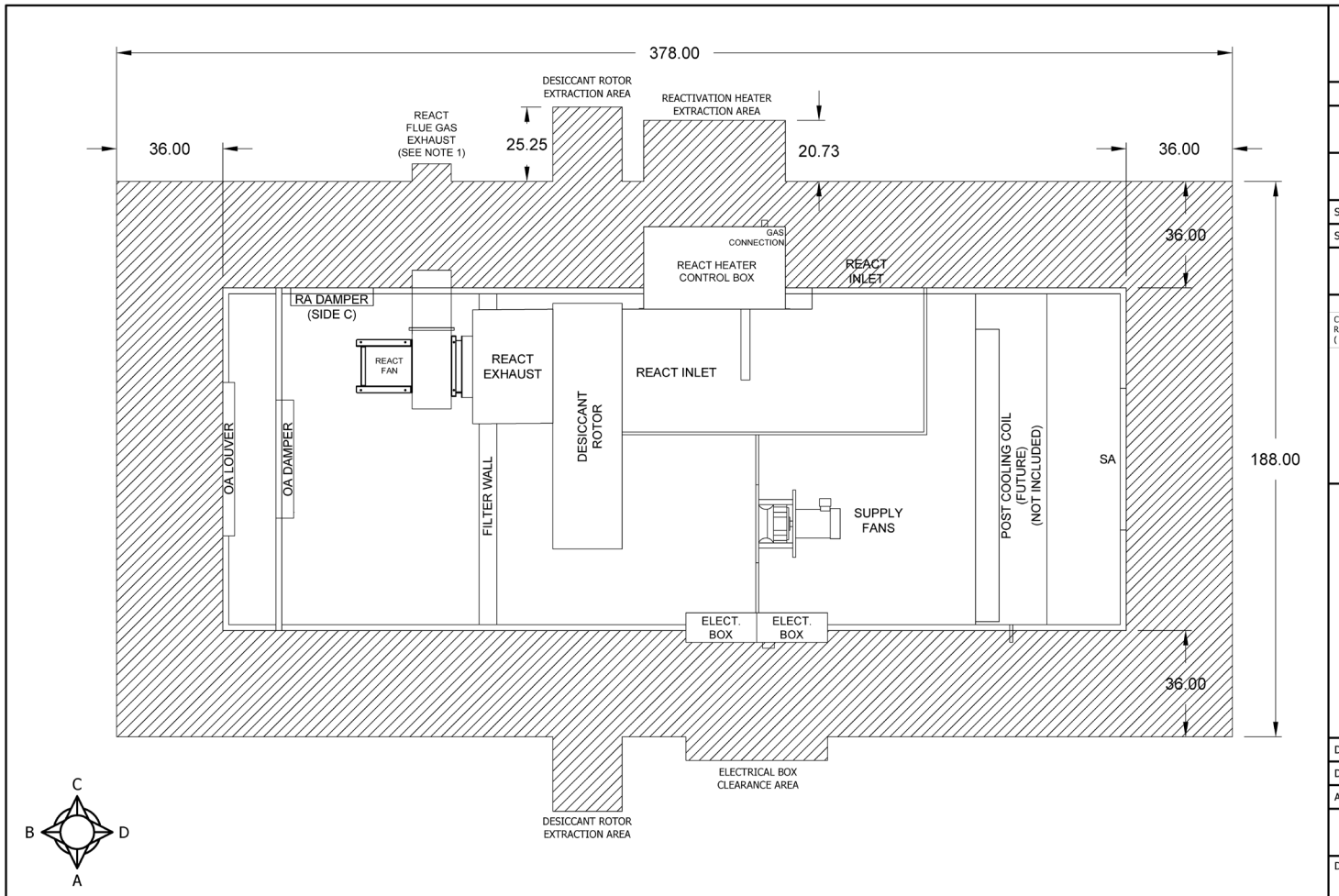
DATE 16/12/2024

APPROVED

DWG NAME LAYOUT

DWG NO. 03

REV A


378.00
36.00
REACT FLUE GAS EXHAUST (SEE NOTE 1)
DESICCANT ROTOR EXTRACTION AREA
25.25
REACTIVATION HEATER EXTRACTION AREA
20.73
36.00
36.00
GAS CONNECTION
REACT HEATER CONTROL BOX
REACT INLET
RA DAMPER (SIDE C)
REACT FAN
REACT EXHAUST
REACT INLET
DESICCANT ROTOR
OA LOUVER
OA DAMPER
FILTER WALL
SUPPLY FANS
POST COOLING COIL (FUTURE) (NOT INCLUDED)
SA
188.00
ELECT. BOX
ELECT. BOX
36.00
ELECTRICAL BOX CLEARANCE AREA
DESICCANT ROTOR EXTRACTION AREA
C
B
D
A
NOT FOR CONSTRUCTION
NOTES:
1. SEE APPLICABLE GAS CODE FOR FLUE GAS CLEARANCES
EI Solutions inc.
DHU
STRATHCONA
SCALE NTS
SIZE B
ISSUED BY ESC "FOR APPROVAL"
CUSTOMER IS REQUIRED TO CHECK (X) ONE BOX ONLY
APPROVED AS IS:
APPROVED AS NOTED:
REVISE & RESUBMIT:
CUSTOMER SIGNATURE
DATE
DRAWN TJR
DATE 16/12/2024
APPROVED
DWG NAME CLEARANCE
DWG NO. 04
REV A

7. General Engineering Data for A-Series Desiccant

a) General

Air handler (AHU) manufacturer, registered under ISO 9001- 2015. Guaranteed to meet performance specification. Units are available for indoor or outdoor and designed for year-round operation.

Virtual or on-site start-up required to meet warranty requirements. Turn-key AHU units are sent to site pre-assembled, and factory tested. They will include all components required to control humidity levels, independent of fluctuating load conditions, within design limits.

The connection of utilities, ductwork, remote sensors and/or controllers by others. Space humidity set point is self-regulated by staged control of the honeycomb dehumidification rotor's metal silicate substrate. Reactivation heat source shall be in the form of a modulating direct-fired gas burner, steam or electric; automatically cycling off during low humidity conditions to minimize energy consumption.

b) Cabinet

AHUs are fabricated with high strength 6063 T5 Light Weight Aluminum extrusions, with a white powder coat finish and exceptional corrosion resistivity. The structural integrity is of light weight insulated composite panels composed of an insulated foam core laminated between two sheets of powder coated white aluminum. The doors are also made with the same using foam core insulated composite panels with high pressure rubber gasket seals.

All of the Aluminum is purchased with a minimum 60% recycled content (48% Pre-Consumer Content & 12% Post Consumer Content) with recovered raw materials that are received from regional suppliers. All excess drop materials that naturally occur in the manufacturing process are recycled locally. This should allow for LEED credits. All major joints and the perimeter are caulked with non-silicone caulking. Outdoor AHU roofs shall be built with rain guards and an EPDM rubber membrane. Temperature and pressure testing ports are located on the outside of the unit. AHU door hinges have a pressure relief mechanism for added safety.

c) Base

AHU structural bases are constructed in house of continuously welded heavy gauge (0.188) Extruded Aluminum tubing - Made here in Canada – provided for the base perimeter, reinforcing ribs, and all joints. The base is further constructed with Integrated balanced lifting points for ease of installation.

d) Filters

Pre-Filters

The AHU pre-filters are MERV 8, which provide 30% filtration. Filters comply with ASHRAE standard 52.2. Filter racks are arranged for ease of servicing. Filter pressure differential switches are standard, with optional differential pressure transducers available at extra cost.

e) Fans

The unit shall be equipped with supply, reactivation, and optional condenser fans to provide the scheduled airflows as indicated. Supply fans shall be direct drive, backward curved, single intake AC centrifugal fans. Reactivation fan shall be a single width, single inlet, direct drive, designed with either a cast aluminum backward curved wheel or cast aluminum radial bladed wheel. In optional air-cooled condenser add-on, condenser fan shall be an EC axial fan featuring a guard grill.

f) Dampers & Louvers

The dampers are built with extruded aluminum, utilizing opposed blade design for even distribution of airflow; including low pressure drop and leakage rating in accordance with AMCA Standard 500-D-98. All dampers are of insulated damper blade type.

The drainable stormproof louvers are available and will have a depth of 4", made with extruded aluminum and with a galvanized bird screen.

g) Control

Equipped with industry leading HVAC control components and sensors resulting in accurate control. Refer to standard sequence of operation for more control details. Site or application specific controls and interface can be provided as necessary. If you prefer to have a partnered control system provider's equipment inside the AHU, please contact us for more information.

Human Machine Interfaces (HMIs) in the AHU and additional remote HMIs can be provided as an option, allowing maintenance staff to have quick and intuitive access of the information and alerts. The sensor suite includes air volume measurement of the supply fan, temperature, and dewpoint readings for humidity monitoring of the room and supply conditions. Filter switches included monitor loading; optional filter transducer can be selected. Internal data transfer uses serial Modbus communications to pass copious amounts of data between the controller and its peripherals. The controller can communicate with third party devices over Modbus RTU and TCP, or BACnet MSTP and IP, to access AHU data.

(For a list of available sensors, refer to the manufacturers' manuals)

h) Electrical

The AHU has a non-fused, main power disconnect, mounted to the high voltage panel, and engaged by an operating mechanism on the panel cover. The unit shall be equipped with thermal overload protection. The entire unit is factory wired in accordance with Canadian Electrical Code. The unit is ESA certified prior to shipping. A single high voltage power connection shall be required for all units. All electrical panel and peripheral devices are suitable for indoor or outdoor application, as per site requirement.

i) Desiccant Rotor Dehumidifier

The unit shall be equipped with a desiccant rotor and cassette. Ideal for optimum humidity control, where efficient dehumidifying is critical with an operating range of 0 to 100% relative humidity. Made of metal silicate synthesized in-situ glass fiber substrate, as the desiccant/adsorbent. The net organic compounds in the honeycomb media shall not exceed 2%. Benefits include water washable, incombustible, high mechanical strength in honeycomb matrix to endure stressful thermal cycling, no-acid constructed matrix (pH neutral), stainless steel construction of rim with integral rolled flange resulting in high corrosion resistance and increased longevity in moisture rich environments. The energy efficient design eliminates matrix burn-off/sintering. The rotors and cassettes are UL certified and produced in ISO 14001:2004 (Environmental Management System Standard) and ISO 9001:2008 (Quality Management System Standard) certified facility.

j) Direct-Fired Reactivation Burner

The AHU is equipped with a direct fired (DF) gas burner. Meeting ANSI Z83.4/ CSA 3.7 standard, for "Non-Recirculating Direct Gas-Fired Heating and Forced Ventilation Appliances for Commercial and Industrial Application". The DF reactivation burner will be in accordance with the National Fuel Gas Code ANSI Z223.1 (NFPA 54) in the United States and Can/CGA-B149 installation Code in Canada. The reactivation module shall provide 100% efficiency of combustion, minimum thermal efficiency of 92%, stainless-steel burner with aluminum burner head casting. The heat module shall employ, gas burners, with integral carryovers, improved turndown ratio with modulating controls, burner circulating air pressure switch to prove air supply for combustion and operation, flame safeguard of gas burner with integral flame sensing, burner ignition via intermittent pilot, listed gas valves (electric safety shut off valve, etc.), automatic reset type high limit switch, Class II step down transformer, test gauge in the gas train, union fitting to facilitate installation and service.

I) Installation Consideration & Minimum Requirements

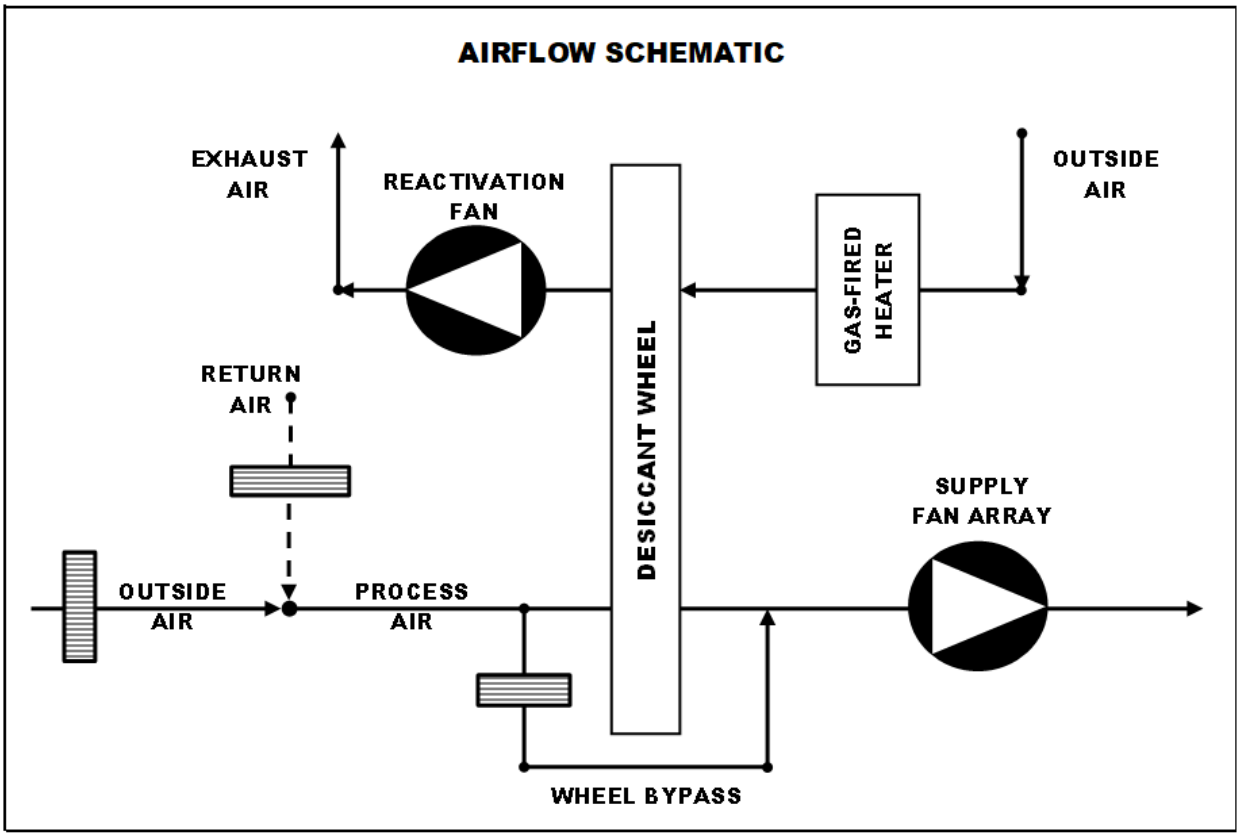
AHU is recommended to be 6" off a concrete pad or floor. Units elevated more than 2 ft off the ground from bottom of the base rail would be ideal to have a permanent work platform with fixed ladder access.

Minimum one meter away from all sides. Ducts must be seal and insulated. All clearances for combustion equipment must follow local jurisdiction. Electrical and gas must be installed as per local jurisdictional codes and standards. All trades must adhere to local jurisdictional codes and laws.

8. Gas-Fired Desiccant Ice Rink Application Unit Control Sequence

SECTION 1: SYSTEM OVERVIEW

The EI Solutions A-Series units are designed to provide an efficient way to control space conditions within an ice rink. The typical space temperatures in ice arenas range between 55°F (12.8°C) to 65°F (18.3°C). Consequently, to provide first-rate ice quality and mitigate any moisture related issues such as fogging and condensation, the humidity level in the space must be maintained between 36°F (2.2°C) to 42°F (5.5°C) dew point.



Two (2) separate air streams are integrated into the A-Series units:

1) **Process** – process (supply) air is a blend of outside and return air that is conditioned and then delivered to the space. The process airstream consists of a desiccant wheel and a process supply fan array.
2) **Reactivation** – the reactivation airstream uses heated outside air to reactivate the desiccant wheel. The reactivation circuit consists of a direct gas-fired heater, desiccant wheel and a reactivation fan.

On a call for dehumidification, the supply fan is energized to draw a blend of outside air and return air from the rink through the desiccant wheel. The desiccant wheel drive motor is energized to rotate the wheel through the process and reactivation air streams at a rate of 8 revolutions per hour. The desiccant draws water vapor from the **process** air stream which is then returned to the rink space at a very low humidity ratio.

During dehumidification mode, the desiccant wheel is continuously regenerated with a separate **reactivation** air stream. Outdoor air is heated by a direct-fire natural gas heater, the heater modulates to maintain the reactivation outlet temperature setpoint (default = 120°F) ensuring the desiccant wheel is thoroughly regenerated. The heated reactivation air drives the moisture from the desiccant and is discharged to the atmosphere.

The dehumidification process is continuous as the desiccant wheel rotates through the supply and reactivation streams. When the rink humidity returns to its control set point, the dehumidifier is de-energized. Unless there is a call for space dehumidification, the desiccant wheel bypass damper remains 100% open to decrease the system air pressure drop and thereby reduce fan motor energy while maintaining the design supply air volume flow rate.

A **H**uman-**M**achine **I**nterface (**HMI**) is a user-interface that connects the building operator to the unit controller (microprocessor). The A-Series dehumidifier is designed with a touch-screen HMI which is mounted directly within the dehumidification unit to provide local access to review unit performance and operational status. The HMI display allows the building operators to view and modify manufacturer-defined parameters without any computer software.

The unit microprocessor is native BACnet and has BACnet MS/TP protocol capability (IP protocol optional) for integration with a **B**uilding **M**anagement **S**ystem (**BMS**). The unit microprocessor monitors and communicates all appropriate indoor and outdoor conditions, system operation and performance along with both Critical (unit SHUTDOWN) and Non-Critical (unit continues OPERATION) alarms.

SECTION 2: UNIT OPERATION

2.1 Unit Command

The unit has an enable command in the HMI;

1. **On** – the supply fan remains operational at all times and the unit will operate to maintain acceptable indoor air quality and space temperature and humidity levels.
2. **Off** – the unit is disabled and is not permitted to operate even if the space conditions are not satisfied.
3. **Auto (**Supply Fan Duty-Cycle) – upon call for either ventilation, dehumidification, and/or cooling, the supply fan is energized and the unit operates to achieve the space control setpoint(s). Once the control setpoint is satisfied, the supply fan is de-energized.

When the unit is enabled, the supply fan is energized and once process airflow is confirmed via the airflow proving switch, the unit microprocessor status will switch from "*STARTING*" to "*NORMAL*" which will allow the unit to fully-operate to maintain required space conditions. The airflow proving switch must be closed within 2-minutes after the supply fan is energized. Otherwise, the supply fan is de-energized and remains OFF for 2-minutes before the starting sequence is re-initiated. The unit microprocessor will attempt three (3) restarts before the unit is shutdown with a supply airflow lockout alarm.

There are two methods to control the unit:

a) Direct feedback (hard-wired space sensors to unit microprocessor)

Option 1 – Space Sensors (Temp/RH/calculated DP)

Option 2 – Return Air Sensors (Temp/RH/calculated DP)

b) BMS values (space conditions via BACnet interface)

The BMS can enable the unit, provide space condition feedback, monitor unit operation and modify user-adjustable setpoints described in Section 4 of this document.

2.2 Outside & Return Air Dampers

The unit will have an adjustable point to set the minimum value for the outside air damper position. When IAQ sensor levels climb above any of their respective space setpoints, the OA dampers will modulate between the minimum and fully-open position.

The dampers are controlled and prioritized by selecting the maximum signal from each of the following PID loops:

a) IAQ Mode – When IAQ levels increase above the setpoints, the outdoor air dampers begin to modulate open and the return dampers modulate proportionally close. As IAQ levels decrease below setpoints, the sequence is reversed.

b) Economizer Mode – When there is a call for Space Cooling only and the outdoor dry-bulb temperature is below the space cooling setpoint, then the outside air and return air damper positions are modulated between the minimum outside air position and fully open outside air position in order to provide outside air for "*free*" space cooling.

i. Economizer – Space Cooling

The outside air and return air dampers are modulated between the minimum outside air position and fully open outside air position to maintain the economizer supply air cooling temperature setpoint (default = 53°F).

2.3 Dehumidification

The space dew point temperature is calculated by the unit microprocessor based upon feedback from the space dry-bulb temperature and relative humidity sensors. When the space dew point temperature climbs above the space dew point setpoint, the dehumidification mode within the unit is energized. When the dehumidification mode is initiated, the supply fan, the desiccant wheel and reactivation fan are energized.

The dehumidification process is continuous as the desiccant wheel rotates through the supply and reactivation streams. The direct-fire natural gas heater modulates to maintain the reactivation outlet temperature setpoint (factory default = 120°F). Unless there is a call for space dehumidification, the desiccant wheel bypass damper remains 100% open to decrease the system air pressure drop and thereby reduce fan motor energy while maintaining supply air volume flow rate.

The dehumidification mode is de-energized when the space dew point temperature setpoint (default = 39°Fdp) minus the dew point dead-band value (default = 2°F) is achieved. For example, if the space dew point setpoint is 39°F, then the dehumidification mode is energized when the space climbs above 39°Fdp and will continue to operate until the space dew point temperature is lowered to 37°Fdp (space setpoint minus dead-band).

Turbo Mode

If the desiccant unit if not able to achieve the space dew point set point within 1 hour of operation (adjustable), the reactivation outlet temperature setpoint is set to 135°F (adjustable). When the space dew point set point minus the dew point dead-band value is achieved, the dehumidification cycle is disabled. If the dehumidification cycle is enabled again, the reactivation outlet temperature set point is reset to the default value of 120°F.

2.4 Cooling (Future Field Installed Chilled Water Coil)

Upon a rise in space temperature above the space temperature cooling setpoint, the chilled water post-cooling is energized. The desiccant unit microprocessor shall send a modulating control signal to the chilled water cooling coil's fluid flow control valve to maintain a user-adjustable supply air cooling temperature setpoint (default = 53°F).

Cooling is allowed to run at the same time as dehumidification.

The cooling mode is de-energized when the space cooling temperature setpoint (default = 65°F) minus the cooling mode dead-band value (default = 2°F) is achieved. For example, if the space cooling setpoint is 65°F, then the cooling mode is energized when the space temperature rises above 65°F and will continue to operate until the space temperature is lowered to 63°F (space setpoint minus dead-band).

SECTION 3: INDIVIDUAL COMPONENT REVIEW

The following section describes the function of the critical components within the desiccant dehumidification unit.

3.1 Desiccant Wheel, Reactivation Heat and Reactivation Fan

Principle – The operation of a HoneyCombe dehumidifier is based on the principle of adsorption by which a desiccant removes water vapor directly from the air. When the air to be dried passes through the HoneyCombe wheel, the desiccant removes the water vapor directly from the air and holds it while the wheel rotates. As the moisture-laden desiccant passes through the reactivation sector, the water vapor is transferred to a heated air stream which is exhausted to the outdoors. The process is continuous, allowing for uninterrupted dehumidification.

Sequence – On a call for dehumidification, the desiccant wheel drive motor is energized to rotate the wheel through the process and reactivation air streams at a rate of 8 revolutions per hour. The supply fan is energized to draw a blend of outside air and return air from the rink through the desiccant wheel. The desiccant draws water vapor from the process air stream which is then returned to the rink space at a very low humidity ratio. The reactivation circuit, which consists of a constant speed reactivation fan and heater, is energized to draw heated outside air through the desiccant wheel. A direct-fire natural gas heater modulates to maintain the reactivation outlet temperature setpoint (factory default = 120°F).

3.2 ECM Supply Fan Array

When the unit is enabled, the supply fan array is energized and once process airflow is confirmed via the airflow proving switch, the unit microprocessor will then allow the unit to fully-operate in order to maintain acceptable indoor air quality, space temperature and humidity. The airflow proving switch must be closed within 2-minutes after the supply fan is energized. Otherwise, the supply fan is de-energized and remains OFF for 2-minutes before the sequence is re-initiated. The unit microprocessor will attempt three (3) restarts before the unit is shutdown in supply airflow lockout alarm. The alarm must be acknowledged and reset by the building operators in order to restart the unit.

The ECM supply fan array control is designed to deliver a constant process airflow rate to the space. The supply fan has two setpoint values that require adjustment during start-up at the

HMI by the air-balancing technician to provide the design airflow rate while the unit is operating in either dehumidification or non-dehumidification mode (wheel bypass). The unit shall have two sets of supply fan speed values to adjust the unit supply airflow (high / low).

Default Supply Fan Speed Settings

- DH On / DH Off = 8,000 CFM Supply Airflow (Low Setting)
- DH On / DH Off = 16,000 CFM Supply Airflow (High Setting)

3.3 Process Post-Cooling (Future Field Installed Chilled Water Coil)

Upon a call for space cooling, the chilled water cooling coil's fluid flow control valve modulates to maintain the supply air cooling temperature setpoint (default = 53°F). The supply air temperature cooling setpoint is defined by the building operators or BMS.

SECTION 4: USER ADJUSTABLE SETPOINTS

The principal user adjustable setpoints are described in this section. **WARNING** – Other factory default operating parameters not listed below can also be adjusted via the HMI display but it is strongly recommended that these variables only be modified by fully-qualified and fully-trained technicians familiar with the operation of these units. Failure to comply may cause premature breakdown of equipment components which will not be covered under warranty.

4.1 Minimum Outside Air Damper Position

Unit will have an adjustable minimum outside air damper position setpoint (default = 0%). When IAQ levels increase above the setpoints, the outdoor air dampers begin to modulate open and the return dampers modulate proportionally close. As IAQ levels decrease below setpoints, the sequence is reversed.

4.2 Space Dew Point Temperature

The default space dew point temperature setpoint is 39°F.

The unit will continue to dehumidify in favor of the space dew point temperature setpoint minus dead-band (default = 2°F). For instance, if the space dew point setpoint is 39°F, then the dehumidification mode is energized when the space climbs above 39°Fdp and will continue to operate until the space dew point temperature is lowered to 37°Fdp (space setpoint minus dead-band).

4.3 Space Cooling and Supply Air Cooling Temperature

The default space cooling temperature setpoint is 65°F and the default supply air cooling temperature setpoint is 53°F.

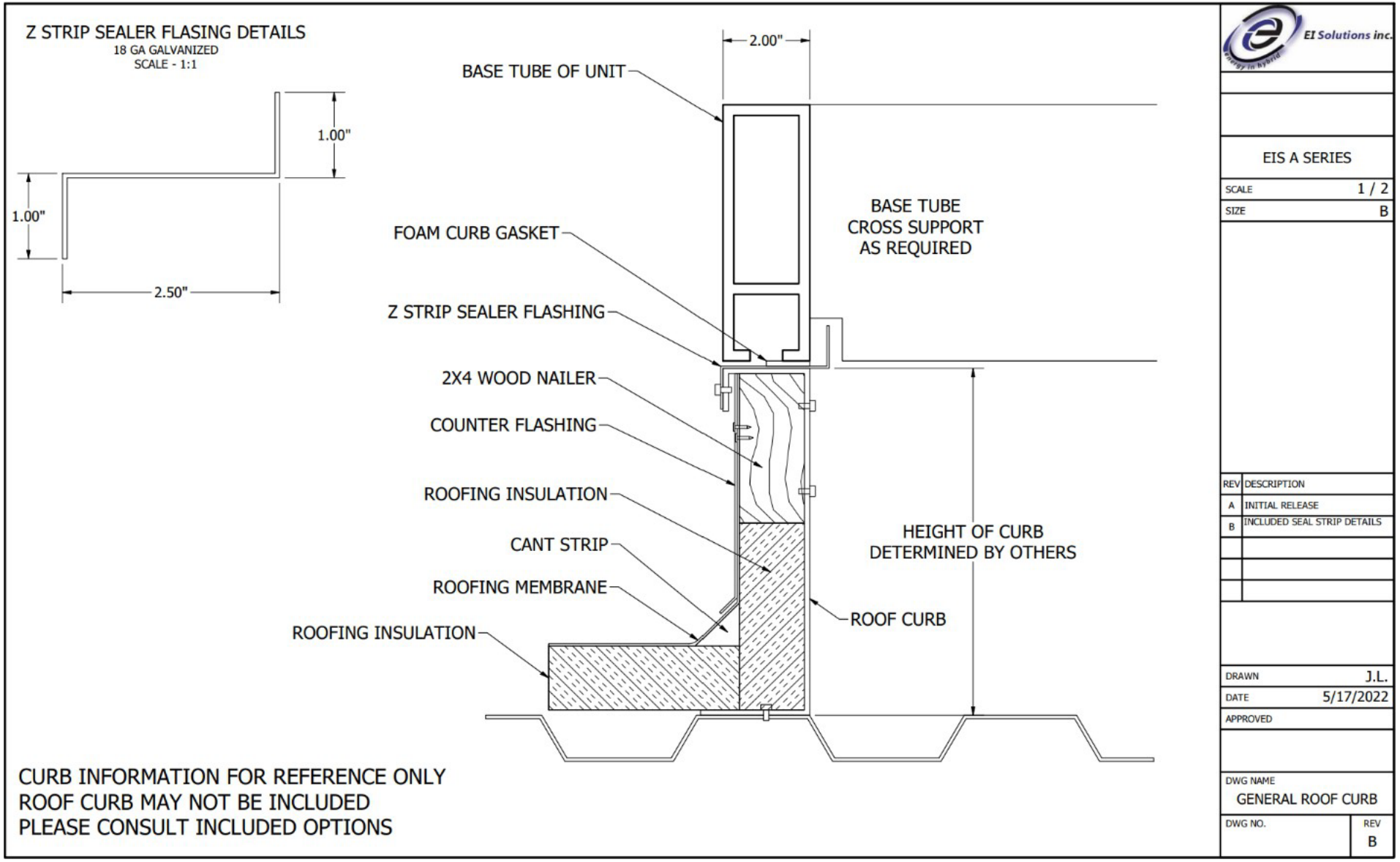
The unit will continue cooling in favor of the space cooling setpoint minus dead-band (default = 2°F). For instance, if the space cooling setpoint is 65°F, then the cooling mode is energized when the space temperature rises above 65°F and will continue to operate until the space temperature is lowered to 63°F (space setpoint minus dead-band).

4.4 Space IAQ Setpoints

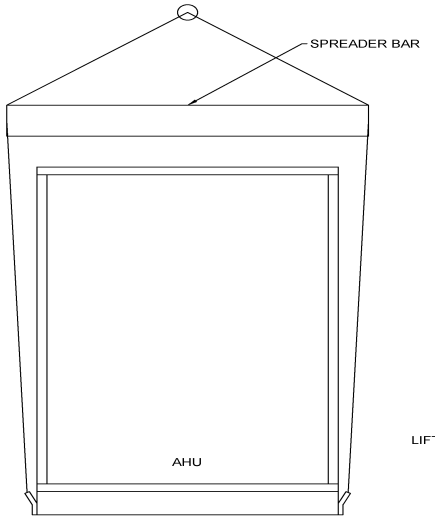
The unit outdoor and return air dampers will modulate to maintain acceptable indoor air quality based upon the space contaminant level setpoints. Factory default set points for optional space IAQ levels are defined below:

- Carbon Monoxide (CO) = 30 ppm
- Carbon Dioxide (CO2) = 1200 ppm
- Nitrogen Dioxide (NO2) = 0.2 ppm

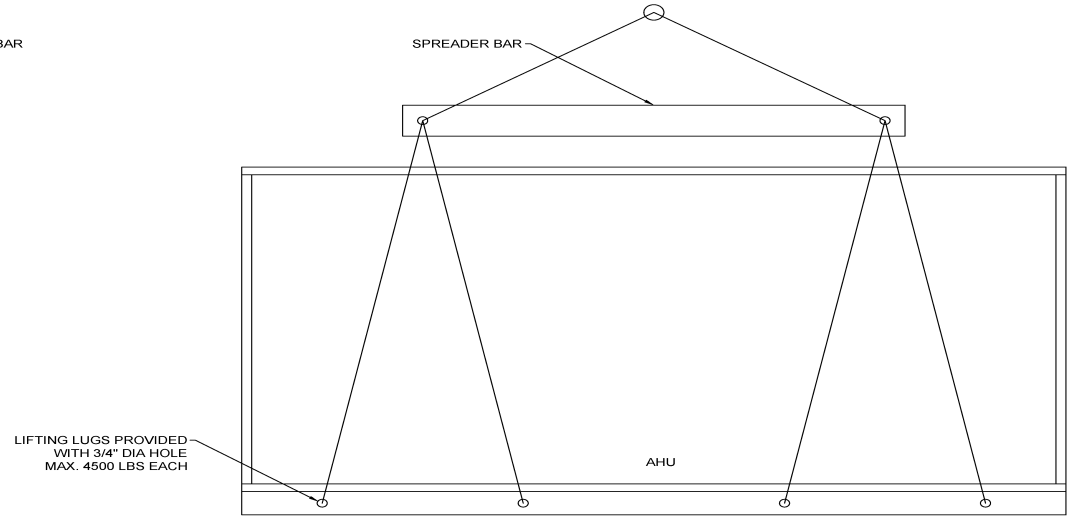
9. Roof Curb Details



10. Rigging Details



RIGGING DETAIL WILL VARY DEPENDING ON DIMENSIONS AND WEIGHT OF UNIT.
SEE EQUIPMENT SCHEDULE FOR UNIT DIMENSIONS AND WEIGHT.



RIGGING DETAIL FOR REFERENCE ONLY

RIGGING TO AVOID CONTACT WITH ALL EQUIPMENT AND
HARDWARE PROTRUSIONS TO REDUCE RISK OF DAMAGE TO UNIT,
PROVIDE PADDING IF UNAVOIDABLE.

11. Component Details

a) Wall Panel Data Sheet

NUDO®
A VERZATEC COMPANY

Technical Data

Nudo AlumaFoam

Nudo AlumaFoam Technical Data

Nudo AlumaFoam panels are insulated composite panels, primarily used within a frame or extrusion. The panels are composed of an insulating foam core laminated between sheet aluminum on the inside and outside of the panel. The aluminum surface may be either embossed or smooth. An EPS (expanded polystyrene) foam is the standard insulating core. Nudo AlumaFoam has a polyester paint finish, available in several standard colors.

Physical Properties: Table 1

Item	Nominal Panel Thickness	Nominal Panel Weight	Color	Size
SN3F94-12-D-PF2-MG WHITE	1"	1.08# psf	Medium Gloss White	4'X12'
SN3F144-12-D-PF2-MG WHITE	1.5"	1.21# psf		

Physical Properties: Table 2 (Typical Foam Core Properties)

Type of Foam	Characteristics	R-Value Per Inch	Density
Expanded Polystyrene (EPS)	Lightweight	5.26	3#

Typical Applications: Nudo AlumaFoam is an interior panel primarily used as a wall or ceiling panel.

Features: The polyester paint finish comes in several standard colors. The polyester paint finish is protected by a film that pulls away when ready for use. The foam substrate offers insulation properties to the panel that exceed that of other substrates.

Tolerances:

- Thickness: +/- 1/16"
- Width: +0", - 1/8"
- Length: +0", - 1/8"
- Squareness: +/-1/4"

Storage: Nudo AlumaFoam Panels should always be stored flat on a smooth surface above the ground. A pallet with a smooth piece of plywood beneath the panels is best to avoid any warping or waviness. As with most building products, it is best to acclimate the panel on site 48 hours before installation. Although the panels are moisture resistant, be sure panels are kept dry prior to installation to ensure water is not trapped under the protective film.

Handling: Although AlumaFoam panels are rigid and have good impact resistance, the aluminum faces can be scratched or dented if not handled properly. Do not drop or bump the panel on its edges as this may cause unwanted bending of the aluminum. Do not slide the panel edges or face over rough surfaces that may cause bending or scratching. Pick panels up when handling as compared to sliding panels across each other. Sliding panels may cause scratches on one or both faces.

Optimization: When performing panel optimizations for the purpose of cutting panels to size, always check to ensure if the surface finish is "directional". Some finishes require the panels to be installed so all panel surfaces run the same direction.

RESPONSIVENESS CONSISTENCY SOLUTIONS

NUDO® ● 1500 Taylor Avenue Springfield, Illinois 62703 ● 800-826-4132

NUDO®
A VERZATEC COMPANY

Technical Data

Nudo AlumaFoam

Fabrication: Use protective eyewear such as goggles or safety glasses, cover your nose and mouth with a filter mask when cutting Nudo AlumaFoam Panels.

- Always position the panel so the saw blades enter the exterior side first to avoid chipping and damage.
- Cutting: Use a circular saw with a 72-tooth carbide tipped blade.

Cleaning & Maintenance: The Nudo AlumaFoam panel requires almost no maintenance. If the surface does need to be cleaned, use a mild cleaning detergent with water.

RESPONSIVENESS CONSISTENCY SOLUTIONS

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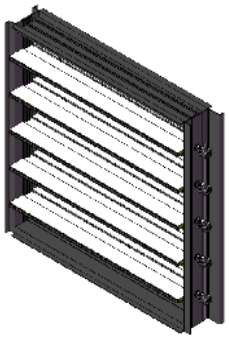
b) Damper Data Sheet

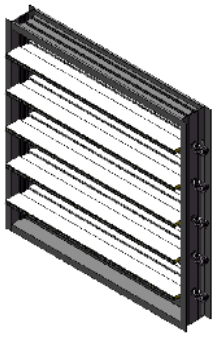
ALUMAVENT
CONTROL DAMPERS & FIRE DAMPERS

3900 SERIES
INSULATED CONTROL DAMPERS
3960 | 3961 | 3965

3960
Duct-Mount



3961 Quick 'N' Stall
Duct-Mount



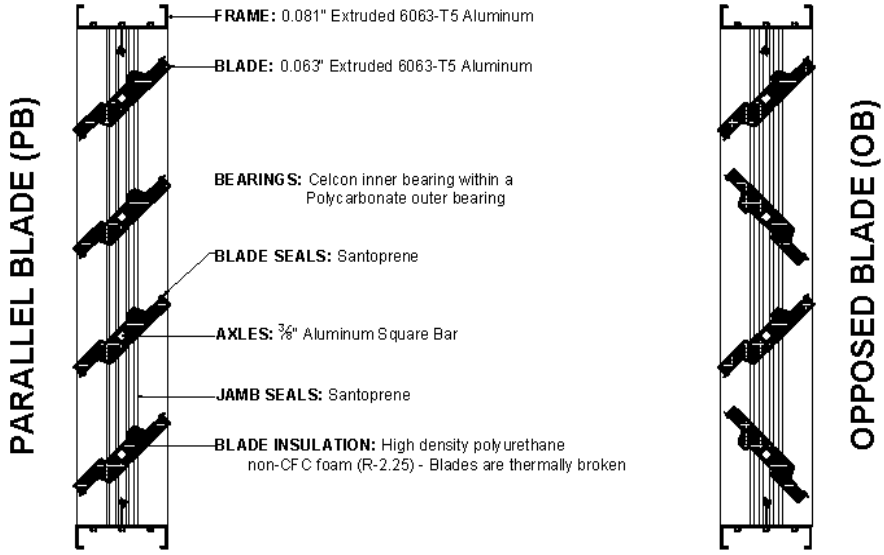
3965
Flanged-to-Duct

STANDARD CONSTRUCTION

Depth: 4" *(101 mm)* – 3960/3965
5.25" *(133 mm)* – 3961
Depth with Blades Open: 6.125" *(156 mm)*
Minimum Height: 8" *(203 mm)* - Single Blade
15" *(381 mm)* - Multiple Blade
Maximum Panel Width: 48" *(1219 mm)*
Maximum Panel Height: 60" *(1524 mm)*
Maximum Panel Size: 20 Sq.Ft.
Maximum System Pressure: 4" w.g. *(1 kPa)*
Operating Temperature Range: -40° to +180° F
Standard Finish: Mill
Standard Motor Installation: 6" Side Shaft Direct Drive
Linkage: Concealed in Frame (3960/3961)
Outside of Frame (3965)

AVAILABLE ACCESSORIES

- **Factory Supplied/Installed Actuators**
- **End Switch for signaling peripheral devices**
- **Jack Shaft**
- **Hand Quadrants**
- **Chain Operation for manual operation spring closed**
- **Silicone Blade and Jamb Seals – Specify 3900SI**
- **Salt Water Construction – Specify 3900SW**
- **Available finish: Clear Anodized**
- **Frame Insulation: Polystyrene Insulation**



DWG. 3960-3961-3965 JAN 2020

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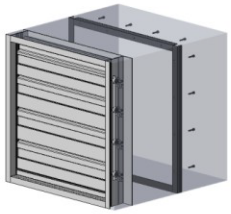
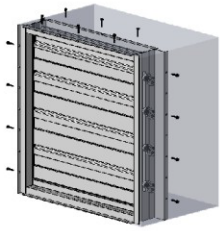
ALUMAVENT
CONTROL DAMPERS & FIRE DAMPERS

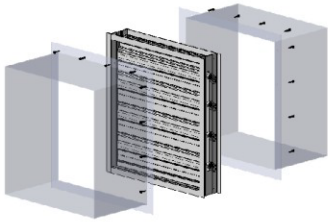
3900 SERIES
INSULATED CONTROL DAMPERS
3960 | 3961 | 3965



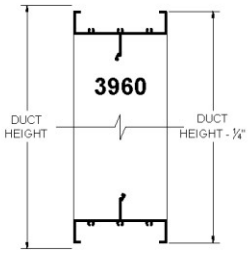
3960 – Duct-Mount

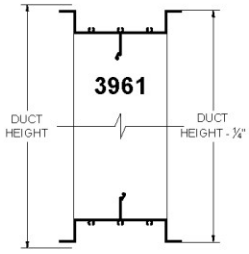


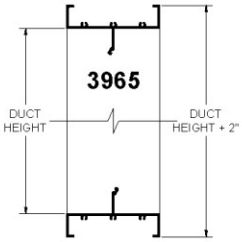
3961 – Duct-Mount



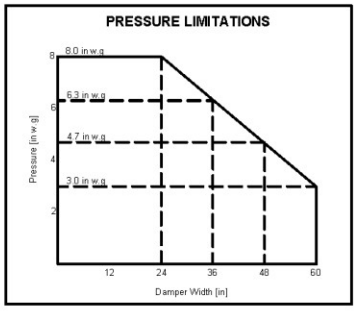
3965 – Flanged-to-Duct







For Duct-Mount Frame specify: *3960 / 3961*
For Flanged-to-Duct Frame specify: *3965*



RECOMMENDED SPECIFICATION

Furnish and install control damper models 3960 / 3961 / 3965 as manufactured by Alumavent, Bolton Ontario. Dampers shall be 4" *(101 mm)* deep. Blades shall be 0.063" *(1.60 mm)* thick, thermally broken with high density Polyurethane non-CFC injected foam insulation. Frame shall be 0.081" *(2.06 mm)* thick, with polystyrene insulation. Axles shall be 0.375" *(9.53 mm)* thick, Aluminum square bar. Blade and Jamb seals shall be Santoprene. Linkage is concealed in frame for models 3960 / 3961 and outside of frame for model 3965. Air leakage through a 36"x36" *(914 mm x 914 mm)* damper shall not exceed 3 CFM/ft^2 *(15.2 L/s/m^2)* against 4" w.g *(1.0 kPa)* static pressure at standard air (as per AMCA testing). Operating temperature range shall be -40° to +180° F.

DWG. 3960-3961-3965 JAN 2020

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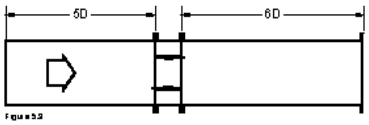
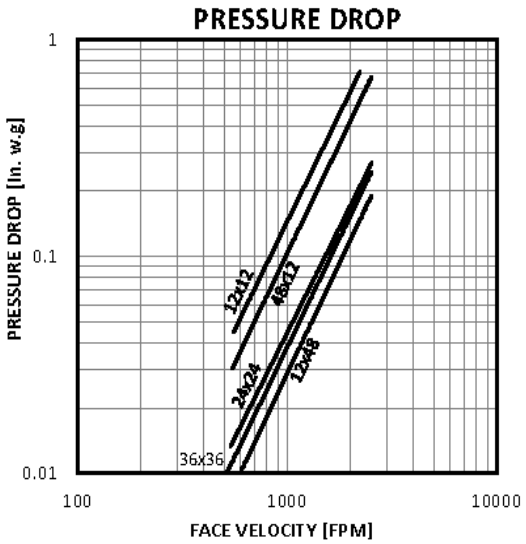
[2]

ALUMAVENT
CONTROL DAMPERS & FIRE DAMPERS

3900 SERIES
INSULATED CONTROL DAMPERS
3960 | 3961 | 3965



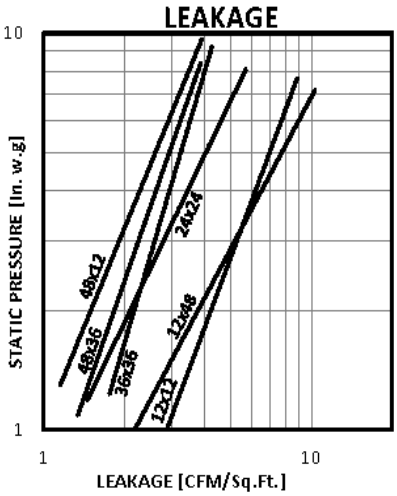
3900 SERIES CONTROL DAMPER PRESSURE DROP	
Velocity [FPM]	Pressure Drop [in. w.g]
12x12 (inches)	
553.6	0.044
891.4	0.119
1051.9	0.161
2021.4	0.554
2221.7	0.740
24x24 (inches)	
536.8	0.014
776.9	0.025
1101.1	0.056
2066.3	0.182
2530.1	0.272
36x36 (inches)	
500.4	0.01
750.6	0.021
1006.1	0.036
2019.5	0.161
2526.6	0.249
12x48 (inches)	
545	0.008
772.8	0.018
1095.3	0.035
2055.5	0.126
2519.2	0.187
48x12 (inches)	
544.6	0.029
772.2	0.064
1094.4	0.1228
2053.1	0.439
2516	0.661



Ratings Based on: AMCA Standard 500-D Intake Ducted Test Figure 5.3 Setup

DEFINITION OF LEAKAGE CLASSIFICATION				
CLASS	LEAKAGE ft³/min/ft² (L/s/m²)			
	1" (0.25 kPa)	4" (1.0 kPa)	8" (2.0 kPa)	12" (3.0 kPa)
1A	3 (15.2)	N/A	N/A	N/A
1	4 (20.3)	8 (40.6)	11 (55.9)	14 (71.1)
2	10 (50.8)	20 (102)	28 (142)	35 (178)
3	40 (203)	80 (406)	112 (569)	140 (711)

3900 SERIES CONTROL DAMPER LEAKAGE RATING			
DAMPER SIZE Width x Height	PRESSURE in w.g (kPa)		
	1" (0.25 kPa)	4" (1.0 kPa)	8" (2.0 kPa)
12"x12" (305x305 mm)	1A	1	1
24"x24" (610x610 mm)	1A	1	1
36"x36" (914x914 mm)	1A	1	1
12"x48" (305x1219 mm)	1A	1	1
48"x12" (1219x305 mm)	1A	1	1
48"x36" (1219x914 mm)	1A	1	1



Leakage test was conducted in accordance with AMCA Standard 500-D-98. Holding torque applied was 6 in.-lbs./sq.ft on parallel blade dampers. AMCA Standard 500-D-98 states that air leakage is based on operation between 50°F (10°C) and 104°F (40°C).

DWG. 3960-3961-3965 JAN 2020

c) Filter – Merv 8 Data Sheet

FG™ Indoor Air Quality

AEROSTAR® SERIES 400 PLEAT

PRODUCT OVERVIEW

- Standard Capacity (MERV 8) & High Capacity (MERV 10)
- Available in 1", 2" & 4"depths
- Ideal for use in
  - Prefilter for high efficiency filters
  - Office and Retail
  - Manufacturing and Distribution
  - Government and Education facilities
  - Doctor offices, assisted living facilities and Hospitals
  - Hotels and Airports
  - Single and Multi-Family Housing

WHY THE SERIES 400?

- 100% synthetic pleated media achieves exceptionally high levels of efficiency
  - Does not rely on electrostatic charge
  - Low resistance to air flow means minimal energy costs
  - Moisture resistant and will not promote microbial growth
  - Excellent pre-filter for higher efficiency air filters
  - Effectively removes airborne irritants
  - Protects cooling coils & ductwork of HVAC system
- Durable construction optimizes performance
  - Media laminated to metal grid
  - Minimized media fluttering
  - Design helps maintain pleat uniformity
  - Frame constructed of high wet strength beverage board
  - Will not warp, crack or distort under normal operating conditions

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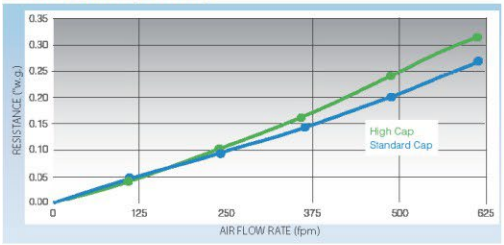
AEROSTAR SERIES 400 PLEAT

PERFORMANCE DATA (24 x 24)

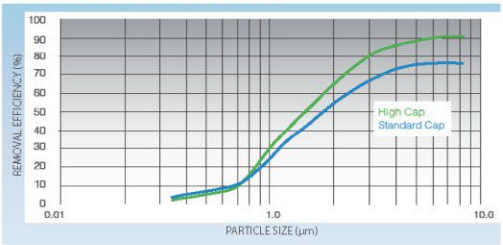
CAPACITY	FILTER DEPTH	INITIAL RESISTANCE ("w.g.) 300 fpm	375 fpm	500 fpm	625 fpm	FINAL RESISTANCE ("w.g.)
Standard MERV 8	1"	0.14	0.21	–	–	1.0
	2"	–	0.14	0.20	0.27	1.0
	4"	–	0.09	0.14	0.21	1.0

CAPACITY	FILTER DEPTH	INITIAL RESISTANCE ("w.g.) 300 fpm	375 fpm	500 fpm	625 fpm	FINAL RESISTANCE ("w.g.)
High MERV 10	1"	0.20	0.28	–	–	1.0
	2"	–	0.16	0.24	0.32	1.0
	4"	–	0.08	0.17	0.26	1.0

INITIAL RESISTANCE (24 x 24 x 2)



MINIMUM REMOVAL EFFICIENCY (24 x 24 x 2)



PRODUCT DATA

PART NUMBER STD CAP	PART NUMBER HIGH CAP	NOMINAL SIZE* (H" x W" x D")	ACTUAL SIZE (H" x W" x D")	CFM CAPABILTIES 300 fpm	375 fpm
10403	10476	8 x 16 x 1	7 ¾ x 15 ¾ x ¾	250	325
10404	10477	10 x 10 x 1	9 ½ x 9 ½ x ¾	200	250
10364	10436	10 x 20 x 1	9 ½ x 19 ½ x ¾	400	525
10405	10478	10 x 24 x 1	9 ⅜ x 23 ⅜ x ¾	500	625
10406	10479	10 x 25 x 1	9 ¾ x 24 ¾ x ¾	525	650
10365	10437	12 x 12 x 1	11 ¾ x 11 ¾ x ¾	300	375
10407	10480	12 x 16 x 1	11 ½ x 15 ½ x ¾	400	500
10366	10438	12 x 20 x 1	11 ½ x 19 ½ x ¾	500	625
10367	10439	12 x 24 x 1	11 ½ x 23 ½ x ¾	600	750
10368	10440	12 x 25 x 1	11 ½ x 24 ½ x ¾	625	775
10369	10441	14 x 20 x 1	13 ½ x 19 ½ x ¾	575	725
10408	10481	14 x 24 x 1	13 ½ x 23 ½ x ¾	700	875
10370	10442	14 x 25 x 1	13 ½ x 24 ½ x ¾	725	900
10371	10443	15 x 20 x 1	14 ½ x 19 ½ x ¾	625	775
10409	10482	15 x 25 x 1	14 ½ x 24 ½ x ¾	800	975
10410	10483	16 x 16 x 1	15 ¾ x 15 ¾ x ¾	525	650
10372	10444	16 x 20 x 1	15 ½ x 19 ½ x ¾	650	825
10411	10484	16 x 24 x 1	15 ½ x 23 ½ x ¾	800	1000
10373	10445	16 x 25 x 1	15 ½ x 24 ½ x ¾	825	1050
10412	10485	18 x 18 x 1	17 ¾ x 17 ¾ x ¾	675	850
10413	10486	18 x 20 x 1	17 ½ x 19 ½ x ¾	750	925
10414	10487	18 x 22 x 1	17 ½ x 21 ½ x ¾	825	1025
10415	10488	18 x 24 x 1	17 ½ x 23 ½ x ¾	900	1125
10374	10446	18 x 25 x 1	17 ½ x 24 ½ x ¾	925	1175
10375	10447	20 x 20 x 1	19 ½ x 19 ½ x ¾	825	1050
10416	10489	20 x 24 x 1	19 ½ x 23 ½ x ¾	1000	1250
10376	10448	20 x 25 x 1	19 ½ x 24 ½ x ¾	1050	1300
10417	10490	22 x 22 x 1	21 ¾ x 21 ¾ x ¾	1000	1250
10377	10449	24 x 24 x 1	23 ½ x 23 ½ x ¾	1200	1500
10378	10450	25 x 25 x 1	24 ½ x 24 ½ x ¾	1300	1625

PART NUMBER STD CAP	PART NUMBER HIGH CAP	NOMINAL SIZE* (H" x W" x D")	ACTUAL SIZE (H" x W" x D")	CFM CAPABILTIES 375 fpm	500 fpm
10418	10491	10 x 10 x 2	9 ¾ x 9 ¾ x 1 ¾	250	350
10379	10451	10 x 20 x 2	9 ½ x 19 ½ x 1 ¾	525	700
10419	10492	12 x 20 x 2	11 ½ x 19 ½ x 1 ¾	625	825
10380	10452	12 x 24 x 2	11 ⅜ x 23 ⅜ x 1 ¾	750	1000
10381	10453	14 x 20 x 2	13 ½ x 19 ½ x 1 ¾	725	975
10382	10454	14 x 25 x 2	13 ½ x 24 ½ x 1 ¾	900	1200
10383	10455	15 x 20 x 2	14 ½ x 19 ½ x 1 ¾	775	1025
10420	10493	16 x 16 x 2	15 ½ x 15 ½ x 1 ¾	650	875
10384	10456	16 x 20 x 2	15 ½ x 19 ½ x 1 ¾	825	1100
10385	10457	16 x 24 x 2	15 ⅜ x 23 ⅜ x 1 ¾	1000	1325
10386	10458	16 x 25 x 2	15 ½ x 24 ½ x 1 ¾	1050	1400
10421	10494	18 x 22 x 2	17 ½ x 21 ½ x 1 ¾	1025	1375
10387	10459	18 x 24 x 2	17 ⅜ x 23 ⅜ x 1 ¾	1125	1500
10422	10495	18 x 25 x 2	17 ½ x 24 ½ x 1 ¾	1175	1550
10388	10460	20 x 20 x 2	19 ½ x 19 ½ x 1 ¾	1050	1400
10389	10461	20 x 24 x 2	19 ⅜ x 23 ⅜ x 1 ¾	1250	1650
10390	10462	20 x 25 x 2	19 ½ x 24 ½ x 1 ¾	1300	1750
10391	10463	24 x 24 x 2	23 ⅜ x 23 ⅜ x 1 ¾	1500	2000
10392	10464	25 x 25 x 2	24 ½ x 24 ½ x 1 ¾	1625	2150
				500 fpm	625 fpm
10393	10465	12 x 24 x 4	11 ⅜ x 23 ⅜ x 3 ¾	1000	1250
10394	10466	16 x 20 x 4	15 ½ x 19 ½ x 3 ¾	1100	1400
10395	10467	16 x 25 x 4	15 ½ x 24 ½ x 3 ¾	1400	1750
10396	10468	18 x 24 x 4	17 ⅜ x 23 ⅜ x 3 ¾	1500	1875
10397	10469	20 x 20 x 4	19 ½ x 19 ½ x 3 ¾	1400	1750
10398	10470	20 x 24 x 4	19 ⅜ x 23 ⅜ x 3 ¾	1650	2100
10399	10471	20 x 25 x 4	19 ½ x 24 ½ x 3 ¾	1750	2200
10400	10472	24 x 24 x 4	23 ⅜ x 23 ⅜ x 3 ¾	2000	2500
10401	10473	25 x 29 x 4	24 ⅜ x 28 ⅜ x 3 ¾	2525	3150
10404	10474	28 x 30 x 4	27 ⅜ x 29 ⅜ x 3 ¾	2900	3650

* Contact Customer Care for additional sizes and information.

ENGINEERING SPECIFICATIONS

1.0 General

1.1 Filters shall be Aerostar® Series 400 extended surface pleated air filters as manufactured by Filtration Group.
1.2 Filters shall be available in standard and high capacity configurations and available in nominal depths of 1", 2", and 4".
1.3 Underwriters Laboratories classified to UL 900 and ULC-S111-07.
1.4 Filters are manufactured by an ISO 9001 registered company.

2.0 Filter Materials of Construction

2.1 Media shall be 100% synthetic, mechanical media that does not support microbial growth.
2.2 Filters shall have a high wet strength beverage board with a cross member design that increases filter rigidity and prevents breaching. Frame shall be recyclable.
2.3 Filters shall have an expanded metal support grid bonded to the air-exiting side of the filter to maintain pleat uniformity and prevent fluttering. Metal support grid shall be recyclable and contain a significant amount of post-consumer and pre-consumer content.

3.0 Filter Performance

3.1 Filters shall be MERV 10/10A in a high capacity configuration and MERV 8/8A in a standard capacity configuration when tested in accordance with ASHRAE 52.2 Test Standard.
3.2 For initial resistance of filters, see Performance Data chart above.
3.3 Filters shall be rated to withstand a continuous operating temperature up to 200°F.
3.4 Filters shall have a recommended final resistance of 1.0" w.g.

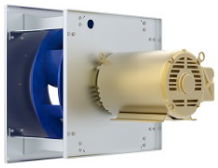
United States • Phone: +1 800 739.4600 • aerostar@filtrationgroup.com | **Canada** • Phone: +1 888 628.3458 • inquirycanada@filtrationgroup.com

FiltrationGroupIAQ.com

FG Indoor Air Quality

d) Supply Fan Data Sheet

1



type	GR50C-4DM.H2.CR*
article no.	115205/HA03 | Portfolio AMCA USA G1

technical data

motor		ZAmotpremium PE
Efficiency class		PEM
power output ($P_{2\ main}$)	hp	10
mains supply	-	3~ 460V 60Hz Y
nominal current (I_N)	A	12.50
motor efficiency grade (η_M)	%	91.7
ambient temperature, max. limit (t_r)	°C	40
grille | influence		no

fan data

SFP-class | SFP-value (P_{SFP})	- | Ws/m³	**5** | 2379
FEG	%	85
FEI	-	1.35
airflow volume (q_V)	ft³/min	5333.0
air velocity	ft/s	34.09
pressure, **stat. (p_{sF})** | tot. (p_F)	in.wg.	**6.050** | 6.307
electrical power input (P_{sys})	W	5987
system eff., **stat. ($\eta_{sF,sys}$)** | tot. ($\eta_{F,sys}$)	%	**63.4** | 66.0
electrical power input (P_1)	W	5807
efficiency grade, **stat. (η_{sF})** | tot. (η_F)	%	**65.3** | 68.1
shaft power **(P_L)** | max. ($P_{L\ max}$)	W	**5322** | 5398
impeller eff., **stat. ($\eta_{sF,L}$)** | tot. ($\eta_{F,L}$)	%	**71.3** | 74.3
fan speed **(n)** | max. (n_{max})	rpm	**2256** | 2450
fan speed, set value (%n_{max})	%	92
frequency **(f_{DP})** | (f_{max})	Hz	**76** | 83
voltage (U_{DP})	V	460
acoustics, suction side **($L_{w(A),5}$)** | ($L_{w,5}$)	dB	**87** | 92
acoustics, pressure side **($L_{w(A),6}$)** | ($L_{w,6}$)	dB	**97** | 101
dimensions (w x h x d)	in	26.38 x 26.38 x 28.58
product weight (m_{pr})	lb	229.3
k-factor nozzle pres. (k)	-	252
differential pres. nozzle ($p_{sF\ nozzle}$)	Pa	1293

nominal values

3~ 208-230V D 60Hz P2 10HP
26.00A 1770/MIN 40°C
3~ 460V Y 60Hz P2 10HP
12.50A 1770/MIN 40°C
OPSB THCL155
fan speed, max. (n_{max}) 2450 1/min

PF:PF_03; BR:BR_17; q_V:1177.2 ft³/min; p_{sF}:0.201 in.wg.; t_r:68 °F; ρ:0.072 lbs/ft³; STol:+-10 %

compact edition FANselect

FANselect

performance curve / acoustics

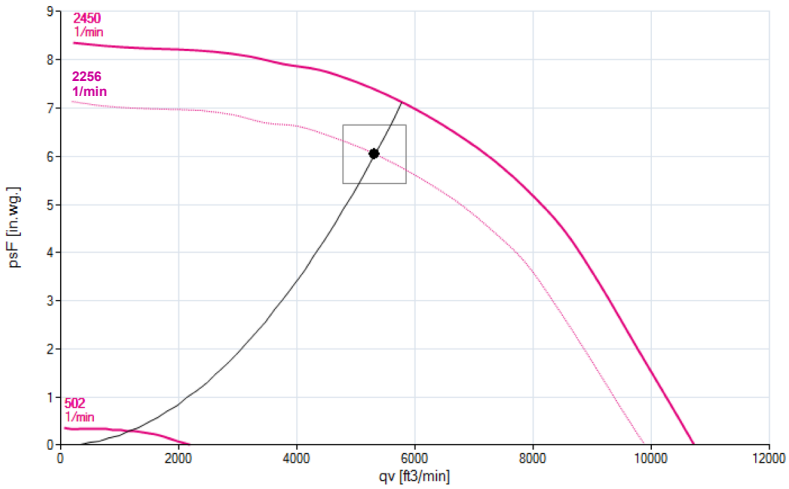
17.12.2024

version FANselect V 1.01 (241217), AMCA V 1.03 September, 2021
RLT V 1.00 Dezember, 2021 / 1.24.12.17 | 30211 | (user ZAFS20211)

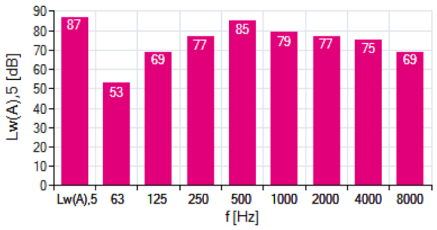
1 GR50C-4DM.H2.CR* measured in standard nozzle in installation type A according to ISO 5801

115205/HA03 | Portfolio AMCA USA G1 measurement density 0.074 [lbs/ft³]

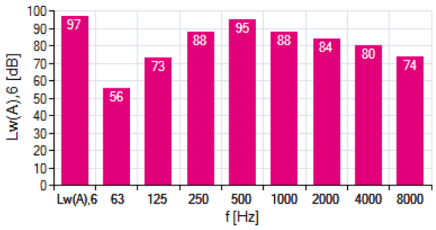
air performance p_{sF}



acoustics ($L_{w(A),5}$)



acoustics ($L_{w(A),6}$)



1 GR50C-4DM.H2.CR*

f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),5}$	87	53	69	77	85	79	77	75	69
$L_{w,5}$	92	78	85	85	88	79	76	74	70

f [Hz]	sum	63	125	250	500	1000	2000	4000	8000
$L_{w(A),6}$	97	56	73	88	95	88	84	80	74
$L_{w,6}$	101	81	89	97	98	88	83	79	75

e) Reactivation Fan Data Sheet

FAN DETAILS

Job Name: 2024 ESC - October Update

TCF TWIN CITY FAN

Tag: A35 - 4500 CFM 5.23" 575
Customer: Environmental Systems Corporation
Job ID: 8011064-1OctoberUpdate
Date: December 18, 2024

Description

Quantity	1
Model	BC-SW
Size	165
Width	SWSI
Arrangement	4
Class	II
Rotation	CCW
Discharge	THD
Wheel Diameter (in)	16.5
Drive method	Direct
Percentage width	100%
Percentage diameter	100%
Motor position	--
Design VFD Op. Freq	49hz

Performance

Volumetric Flow CFM	4,500
Operating SP (in WC)	5.230
Standard SP (in WC)	6.270
RPM	2834
Tip Speed (FPM)	12242
Oper. Power BHP	6.00
Standard Power BHP	7.19
Outlet Area (sq.ft)	1.57
Outlet Velocity (FPM)	2866
Max RPM for Class	3042
Static Efficiency	61.87%
Total Efficiency	66.92%
FEI	1.19
FEP (KW)	4.93
System FEI	1.19
System FEP (KW)	4.93
CA T20 Compliant/Exempt	Yes

Air/Gas Properties

Altitude above sea level (ft)	0
Inlet Pressure (in WC)	0.000
Inlet Temperature(°F)	135
Design Temperature (°F)	140
Gas Type	Operating air
Estimated Density (lb/ft³)	0.0626

Motor Data

Power (HP)	10
Enclosure	TEFC
Speed (RPM)	3600
Voltage	575V
Phase	3
Frequency	60Hz
Frame Size	215T
Technology	

Modifiers

Using VFD.

Sound

Octave Bands	1	2	3	4	5	6	7	8	LwA
Level at Inlet	99	91	94	97	95	90	88	86	99

Sound Power Levels in dB re. 10^{-12} Watts:

Distance in ft	1	3	5
dBA at inlet	99	89	85

Estimated sound pressure level in dBA (re: 0.0002 microbar) based on a single * ducted installation:

*To estimate dBA level for ducted inlet and ducted outlet (into and out of the room) type installation, deduct 20 from the LwA value shown. Using a directivity factor of 1. Estimated Sound Pressure based on free field, spherical (Q = 1) radiation at stated distance.

Definitions:

LwA The overall (single value) fan sound power level, 'A' weighted.

dBA The environment for each fan installation influences its measured sound value, therefore dBA levels cannot be guaranteed. Consult AMCA Publication 303 for further details. A fan's dBA is influenced by nearby reflective surfaces.

Job Name: 2024 ESC - October Update

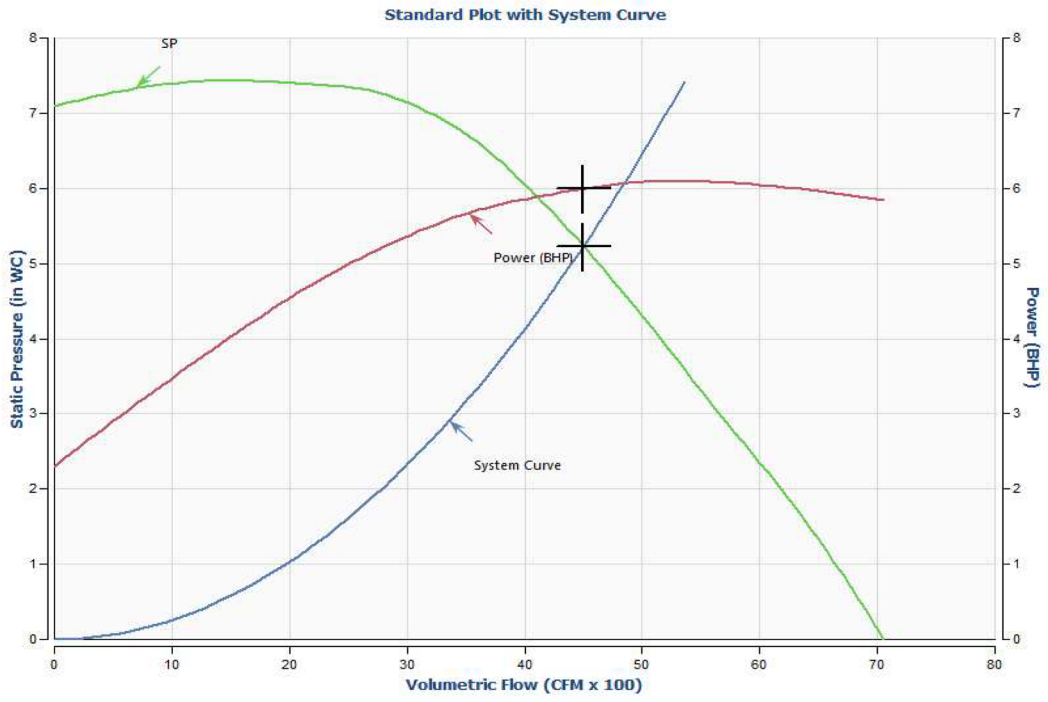
Customer: Environmental Systems Corporation
Job ID: 8011064-1OctoberUpdate
Date: December 18, 2024

Tag: A35 - 4500 CFM 5.23" 575

Fan information

Size/Model	165/BC-SW	Class	II	FEI	1.19
Volumetric Flow (CFM)	4500	Speed (RPM)	2834	System FEI	1.19
SP (in WC)	5.23	Max Speed	3,042 RPM @ 140 °F	FEP (KW)	4.93
		Power (BHP)	6	System FEP (KW)	4.93
		Outlet Vel (FPM)	2866	CA T20 Compliant/Exempt	Yes
		Density (lb/ft³)	0.0626		

Adjusted for Op temp: 135°F, Design temp: 140°F, Humidity: 95%

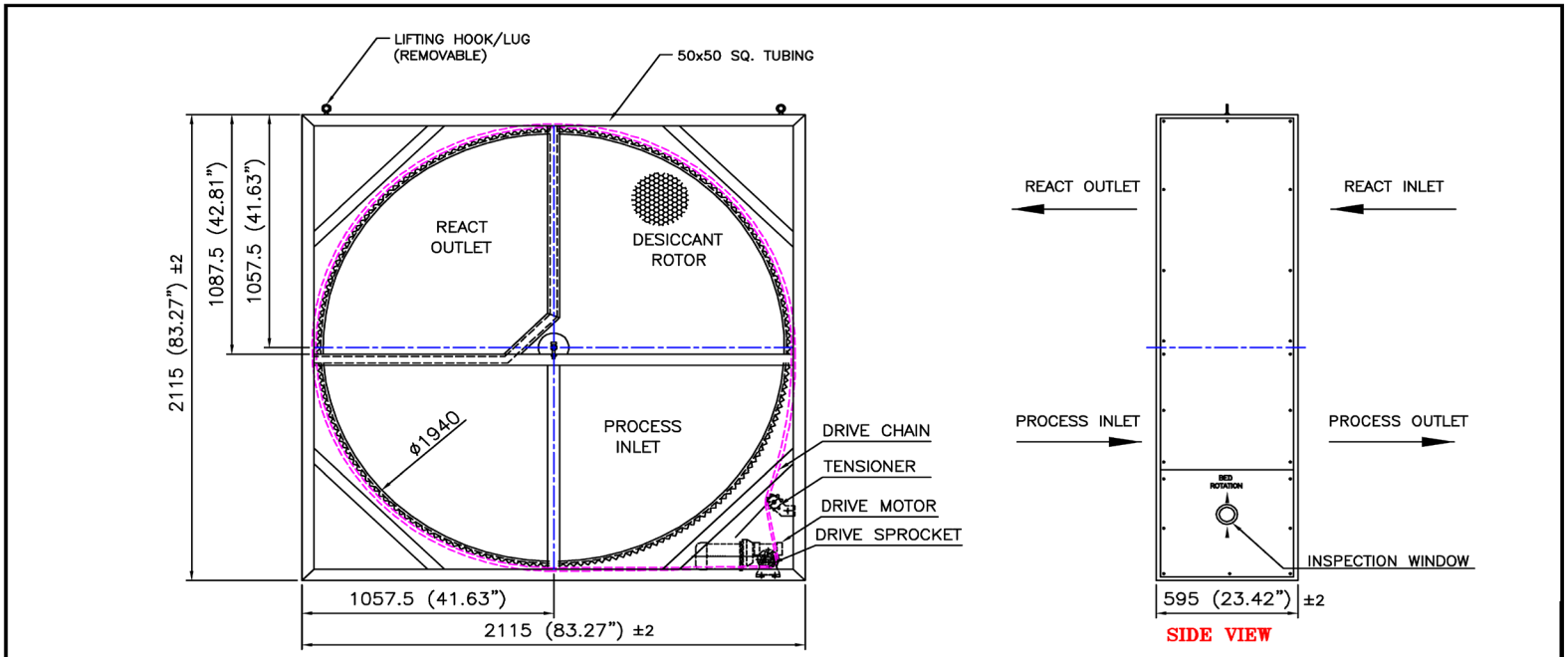


f) Desiccant Wheel Motor Data Sheet

MOTOR	
PRODUCT SERIES	BE - AC IE2 Three Phase Motor
FRAME SIZE	63A - Motor Size 63A
POLE NUMBER	4 - 4 Poles
VOLTAGE-FREQUENCY	230/460-60 - 230 [V] Δ - 460 [V] Y 60 [Hz]
DEGREE OF PROTECTION	IP55 - Standard and Brake Motors
INSULATION CLASS	CLF - Standard Insulation Class
MOUNTING	B5 - B5 Motor Mounting Flange

TECHNICAL DATA	
n Motor Speed [min-1]	1700
Mn Motor Nominal Torque [Nm]	0.67
Tn Motor Nom. Torque [lb-in]	5.9
η100 Efficiency 100% [%]	64.8
In 460V Nomin.Curren.@ 460V[A]	0.41
Cosφ	0.61
Pn Motor Nominal Power [kW]	0.12
Pn Motor Nominal Power [Hp]	0.16
Motor Weight [Kg]	3.5
Motor Weight [lb]	7.7

g) Desiccant Wheel 2D Drawing



NOTE :– CASING–S.S. TUBULAR FRAME WITH PAINTED SHEET METAL.
– OUTER DIMENSIONS EXCLUDES POP RIVETS & BOLT HEADS.
– SPLIT CONFIGURATION–HORIZONTAL
– SPLIT RATIO–75:25.
– POWER REQUIRMENT–100 WATTS, 460V/3PH/60Hz.

REV.	MADE BY / APPR. BY	DATE	DESCRIPTION OF CHANGE

REVISIONS

DESICCANT ROTORS INTERNATIONAL PVT. LTD.
100–101 UDYOG VIHAR, GURGAON.

THIS DRG. IS THE PROPERTY OF DESICCANT ROTORS INT. AND IS NOT TO BE REPRODUCED WITHOUT THEIR WRITTEN PERMISSION.

TITLE: UNIT OUTLINE DIAGRAM – CASSETTE ECO–DRY EDC–1940–400 (G3MH)

Project :–

DRN. BHIM DATE. 11.09.23
CHKD. DATE
APPR. DATE
ORDER NO. DD–
CUST. ORDER No.

SCALE: YTS | SIZE: A4 | DRG. NO.:– S–25707 | PAGE 1 OF 1

h) Direct Heater Data Sheet

Unit Data Sheet - DF Direct Gas-Fired Heat Module

Report Created: 9/27/2024
Created By: Sean Baxter
Work Order #:
Serial #:
Unit Model: DF-04-549GV2CCA0DN1C2SVVC QTY: 1

Customer: ESC
ATTN: Thomas Ring
Project: 23-1292
Unit Tag: A-35

CONFIGURATION

Location:	Outdoor
Application:	Process
Configuration (Airflow):	Left to Right
Vestibule:	VC (Full Vestibule w/ doors)
Altitude:	0 ft

ELECTRICAL

Electrical Ratings:	115 / 60 / 1
Line Voltage:	115 Volts - Single Phase
Stepdown XFMR:	

CONSTRUCTION

AHU Cabinet Dimensions (Internal)	Width (in):	32	Height (in):	34
Burner Section Air Tunnel Dimensions:	Width (in):	32	Height (in):	34
Vestibule Dimensions:	Length (in):	48	Height (in):	34

Vestibule Notes:

Vestibule/ Shroud Matl: 304SS Airside/Galv. Outside

GAS TRAIN COMPONENTS

	ID	Part #	Qty
Modulator	PRV/FCV,PV/FCV,FCV,PR/FCV	MR212E-1212	1
Main Solenoid	SSV,CV	V4295A1056	2
Hydraulic Valve	SSV/ZSC		
Power Head	SSH/ZSC		
Vent Valve	VV-NO		
Pilot Regulator	PPRV	325-3-44-0076	1
Pilot Valve	PSSV	8214G020	1
Gas Safety Switch Low	PSL	C6097A1053	1
Gas Safety Switch High	PSH	C6097B1028	1
Main Gas Regulator	PRV		
Step Down Regulator:			

ELECTRONIC CONTROLS

Designation:	CA (customer provided modulating signal)		
Flame Safeguard:	LME71.111A1PKG-PRG14	Qty:	1
Base:		Qty:	
Timing (sec):		Card:	
Sense Type:	Flame Rod	Optional Remote Sensor:	
Sensor:		Qty:	
Ignition XFMR:	Q624A1014/U	Qty:	1
24V XFMR:	HM24VTRANS2	Qty:	1
Auxillary High Limit:	HIGHLIMITKIT-DF-EXT		

MODULATING CONTROLS

Amplifier:	SC11S-B
Temp. Range:	
Temperature Sensor:	
Temperature Dial:	
Mixing Tube:	
Control Signal:	0-10 VDC

AIR SIDE PERFORMANCE

Airflow Option:	Constant		
Airflow (SCFM):	4,500	VAV Low Airflow:	
Velocity (FPM):	2,845	Inlet Temperature (oF):	0
Pressure Drop ("wc):	0.68	Discharge Temperature (oF):	208

BURNER PERFORMANCE

Fuel:	Natural	Site Press (psi):	0.5
Burner Selection:	Midco	Design Press (psi):	2.0
Max Capacity (Btuh):	1,098,783	Min Capacity(Btuh	42,300
Turndown:	26	Rate MBH/ft.:	549
Gas Train Code:	CSA B149		
Gas Train Size (in.):	1.5		
Manifold Pressure "wc	High Fire:	4.19	

*Manifold Press. is DIFFERENTIAL PRESS. Calculated at a 0"wc external static pressure

BURNER PROFILE PLATE

	Width (in): 22.00	Height (in):	19.49
Profile Mtl:	18 Gauge Galvanized	opening w/	
Damper Mtl:	18 Gauge Galvanized	Damper:	17.49

BURNER CONSTRUCTION

Setting ("wc):
Setting ("wc):

WEIGHTS (lbs):

Shipping Weight:	436	lbs.
Installation Weight:	324	lbs.

Comments:

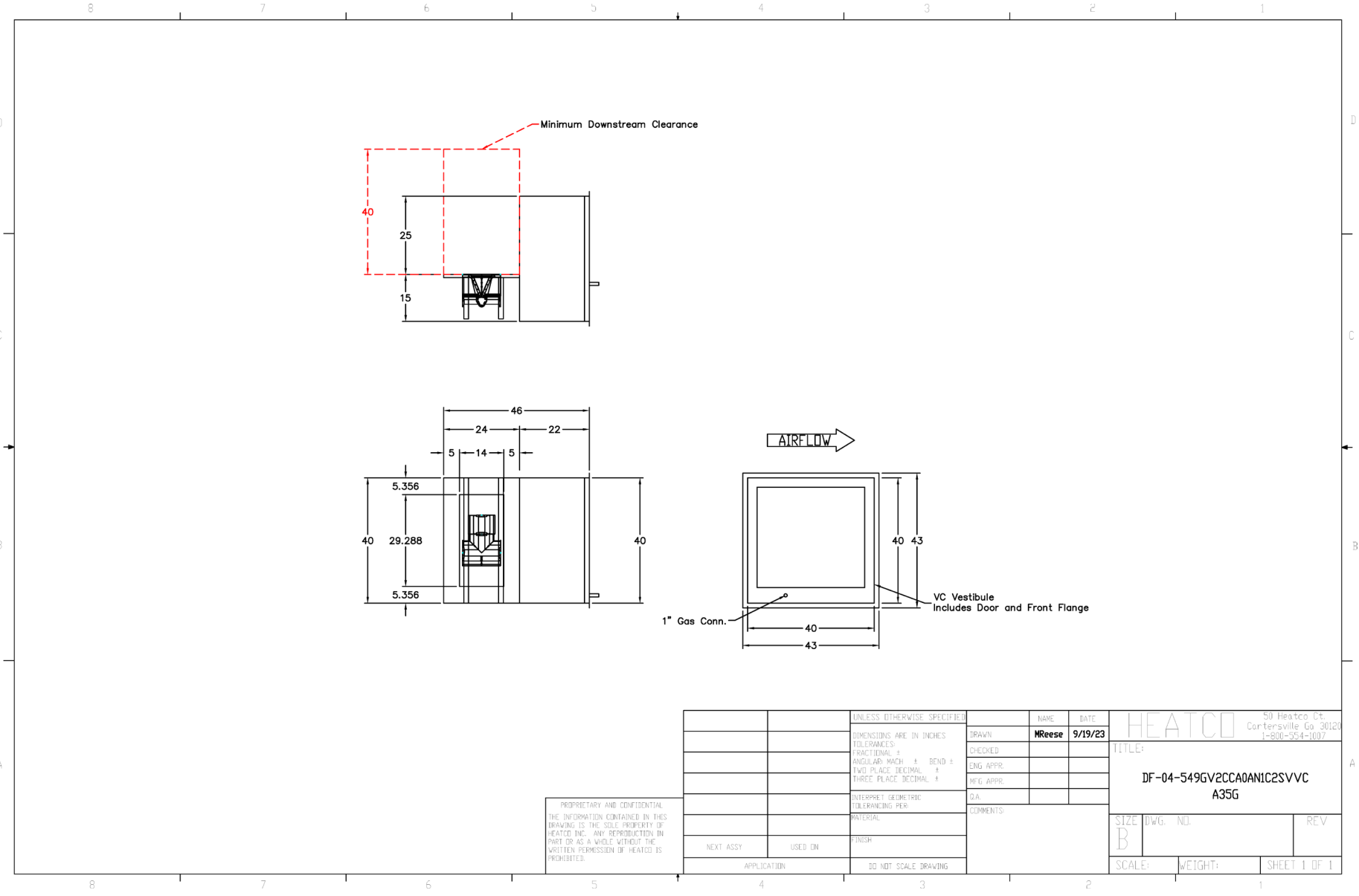
DF Series Heat Modules are to be installed on the negative side of the circulating air blower.
Complete wiring and piping included

These Units carry an ETL or UL Recognized Component Listing to ANSI Z83.25
Overpressure protection device to be supplied by others if required.

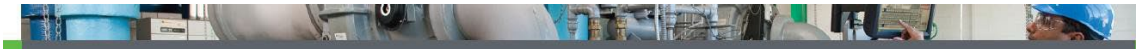
CSA B149 - All tubing must use flared fittings

-23-1292

i) Direct Heater 2D Drawing



j) ALC Microprocessor Controller Data Sheet



OPTICORE LS-1628u

Large Application Controller

The OEMCtrl® OptiCORE™ LS-1628u is a high-performance, BACnet native direct digital controller (DDC). It provides the speed, power, memory, and I/O flexibility needed for the most demanding control applications in the industry. Capable of controlling HVAC equipment with high I/O point counts including 44 points on the base controller and up to 224 through expandable I/O boards. Made with integration in mind, the LS-1628u can integrate with building automation systems via BACnet (IP or MSTP) or Modbus (IP or serial). It also allows for connecting to communicating devices like VFDs via BACnet or Modbus.

Key Features and Benefits

Performance / Hardware

- Powered by 32-bit ARM Cortex-A8, 600MHz, processor with multi-level cache memory with 16 GBs eMMC Flash memory and 512 MB DDR3 DRAM
- Flexible, color-coded and easy to wire I/O

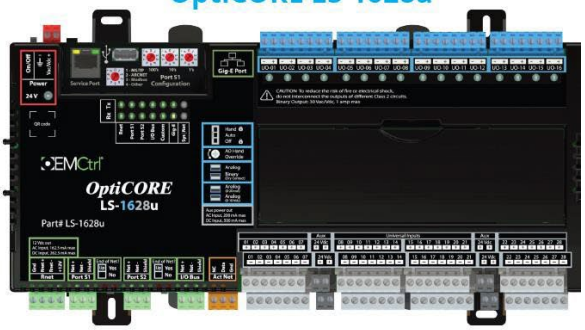
Communication Features:

- 3 - Configurable Communication Ports
  1. Gig-E: 10/100/1000 Base T Ethernet Port for BACnet or Modbus communication, includes DHCP addressing
  2. Port S1: Rotary configurable EIA-485 Port for BACnet MS/TP or Modbus (primarily for BAS connection)
  3. Port S2: Firmware configurable EIA-485 Port for BACnet MS/TP or Modbus (primarily for communicating device connection)
- 6 - Dedicated Communication Ports
  1. Service Port: 10/100 Base T Ethernet port for technician access or for high-speed touchscreen connection
  2. Rnet: Sensor Network or for touchscreen connection
  3. I/O Bus Port: for I/O point expansion via screw terminal for remote mounting
  4. I/O Bus Edge Connector: for I/O point expansion (includes power)
  5. Act Net: Network of communicating valves and actuator
  6. Comm Expansion Edge Connector Port: for comm expansion

Servicability:

- Fully programmable using our powerful EIKON® graphical programming tool. Control sequences can also be fully simulated off-line within EIKON or on-line via "Live Logic" for real-time troubleshooting of the control logic while the equipment is running.
- Built-in support for the OEMCtrl ZS intelligent communicating sensors and touchscreen display units including the Equipment Touch 4.3" touchscreen, and the OptiCORE EQT3s, the rugged, Android, panel-mount interfaces which come in 4.3", 7", & 10" sizes.

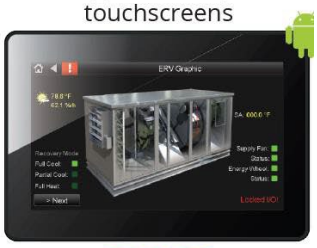
OptiCORE LS-1628u



ASHRAE BACnet

Modbus

Support for EQT3 touchscreens



EQT3-7

Support for up to **9** I/O expanders

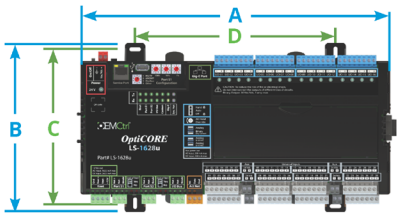
(224 total points)

OEMCtrl®

1025 Cobb Place Boulevard, Kennesaw, GA 30144 | 770-429-3060 | oemctrl.com

Specifications

Power	24 Vac ±15%, 50-60 Hz, 100 VA, 24 Vdc ±10%, 48 W, Single Class 2 source only, 100 VA or less
Operating Range	-40º to 158º F (-40º to 70º C); 10 to 95% relative humidity, non-condensing
Universal Inputs (28) (Software selectable)	28 channels electronically configured to any of the following input types: Digital - **Dry Contact** OR **Pulse Counting** inputs up to 60Hz Analog - **Voltage** (0-5 or 0-10 Vdc) OR **Current** (0-20 mA) OR **Thermistor** (Precon Type II 10kΩ OR Carrier YSI 5kΩ OR S-5700-850 10kΩ w/ 11kΩ shunt) OR **RTD** (Platinum RTD TS-8000 1kΩ @ 32ºF (0.00385 TCR) OR Platinum RTD 1kΩ @ 32ºF (0.00375 TCR) OR Nickel-iron RTD 1kΩ @ 70ºF, 699 Ω @ -40ºF OR Balco (Nickel-iron) TS8000 RTD 1kΩ @ 70ºF, 779 Ω @ -40ºF. 16 bit A/D resolution **24VDC auxiliary sensor power(8):** 200mA max. (AC power input) 500 mA max. (DC power input)
Universal Outputs (16) (Hardware selectable)	16 channels configurable to any of the following output types: **Voltage** (0-10 Vdc) OR **Current** (0-20 mA) OR **Relay** contacts, potential free, normally open, rated 24VAC/DC @ 1 Amp (resistive) Hand/Auto/Off override switches for all outputs. Potentiometer for manual adjustment of all analog outputs. Status LED for all outputs. 12 bits D/A Resolution (AOs)
Communication Ports **BACnet** **Modbus**	**Gig-E port**: 10/100/1000 BaseT Ethernet port for BACnet/IP and/or BACnet/Ethernet and/or MODBUS TCP/IP communication on the Ethernet at 10, 100, or 1000 Mbps, full duplex **Port S1**: High-speed EIA-485 port with End of Net switch configurable with rotary switch: • BACnet MS/TP network at 9.6, 19.2, 38.4, 57.6, 76.8, or 115.2 kbps • Modbus RTU network at 9.6, 19.2, 38.4, 57.6, 76.8, or 115.2 kbps **Port S2**: Electrically isolated EIA-485 port with End of Net switch configurable in firmware: • BACnet MS/TP or Modbus RTU network at 9.6, 19.2, 38.4, 57.6, 76.8, or 115.2 kbps **Service port**: 10/100 Base T Ethernet port for technician use and local EQT displays **Rnet port**: Communicate with ZS communicating sensors and local EQT displays **USB port**: USB 2.0 host port for device recovery
Real Time Clock	Real-time clock keeps track of time in the event of a power failure for up to 3 days
Protection	Two fast acting, 5mm x 20mm glass fuses: • A 2A fuse for the LS-1628u's power / A 4A fuse for the I/O bus edge connector The power and network ports comply with the EMC requirements EN50491-5-2.
Microprocessor / Memory	32-bit ARM Cortex-A8, 600MHz, processor with multi-level cache memory / 16 GBs eMMC Flash memory and 512 MB DDR3 DRAM
Compliance/Listing	**BACnet**: Conforms to the BACnet Building Controller (B-BC) Standard Device and BACnet BBMD (B-BBMD) Device as defined in BACnet 135-2001 2012 Annex L and tested to Protocol Revision 14. **United States**: FCC compliant to Title CFR47, Part 15, Subpart B, Class A; UL Listed, File E143900; CCN PAZX, UL 916, Energy Management Equipment; **ANZ**: RCM Mark AS/NZS 61000-6-3; **Canada**: UL Listed File E143900, CCN PAZX7, CAN/CSA C22.2 No. 205 Signal Equip., Industry Canada Compliant ICES-003, Class A; **CE Mark** Compliant with 2014/30/EU, and **RoHS** Compliant: 2015/863/EU; **UKCA Mark** compliant with Electromagnetic Compatibility Regulations 2016 – Gov.UK and RoHS for Electrical and Electronic Equipment 2012.
Physical	Supports up to 9 OptiCORE I/O expanders OptiCORE I/O expanders • LS-XP812u • LS-XP48u • LS-XP012u DIN rail or Screw mounting Minimum panel depth: 2.75 in. (7 cm) **Dimensions Overall** **A**: 12.75 in. (32.38 cm) **B**: 6.95 in. (17.68 cm) **Depth**: 2.09 in. (5.31 cm) **Weight**: 2.7 lb. (1.22 kg) **Screw Mounting** **C**: 6.45 in (16.38 cm) **D**: 8.25 in. (20.96 cm)



Fire-retardant plastic ABS, UL94-5VA

Rev 10/2022

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Manuals are given in web links instead of screenshot, due to the volume of pages.

k) Direct Fired Heater Modules Link

Heatco OEM Installation Instructions

https://www.heatco.com/download/DF-OEM-MAN-LIST-Z83-25.pdf