AH Series Air Handling Units with Gas & Electric Steam Humidifier

GS Series

Gas Steam Humidifiers

operating ***advantages***

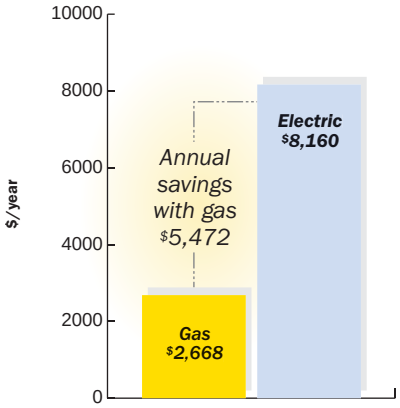
GS Series Gas Steam humidifiers provide pure, clean steam humidification at an economical operating cost. Units are packaged in a powder coated cabinet for zero clearance space requirement while offering high efficiency output. They can be controlled from either a local humidistat, from the central building management system or multiple units can be staged together.

The combustion system utilizes a modulating forced draft combustion air blower, a negative pressure regulator gas valve and a 100% premix burner. On a call for humidity, the combustion air blower starts creating a negative pressure across the orifice located at the air inlet. The hot surface ignitor then energizes. The gas valve opens and the regulated gas/air mixture is forced through the burner ports and is ignited.

The compact stainless steel heat exchanger has large flat surfaces to minimize scale buildup in the humidifier tank. Scale tends to fall off the exchanger wall to the bottom of the tank, maintaining efficient heat transfer to the water and extending the intervals between cleanings. The humidifier tank and heat exchanger can be removed from the humidifier and the smooth stainless steel surface is easily cleaned and maintained.

The GS SERIES compact heat exchanger design provides a minimum footprint area where space requirement is an issue.

Annual Operating Cost of Natural Gas Humidifier vs Electric Humidifier



Operating costs based an electric cost of $0.08 per kWh, natural gas cost $0.64 per therm, full output for 1,500 hours per season. Efficiency of electric unit is 97% and efficiency of gas unit is 82%. Costs do not include electric peak demand charges.

COMPACT REMOVEABLE HEAT EXCHANGER. 105 LBS/HR OF CLEAN STEAM.

system**features**

- Low emission gas appliance
- Capacity up to 630 lbs/hr with a single unit
- Nortec Total Controller
  - Interaction with various building protocols
  - RH display & setpoint adjustment
  - Easy to use scroll down menus
  - Stagged modulation of up to 10 units
- Intuitive scale management based on steam production
- Adaptable for small or large areas
- Heavy-duty drain pump for scale removal
- Modulation to 25 lbs/hr (11 lbs/hr) for all capacities
- Produces pure, uncontaminated steam humidification
- Multiple venting options for easy installation
- All components suitable for RO/DI water as a standard
- The most compact flat surface heat exchanger in the business
- Internal water tempering for drain water cooling
- Fully modulating humidifier
- All service connection outside the cabinet ready for field connection.
- Steam distribution through either ducts or blower packs
- Fully insulated tank for efficient operation
- Pre-cleaning sequence ensures shorter maintenance time

GSTC 100

GSTC 600

distribution**systems**

Independant ***Blower Packs*** for use with GS SERIES in space (remote only). Ranging in capacity from 5 to 100 lbs.

in space

Stainless Steel ***Steam Distributors*** for use with GS SERIES to distribute atmospheric steam into ducts.

SAMe Short Absorption Manifold for use in air handlers or duct where short steam absorption distances in ducts are critical. Single steam inlet configuration available.

in duct

featurecomparison

The **GSTC** has a built-in microcomputer with a full size display that provides instantaneous updating of all operating parameters. The unit accepts a modulation control signal from a BMCS varying its output to meet capacity demand. Models feature a capacity adjustment of output down to 25 lbs/hr.

The **GSP** uses status lamps on the front to provide operating diagnostics. The GSP model can accept a modulating control signal from building management systems.

	GSTC	GSP
Standard Features		
Steam Capacity adjustment	x	
Full size alphanumeric display and keypad	x	
Configurable date and time indication	x	
Transducer signal acceptance	x	
Individual component diagnostic capability	x	
Keypad set-point adjustment (humidity)	x	
Display of relative humidity	x	
Low and high relative humidity alarms	x	
Keep warm feature	x	
Networking capability up to 10 units	x	
Pre-cleaning sequence	x	
Troubleshooting Guide	x	
Self diagnostic capabilities	x	
Fault history	x	
Smart drain water cooling	x	
Backlit display	x	
Stand, GS Series	x	x
3-day drain with no call for humidity	x	x
Full tank blowdown capability via time of day, timer, or signal from BMS	x	x
Board mounted display for fault and demand indication	n/a	x
Parameter change through jumper settings	keypad	x
Remote fault indication	x	x
Single or Dual modulation signal acceptance	x	x
Industry standard modulation signal acceptance	x	x
Time to next maintenance alarm	x	x
Internal Drain water cooler	x	x
System demand indication	x	x
Blowdown based on steam production	x	x
Precise five level water level indication	x	x
Status indicator lamps	x	x
Single or multiple steam outlet options	x	x
Multiple venting options	B or BH vent	
Large Side tank cleaning port	x	x
Top access cleaning	required only for 300-600 lbs/hr	
Single water connections	x	x
Fully modulating down to 25lbs/hr (11kg/hr)	x	x
Options		
Interaction with BMS system (Contact Factory)	x	
Keep warm feature for GSP model		x
Full size alphanumeric display and keypad for GSP model		x
Remote control box with keypad display	x	x
Freeze protection, GS Series	x	x
Sealed combustion / Direct vent	x	x
Distribution Systems		
SAM-e	x	x
Steam distributor	x	x
Blower pack	x	x

GSP: Double line display located on the control board indicates demand signal, fault and service code, resets with power switch, dip switch for power counter (indicating service required). Mounted to main control board in unit's electrical compartment.

technical**data**

SPECIFICATION	GS 100	GS 200	GS 300	GS 400	GS 500	GS 600
Capacity: lbs/hr*	25-105	25-210	25-315	25-420	25-525	25-630
Capacity: kg/hr*	11-47	11-95	11-143	11-191	11-238	11-286
Input BTU/hr max	140,000	280,000	420,000	560,000	700,000	840,000
Input kJ/hr max	41	82	124	165	206	247
Flue Emissions	Low CO (<40ppm) and NOx (<10ppm)					
Unit rated Amps	2	3	4	5	6	7
Voltage/Phase	208-240/1	208-240/1	208-240/1	208-240/1	208-240/1	208-240/1

installation

- Single point cabinet door fastening for easy removal.
- Choice of venting comes standard allowing greater installation flexibility, B or BH venting.
- Cabinet and insulation allows mounting to combustible surfaces for minimum space requirement.
- Exclusive full size cleanout port for fast and easy servicing.
- Telescopic stand is integral to humidifiers for easy installation.
- All service connections exterior to the humidifier ready for field connections.
- 208-240V single phase, 15 amp fused circuit power supply.
- Steam outlet configuration ready for duct distributor, remote mounted blower pack or Short absorption manifold connection.

NH Series
Electric Steam Humidifiers

operating ***advantages***

Precise control

The NHMC and NHDI have an automatic system test routine, and the alphanumeric display window provides readouts on operating parameters and self-diagnostic functions, including service indicators. The humidifier will make service adjustments automatically or trigger a shutdown while displaying the function requiring operator attention.

NH Series humidifiers can be easily integrated with a central HVAC control system, via a computer interface, for maximum control flexibility. Humidifiers can accept command inputs from a BMCS to automatically control the humidifier's output.

Economy

The NH Series humidifiers provide lower initial installation costs for the customer. Operating costs are also reduced through efficient steam conversion rates and minimal energy losses due to low hot water drain rates.

NH humidifiers provide clean humidification, reducing air-borne contaminants and subsequent health-related employee absenteeism. Correct interior humidity levels in winter maintain comfort at lower temperatures and can reduce heating costs. NH self-diagnostics confirm optimal operational efficiency and reduce servicing costs.

Installation Flexibility

NH humidifiers offer unprecedented installation flexibility. They can be configured for both small and large systems.

Steam distribution is easily accomplished through either the HVAC duct system or into individual areas through built-on or remote blower packs.

VERSATILE
STEAM
DISTRIBUTOR
SYSTEMS

SAM-e
SHORT ABSORPTION MANIFOLD

electrode **steam**

The electrode steam system produces pure uncontaminated steam with variable output through electronic power control of the electrodes. Water borne minerals remain in the cylinder and are periodically flushed out through the automatic cylinder drain. On NHMC and NHP models the drain automatically empties the steam cylinder if it is not operated for three days. Solid mineral scale sinks to the bottom of the cylinder which, when filled with residue, is easily removed and replaced.

resistive **steam**

The NHDI resistive element offers the highest accuracy performance available. Designed for use with DI/RO water incorporating high quality stainless steel heating elements combined with solid state relays, it allows for very tight control of relative humidity. When using a high precision humidistat, the NHDI can be accurate to ±1% rh. With standard modulating control ±2% rh is achievable. With either control the NHDI has variable output from 0-100%. Like electrode steam, resistive steam produces pure uncontaminated steam.

system **features**

The ***NHMC*** is the most advanced electrode steam humidifier available in the world today. Its built-in micro-computer provides instantaneous updating of all operating parameters. And, it is easily programmable for compatibility with most Building Management Control Systems.

The ***NHP*** Serie includes all the most wanted technological features, ensuring top-of-the-line performance. Available with modulation and on/off control, and LED display of steam output, this unit offers proven reliability at an economical price.

The ***NHB*** offers all the basic NORTEC time-proven humidification features for advanced technology applications requiring a simple on/off control.

feature**comparison**

The ***NHDI*** is the most advanced resistive steam humidifier when it comes to DI/RO water operation. It's built-in solid state relays and high quality stainless steel heating elements provide the most accurate humidity control available in the world.

	NHMC	NHP	NHB	NHDI
Alphanumeric function display	x			x
Keypad programming	x			x
Auto self-test at start-up	x	x		x
Micro-computer electronics	x	x		x
DI/RO water operation				x
Potable water operation	x	x	x	
Stainless Steel cylinder				x
Disposable cylinders	x	x	x	
Low waste drain water	x	x	x	x
SSR operation (standard)				x
Stainless Steel heating element				x
Auto Adaptive Control System	x	x	x	
Dual float water level control				x
P+I Control System	x	x		x
Network capability to 808 lbs.	x			
Modulation Control	x	x		x
Building Management System Interface	x	x		x
VAV control system	x	x		x
On/Off control systems	x	x	x	x
Dual modulating capability (with NORTEC controller)	x	x		x
Display of space RH	x			
Display of space temperature	x			
Display of RH setpoint	x			
Keypad setpoint adjustment	x			
Output display	x	x		x
Status indicator lamps	x	x	x	x
Autopulse of drain valve	x	x		
Cylinder drain (3 day no-call)	x	x		
Tempered drain during normal operation	x	x	x	
Independent circuits on multi-cylinder humidifiers	x	x	x	
Manual output adjustment (20-100%)	x	x	x	
Manual output adjustment (0-100%)				x
Fill cup with 1" air gap	x	x	x	x
Door interlock switch	x	x	x	x
High water shut-off	x	x	x	x
Key lock doors	x	x	x	x
Simple installation	x	x	x	x
Built-on or remote blower packs	x	x	x	x
Steam distributors with condensate separators	x	x	x	x
UL listed	x	x	x	x
CSA certified	x	x	x	
Two year limited warranty	x	x	x	x

technicaldata

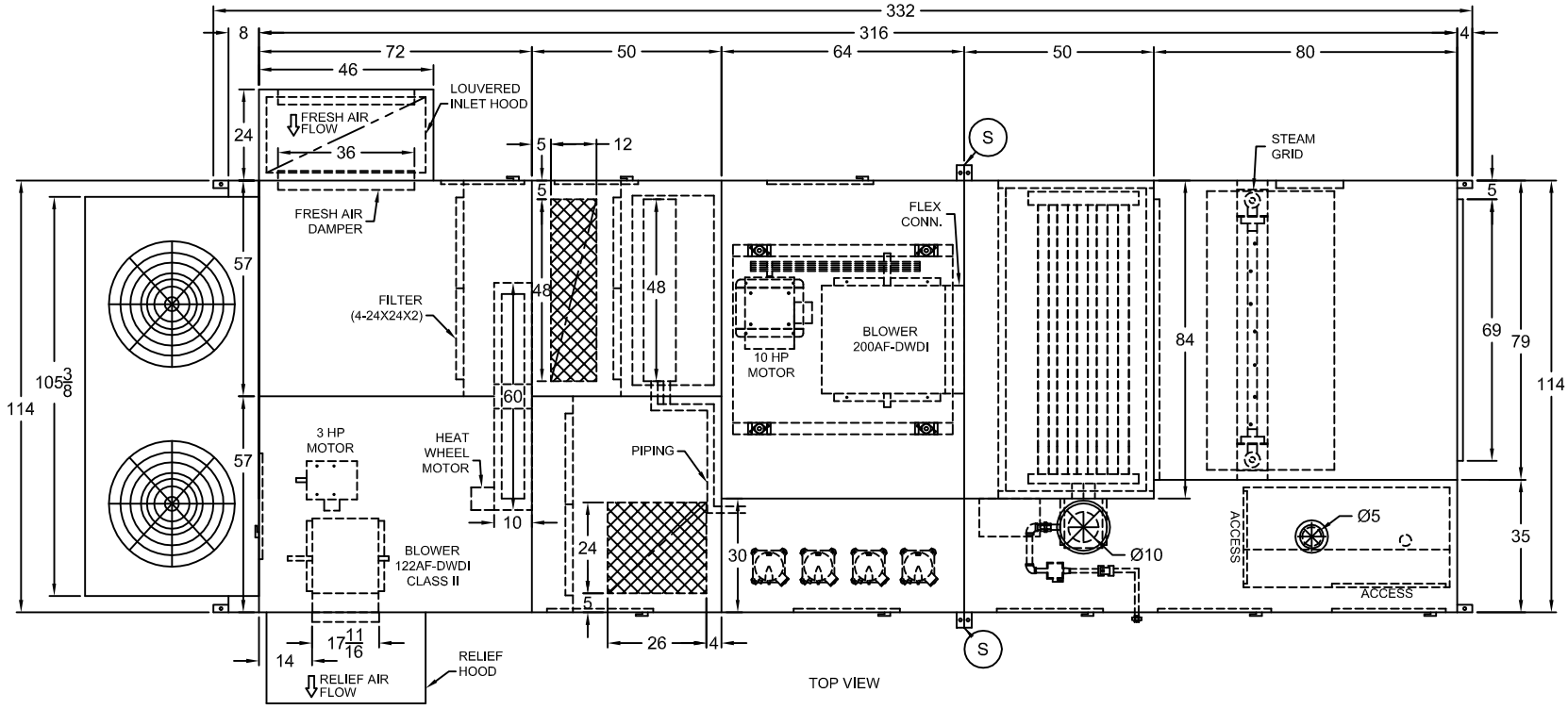
Capacity: lbs/hr*	1-5	2-10	4-20	4-20	6-30	10-50	15-75	20-100	15-150	20-200
Capacity: kg/hr*	0.5-2.2	0.9-4.5	1.8-9	1.8-9	2.7-13.6	4.5-22.7	6.8-34	9-45	6.8-68	9-91
Input kW max	1.9	3.8	7.6	7.6	11.4	17.2	26.0	34.3	52.0	68.6
Voltage	110-120	208-600	208-600	208-600	208-600	208-600	208-600	208-600	208-600	208-600
Phase	1	1	1	3	3	3	3	3	3	3
No. of Cylinders/Control Circuits	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	2/2	2/2
STEAM DISTRIBUTION CHOICES										
Steam hose I.D.	7/8"	7/8"	7/8"	7/8"	7/8"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"
Duct mounted distributors	ASD-12-60	ASD-12-60	BSD-12-102	BSD-12-102	BSD-12-102	CSD-24-144	CSD-24-144	CSD-24-144	CSD-24-144	CSD-24-144
Built-on blower packs	yes	yes	yes	yes	yes	yes	yes	yes	n/a	n/a
Remote mounted blower packs	yes	yes	yes	yes	yes	yes	yes	1-2 units	2-4 units	2-4 units

*NHB, NHP, NHMC can be field adjusted from 20% to 100% of full output.

Capacity: lbs/hr*	0-12.8	0-24.5	0-24	0-31.9	0-54.1	0-77.6	0-92.6	0-155.3	0-185.3
Capacity: kg/hr*	0-5.8	0-11.1	0-10.9	0-14.5	0-24.5	0-35.2	0-42	0-70.4	0-84.1
Input kW max	4.2	8.0	7.8	10.5	18.4	25.3	30.2	50.7	60.4
Voltage	208-600	208-600	208-600	208-600	208-600	460-600	460-600	460-600	460-600
Phase	1	1	3	3	3	3	3	3	3
No. of Stainless Steel Tanks	1	1	1	1	1	1	1	2	2
STEAM DISTRIBUTION CHOICES									
Steam hose I.D.	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"	1-3/4"
Duct mounted distributors	ASD-12-102	BSD-12-102	BSD-12-102	CSD-24-144	CSD-24-144	CSD-24-144	CSD-24-144	CSD-24-144	CSD-24-144
Built-on blower packs	yes	yes	yes	yes	yes	yes	yes	n/a	n/a
Remote mounted blower packs	yes	yes	yes	yes	yes	yes	1-2 units	2-4 units	2-4 units

For details on these and other humidifiers, please consult factory.

*Capacities are voltage dependant. Output can be field adjusted from 0-100%.



NOTE:

(S) SPLIT FOR SHIPMENT:

1. 1 1/2 INLET AND DISCHARGE FLANGES.
2. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED. RECOMMENDED CLEARANCE 24 INCHES.

DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.

Rev	By	Revision Description	Date

ICE WESTERN
HTDM SERIES

TITLE

HTDM 1000 HORIZ. CONFIG. GRAVITY VENTED OUTDOOR UNIT c/w FLAT FILTER, HEAT WHEEL, DX COIL, CONDENSING UNIT, AND HUMIDIFIER.

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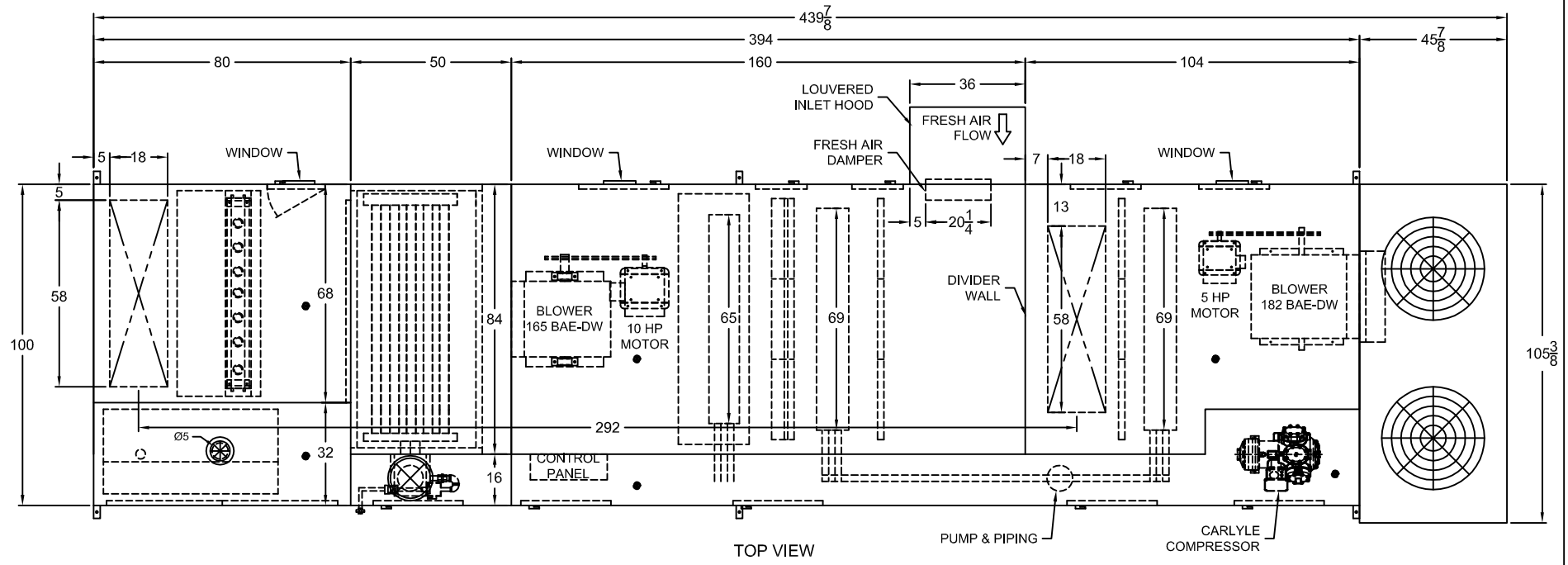
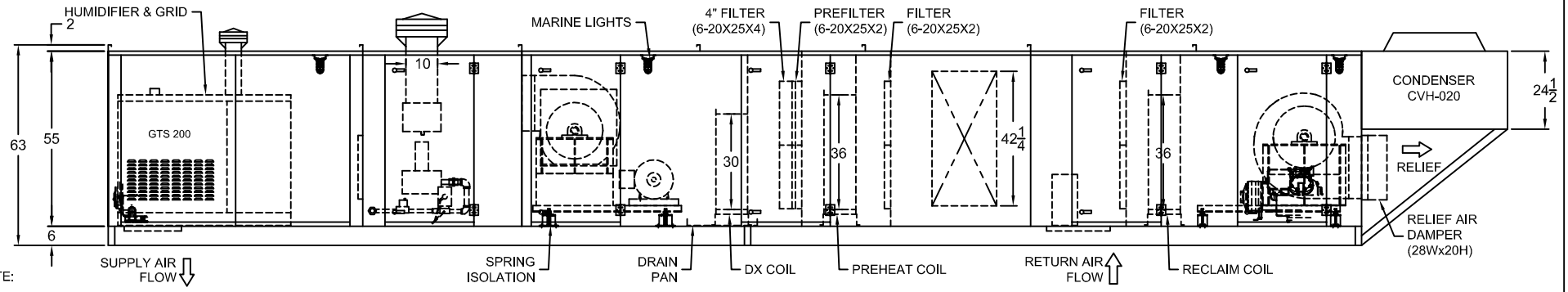


TOP VIEW



SIDE VIEW

NOTE:

1. 1 1/2 INLET AND DISCHARGE FLANGES.
2. SERVICE ACCESS PANELS MUST NOT BE OBSTRUCTED. RECOMMENDED CLEARANCE 24 INCHES

DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.

Rev	By	Revision Description	Date

WESTEN
HTDM SERIES

TITLE

HTDM 1000 HORIZ. CONFIG. GRAVITY VENTED OUTDOOR UNIT c/w FLAT FILTER, MIX BOX w/ RETURN DX COIL, CONDENSING UNIT, AND HUMIDIFIER.

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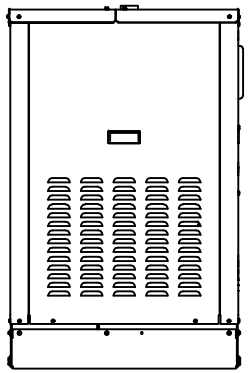

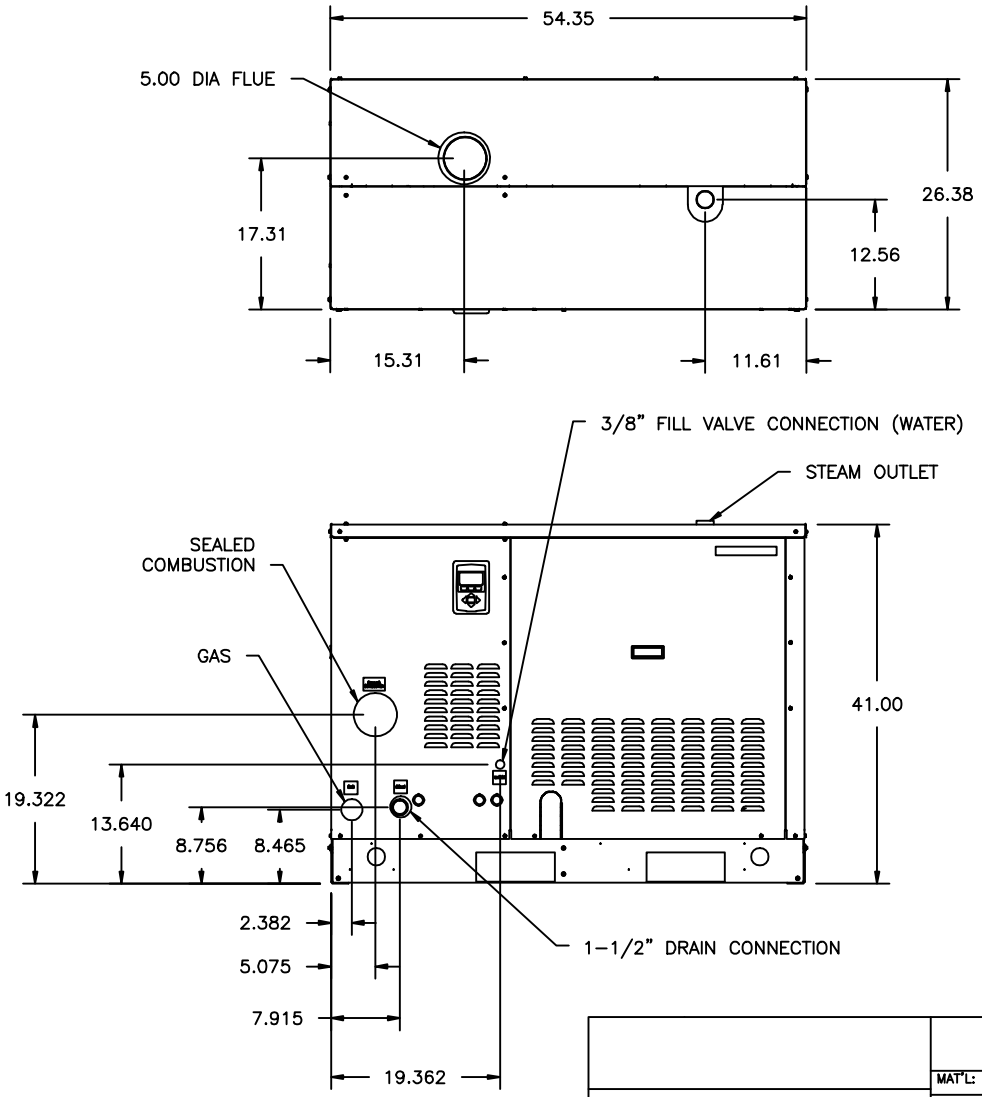

DRISTEEM

GTS04-100, 200
INDOOR SHROUD

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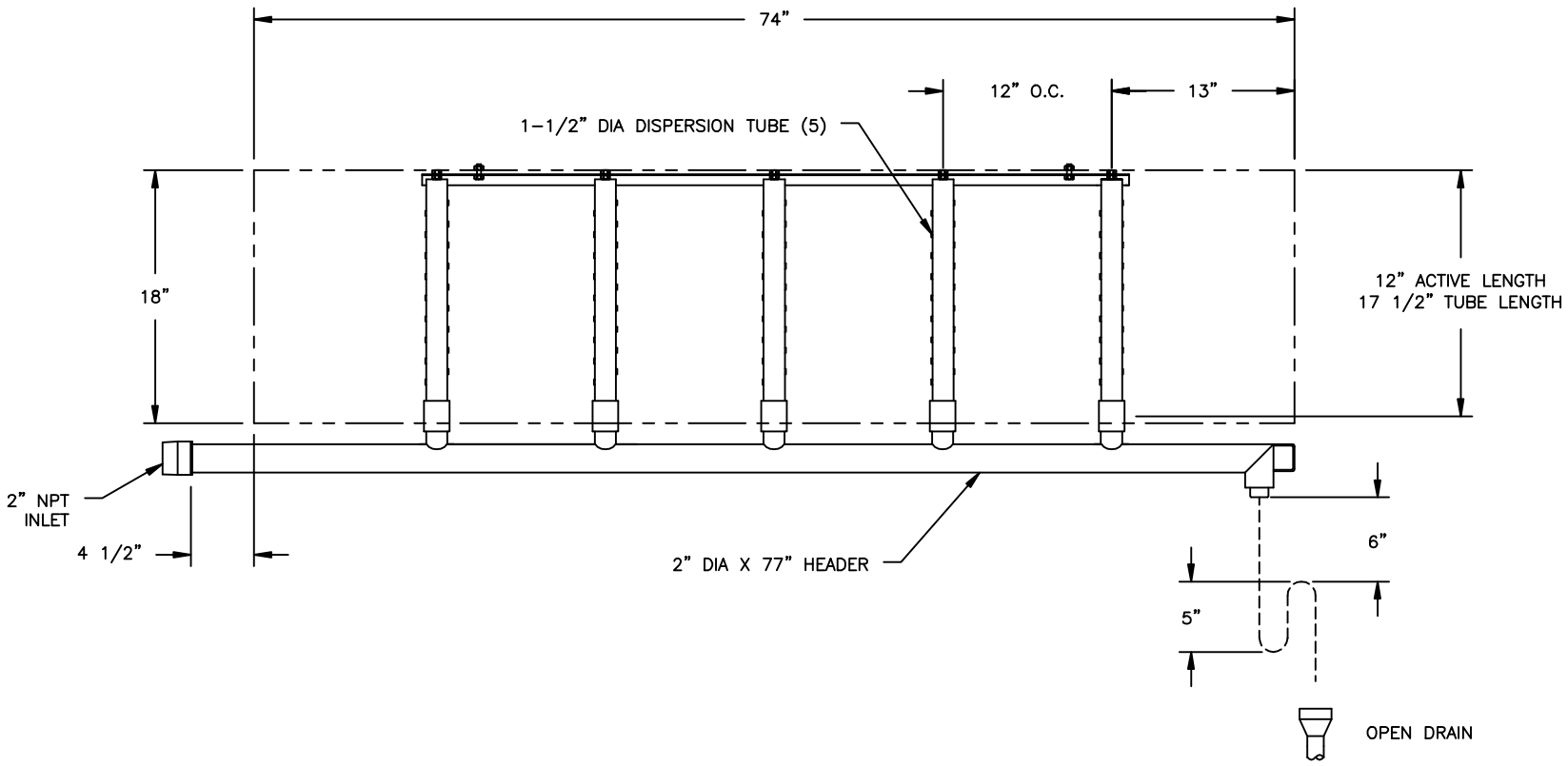

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TYPICAL SPECIFICATIONS

CASING

The unit exterior casing shall be heavy gauge G90 rated bonderized steel. Unit roof shall feature standing seam construction. The entire unit casing shall be insulated with 1-in. thick 1.5-lb. (2-in. thick 1.5-lb.) fiberglass insulation with hard neoprene backing in a sandwich wall fashion (22-gauge solid liner). The unit exterior shall be finished with industrial enamel (catalyzed epoxy) paint. An integral welded iron channel frame shall support the unit casing. The structural iron frame shall be sandblasted, primed and finished with industrial enamel (catalyzed epoxy) paint.

BLOWER/MOTOR SECTION

The fan section and motor assembly shall be constructed in accordance with the requirements of the Air Moving and Conditioning Association (AMCA). The assembly shall be designed to house the fan(s), bearings, motor, and v-belts, which shall be selected for at least 50% above the rated motor capacity. The fan(s) and motor shall be mounted on a welded unitary base made of angle iron frame. The frame shall be sandblasted, primed and finished with industrial enamel (catalyzed epoxy) paint. The unitary base shall be provided with seismic spring vibration isolation. The blower section shall have a hinged access door with Ventlock handles to allow easy maintenance of filters and belts. The NEMA T-Frame motor shall be mounted on an adjustable base located within the fan section. The blower wheel shall be statically and dynamically balanced, and mounted on a turned, ground and polished shaft with rigid bearing supports. The shaft shall be designed with a maximum operating speed not exceeding 75% of the first critical speed. The bearings shall be split taper lock ball bearing type L20 minimum life of 100,000 hours (L10 200 kHr).

Fan performance shall be based on tests conducted in accordance with AMCA Standard Test Code for Air moving Devices. (All fans shall have sharply rising pressure characteristic extending throughout the operating range and continuing to rise well beyond the efficiency peak to assure quiet and stable operation under all conditions. Horsepower characteristics shall be truly non-overloading and shall reach a peak in the normal selection area.) Fan manufacturer shall provide sound power ratings in the eight octave bands, which shall be based on AMCA Standard 300-67, test, setup number one. Sound power ratings shall be referenced 10-12 watts. A factory dynamic balance shall be made on all fans after their assembly. An IRD or PMC analyzer shall be used to measure velocity, and the final reading shall not exceed 0.1 inches per second. The exact level of vibration shall be recorded on the fan as proof of the final dynamic balance at the factory.

COOLING CONTROLS

Cooling control shall be achieved via a Honeywell T775 multi-stage sequencer. The sequencer shall be controlled with an analog signal provided by the discharge air thermostat. As the discharge air thermostat requires cooling the signal shall increase, thereby turning on the stages at specific set points. The set points shall be set with appropriate offset and differential to ensure accurate discharge temperature is maintained. The stages are to be sequenced without turning on and off of compressors to minimize unnecessary wear on the compressors. Upon sensing a call for cooling from the space, the compressors shall provide full cooling until the space sensor is satisfied, upon which time the cooling shall revert to discharge air control. A low discharge temperature set point with a large differential shall

be set to prevent the compressor from cycling on and off. The compressor will remain on low setting until cooling is disabled manually or the ambient temperature falls below the minimum set point.

ELECTRICAL CONTROL EQUIPMENT

Electrical assembly and components shall be in strict accordance with the latest provisions and requirements of the National Electric Code. Control cabinet shall be designed and constructed to ETL specifications. A safety disconnect switch shall be mounted on the unit. The controls shall be located in a weatherproof cabinet. Provisions for service padlocking shall be provided. The following items shall be located within the cabinet: fuses, starters, control relays, timing and holding relays, resistors and numbered terminal strips. All components shall be labeled and cross-referenced to control and field wiring diagrams. The control circuit shall be 24V, single phase. Wiring shall be neatly run in "PANDUIT" wiring duct. Low and/or line voltage thermostats shall be furnished shipped loose for installation by others. Unit shall be equipped with automatic low limit freeze protection with bypass timer.

DAMPERS & FILTER SECTION

The dampers are to be galvanized steel (aluminum airfoil low leak) type (with seals). The dampers shall be equipped with 2-position (modulating) actuators. The filters shall be 2" pleated throwaway type with minimum of 85% arrestance and 30% efficiency. Filter access shall be through a latched and gasketed access doors located on both sides of the unit. (Final filters shall be 4 or 12 inch high efficiency cartridge filters.)

REMOTE CONTROL PANELS

Remote NEMA 1(12) locking control panel shall be equipped with summer/off/winter switch and blower on, burner on, flame failure and loaded filter lights. (A remote adjustment potentiometer shall control damper positioning.) (An LCD display shall provide system temperature and set points.)

FLUID COILS

Fluid coils are intended for use with water, glycol, or other appropriate heat transfer fluids. Coils are to be designed to maximize performance under specified conditions with minimal air-side pressure drop.
All water coils designed with 1/2” or 5/8” tubes are to be ARI performance certified and shall bear the ARI symbol.
Tubes and return bends shall be constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed with a maximum grain size of 0.040 mm.
Tubes are to mechanically expanded into fins (secondary surface) for maximum heat transfer. Materials are to be 3/8” diameter x (0.014, 0.022) wall thickness, 1/2” diameter x (0.016, 0.025) wall thickness, or 5/8” diameter x (0.020, 0.025, 0.035, 0.049) wall thickness.
Secondary surface (fins) shall be of the plate-fin design using aluminum or copper, with die-formed collars. Fin design to be flat, waffle, or sine-wave in a staggered tube pattern to meet performance requirements.
Collars will hold fin spacing at specified density, and cover the entire tube surface. Aluminum properties are to be Alloy 1100 per ASTM B209, with O (soft) temper; copper is to be Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free of oils and oxidation.

Headers are to be constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size. Type K (drawn) copper headers and Schedule 40 steel headers shall be offered as optional materials.
Die-formed copper end caps are brazed on the inside of the headers, unless spun-closed (for sizes up to 1-3/8”). 1/4” vents and drains are to be provided for all fluid coils.
Connection material shall be copper, or Schedule 40 steel or red brass pipe. The type of connection is to be sweat type, MPT or FPT, grooved, or flanged as required.
Coil casing material shall be of G90 galvanized steel, 16 gauge minimum. Heavier material, stainless steel, copper, or aluminum casing are to be provided as required.
Intermediate tube supports are to be provided on all coils 48” and longer fin length. Coil casing on top and bottom of coils are to have double-flange construction, allowing for vertical stacking of coils.
All coils are to be brazed with minimum 5% silver content (BCup-3) filler material to insure joint integrity. Low-fuming, flux-coated bronze braze-weld material is to be used for ferrous to non-ferrous joints.
Coils shall be tested at 550 psig using dry nitrogen, submerged under water. Dual-operator verification shall determine that all coils are leak-free.
Fluid coils shall be designed to withstand 300ºF maximum operating fluid temperature, and 250 psig maximum operating pressure.

EVAPORATOR COILS

Evaporator coils are intended for use with a wide range of applications and refrigerant types. Coils are to be designed to maximize performance under specified conditions with minimal air-side pressure drop.
Coils shall be UL recognized as Refrigerant Containing Component. Coils to be used with refrigerant R-410A shall have undergone cycle testing, and shall be safety listed with 750 psig rating.
Tubes and return bends shall be constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed with a maximum grain size of 0.040 mm.
Tubes are to mechanically expanded into fins (secondary surface) for maximum heat transfer. Materials are to be 3/8” diameter x (0.014, 0.022) wall thickness, 1/2” diameter x (0.016, 0.025) wall thickness, or 5/8” diameter x (0.020, 0.025, 0.035, 0.049) wall thickness.
Secondary surface (fins) shall be of the plate-fin design using aluminum or copper, with die-formed collars. Fin design to be flat, waffle, or sine-wave in a staggered tube pattern to meet performance requirements.
Collars will hold fin spacing at specified density, and cover the entire tube surface. Aluminum properties are to be Alloy 1100 per ASTM B209, with O (soft) temper; copper is to be Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free of oils and oxidation.
Headers are to be constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size. Type K (drawn) copper headers shall be offered as optional material.
Die-formed copper end caps are brazed on the inside of the headers, unless spun-closed (for sized up to 1-3/8”).
Evaporator coils shall be designed with brass liquid distributors (as required), and copper sweat suction connections. Distributors shall be capped using soft-solder for ease of cap removal; suction connections shall be capped.
Coil casing material shall be of G90 galvanized steel, 16 gauge minimum. Heavier material, stainless steel, copper, or aluminum casing are to be provided as required.
Intermediate tube supports are to be provided on all coils 48” and longer fin length. Coil casing on top and bottom of coils are to have double-flange construction, allowing for vertical stacking of coils.

All coils are to be brazed with minimum 5% silver content (BCup-3) filler material to insure joint integrity.
Coils shall be tested at 550 psig using dry nitrogen, submerged under water. Dual-operator verification shall determine that all coils are leak-free.
Coils shall be shipped with nitrogen charge to verify leak-free integrity, and to prevent moisture migration into coil.
Coils shall be certified to withstand 750 psig working pressure.

CONDENSER COILS

Condenser coils are intended for use with a wide range of applications and refrigerant types. Coils are to be designed to maximize performance under specified conditions with minimal air-side pressure drop.
Coils shall be UL recognized as Refrigerant Containing Component. Coils to be used with refrigerant R-410A shall have undergone cycle testing, and shall be safety listed with 750 psig rating.
Tubes and return bends shall be constructed from seamless UNS C12200 copper conforming to ASTM B224 and ASTM E527. Properties shall be O50 light annealed with a maximum grain size of 0.040 mm.
Tubes are to mechanically expanded into fins (secondary surface) for maximum heat transfer. Materials are to be 3/8” diameter x (0.014, 0.022) wall thickness, 1/2” diameter x (0.016, 0.025) wall thickness, or 5/8” diameter x (0.020, 0.025, 0.035, 0.049) wall thickness.
Internally enhanced rifled or cross-hatched tubes can be offered as an option.
Secondary surface (fins) shall be of the plate-fin design using aluminum or copper, with die-formed collars. Fin design to be flat, waffle, or sine-wave in a staggered tube pattern to meet performance requirements.
Collars will hold fin spacing at specified density, and cover the entire tube surface. Aluminum properties are to be Alloy 1100 per ASTM B209, with O (soft) temper; copper is to be Alloy 11000 per ASTM B152-06 with soft (anneal) temper. Fins are to be free of oils and oxidation.
Headers are to be constructed of seamless UNS C12200, Type L (drawn) copper material sized to match specified connection size. Type K (drawn) copper headers shall be offered as optional material.
Die-formed copper end caps are brazed on the inside of the headers, unless spun-closed (for sized up to 1-3/8”).
Condenser coils shall be designed with copper sweat connections, and shall be shipped with caps on connections.
Coil casing material shall be of G90 galvanized steel, 16 gauge minimum. Heavier material, stainless steel, copper, or aluminum casing are to be provided as required.
Coils designed for hot-gas applications shall have oversized tube sheet holes for hot gas feeds to allow for free expansion and contraction of tubes during operation.
Intermediate tube supports are to be provided on all coils 48” and longer fin length. Coil casing on top and bottom of coils are to have double-flange construction, allowing for vertical stacking of coils.
All coils are to be brazed with minimum 5% silver content (BCup-3) filler material to insure joint integrity.
Coils shall be tested at 550 psig using dry nitrogen, submerged under water. Dual-operator verification shall determine that all coils are leak-free.
Coils shall be shipped with nitrogen charge to verify leak-free integrity, and to prevent moisture migration into coil.
Coils shall be certified to withstand 750 psig working pressure.

REFRIGERATION COMPRESSORS

Compressors shall be either hermetic or semi-hermetic type.

A) Semi-Hermetic- Semi-hermetic reciprocating compressors shall be provided on systems with total cooling capacity of 25 Tons and larger. Up to 40 tons a single compressor will be used and multiple semi-hermetic compressors over 40 Tons. Compressors shall be completely factory assembled, piped, insulated, internally wired and tested. Units shall be shipped in one piece and come fully charged with refrigerant and filled with compressor oil. Units shall be rated in accordance with ARI standards. The refrigerant system shall be leak tested, evacuated and refrigerant charged at the factory. Compressors shall be suction gas cooled and come with integral spring vibration isolators, oil level sight glass, discharge mufflers, vibrasorbers, automatic reversible oil pump, oil filter screen. Oil charging valve, crankcase heater which de-energizes during compressor operation, liquid line service valves. Unit shall also have the following safety control features:
    - Low pressure cutout
    - High pressure cutout, manual reset
    - Adjustable low ambient lockout
    - Liquid line solenoids incorporating pump down system
    - Anticycling time device (to prevent excessive cycling and premature wear on compressor and contactors) and phase and brownout protection.
    - Oil failure control

Provide cylinder suction pressure unloaders for capacity control, with minimum steps required to provide coil frost protection, based on refrigerant circuit suction temperatures. Provide filter dryers, sight glasses and compressor service valves for each individual compressor. Provide hot gas bypass for each compressor. Compressor staging to be provided by a Honeywell T775 Series standalone controller mounted in the unit.

B) Hermetic compressors- Compressors shall be set on resilient neoprene mounts and complete with line voltage break internal overload protection, internal pressure relief valve and crankcase heater. Each unit shall have a minimum of two compressors. Whereby a unit utilizing two compressors the first stage compressor must be a digital scroll operating with a Emerson EC3 series stand-alone superheat controller with a built in synchronization control for the digital scroll. Unit will provide turndown on cooling. Multiple refrigeration circuits shall be separate from each other. Refrigeration circuits shall be complete with liquid line filter-driers, and service ports fitted with Schraeder fittings. Units shall incorporate load compensated thermal expansion valves with external equalizers (electronic expansion valves on digital systems) and combination sight glass moisture indicators. System charge will be designed for 10 degrees Fahrenheit. Each system shall be factory run and adjusted prior to shipment. Controls shall include:
    - Compressor motor contactors
    - Overload protection control
    - Cooling relays
    - Ambient compressor lockout
    - Dual pressure controls
    - Anti-cycle timers

- Hot gas bypass on lead compressor to maintain adequate suction pressure in the event of low loads
  (only when digital scrolls are not being used)

Packaged units shall operate down to 50 degrees Fahrenheit as standard. Minus 40 refrigeration systems are available as an option. Compressors shall be located on the side of the unit in a service enclosure complete with hinged access doors.

HTDM TYPE HEAT EXCHANGER

The heat exchanger shall be of two-pass design, made up of at least 16-gauge stainless steel drum and tubes. The primary and secondary heat transfer surfaces shall be constructed of Type 409 series stainless steel, with internal stainless steel high efficiency enhancing baffles. The stainless steel tubes shall be continuously welded into the secondary front and rear header tube sheets to ensure an airtight seal. Units shall be provided with multiple condensate drains. The heat exchanger section shall have an internal radiation shield to maintain a jacket loss of less than 2% of rated output. All heat transfer surfaces, including headers and the front collector box, shall be inside the casing and in the airstream. The construction of the heat exchanger shall permit free, unrestricted lateral, vertical, and peripheral expansion during the heating and cooling cycle without damage or strain to any part. The burner shall be constructed with at least 14-gauge stainless steel and with the air baffles being made up of 430 stainless steel to ensure high durability and life of the burner. The burner assembly shall be a blow through positive pressure type with an intermittent pilot ignition system. Flame supervision shall be with a solid state programmed flame relay complete with flame rod. The unit's burner motor and modulating gas valve must be electronically controlled to guarantee, to the customer, a highly efficient unit at all times and applications. The unit efficiency shall be a minimum of 80% through the entire operating range and shall be independently tested and verified by ETL. The main and pilot manifolds shall be completely factory pre-piped to the burner. This assembly shall be wired and include the following minimum components; main and pilot manual shut-off valves, main and pilot regulators, main and pilot automatic shut off valves and adequate unions and test ports for unconstrained service. There must also be a means of collecting and disposal of condensate formed in the flue gas by means of a 409 stainless steel flue box with drain and heat exchanger drains. Drains shall be made of copper (stainless steel) tubing.

HUMIDIFIER

The tank and cover shall be 14-gauge stainless steel with Heli-arc welded seams. The burner assembly shall be AGA/CGA certified and tested. The humidifier shall be capable of modulating down to 10% of the maximum steam capacity. The gas train assembly complete with burner/mixing tube assembly, igniter, sight glass, flame rod electrode, gas manifold and gas valve. The heat exchanger shall be tubular stainless steel connected to a stainless steel flue box. The humidifier shall be capable of supporting tap, softened or DI/RO water. The unit shall contain the following features: water make-up valve control, auto drain/flush, end-of-season flush, low water cutoff, modulating steam control, aquastat freeze protection, surface skimmer, support legs, factory insulation, blocked flue safety, service access port and removable cleanout tray. A microprocessor-based controller shall be provided and be capable of both on/off and fully modulating (0-100%) control of humidifier outputs as well as control of all fill and drain functions. A keypad capable of either unit or remote mounting shall be provided as the controller. The keypad shall be capable of monitoring and/or controlling the following parameters: relative humidity set-point and actual space conditions, relative humidity set-point and actual duct conditions for variable

air volume applications, relative humidity high limit set-point and actual conditions, total system demand in % of total humidifier capacity, total system output in lb./hr, auto drain/flush frequency interval and duration, end-of-season drain status and system fault indicator. The unit shall be supplied with a stainless steel dispersion assembly complete with calibrated orifice tubelets. Provided assembly for connection between humidifier and dispersion tube assembly.